



> SG BODY REFLECTOR MUTING Safety Light Curtains



ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)

This product is covered by one or more of the following patents.

Italian Patent IT 1,363,719

Additional patents pending

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SG BODY REFLECTOR MUTING Instruction Manual

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INDEX

1	GENERAL INFORMATIONS ABOUT THIS DOCUMENT	1
1.1	Purpose of this document.....	1
1.2	Intended readers	1
1.3	Informations for the use.....	1
2	GENERAL INFORMATION ABOUT THE PRODUCT.....	2
2.1	General description of the safety light curtains	2
2.2	Appearance and interface	3
2.2.1	Package contents.....	3
2.3	Main functions and new features.....	3
2.4	How to choose the device	3
2.5	SG4-RB...-OO-N Family	4
2.6	Resolution	5
2.6.1	Controlled height	6
2.6.2	Minimum installation distance	9
2.7	Typical applications	11
2.8	Safety information	12
3	INSTALLATION MODE	13
3.1	Precautions to be observed for the choice and installation of the device.....	13
3.2	General information on device positioning	14
3.2.1	Minimum installation distance	15
3.2.2	Minimum distance from reflecting surfaces	15
3.2.3	Distance between homologous devices	17
3.2.4	Active and passive orientation.....	19
3.2.5	Precautions to respect during the use of deviating mirrors	19
3.2.6	Controls after first installation	19
4	MECHANICAL MOUNTING.....	21
4.1	Side fixing brackets	21
4.2	Rotating brackets	22
4.3	Bottom fixing brackets	22
4.4	Vibration dampers	23
4.5	Mechanical muting arms mounting.....	23
4.5.1	Mechanical arm mounting (retro-reflex)	24
5	ELECTRICAL CONNECTIONS AND CONFIGURATION	25
5.1	Important notes for installation	25
5.2	Minimal connection.....	25
5.3	SG4-RB...-W models ELECTRICAL connections	26
5.4	SG4-RB...-N models Electrical Connections	26
5.5	Complete dip-switches configuration.....	27
5.6	Restart mode and Reset/Restart button connection for SG-RB...-W Models.....	28
5.7	External relays connection	28
5.8	EDM control connection	29
5.9	MUTING ENABLE input connection for SG-RB...-W Models	29
5.10	Muting arms or Muting function inputs connection	30
5.11	Override connection for SG-RB...-W Models	30
5.12	Earth connection	30
6	FUNCTIONING MODE.....	31
6.1	SG4-RB...-W Configuration	31
6.2	SG-RB...-N Configuration	32
6.3	Reset function	34
6.4	Restart mode selection function	34
6.5	EDM function.....	36
6.5.1	SG4-RB...-W Models EDM Connection	36

6.5.2	SG4-RB...-N Models EDM Function and Connection	37
6.6	Muting function	38
6.6.1	Muting T/L selection function.....	39
6.6.2	Muting timeout selection function	40
6.6.3	Muting low-pass filter function	40
6.6.4	Installation mode of Muting sensors.....	41
6.7	Override function FOR SG4-RB-...-W models	46
6.7.1	Override function activation	46
6.7.2	Override input mode function	48
6.7.3	Override restart mode function.....	50
6.7.4	Override status	50
6.8	Override function FOR SG4-RB-...-N models.....	51
6.8.1	Override function activation.....	51
6.8.2	Override at start-up	51
6.8.3	Override at run time.....	52
6.8.4	Override restart mode function.....	53
6.9	Alignment function.....	54
7	ALIGNMENT PROCEDURE	55
7.1	Light curtain alignment procedure	57
7.2	Correct muting arm alignment procedure.....	58
8	DIAGNOSTICS	59
8.1	User interface	59
8.2	Diagnostic messages	59
8.2.1	Active unit side	59
9	PERIODICAL MAINTENANCE AND WARRANTY	62
9.1	General information and useful data	62
9.2	Warranty.....	62
10	DEVICE MAINTENANCE	63
11	TECHNICAL DATA.....	64
12	DIMENSIONS.....	65
13	LIST OF AVAILABLE MODELS.....	68
14	ACCESSORIES	69
14.1	Metal angled fixing bracket (ST-K4STD-SG BODY BIG)	69
14.2	Rotative fixing bracket (ST-K4ROT-SG BODY BIG)	71
14.3	Rear fixing bracket (ST-K4REAR-SG BODY BIG)	72
14.4	Protective stands (SG-PSM)	73
14.5	Protective stands (SG-PSB).....	74
14.6	Plate kit for protective stands (SG-P)	75
14.7	Columns and floor stands (SE-S).....	76
14.8	Laser pointer (SG-LP)	77
14.9	Test piece (TP).....	77
14.10	Connection cables.....	78
14.11	Muting lamps (LMS)	79
14.12	Safety relay	80
14.13	Connection boxes (SG-SRT).....	81
14.14	Muting Arms	82
15	GLOSSARY	86

1 GENERAL INFORMATIONS ABOUT THIS DOCUMENT

Read this section carefully before implementing the instructions given in this manual and starting up the SG BODY safety system.

1.1 PURPOSE OF THIS DOCUMENT

These instructions for use are addressed to the manufacturer technicians or staff operating the machine and give all necessary instructions for correct and safe assembly, setup, electric connection and commissioning of the SG BODY series light curtains.

Scope of this document excludes information about use of the machine the safety system is installed to.

1.2 INTENDED READERS

The instructions for use given herein are addressed to designers, manufacturers and persons in charge of the safety of systems to be equipped with the SG BODY series light curtains. They are also addressed to the staff in charge of installing the SG BODY light curtain to a machine, commissioning it or servicing it.

1.3 INFORMATIONS FOR THE USE

These instructions for use contain the following details about the SG BODY series light curtains:

- installation	- diagnostics and troubleshooting
- electrical connection	- user interface warnings
- commissioning and setup	- conformity and type approval
- application	- care and maintenance

Designing and using safety devices to integrate to the SG BODY safety system requires specific know-how which is not included in this document. In particular, the applicable industry standards shall be met.

For all the acronyms used in this document please refer to section 15.

2 GENERAL INFORMATION ABOUT THE PRODUCT

2.1 GENERAL DESCRIPTION OF THE SAFETY LIGHT CURTAINS

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

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

EN 61496-1:2013	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 13849-1:2008	Safety of machinery. Safety-related parts of control systems. Part 1: General principles for design
EN 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 1: General requirements
EN 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
EN 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 3: Software requirements
EN 61508-4:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 4: Definitions and abbreviations
EN 62061:2005/A1:2013	Safety of machinery. Functional safety of electrical/ electronic/programmable electronic safety-related control systems.

The device, consisting in one active unit inside a sturdy aluminum profile and a passive unit composed of two or more deviating mirrors, generates couples of infrared beams able to detect an opaque object positioned within the light curtain detection field.

The active unit is composed of two types of optic groups: emitting and receiving units.

The infrared beam, generated by an emitting optic group, is reflected by the deviating mirrors and thus re-guided towards the corresponding receiving optic group of the active unit.

The passive unit is composed of a sturdy aluminum profile containing pre-assembled and pre-aligned mirrors.

The solution with integrated Muting arms can be implemented both in a 'T' or 'L' configuration.

The active unit is equipped with the command and control functions. The connections are made through a M12 connector located in the lower side of the profile of the active unit.

The microprocessor guarantees the check and the management of the beams that are sent and received through the units: The microprocessor LEDs and display inform the operator about the general conditions of the safety light curtain (see section 8 "DIAGNOSTICS").

The device consists in 2 units: the active unit and the passive unit. The active unit, according to the model, is composed by one or several emitting and receiving modules and checks the control operations and safety actions.

During installation, a user interface facilitates the alignment of both units (see section 7 – "ALIGNMENT PROCEDURE").

As soon as an object or the operator's body accidentally interrupts one or some of the infrared beams sent by the emitter, the receiver immediately opens the OSSD outputs and blocks the MPCE machine (if correctly connected to the OSSD).

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



Notes and detailed descriptions about particular characteristics of the safety devices in order to better explain their functioning.

Special instructions regarding the installation process.



The information provided in the paragraphs following this symbol is very important for safety and may prevent accidents.

Always read this information accurately and carefully follow the advice to the letter

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 SG BODY light curtains and the safety rules that regulate the correct installation (see section 9 – “PERIODICAL MAINTENANCE AND WARRANTY”).

2.2 APPEARANCE AND INTERFACE

2.2.1 Package contents

Package contains the following objects:

- Active unit
- SG BODY quick installation guide
- Checklist and periodical maintenance schedule

2.3 MAIN FUNCTIONS AND NEW FEATURES

With respect to SE4-R series, the SG BODY safety light curtain series present new important features:

- No dead zone
- New engineering of passive unit
- Shorter response time (see section 11 – “TECHNICAL DATA”)
- Muting function customization
- Override function customization

2.4 HOW TO CHOOSE THE DEVICE

The SG BODY series light curtains efficiently satisfy all applications that require the Muting function thanks to pre-assembled, pre-cabled and pre-aligned Muting sensors.

T-shaped models are available with integrated Muting sensors for bidirectional Muting, L-shaped models for unidirectional Muting and linear models without integrated Muting sensors are available.

By means of Muting arms accessories, linear models can be converted into T-shaped models and L-shaped models.

The muting arms, available in “T” and “L” versions, take advantage of retro-reflex sensors technology. This version covers a maximum operating distance of light curtain of 3 m.

The integrated Muting solution with “L” configuration facilitates sensor installation and suits applications requiring one-way object passage direction.

The integrated Muting solution with “T” configuration facilitates sensor installation and is ideal for applications requiring a bidirectional object passage movement.

The linear models, presenting a specific connector allowing easy connection of the Muting sensors, are recommended for difficult or particular applications.

Sensor positioning has to be carried out by the operator, respecting the precautions listed in the following chapters.

2.5 SG4-RB...-OO-N FAMILY

SG4N Light Curtains series include new models which feature a single 8P connector Pin-to-Pin compatible with SE-...-PP-W models.

SG4N series include a list of modified functions:

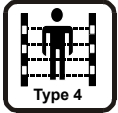
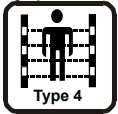
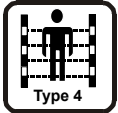
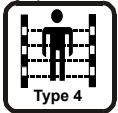
OVERRIDE	Activation from pattern signal on single input instead of edges on two inputs
EDM / RESTART	Feedback shared with test/restart input instead of dedicated input

2.6 RESOLUTION

The resolution of the device is the minimum dimension that an opaque object must have in order to obscure at least one of the beams that constitute the sensitive area.

The resolution strictly depends on the part of the body to be protected.

The following table shows the values of the optic interaxis (**I**), the resolution (**R**) and the optic diameter (**d**), of the safety light curtains.

Model	Optic interaxis (I) [mm]	N. optics	Resolution (R) [mm]	Lens diameter (d) [mm]	ESPE Type
SG4-RB2-050-OO-W SG4-RB2L-050-OO-W SG4-RB2T-050-OO-W SG4-RB2-050-OO-N	500	2	519,75	19,75	Body protection 
SG4-RB3-080-OO-W SG4-RB3L-080-OO-W SG4-RB3T-080-OO-W SG4-RB3-080-OO-N	380	3	399,75	19,75	Body protection 
SG4-RB4-090-OO-W SG4-RB4-090-OO-N	300	4	319,75	19,75	Body protection 
SG4-RB4-120-OO-W SG4-RB4-090-OO-N	400	4	419,75	19,75	Body protection 

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

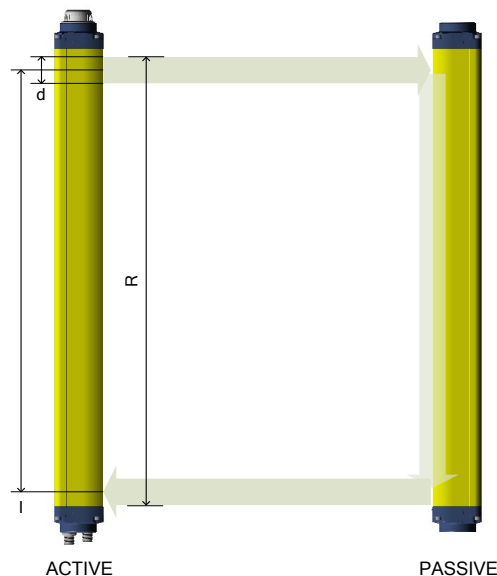


Figure 1

The resolution value is obtained applying the following formula: **R = I + d**

Where:

I = Distance between two adjacent optics
d = Lens diameter



Note: Safety light curtains for body protection with sensitive area heights and optic interaxis different from the standard versions can be manufactured upon specific request.

2.6.1 Controlled height

The controlled height is the height protected by the safety light curtain (H_p). SG BODY models have no dead zone inside the protected area.

In Figure 2, Figure 3 and Figure 4 SG BODY Reflector schemes respectively for 2 beams, 3 beams and 4 beams models are shown.

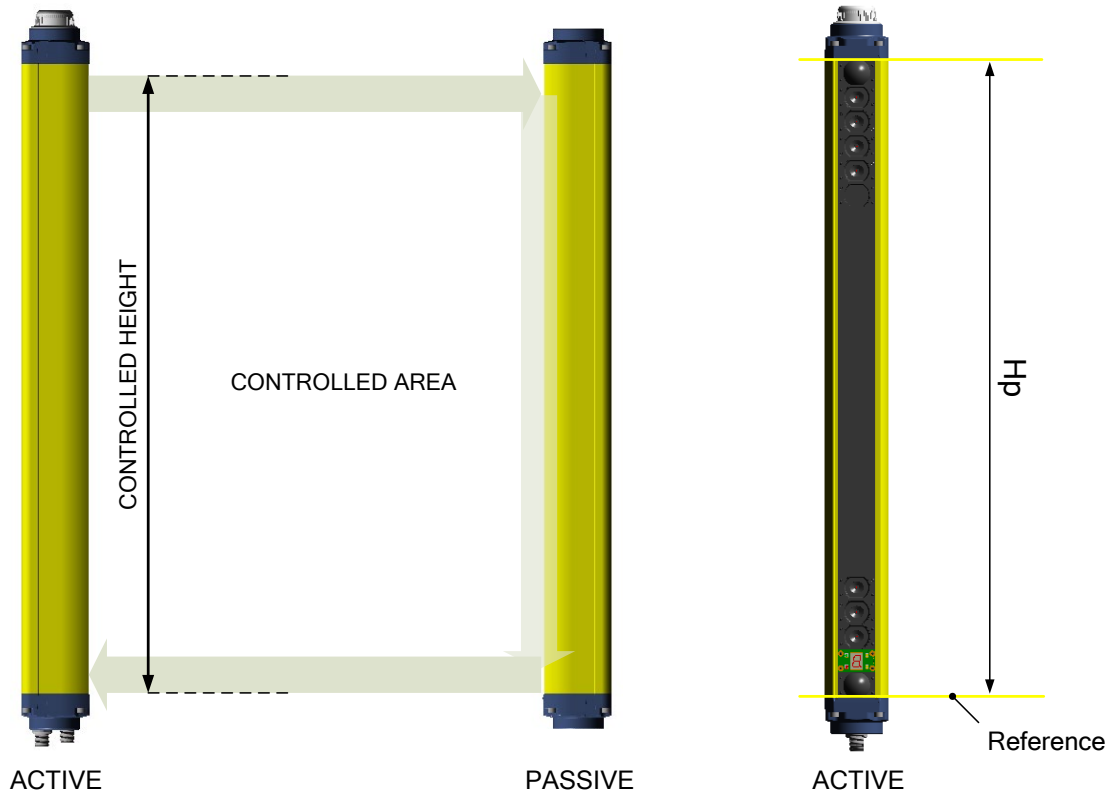


Figure 2 – 2 Beams Model

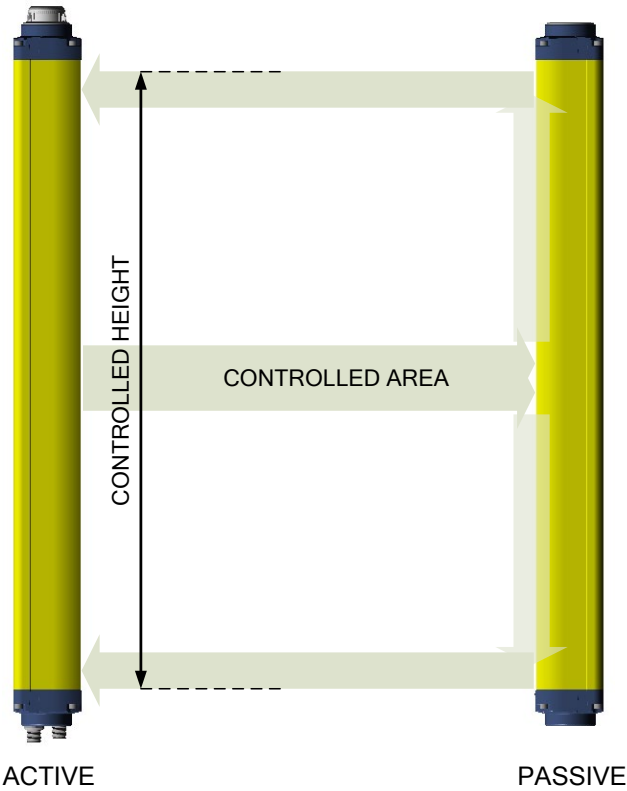


Figure 3 – 3 Beams Model

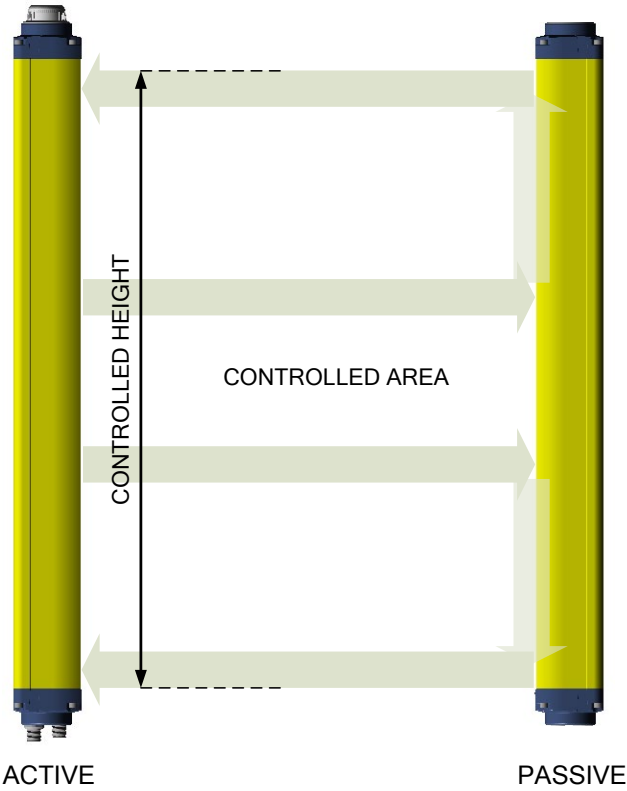
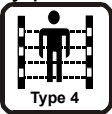
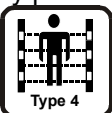
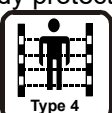
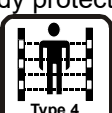


Figure 4 – 4 Beams Model

Model	Hp [mm]	ESPE Type
SG4-RB2-050-OO-W SG4-RB2L-050-OO-W SG4-RB2T-050-OO-W SG4-RB2-050-OO-N	500	Body protection  Type 4
SG4-RB3-080-OO-W SG4-RB3L-080-OO-W SG4-RB3T-080-OO-W SG4-RB3-080-OO-N	800	Body protection  Type 4
SG4-RB4-090-OO-W SG4-RB4-090-OO-N	900	Body protection  Type 4
SG4-RB4-120-OO-W SG4-RB4-120-OO-N	1200	Body protection  Type 4

2.6.2 Minimum installation distance

As shown in Figure 5, the safety device must be positioned at a specific safety distance. This distance must ensure that the dangerous area cannot be reached before the dangerous motion of the machine has been stopped by the ESPE.

The safety distance depends on 4 factors, according to the **EN ISO 13855 “Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body”** Standard:

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

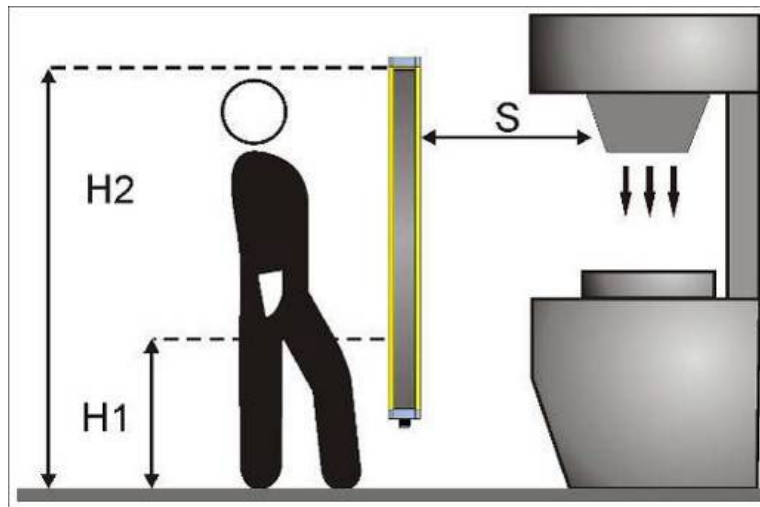


Figure 5

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/sec.
- t_1 = Response time of the ESPE in seconds (see section 11 – “TECHNICAL DATA”)
- t_2 = Machine stopping time in seconds.
- d = Resolution of the system.
- C = Additional distance based on the possibility to insert the body or one of body parts inside the dangerous area before the protective device trips.
- C = $8 (d - 14)$ for devices with resolution ≤ 40 mm
- C = 850 mm for devices with resolution > 40 mm



Note: K value is:

- 2000 mm/s if the calculated value of S is ≤ 500 mm
- 1600 mm/s if the calculated value of S is > 500 mm

When devices with > 40 mm resolution are used, the height of the top beam has to be ≥ 900 mm (H2) from machine supporting base while the height of the bottom beam has to be ≤ 300 mm (H1).
If the safety light curtain must be mounted in a horizontal position (Figure 6), 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.
- t_1 = Response time of the ESPE in seconds (see section 11 – “TECHNICAL DATA”)
- t_2 = Machine stopping time in seconds.
- H = Beam height from ground. This height must always be less than 1000 mm.

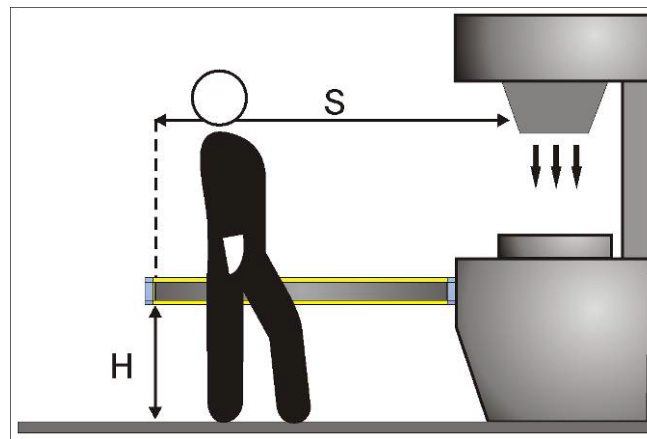


Figure 6

Practical examples

Let's suppose to have a light curtain with height = 500 mm

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

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

Where:

- T = $t_1 + t_2$
- t_1 = ESPE response time + SE-SR2 relay release time (max 80 ms)
- t_2 = Machine total stopping time (e.g. 300 ms).
- C = $8(d - 14)$ for devices with resolution ≤ 40 mm
- C = 850 mm for devices with resolution > 40mm
- d = resolution

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

	SGx-RB2	SGx-RB4
T [sec]	0.391	0.392
C [mm]	850	850
S [mm]	1475.6	1477.2

x = ESPE Type: 2, 4



The reference standard is **EN ISO 13855 “Machine safety - the positioning of the protective device based on the approaching speed 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.

2.7 TYPICAL APPLICATIONS

The safety light curtains of the SG BODY Series are used in all automation fields where control and protection of the access to dangerous zones is necessary, as well as allowing, by means of the Muting function, material passage inside a dangerous zone during working.

In particular, they are used to stop the moving mechanical parts in:

- Access control
- Working areas
- Packaging machines, handling machines, storing machines;
- Automatic and semi-automatic assembly lines;
- Automatic warehouses;
- Robotics.

In food industry applications, Datasensing Technical Service has to verify the compatibility of the material of the safety light curtain housing with any chemical agents used in the production process.

The following pictures show some main applications.

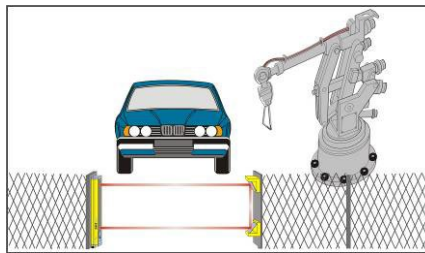


Figure 7 - Robotised assembly lines

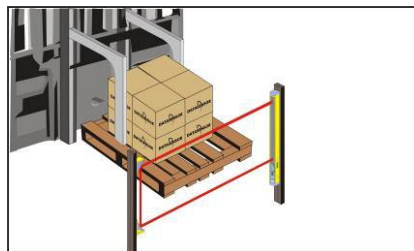


Figure 8 - Transfer areas

2.8 SAFETY INFORMATION



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

- The stopping system of the machine must be electrically controlled.
- This control system must be able to stop the dangerous movement of the machine within the total machine stopping time T as per paragraph 2.6.2, and during all working cycle phases.
- Mounting and connection of the safety light curtain must be carried out by qualified personnel only, according to the indications included in the special sections (refer to sections 3, 4, 5, 7) and to the applicable standards.
- The safety light curtain must be securely placed in a particular position so that access to the dangerous zone is not possible without the interruption of the beams (refer section 3 – “INSTALLATION MODE”).
- The personnel operating in the dangerous area must be well trained and must have adequate knowledge of all the operating procedures of the safety light curtain.
- The TEST button must be located outside the protected area because the operator must check the protected area during all the Test operation.
- The RESET/RESTART button must be located outside the protected area because the operator must check the protected area during all the Reset/Restart operations.
- The OVERRIDE buttons must be located outside the protected area because the operator must check the protected area during all the Override operations.
- The external signaling lamp of the active Muting/Override must be visible from all operating sides.
- Please carefully respect the mounting instructions for the correct functioning of the Muting devices.
- The function of the external device monitoring (EDM) is active only if the specific wire is correctly connected to the device.
- Please carefully read the instructions for the correct functioning before powering the light curtain.

3 INSTALLATION MODE

3.1 PRECAUTIONS TO BE OBSERVED FOR THE CHOICE AND INSTALLATION OF THE DEVICE



Make sure that the protection level assured by the SG BODY series device (Type 2 or Type 4 respectively) is compatible with the real danger level of the machine to be controlled, according to EN 954-1 and EN13849-1.

- The outputs (OSSD) of the ESPE must be used as machine stopping devices and not as command devices (the machine must have its own START command).
- The dimension of the smallest object to be detected must be larger than the resolution level of the device.
- The ESPE must be installed in a room complying with the technical characteristics indicated in section 11 - TECHNICAL DATA. Datasensing does not recommend the use of the product in ambient where direct or indirect exposure to solar light is present.
- Do not install device near strong and/or flashing light sources or close to similar devices.
- Strong electromagnetic disturbance might negatively affect device operation. Should this be the case contact 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 so jeopardize functioning.
- The Muting/Override function is signaled by a specific Muting/Override signaling lamp. Ensure that the signaling device has sufficient lighting and visibly positioned near the dangerous zone.
- Ensure to correctly use Muting sensors as described in the instructions supplied hereinafter. Avoid incongruent connections that cannot be controlled and thus excluding undesired potentially dangerous activations.

3.2 GENERAL INFORMATION ON DEVICE POSITIONING

Pay special care when positioning the safety light curtain so to offer effective protection. The device should be installed in such a way that the dangerous area can only be entered after detecting the sensitive area.



Figure 9 shows some examples of possible access to the machine from the top and the bottom sides. These situations may be very dangerous and so the installation of the safety light curtain at sufficient height in order to completely cover the access to the dangerous area becomes necessary (see Figure 10).

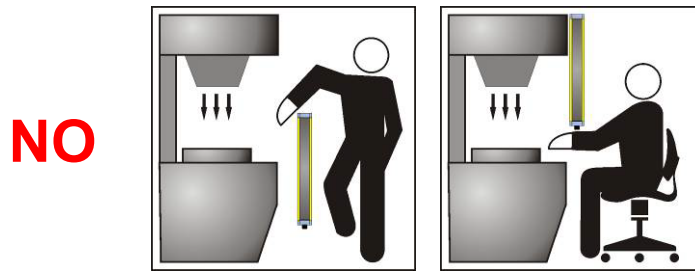


Figure 9

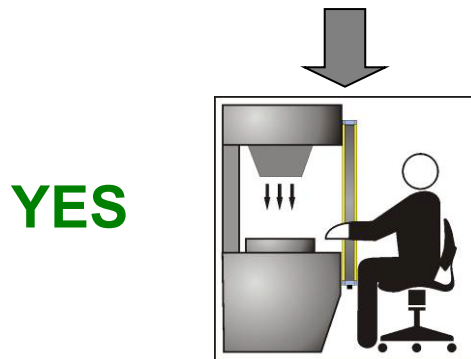


Figure 10

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

When the installation of the safety light curtain very near to the dangerous area is not possible, a second light curtain must be mounted in a horizontal position in order to prevent any lateral access, as shown in Figure 12



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

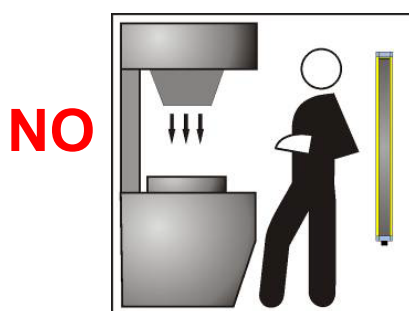


Figure 11



Figure 12

3.2.1 Minimum installation distance

Refer to paragraph 2.6.2 - Minimum installation distance.

3.2.2 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. However, 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.

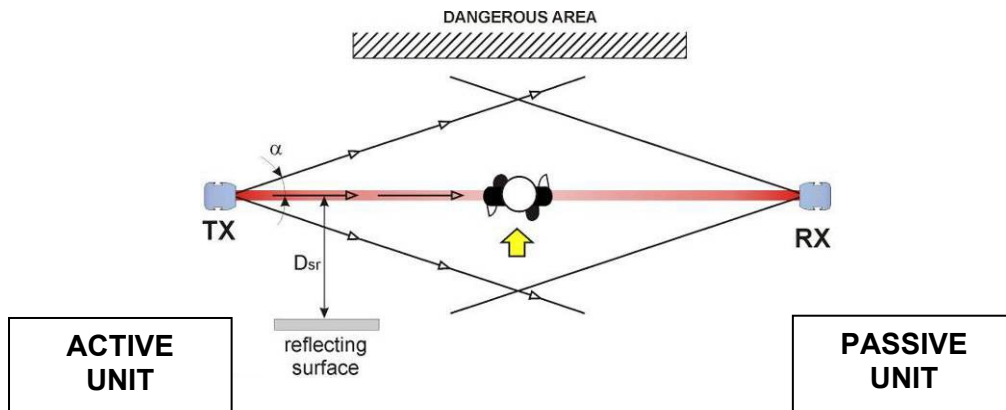


Figure 13

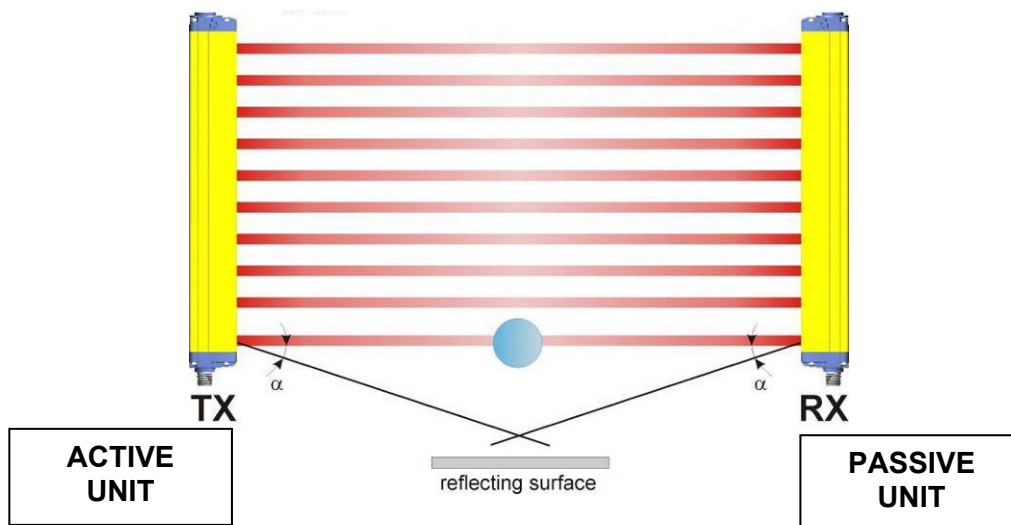


Figure 14

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

The minimum distance depends on:

- operating distance between active and passive units.
- real aperture angle of ESPE (EAA); especially:
- for ESPE type 4 $EAA_{MAX} = 5^\circ$ ($\alpha = \pm 2.5^\circ$)

Diagram of Figure 15 shows the minimum distance from the reflecting surface (D_{sr}) based on the operating distance for a Type 4 ESPE:

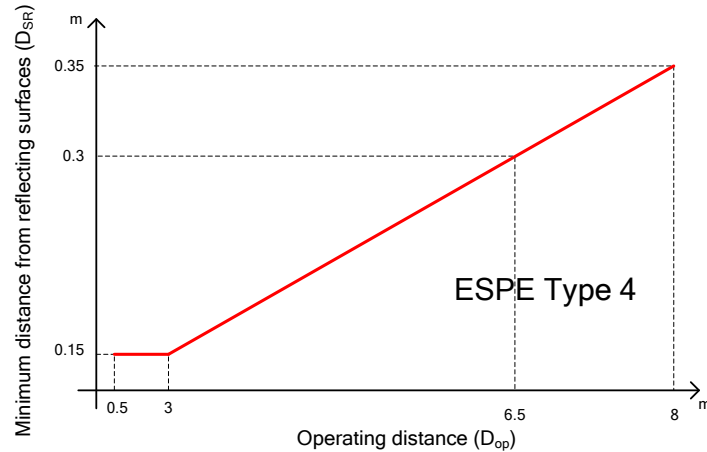


Figure 15

The formula to get D_{sr} for a Type 4 ESPE is the following:

$$D_{sr} (m) = 0.15 \quad \text{for operating distance} < 3 \text{ m}$$

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

Even in presence of beam interruption due to reflecting objects, the correct device functioning is guaranteed and certified up to a maximum operating distance of 6.5m for SG4-RB4-090 model, or 8 m for SG4-RB2-050, SG4-RB3-080, SG4-RB4-120 models. The use of the device at higher distances, when possible, is however not recommended. If used, the user must check the correct functioning verifying that no dangerous reflections towards the receiving optics are generated by shiny objects (Figure 16).

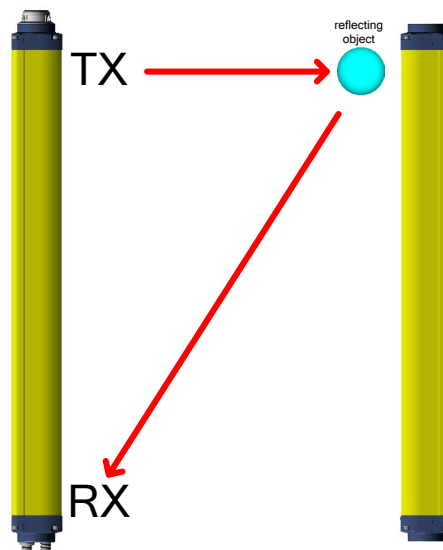


Figure 16

3.2.3 Distance between homologous devices

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

Passive B interfering device must be positioned outside a minimum D_{do} distance from the active – passive axis of the device A.

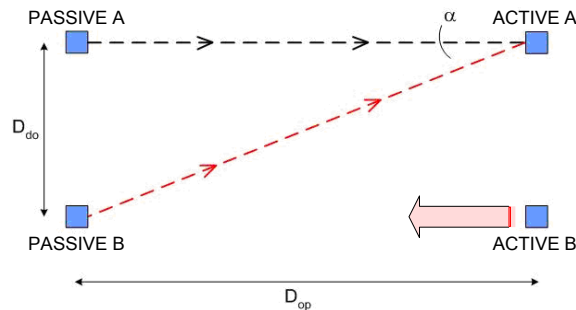


Figure 17

This minimum D_{do} distance depends on:

- the operating distance between Passive A and Active A;
- the effective aperture angle of the ESPE (EAA); especially:
- for ESPE type 4 $EAA_{MAX} = 5^\circ$ ($\alpha = \pm 2.5^\circ$)



The interfering device Passive B must be positioned at the same D_{do} distance, calculated as shown above, even if closer to Passive A respect to Active A.

The following graphic shows the distance from the interfering devices (D_{do}) according to the operating distance (D_{op}) of the couple Passive A – Active A for a Type 4 ESPE.

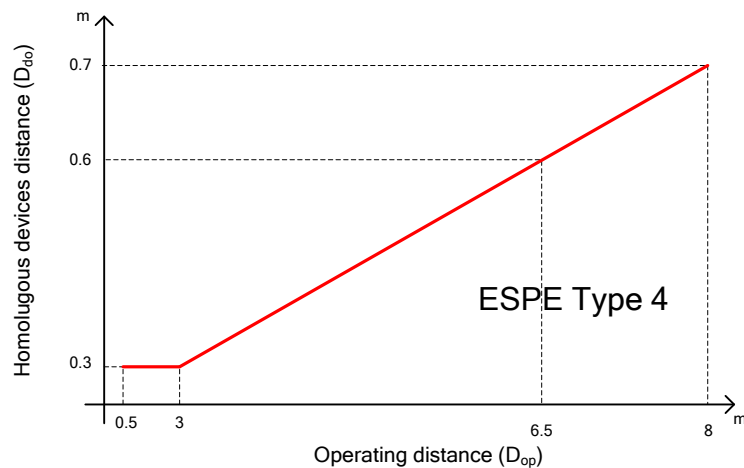


Figure 18

The formula to get D_{op} for a Type 4 ESPE is the following:

$$D_{op} (m) = 0.3 \quad \text{for operating distance} < 3 \text{ m}$$

$$D_{op} (m) = \text{operating distance} (m) \times \tan 2\alpha \quad \text{for operating distance} \geq 3 \text{ m}$$

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.

Figure 19 provides some examples for a 4-beam device; obviously a contemporary activation of more emitters is not possible and the emitter/receiver couples are activated sequentially.

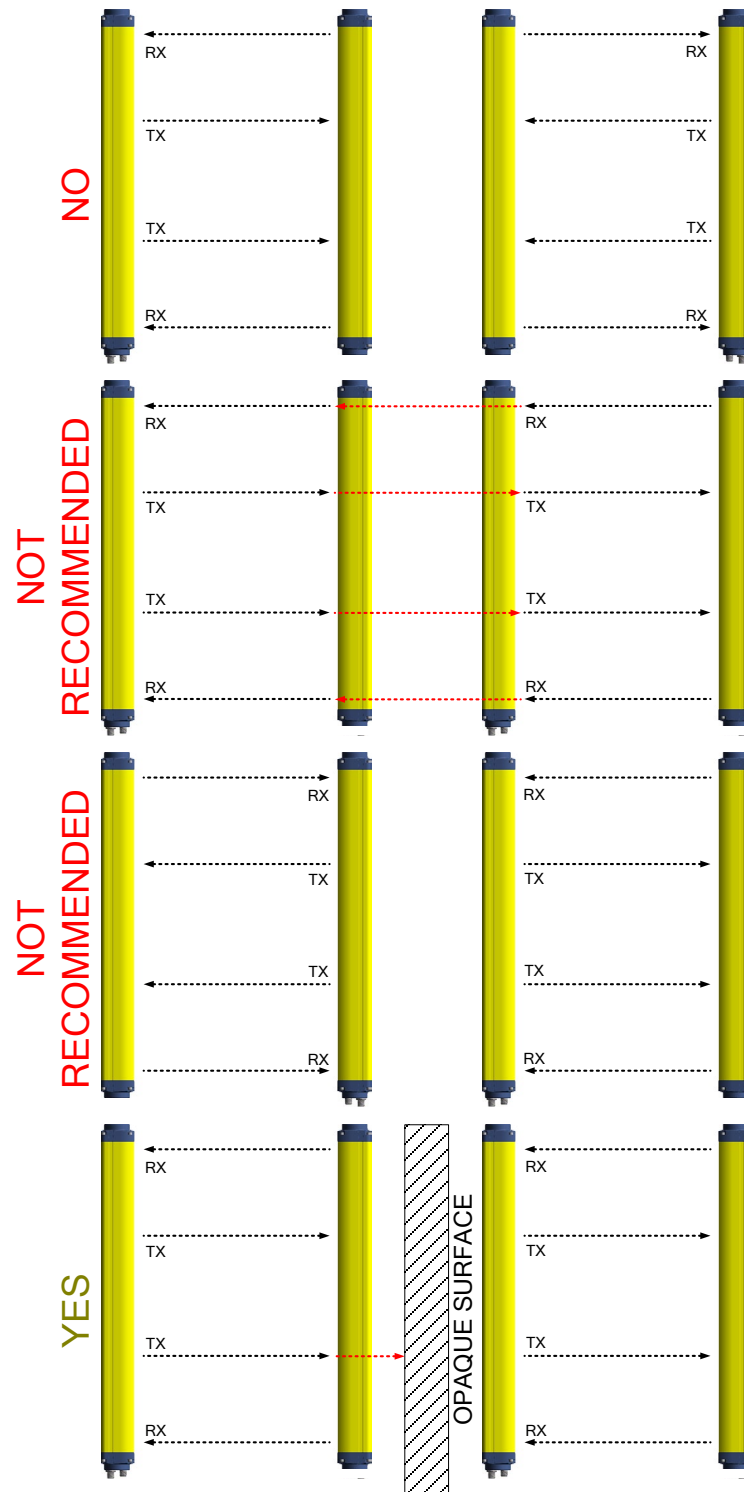


Figure 19

3.2.4 Active and passive orientation

The two units shall be assembled parallel each other, and looking at the references on the aluminium profile. The configurations shown in Figure 20 must be avoided:

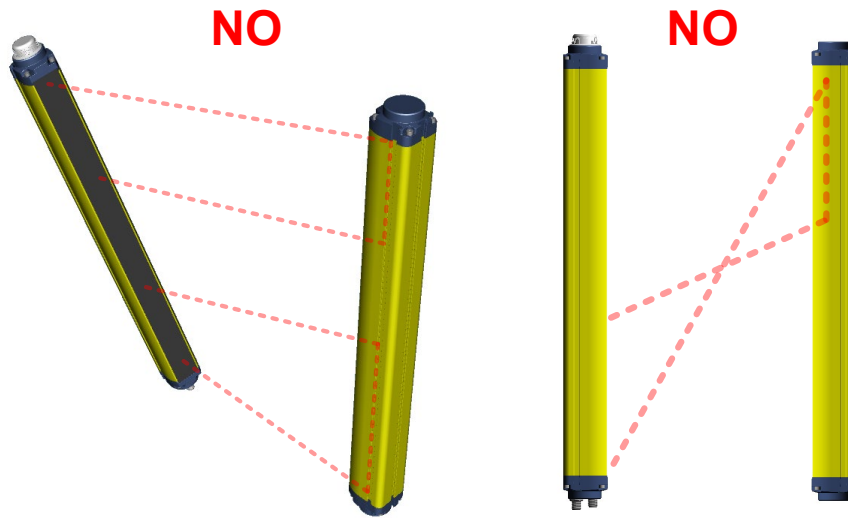


Figure 20

3.2.5 Precautions to respect during the use of deviating mirrors

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



- The alignment of the active unit can become a very critical operation when deviating mirrors are used. Even a very small angular displacement of the mirror is enough to lose alignment. The SG-LP laser pointer accessory can be used to avoid this problem.
- The presence of dust or dirt on the reflecting surface of the mirror causes a drastic reduction in the range.

3.2.6 Controls after first installation

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

Verify that:

- ESPE remains in SAFE state (➡I) intercepting the beams along the protected area using the specific test piece (TP-40, TP-50, TP-90), following the Figure 21 scheme.

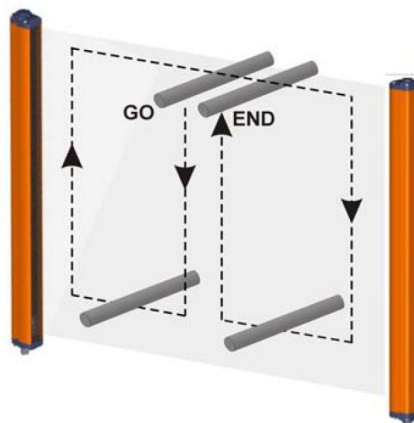


Figure 21

- ESPE has to be correctly aligned, press slightly on the product side in both directions the red LED must not turn on .
- The activation of the TEST function causes the opening of the OSSD outputs (red LED  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 section 3 – “INSTALLATION MODE”).
- The safety distance between the dangerous parts and ESPE must comply with the requirements indicated in section 3 – “INSTALLATION MODE”.
- A person must not access or remain between ESPE and the dangerous parts of the machine.
- Access to the dangerous areas of the machine must not be possible from any unprotected area.
- ESPE must not be disturbed by external light sources, ensuring that it remains in NORMAL OPERATION condition for at least 10-15 minutes and, placing the specific test piece in the protected area, in the SAFE state for the same period.
- Verify the correspondence of all the accessory functions, activating them in the different operating conditions.

4 MECHANICAL MOUNTING

The active and passive units must be installed with the relevant sensitive surfaces facing each other and the distance must be included within the operating range of the model used (see section 13).

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

The next step is the fine alignment, as shown in section 7 – “ALIGNMENT PROCEDURE”.



SG BODY series light curtains are provided without mounting brackets. It is possible to order separately the accessory kits of brackets described in the following paragraphs depending on the fastening mode required by the particular application. Please refer to section 14 – “ACCESSORIES”.

4.1 SIDE FIXING BRACKETS

As all the SG series safety light curtains, the most common way to fix the product is by taking advantage from the two grooves along the sides of the aluminum case, the 90° bracket system is made by ST-5090 + IM-5018 and screws (see Figure 22).

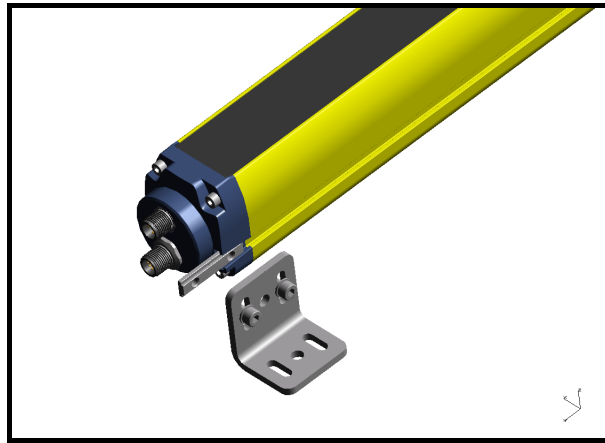


Figure 22

The ST-5090 is a 4 mm thickness sheet metal. The IM-5018 is a double nut M5 tapped obtained by machine tooling (for further details and recommended mounting positions see also paragraph 14.1).

4.2 ROTATING BRACKETS

The rotating fixing has been improved and revised due to the size of the caps. It is possible to ensure a 360° rotation around the dedicated cylindrical surfaces designed on the caps. To carry out this procedure, employ the ST-5089, 4 mm thickness sheet metal with a special, dedicated shape. The screw to fix this bracket is the same one used to fix the closing caps, with an M4 nut (see Figure 23).

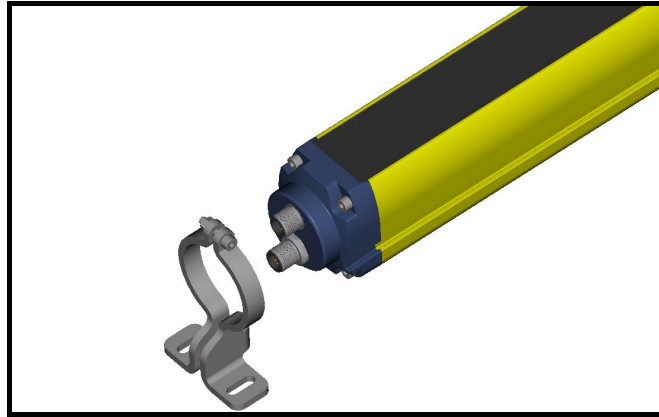


Figure 23

4.3 BOTTOM FIXING BRACKETS

With the SG BODY series has been implemented a new kind of bracket fixing, by using the third groove, on the bottom side of the housing, that allows to use whether the 90° bracket ST-5090 or the new ST-5093 and, in both the cases, the same IM-5018 and screws seen before.

This kind of fixing is also very versatile in order to assembly the product into the new Protective Stands mechanical armor.

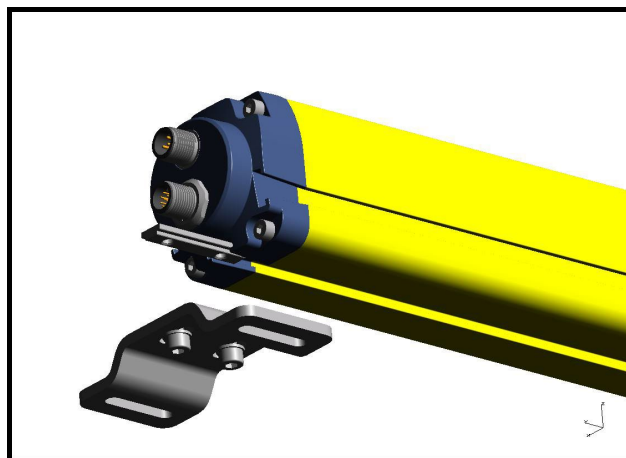


Figure 24

The ST-5093 is a 4 mm thickness sheet metal as well. For further details and recommended mounting positions see also paragraph 14.1.

4.4 VIBRATION DAMPERS

In case of applications with particularly strong vibrations, vibration dampers together with mounting brackets are recommended to reduce the impact of the vibrations (see Figure 24).

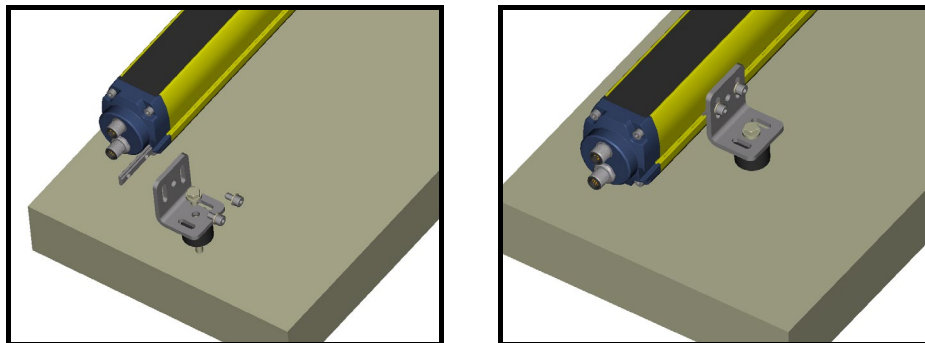


Figure 25

4.5 MECHANICAL MUTING ARMS MOUNTING

To mount the Muting arms on both the “L” and “T” version, use the fixing bracket shown in Figure 26.

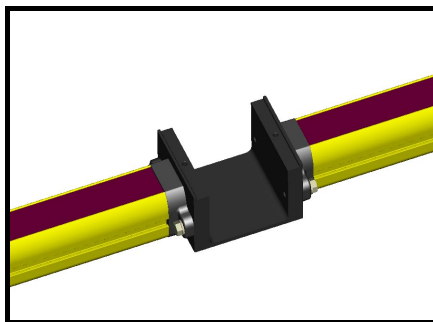


Figure 26

This fixing bracket guarantees the perfect alignment of the arms and the perpendicularity to the main unit. Position the bracket on the main unit, after having mounted the arm or arms, as shown in Figure 27.

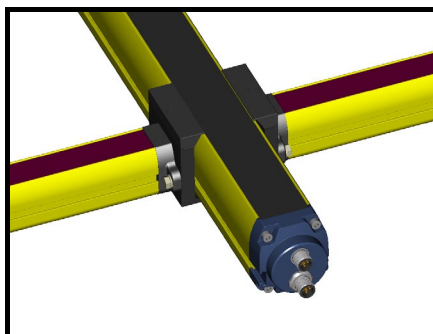


Figure 27

Verify the correct functioning position and block the group using the two plates and the screws and tightening them with a CH.2.5 Allen key.

- In the “L” version mount the arms in order to intercept the object before entering in the light curtain sensitive area.
- The two arms have to be mounted in order to be the most parallel and aligned possible. The sensors have default alignment, but the rotation around the main arm can be further adjusted by regulating the specific fixing bracket.
- In critical applications due to the presence of strong vibrations, the arms have to be fixed using the specific fixing brackets (Figure 27). The Muting arms can be adjusted vertically according to the application and to the connecting cable lengths (typical range is 14 cm).

In presence of strong vibrations fixing brackets (see paragraph 4.1) for the Muting arms mounting are compulsory (Figure 28), which are optional in normal working conditions.

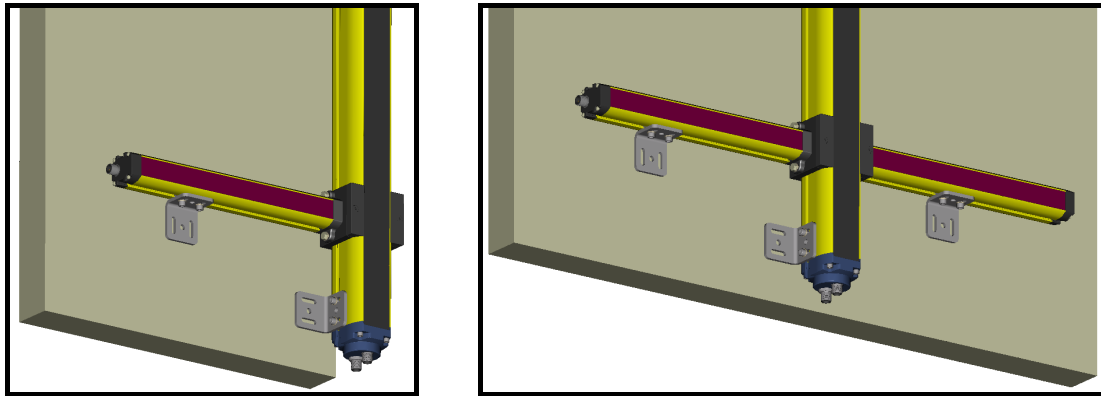


Figure 28

4.5.1 Mechanical arm mounting (retro-reflex)



The following aspects have to be considered during the mechanical arm mounting for the “L” and “T” light curtain models:

- Mount the arm with the active Muting sensors on the active unit and the arms with the reflectors on the passive unit.
- The use of retro-reflex arms for the Muting function limits the maximum operating distance to 3 meters.

5 ELECTRICAL CONNECTIONS AND CONFIGURATION

All electrical connections to the emitting and receiving units are made through male M12 connectors, located on the lower part of the two units.

For active unit M12 12-poles and a M12 5-poles connectors are used.

A closing cap coupled with the top cap of the RX unit can be unscrewed to access dip-switches slot. By means of internal dip-switches the user can set-up some functions, as described in paragraph 5.5.

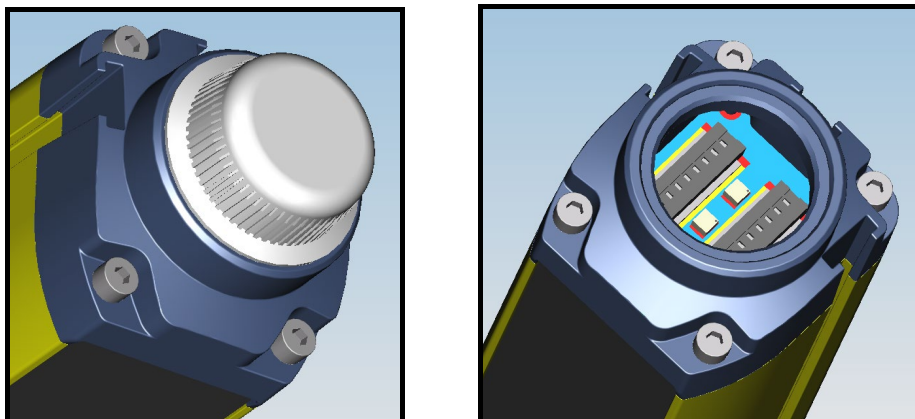


Figure 29

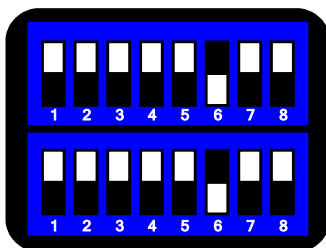
5.1 IMPORTANT NOTES FOR INSTALLATION

For the correct functioning of the SG BODY series safety light curtains, the following precautions regarding the electrical connections have to be respected:

- Do not place connection cables in contact with or near high-voltage cables and/or cable undergoing high current variations (e.g. motor power supplies, inverters, etc.);
- Do not connect in the same multi-pole cable the OSSD wires of different light curtains;
- The device is already equipped with internal overvoltage and overcurrent suppression devices. The use of other external components is not recommended.

5.2 MINIMAL CONNECTION

Dip switches configuration: EDM disabled

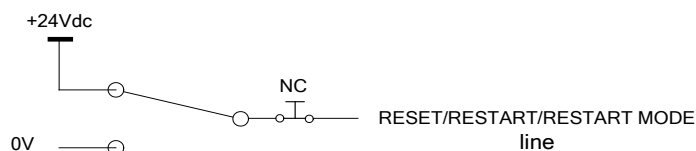


Dip switches n°1,2,3,4,5,7,8: ON

Dip switches n°6: OFF

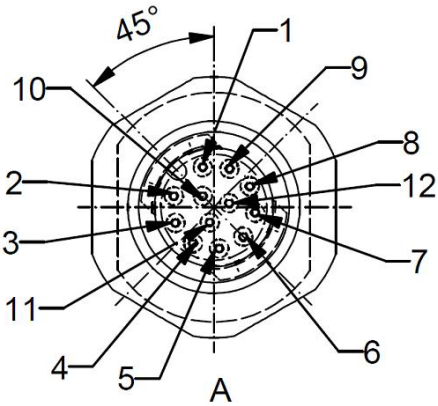
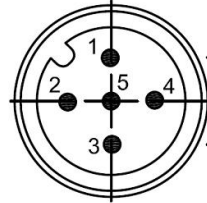
Wires configuration: automatic restart

Power supply: 0V, 24V

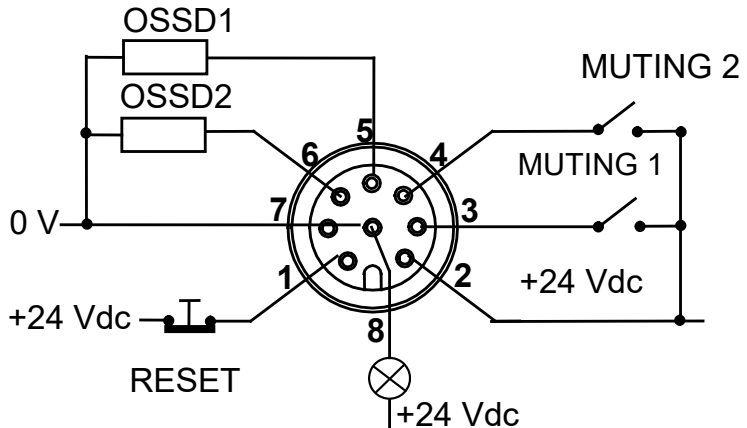


OTHER lines: floating

5.3 SG4-RB...-W MODELS ELECTRICAL CONNECTIONS

<u>RECEIVER (RX)</u>	
	
M12 12 POLES: BROWN = 24V BLUE = 0V WHITE = RESET/RESTART/ RESTART MODE GREEN = OVERRIDE1 PINK = OSSD2 YELLOW = EDM BLACK = MUTING ENABLE GREY = OSSD1 RED = OVERRIDE2 VIOLET = LAMP INPUT GREY-PINK = OVERRIDE STATUS RED-BLUE = EARTH	M12 5 POLES: BROWN = 24V WHITE = MUTING 2 BLUE = 0V BLACK = MUTING 1 GREY = N.C.

5.4 SG4-RB...-N MODELS ELECTRICAL CONNECTIONS

<u>RECEIVER (RX)</u>	
	
M12 8 POLES: WHITE = START / RESET / EDM / OVERRIDE BROWN = +24 VDC GREEN = MUTING YELLOW = MUTING 2 GREY = OSSD1 PINK = OSSD2 BLUE = 0 V RED = MUTING LAMP	

5.5 COMPLETE DIP-SWITCHES CONFIGURATION



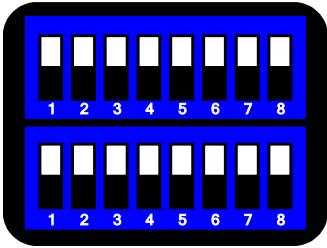
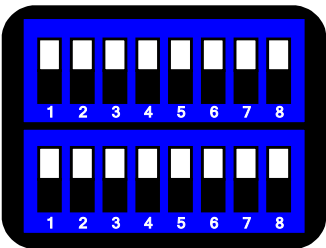
The device does not accept configuration changes during normal functioning. A change is accepted only beginning from the successive powering of the device. Particular attention has to be taken during the configuration dip-switch management and use.



Muting time-out “∞” does not comply with the requirements of IEC 61496-1. Therefore, all possible risks must be considered and related precautions undertaken before selecting the “∞” option.



For RX side the top and bottom dip-switches must be configured in the same manner. The “ON” position is the default.

SG-RB...-W			SG-RB...-N		
					
	ON	OFF		ON	OFF
Dip switches n°1: Muting timeout	10 min	∞	Dip switches n°1: Muting timeout	10 min	∞
Dip switches n°2: Muting T/L	T	L	Dip switches n°2: Muting T/L	T	L
Dip switches n°3: Muting filter	Disabled	Enabled	Dip switches n°3: Muting filter	Disabled	Enabled
Dip switches n°4: Override restart	Manual	Automatic	Dip switches n°4: Override restart	Manual	Automatic
Dip switches n°5: Override mode	Maintained	Impulsive	Dip switches n°5: not used	-	-
Dip switches n°6: EDM enable	EDM on	EDM off	Dip switches n°6: EDM enable	EDM on	EDM off
Dip switches n°7: not used	-	-	Dip switches n°7: Restart Mode	Automatic	Manual
Dip switches n°8: not used	-	-	Dip switches n°8: not used	-	-

5.6 RESTART MODE AND RESET/RESTART BUTTON CONNECTION FOR SG-RB...-W MODELS

The Restart mode and Reset/Restart wire must be connected through a N.C. button to the 0V or 24V from the power supply of the ESPE to select, respectively, manual restart or automatic restart.

The Reset/Restart wire can be used to enter alignment function when N.C. button is pressed at start-up.



The RESET/RESTART button must be located in such a way that the operator can check the protected area during any reset operation (see section 3).

5.7 EXTERNAL RELAYS CONNECTION

Example: connection to the safety relay.

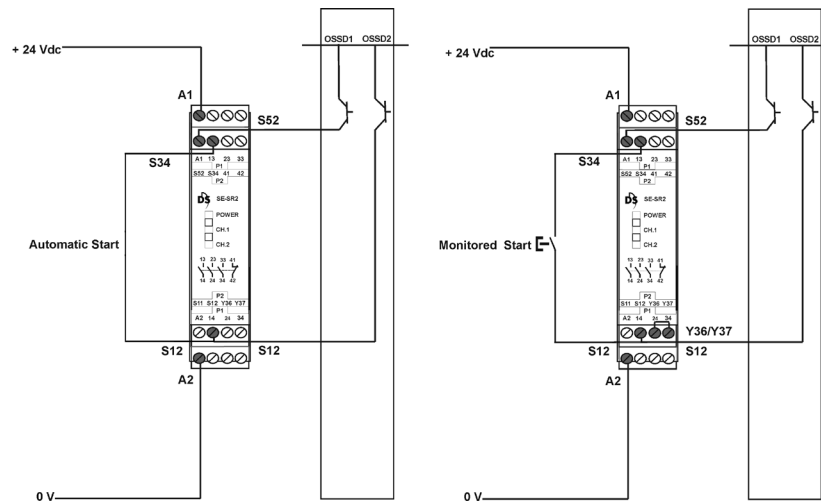


Figure 30

The previous 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 must be used separately (Figure 30), conforming to the plant's safety requirements.
- If one of these configurations is erroneously used, the device enters the output failure condition.

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

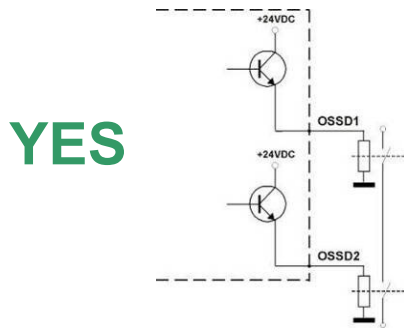


Figure 31

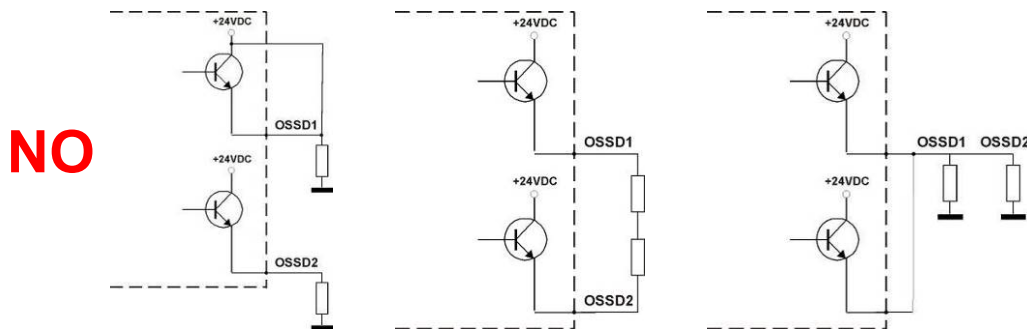


Figure 32

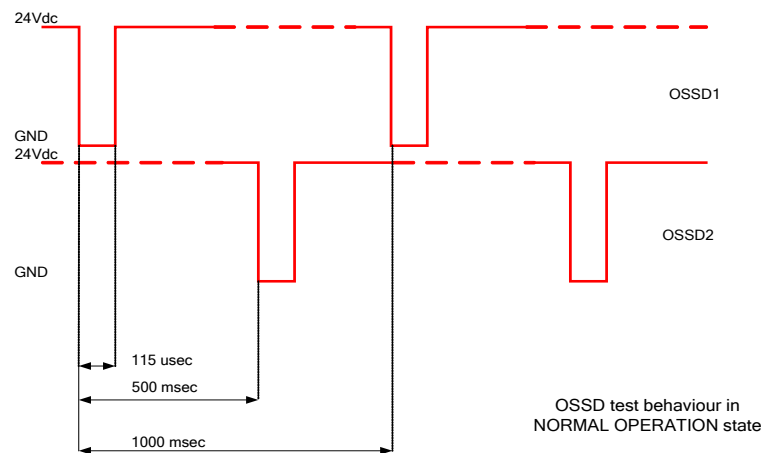


Figure 33

5.8 EDM CONTROL CONNECTION

The EDM wire has to be connected to a 24 Vdc normally closed contact, before powering. The monitoring function, if selected, is not activated if at powering the wire is not correctly connected; in this case the light curtain enters in a failure condition.

5.9 MUTING ENABLE INPUT CONNECTION FOR SG-RB...-W MODELS

The MUTING ENABLE wire must be connected to 0V or 24V from the power supply of the ESPE, respectively, to enable or to disable Muting function. Floating line level is the same as 0V.

5.10 MUTING ARMS OR MUTING FUNCTION INPUTS CONNECTION

Muting arms or external Muting sensors can be connected to ESPE by mean of the committed M12 connector. Read see par. 6.6 – “Muting function” for the use and the positioning of the activating sensors.

5.11 OVERRIDE CONNECTION FOR SG-RB...-W MODELS

The Override1 wire must be connected through a N.O. button to the 24 Vdc from the power supply of the ESPE; Override 2 wire must be connected through a N.O. button to the 0V from the power supply of the ESPE. If the wires are not correctly connected, the light curtain enters in a failure condition.



The OVERRIDE button/key must be located in such a way that the operator can check the protected area during any test.

5.12 EARTH CONNECTION

The SG BODY safety light curtain has to be connected as a protective class III equipment (SELV/PELV power supply), like in the table.

Electrical protection	layout connection	note
class III	SELV/PELV	---

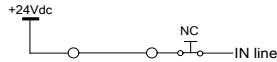
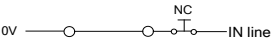
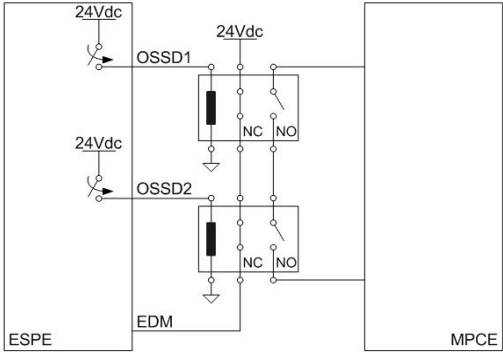
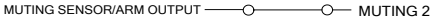
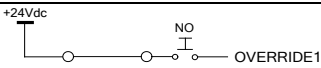
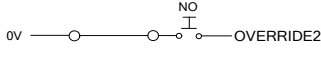
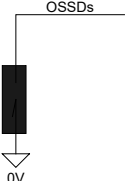
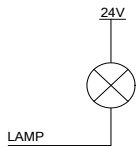


For the SG4-RB...-W models, a functional earth is available on a line of the M12 connector on TX and RX equipment.

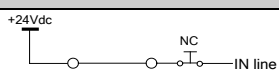
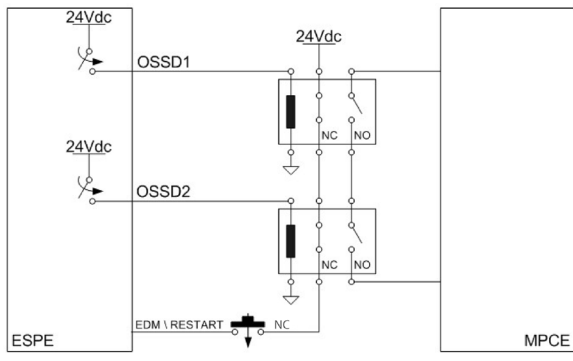
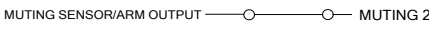
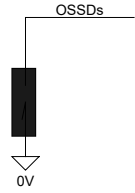
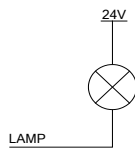
User can optionally connect or leave floating the functional earth in order to achieve in own application a best compliance with electromagnetic Interferences.

6 FUNCTIONING MODE

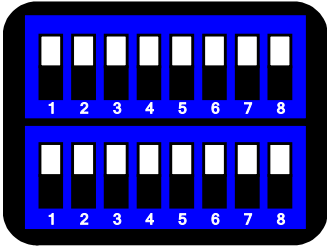
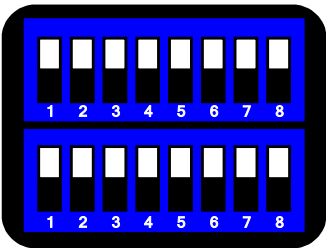
6.1 SG4-RB...-W CONFIGURATION

LINE	LAYOUT CONNECTION	BEHAVIOUR
RESET/RESTART/ RESTART MODE		AUTOMATIC RESTART
RESET/RESTART/ RESTART MODE		MANUAL RESTART
EDM		(EDM ENABLE: active)
MUTING ENABLE		Muting enabled
OVERRIDE STATUS		
MUTING1		
MUTING2		
OVERRIDE1		
OVERRIDE2		
OSSDs		
LAMP INPUT		

6.2 SG-RB...-N CONFIGURATION

LINE	LAYOUT CONNECTION	BEHAVIOUR
RESET/RESTART/ EMD/ OVERRIDE		
EDM		(EDM ENABLE: active)
MUTING1		
MUTING2		
OSSDs		
LAMP INPUT		

The following table shows factory default configuration for dip-switches

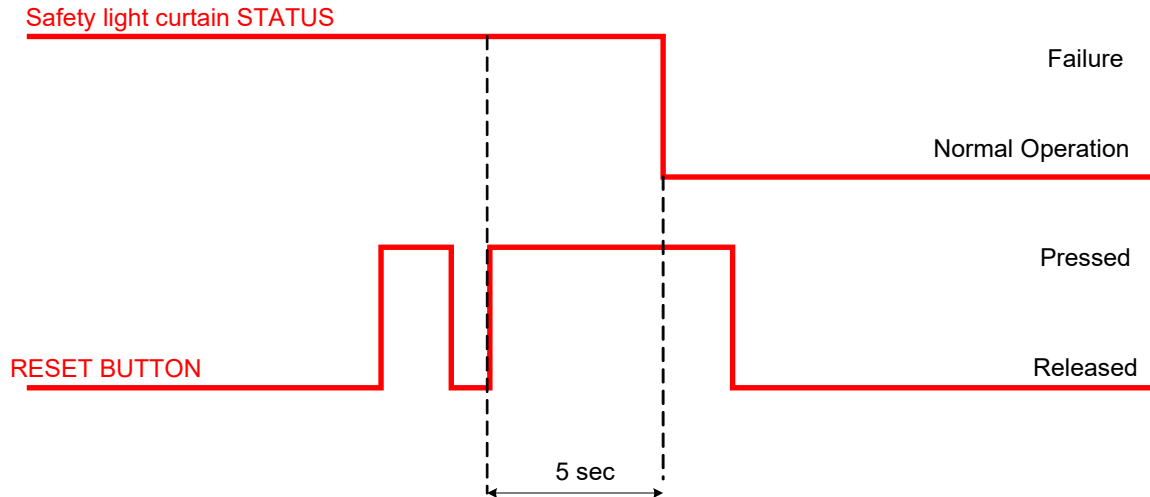
SG-RB...-W			SG-RB...-N		
					
	ON	OFF		ON	OFF
Dip switches n°1: Muting timeout	10 min	∞	Dip switches n°1: Muting timeout	10 min	∞
Dip switches n°2: Muting T/L	T	L	Dip switches n°2: Muting T/L	T	L
Dip switches n°3: Muting filter	Disabled	Enabled	Dip switches n°3: Muting filter	Disabled	Enabled
Dip switches n°4: Override restart	Manual	Automatic	Dip switches n°4: Override restart	Manual	Automatic
Dip switches n°5: Override mode	Maintained	Impulsive	Dip switches n°5: not used	-	-
Dip switches n°6: EDM enable	EDM on	EDM off	Dip switches n°6: EDM enable	EDM on	EDM off
Dip switches n°7: not used	-	-	Dip switches n°7: Restart Mode	Automatic	Manual
Dip switches n°8: not used	-	-	Dip switches n°8: not used	-	-

6.3 RESET FUNCTION

The RX light curtain has a RESET function that is activated consequently to an internal failure. The operator has to press the NC RESET button that resets the failure condition and thus the ESPE can return to a normal functioning behavior.

The button has to be kept pressed for at least 5 seconds in one of the following conditions:

- Output failure;
- Optic failure;
- EDM test function failure;
- Lamp failure;



If the error is not removed, the light curtain goes in the failure configuration (for all failures) again.



Note: The micro controller failure is a non-restorable failure. In this case is necessary a “turn OFF-turn ON action” to return to a normal behavior. This is also valid for the following failures:

- Restart selection failure
- Override connection failure
- Override sequence failure
- Dip switch failure

6.4 RESTART MODE SELECTION FUNCTION

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

ESPE standard operation can be reset to NORMAL OPERATION condition (OSSD safety contact closing condition, ➡) in two different ways:

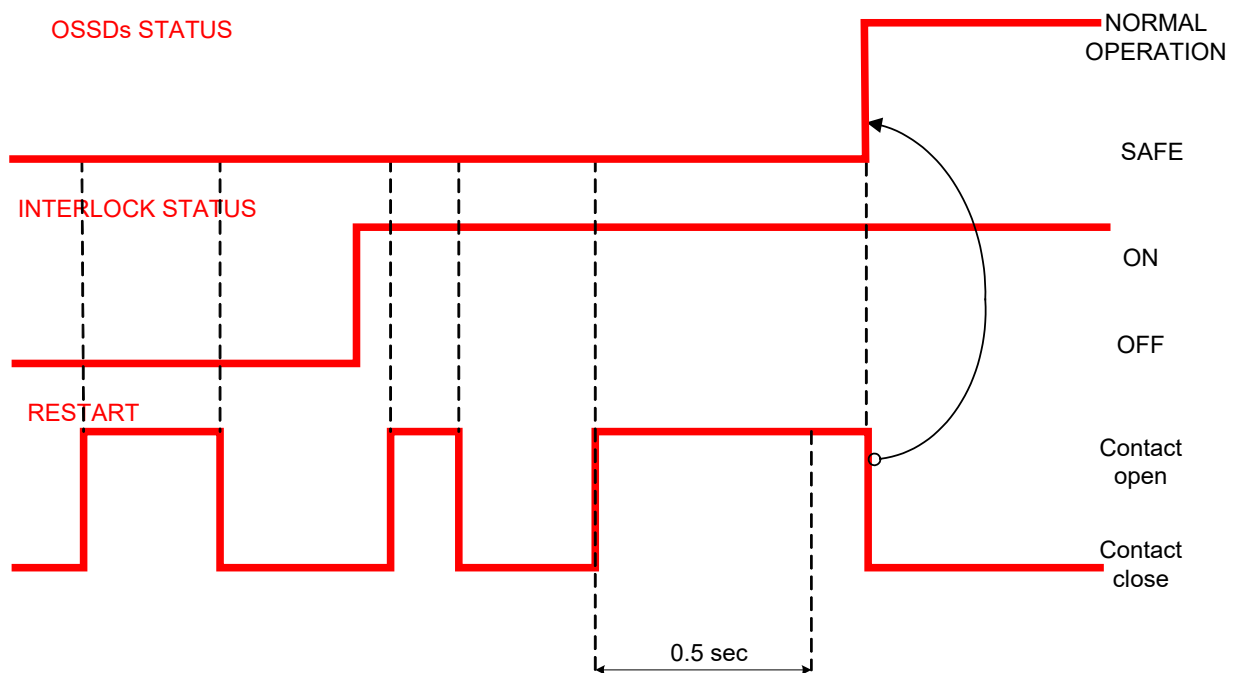
Automatic Restart: after activation, ESPE resets to NORMAL OPERATION condition once the object has been removed from the controlled area.

Manual Restart: after activation, ESPE resets to NORMAL OPERATION condition only once the Restart function has been enabled and provided that the object has been removed from the controlled area (see figure below). This condition, called interlock, is signaled on the display (see paragraph 0)

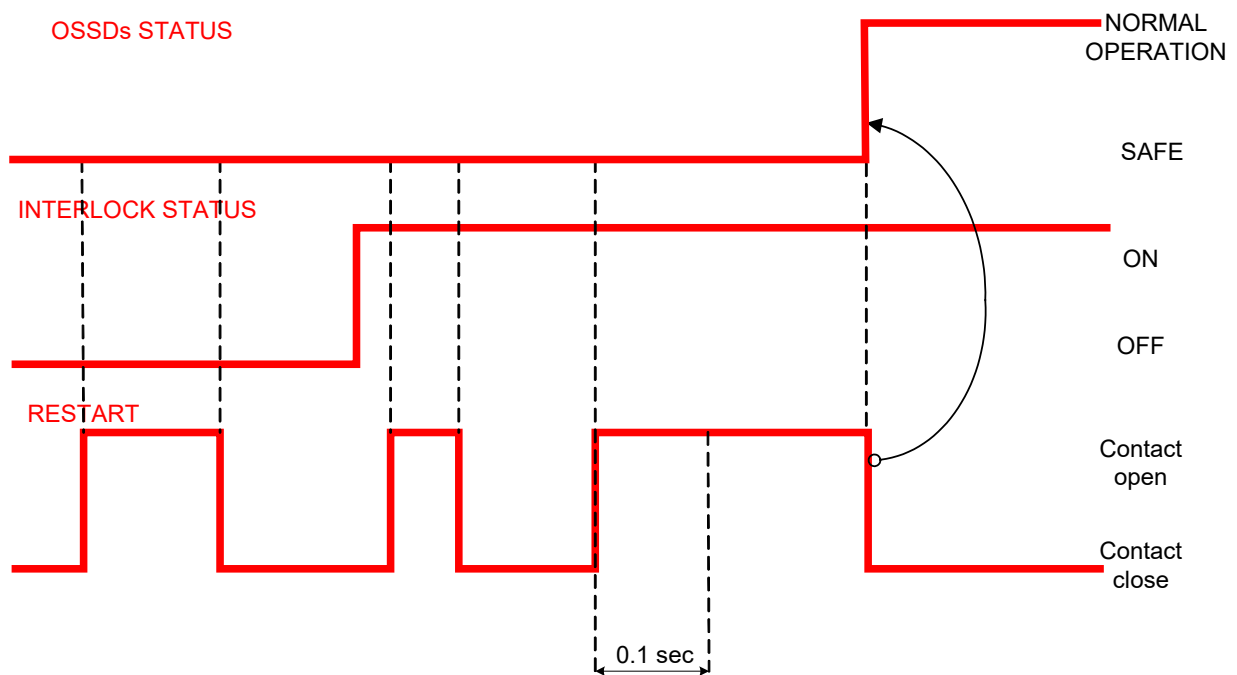


Carefully assess risk conditions and restart modes.
In applications protecting access to dangerous areas, the automatic restart mode is potentially unsafe if it allows the operator to pass completely beyond the sensitive area. In this case, the manual restart or, for example, the manual restart of the SE-SR2 relay (paragraph 5.7 – “External relays connection”) is necessary.

SG4-RB...-W Models Manual Restart Diagram



SG4-RB...-N Models Manual Restart Diagram



6.5 EDM FUNCTION

The light curtain has a function for monitoring actuation external devices (EDM). This function can be enabled or deactivated by dip-switches of RX device (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”).

The timing diagram below explains the relationship between the cause (OSSDs) and the effect (EDM), with the maximum permissible delay.

OSSDs STATUS

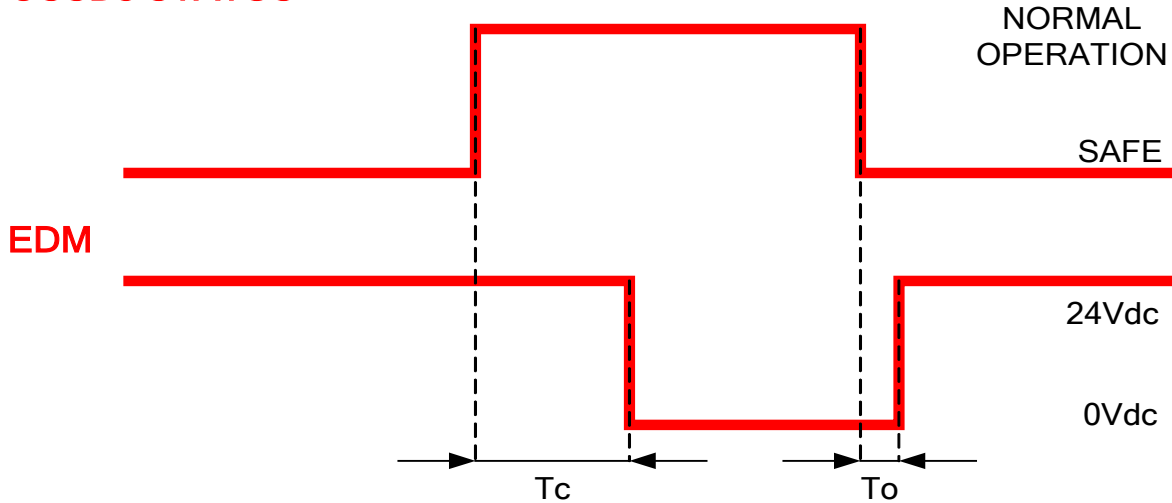


Figure 34

$T_c \leq 350$ msec time after the OSSD OFF-ON passage when EDM is carried-out;
 $T_o \leq 100$ msec time after the OSSD ON-OFF passage when EDM is carried-out.

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

6.5.1 SG4-RB...-W Models EDM Connection

EDM deactivated:

Disconnect or connect to 0V EDM input pin of RX connector.

EDM enabled:

Connect EDM input pin of RX connector (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”) to a 24 VDC normally closed contacts of the device to be monitored (see Figure 35).



Note: The decimal dot on the display shows that the function is enabled.

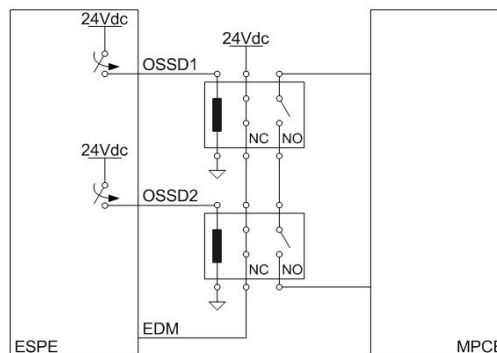


Figure 35 – Connection of EDM (for SG4-RB...-W models)

The function controls the NC contact switching according to the changes of the OSSD status.

6.5.2 SG4-RB...-N Models EDM Function and Connection

This function can be activated or deactivated with dip-switches 6.

To correctly use this function:

- activate it using the corresponding dip-switches;
- connect pin1 to +24 VDC through the normally closed contacts of the device to be monitored.

This function checks that the normally closed contacts switch state when the OSSD outputs change state.

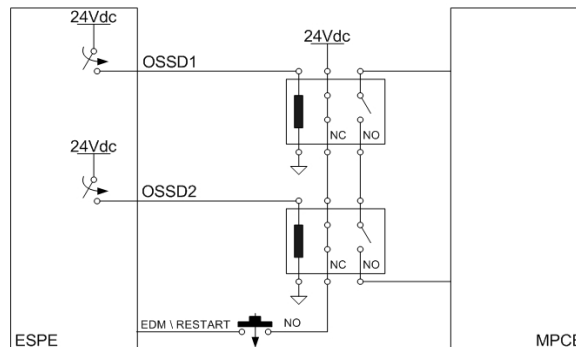


Figure 36 - Connection of EDM (for SG4-RB...-N models)

6.6 MUTING FUNCTION

This function can be enabled or deactivated by pin of RX connector (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”).

The Muting sensors must be able to recognise the passing material (pallets, vehicles, ...) according to the 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 OSSD outputs, according to particular operating requirements (Figure 37).

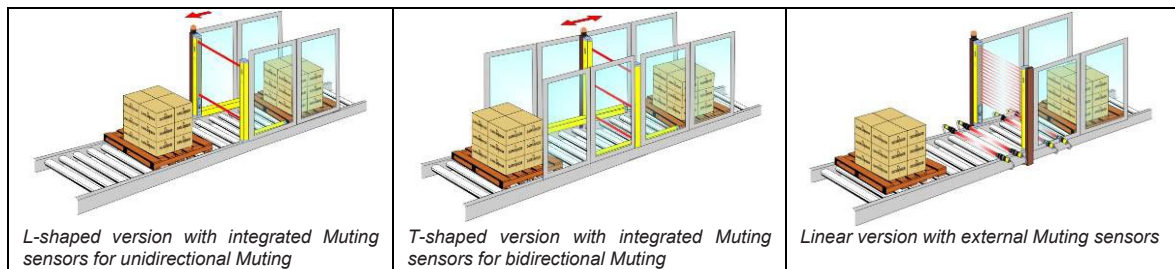


Figure 37

- The safety light curtain is equipped with two inputs (Muting1 and Muting2) for the activation of this function, according to the Standards in force.
- 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 system condition and therefore has to be used with the necessary precautions.
- If Muting1 and Muting 2 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.
- State of Muting is signaled by Muting Lamp integrated on the top of receiver side (see Figure 38). When the MUTING function is ON the LAMP becomes active. Contextually also LAMP output line (PIN 10 M12-12 poles) is driven.

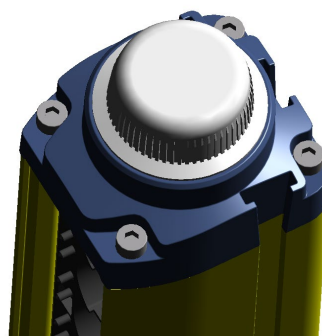
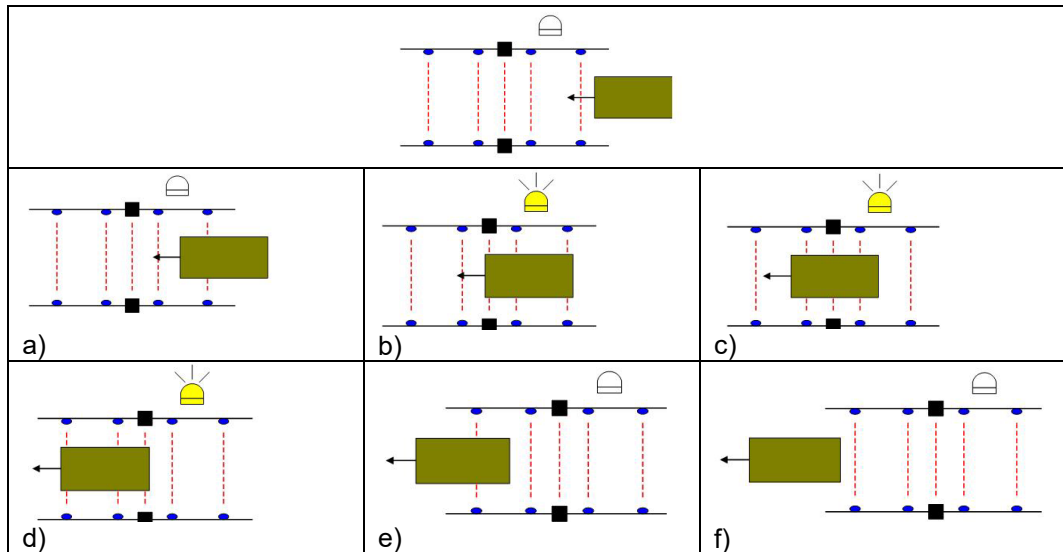


Figure 38

During the installation take care to place the lamps in an as visible as possible position.

If both the internal lamp and the external lamp are broken and/or not connected, the Muting request causes the opening of the safety contacts, the device is blocked in SAFE state and the failure is signaled (see par. 8.2).

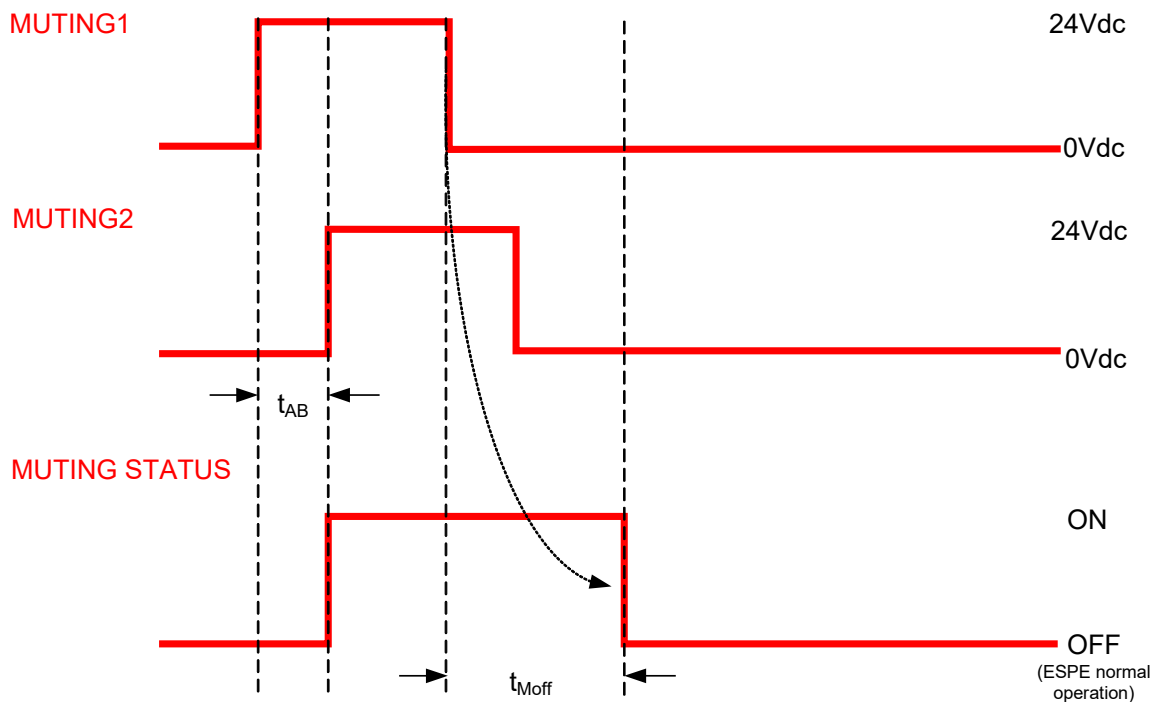
Next picture shows an example of Muting functioning:



6.6.1 Muting T/L selection function

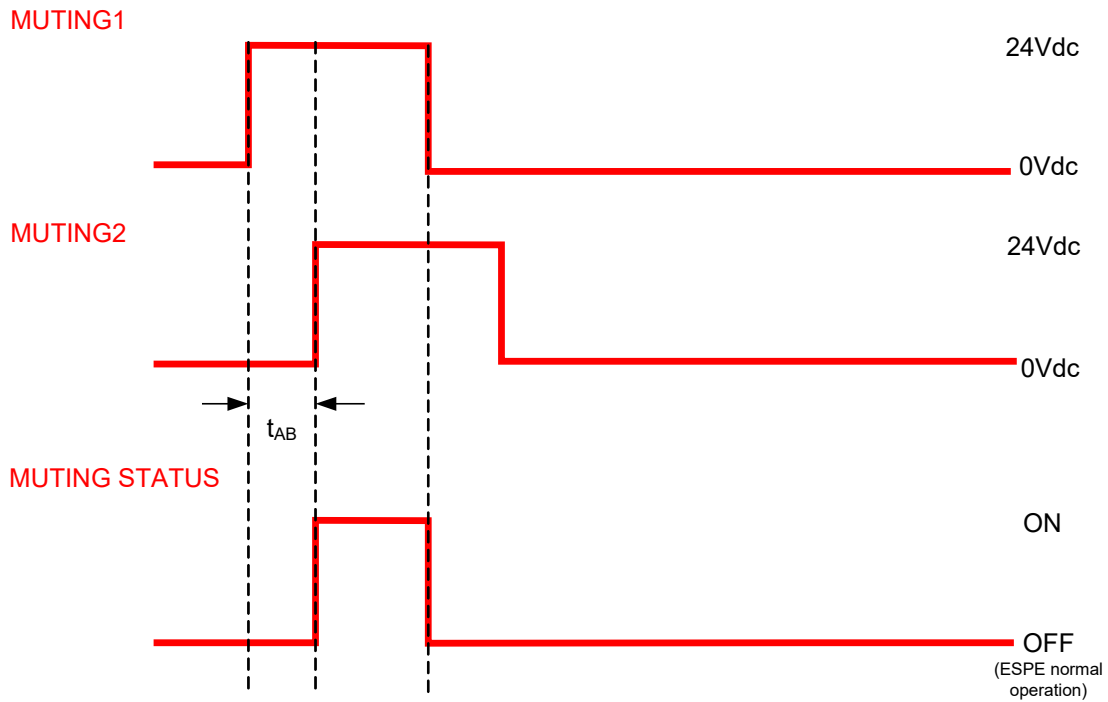
This function let the user select the requested configuration for muting sensors, and can be set by dip-switches of RX device (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”).

Temporal diagram of the Muting function for two-sensor configuration (“L-shaped” or crossed-beam versions)



As shown in the previous picture, t_{AB} indicates the interval of time between Muting1 and Muting2 activation (see paragraph 6.6.4 - “Installation mode of Muting sensors”). After a t_{Moff} interval of time between deactivation of Muting1, light curtain exits the muting status and returns in normal operation (see paragraph 6.6.4 - “Installation mode of Muting sensors”).

Temporal diagram of the Muting function for four-sensor configuration ("T-shaped" version)



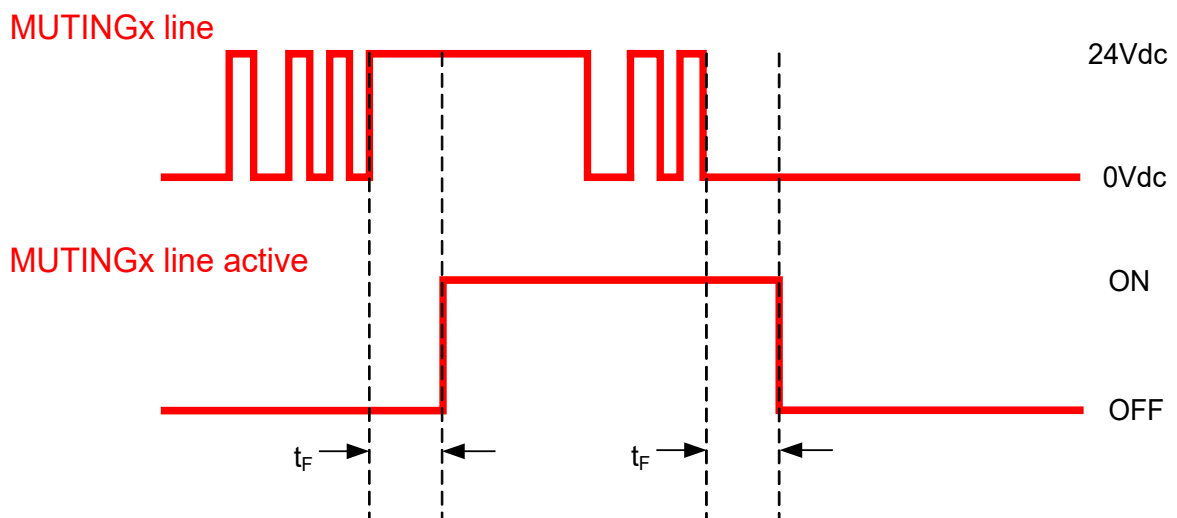
As shown in the previous picture, t_{AB} indicates the interval of time between MUTING1 and MUTING2 activation (see paragraph 6.6.4 - "Installation mode of Muting sensors"). In this case, when MUTING1 de-activates, light curtain exits the muting status and returns in normal operation.

6.6.2 Muting timeout selection function

This function let the user choose the muting timeout value between 10 minutes and infinite and can be set by dip-switches of RX device (see section 5 – "ELECTRICAL CONNECTIONS AND CONFIGURATION").

6.6.3 Muting low-pass filter function

The muting filter is a filter on the muting inputs; low-high or high-low transitions of MUTINGs signals are considered valid only if maintained for t_F seconds ($t_F \geq 0.1$ s), as shown in the following figure.



This function can be enabled using dip-switches of RX device (see section 5 – "ELECTRICAL CONNECTIONS AND CONFIGURATION").

6.6.4 Installation mode of Muting sensors



Select carefully the configuration, as a wrong configuration can cause the incorrect functioning of the Muting function and a reduction of the safety level.



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.

- The Muting request can be performed activating the Muting1 first and then the Muting2, or vice versa. In this case, the second activation should occur within 4 sec. after the first; otherwise the Muting will not be activated.
- Any Muting request cannot be made if the ESPE is in the SAFE condition (red LED is ON and the beams are interrupted).
- Figure 39 provides an installation example of a linear light curtain mounted on a conveyor, with the relative external Muting sensors.
- The A1, A2, B1, B2 Muting activation sensors temporarily inhibit the ESPE if a package passes between the sensors.
- The outputs of these sensors are connected to the Muting1 and Muting2 inputs of the receiving unit of the ESPE.
- The contacts of these sensors are controlled by the receiving unit.

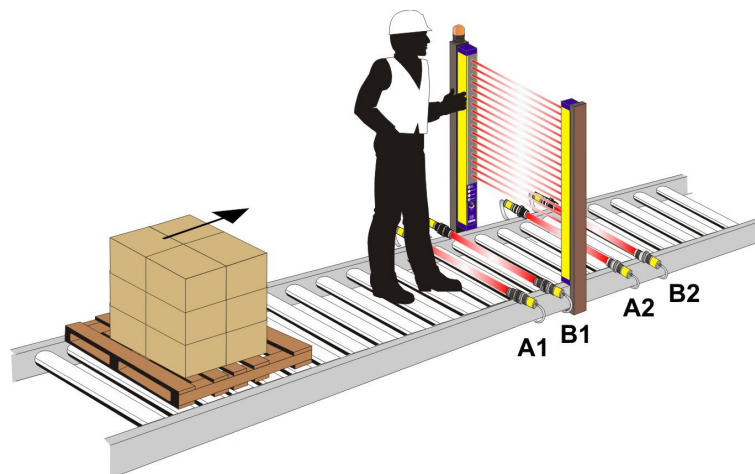


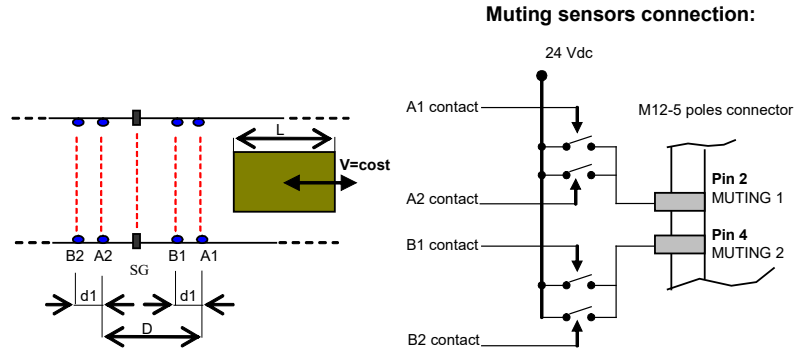
Figure 39

- Optoelectronic, mechanical, proximity sensors etc. can be used as Muting sensors, with closed contact in the presence of the object to be detected.

The following are some configuration examples when using the Muting function.

- **Application with 4 optoelectronic sensors: parallel-beam configuration**

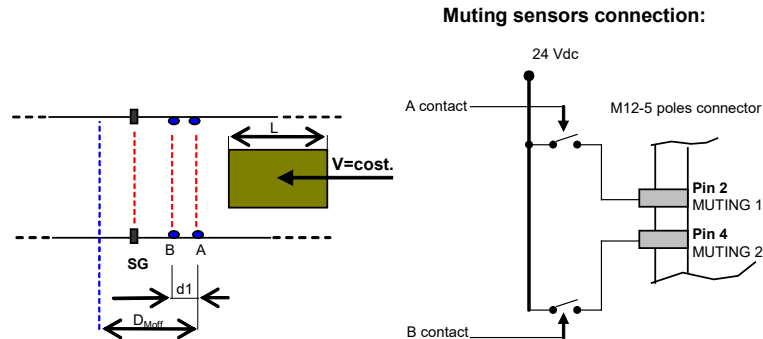
The solution is suitable for applications requiring bidirectional movements of objects. For correct functioning, position the dip-switches to select “T” configuration.



Symbol	Unit	Formula	Min	Typ	Max	Description
D	cm		L			Interaxis between sensors connected to the same Muting input
D₁	cm	$= V * t_{AB} * 100$	0.1			Interaxis between sensor A and sensor B
t_{AB}	sec	Compulsory condition	0.01		4	Activation time of the second sensor after first sensor activation (A→B) (B→A)
D_{OA}	cm		$d_1 + D$			Distance to respect between adjacent objects to obtain the correct Muting functioning
L	cm		D			Object dimension to activate the Muting function passing between the sensors
V	cm/sec	$= d_1 / t_{AB}$			250 (suggested)	Object speed to activate the Muting function passing between the sensors

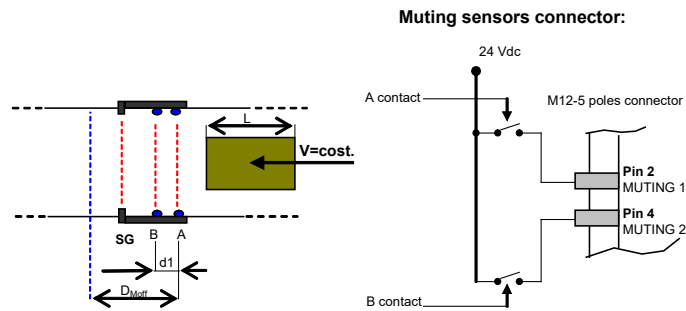
- **Application with 2 optoelectronic sensors: parallel-beam configuration**

The solution is suitable for applications requiring unidirectional movements of objects. For correct functioning, position the dip-switches to select "L" configuration. The reset of normal Muting functioning is obtained at a DMoff distance from sensor A.



Symbol	Unit	Formula	Min	Typ	Max	Description
D_1	cm	$= V \cdot t_{AB} \cdot 100$	0.1			Interaxis between sensor A and sensor B
D_{Moff}	cm	Compulsory condition		33		Distance from sensor A at which the Muting function is deactivated and the light curtain returns to normal functioning
t_{AB}	sec	Compulsory condition	0.01		4	Activation time of the second sensor after first sensor activation (A→B)
t_{Moff}	sec	$= D_{Moff} / V$	0.132 (at max. suggested speed)		8	Time period, referred to sensor A, after which the Muting function is deactivated and the light curtain returns to normal functioning
D_{OA}	cm	$= D_{Moff}$	49.5			Distance to respect between adjacent objects to obtain the correct Muting functioning
L	cm		d1			Object dimension to activate the Muting function passing between the sensors
V	cm/sec	$= d_1 / t_{AB}$	4.125		250 (suggested)	Object speed to activate the Muting function passing between the sensors

- **Application with L arm**



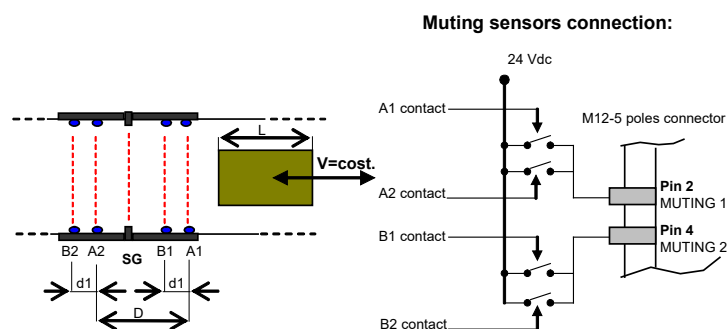
The L-configured solution with integrated Muting facilitates sensor installation and suits applications with unidirectional object passage.

For correct functioning, position the dip-switches to select “L” configuration.

The reset of normal Muting functioning is obtained at a DMoff distance from sensor A.

Symbol	Unit	Formula	Min	Typ	Max	Description
d_1	cm	Compulsory condition		16.5		Interaxis between sensor A and sensor B
D_{Moff}	cm	Compulsory condition		33		Distance from sensor A at which the Muting function is deactivated and the light curtain returns to normal functioning
t_{AB}	sec	Compulsory condition	0.01		4	Activation time of the second sensor after first sensor activation (A→B)
t_{Moff}	sec	$= D_{Moff} / V$	0.132 (at max. suggested speed)		8	Time period, referred to sensor A after which the Muting function is deactivated and the light curtain returns to normal functioning
D_{OA}	cm	$= D_{Moff}$	49.5			Distance to respect between adjacent objects to obtain the correct Muting functioning
L	cm		d_1			Object dimension to activate the Muting function passing between the sensors
V	cm/sec	$= d_1 / t_{AB}$	4.125		250 (suggested)	Object speed to activate the Muting function passing between the sensors

- Application with T arm



The T-configured solution with integrated Muting facilitates sensor installation and suits applications with bidirectional object passage.

For correct functioning, position the dip-switches to select “T” configuration.

The reset of normal Muting functioning is obtained at the deactivation of the A2 sensor (or B1 according to the object passage direction).

Symbol	Unit	Formula	Min	Typ	Max	Description
D	cm	<i>Compulsory condition</i>		34.5		Interaxis between sensors connected to the same Muting input
d ₁	cm	<i>Compulsory condition</i>		16.5		Interaxis between sensor A and sensor B
t _{AB}	sec	<i>Compulsory condition</i>	0.01		4	Activation time of the second sensor after first sensor activation (A1→B1) (B2→A2)
t _{Moff}	sec	= D / V	0.132 (at max. suggested speed)		8	Time period, referred to sensor A2(B1), after which the Muting function is deactivated and the light curtain returns to normal functioning
D _{oA}	cm		d ₁ + D = 51			Distance to respect between adjacent objects to obtain the correct Muting functioning
L	cm	= D	34.5			Object dimension to activate the Muting function passing between the sensors
V	cm/sec	= d ₁ / t _{AB}	4.125		250 (suggested)	Object speed to activate the Muting function passing between the sensors

6.7 OVERRIDE FUNCTION FOR SG4-RB-...-W MODELS

This function allows forcing a Muting condition when machine reset is necessary, even if one or more beams are interrupted by passing material.

The purpose is to clear the protected area of any material accumulated consequently to a failure in the working cycle.

For example, if a pallet stops in front of the protected area, the conveyor may not restart as the ESPE (that has one or more interrupted beams) opens the OSSD outputs and will not permit the controlled area clearance.

The activation of the Override function allows this operation.

6.7.1 Override function activation

- Override function cannot be activated when the light curtain is in SAFE state or NORMAL OPERATION state, but only when OVERRIDE condition is met. OVERRIDE condition is met when the light curtain is in SAFE state and at least one MUTING beam is obscured.
- When the requirements for the activation are met, a signaling is provided onto the LED display in order to inform users that an override is possible and required (see Figure 40).

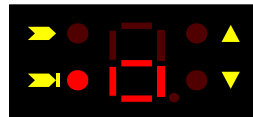


Figure 40

Two input lines are provided for the activation of the override function, Override1 and Override2 that must be connected to +24 Vdc and to 0 Vdc respectively by means of two normal open contacts (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”).

Standard requires the use of spring return hold-to-run devices or secure momentary action push buttons, located so that it will not be possible to enter the hazardous zone whilst maintaining the action on devices.

Override function can be actuated closing both contacts: whatever contact can be activated first.

The maximum out-of-sync interval time allowed is 400 ms, while the minimum one is 0 ms, as shown in the timing diagram of Figure 42.

While override is actuated, the integrated lamp will be blinking.

State of Override is signaled by the Override Lamp integrated on the top of receiver side (see Figure 41).

When the Override function is ON the LAMP output signal is driven.

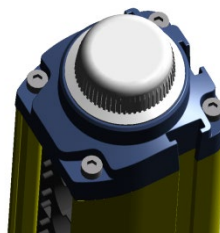


Figure 41

During the installation take care to place the lamps in an as visible as possible position.

If both the internal lamp and the external lamp are broken and/or not connected, the Override request causes the opening of the safety contacts, the device is blocked in SAFE state and the failure is signalled (see par. 8.2)

Override function will automatically terminate when one of the following condition will be given:

- all the muting sensors are de-actuated (*);
- the pre-determined time limit has expired;
- the requirements for actuation are not met any more (at least one override input line is deactivated).

(*) This is true for light curtains configured as T Muting. For light curtains configured as L Muting, override will terminate when muting sensors are de-actuated AND the light curtain's beams are free.

- Keep the button pressed until the clearance of the protected area has been completed.
- The maximum length of the Override function is 120 sec. After that time, the ESPE returns to NORMAL OPERATION, even if the OVERRIDE button is pressed. Obviously, if the button is released within the 120 seconds, the Override function stops immediately.
- When override is de-actuated, the light curtain will return into the NORMAL OPERATION.

All possible fault conditions at runtime are shown below.

Fault	Cause	Action
Contacts out-of-sync: when trying to actuate the override function, the activation timer expires.	A shortcut to VDC or GND may be present on one of the override input lines or a contact may be defective.	Override is not actuated: the fault is signalled by the user interface (see Figure 43) This is not a lockout condition: the override can be run after fixing the fault.

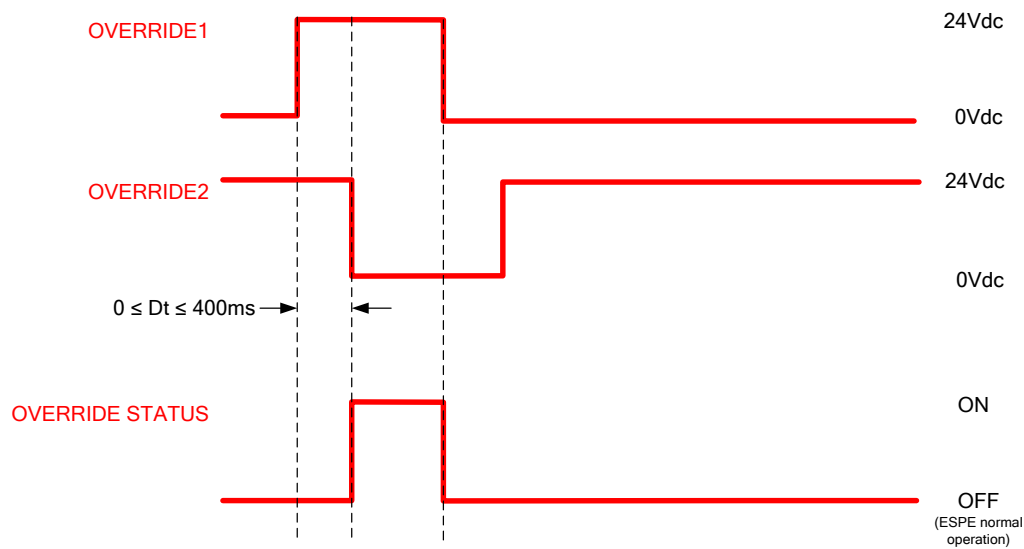


Figure 42 - Temporal diagram of the Override function

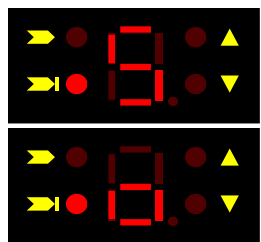


Figure 43 - Override sequence failure

6.7.2 Override input mode function

This function let the user choose, setting dip-switches of RX device (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”), the input mode for override lines, and in particular select impulsive Override mode.



The Edge Triggered Override function provides that the Override state remains active even if the related activation buttons are released.

The device exits the Override state when one of the following events happens:

- the muting sensors are free (T-Muting, Figure 44), or the muting sensor are deactivated and the beams of the light curtain are free (L-Muting, Figure 45).
- The time-out expires (Figure 46).
- For this reason, all possible risks must be considered and related precautions undertaken.

It is recommended that:

- all control operations must be assigned only to a well-trained and skilled personnel;
- the user assigned to the actuation of the override function, must be able to work in a condition of maximum surveillance and visibility of the whole area.

When Override status ends, the light curtain returns to normal operation.

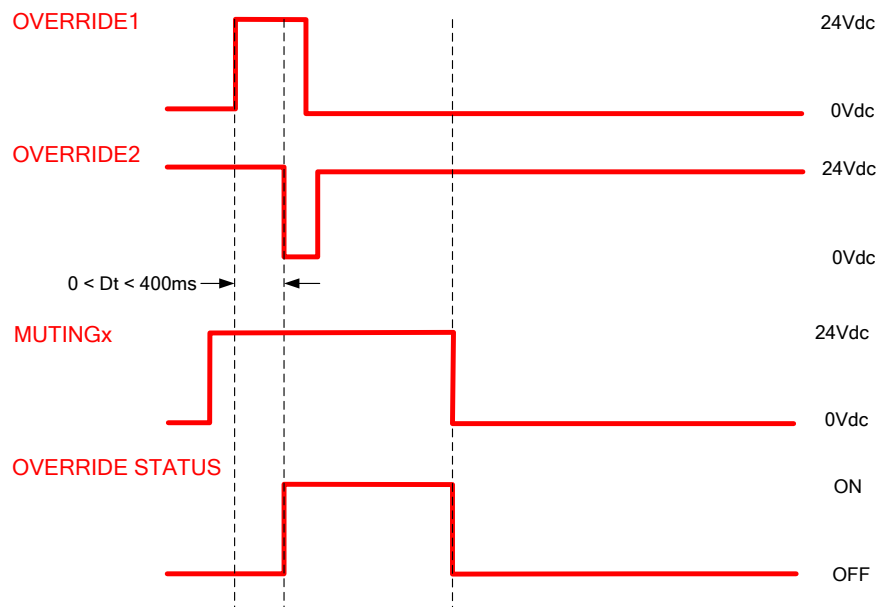


Figure 44

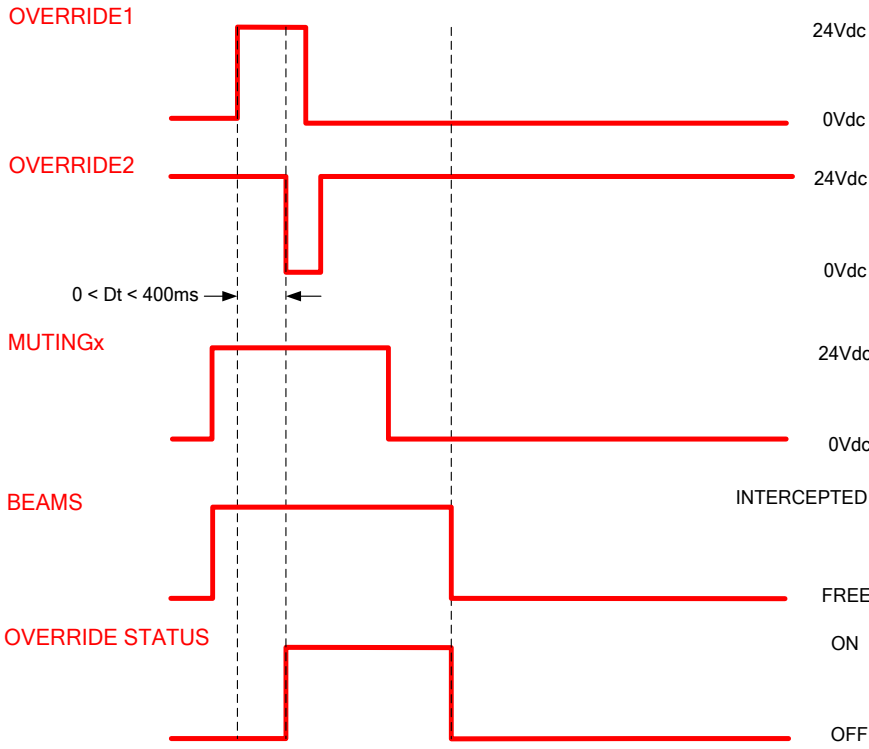


Figure 45

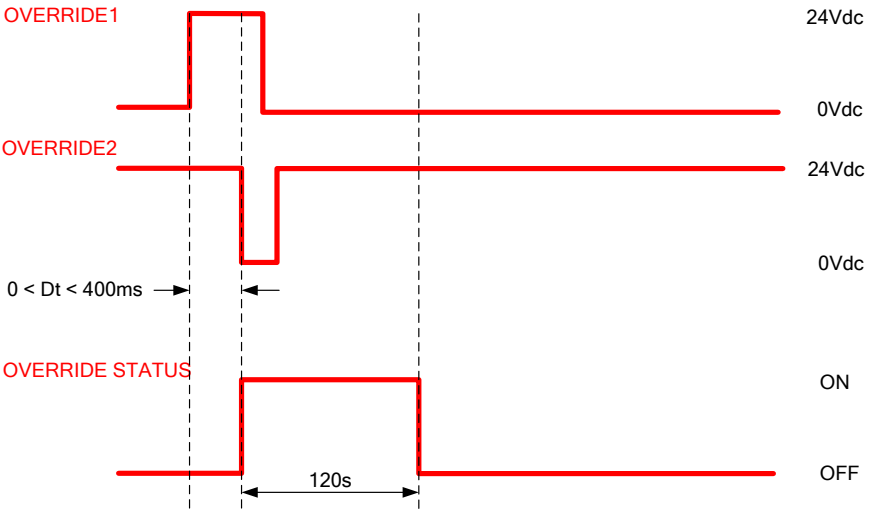


Figure 46

6.7.3 Override restart mode function

This function let the user choose, setting dip-switches of RX device (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”), the restart mode after Override when ESPE is configured in manual restart mode, and in particular to force automatic restart mode of light curtain as shown in Figure 47.

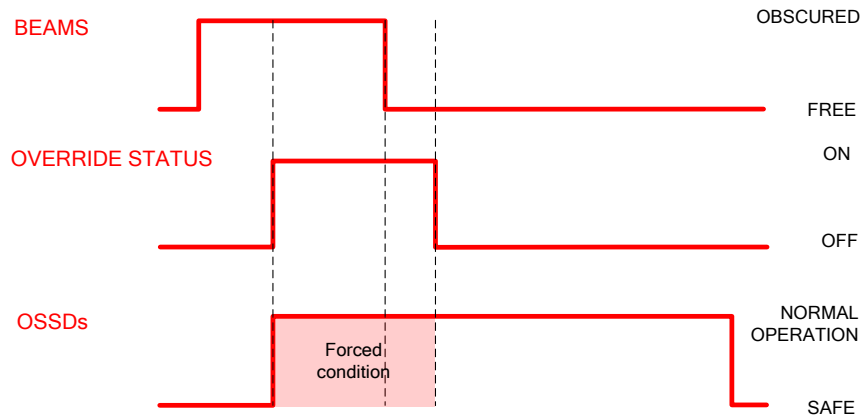


Figure 47



Override with automatic restart function, allows to restart automatically the normal working of the curtain (normal operation condition) when the detection area (curtains + sensors) is cleared.

This function does not comply with the requirements of IEC 61496-1, because it is a forcing of the safety condition.

For this reason, all possible risks must be considered and related precautions undertaken.

It is recommended that:

- all control operations must be assigned only to a well-trained and skilled personnel;
- the user assigned to the actuation of the override function, must be able to work in a condition of maximum surveillance and visibility of the whole area.

6.7.4 Override status

When the device enters the Override status, OVERRIDE STATUS PNP output line provided on M12 12 RX connector (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”) switches from 0Vdc to 24Vdc, providing electronic information to the user.

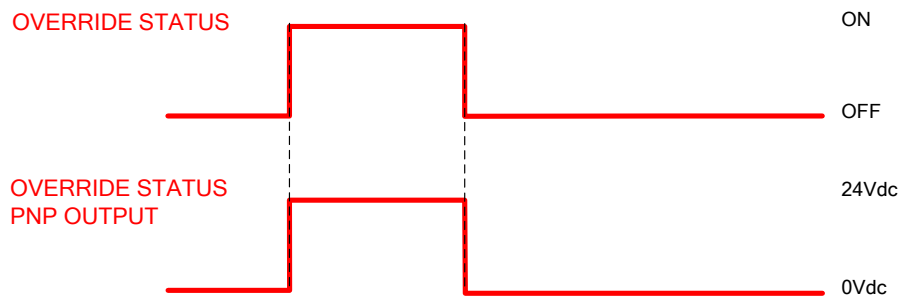


Figure 48

6.8 OVERRIDE FUNCTION FOR SG4-RB-...-N MODELS

6.8.1 Override function activation



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 integrated lamp on the top of the receiver is on and the lamp output (pin 8) is driven.
- If both the integrated lamp and the external lamp are 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.

6.8.2 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.
- If the AOPD is in Automatic Reset, the OSSD outputs remain on after the end of the override.
- If the AOPD is in Manual Reset, it is possible to choose between a Manual Reset and an Automatic Reset for the Override function.

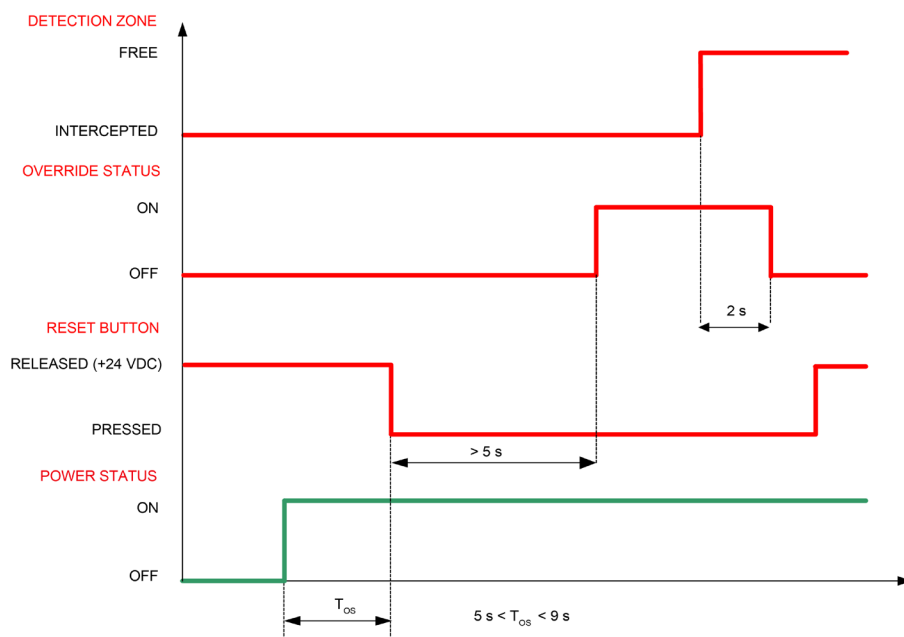


Figure 49 Startup Override activation and timings

6.8.3 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 integrated muting lamp flashes. So does the external lamp if connected.
- If the AOPD is in Automatic Reset, the OSSD outputs remain on after the end of the override.
- If the AOPD is in Manual Reset, it is possible to choose between a Manual Reset and an Automatic Reset for the Override function

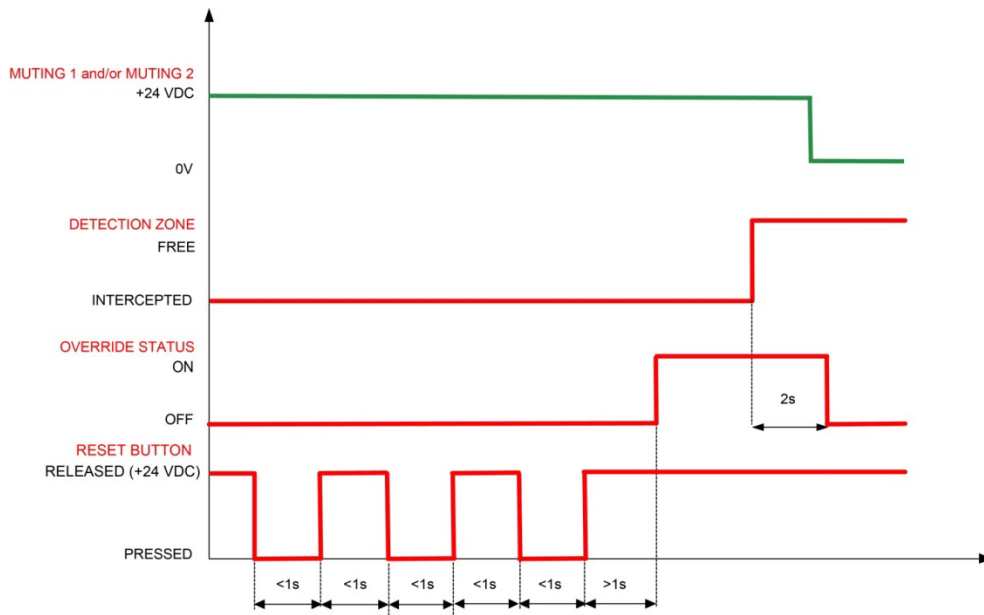


Figure 50 Runtime Override activation and timings

6.8.4 Override restart mode function

This function let the user choose, setting dip-switches of RX device (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”), the restart mode after Override when ESPE is configured in manual restart mode, and in particular to force automatic restart mode of light curtain as shown in Figure 47.

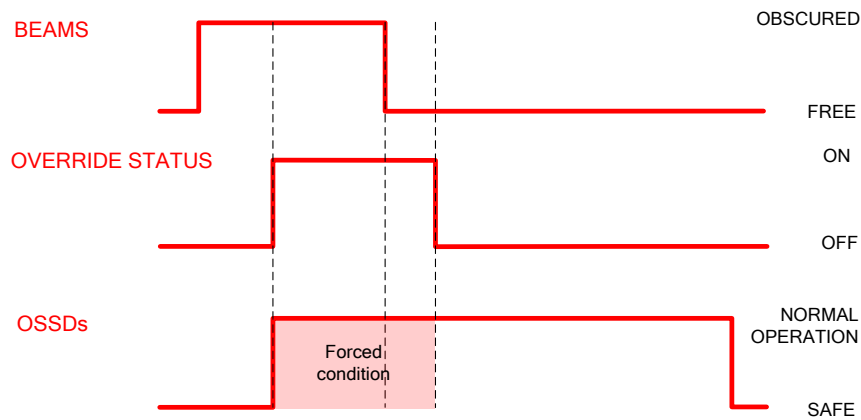


Figure 51



Override with automatic restart function, allows to restart automatically the normal working of the curtain (normal operation condition) when the detection area (curtains + sensors) is cleared.

This function does not comply with the requirements of IEC 61496-1, because it is a forcing of the safety condition.

For this reason, all possible risks must be considered and related precautions undertaken.

It is recommended that:

- all control operations must be assigned only to a well-trained and skilled personnel;
- the user assigned to the actuation of the override function, must be able to work in a condition of maximum surveillance and visibility of the whole area.

6.9 ALIGNMENT FUNCTION

SG BODY series light curtains are provided with a system which informs the user about alignment quality. The ALIGNMENT function also can be activated by simply pressing the external normally closed push-button link to RESET/RESTART/RESTART MODE line (see section 5 – “ELECTRICAL CONNECTIONS AND CONFIGURATION”) for at least 0.5 sec at start-up, as shown in the timing diagram of Figure 52.

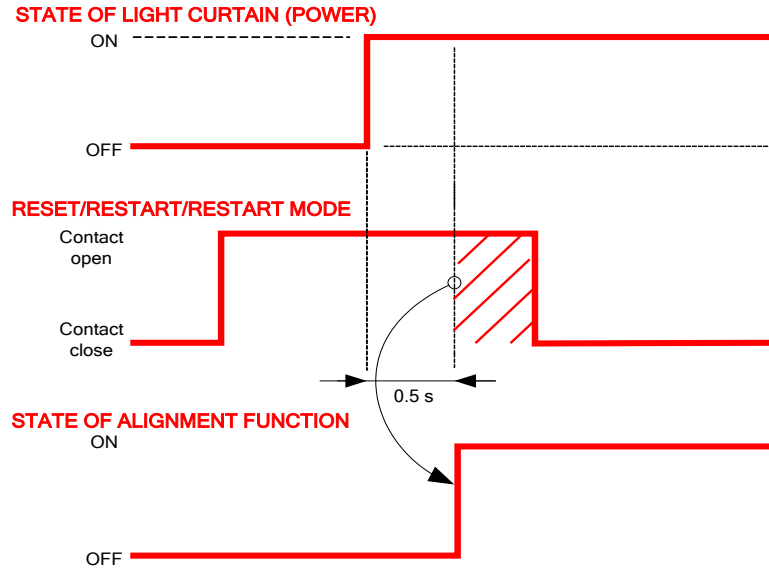


Figure 52

When a good state of alignment is reached a power OFF and a power ON operation carry back the ESPE in normal operation (OSSDs in ON state). In the alignment mode the OSSDs are OFF.

7 ALIGNMENT PROCEDURE

The good alignment between the active and the passive unit of the ESPE is necessary to obtain the correct behavior of the light curtain. A good alignment avoids a not steady light curtain status (OSSDs flicker on→off and vice versa) due to dust or vibration.

The alignment is perfect if the optic axes of the active unit's beams coincide with the optic axes of the corresponding mirrors on the passive unit.

It is important to define the means of symbol drawn on optic side of light curtain.

The direction of arrows associated to the two yellow LEDs are correlated to the first and the last emitter/receiver couple, referring the position of M12 connector. Signals are clearly identified through symbols allowing their immediate reading, independent of bars directions; a short description of LEDs signals proves nevertheless necessary so as to avoid misunderstandings.

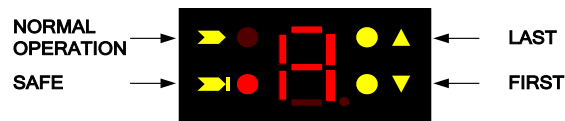


Figure 53

Figure 54 shows that the first couple emitter/receiver is the nearest to M12 connector; the last couple emitter/receiver is the farther to M12 connector.

The standard installation described hereinafter is the one shown in Figure 54 for a SG4-RB4 model, i.e. with the bar assembled with the connectors pointing down. In SG4-RB2 models, obviously, the first and the last couple coincide.

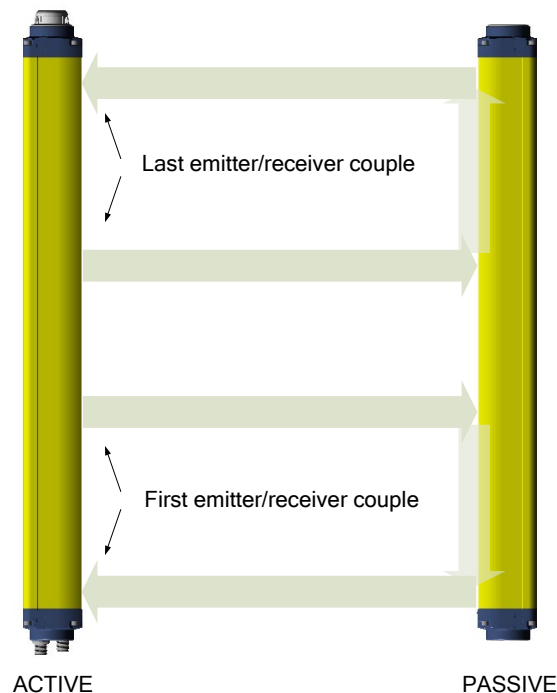


Figure 54

One-digit display can inform the user about the level of alignment of the array of beams.

In alignment mode the internal and external lamps blink as quickly as the alignment level increases.

As operating distance increase, the SG-LP laser pointer tool attached on active or passive unit can be used to help the user to obtain the best alignment (see Figure 55).

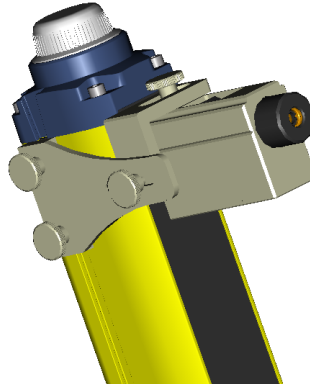


Figure 55

Also for Muting arms installation similar considerations must be taken. In the following paragraphs the alignment procedure for light curtain and Muting arms are described.

7.1 LIGHT CURTAIN ALIGNMENT PROCEDURE

The light curtain alignment can be performed only after having completed the mechanical installation and the electrical connections as described above. Compare alignment results with those given in the following table. To enter alignment mode, see paragraph 6.9 – “”.



In alignment mode the OSSDs of the light curtain are in OFF state

VISUALIZATION	ALIGNMENT STATE	ALIGNMENT QUALITY	OSSD STATE OUT OF ALIGNMENT-FUNCTION
	first and last couple are not aligned	BAD	OFF
	last couple isn't aligned	BAD	OFF
	first couple isn't aligned	BAD	OFF
	every couple over the lower threshold and no couple over the upper threshold	GOOD 	ON
	every couple over the lower threshold and one couple over the upper threshold		ON
	every couple over the upper threshold	EXCELLENT	ON

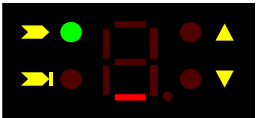
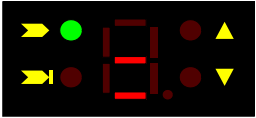
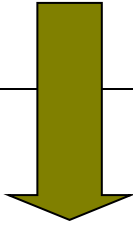
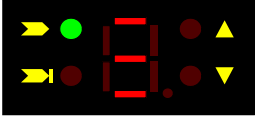
1. Keep the active unit in a steady position and set the passive unit until the yellow LED (▼ FIRST) is OFF. This condition shows the alignment of the first emitter/receiver couple.
2. Rotate the passive unit, pivoting on the lower optics axis, until the yellow LED (▲ LAST) is OFF.



Note: Ensure that the green LED (➡ NORMAL OPERATION) is steady ON.

3. Delimit the area in which the green LED (➡) is steady through some micro adjustments - for the first and then for the second unit - so to have the maximum alignment (3) and then place both units in the centre of this area.
4. Fix the two units firmly using brackets. Verify that the green LED (➡) on the active unit is ON and beams are not interrupted, then verify that the red LED SAFE (➡I) turns ON if even one single beam is interrupted (condition where an object has been detected). This verification shall be made with the special cylindrical “Test Piece” having a size suitable to the resolution of the device used (refer paragraph 3.2.6 – “Controls after first installation”).
5. Switch OFF and ON the device in normal operating mode.

The alignment level is monitored also during device normal operating mode, and is visualized by a bar graph shown on the user interface. Once the curtain has been aligned and correctly fastened, the display signal is useful to check the alignment and to view any change in the environmental conditions (presence of dust, light disturbance and so on). The behaviour is resumed in the next table.

VISUALIZATION	ALIGNMENT STATE	ALIGNMENT QUALITY
	every couple over the lower threshold and no couple over the upper threshold	MIN
	every couple over the lower threshold and one couple over the upper threshold	
	every couple over the upper threshold	EXCELLENT

7.2 CORRECT MUTING ARM ALIGNMENT PROCEDURE

Once effected the safety light curtain alignment and the mechanical arm mounting and the relative connection, ensure the correct alignment of the arm sensors regulating the fixing bracket.

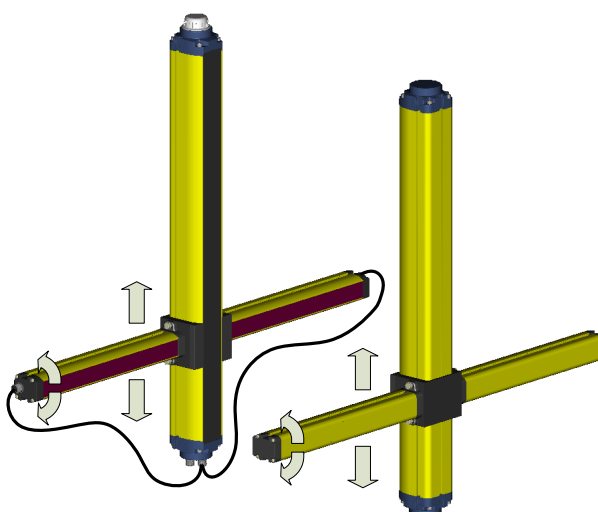


Figure 56

The arm position can be modified vertically and horizontally respect to the main axis. Avoid unsafe alignment conditions; carefully check the status of the red warning LEDs on active arms sensors. The alignment is perfect if all the warning LEDs are off.

8 DIAGNOSTICS

8.1 USER INTERFACE

A user interface aids the customer to control and check the state of the light curtain, for alignment mode, normal operation and for troubleshooting activity. User interface is composed by four LEDs and an one-digit display on the active unit.

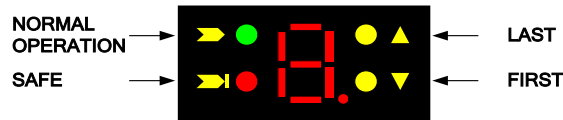


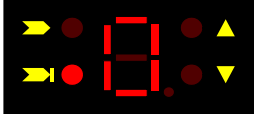
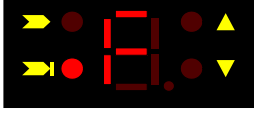
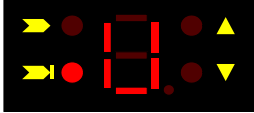
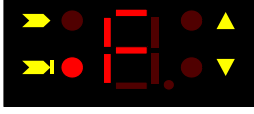
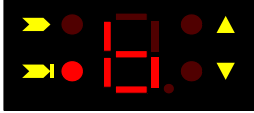
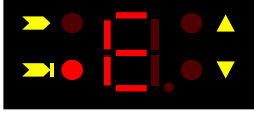
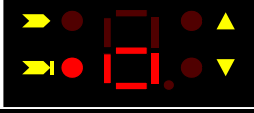
Figure 57

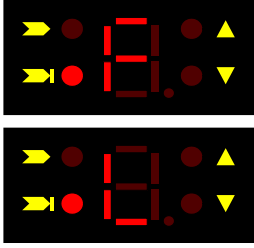
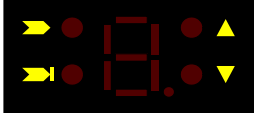
8.2 DIAGNOSTIC MESSAGES

8.2.1 Active unit side

The table completely explains all the visualization information except those relative to the alignment function (see par. 7.1 – “Light curtain alignment procedure”).

VISUALIZATION	STATUS	DESCRIPTION	ACTION
	INTERLOCK	FREE BEAMS, OSSDS OFF	USER CAN TAKE DEVICE IN NORMAL OPERATION ACTIVATING RESTART LINE.
	INTERLOCK	INTERRUPTED BEAMS, OSSDS OFF	USER MUST FREE BEAMS PATH BEFORE ACTIVATING RESTART LINE.
	NORMAL OPERATION	OSSDS ON	
	SAFE	OSSDS OFF	
	NORMAL OPERATION, SAFE, INTERLOCK	EDM FUNCTION ACTIVE	
	NORMAL OPERATION, SAFE, INTERLOCK	EDM FUNCTION NOT ACTIVE	
	SAFE, INTERLOCK	OVERRIDE FUNCTION READY TO BE ACTIVATED	USER CAN ACTIVATE OVERRIDE FUNCTION ACTIVATING THE CORRECT SEQUENCE ON OVERRIDE LINES.
	FAILURE LOCKOUT (RECOVERABLE)	FAILURE ON ONE OR BOTH OSSDS, OSSDS OFF	USER MUST ACTIVATE RESET LINE. IF ESPE DOES NOT RESET USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.

VISUALIZATION	STATUS	DESCRIPTION	ACTION
			
 	FAILURE LOCKOUT (NOT RECOVERABLE)	MICROCONTROLLER FAILURE, OSSDS OFF	USER MUST TURN OFF/ON ESPE. IF THE PROBLEM PERSISTS USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
 	FAILURE LOCKOUT (RECOVERABLE)	OPTICAL FAILURE, OSSDS OFF	USER MUST ACTIVATE RESET LINE. IF ESPE DOES NOT RESET USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
 	FAILURE LOCKOUT (RECOVERABLE)	EDM FAILURE, OSSDS OFF	USER MUST CHECK EDM ENABLE LINE OR DIP-SWITCHES, EDM LINE, EXTERNAL SWITCHING DEVICE AND ACTIVATE RESET LINE. IF ESPE DOES NOT RESET USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
 	FAILURE LOCKOUT (NOT RECOVERABLE)	OVERRIDE CONNECTION FAILURE, OSSDS OFF	USER MUST CHECK OVERRIDE LINES CONNECTION AND TURN OFF/ON ESPE. IF THE PROBLEM PERSISTS USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
 	SAFE	OVERRIDE SEQUENCE FAILURE, OSSDS OFF	USER MUST CHECK OVERRIDE LINES ACTIVATION SEQUENCE TIMINGS AND REPEAT OVERRIDE SEQUENCE. IF THE PROBLEM PERSISTS USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
 	FAILURE LOCKOUT (NOT RECOVERABLE)	DIP SWITCH FAILURE, OSSDS OFF	USER MUST CHECK DIP-SWITCH CONFIGURATION AND TURN OFF/ON ESPE. IF THE PROBLEM PERSISTS USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.

VISUALIZATION	STATUS	DESCRIPTION	ACTION
	FAILURE LOCKOUT (RECOVERABLE)	INTERNAL AND EXTERNAL LAMP FAILURE, OSSDS OFF	USER MUST CHECK LAMP INPUT LINE AND ACTIVATE RESET LINE. IF ESPE DOES NOT RESET USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.
	ESPE OFF	POWER SUPPLY FAILURE, OSSDS OFF	USER MUST CHECK POWER SUPPLY CONNECTION. IF THE PROBLEM PERSISTS USER MUST CONTACT DATASENSING TECHNICAL SUPPORT.

9 PERIODICAL MAINTENANCE AND WARRANTY

The following is a list of recommended check and maintenance operations that should be periodically carried-out by qualified personnel (see also paragraph 3.2.6 – “Controls after first installation”)

Check that:

- The ESPE stays in SAFE state (➡I) during beam interruption along the entire protected area, using the specific Test Piece (TP-40, TP-50, TP-90), according to the Figure 21 scheme.
- The ESPE is correctly aligned. Press slightly product side, in both directions and the red LED (➡I) must not turn ON.
- Enabling the TEST function, the OSSD outputs should open (the red LED ➡I 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 section 3 – “INSTALLATION MODE”).
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in section 3 – “INSTALLATION MODE”.
- Access of a person between ESPE and machine dangerous parts is not possible nor is it possible for him/her to stay there.
- Access to the dangerous area of the machine from any unprotected area is not possible.
- The ESPE and the external electrical connections are not damaged.

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

9.1 GENERAL INFORMATION AND USEFUL DATA

Safety MUST be a part of our conscience.

The safety devices fulfil their safety function only if they are correctly installed, in accordance with the Standards in force. If you are not certain to have the expertise necessary to install the device in the correct way, Datasensing Technical Support is at your disposal to carry out the installation.

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

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

9.2 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.

10 DEVICE MAINTENANCE

SG BODY safety light curtains do not require special maintenance operations.

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

Use soft cotton cloths dampened in water.

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

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

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



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

11 TECHNICAL DATA

ELECTRICAL DATA	
Power supply:	24 VDC $\pm$ 20%
Active unit consumption (RX):	6.5 W max (without load)
Outputs:	2 PNP outputs short-circuit protection (1.4 A @55°C)
Output current:	0.5 A max / each output
Output voltage - ON min:	Power supply value less 1 V
Output voltage - OFF max:	0.2 V
Output capacitive load	2.2 μ F @24 VDC
Response time:	From 11 to 24 ms (see section 13)
Protected height:	from 500 mm to 1200 mm (see section 13)
Safety category:	Type 4 (ref. EN 61496-1) SIL 3 (ref. EN 61508) SIL CL 3 (ref. EN 62061) PL e Cat. 4 (ref. IEC 13849-1 2008) (see section 13)
Auxiliary functions:	Reset, Restart selection, Alignment, EDM, Muting, Override
Electrical protection – Layout connection:	class III – SELV/PELV
SG4-RB...-W Connections:	M12 5, 12 poles
SG4-RB...-N Connections	M12 5, 8 poles
Cable length (for power supply):	70 m. max
Pollution degree	2
OPTICAL DATA	
Light source:	Infrared LED (950 nm wavelength)
Resolution:	40 mm 319,75 mm 419,75 mm 519,75 mm
Beam spacing	20 mm 300 mm 400 mm 500 mm
Operating distance:	From 0,5 to 8 mt (see section 13)
Ambient light rejection:	IEC 61496-2
MECHANICAL AND ENVIRONMENTAL DATA	
Operating temperature:	0...55°C
Storage temperature:	-25...+ 70 °C
Temperature class:	T6
Humidity:	15...95 % (no condensation)
Water protection grade:	IP 65 (EN 60529)
Vibrations:	0.35 mm width, 10...55 Hz frequency, 20 sweep for each axis, 1 octave/min (EN 60068-2-6)
Shock resistance:	16 ms (10g) 1.000 shock for each axis (EN 60068-2-29)
Housing material:	Painted aluminium (yellow RAL 1003)
Caps material:	PBT Valox 508 (pantone 072-CVC)
Front glass material:	PMMA
Connections:	M12 connector
Weight:	SG4-RB2-050-OO-X: 1,3 Kg SG4-RB2L-050-OO-X: 1,3 Kg SG4-RB2T-050-OO-X: 1,3 Kg SG4-RB3-080-OO-X: 1,8 Kg SG4-RB3L-080-OO-X: 1,8 Kg SG4-RB3T-080-OO-X: 1,8 Kg SG4-RB4-090-OO-X: 2,1 Kg SG4-RB4-120-OO-X: 2,6 Kg SG4-RDB2 (passive): 1,2 Kg SG4-RDB2L (passive): 1,2 Kg SG4-RDB2T (passive): 1,2 Kg SG4-RDB3 (passive): 1,7 Kg SG4-RDB3L (passive): 1,7 Kg SG4-RDB3T (passive): 1,7 Kg SG4-RDB4-090 (passive): 1,9 Kg SG4-RDB4-120 (passive): 2,5 Kg (single bar---not packaged---without muting arms)

12 DIMENSIONS

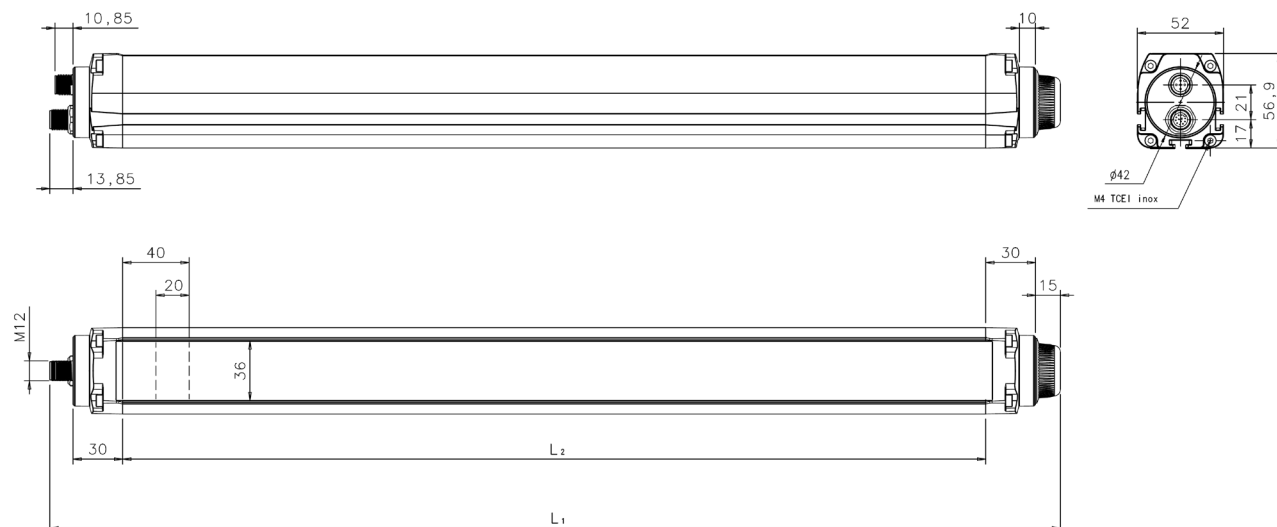


Figure 54

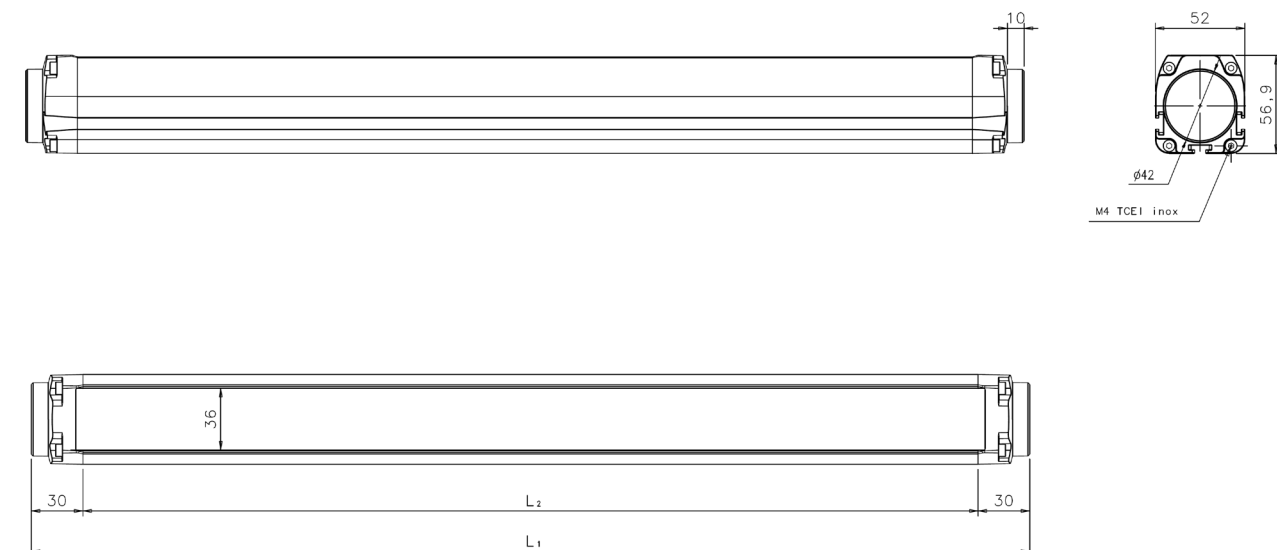
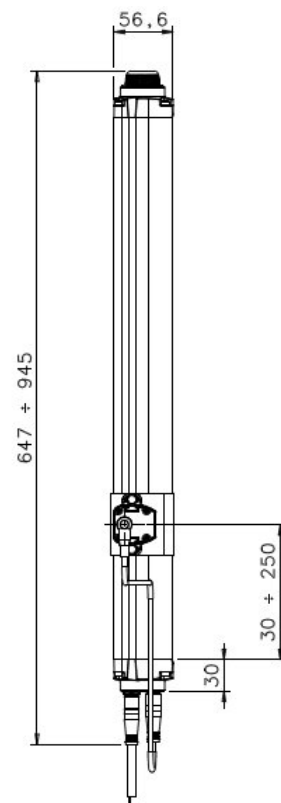
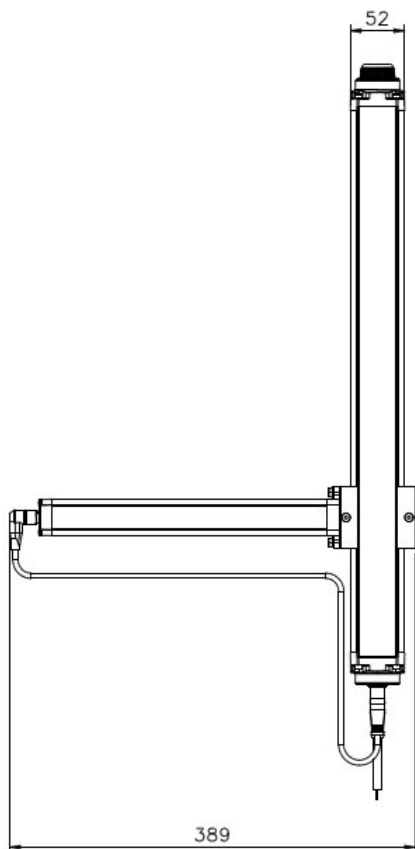


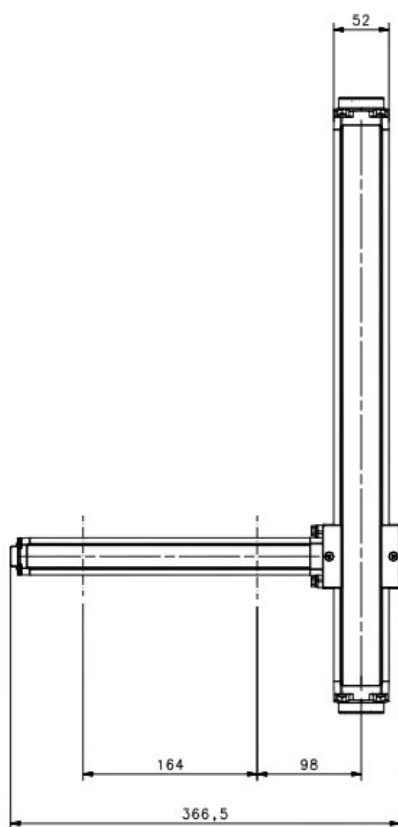
Figure 55

Model	L1 [mm]	L2 [mm]
SG4-RB2-050-OO-x (Figure 54)	609,35	520,5
SG4-RB2L-050-OO-x (Figure 54)	609,35	520,5
SG4-RB2T-050-OO-x (Figure 54)	609,35	520,5
SG4-RB3-080-OO-x (Figure 54)	909,35	820,5
SG4-RB3L-080-OO-x (Figure 54)	909,35	820,5
SG4-RB3T-080-OO-x (Figure 54)	909,35	820,5
SG4-RB4-090-OO-x (Figure 54)	1009,35	920,5
SG4-RB4-120-OO-x (Figure 54)	1309,35	1220,5
SG4-RDB2 (Figure 55)	580,5	520,5
SG4-RDB2L (Figure 55)	580,5	520,5
SG4-RDB2T (Figure 55)	580,5	520,5
SG4-RDB3 (Figure 55)	880,5	820,5
SG4-RDB3L (Figure 55)	880,5	820,5
SG4-RDB3T (Figure 55)	880,5	820,5
SG4-RDB4-090 (Figure 55)	980,5	920,5
SG4-RDB4-120 (Figure 55)	1280,5	1220,5

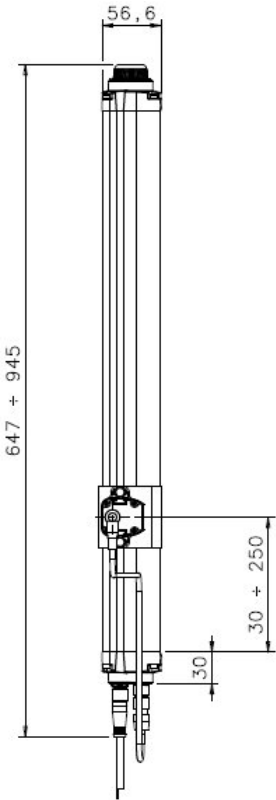
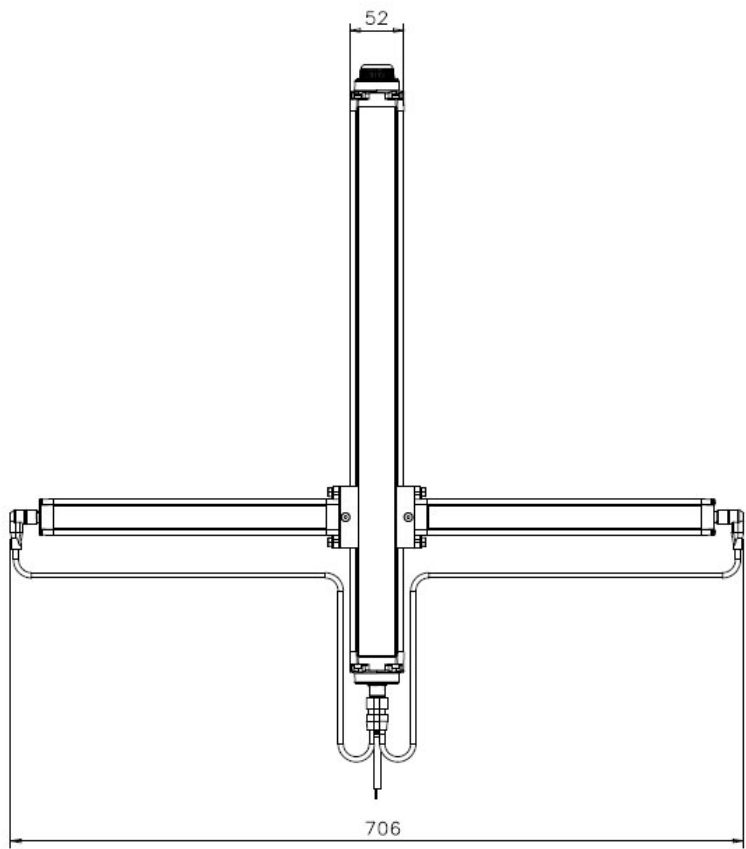
SG4-RB2/3L



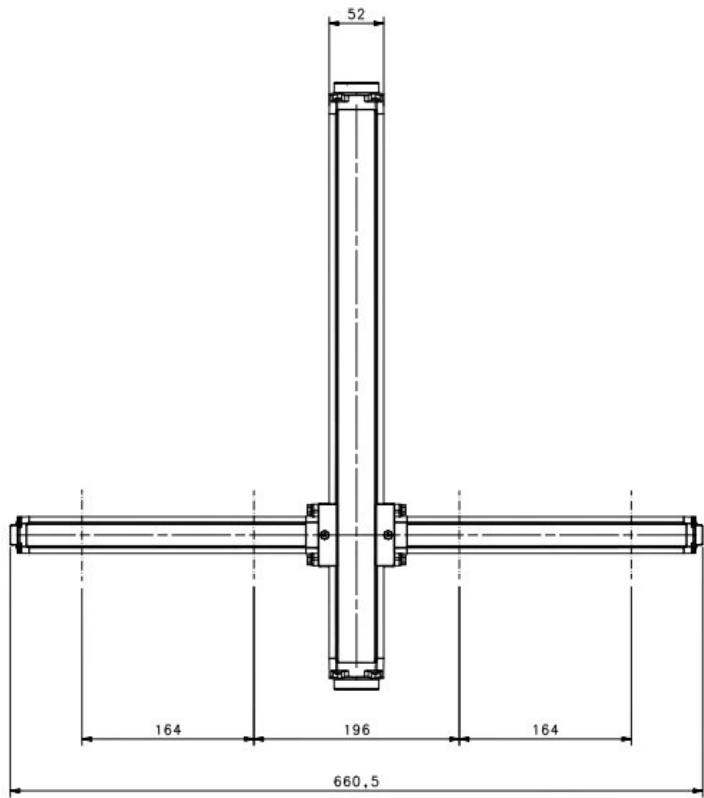
SG4-RDB2/3L



SG4-RB2/3T



SG4-RDB2/3T



13 LIST OF AVAILABLE MODELS

Description	Protecte d height (mm)	Beams (Nr.)	Resolution (mm)	Response time (msec)	Interaxis (mm)	Operating Distance (m)	Code
SG4-RB2-050-OO-W	500	2	519,75	11	500	0.5..8	957951030
SG4-RB2L-050-OO-W	500	2	519,75	11	500	0.5..3	957951060
SG4-RB2T-050-OO-W	500	2	519,75	11	500	0.5..3	957951080
SG4-RB3-080-OO-W	800	3	399,75	12	380	0.5..8	957951040
SG4-RB3L-080-OO-W	800	3	399,75	12	380	0.5..3	957951070
SG4-RB3T-080-OO-W	800	3	399,75	12	380	0.5..3	957951090
SG4-RB4-090-OO-W	900	4	319,75	12	300	0.5..6.5	957951180
SG4-RB4-120-OO-W	1200	4	419,75	12	400	0.5..8	957951050
SG4-RB2-050-OO-N	500	2	519,75	11	500	0.5..8	957951220
SG4-RB3-080-OO-N	800	3	399,75	12	380	0.5..8	957951230
SG4-RB4-090-OO-N	900	4	319,75	12	300	0.5..6.5	957951240
SG4-RB4-120-OO-N	1200	4	419,75	12	400	0.5..8	957951250
SG4-RDB2 (passive)	500	2	-	-	500	-	957951100
SG4-RDB2L (passive)	500	2	-	-	500	-	957951130
SG4-RDB2T (passive)	500	2	-	-	500	-	957951150
SG4-RDB3 (passive)	800	3	-	-	380	-	957951110
SG4-RDB3L (passive)	800	3	-	-	380	-	957951140
SG4-RDB3T (passive)	800	3	-	-	380	-	957951160
SG4-RDB4-090 (passive)	900	4	-	-	300	-	957951170
SG4-RDB4-120 (passive)	1200	4	-	-	400	-	957951120

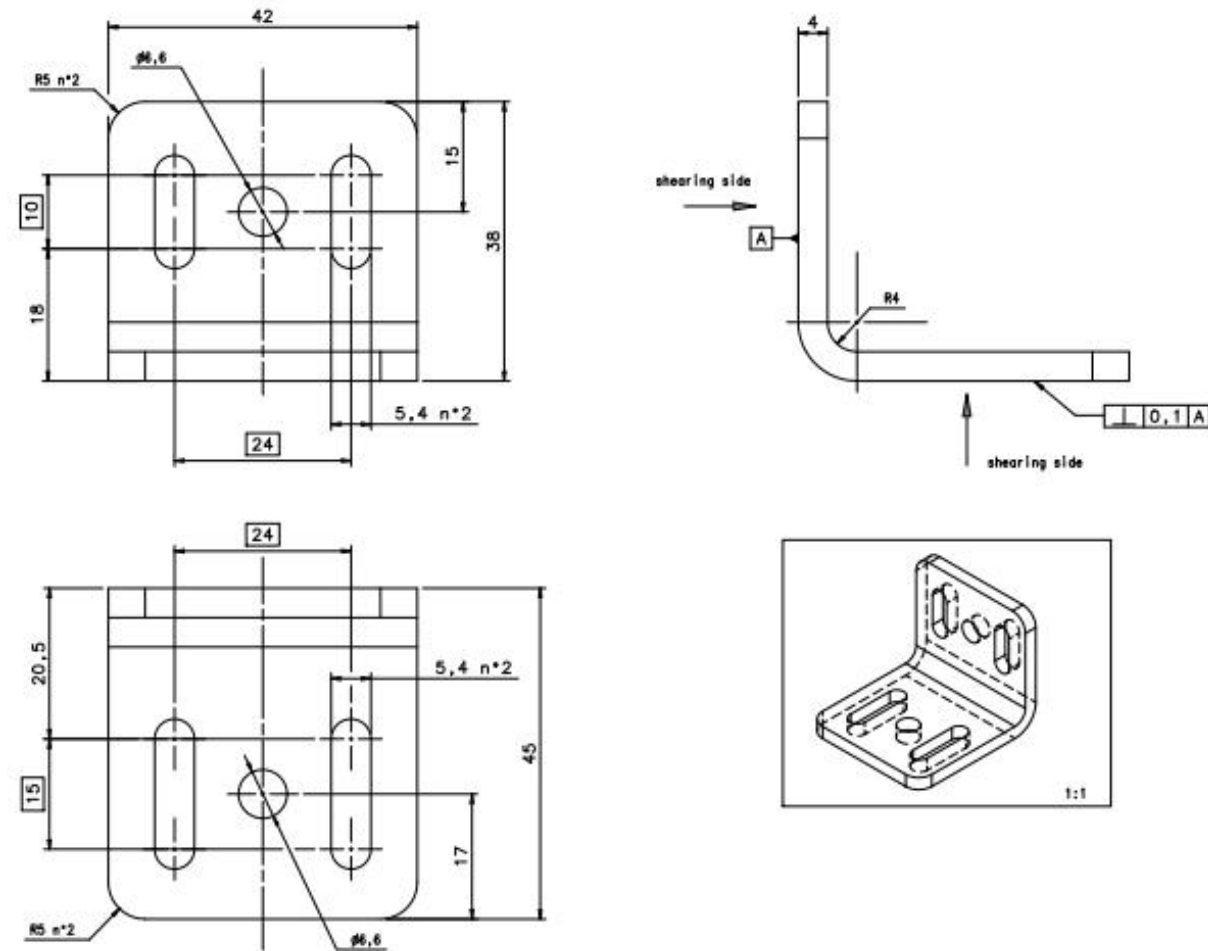
Description	EN ISO 13849-1				Prob. of danger failure/hour	Life span	Mean Time to Dangerous Failure	Average Diagnostic Coverage	Safe Failure Fraction	Hardware Fault Tolerance
	PL	CAT	SIL	SIL CL						
SG4-RB2-050-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB2L-050-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB2T-050-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB3-080-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB3L-080-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB3T-080-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB4-090-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1
SG4-RB4-120-OO-x	e	4	3	3	8,57E-09	20	439	96,50%	97,50%	1

14 ACCESSORIES

(dimensions in mm)

14.1 METAL ANGLED FIXING BRACKET (ST-K4STD-SG BODY BIG)

MODEL	DESCRIPTION	CODE
ST-K4STD-SG BODY BIG	Angled fixing bracket (4 pcs kit)	95ASE1950

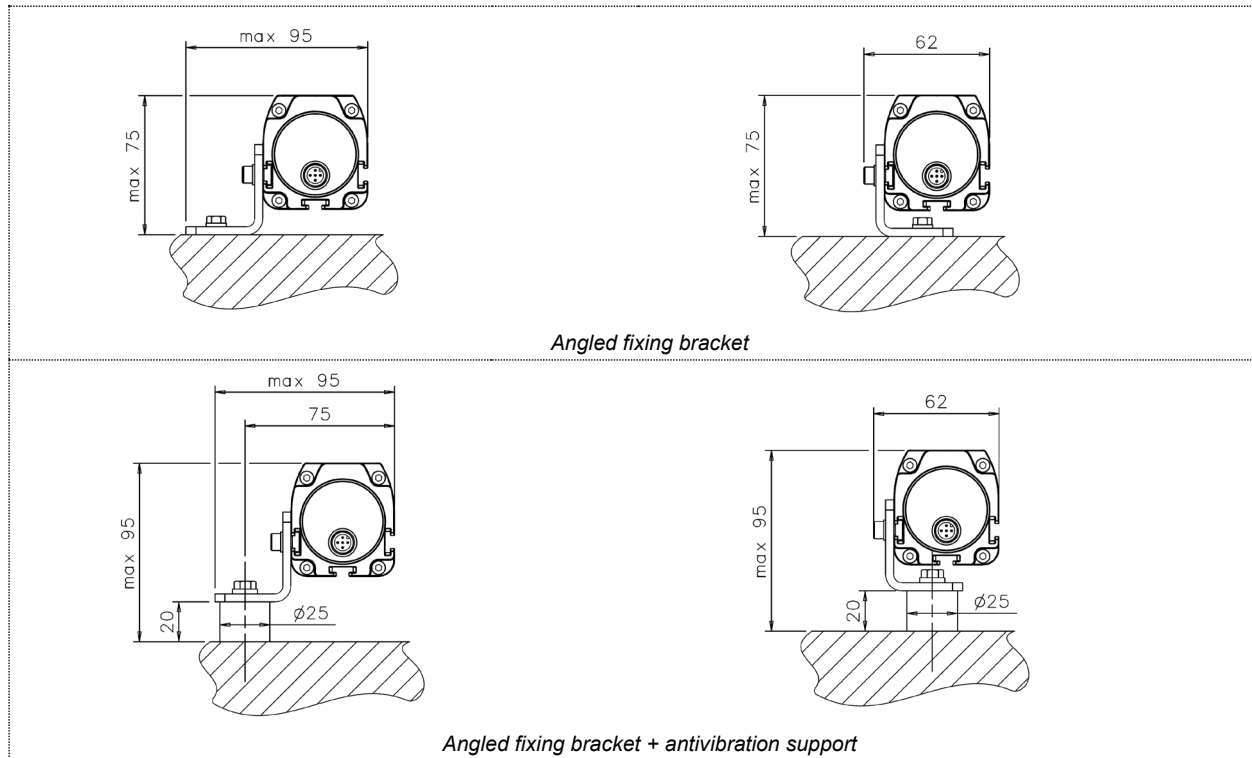


Side fixing bracket mounting

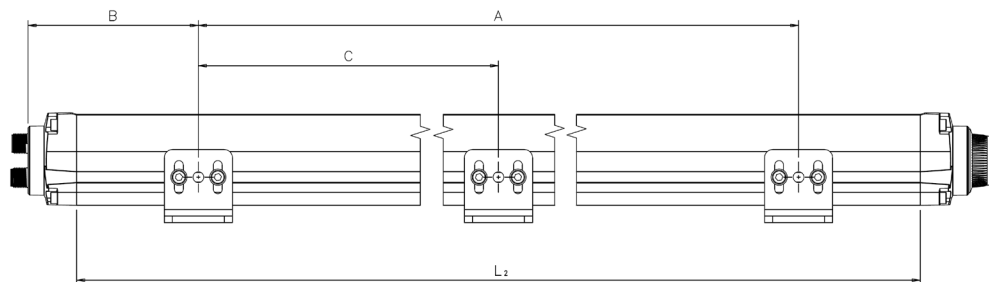
MODEL	DESCRIPTION	CODE
ST-K4AV	Antivibration support (4 pcs kit)	95ACC1700
ST-K6AV	Antivibration support (6 pcs kit)	95ACC1710

MOUNTING A

MOUNTING B



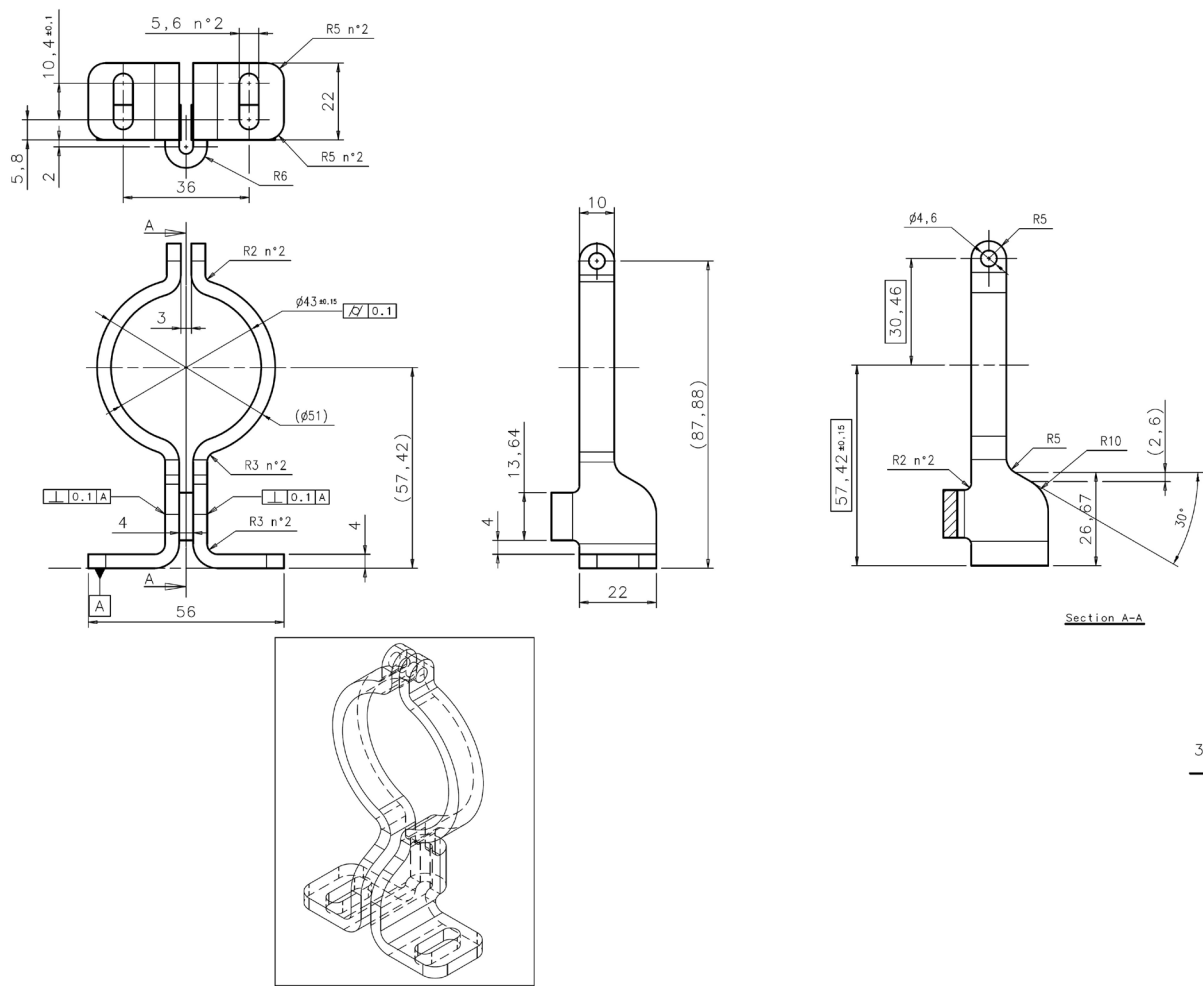
The recommended mounting positions according to the light curtain length are shown and in the subsequent table.



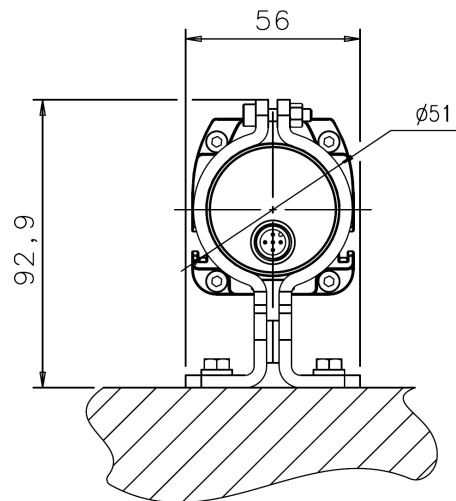
MODEL	L2 [mm]	A [mm]	B [mm]	C [mm]	CODE
SG4-RB2-050-OO-x	520,5	320,5	100	-	957951030
SG4-RB2L-050-OO-x	520,5	320,5	100	-	957951060
SG4-RB2T-050-OO-x	520,5	320,5	100	-	957951080
SG4-RB3-080-OO-x	820,5	370,5	125	-	957951040
SG4-RB3L-080-OO-x	820,5	370,5	125	-	957951070
SG4-RB3T-080-OO-x	820,5	370,5	125	-	957951090
SG4-RB4-090-OO-x	920,5	620,5	150	-	957951180
SG4-RB4-120-OO-x	1220,5	1020,5	100	510,25	957951050
SG4-RDB2 (passive)	520,5	320,5	100	-	957951100
SG4-RDB2L (passive)	520,5	320,5	100	-	957951130
SG4-RDB2T (passive)	520,5	320,5	100	-	957951150
SG4-RDB3 (passive)	820,5	370,5	125	-	957951110
SG4-RDB3L (passive)	820,5	370,5	125	-	957951140
SG4-RDB3T (passive)	820,5	370,5	125	-	957951160
SG4-RDB4-090 (passive)	920,5	620,5	150	-	957951170
SG4-RDB4-120 (passive)	1220,5	1020,5	100	510,25	957951120

14.2 ROTATIVE FIXING BRACKET (ST-K4ROT-SG BODY BIG)

MODEL	DESCRIPTION	CODE
ST-K4ROT-SG BODY BIG	Metal rotative fixing bracket (4 pcs kit)	95ASE1960

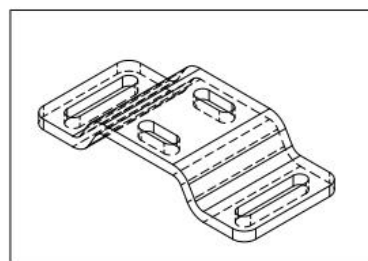
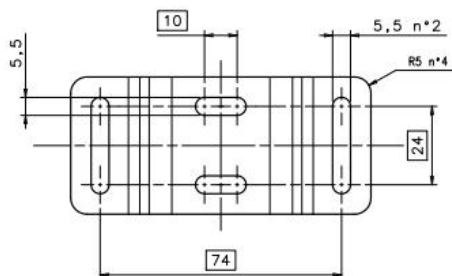
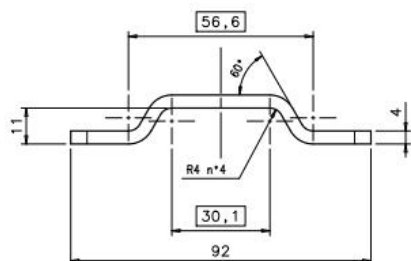


Rotative fixing bracket mounting



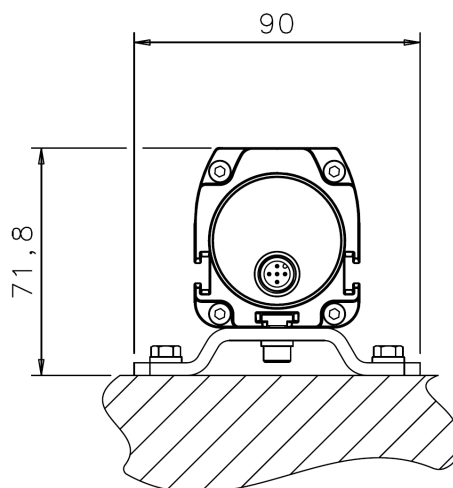
14.3 REAR FIXING BRACKET (ST-K4REAR-SG BODY BIG)

MODEL	DESCRIPTION	CODE
ST-K4REAR-SG BODY BIG	Metal rear fixing bracket (4 pcs kit)	95ASE1970



3,2/

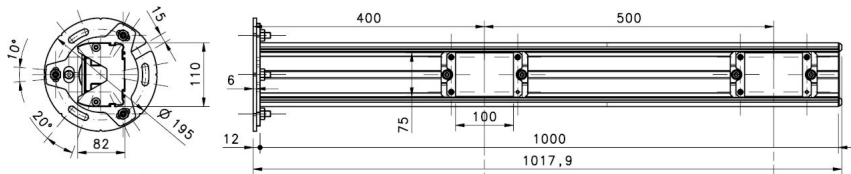
Rear fixing bracket mounting



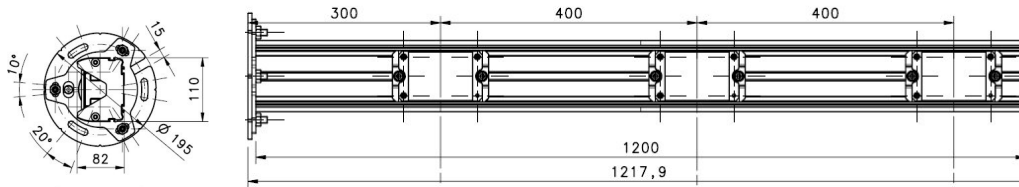
14.4 PROTECTIVE STANDS (SG-PSM)

MODEL	DESCRIPTION	CODE
SG-PSM-2-500	Protective stand with 2 mirrors H=500mm	95ASE2300
SG-PSM-3-800	Protective stand with 3 mirrors H=800mm	95ASE2310
SG-PSM-4-900	Protective stand with 4 mirrors H=900mm	95ASE2320
SG-PSM-4-1200	Protective stand with 4 mirrors H=1200mm	95ASE2330

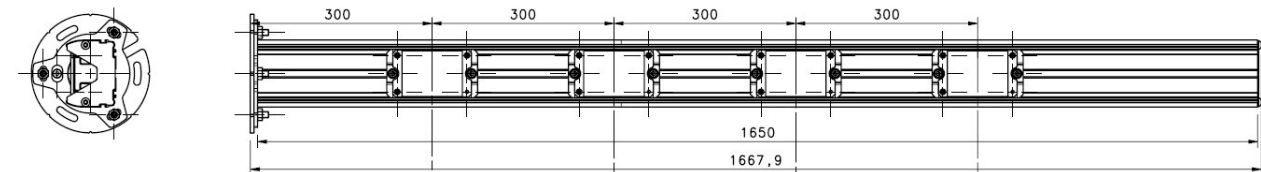
SG-PSM-2-500



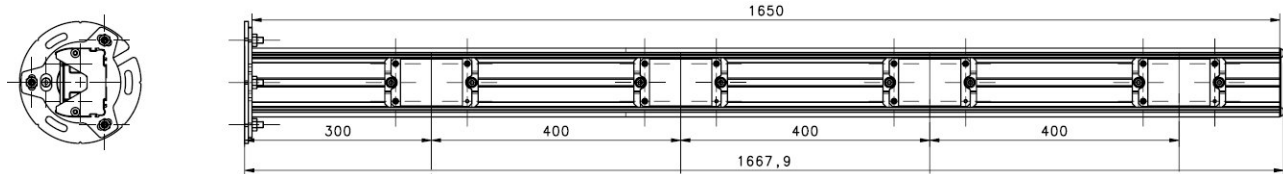
SG-PSM-3-800



SG-PSM-4-900

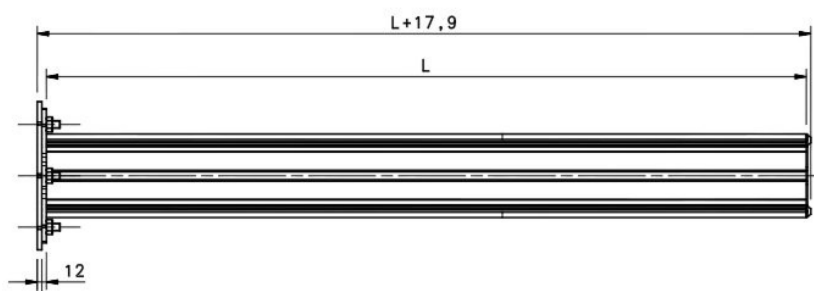
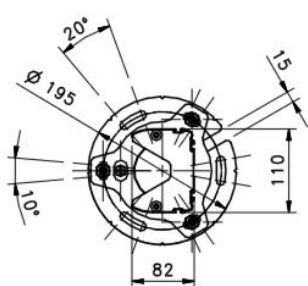


SG-PSM-4-1200



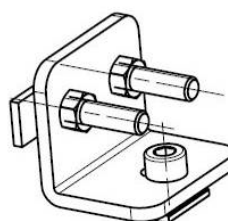
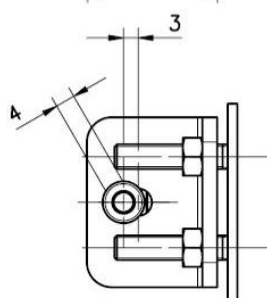
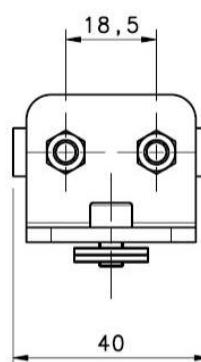
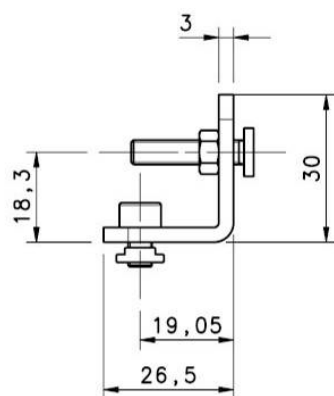
14.5 PROTECTIVE STANDS (SG-PSB)

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



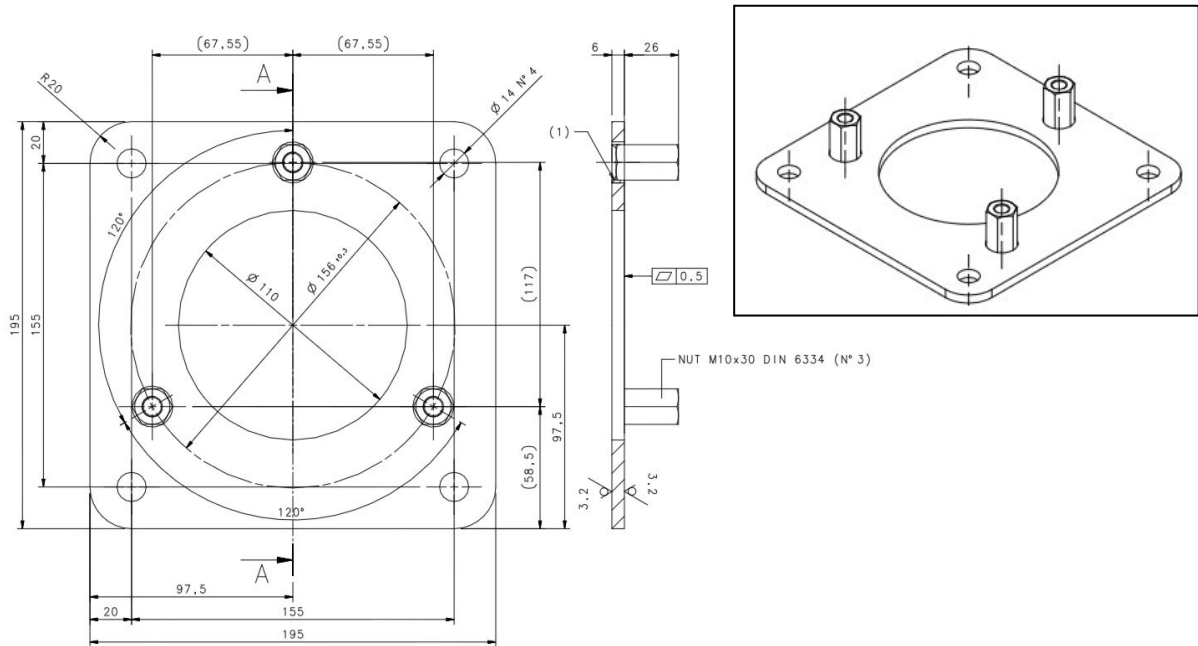
Fixing kit

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

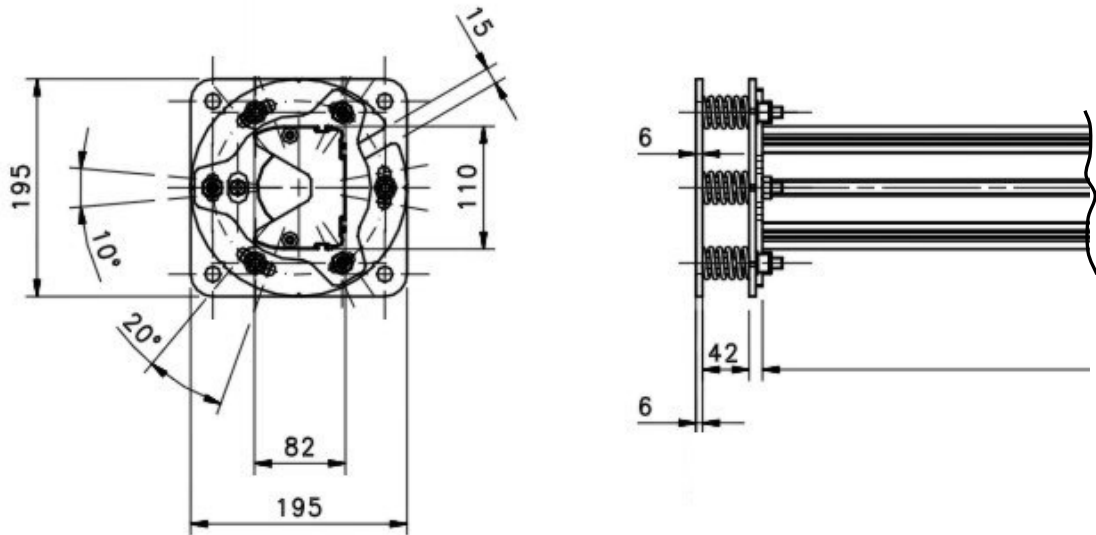


14.6 PLATE KIT FOR PROTECTIVE STANDS (SG-P)

MODEL	DESCRIPTION	CODE
SG-P	Plate kit for SG-PSB/SG-PSM	95ASE2290

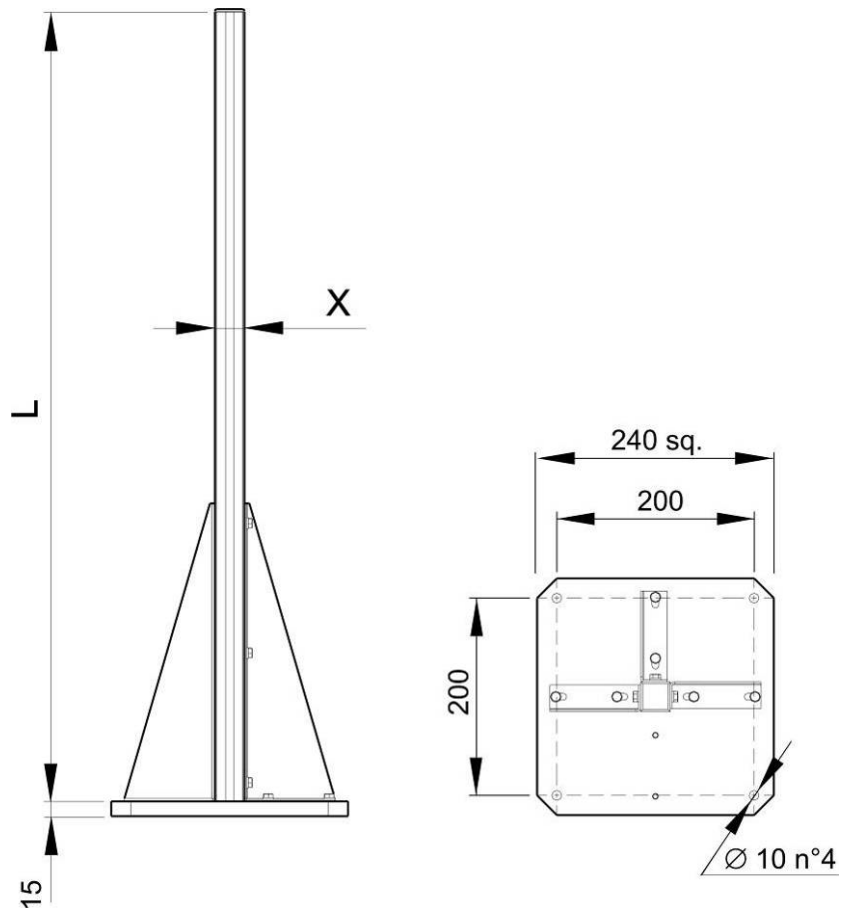


Mounting with SG-PSB/SG-PSM



14.7 COLUMNS AND FLOOR STANDS (SE-S)

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

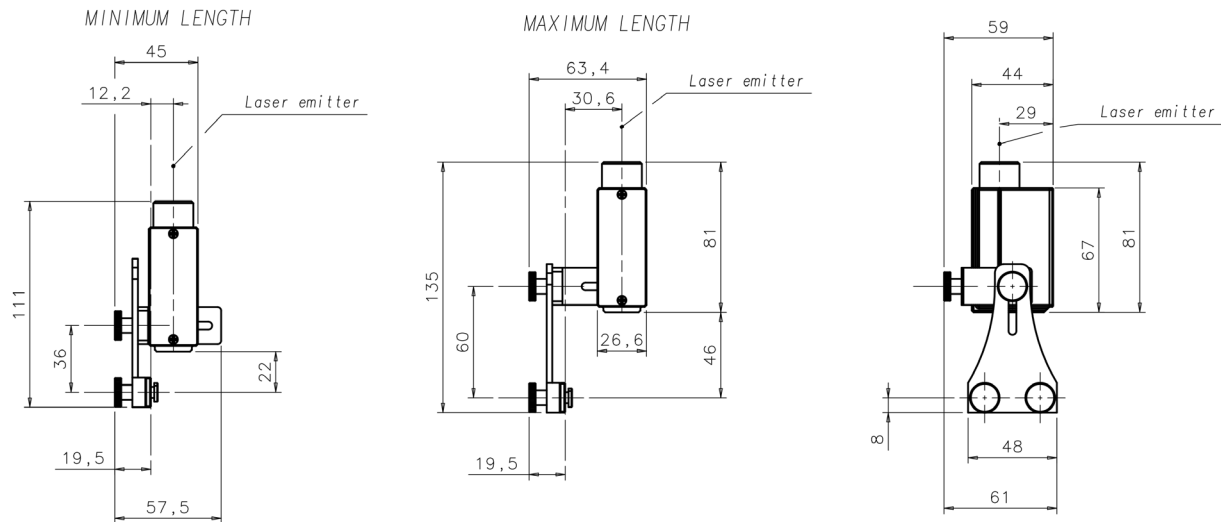


14.8 LASER POINTER (SG-LP)

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).



14.9 TEST PIECE (TP)

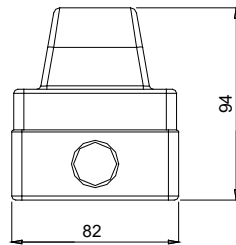
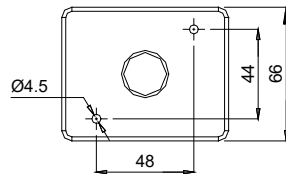
MODEL	DESCRIPTION	CODE
TP-14	Test piece Ø 14mm L = 300mm	95ACC1630
TP-20	Test piece Ø 20mm L=300mm	95ACC1640
TP-24	Test piece Ø 24mm L=300mm	95ASE2570
TP-30	Test piece Ø 30mm L=300mm	95ACC1650
TP-34	Test piece Ø 34mm L=300mm	95ASE2580
TP-35	Test piece Ø 35mm L=300mm	95ACC1660
TP-40	Test piece Ø 40mm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

14.10 CONNECTION CABLES

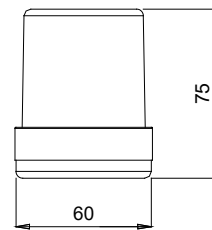
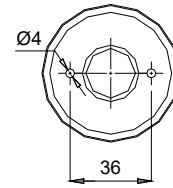
MODEL	DESCRIPTION	CODE
CS-A1-03-U-03	5-pole M12 cable (axial) 3 m	95ASE1170
CS-A1-03-U-05	5-pole M12 cable (axial) 5 m	95ASE1180
CS-A1-03-U-10	5-pole M12 cable (axial) 10 m	95ASE1190
CS-A1-03-U-15	5-pole M12 cable (axial) 15 m	95ASE1200
CS-A1-03-U-25	5-pole M12 cable (axial) 25 m	95ASE1210
CS-A1-03-U-50	5-pole M12 cable (axial) 50m	95A252700
CS-A1-06-U-03	8-pole M12 cable (axial) 3 m	95ASE1220
CS-A1-06-U-05	8-pole M12 cable (axial) 5 m	95ASE1230
CS-A1-06-U-10	8-pole M12 cable (axial) 10 m	95ASE1240
CS-A1-06-U-15	8-pole M12 cable (axial) 15 m	95ASE1250
CS-A1-06-U-25	8-pole M12 cable (axial) 25 m	95ASE1260
CS-A1-06-U-50	8-pole M12 cable (axial) 50 m	95A252710
CS-A1-10-U-03	12-pole M12 cable (axial) 3 m	95A252720
CS-A1-10-U-05	12-pole M12 cable (axial) 5 m	95A252730
CS-A1-10-U-10	12-pole M12 cable (axial) 10 m	95A252740
CS-A1-10-U-15	12-pole M12 cable (axial) 15 m	95A252750
CS-A1-10-U-25	12-pole M12 cable (axial) 25 m	95A252760
CS-A1-10-U-50	12-pole M12 cable (axial) 50 m	95A252770

14.11 MUTING LAMPS (LMS)

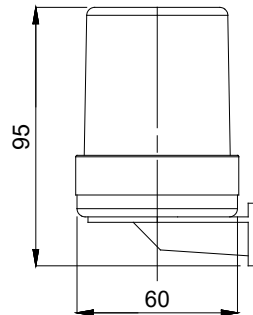
MODEL	DESCRIPTION	CODE
LMS	Muting lamp	95ASE1830
LMS-1	Modular Muting lamp	95ACC1990
LMS-2	Muting lamp –horizontal mounting	95ACC2000
LMS-3	Muting lamp –vertical mounting	95ACC2010
SU-LMS-1A	Basic support for LMS-1	95ACC2020
SU-LMS-1B	Tower module for LMS-1	95ACC2030



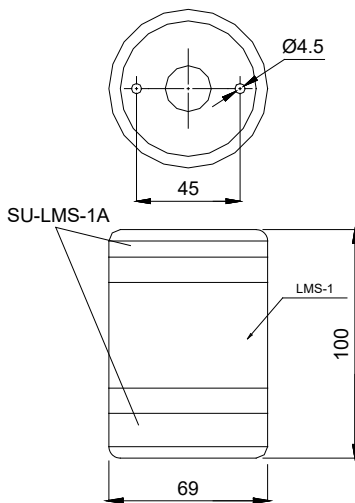
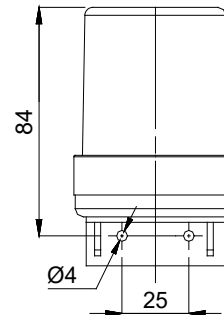
LMS LAMP



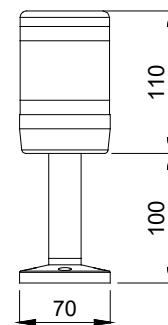
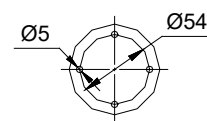
LMS-2 LAMP



LMS-3 LAMP



SU-LMS-1A + LMS-1 MODULE

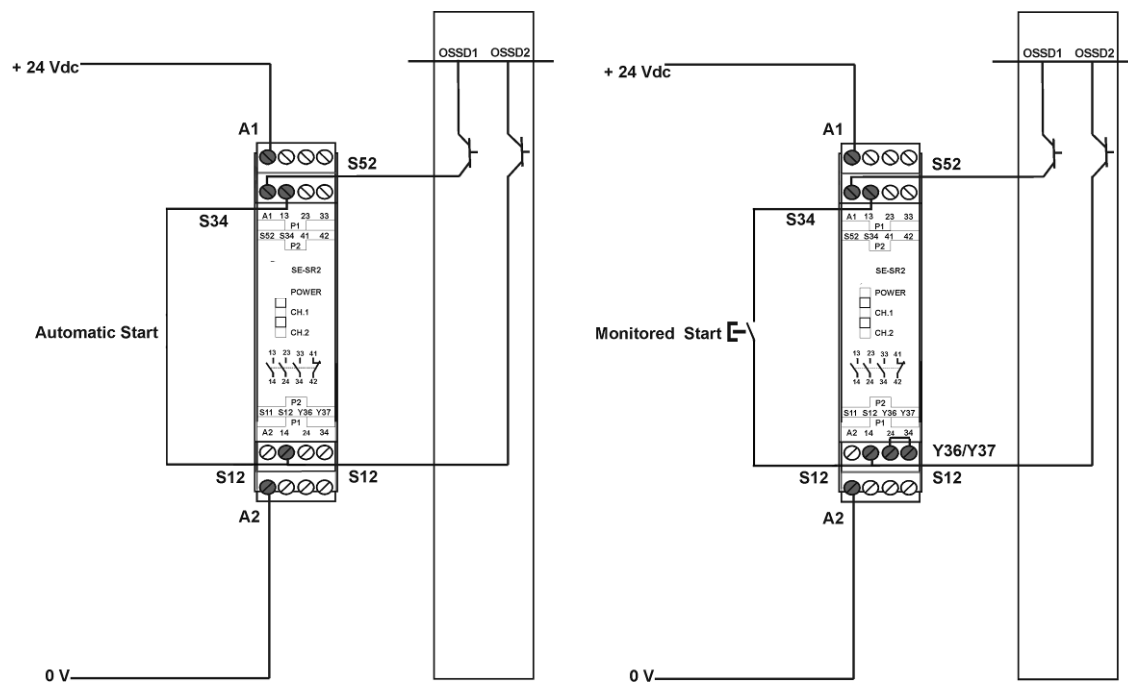


SU-LMS-1B + LMS-1 SUPPORT

14.12 SAFETY RELAY

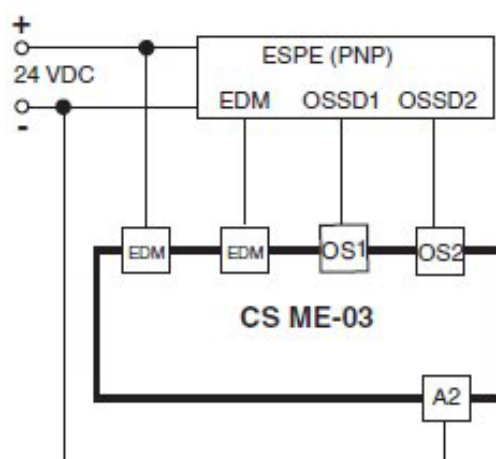
MODEL	DESCRIPTION	CODE
SE-SR2	Type 4 safety relay - 3 NQ 1 NC	95ACC6170

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.



EDM Relay Box

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



14.13 CONNECTION BOXES (SG-SRT)

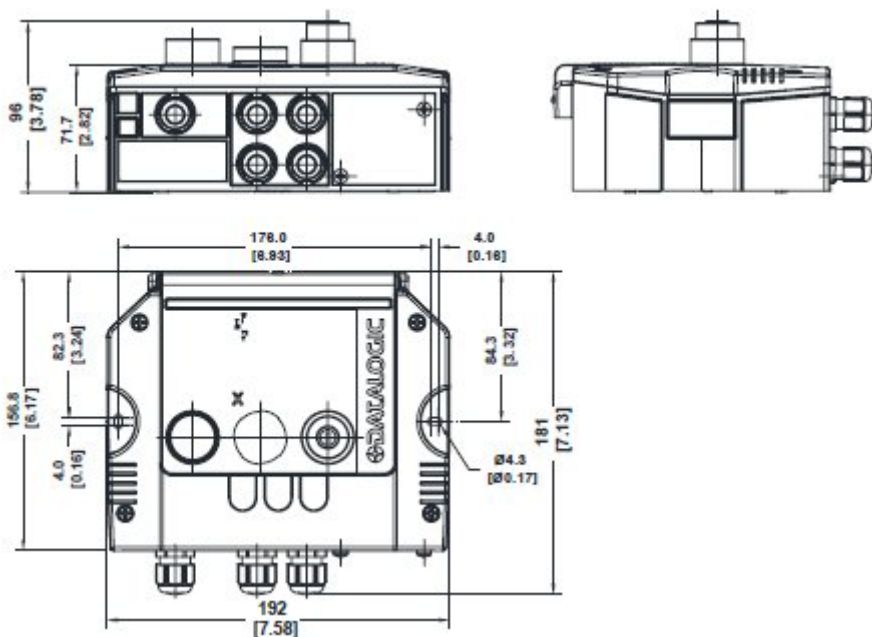
MODEL	DESCRIPTION	CODE
SG-SRT-1	Muting connection box	95ASE2050
SG-SRT-2	Muting connection box with lamp	95ASE2060



SG-SRT-1



SG-SRT-2

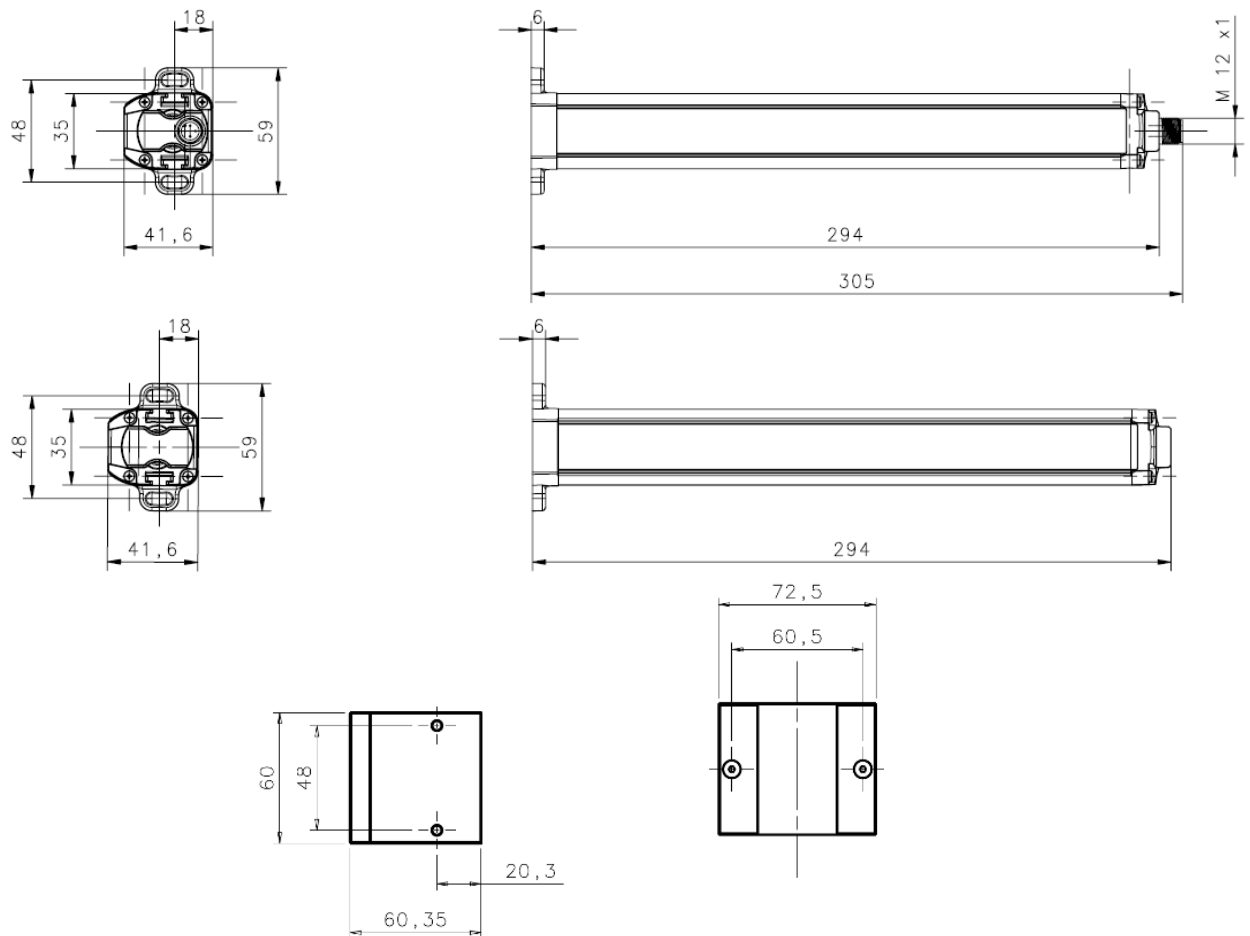


14.14 MUTING ARMS

MODEL	DESCRIPTION	CODE
SG-AS-ARM	Single active arm with RRX sensors V2	95ASE1841
SG-PR-ARM	Single passive arm with reflectors V2	95ASE1851
SG-CB-B	Muting arms mounting bracket kit	95ASE1920

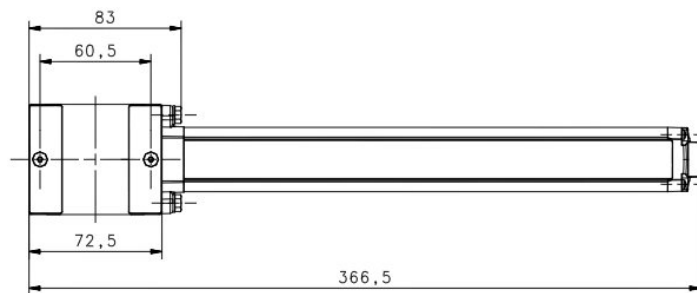
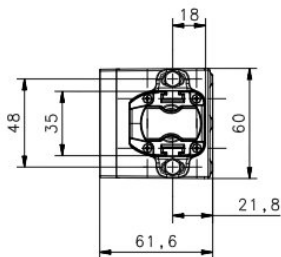
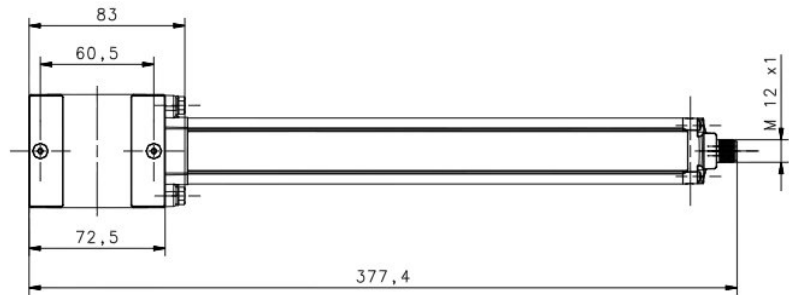
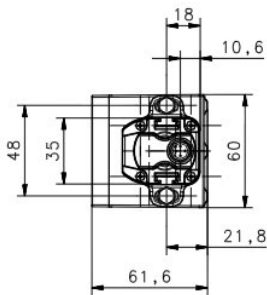
Muting arms are available in 2 versions: with retroreflex sensors and with emitter-receiver sensors. SG BODY series light curtains are designed, on both emitter and receiver, for mounting of both typology of Muting arms.

The following figures show the dimensions of active, emitter and receiver arms, passive arms and the mounting bracket.

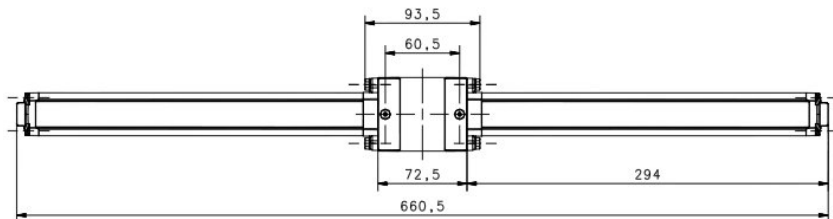
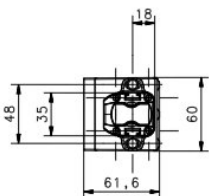
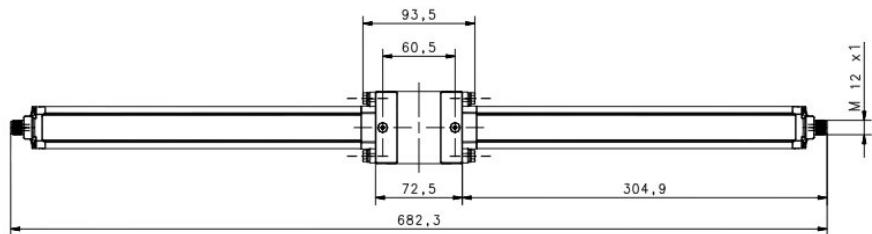
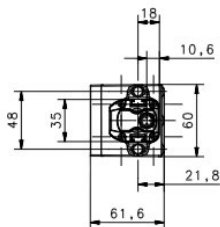


The following figures show, respectively, the dimensions of single active arms with fixing bracket mounted, of single passive arms with fixing bracket mounted, of double active arms with fixing bracket mounted, of double passive arms with fixing bracket mounted.

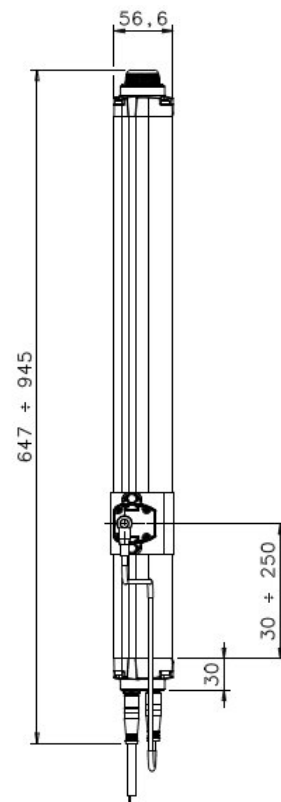
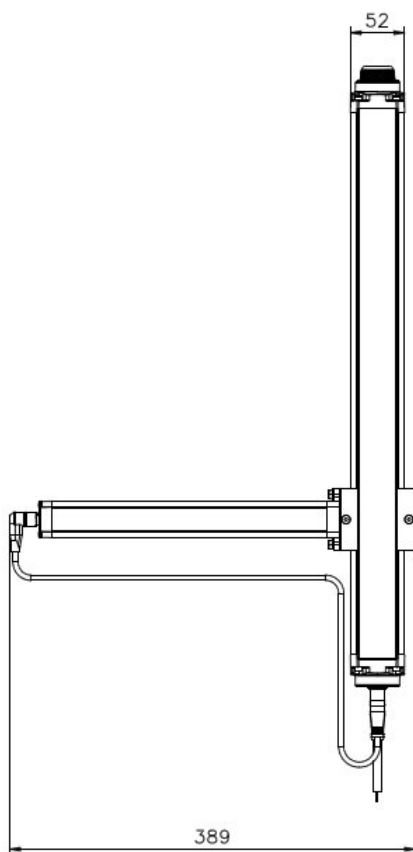
ACTIVE/PASSIVE ARMS L



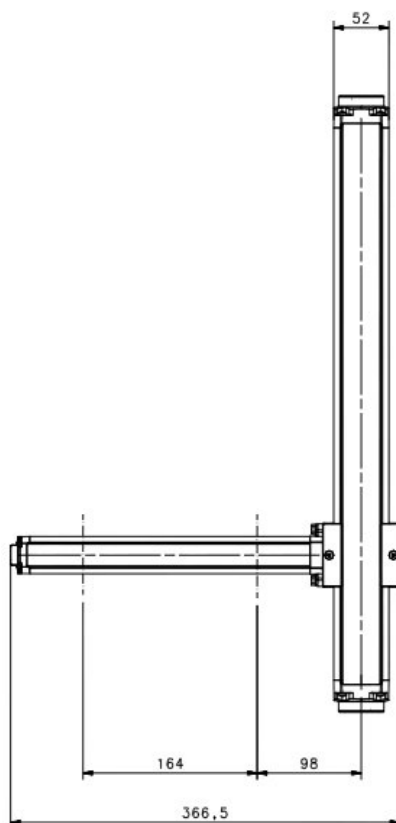
ACTIVE/PASSIVE ARMS T



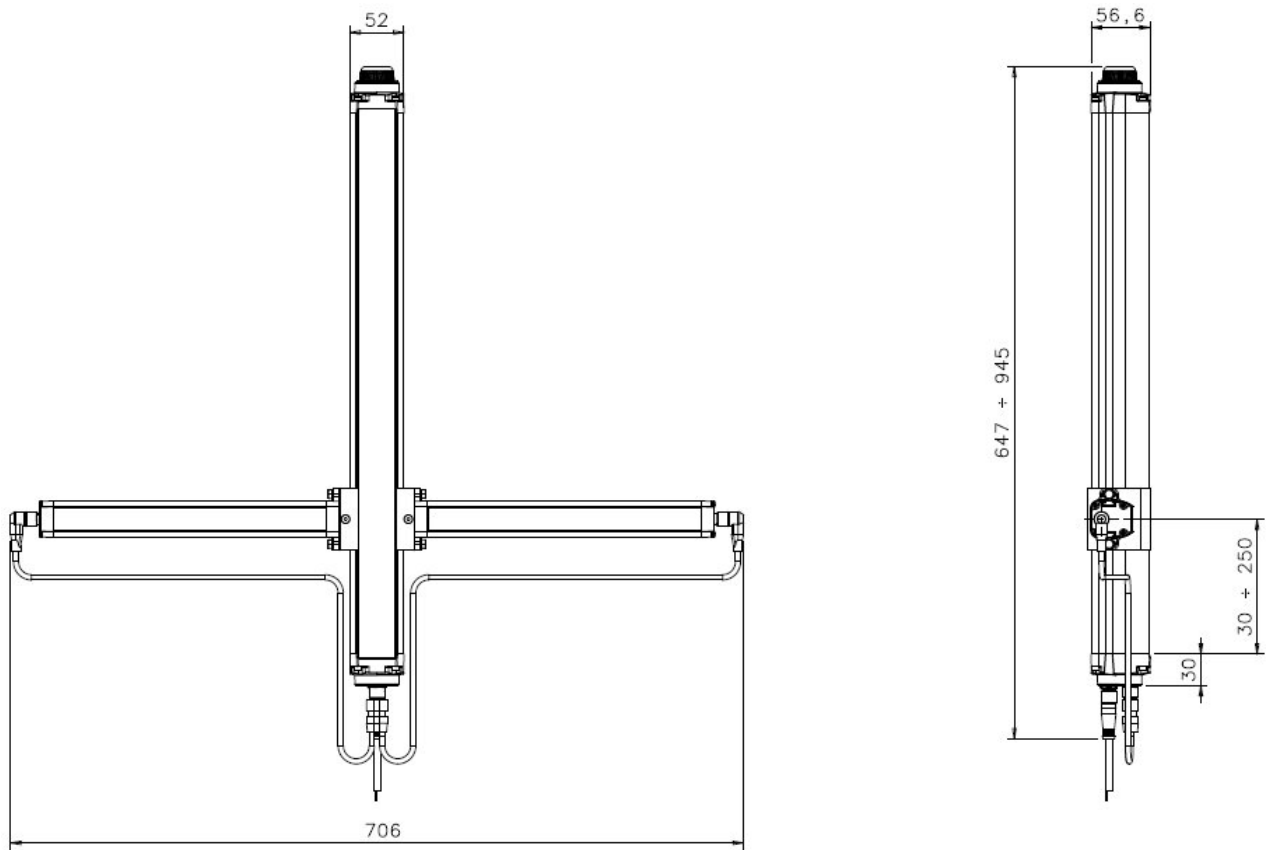
ACTIVE



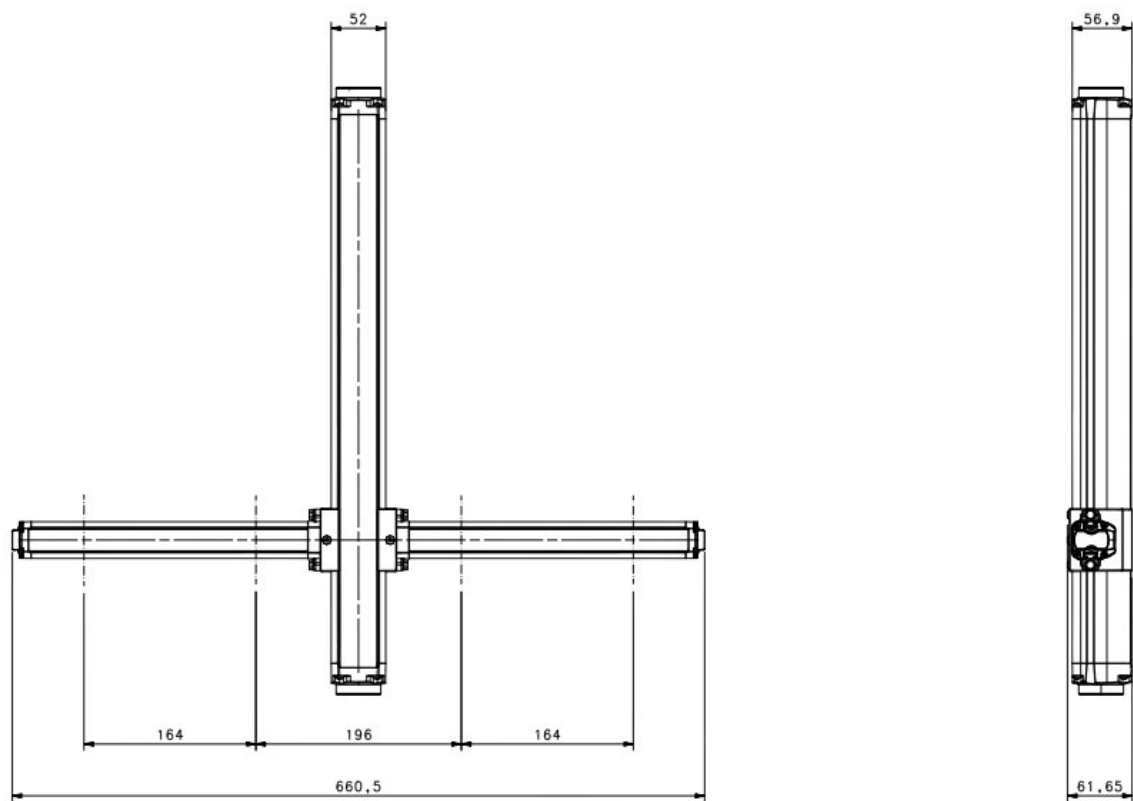
PASSIVE



ACTIVE



PASSIVE



15 GLOSSARY

ACTIVE OPTOELECTRONIC PROTECTIVE DEVICE (AOPD): its detection function is achieved thanks to the use of optoelectronic receivers and emitters detecting the optical beams interruptions inside the device caused by an opaque object present inside the specified detecting area.

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

BLOCK CONDITION (=BREAK): status of the light curtain taking place when a suitably-sized opaque object (see DETECTING CAPACITY) interrupts one or several light curtain beams.

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

BREAK: see “Block condition” in the glossary.

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

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.

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

EDM: see “External device monitoring” in the glossary.

ELECTROSENSITIVE PROTECTIVE EQUIPMENT (ESPE): assembly of devices and/or components working together to activate the protective disabling function or to detect the presence of something and including at least: a sensor, command/control devices and output signal switching devices.

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

EXTERNAL DEVICE MONITORING (EDM): device used by the ESPE to monitor the status of the external command devices.

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

FORCE-GUIDED CONTACTS: Contacts can be guided forcibly when they are connected mechanically so that they can switch simultaneously, when the input stage is active.

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

This function allows the control of the EDM status.

MACHINE OPERATOR: qualified person allowed to use the machine.

MACHINE PRIMARY CONTROL ELEMENT (MPCE): electrically-powered element having the direct control of machine regular operation so as to be the last element, in order of time, to operate when the machine has to be enabled or blocked.

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.

N.O.: normally opened

N.C.: normally closed

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

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

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

PROTECTED AREA: area where a specified test object is detected by the ESPE.

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

RESOLUTION: see "Detecting capacity" in the glossary.

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

RESTART: see "Restart Interlocking Device" in the glossary.

RESTART INTERLOCKING DEVICE: 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.

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) has different reactions in case of faults or under different environmental conditions. The classification and definition of the "type" (ex. type 2, type 4, according to IEC 61496-1) defines the minimum requirements needed for ESPE design, manufacturing and testing.

WORKING POINT: machine position where the material or unfinished product is worked.



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