DATALOGIC

SG4 EXTENDED

Instruction Manual

ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)

Datalogic Automation S.r.l.
Via Lavino, 265
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Bologna - Italy

"SG4 EXTENDED" Instruction Manual

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RTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Product Service

CERTIFICATE

No. Z10 12 04 70800 006

Holder of Certificate: **DATALOGIC AUTOMATION S.r.l**
Via Lavino 265
40050 Monte S. Pietro
ITALY

Factory(ies): 70800

Certification Mark:

Product: **Electro-Sensitive Protective Equipment**
Safety Light Curtain (Type 4)

Model(s): **SG 4-Series**
For nomenclature see attachment

Parameters:

Supply Voltage:	24 ±20% Vdc
Resolution:	14mm, 30mm
Operating distance 14mm:	0,2m...6m
Operating distance 30mm:	0,2m...19m
Operating temperature:	-10....+55°C
Storage temperature:	-25..+70°C
Protection class:	IP65

Tested according to:
2006/42/EC
EN 61496-1/AC:2010
IEC 61496-2:2006
EN ISO 13849-1:2008 (Cat.4, PL e)
EN 61508-1:1998 (SIL3)
EN 61508-2:2000 (SIL3)
EN 61508-3:1998 (SIL3)
EN 61508-4:1998 (SIL3)
EN 62061:2005 (SIL CL3)
EN 50178:1997
EN 55022:2006

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.: DM82444T

Valid until: 2017-04-18

Date, 2012-04-23

(Peter Weiss)

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GENERAL VIEW

SG4 EXTENDED

LED DESCRIPTION

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, both for settings and for diagnostics (see chapter 6 and 8).

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION

1.1.1 General Description of the safety light curtains

The safety light curtains of the SG4 series 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 of the SG4 series are Type 4 intrinsic safety systems used as accident-prevention protection devices and are manufactured in accordance with the international Standards in force for safety, in particular:

EN 61496-1/AC: 2010 Safety of machinery: electrosensitive protective equipment.
Part 1: General prescriptions and tests.

IEC 61496-2: 2006 Safety of machinery: electrosensitive protective equipment - Particular requirements for equipment using active optoelectronic protective devices.

EN ISO 13849-1: 2008 (Cat.4, PL e) Safety of machinery. Safety-related parts of control systems.
Part 1: General principles for design

EN 61508-1: 1998 (SIL 3) Functional safety of electrical/electronic/programmable electronic safety-related systems.
Part 1: General requirements

EN 61508-2: 2000 (SIL 3) Functional safety of electrical/electronic/programmable electronic safety-related systems.
Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems

EN 61508-3: 1998 (SIL 3) Functional safety of electrical/electronic/programmable electronic safety-related systems.
Part 3: Software requirements

EN 61508-4: 1998 (SIL 3) Functional safety of electrical/electronic/programmable electronic safety-related systems.
Part 4: Definitions and abbreviations

EN 62061: 2005 (SIL CL3) Safety of machinery. Functional safety of electrical/ electronic/programmable electronic safety-related control systems.

The device, consisting of one emitter and one receiver housed inside strong 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 a M12 connector located in the lower side of the profile. 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 (see chapter 8 “*Diagnostic*”).

The device consists in 2 units that, according to the model, are composed by one or several emitting and receiving modules. 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 (see chapter 5 "*Alignment procedure*").
As soon as an object, 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 and blocks the MPCE machine (if correctly connected to the OSSD).

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

	**The information provided in the paragraphs following this symbol is very important for safety and may prevent accidents.** **Always read this information accurately and carefully follow the advice to the letter.**

GUI	**The paragraphs containing descriptions reported on the GUI too are written with this character.**

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 SG light curtains and the safety rules that regulate the correct installation (see chapter 9).

1.1.2 Package Contents

Package contains the following objects:

- Receiver (RX)
- Emitter (TX)
- Installation Quick Guide of SG4 EXTENDED curtain
- Biannual checklist and periodical maintenance schedule
- CD with instruction manual and other documents
- 4 angled fixing brackets and specific fasteners
- 2 additional angled fixing brackets for models with heights included between 1200 and 1800 mm

1.2 NEW FEATURES COMPARED TO SG4 BASE

With respect to SG4 BASE series, safety light curtains of SG4 EXTENDED series have some new important features:

- Higher operating distance
- New profile compatible with SE accessories
- Advanced alignment function for receiver and transmitter units
- Muting function
- Partial muting
- Selectable muting timeout
- Override
- Override status
- Blanking function (fixed and floating)
- Teach-in
- Tolerance
- Reduction Range
- Null dead zone (the controlled height of the light curtain is equivalent to the light curtain's height)
- Basic configuration with push-buttons (BCM)
- Advanced configuration with Grafic User Interface (ACM)
- Ethernet connection to pc
- PNP/NPN
- Coding
- Cascade
- Possibility of copying the setting of one light curtain and saving it into other light curtains
- Possibility of having a log report about the configuration

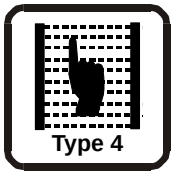
1.3 HOW TO CHOOSE THE DEVICE

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

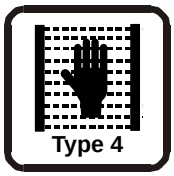
1.3.1 Resolution

The resolution of the device is the minimum dimension that an opaque object must have in order to obscure at least one of the beams that constitute the sensitive area.
The resolution strictly depends on the part of the body to be protected.

R =14mm finger protection



R = 30 mm hand protection



As shown in Fig. 1, 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.

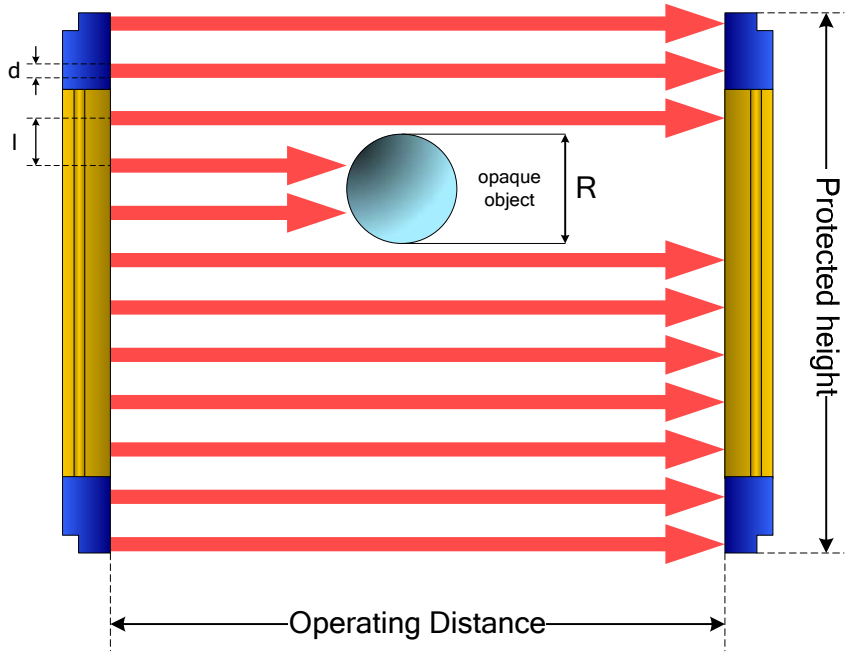


Fig. 1 – Resolution

The resolution value is obtained applying the following formula:

$$R = l + d$$

where:

l = Distance between two adjacent optics
d = Lens diameter

1.3.2 Controlled height

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

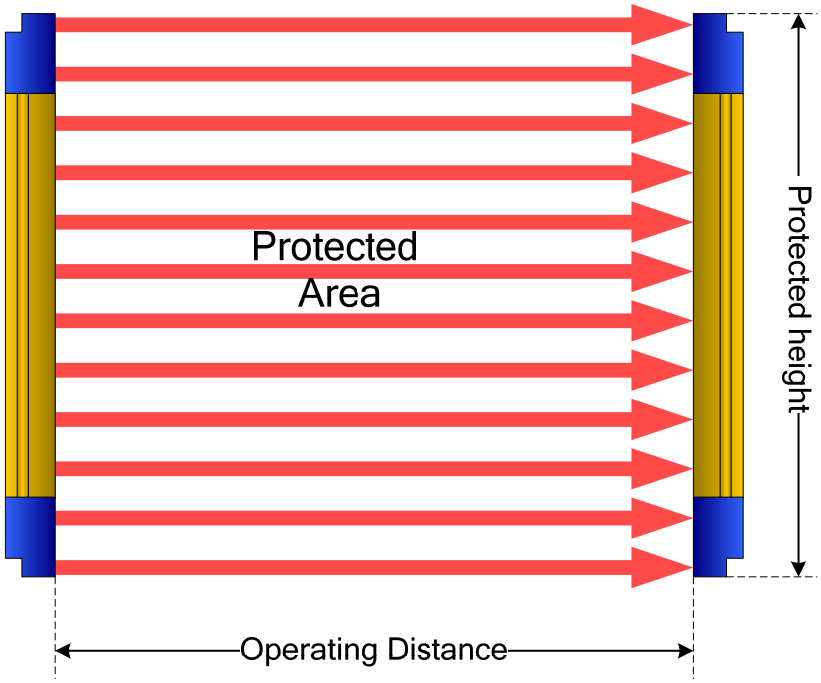


Fig. 2 – Controlled height

The height controlled by the SG4 EXTENDED is the whole height of the light curtain. Referring to the figure above the protected height is reported in the table here below.

Model	Protected height (mm)
SG4-xx-030-OO-P	300
SG4-xx-045-OO-P	450
SG4-xx-060-OO-P	600
SG4-xx-075-OO-P	750
SG4-xx-090-OO-P	900
SG4-xx-105-OO-P	1050
SG4-xx-120-OO-P	1200
SG4-xx-135-OO-P	1350
SG4-xx-150-OO-P	1500
SG4-xx-165-OO-P	1650
SG4-xx-180-OO-P	1800

xx = Resolution (14mm - 30mm)

1.3.3 Minimum installation distance

The safety device must be positioned at a specific safety distance (Fig. 3).
This distance must ensure that the dangerous area cannot be reached before the dangerous motion of the machine has been stopped by the ESPE.
The safety distance depends on 4 factors, according to the EN ISO 13855 Standard (which replaces EN999):

- Response time of the ESPE (the time between the effective beam interruption and the opening of the OSSD contacts)
- Machine stopping time (the time between the effective opening of the contacts of the ESPE and the real stop of the dangerous motion of the machine)
- ESPE resolution
- Approaching speed of the object to be detected

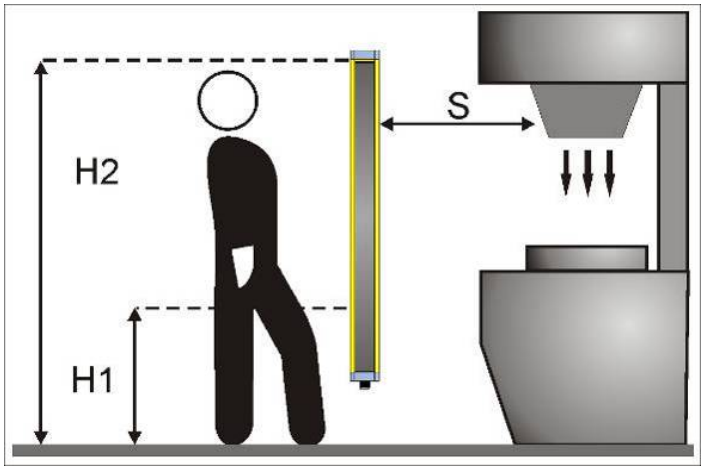


Fig. 3 – Minimum installation distance (vertical)

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 chapter 11)
t2 = Machine stopping time in seconds
d = Resolution of the 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 (d -14) for devices with resolution ≤ 40 mm
C = 850 mm for devices with resolution > 40 mm

NOTE: 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. 4), 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 (see chapter 11)
t2 = Machine stopping time in seconds.
H = Beam height from ground; this height must always be less than 1,000 mm.

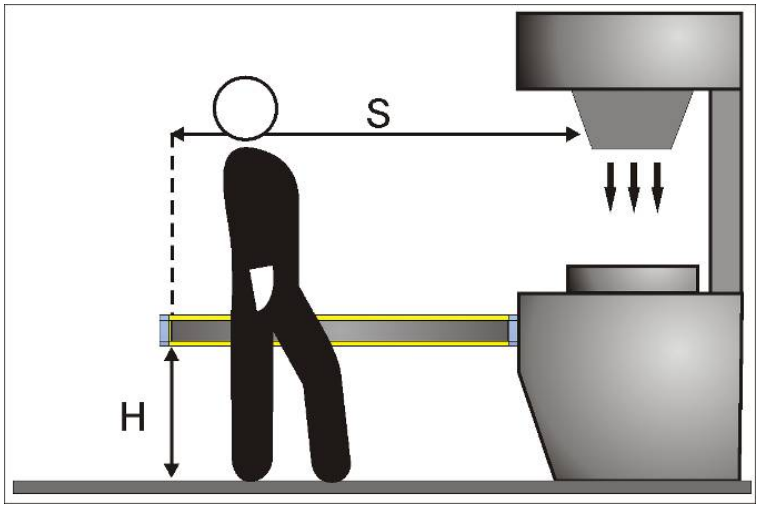


Fig. 4 – Minimum installation distance (horizontal)

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:
T = $t_1 + t_2$
t_1 = ESPE response time + SE-SR2 relay release time (max 80 ms)
t_2 = Machine total stopping time.
C = 8 * (d – 14) for devices with resolution <= 40 mm
D = resolution

In all cases, if K = 2000mm/sec then S > 500 mm. Distance will have then to be recalculated using K = 1600 mm/sec.

⚠	**WARNING: the reference standard is EN ISO 13855 (replaces EN 999) "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

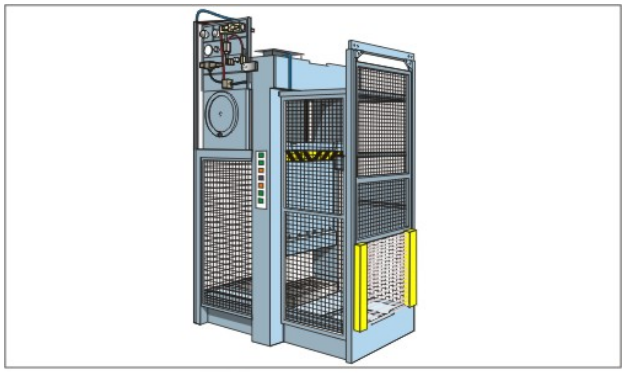
Example 1: operating point protection on drilling machines

The operator positions the part and takes it back after machining. The operator must be protected against possible abrasions while working.
Solution: SG4 EXTENDED 14 mm safety light curtain is especially suitable for this kind of application, which requires the installation of the device directly on the machine.

Benefits: Highly reduced profile size guarantees installation flexibility for machine dimensions.

Example 2: Bending presses

The safety device must protect the operator from being squashed between the top and bottom tool or the machined part during the fast approach phase.

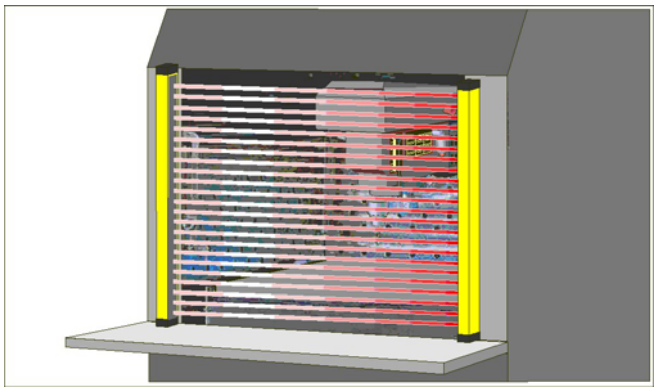


Solution: If only one beam of the SG4 EXTENDED safety light curtain is darkened while the press is moving down, the mobile tool bar will stop.

Benefits: The safety light curtain can be used in most bending operations thanks to its easy installation and compact dimensions. As well as offering excellent reliability, SG4 EXTENDED ensures increased plant productivity as it reduces the dead times necessary for machine accessing, adjustment and maintenance.

Example 3: Paper cutting machines

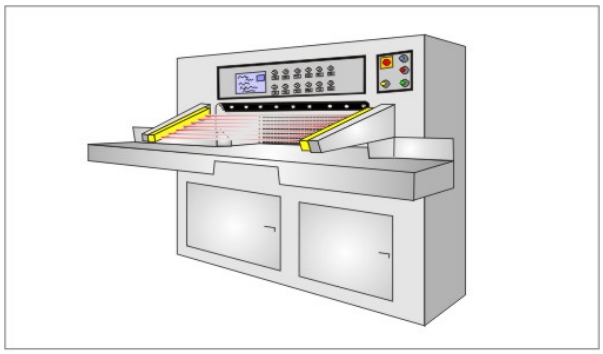
These machines typically cut paper to a specific size for newspapers or special applications. The operator must be protected against abrasion or cuts by cutter blades.



Solution: SG4 EXTENDED safety light curtain is especially suitable for this kind of application, which require the installation of the device directly on the machine.

Benefits: Highly reduced profile and the two side slots ensure installation flexibility for machine dimensions.

Example 4: Milling machines
A milling machine is a machine tool used for the shaping of metals and other solid materials. Operator hands and body must be protected from being dragged, entangled or cut by the tool / spindle.



Solution: SG4 EXTENDED series safety light curtain is the best solution considering the required safety levels and application type. When even just one of the light curtain beams is interrupted, the machine is immediately stopped.

Benefits: Highly reduced profile size guarantees installation flexibility for machine dimensions.

1.5 SAFETY INFORMATIONS

⚠	**For a correct and safe use of the safety light curtains of the SG4 series, 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 reported in par. 1.3.3 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 (see chapters 2, 3, 4, 5) 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 (see chapters 2, 3)
- 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 TEST button must be located outside the protected area because the operator must check the protected area during all Test and Reset operations

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

2 INSTALLATION

2.1 PRECAUTIONS TO BE OBSERVED FOR THE CHOICE AND INSTALLATION

Make sure that the protection level assured by the SG4 device (Type 4) is compatible with the real danger level of the machine to be controlled, according to EN ISO 13849-1 or EN 62061.

- Use only matched pair 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 a room complying with the technical characteristics indicated in chapter 11.
- Do not install anything close to strong and/or flashing light sources or close to similar devices
- The presence of intense electromagnetic disturbances could affect device's correct operation. This condition shall be carefully assessed by seeking 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 so jeopardise functioning.

2.2 GENERAL INFORMATION ON DEVICE POSITIONING

The safety light curtain should be carefully positioned, in order to reach a very high protection standard; access to the dangerous area must only be possible by passing through the protecting safety light beams.

⚠	**Fig. 5 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 a sufficient height in order to completely cover the access to the dangerous area (Fig. 6) becomes necessary.**

NO

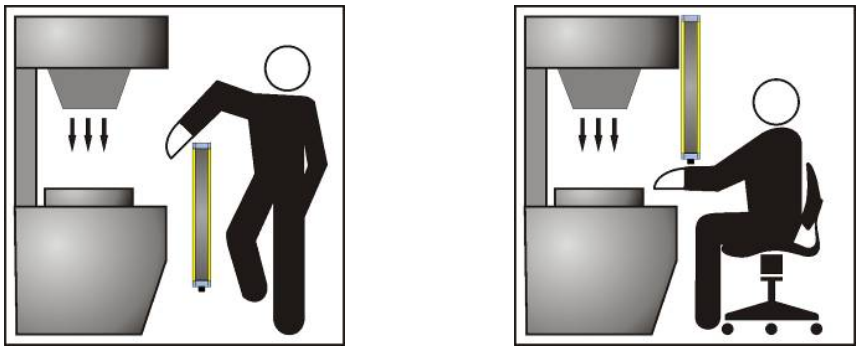


Fig. 5 – Incorrect device positioning

YES

Fig. 6 – Correct device positioning

Under standard operating conditions, machine starting must not be possible while operators are inside the dangerous area.
When the installation of the safety light curtain very near to the dangerous area is not possible, a second light curtain must be mounted in a horizontal position in order to prevent any lateral access, as shown in **Fig. 8**.

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

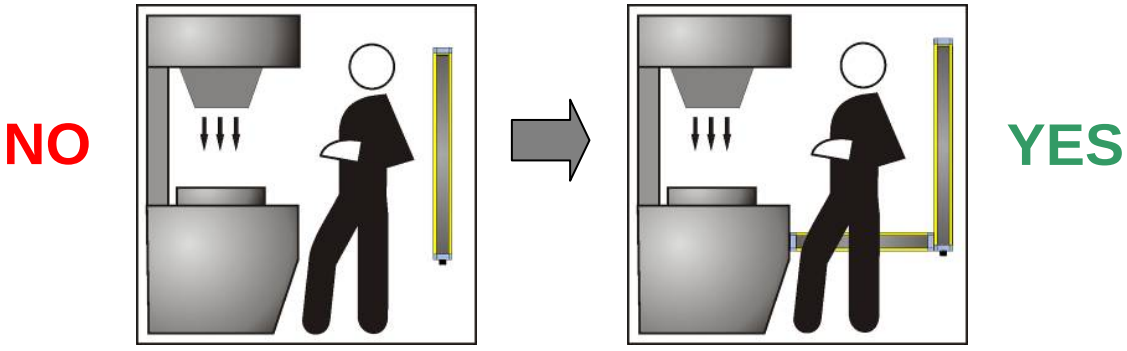


Fig. 7 Fig. 8

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.

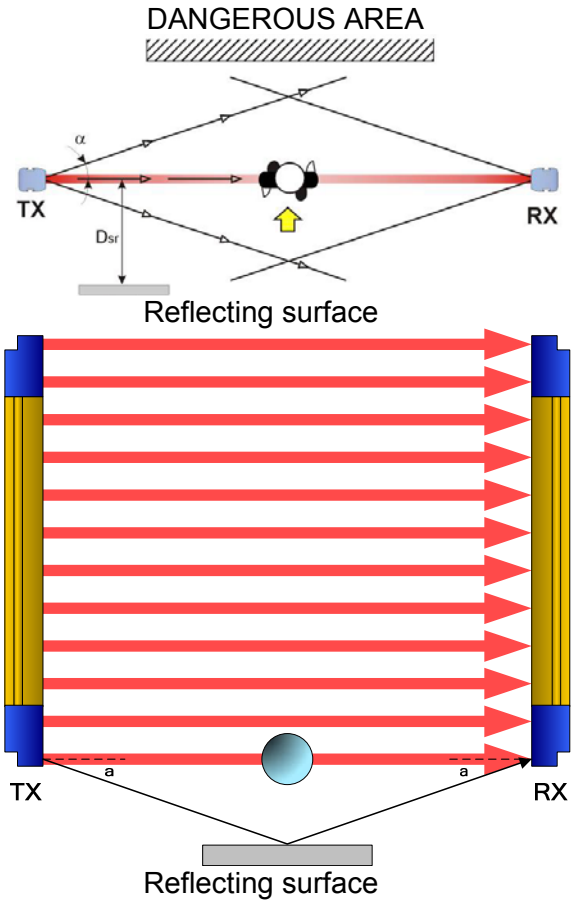


Fig. 9 – Minimum distance from reflecting surfaces

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° (α = ± 2,5°)

Diagram of Fig. 10 shows the minimum distance from the reflecting surface (Dsr), based on the operating distance:

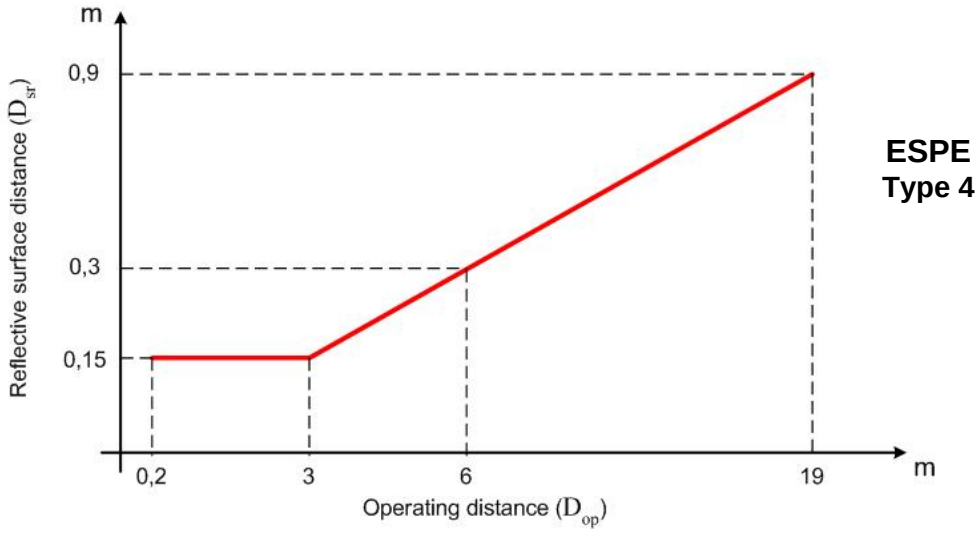


Fig. 10

The formula to get Dsr is the following:

Dsr (m) = 0.15 for operative distances < 3 m

Dsr (m) = 0.5 x operating distance (m) x tg 2α for operative distances $\geq$ 3 m

2.2.2 Distance between homologous devices

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.

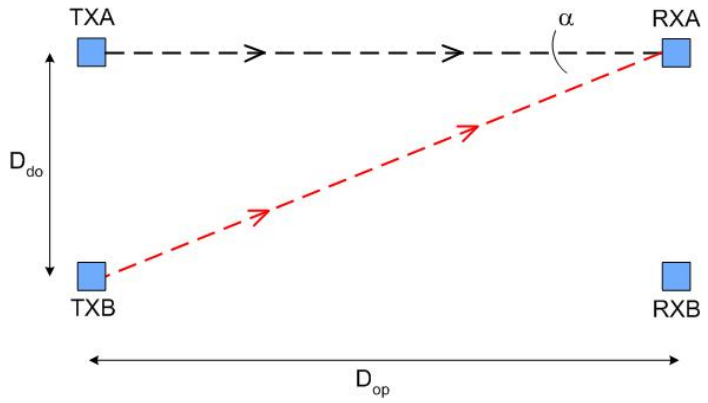


Fig. 11 – Distance between homologous devices

This minimum Ddo distance depends on:

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

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

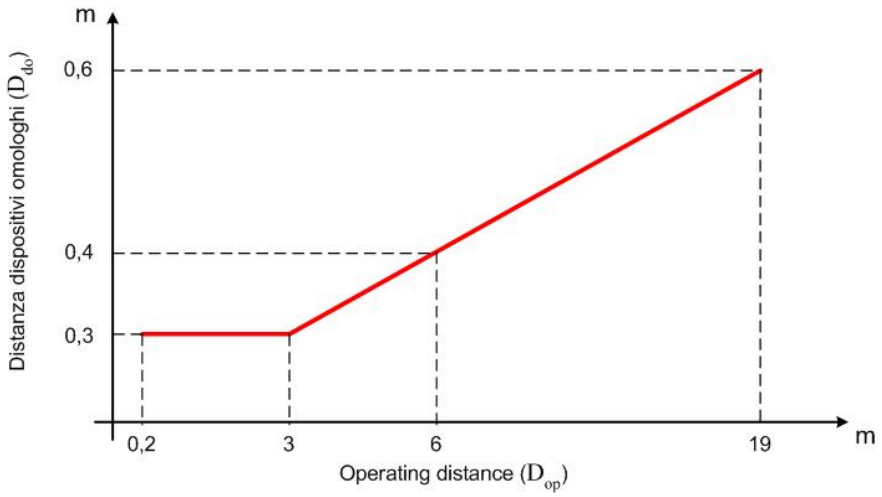


Fig. 12

The following table shows, for convenience, the values of the minimum installation distances relative to some operating distances:

Operating distance (m)	Minimum installation distance (m)
3	0,3
6	0,4
10	0,5
19	0,6

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

When several safety devices have to be installed in adjacent areas, the interference between the emitter of one device and the receiver of the other must be avoided.

Fig. 13 provides an example of possible interference between different devices and two possible solutions.

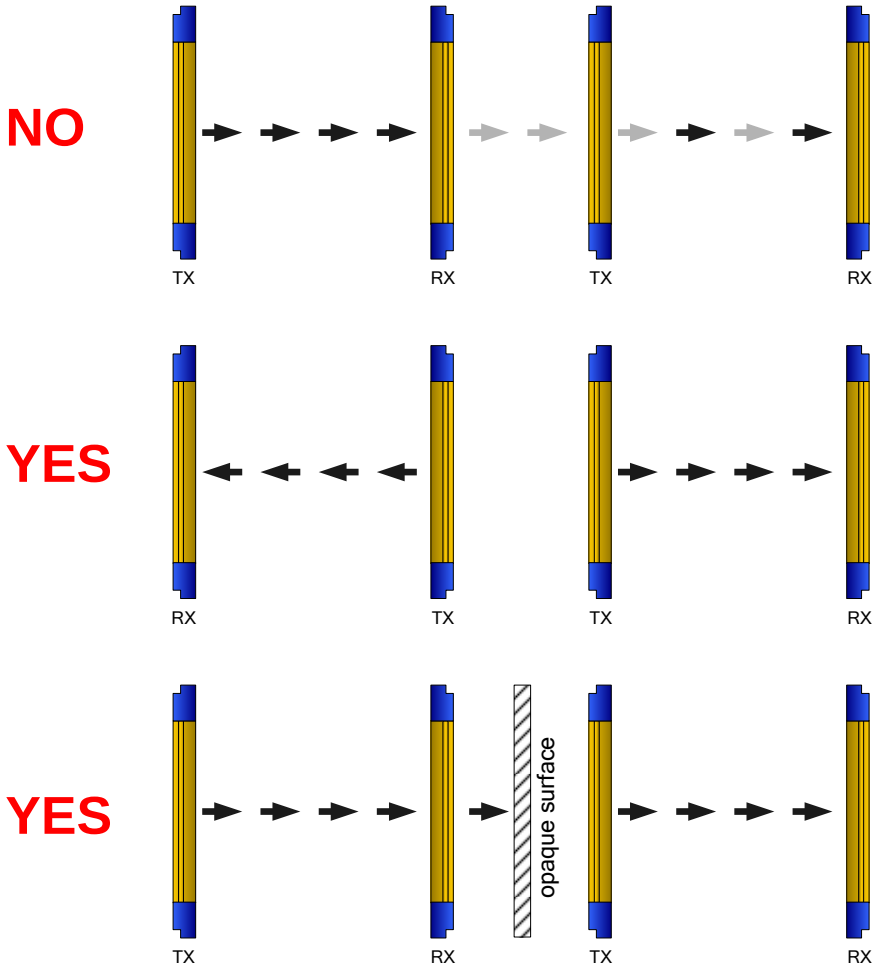


Fig. 13 – Interference between adjacent light curtains

If two light curtains have to be mounted near each other as reported in the first example of Fig. 13, coding function can resolve this situation (refer to par. 7.12)

2.2.3 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 Fig. 14 must be avoided:

Fig. 14 – Light curtains orientation

2.2.4 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.
Fig. 15 shows a possible solution to control three different access sides, using two mirrors placed at 45° with respect to the beams.

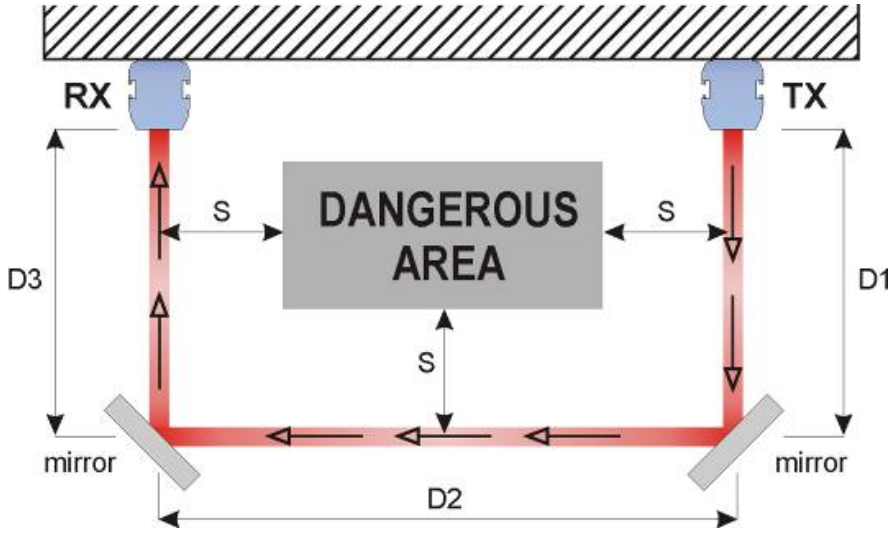


Fig. 15 – Use of deviating mirrors

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 15% 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 the operating distances relating to the number of mirrors used.

number of mirrors	operating distance (30 mm)	operating distance (14 mm)
0	20 m	7 m
1	16,5 m	5,1 m
2	13,7 m	4,3 m
3	11,6 m	3,7 m

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

2.2.5 Checks 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:

- ESPE remains in SAFE state intercepting the beams along the protected area using the specific test piece (TP-14 or TP-30), following the Fig. 16 scheme.

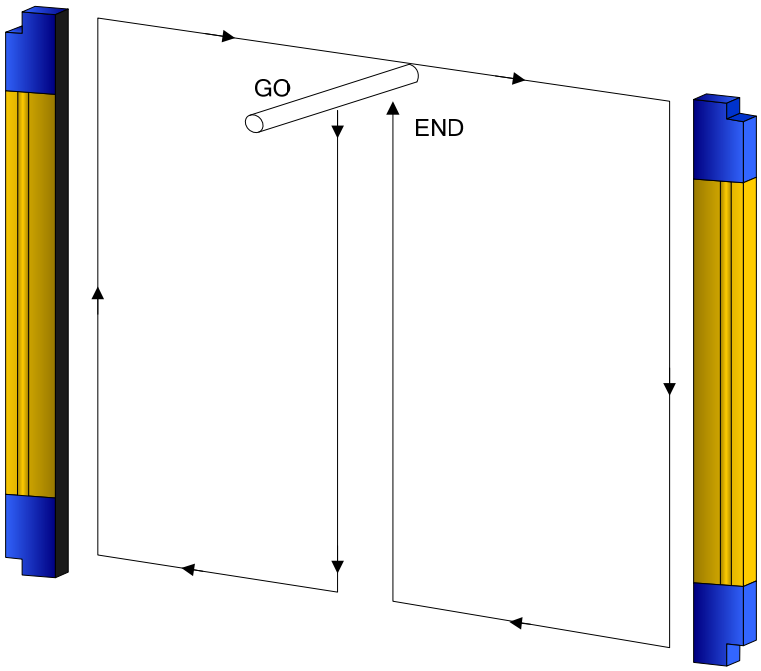


Fig. 16 – Path of the test piece

- ESPE has to be correctly aligned, press slightly on the product side in both directions the red LED must not turn on

- The activation of the TEST function (on TX side) causes the opening of the OSSD outputs (red LED, OSSD on RX side, ON and controlled machine stop)

- 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 chapter 2)

- The safety distance between the dangerous parts and ESPE must comply with the requirements indicated in chapter 2

- 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, ensuring that it remains in NORMAL OPERATION condition for at least 10-15 minutes and, placing the specific test piece in the protected area, in the SAFE state for the same period

- Verify the correspondence of all the accessory functions, activating them in the different operating conditions

3 MECHANICAL MOUNTING

The emitting (TX) and receiving (RX) units must be installed with the relevant sensitive surfaces facing each other. The connectors must be positioned on the same side and the distance must be included within the operating range of the model used (see chapter 11).

The two units must be positioned the most aligned and parallel possible.
The next step is the fine alignment, as shown in chapter 5.

Outfit angled fixing brackets kit, for units mounting, must be used as described below (Fig. 17).

Adjustable supports for adjusting unit inclinations around the axes are available on request (see chapter 15).

To mount the angled fixing brackets kit, place the threaded pins metallic insert into the dedicated side seat of the terminator cap side light curtain closing cap; slide the insert towards the metallic drawn profile groove. Fix the bracket against the profile by tightening the M5 hexagonal nuts. It's possible to slide the bracket group along their dedicated rail and fix it once again just working on the above mentioned nuts.

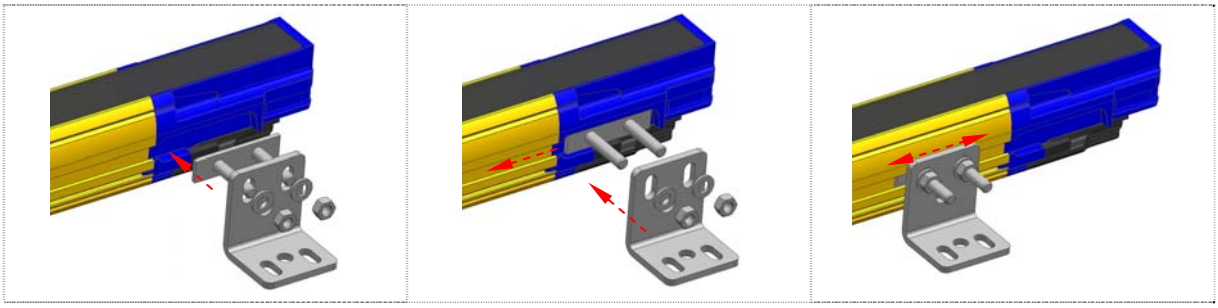


Fig. 17 – Fixed brackets mounting procedure

In case of applications with particularly strong vibrations, vibration dampers, together with mounting brackets, are recommended to reduce the impact of the vibrations.

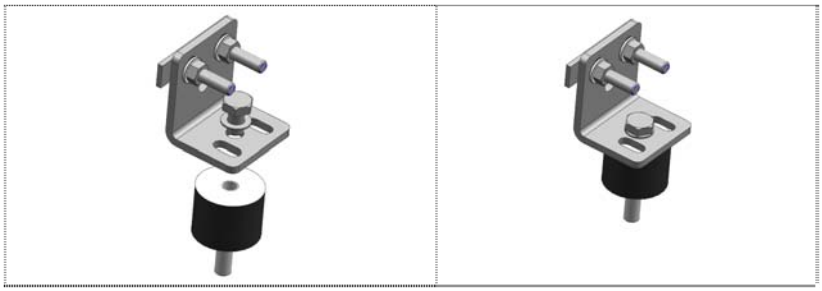


Fig. 18 – Anti-vibration dampers

The recommended mounting positions according to the light curtain length are shown in Fig. 19 and in the following table.

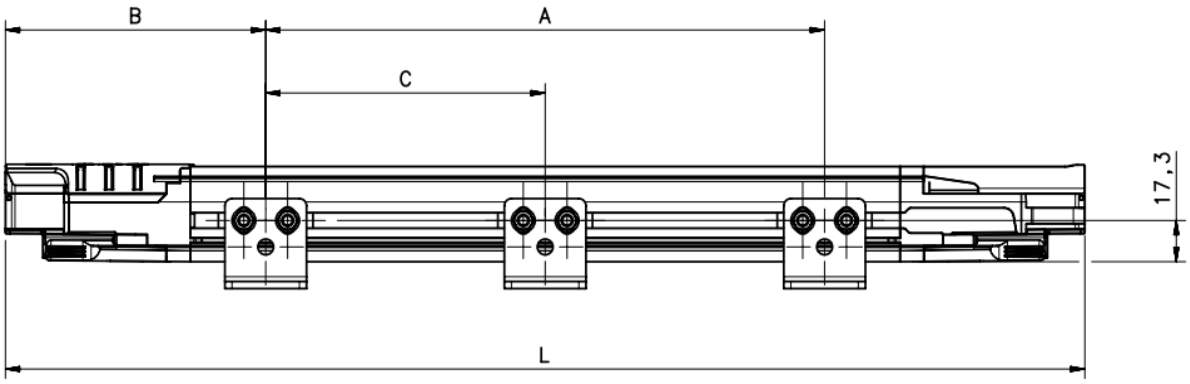


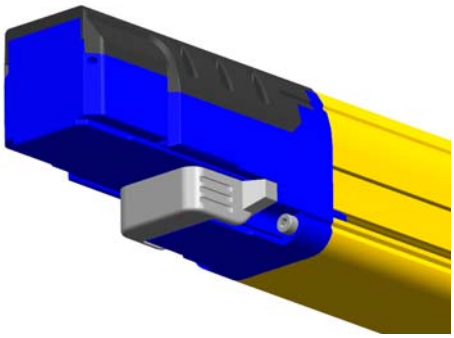
Fig. 19 – Light curtain dimensions

MODELS	L (mm)	A (mm)	B (mm)	C (mm)
SG4-xx-030-OO-P	**306.3**	**86.3**	**110**	**-**
SG4-xx-045-OO-P	**456.3**	**236.3**	**110**	**-**
SG4-xx-060-OO-P	**606.2**	**306.2**	**150**	**-**
SG4-xx-075-OO-P	**756.2**	**406.2**	**175**	**-**
SG4-xx-090-OO-P	**906.1**	**506.1**	**200**	**-**
SG4-xx-105-OO-P	**1056.1**	**606.1**	**225**	**-**
SG4-xx-120-OO-P	**1206**	**966**	**150**	**453**
SG4-xx-135-OO-P	**1356**	**1066**	**175**	**503**
SG4-xx-150-OO-P	**1505.9**	**1166**	**200**	**553**
SG4-xx-165-OO-P	**1655.9**	**1266**	**225**	**603**
SG4-xx-180-OO-P	**1805.8**	**1366**	**250**	**652.9**

xx = Resolution (14mm - 30mm)

4 ELECTRICAL CONNECTIONS

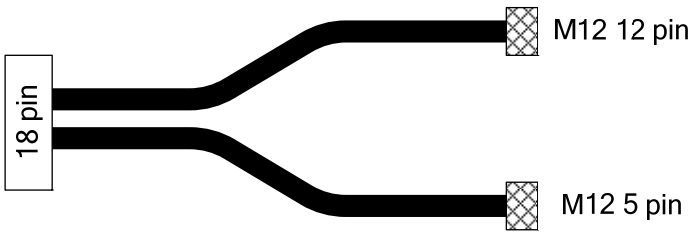
All electrical connections to the emitting and receiving units are made through some particular cables; these cables are composed of a rectangular 18 pin connector on light curtain side and M12 male connector(s) on the other side.
The Muting cable allows to have on the receiving unit one M12 12-pole connector and one M12 5-pole connector.
The Blanking cable allows to have on the receiving unit one M12 12-pole connector.
The emitting unit has one M12 5-pole connector (both in Muting and Blanking mode).
The cables have to be connected on the bottom side of the light curtains (leds and push button side) by removing the white cap that is present.



Take care that the terminator cap (CVL-5196, see chapter 14) is connected on the top side of the light curtains. If this connection misses, Master and Slave units go in critical Communication failure.

N.B.: since the RX connections are different for M12 12-poles of muting cable and M12 12-poles of blanking cable, it's important to use the correct cable for each configuration (connector with <u>two</u> M12 with the muting configuration and connector with <u>one</u> M12 with the blanking configuration)

PIG-TAIL CABLE MUTING CONFIGURATION FOR RECEIVER (CS-R1-75-B-002)



M12 12 pin:
1. 24V (brown)
2. 0V (blue)
3. RESET/RESTART/ALIGN (white)
4. OVERRIDE1 (green)
5. OSSD2 (pink)
6. EDM (yellow)
7. MUTING DISABLE (black)
8. OSSD1 (grey)
9. OVERRIDE2 (red)
10. MUTING LAMP (violet)
11. OVERRIDE STATUS (grey-pink)
12. EARTH (red-blue)

M12 5 pin:
1. 24V (brown)
2. MUTING2 (white)
3. 0V (blue)
4. MUTING1 (black)
5. N.C. (grey)

PIG-TAIL CABLE BLANKING CONFIGURATION FOR RECEIVER (CS-G1-70-B-002)

M12 12 pin:

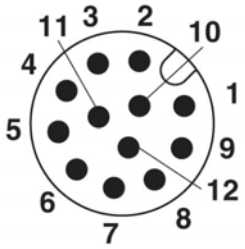
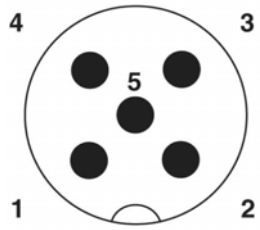
1. 24V (brown)
2. 0V (blue)
3. RESET/RESTART/ALIGN (white)
4. TEACH IN (green)
5. OSSD2 (pink)
6. EDM (yellow)
7. N.C. (black)
8. OSSD1 (grey)
9. TOLERANCE (red)
10. LAMP (violet)
11. N.C. (grey-pink)
12. EARTH (red-blue)

PIG-TAIL CABLE FOR EMITTER (CS-G1-50-B-002)

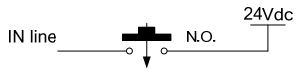
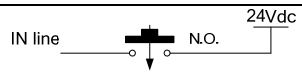
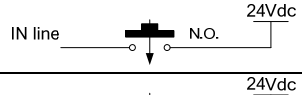
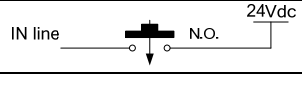
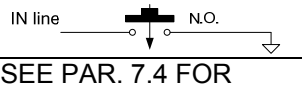
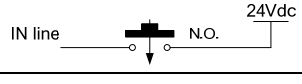
M12 5 pin:

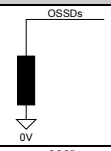
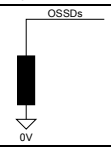
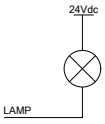
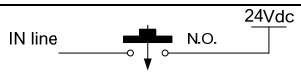
1. 24V (brown)
2. TEST (white)
3. 0V (blue)
4. EARTH (black)
5. NOT USED (grey)

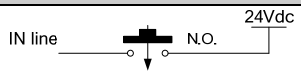
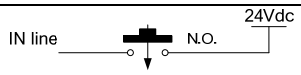
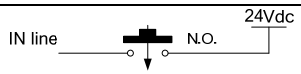
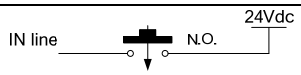
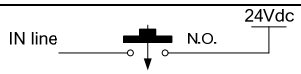
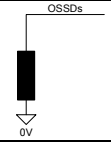
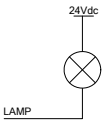
M12 Connectors pinout

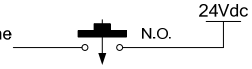
12 pin	5 pin
	

MUTING CONFIGURATION

LINE	LAYOUT CONNECTION	BEHAVIOUR
RESET		active on high level in failure lockout
RESTART		active on high level at runtime
ALIGNMENT		active on high level at startup
OVERRIDE 1		active on high level at runtime
OVERRIDE 2		active on low level at runtime
EDM	SEE PAR. 7.4 FOR CONNECTIONS	must be ossds antivalent at runtime with edm enabled
MUTING DISABLE		muting disabled on high level at runtime

MUTING CONFIGURATION RECEIVER		
LINE	**LAYOUT CONNECTION**	**BEHAVIOUR**
OSSD1 / OSSD 2		high level = free path low level = object detection
OVERRIDE STATUS		high level = override function active low level = override function not active **NB: at startup there are fluctuations on this line not concerning the override activation**
MUTING LAMP		open collector sinks on muting activation.
MUTING1/MUTING2		active on high level at runtime
EARTH		connect directly to earth

BLANKING CONFIGURATION RECEIVER		
LINE	**LAYOUT CONNECTION**	**BEHAVIOUR**
RESET		active on high level in failure lockout
RESTART		active on high level at runtime
ALIGNMENT		active on high level at startup
TEACH IN		active on high level at runtime
TOLERANCE		active on high level at startup
EDM	SEE PAR. 7.4 FOR CONNECTIONS	must be ossds antivalent at runtime with edm enabled
OSSD1 / OSSD 2		high level = free path low level = object detection
BLANKING LAMP		open collector sinks on blanking active
EARTH		connect directly to earth

EMITTER		
LINE	LAYOUT CONNECTION	BEHAVIOUR
TEST		active on high level at runtime
EARTH		connect directly to earth

4.1 NOTES ON CONNECTIONS

For the correct functioning of the SG4 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 TEST wire must be connected through a N.O. button to the supply voltage of the ESPE.

⚠	**The TEST button must be located in such a way that the operator can check the protected area during any test.**

⚠	**The RESET/RESTART/ALIGN button must be located in such a way that the operator can check the protected area during any reset operation.**

- 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.

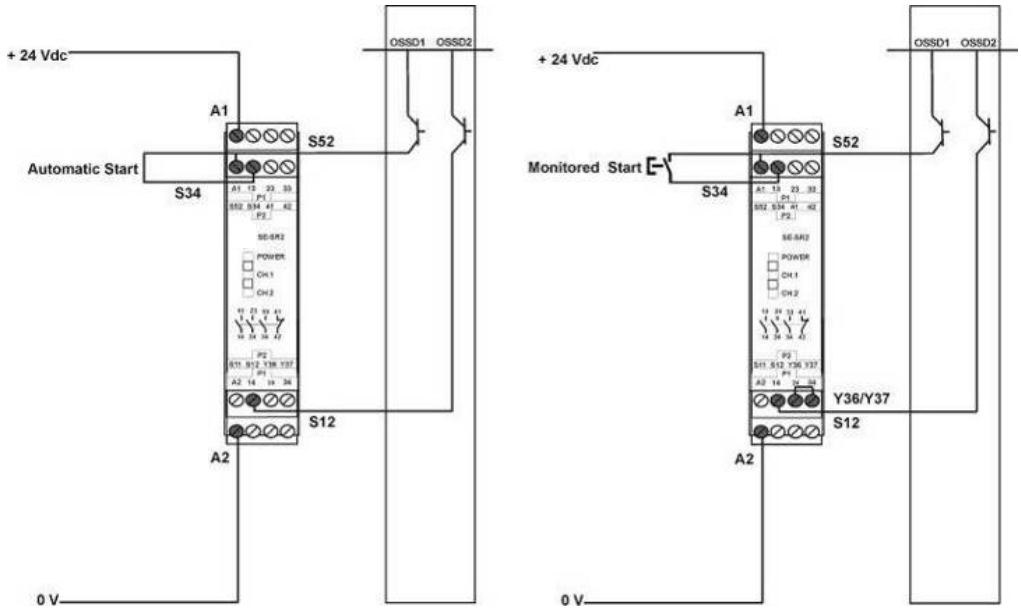


Fig. 20 – Connection to safety relay

The figures show the connection between the safety light curtains and the safety relay of the SE-SR2 series functioning in the Automatic Start mode (left side) and Manual Start 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 they have to be used separately (Fig. 21).
- If one of these configurations is erroneously used, the device enters into the output failure condition (see chapter 8).

- Connect both OSSDs to the device to control. Failure to connect an OSSD to the activating device jeopardises the system safety degree that the light curtain has to control.

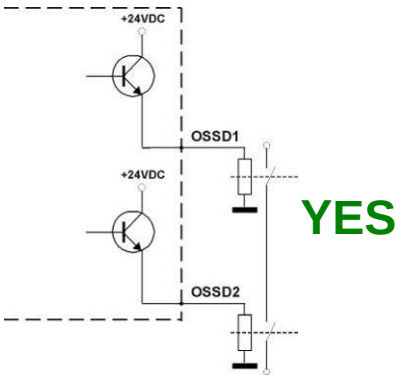


Fig. 21 – Correct connection of the load

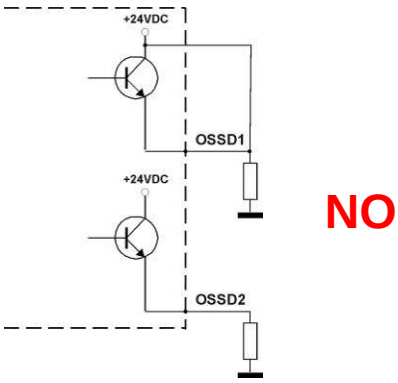


Fig. 22 – Incorrect connection of the load (I)

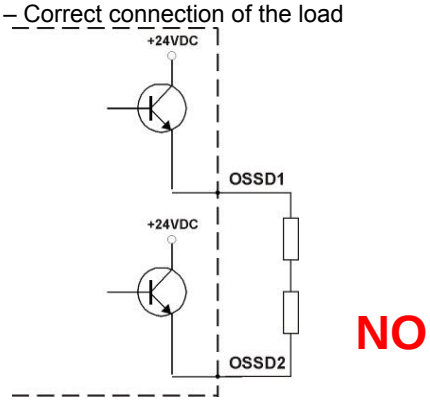


Fig. 23 – Incorrect connection of the load (II)

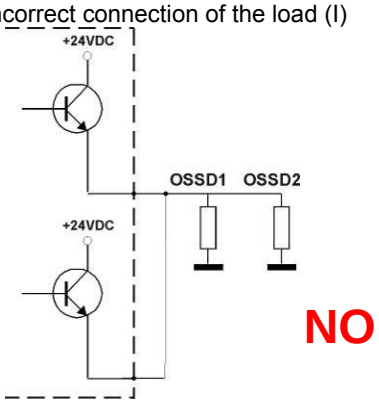


Fig. 24 – Incorrect connection of the load (III)

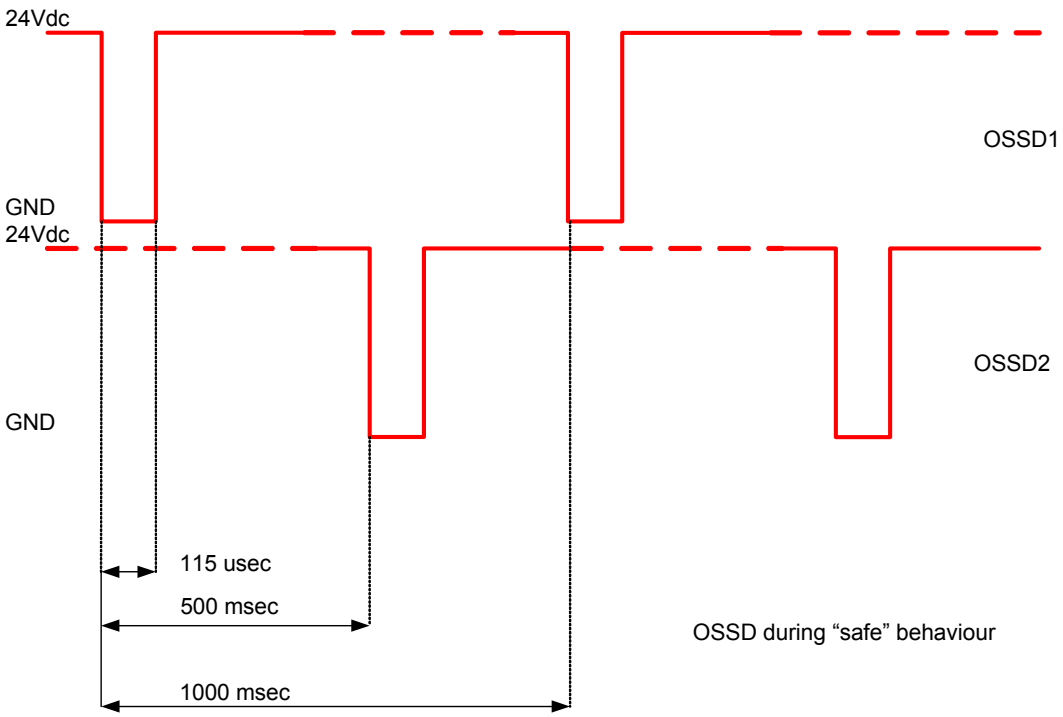


Fig. 25 – Behaviour of OSSDs

5 ALIGNMENT PROCEDURE

The alignment between the emitting and the receiving units is necessary to obtain the correct functioning of the light curtain.
A good alignment prevents output's 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.
Since the light curtain has two beams for the synchronization, let's call SYNC1 the sync beam at the bottom, the first beam of the array, and SYNC2 the sync beam on the opposite part of the light curtain, the last beam of the array.
The figure shows that the first beam is located at the bottom edge of the light curtain, near to led display. The last beam is at the opposite near the terminator cap. These two beams are the synchronization beams too.

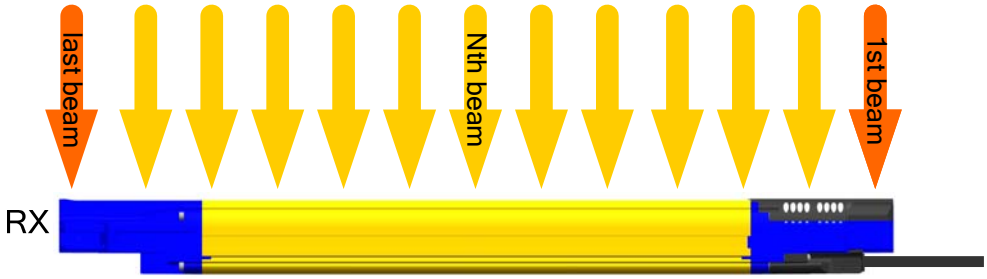


Fig. 26 – Description of the beams

The Alignment function can be activated by simply keeping pressed the external normally open push-button linked to RESET/RESTART/ALIGN input (pin 3 of M12-12 poles – RX side) at start-up until the second led (red) begins to blink indicating the activation of the Alignment function, as shown in the following timing diagram. When a good state of alignment is reached a power OFF and a power ON operation carry back the ESPE in normal operation.

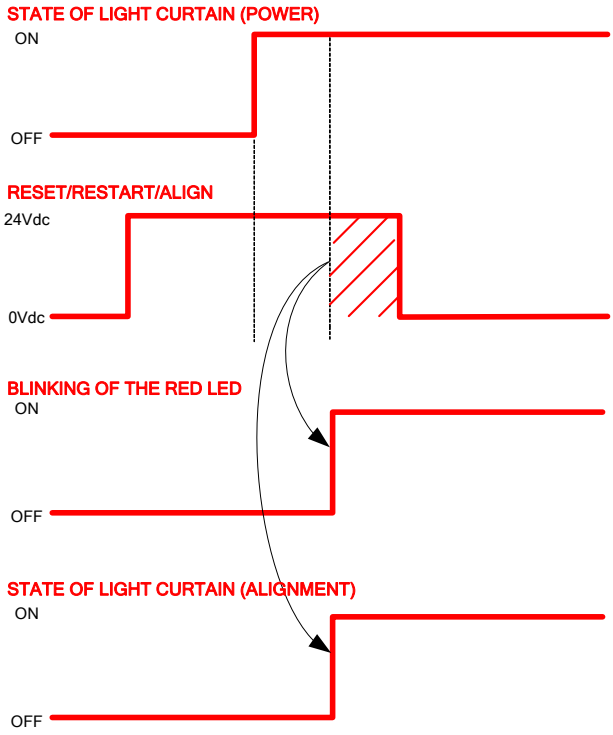
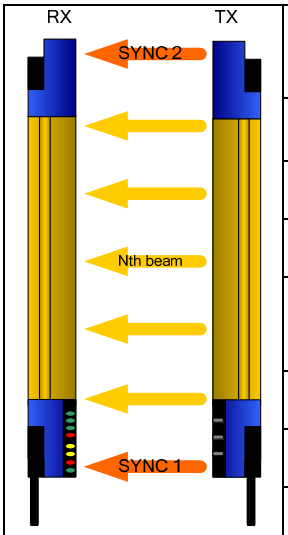


Fig. 27 – Alignment timings

In Alignment Mode ESPE is always in Safe State and the OSSDs are kept OFF.
The state of alignment is estimated from RX unit by reading the received signal level of each beam compared on 4 factory established thresholds. First and last beams received level get some more weight.
In alignment mode user interface informs the user about quality and level of alignment:

A. Keep the receiver in a steady position and set the emitter until the yellow SYNC1 LED is OFF. This condition shows the effective alignment of the first synchronisation beam
B. Rotate the emitter, pivoting on the lower optics axis, until the yellow SYNC2 LED is OFF
C. Delimit the area in which alignment is good and steady through some micro adjustments - for the first and then for the second unit – in order to have the maximum alignment LEVEL (●●●●) and then place both units in the centre of this area
D. Fix the two units firmly using brackets. Verify that the LEVEL on the RX unit is as high as possible and beams are not interrupted, then verify that all LEVEL Led turn OFF if even one single beam is interrupted. This verification shall be made with the special cylindrical “Test Piece” having a size suitable to the resolution of the device used (see par 2.2.5)
E. Switch-off and on the device in standard operating mode. The alignment level is monitored also during the device normal operation with the same display (see par 8.1). Once the light curtain has been aligned and correctly fastened, the signal display is useful both to check the alignment and show a change in the environmental conditions (occurrence of dust, light disturbance and so on) via signal level monitoring



Indication	RX Led configuration	Alignment Status	OSSD Status in Normal Operation
No Sync, check SYNC1	●○○ ●●●●	NONE	OFF
SYNC1 aligned	●●○ ●●●●	NONE	OFF
SYNC2 aligned	●○● ●●●●	NONE	OFF
One or more intermediate beams not aligned	●●● ●●●●	NONE	OFF
All beams aligned	●●● ●●●●	BAD	ON
All beams aligned	●●● ●●●●		ON
All beams aligned	●●● ●●●●		ON
All beams aligned	●●● ●●●●	EXCELLENT	ON

If the dongle is installed, the 7-segment display shows further messages. Please refer to the dongle manual for details.

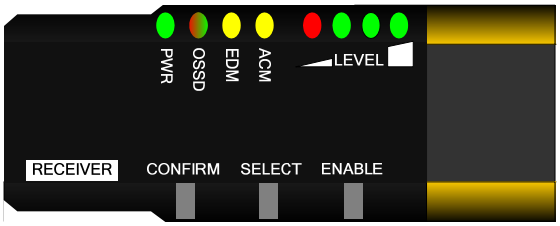
6 FUNCTION SETTING

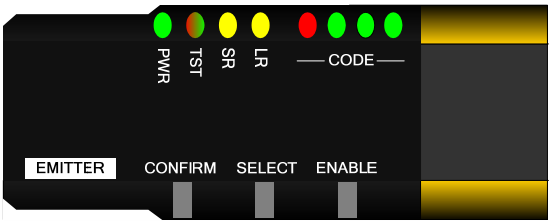
ESPE operation functions and parameters configuration can be performed in two different ways:

- **Basic Configuration Mode (BCM):**
Let the user select among basic functions / basic parameters with the help of push buttons and led user interface (available on both RX and TX unit)

- **Advanced Configuration Mode (ACM):**
Let the user select among advanced functions / advanced parameters with the help of a PC Software GUI interface (available for RX only)

BASIC CONFIGURATION MODE
A user interface of 8 leds and 3 protected push buttons lets the user operate basic configuration. Leds are the same used for user interface in normal operation.
The user must use the provided special tool (see chapter 14) to activate push buttons thus accidental access to safety configuration is avoided.





Basic configuration steps:
In the right side of user control panel (on both units of the light curtain) a setting interface composed by 3 push buttons is present; the purpose of the interface is to let the user set light curtain locally and without use of PC graphic user interface.

Setting interface is composed by a CONFIRM push button used to enter in BCM and to confirm the selected configuration, a SELECT push button used to roll by different functions and an ENABLE push button to activate/deactivate the current function.

Here below the necessary steps for BCM configuration:

1. Keep **CONFIRM** button pressed to enter Basic Configuration Mode
2. A Test Pattern is shown on led interface; **carefully check that ALL led are lit** in sequence from 2 to 8, then current configuration is shown
3. Choose function to set by **SELECT** button; selected led blinks
4. Configure selected function with **ENABLE** button (switch led on/off)
5. Repeat steps 3 and 4 until desired configuration is visualized
6. Keep **CONFIRM** button pressed to authorize the new configuration

If an Advanced Configuration is already set on ESPE (configuration by SG4-GUI PC User Interface), a button pressure on Step 2 causes ESPE configuration failure lockout to prevent unauthorized advanced configuration changes.

ADVANCED CONFIGURATION MODE

SG Extended UI software (Graphic User Interface, GUI) for PC allows the user to set ESPE advanced configuration. Many parameters are available to customize ESPE behaviour for specific applications.
Since ESPE parameters can be safety critical and PC software cannot be guaranteed as a safety component, a safe configuration procedure has to be followed.
Configuration procedure on UI can be done by authorized personnel only. Such personnel must be sure that protected dangerous machine has no access during configuration procedure.
There are 3 different kinds of operator that can use the GUI with 3 different levels of authorizations.
System Integrator: has all the possible authorizations and can set every configuration on the GUI
Maintainer: can upload the configurations (saved on the GUI) on the light curtain and use the GUI for monitoring the system, but he can't create new configurations
Machine Operator: uses the GUI only for monitoring the system

Depending on the kind of operator there are different passwords that protect some functions of the GUI.

Operator	Password
System Integrator	SystemIntegrator
Maintainer	Maintainer
Machine Operator	no password requested

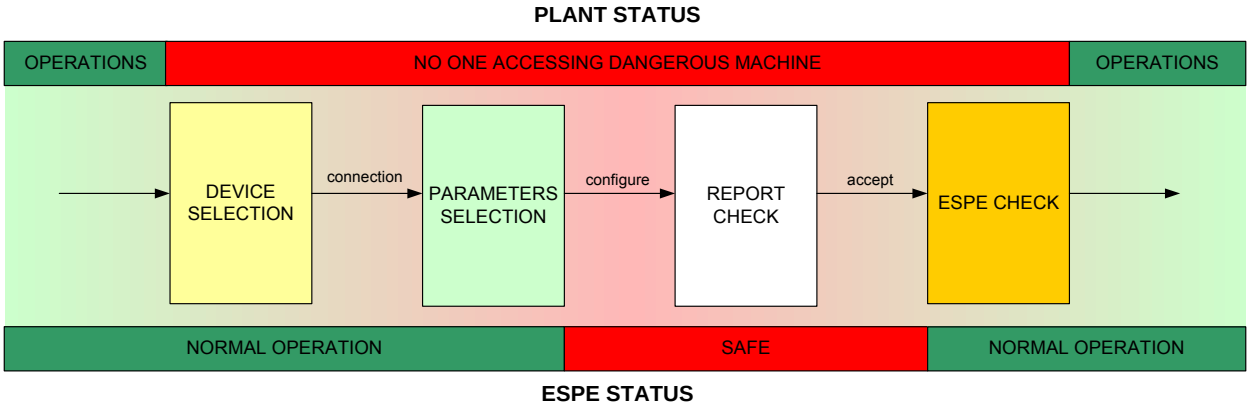


Fig. 28 – ACM configuration cycle

1) **Device selection:** user selects ESPE to configure, choosing among devices on network identified by a unique Serial Number
2) **Parameters selection:** user sets required ESPE configuration.

   After selection user sends configuration command, ESPE switches to SAFE state, a "configuration in progress" indication is shown on ESPE led interface, old configuration on ESPE is erased
3) **Report check:** ESPE sends back to UI the received configuration, UI produces a printable SAFETY REPORT with all safety related informations about configuration in progress (Fig. 29). After checking all report contents user can accept configuration: ESPE restarts in normal operation with the new configuration
4) **ESPE Check:** user checks if ESPE is working according to SAFETY REPORT (resolution check with proper test piece, parameters check …)

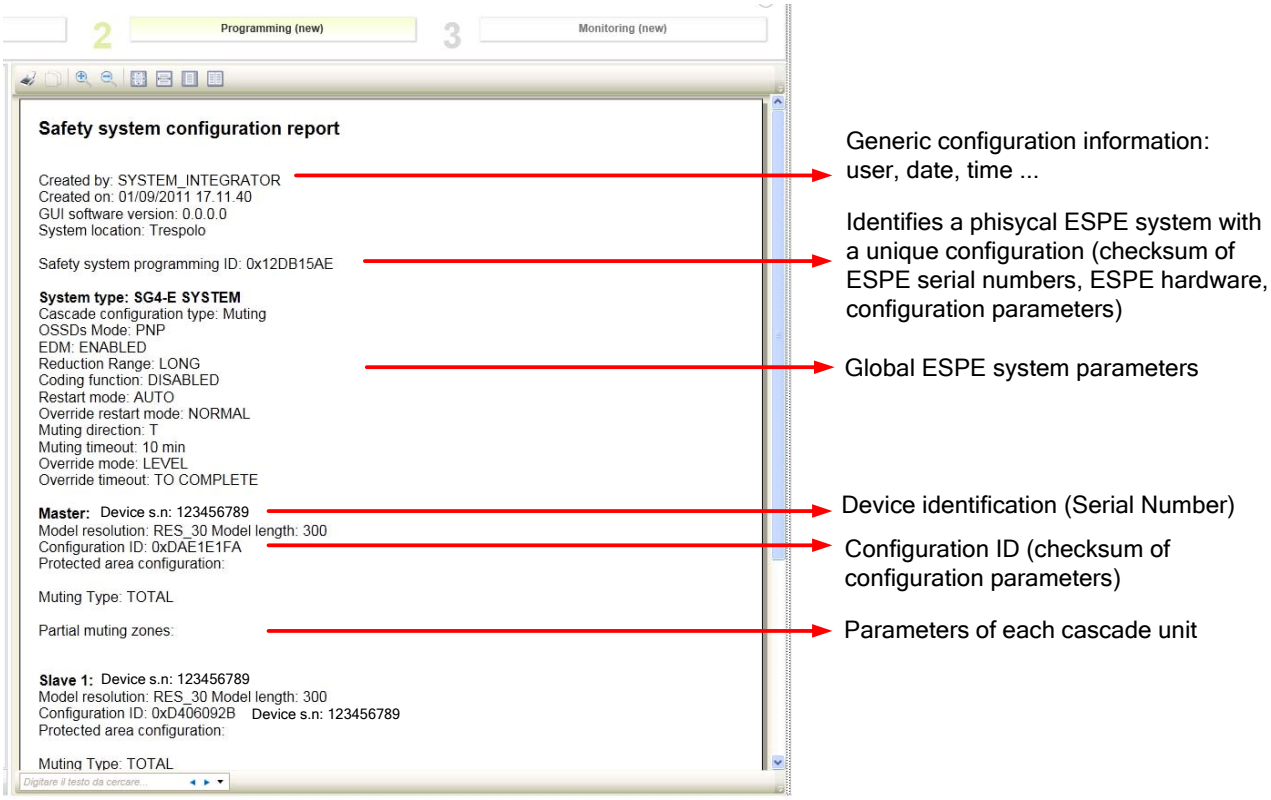


Fig. 29 – Safety report

6.1 RESET TO FACTORY CONFIGURATION

User can also reset ESPE at factory configuration settings with the following push button action:

1. press and keep pressed CONFIRM button for at least 9 sec. (but less than 30 sec. otherwise the light curtin goes in lockout failure)
2. the leds blink for a while, then the light curtain resets
3. after reset the light curtains begins its normal functioning with the factory configuration

N.B.: Factory reset will erase both BCM and ACM configurations.

6.2 FUNCTION LIST

SG4 EXTENDED has two main operating modes: Blanking and Muting. Choosing between Blanking and Muting changes the function setting associated to Leds 5 to 8.

N.B.: the default configuration is indicated in bold characters

N.B.: since the last 3 leds don't change status by passing from a muting configuration to a blanking configuration (and viceversa) and since these 3 leds have 3 different meanings depending on the configuration, the user has to pay attention to the configuration setting when decides to change configuration

RX Function list in Muting operation Mode (Led 3 ON Yellow)			
Function	**Led #**	**Setting**	**Led Status** (PWR, OSSD, EDM, ACM, LEVEL)
Coding	2	Code 1	
		Code 2	
		No Code	
Muting/Blanking Selection	3	**Muting**	
		Blanking	
EDM	4	**Enabled**	
		Disabled	
Restart mode	5	**Auto**	
		Manual	
Muting Direction	6	**T (bidirectional)**	
		L (monodirectional)	
Muting Timeout	7	**10 min**	
		Inf.	
Override Trigger	8	**Level**	
		Edge	

Function list in Blanking operation Mode (Led 3 OFF)			
Function	**Led #**	**Setting**	**Led Status** (PWR, OSSD, EDM, ACM, LEVEL)
Coding	2	Code 1	
		Code 2	
		No Code	
Muting/Blanking Selection	3	**Muting**	
		Blanking	
EDM	4	**Enabled**	
		Disabled	
Restart mode	5	**Auto**	
		Manual	
Floating Blanking Selection	6-7	**Floating Blanking Disabled**	
		Floating Blanking 1 beam	
		Floating Blanking 2 beams	
		Reduced Res 4 beams	
Fixed blanking selection	8	**1 Fixed Blanking Zone**	
		2 Fixed Blanking Zones	

Tx Function list			
Function	**Led #**	**Setting**	**Led Status** (PWR, TST, SR, LR, CODE)
Coding	2	Code 1	
		Code 2	
		No Code	
Range Selection	3	**Long**	
		Short	

7 FUNCTIONS

This chapter deals with all the functions of the light curtain.

7.1 RESTART MODE

An opaque object detected by the beams causes the switching of the OSSD outputs (i.e. the opening of the safety contacts - SAFE condition). The restart mode allows the user to define how the light curtain returns in a Normal Operation condition.
The restart of the ESPE (i.e. the closing of the OSSD safety contacts - SAFE condition) can be carried-out in two different ways: Automatic or Manual Restart.

Automatic Restart: when an opaque object is detected, the ESPE enters in the SAFE condition. Then, after the object has been removed from the controlled area, the ESPE begins its normal functioning again.
The response time is the time between the object introduction in the protected area and the OSSDs achieving the OFF state (SAFE); the recovery time is the time within OSSDs go in the ON state (SAFE) after the object is removed.
These times are function of length. Please refer to the tables in chapter 12 for further details.

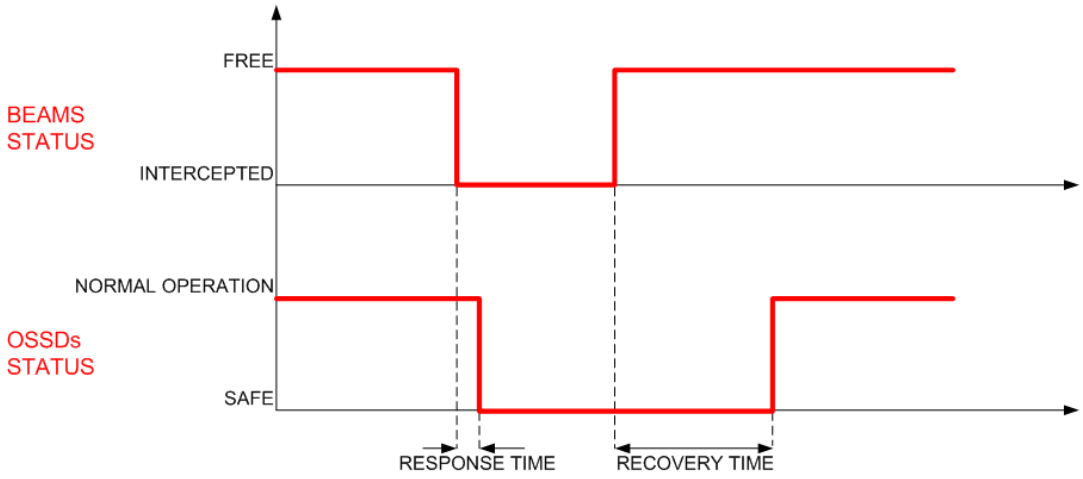


Fig. 30 – Restart timings (auto)

In Automatic Restart the RESET/RESTART/ALIGN input (pin 3 of M12-12 poles – RX side) has to be left floating.

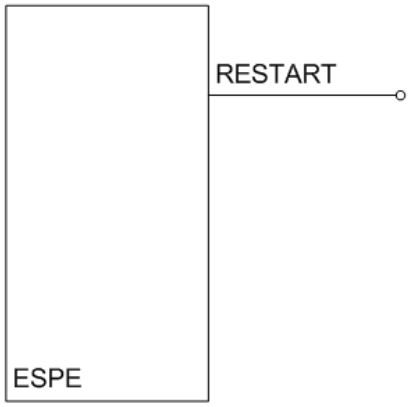


Fig. 31 – Restart connection (auto)

Manual Restart: after the ESPE has detected an opaque object in the controlled area, the light curtain begins its normal functioning only by pressing the Restart button (normal open push button) and after the object has been removed from the controlled area.
The RESTART push-button must be kept pressed for at least 500 msec. When the RESTART push-button is released, the OSSD outputs switch to normal operation.
A timeout greater than 5s on the high RESTART brings the ESPE in failure lockout.

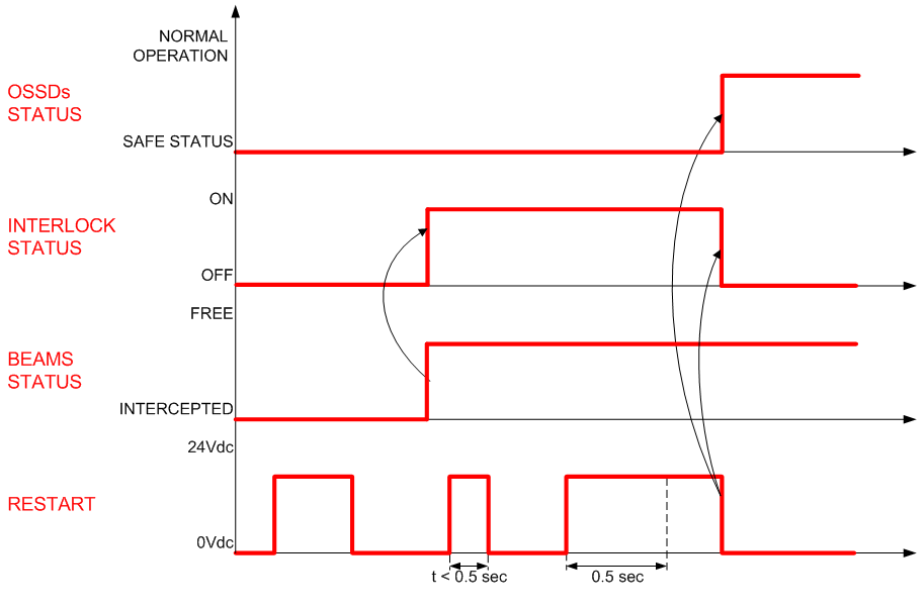


Fig. 32 – Restart timings (manual)

In Manual Restart the RESET/RESTART/ALIGN input (pin 3 of M12-12 poles – RX side) has to be connected to a 24VDC normally-open contact.

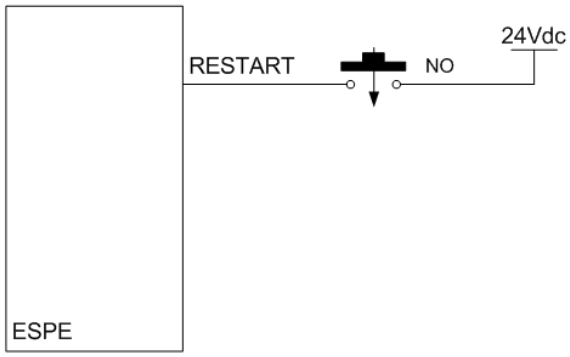
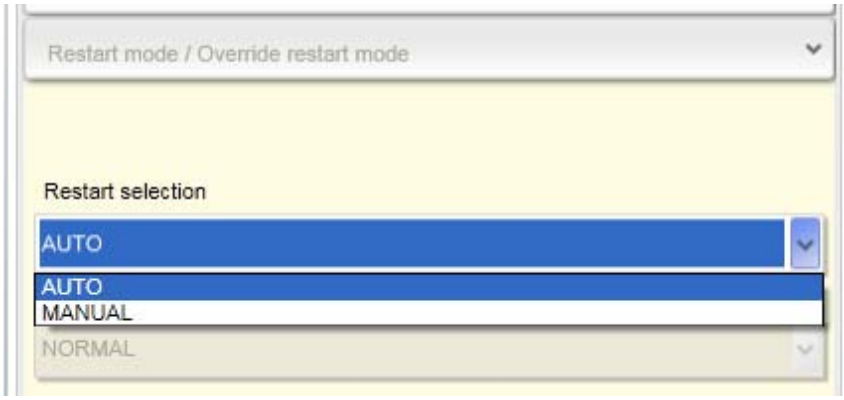


Fig. 33 – Restart connection (manual)

⚠	WARNING: Carefully assess risk conditions and reset modes. In applications protecting access to dangerous areas, the automatic reset mode is potentially unsafe if it allows the operator to pass completely beyond the sensitive area. In this case, the manual reset or, for example, the manual reset of the SE-SR2 relay (see chapter 15) is necessary.

Here below the way to select the restart mode is explained, both through push-button and the graphic user interface.

BCM Configuration: Restart Mode		
		PWR OSSD EDM ACM LEVEL
Auto	**Led 5 ON Red**	
Manual	Led 5 OFF	

ACM Configuration: Restart Mode


7.2 TEST

The TEST function can be activated by pressing the 24VDC normally-open push-button connected to TX unit TEST input (pin 2 of M12-5 poles) for at least 0.5 seconds.
The TEST disables the emission stage, so the RX side sees interrupted all beams and the OSSD goes low within response time. As shown in the timing diagram below, the OSSDs go OFF (BREAK status) after 500msec (plus a cycle time) and after the response time of the light curtain.

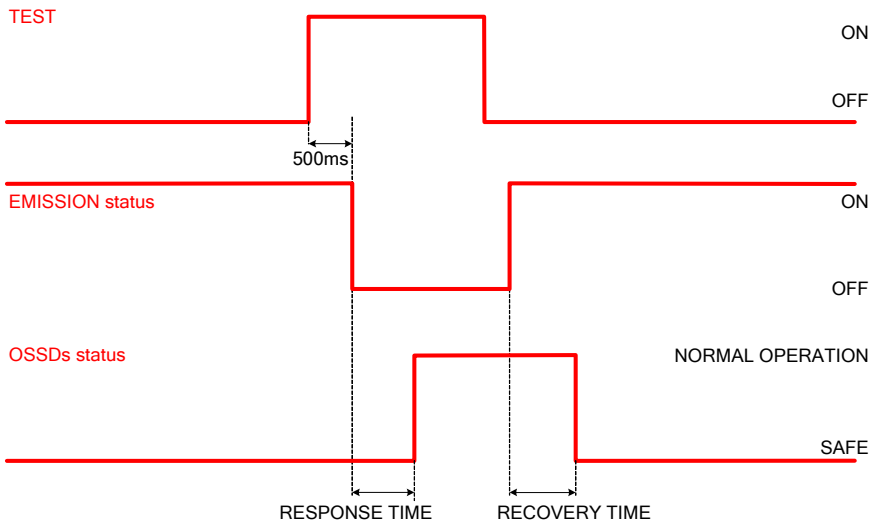


Fig. 34 – Test timings

7.3 RESET

When ESPE locks into failure state user can go back to Normal Operation with a power cycle or using the activation of RESET function (non critical failures only).
To activate RESET function the 24VDC normally-open button connected to RESET/RESTART/ALIGN input (pin 3 of M12-12 poles – RX side) has to be kept pressed for at least 5 seconds in non critical failure state.
For all critical failures a power cycle is necessary.
When in failure state the light curtain can be reset with the procedure explained above except the case of failure on microprocessor, for which a power cycle is necessary.

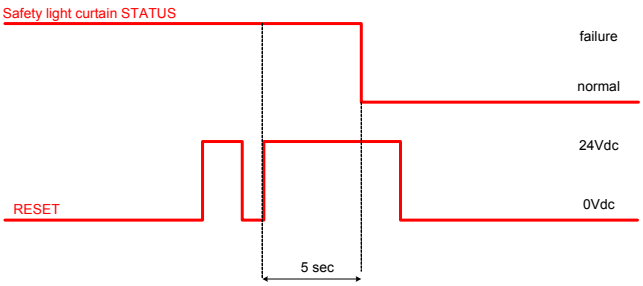


Fig. 35 – Reset timings

If the error is not removed, the light curtain goes in lockout failure again.

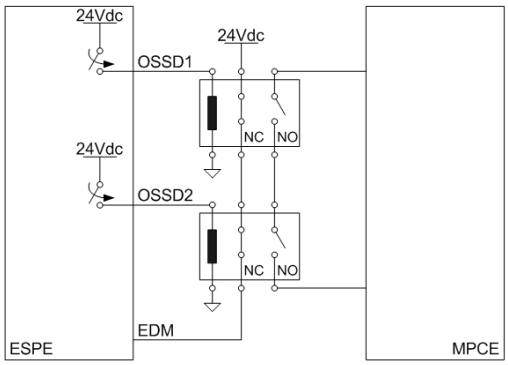
7.4 EDM

The External Device Monitoring (EDM) function controls external devices by verifying the OSSDs status.

EDM enabled:

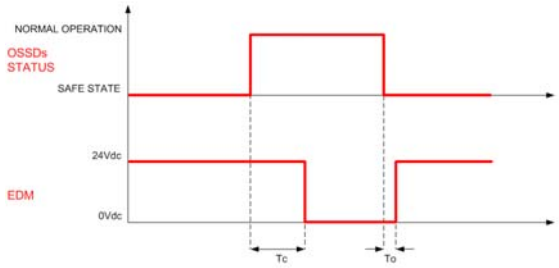
When EDM is enabled in PNP configuration it's necessary to connect EDM input (pin 6 of M12-12 poles - RX) to a 24 VDC normally-closed contact of the device to be monitored.
The EDM function cannot be used in NPN configuration.

NOTE: in normal operation the third led switched on in the user interface indicates that this function is active.
The figure below shows how to connect the EDM input.



PNP CONFIGURATION

The function controls the 24VDC normally-closed contact switching according to the changes of the OSSDs' status.



PNP CONFIGURATION

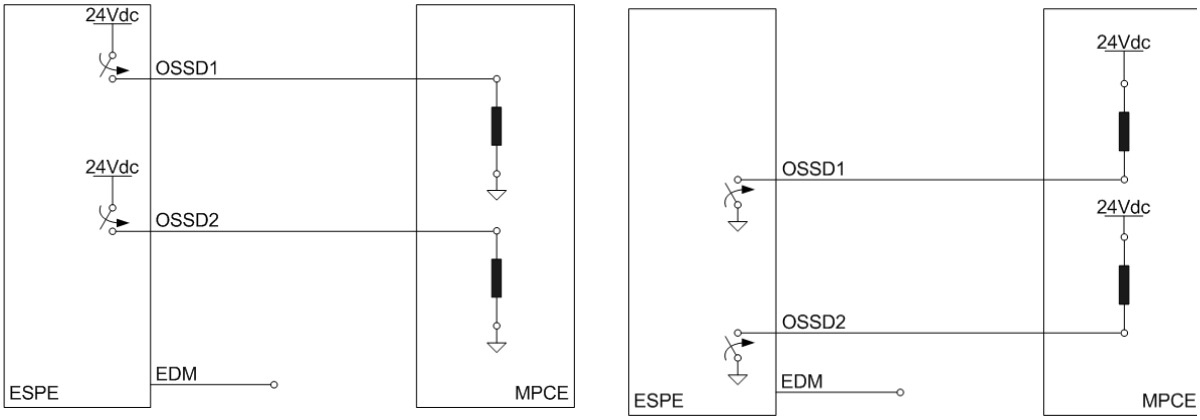
Fig. 36 – EDM timings

The EDM status is antivalent with OSSDs': the timing diagram explains the relationship between the cause (OSSDs) and the effect (EDM) with the maximum permissible delay.

Tc ≤ 350 msec (time between OSSD OFF-ON transition and EDM test)
To ≤ 100 msec (time between OSSD ON-OFF transition and EDM test)

(two different times for the mechanical contact driven by a spring)

EDM disabled:
When EDM is disabled it's necessary to leave the EDM input floating.



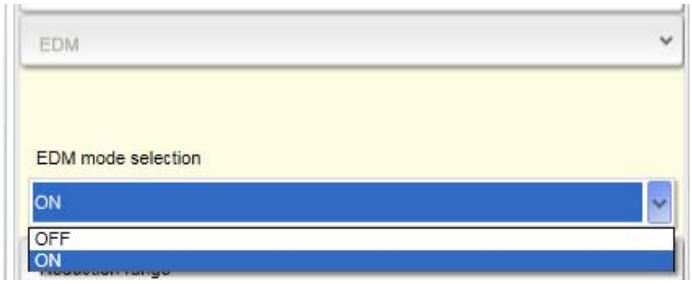
PNP CONFIGURATION **NPN CONFIGURATION**

Fig. 37 – EDM connection

7.5 EDM SELECTION

This function lets the user to select or exclude the monitoring of the external switching devices.

BCM Configuration: EDM Selection		
		PWR OSSD EDM ACM LEVEL
Enabled	**Led 4 ON Yellow**	
Disabled	Led 4 OFF	

ACM Configuration: EDM Selection


To increase safety level, when EDM is set OFF, at start-up ESPE checks if EDM input is floating.

7.6 REDUCTION RANGE

This function allows the user to select the maximum operating distance at which the curtains can be mounted.
When Long Range is selected on RX, if TX is configured as
Long Range, the maximum operating distance is 20m (30mm resolution) and 7m (14mm resolution); if TX is configured as Short Range the maximum operating distance is 12m (30mm resolution) and 4m (14mm resolution).
When Short Range is selected on RX, if TX is configured as Long Range, the maximum operating distance is 6m (30mm resolution) and 2m (14mm resolution); if TX is configured as Short Range the maximum operating distance is 4m (30mm resolution) and 1m (14mm resolution). Please refer to the table on the next page.

The user can select this function for RX side through ACM and for TX side through BCM.

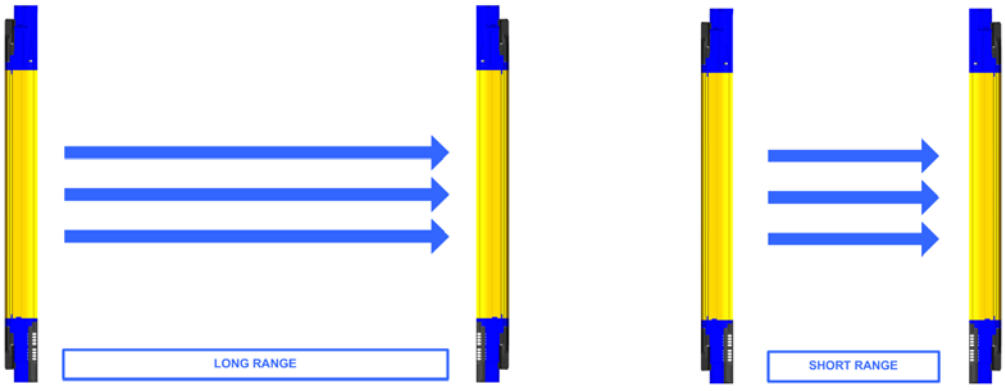
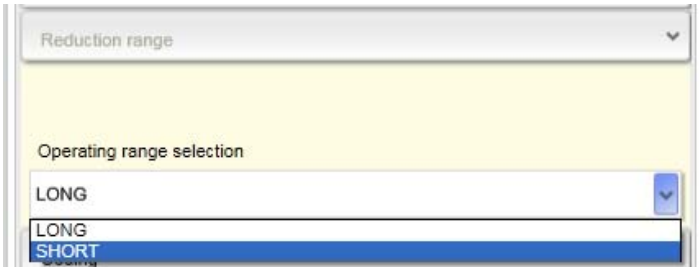


Fig. 38 – Reduction Range

BCM Configuration (TX side): Reduction Range									
		PWR	TST	SR	LR	CODE			
Long	**Led 3 ON Yellow**								
Short	Led 3 OFF								

ACM Configuration (RX side) : Reduction Range


In particular, if long range is selected TX and RX can be mounted at the maximum allowed operating distance; short range is indicated in those cases in which multiple couples of light curtains have to be mounted near and no code can be used.
Next tables resume, for both resolution, the different operating distances when the reduction range is changed.

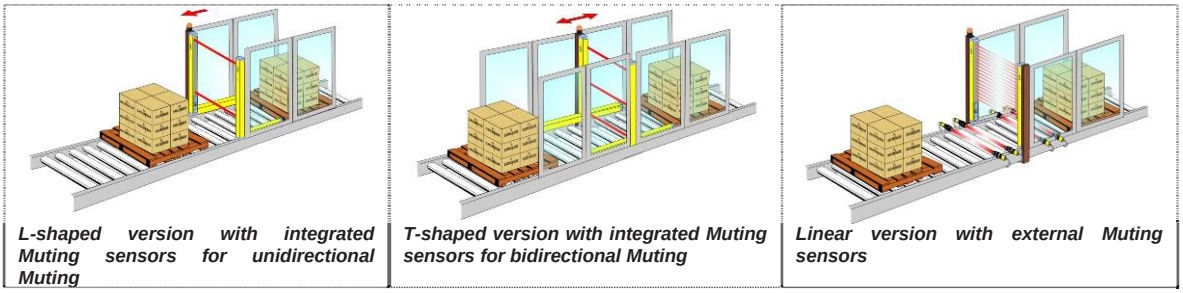
Resolution 30mm	RX Long Range	RX Short range
Long Range TX	**20**	**6**
Short range TX	**12**	**4**

Resolution 14mm	RX Long Range	RX Short range
Long Range TX	**7**	**2**
Short range TX	**4**	**1**

7.7 MUTING

Muting function allows automatic deactivation of the safety function on the whole or part of protected height in order to carry out definite cyclical operations without blocking machine work.
As the pertaining safety requirements demand, ESPE is equipped with two muting activation inputs, MUTING1 and MUTING2.
The Muting sensors must be able to recognise the passing material (pallets, vehicles, …) according to material's length and speed. In case of different transport speeds in the Muting area, it is necessary to consider their effect on the total Muting duration.

- The Muting function excludes the light curtain during functioning, maintaining active the OSSDs' outputs, according to particular operating requirements (Fig. 39).



L-shaped version with integrated Muting sensors for unidirectional Muting

T-shaped version with integrated Muting sensors for bidirectional Muting

Linear version with external Muting sensors

Fig. 39 – Examples of muting application

- The safety light curtain is equipped with two inputs (MUTING1 and MUTING2) for the activation of this function, according to the current Standards.
- This function is particularly suitable when an object, but not a person, has to pass through the dangerous area, under certain conditions.
- It is important to remember that the Muting function represents a forced condition of the system and therefore has to be used with the necessary precautions.
- If MUTING1 and MUTING2 inputs are activated by two Muting sensors or actuators, these should be correctly connected and positioned in order to avoid undesired Muting or potentially dangerous conditions for the operator.
- MUTING1 and MUTING2 can't be activated simultaneously
- State of Muting is signalled by an external Muting Lamp (that can be connected to the light curtains with the pin 10 of the M12-12 poles connector) and by some leds on the user interface. When the Muting function is ON the LAMP and the leds begin to blink.
- During the installation take care to place the lamp in a position as visible as possible.
- If the external lamp is broken and/or not connected, the Muting request causes a SAFE lockout condition and the corresponding failure is signalled.
- If both first and last beams are intercepted by the passing material the light curtain recovery time may be longer. A material moving faster than 1 m/s could lead light curtain to switch in OFF-state at the end of muting sequence.

⚠	**Select carefully the configuration, as a wrong configuration can cause the incorrect functioning of the Muting function and a reduction of the safety level. For correct use of Muting, please refer to the relevant reference standards.**

⚠	**The Muting sensors must be positioned in such a way that the activation of the Muting function is not possible with the accidental passing of a person. Particular attention must be paid to the use of the one-way L-muting mode: the external muting sensors or the SG-L-ARMS muting arms must be positioned so as to allow the passage of the material coming out of the dangerous area protected by the light curtain.**

7.7.1 Muting function disable

During SG4 EXTENDED operations muting function can be dynamically disabled or enabled: when disabled no valid muting request will be accepted at the MUTINGX inputs and safety function will always be on.
The user can disable the muting function at runtime by setting a high level on the signal MUTING DISABLE (pin 7 of the M12-12 poles connector).

7.7.2 Muting signalling devices

In order to make use of Muting function, it is compulsory to connect a dedicated signalling device (lamp); without it the light curtain goes in failure lock-out state.
Both incandescent and LED lamps are allowed. In case of use of LED lamp, take care to connect it respecting the right polarity .
A Lamp TEST is executed cyclically when the lamp is lighted on in order to guarantee the detection of lack of functionality. If a lamp break is detected, ESPE goes in Lamp Failure Lock-Out state and shows the related message on the display (refer to chapter 11 for informations about the lamp).

7.7.3 Typical muting application and safety light curtain connection

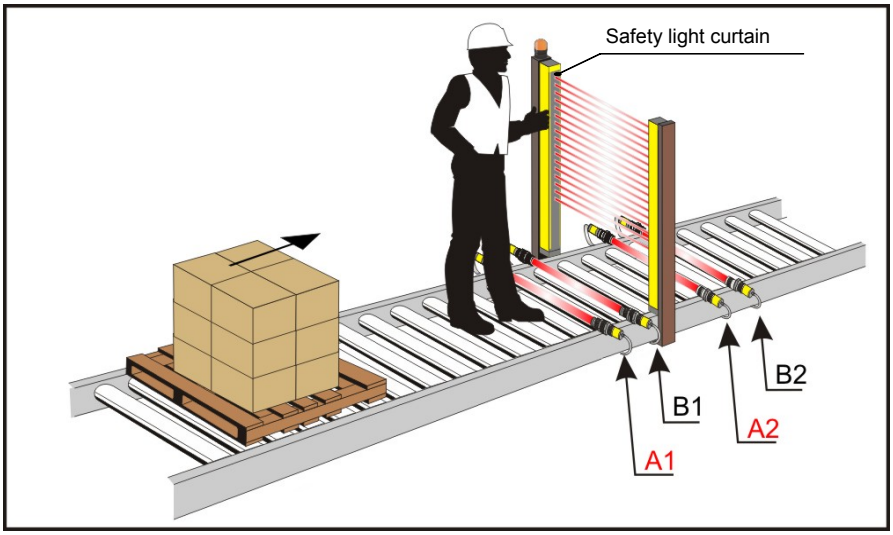


Fig. 40 – Typical Muting Application

The figure above shows a typical muting application: a protection installed on a conveyor should allow the pack passing-by but not the worker. The ESPE temporarily suspends its safety function on a correct activation sequence of A1, B1, A2, B2 sensors.
These sensors can be optical, mechanical, proximity sensors … etc., with high output PNP when the object is detected.

7.7.4 Muting direction

The ESPE can be used with both bidirectional (T type, four sensors) and monodirectional (L type, two sensors) muting.
Bidirectional muting can be used in those applications in which the packs can move in both directions and monodirectional muting can be used in those applications in which the packs move in one direction only.
In BCM the maximum activation delay between MUTING1 and MUTING2 (T12max) is 4 sec.

T muting

In T type operations the device enters muting function if the input MUTING2 goes high within a fixed T12max after the rise of MUTING1 (or viceversa). The muting function ends as soon as the signal on MUTING1 or MUTING2 goes low. A further custom delay (Tdelay) may be set by the user in a 0-1000 ms range. The maximum activation delay between MUTING1 and MUTING2 (or viceversa) can be set by the user from a minimum of 1 sec to a maximum of 16 sec (T12max). After this time if the user wants to enter in muting has to deactivate the muting input and start the sequence from the beginning.

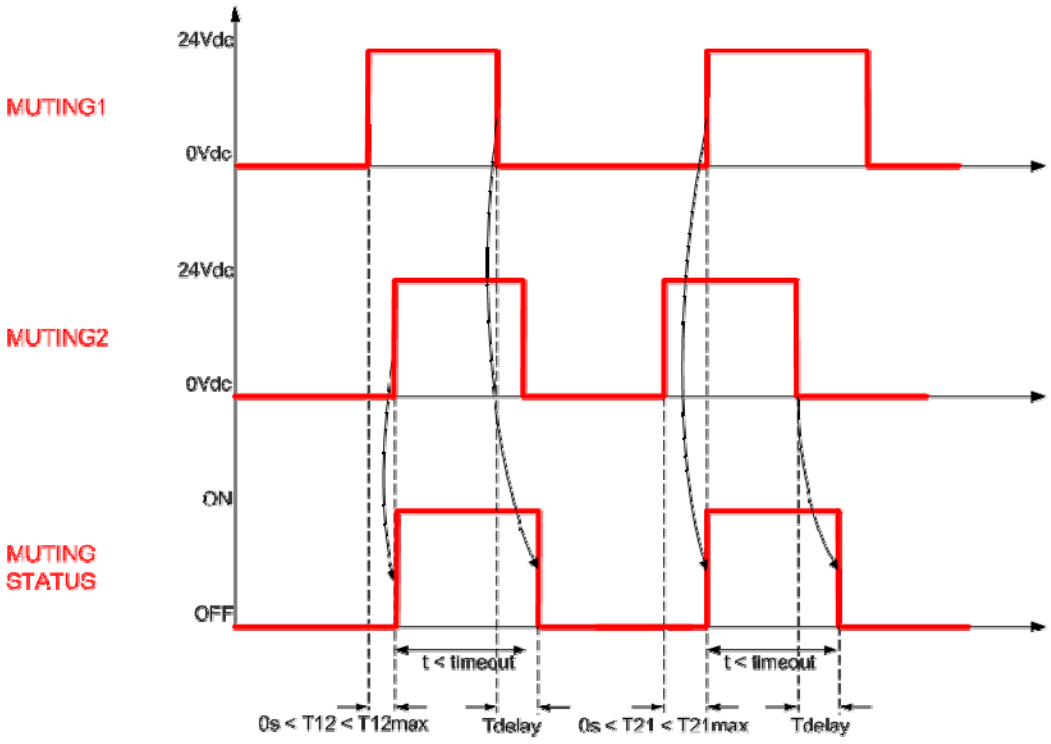


Fig. 41 – T muting timings

The sensors named A1/A2 are connected to the same muting input (MUTING1) and the sensors named B1/B2 are connected to MUTING2. The sensors that end with “1” are on the same side of the light curtain and are on the opposite side of the sensors that end with “2”.

“D” is the distance at which the sensors A1/A2 or B1/B2 have to be mounted; it depends on the package length (L):

$$D < L$$

“d1” is the maximum distance between the muting sensors; it depends on the package speed (V):

$$d1_{max}[cm] = V[m/s] * T12[s] * 100,$$

“d2” is the maximum distance for the muting request to be accepted; it depends on the package speed (V):

$$d2_{max}[cm] = V[m/s] * T12[s] * 100,$$

where “T12” is the activation delay between MUTING1 and MUTING2 that is selectable by the user by means of ACM.

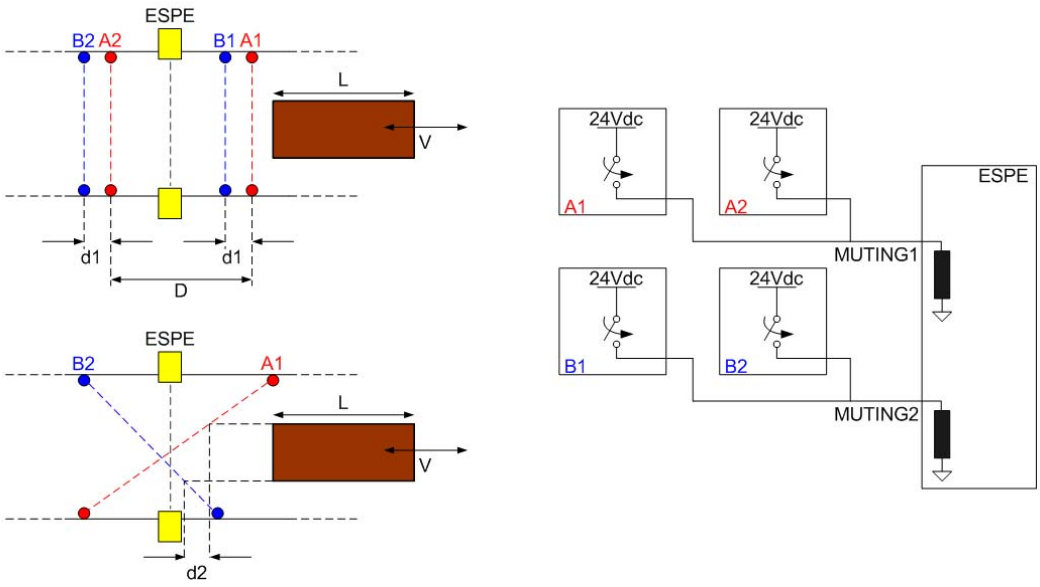


Fig. 42 – T muting connection

L muting

In L type operation the device enters muting function if the inputs go high in a particular order: MUTING1 has to activate first, then MUTING2 can activate; if MUTING2 activates before MUTING1, the device doesn't enter the muting function.
"T12" is the activation delay between MUTING1 and MUTING2 that is selectable by the user by means of ACM.
The muting function ends after a time that is a multiple of the activation delay between the two sensors (this time is m * T12). The value of "m" (T12 multiplier) can be chosen by the user. In BCM this value is 2 by default.
The maximum activation delay between MUTING1 and MUTING2 can be set by the user from a minimum of 1 sec to a maximum of 16 sec. After this time if the user wants to enter in muting has to deactivate the muting input and start the sequence from the beginning.

⚠	**Muting L must be used exclusively for removing materials from the dangerous area.**

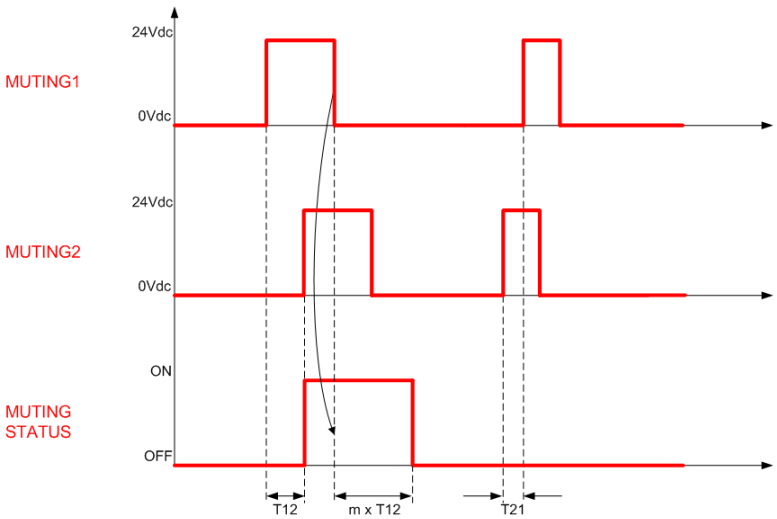


Fig. 43 – L muting timings

The sensor named A is the farthest from the light curtain, so its beam is intercepted first. Making reference to the next figure, since the pack goes from right to left only, B sensor can't be intercepted first; if this happens the device doesn't enter muting function.
"V" indicates a constant speed. As a consequence, "d1" is fixed according to the following formula:

$$d1[cm] = V[m/s] * T12[s] * 100$$

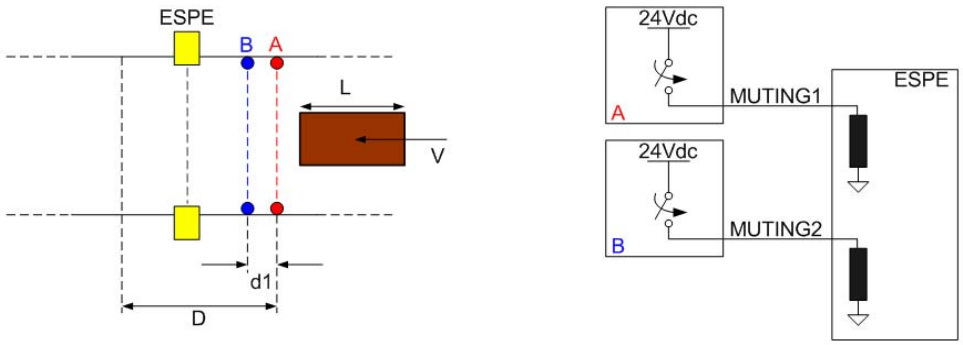
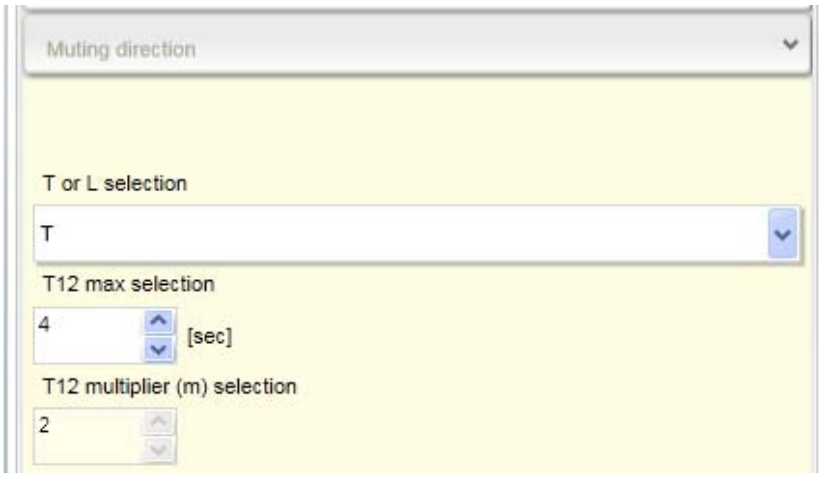


Fig. 44 – L muting connection

BCM Configuration: Muting Direction		
		PWR OSSD EDM ACM LEVEL
T (bidirectional)	**Led 6 ON Green**	
L (monodirectional)	Led 6 OFF	

ACM Configuration: Muting Direction



7.7.5 Muting timeout

Muting timeout is a time that defines the maximum duration of muting function; after the timeout the muting ends.

This time can be set from the user in both BCM and ACM mode.

In BCM mode the user can select a timeout of 10 minutes or infinite; “infinite” means that muting timeout could never end: if the conditions of muting persist, the muting function still continues to exist. This is not compliant with the 61496-1 rule and the user is warned about it.

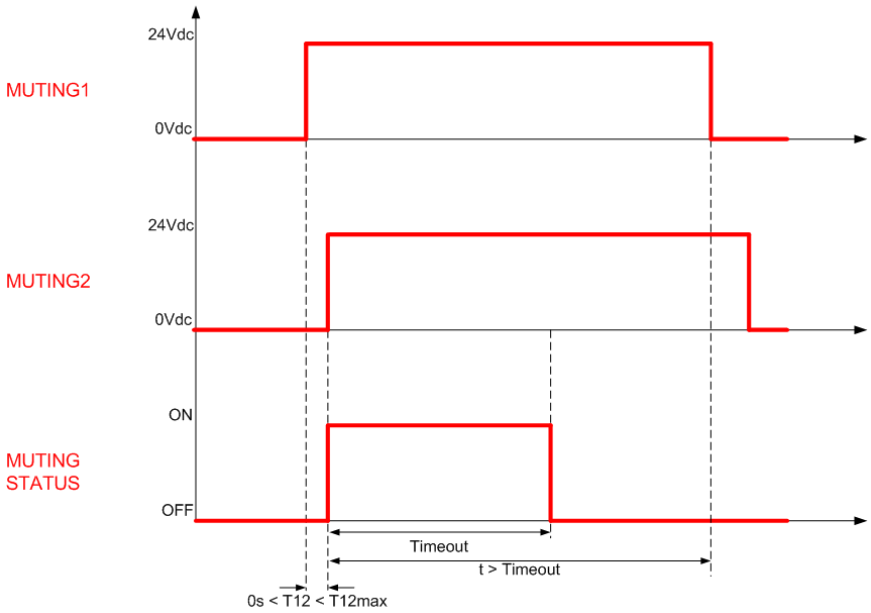
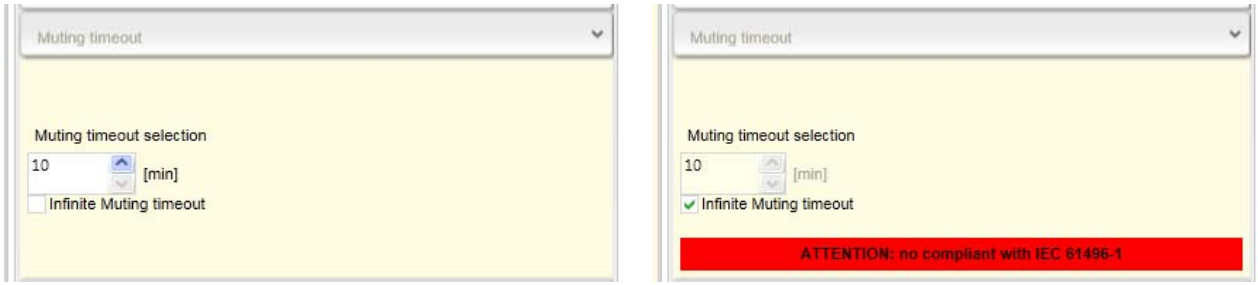


Fig. 45 – Muting timeout

The user can personalize the timeout from 10 minutes to 1080 minutes (that correspond to 18 hours) with steps of 1 minute; the user can even set infinite timeout. In this case there’s a warning that alerts the user that this timeout is not IEC 61496-1 compliant.

BCM Configuration: Muting Timeout								
		PWR	OSSD	EDM	ACM	LEVEL		
10 min	**Led 7 ON Green**	●	○	○	○	○	○	●	○
infinite	Led 7 OFF	●	○	○	○	○	○	■	○

ACM Configuration: Muting Timeout

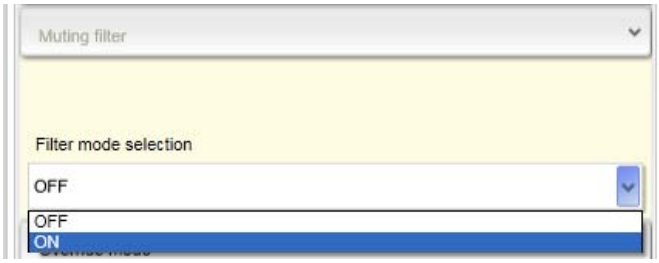


Note: Infinite is not 61496-1 compliant thus the user is warned about it

7.7.6 Muting Filter

This function avoids undesired activations of the muting.
The muting filter is a filter on muting inputs; low-high or high-low transitions of MUTING signals are considered valid only if maintained for a time (Tf) greater than 100ms.
If this function is disabled the logical level of the muting sensors corresponds to the wire level.

ACM Configuration: Muting Filter



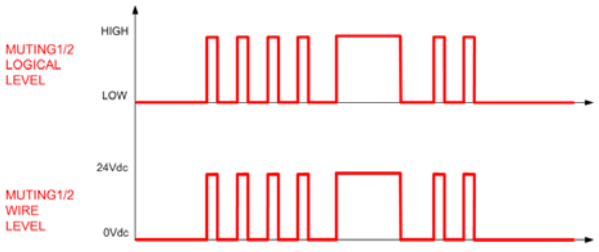


Fig. 46 – Muting filter disabled

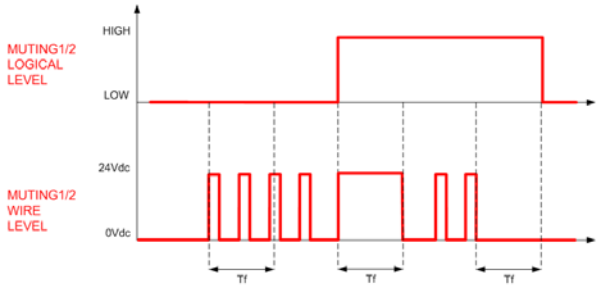


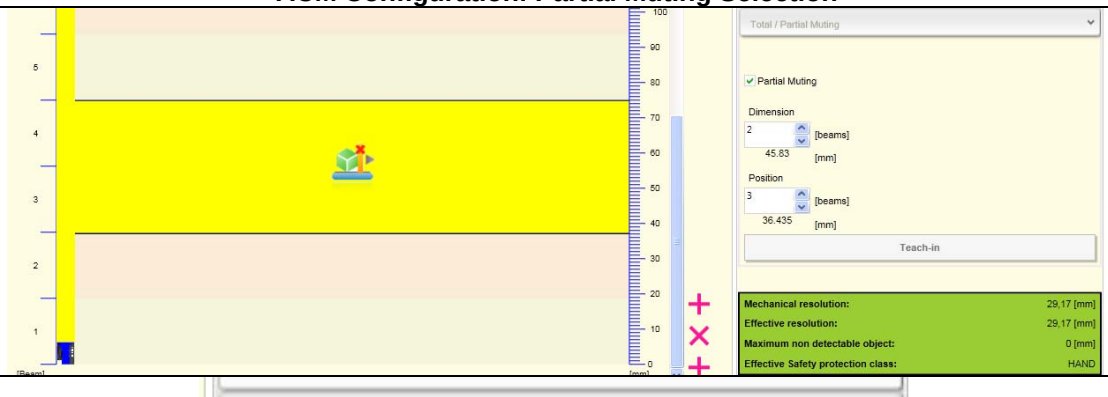
Fig. 47 – Muting filter enabled

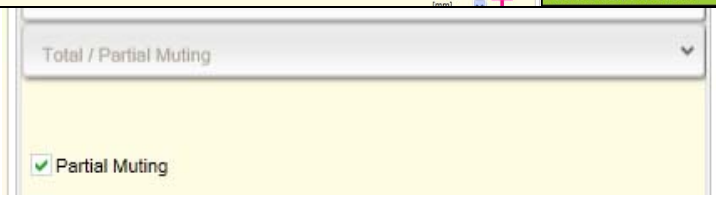
7.7.7 Partial muting

It's possible to configure the type of muting: total or partial. Partial muting can be useful in those applications in which the user wants to limit the muting function effects to selected zones only.

In ACM Configuration the user can select a maximum of 5 muting zones, each defined with the following parameters:
- **Position:** first beam of muting zone (starting from user display cap)
- **Dimension:** number of beams of muting zone

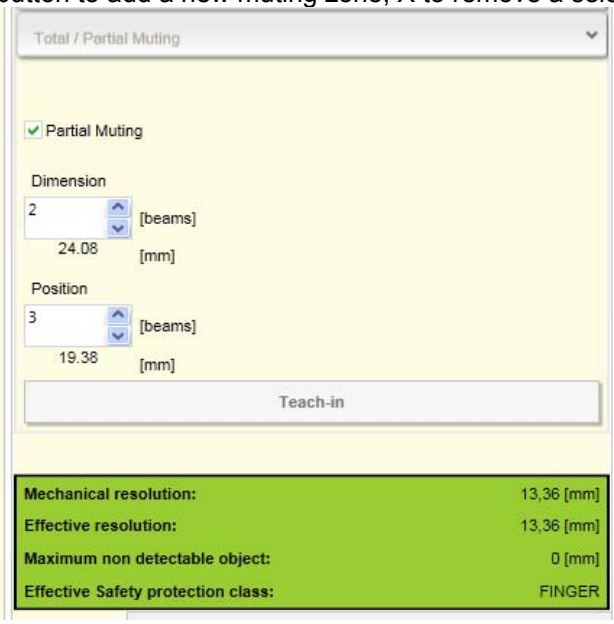
ACM Configuration: Partial Muting Selection





Check "Partial Muting" to enable function.

Click "+" button to add a new muting zone, X to remove a selected one



Choose correct parameters for selected zone. Both Dimension and Position are set in beams unit, equivalent measures in mm are exposed by GUI.

7.8 OVERRIDE

Override function allows the user to force safety function deactivation whenever it's necessary to restart the machine despite one or more ESPE beams are intercepted. The aim is clearing protected area of any working materials blocked ahead of ESPE because of (i.e.) a cycle anomaly.

Override redundant inputs have to be connected to a 24VDC normally-open contact and to a GND normally-open contact.
As the pertaining requirements request ESPE is equipped with two Override activation inputs: OVERRIDE1 and OVERRIDE2 (respectively, pin 4 of the M12-12 poles connector and pin 9 of the M12-12 poles connector – RX).

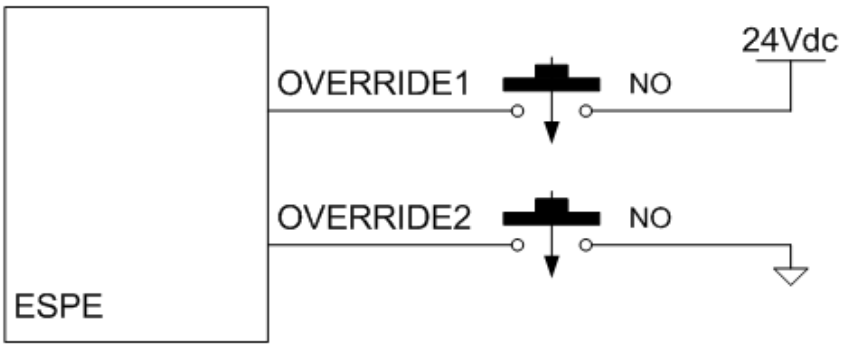


Fig. 48 – Override connection

Necessary condition for override request to be accepted is: ESPE in SAFE state and at least one muting sensor intercepted.
When such condition is verified user interface visualizes "override attention status" with both red OSSD led and alignment leds blinking.

	PWR OSSD EDM ACM LEVEL
OVERRIDE ATTENTION STATUS	

Then, an override request is accepted only if signals at OVERRIDE X inputs follow the timings shown hereafter.
Override function will automatically end when one of the following conditions is present:

- all the muting sensors are deactivated (in a T-muting configuration)
- all the muting sensors are deactivated AND no beams are intercepted (in a L-muting configuration)
- the pre-determined time limit has expired
- the requirements for actuation aren't met anymore (for example, one override input is deactivated)

7.8.1 Override mode

It's possible to configure the trigger of override inputs: Level or Edge.

As explained in diagrams below two types of override trigger sequence are accepted on external inputs:

- **Level Trigger:** override engaged until both contacts are closed AND at least one muting sensor is intercepted.
OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

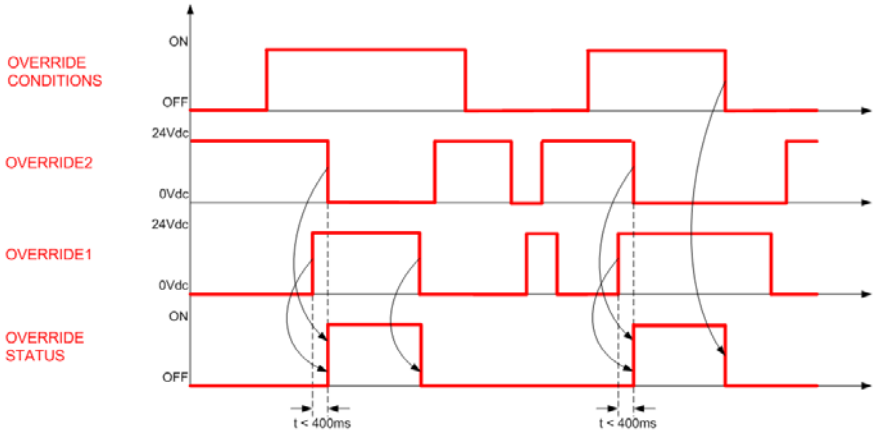


Fig. 49 – Override timings (level trigger)

- **Edge Trigger:** override engaged on contacts closing until at least one muting sensor is intercepted. In this case the override state rests even if the override contacts are released. The device exits the override state when one of the following events happens:
- the muting sensors are deactivated (T-muting) or the muting sensor are deactivated AND no beams are intercepted (L-muting)
- the timeout expires
OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

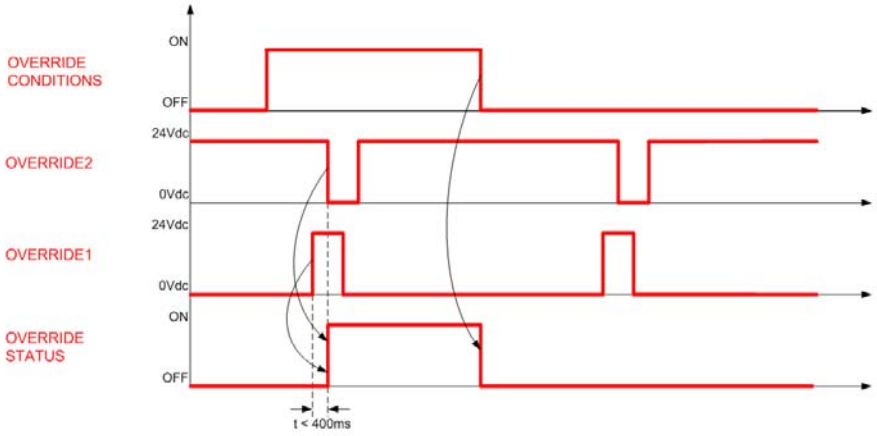
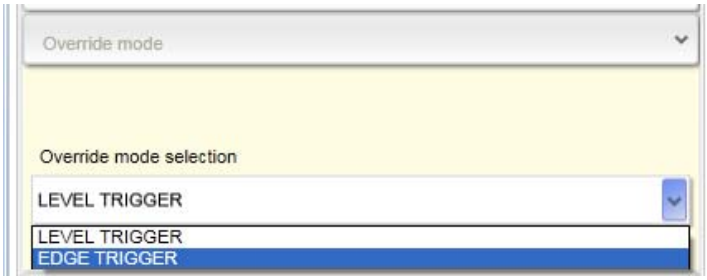


Fig. 50 – Override timings (edge trigger)

BCM Configuration: Override Mode									
		PWR	OSSD	EDM	ACM	LEVEL			
Level	**Led 8 ON Green**	●	○	○	○	○	○	○	●
Edge	Led 8 OFF	●	○	○	○	○	○	○	●

ACM Configuration: Override Mode


7.8.2 Override timeout

BCM mode
In both modes Override status timeout is 120s: if Override conditions remain active and both Override contacts remain closed (this condition only in Level Trigger Mode) more than 120s, the Override goes low in any case after a maximum of 120s.

ACM mode
Override timeout is the maximum duration of override. This time can be chosen by the user from a minimum of 1 minute to a maximum of 256 minutes.
After timeout the override ends even if the conditions for its activation are still existing and the override inputs are active.
OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

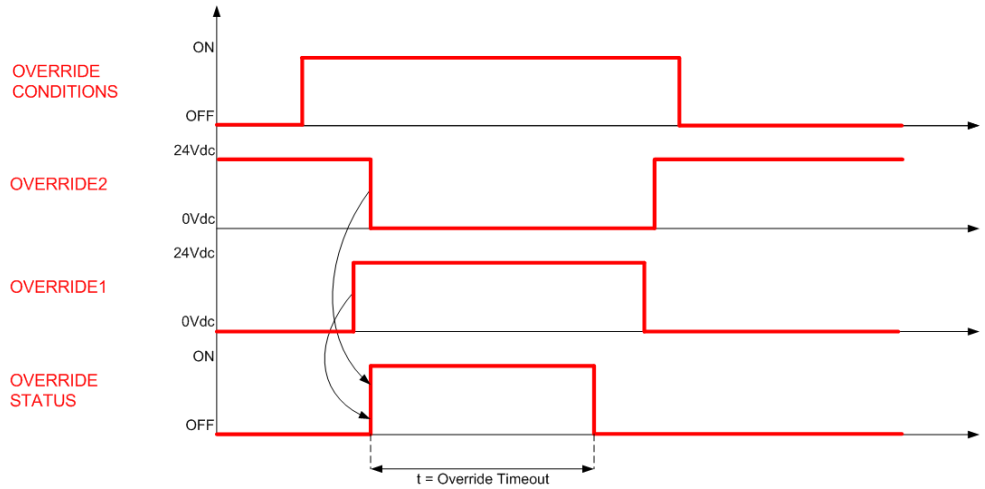


Fig. 51 – Override timeout timings

ACM Configuration: Override Timeout


7.8.3 Override restart

This kind of selection can be achieved only if the light curtain is in Manual Restart; the user can select the type of Override Restart: Normal or Auto.

The user has to connect the RESET/RESTART/ALIGN input (pin 3 of M12-12 poles – RX side) to a 24VDC normally-open contact.

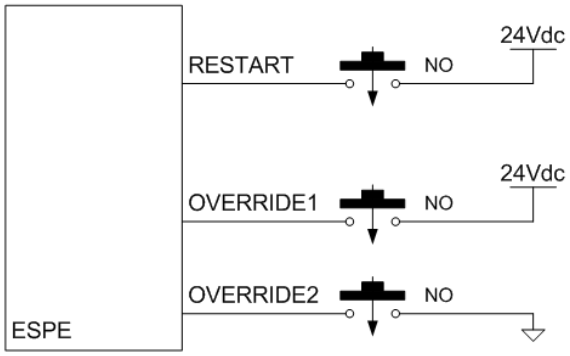


Fig. 52 – Override restart connection

AUTO OVERRIDE RESTART

The OSSDs go in normal operation state after the RESTART signal goes low, and not after 500msec. A timeout of 5s on the high RESTART brings the ESPE in failure lockout.
The outputs go high after a time that is the maximum value between the recovery time and the time of restart high (greater or equal to 500msec), so this time can be any value between 500ms and 5s.
When override ends if the beams are free the OSSDs go to normal operation state.
OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

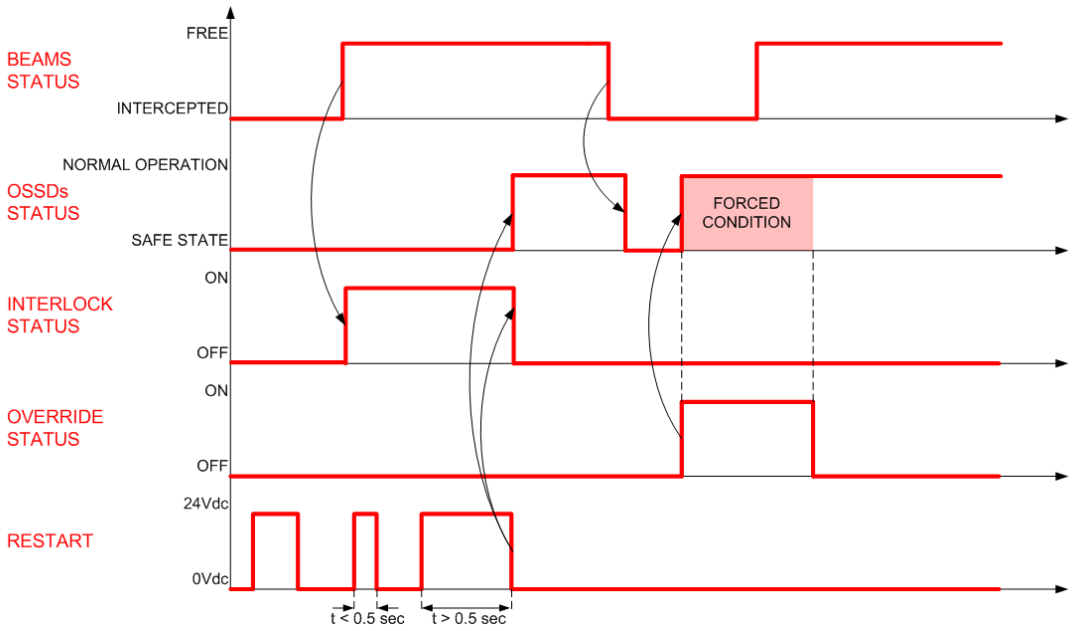
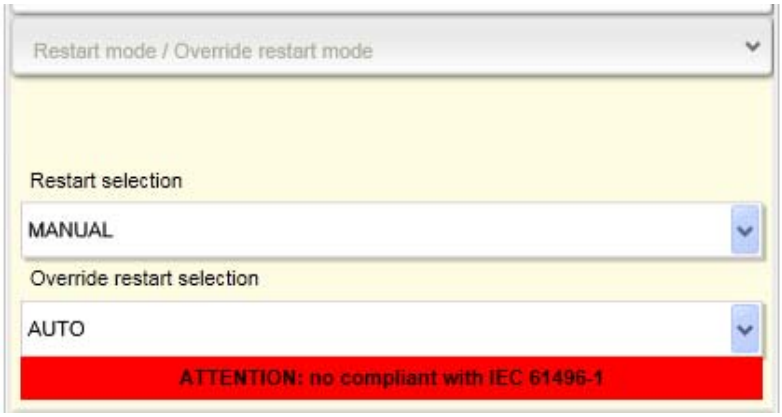


Fig. 53 – Override restart timings (auto)

ACM Configuration: Auto Override Restart Selection



This selection is not compliant with IEC 61496-1 and the user is warned about it.

NORMAL OVERRIDE RESTART

The OSSDs go in normal operation state after the RESTART signal goes low, and not after 500msec. A timeout of 5s on the high RESTART brings the ESPE in failure lockout.
The outputs go high after a time that is the maximum value between the recovery time and the time of restart high (greater or equal to 500msec), so this time can be any value between 500ms and 5s.
When override ends if the beams are free the ESPE goes to interlock state and a restart is required to achieve normal operation state.
OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

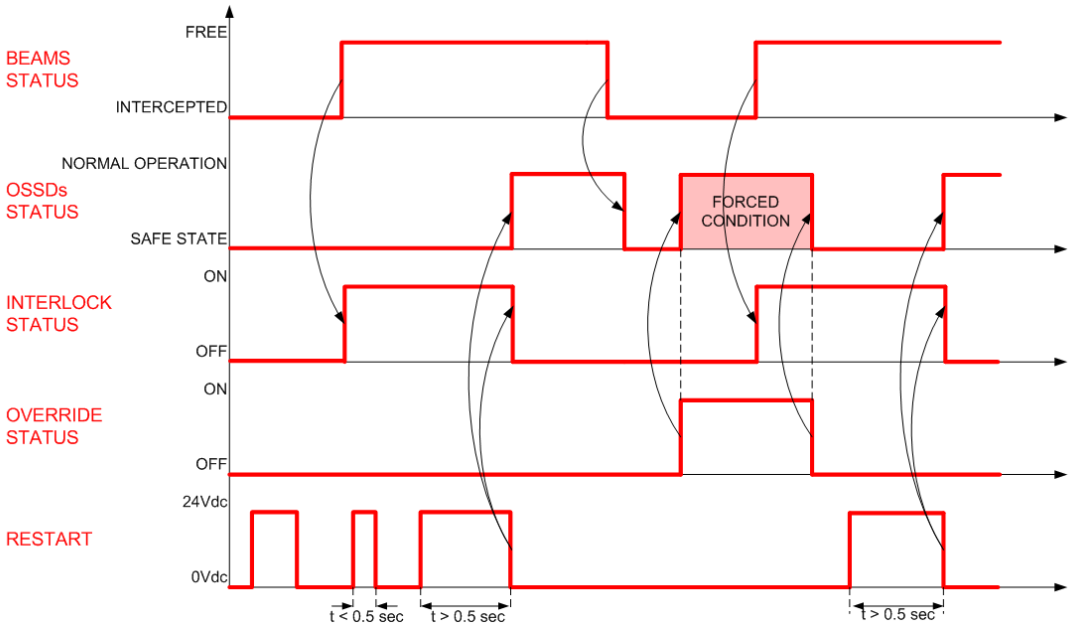


Fig. 54 – Override restart timings (normal)

ACM Configuration: Normal Override Restart Selection

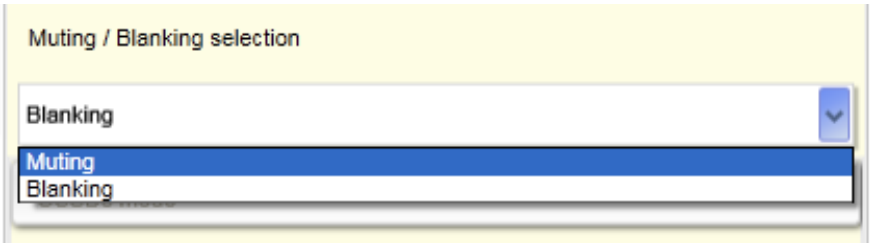

7.9 BLANKING

Blanking is an auxiliary function of safety light curtains for which the introduction of an opaque object inside parts of the light curtain's controlled area is allowed without stopping the normal functioning of the machine. Blanking is only possible in the presence of determined safety conditions and in accordance with a configurable operating logic.
The blanking function is therefore particularly useful when light curtain's controlled area must be inevitably intercepted by the material being worked or by a fixed or mobile part of the machine. In practice, it is possible to keep light curtain's safety outputs in a normal operation condition and the machine working, even if a pre-determined number of beams within the controlled area is being intercepted.
The user can even connect a lamp (whose characteristics are reported in chapter 11) to indicate that a blanking function is active. The use of the lamp is not mandatory for a light curtain in blanking mode. The lamp begins to blink in the following cases:
- the light curtain is in any fixed blanking mode and the object is removed from the blanked zone
- the light curtain is in floating mode with total surveillance and the dimension of the taught object changes or the object is removed from the blanked zone.

To activate all blanking functions Blanking Operation can be selected either in BCM or in ACM.

BCM Configuration: Muting/Blanking Selection		
		PWR OSSD EDM ACM LEVEL
Muting	**Led 3 ON YELLOW**	
Blanking	Led 3 OFF	

ACM Configuration: Muting/Blanking Selection

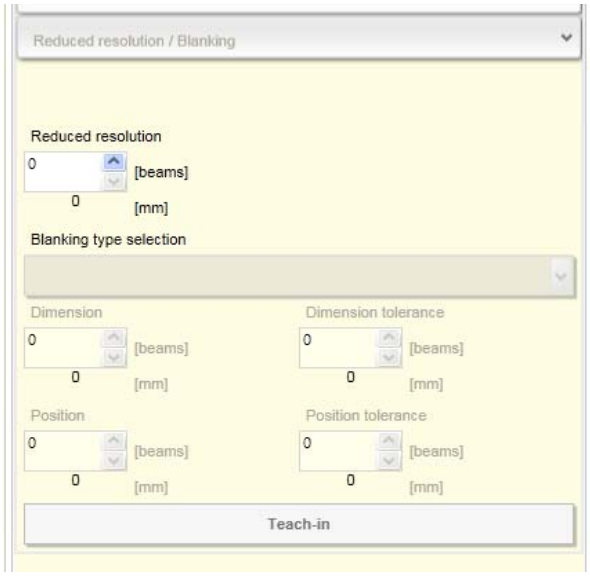


Blanking function can be realized in two different modes: fixed blanking and floating blanking. These two modes can be enabled individually or contemporaneously.

7.9.1 Fixed Blanking

Fixed Blanking allows a fixed portion of the controlled area (i.e. a fixed set of beams) to be occupied, while all the other beams operate normally.
The blanking zone can be obtained through a Teach-in operation: the user has to keep pressed the 24VDC normally-open contact of Teach-in (pin 4 of M12-12 poles - RX) for at least 3 seconds while an object intercepts the area to be blanked. The blanking zone becomes active after the Teach-in contact has been released.
If Teach-in contact is kept pressed for a time greater than 1 minute the light curtain goes in a lockout failure.
The Teach-in operation can be performed in ACM too. The user has to place the object(s) within the protected area and press the button “Teach-in” (in “Reduced resolution / Blanking” in the blanking section of the GUI).

ACM Configuration: Teach-in operation



In Fixed Blanking the beams of the blanked zone have to remain intercepted, otherwise the light curtain goes in SAFE state.
The Tolerance function can be activated by keeping pressed at startup the 24VDC normally-open contact on Tolerance signal (pin 9 of M12-12 poles - RX). With Tolerance active the object can move 1 beam above or below the blanking zone. If object moves more than 1 beam out of the blanking zone ESPE locks-out in Blanking Tolerance Fault.
Tolerance function is useful if there is the possibility that the object can have little movements from its initial position.
If the light curtain is switched off the Tolerance is lost and a new Tolerance operation (described here above) is necessary.
With Tolerance active at least two not blanked beams must separate two blanking zones.
Teach-In Configuration is kept on both power disconnection and ESPE Reset, till next Teach-In. The user can erase the Teach-In Configuration by making a new Teach-in operation with the controlled area free from objects.
On a Blanking Faults Teach-in configuration gets erased after Reset.
If the user changes configuration from blanking to muting and then blanking again, every possible Teach-in zone stored at the beginning is cancelled.
Fixed Blanking can be combined with floating blanking; at least one sync beam must be free.

7.9.2 Fixed Blanking with increased tolerance

This is a fixed blanking with the tolerance only on one side of the blanking zone, so the user has to choose a “tolerance top” or a “tolerance bottom”.
This function is useful for conveyors (that use fixed blanking) with goods moving on them (with a dimension within the tolerance).
Only fixed blanking zones can be set on the side of the tolerance; on the other side fixed blanking or floating blanking with total surveillance zones are allowed.
Only one zone can be set as fixed blanking with increased tolerance.
This function can be set only by means of ACM.

Note: Tolerance affects effective ESPE resolution.

7.9.3 Floating Blanking with total surveillance

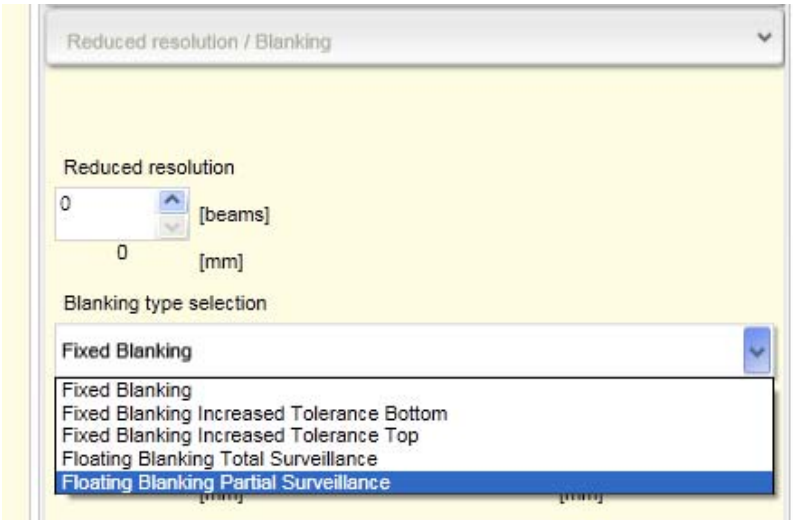
Floating Blanking with total surveillance allows the object to move freely inside the light curtain’s controlled area. The blanked beams must be occupied and therefore the object has to be inside the controlled area of the light curtain to remain in normal operation state.
This function can be set only by means of ACM.

7.9.4 Floating Blanking with partial surveillance

Floating Blanking with partial surveillance allows the object to move freely inside the light curtain’s controlled area, occupying till a given number of beams, at the condition that the occupied beams are adjacent and that their number is not higher than the configured one.
In this mode, the object may be removed from the controlled area.

This function can be set only by means of ACM.
In the figure below the different blanking configurations can be seen.

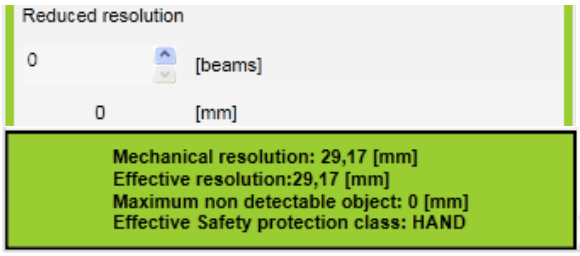
ACM Configuration: Blanking configuration

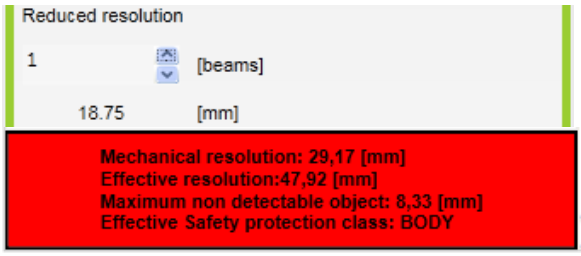


7.9.5 Reduced Resolution

Reduced Resolution is a particular kind of floating blanking in which more than one object can intercept each a defined number of beams with the ESPE remaining in normal operation. The number that follows indicates how many adjacent beams can be intercepted by the object to allow the light curtain to remain in Normal Operation. For example, with Reduced Resolution 2 the object intercepts 1, 2 or no beams and the light curtain remains in Normal Operation. This function can be set only by means of ACM.

NB: This function affects the effective resolution of the light curtain and the user is warned about it.





7.9.6 Dimension

This value indicates the size of blanking zone.
This function can be set only by means of ACM.

7.9.7 Position

This value indicates the first beam of the blanking zone, starting from the bottom of the ESPE (the bottom of the ESPE is the side with the leds and the push buttons).
Since in floating blanking configuration zones haven't a fixed position, it is valid only in fixed blanking.
This function can be set only by means of ACM.

7.9.8 Tolerance

There are 2 types of tolerance: position and dimension.

Position Tolerance

It indicates the number of beams in blanking zone that can be intercepted above and below the blanking zone without making the OSSDs switch off.
In presence of wide vibrations, it is useful to use this function in order to avoid the changing of the OSSDs' status.

Dimension Tolerance

It indicates how many beams the object can be smaller than the number fixed by the value Dimension. It's a negative quantity.
It is useful when an object intercepts half optic; in this case a little vibration can make the OSSDs change status.

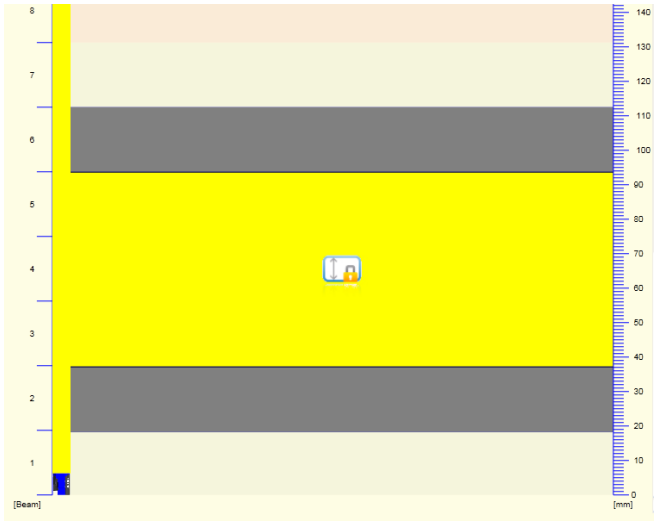
Tolerance can be selected via wire or ACM.
If the user wants to select this function with ACM, he must have at least one blanking zone; then he can choose Position or Dimension Tolerance. Next tables shows the different cases on a blanking zone of 3 beams.
If the light curtain is configured with ACM it doesn't take care if the Tolerance has been selected by means of Tolerance wire (pin 9 of M12-12 poles - RX).

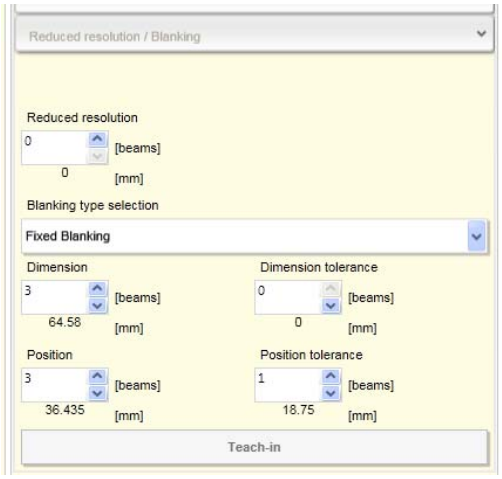
The presence of the tolerance is indicated with the blinking of some leds in the user interface as shown below.

Tolerance indication		
		PWR OSSD EDM ACM LEVEL
Tolerance active	Led 3 blinking YELLOW	

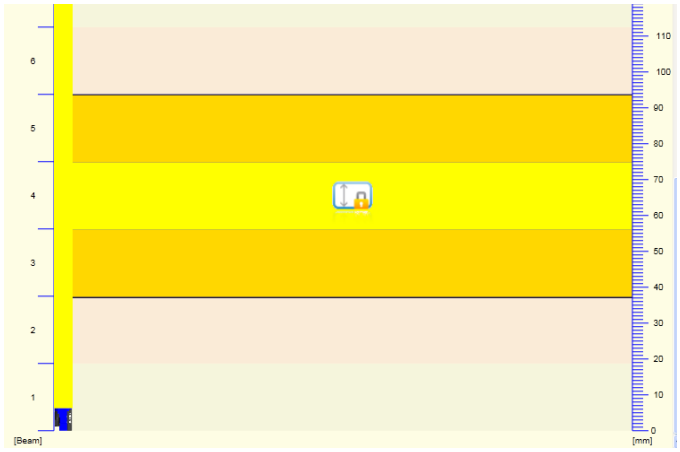
⚠	**Tolerance affects the ESPE resolution. Take care to the new resolution in order to calculate a new mechanical mounting**

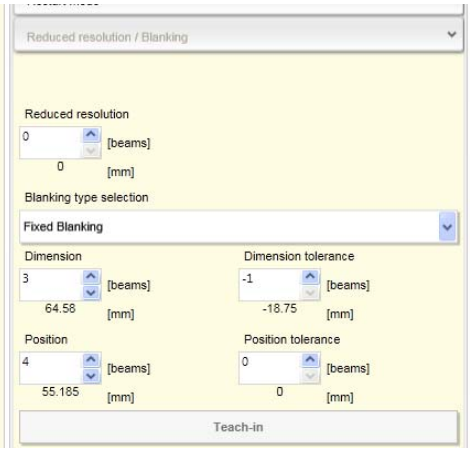
POSITION TOLERANCE





DIMENSION TOLERANCE





BLANKING IN BASIC CONFIGURATION MODE

In basic configuration mode only a reduced set of possible blanking configuration is possible.

BCM Configuration: Fixed Blanking		
		PWR OSSD EDM ACM LEVEL
1 Fixed Blanking Zone	**Led 8 ON Green**	
2 Fixed Blanking Zones	Led 8 OFF	

1 Fixed Blanking zone: only 1 zone can be configured as blanking zone

2 Fixed Blanking zones: 2 zones can be configured as blanking zone

BCM Configuration: Floating Blanking		
		PWR OSSD EDM ACM LEVEL
Floating Blanking Disabled	**Led 6 ON Green** **Led 7 ON Green**	
Floating Blanking 1 beam (with partial surveillance)	Led 6 ON Green Led 7 OFF	
Floating Blanking 2 beams (with partial surveillance)	Led 6 OFF Led 7 ON Green	
Reduced Resolution 4	Led 6 OFF Led 7 OFF	

Floating blanking disabled: no Floating Blanking allowed.

Floating Blanking 1 beam: ESPE stays in NORMAL OPERATION if 1 or 0 beams are intercepted.

Floating Blanking 2 beams: ESPE stays in NORMAL OPERATION if 2 adjacent, 1 or 0 beams are intercepted.

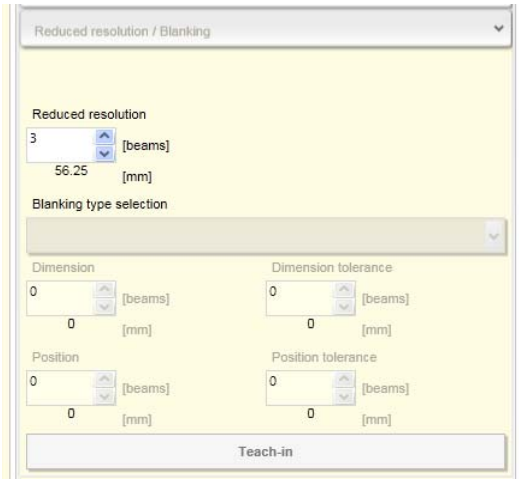
Reduced Resolution 4: ESPE goes in SAFE state if more than 4 adjacent beams gets intercepted.

BLANKING IN ADVANCED CONFIGURATION MODE

In ACM a maximum of 5 blanking zones (fixed + floating) can be configured (at least 1 beam of separation between zones is necessary).
In ACM the number of beams can be chosen by the user.

REDUCED RESOLUTION

ACM Configuration

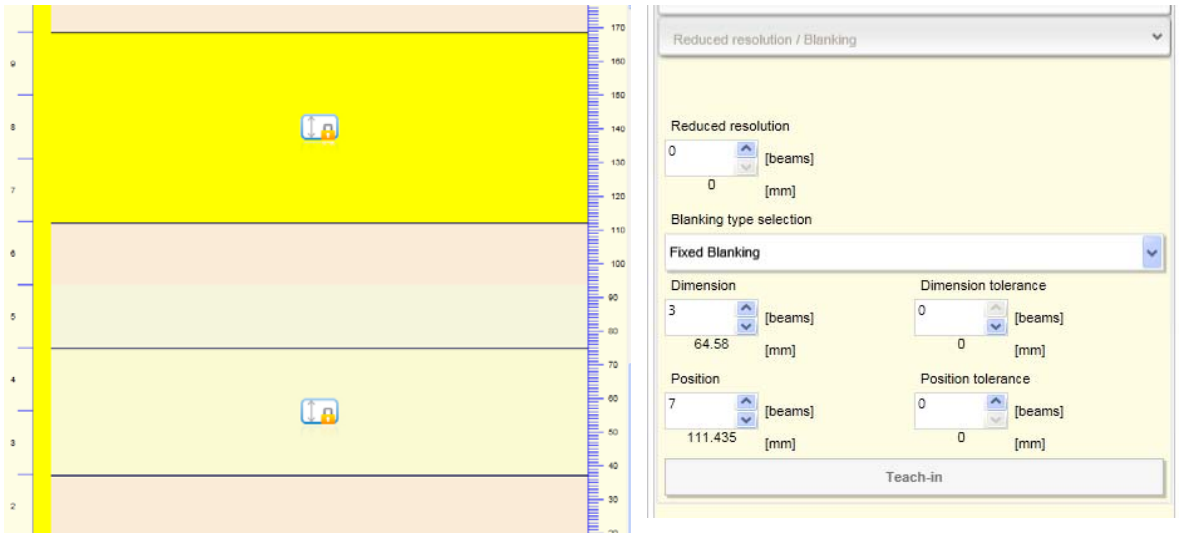


GUI calculates the maximum object size (in mm) that can intercept ESPE without causing SAFE STATE.
Effective ESPE resolution changes depending on the different value assigned to parameter N.
Safety distance should be calculated according to effective resolution.

N value	14mm ESPE effective resolution	30mm ESPE effective resolution
1	23mm	49mm
2	33mm	68mm
3	42mm	87mm
4	51mm	105mm

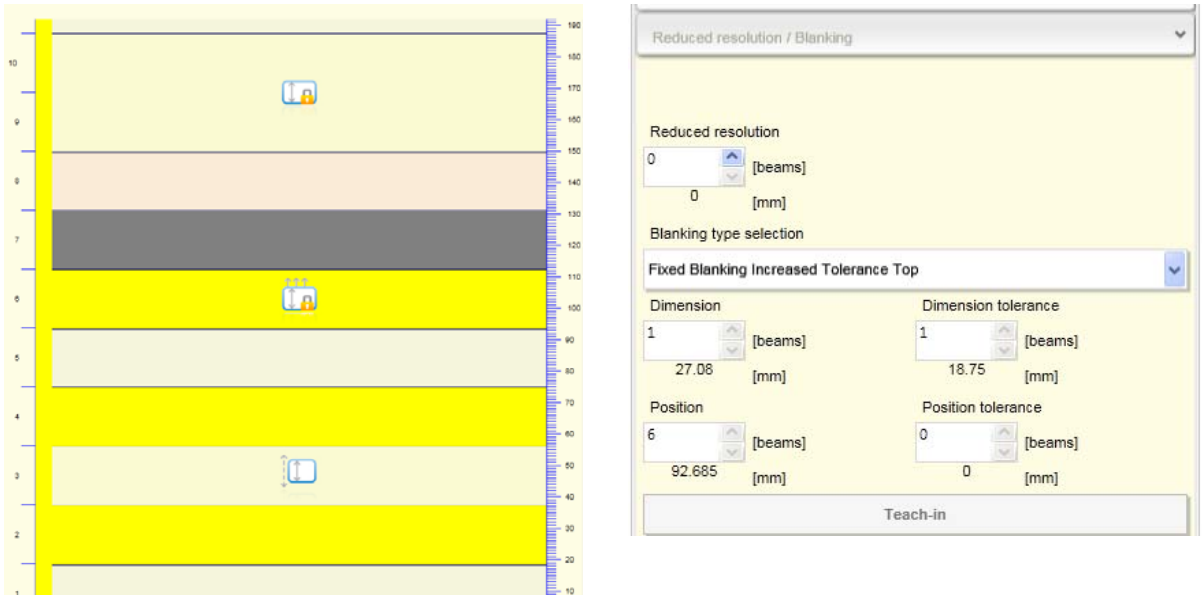
FIXED BLANKING 

The panel on the right shows the settings of the active blanking zone (in the example here below the active blanking zone has a dimension of 3 beams and is 7 beams from the bottom of the light curtain; no tolerance is set).



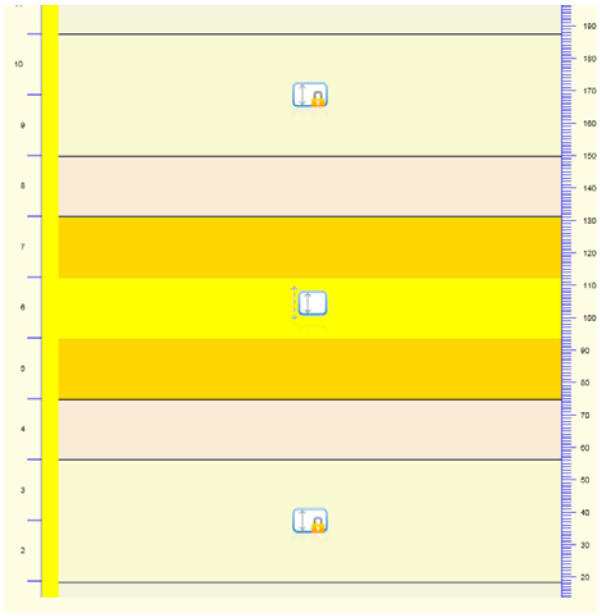
FIXED BLANKING WITH INCREASED TOLERANCE (TOP  or BOTTOM )

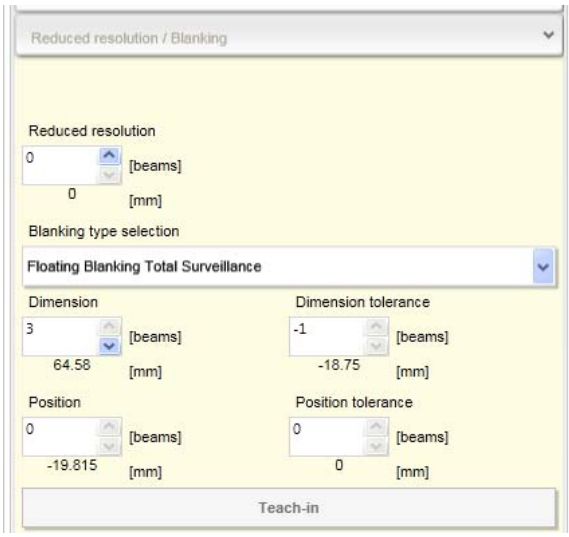
The example below shows a setting with fixed blanking with increased tolerance top: over this zone fixed blanking zones only are allowed; under this zone fixed and total surveillance blanking zones are allowed.



FLOATING BLANKING WITH TOTAL SURVEILLANCE 

Floating objects can move up or down intercepting different beams while moving; the objects can't overlap nor change relative positions.
Object must be always present in the protected area and intercept the configured number of beams with a mandatory fixed tolerance of one beam; that is necessary since a moving object will always intercept a different number of beams.

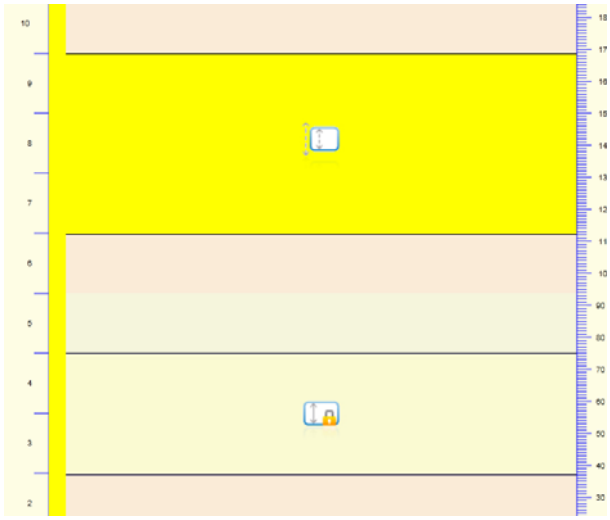


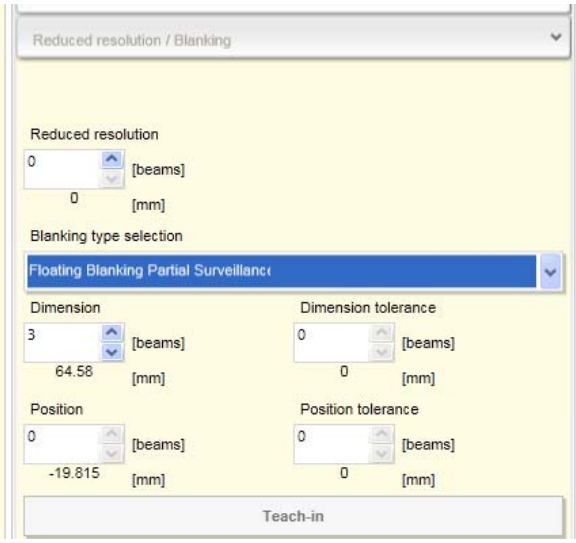


FLOATING BLANKING WITH PARTIAL SURVEILLANCE

Floating objects can move up or down intercepting different beams while moving; they can even get out of the protected area or intercept a number of beams minor than the configured one.

Adjacent to this zone fixed blanking only can be configured; with such fixed blanking zones floating objects can overlap and even change relative positions without causing the switching of the OSSDs.





7.10 CASCADE

A dedicated Bus provides the connection between master and slave units. The same bus is used to connect SG-Dongle which links the light curtain to Ethernet.
A proprietary transmission protocol for bus is used to communicate to slaves safety related informations and status.
OSSDs are physically connected to master unit only; only the master unit can control their status.
If transmission fails, due to a stuck-at fault or a signal degradation, master and slave units go in failure lock-out condition.
A maximum of three units (master and two slaves) can be connected in a cascade configuration (a maximum of 160 beams for 30mm resolution models and a maximum of 320 beams for 14mm resolution models). The maximum length of the master unit is 1800mm and the maximum length of each slave is 1200mm. For the correct connection of the units in a cascade configuration, the right cables have to be used (CVL-5193, CVL-5194, CVL-5195 on chapter 15).
A safe auto-recognition procedure at startup is implemented; it automatically detects cascade topology and correctly address units.
In order to allow auto-recognition it's mandatory to connect the termination cap (supplied on kit) on the tail connector of last cascade unit, in both transmitter and receiver unit.
If this connection misses, Master and Slave units go in critical Communication failure.

7.11 PNP/NPN

The PNP/NPN function allows the user to inform the light curtain on how the OSSDs are connected.

PNP CONFIGURATION

IN THIS CONFIGURATION THE LOAD IS CONNECTED BETWEEN OSSD OUTPUT AND GND.

IN NORMAL OPERATION OSSDS OUTPUT VOLTAGE IS 24VDC.

WHEN AN OPAQUE OBJECT INTERCEPTS THE BEAMS THE STATUS OF OSSDS CHANGES FROM HIGH TO LOW.

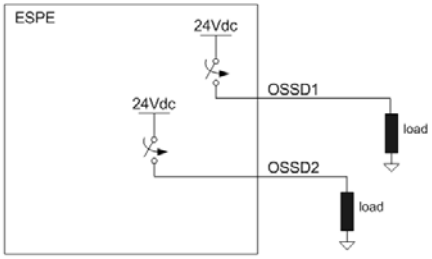


FIG. 55 – PNP CONNECTION

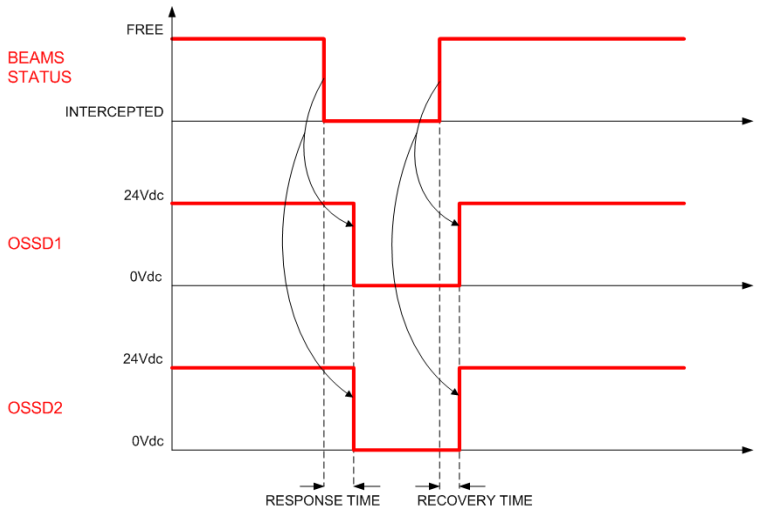


Fig. 56 – PNP timings

NPN CONFIGURATION

IN THIS CONFIGURATION THE LOAD IS CONNECTED BETWEEN 24VDC AND OSSD OUTPUT.

IN NORMAL OPERATION OSSDS OUTPUT VOLTAGE IS 0V. WHEN AN OPAQUE OBJECT INTERCEPTS THE BEAMS THE STATUS OF OSSDS CHANGES FROM LOW TO HIGH.

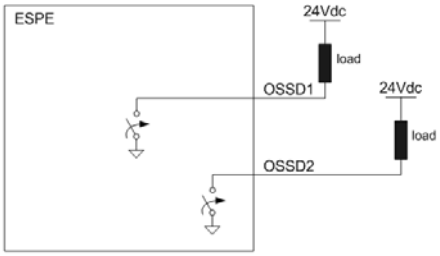


FIG. 57 – NPN CONNECTION

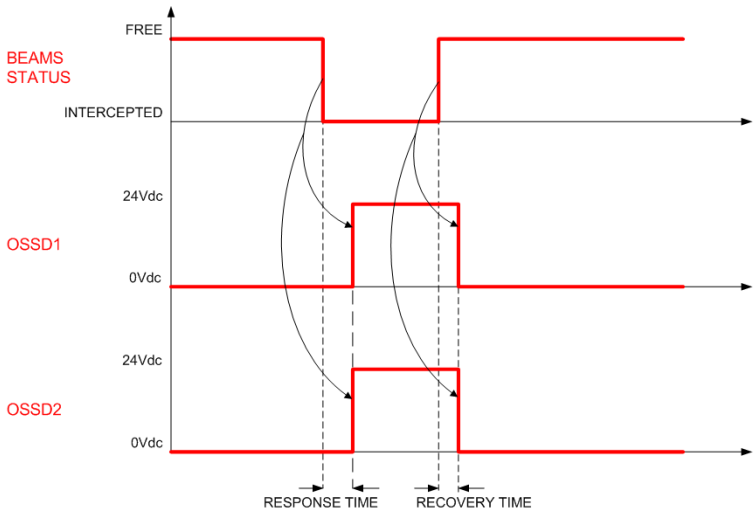


Fig. 58 – NPN timings

7.12 CODING

The coding function allows the ESPE to remain in normal operation also when an interference condition with an other ESPE occurs, and in particular when the TX of the first light curtain radiates in the direction of the RX of the second light curtain. Obviously, both light curtains must be configured with two different codes (see also par. 2.2.2).

No code

In this situation, no code is selected and the safety light curtain has to be installed at a certain distance from other light curtains with no code, in order to avoid possible interferences that can lead to a dangerous situation.
If the user has to install the light curtains nearer than the minimum allowed distance he should take care to install the TX of the first light curtain on the same side of the RX of the second.

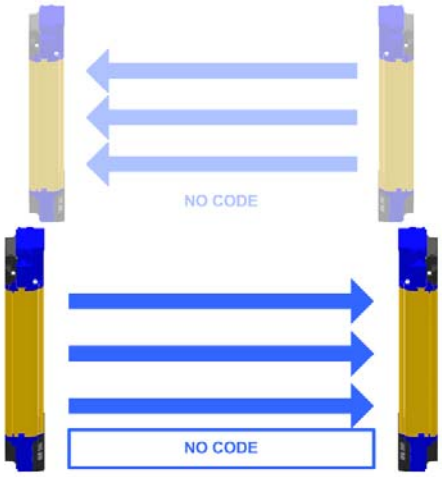


Fig. 59 – No code

Code 1 or Code 2

When the user has to install two light curtains at a distance that is lower than the minimum distance allowed from homologous devices (and has to have the RXs on the same side), he has to configure the light curtains with different codes.
The configuration by means of GUI changes the code only on RX side; in order to have the light curtain correctly working, the user has to configure TX side with the same code by means of BCM.

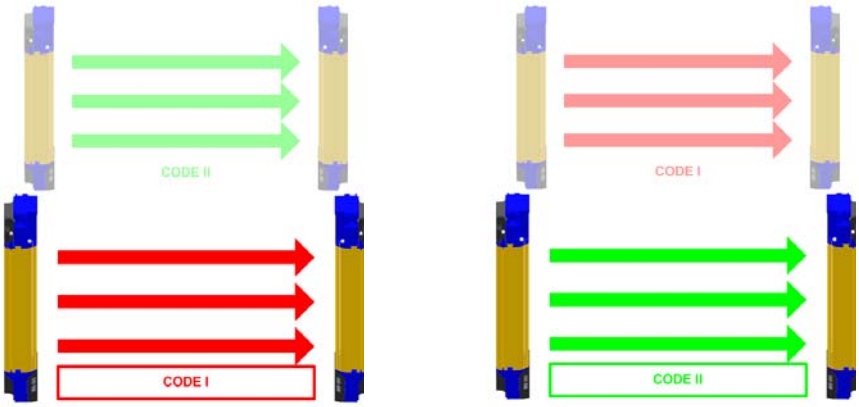


Fig. 60 – Code 1 and code 2

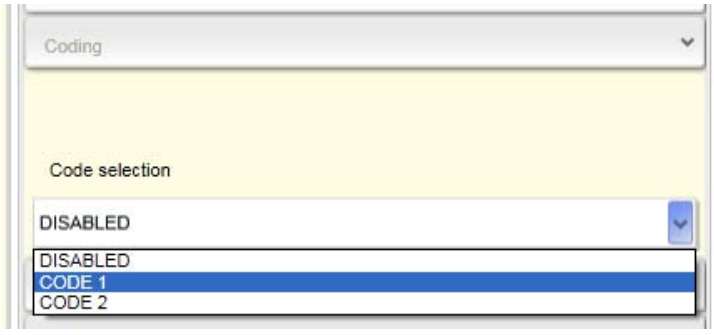
When one of the three option (no code, code 1 and code 2) is selected and the beams are intercepted, the indication on the user interface is the following.

Normal Operation (RX side): Intercepted beams								
		PWR	OSSD	EDM	ACM	LEVEL		
No Code	Led 5 and 6 OFF	●	●	○	○	●	●	●	●
Code 1	Led 5 ON Red, Led 6 OFF	●	●	○	○	●	●	●	●
Code 2	Led 5 OFF, Led 6 ON Green	●	●	○	○	●	●	●	●

Normal Operation (TX side)								
		PWR	TST	SR	LR	CODE		
No Code	Led 5 and 6 OFF	●	○	○	○	●	●	●	●
Code 1	Led 5 ON Red, Led 6 OFF	●	○	○	○	●	●	●	●
Code 2	Led 5 OFF, Led 6 ON Green	●	○	○	○	●	●	●	●

The function can be set by BCM of both RX and TX devices. The number of available codes is two.

BCM Configuration: Coding Selection (TX and RX)								
		PWR	OSSD	EDM	ACM	LEVEL		
		PWR	TST	SR	LR	CODE		
No Code	**Led 2 OFF**	●	●	○	○	○	○	○	○
Code 1	Led 2 ON Red	●	●	○	○	○	○	○	○
Code 2	Led 2 ON Green	●	●	○	○	○	○	○	○

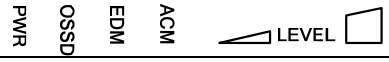
ACM Configuration: Coding Selection


8 DIAGNOSTIC

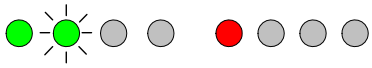
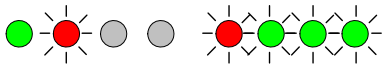
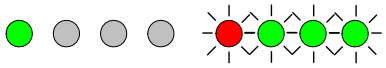
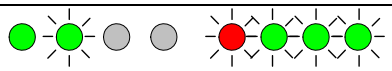
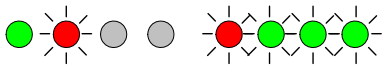
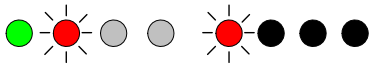
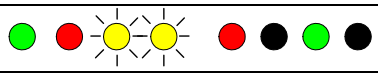
8.1 USER INTERFACE

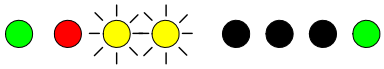
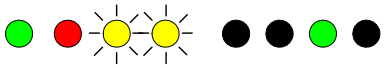
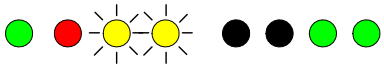
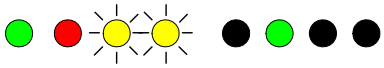
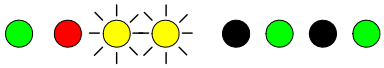
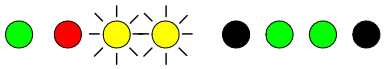
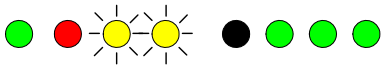
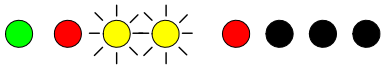
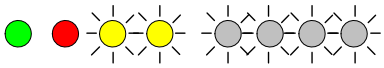
In the left side of user control panel (on both units of light curtains) an 8 leds user interface helps customer to control and check the state of the light curtain, for alignment mode, normal operation and for troubleshooting activity. User interface allows the user to understand which is the configuration set with the push buttons.

RX SIDE:



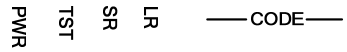
ESPE WORKING MODE	INDICATION	LED CONFIGURATION (Off / On / Blink / Indifferent)	SUGGESTED ACTION
ALIGNMENT	NOT ALIGNED		
	1ST SYNC ENGAGED		
	LAST SYNC ENGAGED		
	MININUM SIGNAL LEVEL		
	MAXIMUM SIGNAL LEVEL		
NORMAL OPERATION MANUAL RESTART ONLY	INTERLOCK FREE BEAMS		user can restart device in normal operation activating RESTART line
	INTERLOCK INTERRUPTED BEAMS		user must free protected area before activating RESTART line
NORMAL OPERATION	OSSD ON (MAXIMUM ALIGNMENT)		
	OSSD OFF CODE1		
	OSSD OFF CODE 2		
	OSSD OFF NO CODE		
	LEVEL SIGNAL ON BEAMS	None Insufficient Low Good Best	
	EDM ACTIVE		
	ACM ACTIVE		
	ACM CONFIGURATION PENDING		configuration from PC in progress, follow software instructions

ESPE WORKING MODE	INDICATION	LED CONFIGURATION Off On Blink Indifferent	SUGGESTED ACTION
NORMAL OPERATION BLANKING ONLY	VALID BLANKING (OSSDS ON)		
	INVALID BLANKING (OSSDS OFF)		blanking zones not respected reconfigure blanking (teach-in if BCM)
	BCM TOLERANCE ACTIVE		check effective ESPE resolution and intentional activation of tolerance function
NORMAL OPERATION MUTING ONLY	MUTING ACTIVE		if unexpected OSSD OFF with muting active, check partial muting configuration
	OVERRIDE ACTIVE		OSSD ON, muting lamp flashing
	OVERRIDE ATTENTION STATUS		trigger override button to force OSSDs ON
	OVERRIDE TIMINGS FAILURE		check and repeat override activation sequence check override connections
	LAMP FAILURE		check if lamp connections and/or if lamp is broken

ESPE WORKING MODE	INDICATION	LED CONFIGURATION Off On Blink Indifferent	SUGGESTED ACTION
FAILURE INFORMATION	FAILURE ON OSSDS		Activate RESET line. If error persists contact Datalogic Automation Technical Support
	FAILURE ON MICROPROCESSOR		Activate RESET line. If error persists contact Datalogic Automation Technical Support
	FAILURE ON OPTICS		Activate RESET line. If error persists contact Datalogic Automation Technical Support
	FAILURE ON EDM		Check EDM feedback line and EDM configuration. Activate RESET line
	FAILURE ON RESTART		Check RESTART line connection. Activate RESET line
	COMUNICATION FAILURE		Check cascade connection and correct mounting of terminator cap. Activate RESET line
	BCM CONFIGURATION FAILURE		Re-operate Basic Configuration. If error persists contact Datalogic Automation Technical Support
	ACM CONFIGURATION FAILURE		Re-operate Advanced Configuration. If error persists contact Technical Support Make sure the most recent version of the GUI available on www.datalogic.com is installed.
	CRITICAL FAILURE		Turn ON/OFF ESPE. If error persists contact Datalogic Automation Technical Support
	POWER SUPPLY FAILURE		Check Power Supply Connection. If error persists contact Technical Support

A critical failure can't be re-established with a Reset procedure but it's necessary to switch-off and switch-on the light curtain; if the failure persists, please contact the Datalogic Technical Support.

TX SIDE:



ESPE WORKING MODE	INDICATION	LED CONFIGURATION (Off On Blink Indifferent)	SUGGESTED ACTION
NORMAL OPERATION	SHORT RANGE EMISSION		
	LONG RANGE EMISSION		
	NO CODE		
	CODE 1		
	CODE 2		
	TEST		if undesired Test, check TEST line connection
	EMISSION		
FAILURE	FAILURE ON MICROPROCESSOR		Activate RESET line. If error persists contact Datalogic Automation Technical Support
	FAILURE ON OPTICS		Activate RESET line. If error persists contact Datalogic Automation Technical Support
	BCM CONFIGURATION FAILURE		Re-operate Basic Configuration. If error persists contact Datalogic Automation Technical Support
	COMUNICATION FAILURE		Check cascade connection and correct mounting of terminator cap. Activate RESET line
	CRITICAL FAILURE		Turn ON/OFF ESPE. If error persists contact Datalogic Automation Technical Support

A critical failure can't be re-established with a Reset procedure but it's necessary to switch-off and switch-on the light curtain; if the failure persists, please contact the Datalogic Technical Support.

9 PERIODICAL CHECKS

The following is a list of recommended check and maintenance operations that should be periodically carried-out by qualified personnel (see also par 2.2.5).

Check that:

- The ESPE stays in SAFE state during beam interruption along the entire protected area, using the specific Test Piece (TP-14 or TP-30)
- The ESPE is correctly aligned. Press slightly product side, in both directions and the red LED (named OSSD on RX side) must not turn ON
- Enabling the TEST function (on TX side), the OSSD outputs should open (the red LED, OSSD on RX side, is ON and the controlled machine stops)
- 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 chapter 2)
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in chapter 2
- Access of a person between ESPE and machine dangerous parts is not possible nor it is 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.

9.1 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 Automation 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 Automation Repair Service.

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.

9.2 WARRANTY

DATALOGIC AUTOMATION guarantees each brand new SG system, under standard use conditions, against manufacturing defects in material and workmanship for a period of 36 (thirty-six) months from the date of manufacturing.
DATALOGIC AUTOMATION will not be liable for any damages to persons and things caused by wrong installation modes or device use.
Warranty validity is subject to the following conditions:

- User shall notify DATALOGIC AUTOMATION the failure within thirty-six months from product manufacturing date
- Failure or malfunction shall not have been originated directly or indirectly by:
- use for unsuitable purposes;
- failure to comply with the intended use prescriptions;
- negligence, unskillfulness, wrong maintenance;
- repairing, changes, adaptations not made by DATALOGIC AUTOMATION personnel, tampering with the device, etc.;
- accidents or crashes (even due to transportation or by force majeure causes);
- other causes not depending from DATALOGIC AUTOMATION

If the device does not work, send both units (receiver and emitter) to DATALOGIC AUTOMATION.
The Customer is responsible for all transport charges and damage risks or material loss during transport, unless otherwise agreed.
All replaced products and parts become a property of DATALOGIC AUTOMATION.
DATALOGIC AUTOMATION does not accept any warranty or right other than the above-described ones. No requests for compensation for expenses, activities stop or other factors or circumstances somehow connected to the failure of the product or one of its parts to operate cannot be put forward for any reason.

In case of problems, please contact DATALOGIC AUTOMATION Service Department.

Service Department
Tel.: +39 051 6765611
Fax.: +39 051 6759324
email: info.automation@datalogic.com

10 DEVICE MAINTENANCE

SG4 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

10.1 PRODUCT DISPOSAL

Under current Italian and European laws, DATALOGIC S.p.A. is not obliged to take care of product disposal at the end of its life.
DATALOGIC S.p.A. recommends to dispose of the product in compliance with local laws or contact authorised waste collection centres.

11 TECHNICAL DATA

ELECTRICAL DATA	
Power supply (Vdd):	24 Vdc ± 20%
Unit current draw (TX):	3 W max
Unit current draw (RX):	5 W max (without load)
Outputs:	2 PNP or 2 NPN
Short-circuit protection:	1.4 A max
Output current:	0.5 A max / each output
Output voltage – status ON:	Vdd –1 V min
Output voltage – status OFF:	0.2 V max
Capacitive load	2.2 uF @ 24Vdc max
Response times:	See table below
Recovery time:	typ. 100ms *
Controlled height:	300..1800mm
Safety category:	Type 4 (ref. EN 61496-1) SIL 3 (ref. EN 61508) SIL CL 3 (ref. EN 62061) PL e, Cat. 4 (ref. IEC 13849-1 2008) PFHd [1/h] = 2,64E-09 MTTFd [years] = 444
Auxiliary functions:	test; manual/automatic restart; EDM; reset; muting; blanking; GUI; coding; PNP/NPN connection; cascade
Electrical protection:	Class I / Class III
Current for External Lamp:	20mA min; 300 mA max
Connections:	M12 12-poles + M12 5-poles for receiver (muting models) M12 12-poles for receiver (blanking models) M12 5-poles for emitter (for both models)
Cables length (for power supply):	50 m. max
OPTICAL DATA	
Emitting light (λ):	Infrared, LED (950 nm)
Resolution:	14 - 30 mm
Operating distance:	0.2…20 m for 30 mm 0.2…7 m for 14 mm
Ambient light rejection:	IEC-61496-2
MECHANICAL AND ENVIRONMENTAL DATA	
Operating temperature:	0…+ 50 °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, 1octave/min (EN 60068-2-6)
Shock resistance:	16 ms (10 G) 1,000 shocks per axis (EN 60068-2-29)
Housing material:	Painted aluminium (yellow RAL 1003)
Front side material:	PMMA
Caps material:	PBT Valox 508 (pantone 072C)
Cover material:	PC LEXAN
Weight:	1.35 kg per linear meter for single unit

* Recovery Time may be longer if both first and last optics are intercepted

12 LIST OF AVAILABLE MODELS

Model	Controlled height (mm)	No. Beams	Response time AIC OFF (msec)	Response time AIC ON (msec)	Resolution (mm)
SG4-14-030-OO-P	300	32	15	20	14
SG4-14-045-OO-P	450	48	17	25	14
SG4-14-060-OO-P	600	64	19	29	14
SG4-14-075-OO-P	750	80	20	34	14
SG4-14-090-OO-P	900	96	22	38	14
SG4-14-105-OO-P	1050	112	24	43	14
SG4-14-120-OO-P	1200	128	26	47	14
SG4-14-135-OO-P	1350	144	27	52	14
SG4-14-150-OO-P	1500	160	29	56	14
SG4-14-165-OO-P	1650	176	31	61	14
SG4-14-180-OO-P	1800	192	33	65	14
SG4-30-030-OO-P	300	16	13	16	30
SG4-30-045-OO-P	450	24	14	18	30
SG4-30-060-OO-P	600	32	15	20	30
SG4-30-075-OO-P	750	40	16	23	30
SG4-30-090-OO-P	900	48	17	25	30
SG4-30-105-OO-P	1050	56	18	27	30
SG4-30-120-OO-P	1200	64	19	29	30
SG4-30-135-OO-P	1350	72	19	32	30
SG4-30-150-OO-P	1500	80	20	34	30
SG4-30-165-OO-P	1650	88	21	36	30
SG4-30-180-OO-P	1800	96	22	38	30

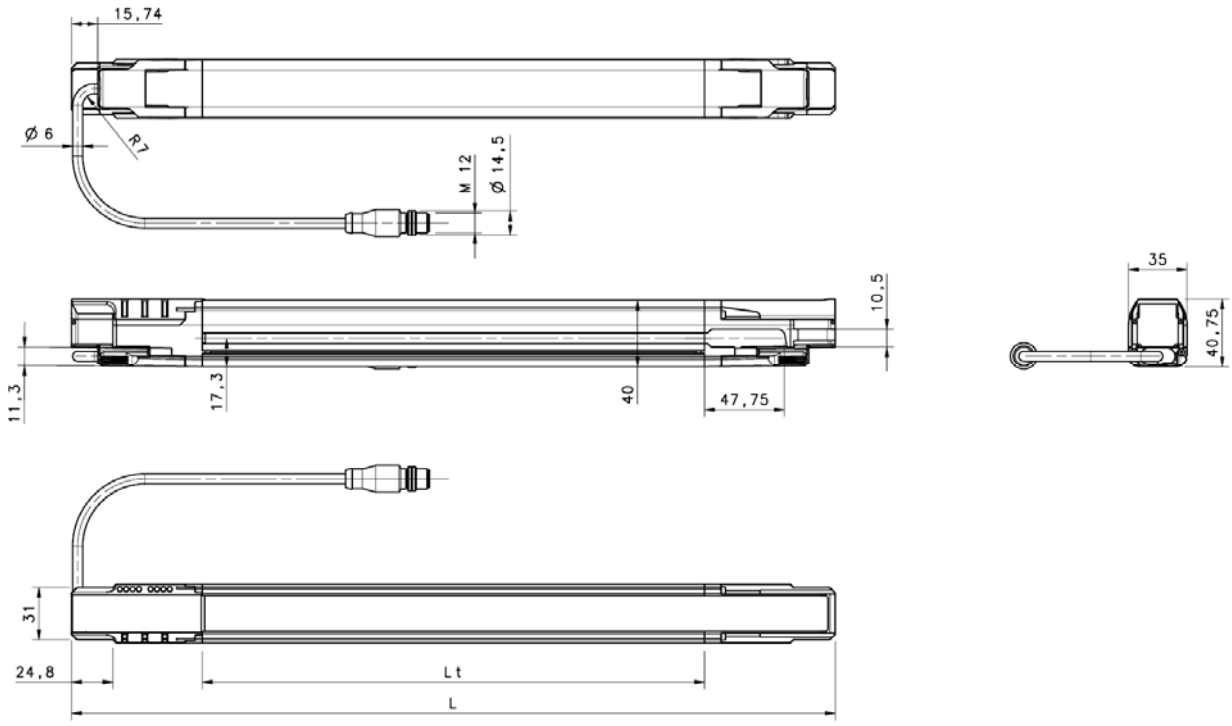
With the following formulas (and referring to the response time reported in the following tables) the user can calculate the response time of whatever cascade he creates:

AIC OFF *(no code)*	Tcascade [msec] = Tmaster + Tslave1 + Tslave2 + 7,5
AIC ON *(with code)*	Tcascade [msec] = Tmaster AIC + Tslave1 AIC + Tslave2 AIC + 7,5

	Master response time AIC OFF (msec) Tmaster	Slave response time AIC OFF (msec) Tslave	Master response time AIC ON (msec) Tmaster AIC	Slave response time AIC ON (msec) Tslave AIC
SG4-14-030-OO-P	**13,7**	**13,7**	**19,1**	**19,1**
SG4-14-045-OO-P	**15,4**	**15,4**	**23,6**	**23,6**
SG4-14-060-OO-P	**17,2**	**17,2**	**28,1**	**28,1**
SG4-14-075-OO-P	**18,9**	**18,9**	**32,6**	**32,6**
SG4-14-090-OO-P	**20,7**	**20,7**	**37,1**	**37,1**
SG4-14-105-OO-P	**22,4**	**22,4**	**41,6**	**41,6**
SG4-14-120-OO-P	**24,2**	**24,2**	**46,0**	**46**
SG4-14-135-OO-P	**26,0**	**-**	**50,5**	**-**
SG4-14-150-OO-P	**27,7**	**-**	**55,0**	**-**
SG4-14-165-OO-P	**29,5**	**-**	**59,5**	**-**
SG4-14-180-OO-P	**31,2**	**-**	**64,0**	**-**

	Master response time AIC OFF (msec) Tmaster	Slave response time AIC OFF (msec) Tslave	Master response time AIC ON (msec) Tmaster AIC	Slave response time AIC ON (msec) Tslave AIC
SG4-30-030-OO-P	**11,9**	**11,9**	**14,6**	**15**
SG4-30-045-OO-P	**12,8**	**12,8**	**16,8**	**17**
SG4-30-060-OO-P	**13,7**	**13,7**	**19,1**	**19**
SG4-30-075-OO-P	**14,5**	**14,5**	**21,3**	**21**
SG4-30-090-OO-P	**15,4**	**15,4**	**23,6**	**24**
SG4-30-105-OO-P	**16,3**	**16,3**	**25,8**	**26**
SG4-30-120-OO-P	**17,2**	**17,2**	**28,1**	**28**
SG4-30-135-OO-P	**18,0**	**-**	**30,3**	**-**
SG4-30-150-OO-P	**18,9**	**-**	**32,6**	**-**
SG4-30-165-OO-P	**19,8**	**-**	**34,8**	**-**
SG4-30-180-OO-P	**20,7**	**-**	**37,1**	**-**

13 OVERALL DIMENSIONS

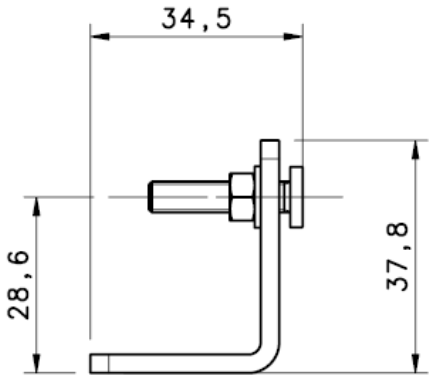


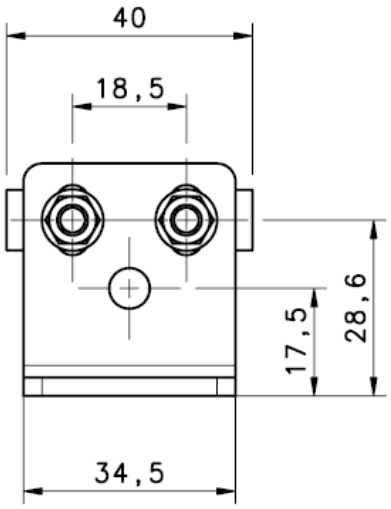
MODEL	L_t (mm)	L (mm)
SG4-xx-030-OO-P	150	306,3
SG4-xx-045-OO-P	300	456,3
SG4-xx-060-OO-P	450	606,3
SG4-xx-075-OO-P	600	756,3
SG4-xx-090-OO-P	750	906,3
SG4-xx-105-OO-P	900	1056,3
SG4-xx-120-OO-P	1050	1206,3
SG4-xx-135-OO-P	1200	1356,3
SG4-xx-150-OO-P	1350	1506,3
SG4-xx-165-OO-P	1500	1656,3
SG4-xx-180-OO-P	1650	1806,3

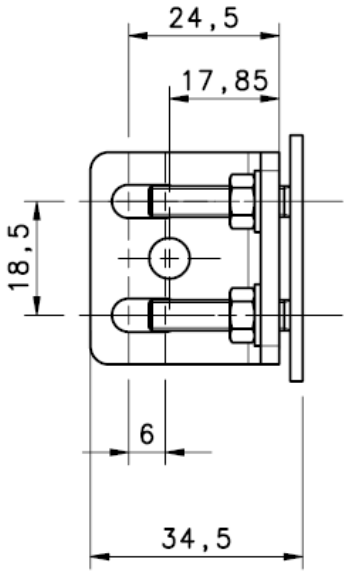
xx = Resolution (14mm - 30mm)

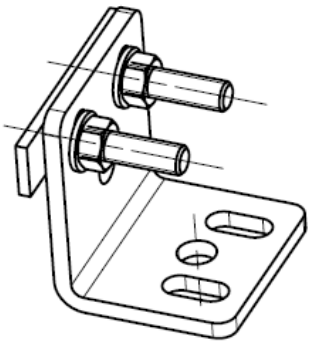
14 OUTFIT

Angled fixing bracket (with threaded pins metallic insert)

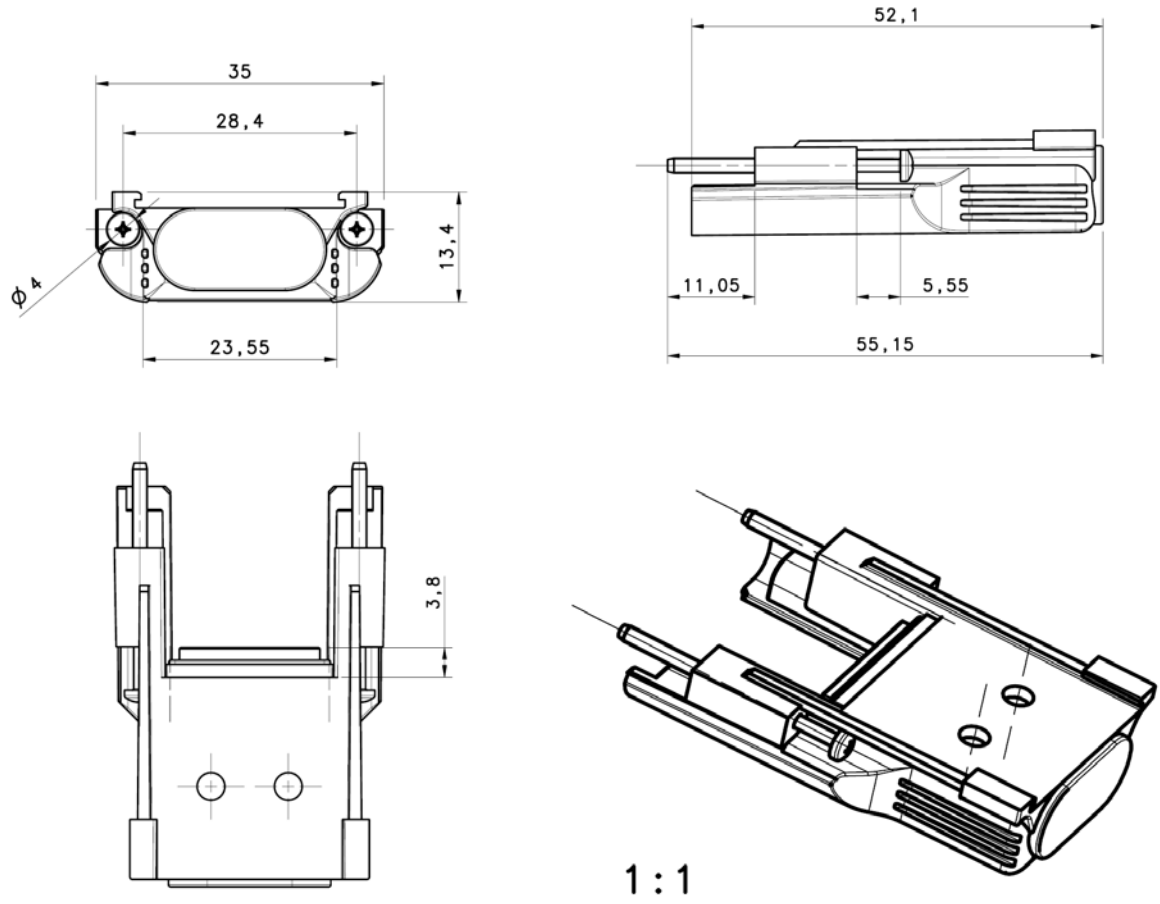




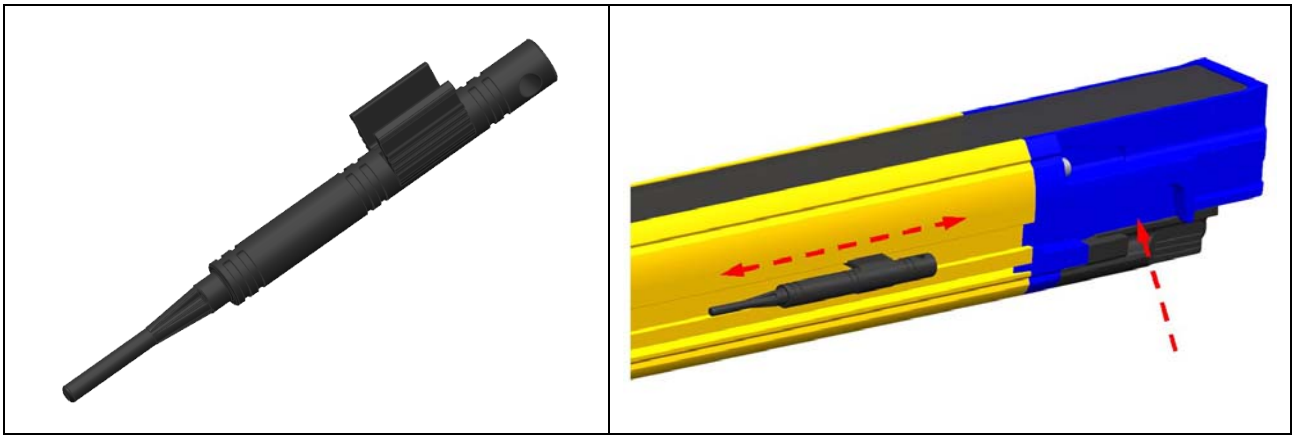




Terminator cap (CVL-5196)



Tool for BCM configuration



The tool for BCM configuration, when not used, can be inserted in the profile groove by making it enter from the top of the light curtain

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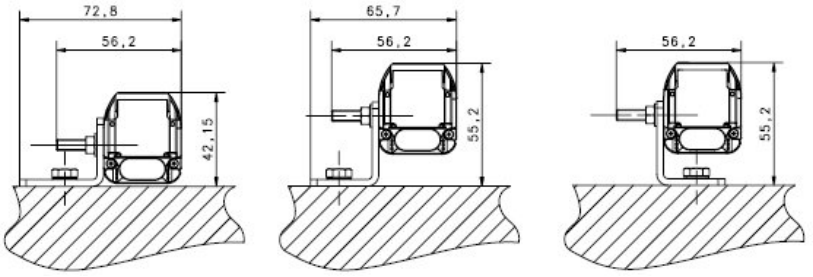
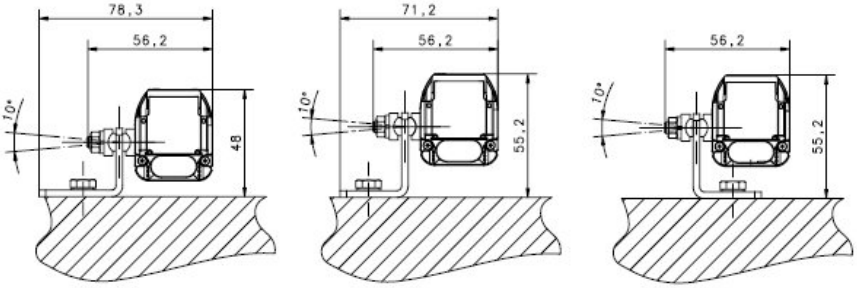
15 ACCESSORIES

15.1 BRACKETS FIXING

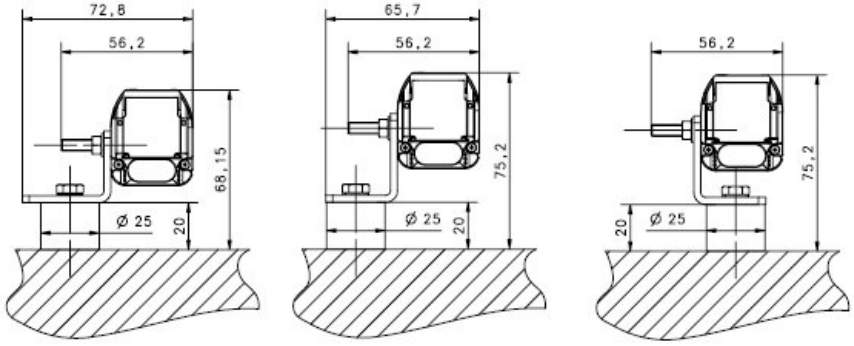
Metal angled fixing bracket



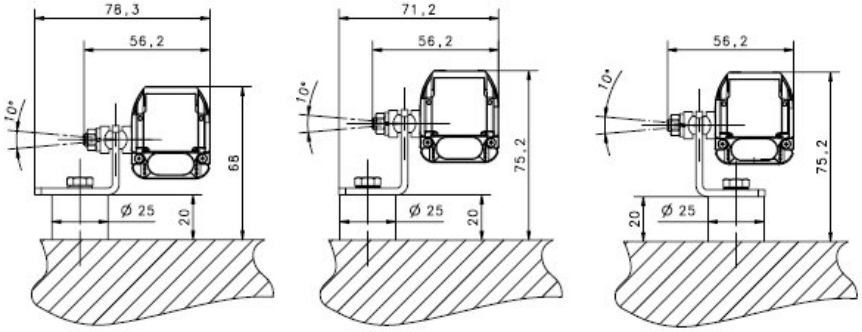
Angled fixing bracket



Angled fixing bracket + Orientable support



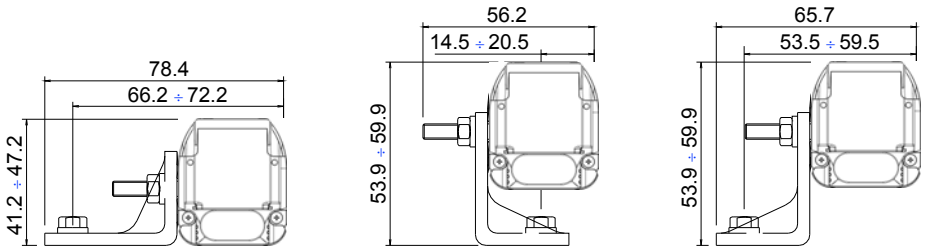
Angled fixing bracket + Antivibration support



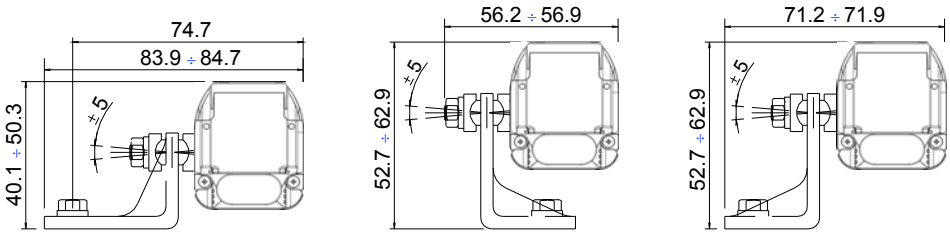
Angled fixing bracket + Orientable support + Antivibration support

MODEL	DESCRIPTION	CODE
ST-KSTD	Fixing brackets (4 pcs kit)	95ACC1670
ST-K4OR	Orientable supports (4 pcs kit)	95ACC1680
ST-K6OR	Orientable supports (6 pcs kit)	95ACC1690
ST-K4AV	Antivibration supports (4 pcs kit)	95ACC1700
ST-K6AV	Antivibration supports (6 pcs kit)	95ACC1710

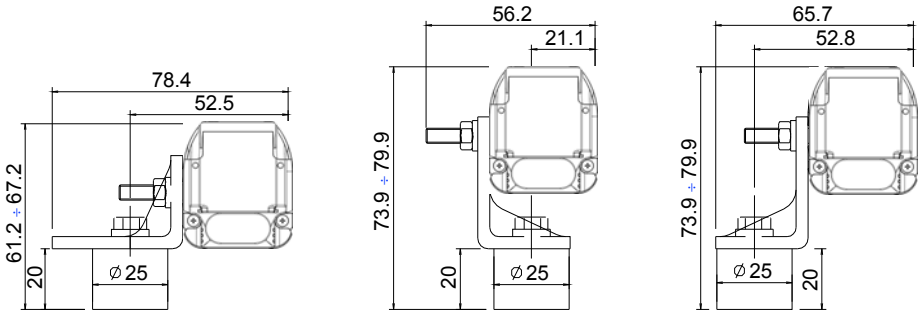
Plastic angled fixing bracket



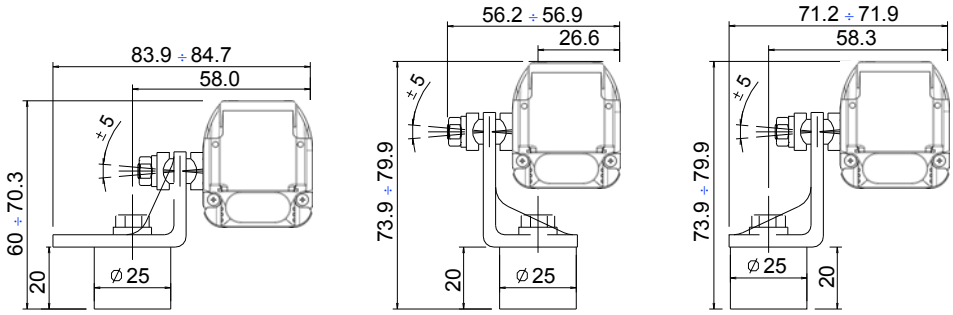
Fixing bracket



Fixing bracket + Orientable support



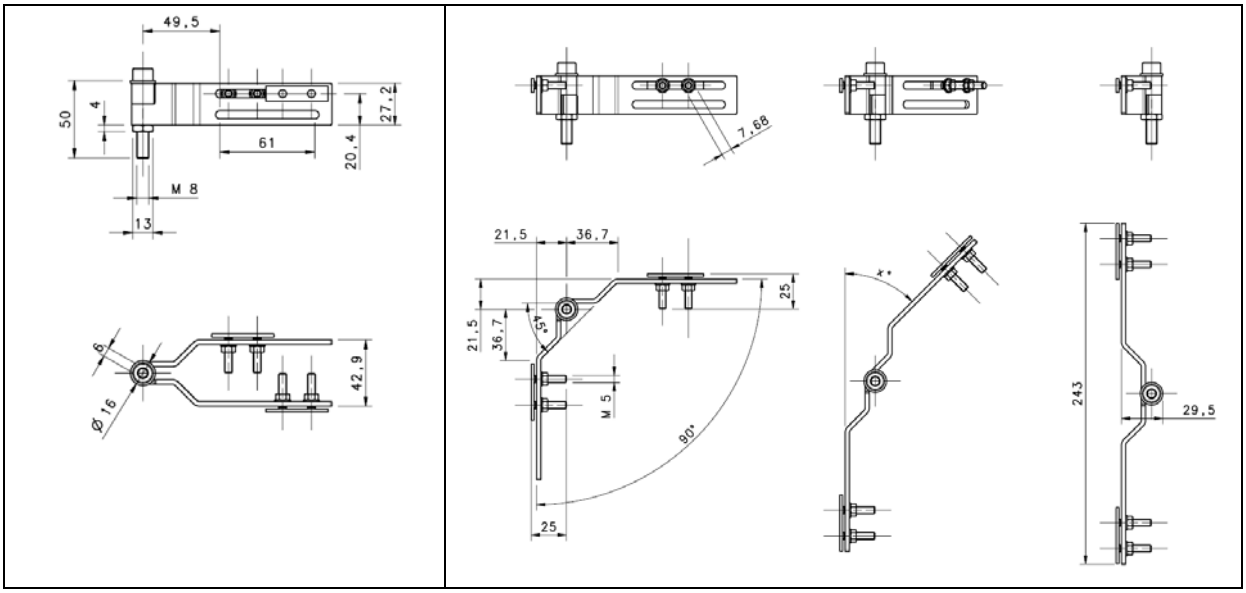
Fixing bracket + Antivibration support

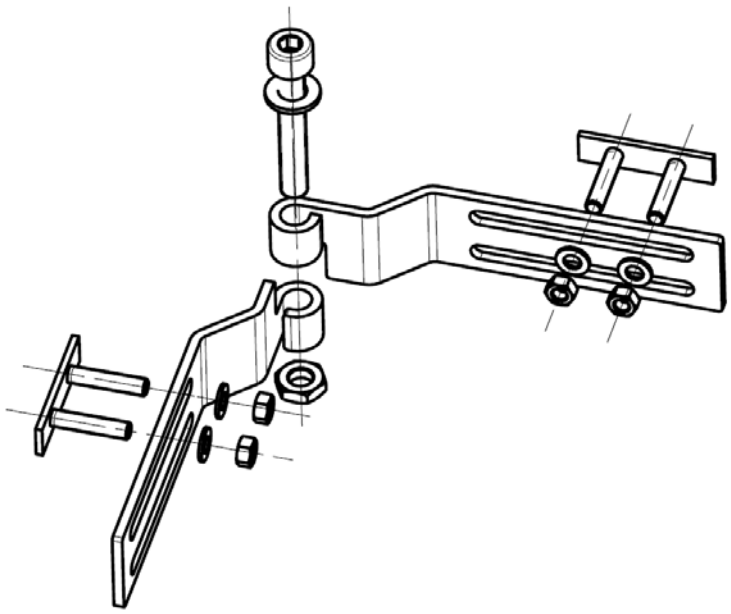


Fixing bracket + Orientable support + Antivibration support

MODEL	DESCRIPTION	CODE
ST-KP4MP	Fixing brackets (4 pcs kit)	95ASE1100
ST-KP6MP	Fixing brackets (6 pcs kit)	95ASE1110

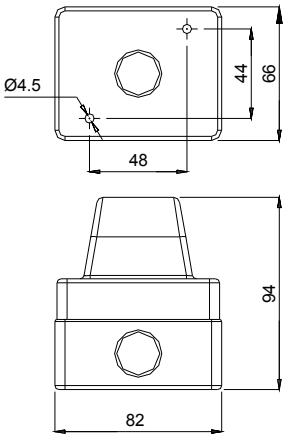
Cascade bracket



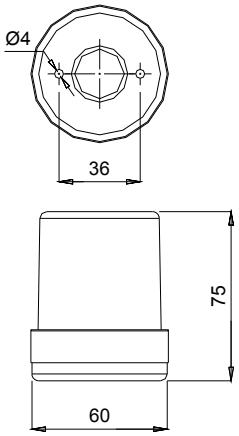


MODEL	DESCRIPTION	CODE
ST-KCASCADE-SG EXTENDED	Bracket	95ASE2110

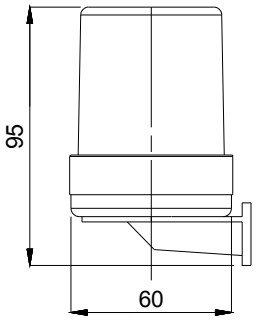
15.2 MUTING LAMP

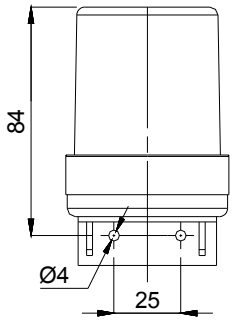


LMS

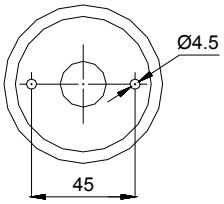


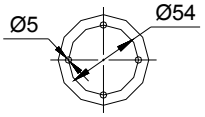
LAMPADA LMS-2

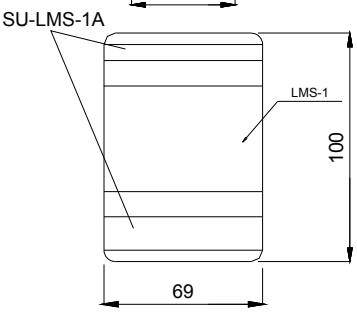




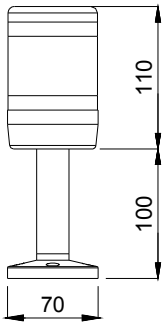
LAMPADA LMS-3







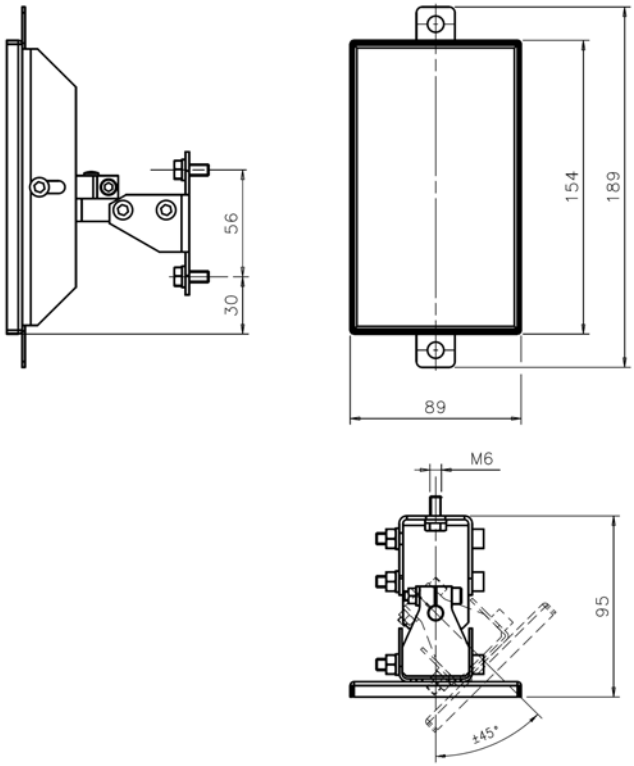
MODULO SU-LMS-1A + LMS-1



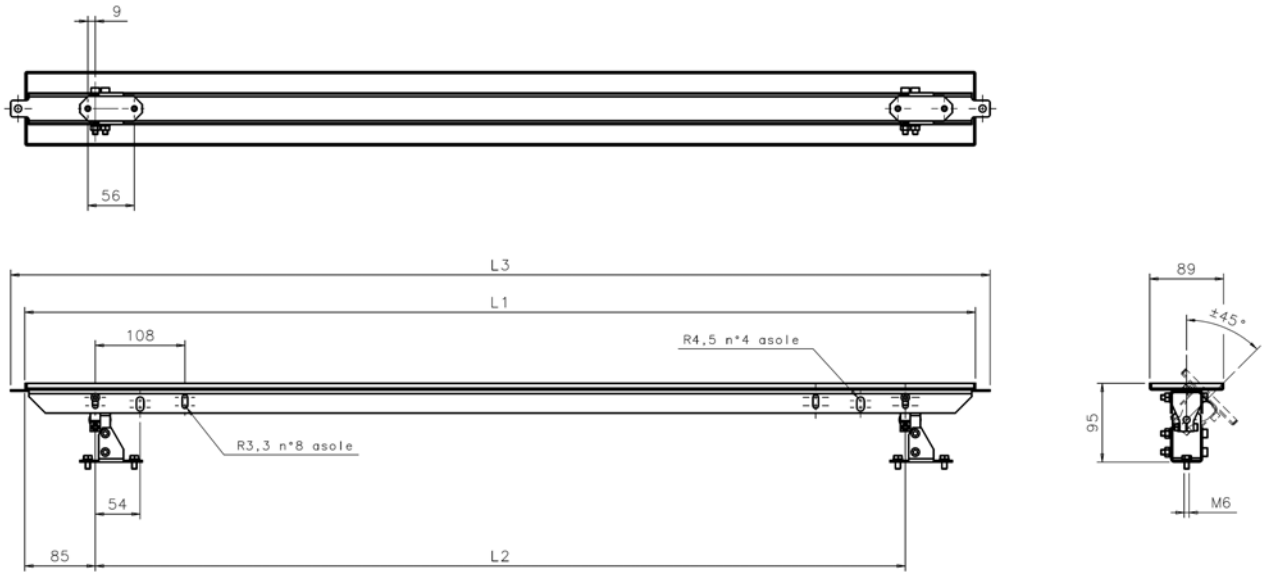
SUPPORTO SU-LMS-1B + LMS-1

MODEL	DESCRIPTION	CODE
LMS	Muting lamp	95ASE1830
LMS-1	Modular Muting lamp	95ACC1990
LMS-2	Muting lamp - horizontal mounting	95ACC2000
LMS-3	Muting lamp - vertical mounting	95ACC2010
SU-LMS-1A	Basic module for LMS-1	95ACC2020
SU-LMS-1B	Tower module for LMS-1	95ACC2030

15.3 DEVIATING MIRRORS

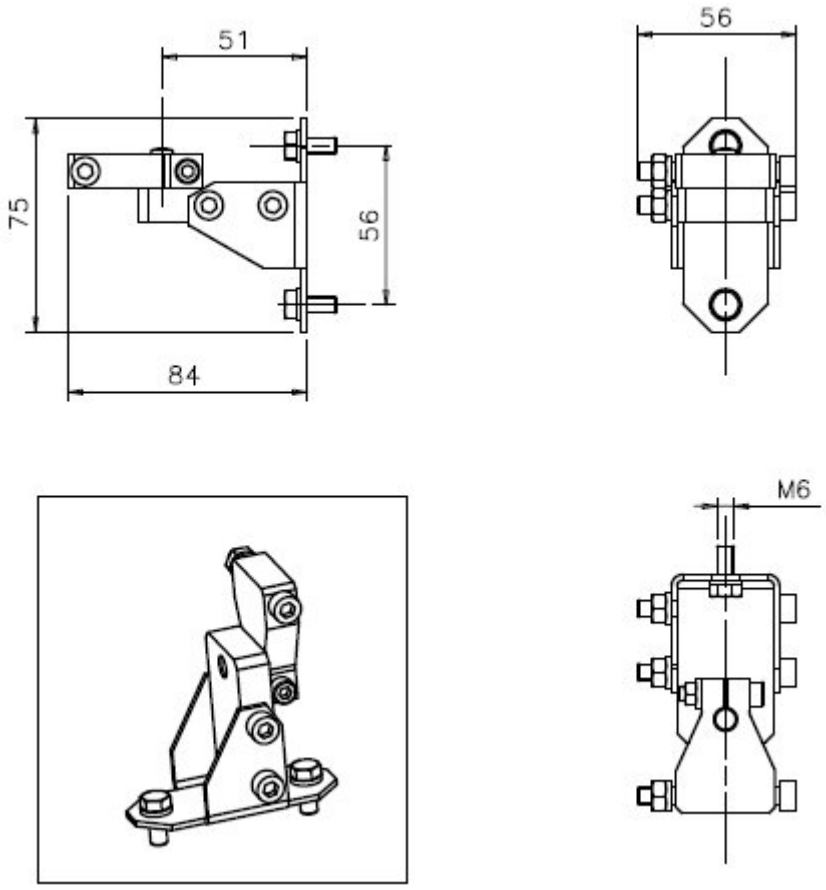


MODEL	DESCRIPTION	CODE
SG-DM 150	Deviating mirror version 150 mm	95ASE1670



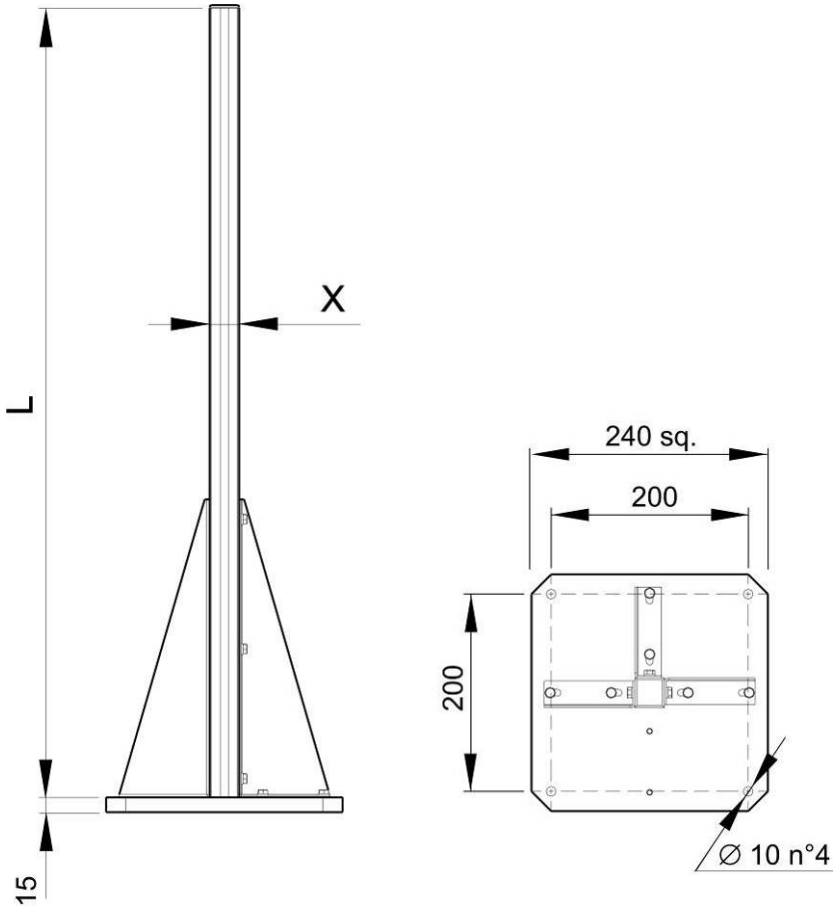
MODEL	DESCRIPTION	L_1 (mm)	L_2 (mm)	L_3 (mm)	CODE
SG-DM 600	Deviating mirror version 600 mm	545	376	580	95ASE1680
SG-DM 900	Deviating mirror version 900 mm	845	676	880	95ASE1690
SG-DM 1200	Deviating mirror version 1200 mm	1145	976	1180	95ASE1700
SG-DM 1650	Deviating mirror version 1650 mm	1595	1426	1630	95ASE1710
SG-DM 1900	Deviating mirror version 1900 mm	1845	1676	1880	95ASE1720

Fixing kit



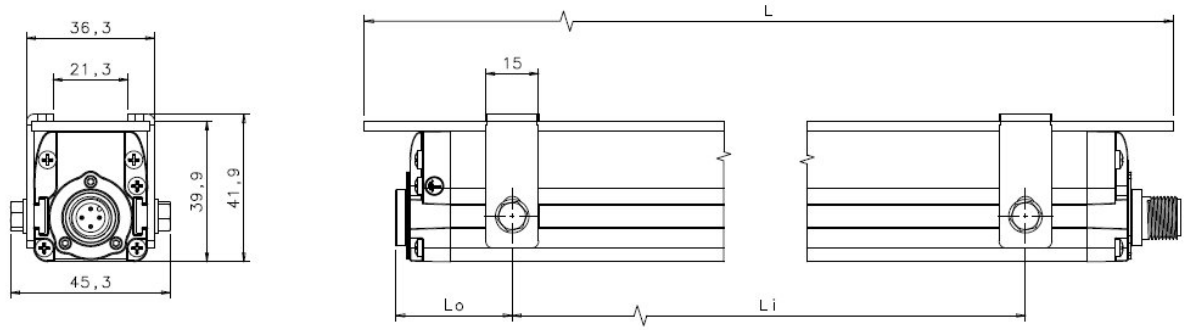
MODEL	DESCRIPTION	CODE
ST-DM	Kit “STAND ALONE”	95ASE1940

15.4 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

15.5 LENS SHIELD (PMMA)



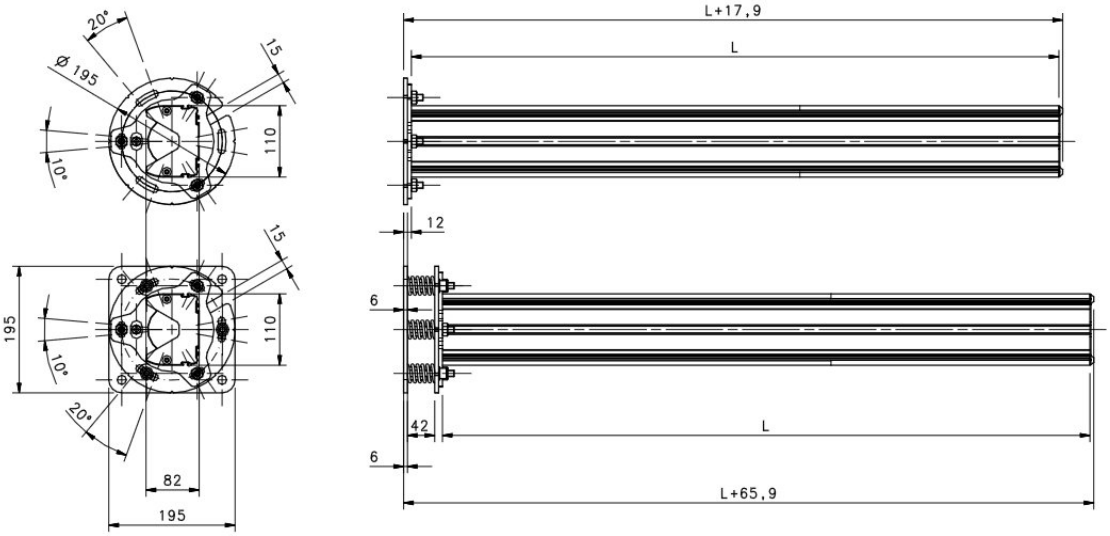
Measurement in mm									
SG2, SG4B, SE Hand/Finger protection					SE Body protection				
	VERS.	L	Li	Lo	VERS.	L	Li	Lo	
n°2+2 BRACKETS	15	245	160	30	2r 050	642	490	75	n°2+2 BRACKETS
	30	392	345	45	3r 080	942	640	175	
	45	540	400	60	4r 090	1042	660	200	
	60	686	520	75					n°3+3 BRACKETS
	75	832	590	115					
	90	980	640	175	4r 120	1342	480	200	
	105	1126	740	200					
n°3+3 BRACKETS	120	1274	445	200					
	135	1422	520	200					
	150	1568	595	200					
	165	1715	670	200					
	180	1860	745	200					

MODEL	DESCRIPTION	CODE
SG-LS 150	Lens Shield H=150mm (5pcs)	95ASE1450
SG-LS 300	Lens Shield H=300mm (5pcs)	95ASE1460
SG-LS 450	Lens Shield H=450mm (5pcs)	95ASE1470
SG-LS 600	Lens Shield H=600mm (5pcs)	95ASE1480
SG-LS 750	Lens Shield H=750mm (5pcs)	95ASE1490
SG-LS 900	Lens Shield H=900mm (5pcs)	95ASE1500
SG-LS 1050	Lens Shield H=1050mm (5pcs)	95ASE1510
SG-LS 1200	Lens Shield H=1200mm (5pcs)	95ASE1520
SG-LS 1350	Lens Shield H=1350mm (5pcs)	95ASE1530
SG-LS 1500	Lens Shield H=1500mm (5pcs)	95ASE1540
SG-LS 1650	Lens Shield H=1650mm (5pcs)	95ASE1550
SG-LS 1800	Lens Shield H=1800mm (5pcs)	95ASE1560
SG-LS-2-050	Lens Shield H=500mm (5pcs)	95ASE1570
SG-LS-3-080	Lens Shield H=800mm (5pcs)	95ASE1580
SG-LS-4-090	Lens Shield H=900mm (5pcs)	95ASE1590
SG-LS-4-120	Lens Shield H=1200mm (5pcs)	95ASE1600

NOTE :Each package contains what is necessary to protect a single unit (TX or RX). To protect both TX and RX , two pieces of the same code are needed

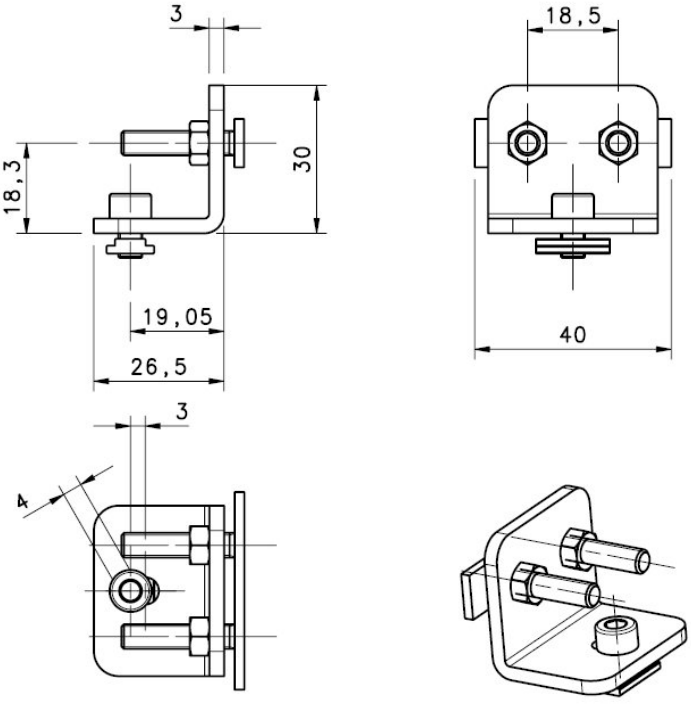
MODEL	DESCRIPTION	CODE
SG-LS-MC4	Elastic fastner for LENS SH IELD (kit 4pcs.)	95ASE1810

15.6 PROTECTIVE STANDS



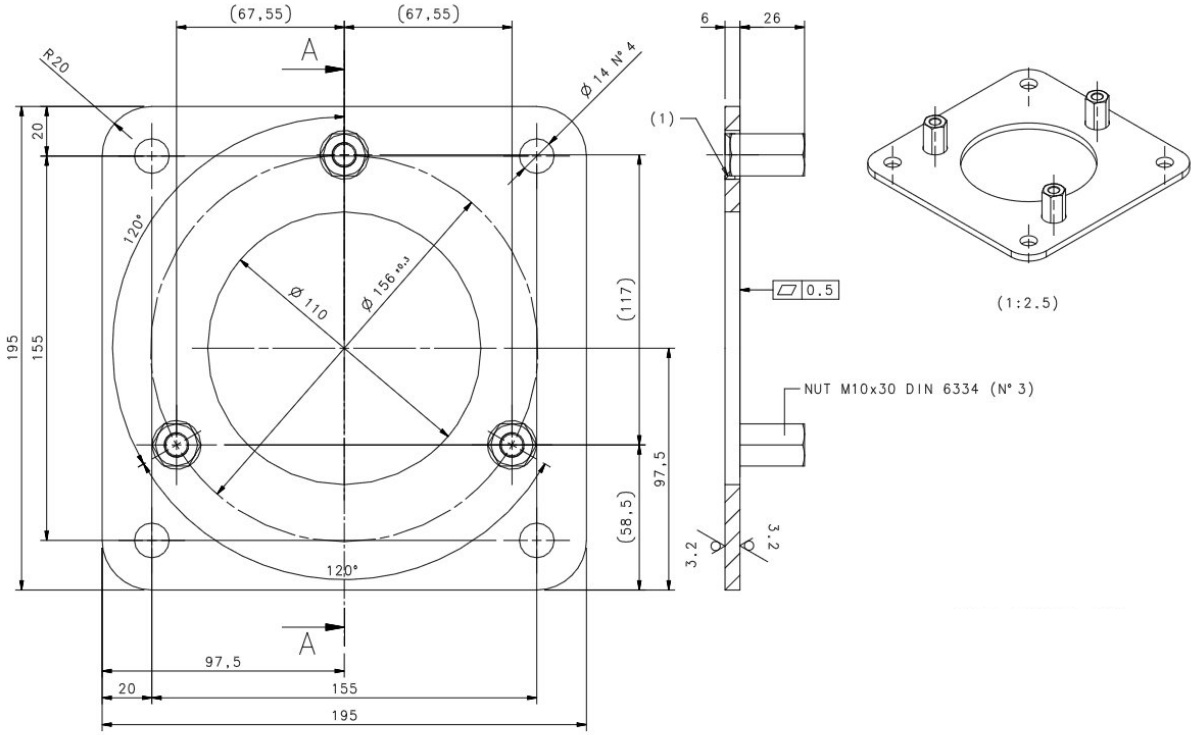
MODEL	DESCRIPTION	L (mm)	CODE
SG-PSB 600	Protective stand H=600mm	600	95ASE2240
SG-PSB 1000	Protective stand H=1000mm	1000	95ASE2250
SG-PSB 1200	Protective stand H=1200mm	1200	95ASE2260
SG-PSB 1650	Protective stand H=1650mm	1650	95ASE2270
SG-PSB 1900	Protective stand H=1900mm	1900	95ASE2280

Fixing kit



MODEL	DESCRIPTION	CODE
ST-PS4-SG-SE	Kit 4pcs for protect ive stands mounting	95ASE1750
ST-PS6-SG-SE	Kit 6pcs for protect ive stands mounting	95ASE1760

15.7 PLATE FOR PROTECTIVE STANDS

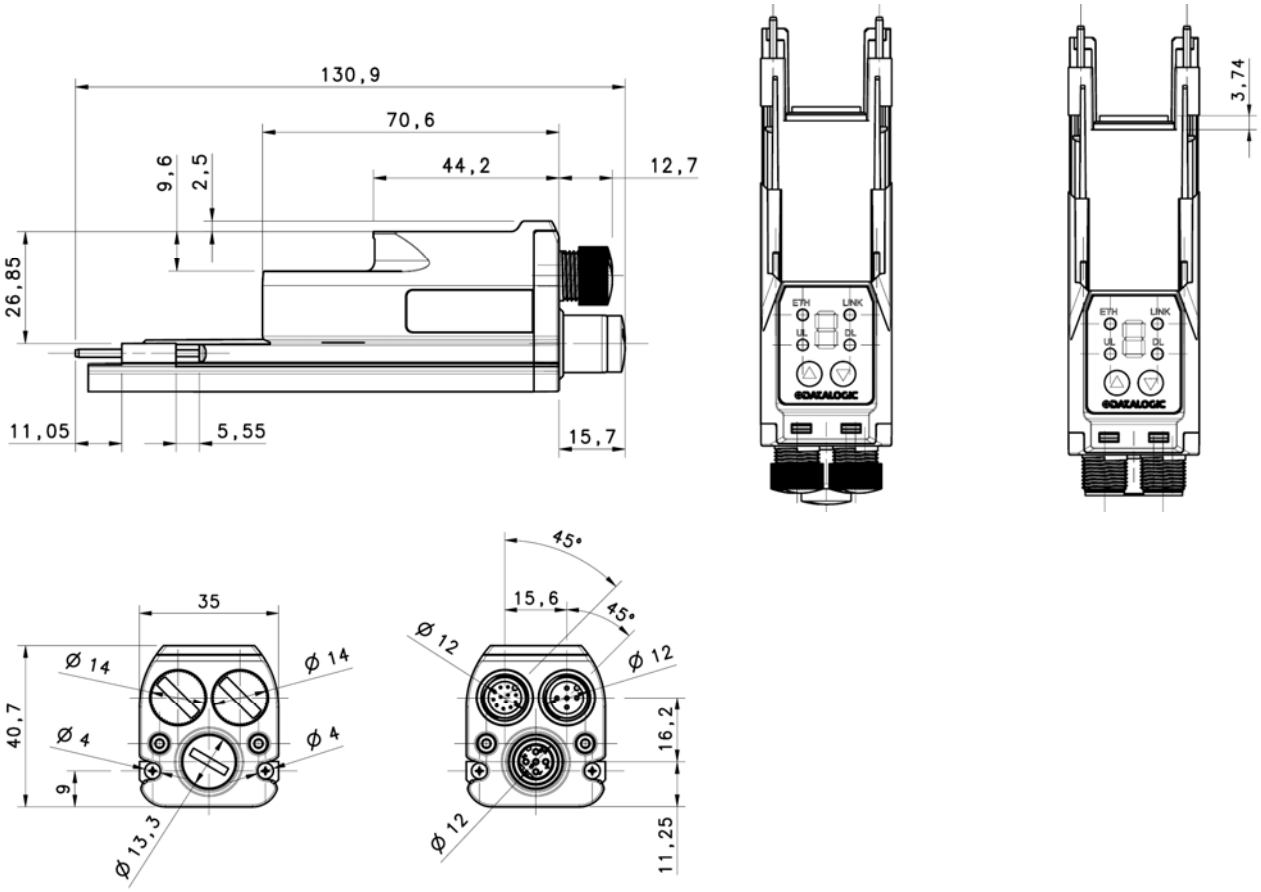


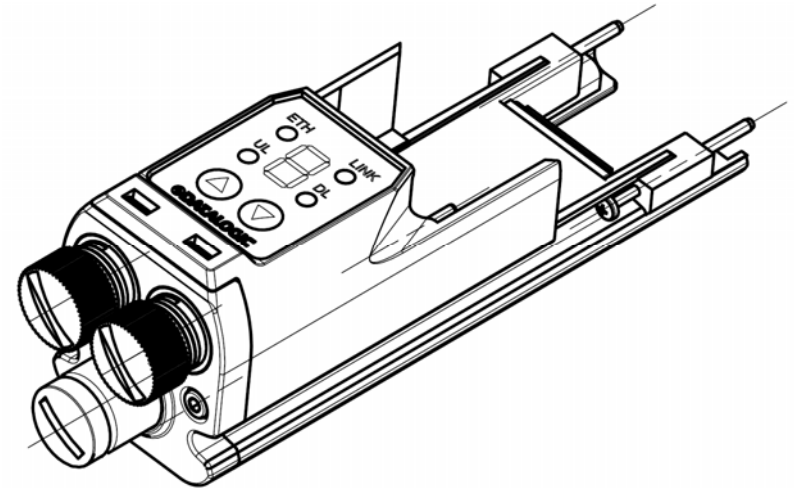
MODEL	DESCRIPTION	CODE
SG-P	Plate kit for SG-PSG	95ASE2290

15.8 TEST PIECE

MODEL	DESCRIPTION	CODE
TP-14	Test piece Ø 14mm L = 300mm	95ACC1630
TP-30	Test piece Ø 30mm L = 300mm	95ACC1650

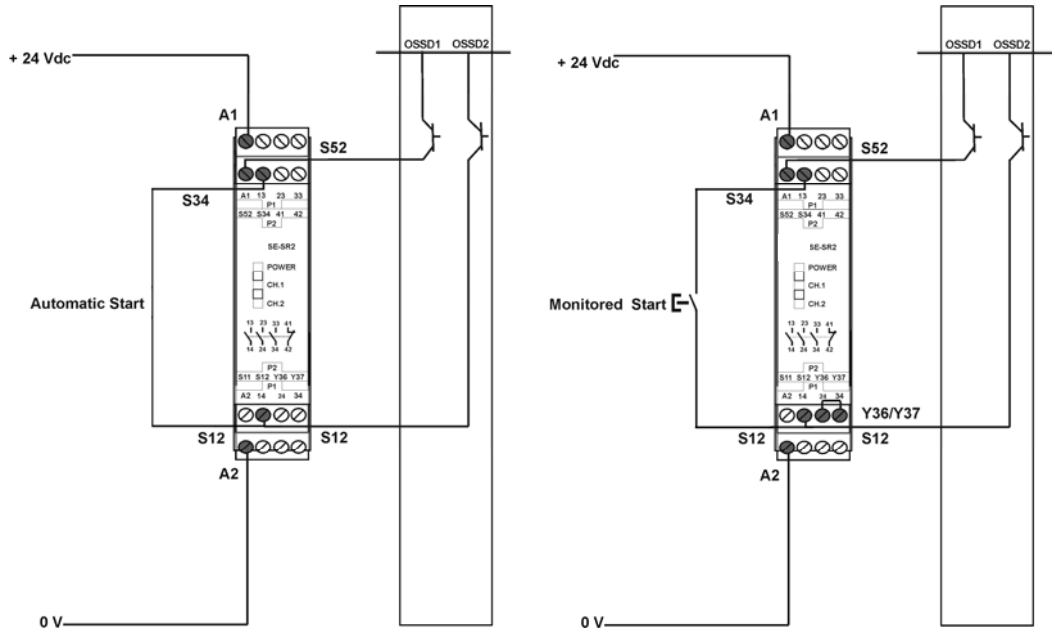
15.9 SG4-DONGLE ETHERNET ADAPTOR





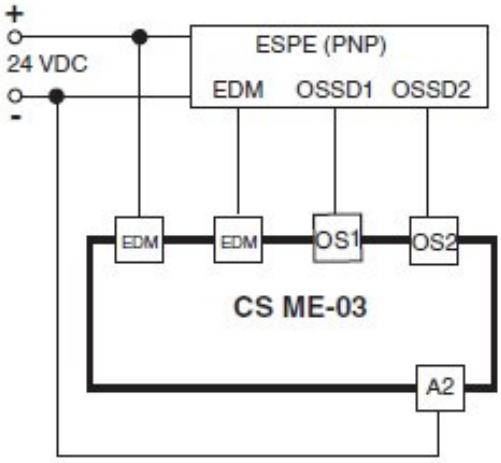
MODEL	DESCRIPTION	CODE
SG4-DONGLE	ETHERNET ADAPTOR	95ASE2080

15.10 SAFETY RELAY



The drawings 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(on the left) and manual Restart mode with monitoring (on the right).

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

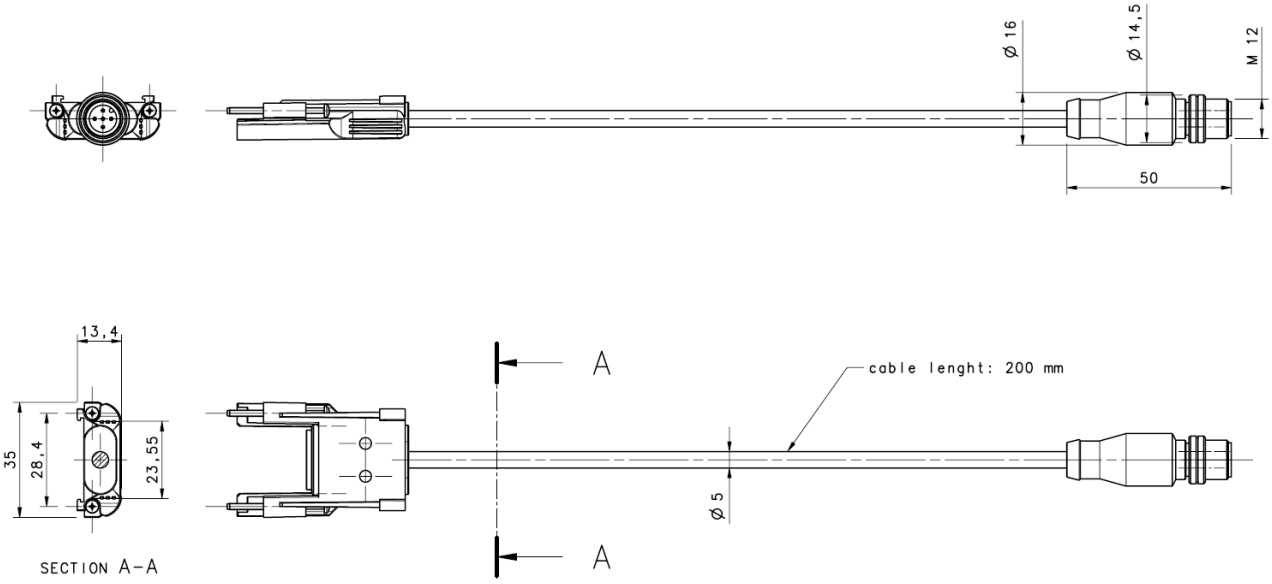


MODEL	DESCRIPTION	CODE
CS ME-03VU24-Y14	EDM Relay Box	95ASE1270

15.11 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
CS-A1-10-U-03	12-pole M12 cable (axial)	3 m	UL2464	95A252720
CS-A1-10-U-05	12-pole M12 cable (axial)	5 m	UL2464	95A252730
CS-A1-10-U-10	12-pole M12 cable (axial)	10 m	UL2464	95A252740
CS-A1-10-U-15	12-pole M12 cable (axial)	15 m	UL2464	95A252750
CS-A1-10-U-25	12-pole M12 cable (axial)	25 m	UL2464	95A252760
CS-A1-10-U-50	12-pole M12 cable (axial)	50 m	UL2464	95A252770

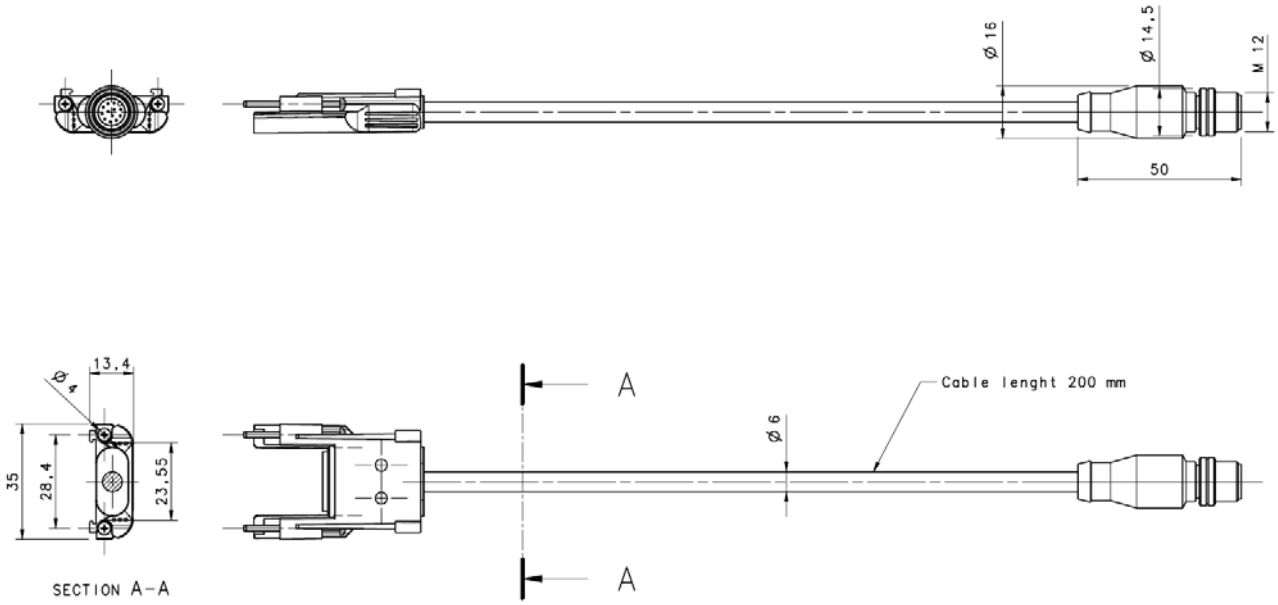
TX - PIG-TAIL CABLE



This is the Pig-Tail cable that must be always used for TX UNIT SG4 EXTENDED.
It has a 18 poles socket in one side and a M12 5 poles in the other.

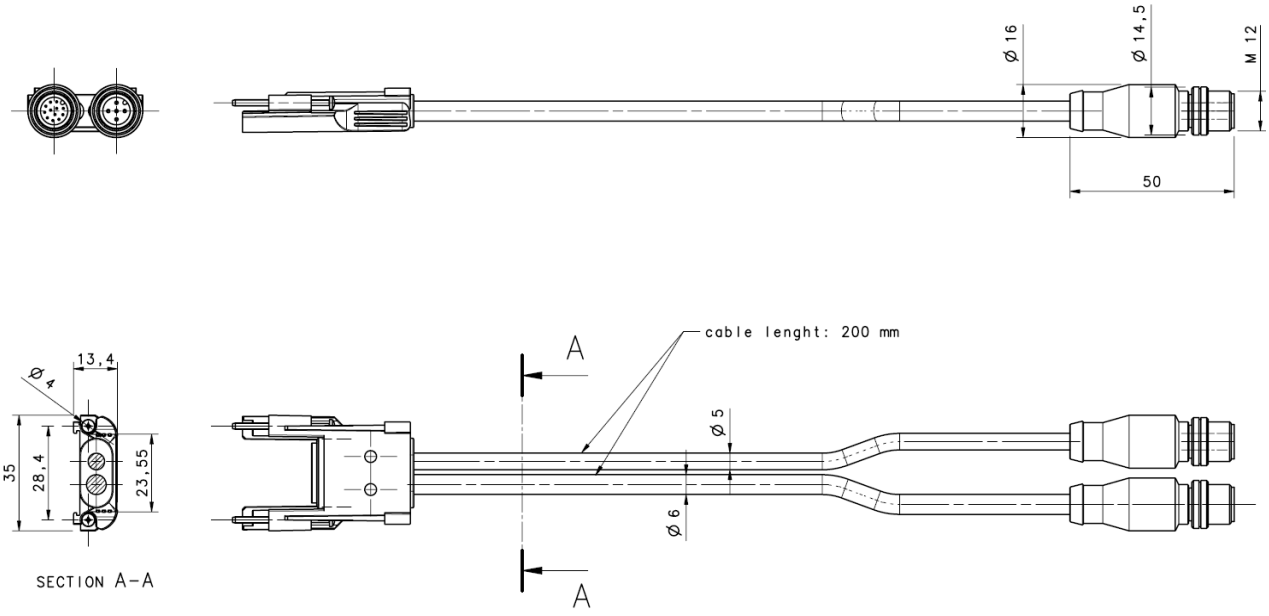
MODEL	DESCRIPTION	CODE
CS-G1-50-B-002	SG EXTENDED TX 0,2m	95A252820

RX BLANKING - PIG-TAIL CABLE



This is the Pig-Tail cable that must be used for RX UNIT of SG4 EXTENDED when you configure it in BLANKING MODE and DON'T USE SG4 DONGLE. It has a 18 poles socket in one side and a M12 12 poles in the other

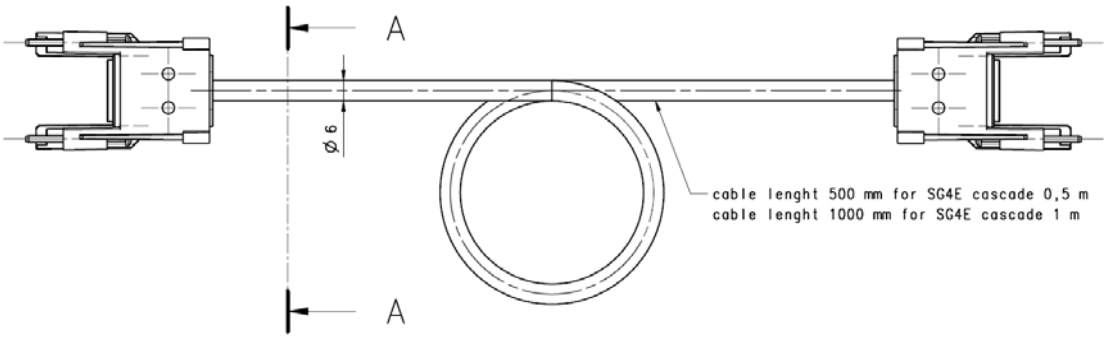
RX MUTING - PIG-TAIL CABLE

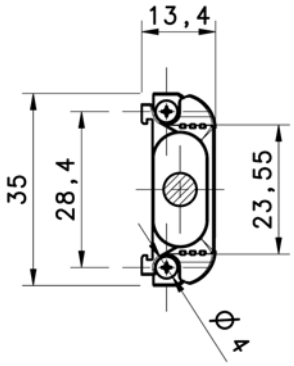


This is the Pig-Tail cable that must be always used for RX UNIT SG4 EXTENDED when you configure it in MUTING MODE and DON'T USE SG4 DONGLE. It has a 18 poles socket in one side and a M12 5 poles plus M12 12 poles in the other.

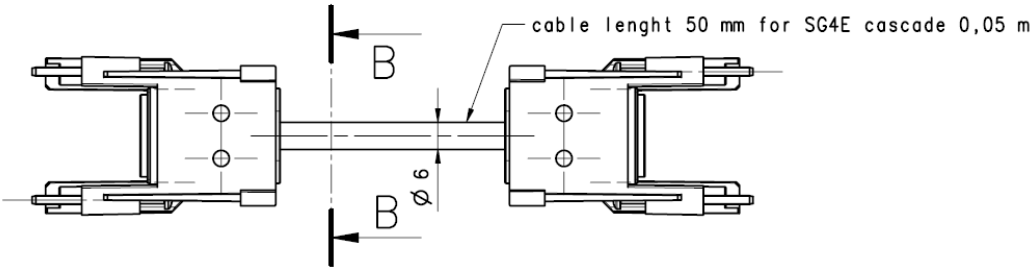
MODEL	DESCRIPTION	CODE
CS-G1-70-B-002	SG EXTENDED BLANKING RX 0,2m	95A252830
CS-R1-75-B-002	SG EXTENDED MUTING RX 0,2m	95A252810

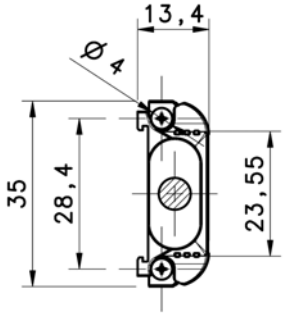
Cascade cables





MODEL	DESCRIPTION	CODE
CS-F1-80-B-01	SG EXTENDED CASCADE 1m	95A252840
CS-F1-80-B-005	SG EXTENDED CASCADE 0,5m	95A252850



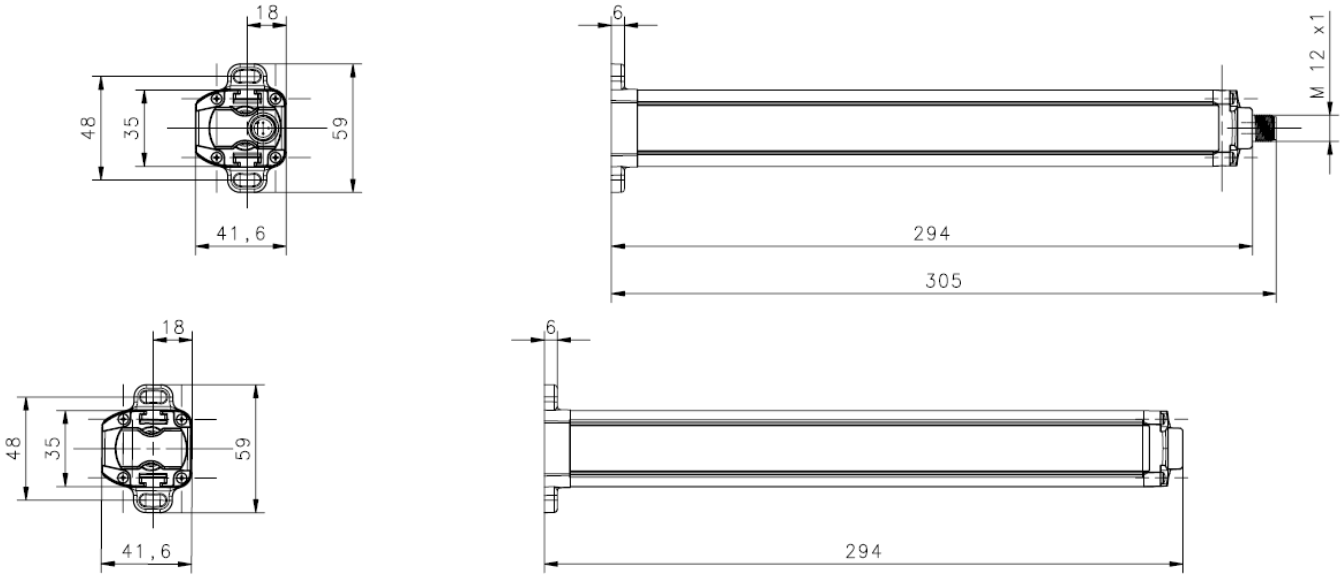


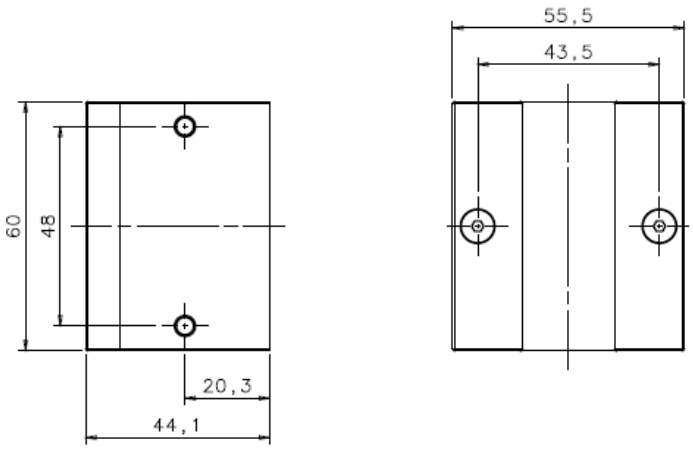
MODEL	DESCRIPTION	CODE
CS-F1-80-B-0005	SG EXTENDED CASCADE 0,05m	95A252860

15.12 MUTING ARMS

The SG4 EXTENDED series light curtains can be equipped with retro-reflective muting arms to obtain the “T” or “L” configuration.

The following figures show, respectively, the dimensions of single active arms, of single passive arms, and the corresponding fixing bracket stand alone.

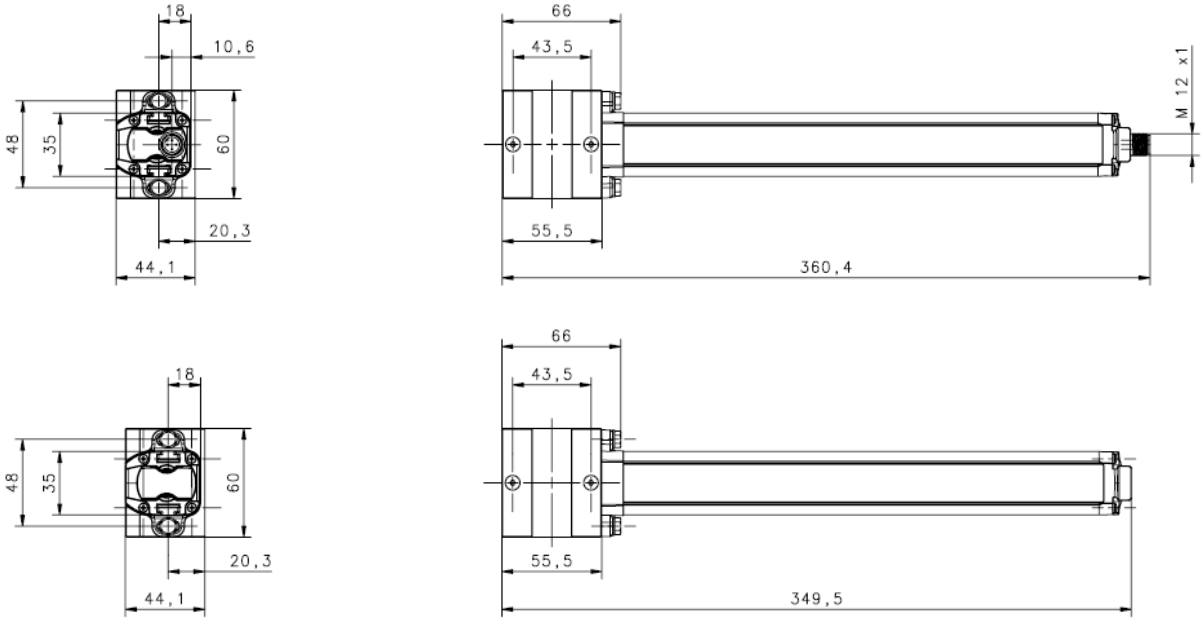




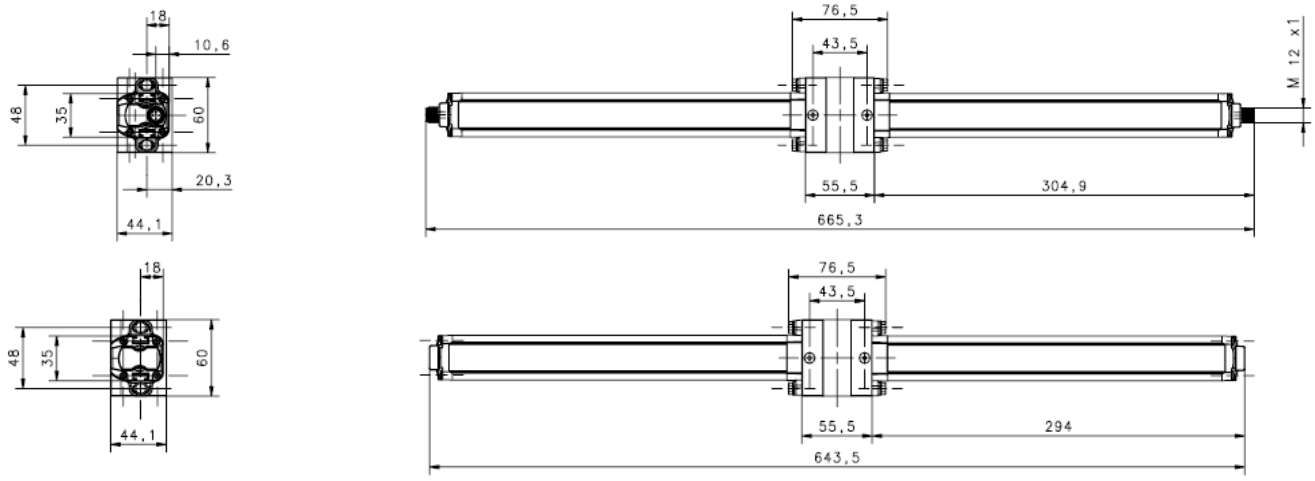
MODEL	DESCRIPTION	CODE
SG-AS-ARM	SINGLE ACTIVE ARM WITH RRX SENSORS V2	95ASE1841
SG-PR-ARM	SINGLE PASSIVE ARM WITH REFLECTORS V2	95ASE1851
SG-CB-C	MUTING ARMS MOUNTING BRACKET KIT	95ASE1930

The following figures show, respectively, the dimensions of single active arms with fixing bracket mounted, of single passive arms with fixing bracket mounted, of double active arms with fixing bracket mounted, of double passive arms with fixing bracket mounted.

ACTIVE/PASSIVE ARMS L

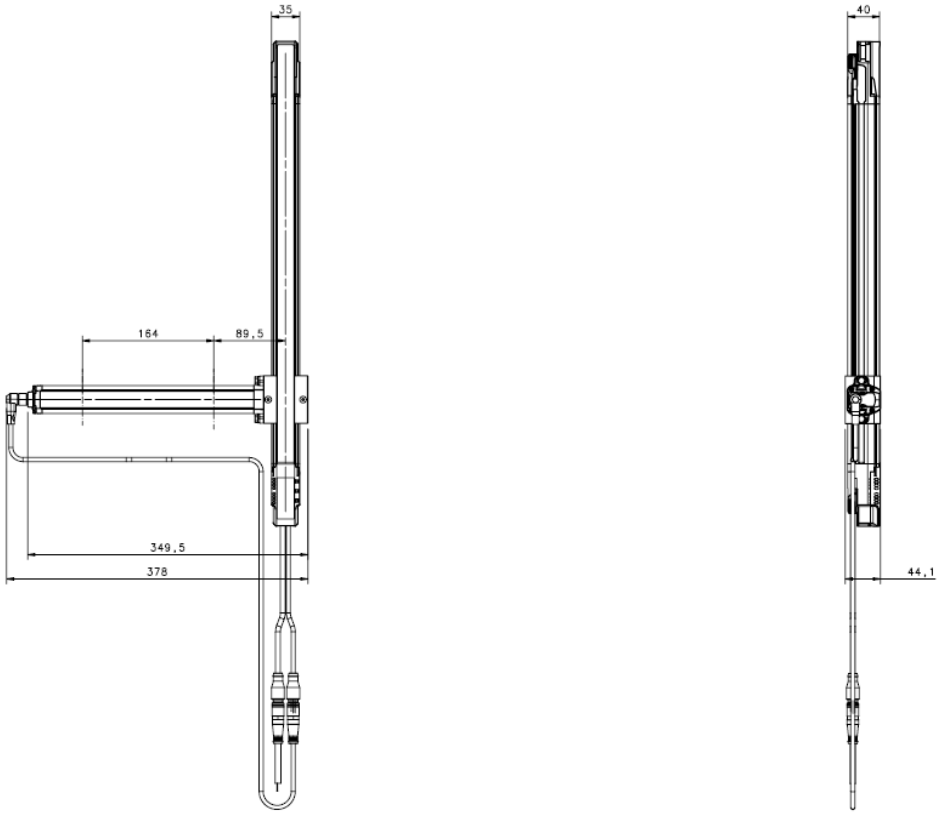


ACTIVE/PASSIVE ARMS T

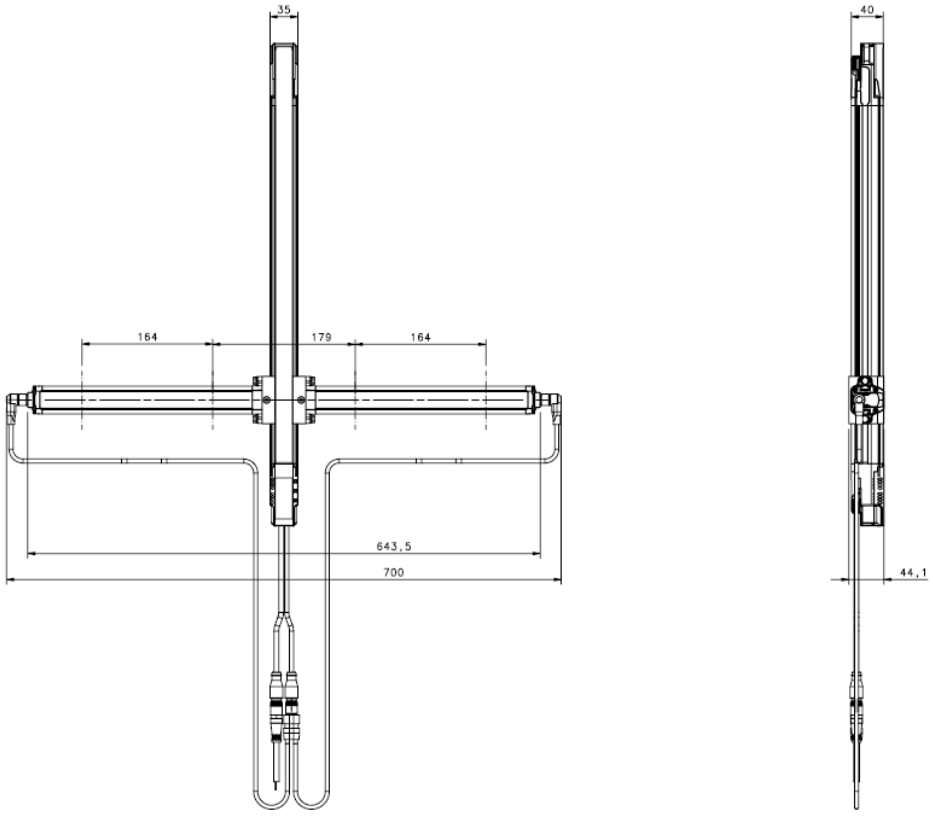


MODEL	DESCRIPTION	CODE
SG-L-ARMS	ACTIVE/PASSIVE ARMS L COUPLE V2	95ASE1861
SG-T-ARMS	ACTIVE/PASSIVE ARMS T COUPLE V2	95ASE1871

SG4 EXTENDED + BRACCI ATTIVO/PASSIVO L



SG4 EXTENDED + BRACCI ATTIVO/PASSIVO T



GLOSSARY

ELECTROSENSITIVE PROTECTIVE EQUIPMENT (ESPE): 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.

PROTECTED AREA: area where a specified test object is 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.

DETECTING CAPACITY (= RESOLUTION): sensor function parameter limit as specified by the manufacturer, which activates the electrosensitive protection equipment (ESPE). In case of an active optoelectronic protective device (AOPD), with resolution we mean the minimum dimension, which an opaque object must have in order to interrupt at least one of the beams that constitute the sensitive area.

BLOCK CONDITION (=BREAK): status of the light curtain taking place when a suitably-sized opaque object (see DETECTING CAPACITY) interrupts one or several light curtain beams.
Under these conditions, OSSD1 and OSSD2 light curtain outputs are simultaneously switched OFF within the device response time.

OUTPUT SIGNAL SWITCHING DEVICE (OSSD): part of the ESPE connected to machine control system. When the sensor is enabled during standard operating conditions, it switches to disabled status.

FINAL SWITCHING DEVICE (FSD): part of the control system involving machine safety conditions. It breaks the circuit to the machine primary control element (MPCE) when the output signal switching device (OSSD) becomes inactive.

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

ACTIVE OPTOELECTRONIC PROTECTIVE DEVICE (AOPD): 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.

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.

MACHINE PRIMARY CONTROL ELEMENT (MPCE): 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: 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.

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

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.

CONTROLLED MACHINE: machine having the potentially-dangerous points protected by the light curtain or by another safety system.

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: 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.

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

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.

OFF STATUS: status when the output circuit is interrupted and does not allow current stream.

ON STATUS: status when the output circuit is operational and allows current stream.

RESPONSE TIME: max. time elapsing between the occurrence of the event leading to sensor activation and the reaching of the inactive state by the output signal switching device (OSSD).

TEST PIECE: opaque object having a suitable size and used to test safety light curtain correct operation.

TYPE (OF ESPE): the Electrosensitive 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 IEC 61496-1) 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.