

SG4 Extended

INSTRUCTION MANUAL



Safety Light Curtains

 **DATALOGIC**

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Original Instructions (ref. 2006/42/EC)

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PREFACE

ABOUT THIS MANUAL

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

Manual Conventions

The following conventions are used in this document:

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



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

NOTE



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

CAUTION



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

WARNING

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COMPLIANCE

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GENERAL VIEW



Figure 1 - Safety Light Curtain

CHAPTER 1

GENERAL INFORMATION

GENERAL DESCRIPTION

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

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

NORM	DESCRIPTION
EN 61496-1: 2013	Safety of machinery: electrosensitive protective equipment. Part 1: General prescriptions and tests.
EN 61496-2: 2013	Safety of machinery: electrosensitive protective equipment - Particular requirements for equipment using active optoelectronic protective devices.
EN ISO 13849-1: 2015	Safety of machinery. Safety-related parts of control systems. Part 1: General principles for design
EN 61508-1: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 1: General requirements
EN 61508-2: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
EN 61508-3: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 3: Software requirements
EN 61508-4: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 4: Definitions and abbreviations
EN 62061:2005/A2: 2015	Safety of machinery. Functional safety of electrical/ electronic/ programmable electronic safety-related control systems.

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

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

The connections are made through one or more connectors as specified in "[Electrical Connections](#)" on page 21.

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

The microprocessor guarantees the check and the management of the beams that are sent and received through the units: the microprocessor – through some LEDs – informs the operator about the general conditions of the safety light curtain (see "[User Interface and Diagnostics](#)" on page 77).

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

During installation, a user interface facilitates the alignment of both units (see "[Alignment Procedure](#)" on page 29).

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

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

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

As the required knowledge may not be completely included in this manual, we suggest the customer to contact Datasensing Technical Service for any necessary information relative to the functioning of the light curtains and the safety rules that regulate the correct installation (see "[User Interface and Diagnostics](#)" on page 77).

PACKAGE CONTENTS

Package contains the following objects:

- Receiver (RX)
- Emitter (TX)
- 8-pole Rx pigtail cable
- 5-pole Tx pigtail cable
- Quick Guide of safety light curtain
- Periodical checklist and maintenance schedule
- 4 angled fixing brackets and specific fasteners
- 2 additional angled fixing brackets for models with heights included between 1200 and 1800 mm

MODELS

SG4 EXTENDED comes with two models:

- A programmable model, with advanced functionalities, like muting and blanking, which can be configured by pushbuttons or by Graphical User Interface. Its code is SG4-xx-xxx-OO-P and it will be referred to in this manual as SG4-P.
- A non-programmable model, only configurable by pushbuttons, with simplified muting function. Its code is SG4-xx-xxx-OO-N and it will be referred to in this manual as SG4-N.

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
- Zero 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 Graphic User Interface (ACM)
- Ethernet connection to PC
- 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

NEW FEATURES COMPARED TO SE

SG4-N features a single 8P connector Pin-to-Pin compatible with SE-..-PP-W models.

SG4-N models are only configurable via Basic Configuration Mode.

SG4-N series includes a list of modified functions:

OVERRIDE	Activation from pattern signal on single input instead of edges on two inputs
EDM / RESTART	EDM feedback shared with RESET/RESTART input instead of dedicated input

HOW TO CHOOSE THE DEVICE

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

Detection capability

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

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



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

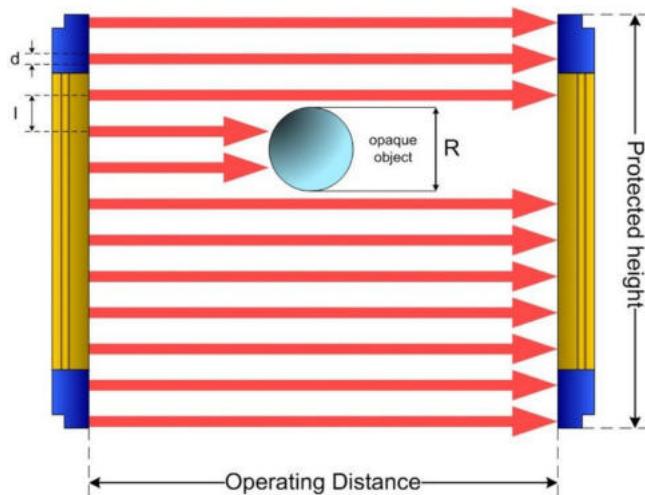


Figure 1 - Detection capability

The resolution value is obtained applying the following formula:

$$R = I + d$$

where:

I = Interaxes between two adjacent optics

d = Lens diameter

Height of the detection zone

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

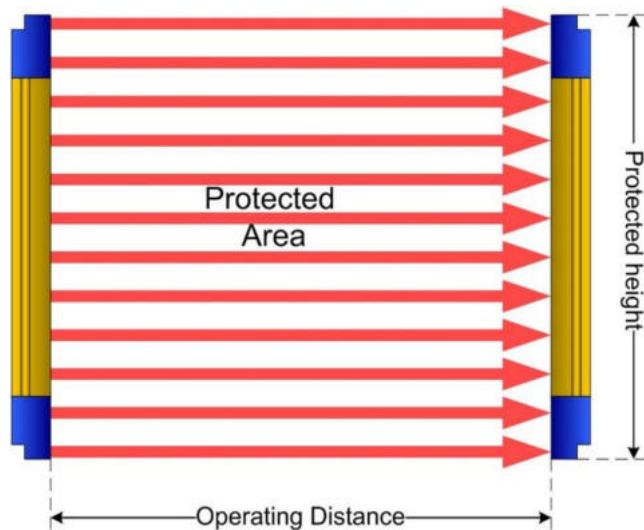


Figure 2 - Detection zone

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



MODEL	CONTROLLED HEIGHT Hp (mm)
SG4-14-030-00-x / SG4-30-030-00-x	300
SG4-14-045-00-x / SG4-30-045-00-x	450
SG4-14-060-00-x / SG4-30-060-00-x	600
SG4-14-075-00-x / SG4-30-075-00-x	750
SG4-14-090-00-x / SG4-30-090-00-x	900
SG4-14-105-00-x / SG4-30-105-00-x	1050
SG4-14-120-00-x / SG4-30-120-00-x	1200
SG4-14-135-00-x / SG4-30-135-00-x	1350
SG4-14-150-00-x / SG4-30-150-00-x	1500
SG4-14-165-00-x / SG4-30-165-00-x	1650
SG4-14-180-00-x / SG4-30-180-00-x	1800

Minimum installation distance

The safety device must be positioned at a specific safety distance (Figure 3).

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

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

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

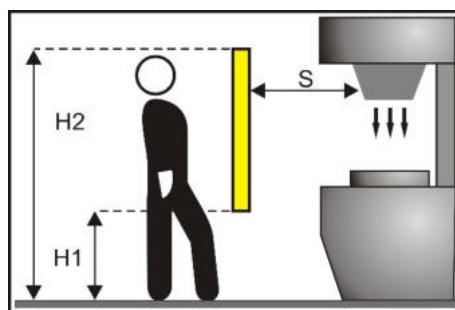


Figure 3 - Installation distance (vertical positioning)

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

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

where:

- S = Minimum safety distance in mm
- K = Speed of the object, limb or body approaching the dangerous area in mm/s
- t₁ = Response time of the ESPE in seconds (see "Technical Data" on page 84)
- t₂ = Machine stopping time in seconds (including the Safety Control System)
- C = Additional distance based on the possibility to insert the body or one of the body parts inside the dangerous area before the protective device trips.
C=8 (R - 14) for devices with resolution ≤ 40 mm
C=850 mm for devices with resolution > 40 mm
- R = Resolution of the system



K value is:

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

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

When devices with > 40 mm resolution are used, the height of the top beam has to be ≥ 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 (Figure 4) the distance between the dangerous area and the most distant optical beam must be equal to the value calculated using the following formula:

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

where:

- S = Minimum safety distance in mm
- t1 = Response time of the ESPE in seconds (see "Technical Data" on page 84)
- t2 = Machine stopping time in seconds (including the Safety Control System)
- H = Beam height from ground; this height must always be less than 1,000 mm

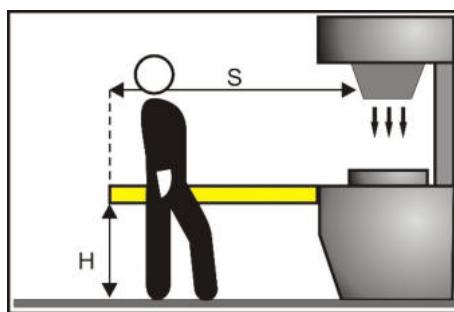


Figure 4 - Installation distance (horizontal positioning)

Practical examples

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

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

$$S = K * T + C$$

where:

- S = Minimum safety distance in mm
- t1 = ESPE response time
- t2 = Machine stopping time (including the Safety Control System)
- T = $(t_1 + t_2)$ Overall system stopping performance
- C = $8 * (R - 14)$ for devices with resolution ≤ 40 mm
- R = Resolution of the system

In all cases, if $K = 2000$ mm/s, then $S > 500$ mm.

Distance will have to be recalculated using $K = 1600$ mm/s.



NOTE

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

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

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

TYPICAL APPLICATIONS

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: SG 14mm safety light curtain is especially suitable for this kind of application, which requires the installation of the device directly on the machine.

Advantages: 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 safety light curtain is darkened while the press is moving down, the mobile tool bar will stop.

Advantages: 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, SG ensures increased plant productivity as it reduces the dead times necessary for machine accessing, adjustment and maintenance.



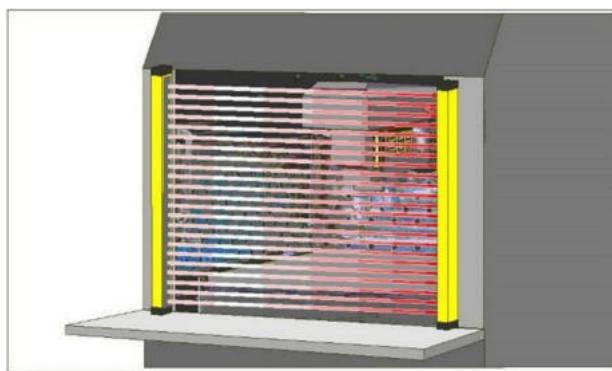
Example 3: Paper cutting machines

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: SG 30mm safety light curtain is especially suitable for this kind of application, which require the installation of the device directly on the machine.

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

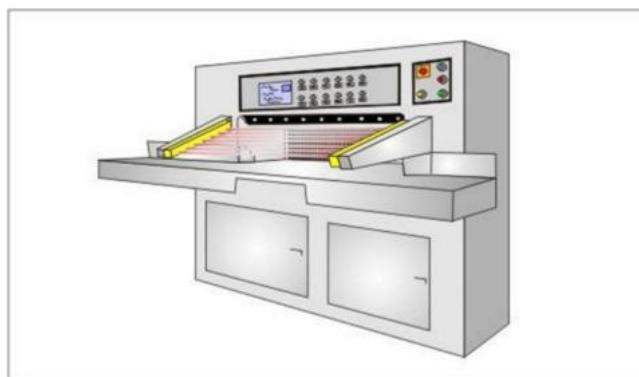


Example 4: Milling machines

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: SG 30mm 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.

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



SAFETY INFORMATION



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

CAUTION

- The stopping system of the machine must be electrically controlled.
- This control system must be able to stop the dangerous movement of the machine within the total machine stopping time T as per paragraph "[Minimum installation distance](#)" on page 6 and during all working cycle phases.
- Mounting and connection of the safety light curtain must be carried out by qualified personnel only, according to the indications included in the special sections (refer to "[Installation](#)" on page 11, "[Mechanical Mounting](#)" on page 19, "[Electrical Connections](#)" on page 21, "[Alignment Procedure](#)" on page 29) and in the applicable standards.
- The safety light curtain must be securely placed in a particular position so that access to the dangerous zone is not possible without the interruption of the beams (refer to "[Installation](#)" on page 11).
- The personnel operating in the dangerous area must be well trained and must have adequate knowledge of all the operating procedures of the safety light curtain.
- The TEST button must be located outside the dangerous zone because the operator must check the dangerous zone during all Test operations.



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

NOTE

CHAPTER 2

INSTALLATION

PRECAUTIONS TO BE OBSERVED FOR THE CHOICE AND INSTALLATION



Make sure that the protection level assured by the light curtain device is compatible with the real danger level of the machine to be controlled, according to EN ISO 13849-1: 2015 or EN 62061:2005/A2: 2015.

- Use only matched emitter and receiver pairs with same serial no.
- The outputs (OSSD) of the ESPE must be used as machine stopping devices and not as command devices.
- The machine must have its own START command.
- The dimension of the smallest object to be detected must be larger than the resolution level of the device.
- The ESPE must be installed in an environment complying with the characteristics indicated in "[Technical Data](#)" on page 84.
- The ESPE must not be installed close to strong and/or flashing light sources, in particular close to the front window of receiving unit.
- The presence of intense electromagnetic disturbances could affect device's correct operation.
- This condition shall be carefully assessed with the advice of DATASENSING Technical Service.
- The operating distance of the device can be reduced in presence of smog, fog or airborne dust.
- A sudden change in environment temperature, with very low minimum peaks, can generate a small condensation layer on the lenses and thus jeopardize correct operation.

GENERAL INFORMATION ON DEVICE POSITIONING

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



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

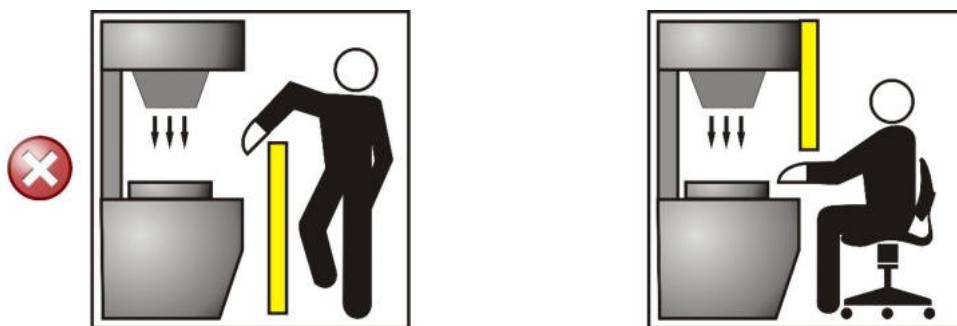


Figure 1 - Wrong light curtain positioning



Figure 2 - Correct light curtain positioning



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

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

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

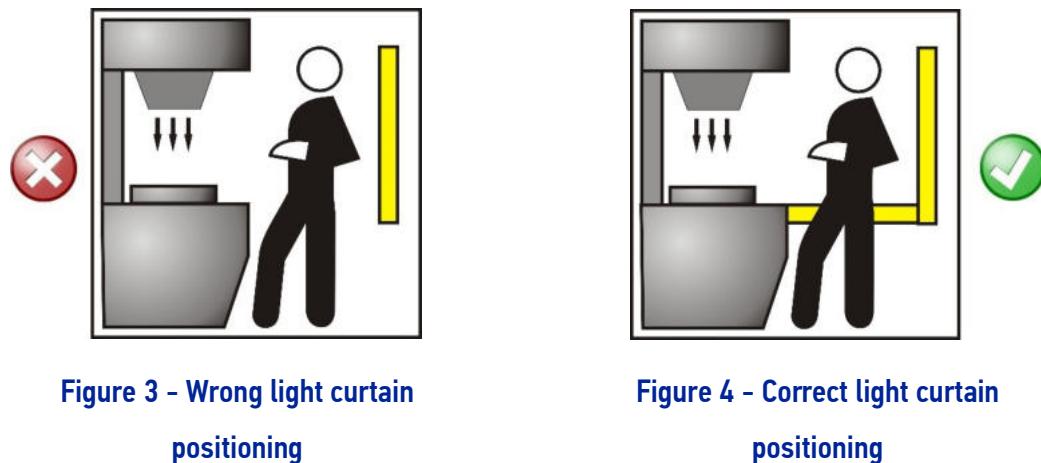


Figure 3 - Wrong light curtain positioning

Figure 4 - Correct light curtain positioning

Minimum distance from reflecting surfaces

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

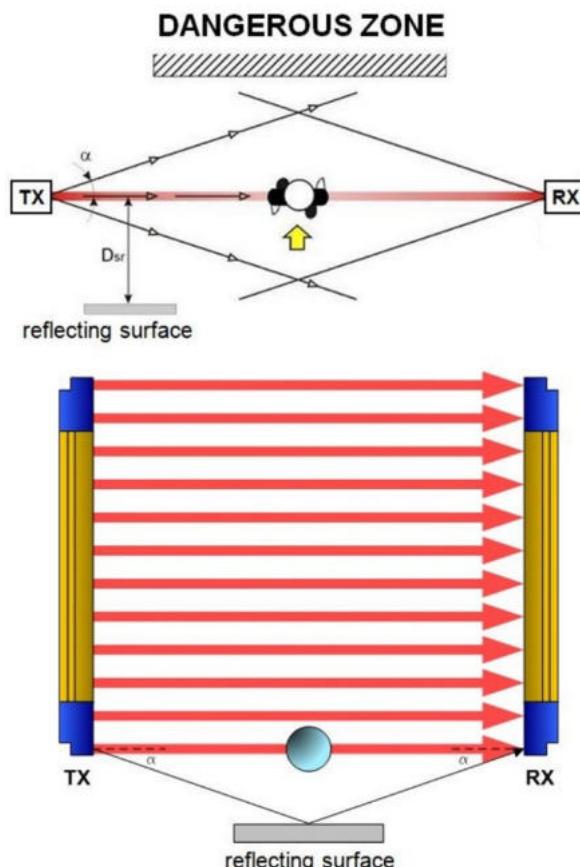


Figure 5 - Distances from reflective surfaces

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

The minimum distance depends on:

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

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

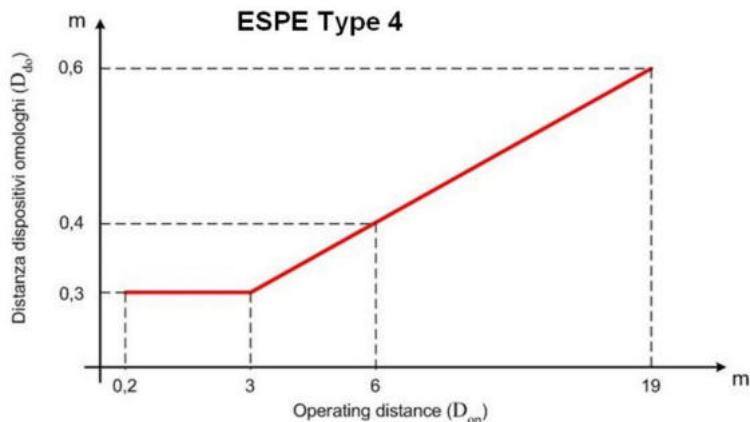


Figure 6 - Minimum distance from reflective surface

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

For ESPE Type 4:

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

$$D_{sr} (m) = 0.5 \times \text{operating distance (m)} \times \tan 2^\circ \quad \text{for operating distance} \geq 3 \text{ m}$$

Distance between homologous devices

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

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

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

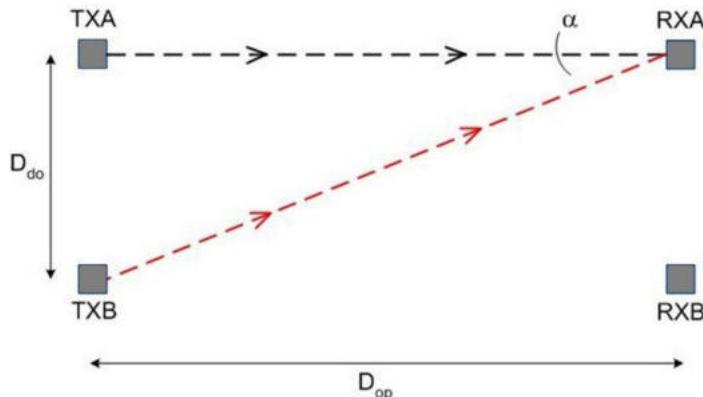


Figure 7 - Distance between homologous devices

This minimum Ddo distance depends on:

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

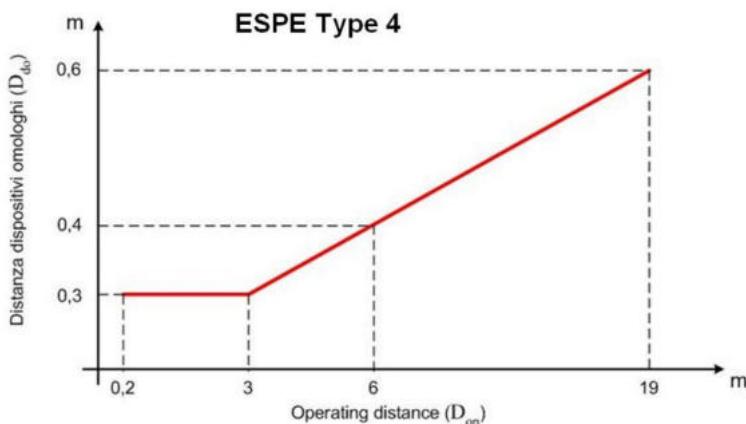


Figure 8 - ESPE Type 4

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



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

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

The figure provides two examples:

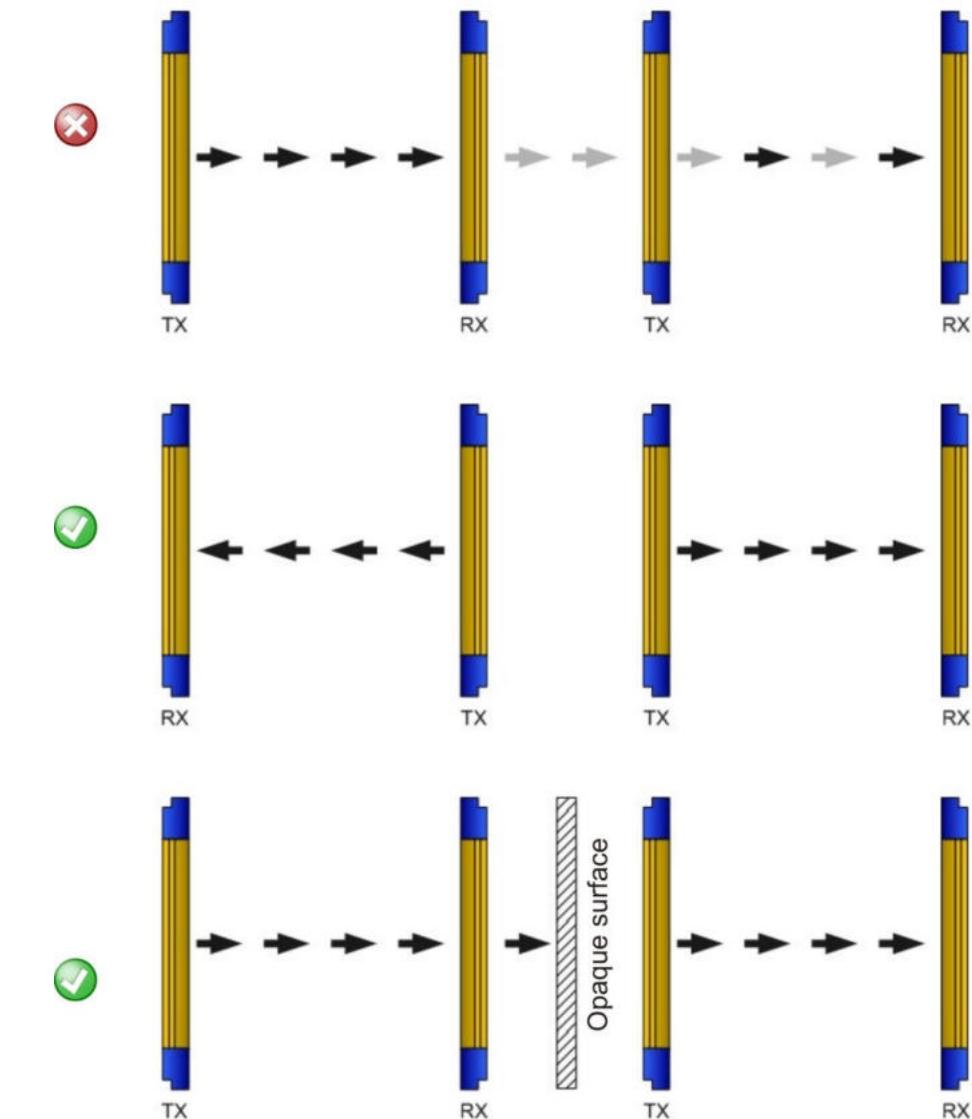


Figure 9 - Recommended positioning for homologous devices



If two light curtains have to be mounted near each other as reported in the first example of Figure 9.

Emitter and receiver orientation

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

The configurations shown in the figure must be avoided:

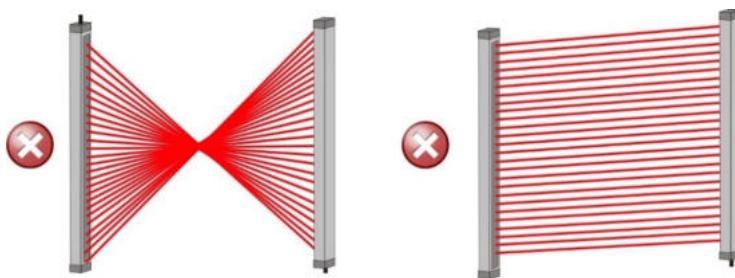


Figure 10 - Wrong light curtain TX-RX orientations

Use of deviating mirrors

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

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

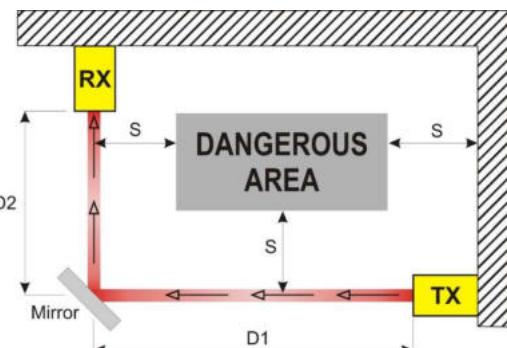


Figure 11 - Use of deviating mirrors

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 DATASENSING laser pointer accessory is recommended under these conditions.
- The minimum safety distance (S) must be respected for each single section of the beams.
- The effective operating range decreases by about 20% by using only one deviating mirror.

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

NO. OF MIRRORS	OPERATING DISTANCE (14mm)	OPERATING DISTANCE (30mm)
0	7 m	20
1	5.6 m	16

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

Controls after first installation

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

Check that:

- The ESPE remains in Safe State intercepting the beams along the detection zone using the specific test piece (TC-14, TP-30), following the scheme shown in Figure 12.

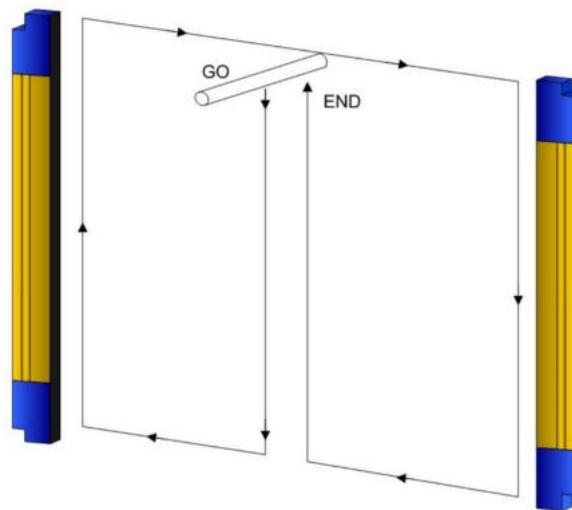


Figure 12 - Path of the test piece

- ESPE has to be correctly aligned: press slightly on the product side in both directions, the red LED must not turn on.
- The activation on 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 "[Minimum installation distance](#)" on page 6).
- The safety distance between the dangerous parts and ESPE must comply with the requirements indicated in "[Minimum installation distance](#)" on page 6.
- A person must not access or remain between ESPE and the dangerous parts of the machine.
- Access to the dangerous areas of the machine must not be possible from any unprotected area.
- ESPE must not be disturbed by external light sources, ensure that it remains in Normal Operation for at least 10-15 minutes, 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.

CHAPTER 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 "[Technical Data](#)" on page 84).

The two units must be positioned the most aligned and parallel possible.

The next step is the fine alignment, as shown in "[Alignment Procedure](#)" on page 29.

Outfit angled fixing brackets kit for units mounting must be used as described below (see Figure 1).

Adjustable supports for adjusting unit inclinations around the axes are available on request (see "[Accessories](#)" on page 93).

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.

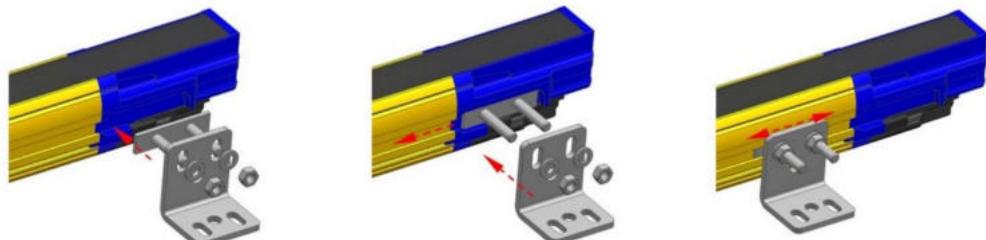


Figure 1 - Fixed brackets mounting procedure

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



Figure 2 - Anti-vibration dampers

The recommended mounting positions according to the light curtain length are shown in Figure 3 and in the following table.

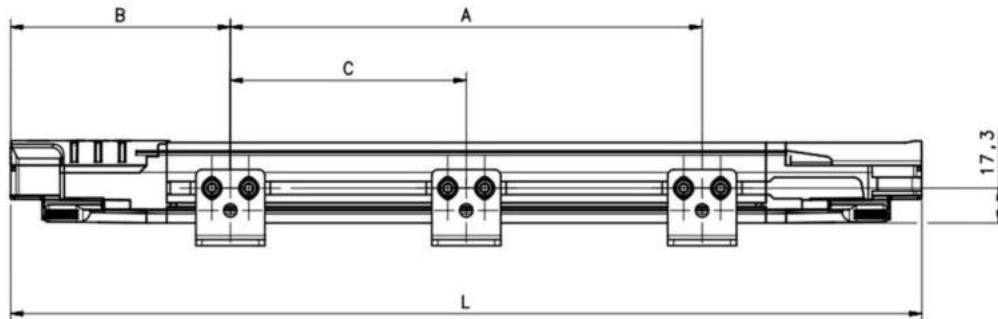


Figure 3 - Light curtain dimensions

MODEL 14 mm	MODEL 30 mm	L (mm)	A (mm)	B (mm)	C (mm)
SG4-14-030-00-x	SG4-30-030-00-x	306.3	86.3	110	-
SG4-14-045-00-x	SG4-30-045-00-x	456.3	236.3	110	-
SG4-14-060-00-x	SG4-30-060-00-x	606.2	306.2	150	-
SG4-14-075-00-x	SG4-30-075-00-x	756.2	406.2	175	-
SG4-14-090-00-x	SG4-30-090-00-x	906.1	506.1	200	-
SG4-14-105-00-x	SG4-30-105-00-x	1056.1	606.1	225	-
SG4-14-120-00-x	SG4-30-120-00-x	1206	966	150	453
SG4-14-135-00-x	SG4-30-135-00-x	1356	1066	175	503
SG4-14-150-00-x	SG4-30-150-00-x	1505.9	1166	200	553
SG4-14-165-00-x	SG4-30-165-00-x	1655.9	1266	225	603
SG4-14-180-00-x	SG4-30-180-00-x	1805.8	1366	250	652.9

CHAPTER 4

ELECTRICAL CONNECTIONS

PIN-OUT AND CONFIGURATION PIN CONNECTION

All electrical connections to the emitting and receiving units are made through some particular cables; these 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 having on the receiving unit one M12 12-pole connector and one M12 5-pole connector.

The Blanking cable allows having 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.

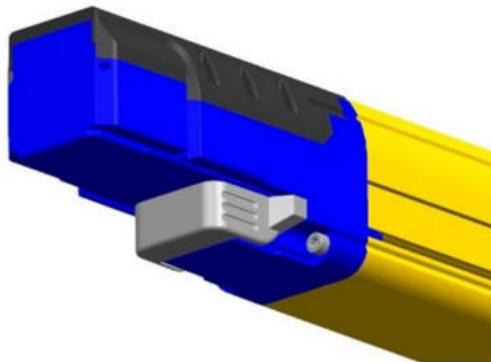


Figure 1 - Connections

Take care that the terminator cap (see "Accessories" on page 93) is connected on the top side of the light curtains. If this connection misses, Master and Slave units go in critical Communication failure.



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 two M12 with the Muting configuration and connector with one M12 with the blanking configuration).

PIG-TAIL CABLE MUTING CONFIGURATION FOR RECEIVER (SG4-P)

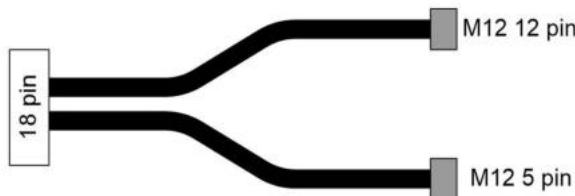


Figure 2 – Pigtail cable Muting configuration for receiver (CS-R1-75-B-002)

M12 12 pin:

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

M12 5 pin:

1. 24 V (brown)
2. MUTING 2 (white)
3. 0V (blue)
4. MUTING 1 (black)
5. N.C. (gray)

PIG-TAIL CABLE BLANKING CONFIGURATION FOR RECEIVER (SG4-P)



Figure 3 – Pigtail cable Blanking configuration for receiver (CS-G1-70-B-002)

M12 12 pin:

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

PIG-TAIL CABLE FOR RECEIVER (SG4-N MODEL)



Figure 4 - Pigtail cable: Receiver RX for SG4-N Models (CS-G1-60-B-002)

M12 8 pin:

1. RESTART / RESET / EDM / OVERRIDE (white)
2. +24 VDC (brown)
3. MUTING 1 (green)
4. MUTING 2 (yellow)
5. OSSD 1 (gray)
6. OSSD2 (pink)
7. 0V (blue)
8. MUTING LAMP (red)

PIG-TAIL CABLE FOR EMITTER



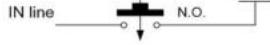
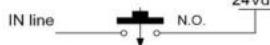
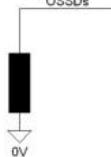
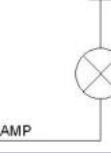
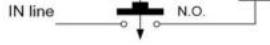
Figure 5 - Pigtail cable: Emitter TX (CS-G1-50-B-002)

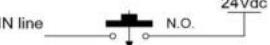
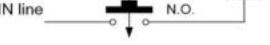
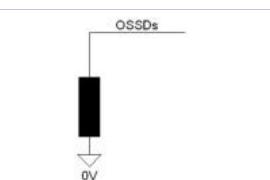
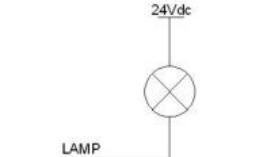
M12 5 pin:

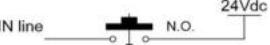
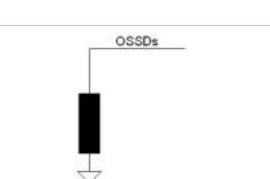
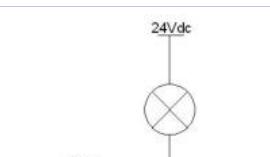
1. +24V (brown)
2. TEST (white)
3. 0V (blue)
4. EARTH (black)
5. NOT USED (gray)

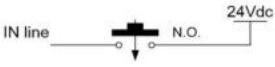
M12 CONNECTORS PINOUT

12 pin	8 pin	5 pin

MUTING CONFIGURATION RECEIVER SG4-P		
LINE	LAYOUT CONNECTION	BEHAVIOR
RESET		active on high level in failure lockout
RESTART	IN line 	active on high level at runtime
ALIGNMENT		active on high level at startup
OVERRIDE	IN line 	active on high level at runtime
OVERRIDE 2	IN line 	active on low level at runtime
EDM	See "EDM" on page 45	must be OSSDs antivalent at runtime with EDM enabled
MUTING DISABLE	IN line 	Muting disabled on high level at runtime
OSSD 1 / 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 start-up there are fluctuations on this line not concerning the override activation
MUTING LAMP		open collector sinks on Muting activation
MUTING 1 / MUT- ING 2	IN line 	active on high level at runtime
EARTH		connect directly to earth

MUTING CONFIGURATION RECEIVER SG4-N		
LINE	LAYOUT CONNECTION	BEHAVIOR
RESET		active on low level in failure lockout
RESTART	IN line  24Vdc	active on low level at runtime
ALIGNMENT		active on low level at startup
OVERRIDE	IN line  24Vdc	refer to "Override for SG4-N" on page 63
EDM	See "EDM" on page 45	must be OSSDs antivalent at runtime with EDM enabled
OSSD 1 / OSSD 2	 OSSDs 0V	high level = free path low level = object detection
MUTING LAMP	 24Vdc LAMP	open collector sinks on Muting activation
MUTING 1 / MUTING 2	IN line  24Vdc	active on high level at runtime

BLANKING CONFIGURATION RECEIVER SG4-P		
LINE	LAYOUT CONNECTION	BEHAVIOR
RESET		active on high level in failure lockout
RESTART	IN line  24Vdc	active on high level at runtime
ALIGNMENT		active on high level at startup
TOLERANCE		active on high level at startup
TEACH-IN	IN line  24Vdc	active on high level at runtime
EDM	See "EDM" on page 45	must be OSSDs antivalent at runtime with EDM enabled
OSSD 1 / OSSD 2	 OSSDs 0V	high level = free path low level = object detection
BLANKING LAMP	 24Vdc LAMP	open collector sinks on Blanking activation
EARTH		connect directly to earth

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

NOTES ON CONNECTIONS

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

- Do not place connection cables in contact with or near high-voltage cables and/or cable undergoing high current variations (e.g. motor power supplies, inverters, etc.);
- **Do not connect the OSSD wires of different light curtains in the same multi-pole cable.**
 - 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 SE-SR2

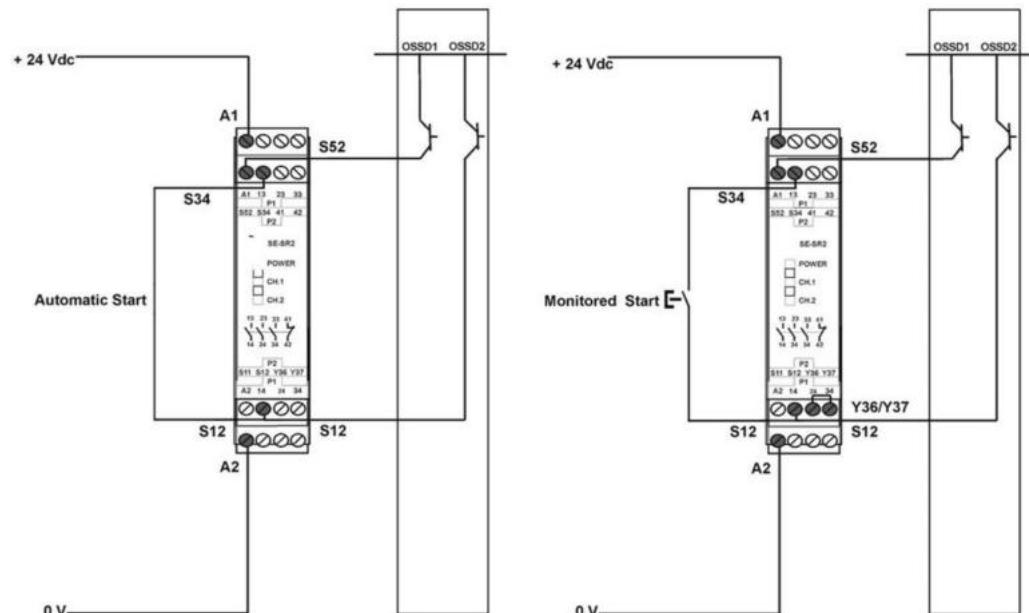


Figure 6 - Connection to SE-SR2 Safety Relays

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

- Do not use varistors, RC circuits or LEDs in parallel at relay inputs or in series at OSSD outputs.
- The OSSD1 and OSSD2 safety contacts cannot be connected in series or in parallel, but can be used separately, conforming to the plant's safety requirements.

- If one of these configurations is erroneously used, the device enters the output failure condition (see "User Interface and Diagnostics" on page 77).
- Connect both OSSDs to the device to control.
- Failure to connect an OSSD to the activating device jeopardizes the system safety degree that the light curtain has to control.

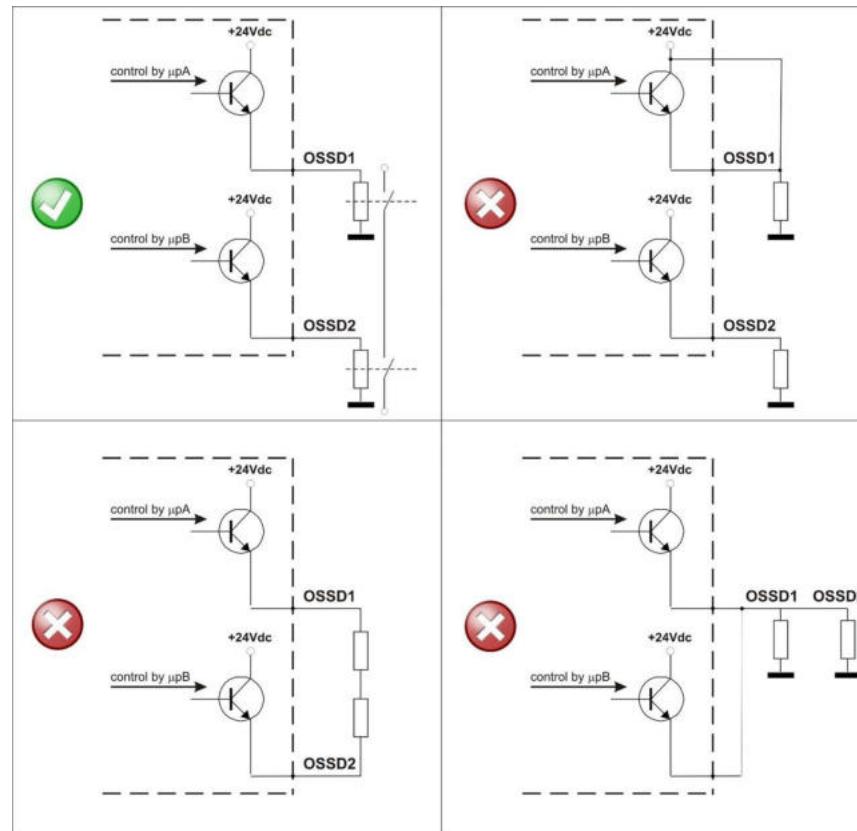


Figure 7 - OSSDs connection

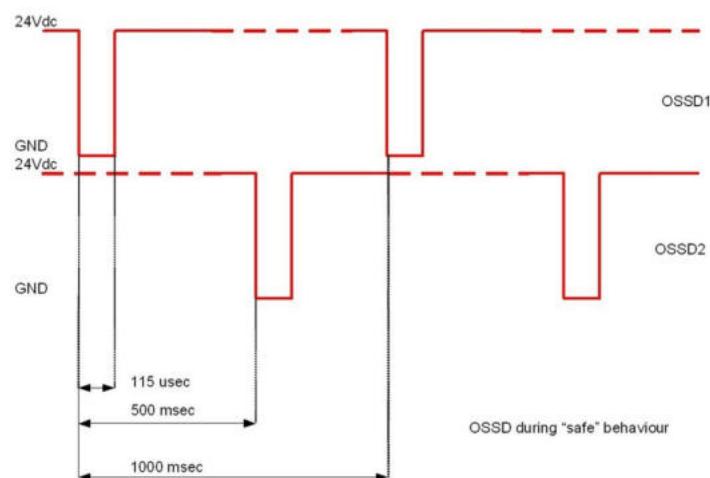


Figure 8 - Behavior of OSSDs

CHAPTER 5

ALIGNMENT PROCEDURE

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

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

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

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 the LED display.

The last beam is at the opposite end near the terminator cap. These two beams are the synchronization beams too.

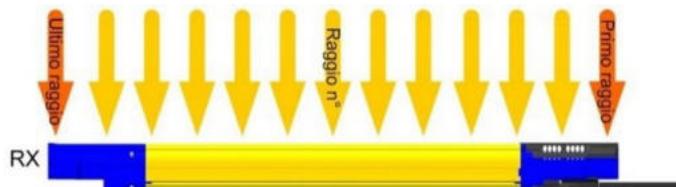
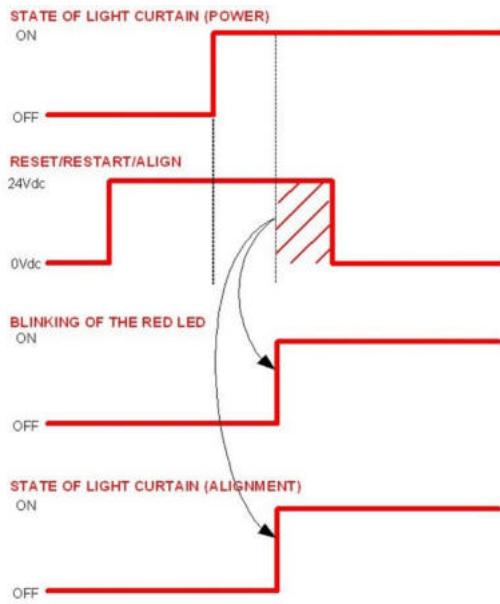


Figure 1 - Description of the beams

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 take the ESPE back to normal operation.



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: 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. Rotate the emitter, pivoting on the lower optics axis, until the yellow SYNC2 LED is OFF. 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 center of this area.

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 "[Controls after first installation](#)" on page 18).

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 "[User interface](#)" on page 77). 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 SG4-DONGLE is installed, the 7-segment display shows further messages.

Please refer to the SG4-DONGLE manual for details.

CHAPTER 6

FUNCTIONS 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 "Included Accessories" on page 91), to activate push buttons thus accidental access to safety configuration is avoided.



Do not use screwdrivers to activate push buttons!

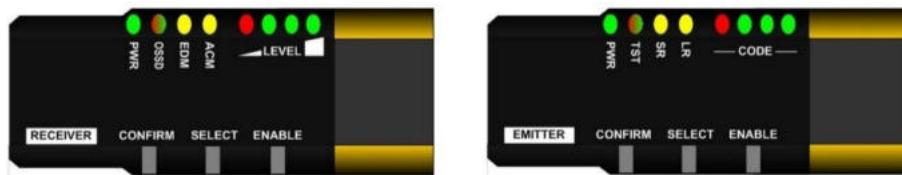


Figure 1 - User interface

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 for 5 seconds 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 SG Extended GUI PC User Interface), a button pressure on Step 2 causes ESPE configuration failure lockout to prevent unauthorized advanced configuration changes.

ADVANCED CONFIGURATION MODE (SG4-P)

SG Extended GUI software (Graphic User Interface, GUI) for PC allows the user to set ESPE advanced configuration. Many parameters are available to customize ESPE behavior 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 GUI 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	<i>no password requested</i>

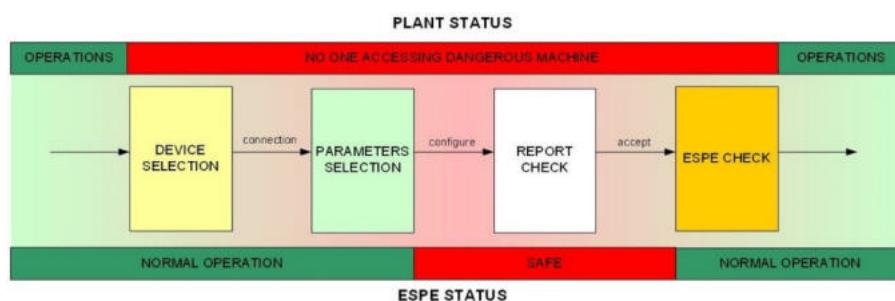


Figure 2 - ACM configuration cycle

Device selection: user selects ESPE to configure, choosing among devices on network identified by a unique Serial Number

Parameters selection: user, after setting the configuration ESPE, requires the transfer at the GUI and insert the password to access the device. The GUI sends the configuration command, ESPE switches to SAFE state, a “configuration in progress” indication is shown on ESPE led interface, old configuration on ESPE is erased

Report check: ESPE sends back to GUI the received configuration, GUI produces a printable SAFETY REPORT with all safety related information about configuration in progress (see Figure 3).

After checking all report contents user can accept configuration: ESPE restarts in normal operation with the new configuration.

ESPE Check: user checks if ESPE is working according to SAFETY REPORT (resolution check with proper test piece, parameters check ...)

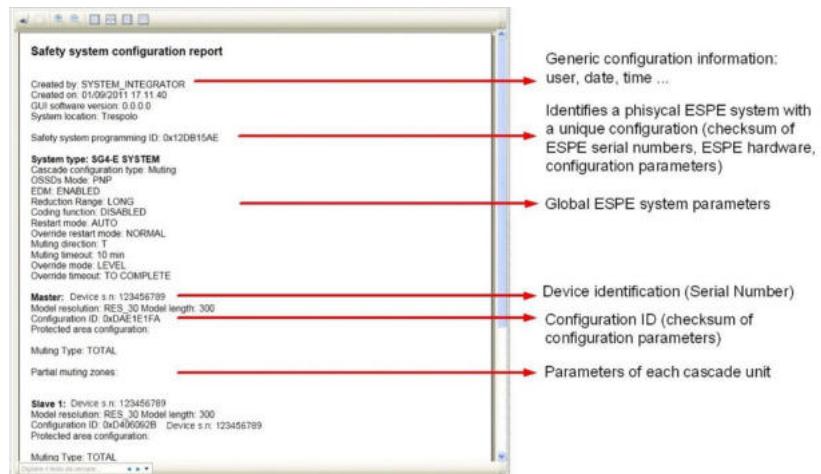


Figure 3 - Safety report

Password protection and not up to date devices versions compatibility

Starting from release 1.3.0 of SG Extended GUI, firmware version 6.2.0 of SG4-DONGLE, and firmware version 6.1.0 of SG4 EXTENDED light curtain, an improved configuration protection mechanism has been implemented by means of a device embedded password.

For combinations of GUI, SG4-DONGLE and SG4 EXTENDED with different versions of release or firmware, please check the following compatibility table:

SG EXTENDED GUI RELEASE	SG4-DONGLE FIRMWARE	SG4 EXTENDED FIRMWARE	
R < 1.0.3	-	-	Please update to last version of SG Extended GUI, available for free at www.datasens-ing.com
R ≥ 1.0.3	Fw < 6.2.0	Fw < 6.1.0	During on-line or off-line configuration, system will request a GUI password but not a device embedded password.
R ≥ 1.0.3	Fw < 6.2.0	Fw ≥ 6.1.0	During on-line configuration a device embedded password will be requested. Off-line configuration is not possible with this combination: SG4-DONGLE with Fw ≥ 6.2.0 is needed.
R ≥ 1.0.3	Fw ≥ 6.2.0	Fw < 6.1.0	During offline configuration, a password will be requested to store the configuration on SG4-DONGLE, but not transferred to the SG4 EXTENDED.
R ≥ 1.0.3	Fw ≥ 6.2.0	Fw ≥ 6.1.0	System will always request a device embedded password for configuration. It is also possible to input an empty password.



**SG4-DONGLE with Fw version ≥ 6.2.0 reports Fw version on product label.
Otherwise SG4-DONGLE with Fw version < 6.2.0 doesn't report this information on product label.**

Reset to factory configuration

System Integrator User can reset ESPE at factory configuration settings with SG Extended GUI software with the following action:

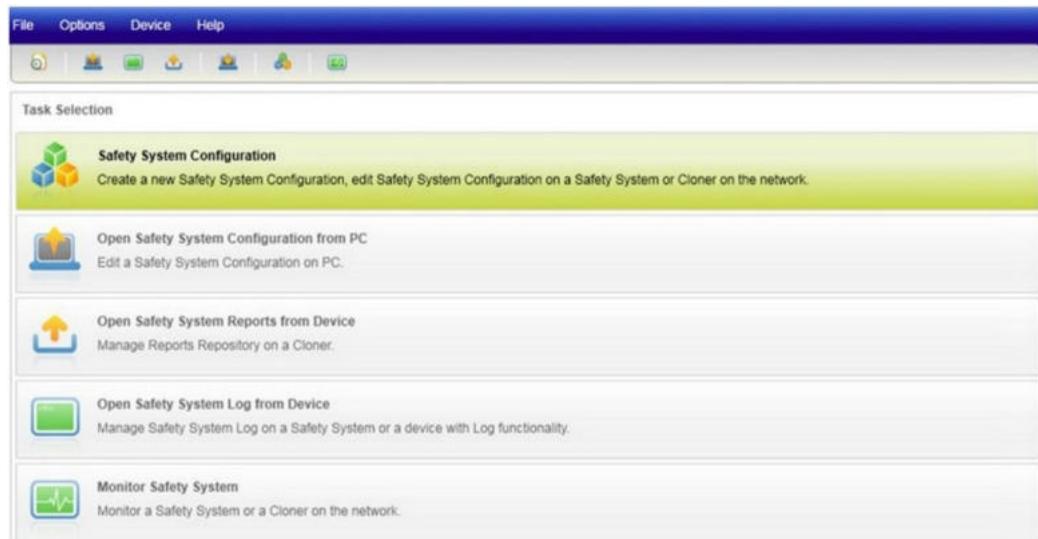


Figure 4 - Task selection



Figure 5 - Device selection and erase configuration



Figure 6 - Insert password



Password is requested only from GUI version 1.3.0 and firmware version 6.1.0.

NOTE

Only if there is no ACM configuration on light curtains, user can also reset ESPE at factory configuration settings with the following push button action:

- press and keep pressed CONFIRM button for at least 9 sec. (but less than 30 sec. otherwise the light curtain goes in lockout failure)
- LEDs blink for a while, then the light curtain resets

- after reset the light curtains begins its normal functioning with the factory configuration

FUNCTION LIST

Programmable models

SG4 EXTENDED programmable models (SG4-P) have two main operating modes: Blanking and Muting. Choosing between Blanking and Muting changes the function setting associated to LEDs 5 to 8.



NOTE

The default configuration is indicated in bold characters.

Since the last 3 LEDs don't change status by passing from a Muting configuration to a blanking configuration (and vice versa) 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	0SS0	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 (unidirectional)					
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
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 Blank- ing Selection	8	1 Fixed Blanking Zone	● ● ● ● ● ● ● ●
		2 Fixed Blanking Zones	● ● ● ● ● ● ● ●

TX FUNCTION LIST			
FUNCTION	LED #	SETTING	LED STATUS
Coding	2	Code 1	● ● ● ● ● ● ● ●
		Code 2	● ● ● ● ● ● ● ●
		No Code	● ● ● ● ● ● ● ●
Range Selection	3	Long	● ● ● ● ● ● ● ●
		Short	● ● ● ● ● ● ● ●

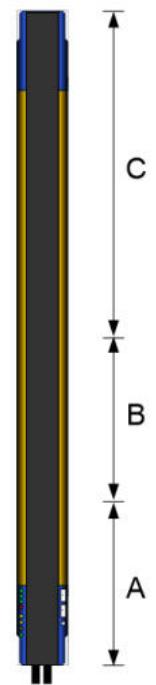
SG4-N models

SG4-N model provides Muting and Override functions along with Automatic/Manual Restart and External Device Monitoring.



The default configuration is indicated in bold characters.

RX FUNCTION LIST IN MUTING OPERATION MODE (LED 3 ON YELLOW)				
FUNCTION	LED #	SETTING	LED STATUS	ESPE ZONES
Partial Muting	2	Zone (A)	PMR OSS EDM ACM LEVEL	
		Zone (A + B)	PMR OSS EDM ACM LEVEL	
		Zone (A + B + C)	PMR OSS EDM ACM LEVEL	
Muting Exit Delay	3	ON	PMR OSS EDM ACM LEVEL	
		OFF	PMR OSS EDM ACM LEVEL	
EDM	4	Enabled	PMR OSS EDM ACM LEVEL	
		Disabled	PMR OSS EDM ACM LEVEL	
Restart Mode	5	Auto	PMR OSS EDM ACM LEVEL	
		Manual	PMR OSS EDM ACM LEVEL	
Muting Direction	6	T (bidirectional)	PMR OSS EDM ACM LEVEL	
		L (unidirectional)	PMR OSS EDM ACM LEVEL	
Muting Timeout	7	10 min	PMR OSS EDM ACM LEVEL	
		Inf.	PMR OSS EDM ACM LEVEL	
Muting Filter	8	ON	PMR OSS EDM ACM LEVEL	
		OFF	PMR OSS EDM ACM LEVEL	



CHAPTER 7

FUNCTIONS

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

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 depend on the light curtain length. Please refer to the tables in chapter "Available Models and Response Times" on page 87 for further details.

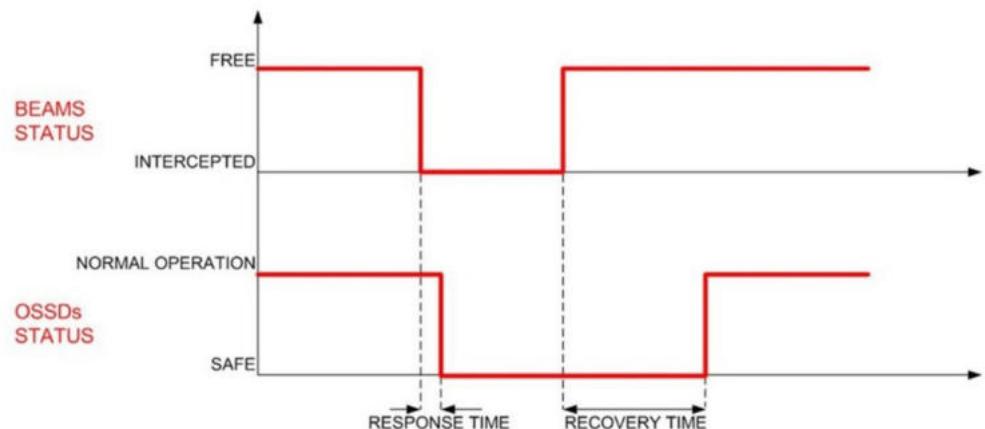
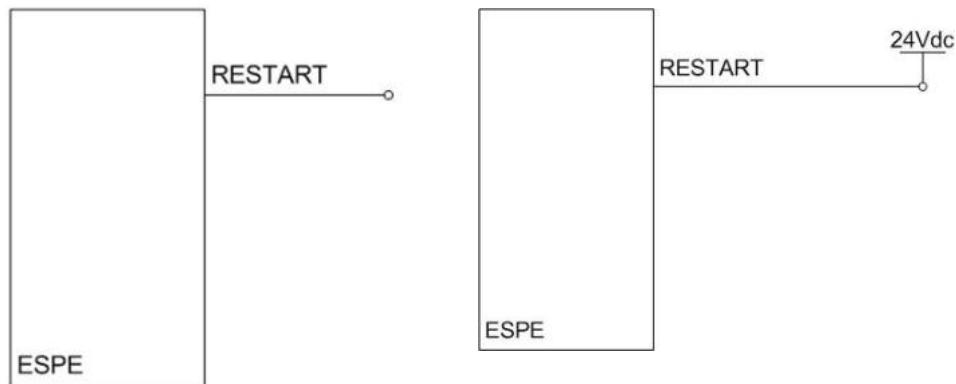


Figure 1 - Restart timings (auto)

In Automatic Restart the RESTART input (pin 3 of M12-12 poles or pin 1 of M12-8 poles - RX side) has to be left floating on SG4-P models or connected to 24V on SG4-N models.

Please refer to paragraph 8.4 EDM for RESTART input connection when used in combination with EDM function on SG4-N models.

SG4-P Restart Connection (Auto) SG4-N 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 500msec (100ms on SG4-N Models). 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.

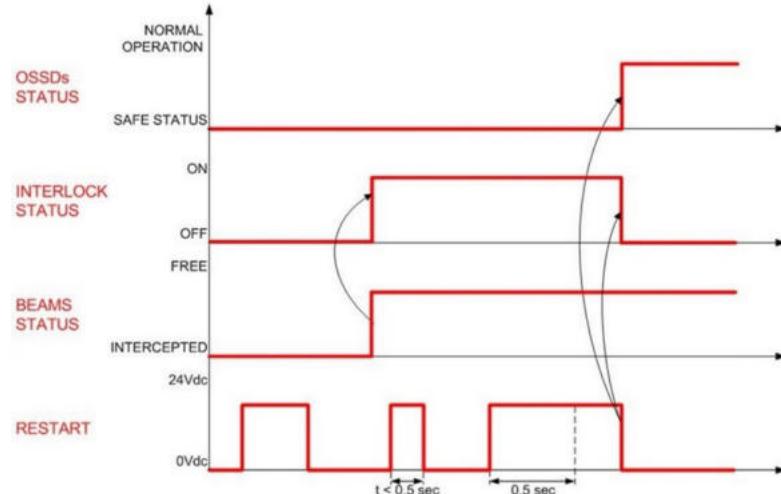


Figure 2 - SG4-P Restart timings (manual)

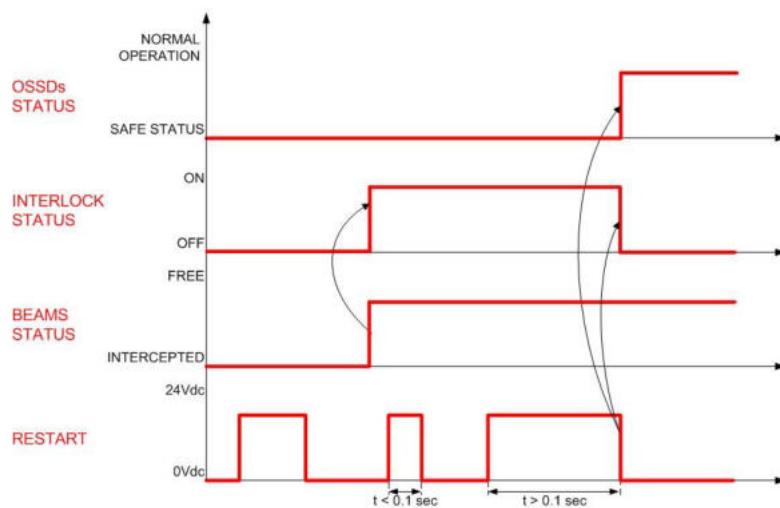
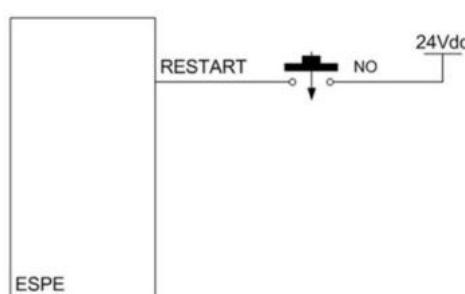


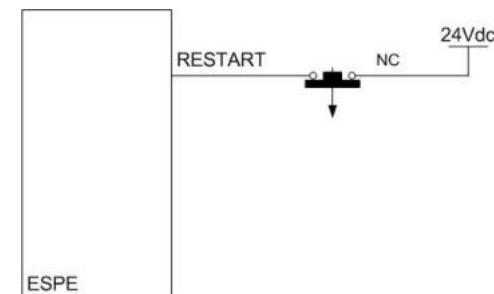
Figure 3 - SG4-N Restart timings (manual)

In Manual Restart the RESTART input (pin 3 of M12-12 poles or pin 1 of M12 8 poles - RX side) has to be connected to 24VDC through a normally- open contact for SG4-P models or a normally closed contact on SG4-N models. Please refer to paragraph 8.4 EDM for RESTART input connection when used in combination with EDM function SG4-...-N models.

SG4-...-P Restart Connection (manual)



SG4-...-N Restart Connection (manual)



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 "Accessories" on page 93) is necessary.

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



Figure 4 - ACM Configuration: Restart Mode

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.

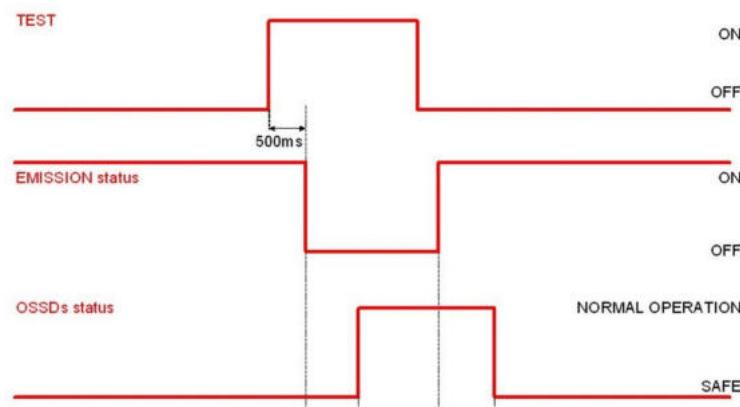


Figure 5 - Test timings

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 input (pin 3 of M12-8 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.

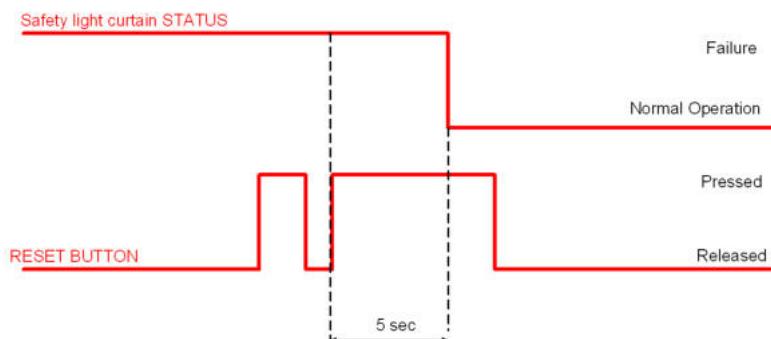


Figure 6 - Reset timings

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

EDM

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

EDM enabled

When EDM is enabled it is necessary to connect EDM input (pin 6 of M12-12 poles or pin 1 of M12-8 poles- RX) to a 24 VDC normally-closed contact of the device to be monitored.



In normal operation the third led switched on in the user interface indicates that this function is active.

NOTE

The figure below shows how to connect the EDM input.

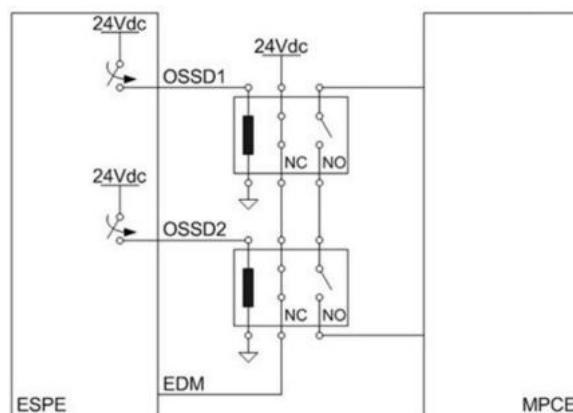


Figure 7 - EDM connection with automatic restart selected on SG4-N models

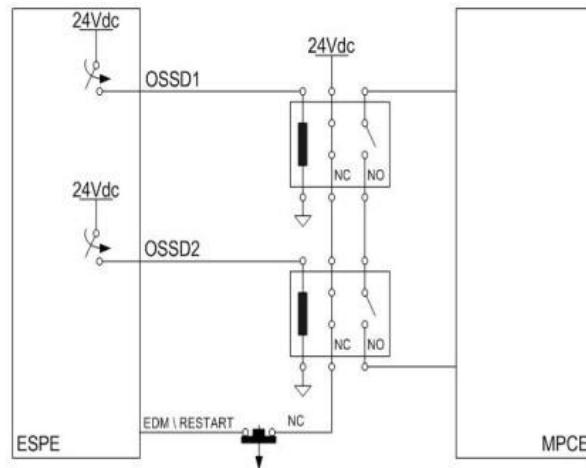


Figure 8 - EDM connection with manual restart selected on SG4-N models

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

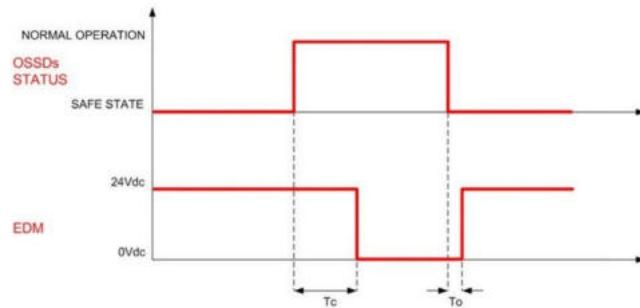


Figure 9 - EDM timings

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.

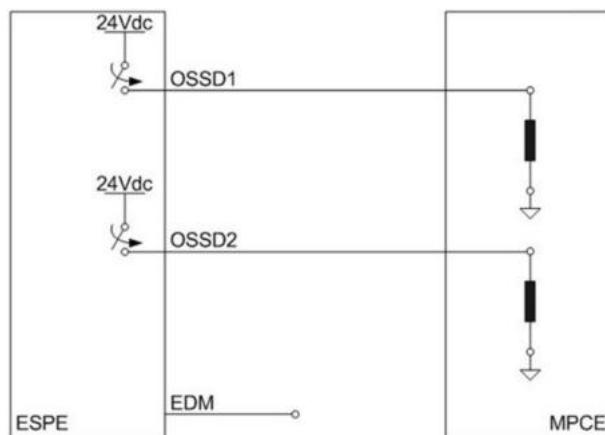
$T_c \leq 350$ msec (time between OSSD OFF-ON transition and EDM test)

$T_o \geq 100$ msec (time between OSSD ON-OFF transition and EDM test)

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

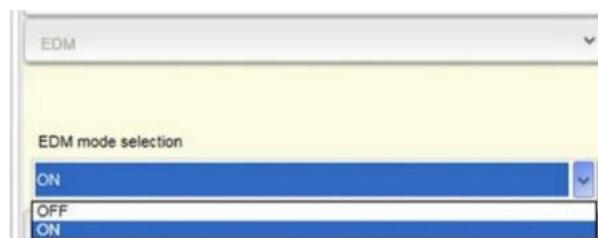
EDM disabled

When EDM is disabled it's necessary to leave the EDM input floating for SG4-...-P models. Please refer to 8.1 RESTART MODE for EMD/RESTART line connection on SG4-...-N models.

**Figure 10 - EDM disabled****EDM SELECTION**

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

		PWR	OSSD	EDM	ACM	LEVEL
Enabled	LED 4 ON Yellow	●	●	●	●	□
Disabled	LED 4 OFF	●	●	●	●	●

Figure 11 - BCM Configuration: EDM Selection**Figure 12 - ACM Configuration: EDM Selection**

RANGE REDUCTION

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 (SG4-...-P models only) and for TX side through BCM.

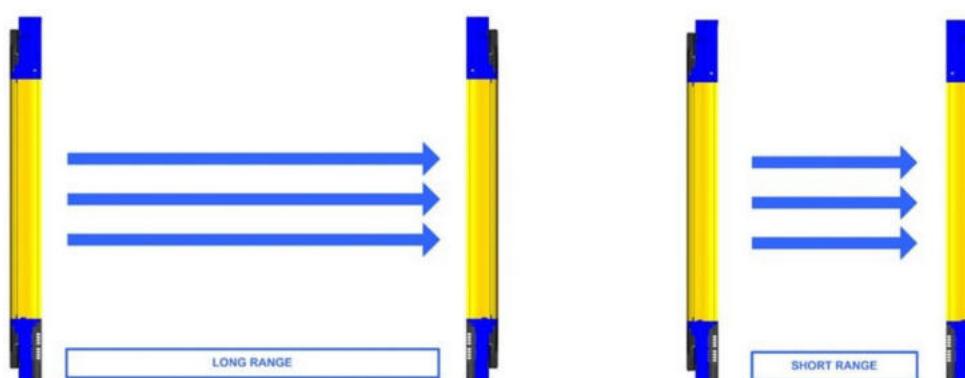


Figure 13 - Reduction range

		APR	TSL	TS	DS	LS	BP	CODE
Long	LED 3 ON Yellow	●	●	●	●	●	●	●
Short	LED 3 OFF	●	●	●	●	●	●	●

Figure 14 - BCM Configuration: reduction range

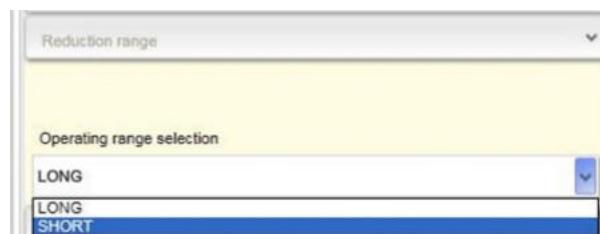


Figure 15 - ACM Configuration: reduction range

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.

The tables below resume, for both resolutions, the different operating distances when the reduction range is changed.

RESOLUTION 30mm	LONG RANGE RX	SHORT RANGE RX
Long range TX	20	6
Short range TX	12	4

RESOLUTION 14mm	LONG RANGE RX	SHORT RANGE RX
Long range TX	7	2
Short range TX	4	1



SG4-...-N models only have RX Long Range.

NOTE

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 recognize 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 (see figures below).

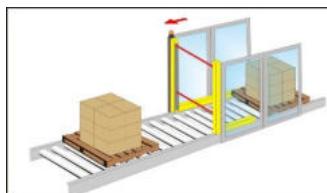


Figure 16 - L-shaped version with integrated Muting sensors for unidirectional Muting

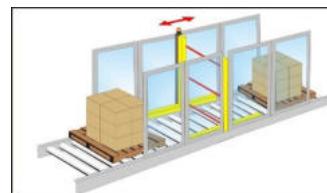


Figure 17 - T-shaped version with integrated Muting sensors for bidirectional Muting

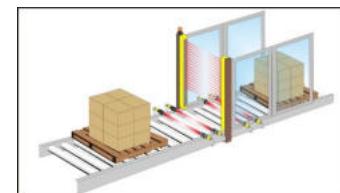


Figure 18 - Linear version with external Muting sensors

- 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 signaled 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 make sure 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 signaled.
- 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 V2 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.

Muting function disable (SG4-P Models)

During light curtain 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).

Muting signaling devices

In order to make use of Muting function, it is compulsory to connect a dedicated signaling 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 "Technical Data" on page 84 for information about the lamp).

Typical Muting application and safety light curtain connection

The figure 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.

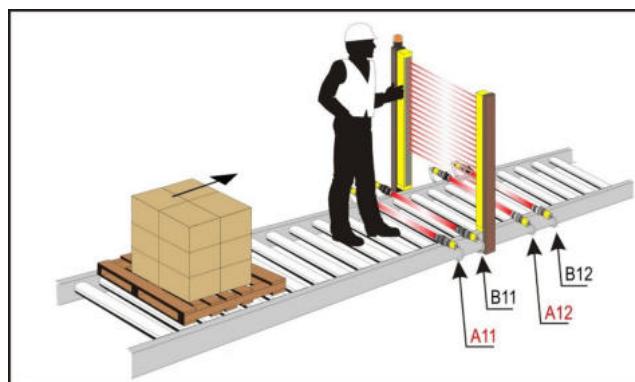


Figure 19 - Typical Muting Application

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.

Muting T

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 vice versa).

The Muting function ends as soon as the signal on MUTING1 or MUTING2 goes low.

A further custom Muting Exit delay (Tdelay) may be set by the user in a 0-1000 ms range.

For SG4-...-OO-N models, Tdelay is fixed at 1000 ms when activated in BCM configuration.

The maximum activation delay between MUTING1 and MUTING2 (or vice versa) 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.

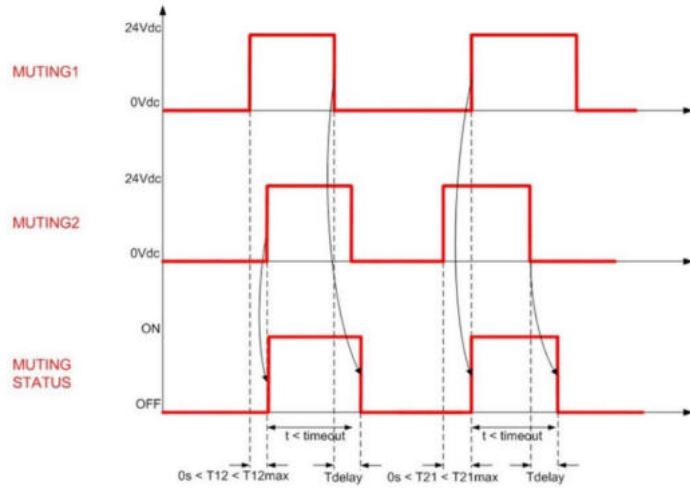


Figure 20 - T Muting timings

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):

$$d1\text{max}[\text{cm}] = V[\text{m/s}] * T12[\text{s}] * 100,$$

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

$$d2\text{max}[\text{cm}] = V[\text{m/s}] * T12[\text{s}] * 100,$$

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

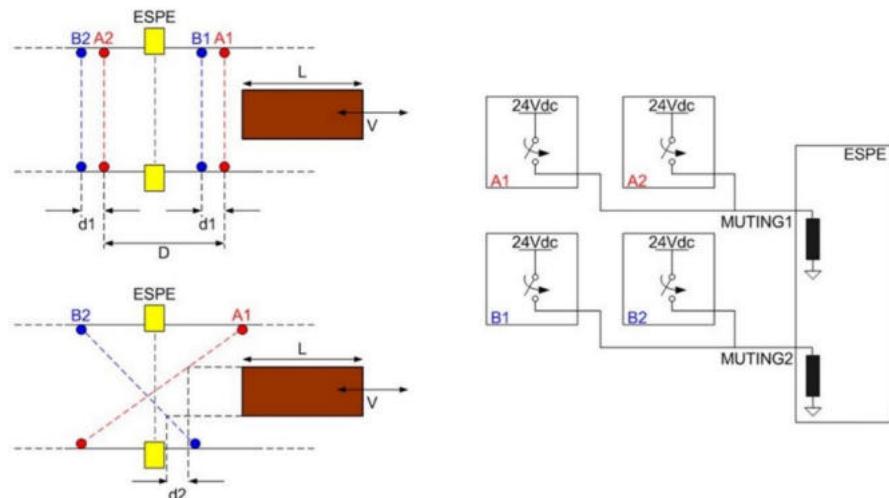


Figure 21 - Muting T connection

Muting L

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, to enter in Muting the user has to deactivate the Muting input and start the sequence from the beginning.



Muting L must be used exclusively to allow the passage of the material coming out of the dangerous area protected by the light curtain.

CAUTION

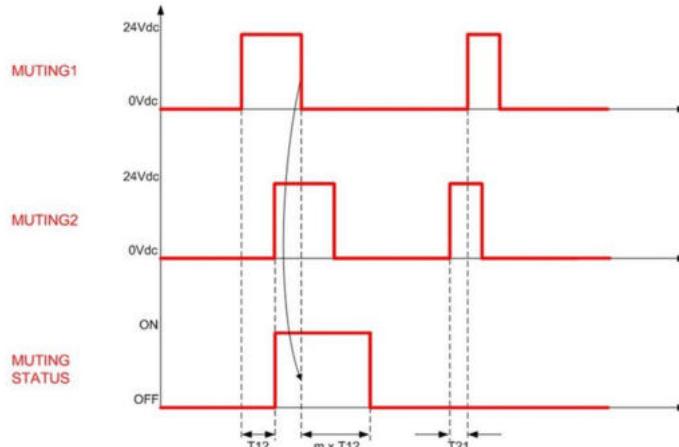


Figure 22 - Muting L timings

The sensor named A is the farthest from the light curtain, so its beam is intercepted first. Referring 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:

$$d1[\text{cm}] = V[\text{m/s}] * T12[\text{s}] * 100$$

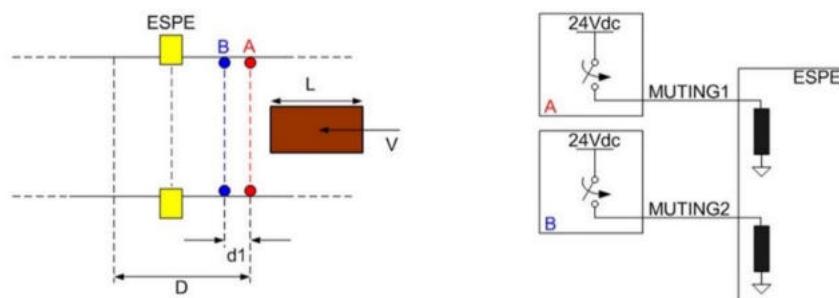


Figure 23 - Muting L connection

		PWR	OSD	EDM	ACM	LEVEL
T (bidirectional)	LED 6 ON Green	●	●	●	●	● ● ● ● ● ● ● ●
L (monodirectional)	LED 6 OFF	●	●	●	●	● ● ● ● ● ● ● ●

Figure 24 - BCM Configuration: Muting Direction



Figure 25 - ACM Configuration: Muting direction

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 continues to exist.

This is not compliant with the EN 61496-1: 2013 standard, and the user is warned about it.

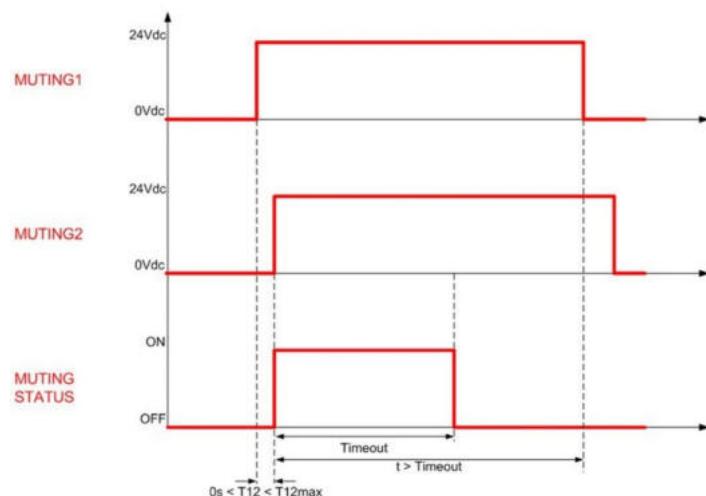


Figure 26 - Muting timeout

In ACM mode, 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 EN 61496-1: 2013 compliant.

		PWR	OSD	EDM	ACM	LEVEL
10 min	LED 7 ON Green	●	●	●	●	●
infinite	LED 7 OFF	●	●	●	●	●

Figure 27 - BCM Configuration: Muting timeout

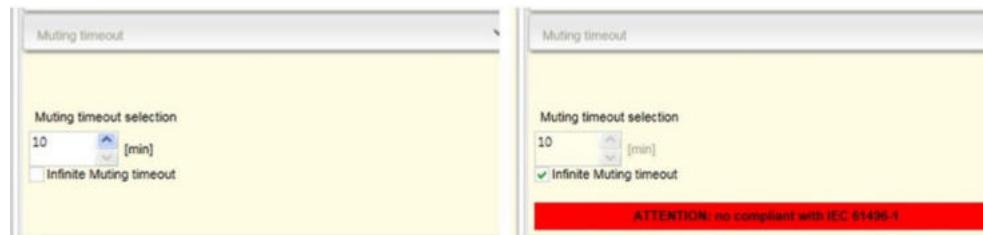


Figure 28 - ACM Configuration: Muting timeout



Infinite is not EN 61496-1: 2013 compliant thus the user is warned about it.

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 (T_f) greater than 100ms.

If this function is disabled, the logical level of the Muting sensors corresponds to the wire level.

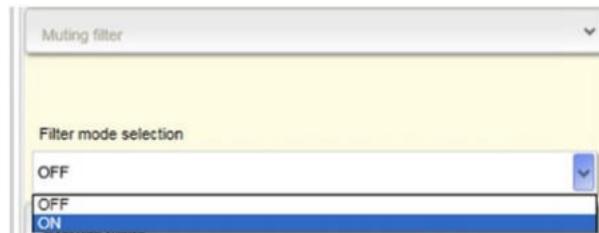


Figure 29 - ACM Configuration: Muting Filter

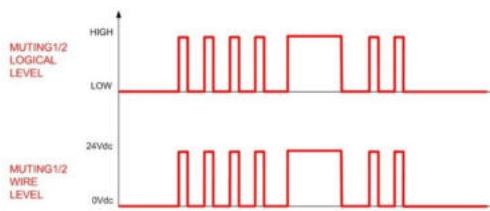


Figure 30 - Muting filter disabled

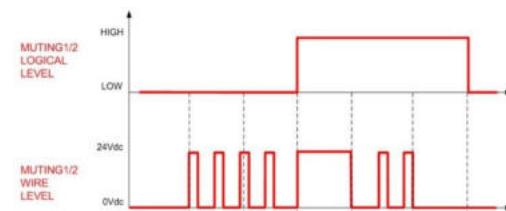
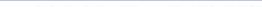


Figure 31 - Muting filter enabled

For SG4-N models Muting Filter can be set in BCM mode as follows:

			 LEVEL 
Muting Filter	8	ON	
		OFF	

Partial Muting

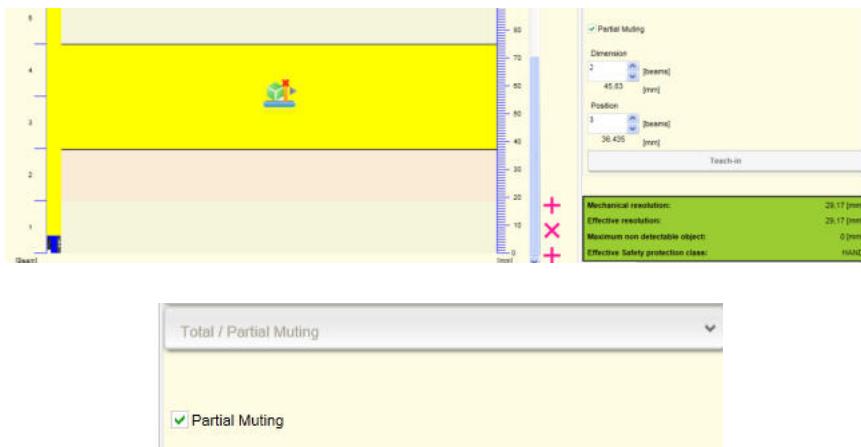
It's possible to configure the type of Muting: total or partial.

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

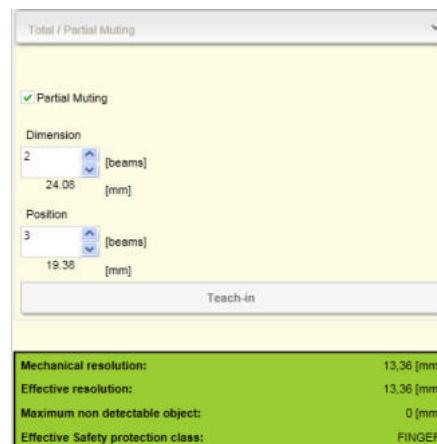
ACM Configuration: Partial Muting Selection



Check “Partial Muting” to enable the function.

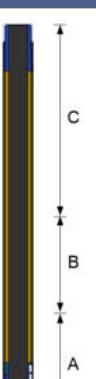
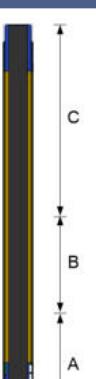
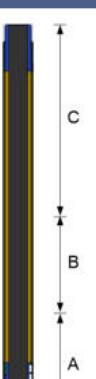


Click the “+” button to add a new Muting zone, and the “x” button to remove a selected one.



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

For SG4-N models Partial Muting can be configured in BCM mode according to the following table.

PARTIAL MUTING SELECTION				
MUTING ZONE	LED #	LED STATUS	ESPE ZONES	
A	LED 2 OFF			C B A
	LED 3 OFF			
A+B	LED 2 ON Green			C B A
	LED 3 OFF			
A+B+C	LED 2 ON Red			C B A
	LED 3 OFF			

OVERRIDE FOR SG4-P

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).

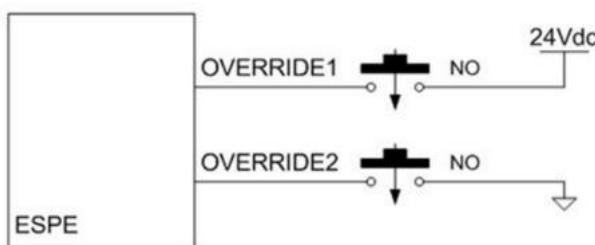


Figure 32 - Override connection

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.



Figure 33 – Override attention status

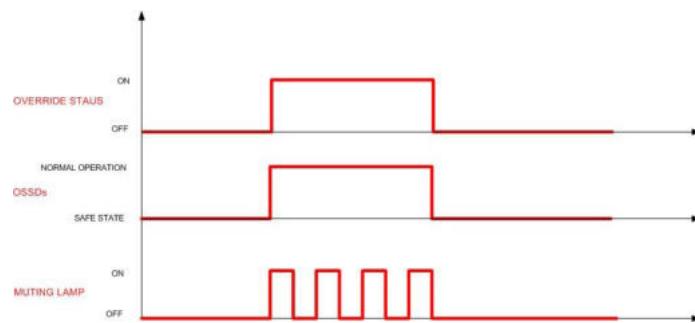
Then, an override request is accepted only if signals at OVERRIDE X inputs follow the timings shown hereafter.

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)

Override status

SG4-P models provide Override Status digital output on pin 11 of M12 - 12 poles when used in Muting configuration. This output goes high (24V) when light curtain Override status is active along with Muting Lamp blinking.



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.

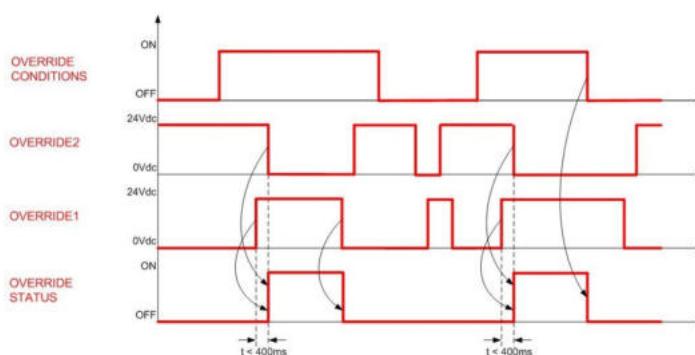


Figure 34 - Override timings (level trigger)

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



In such a case reactivation of normal operation could be not monitored by an operator thus becoming virtually dangerous.

Please consider any possible risk and take necessary counter-measures if edge override is selected.

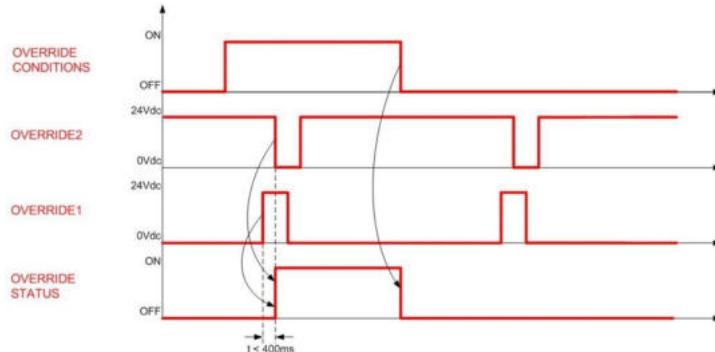


Figure 35 - Override timings (edge trigger)

		PLC	DS32	EDM	ACM	LEVEL
Level	LED 8 ON Green	●	●	●	●	●
Edge	LED 8 OFF	●	●	●	●	●

Figure 36 - BCM Configuration: Override Mode

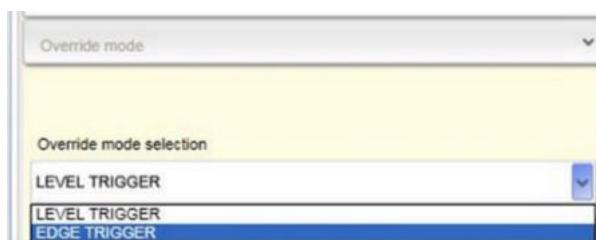


Figure 37 - ACM Configuration: Override Mode

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.

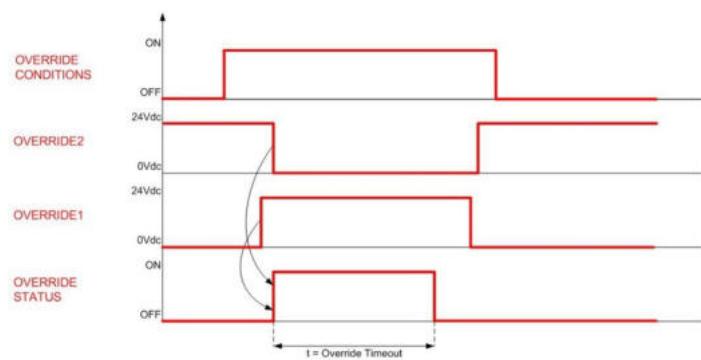


Figure 38 - Override timeout timings

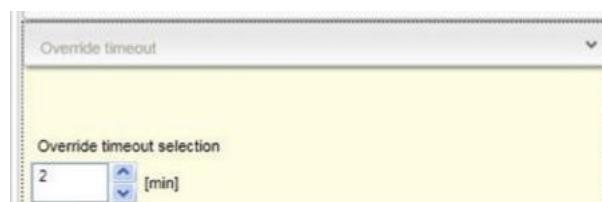


Figure 39 - ACM Configuration: Override Timeout

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.

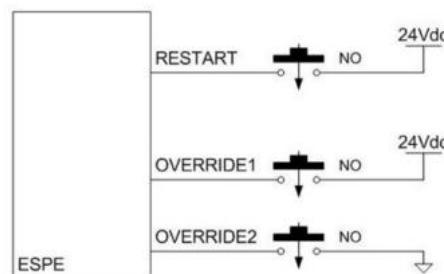


Figure 40 - Override restart connection

Auto Override restart

When override ends if the beams are free the OSSDs remain in normal operation state.

OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

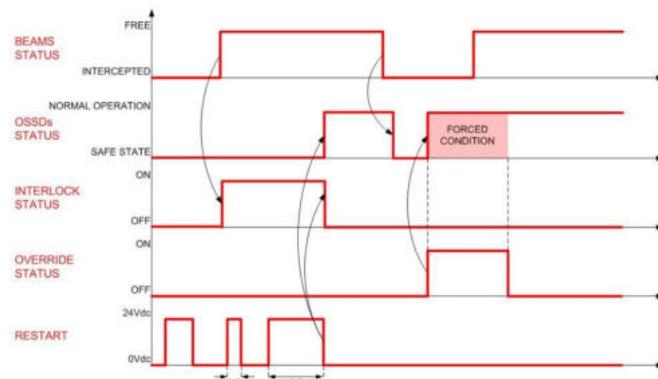


Figure 41 - Override restart timings (auto)



Figure 42 - ACM Configuration: Auto Override Restart Selection



This selection is not compliant with EN 61496-1: 2013 and the user is warned about it.

Normal Override restart

When override ends if the beams are free the ESPE goes to interlock state and a restart is required to achieve normal operation state.

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.

OVERRIDE STATUS is an output signal that informs the user if the override inputs are active with override conditions present.

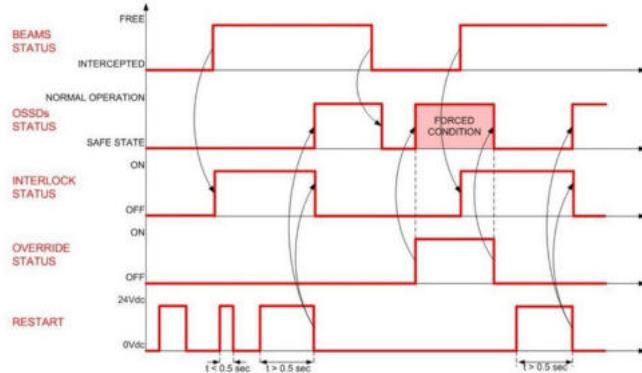


Figure 43 – Override restart timings (normal)



Figure 44 – ACM Configuration: Normal Override Restart Selection



NOTE

This selection is not compliant with EN 61496-1: 2013 and the user is warned about it.

OVERIDE FOR SG4-N

Override function activation



CAUTION

To start override, the OSSD outputs must be switched off and at least one beam must be interrupted.

- If the entire detection zone is free for more than 2 s, the override function is immediately deactivated.
- The maximum timeout for the override function is 600 s.
- The standard requires the use of a device like a hold-to-run device so that it is impossible to enter the hazardous zone while maintaining the action on the device.
- When the Override function is on, the lamp output (pin 8) is driven.
- If the external lamp is broken and/or not connected, the override request causes the AOPD to enter Error mode and the OSSD outputs to switch off. The corresponding error is indicated.

Override at start-up

- Switch off the power supply.
- Restore the power supply and press the RESET button after approx. 5 s but within 9 s and keep it pressed for at least 5 s. The OSSD outputs switch on and remain activated for a maximum time of 600 s.
- The override function is now activated and the integrated lamp flashes. So does the external lamp if connected.



CAUTION

If the AOPD is in Automatic Reset, the OSSD outputs remain on after the end of the override.

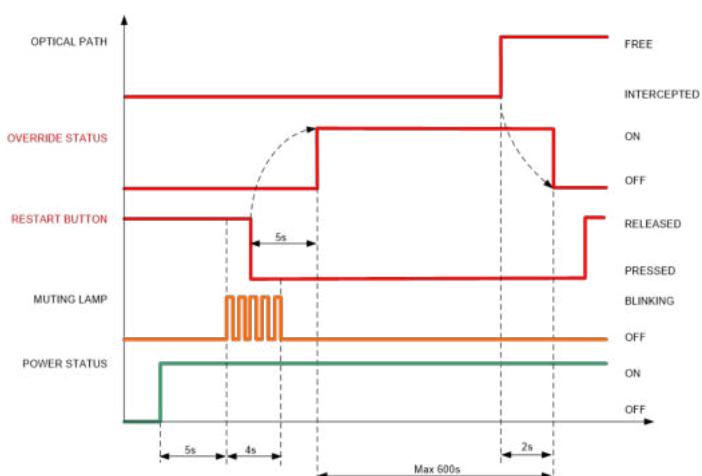


Figure 45 - Startup Override activation and timings

Override at run time

- One or both muting inputs must be active.
- Press and release the RESET button 3 times < 1 s. The OSSD outputs will be activated for more than 2 s and 600 s max.
- The override function is now activated and the external muting lamp flashes.



If the AOPD is in Automatic Restart, the OSSD outputs remain on after the end of the override.

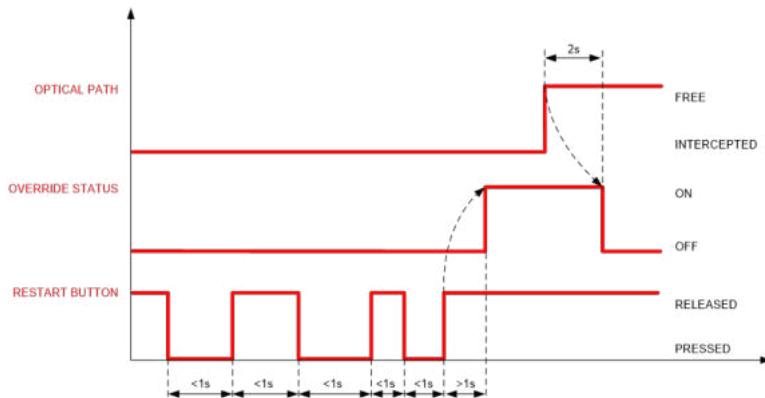


Figure 46 - Runtime Override activation and timings

BLANKING (SG4-P)

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 "Technical Data" on page 84) 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.

		PAR	SSD	EMC	ACM	LEVEL
Muting	LED 3 ON YELLOW	●	●	●	●	●
Blanking	LED 3 OFF	●	●	●	●	●

Figure 47 - BCM Configuration: Muting/Blanking Selection



Figure 48 - 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.

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).

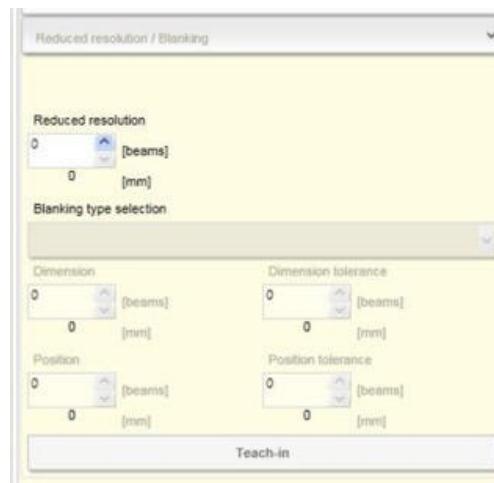


Figure 49 - ACM Configuration: Teach-in operation

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.

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.



Tolerance affects effective ESPE resolution.

NOTE

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.

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.

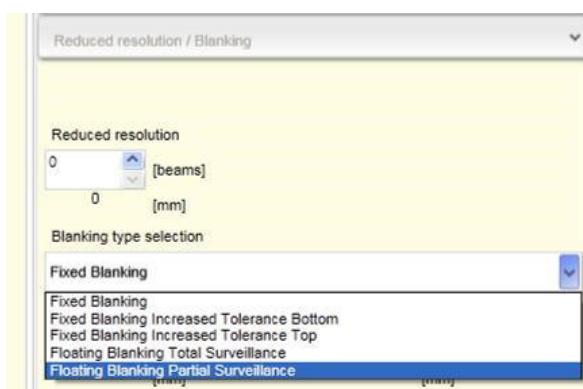


Figure 50 - ACM Configuration: Blanking configuration

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.



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

NOTE

Reduced resolution	Reduced resolution
0 [beams]	1 [beams]
0 [mm]	18.75 [mm]

Mechanical resolution: 29,17 [mm]
 Effective resolution: 29,17 [mm]
 Maximum non detectable object: 0 [mm]
 Effective Safety protection class: HAND

Mechanical resolution: 29,17 [mm]
 Effective resolution: 47,92 [mm]
 Maximum non detectable object: 8,33 [mm]
 Effective Safety protection class: BODY

Figure 51 - Reduced resolution

Dimension

This value indicates the size of blanking zone.

This function can be set only by means of ACM.

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.

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.

When enabled via wire (pin 9 of M12 12-pole connector connected to 24V), a position tolerance of 1 beam and a dimension tolerance of -1 beam is configured.

ACM setting overrides these values and Tolerance wire input is disabled.

If the user wants to select this function with ACM, he must have at least one blanking zone; then they can choose Position or Dimension Tolerance. Next tables show 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.

		PWR	OSSD	EDM	ACM	LEVEL
Tolerance active	LED 3 blinking YELLOW	●	●	●	●	●

Figure 52 - Tolerance indication



Tolerance affects the ESPE resolution. Please consider the new resolution to calculate a new mechanical mounting.

NOTE



Figure 53 - Position tolerance

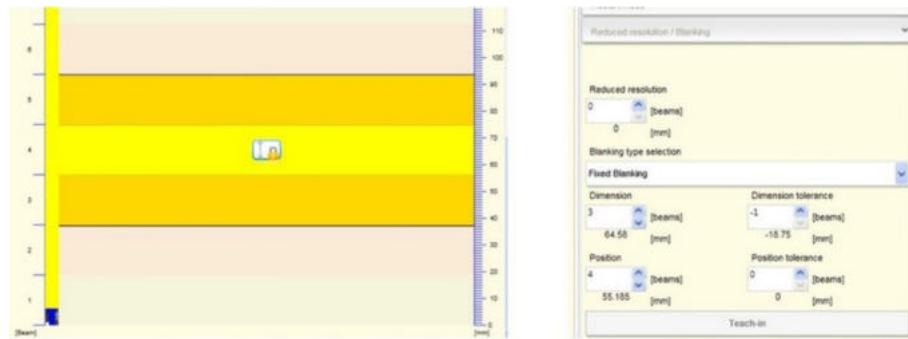


Figure 54 - Dimension tolerance

Blanking in Basic Configuration Mode

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

		PWR	OSD	EDM	ACM	LEVEL
1 Fixed Blanking Zone	LED 8 ON Green	●	●	●	●	●
2 Fixed Blanking Zones	LED 8 OFF	●	●	●	●	●

Figure 55 – BCM Configuration: Fixed Blanking

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.

		PWR	OSD	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	●	●	●	●	●

Figure 56 – BCM Configuration: Floating Blanking

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

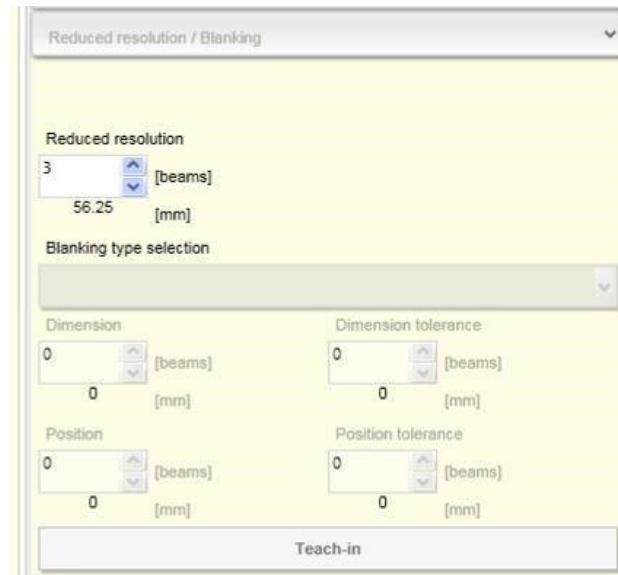


Figure 57 - ACM Configuration

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.

VALUE NO.	EFFECTIVE RESOLUTION ESPE 14 mm	EFFECTIVE RESOLUTION ESPE 30 mm
1	23 mm	49 mm
2	33 mm	68 mm
3	42 mm	87 mm
4	51 mm	105 mm

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).

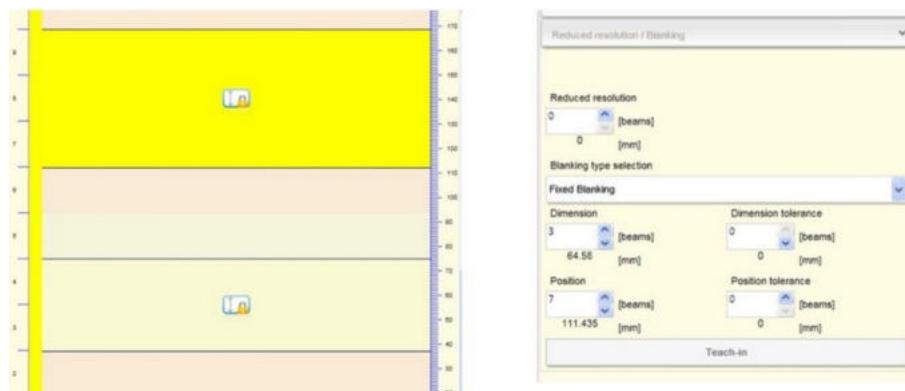


Figure 58 – Fixed Blanking

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.



Figure 59 – Fixed Blanking with increase tolerance

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.



Figure 60 - Floating Blanking with total surveillance

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.

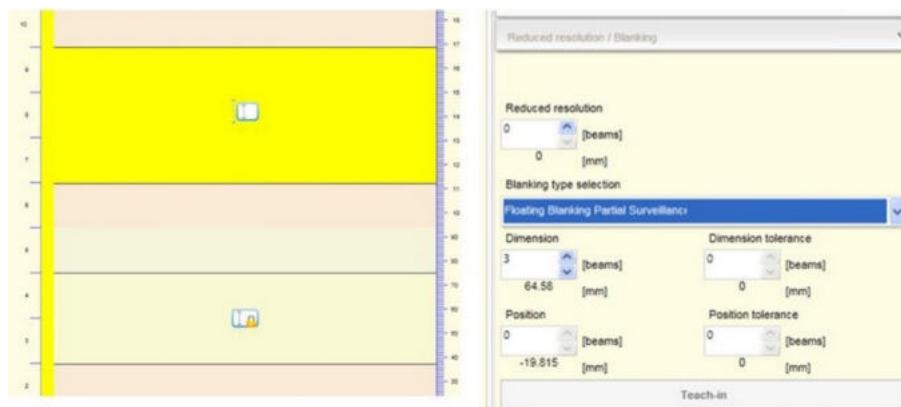


Figure 61 - Floating blanking with partial surveillance

CASCADE (SG4-P MODELS)

A dedicated Bus provides the connection between Master and Slave units. The same bus is used to connect SG4-DONGLE which links the light curtain to Ethernet.

A proprietary transmission protocol for bus is used to communicate to slaves safety related information 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 (CS-F1-80-B-01, CS-F1-80-B-005, CS-F1-80-B-0005 on "Accessories" on page 93).

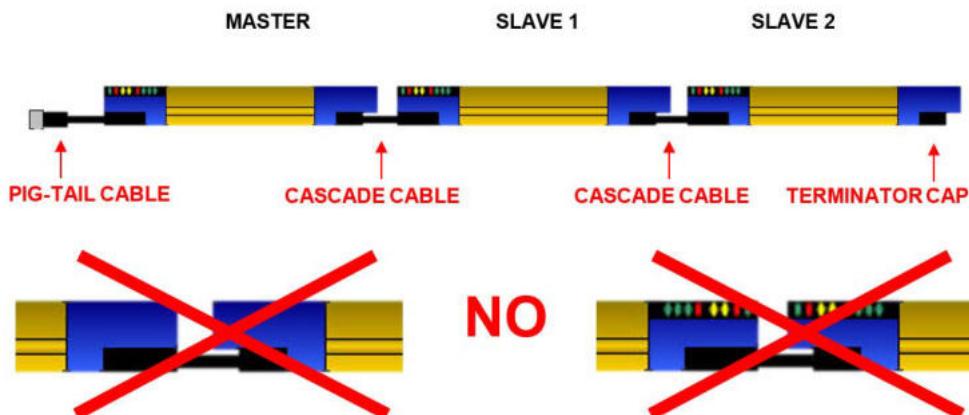
MAX. 3 UNITS (MASTER AND 2 SLAVES)	
30 mm resolution models	max. 160 beams
14 mm resolution models	max. 320 beams

A safe auto-recognition procedure at startup is implemented; it automatically detects cascade topology and correctly address units.

To allow auto-recognition, it is 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.

Cascade connection



The Cascade connection can be done by using two or three Light Curtains (Standard Model), which can have different length and resolution.

The cascade configuration can reach 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.

The connection among the light curtains needs a Cascade Cable that is available in three different lengths:

- Cascade Cable 1 m (CS-F1-80-B-01)
- Cascade Cable 0.5 m (CS-F1-80-B-005)
- Cascade Cable 0.05 m (CS-F1-80-B-0005)

The cascade cable must be connected between a Top side (without LEDs) and a Bottom Side (with LEDs) of two SG4-P Light Curtains.



Make sure to correctly connect the Light Curtains in order to avoid devices damages.

Before connecting or disconnecting the Light Curtains please make sure to power off all units. Connection or disconnection with powered products can damage the Light Curtains.

CODING (SG4-P MODELS)

The coding function allows the ESPE to remain in normal operation also when an interference condition with another 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 "Distance between homologous devices" on page 14).

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.

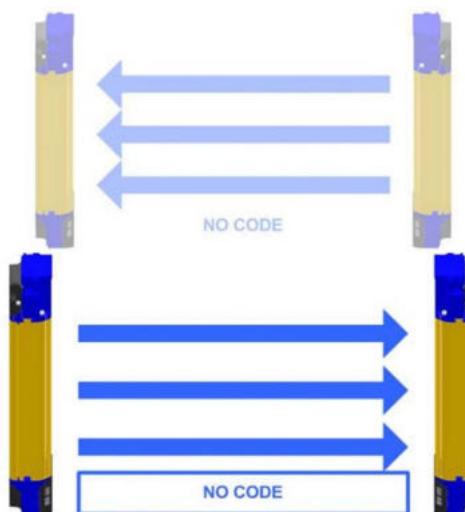


Figure 62 - No code

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.

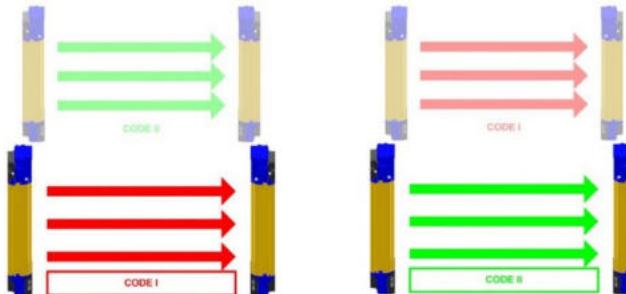


Figure 63 - Code 1 or Code 2

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

		POWER TEST SEL SRS 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	● ● ● ● ● ●

Figure 64 - Normal operation (RX side): intercepted beams

		POWER TEST SEL SRS 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	● ● ● ● ● ●

Figure 65 - Normal operation (TX side)

		POWER TEST SEL SRS LR —CODE—
No Code	LED 2 OFF	● ● ● ● ● ●
Code 1	LED 2 ON Red	● ● ● ● ● ●
Code 2	LED 2 ON Green	● ● ● ● ● ●

Figure 66 - BCM Configuration: Coding Selection (TX and RX)

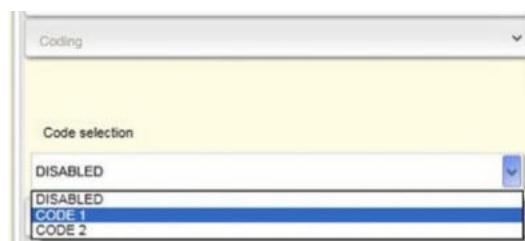


Figure 67 ACM Configuration: Coding Selection

CHAPTER 8

USER INTERFACE AND DIAGNOSTICS

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					RECOMMENDATIONS
		PWR	OSSD	EDM	ACM	LEVEL	
ALIGNMENT	NOT ALIGNED						
	1ST SYNC ENGAGED						
	LAST SYNC ENGAGED						
	MINIMUM SIGNAL LEVEL						
	MAXIMUM SIGNAL LEVEL						
NORMAL OPERATION MANUAL RESTARTS ONLY	INTERLOCK FREE BEAMS						User can restart device in normal operation activating RESTART line
	INTERLOCK INTERCEPTED BEAMS						User must free protected area before activating RESTART line

ESPE WORKING MODE	INDICATION	LED CONFIGURATION						RECOMMENDATIONS
		PWR	OSSD	EDM	ACM	LEVEL		
NORMAL OPERATION	OSSD ON (MAX. ALIGNMENT)							
	OSSD OFF CODE 1 (SG4-P only)							
	OSSD OFF CODE 2 (SG4-P only)							
	OSSD OFF NO CODE							
	LEVEL SIGNAL ON BEAMS			None				
				Insufficient				
				Low				
				Good				
				Best				
	EDM ACTIVE							
	ACM ACTIVE (SG4-P only)							
	ACM CONFIGURATION PENDING (SG4-P only)							
NORMAL OPERATION BLANKING ONLY (SG4-P only)	VALID BLANKING (OSSDs ON)							
	INVALID BLANKING (OSSDs OFF)							
	BCM TOLERANCE ACTIVE							
NORMAL OPERATION MUTING ONLY	MUTING ACTIVE							
	OVERRIDE ACTIVE							
	OVERRIDE ATTENTION STATUS							
	OVERRIDE TIMINGS FAILURE							
	LAMP FAILURE							

ESPE WORKING MODE	INDICATION	LED CONFIGURATION					RECOMMENDATIONS
		PWR	OSD	EDM	ACM	LEVEL	
FAILURE INFORMATION	FAILURE ON OSSD						Activate RESET line. If error persists, contact Datasensing Technical Support
	FAILURE ON MICROPROCESSOR						Activate RESET line. If error persists, contact Datasensing Technical Support
	FAILURE ON OPTICS						Activate RESET line. If error persists, contact Datasensing Technical Support
	FAILURE ON EDM						Check EDM feedback line and EDM configuration. Activate RESET line
	FAILURE ON RESTART						Check RESART line connection. Activate RESET line
	COMMUNICATION FAILURE (SG4-P only)						Check cascade connection and correct mounting of terminator cap. Activate RESET line
	BCM COMMUNICATION FAILURE						Re-operate Basic configuration. If error persists, contact Datasensing Technical Support
	ACM CONFIGURATION FAILURE (SG4-P only)						Re-operate Advanced configuration. If error persists, contact Datasensing Technical Support. Make sure the most recent version of the GUI available on www.datasensing.com is installed.
	CRITICAL FAILURE						Turn ON/OFF ESPE. If error persists, contact Datasensing Technical Support
	POWER SUPPLY FAILURE						Check power supply connection. If error persists, contact Datasensing 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 DATASENSING Technical Support.

TX side

ESPE WORKING MODE	INDICATION	LED CONFIGURATION								RECOMMENDATIONS
		PWR	TST	SR	LR	— CODE —				
NORMAL OPERATION	SHORT RANGE EMISSION (SG4-P only)	●	○	○	●	○	●	●	●	
	LONG RANGE EMISSION (SG4-P only)	●	○	●	●	○	●	●	●	
	NO CODE (SG4-P only)	●	○	○	○	○	●	●	●	
	CODE 1 (SG4-P only)	●	○	○	○	●	●	●	●	
	CODE 2 (SG4-P only)	●	○	○	○	●	●	●	●	
	TEST	●	●	●	●	●	●	●	●	If undesired Test, check TEST line connection
	EMISSION	●	●	○	○	○	○	○	○	
FAILURE	FAILURE ON MICROPROCESSOR	●	●	●	●	●	●	●	●	Activate RESET line. If error persists, contact Datasensing Technical Support
	FAILURE ON OPTICS	●	●	●	●	●	●	●	●	Activate RESET line. If error persists, contact Datasensing Technical Support
	BCM CONFIGURATION FAILURE (SG4-P only)	●	●	●	●	●	●	●	●	Re-operate Basic configuration. If error persists, contact Datasensing Technical Support
	COMMUNICATION FAILURE (SG4-P only)	●	●	●	●	●	●	●	●	Check cascade connection and correct mounting of terminator cap. Activate RESET line
	CRITICAL FAILURE	●	●	●	●	●	●	●	●	Turn ON/OFF ESPE. If error persists, contact Datasensing 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 DATASENSING Technical Support.

CHAPTER 9

PERIODICAL CHECKS

The following is a list of recommended check and maintenance operations that should be periodically carried-out by qualified personnel (see "[Controls after first installation](#)" on [page 18](#)).

Check that:

- The ESPE remains in Safe State (Red OSSD LED ON) during beam interruption along 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 "[Installation](#)" on [page 11](#)).
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in "[Installation](#)" on [page 11](#).
- 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.

GENERAL INFORMATION AND USEFUL DATA



Safety MUST be a part of our conscience.

NOTE

The safety devices fulfill 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, DATASENSING 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 safety light curtains (RX and TX) shall be sent to DATASENSING Repair Service Department.

A power failure caused by interferences may temporarily open the OSSD outputs or trigger Safety State over connected safety Fieldbus, but the safe functioning of the light curtain will not be compromised.

WARRANTY

The warranty period for this product is 36 months.

See the General Terms and Conditions of Sales at www.datasensing.com for further details.

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

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

CHAPTER 10

DEVICE MAINTENANCE

DATASENSING safety light curtains do not require special maintenance operations.

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

Use soft cotton cloths damped in water.

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

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

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

PRODUCT DISPOSAL



For information about the disposal of Waste Electrical and Electronic Equipment (WEEE), please refer to the website at www.datasensing.com.

APPENDIX A

TECHNICAL DATA

SAFETY CATEGORY
Type 4 (rif. EN 61496-1: 2013)
SIL 3 (rif. EN 61508)
SIL CL 3 (rif. EN 62061:2005/A2: 2015)
PL e, Cat. 4 (rif. EN ISO 13849-1: 2015)
PFHd [1/h] = 8.4E-09 (ref. EN 61508)
MTTFd [years] = 131 (ref. EN ISO 13849-1 2015)

ELECTRICAL DATA	
Power supply (Vdd)	24 VDC \pm 20%
Consumption (TX)	3 W max.
Consumption (RX)	5 W max (without load)
Outputs	2 PNP
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
Capacitative load	2.2 μ F at 24 Vcc max.
Response times	see "Available Models and Response Times" on page 87
Recovery time	Typ. 100 ms *
Controlled height	300...1800 mm
Auxiliary functions	test; manual/automatic restart; EDM; reset; Muting; Blanking; GUI; coding; PNP connection; cascade
Electrical protection	Class I / Class III (see "Electrical Connections" on page 21)
Current for external lamp	20 mA min.; 300 mA max.
Connections:	
Muting models	M12 12-pole + M12 5-pole
Blanking models	M12 12-pole
for both models	M12 5-pole
Cable length (for power supply)	50 m max.

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

OPTICAL DATA	
Emitting light (λ)	Infrared, LED (950 Nm)
Resolution	14 - 30 mm
Operating distance	0.2...7 m for 14 mm 0.2...20 m for 30 mm
Ambient light rejection	EN 61496-2: 2013

MECHANICAL AND ENVIRONMENTAL DATA	
Operating temperature	0...+50 °C
Storage temperature	-25...+70 °C
Temperature class	T6
Humidity	15...95 % (non condensing)
Mechanical protection	IP65 (EN 60529)
Vibrations	Width 0.35 mm, Frequency 10...55 Hz 20 sweep per axis, 1 octave/min (EN 60068-2-6)
Shock resistance	10G (16 ms) 1,000 shocks per axis (EN 60068-2-27)
Housing material	Painted aluminum (yellow RAL 1003)
Front side material	PMMA
Cap material	PBT Valox 508 (PANTONE 072C)
Cover material	PC LEXAN
Weight	1.35 kg per linear meter for single unit

APPENDIX B

AVAILABLE MODELS AND RESPONSE TIMES

SG4-P MODELS RANGE AND RESPONSE TIMES

MODEL	CONTROLLED HEIGHT (mm)	NO. BEAMS	RESPONSE TIME AIC OFF (ms)	RESPONSE TIME AIC ON (ms)	RESOLUTION (mm)
SG4-14-030-00-P	300	32	15	20	14
SG4-14-045-00-P	450	48	17	25	14
SG4-14-060-00-P	600	64	19	29	14
SG4-14-075-00-P	750	80	20	34	14
SG4-14-090-00-P	900	96	22	38	14
SG4-14-105-00-P	1050	112	24	43	14
SG4-14-120-00-P	1200	128	26	47	14
SG4-14-135-00-P	1350	144	27	52	14
SG4-14-150-00-P	1500	160	29	56	14
SG4-14-165-00-P	1650	176	31	61	14
SG4-14-180-00-P	1800	192	33	65	14
SG4-30-030-00-P	300	16	13	16	30
SG4-30-045-00-P	450	24	14	18	30
SG4-30-060-00-P	600	32	15	20	30
SG4-30-075-00-P	750	40	16	23	30
SG4-30-090-00-P	900	48	17	25	30
SG4-30-105-00-P	1050	56	18	27	30
SG4-30-120-00-P	1200	64	19	29	30
SG4-30-135-00-P	1350	72	19	32	30
SG4-30-150-00-P	1500	80	20	34	30
SG4-30-165-00-P	1650	88	21	36	30
SG4-30-180-00-P	1800	96	22	38	30

SG4-P MODELS CASCADE RESPONSE TIMES

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 [ms] = Tmaster + Tslave1 + Tslave2 + 7.5
AIC ON (with code)	Tcascade [ms] = Tmaster AIC + Tslave1 AIC + Tslave2 AIC + 7.5

MODEL	MASTER RESPONSE TIME AIC OFF (ms) Tmaster	SLAVE RESPONSE TIME AIC OFF (ms) Tslave	MASTER RESPONSE TIME AIC ON (ms) Tmaster AIC	SLAVE RESPONSE TIME AIC ON (ms) Tslave AIC
SG4-14-030-00-P	13.7	13.7	19.1	19.1
SG4-14-045-00-P	15.4	15.4	23.6	23.6
SG4-14-060-00-P	17.2	17.2	28.1	28.1
SG4-14-075-00-P	18.9	18.9	32.6	32.6
SG4-14-090-00-P	20.7	20.7	37.1	37.1
SG4-14-105-00-P	22.4	22.4	41.6	41.6
SG4-14-120-00-P	24.2	24.2	46.0	46
SG4-14-135-00-P	26.0	-	50.5	-
SG4-14-150-00-P	27.7	-	55.0	-
SG4-14-165-00-P	29.5	-	59.5	-
SG4-14-180-00-P	31.2	-	64.0	-

MODEL	MASTER RESPONSE TIME AIC OFF (ms) Tmaster	SLAVE RESPONSE TIME AIC OFF (ms) Tslave	MASTER RESPONSE TIME AIC ON (ms) Tmaster AIC	SLAVE RESPONSE TIME AIC ON (ms) Tslave AIC
SG4-30-030-00-P	11.9	11.9	14.6	15
SG4-30-045-00-P	12.8	12.8	16.8	17
SG4-30-060-00-P	13.7	13.7	19.1	19
SG4-30-075-00-P	14.5	14.5	21.3	21
SG4-30-090-00-P	15.4	15.4	23.6	24
SG4-30-105-00-P	16.3	16.3	25.8	26
SG4-30-120-00-P	17.2	17.2	28.1	28
SG4-30-135-00-P	18.0	-	30.3	-
SG4-30-150-00-P	18.9	-	32.6	-
SG4-30-165-00-P	19.8	-	34.8	-
SG4-30-180-00-P	20.7	-	37.1	-

SG4-N MODELS RANGE AND RESPONSE TIMES

MODEL	CONTROLLED HEIGHT (mm)	NO. BEAMS	RESPONSE TIME AIC OFF (ms)	RESOLUTION (mm)
SG4-14-030-00-N	300	32	15	14
SG4-14-045-00-N	450	48	17	14
SG4-14-060-00-N	600	64	19	14
SG4-14-075-00-N	750	80	20	14
SG4-14-090-00-N	900	96	22	14
SG4-14-105-00-N	1050	112	24	14
SG4-14-120-00-N	1200	128	26	14
SG4-14-135-00-N	1350	144	27	14
SG4-14-150-00-N	1500	160	29	14
SG4-14-165-00-N	1650	176	31	14
SG4-14-180-00-N	1800	192	33	14
SG4-30-030-00-N	300	16	13	30
SG4-30-045-00-N	450	24	14	30
SG4-30-060-00-N	600	32	15	30
SG4-30-075-00-N	750	40	16	30
SG4-30-090-00-N	900	48	17	30
SG4-30-105-00-N	1050	56	18	30
SG4-30-120-00-N	1200	64	19	30
SG4-30-135-00-N	1350	72	19	30
SG4-30-150-00-N	1500	80	20	30
SG4-30-165-00-N	1650	88	21	30
SG4-30-180-00-N	1800	96	22	30

APPENDIX C

OVERALL DIMENSIONS

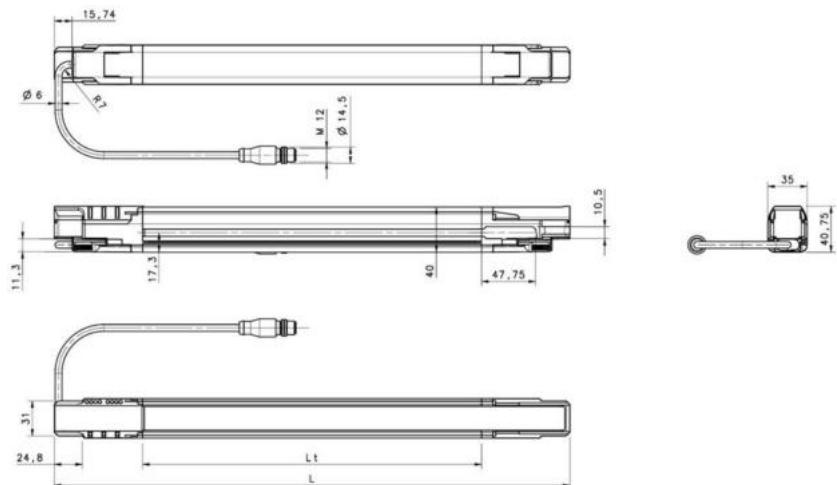


Figure 1 - Overall dimensions (mm)

MODEL 14mm	MODEL 30mm	Lt (mm)	L (mm)
SG4-14-030-00-x	SG4-30-030-00-x	150	306.3
SG4-14-045-00-x	SG4-30-045-00-x	300	456.3
SG4-14-060-00-x	SG4-30-060-00-x	450	606.3
SG4-14-075-00-x	SG4-30-075-00-x	600	756.3
SG4-14-090-00-x	SG4-30-090-00-x	750	906.3
SG4-14-105-00-x	SG4-30-105-00-x	900	1056.3
SG4-14-120-00-x	SG4-30-120-00-x	1050	1206.3
SG4-14-135-00-x	SG4-30-135-00-x	1200	1356.3
SG4-14-150-00-x	SG4-30-150-00-x	1350	1506.3
SG4-14-165-00-x	SG4-30-165-00-x	1500	1656.3
SG4-14-180-00-x	SG4-30-180-00-x	1650	1806.3

APPENDIX D

INCLUDED ACCESSORIES

METAL ANGLED FIXING BRACKET (ST-KSTD)

MODEL	DESCRIPTION
ST-KSTD	Angled fixing bracket (4 pcs kit)

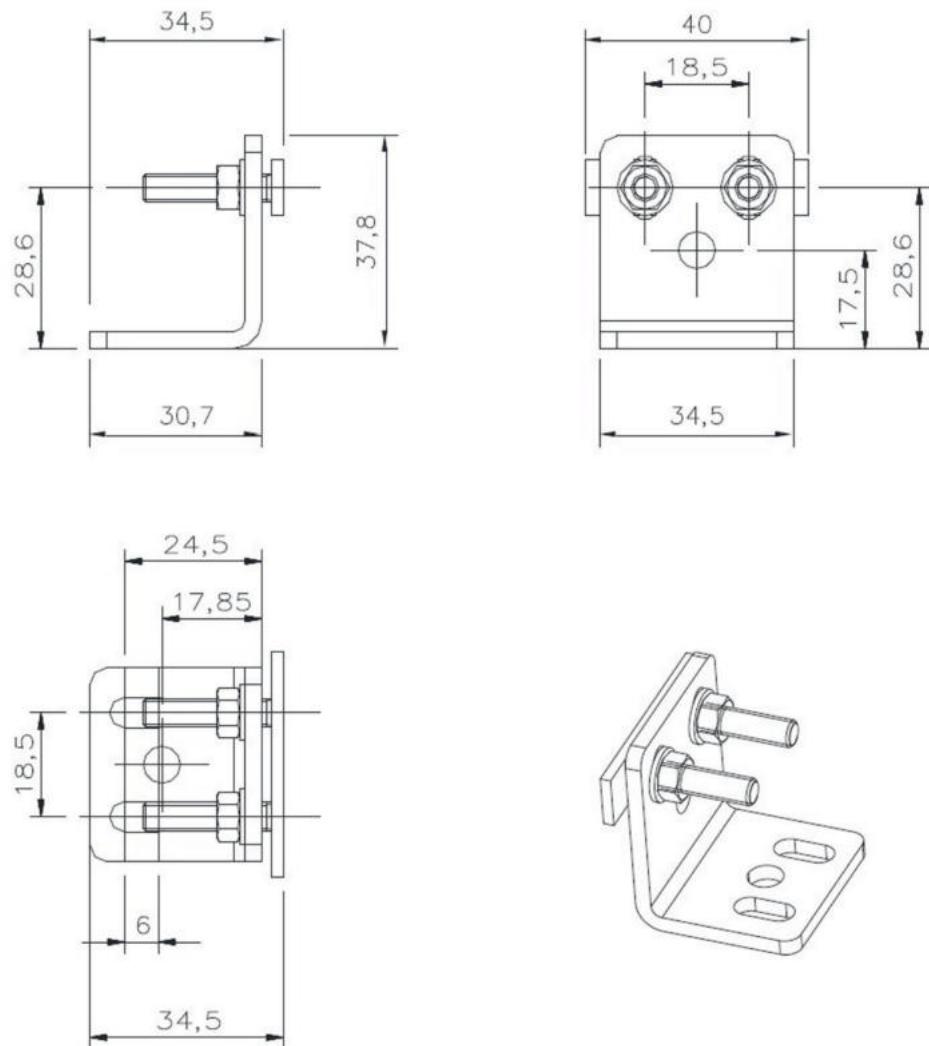


Figure 1 - Dimensions (mm)

TERMINATOR CAP

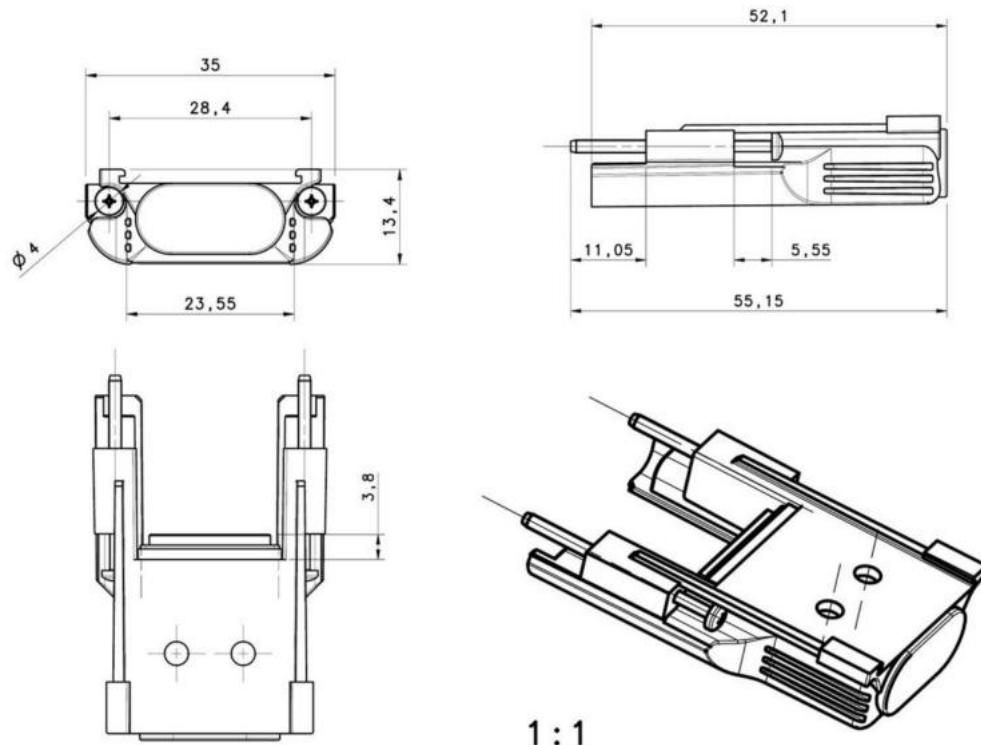


Figure 2 - Dimensions (mm)

TOOL FOR BCM CONFIGURATION



Figure 3 - 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.

APPENDIX E

ACCESSORIES

(ST-KSTD) METAL ANGLED FIXING BRACKET

MODEL	DESCRIPTION	CODE
ST-KSTD	Angled fixing bracket (4 pcs kit)	95ACC1670

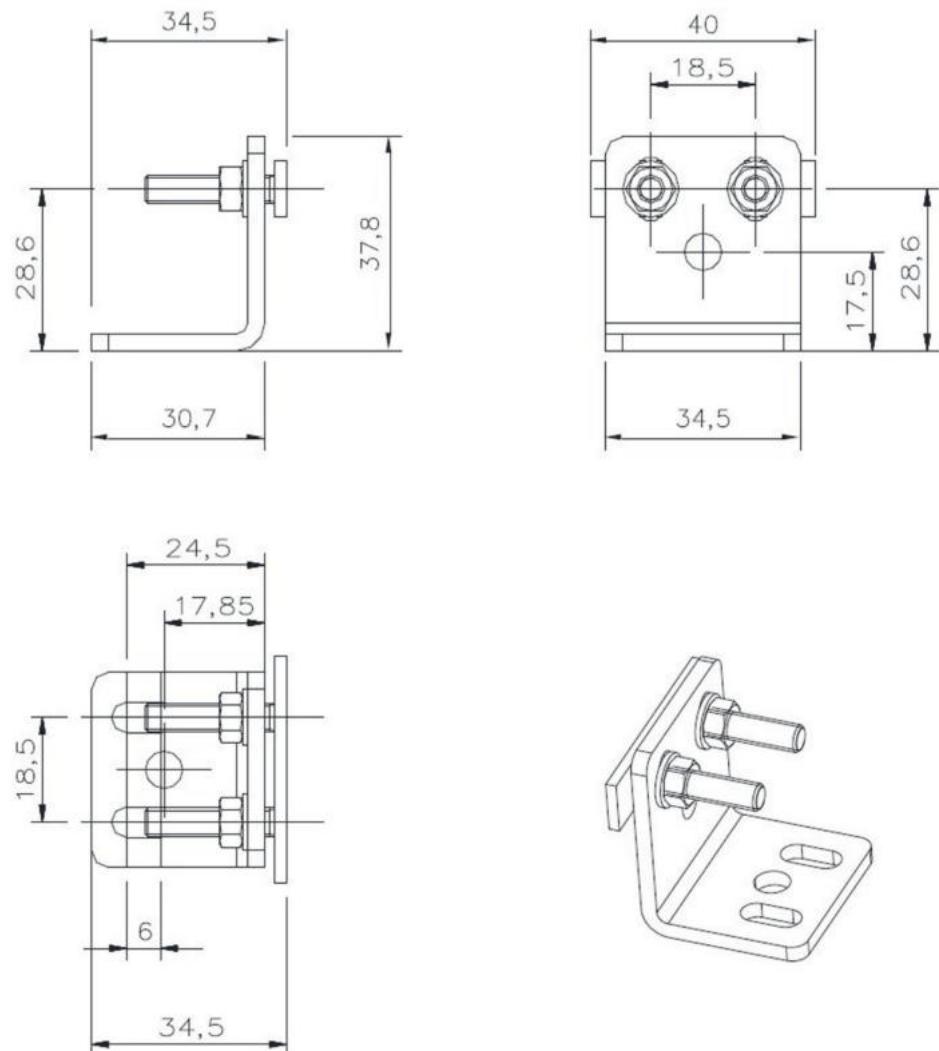


Figure 1 - ST-KSTD

Angled fixing bracket mounting with orientable and anti-vibration supports

MODEL	DESCRIPTION	CODE
ST-K4OR	Orientable supports (4 pcs kit)	95ACC1680
ST-K6OR	Orientable supports (6 pcs kit)	95ACC1690
ST-K4AV	Anti-vibration supports (4 pcs kit)	95ACC1700
ST-K6AV	Anti-vibration supports (6 pcs kit)	95ACC1710

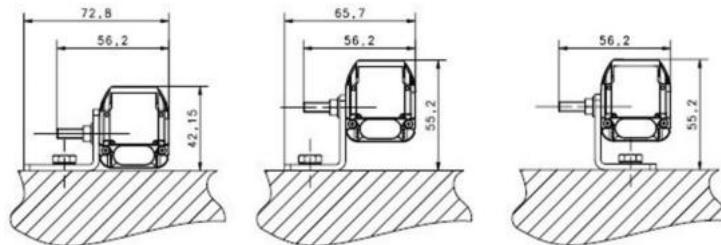


Figure 2 - Angled fixing bracket

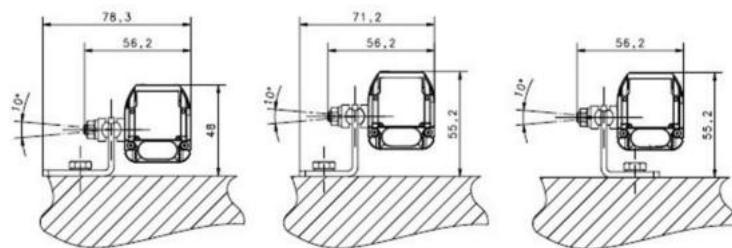


Figure 3 - Angled fixing bracket + Orientable support

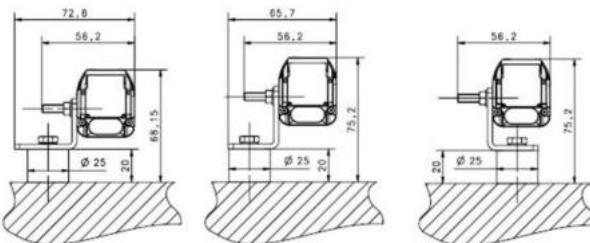


Figure 4 - Angled fixing bracket + Anti-vibration support

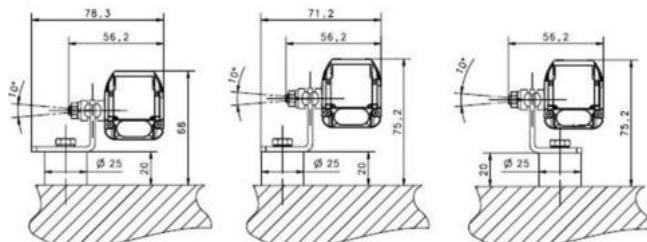


Figure 5 - Angled fixing bracket + Orientable support + Anti-vibration support

(ST-KPxMP) PLASTIC ANGLED FIXING BRACKET

MODEL	DESCRIPTION	CODE
ST-KP4MP	Angled fixing bracket (4 pcs kit)	95ASE1100
ST-KP6MP	Angled fixing bracket (6 pcs kit)	95ASE1110

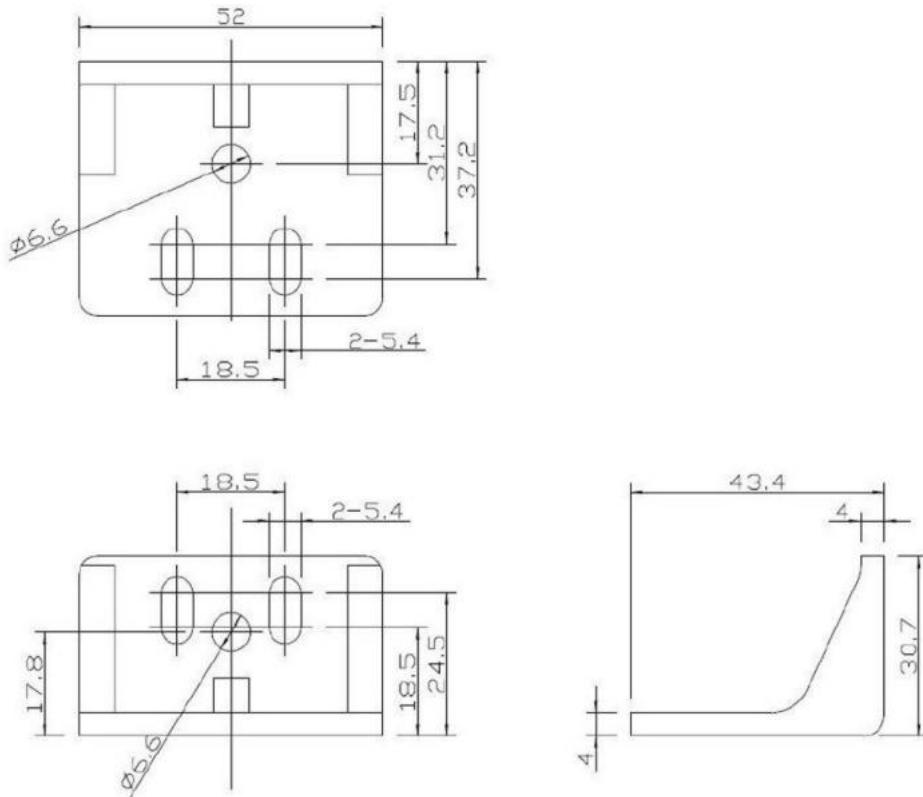


Figure 6 - ST-KPxMP

Angled fixing bracket mounting with orientable and anti-vibration supports

MODEL	DESCRIPTION	CODE
ST-K4OR	Orientable supports (4 pcs kit)	95ACC1680
ST-K6OR	Orientable supports (6 pcs kit)	95ACC1690
ST-K4AV	Anti-vibration supports (4 pcs kit)	95ACC1700
ST-K6AV	Anti-vibration supports (6 pcs kit)	95ACC1710

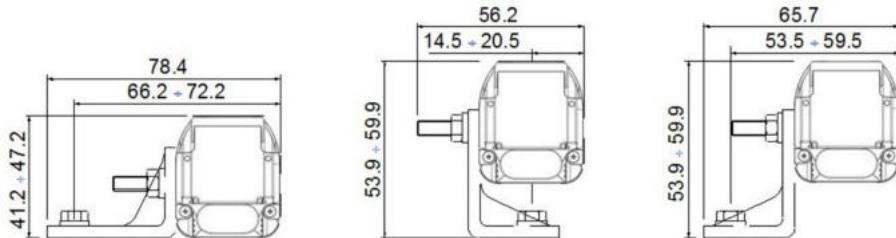


Figure 7 - Angled fixing bracket

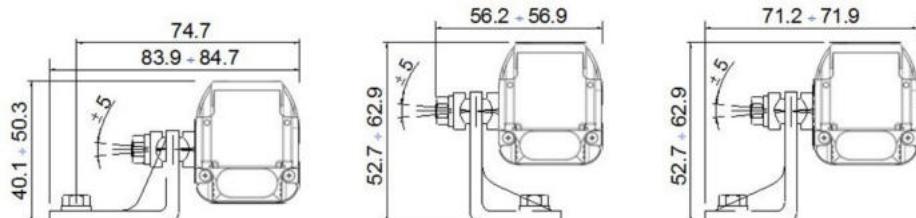


Figure 8 - Angled fixing bracket + Orientable support

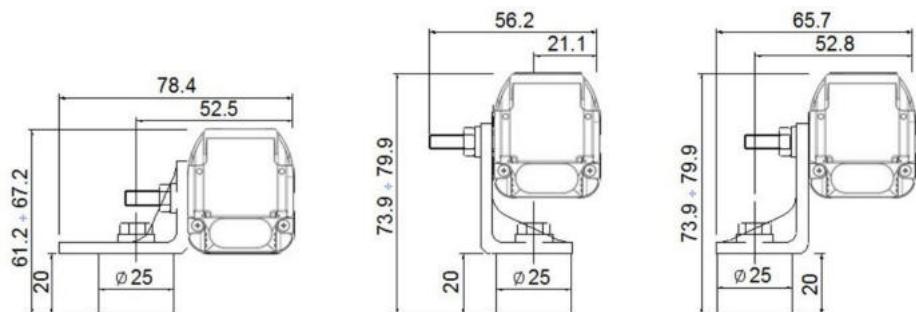


Figure 9 - Angled fixing bracket + Anti-vibration support

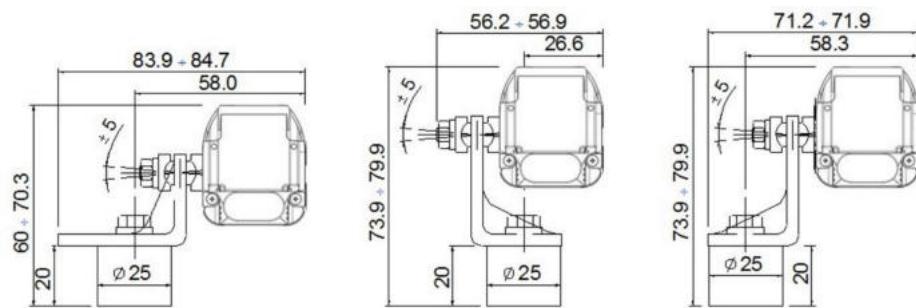


Figure 10 - Angled fixing bracket + Orientable support + Anti-vibration support

(ST-KCASCADE-SG EXTENDED) CASCADE BRACKET

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

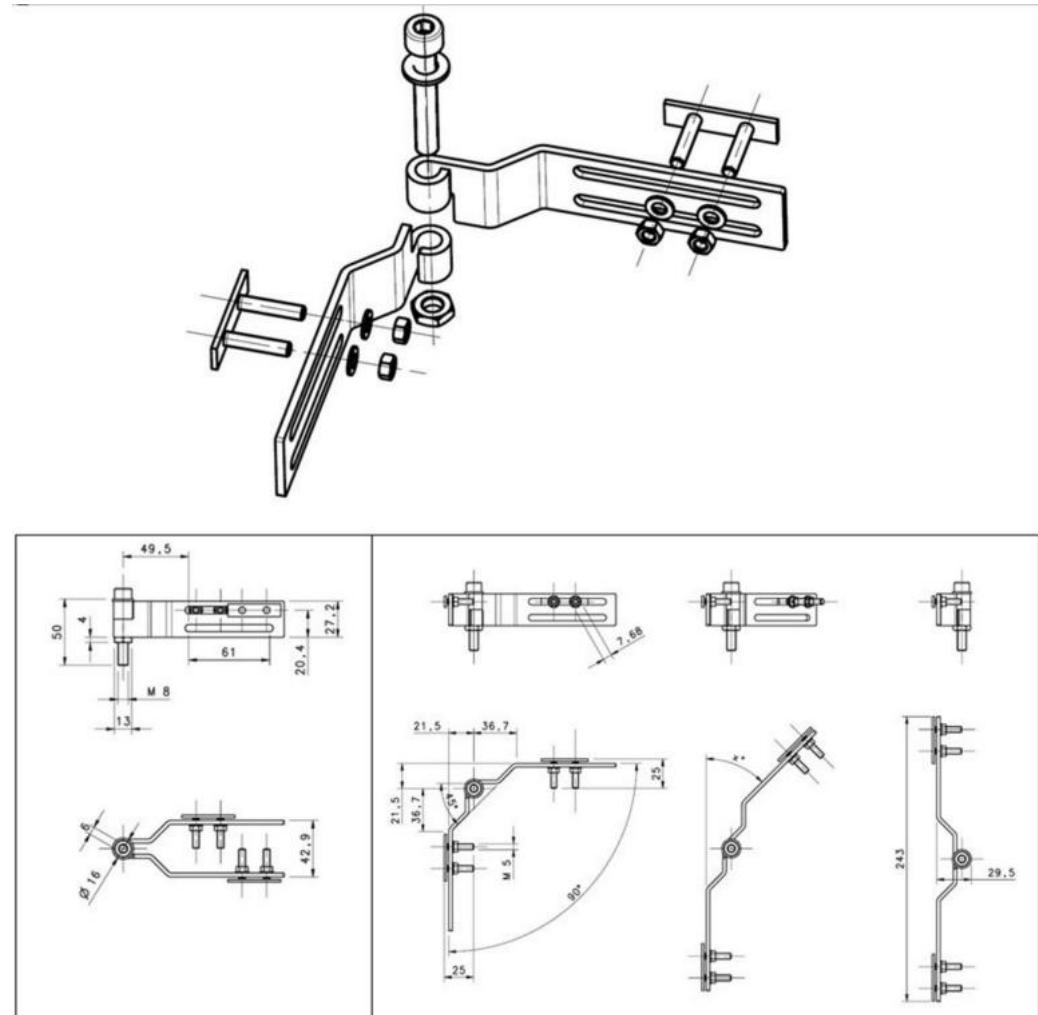


Figure 11 - Dimensions (mm)

(SG-PSB) PROTECTIVE STANDS

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

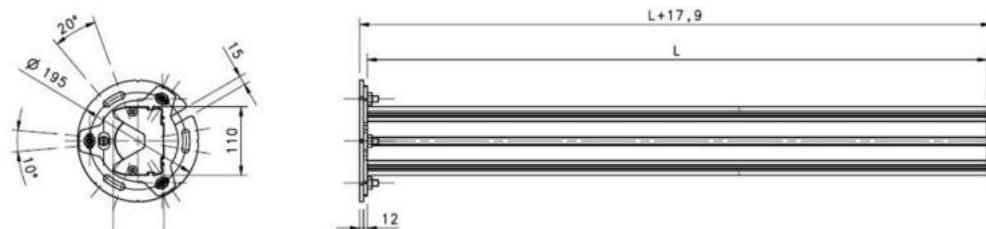


Figure 12 - Dimensions (mm)

Mounting kit

MODEL	DESCRIPTION	CODE
ST-PS4-SG-SE	Mounting kit (4 pcs kit)	95ASE1750
ST-PS6-SG-SE	Mounting kit (6 pcs kit)	95ASE1760

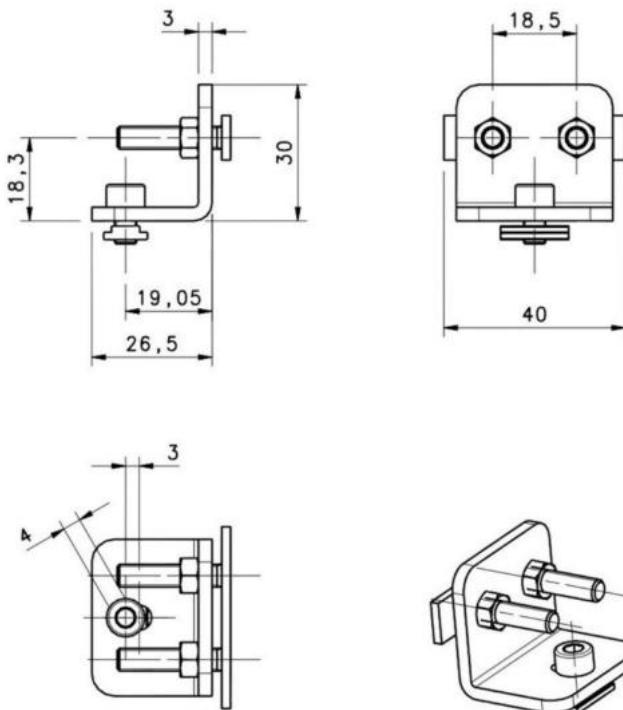


Figure 13 - Fixing kit

(SG-P) PLATE KIT FOR PROTECTIVE STANDS

MODEL	DESCRIPTION	CODE
SG-P	Plate kit with springs	95ASE2290

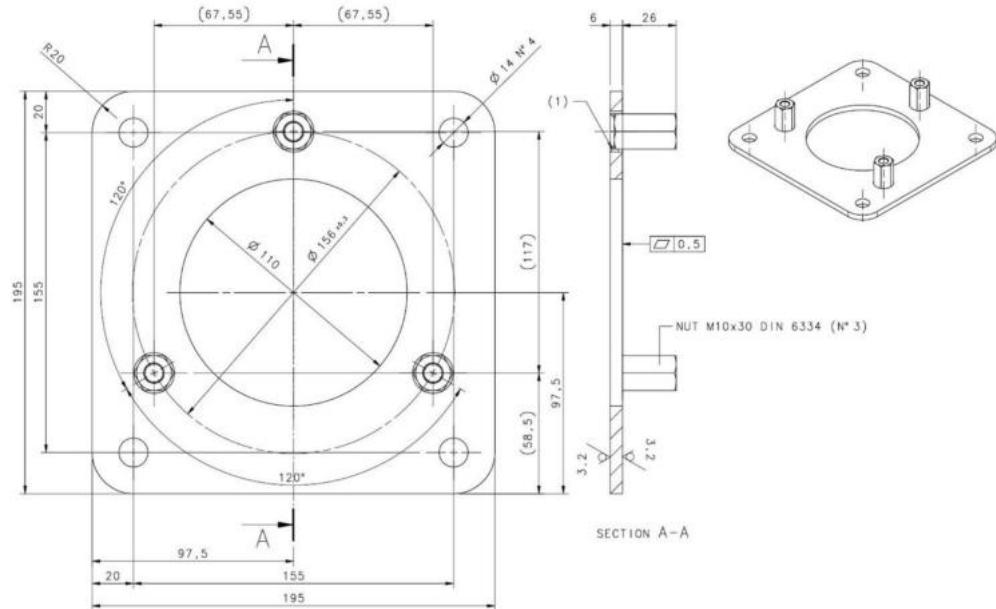


Figure 14 - Dimensions (mm)

Mounting with SG-P SB

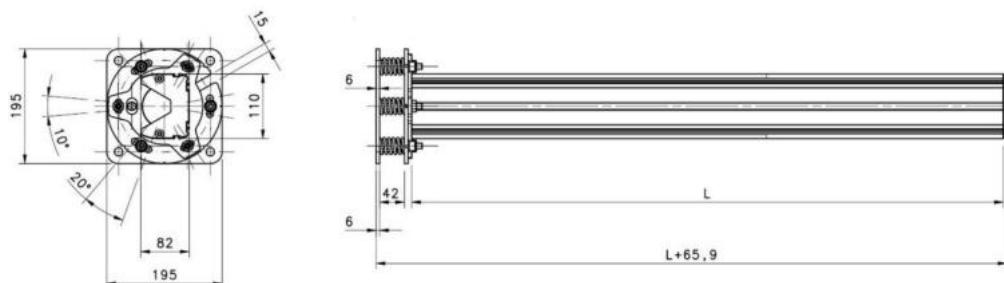


Figure 15 - Mounting

(SE-S) COLUMNS AND FLOOR STANDS

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

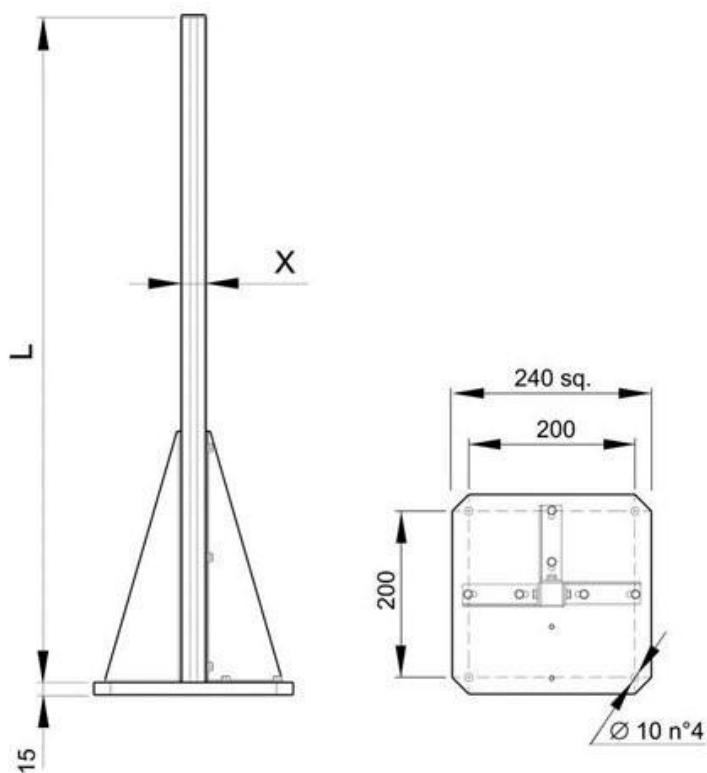


Figure 16 - Dimensions (mm)

(SG-DM) DEVIATING MIRRORS

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

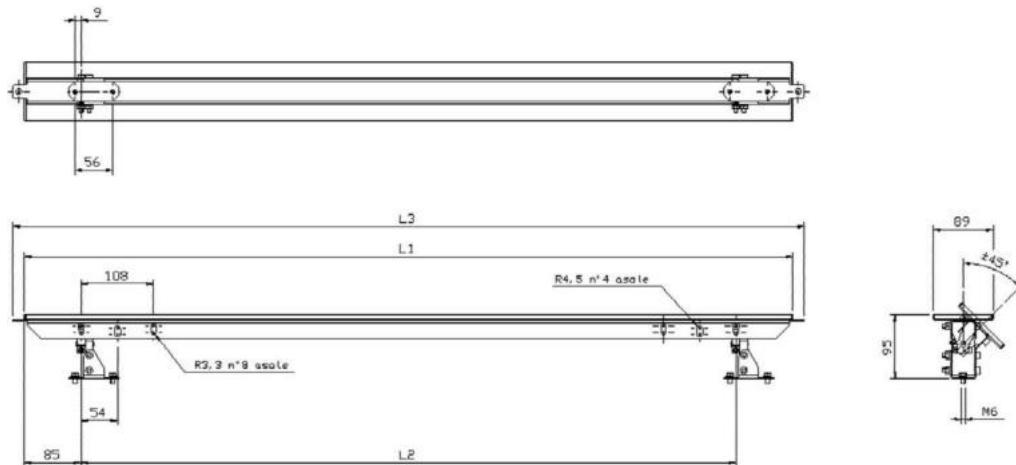


Figure 17 - Deviating mirrors (mm)

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

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

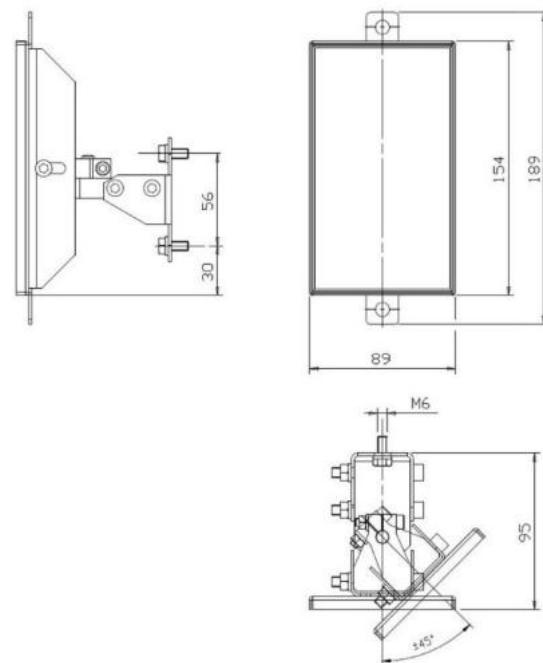


Figure 18 - SG-DM 150 (mm)

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

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

MODEL	DESCRIPTION	CODE
ST-DM	SG-DM mounting kit (2 pcs kit)	95ASE1940

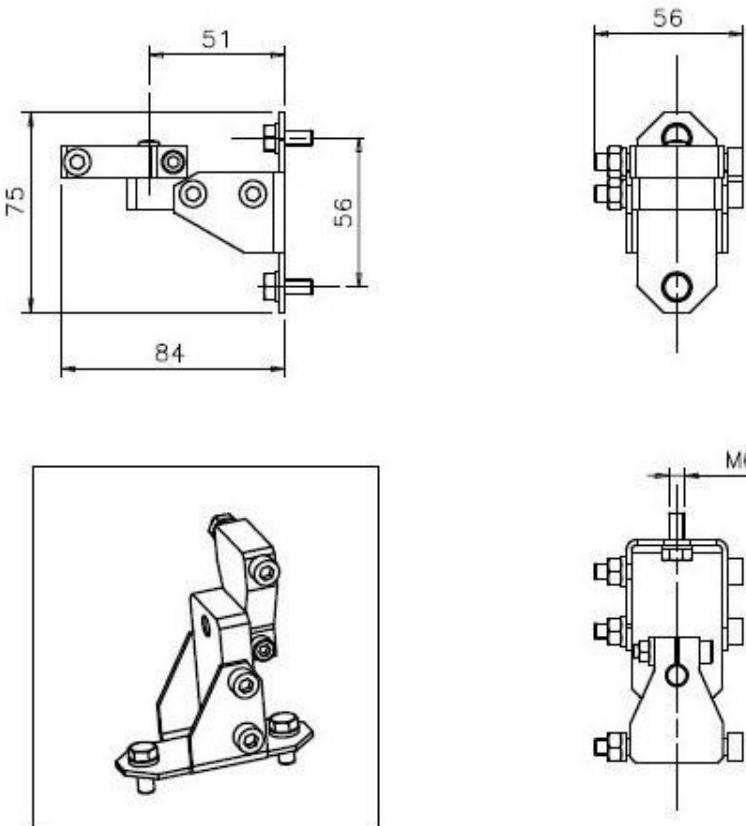


Figure 19 - Mounting kit

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

Mounting kit SG-DM on SG-PSB (ST-PS-DM)

MODEL	DESCRIPTION	CODE
ST-PS-DM	Deviating mirror SG-DM mounting kit (2 T-units)	95ASE1770

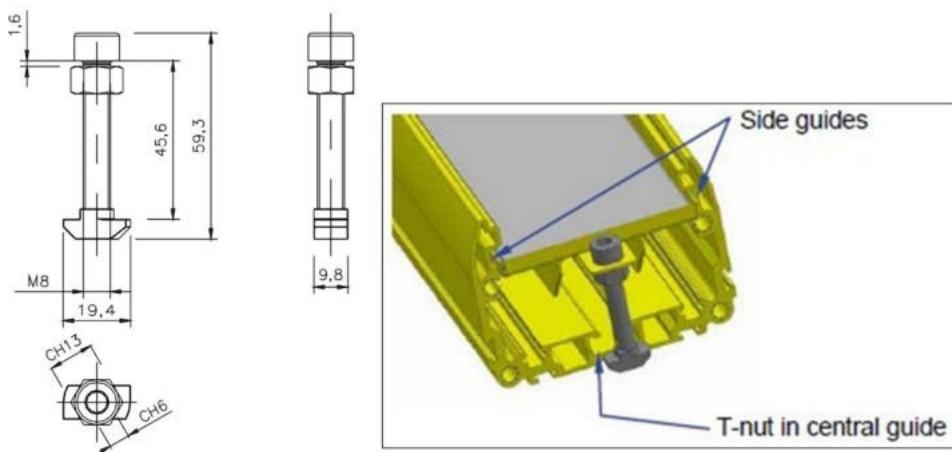


Figure 20 - Mounting kit

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

(TP) TEST PIECE

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

CONNECTION CABLES

5-pole M12 cables

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

12-pole M12 cables

MODEL	DESCRIPTION	CODE
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

8-pole M12 cables

MODEL	DESCRIPTION	CODE
CS-A1-06-U-03	8-pole M12 cable (axial) 3 m UL2464	95ASE1220
CS-A1-06-U-05	8-pole M12 cable (axial) 5 m UL2464	95ASE1230
CS-A1-06-U-10	8-pole M12 cable (axial) 10 m UL2464	95ASE1240
CS-A1-06-U-15	8-pole M12 cable (axial) 15 m UL2464	95ASE1250
CS-A1-06-U-25	8-pole M12 cable (axial) 25 m UL2464	95ASE1260
CS-A1-06-U-50	8-pole M12 cable (axial) 50 m UL2464	95A252710

PIGTAIL CABLES

TX - PIGTAIL CABLE (M12 5-POLE included in SG4-N models)

MODEL	DESCRIPTION	CODE
CS-G1-50-B-002	SG EXTENDED TX 0.2m	95A252820

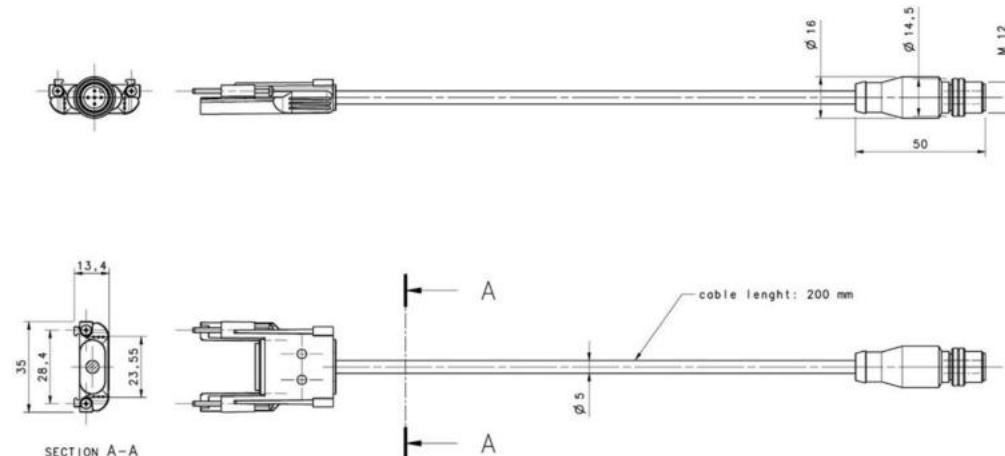


Figure 21 - TX - Pigtail cable

This pigtail cable must always be used for TX UNIT of SG4 EXTENDED.

It has an 18-pole socket on one side and an M12 5-pole socket on the other.

RX BLANKING - PIGTAIL CABLE (M12 12-POLE)

MODEL	DESCRIPTION	CODE
CS-G1-70-B-002	SG EXTENDED RX BLANKING 0.2m	95A252830

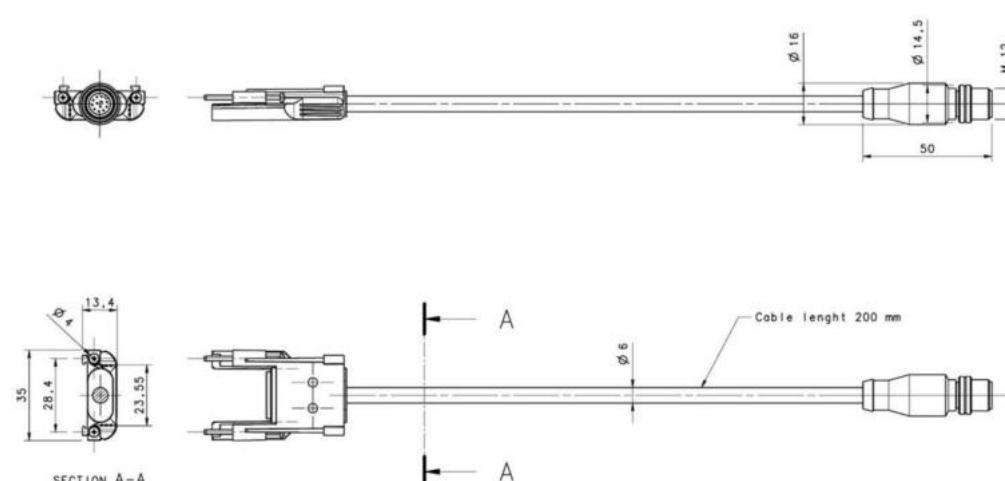


Figure 22 - RX BLANKING - Pigtail cable

This pigtail cable must be used for RX UNIT of SG4 EXTENDED when you configure it in BLANKING MODE and DO NOT USE SG4-DONDLE. It has an 18-pole socket on one side and an M12 12-pole socket on the other.

RX MUTING - PIGTAIL CABLE (M12 12-POLE + M12 5-POLE)

MODEL	DESCRIPTION	CODE
CS-R1-75-B-002	SG EXTENDED RX MUTING 0.2m	95A252810

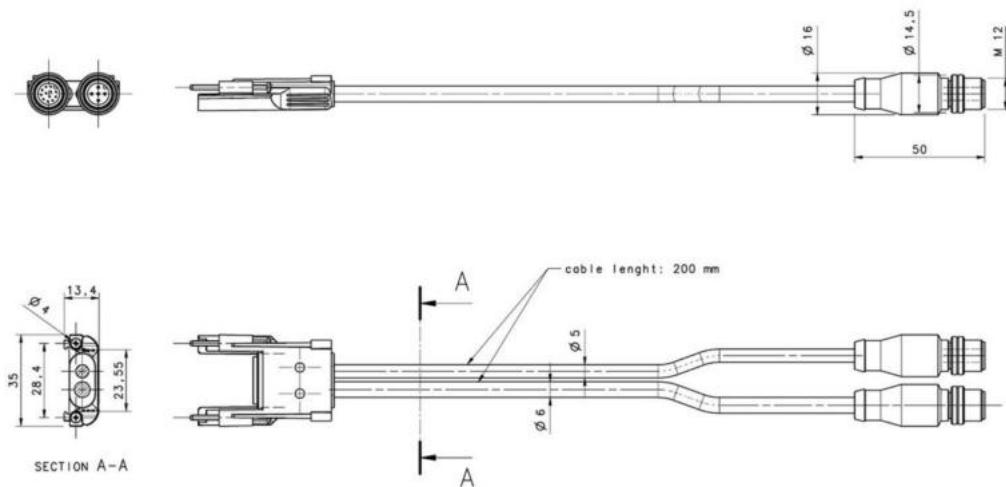


Figure 23 - RX MUTING - Pigtail cable

This pigtail cable must always be used for RX UNIT of SG4 EXTENDED when you configure it in MUTING MODE and DON'T USE SG4-DONGLE. This cable has an 18-pole socket on one side and an M12 5-pole plus an M12 12-pole socket on the other.

RX MUTING SG4-N - PIGTAIL CABLE (M12 8-POLE included in SG4-N models)

MODEL	DESCRIPTION	CODE
CS-G1-60-B-002	SE CROSSOVER 0.2m	95A252910

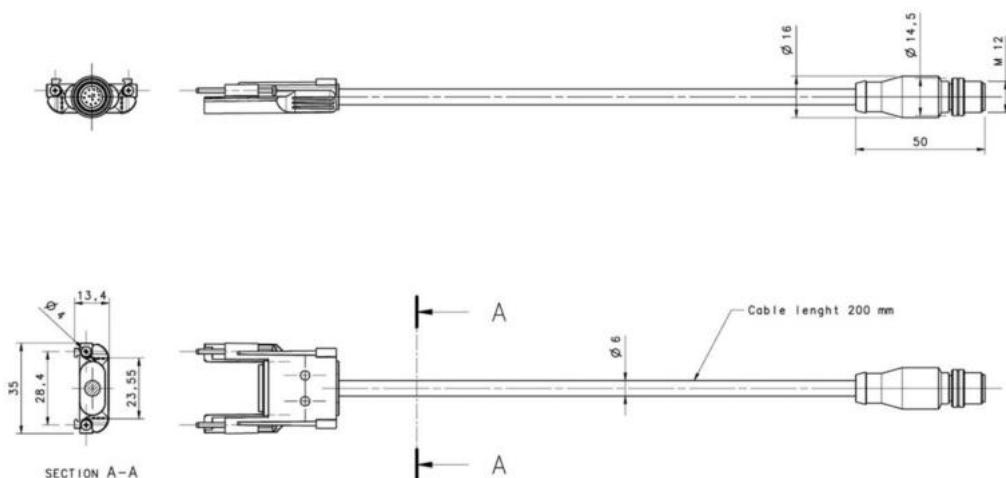


Figure 24 - RX MUTING SG4-N - Pigtail cable

This pigtail cable must always be used for RX UNIT for SG4-N models. It has one 18-pole socket on one side and an M12 8-pole socket on the other.

CASCADE CABLES

MODEL	DESCRIPTION	CODE
CS-F1-80-B-01	Cascade cable 1 m	95A252840
CS-F1-80-B-005	Cascade cable 0.5 m	95A252850
CS-F1-80-B-0005	Cascade cable 0.05 m	95A252860

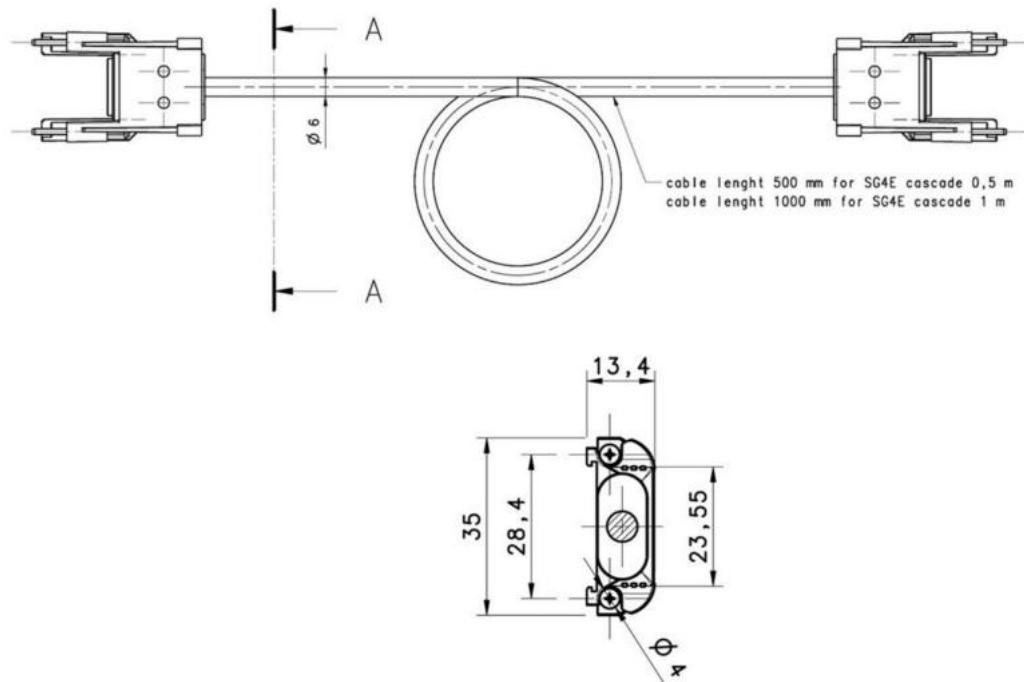


Figure 25 - Dimensions (mm)

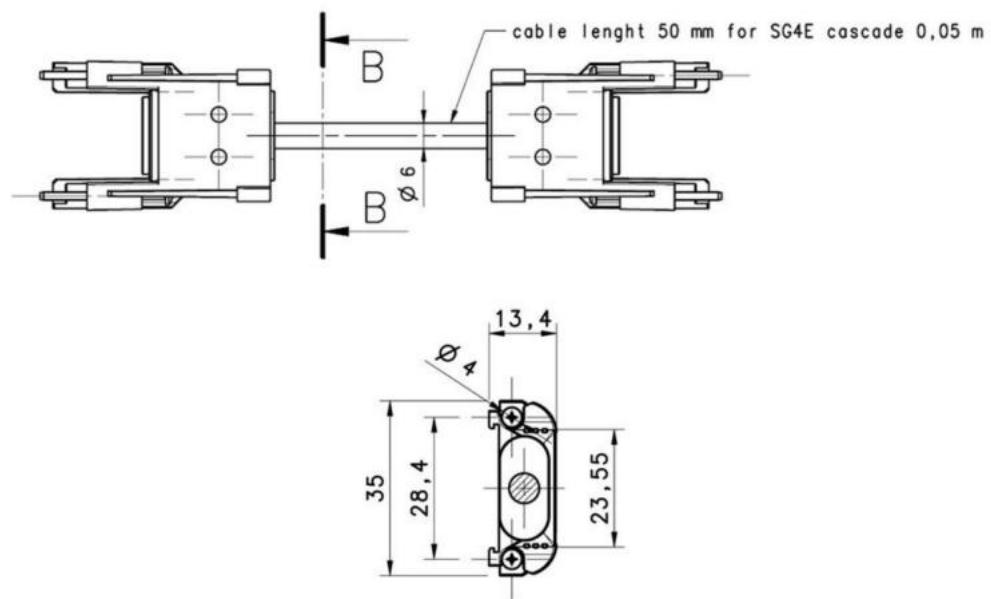


Figure 26 - CS-F1-80-B-0005 Dimensions (mm)

(SG-LP) LASER POINTER

MODEL	DESCRIPTION	CODE
SG-LP	Laser pointer	95ASE5590

The laser pointer of the SG-LP series represents a valid alignment and installation support for the safety light curtain series.

The pointer can be moved along the light curtain profile to verify the complete device alignment (top and bottom).

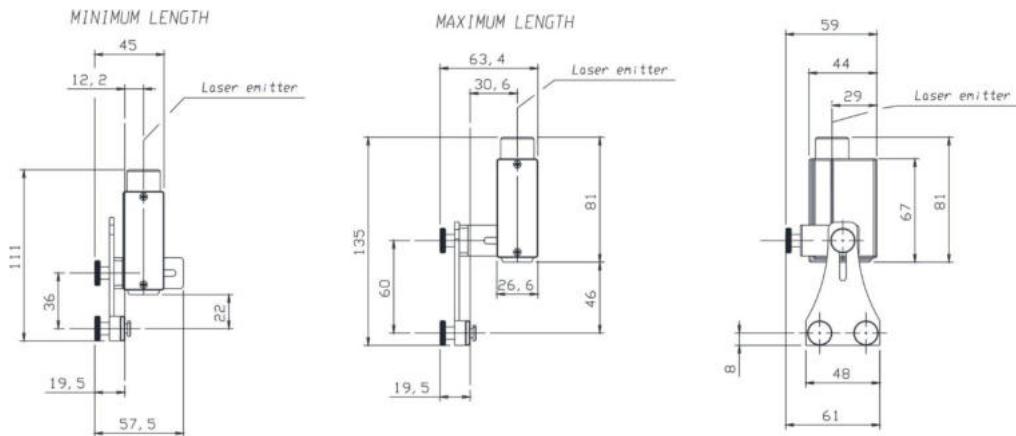


Figure 27 - Dimensions (mm)



Figure 28 - Laser pointer

(SG4-DONGLE) ETHERNET ADAPTER

MODEL	DESCRIPTION	CODE
SG4-DONGLE	Ethernet adapter	95ASE2080

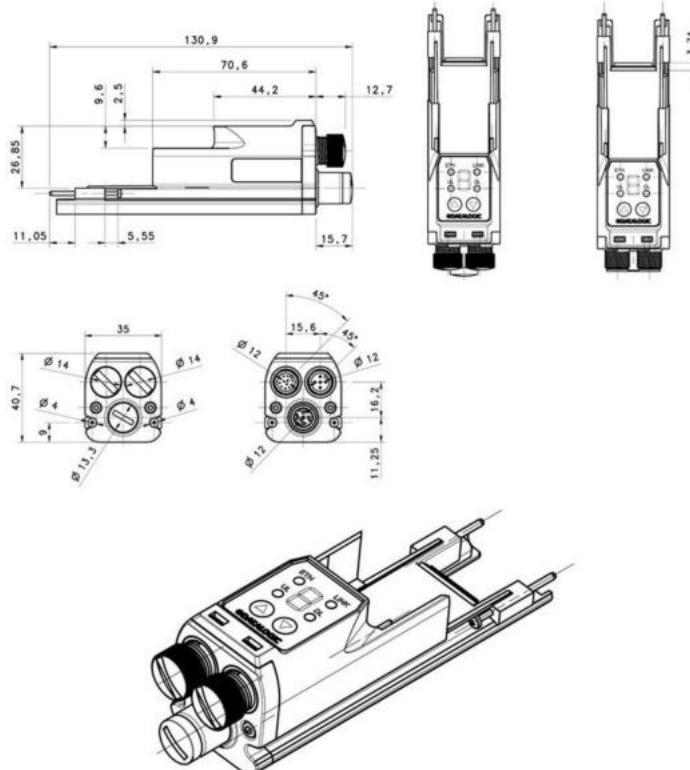


Figure 29 - Dimensions (mm)

ETHERNET CABLE SG4-DONGLE (CAB-ETH-xxx)

MODEL	DESCRIPTION	CODE
CAB-ETH-M01	Ethernet cable M12-IP67 (1 m)	93A051346
CAB-ETH-M03	Ethernet cable M12-IP67 (3 m)	93A051347
CAB-ETH-M05	Ethernet cable M12-IP67 (5 m)	93A051348

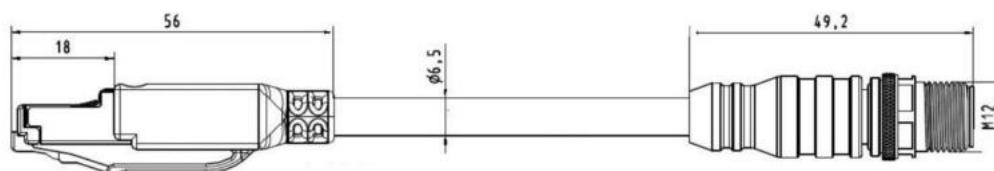


Figure 30 - Dimensions (mm)

(SE-SR2) SAFETY RELAY

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

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

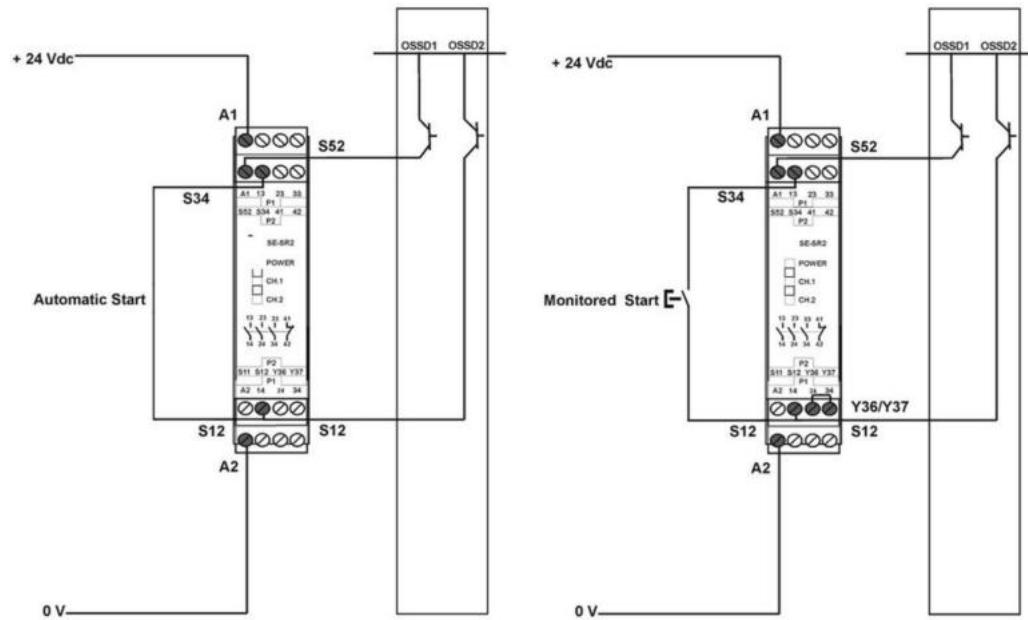


Figure 31 - Safety relay

(CSME-03VU24-Y14) EDM RELAY BOX

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

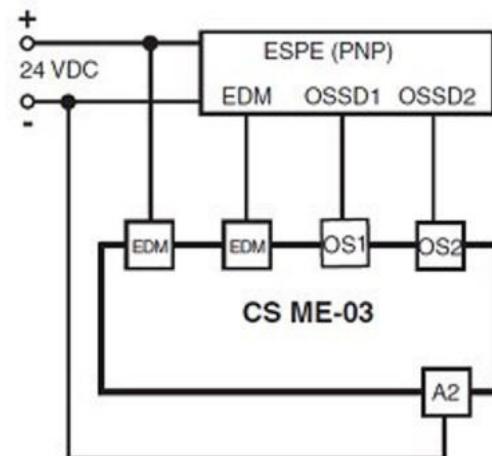


Figure 32 - EDM relay

(LMS) MUTING LAMPS

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 support for LMS-1	95ACC2020
SU-LMS-1B	Tower module for LMS-1	95ACC2030

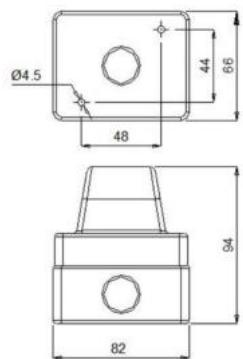


Figure 33 - Lamp LMS

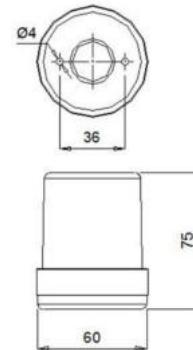


Figure 34 - Lamp LMS-2

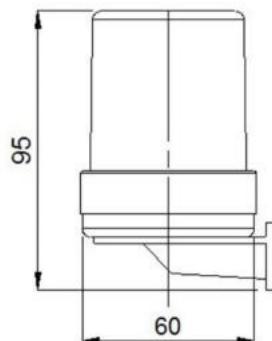
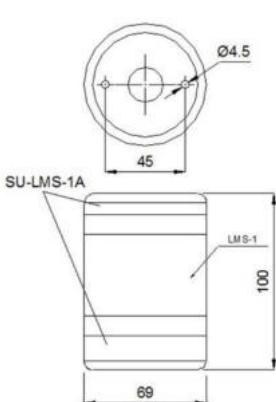
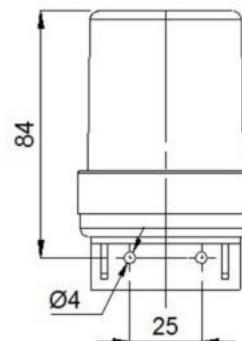
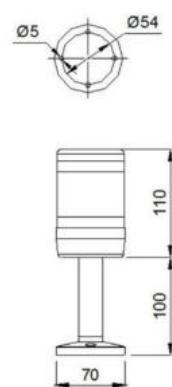


Figure 35 - Lamp LMS-3

Figure 36 - Module SU-LMS-1A +
LMS-1Figure 37 - Module SU-LMS-1B +
LMS-1

SINGLE MUTING ARMS

MODEL	DESCRIPTION	CODE
SG-AS-ARM V2	Single active arm with RRX sensors V2	95ASE1841
SG-PR-ARM V2	Single passive arm with reflectors V2	95ASE1851
SG-F1-G1-ARMS	F1-G1 Muting arms	95ASE1880
SG-F2-G2-ARMS	F2-G2 Muting arms	95ASE1890

SG4-P 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.

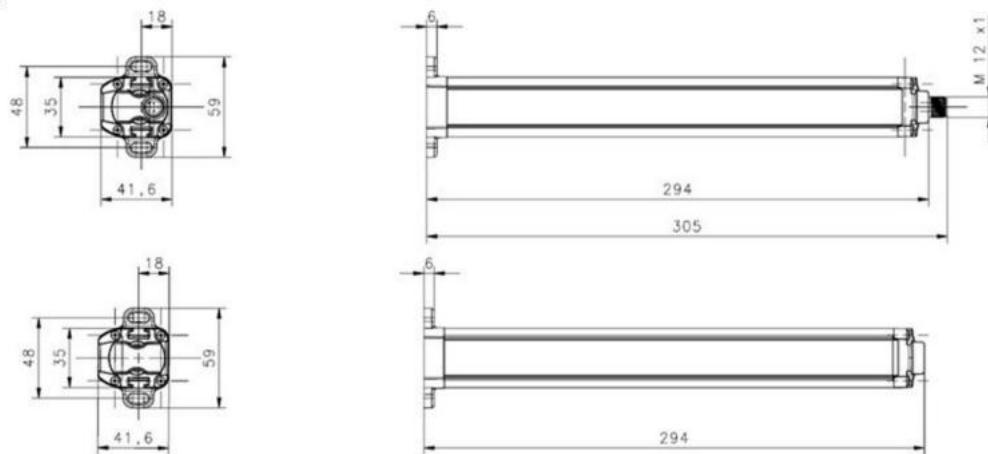


Figure 38 - Dimensions (mm)

MODEL	DESCRIPTION	CODE
SG-CB-C	Muting arms mounting bracket kit	95ASE1930

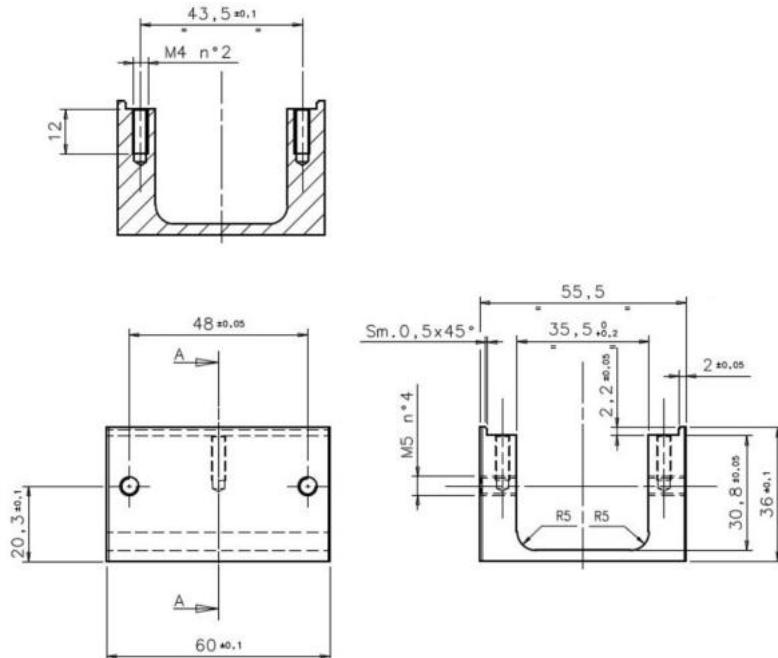


Figure 39 - Mounting bracket



To obtain an “L” configuration with F/G arms use **SG-F1-G1-ARMS** together with 2 pieces of **SG-CB-C**.

Please install F1 arm on RX unit and G1 arm on TX in order to have them facing one to another.

To obtain a “T” configuration with F/G arms use **SG-F1-G1-ARMS** and **SG-F2-G2-ARMS** together with 2 pieces of **SG-CB-C**.

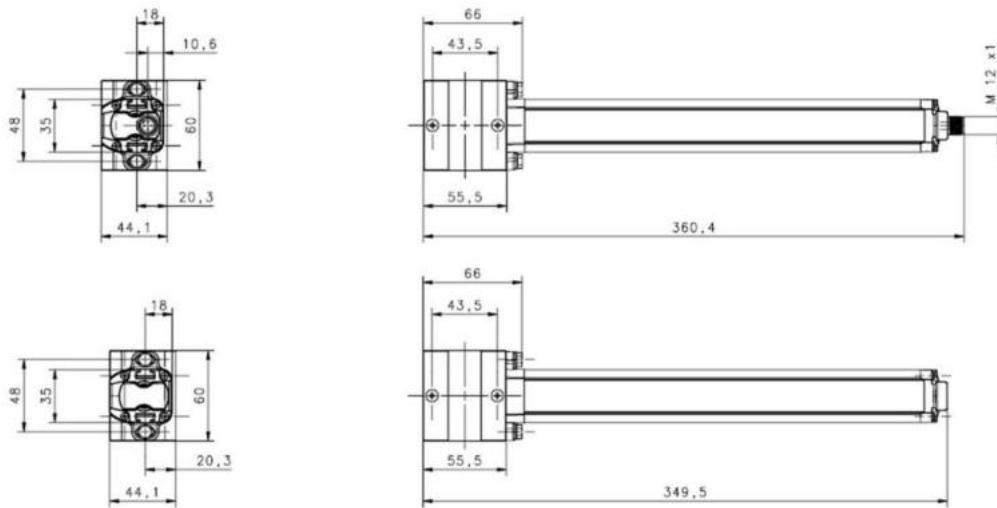
Please install F1 and F2 arms on RX unit and G1 and G2 arms on TX in order to have them facing one to another.

DOUBLE MUTING ARMS

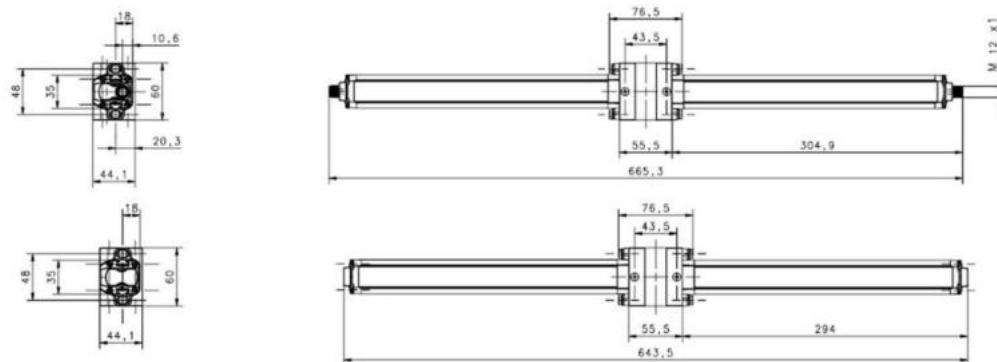
MODEL	DESCRIPTION	CODE
SG-L-ARMS V2	Active/Passive arms L couple V2	95ASE1861
SG-T-ARMS V2	Active/Passive arms T couple V2	95ASE1871

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, and of double passive arms with fixing bracket mounted.

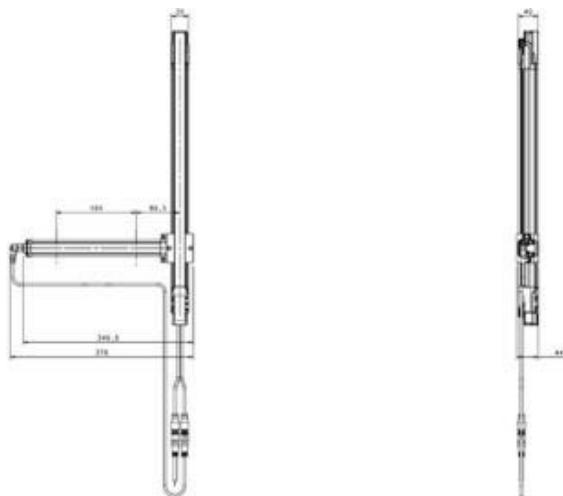
Active/Passive Arms L



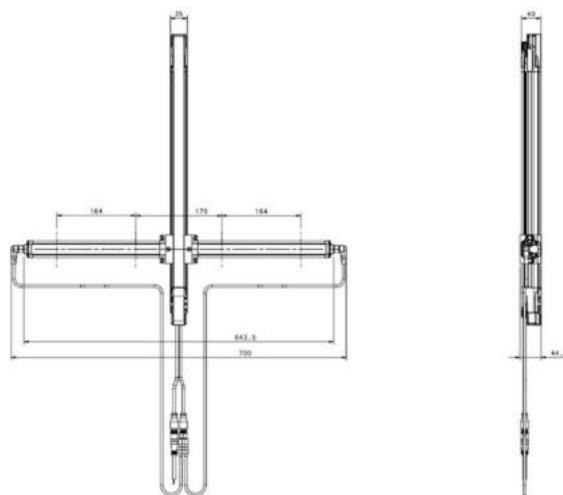
Active/Passive Arms T



Light curtain + Active/Passive Arms L



Light curtain + Active/Passive Arms T



(SG-M) MUTING ARMS WITH EXTERNAL SENSORS

System is compatible with all SG safety light curtains with muting function feature.

For correct use and safety prescriptions refer to the user manual of Datasensing safety light curtains where muting kit is installed.

With muting modular systems multiple configurations can be arranged.

MODEL	DESCRIPTION	CODE
SG-ML-S8-L	Kit for L Muting; left side: 2 sensor S8-PR-5-B01-PP; 2 reflector; 1 active arm; 1 passive arm; 2 cable-lockers; 2x700 mm cables with M12 connectors	95ASE2600
SG-ML-S8-R	Kit for L Muting, right side: 2 sensors S8-PR-5-B01-PP; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2 x 700mm cables with M12 connectors	95ASE2370
SG-ML-S8-200-L	Kit for L Muting, left side: 2 sensors S8-PR-5-B01-PP; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2 x 2000mm cables with M12 connectors	95ASE2590
SG-ML-S8-200-R	Kit for L Muting, right side: 2 sensors S8-PR-5-B01-PP; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2 x 2000mm cables with M12 connectors	95ASE2340
SG-ML-S100-L	Kit for L Muting, left side: 2 sensors S100-PR-5-B10-PK; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2x 700mm cables with M12 connectors	95ASE2620
SG-ML-S100-R	Kit for L Muting, right side: 2 sensors S100-PR-5-B10-PK; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2x 700mm cables with M12 connectors	95ASE2430
SG-ML-S100-200-L	Kit for L Muting, left side: 2 sensors S100-PR-5-B10-PK; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2 x 2000mm cables with M12 connectors	95ASE2610
SG-ML-S100-200-R	Kit for L Muting, right side: 2 sensors S100-PR-5-B10-PK; 2 reflectors; 1 active arm; 1 passive arm; 2 cable-lockers; 2 x 2000mm cables with M12 connectors	95ASE2400

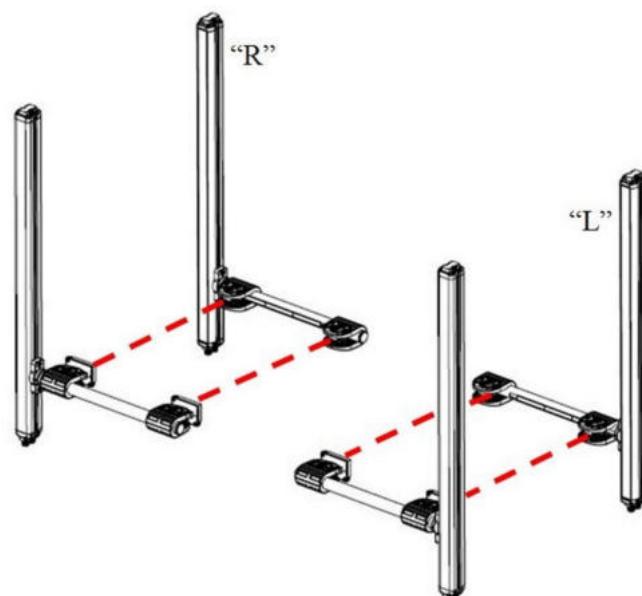


Figure 40 - L-Muting

MODEL	DESCRIPTION	CODE
SG-MT-S8	Kit for T Muting: 4 sensors S8-PR-5-B01-PP; 4 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 4 x 700mm cables with M12 connectors	95ASE2380
SG-MT-S8-200	Kit for T Muting: 4 sensors S8-PR-5-B01-PP; 4 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 4 x 2000mm cables with M12 connectors	95ASE2350
SG-MT-S100	Kit for T Muting: 4 sensors S100-PR-5-B10-PK; 4 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 4 x 700mm cables with M12 connectors	95ASE2440
SG-MT-S100-200	Kit for T Muting: 4 sensors S100-PR-5-B10-PK; 4 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 4 x 2000mm cables with M12 connectors	95ASE2410

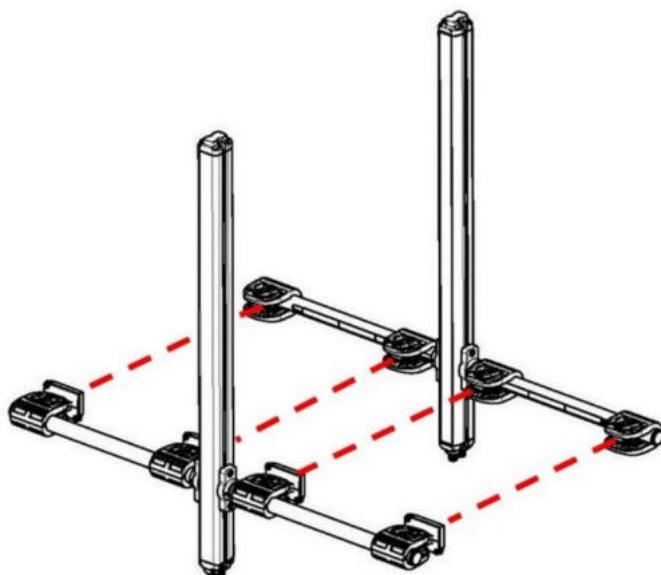


Figure 41 - T-Muting

MODEL	DESCRIPTION	CODE
SG-MX-S8	Kit for X Muting; 2 sensors S8-PR-5-B01-PP; 2 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 700mm pigtail cables with M12 connectors	95ASE2390
SG-MX-S8-200	Kit for X Muting; 2 sensors S8-PR-5-B01-PP; 2 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 2000mm pigtail cables with M12 connectors	95ASE2360
SG-MX-S100	Kit for X Muting; 2 sensors S100-PR-5-B10-PK; 2 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 700mm pigtail cables with M12 connectors	95ASE2450
SG-MX-S100-200	Kit for X Muting; 2 sensors S100-PR-5-B10-PK; 2 reflectors; 2 active arms; 2 passive arms; 4 cable-lockers; 2000mm pigtail cables with M12 connectors	95ASE2420

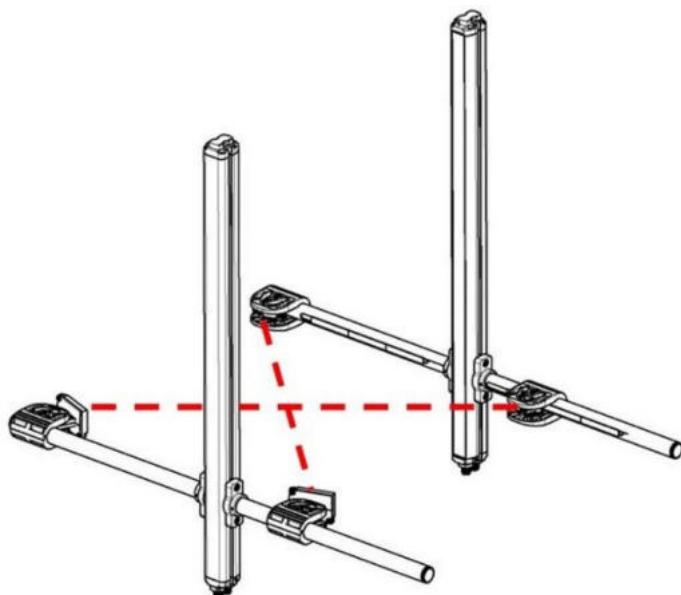
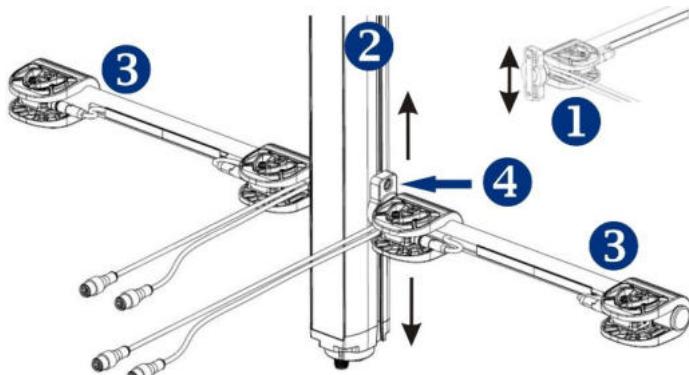


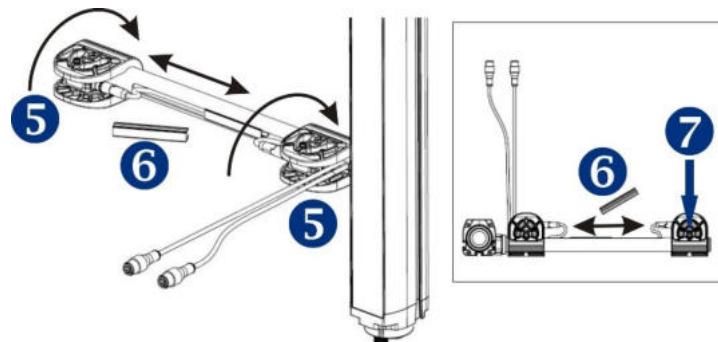
Figure 42 - X-Muting

Mounting

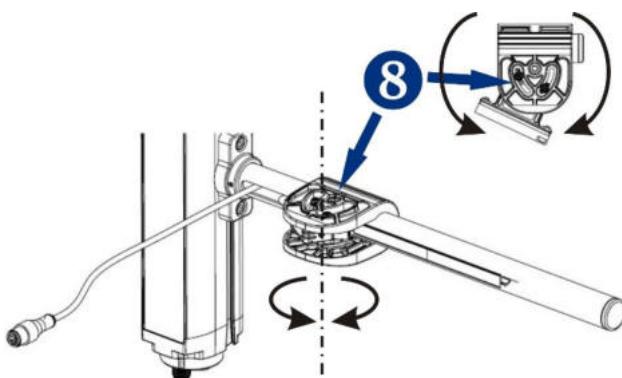
- Put the arm slider (1) into the column slot (2).
- Fix the arm (3) in the desired position by screws (4), 1 Nm recommended tightening torque.

**Figure 43 - Phase 1**

- Rotate sensors/reflectors support (5) in the desired position; if necessary, translate support removing and spacing cable-locker (6) and fix by screws (7), 2 - 3 Nm recommended tightening torque.

**Figure 44 - Phase 2**

- Loosen the two screws (8) and rotate/set the sensor/reflector as desired; then fix by screws (8), 1 Nm recommended tightening torque.

**Figure 45 - Phase 3**

For electrical link of SG-M kit to Datasensing safety curtains the use of Datasensing Connection ox SG-M-CB is recommended.

For each muting system kit the use of the same sensor type is recommended. Sensors must be set on Dark Mode.

(SG-M-CB) CONNECTION BOX

The SG-M-CB Connection box is part of SG-M accessories for Muting, to be used with Datasensing safety light curtains of SG series, with integrated muting function (e.g. SG BODY REFLECTOR MUTING).

Muting sensors can be connected to SG-M-CB Connection box via M12 cables.

The signals are connected to safety light curtain dedicated muting connector via approx. 0.5m long pigtail cable with M12 female connector.

Aside from the green LEDs¹ (to indicated sensors output status), the SG-M-CB does not contain any electronic elements and is therefore not subject to any safety classification.

Features:

- Supply and switching voltage +24Vdc
- M12 connection
- Simple connection to safety light curtains



Figure 46 - Connection box

1. For correct operation of LED indicators, it is mandatory to connect identical sensors to the four M12 sockets.

MODEL	DESCRIPTION	CODE
SG-M-CB	Connection box	95ASE2500
SG-M-CB-KIT	Mounting kit	95ASE2830

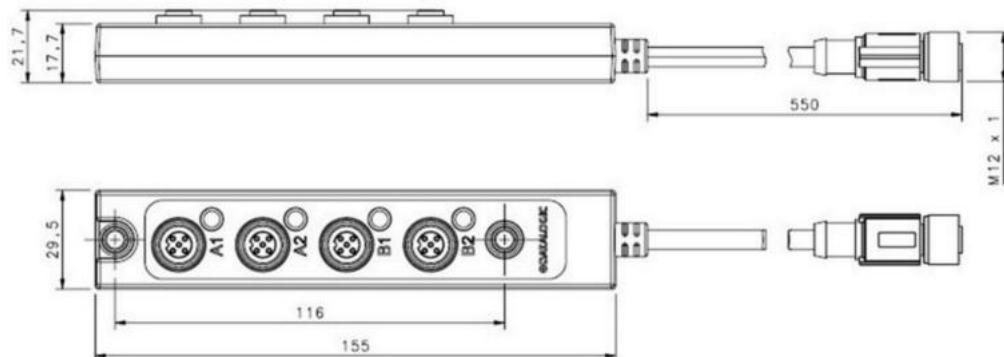


Figure 47 - Dimensions (mm)

Power supply & Switching voltage	+24 Vcc \pm 20%
Current load max.	1 A
Insulating resistance	> 1009 Ω
Mechanical protection	IP 65
Operating temperature	-10° C ... +55° C
Storage temperature	-25° C ... +70° C
Housing material	PVC, Black (UL Recognized)
Housing cable (C2)	PVC, Black (UL Recognized)
Housing connector (C1)	Plug M12-5P A-Coding Female
Housing connectors (A1, A2, B1, B2)	Sockets M12-5P A-Coding Female



For each muting system kit the use of the same sensor type is recommended.

NOTE

GLOSSARY

AOPD (Active optoelectronic protective device)

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

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

Block condition (=BREAK)

Status of the light curtain taking place when a suitably-sized opaque object (see "["Detection capability" on page 4](#)) interrupts one or several light curtain beams.

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

Crossing hazard

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

Dangerous area

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

Detection capability (or Resolution)

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

Detection zone

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

EDM (External device monitoring)

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

Emitter (TX)

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

ESPE (Electro-sensitive protective equipment)

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

Force-guided contacts

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

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

That relay characteristic allows the use of EDM function.

Interlock

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

Machine operator

Qualified person allowed to use the machine.

Min. installation distance

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

MPCE (Machine primary control element)

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

N.O.

Normally opened

N.C.

Normally closed

Normal Operation

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

OSSD (Output signal switching device)

Part of the ESPE connected to machine control system.

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

Protective device

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

Qualified operator

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

Receiver (RX)

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

Response time

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

Restart interlocking device (=RESTART)

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

Risk

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

Safe State

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

Safety light curtain

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

Start interlocking device (= START)

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

Test piece

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

Type (of ESPE)

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

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

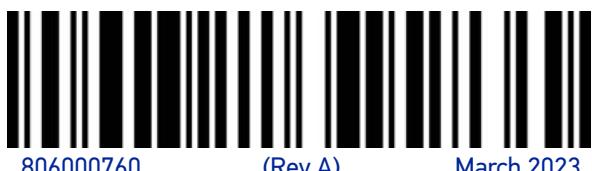
Working point

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

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