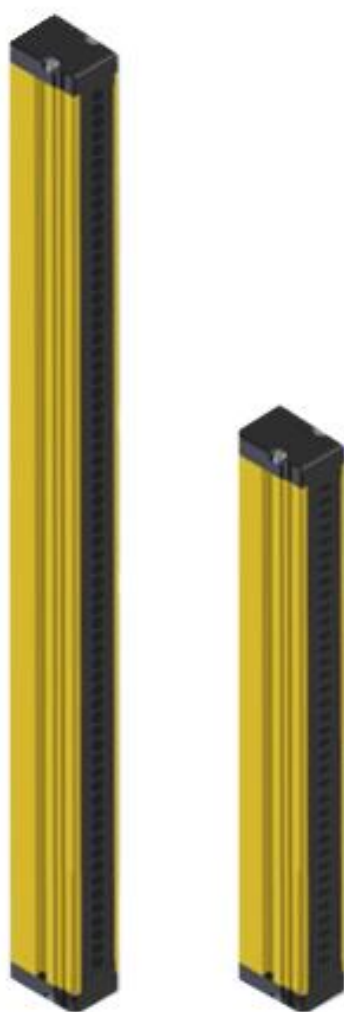


## “EFESTO4” Safety Light Curtain with multi beams

### Instruction use and maintenance



---

## IMPORTANT REMARKS ON SAFETY

---

As this device, for the safety of operators working on dangerous machinery, it is necessary that an authorised person should carry out the installation carefully while making notes and maintain such records for future instruction and maintenance.

The safety light curtain forms only one link of the safety system.

Therefore, complete system performance remains the responsibility of the machine builder or end user.

Please observe all technical details and recommendations reported in this installation/instruction manual without exception and with strict adherence to all applicable local, National and International Safety Standards and guidelines which may apply to the machines.

**GREIN is not responsible for any dangerous occurs to a not good employ of the product.**

## Summary

GENERAL INFORMATIONS	pag. 4
TERMS AND DEFINITIONS	pag. 4
TECHNICAL CARATTERISTICS AND FUNCTIONS	pag. 5
INSTALLATION GUIDELINES	pag. 6
DETERMINATION OF SAFETY DISTANCE	pag. 7
MINIMUM DISTANCE TO AVOID THE REFLECTIONS	pag. 9
MECHANICAL MOUNTING	pag. 10
GROUPING OF BARRIERS	pag. 11
MASTER / SLAVE BARRIERS	pag. 12
MODELS AND E FUCTION	pag. 13
WIRING CONNECTIONS	pag. 14
CONNECTING EXTERNAL CONTACTORS	pag. 21
EMITTER CONNECTIONS AND FUNCTIONS	pag. 22
RECEIVER CONNECTIONS AND FUNCTIONS	pag. 22
INDICATION AND DIAGNOSTIC	pag. 27
SERVICE AND TEST	pag. 31
SETTING UP AND TEST	pag. 32
LIST OF MODELS AND CHARACTERISTICS	pag. 33
RESPONS TIME FOR MASTER / SLAVE	pag. 41
BLANKING FUNCTION	pag. 42
MUTING FUNCTION	pag. 45
ACCESSORIES - MIRRORS	pag. 47
MOUNTING BRACKETS	pag. 52
CONNECTION CABLES	pag. 55
INTEGRATED SIGNALLING LAMP	pag. 55
RELAYS MODULE DIN RAIL	pag. 56
EXTERNAL MODULES BOX	pag. 57
WARRANTY	pag. 61
UE DECLARATION OF CONFORMITY	pag. 62

## GENERAL INFORMATIONS

The EFESTO4 light curtain is a optoelectronic system with multi beams ( **Electro-Sensitive Protective Equipment** ) type 4 for the protection of body to prevent accident on the machine on dangerous plants in accordance with International safety standards.

EFESTO4 is formed of an emitter and a receiver unit synchronized through a optic link. The safety output are at solid state with possibility to transform on power with relays inserted on special module.

The wide range of model permit the employ on every field of industrial automation supplying the protection of the fingers, hand, arm, body, for the movement on dangerous area. The principal application are presses, robotized areas, highly automated equipment, and many others.

The series EFESTO4 is divided in different models based on the functions implemented. This system allows the customer to choose the most adequate model of barrier in according to his requirements. To complete the range are available some interconnection modules to connect the barrier without to pass to the general panel of machine.

## TERMS AND DEFINITIONS

<b>OSSD0</b>	Safety output channel zero.
<b>OSSD1</b>	Safety output channel one.
<b>OSSD STATO ON</b>	Condition on which the output permits the flow of current.
<b>OSSD STATO OFF</b>	Condition on which the output do not permit the flow of current.
<b>EDM</b>	External Device Monitor.
<b>RESET</b>	OSSD restart from OFF to ON.
<b>MUTING</b>	Temporary suspension of the safety function.
<b>OVERRIDE</b>	Manual muting function after a mistake in automatic muting.

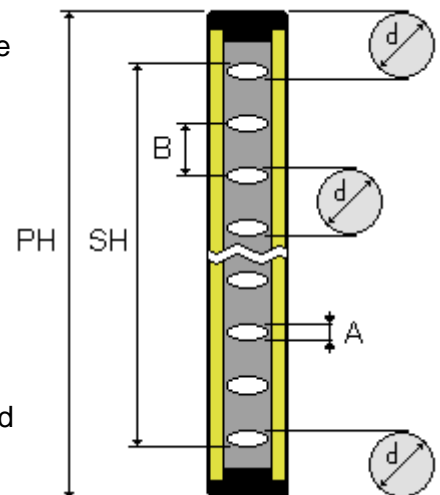
**Protective height PH**  
It is the zone in which the test rod will stop the barrier.

**Sensitive height SH**  
It is the zone covered by the beams.

**A**  
Active part of the lens.

**B**  
Beam spacing in mm.

**Resolution d**  
It is the minimum object detected on protected area, Is the dimension necessary for the obscuration of two adjacent beams.  
 $d = A + B$ .



## Technical characteristics

<b>Synchronization Tx Rx</b>	Optical
<b>Total aperture angle</b>	5°
<b>Wave length</b>	940 nm
<b>Resolutions</b>	14, 20, 30, 40, 55, 65, 125, 135, 306, 315 mm
<b>Maximum range</b>	6 - 15 - 30 - 60m depending from the resolution
<b>Protected height</b>	from 200 mm to 3000 mm
<b>Maximum speed</b>	3,3 m/s ( of test rod 150mm length )
<b>Output</b>	2 PNP - 500 mA short circuit and overload protected
<b>Connections</b>	M12 5 / 8 poles or M23 17 in functions of the model and options
<b>Power supply</b>	24Vcc ± 10% PELV
<b>Response time</b>	From 5 to 30ms depending to number of beams
<b>Max connections length</b>	100 m
<b>Body</b>	Extruded aluminium, 36 x 50, RAL 1.021
<b>IP protection degree</b>	IP 65
<b>Relative umidity</b>	5 - 95%
<b>Working temperature</b>	0 ÷ 65 °C
<b>Safety level</b>	Tpe 4 - SIL 3 - SILCL 3 - PL e – Cat. 4

## Functions

<b>Reset</b>	Selection of the restart of the barrier
<b>Type</b>	Automatic or manual
<b>Restart time</b>	100 ms
<b>Blanking</b>	Beams exclusion
<b>N of beams</b>	1, 2 or 3 beams
<b>Type</b>	Blanking with or without the presence of the object
<b>Selection</b>	Through wiring, are not necessary programming modules
<b>MUTING</b>	Temporary exclusion of safety function of the barrier
<b>Muting type</b>	Two sensors, with contemporaneity control
<b>Muting enable</b>	Enable / disable muting function
<b>Override</b>	Manual override of muting function
<b>Muting lamp output</b>	Output for muting lamp, 24V 500mA max
<b>EDM</b>	External Device Monitor
<b>OSSD-S</b>	Output signaling of the safety outputs state
<b>MUTE - F</b>	Output for signaling of interrupted barrier when muting active
<b>TEST</b>	Simulation of interruption of light curtain beams barrier, to facilitate the monitoring of the safety of the machine
<b>BARGRAPH</b>	3 led for alignment and indications

### INSTALLATION GUIDELINES

#### Correct Installation



frontal protection



vertical and horizontal protection



oblique protection

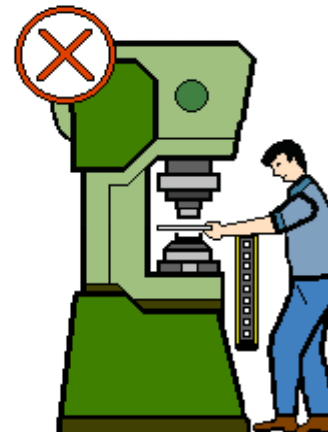
#### Incorrect installation



insertion into the danger zone under the barrier



insertion between the barrier and dangerous zone



insertion into the dangerous zone above the barrier

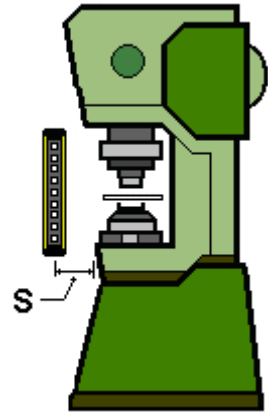
Refer to the standard EN ISO 13855 for a correct installation of the safety device

## DETERMINATION OF SAFETY DISTANCE

Before of the installation it is necessary to calculate the safety distance in order to allow the stop of the machine before the operator or part of his body enter in the dangerous area ( as described in EN 999 and ISO 13855 ).

### Definitions:

- S** safety distance in mm
- T1** response time of machine in ms
- T2** response time of curtain in ms  
(see TX / RX label)
- d** resolution of the system in mm



### Vertical installation

#### Models with resolution up to 40mm

The following formula is valid for a distance S included between 100 and 500 mm:

$$S = 2 (T1 + T2) + 8 (d - 14)$$

If S results more of 500mm, use the following formula :

$$S = 1,6 (T1 + T2) + 8 (d-14)$$

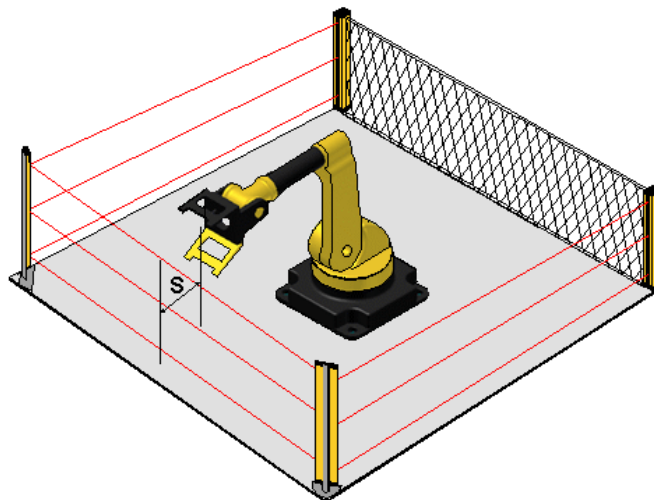
#### Models with resolution more than 40 and up to 90 mm

$$S = 1,6 (T1 + T2) + 850$$

The highest beam must be placed at a minimum height of 900 mm from the installation plane of the machine, while the inferior beam must be at a height less than 300 mm

#### Models with resolution more than 90 mm

$$S = 1,6 (T1 + T2) + 1.200$$



## DETERMINATION OF SAFETY DISTANCE

### Horizontal installation

For all types of light curtains with horizontal installation, to detect intrusion of legs and body, the distance **S** shall be calculated using formula :

$$S = 1,6 (T1 + T2) + K$$

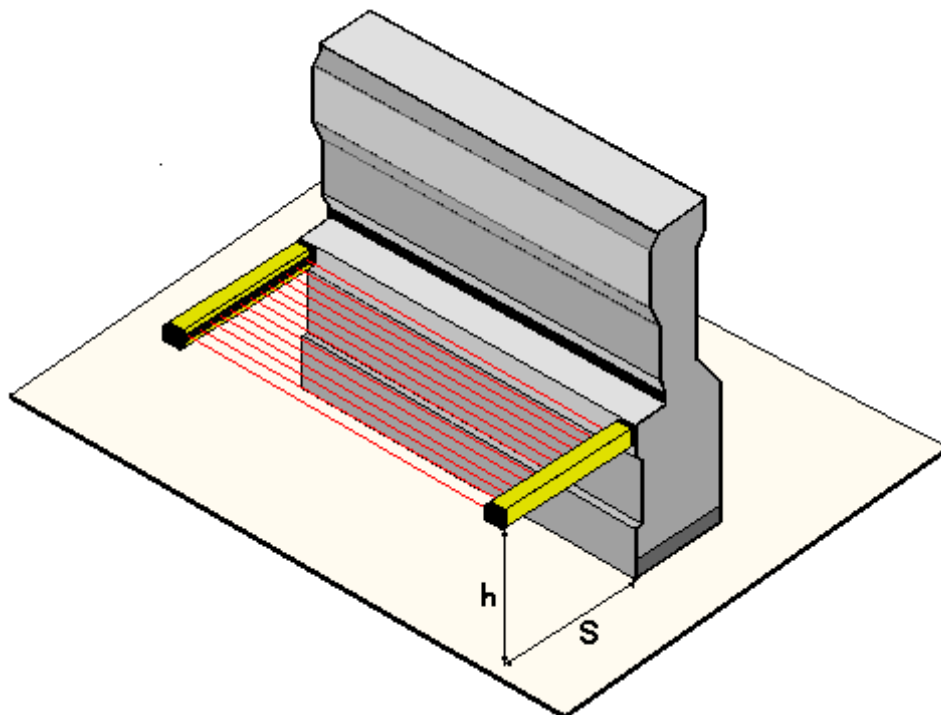
where:

**K** = (1200 - 0.4 H) ) must be > 850 mm  
**H** = height of curtain in mm from ground

**H** must be lower than the working plane, and in any case don't higher than 1.000 mm

Example using a light curtain with resolution 50 mm height of working plane 800 mm:

**T1** = 100ms  
**T2** = 10 ms  
**H** = 750 mm  
**K** = 1200 - 0.4 x 750 = 900 mm  
**S** = 1.6 (100 + 10) + K = 1076 mm





## MINIMUM DISTANCE TO AVOID THE REFLECTIONS

The beam angle of optic and alignment tolerance for emitter and receiver is 5 degrees. Since reflective surfaces near the detection zone can cause reflections and therefore non-detection of an object, a minimum distance **A** to the optical axis, should be observed according to the following formula:

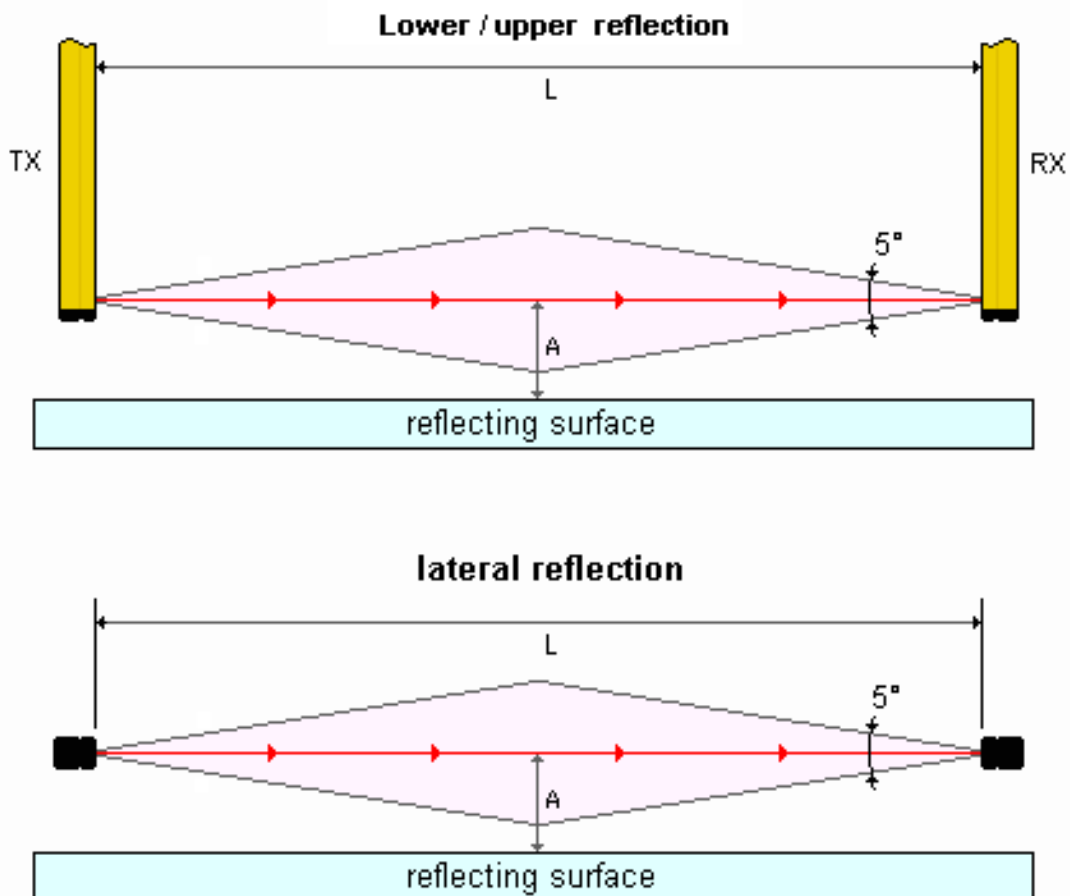
$$A = 44 L \quad \text{where } A \text{ is in mm, } L \text{ is in m}$$

**A** should never be less than 131 mm

To verify the above, after the installation of the light curtain, is necessary to pass the test rod through the detection zone, near the emitter, the receiver and in the middle of the detection zone, verifying that :

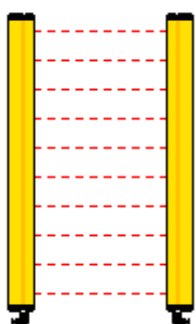
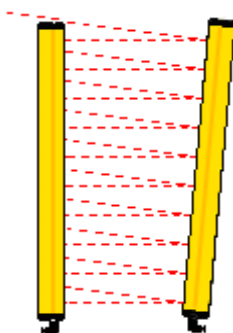
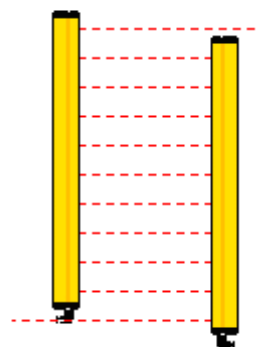
If selected the automatic restart      the LED OS OFF      should remain always ON;  
 If selected the manual restart      the LED BMS      should remain always OFF.

If the indication are not as described above, there is a hole in the detection zone due to reflection.  
 Modify the position of the barrier to avoid the reflection.



**MECHANICAL ASSEMBLY**

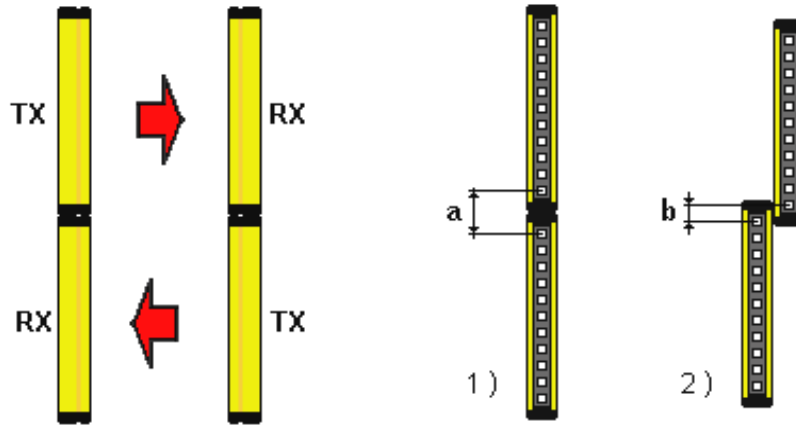
During the installation it is necessary to verify the right position of emitter and receiver in order to check that they are in the same plane and axis as shown on the following drawings.

**SIDE VIEW :****CORRECT****ANGULAR MISTAKE****AXIAL MISTAKE****TOP VIEW :****CORRECT****ANGULAR MISTAKE****AXIAL MISTAKE**

### GROUPING OF LIGHT CURTAINS

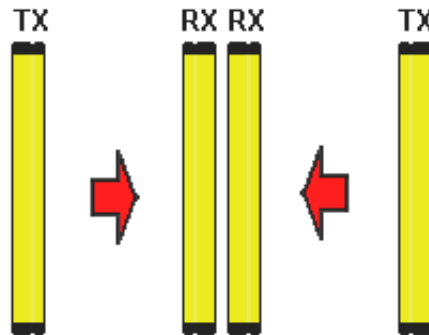
**Linear assembly:** to increase the protected height

To avoid the reciprocal interference between 2 light curtains it is necessary that the emitter and receiver are mounted on opposite sides.

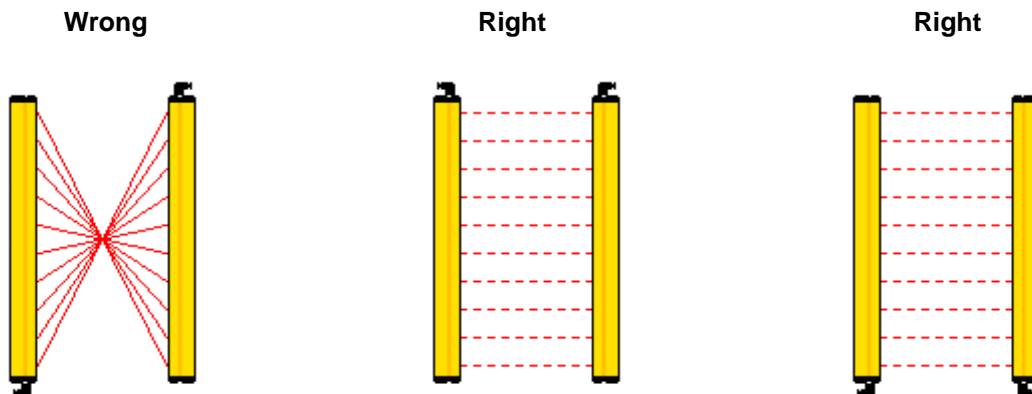


- 1) Example of two light curtains on the same axis with a non-constant resolution in the join point
- 2) Example of two light curtains no aligned to maintain constant resolution in the joint point.

Suggestions to avoid interference between light curtains assembled in line in case of long distances or protected machines installed in series:



The light curtain can work on vertical position or upside-down.  
Don't turn the transmitter in the opposite direction of the receiver, it changes the protected field.



## LIGHT CURTAINS FOR ANGLED APPLICATION "L" SHAPE ( master and slave )

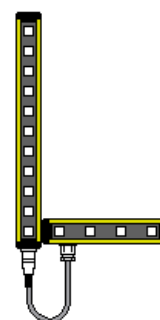
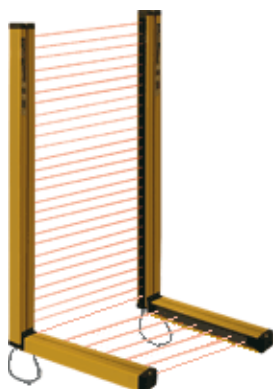
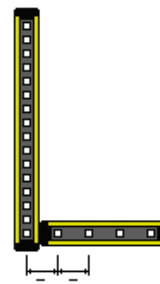
Where the safety distance is particularly long (for example using large presses) it is necessary that nobody can enter in the dangerous area at the restart of the machine. This problem can be solved by installing the angled version light curtain, which consists of a vertical unit (MASTER) and a horizontal unit (SLAVE) used to stop behind protection.

The vertical light curtain is provided with one fixed cable of length max. 0.5m and a male connector. The horizontal light curtain is provided with female connector only.

Particular attention must be taken during the installation, insuring that on the point where the light curtains meet, the resolution must be the same as the horizontal light curtain (see drawing below).

As the two units (vertical and horizontal) works electrically as one light curtain, attention must be taken during the installation, the system will operate only if all the vertical / horizontal - emitter / receiver are perfectly aligned. The bargraph can help in this operation.

On this solution, the function of floating blanking is active only on vertical light curtain ( MASTER ). On the horizontal unit ( SLAVE ) the blanking is not active and the interruption of a single beam leads OSSD in the OFF state.



Connection Master / slave

## Model and function

All model have the following features :

- TX with M12 4 poles connector and test input;
- RX with 2 solid state PNP output;
- Automatic reset;
- Bargraph with 3 led for alignment and signaling.

### Functions and connections available of different models

Model	Function available							RX Connectors		
	RM	EDM	BLNK	MUTE-E	MUTE	O-S	M-F	M12 5P	M12 8P	M23-17P
EF - a ...								•		
EF - b ...	•	•							•	
EF - c ...			•						•	
EF - d ...	•	•	•			•		•	•	
EF - e ...	•	•			•			•	•	
EF - f1 ...	•	•		•	•	•				•
EF - f2 ...	•	•		•	•		•			•

... optical code

### Optic

optic	Resolution	Min. Range	Max range
__ A	14 mm	0.5	6 m
__ AL	20 mm	2 m	15 m
__ B	30 mm	0.5m	15 m
__ BL	40 mm	6 m	30 m
__ C	55 mm	0.5m	15 m
__ CL	65 mm	6 m	30 m
__ D	125 mm	0.5m	15 m
__ DL	135 mm	6 m	30 m
__ E	306 mm	0.5m	15 m
__ EL	315 mm	6 m	30 m

\_\_ protection height

**Note** are available special versions \_\_DLL and \_\_ELL with range from 6 up to 60m

### LEGEND

RM	Manual reset
EDM	External Device Monitoring
BLNK	Blanking
MUTE-E	Input for muting enable
MUTE	Input of 2 external sensors + guard override + signaling lamp
O-S	Output signaling the status of the safety outputs
M-F	Output signaling the status of interrupted barrier during the muting state.

### RECEIVER CONNECTIONS

M12-5P	Connector M12 - 5 Poles - male
M12-8P	Connector M12 - 8 Poles - male
M23-17P	Connector M23 - 17 Poles - male

## Wiring connection

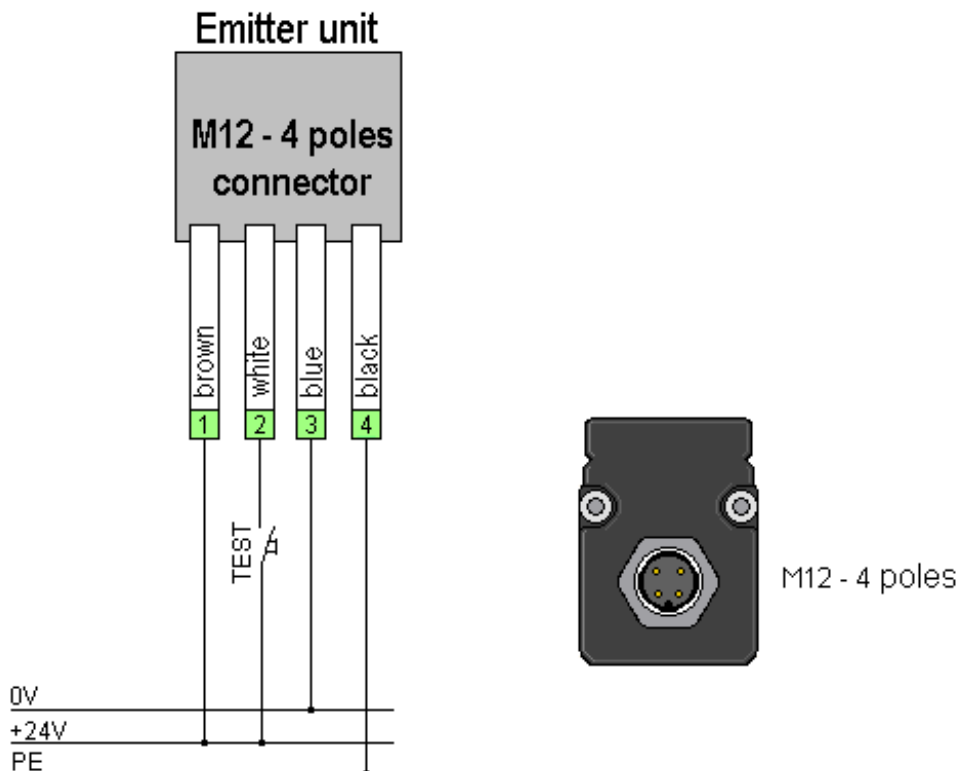
### Warning on connection cables

- 1 – Use cables with section of 1 mm<sup>2</sup> for length connection more than 50m.
- 2 – The units TX / RX shall be connect to the ground (PE).
- 3 – All the cables shall follow different way from those of power.
- 4 – The power of the barrier should be separated from that of equipment dedicated to the control of power equipment, such as inverters.
- 5 – If there is the possibility to damage the cables, take care to protect them against crushing or cutting.
- 6 – The cables should be shielded type, the shield should be connected to the ground ( PE ).

### Emitter connection

Emitter		EF - ... -				
Pin N	Wire color	Function	Description	Type	Level	
M12 4 poles						
1	Brown	+24V	Positive power supply	IN	+24Vdc +/- 10%	0,5A
2	White	TEST	TEST signal	IN	0 - 24 Vdc	10mA
3	Blue	GND	0V power supply	IN	0V	
4	Black	PE	Ground	-	-	

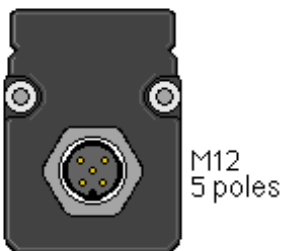
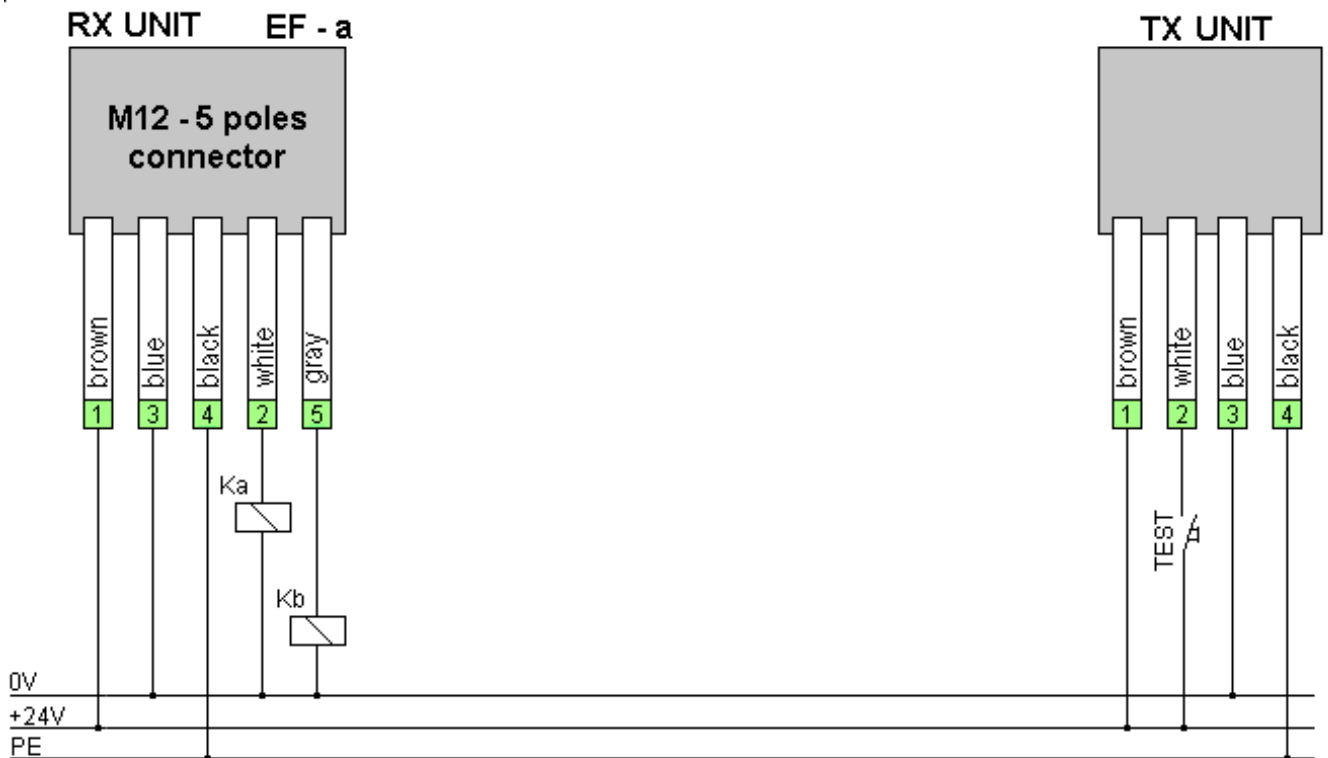
Example of connection



**EF- a CONNECTION**

Receiver EF-a - ... - Base						
Pin N	Wire color	Function	Description	Type	Level	
M12 5 poles						
1	Brown	+24V	Positive power supply	IN	+24Vdc +/- 10% 1A	
2	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc 0,5A max	
3	Blue	GND	0V power supply	IN	0V	
4	Black	PE	Ground	-	-	
5	Grey	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc 0,5A max	

Example of connection

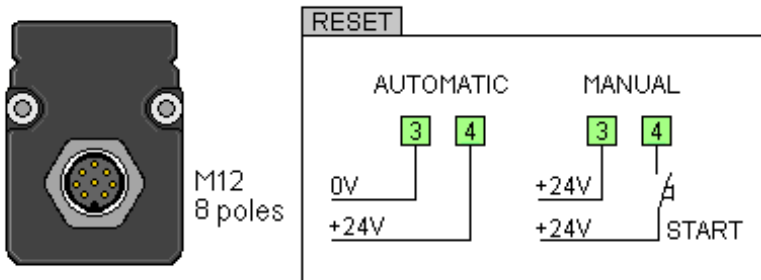
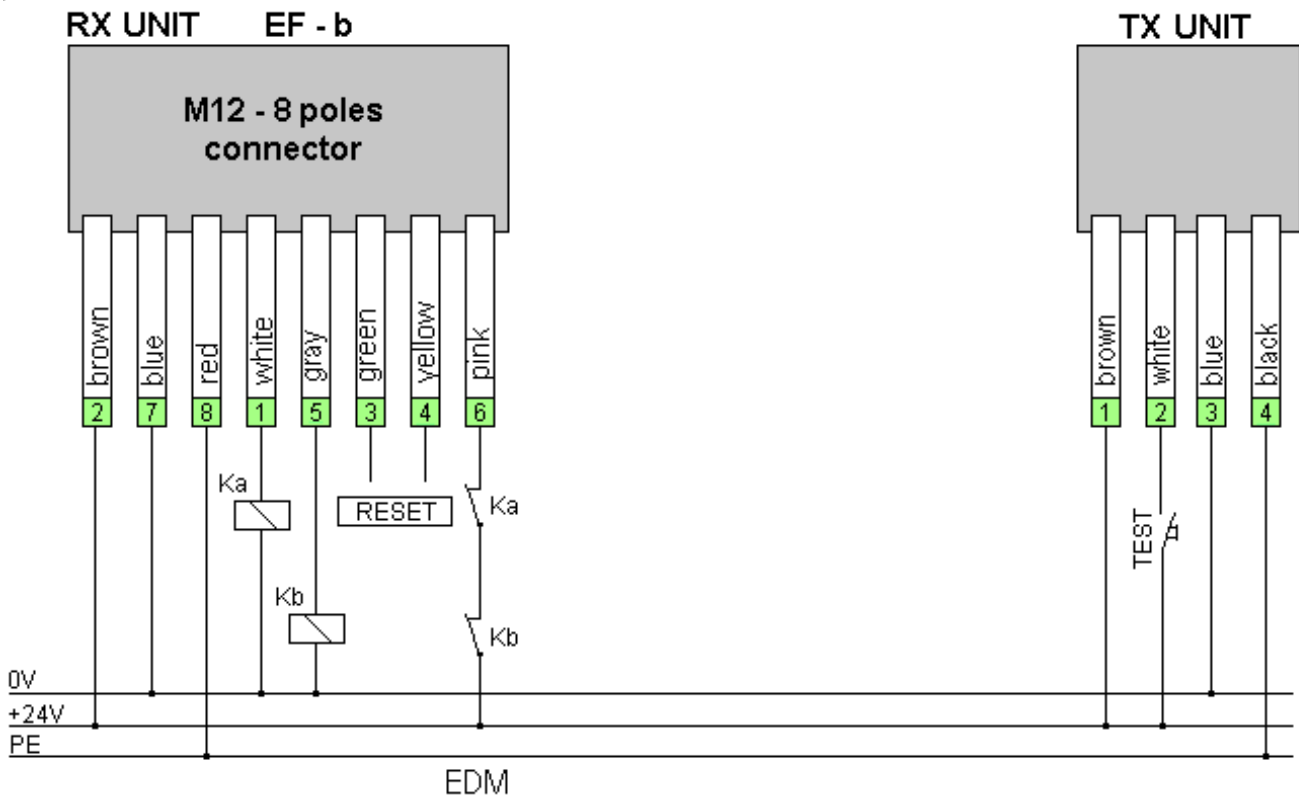


This version does not have the control of the external relays. The OSSD output must be connected to the machine through a safety module or a PLC.

EF- b CONNECTION

Receiver EF-b - ... Reset + Edm						
Pin N	Wire color	Function	Description	Type	Level	
M12 8 poles						
1	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc	0,5A max
2	Brown	+24V	Positive power supply	IN	+24Vdc +/- 10%	1A
3	Green	START ENABLE	Selection of manual or automatic reset	IN	0 - 24 Vdc	10mA
4	Yellow	START	Input of external RESET	IN	0 - 24 Vdc	10mA
5	Gray	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc	0,5A max
6	Pink	EDM	External device monitor input	IN	0 - 24 Vdc	10mA
7	Blue	GND	0V power supply	IN	0V	
8	Red	PE	Ground	-	-	

Example of connection

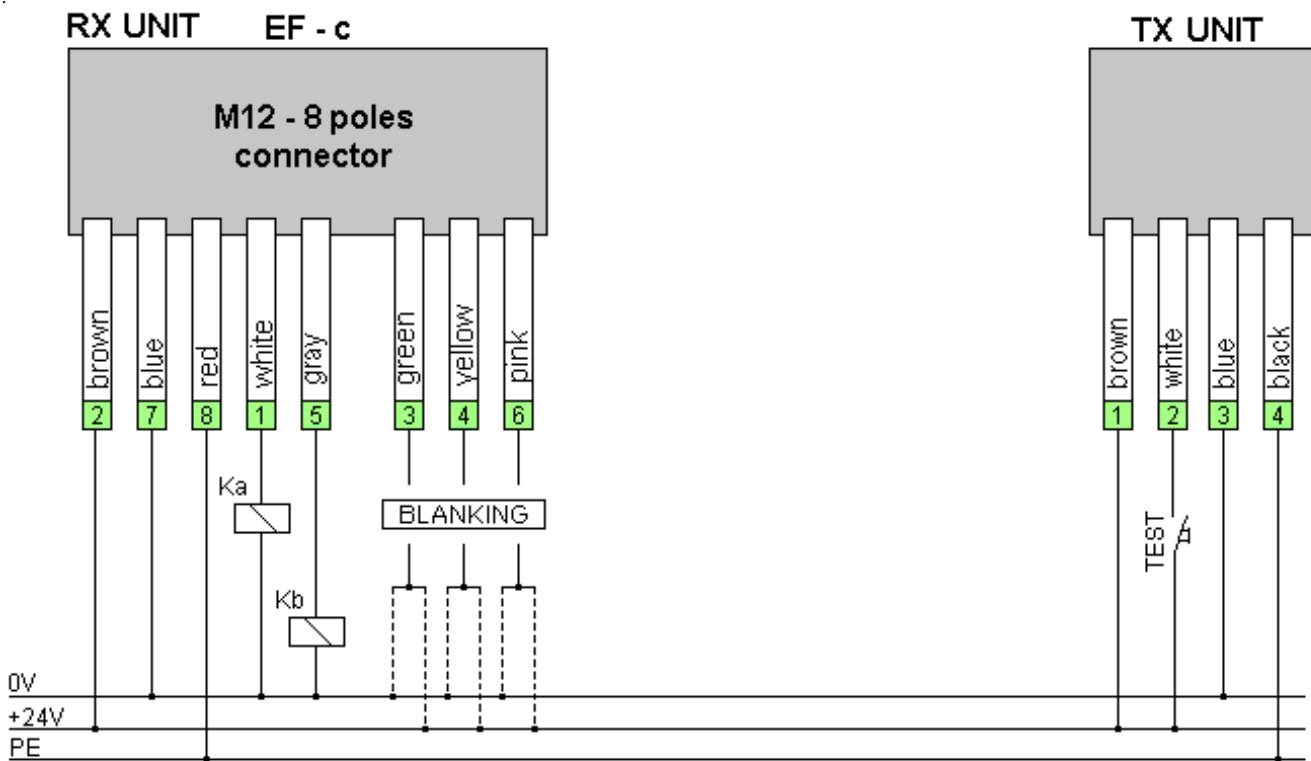




EF- c CONNECTION

Receiver	EF-c - ...	Blanking			
Pin N	Wire color	Function	Description	Type	Level
M12 8 poles					
1	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc 0,5A max
2	Brown	+24V	Positive power supply	IN	+24Vdc +/- 10% 1A
3	Green	BLNK-0	BLANKING input 0	IN	0 - 24 Vdc 10mA
4	Yellow	BLNK-1	BLANKING input 1	IN	0 - 24 Vdc 10mA
5	Gray	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc 0,5A max
6	Pink	BLNK-2	BLANKING input 2	IN	0 - 24 Vdc 10mA
7	Blue	GND	0V power supply	IN	0V
8	Red	PE	Ground	-	-

Example of connection



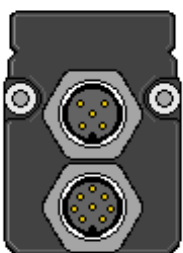
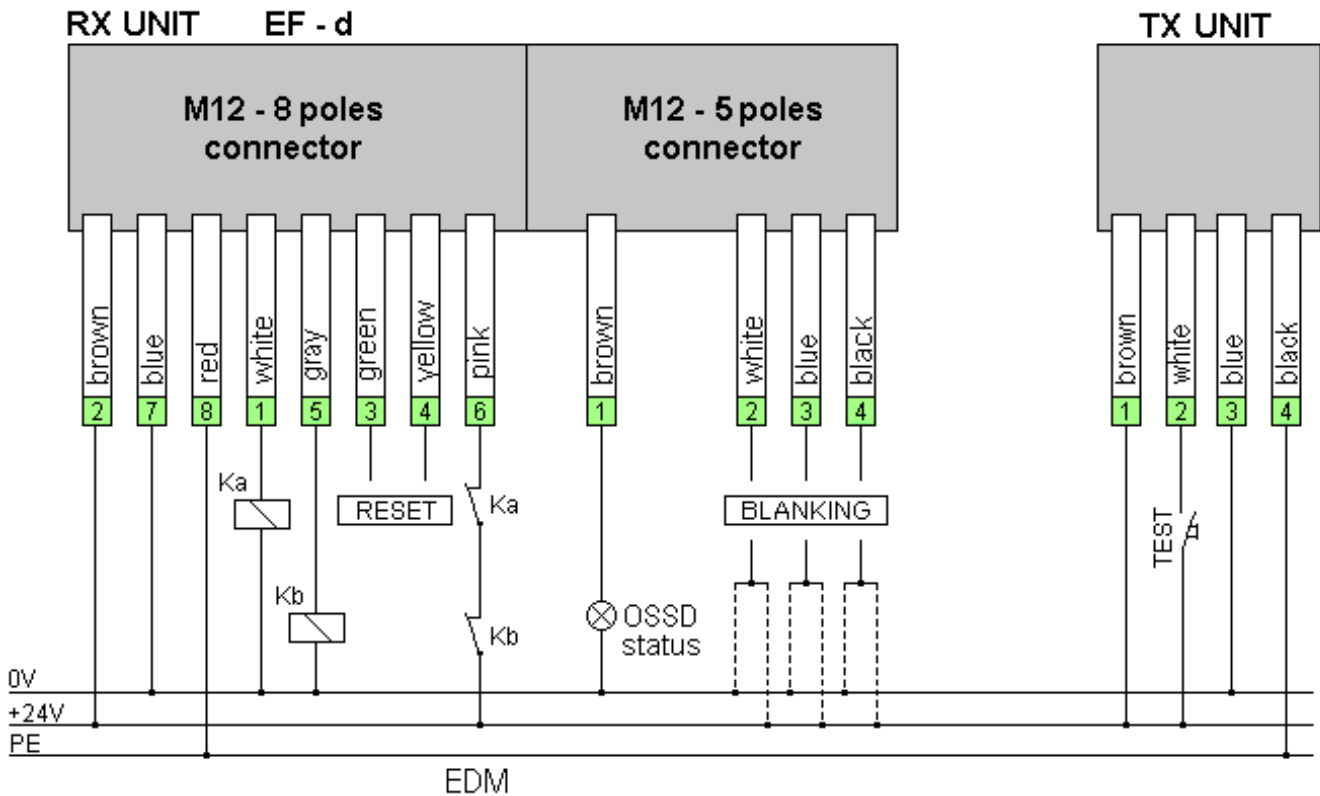
M12 8 poles

This version does not have the control of the external relays. The OSSD output must be connected to the machine through a safety module or a PLC.

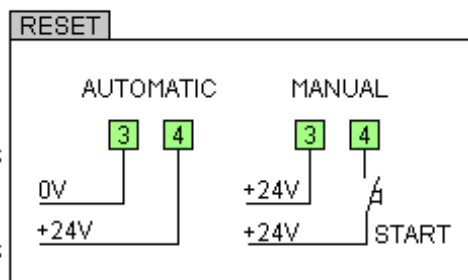
EF- d CONNECTION

Receiver		EF-d - ...	Reset + Edm + Blanking			
Pin N	Wire color	Function	Description	Type	Level	
M12 8 poles						
1	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc	0,5A max
2	Brown	+24V	Positive power supply	IN	+24Vdc +/- 10%	1A
3	Green	START ENABLE	Selection of manual or automatic reset	IN	0 - 24 Vdc	10mA
4	Yellow	START	Input of external RESET	IN	0 - 24 Vdc	10mA
5	Gray	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc	0,5A max
6	Pink	EDM	External device monitor input	IN	0 - 24 Vdc	10mA
7	Blue	GND	0V power supply	IN	0V	
8	Red	PE	Ground	-	-	
M12 5 poles						
1	Brown	OSSD-S	Output signaling of the safety outputs state	OUT	0 - 24 Vdc	0,2A max
2	White	BLNK-0	BLANKING input 0	IN	0 - 24 Vdc	10mA
3	Blue	BLNK-1	BLANKING input 1	IN	0 - 24 Vdc	10mA
4	Black	BLNK-2	BLANKING input 2	IN	0 - 24 Vdc	10mA
5	Grey	nc		-	-	

Example of connection



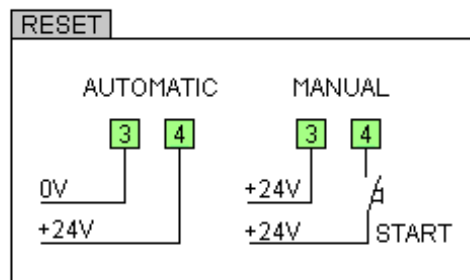
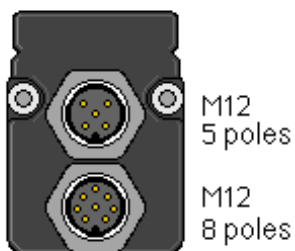
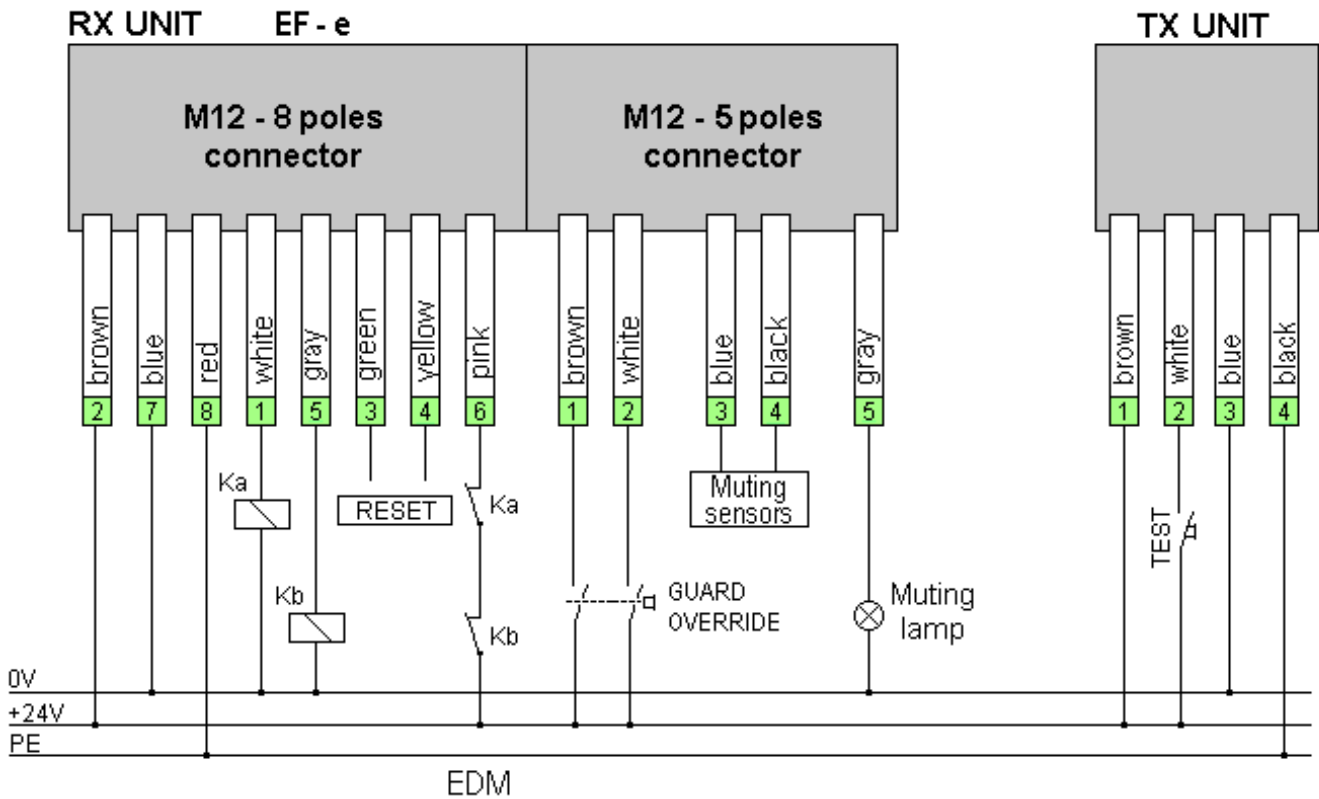
M12 5 poles  
M12 8 poles



**EF- e CONNECTION**

Receiver EF-e - ... Reset + Edm + Muting						
Pin N	Wire color	Function	Description	Type	Level	
M12 8 poles						
1	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc	0,5A max
2	Brown	+24V	Positive power supply	IN	+24 Vdc +/- 10%	1A
3	Green	START ENABLE	Selection of manual or automatic reset	IN	0 - 24 Vdc	10mA
4	Yellow	START	Input of external RESET	IN	0 - 24 Vdc	10mA
5	Grey	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc	0,5A max
6	Pink	EDM	External device monitor input	IN	0 - 24 Vdc	10mA
7	Blue	GND	0V power supply	IN	0V	
8	Red	PE	Ground	-	-	
M12 5 poles						
1	Brown	GOVR-0	Guard override input 0, bypass of the muting function	IN	0 - 24 Vdc	10mA
2	White	GOVR-1	Guard override input1, bypass of the muting function	IN	0 - 24 Vdc	10mA
3	Blue	MUTE-0	Muting 0 input	IN	0 - 24 Vdc	10mA
4	Black	MUTE-1	Muting 1 input	IN	0 - 24 Vdc	10mA
5	Grey	MUTE-S	Muting lamp output	OUT	0 - 24 Vdc	0,5A max

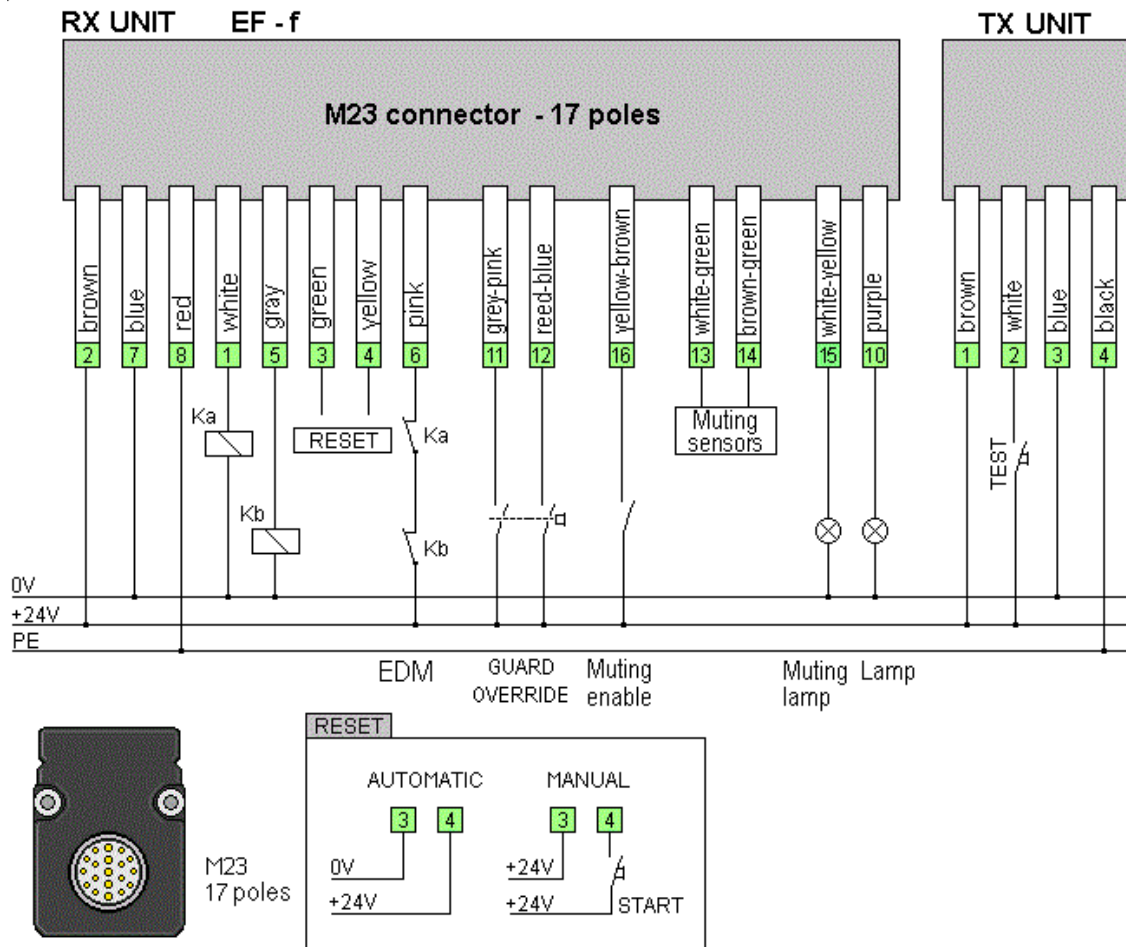
Example of connections



EF - f1 / EF - f2 CONNECTION

Receiver		EF-f - ...	Reset + Edm + Muting			
Pin N	Wire color	Function	Description	Type	Level	
M23 17 poles						
1	White	OSSD-0	Static safety output 0	OUT	0 - 24 Vdc	0,5A max
2	Brown	+24V	Positive power supply	IN	+24 Vdc +/- 10%	1A
3	Green	START ENABLE	Selection of manual or automatic reset	IN	0 - 24 Vdc	10mA
4	Yellow	START	Input of external RESET	IN	0 - 24 Vdc	10mA
5	Grey	OSSD-1	Static safety output 1	OUT	0 - 24 Vdc	0,5A max
6	Pink	EDM	External device monitor input	IN	0 - 24 Vdc	10mA
7	Blue	GND	0V power supply	IN	0V	
8	Red	PE	Ground	-	-	
9	Black	nc		-	-	
10	Purple	OSSD-S MUTE-F	EF f1 = OSSD-S Output signaling of the safety outputs state EF f2 = MUTE - F main beam interrupted when MUTING function is activated	OUT	0 - 24 Vdc	0,2A max
11	Grey - pink	GOVR-0	Guard override input 0, bypass of the muting function	IN	0 - 24 Vdc	10mA
12	Red - blue	GOVR-1	Guard override input 1, bypass of the muting function	IN	0 - 24 Vdc	10mA
13	White - green	MUTE-0	Muting 0 input	IN	0 - 24 Vdc	10mA
14	Brown - green	MUTE-1	Muting 1 input	IN	0 - 24 Vdc	10mA
15	White - yellow	MUTE-S	Muting lamp output	OUT	0 - 24 Vdc	0,5A max
16	Yellow - brown	MUTE-E	Muting function enable	IN	0 - 24 Vdc	10mA
17	White - grey	nc		-	-	

Example of connections



## EXTERNAL CONTACTORS CONNECTION

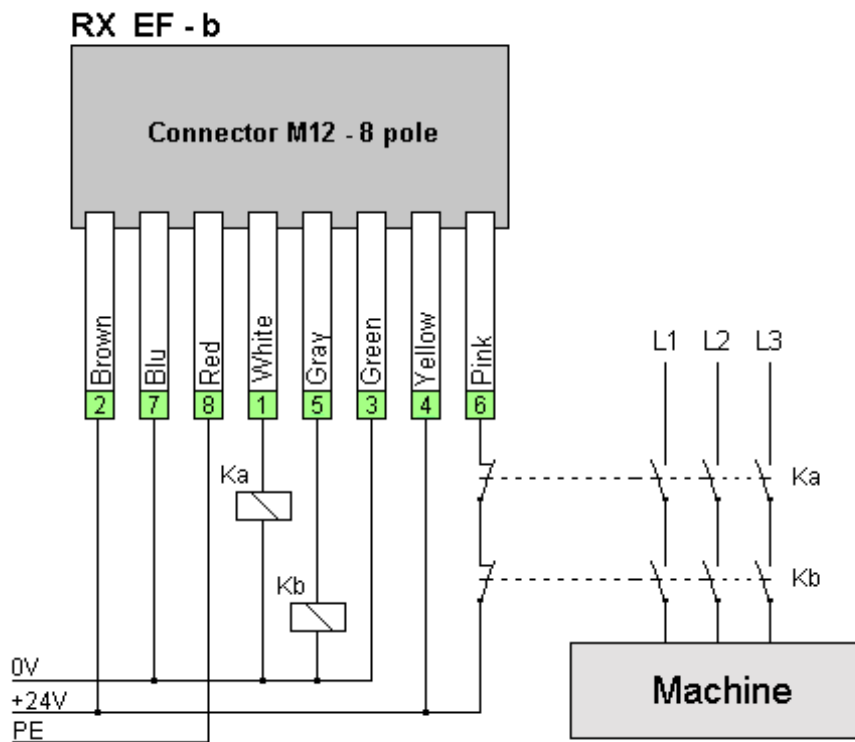
The diagram below shows the connection of the external contactors to increase the number of contacts or the necessary current to the load and the connection contacts of the feedback signal to the EDM (External Device Monitor, pink wire).

Only series barriers EFESTO4 with EDM (external device monitor) can be used to carry out properly the application.

The voltage supplied by the EFESTO4 light curtain is 24V with a maximum current of 0.5A. Select the external contactors on the basis of these values.

In the example below, a EFESTO4 model B light curtain with setting the automatic reset it connected to Ka and Kb contactors.

The normally closed contacts of external contactors are connected in series, with the voltage of + 24V and the EDM input (pink wire) of the light curtain.



## EMITTER CONNECTIONS AND FUNCTIONS

<b>+24 Vdc</b>	+24 Vdc Power supply
----------------	----------------------

Connect to +24Vdc PELV  $\pm 10\%$  1A power supply.  
The current of 1A is the supply current for all type of EFESTO4 light curtains

<b>0 Vdc</b>	0 Vdc Power supply
--------------	--------------------

Connect to 0 Vdc of 24 Vdc PELV  $\pm 10\%$  1A power supply.

<b>PE</b>	Protective Earth
-----------	------------------

Connect to the ground of machine.

<b>TEST</b>	TEST input
-------------	------------

This signal simulates the interruption of the beams to check the safety chain.  
During the test, OSSD0 and OSSD1 are in OFF state and the POWER / TEST indicator blinks.  
The TEST is active when connected to +24 Vdc.  
If connected to 0V or not connected the test is not active, the POWER / TEST indicator is OFF.

## RECEIVER CONNECTIONS AND FUNCTIONS

Some of the following functions can be present or not, depending of the model ordered.

### Power supply

<b>+24 Vdc</b>	+24 Vdc Power supply
----------------	----------------------

Connect to +24Vdc PELV  $\pm 10\%$  1A power supply.  
The current of 1A is the supply current for the EFESTO4 light curtains.

To calculate the total current is necessary include:

- OSSD0 e OSSD1 absorbed current ( max 0.5A each );
- STATUS lamp absorbed current ( max 0.2A );
- MUTING lamp absorbed current (max. 0.5 A).

<b>0 Vdc</b>	0 Vdc Power supply
--------------	--------------------

Connect to 0 Vdc of 24 Vdc PELV  $\pm 10\%$  1A power supply.

<b>PE</b>	Protective Earth
-----------	------------------

Connect to the ground of machine.

## Outputs

<b>OSSD-0</b>	Safety output 0
<b>OSSD-1</b>	Safety output 1

Static safety PNP outputs, OSSD0 channel 0 and OSSD1 channel 1.

Use the OSSD outputs to stop the dangerous movement of the machine through contactors with guided contacts controlled by the barrier, or by safety relay module or safety PLC.

The OSSDs outputs go in ON state ( +24 V ) if are satisfy the following conditions:

- barrier aligned and activated by reset command,
- protected area free,
- correct connections and no internal fault.

The barriers with MUTING function can activate the OSSDs also using the guard override function.

The OSSD outputs go or remain in OFF state ( 0Vdc ) if is not satisfied one or more of the above conditions.

The outputs are dynamically monitored. To check the absence of fault, when the OSSDs are in ON state, will be switched in OFF state for 0,2 ms, with a period = response time – 1 ms

## ELECTRICAL CHARACTERISTICS OF THE OUTPUTS

DESCRIPTION	
Nominal output current for resistive load	500 mA
Max. output current for resistive load	500 mA
Nominal output current for inductive load	500 mA
Max. output current for inductive load	500 mA
Max. capacitive load with no resistive load applied	1 $\mu$ F
Max. capacitive load with resistive load of 48 OHM applied	2 $\mu$ F
Max. output voltage in OFF-State	0.1 V
Max. output current in OFF-State	10 $\mu$ A ( leakage current )
Max. resistance between the OSSDs outputs and the load	22 $\Omega$

<b>OSSD-S</b>	Output for OSSD state
---------------	-----------------------

PNP output to indicate the state of the OSSDs outputs.

This output is 24V when the OSSDs are active, vice versa 0V.

<b>EDM</b>	Input for External Device Monitor
------------	-----------------------------------

Monitoring of external contactors.

Allow to check the external contactors using their series of the NC contacts.

The contactors shall have the forced guided contacts.

With OSSD in OFF state on the EDM input shall be present 24V.

With OSSD in ON state on the EDM input shall be present 0V.

The barrier checks the EDM input after the power on, and at every change state of the OSSDs.

The barrier checks the time of ON / OFF commutation, it shall be max 500 ms.

**If the EDM is not used, connect it to the OSSD 0 output.**

**Reset**

<b>START-E</b>	Input for reset selection
<b>START</b>	Input for restart pushbutton

**AUTOMATIC RESET**

With the selection of the automatic reset, the OSSDs outputs follow the state of the barrier.

When the protected area is free, automatically the OSSDs go in ON state.

Take into consideration that in this case there is not the start interlock. If this function is necessary, verify that other means are present to stop the machine at the power on.

**MANUAL RESET**

One push button NO shall be activated to start or re-start the OSSD0 and OSSD1 after the interruption of the beams or when the ESPE is turned on at first time.

This pushbutton must be located outside the dangerous area and shall not be possible to activate it from inside of the dangerous area. It shall be located where is possible to check the dangerous area. The manual reset has the function of start interlock.

This system shall be utilized when the barrier is employed for the protection of a dangerous passage.

The following table show the reset setup.

<b>START- E</b>	<b>START</b>	<b>Function selected</b>
0Vdc	24Vdc	AUTOMATIC RESET
24Vdc	NO / 24Vdc	MANUAL RESET

**Blanking**

<b>BLNK-0</b>	INPUT blanking 0
<b>BLNK-1</b>	INPUT blanking 1
<b>BLNK-2</b>	INPUT blanking 2

This function allows to inhibit 1, 2 or 3 beams. Their interruptions will not turn OFF the OSSDs.

The blanking function is useful in applications where the working materials cross the protected area, and the interruption of the beams shall not stop the machine.

The configuration is realized using 3 wires on the connector of the receiver and will be memorized at power on.

Every modification during the normal operation will not be accepted until the next power on cycle.

Where the blanking selection signals are derived from device external to the barrier (eg. PLC), this device should meet the relevant requirements of other appropriate standards (for example ISO 13849-1, IEC 62061)

The first beam near the end cap with the connector is the synchronization beam and cannot be excluded from the blanking.

Some models of barriers can't use the blanking function ( see pag 35-36 )



The following table indicates the setup of the blanking:

BLNK-2	BLNK-1	BLNK-0	DESCRIPTION
0V	0V	24V	<b>BSO1</b> blanking without requirement of object presence, 1 beam
0V	24V	0V	<b>BSO2</b> blanking without requirement of object presence, 1-2 beams
0V	24V	24V	<b>BSO3</b> blanking without requirement of object presence, 1-2-3 beams
24V	0V	24V	<b>BCO1</b> blanking with requirement of object presence, 1 beam
24V	24V	0V	<b>BCO2</b> blanking with requirement of object presence, 1-2 beams
24V	24V	24V	<b>BCO3</b> blanking with requirement of object presence, 1-2-3 beams
NC	NC	NC	no blanking
0V	0V	0V	no blanking
24V	0V	0V	no blanking
NC	X	X	error on the blanking configuration, the curtain is in block state
X	NC	X	error on the blanking configuration, the curtain is in block state
X	X	NC	error on the blanking configuration, the curtain is in block state

**X** : +24Vdc or 0Vdc , **NC** : not connected.

In case of mistake of blanking programming, the curtain is in block state.

## Muting

### MUTING with two sensors.

The muting function generates a temporary suspension of the protective function of the barrier in order to ensure the normal passage of the material through the protected area.

If the MUTING function is active, the interruption of the beams does not disable the OSSDs outputs.

The muting function is activated through the activation of two sensors within 2 sec of each other.

Any other conditions applied to the sensors do not activate the MUTING function.

During the MUTING, the two sensors shall be always active.

Disabling a muting sensor terminates the muting function.

A signalling MUTING lamp can be connected to MUTE-S output to indicate that the MUTING function is active.

If for any reason, the muting does not activate, the interruption of the beams will determine the block of the machine. In this case the cycle can be restarted using the **GUARD-OVERRIDE** command.

The GUARD-OVERRIDE function can be utilized only at the following conditions:

- the muting enable command is active, and
- mistake of sequence of muting sensors, and
- at least one beam of vertical barrier is interrupted, and
- the correct activation of the GUARD OVERRIDE commands.

The GUARD-OVERRIDE it is not performed if:

- the muting enable command is not active, or
- one command of GUARD OVERRIDE is OFF, or
- time out expired, or
- all mute inputs and the beams are free.

The command for the GUARD OVERRIDE is formed by a couple of contacts NO (i.e. key selector with spring return) that shall be activated simultaneously within 300 ms. If this don't happen the guard-override function will not be activated.

The opening of only one contact cause the stop of the OVERRIDE function.

The time out is 3 minutes. After this time, the guard-override function is terminated.

The OVER indicator is ON if the guard-override function is active and vice versa.

The OVER indicator blinks if are past the 3 minutes of TIME OUT, or if the MUTING conditions have been restored ( vertical beams are free and MUTING sensors are free) and the GUARD OVERRIDE command is still active.

<b>MUTE-E</b>	MUTING Enable input
---------------	---------------------

Input for enable the MUTING function.

If connected to 24Vdc the MUTING function is enabled and the E-MUTE indicator is ON, otherwise if floating or connected to 0V, the MUTING function is not enabled, and the E-MUTE indicator is OFF.

<b>MUTE-0</b>	MUTING 0 sensor input
<b>MUTE-1</b>	MUTING 1 sensor input

Inputs for external muting sensors.

If they are connected to 24Vdc are active, and SENSE 0 / 1 indicators are ON, otherwise if are floating or are connected to 0V, are not active and SENSE 0 / 1 indicators are OFF.

<b>GOVR-0</b>	Guard Override 0 input
<b>GOVR-1</b>	Guard Override 1 input

Inputs for external guard override commands.

If they are connected to 24Vdc the GOVR-0 / 1 are active, and OVER indicator is ON, otherwise if are floating or are connected to 0V, the GOVR-0 / 1 aren't active and OVER indicator is OFF.

<b>MUTE-S</b>	Output MUTING Lamp
---------------	--------------------

Output for MUTING lamp.

The muting lamp is active ( +24V ) when the MUTING function is active and vice-versa.

<b>MUTE-F</b>	Muting phase, main beams interrupted
---------------	--------------------------------------

This output is active ( +24V ) only when the muting function is active and the beams of the “ Sensitive Height “ are interrupted and vice-versa.

The output is deactivated when the barrier is in MUTING, and the main beams are not interrupted, or when the MUTING function is not active.

For other details of muting function see pag. 45.

## INDICATIONS and DIAGNOSTIC

Below are the main functions related to each indicator and its status.

### TRANSMITTER

<b>POWER-TEST</b>	YELLOW - Power On & Test
-------------------	--------------------------

If the indicator is ON, the power supply is connected correctly.  
If the indicator blinks, the TEST function is active.

<b>FAULT</b>	RED - Fault
--------------	-------------

If the indicator is blinking, the light curtain is stopped due to an internal failure.  
In this case contact the technical support.

### RECEIVER

<b>OS OFF</b>	RED - State of OSSD0 e OSSD1
---------------	------------------------------

The OSSD0 and OSSD1 outputs are in OFF state.

<b>OS ON</b>	GREEN - State of static OSSD0 e OSSD1
--------------	---------------------------------------

The OSSD0 and OSSD1 outputs are in ON state.

<b>BMS</b>	YELLOW - Wait external reset
------------	------------------------------

If all beams of the sensitive zone are aligned and the manual RESTART is selected, the indicator is ON. After pressed and released the restart button, the indicator is OFF.

<b>FAULT</b>	RED - Fault
--------------	-------------

If the indicator is ON, the light curtain is stopped due to an internal failure.  
In this case contact the technical support.

<b>ALN1</b>	YELLOW - BARGRAPH Led 1
<b>ALN2</b>	YELLOW - BARGRAPH Led 2
<b>ALN3</b>	YELLOW - BARGRAPH Led 3

The three LEDs provide indications on the beams alignment. This simplifies the alignment of the light curtain, particularly in case of difficult installations, for example with the use with mirrors or on long range.

To each indicator is associated a percentage of beams aligned.

The indications given are summarized in the following table.

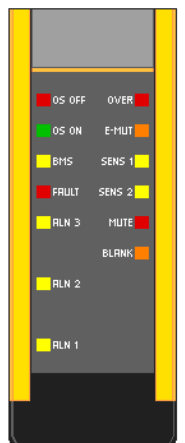
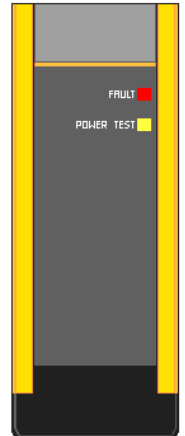
ALN1	ALN2	ALN3	DESCRIPTION
OFF	OFF	OFF	No beam is alignment or the first beam is interrupted
BLINK	OFF	OFF	The number of the aligned beams is less than 1/3 of total beams
ON	BLINK	OFF	The number of the aligned beams is between 1/3 and 2/3
ON	ON	BLINK	The number of aligned beams is between 1/3 and up to maximum
ON	ON	ON	All beams are aligned

The blink period is 1 second.

When the OSSDs go from OFF to ON state, the alignment indicators will turn OFF.

<b>OVER</b>	RED - GUARD OVERRIDE function
-------------	-------------------------------

If the GUARD OVERRIDE function is active the indicator is ON, and vice-versa.  
If there is an error on the function activation, the indicator blinks ( see pag 31 ).



<b>E-MUTE</b>	ORANGE - MUTING Function enabled
---------------	----------------------------------

If the MUTING function is enabled the indicator is ON, and vice-versa.

<b>SENSE-1</b>	YELLOW - External Muting Sensor 1
----------------	-----------------------------------

If the MUTING sensor 1 is active the indicator is ON, and vice-versa.

<b>SENSE-2</b>	YELLOW – External Muting Sensor 2
----------------	-----------------------------------

If the MUTING sensor 2 is active the indicator is ON, and vice-versa.

<b>MUTE</b>	Red – gives the function of MUTING
-------------	------------------------------------

If the MUTING function is active the indicator is ON, and vice-versa.

<b>BLNK</b>	Orange - Function of BLANKING
-------------	-------------------------------

At power up, for about 5 seconds, the barrier provides an indication of the type of blanking set. The indications are:

- 2 blinks, blanking without object presence obligation,
- 3 blinks, blanking with object presence obligation.

Blanking without object presence obligation: if BLNK indicator is ON the area is free, or the number of interrupted beams is correct, vice-versa if BLNK indicator blinks, indicates that the number of interrupted beams is greater than beams selected or the beams are not adjacent.

Blanking with object presence obligation: if BLNK indicator blinks, the area is free or the number of interrupted beams is greater than the selected beams or the beams are not adjacent, vice-versa if the BLNK indicator is ON, indicates that the area is occupied by an object and the number of interrupted beams is correct.

The number of beams excluded is indicated with the indicators ALN:

- ALN1 ON BLANKING of 1 beam
- ALN2 ON BLANKING of 2 beams
- ALN3 ON BLANKING of 3 beams

In case of an error on the connections settings Blanking, the **FAULT** indicator is ON and the **BLNK** indicator blinks.

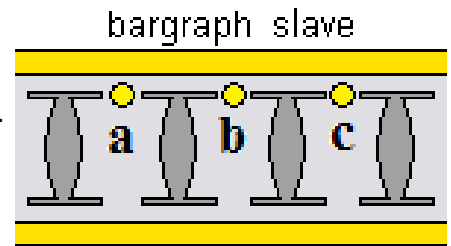
The light curtain is locked, turn OFF it, check the settings and then turn ON.

**Sequence of led BLNK e ALN at power ON**

<b>Blanking without object presence obligation</b>		
Led ALN		Protected area is free
Led BLNK		
Led ALN		Protected area is busy
Led BLNK		
<b>Blanking with object presence obligation</b>		
Led ALN		Protected area is free with object positioned correctly
Led BLNK		
Led ALN		Protected area is busy object not positioned correctly
Led BLNK		
Led FAULT		error on the blanking configuration
Led BLNK		

## MASTER-SLAVE

In the master / slave barrier models, to facilitate the alignment of the slave part (horizontal) it is provided an additional bargraph alignment. The bargraph of the master performs as previously described.



When the master (vertical) is fully aligned, the first indicator of the slave (horizontal) start flashing at a rate of a brief flash and a pause (FLASH).

When at least one beam of the slave is aligned, the bargraph provides the following information:

a	b	c	DESCRIPTION
FLASH	OFF	OFF	No aligned beams or first beam obscured
BLINK	OFF	OFF	The number of the aligned beams is less than 1/3 of total beams
ON	BLINK	OFF	The number of the aligned beams is between 1/3 and 2/3
ON	ON	BLINK	The number of aligned beams is between 1/3 and up to maximum
ON	ON	ON	All beams are aligned

When the barrier is fully aligned, the LEDs of the master and the slave are switched off.

### Further indication to find the faults.

#### MANUAL and AUTOMATIC RESTART

If an error occurs in the reset setting, the **FAULT** indicator is ON and **ALN1** indicator blinks. The light curtain is locked.

Turn OFF the light curtain, check the reset settings and then turn ON the barrier.

The main causes can be :

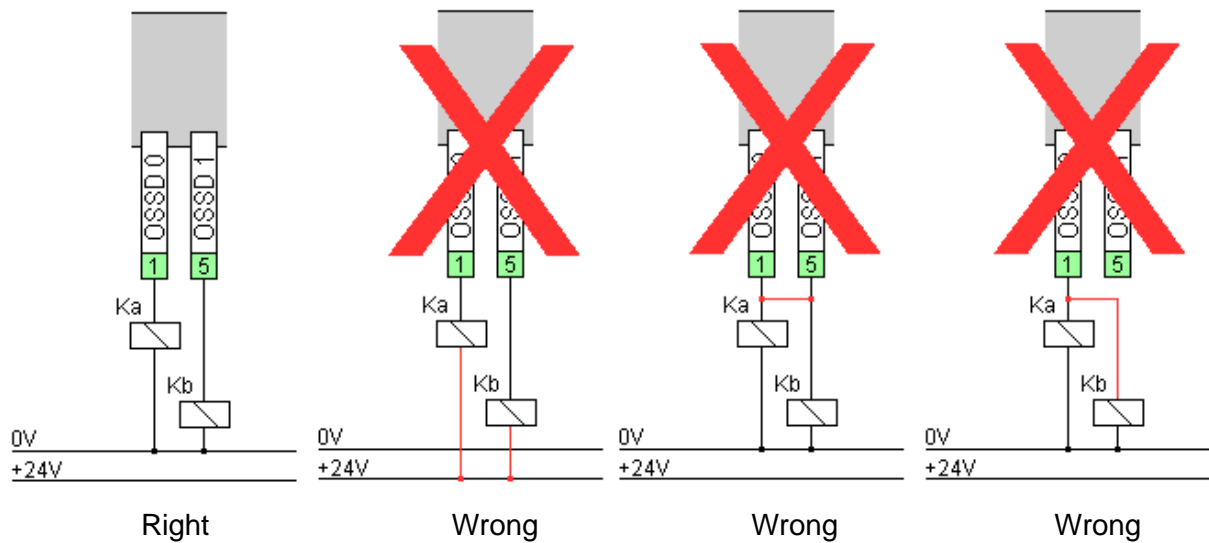
- Restart wires not connected properly;
- push button of manual reset is NC instead of NO;
- push button of manual reset pressed during the turn on of the barrier.

**OSSD 0 / OSSD 1**

If an error occurs on the OSSD output, the **FAULT** indicator is ON and **ALN2** indicator blinks. The light curtain is locked. Turn OFF the barrier, check the OSSD output connections and then turn ON the power supply.

The main causes can be :

- short circuit between OSSDs;
- OSSD connected to +24V or 0V;
- capacitive load beyond the limit, excessive cable length;
- wrong connection of the outputs;
- internal fault.



**EDM**

If an error occurs on the EDM function, the **FAULT** indicator is ON and **ALN3** indicator blinks. The light curtain is locked. Turn OFF the barrier, check the EDM connections and then turn ON the power supply.

The main causes can be :

- wire not connected or connected to 0V;
- contact of external device open when the barrier is in OFF state;
- voltage to external device not present or not correct;
- external contactor defective.

In Manual reset if the safety conditions are met the BMS indicator is ON. Press and release the RESTART push button to activate the barrier.

In Automatic reset if the safety conditions are met the barrier will be activated.

In the case that the external contactors are not connected directly to the barrier, and do not switch when the OSSDs pass in the ON state, the barrier goes cyclically into the OFF state for 15 seconds, and after, if the conditions allow it, resumes the ON state testing again the EDM input.

**If the EDM is not used, connect it to the OSSD 0 output.**

## GUARD OVERRIDE

If an error occurs in the GUARD OVERRIDE function, the **FAULT** indicator is ON and the **OVER** indicator blinks.

The light curtain remains locked.

Turn OFF the barrier, check the GUARD OVERRIDE connections and then turn ON the power supply.

The main causes can be :

- one or two contacts are normally closed instead of normally open;
- break of one contact;
- end of the GUARD OVERRIDE time out;
- non simultaneous closing of contacts in the maximum expected time of 300 ms.

## ATTENTION

Each repair operation should be performed only by GREIN authorized technicians.

## SERVICE AND TEST

### Putting into service and tests at regular intervals

The installer that put the equipment into service shall have all necessary information about the machine or the plant, and the installed ESPE EFESTO4.

The testing shall cover the correct interaction of the ESPE and the control system of the power-operated working equipment, the safe state, and the construction in compliance with the equipment-specific safety rules. The test-relevant information provided by the machine or plant manufacturer (e.g. a press manufacturer) shall always be observed when testing.

A distinction is made between the following types of test:

### Testing prior to put a device into service for the first time and after modifications (approval tests)

An authorized, qualified person should test the ESPE prior to its being put into service for the first time, and after its - or its components / units involved in the safety function - having been modified.

All changes of the circuit/switching, the control system, the ESPE configuration and the involved components/units affecting the safety function are considered a modification.

Those tests are to determine that the power-operated working equipment (e.g. the press) fulfils the requirements when the ESPE is employed, and that the correct operation of the components/units involved in the safety function is ensured for the interaction with the ESPE. Furthermore, type of use and installation of the ESPE shall be tested.

### Periodical tests

Periodical tests serve the purpose of systematically detecting and removing safety-relevant deficiencies (e.g. in the event of modification or manipulation) of the protective equipment of the machine or facility which occur after the machine/facility having been put into service. Type, scope and time intervals to be followed are listed in clause "**SETTING UP AND TEST**" of the ESPE's instructions for use and shall be determined and specified for each individual working equipment (e.g. for a press). Furthermore, the prerequisites (e.g. qualified person, expert) to be fulfilled by the appointed person are to be specified.

The testing includes a safety check of the correct functioning of the ESPE, the condition of the components, the correct installation of the ESPE, and the interaction of the ESPE with the control system of the press. The test results shall be recorded and writing in a report which is to be signed by the inspector. The report shall be kept at the installation site of the machine or facility, respectively.

## SETTING UP AND TEST

### FINAL CHECK BEFORE STARTING

Before connecting the curtain to the power supply, ensure that:

- the value of power supply is 24Vdc ;
- connection cables of emitter and receiver to machine are correct ;
- if there is the BLANKING function deactivate it.

When the barrier is aligned, if AUTOMATIC RESTART is set, the OS ON indicator will turn ON and the 24Vdc is present on OSSDs outputs. Otherwise, if the MANUAL RESTART is set, the BMS indicator is ON and OS ON is OFF, then press and release the START button to activate the barrier ( 24Vdc is present on OSSDs outputs, BMS is OFF and OS ON is ON ).

Performing the periodical test follow the verifications listed below:

**Hint: to ensure higher safety level, perform these tests in manual reset.**

Daily testing of the protective device by authorized personnel.

By the operator, daily or prior to each work session by means of complete coverage of every beam of light using the test rod. The test rod is supplied up to 40mm resolution.

Move the test rod slowly through the length of the protective field at three different points:

- 1) Protective field limits / protective field markings close to sender (access opening).
- 2) Protective field limits / protective field markings close to receiver.
- 3) Protective field limits in middle between transmitter and receiver.

During the test, the BMS indicator must be turned OFF. If during this test the BMS indicator is lights up, it is necessary to verify the mechanical installation in accordance with the minimum distance to avoid the reflecting signal as reported in page 9.

If used the function “blinking without object presence obligation”, may be used a test rod with a diameter equal to the resolution indicated in pag 42

Check for damage to the protective device, the mounting, electrical connection.

Check for wear or damage to the housing, front screen, or electrical connection cable.

Check that people or body parts can only access the danger zone through the protective field.

If one or more errors occur during the test, the machine must be shut down.

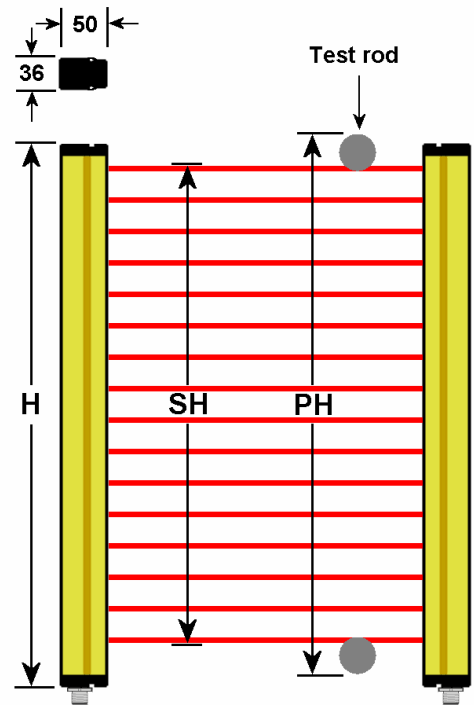
Now the light curtain is ready for working and you can select the automatic or manual reset as desired and activated the BLANKING function.



### List of models and characteristics

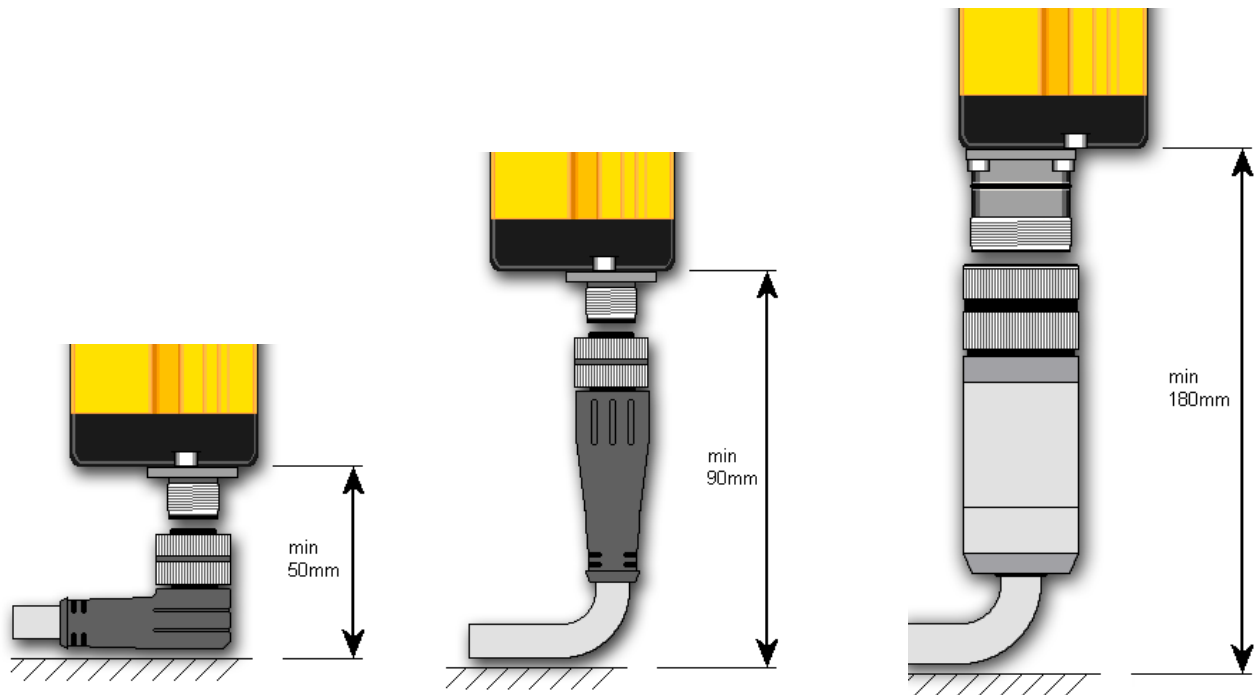
The images describe the main parameters considered in the selection of light curtain, in the following pages are shown the complete list of barriers "EFESTO4" series.

**Total height.** Total height. To estimate the total height of the barrier check the column H ( barrier height ) in table below and add the connector height how show in the figure below.



### Minimum dimensions for the connection

It is necessary to provide a minimum space for the connector, refer to figure below.



M12 angle

M12 right

Connector M23

**Special size.** If the standard barriers do not satisfy the customer application, our technical office will evaluate the possibility to produce a custom model.

Resolution 14mm Range 0 - 6m Optical Code "A"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 0120 A	12	134	114	276	0.8	6	7.5	100	e
EF -x - 0240 A	24	254	234	330	1.1	6	7.5	100	e
EF -x - 0360 A	36	374	354	450	1.7	11	15	100	e
EF -x - 0480 A	48	494	474	570	2.1	11	15	100	e
EF -x - 0600 A	60	614	594	690	2.5	11	15	100	e
EF -x - 0700 A	72	734	714	810	3.0	16	22.5	84	e
EF -x - 0850 A	84	854	834	930	3.4	16	22.5	76	e
EF -x - 0950 A	96	974	954	1050	3.8	16	22.5	70	e
EF -x - 1100 A	108	1094	1074	1170	4.2	16	22.5	64	e
EF -x - 1200 A	120	1214	1194	1290	4.7	21	30	59	e
EF -x - 1300 A	132	1334	1314	1410	5.1	21	30	55	e
EF -x - 1400 A	144	1454	1434	1530	5.5	21	30	52	e
EF -x - 1500 A	156	1574	1554	1650	5.9	26	37.5	49	e
EF -x - 1700 A	168	1694	1674	1770	6.4	26	37.5	46	e
EF -x - 1800 A	180	1814	1794	1890	6.8	26	37.5	43	e
EF -x - 1900 A	192	1934	1914	2010	7.2	31	45	41	e
EF -x - 2000 A	204	2054	2034	2130	7.6	31	45	39	e
EF -x - 2200 A	216	2174	2154	2250	8.1	31	45	39	e
EF -x - 2300 A	228	2294	2274	2370	8.5	31	45	36	e

Resolution 20mm Range 2 - 15m Optical code "AL"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 0120 AL	12	260	240	276	0.8	6	7.5	100	e
EF -x - 0240 AL	24	260	240	330	1.1	6	7.5	100	e
EF -x - 0360 AL	36	380	360	450	1.7	11	15	100	e
EF -x - 0480 AL	48	500	480	570	2.1	11	15	100	e
EF -x - 0600 AL	60	620	600	690	2.5	11	15	100	e
EF -x - 0700 AL	72	740	720	810	3.0	16	22.5	84	e
EF -x - 0850 AL	84	860	840	930	3.4	16	22.5	76	e
EF -x - 0950 AL	96	980	960	1050	3.8	16	22.5	70	e
EF -x - 1100 AL	108	1100	1080	1170	4.2	16	22.5	64	e
EF -x - 1200 AL	120	1220	1200	1290	4.7	21	30	59	e
EF -x - 1300 AL	132	1340	1320	1410	5.1	21	30	55	e
EF -x - 1400 AL	144	1460	1440	1530	5.5	21	30	52	e
EF -x - 1500 AL	156	1580	1560	1650	5.9	26	37.5	49	e
EF -x - 1700 AL	168	1700	1680	1770	6.4	26	37.5	46	e
EF -x - 1800 AL	180	1820	1800	1890	6.8	26	37.5	43	e
EF -x - 1900 AL	192	1940	1920	2010	7.2	31	45	41	e
EF -x - 2000 AL	204	2060	2040	2130	7.6	31	45	39	e
EF -x - 2200 AL	216	2180	2160	2250	8.1	31	45	39	e
EF -x - 2300 AL	228	2300	2280	2370	8.5	31	45	36	e

Resolution 30mm Range 0,5 - 15m Optical code "B"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 0150 B	6	174	126	276	0.8	6	7.5	100	e
EF -x - 0210 B *	8	222	174	276	0.9	6	7.5	100	e
EF -x - 0240 B *	9	246	198	300	1.0	6	7.5	100	e
EF -x - 0300 B	12	318	270	372	1.2	6	7.5	100	e
EF -x - 0360 B *	14	366	318	420	1.3	6	7.5	100	e
EF -x - 0390 B *	15	390	342	444	1.4	6	7.5	100	e
EF -x - 0450 B	18	462	414	516	1.6	6	7.5	100	e
EF -x - 0540 B *	21	534	486	588	1.8	6	7.5	100	e
EF -x - 0600 B	24	606	558	660	2.0	6	7.5	100	e
EF -x - 0680 B *	27	678	630	732	2.4	11	15	100	e
EF -x - 0750 B	30	750	702	804	2.4	11	15	100	e
EF -x - 0820 B *	33	822	774	876	2.6	11	15	100	e
EF -x - 0900 B	36	894	846	948	2.8	11	15	100	e
EF -x - 0970 B *	39	966	918	1020	3.0	11	15	100	e
EF -x - 1050 B	42	1038	990	1092	3.2	11	15	100	e
EF -x - 1100 B *	45	1110	1062	1164	3.4	11	15	100	e
EF -x - 1200 B	48	1182	1134	1236	3.6	11	15	100	e
EF -x - 1250 B *	51	1254	1206	1308	3.8	11	15	100	e
EF -x - 1350 B	54	1326	1278	1380	4.0	11	15	100	e
EF -x - 1400 B *	57	1398	1350	1452	4.2	11	15	100	e
EF -x - 1500 B	60	1470	1422	1524	4.4	11	15	100	e
EF -x - 1650 B	66	1614	1566	1668	4.8	11	15	100	e
EF -x - 1800 B	72	1758	1710	1812	5.2	16	22.5	100	e
EF -x - 1950 B	78	1902	1854	1956	5.6	16	22.5	100	e
EF -x - 2100 B	84	2046	1998	2100	6.0	16	22.5	100	e
EF -x - 2200 B	90	2190	2142	2244	6.4	16	22.5	100	e
EF -x - 2300 B	96	2334	2286	2388	6.8	16	22.5	100	e
EF -x - 2450 B	102	2478	2430	2532	7.2	16	22.5	100	e
EF -x - 2650 B	108	2622	2574	2676	7.6	16	22.5	99	e
EF -x - 2750 B	114	2776	2718	2820	8.0	21	30	97	e
EF -x - 2900 B	120	2910	2862	2964	8.4	21	30	95	e
EF -x - 3000 B	126	3054	3006	3108	8.8	21	30	93	e

\* Models shown may not implement the blanking function.

Resolution 40mm Range 6 - 30m Optical code "BL"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mttf ( years )	PL
EF -x - 0150 BL	6	185	135	276	0.8	6	7.5	100	e
EF -x - 0210 BL *	8	233	183	276	0.9	6	7.5	100	e
EF -x - 0240 BL *	9	257	207	300	1.0	6	7.5	100	e
EF -x - 0300 BL	12	329	279	372	1.2	6	7.5	100	e
EF -x - 0360 BL *	14	377	327	420	1.3	6	7.5	100	e
EF -x - 0390 BL *	15	401	351	444	1.4	6	7.5	100	e
EF -x - 0450 BL	18	473	423	516	1.6	6	7.5	100	e
EF -x - 0540 BL *	21	545	495	588	1.8	6	7.5	100	e
EF -x - 0600 BL	24	617	567	660	2.0	6	7.5	100	e
EF -x - 0680 BL *	27	689	639	732	2.4	11	15	100	e
EF -x - 0750 BL	30	761	711	804	2.4	11	15	100	e
EF -x - 0820 BL *	33	833	783	876	2.6	11	15	100	e
EF -x - 0900 BL	36	905	855	948	2.8	11	15	100	e
EF -x - 0970 BL *	39	977	927	1020	3.0	11	15	100	e
EF -x - 1050 BL	42	1049	999	1092	3.2	11	15	100	e
EF -x - 1100 BL *	45	1121	1071	1164	3.4	11	15	100	e
EF -x - 1200 BL	48	1193	1143	1236	3.6	11	15	100	e
EF -x - 1250 BL *	51	1265	1215	1308	3.8	11	15	100	e
EF -x - 1350 BL	54	1337	1287	1380	4.0	11	15	100	e
EF -x - 1400 BL *	57	1409	1359	1452	4.2	11	15	100	e
EF -x - 1500 BL	60	1481	1431	1524	4.4	11	15	100	e
EF -x - 1650 BL	66	1625	1575	1668	4.8	11	15	100	e
EF -x - 1800 BL	72	1769	1719	1812	5.2	16	22.5	100	e
EF -x - 1950 BL	78	1913	1863	1956	5.6	16	22.5	100	e
EF -x - 2100 BL	84	2057	2007	2100	6.0	16	22.5	100	e
EF -x - 2200 BL	90	2201	2151	2244	6.4	16	22.5	100	e
EF -x - 2300 BL	96	2345	2295	2388	6.8	16	22.5	100	e
EF -x - 2450 BL	102	2489	2439	2532	7.2	16	22.5	100	e
EF -x - 2650 BL	108	2633	2583	2676	7.6	16	22.5	99	e
EF -x - 2750 BL	114	2777	2727	2820	8.0	21	30	97	e
EF -x - 2900 BL	120	2921	2871	2964	8.4	21	30	95	e
EF -x - 3000 BL	126	3065	3015	3108	8.8	21	30	93	e

\* Models shown may not implement the blanking function.

Resolution 55mm Range 0,5 - 15m Optical code "C"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 0150 C	3	200	102	276	0.8	6	7.5	100	e
EF -x - 0250 C	5	296	198	300	1.1	6	7.5	100	e
EF -x - 0300 C	6	344	246	372	1.2	6	7.5	100	e
EF -x - 0400 C	8	440	342	444	1.5	6	7.5	100	e
EF -x - 0450 C	9	488	390	516	1.6	6	7.5	100	e
EF -x - 0600 C	12	632	534	660	2.0	6	7.5	100	e
EF -x - 0750 C	15	776	678	804	2.4	6	7.5	100	e
EF -x - 0900 C	18	920	822	948	2.8	6	7.5	100	e
EF -x - 1050 C	21	1064	966	1092	3.2	6	7.5	100	e
EF -x - 1200 C	24	1208	1110	1236	3.6	6	7.5	100	e
EF -x - 1350 C	27	1352	1254	1380	4.0	11	15	100	e
EF -x - 1500 C	30	1496	1398	1524	4.4	11	15	100	e
EF -x - 1650 C	33	1640	1542	1668	4.8	11	15	100	e
EF -x - 1800 C	36	1784	1686	1812	5.2	11	15	100	e
EF -x - 1950 C	39	1928	1830	1956	5.6	11	15	100	e
EF -x - 2100 C	42	2072	1974	2100	6.0	11	15	100	e
EF -x - 2200 C	45	2216	2118	2244	6.4	11	15	100	e
EF -x - 2300 C	48	2360	2262	2388	6.8	11	15	100	e
EF -x - 2450 C	51	2504	2406	2532	7.2	11	15	100	e
EF -x - 2650 C	54	2648	2550	2676	7.6	11	15	100	e
EF -x - 2750 C	57	2792	2694	2820	8.0	11	15	100	e
EF -x - 2900 C	60	2936	2838	2964	8.4	11	15	100	e
EF -x - 3000 C	63	3080	2982	3108	8.8	11	15	100	e

Resolution 65mm Range 6 - 30m Optical code "CL"									
Model	N° of beams	Protected Height PH ( mm )	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 0150 CL	3	211	111	276	0.8	6	7.5	100	e
EF -x - 0250 CL	5	307	207	300	1.1	6	7.5	100	e
EF -x - 0300 CL	6	355	255	372	1.2	6	7.5	100	e
EF -x - 0400 CL	8	451	351	444	1.5	6	7.5	100	e
EF -x - 0450 CL	9	499	399	516	1.6	6	7.5	100	e
EF -x - 0600 CL	12	643	543	660	2.0	6	7.5	100	e
EF -x - 0750 CL	15	787	687	804	2.4	6	7.5	100	e
EF -x - 0900 CL	18	931	831	948	2.8	6	7.5	100	e
EF -x - 1050 CL	21	1075	975	1092	3.2	6	7.5	100	e
EF -x - 1200 CL	24	1219	1119	1236	3.6	6	7.5	100	e
EF -x - 1350 CL	27	1363	1263	1380	4.0	11	15	100	e
EF -x - 1500 CL	30	1507	1407	1524	4.4	11	15	100	e
EF -x - 1650 CL	33	1651	1551	1668	4.8	11	15	100	e
EF -x - 1800 CL	36	1795	1695	1812	5.2	11	15	100	e
EF -x - 1950 CL	39	1939	1839	1956	5.6	11	15	100	e
EF -x - 2100 CL	42	2083	1983	2100	6.0	11	15	100	e
EF -x - 2200 CL	45	2227	2127	2244	6.4	11	15	100	e
EF -x - 2300 CL	48	2371	2271	2388	6.8	11	15	100	e
EF -x - 2450 CL	51	2515	2415	2532	7.2	11	15	100	e
EF -x - 2650 CL	54	2659	2559	2676	7.6	11	15	100	e
EF -x - 2750 CL	57	2803	2703	2820	8.0	11	15	100	e
EF -x - 2900 CL	60	2947	2847	2964	8.4	11	15	100	e
EF -x - 3000 CL	63	3091	2991	3108	8.8	11	15	100	e

Resolution 125 mm Range 0,5 - 15m Optical code "D"								
Model	N° of beams	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF - x - 350 D	4	366	468	1.6	6	7.5	100	e
EF - x - 600 D	6	606	708	2.8	6	7.5	100	e
EF - x - 850 D	8	846	948	3.2	6	7.5	100	e
EF - x - 1050 D	10	1086	1188	4.2	6	7.5	100	e
EF - x - 1350 D	12	1326	1428	4.8	6	7.5	100	e
EF - x - 1550 D	14	1566	1668	5.4	6	7.5	100	e
EF - x - 1800 D	16	1806	1908	6.0	6	7.5	100	e
EF - x - 2050 D	18	2046	2148	6.6	6	7.5	100	e
EF - x - 2250 D	20	2286	2388	7.2	6	7.5	100	e
EF - x - 2550 D	22	2526	2628	7.8	6	7.5	100	e
EF - x - 2750 D	24	2766	2868	8.4	6	7.5	100	e
EF - x - 3050 D	26	3006	3108	9.0	11	15	100	e

Resolution 135 mm Range 6 - 30m Optical code "DL"								
Model	N° of beams	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF - x - 350 DL	4	375	468	1.6	6	7.5	100	e
EF - x - 600 DL	6	615	708	2.8	6	7.5	100	e
EF - x - 850 DL	8	855	948	3.2	6	7.5	100	e
EF - x - 1050 DL	10	1095	1188	4.2	6	7.5	100	e
EF - x - 1350 DL	12	1335	1428	4.8	6	7.5	100	e
EF - x - 1550 DL	14	1575	1668	5.4	6	7.5	100	e
EF - x - 1800 DL	16	1815	1908	6.0	6	7.5	100	e
EF - x - 2050 DL	18	2055	2148	6.6	6	7.5	100	e
EF - x - 2250 DL	20	2295	2388	7.2	6	7.5	100	e
EF - x - 2550 DL	22	2535	2628	7.8	6	7.5	100	e
EF - x - 2750 DL	24	2775	2868	8.4	6	7.5	100	e
EF - x - 3050 DL	26	3015	3108	9.0	11	15	100	e

Resolution 306 mm Range 0,5 - 15m Optical code "E"								
Model	N° of beams	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 300 E	2	306	458	1.5	6	7.5	100	e
EF -x - 650 E	3	606	758	1.9	6	7.5	100	e
EF -x - 900 E	4	906	1058	3.0	6	7.5	100	e
EF -x - 1200 E	5	1206	1358	4.1	6	7.5	100	e
EF -x - 1550 E	6	1506	1658	5.2	6	7.5	100	e
EF -x - 1800 E	7	1806	1958	6.3	6	7.5	100	e
EF -x - 2250 E	8	2106	2258	7.4	6	7.5	100	e
EF -x - 2400 E	9	2406	2558	8.5	6	7.5	100	e
EF -x - 2750 E	10	2706	2858	9.6	6	7.5	100	e
EF -x - 3000 E	11	3006	3158	10.7	6	7.5	100	e

Resolution 315 mm Range 6 - 30m Optical code "EL"								
Model	N° of beams	Sensitive Height SH ( mm )	Barrier Height H ( mm )	Weight (Tx+RX) ( Kg )	Response Time ( ms )	Response Time blanking ( ms )	Mtff ( years )	PL
EF -x - 300 EL	2	315	458	1.5	6	7.5	100	e
EF -x - 650 EL	3	615	758	1.9	6	7.5	100	e
EF -x - 900 EL	4	915	1058	3.0	6	7.5	100	e
EF -x - 1200 EL	5	1215	1358	4.1	6	7.5	100	e
EF -x - 1550 EL	6	1515	1658	5.2	6	7.5	100	e
EF -x - 1800 EL	7	1815	1958	6.3	6	7.5	100	e
EF -x - 2250 EL	8	2115	2258	7.4	6	7.5	100	e
EF -x - 2400 EL	9	2415	2558	8.5	6	7.5	100	e
EF -x - 2750 EL	10	2715	2858	9.6	6	7.5	100	e
EF -x - 3000 EL	11	3015	3158	10.7	6	7.5	100	e



### Response time of master / slave configuration

The response time is variable with the number of beams and increases if the blanking function is active.

In the master / slave configuration, the total response time is calculate as follow :

**Total beams number** = number of the MASTER beams + number of the SLAVE beams

Total beams number	Response Time ms	Response time with blanking active ms
from 2 up to 24	6	7.5
from 25 up to 66	11	15
from 67 up to 108	16	22.5
from 109 up to 150	21	30
from 151 up to 186	26	37.5
from 187 up to 228	31	45

I.E. - The following configuration of the light curtains produce a response time equal to:

MASTER 90 beams + SLAVE 18 beams total 108 beams

Response time = 16 ms blanking not active  
 Response time = 22.5 ms blanking active

### MTTFd

In the master / slave configuration, the total MTTFd value is obtained by adding the MASTER number beams with the SLAVE number beams. After deriving from " List of the models and the characteristics " tables, the total value of MTTF based on the total number of beams obtained previously.

### BARRIER CODE

		EF - a	450	B	-	-
<b>Model</b>	see table pag 13					
<b>Sensitive height</b>	see table pag 32-39					
<b>Optical code</b>	see table pag 32-39					
<b>Master / Slave *</b>	optional	M = master	S = slave			
<b>Additional indicator</b>	optional	J = end cap LED	D = display slave			

\* suffix present only in the Master / Slave versions

### BLANKING FUNCTION DETAILS

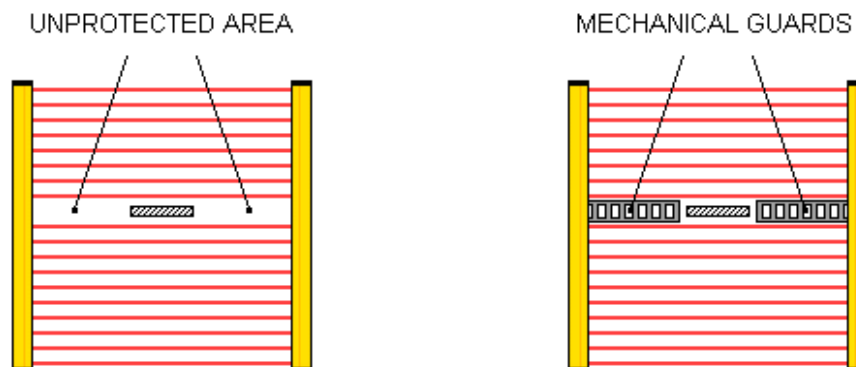
For the blanking connection refer to pag 18, 24

Some models of barriers can't use the blanking function ( see pag 35-36 )

- 1) Cannot be selected on the first beam near the cap with connectors because this is the synchronism beam. The interruption of this beam causes the OSSD OFF.
- 2) In the MASTER / SLAVE model, the blanking function is active only on the MASTER.
- 3) In the blanking version without the presence of the object, **BSO**, the resolution of the ESPE changes as shown in the table below.

Barrier model	Blanking without object obligation	Resolution	Maximum size of non detected object
EF A	Resolution without blanking	14mm	0mm
	Resolution with blanking 1 beam BSO1	24mm	6mm
	Resolution with blanking 2 beams BSO2	34mm	16mm
	Resolution with blanking 3 beams BSO3	44mm	26mm
EF AL	Resolution without blanking	20mm	0mm
	Resolution with blanking 1 beam BSO1	30mm	2mm
	Resolution with blanking 2 beams BSO2	40mm	12mm
	Resolution with blanking 3 beams BSO3	50mm	22mm
EF B	Resolution without blanking	30mm	0mm
	Resolution with blanking 1 beam BSO1	54mm	18mm
	Resolution with blanking 2 beams BSO2	78mm	42mm
	Resolution with blanking 3 beams BSO3	102mm	66mm
EF BL	Resolution without blanking	40mm	0mm
	Resolution with blanking 1 beam BSO1	64mm	10mm
	Resolution with blanking 2 beams BSO2	88mm	34mm
	Resolution with blanking 3 beams BSO3	112mm	58mm
EF C	Resolution without blanking	55mm	0mm
	Resolution with blanking 1 beam BSO1	102mm	42mm
	Resolution with blanking 2 beams BSO2	150mm	90mm
	Resolution with blanking 3 beams BSO3	198mm	186mm
EF CL	Resolution without blanking	65mm	0mm
	Resolution with blanking 1 beam BSO1	112mm	34mm
	Resolution with blanking 2 beams BSO2	160mm	82mm
	Resolution with blanking 3 beams BSO3	208mm	178mm

- 4) Using the **BCO** blanking, if the width of the worked object is lower than protected field, in order to maintain the nominal resolution , is necessary to install special mechanical protection as drawing below. If is not possible insert the protection in this area, the resolution increases. Refer to the **BSO** table to obtain the new value of resolution.



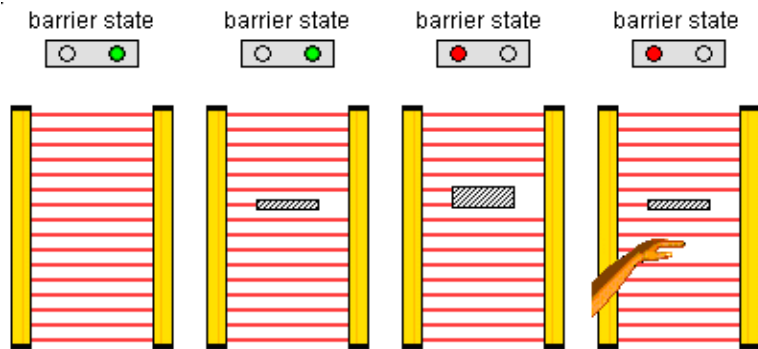
- 5) It is possible set the type of blanking as indicated below.

### Blanking without object presence obligation

This function allows to enter an object in the sensitive area without deactivating the outputs of the light curtain. The resolution is modified for the entire height of the protected area as indicated in the table above. Can be implemented the following configurations:

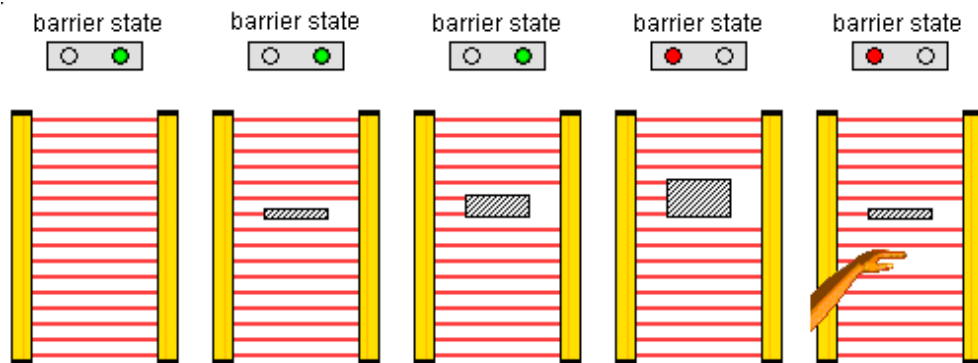
#### **BSO1 1 BEAM**

- With all the beams free, the protected area is free.
- With one beam interrupted, the protected area is considered free and the OSSDs are in ON state.
- With two or more beams interrupted, the protected area is considered occupied and the OSSD are in OFF state.



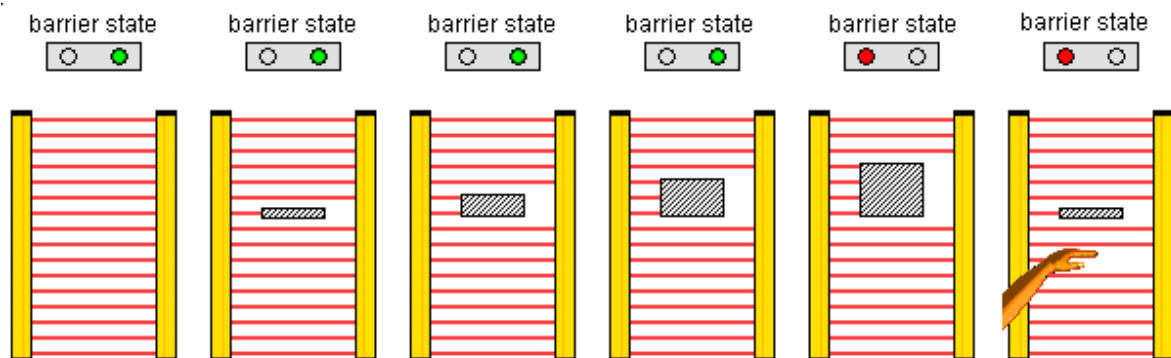
#### **BSO2 1-2 BEAMS**

- With all the beams free, the protected area is free.
- With one or two adjacent beams interrupted, the area is considered free and the OSSDs are in ON state.
- With two or more non-adjacent beams interrupted, the area is considered occupied and the OSSDs are in OFF state.



#### **BSO3 1-2-3 BEAMS**

- With all the beams free, the protected area is free.
- With one, two or three adjacent beams interrupted, the area is considered free and the OSSDs are in ON state.
- With two or more non-adjacent beams interrupted, the area is considered occupied and the OSSDs are in OFF state.

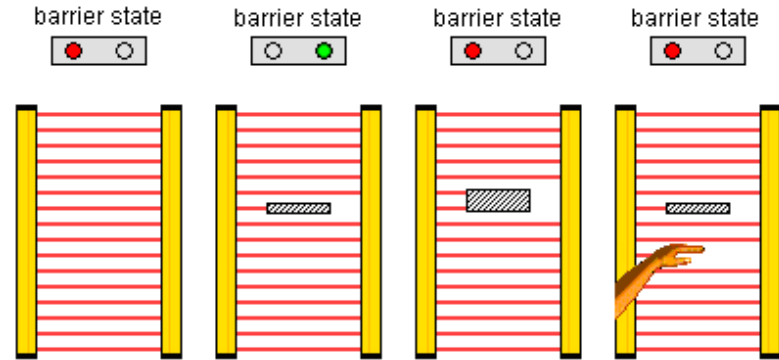


### Blanking with object presence obligation

This function allows to keep an object in the sensitive area without deactivating the outputs of the light curtain. Can be implemented the following configurations:

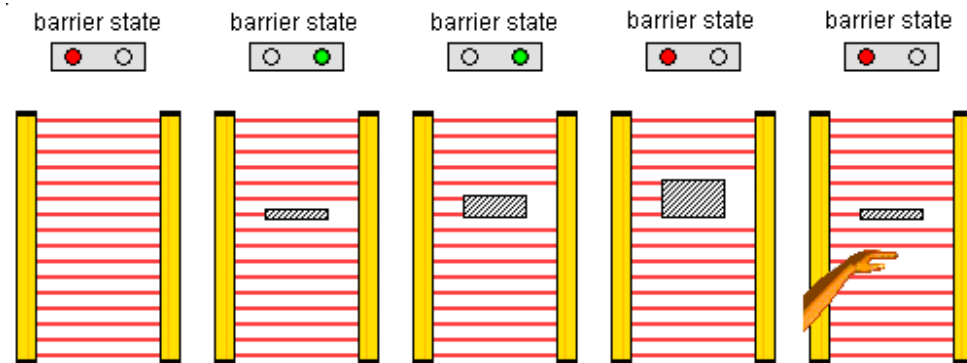
#### BCO1 1 BEAM

- If the movable object is not present the OSSDs are in OFF state.
- With one beam interrupted, the area is considered free and the OSSDs are ON.
- With two adjacent beams interrupted, the area is considered occupied and the OSSDs are in OFF state.



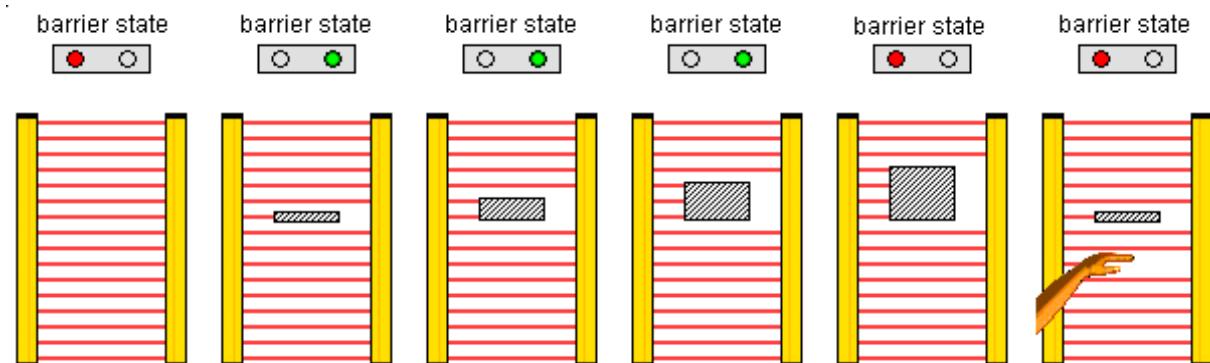
#### BCO2 1-2 BEAMS

- If the movable object is not present, the OSSDs are in OFF state.
- With one or two adjacent beams interrupted, the area is considered free and the OSSDs are in ON state.
- With two or more non-adjacent beams interrupted, the area is considered occupied and the OSSDs are in OFF state.



#### BCO3 1-2-3 BEAMS

- If the movable object is not present, the OSSDs are OFF.
- With one, two or three adjacent beams interrupted, the area is considered free and the OSSDs are ON.
- With two or more non-adjacent beams interrupted, the area is considered occupied and the OSSDs are in OFF state.



## MUTING FUNCTION DETAILS

Before to use the muting function, should be evaluated:

- a. the application;
- b. the installation of the two sensors;
- c. the risk of the machinery or the plant.

In order to use the muting function, thus the knowledge and observance of the machinery / equipment-specific standards and the relevant standards or guidelines for machine safety / protective devices.

The following overview, which does not claim to be exhaustive, gives some of the major standards:

EN 61496-1	Safety of machinery - Electro-sensitive protective equipment
EN 60947-5-3	Low-voltage switchgear and controlgear
EN ISO 13855	Safety of machinery - Positioning of protective equipment
IEC/TS 62046:2008	Safety of machinery - Application of protective equipment to detect the presence of persons

### **!! Warning ! SAFETY INSTRUCTION !! Warning !!**

Failure to observe the following instructions may lead to most severe injuries and death.

- Observe the above-mentioned standards as regards configuration, installation, and operation of muting systems.
- Take measures to exclude common mode failures.
- Take measures to exclude failures by cross circuits.
- Take measures to prevent the muting function from being tripped by persons.
- Please note that a muting function shall not be initiated until the preceding muting function has been terminated.
- Take measures to safeguard maintenance gates to the danger zones in compliance with the necessary safety level.

The muting function integrated in the EFESTO4 is appropriate for applications where the muting sensors used to initiate the muting function are the same as those used to terminate the muting function.

#### **Muting sensors location and positioning:**

The muting sensors shall be located such that the user is not able to manipulate / defeat the muting sensors to activate the muting function. The above-mentioned standards and safety instructions shall be observed.

This means e.g. for safeguarding the access with use infrared emitter-receiver type as sensors:

- the beams of the muting sensors shall always meet in the danger zone.
- the muting sensors shall be positioned / located such that the light grid is interrupted before it is possible to reach the beam intersection point.

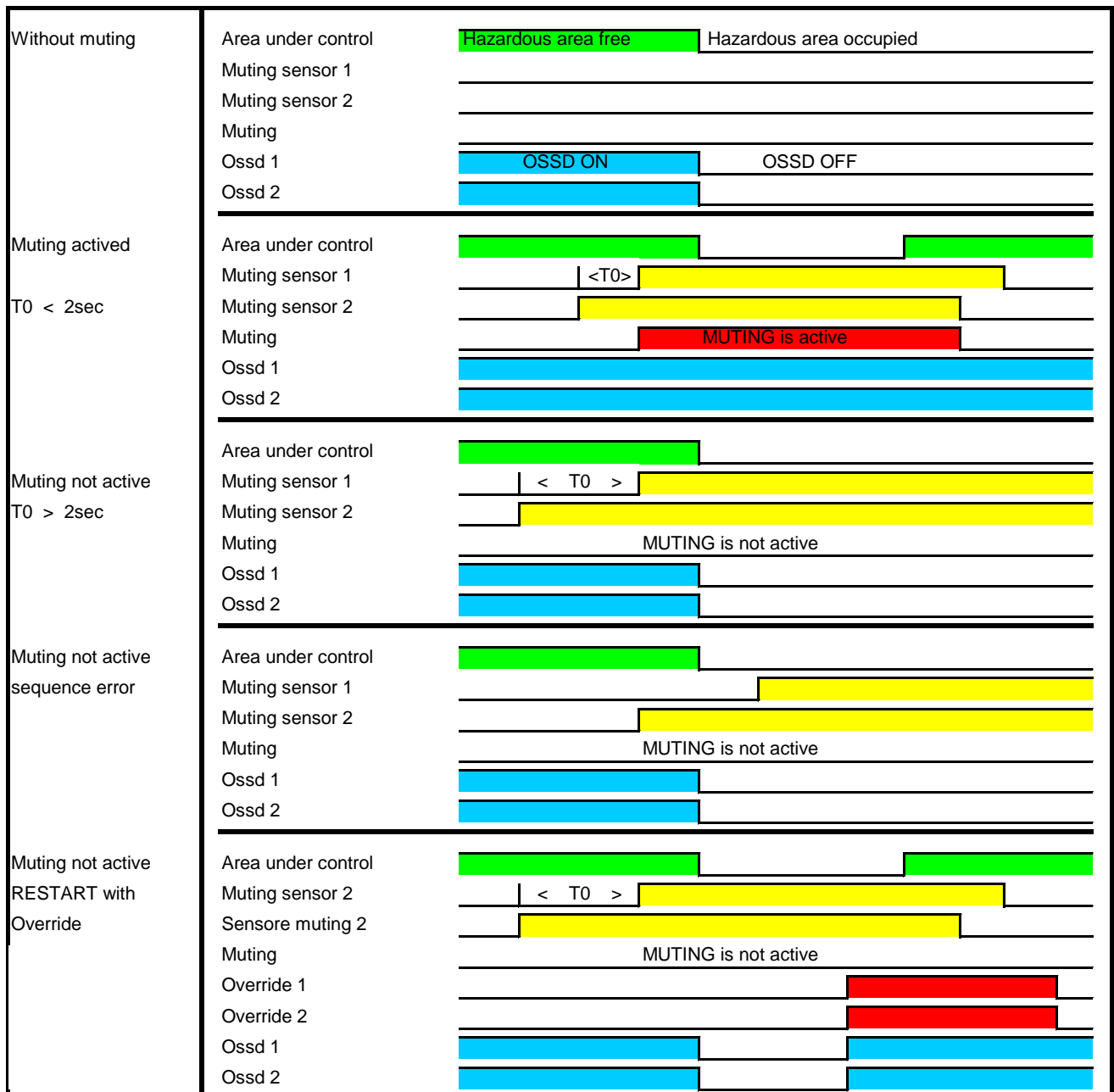
### Type and connection of the sensors

The sensors can be of every type (also no safety sensor) because the internal circuit of the barrier provide the control of the same and to block on the case of damage.

These components can be choice between proximity, mechanical micro, light curtains, ect as specify on the standard machinery. When activate, the muting sensor must supply 24Vdc.

To avoid common mode failures the conductors must be of type armed against the mechanical crushing and screened electrically. Their installation must happen on two separate runs for avoid that a possible cause could damage both the connections with a short circuit or with the cut of the conductors.

### Sequence function of muting



## ACCESSORIES

### MIRRORS

They are the ideal solution for the protection of area as they protect 2 or 3 sides of the machine reducing the cost of installation. It is possible to resolve the following situations:

- Protection to “ L “ shape when the unit must protect 2 sides with the employ of 1 mirror as fig. 1
- Protection to “ U “ shape when the barrier must protect 3 sides with employ of 2 mirrors as fig. 2
- Total protection when the light curtain protects 4 sides with the employ of 3 mirrors as fig. 3. If the perimeter is quite long this solution is not suggested for difficulty of alignment, the best solution is to use 2 barriers and 2 mirrors as shown in fig. 4.

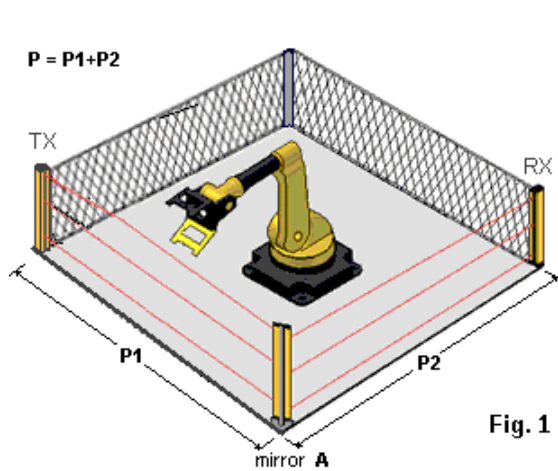


Fig. 1

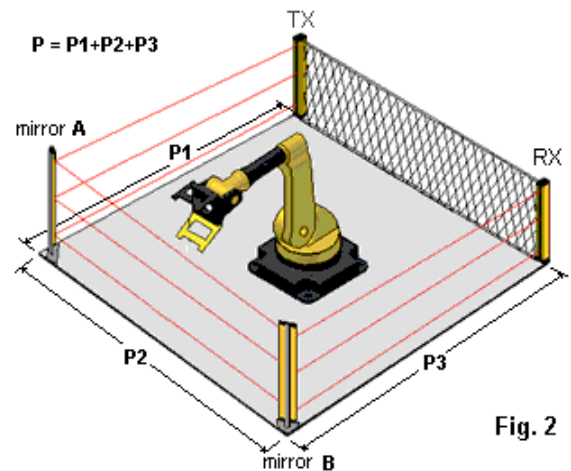


Fig. 2

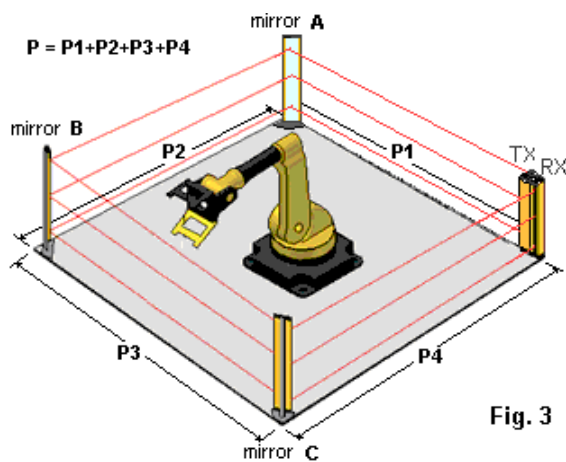


Fig. 3

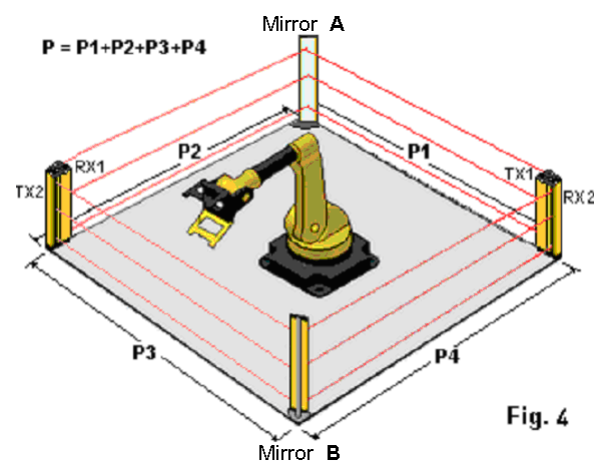


Fig. 4

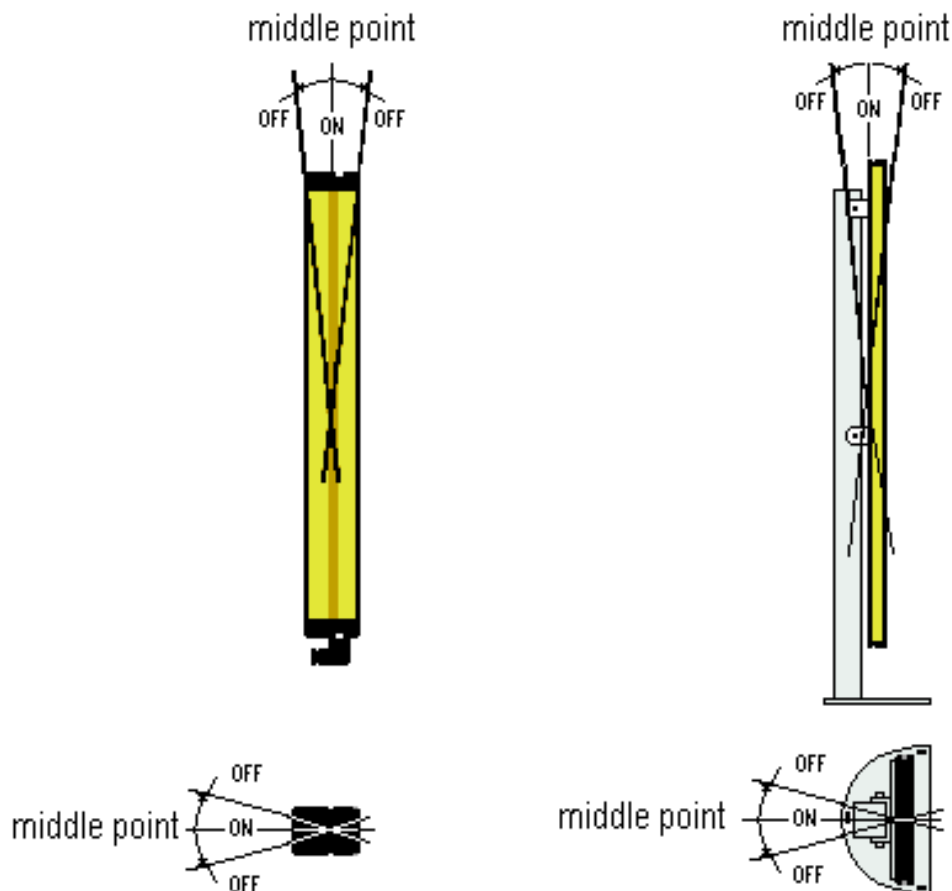
### Range of curtain using mirrors

The nominal range of the light curtain using these devices will be reduced depending on the number of mirrors, taking into consideration that every mirror reduces the total range by about 25 %. The values of the range are the following:

	Range up to 15 m	Range up to 30 m
Solution fig. 1	P = 12 m	P = 22,5 m
Solution fig. 2	P = 8,5 m	P = 16,5 m
Solution fig. 3	P = 6 m	P = 12 m

### Alignment of barriers using mirrors

- Verify the distance of the sides to protect considering the above data.
- Install the light curtain and the mirrors on the stated points.
- By the adjustments permitted by the brackets set heights of light curtain and verify the verticality of all components.
- Proceed to accurate adjustment as indicated below.





## Application of 1 mirrors with two protected sides

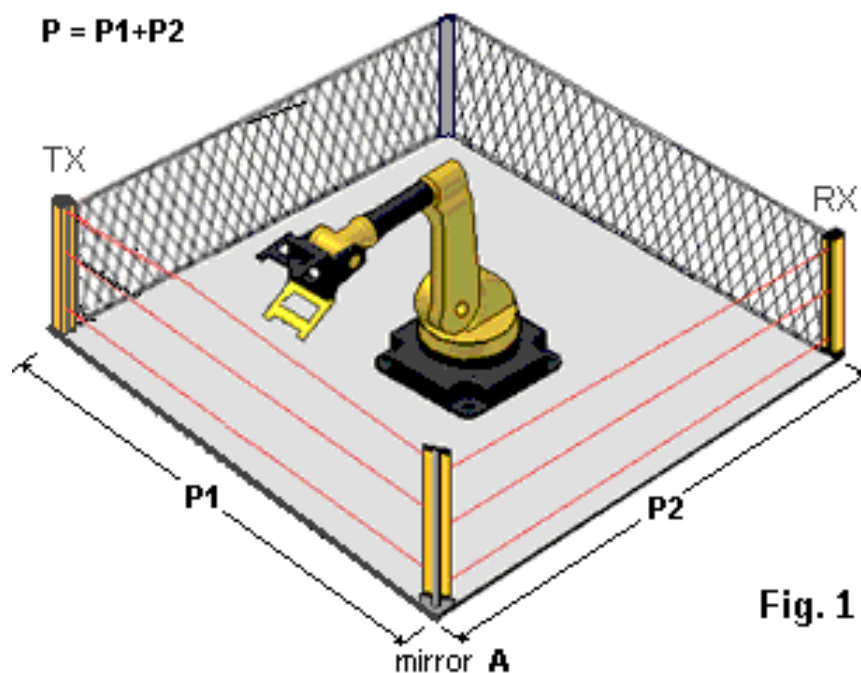
Application of 1 mirror for protection of 2 sides

- **first adjustment**

- stand behind the emitter, rotate the mirror until the receiver is visible in the mirror.
- check the verticality of all components.

- **second adjustment to the tuning**

- stand behind the emitter, rotate the mirror until the receiver is visible in the middle of the mirror.
- Turn on the light curtain and use the "bargraph" for alignment. If the restart is automatic, when the beam is all alignment the OS ON is green, otherwise if the restart is manual the BMS is light on if the beam is all alignment.
- At this point, check the system to render insensible at the vibrations. We must find the middle point as shown in page 48.



## Application of 2 mirrors with three protected sides

Application of 2 mirrors for protection of 3 sides

- **first adjustment**

- place the mirrors on the line of TX or RX unit to center the axis of the beams. Check the distance between the TX and RX with those of the two mirrors and verify the angularity of 90° of each side.
- Place behind the TX and move the mirror A to see the mirror B
- Place behind the RX and move the mirror B to see the mirror A
- check the verticality of all components.

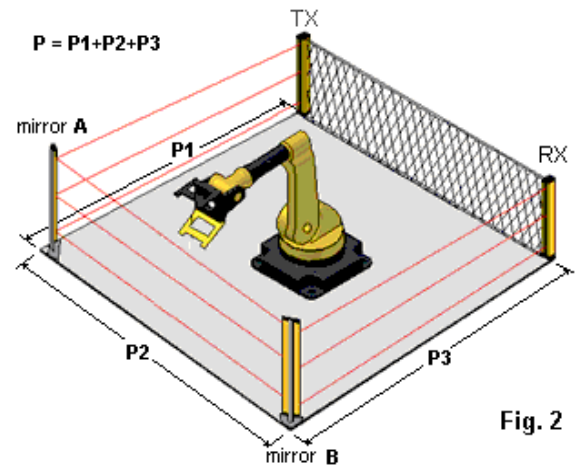


Fig. 2

- **second adjustment to the tuning**

- stand behind the TX, rotate the mirrors until the RX is visible in the middle of the mirror B; stand behind the RX, rotate the mirrors until the TX is visible in the middle of the mirror A
- Turn on the light curtains and use the "bargraph" for alignment. If the restart is automatic, when the beam is all alignment the OS ON is green, otherwise if the restart is manual the BMS is light on if the beam is all alignment.
- At this point, check the system to render insensible at the vibrations. We must find the middle point as shown in page 48.

## Application of 3 mirrors with 4 protected sides

Follow the same procedure as the above point of fig. 2 considering that the centering will be made on 3 mirrors instead of 2. It is quite difficult to align a system using 3 mirrors. For this reason, we suggest using 2 light curtains and 1 mirror or 2 barriers and 2 mirrors depending on the perimeter length needed.

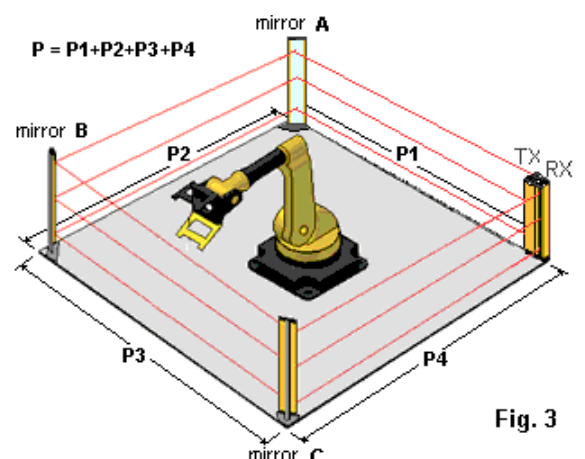


Fig. 3

### Application of 2 mirrors with 2 units

This solution allows to protect the 4 sides as in the previous case, but with the use of two mirrors and two light curtains. The alignment should be done as shown in the first reference (fig.1) but acting independently on two combinations of mirrors / barriers.

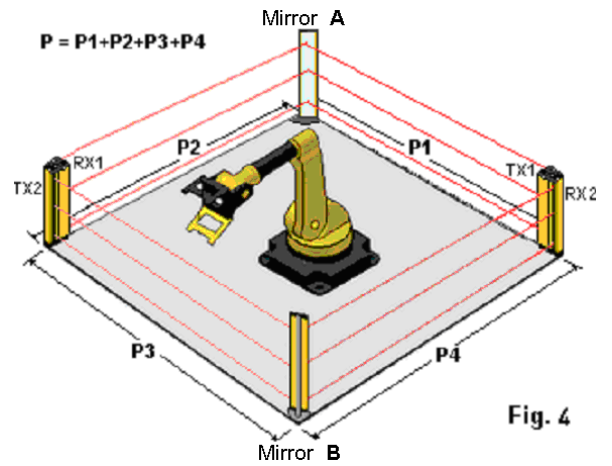
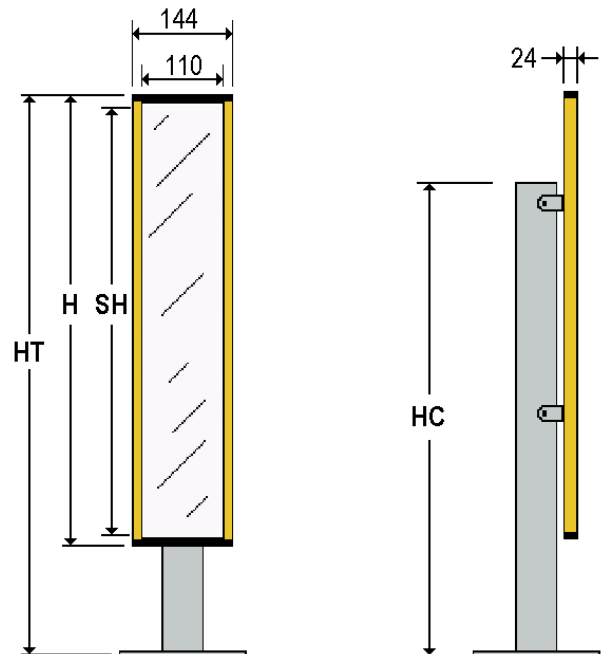
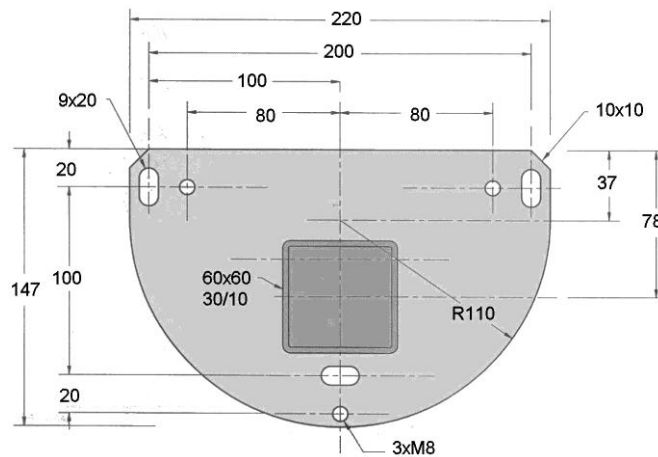


Fig. 4

### DIMENSIONS



### Mirrors models

Model	SH mm	H mm	HC mm	HT min : max
WAB 501	370	390	385	400 : 570
WAB 502	690	710	705	720 : 1050
WAB 503	1010	1030	1025	1040 : 1530
WAB 504	1330	1350	1345	1360 : 2010
WAB 505	1650	1670	1345	1680 : 2320
WAB 506	1810	1830	1345	1840 : 2480
WAB 507	1970	1990	1345	2000 : 2640

## BRACKETS

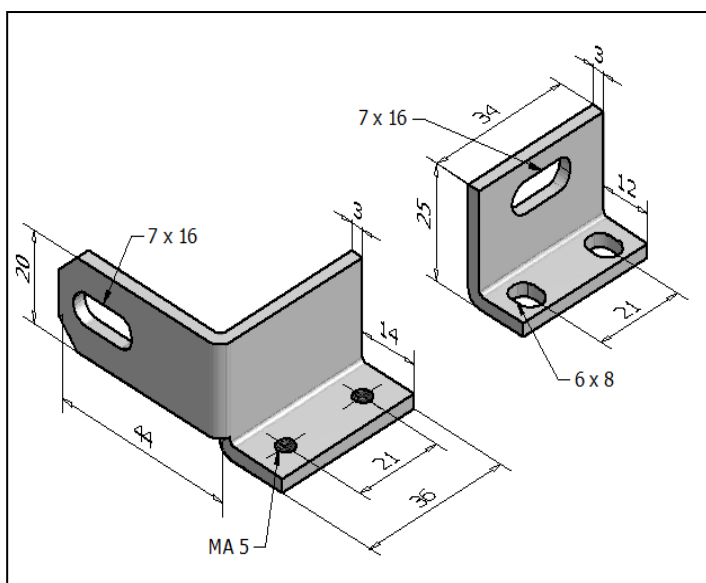
### KIT brackets type "STVB"

Supplied as standard with the barrier.

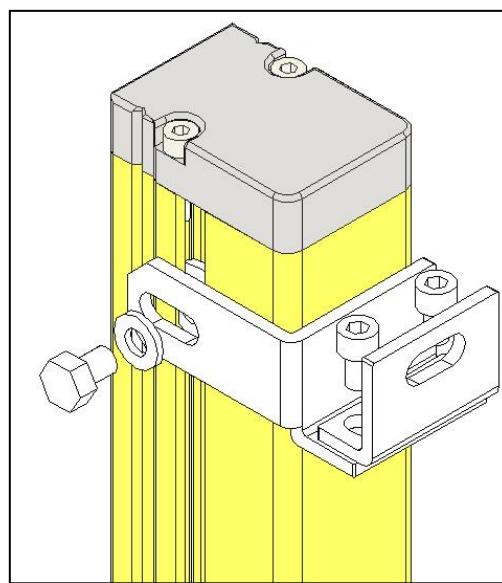
It is the more complete bracket: it is composed from two units (VB1 and VB2) that allow the rotation of the light curtain on the 3 axes to regulate the alignment of TX or RX unit.

They include :

- 4 brackets VB1
- 4 brackets VB2
- 4 washers Ø6
- 4 screws M 6X8
- 8 screws M 5X8



Brackets type VB1 / VB2



Brackets STVB assembled on the barrier

### NOTE :

To remove the flowing insert ( in order to insert them in the opposite guide of the aluminium enclosure ) you need to remove the end cap without the connector, unscrewing the two screws.

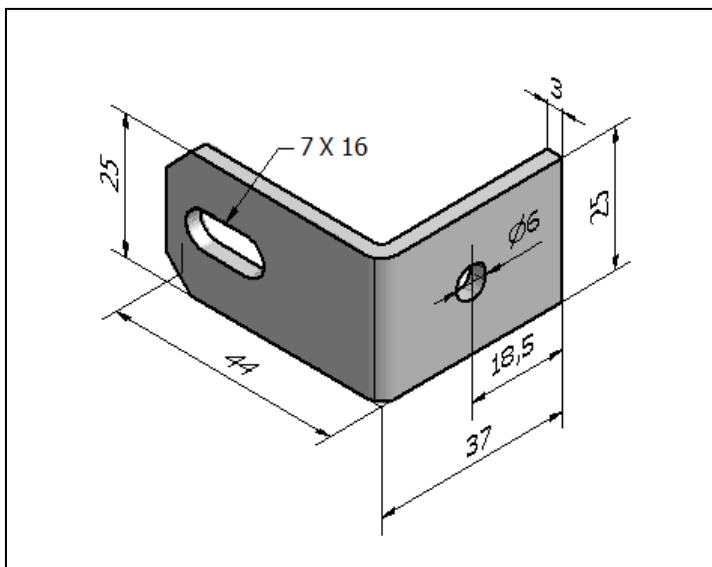
**KIT OF BRACKETS "STGM"**

supplied as optional to STVB kit

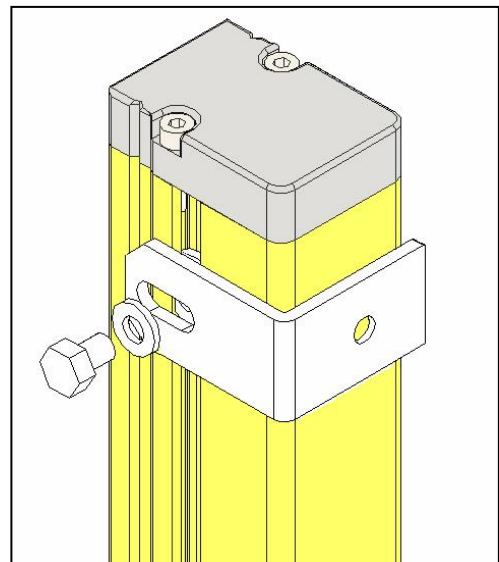
Is formed by a one bracket "L" shape that is used for the angular regulation of the barrier. The sliding insert inside the aluminium profile allows the sliding of the light curtain in the height to facilitate its correct positioning.

Content :

- 4 brackets GM
- 4 washers  $\varnothing 6$
- 4 screws M 6X8



Brackets type GM



Brackets mounted on the barriers

**NOTE :**

To remove the flowing insert ( in order to insert them in the opposite guide of the aluminium enclosure) you need to remove the end cap without the connector, unscrewing the two screws.

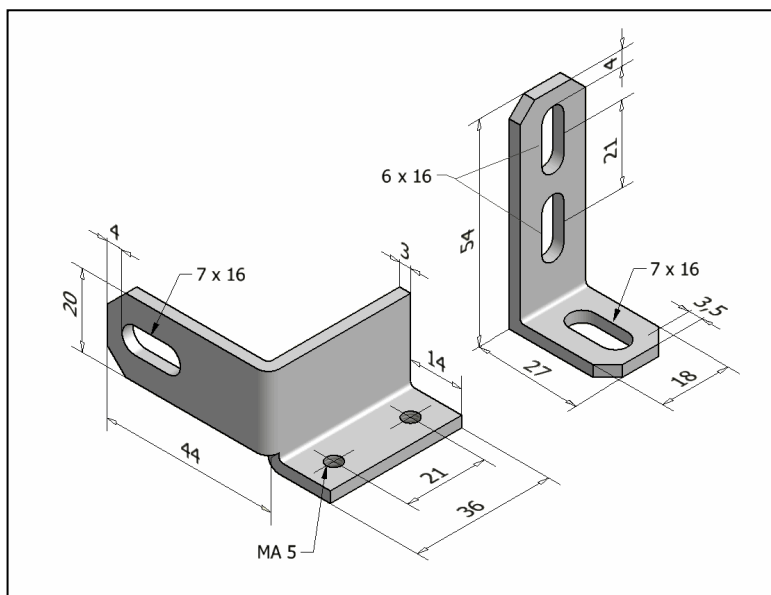
**KIT OF BRACKETS "STDL"**

Supplied on request as alternative to mod. STVB

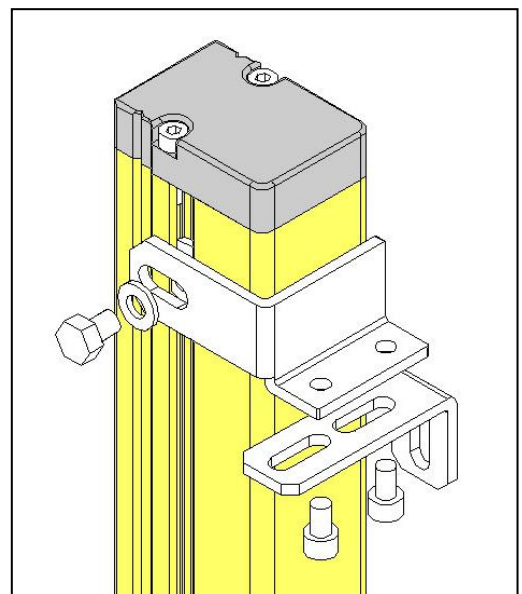
This brackets kit allows to stay the light curtain in its place established by fixing one of the brackets to the side of the light curtain, is recommended when there are needs or difficulties in the installation of light curtains.

Content:

- 4 brackets type VB1
- 4 brackets type VB3
- 4 washers Ø6
- 4 screws M 6X8
- 8 screws M 5X8



**Brackets type VB1 / VB3**





**Brackets STDL mounted on the barrier**

**NOTE:**

To remove the flowing insert ( in order to insert them in the opposite guide of the aluminium enclosure) you need to remove the end cap without the connector, unscrewing the two screws.

### CONNECTION CABLES

Description		Code	
<b>Connection cable barrier - cabinet / relay module din rail</b>			
M12 / 4 pins shielded connecting cable, right connector for TX	5m	E-84-5	
	10m	E-84-10	
M12 / 5 pins shielded connecting cable, right connector for RX a/d/e	5m	E-85-5	
	10m	E-85-10	
M12 / 8 pins shielded connecting cable, right connector for RX b/c/d/e	5m	E-88-5	
	10m	E-88-10	
M23 / 17 pins shielded connecting cable, right connector for RX f	5m	E-817-5	
<b>Connection cable barrier - external relay module</b>			
M12 / 4 pins shielded cable, 2 female right connector for TX-Rel 021/ 022	10m	E-94-10	
M12 / 5 pins shielded cable, 2 female right connector for RXa/d/e -Rel021/022	10m	E-95-10	
M12 / 8 pins shielded cable, 2 female right connector for RXb/c/d/e-Rel 021/022	10m	E-98-10	
M23 / 17pin shielded cable, 2 female right connector for RX f -Rel 021/ 022	10m	E-917-10	

### INTEGRATED SIGNALLING LAMP

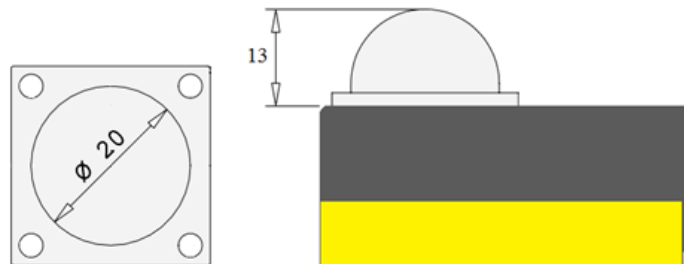
The optional lamp integrated inside the upper end cup of the barrier, provides information on the status of the OSSD and the MUTING function.

The MUTING lamp function should be provided for the “e, f1, f2” versions.

In the following table there are relationships between the state of the lamp and the active functions of the barrier.



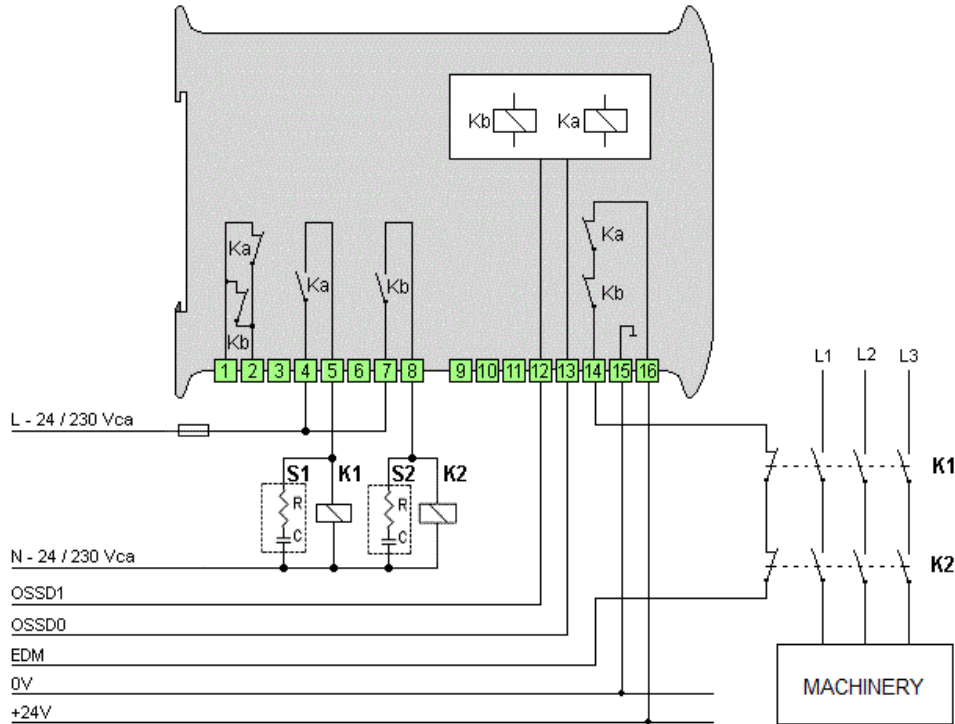
CURTAIN STATE	END CAP LIGHT COLOR
OSSD OFF	RED
OSSD ON	GREEN
MUTING ACTIVE	YELLOW



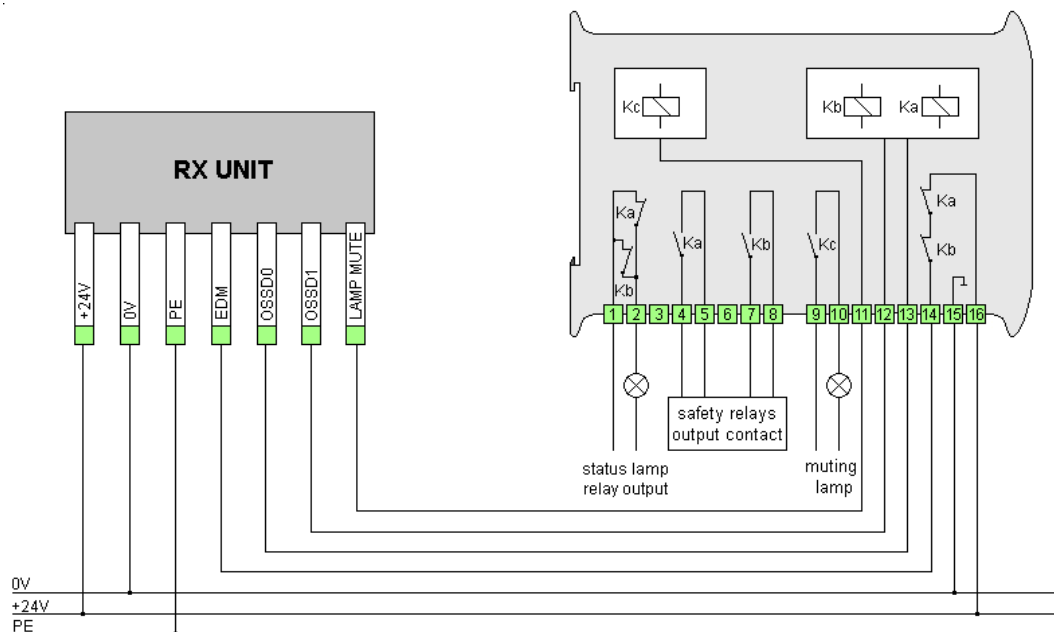
### RELAYS MODULE DIN RAIL

The following box changes the static output of the light curtain, into relays output. This module can be mounted on DIN rail and are matched with light curtains with EDM function: **EF b, EF d, EF e, EF f.**

**REL 011** relay module standard - example of connections with external contactors. The same wiring diagram can be applied to REL012.



**REL 012** relay module with blinking muting lamp - example of connections



If not used the external contactors control, directly connect the pin 14 to the EDM input of the barrier.

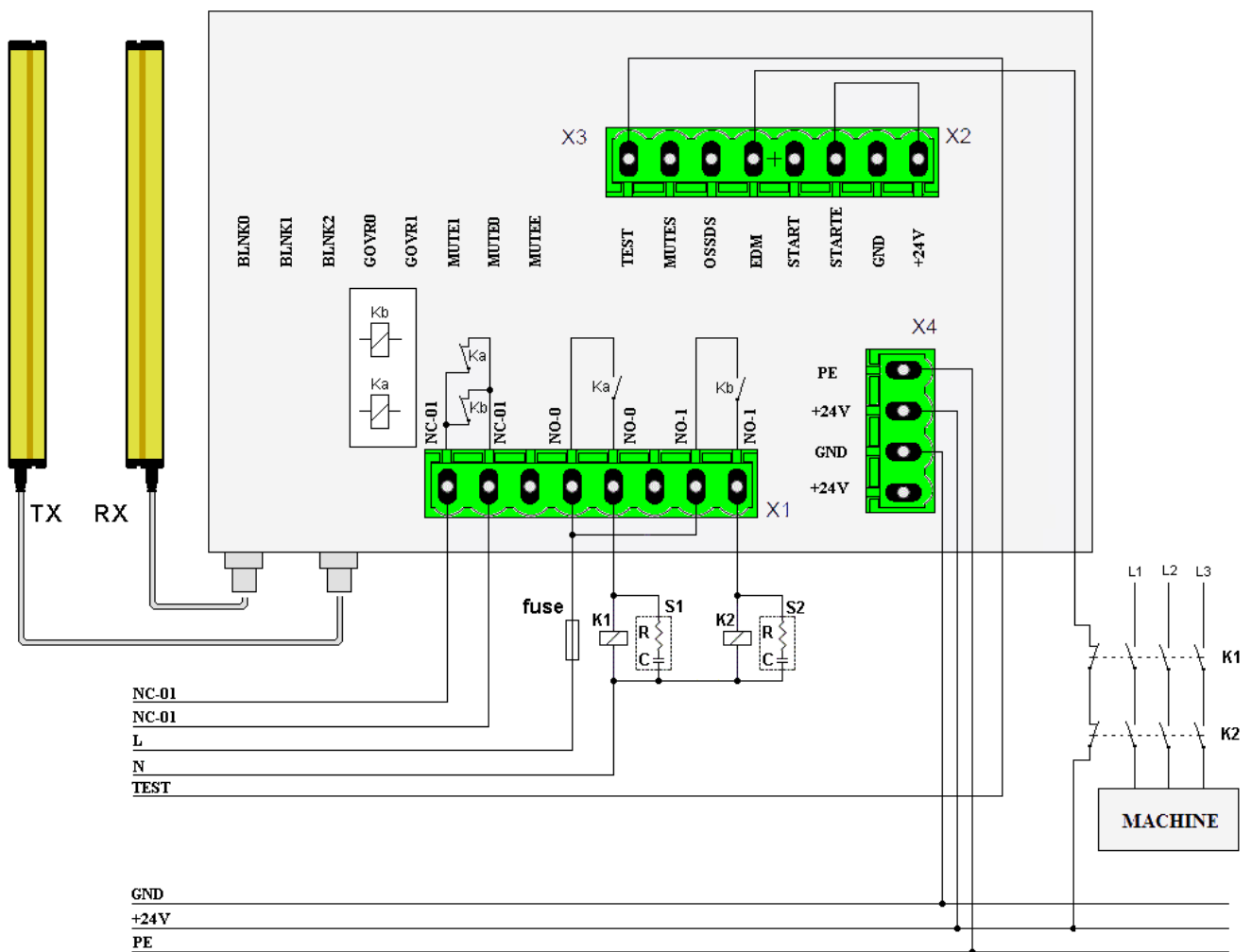


### EXTERNAL RELAY MODULES

**REL 021 B** relays module with spring-key for manual reset and OSSD status lamp for EF b.



Example of connection with external contactor control.



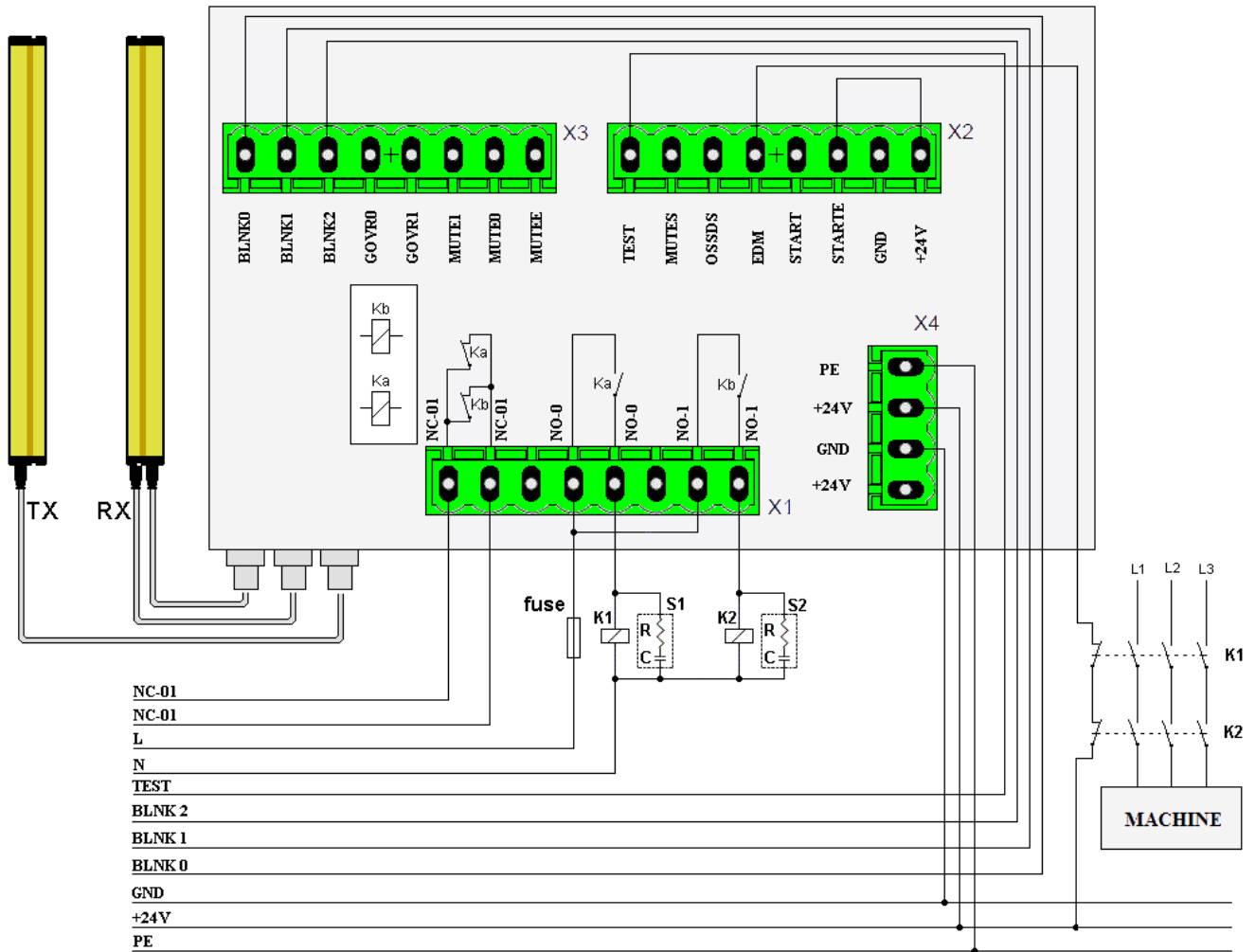
The TEST signal can be led outside to test the safety chain.  
 The signal START-E is connected to +24V, so the manual reset is selected.

If not used the external contactors control, connect the EDM input to +24V of X2 connector.

**REL 021 D** relays module with spring-key for manual reset and OSSD status lamp for **EF d**.



Example of connection with external contactor control.



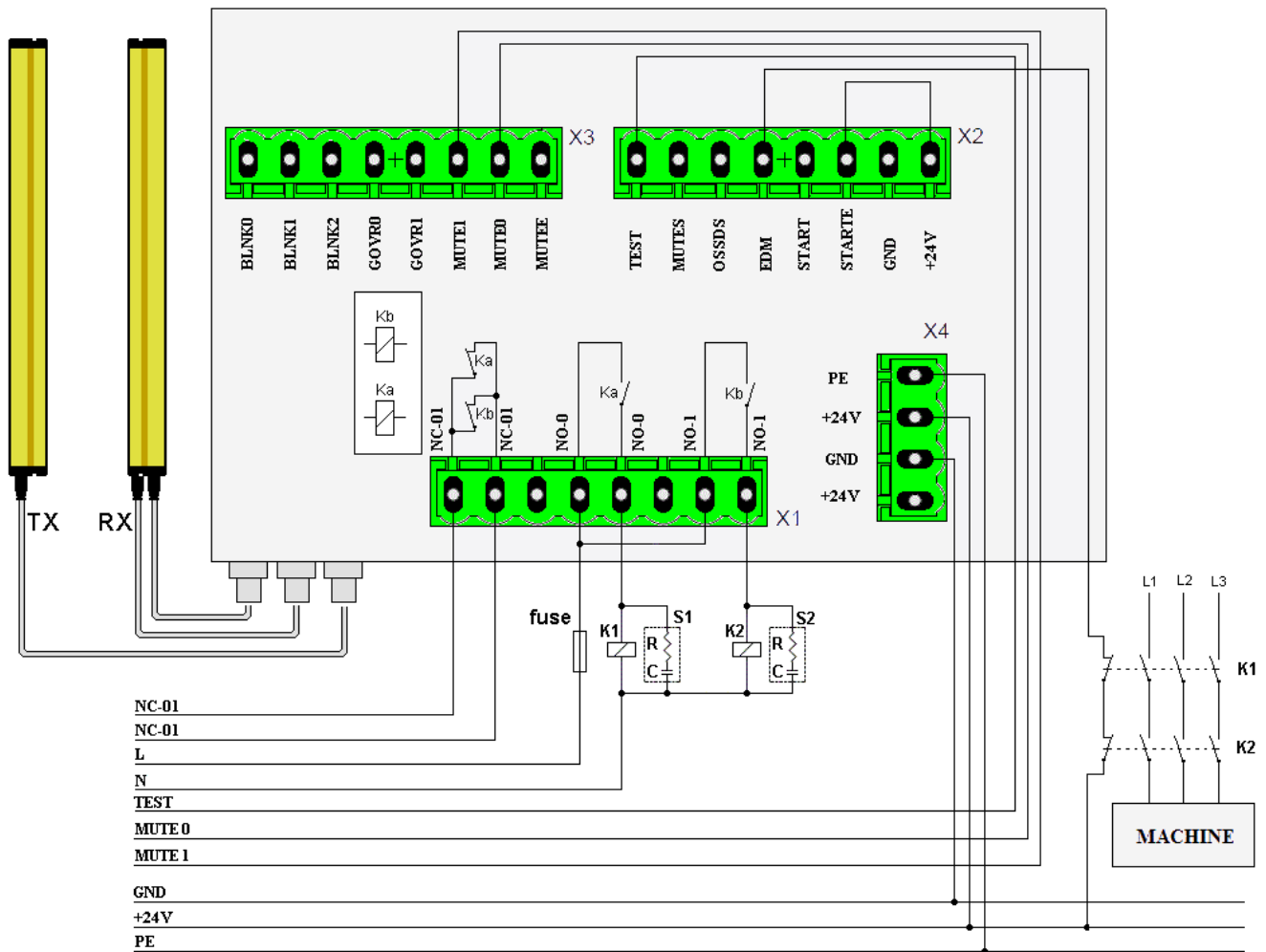
The TEST signal can be led outside to test the safety chain.  
 The signal START-E is connected to +24V, so the manual reset is selected.  
 The signals BLNK0 ... BLNK2 can be connected inside the box, otherwise can be brought out and connected at other ... control system ( i.e. PLC ).

If not used the external contactors control, connect the EDM input to +24V of X2 connector.

**REL 022 E** relays module with spring-key for manual reset and guard override; OSSD status and MUTING lamp for **EF e**.



Example of connection with external contactor control.



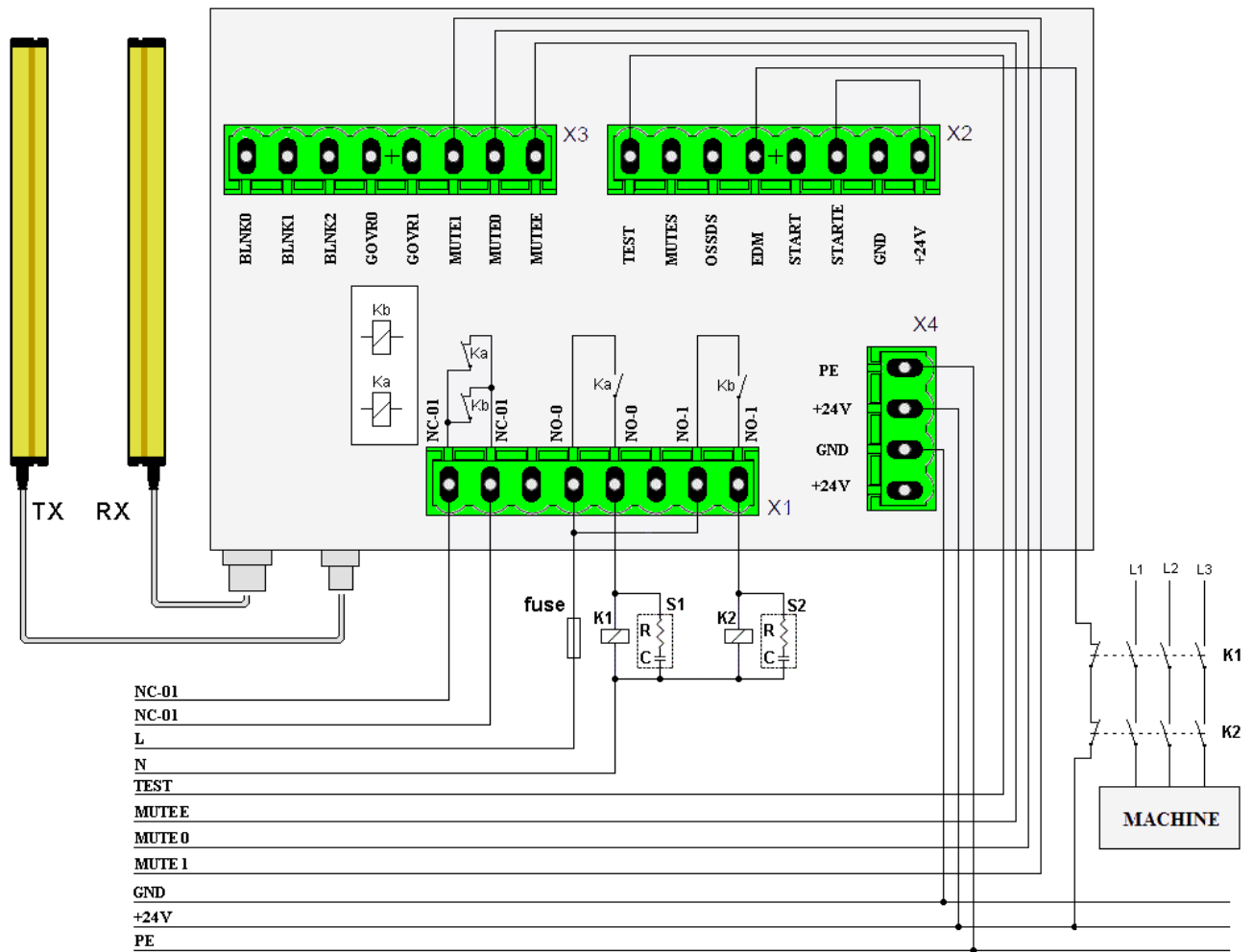
The TEST signal can be led outside to test the safety chain.  
 The signal STARTE is connected to +24V, so the manual reset is selected.  
 The signals MUTE0 and MUTE1 are brought out of the box and connected to the MUTING sensors.  
 The MUTE0, signal for enable the MUTING function, is connected to +24V inside the box.  
 The MUTING function is always active, is no possible deactivate it.

If not used the external contactors control, connect the EDM input to +24V of X2 connector.

**REL 022 F** relays module with spring-key for manual reset and guard override; OSSD status and MUTING lamp for **EF f1, f2**.



Example of connection with contactors control.



The TEST signal can be led outside to test the safety chain.

The signal STARTE is connected to +24V, so the manual reset is selected.

The signals MUTE0 and MUTE1 are brought out of the box and connected to the MUTING sensors.

The MUTE1, signal for enable the MUTING function, is also brought out of the box, so the customer can activate or not the MUTING function.

If not used the external contactors control, connect the EDM input to +24V of X2 connector.

---

## Warranty

---

A guarantee is provided for a period of 12 months from the delivery date and terminates at the expiration of this term, even if the materials have not been used for any reason.

Our company undertakes to repair or replace, during this period, free of charge, within the shortest possible time, those parts which owing to poor quality of material or defective workmanship or inaccurate assembly should prove defective. This is providing that defects are not due to:

- wear and tear
- failure caused by inexperience or negligence
- unauthorized intervention or tampering
- overloads behind contract limits
- accidental causes or "force major"

These repairs or replacements shall be performed AT OUR WORKSHOP in MILANO.  
Transport and workmanship will be completely charged to purchaser.

Nothing will be owed to the purchaser for the time during which the plant may remain idle, nor shall he make claims or ask indemnity for charges, accidents or direct or indirect damages.

For anything else not specified or that becomes a subject of dispute, the ANIE (Italian Electrotechnical Industries Association) general sale conditions will be applied.

**GREIN S.r.l. Milan**

**NOTE: characteristics and dimensions reported in this manual are for reference only and they can be subject to change without notice.**

---

**DICHIARAZIONE “UE” DI CONFORMITA’  
“UE” DECLARATION OF CONFORMITY**

---

**Il fabbricante****The manufacturer****GREIN S.r.l.**

Via S.G.B. De La Salle 4/A 20132 MILANO ITALY

**Dichiara che****Declares that**I prodotti identificati come "EFESTO4" sono  
Dispositivi Elettrosensibili di Sicurezza (ESPE)  
Versione 1609 di:The products identified with the name EFESTO4  
are Device for protection of dangerous area  
(ESPE) Version 1609 of:

Tipo 4, SIL 3, Cat 4 – PL e

Type 4, SIL 3, Cat 4 – PL e

**Organismo Notificato****Notified Body****TÜV Intercert S.r.l. N identificazione 2616  
Via Cecati 1/1 – 42123 Reggio Emilia, Italia  
N attestato esame CE del tipo N 16-MD-B002-TIC**

Conformi alle seguenti direttive

Conforms to the following directives

2006 / 42 / EC Direttiva Macchine  
come attuata dal DLGS N17 del 27 gen 2010  
2014 / 30 / EC Compatibilità Elettromagnetica  
come attuata dal DLGS N 80 del 18 mag 2016Machine Directive  
Electro Magnetic Compatibility Directive

Norme armonizzate utilizzate

Harmonized standards used

EN 61496-1: 2013, EN 61000-6-2: 2005, EN 61000-6-4: 2007 + A1: 2011  
EN 62061: 2005 + AC: 2010 + A1: 2013 + A2: 2015  
EN ISO 13849-1: 2015, EN ISO 13849-2: 2012

Altre norme e specifiche tecniche utilizzate

Other technical standards and specifications used

EN 61496-2: 2013, EN 61508-3: 2010

Persona autorizzata a costituire il fascicolo tecnico

Person authorized to compile the technical file

Grein S.r.l. Via S.G.B. De La Salle 4/A 20132 MILANO ITALY

NAME Perissinotto Antonio  
POSITION C E O GREIN S.r.l.

Milano, 04 lug 2016

Originale / Original

La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante  
This declaration of conformity is issued under the sole responsibility of the manufacturer

**GREIN s.r.l.**  
Amministratore Unico  
A. Perissinotto

# GREIN



Via S. G. B. De la Salle 4/A 20132 Milano - MI Tel 02 26300140 Fax 02 26300711  
[www.grein.it](http://www.grein.it) | [info@grein.it](mailto:info@grein.it)