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1. GENERAL INFORMATION

1.1. General description of the SAFEasy™ safety light curtain

The **SAFEasy™** safety light curtains – SF2 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 **SAFEasy™** devices are type 2 intrinsic safety systems, used as accident-prevention protection devices and are manufactured in accordance with the international standards in force for safety, in particular:

CEI EN 61496-1: 1997 Safety of machinery: electro-sensitive protective equipment - General requirements and test.

CEI IEC 61496-2: 1997 Safety of machinery: electro-sensitive protective equipment - Particular requirements for equipment using active optoelectronic protective devices.

The device, consisting in one emitter and one receiver units housed inside strong aluminium profiles (Fig.1), generates infrared beams that detect any opaque object positioned within the light curtains' detection field.

The emitter and the receiver units are equipped with the command and control functions (no external control unit is required); the connections are made through a M12 connector located in the lower side of the profile.

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

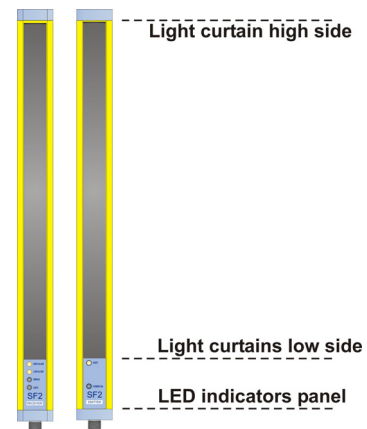


Fig. 1

The check and the management of the beams, that are sent and received through the units, are guaranteed by microprocessor – through some LEDs – give, also to the operator, information about the general conditions of the light curtain and about eventual faults (see section 7 “Diagnostic functions”).

During installation, two yellow LEDs facilitate the alignment of both units (see section 5 “Alignment procedures”).

As soon as an object, a limb or the operator’s body accidentally interrupts the beams sent by the emitter, the receiver immediately opens the OSSD output and blocks the machine (if correctly connected to the OSSD).

N.B.: The following abbreviations will be used in this manual as they are defined by the standards in force:

AOPD Active opto-electronic protective device

ESPE Electro-sensible protective equipment

MPCE Machine primary control element

OSSD Output signal switching device (switching output)

TX Emission device

RX Receiving device

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



Notes and detailed descriptions about particular characteristics of the **SAFEasy™** 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 carefully and follow the advice to the letter.

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

However, specialised knowledge not included in this technical description is required for the planning and implementation of a safety light curtain on a power-driven machine. As the required knowledge may not be completely included in this manual, the customer is authorised to contact DATASENSOR After Sales Technical Service for any necessary information relative to the functioning of the SF2 series light curtains and the safety rules that regulate the correct installation (see section 8 “Checks and periodical maintenance”).

1.2. How to choose the device

There are at least three different main characteristics that should be considered when choosing a safety light curtain:

- **The resolution** strictly depending on the part of the body to be protected. The SF2 series has a 30mm resolution, particularly suitable for hand protection of operators exposed to risks.

R = 30mm

hand protection



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

As shown in Fig.2, the resolution only depends on the geometrical characteristics of the lenses, diameter and distance between centres, and is independent of any environmental and operating condition of the safety light curtain.

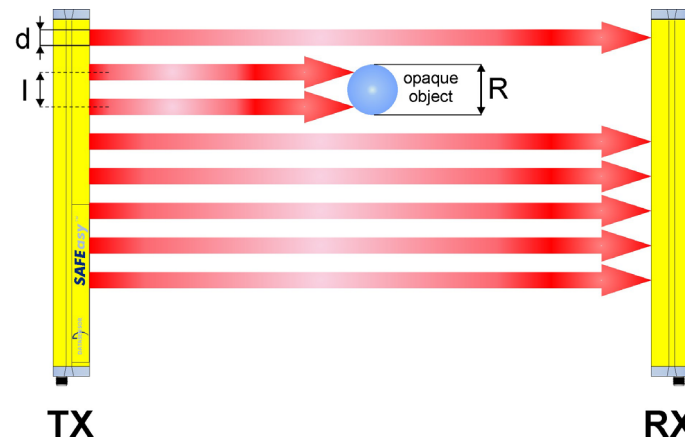


Fig. 2

The following formula is applied to obtain the value of the resolution:

$$R = l + d$$

- **The height of the protected area**

It is important to distinguish between “Height of the sensitive area” and “Height of the controlled area” (Fig.3).

- The height of the sensitive area is the distance between the lower and the upper limits respectively of the first and the last lens.
- The height of the controlled area is the effectively protected area; it delimits the area where an opaque object with larger or equal dimensions respect to the resolution of the safety light curtain may certainly cause the darkening of a beam.

English

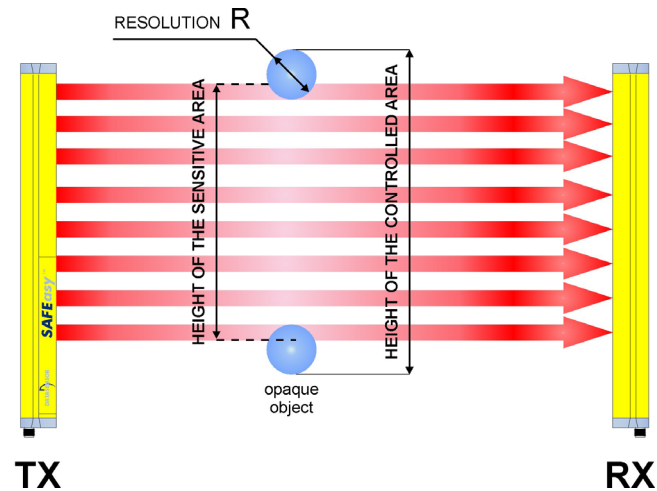


Fig. 3

- **The safety distance**

It is important to carefully calculate the distance between the point where the safety device will be placed and the possible danger associated with the machine to be protected (see *section 2 “Installation mode”* for the calculation of the safety distance).

1.3. Typical applications

The **SAFEasy™** safety light curtains are used in all automation fields where it is necessary to control and protect the access to dangerous zones.

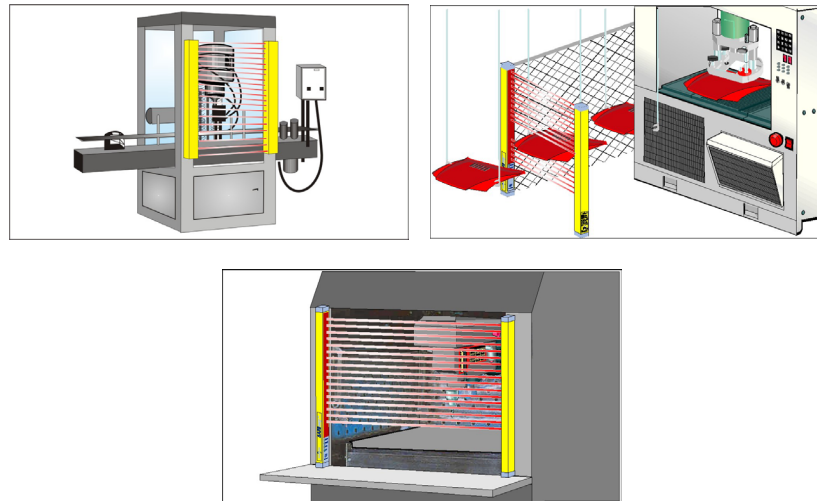
In particular they are used to stop the moving mechanical parts of:

- Automatic machines
- Packaging machines, handling machines, storing machines
- Textile, ceramic, wood and leather working machines.
- Automatic and semi-automatic assembly lines
- Automatic warehouses



In food industry applications, it's necessary to verify with DATASENSOR Technical Service the compatibility of the materials of the safety light curtain shell with the eventual chemical agents that are used in the production process.

The following pictures show some main applications.



1.4. Safety information



The following points must be observed for a correct and safe use of the **SAFEasy™** safety device:

- The stopping system of the machine must be electrically controllable.
- This control system must be able to instantly stop the dangerous movement of the machine during all the phases of the working cycle.
- Mounting and connection of the safety light curtain must only be carried out by qualified personnel, according to the indications included in the special sections (*refer to sections 2; 3; 4; 5; 6*).
- The safety light curtain must be securely placed in a particular position so that access to the danger zone is not possible without the interruption of the beams (*see section 2 "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 and Reset operations.

English

2 INSTALLATION MODE

2.1. Precautions to be observed for the choice and installation of the device



- Make sure that the protection level assured by the **SAFEasy™** (type 2) is compatible with the real danger level of the machine to be controlled, according to EN 954-1.
- The outputs (OSSD) of the ESPE must be used as stopping devices of the machine and not as command devices. The machine must have a special START command.
- The dimension of the smallest object to be detected must be larger than the resolution level of the ESPE.
- The ESPE must be installed in a place compatible with the technical characteristics shown in section 9.
- Do not place the device, in particular the receiver unit, near any intense light sources.
- Strong electromagnetic interferences can compromise the correct functioning of the device. DATASENSOR suggests contacting its own Technical Service when this problem occurs.
- The operating distance of the device can be reduced by 50% in the 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.

2.2. General information on the device positioning

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

Fig. 4a shows some examples of possible access to the machine from the top and the bottom sides; these situations may be very dangerous so, it's necessary to install a safety light curtain with a sufficient length to completely cover the access to the dangerous area (Fig. 4b).



Fig. 4a

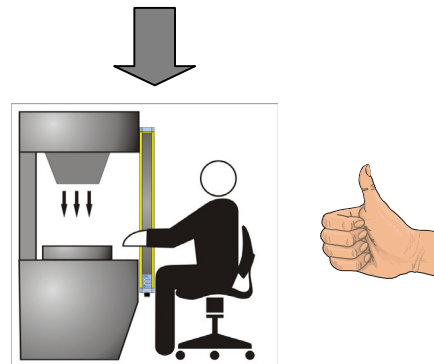


Fig. 4b

English

However, under normal running conditions, the starting of the machine must not be possible while operators are within the hazard area. When it is not possible to install the safety light curtain in direct proximity to the danger area, it is necessary to place a second light curtain in a horizontal position, in order to prevent any lateral access (as shown in Fig. 5b).

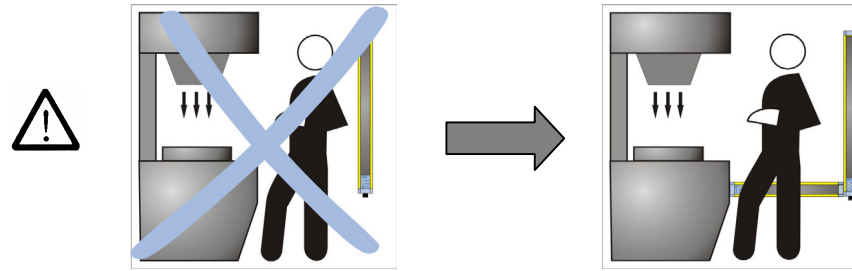



Fig. 5a

Fig. 5b

 If the operator is able to enter the danger area and is not intercepted by the beams, it is necessary to install an additional mechanical protection.

2.2.1. Minimum installation distance

The **SAFEasy™** safety device must be placed according to a specific safety distance (Fig.6); this distance must ensure that the danger zone 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-999, 775 and 294 standards:

- 1 Response time of the ESPE (the time between the effective interception of the beams and the opening of the OSSD contacts).
- 2 Machine stopping time (the time between the effective opening of the contacts of the ESPE and the real stop of the dangerous movement of the machine).
- 3 ESPE resolution.
- 4 Approach speed of the object to be intercepted.

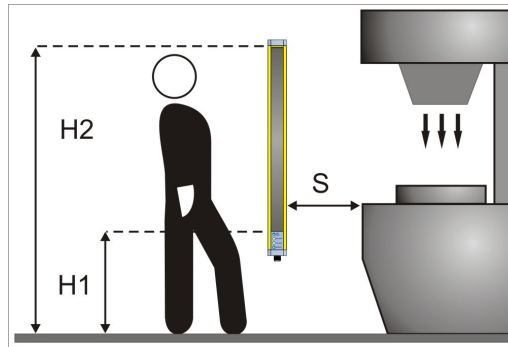


Fig. 6

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

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

Where:

S = Minimum safety distance in mm.

K = Speed of the object, limb or body approaching the dangerous area in mm/s

t₁ = Response time of the ESPE in seconds (*see section 9 "Technical data"*)

t₂ = Machine stopping time in seconds.

d = Resolution of the system.

C = **8 (d - 14)** for device with resolution ≤ 40mm

N.B.: The value of K is:**2000 mm/s if the calculated value of S is \leq 500 mm****1600 mm/s if the calculated value of S is $>$ 500 mm**

When it is possible to reach the dangerous area through the upper and lower sides of the machine, the upper beam must be positioned at the height of 900 mm (H2) above the base of the machine; the lower beam must be positioned at the height of 300 mm (H1).

If the safety light curtain must be placed in a horizontal position (Fig.7), the distance between the dangerous area and the most distant optic beam must be equal to the value calculated using the following formula:

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

Where:

S = minimum safety distance in mm

t₁ = Response time of the ESPE in seconds (*see section 9 "Technical data"*)

t₂ = Machine stopping time in seconds

H = Height of the beam above the floor; this height must be included between a minimum of 225 mm and a maximum of 1000 mm in order to prevent any possible access from the upper side of the safety light curtain.

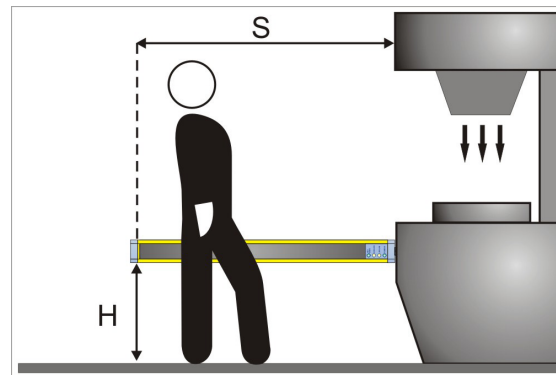
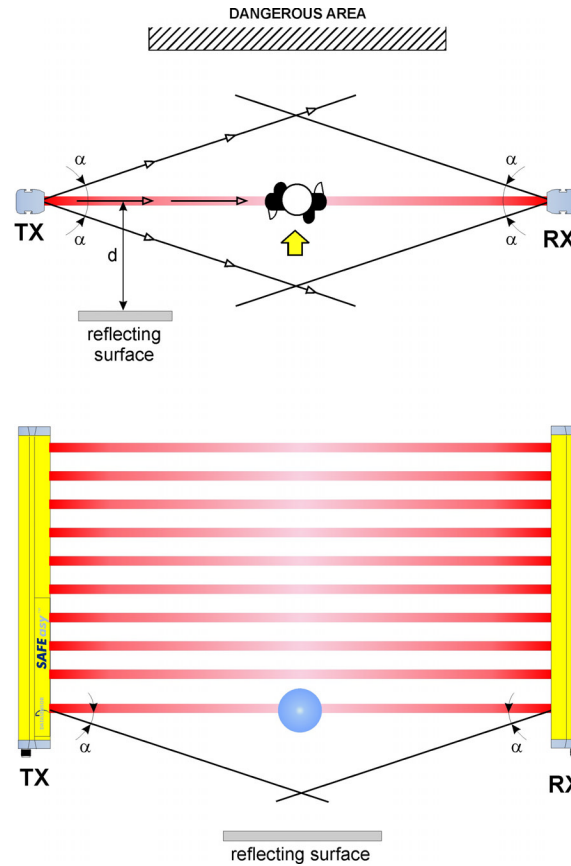


Fig.7

2.2.2. Minimum distance from reflecting surfaces

Reflecting surfaces placed near the light beams of the **SAFEasy™** device (over, under or laterally) may cause passive reflections; these reflections could compromise the recognition of an object inside the controlled area (see Fig. 8).



English

Fig. 8

However, if the **RX** Receiver detects a secondary beam (reflected by the side-reflecting surface) the object cannot be detected, even if the main beam is interrupted by the penetrating object.

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

The minimum distance depends on:

- Operating distance between emitter (TX) and receiver (RX);
- Maximum opening angle of the light beam sent by the safety light curtain, in particular:
 - 10° for ESPE type 2 ($\pm 5^\circ$ as to the optic axis)

The graphic in Fig. 9 shows the data of the minimum distance.

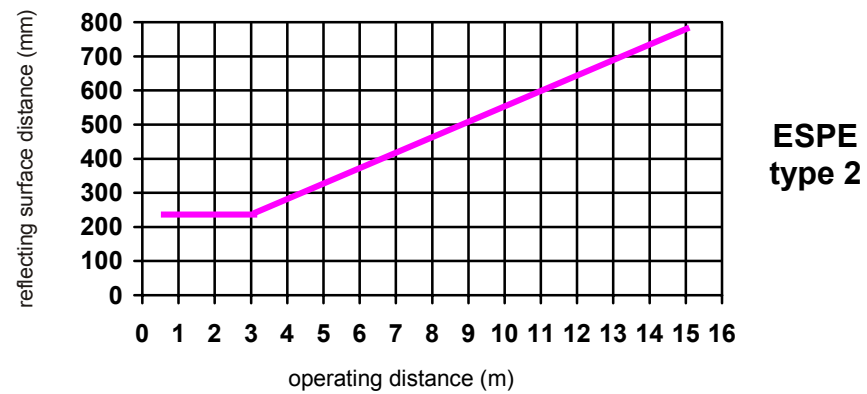


Fig. 9

2.2.3. Installation of several adjacent safety light curtains

When several safety devices must be installed in adjacent areas, it's necessary to prevent the interferences between the emitter of one device and the receiver of another.

Fig.10 gives an example of possible interferences between different devices and two pertinent solutions.

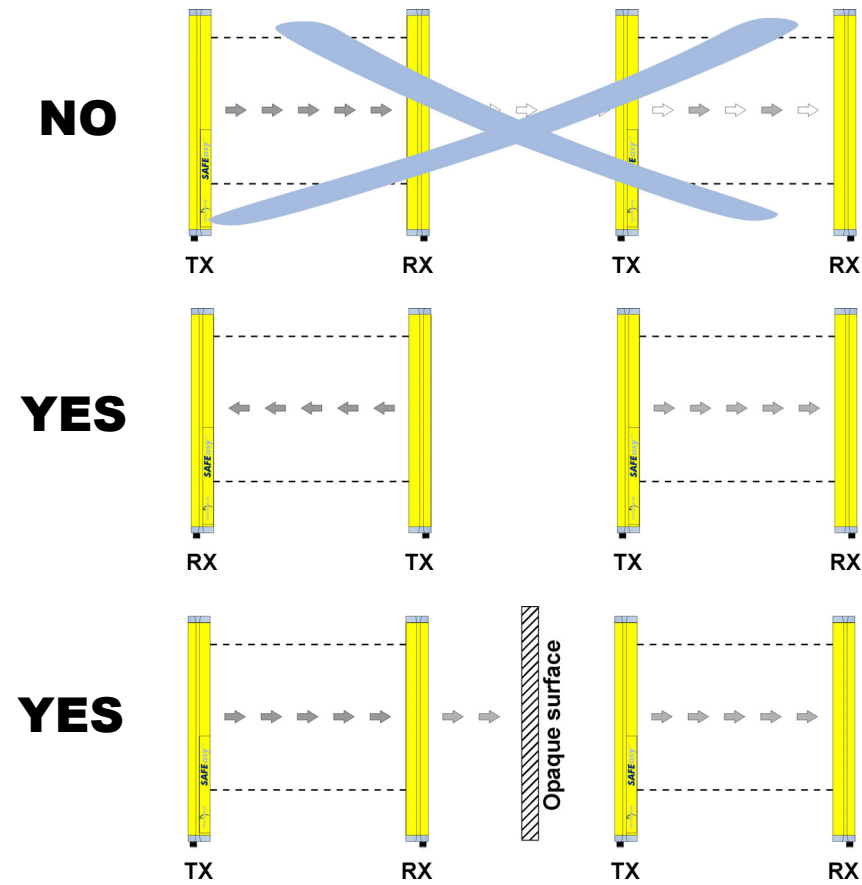


Fig.10

English

2.2.4. Use of deviating mirrors

The control of any dangerous area, with several but adjacent access sides, is possible using only one **SAFEasy™** light curtain and well-positioned deviating mirrors.

Fig.11 shows a possible solution to control three different access sides, using two mirrors placed at 45° angle respect to the beams.

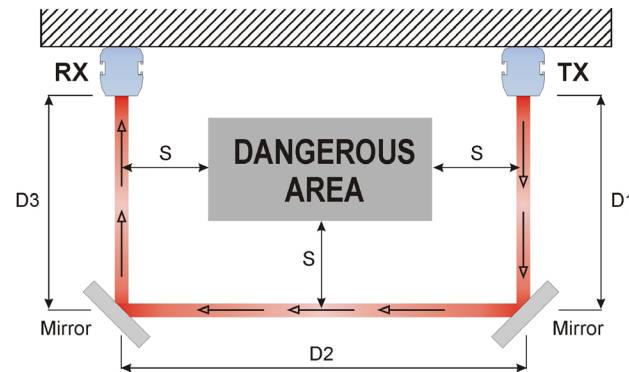


Fig. 11

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

- The alignment of the emitter and the receiver may be a very critical operation when the deviating mirrors are used; a very small angular displacement of the mirror is enough to lose the alignment.
- The minimum safety distance (S) must be respected for each single section of the beams.
- The effective operating range decreases by about 15% by using only one deviating mirror, the percentage further decreases by using 2 or more mirrors (for more details make reference to the technical specifications of the used mirrors).
- Do not use more than three mirrors for each device.
- The eventual presence of dust or dirt on the reflecting surface of the mirror causes a drastic reduction in the range.

3. MECHANICAL MOUNTING

The emission (TX) and receiving (RX) units must be installed with the relevant sensitive surfaces turned toward each other; the connectors must be positioned on the same side and the distance must be included within the operating range of the SF2 light curtain (see section 9 "Technical data").

Once they have been positioned, the two units should be aligned and parallel as much as possible.

The next step is the fine alignment, as shown in section 5 "Alignment procedures".

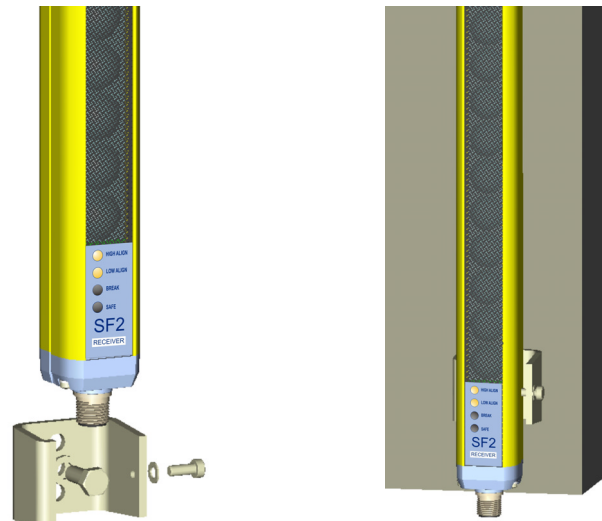


Fig. 12

English

Are available on request L-brackets see Fig.13.

This rigid brackets can be used where no large mechanical tolerances require compensation, during the alignment operation.

Also are available on request the rotating supports for the correction of the units inclination.

In case of applications with particularly strong vibrations, it is advisable to use some anti-vibration shock absorbers with the capacity to reduce the impact of the vibrations – together with rigid brackets.

The recommended mounting positions according to the length of the safety light curtain are shown in the following drawing and table:

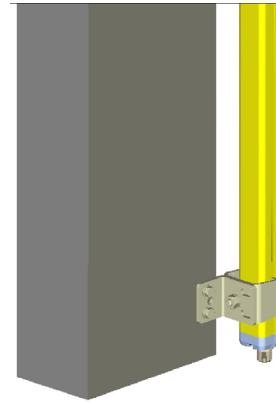
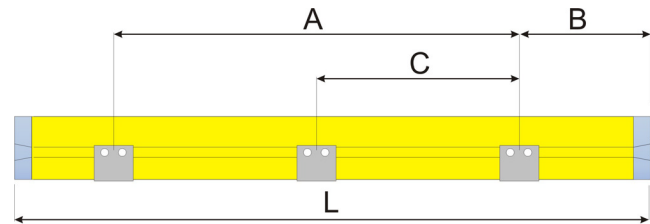


Fig. 13



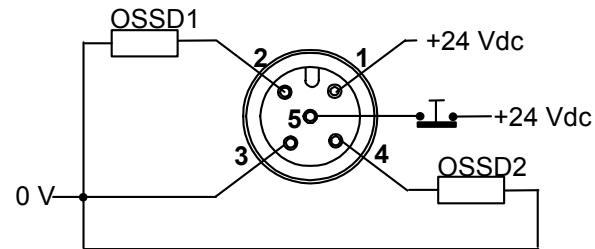
MODEL	L (mm)	A (mm)	B (mm)	C (mm)
SF2-30-015-PP-*	212	72	70	-
SF2-30-030- PP-*	359	179	90	-
SF2-30-045- PP-*	506	286	110	-
SF2-30-060- PP-*	653	373	140	-
SF2-30-075- PP-*	800	460	170	-
SF2-30-090- PP-*	947	547	200	-
SF2-30-105- PP-*	1094	654	220	-
SF2-30-120- PP-*	1241	841	200	420
SF2-30-135- PP-*	1388	988	200	494
SF2-30-150- PP-*	1535	1095	220	547

* = X automatic START version or
Y manual START version

4. ELECTRICAL CONNECTIONS

Every electrical connection to the emitter and receiving units is made through a male M12 connector, located in the lower part of the safety light curtain.

A M12 5-pole connector is used for the receiver and a M12 4-pole connector for the emitter.

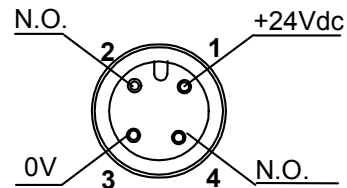


English

RECEIVER (RX):

1 = brown	= +24 Vdc
2 = white	= OSSD 1
3 = blue	= 0 V
4 = black	= OSSD 2
5 = grey	= TEST (see note) *

- * = automatic START (X version) TEST/RESET function
 = manual START (Y version) TEST/START/RESET function



EMITTER (TX):

1 = brown	= +24 Vdc
3 = blue	= 0 V

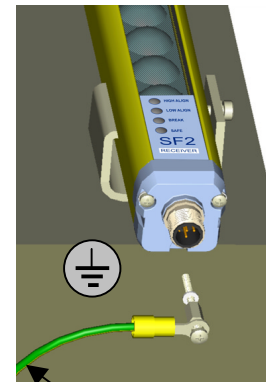
4.1. Notes on the connections

For the correct functioning of the **SAFEasy™** safety light curtain, it is necessary to observe the following precautions regarding the electrical connections:

- The cables must not be placed in contact with or near any high voltage cable (e.g. motor power supply, inverters, etc.); the correct functioning of the safety device can be compromised by the presence of strong electro-magnetic fields.
- The use of multipoles cable to collect more than one safety light curtain outputs is not allowed.
- The TEST wire must be connected through a N.C. button to the supply voltage of the ESPE. A daily manual test is necessary to verify the correct functioning of the safety light curtain; push the relevant button to activate the test.
- If TEST is connected to 0VDC, or it is floating, at the system power up the light curtain goes in break condition (see section 7 "Diagnostic functions").



- The TEST button must be located in such a way that the operator can check the protected area during any test, and reset operation. (see section 6 "Reset mode").
- For Class 3 the ground connection of the two units is not allowed and the SELV/PELV power supply is mandatory.
- For Class 1 the ground connection and the symbol for connection of the two units is mandatory (using the special screw – supplied with the device – instead of one of the 6 screws that lock the heads of each bar) and the SELV/PELV power supply is recommended.



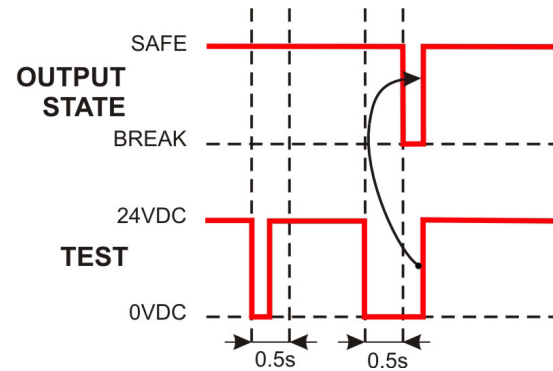
connect to
hearth reference

4.2. TEST timing diagrams

The output electronic functionalities of light curtain are self checked every 0.5 seconds during the normal operation.

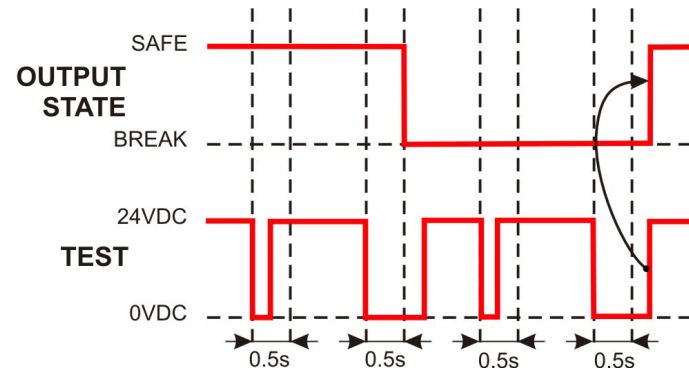
The TEST also can be activated by the external TEST button. Push the button for at least 0.5 seconds in order to activate the function, see the following TEST timing diagram.

AUTOMATIC VERSION



English

MANUAL VERSION





- The safety contacts OSSD1 and OSSD2 have to be connected as Fig.14 cannot be connect in series or in parallel. If one of these configurations is wrongly used (Fig.15, 16, 17), the device enters protection block condition (see cap.7 "Diagnostic functions").

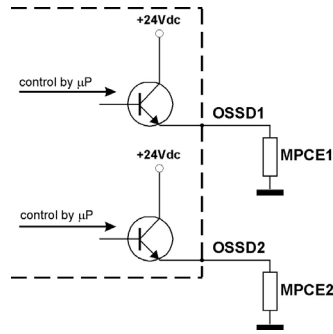


Fig. 14

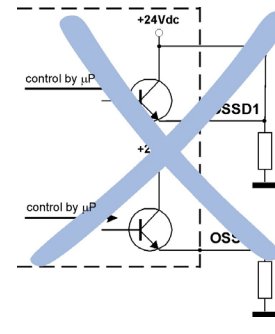


Fig. 15

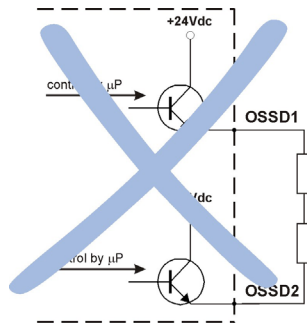


Fig. 16

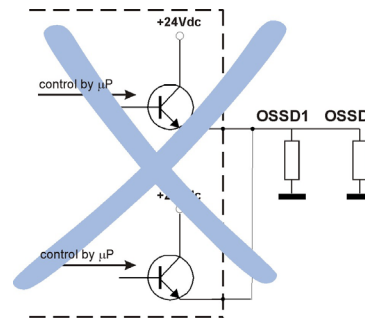
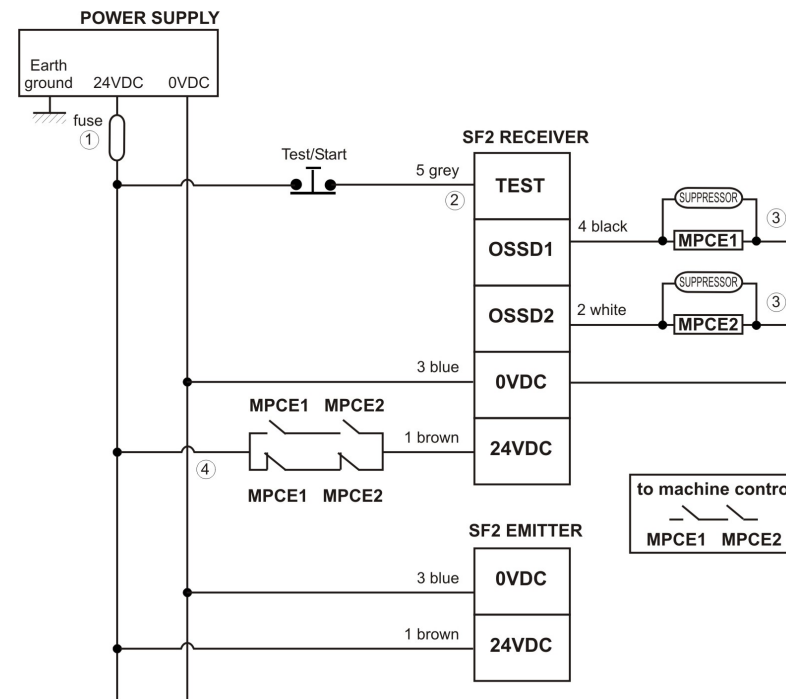


Fig. 17

The following connection diagram shows as the SF2 light curtain can be connected with force-guided relays (MPCE).



English

- ① User-supplied fuse.
- ② For the normal operation mode the TEST wire has to be connected to 24Vdc by a NC button. If the wire is floating or connected to 0VDC the SF2 goes in break condition.
- ③ The MPCE coils must be suppressed.
- ④ To monitor the external MPCE devices it is possible to connect the MPCE contacts as showed. If one of the MPCEs were to fail in a closed (welded) condition, power to the SF2 would be interrupted and the second MPCE would stop the machine when beams interruption occurred or a TEST procedure is performed.






5. ALIGNMENT PROCEDURES

The alignment between the emitter and the receiver units is necessary to obtain the correct functioning of the light curtain.

The alignment is perfect if the optic axes of the first and the last emitter beam coincide with the optic axes of the corresponding elements of the receiver unit. To facilitate the alignment procedure two yellow LED indicators (HIGH ALIGN and LOW ALIGN) are available on SF2 receiver unit. During the normal light curtain operations, the LEDs show the alignment state as follow, no special operating mode is required.

5.1. Correct alignment procedure (AUTOMATIC START)

OPERATING STATE

		SAFE condition	BREAK condition		
Yellow	 HIGH ALIGN	OFF	ON	OFF	OFF
Yellow	 LOW ALIGN	OFF	ON	ON	OFF
Red	 BREAK	OFF	ON	ON	ON
Green	 SAFE	ON	OFF	OFF	OFF
		- Normal operating mode no beams are interrupted	- Light curtain not aligned - High side not aligned - Highest beam interrupted	- Low side not aligned - Lowest beam interrupted	- Light curtain aligned but almost one beam is interrupted except highest and lowest one

When the mechanical installation and the electrical connection have been accomplished – as explained in the previous paragraphs – it is possible to go through the alignment of the safety light curtain, according to the following procedure:

- Check the green LED ON the bottom of the TX unit (POWER ON) and the yellow LED (SAFE); if they are ON, the unit is running correctly.
- Check that the light curtain controlled area is free of any opaque object.

Verify that one of the following conditions is present on the RX unit:

SAFE CONDITION

1. The green LED (SAFE) is ON and the red LED (BREAK) is OFF. Both yellow LED (High ALIGN and Low ALIGN) are OFF

BREAK CONDITION

2. The green LED (SAFE) is OFF and the red LED (BREAK) is ON. The state of the yellow LEDs are not relevant.
- Go on with the following steps to change from condition 2 to condition 1:
 - A Keep the receiving unit in a steady position and set the transmission unit until the yellow LED on the top (HIGH ALIGN) is OFF: this condition shows the effective alignment of the first higher beam.
 - B Rotate the transmission unit until also the lower yellow LED (LOW ALIGN) is OFF: in this condition the SAFE LED switches ON.

Note: Make sure that the green light of the SAFE LED is ON and steady.






- C Delimit the area in which the SAFE LED is steady through some micro adjustments - for the first and then for the second unit - then place both units in the centre of this area.
- Fix the two units firmly using pins and brackets, now the light curtain is ready for the normal operating mode.
 - Verify that the GREEN LED on the RX unit is ON: in that condition the beams are free (SAFE); then verify that the same LED switches is OFF and red LED switches ON if almost one single beam is interrupted, in that condition an object has been intercepted (BREAK).
 - It is important to do this check through the special cylindrical "Test Piece" with a diameter adequate for the resolution of the used device (30 mm).

N.B.: When the Test Piece is passed – from the top to the bottom – through the full sensitive area at any distance from the two units, the BREAK LED must always stay ON – red light – without any spurious commutation.

It is advisable to execute this test every day.

5.2. Correct alignment procedure (MANUAL START)

OPERATING STATE

		SAFE condition	WAITING for RESET condition (BREAK)	BREAK condition		
Yellow	 HIGH ALIGN	OFF	ON	ON	OFF	OFF
Yellow	 LOW ALIGN	OFF	OFF	ON	ON	OFF
Red	 BREAK	OFF	ON	ON	ON	ON
Green	 SAFE	ON	OFF	OFF	OFF	OFF
		-Normal operating mode no beams are interrupted	- Light curtain aligned - Availability to the reset	- Light curtain not aligned - High side not aligned - Highest beam interrupted	- Low side not aligned - Lowest beam interrupted	- Light curtain aligned but almost one beam is interrupted except highest and lowest one

When the mechanical installation and the electrical connection have been accomplished – as explained in the previous paragraphs – it is possible to go through the alignment of the safety light curtain, according to the following procedure:

- Check the green LED on the bottom of the TX unit (POWER ON) and the yellow LED (SAFE); if they are ON, the unit is running correctly.
- Check that the light curtain controlled area is free of any opaque object.

Verify that one of the following conditions is present on the RX unit:

WAITING FOR RESET CONDITION (BREAK)

1. The green LED (SAFE) is OFF and the red LED (BREAK) is ON. The yellow LED (HIGH ALIGN) is ON, the yellow LED (LOW ALIGN) is OFF. Condition of light curtain aligned and available to the reset. Activate the TEST push-button for pass to Normal Condition (SAFE).

BREAK CONDITION

2. The green LED (SAFE) is OFF and the red LED (BREAK) is ON. The state of the yellow LEDs (HIGH ALIGN, LOW ALIGN) is different from the WAITING FOR RESET condition. Condition of light curtain not aligned.
- Go on with the following steps to change from condition 2 to condition 1:
 - A** Keep the receiving unit in a steady position and set the transmission unit until the yellow LED on the top (HIGH ALIGN) is OFF and the relighting of the yellow LED (HIGH ALIGN).
 - B** Rotate the transmission unit until also the lower yellow LED (LOW ALIGN) is OFF: in this condition the yellow LED (HIGH ALIGN) switches ON.
 - C** Delimit the area in which the condition is steady through some micro adjustments - for the first and then for the second unit - then place both units in the centre of this area.
 - Fix the two units firmly using pins and brackets, now the light curtain is ready for the normal operating mode.
 - Verify that the GREEN LED on the RX unit is ON: in that condition the beams are free (SAFE); then verify that the same LED switches is OFF and red LED switches ON if almost one single beam is interrupted, in that condition an object has been intercepted (BREAK).
 - It is important to do this check through the special cylindrical "Test Piece" with a diameter adequate for the resolution of the used device (30 mm).
- N.B.: When the Test Piece is passed – from the top to the bottom – through the full sensitive area at any distance from the two units, the BREAK LED must always stay ON – red light – without any spurious commutation.**

It is advisable to execute this test every day.

English

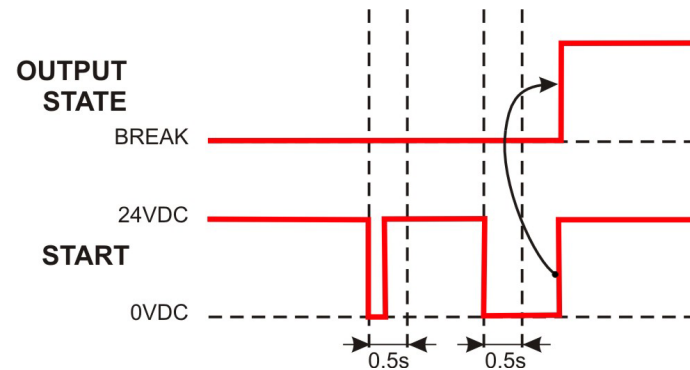
6. START MODE

The beams sent by the emitter unit that intercept an opaque object cause the switching of the OSSD outputs – opening of the safety contacts: BREAK condition.

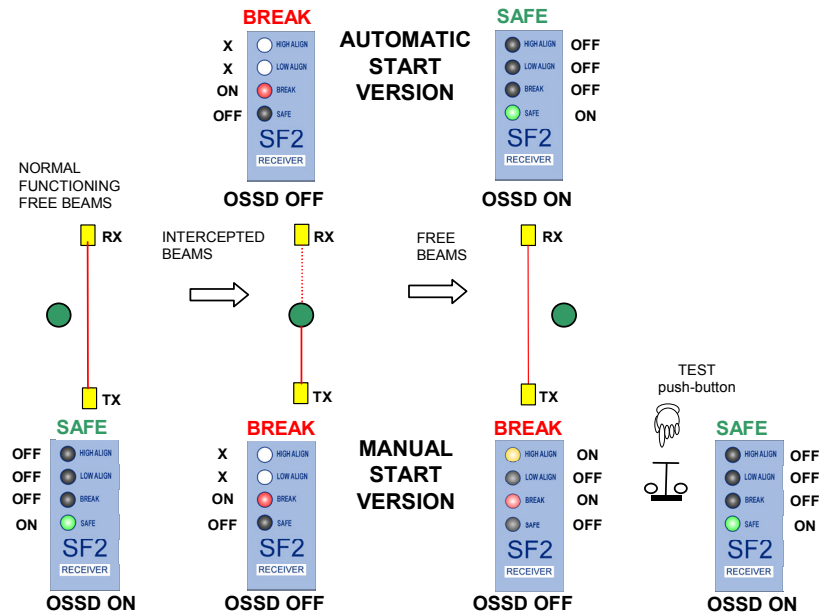
The reset of the normal functioning of the ESPE – closing of the OSSD safety contacts (SAFE condition) – can be accomplished in two different ways:

- **Automatic Start:** when an opaque object is detected, the ESPE goes in BREAK condition; then, after the opaque object has been removed from the controlled area, the ESPE returns in SAFE condition (switches OSSD ON).
- **Manual Start:** after the ESPE has detected an opaque object in the controlled area, the light curtain restarts its functioning by pressing the TEST button for at least 0.5 seconds (see the following START/RESET diagram) after that the object has been removed from the controlled area.

START/RESET TIMING DIAGRAM



The Fig.18 below shows these two functioning modes.



English

Fig. 18

X = The LEDs state can be OFF or ON.

7. DIAGNOSTIC FUNCTIONS

7.1. Visualization of the functions

The operator can visualize the operating condition of the light curtains through four LEDs positioned on the receiver unit and two LEDs on the emitter unit (Fig.19).

- **SAFE/BREAK LED:**

SAFE GREEN LED when **ON** it shows that no objects have been intercepted by the device; in this condition the outputs are ON.

BREAK RED LED when **ON** it shows that one object has been intercepted; in this condition the outputs are OFF.

- **ALIGN HIGH LED: (yellow)** when **OFF**, it shows the correct alignment of the last TX optic with the corresponding RX optic (upper side of the device).

When **continuously ON** it shows that it is necessary to press the TEST button to reset the device in consequence of an object interception. This occurs only when the device is a manual START version.

- **ALIGN LOW LED: (yellow)** when **OFF**, it shows the correct alignment of the first TX optic with the corresponding RX optic (lower side of the device).

The LEDs located on the emitter (**TX**) have the following meanings:

- **SAFE LED (yellow):** when **ON**, it shows that the unit is emitting correctly.
- **POWER ON LED (green):** when **ON**, it shows that the unit is correctly power supplied.

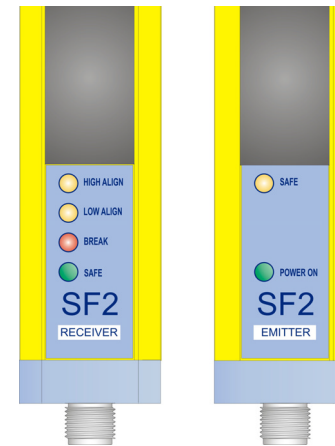


Fig. 19

7.2. Fault messages and Diagnostics

The operator is able to check the main causes of stop and breakdown of the system, using the same LEDs used for the visualization of the functions.

RECEIVER UNIT:

Breakdown	Check and Repair
<ul style="list-style-type: none"> HIGH ALIGN } Yellow blinking LOW ALIGN } BREAK Red blinking SAFE Green OFF 	<ul style="list-style-type: none"> - Check the output connections. - Contact Datasensor in case of a capacitive load > 0.1µF is connected - Press TEST button for at least 0.5 seconds (see section 6 "the START/RESET timing diagram"). If the condition continues and contact Datasensor
<ul style="list-style-type: none"> HIGH ALIGN } Yellow blinking LOW ALIGN } BREAK Red OFF SAFE Green OFF 	<ul style="list-style-type: none"> - Press TEST button for at least 0.5 seconds (see section 6 "the START/RESET timing diagram"). If the condition continues and contact Datasensor
<ul style="list-style-type: none"> HIGH ALIGN Yellow OFF LOW ALIGN Yellow blinking BREAK Red OFF SAFE Green OFF 	<ul style="list-style-type: none"> - Check the alignment of both units - Press TEST button for at least 0.5 seconds (see section 6 "the START/RESET timing diagram"). If the condition continues and contact Datasensor
<ul style="list-style-type: none"> HIGH ALIGN } Yellow ON LOW ALIGN } BREAK Red ON SAFE Green ON 	<ul style="list-style-type: none"> - Switch off the device, switch ON with the TEST wire connected through a NC button to supply voltage.
<ul style="list-style-type: none"> HIGH ALIGN Yellow OFF LOW ALIGN Yellow OFF BREAK Red OFF SAFE Green OFF 	<ul style="list-style-type: none"> - Power supply failure, check the power supply.

English

EMITTER UNIT:

Breakdown	Check and Repair
<ul style="list-style-type: none"> SAFE Yellow blinking POWER ON Green OFF 	<ul style="list-style-type: none"> - Transmission failure, check the power supply. If the condition continues and contact Datasensor
<ul style="list-style-type: none"> SAFE Yellow OFF POWER ON Green OFF 	<ul style="list-style-type: none"> - Power supply failure, check the power supply.

8. CHECKS AND PERIODICAL MAINTENANCE

The following is a list of recommended check and maintenance operations that should be periodically carried out by qualified personnel.

Check that:

- The ESPE stays locked while intercepting the beams along the entire protected area, using the suitable "Test Piece".
- Pressing the TEST button, the OSSD outputs should open (the red BREAK LED is ON and the controlled machine stops).
- The response time at the machine STOP (inclusive of the response time of the ESPE and of the machine) is within the limits defined by the calculation of the safety distance (see section 2 "Installation Mode").
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in section 2 "Installation Mode".
- Access to the dangerous area of the machine from any unprotected area is not possible .
- The ESPE and the external electrical connections are not damaged.

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

8.1. Maintenance

The **SAFEasy™** SF2 safety devices do not need any particular maintenance, with the exception of the cleaning of the protection frontal surfaces of the optics.

When cleaning, use a cotton cloth dampened with water.



Do not under any circumstances use:

- alcohol or solvents
- wool or synthetic cloths

8.2. General information and useful data



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 as to whether or not you have the necessary expertise to install the device in the correct way, DATASENSOR technical service is at your disposal to carry out the installation.

The device is protected against a short circuit but a non auto-regenerating type fuse is used. If short circuit occurs the fuse as to be changed, contact DATASENSOR services.

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.

English

8.3. Warranty

All appliances are under a 36 months guarantee from the manufacturing date.

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

The warranty will not cover damages caused by incorrect installation, incorrect use and accidental causes such as bumps or falls.



In the event of breakdown send both units to DATASENSOR S.p.A.

Sales Technical Service

Tel.: +39 051 6765611

Fax.: +39 051 6759324

email: service@datasensor.com

9. TECHNICAL DATA

Power supply = Vdd:	24 Vdc ± 20% (SELV/PELV)
Emitter consumption (TX):	50 mA max / 1W
Receiver consumption (RX):	90 mA max (without load) / 2.5 W
Outputs: SF2	2 PNP output; (2 NPN on request) Short-circuit protection max: 1.4A at 55 °C min: 1.2A at 0 °C
Output current (for all loads):	500 mA max. (on single output)
Output voltage ON min	Vdd - 1V
Output voltage OFF max	0.2 V
Leakage current :	0.65 mA
Capacitive load (pure):	100 nF max
Resistive load (pure):	60Ω min
Response time:	24ms on the maximum length (see section 10 "List of the available models")
Emission type:	Infrared (880 nm)
Resolution:	30 mm
Operating distance:	0.2 ... 15 m
Safety range:	Type 2
Operating temperature:	0...+55 °C
Storage temperature:	-25...+70 °C
Humidity:	15...95 % (no condensation)
Electrical protection:	Class 1 (** see note)
Mechanical protection:	IP 65 (EN 60529)
Ambient light rejection:	IEC-61496-2
Vibrations:	0.35 mm amplitude, 10 ... 55 Hz frequency, 20 sweep for every axis, 1octave/min (EN 60068-2-6)
Shock resistance:	16 ms (10 G) 1.000 shock for every axis (EN 60068-2-29)
Reference standards	EN 61496-1; IEC 61496-2
Housing material:	Painted aluminium (yellow RAL 1003)
End cap material:	PBT
Lens material:	PMMA
Connections:	M12 4-pole connector for TX M12 5-pole connector for RX
Cable length:	50m. max * (at 100 nF capacitive load and Vcc=24V) M12 conductors (according to EN 50044, EN 60947-5-2) Ø poles = 32x0.1 mm, Ø external = 5 mm
Weight:	1 Kg max./m of total height

* = if a longer cable has to be used, please verify that the same specifications are respected.

** Electrical protection	Class 1	Class 3
Protective grounding	Mandatory	Not allowed
Symbol for connection protective grounding	Mandatory	Not allowed
Protection by means of extra- low voltage with protective separation (SELV and PELV)	Recommended	Mandatory

10. LIST OF THE AVAILABLE MODELS

Model	Length of the sensitive area (mm)	Length of the controlled area (mm)	Number of beams	Response time (msec)	Resolution (mm)	Operating distance (m)
SF2-30-015- PP.*	147	187	8	14	30	0.2...15
SF2-30-030- PP.*	294	334	16	15		
SF2-30-045- PP.*	441	481	24	16		
SF2-30-060- PP.*	588	628	32	17		
SF2-30-075- PP.*	735	775	40	18		
SF2-30-090- PP.*	882	922	48	19		
SF2-30-105- PP.*	1029	1069	56	20		
SF2-30-120- PP.*	1176	1216	64	22		
SF2-30-135- PP.*	1323	1363	72	23		
SF2-30-150- PP.*	1470	1510	80	24		

English

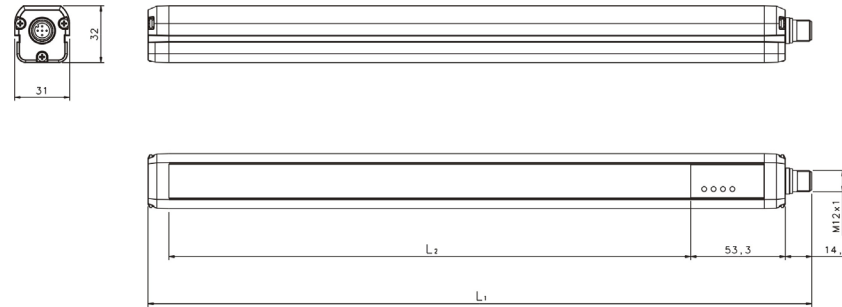
Available models:

MODEL	a x b (mm)	h (mm)
SF2-30-015- PP.*	31 x 32	227
SF2-30-030- PP.*		374
SF2-30-045- PP.*		521
SF2-30-060- PP.*		668
SF2-30-075- PP.*		815
SF2-30-090- PP.*		962
SF2-30-105- PP.*		1109
SF2-30-120- PP.*		1256
SF2-30-135- PP.*		1403
SF2-30-150- PP.*		1550

* = X automatic START version or
Y manual START version

11. OVERALL DIMENSIONS

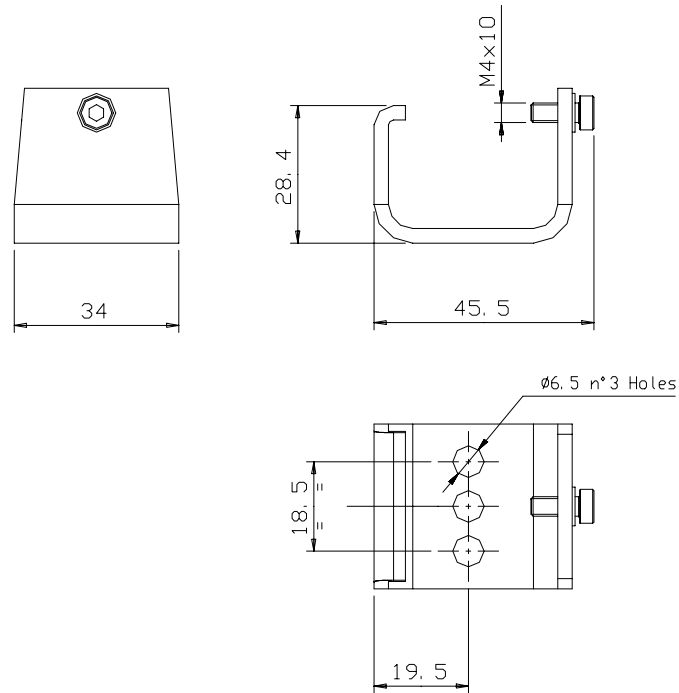
All the reported dimensions are in mm.



MODEL	L ₁	L ₂
SF2-30-015	227	147
SF2-30-030	374	294
SF2-30-045	521	441
SF2-30-060	668	588
SF2-30-075	815	735
SF2-30-090	962	882
SF2-30-105	1109	1029
SF2-30-120	1256	1176
SF2-30-135	1403	1323
SF2-30-150	1550	1470

12. ACCESSORIES

Mounting brackets



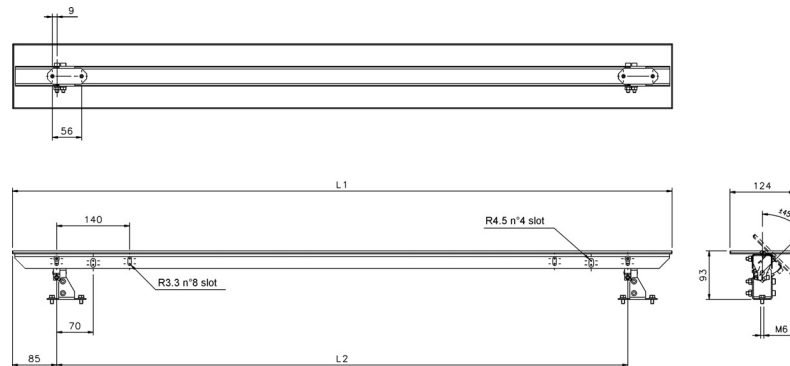
English

Are available also:

MODEL	DESCRIPTION	CODE N°
ST-KSTD	Angle mounting brackets Kit 4 pz.	95ACC1670
ST-K4AV	Anti-vibration supports Kit 4 pz.	95ACC1700
ST-K6AV	Anti-vibration supports Kit 6 pz.	95ACC1710
ST-K4OR	Orientable supports Kit 4 pz.	95ACC1680
ST-K6OR	Orientable supports Kit 6 pz.	95ACC1690

Deviating mirrors

MODEL	DESCRIPTION	CODE N°
SE-DM 500	Deviating mirror H= 550 mm	95ACC1910
SE-DM 600	Deviating mirror H= 700 mm	95ACC1920
SE-DM 800	Deviating mirror H= 900 mm	95ACC1930
SE-DM 900	Deviating mirror H= 1000 mm	95ACC1940
SE-DM 1200	Deviating mirror H= 1270 mm	95ACC1950
SE-DM 1500	Deviating mirror H= 1600 mm	95ACC1960

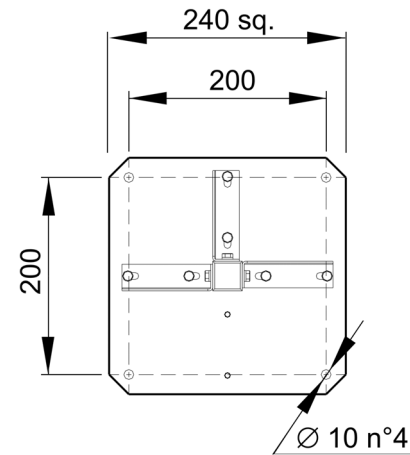
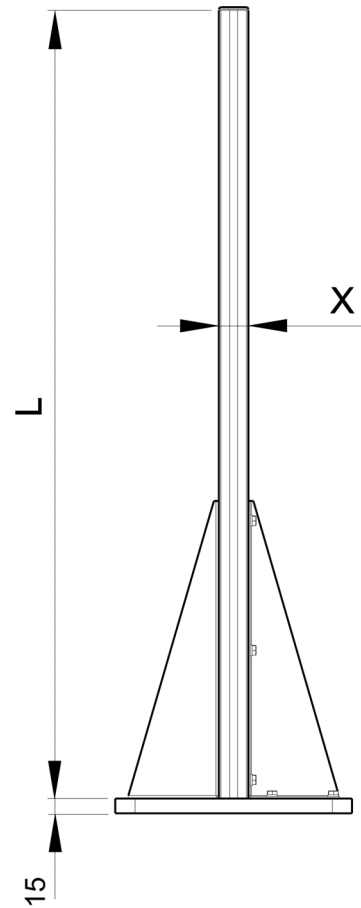


MODEL	L ₁ (mm)	L ₂ (mm)
SE-DM 500	554	384
SE-DM 600	704	534
SE-DM 800	904	734
SE-DM 900	1004	834
SE-DM 1200	1264	1094
SE-DM 1500	1604	1434

Columns and floor stands

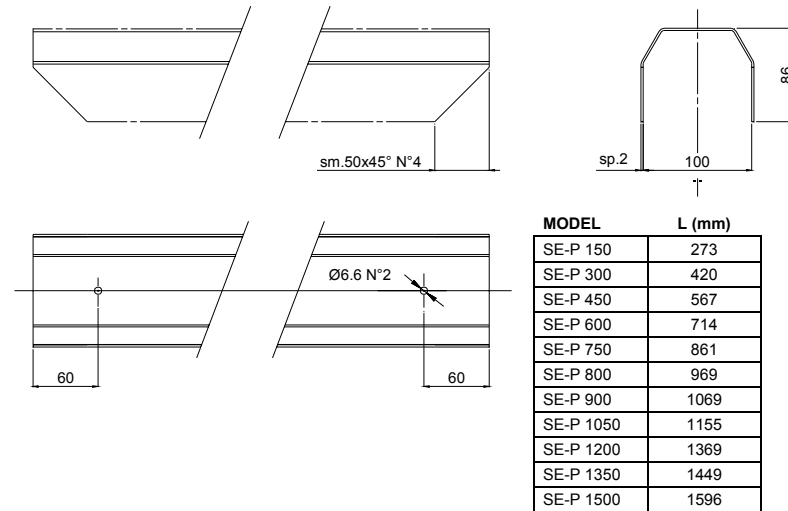
MODEL	DESCRIPTION	CODE N°
SE-S 800	Column and floor stand H= 800 mm	95ACC1730
SE-S 1000	Column and floor stand H= 1000 mm	95ACC1740
SE-S 1200	Column and floor stand H= 1200 mm	95ACC1750
SE-S 1500	Column and floor stand H= 1500 mm	95ACC1760
SE-S 1800	Ground support H= 1800 mm	95ACC1770

MODEL	L (mm)	X (mm)
SE-S 800	800	30x30
SE-S 1000	1000	30x30
SE-S 1200	1200	30x30
SE-S 1500	1500	45x45
SE-S 1800	1800	45x45



English

Protective stand



MODEL	DESCRIPTION	CODE N°
SE-P 150	Protective stand H= 273 mm	95ACC1780
SE-P 300	Protective stand H= 420 mm	95ACC1790
SE-P 450	Protective stand H= 567 mm	95ACC1800
SE-P 600	Protective stand H= 714 mm	95ACC1810
SE-P 750	Protective stand H= 861 mm	95ACC1820
SE-P 800	Protective stand H= 969 mm	95ACC1830
SE-P 900	Protective stand H= 1069 mm	95ACC1840
SE-P 1050	Protective stand H= 1155 mm	95ACC1850
SE-P 1200	Protective stand H= 1302 mm	95ACC1860
SE-P 1350	Protective stand H= 1449 mm	95ACC1870
SE-P 1500	Protective stand H= 1596 mm	95ACC1880

Test piece

MODEL	DESCRIPTION	CODE N°
TP-30	Test piece Ø 30 mm	95ACC1650

Connecting cable

MODEL	DESCRIPTION	CODE N°
CS-A1-02-G-03	Axial 4-pin 3 m. cable	95A251380
CS-A1-02-G-05	Axial 4-pin 5 m. cable	95A251270
CS-A1-02-G-10	Axial 4-pin 10 m. cable	95A251390
CS-A1-03-G-03	Axial 5-pin 3 m. cable	95ACC2110
CS-A1-03-G-05	Axial 5-pin 5 m. cable	95ACC2120
CS-A1-03-G-10	Axial 5-pin 10 m. cable	95ACC2140

English