

## Safety Light Curtain with infrared beams SC4 Quick start guide

**Sense**



## **ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)**

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**SC4 Quick Start Guide**  
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**CARLO GAVAZZI**  
Automation Components

**DECLARATION OF CONFORMITY**



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declares that the

**SC4**  
**SAFETY LIGHT CURTAINS - ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT**  
**(Type 4 ESPE)**

and all its models are in conformity with the requirements of the European Council Directives listed below:

**2006 / 42 / EC Machinery Directive**  
**2004 / 108 / EC EMC Directive**  
**2006 / 95 / EC Low Voltage Directive**

This Declaration is based upon compliance of the products to the following standards:

<b>EN 61496-1: 2004</b>	Safety of machinery - Electro-Sensitive protective equipment. Part 1: General requirements and tests.
<b>IEC 61496-2: 2006</b>	Safety of machinery - Electro-Sensitive protective equipment. Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs).
<b>IEC 61508-1/3/4: 1998</b>	Functional safety of electrical/electronic/programmable electronic. Safety-related systems.
<b>IEC 61508-2: 2000</b>	Safety-related systems.
<b>EN 954-1: 1996</b>	Safety of machinery - Safety related parts of control system.
<b>EN ISO 13849-1: 2008</b>	Safety of machinery - Safety related parts of control system. Part 1: General principles for design.
<b>EN 62061: 2005</b>	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control system.
<b>EN 50178: 1997</b>	Electronic equipment for use in power installations.
<b>EN 61000-6-2: 2005</b>	Electromagnetic standards - Immunity for industrial environments.
<b>EN 55022 (Class A ITE): 2010</b>	Limits and methods of measurements of radio disturbance of information technology equipment.

Conformity as been certified by the following Notified/Competent body (identification N° 0123): TÜV SÜD Rail GmbH, Ridlerstrasse, 57 - D80339 München.

Carlo Gavazzi Logistics have a quality system certified by the EQA, Nr. QA130463, as per ISO 9001 and have therefore observed the regulations foreseen during development and manufacturing.



Lainate / September 30<sup>th</sup> 2013

**Vittorio Rossi**  
Carlo Gavazzi Logistics S.p.A.  
Managing director



## Safety Information

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### **The following points must be observed for a correct and safe use of the safety light curtains of the SC4 series:**

- The stopping system of the machine must be electrically controlled.
- This control system must be able to stop the dangerous movement of the machine within the total machine stopping time T as per section 1.3.3 of the manual included in the CD supplied and during all working cycle phases.
- Mounting and connection of the safety light curtain must be carried out only by qualified personnel, according to the indications included in the special sections (refer to sections 2; 3; 4; 5) and in respect to the applicable Standards.
- The safety light curtain must be securely installed so that access to the dangerous zone is not possible without interrupting the beams.
- The personnel operating in the dangerous area must be well-trained and must have adequate knowledge of all the operating procedures of the safety light curtain.
- The TEST and RESET/RESTART buttons must be located outside the protected area as the operator must check the protected area during all Test and Restart operations.
- Please carefully read the instructions for the correct functioning before powering the light curtain.

### **Precautions to be Observed for the Choice and Installation of the Device**

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#### **Make sure that the protection level assured by the SC4 device (Type 4) is compatible with the real danger level of the machine to be controlled, according to EN 954-1 and EN 13849-1.**

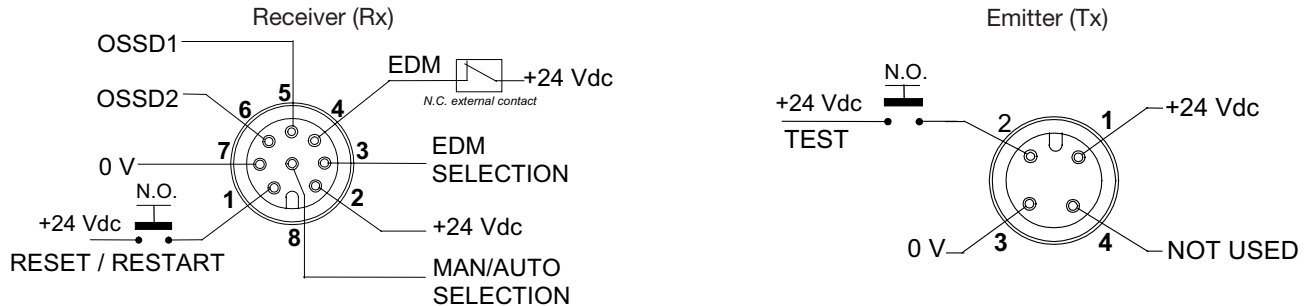
- The outputs (OSSD) of the ESPE (Electro Sensitive Protective Equipment) must be used as machine stopping devices and not as command devices. The machine must have its own START command.
- The dimension of the smallest object to be detected must be larger than the resolution level of the device.
- The ESPE must be installed in a room complying with the technical characteristics indicated in section 10 "Technical data" of the manual included in the CD supplied.
- Do not place the device near intense and/or flashing light sources and, in particular, close to receiving unit front surface.
- The presence of intense electromagnetic disturbances could jeopardise device operation. This condition has to be carefully evaluated with the support of the Carlo Gavazzi Technical service.
- The operating distance of the device can be reduced in presence of smog, fog or airborne dust.
- A sudden change in environment temperature, with very low minimum peaks, can generate a small condensation layer on the lenses and so jeopardise functioning.
- Reflecting surfaces near the safety light curtain light beam (above, under or lateral) can cause passive reflections that can jeopardise functioning.
- The safety device must be installed at a distance which is major or equal to the minimum safety distance S to ensure that the operator can not reach the dangerous area until the moving dangerous object has been blocked by the ESPE.

#### **The failure to respect the safety distance reduces or cancels ESPE the protection function. For more detailed information about calculation of safety distance, please refer to the complete manual contained in the CD supplied.**



## Connections

### SC4



- 1 = white = REST / RESTART (\*)
- 2 = brown = +24VDC
- 3 = green = EDM SELECTION
- 4 = yellow = EDM
- 5 = grey = OSSD1
- 6 = pink = OSSD 2
- 7 = blue = 0V
- 8 = red = SEL.MAN. / AUTO RESTART

- 1 = brown = +24VDC
- 2 = white = TEST
- 3 = blue = 0V
- 4 = black = NOT USED

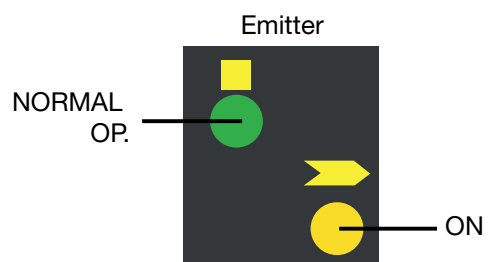
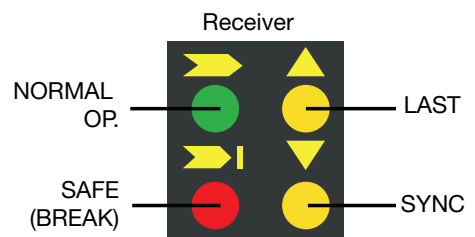
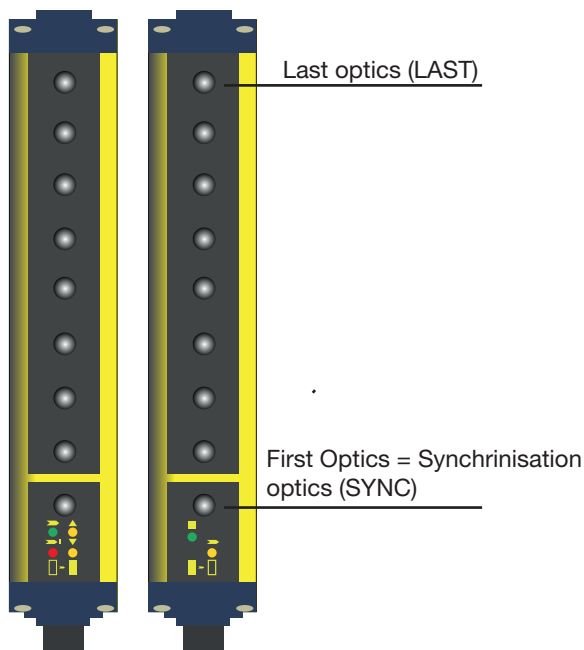
(\*) Automatic RESTART ⇒ RESET function  
Manual RESTART ⇒ RESET/RESTART function

### Alignment Procedure

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

A good alignment prevents output instability caused by dust or vibrations. The alignment is perfect if the optical axes of the first and the last emitting unit beams coincide with the optical axes of the corresponding elements of the receiving unit.

The beam used to synchronise the two units is the first after the connector. SYNC is the optics connected with this beam and LAST is the optics connected to the last beam after the SYNC unit.





Signals are clearly identified through symbols allowing immediate reading, independent of bars directions. A short description of the signalling LEDs is necessary to avoid misunderstandings.

Two yellow LEDs (▲ LAST, ▼ SYNC) on SC4 receiver, facilitate the alignment procedure.

**Correct alignment procedure**

The light curtain alignment can be effected only after having completed the mechanical installation and the electrical connections. The following procedure has to be followed:

**NOTE: SC4 is equipped with a system which informs the user on the alignment obtained. The alignment function can be activated when powering the device, by keeping the normally open RESET/RESTART contact closed for at least 0.5 seconds.**

Display	LED ➡ Normal Op.	LED ➡ I Safe (Break)	LED yellow ▼ SYNC	LED yellow ▲ LAST	Condition	Alignment Status
	OFF	ON	ON	ON	Sync NOK Last NOK	NO align
			OFF		Sync OK Last NOK	
			OFF	OFF	Sync OK Last OK Middle optics NOK	
	ON	OFF	OFF	OFF	Each beam is over the min. operating threshold and the number of beam over the threshold is included between 0 and 25%	MINIMUM align
	ON	OFF	OFF	OFF	Each beam is over the min. operating threshold and the number of beam over the threshold is included between 25 and 50%	
	ON	OFF	OFF	OFF	Each beam is over the min. operating threshold and the number of beam over the threshold is included between 50 and 75%	
	ON	OFF	OFF	OFF	Each beam is over the min. operating threshold and the number of beam over the threshold is included between 75 and 100%	MAXIMUM align.





- A Keep the receiver in a steady position and set the emitter until the yellow LED (▼ SYNC) is OFF. This condition shows the effective alignment of the first beam (synchronisation beam).
- B Rotate the emitter, pivoting on the lower optics axis, until the yellow LED (▲ LAST) is OFF.

NOTE: Ensure that the green LED (➡ NORMAL OP.) is steady ON.

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

The alignment level is monitored also during device normal operation mode via display (see on the manual inside of the attached CD-ROM).

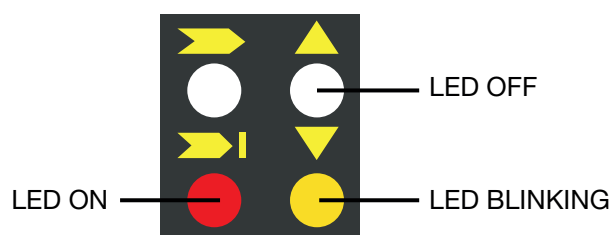
Once the curtain has been aligned and correctly fastened, the display signal is useful both to check the alignment and show a change in the environmental conditions (occurrence of dust, light disturbance and so on) via signal level monitoring.



## Diagnostic Function

The operator can visualise the operating condition of the light curtains thanks to a one-digit display positioned on both the RX and TX unit. SC4 also has four LEDs on the RX unit and two LEDs on the TX unit.

The figure below shows all signalling LEDs modes: OFF, ON and BLINKING.



The operator can evaluate the main causes of the system stopping or failure using the 7-segment display and LEDs used to visualise the functions. For the receiver:

Function	Status	Meaning	LED	DIGIT
Normal operation	Alignment	See section 5		A
	TEST (red ON)	Light curtain being tested. OSSD status shall be OFF		
	Emission (OSSD ON) (green ON)	Light curtain working and in safety block conditions.		
	Interruption (OSSD OFF) (red ON)	Light curtain working in safety block conditions.		
	Interlock Beams free (red ON yellow ON)	Light curtain in interlock, waiting for restart. OSSD status must be OFF		!
	Interlock Beams interrupted (red ON yellow ON)	Light curtain in interlock. OSSD status must be OFF		
	Signal level	Minimum (1 bar) Medium (2 bar) Maximum (3 bar)		- -- ---
	EDM enabled	EDM function is selected		





Function	Status	Meaning	LED	DIGIT
<b>Error status</b>	OSSD error (red ON)	Check OSSD connections. Make sure that they are not in contact with one another or with the supply cables, then Reset. If the failure continues contact Carlo Gavazzi		<i>F0</i>
	Internal error (red ON)	Switch OFF and switch ON the power supply circuit. If the failure continues contact Carlo Gavazzi		<i>FU</i>
	Optical error (red ON)	Reset. If the failure continues contact Carlo Gavazzi		<i>Fb</i>
	EDM error (red ON)	Check EDM connections and lines. If the failure continues contact Carlo Gavazzi		<i>FE</i>
	Restart selection error (red ON)	Check the man/auto restart connection. If the failure continues contact Carlo Gavazzi		<i>Fr</i>
	No power supply (LEDs OFF)	Check connections and input voltage value. If the failure continues contact Carlo Gavazzi		
Function	Status	Meaning	LED	DIGIT
<b>Normal operation</b>	TEST (green ON)	Light curtain being tested. OSSD status on the receiver must be OFF		<i>L</i>
	Emission (green ON yellow ON)	Light curtain in normal operating condition		
Function	Status	Meaning	LED	DIGIT
<b>Error status</b>	Internal error (green ON)	Switch OFF and switch ON the power supply circuit. If the failure continues contact Carlo Gavazzi		<i>FU</i>
	Optical error (green ON)	Switch OFF and switch ON the power supply circuit. If the failure continues contact Carlo Gavazzi		<i>Fb</i>
	No power supply (LEDs OFF)	Check connections and input voltage correct value. If the failure continues contact Carlo Gavazzi		

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