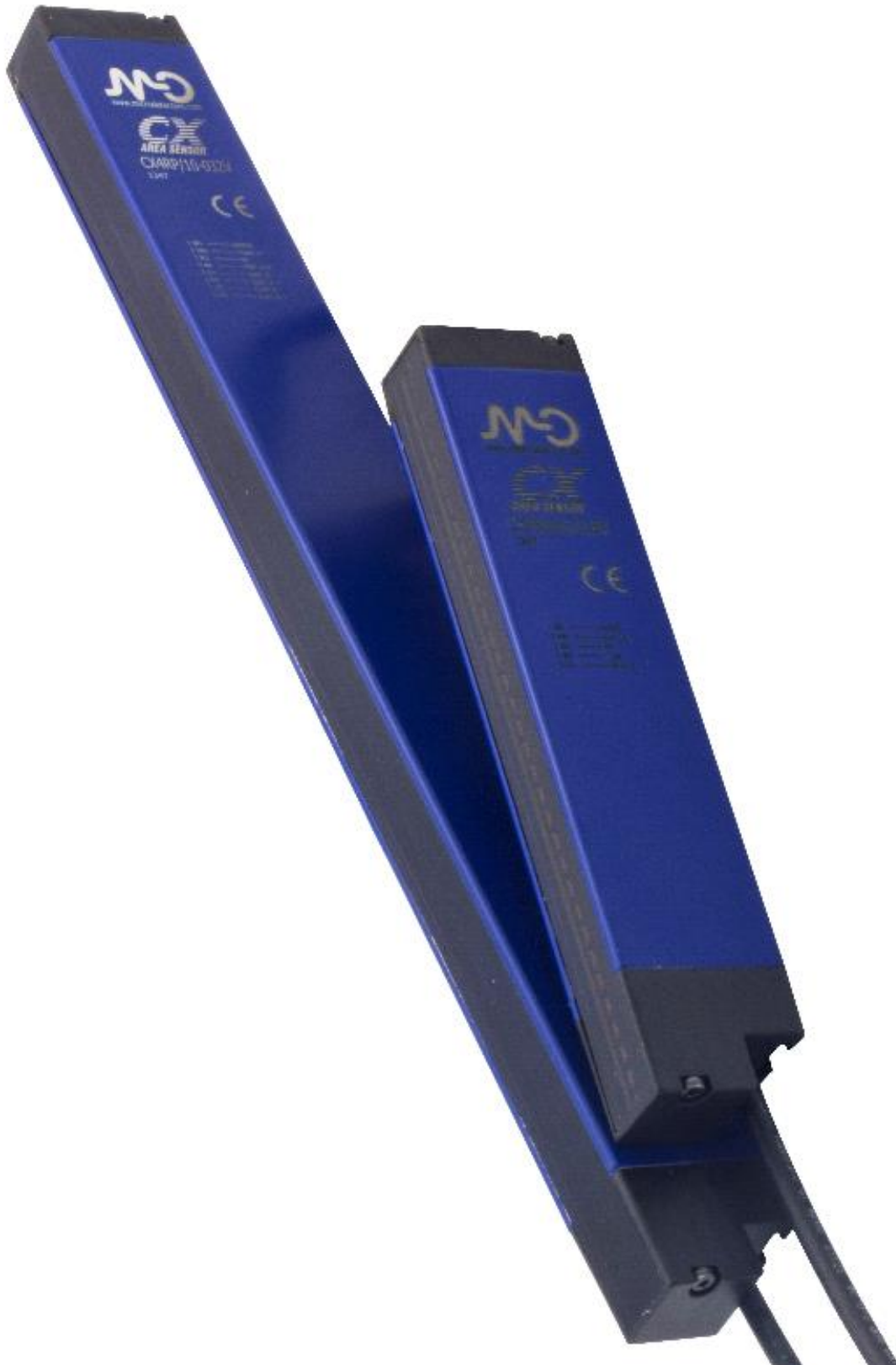


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		<b>Installation and Operation Manual</b>	<b>ENGLISH</b>



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## 1.0 A GENERAL

Please attentively read this manual before installation, start-up, use and maintenance of **CX2** light curtains. This manual contains detailed instructions that must be carefully followed.

### THIS MANUAL IS NOT IN THE ORIGINAL LANGUAGE

#### 1.1 Function of this manual

This manual provides the user with the necessary instructions for safe and proper installation, electrical connection, start-up, use and maintenance of **CX2** light curtains.

#### 1.2 Explanation of symbols



##### Warning

A warning sign indicates actual or potential hazards. It indicates procedures and behaviours which can be useful to prevent accidents. Read and follow these instructions carefully.



##### Indication

It refers to indications that can help achieve better performances.



##### Emitter

It identifies devices that have the function of Emitter.



##### Receiver

It identifies devices that have the function of Receiver.

## 2.0 SAFETY AND PROPER USE



##### Warning

This is NOT a protective device. Therefore, it should not be used to guarantee personnel safety.



##### Warning

This is a low-voltage, direct current device. Proper functioning is only guaranteed between **16.8V<sub>DC</sub>** and **30V<sub>DC</sub>**. Under **15V<sub>DC</sub>** voltage all outputs are in an OFF state. Over **30V<sub>DC</sub> permanent voltage** the device may be damaged.

When the device is switched on, outputs are inactive for a certain amount of time known as **power on delay** (see table below).




##### Warning

The Emitter emits near-infrared light at non-dangerous levels. The device is classified as **RG0** (exempt) according to **IEC 62471: 2008-09**.



##### Warning

Please make sure that light curtains are used in proper environmental conditions. Automatic calibration must always be carried out aiming for the best possible alignment. More than one calibration and alignment adjustment may be necessary to guarantee the best alignment. Check any reflective surface next to the light beams which may influence them. Check any transparent panels or similar panels which may change the beam angle of the light curtains. Prevent the light curtain's optical window from getting scratched or tarnished. Do not expose the receiver to strong natural or artificial light sources, including stroboscopic light. Do not expose the receiver directly to optical beams projected by other optical devices. Ensure that the ambient temperature does not exceed the stated limits. Bear in mind that smoke, vapour, liquids and powders may alter transparency of air or dirty the optical window. Dispose of unusable or irreparable devices always in accordance with national regulations regarding waste disposal.

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### 3.0 PRODUCT DESCRIPTION

#### 3.1 Short description

**CX2** light curtains are photoelectric devices built according to the **IEC 60497-5-2** norm and they must **not** be considered as safety devices. Therefore they must **not** be used to guarantee operators' safety nor to protect users on dangerous machines. They must rather be used to detect objects reducing or obscuring the intensity of light beams hitting the receiver.

The housing is in aluminium, painted in blue **RAL5002**, size **20x36mm**, (20 mm refers to the front side). A groove on the back allows connection with T-shaped components. The top and bottom side are in black **PBT**, the optical window is in **PC**, Protection degree is **IP67**.


Models of this series can be delivered either with **5mm-pitch** and controlled height of **160, 320, 480mm** or with **10mm-pitch** and controlled height of **160, 320, 480, 640, 800, 960mm**. Controlled height is indicated in the item code which goes from **016** to **096**. In all models, the axis of the first and last optical elements are at **4.5 mm** from the housing edge. Therefore, the housing is always 9mm higher than the optical elements.

#### 3.2 Available models

In the tables, descriptions and model codes, height of light curtains is defined with a number indicating the distance "h" between the first and the last optic, expressed in cm. The housing height "H" of light curtains normally is  $H=(h+9\text{mm})$ .

MODEL	Synchronisation	Cross beams y/(N)	Number of boards	Optical Pitch	Optical height	Light curtain height	Beams	Sensing distance	Response time 2x integration	Maximum switching frequency	Inputs/Outputs  The digital outputs state depend on the parallel and crossed beams state.  The analogue outputs depend on the parallel beams state only. The cross beams models have the automatic floating crossed beam array function at Teach-in.	NOTES							
													CODE ARTICLE	P	h	H	Sn	Tr	f
													No	mm	mm	mm	No	m	ms
CX2E0RF-05-016V	Cable Synchronisation	Y	1	5	160	169	33	0.1...3	14.8	33.7	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	One ST151 kit is delivered							
CX2E0RF-05-032V			2	5	320	329	65	0.1...3	27.6	18.1	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Two ST151 kits are delivered							
CX2E0RF-05-048V			3	5	480	489	97	0.1...3	40.4	12.3	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Two ST151 kits are delivered							
CX2E0RF-10-016V		Y	1	10	160	169	17	0.3...6	8.4	59.5	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	One ST151 kit is delivered							
CX2E0RF-10-032V		Y	1	10	320	329	33	0.3...6	14.8	33.7	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Two ST151 kits are delivered							
CX2E0RF-10-048V			2	10	480	489	49	0.3...6	21.2	23.5	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Two ST151 kits are delivered							
CX2E0RF-10-064V			2	10	640	649	65	0.3...6	27.6	18.1	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Three ST151 kits are delivered							
CX2E0RF-10-080V			3	10	800	809	81	0.3...6	34	14.7	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Three ST151 kits are delivered							
CX2E0RF-10-096V			3	10	960	969	97	0.3...6	40.4	12.3	Test. NC/NO; Teach; Blank.; PNP; Analog 0-10V	Three ST151 kits are delivered							
CX2E0RD-05-016V		Y	1	5	160	169	33	0.1...3	14.8	33.7	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	One ST151 kit is delivered							
CX2E0RD-05-032V			2	5	320	329	65	0.1...3	27.6	18.1	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Two ST151 kits are delivered							
CX2E0RD-05-048V			3	5	480	489	97	0.1...3	40.4	12.3	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Two ST151 kits are delivered							
CX2E0RD-10-016V		Y	1	10	160	169	17	0.3...6	8.4	59.5	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	One ST151 kit is delivered							
CX2E0RD-10-032V		Y	1	10	320	329	33	0.3...6	14.8	33.7	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Two ST151 kits are delivered							
CX2E0RD-10-048V			2	10	480	489	49	0.3...6	21.2	23.5	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Two ST151 kits are delivered							
CX2E0RD-10-064V			2	10	640	649	65	0.3...6	27.6	18.1	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Three ST151 kits are delivered							
CX2E0RD-10-080V			3	10	800	809	81	0.3...6	34	14.7	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Three ST151 kits are delivered							
CX2E0RD-10-096V			3	10	960	969	97	0.3...6	40.4	12.3	Test. NC/NO; Teach; Blank.; PNP; Analog 4-20mA	Three ST151 kits are delivered							

Tab.: 3.1.

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## 4.0 START-UP INSTRUCTIONS

### 4.1 Mechanical mounting of CX2 models

It is extremely important to secure the light curtains to a rigid structure, not subject to deformation or strong vibrations. Decide where to place the Receiver so that it is not subject to strong natural or artificial light sources nor to luminous interference of other sensors.

Place the Emitter and Receiver facing one another, at the same height above the reference plane, following the same orientation, the output wires of the transmitter and receiver must be on the same side.

The distance between the two elements must not exceed the limits set by the specifications. To secure the light curtains to a supporting structure, use the inserts which must be applied to the rear groove and the brackets which are provided (mounting accessory **ST151**).

If the application is subject to vibrations, which anyway do not prevent the optical alignment, use damping supports.

The optical beams can be partially deflected by nearby reflective surfaces. Because of that, the path beam interruption may not be detected, therefore, all the reflective surfaces should be positioned at a minimum distance (**Rs**) from the optical axis, **Rs** depends on the range **Re** and the angle of optical aperture  $\varphi$ .

This formula defines a theoretical calculation of the safety distance **Rs** =  $\tan \varphi * Re/2$ ; see Tab.:5.2, Tab.:5.3 and Fig.: 5.1.

**If the deviating effect of a reflective surface cannot be reduced or eliminated, it is necessary that this effect remains stable or, at least, that all system functions work in an acceptable and predictable way.**

**If there are barriers that do not allow to have a completely free optical window, you will also activate the Blanking.**

### 4.2 Electrical installation

Use PELV power supplies, in compliance with Chap.: 6.4. of EN 60204-1.

If using a non-stabilized power supply, the transformer must have double insulation and adequate power, the secondary winding must not exceed 18Vac. Use a bridge rectifier, a filtering capacitor with a minimum value of 2200 $\mu$ F for absorptions up to 1A, for higher absorptions add 2200 $\mu$ F for each extra Ampere.

Connect the supply cables directly to the source and not downstream of other power or highly inductive devices.

Run the cables of the light curtains in dedicated raceways or where only signals run; do not use raceways already carrying power cables. If you use two separate power supplies for Transmitter and Receiver, they must have in common 0V.

Comply with the specification of the maximum length of the connection cables. Make sure that the part or parts of the metal structure on which the sensors are installed are effectively connected to the same earth ground.

Before inserting the connector, check that the mains voltage and the supply voltage are within the required limits, apply the connector and check again that the supply voltage has a correct nominal value and remains within the limits defined in all working conditions. Check the limits in the two extreme conditions of minimum and maximum absorption of all devices connected to the same power supply, especially if this is **not** a stabilized power supply.



#### **Danger!**

In order to carry out the following operations, a voltage supply to the emitter and to the receiver is necessary. Before starting this phase, make sure that the output's switching cannot lead to any danger.

Considering the wiring diagrams indicated in **Tab.: 4.2, 4.3, 4.4** provide for the basic electrical connections necessary for a proper functioning of the device. Make sure that connection for synchronism is available and that **Test** input of the emitter is not set on positive. If possible, apply the stated loads to the outputs of the receiver, then properly connect the **NC-NO** input, the receiver can be in this state only at switch-on. **Do not** connect the **Teach** input and the **Blank** input to the positive or common yet, even if the application later needs this kind of command.

Devote special attention to the synchronism connection between emitter and receiver, must be two cables connected directly: synchronism (pin 8 of receiver and pin 2 of emitter) and the common (pin 3 of both), the length of these connections must not exceed 20m.

### 4.3 Alignment of CX2E0R\* models

Apply supply voltage and make sure that the LEDs do not indicate any error state. The green or blue LEDs of emitter and receiver must be on, if they blink it means that supply voltage is not enough. On the emitter, also the yellow LED should be permanently on. If not, make sure once again that the Test input is not set on positive. The red LED must be off. If it is on, it means either that an out-of-scale piloting current value of the IR LEDs resulting from a previous adjustment has been registered, or that a breakdown occurred. If the yellow LED flashes on the transmitter and - or on receiver it means that the synchronization is missed, check the connections. If on the emitter and receiver only the yellow LEDs are ON, it means that a Blanking or a Teach is ongoing, wait for it to finish and check the connections. If on the emitter or receiver, the red LED flashes continuously, it means there was a writing error for the memory due to a power failure, perform a Blanking.

### 4.4 Verify alignment for CX2 models

Make sure that the signal level achieved with the adjustment is sufficient to guarantee the stability of work. Check this by slightly changing the alignment or by urging the mechanical structure and making sure that the system remains in a light state. In case of instability rerun several times a "Fine" calibration procedure followed by an accurate mechanical alignment, then finally run the Teach required by the application.



#### **Indication**

A correct optical alignment with a good signal margin prevents unstable functioning of the light curtains, reduces optical interferences and reflection by shiny surfaces and guarantees better stability in general.

#### 4.5 Electrical drawing



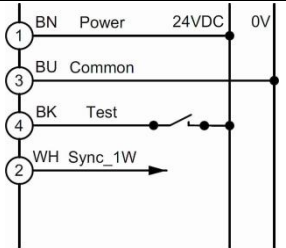
In the following tables the colours of the cables and LEDs are indicated with the abbreviations defined in IEC 60707 in English. The pin assignment is adopted following the **IEC 60947-5-2**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>BN</b>	<b>WH</b>	<b>BU</b>	<b>BK</b>	<b>GY</b>	<b>PK</b>	<b>VT</b>	<b>OG</b>
Brown	White	Blue	Black	Grey	Pink	Violet	Orange


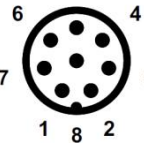
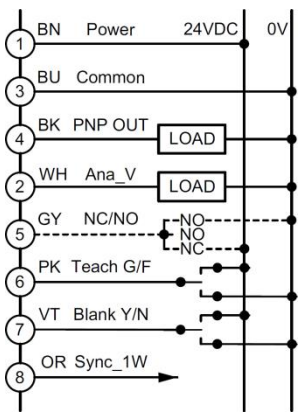
Some of the cables in the market may follow the pin assignment following the **DIN 47100**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>WH</b>	<b>BN</b>	<b>GN</b>	<b>YE</b>	<b>GY</b>	<b>PK</b>	<b>BU</b>	<b>RD</b>
White	Brown	Green	Yellow	Grey	Pink	Blue	Red

Tab.:4.1

CX2 SERIES	 <b>EMITTER</b>	<b>CX2E0 MODEL Emitter with input Test</b>			
<b>M12, 4 pole Male connector</b>	<b>Wiring</b>	<b>Connectors</b>			
		<b>Pin</b>	<b>Color</b>	<b>Signal</b>	<b>Description</b>
		<b>1</b>	<b>BN</b>	<b>24V<sub>DC</sub></b>	Power supply input from 16.8 to 30V
		<b>2</b>	<b>WH</b>	<b>Sync_1W</b>	Connect to same signal of the receiver, maximum cable length: 20 m
		<b>3</b>	<b>BU</b>	<b>0V</b>	Supply voltage reference, this pin must be tied together to the common of the receiver, maximum cable length: 20 m
		<b>4</b>	<b>BK</b>	<b>Test</b>	Test input: if it is connected to the positive it interrupts the emission
<b>NOTE:</b> Pin 2 (Sync_1W) must be connected, the yellow LED of the emitter and receiver are flashing highlighting an error.					

Tab. : 4.2

CX2 SERIES	 <b>RECEIVER</b>	<b>CX2RF MODEL Receiver with digital PNP and voltage analogue outputs</b>			
<b>M12, 8 pole Male connector</b>	<b>Wiring</b>	<b>Connectors and cables. Colors of CD12M as for IEC 60947-5-2, see Tab.:1; Cap.:8</b>			
		<b>Pin</b>	<b>Color</b>	<b>Signal</b>	<b>Description</b>
		<b>1</b>	<b>BN</b>	<b>24V<sub>DC</sub></b>	Power supply input from 16.8 to 30V
		<b>2</b>	<b>WH</b>	<b>Analogue V</b>	Analogue Voltage Output 0-10V, c.c. Current 60mA, maximum Voltage output 10V, minimum resistance 1KΩ.
		<b>3</b>	<b>BU</b>	<b>0V</b>	Supply voltage reference. This pin must be tied together the common of the emitter, maximum cable length: 20 m
		<b>4</b>	<b>BK</b>	<b>PNP Out</b>	Apply a load connected to the common, maximum current 100mA
		<b>5</b>	<b>GY</b>	<b>NC-NO</b>	Open or 0V: Outputs proportional to optics in Dark +24V <sub>DC</sub> : Outputs proportional to optics in Light
		<b>6</b>	<b>PK</b>	<b>Teach G-F</b>	Teach-in input: Gross at positive; Fine at common
		<b>7</b>	<b>VT</b>	<b>Blank Y-N</b>	Blanking at Power-ON Activation (at positive) - Deactivation (at common)
		<b>8</b>	<b>OR</b>	<b>Sync_1W</b>	Connect to the same signal of the emitter, maximum cable length: 20 m
<b>NOTA:</b> NC-NO inputs and Blank Y-N are read only at sensor's Power-ON. If NO-NC input is left open or permanently wired to the common, it selects analogue outputs proportionally to the number of optics in Dark. If connected to the positive, it selects analogue outputs proportionally to the number of optics in Light. Pin 8 (Sync_1W) must be connected, otherwise the yellow LED of the receiver and emitter are flashing highlighting an error. If Blank Y-N is connected to the positive, at Power_ON it excludes optics in Dark. If it is connected to the common it activates all optics and will recover the system from a memory error (RED LED flashing).					

Tab.: 4.3

CX2 SERIES	RECEIVER	CX2RD MODEL Receiver with digital PNP and current analogue outputs			
M12, 8 pole Male connector	Wiring	Connectors and cables. Colors of CD12M as for IEC 60947-5-2, see Tab.:1; Cap.:8			
		Pin	Color	Signal	Description
	1	BN	24V <sub>Dc</sub>	Power supply input from 16.8 to 30V	
	2	WH	Analogue I	Analogue Current Output 4...20mA, c.c. maximum Voltage output 10V, minimum resistance 500Ω.	
	3	BU	0V	Supply voltage reference. This pin must be tied together the common of the emitter, maximum cable length: 20 m	
	4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA	
	5	GY	NC-NO	Open or 0V: Outputs proportional to optics in Dark +24V <sub>Dc</sub> : Outputs proportional to optics in Light	
	6	PK	Teach G-F	Teach-in input: Gross at positive; Fine at common	
	7	VT	Blank Y-N	Blanking at Power-ON Activation (at positive) - Deactivation (at common)	
	8	OR	Sync_1W	Connect to the same signal of the emitter, maximum cable length = 20 m	
<b>NOTE:</b> NC-NO inputs and Blank Y-N are read only at sensor's Power-ON. If NO-NC input is left open or permanently wired to the common, it selects analogue outputs proportionally to the number of optics in Dark. If connected to the positive, it selects analogue outputs proportionally to the number of optics in Light. Pin 8 (Sync_1W) must be connected, otherwise the yellow LED of the receiver and emitter are flashing highlighting an error. If Blank Y-N is connected to the positive, at Power_ON it excludes optics in Dark. If it is connected to the common it activates all optics and will recover the system from a memory error (RED LED flashing).					

**Tab.:4.4**

**4.5 Panel indications and diagnostics.**

Two sets of three LEDs each (green, yellow and red) are on the front panel. The two sets provide the same indications. They are located respectively on the upper and lower part of the front panel. For light curtains with just one master board, the two sets are controlled in parallel. In case the curtain has one master board and one slave board, the two sets are controlled separately by the two different boards. The green LEDs or the blue and yellow ones give the same information, whereas the red LEDs show the DARK-LIGHT state (of the receiver) or a breakdown (of the emitter) for each board.

The units can be composed of one or more boards (see Tab. : 3.1), each card has two triplets of indicator LEDs that indicate the status of individual board.

MEANINGS OF LED SIGNALLING MODES			
	LED is permanently ON		LED blinks continuously
	LED ON at low intensity or intermittent with periodic blinking		LED is OFF

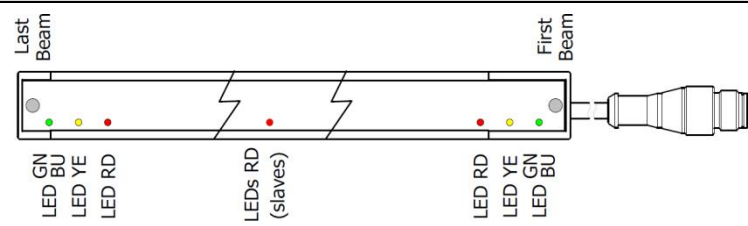
**Tab.:4.5**

		CX2 EMITTERS
GN		No power supply.
		Supply voltage below 15V, insufficient.
		Supply voltage above 16V, sufficient.
YE		Emission stopped ( on Test).
		There is currently a Teach or a Blanking. Ceaselessly: missing sync.
		Emission enabled (if the red LED is not on).
RD		Under normal operating conditions
		Breakdown of some IR LEDs.
		Only the red LED flashing. Memory error Make a Blanking N to recover.

**Tab. : 4.6**


		CX2 RECEIVERS
BU		No power supply.
		Supply voltage below 15V, insufficient.
		Supply voltage above 16V, sufficient.
YE		Digital output OUT_1 OFF.
		Digital output OUT_1 ON.
		Outputs shorted or overloaded.
RD		There is currently a Teach or a Blanking. Ceaselessly: missing sync.
		LIGHT state (all beams are free).
		Some beams are in DARK.
		Many or all the beams are interrupted.
		Only the red LED flashing. Memory error. Make a Blanking N to recover.

**Tab.:4.7**

<b>COMBINED INDICATIONS</b>													
													
<b>EMITTER</b>							<b>RECEIVER</b>						
							NO	NC	NO	NC	C.C.		
<b>GN</b>	<b>BU</b>	●	☼	☼	☼	●	●	●	☼	☼	☼	☼	☼
<b>YE</b>		☼	●	☼	☼	☼...☼	●	●	☼	●	●	☼	☼
<b>RD</b>		●	●	●	☼	●	☼	●	☼...☼	●		●	☼
<b>STATE</b>							<b>Make a Blanking</b>	<b>Power</b>					<b>Out</b>
		NO SYNC.	ON TEST	EMIS- SION	LED FAILURE	TEACH - BLANK.	MEMORY ERROR	OFF-LOW	DARK	LIGHT	SHORT CIRCUIT		

Tab. : 4.8



 <b>Micro Detectors</b> Italian Sensors Technology	<b>M.D. Micro Detectors</b> Strada S. Caterina, 235 41122 Modena Italy Tel. +39 059 420411 Fax +39 059 253973 www.microdetectors.com info@microdetectors.com	<b>CX2 SERIES</b> <b>LIGHT CURTAINS</b>	<b>LANGUAGE</b>
		<b>Installation and Operation Manual</b>	<b>ENGLISH</b>

## 5.0 TECHNICAL SPECIFICATIONS

CX2E*R*_*_*_*_*V MODELS			TECHNICAL SPECIFICATION			
PARAMETERS			Min.	Nom.	Max.	NOTES
<b>Power supply</b>						
Supply voltage	V <sub>DC</sub>	16.8	24	30	From PELV power supply according to EN 60204-1 Chap.6.4	
Residual ripple	V			1.2	Supply voltage must stay within the stated limits	
Absorbed power, Receiver	W	1		2.5	Excluding loads	
Absorbed power, Emitter	W	1		3.0		
<b>Digital output</b>						
Output type	N°	PNP			Completely protected outputs	
Current	mA		100		Higher values are interpreted as overload or short circuit	
Voltage drop @100mA	V			1.5	Reduction in output voltage compared to the supply voltage	
Minimum resistive load	Ω	280			Lower values are interpreted as short circuit	
Leakage current	μA			10	Value at which the OFF state of the load must be guaranteed	
Tolerated capacitive load	μF			0.7	Higher values can be interpreted as short circuit.	
Switching time ON	μs		0.05		With load of 220-1000Ω	
Switching time OFF	μs	2		10	With load of 220-1000Ω	
<b>Analogue outputs</b>						
Voltage Output	V	0		10	Variation range of the analogue signal	
Minimum resistive value	KΩ	1			Minimum resistance value applicable to the voltage output	
Current Output	mA	4		20	Variation range of the analogue signal	
Maximum resistive value	KΩ			0.5	Maximum resistance value applicable to the current output	
Ripple overlapped	%			1		
Conformity	%	0		+10		
Repeatability	%			5		
Restore time	ms			0.1		
Short circuit current	mA			60		
<b>Response time</b>						
			<b>See also Tab.:1; Cap.:3</b>			
Time delay before availability	s			3	All outputs are in the OFF state during this time	
Time delay before availability with Blanking	s	1 * No. of beams			Blank Y-N connected to Positive or Common at Power on	
Teach-in	s	0,5 * No. of beams			Teach G-F momentarily connected to the positive or common	
Outputs response time (formula)	ms	$Tr = ((0.2 * (N° - 1)) + 1) * 2$			Maximum switching frequency $f = 1 - (2 * Tr)$	
<b>Input at two levels (Test and NC-NO)</b>						
Low or open level	V	0	open	5.8	Rec: Selects function NO (Dark ON). Em: not on Test	
High level	V	5.8		30	Rec: Selects function t NC (Light ON). Em: on Test	
Integration time inputs	ms		20		The state must persist at least for the required time	
<b>Input at three levels (Teach G-F and Blank Y-N)</b>						
Low input	V	0		0.8	Select function Teach F or Blank N	
Open input	V	1.3		2.35	No action	
High input	V	6		30	Select function Teach G or Blank Y	
<b>Input currents</b>						
Input current for low level	μA	-250		520	Outgoing or incoming current	
Input current for high level	mA	0.52		1.2	Incoming current	
<b>Optical parameters</b>						
<b>See This Chapter, Tab.:2, 3, 4 and Fig.:1</b>						
<b>Ambient</b>						
Models with standard protection according to			<b>IP67</b>		Dust and water protection (immersion for 60 min. at a depth of 1m)	
Working temperature	°C	-10		55	Without condensation	
Storage temperature	°C	-25		60	To be respected also during transportation	
Humidity	%			95%	Without condensation	
Vibrations according to		Acc. to IEC 60947-5-2			It complies with limits and conditions stated in the norm	
Impact according to		Acc. to IEC 60947-5-2			It complies with limits and conditions stated in the norm	
<b>Range correction factors</b>						
Use of diverter mirrors		<b>0.85</b>			For each diversion with a mirror	
Environmental factors		<b>0.50 - 0.25</b>			For the presence of dust, vapours - mist, fumes (indicative values)	
<b>Connections</b>						
Cables' section	mm <sup>2</sup>		0.34		To guarantee the stated maximum length	
Total length of cables for supply - output	m			100	With indicated cables' section	
Length of Interconnection cables (extensions)	m			20	Length of connections <b>Sync. 1W</b> (a wire and common ground)	
<b>Dimensions</b>						
Housing section	mm	<b>20 (front) x 36</b>			Painted aluminium, colour: opaque blue RAL5002	
Groove for fixing	mm	<b>2-10-6.5</b>			Rear groove, depth - width - width of entry	
Front window width	mm	<b>15mm</b>			Central width: 13mm; material PC	
Outer closings	N°	<b>2</b>			Material: Black PBT + 30% GF	
Closing screws	N°	<b>2+2</b>			2M, FE37, burnished	
<b>Connectors-Cable</b>						
<b>CX2E Models</b>			<b>1xM12, 4p, Male</b>		Pig-tail External cable length 240mm, PVC Ø 4,7mm	
<b>CX2R Models</b>			<b>1xM12, 8p, Male</b>		Pig-tail External cable length 240mm, PVC, Ø 6mm	

Tab.: 5. 1; (see also Tab.:3.1).

MODELS: CX2E*R*-05-***V (Pitch: 5mm)						
OPTICAL PARAMETERS			Min.	Nom.	Max.	NOTE
Operating range (Ro)	m		0.1	3		Displacement between sender and receiver
Wavelength of IR LEDs	nm			850		
Aperture angle (φ)	deg			±30°		tan φ = 0.557; see Fig.: 5.1 to avoid reflections
Threshold level for Teach G				0.33		Ratio between threshold value and signal relative to the LIGHT state
Detection capability for Teach G	mm			1.5		With a rod of specified diameter, also see the normalized graphics
Threshold level for Teach F				0.8		Ratio between threshold value and signal relative to the LIGHT state
Detection capability for Teach F	mm			1		With a rod of specified diameter, also see the normalized graphics
Immunity for artificial light, direct - indirect	lux		20000-60000			Incandescent lamp, standard calibration (Teach G)
Immunity for artificial light, direct - indirect	lux		1000-2000			Incandescent lamp, fine calibration (Teach F)
Immunity for artificial light, direct - indirect	lux		3000-10000			Fluorescent lamp, standard calibration (Teach G)
Immunity for artificial light, direct - indirect	lux		350-500			Fluorescent lamp, fine calibration (Teach F)

Tab.: 5.2; (see also Tab.:3.1).

MODELS: CX2E*R*-10-***V (Pitch: 10mm)						
OPTICAL PARAMETERS			Min.	Nom.	Max.	NOTE
Operating range (Ro)	m		0.3	6		Displacement between sender and receiver
Wavelength of IR LEDs	nm			880		
Aperture angle (φ)	deg			±15°		tan φ = 0.268; see Fig.: 5.1 to avoid reflections
Threshold level for Teach G				0.33		Ratio between threshold value and signal relative to the LIGHT state
Detection capability for Teach G	mm			2		With a rod of specified diameter, also see the normalized graphics
Threshold level for Teach F				0.8		Ratio between threshold value and signal relative to the LIGHT state
Detection capability for Teach F	mm			1		With a rod of specified diameter, also see the normalized graphics
Immunity for artificial light, direct - indirect	lux		10000-30000			Incandescent lamp, standard calibration (Teach G)
Immunity for artificial light, direct - indirect	lux		1000-10000			Incandescent lamp, fine calibration (Teach F)
Immunity for artificial light, direct - indirect	lux		3000-10000			Fluorescent lamp, standard calibration (Teach G)
Immunity for artificial light, direct - indirect	lux		350-1000			Fluorescent lamp, fine calibration (Teach F)

Tab.:5. 3; (see also Tab.:3.1).

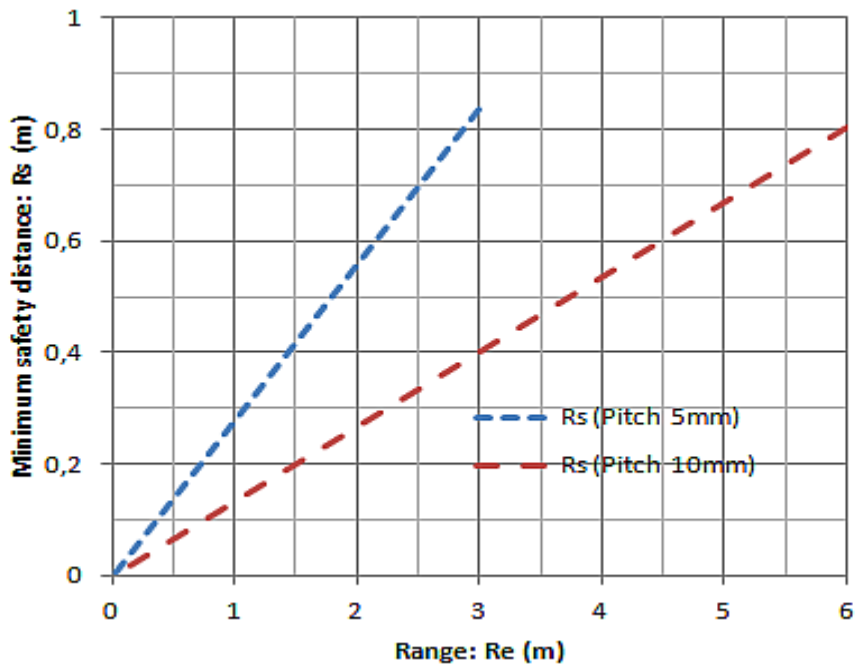


Fig.:5.1 ;  $R_s = \tan \varphi * Re/2$

## 6.0 DETECTION

### 6.1 Signal Margin.

With these sensors you can easily get only two levels of signal margin, with **Teach\_G: 3**; with **Teach\_F: 1.25**.

The margin **3** is usable in standard applications such as the detections of objects completely opaque and dimension larger than the optical pitch. This margin presents less pitfalls as regards the stability and repeatability of performance and is less sensitive to environmental conditions.

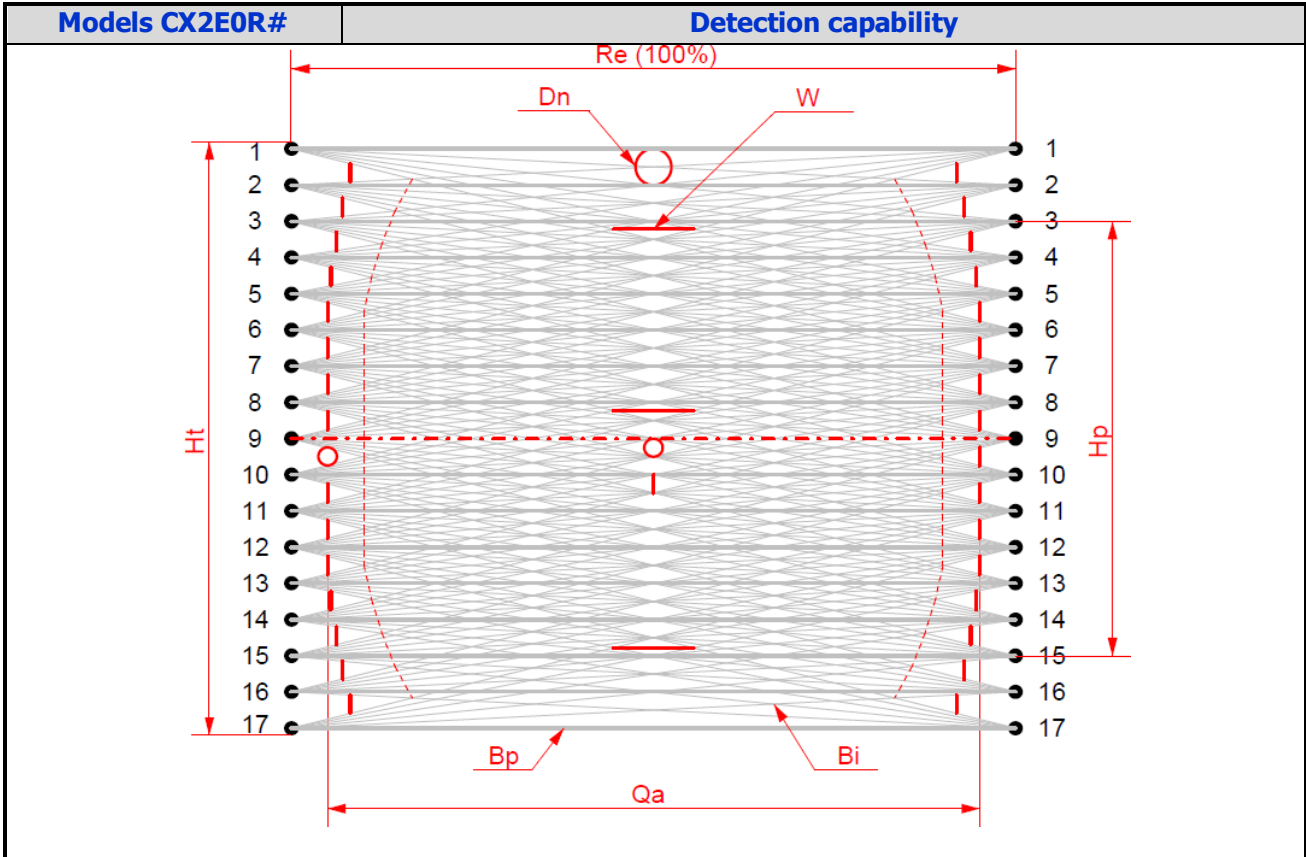
The margin of **1.25** is used to detect objects of size less than the optical pitch or semitransparent.

To get higher signal margin the best method is to insert a slightly opaque material, preferably close to the emitter and run a teach, then remove the opaque material; you will get a margin **3** or **1.25** multiplied by the inverse value of the transmittance of the opaque material, this method maintains the equalized margin values for all parallel and interlaced beams.

This is also the method to be used to detect objects in a translucent casing.

A coarser method is to perform a Teach with controlled conditions of misalignment and then to realign the unit without performing again a teach, however, this method does not guarantee a perfect equalization of the signal margins.

**6.2 Detection capability.**



**This figure represents a model with 17 optics, 10mm pitch and an interlacement of 5+1+5, it is purely indicative, the data for individual models are in the following tables.**

<b>Re</b>	Range, distance between Em. and Rec., the subsequent parameter <b>Qa</b> and <b>W</b> shall be calculated as a percentage of <b>Re</b>
<b>No</b>	Number of optics
<b>Do</b>	Diameter of the optics (of the beams)
<b>Po</b>	Optical pitch
<b>Ht</b>	Total height of the controlled area: <b>Ht = Po * (No - 1)</b>
<b>Bp</b>	Parallel beams
<b>Bi</b>	Crossed beams
<b>Re*Ht</b>	Whole sensitive area with the detection capabilities <b>Dn</b> defined below
<b>Models with only parallel beams</b>	
<b>D1</b>	Detection capability (diameter) guaranteed anywhere in the area <b>Re*Ht</b> with high signal margin
<b>D2</b>	Detection capability (diameter) guaranteed anywhere in the area <b>Re*Ht</b> with <b>Teach_G</b>
<b>D3</b>	Detection capability (diameter) guaranteed anywhere in the area <b>Re*Ht</b> with <b>Teach_F</b>
<b>Models with parallel and crossed beams</b>	
<b>Qa</b>	Width of the central area with increased detection capabilities <b>Dn</b> defined below
<b>Qa*Ht</b>	Area with an incised detection capabilities <b>Dn</b> defined below
<b>D1</b>	Detection capability (diameter) guaranteed anywhere in the area <b>Re*Ht</b> with high signal margin
<b>D2</b>	Detection capability (diameter) with <b>Teach_G</b> in the area external to <b>Qa</b> (close to the sensors front window)
<b>D3</b>	Detection capability (diameter) with <b>Teach_F</b> in the area external to <b>Qa</b> (close to the sensors front window)
<b>D4</b>	Detection capability (diameter) with <b>Teach_G</b> (detected continuously, considering the entire area <b>Qa*Ht</b> )
<b>D5</b>	Detection capability (diameter) with <b>Teach_F</b> (detected continuously, considering the entire area <b>Qa*Ht</b> )
<b>Hp</b>	Height of the central area with a detection capability (width) <b>W</b>
<b>Qa*Hp</b>	Area with the detection capability <b>W</b> , considering this whole area
<b>W</b>	Detection capability defined as the minimum width of a thin blade

**Fig.:6.1.**

MODEL	Beams		Optical height	Cross beams Y-(N)	Horizontal central area	Vertical central area	Beam diameter	Detection capab.	Detection capab.	Detection capab.	Detection capab.	Detection capab.	Detection capab.	NOTES
	No Nr	Po mm												
CX2E0R*-05-016V	33	5	160	Y	93.75	130	2	6	4.5	3.5	2.5	1.5	6.25	1)
CX2E0R*-05-032V	65	5	320	-	-	-	2	6	5	4	-	-	-	Only parallel beams
CX2E0R*-05-048V	96	5	480	-	-	-	2	6	5	4	-	-	-	Only parallel beams
CX2E0R*-10-016V	17	10	160	Y	93.75	100	4	14	10	8	4	2.5	6.25	1)
CX2E0R*-10-032V	33	10	320	Y	93.75	260	4	14	10	8	4	2.5	6.25	1)
CX2E0R*-10-048V	49	10	480	-	-	-	4	14	10	8	-	-	-	Only parallel beams
CX2E0R*-10-064V	65	10	640	-	-	-	4	14	10	8	-	-	-	Only parallel beams
CX2E0R*-10-080V	81	10	800	-	-	-	4	14	10	8	-	-	-	Only parallel beams
CX2E0R*-10-096V	97	10	960	-	-	-	4	14	10	8	-	-	-	Only parallel beams

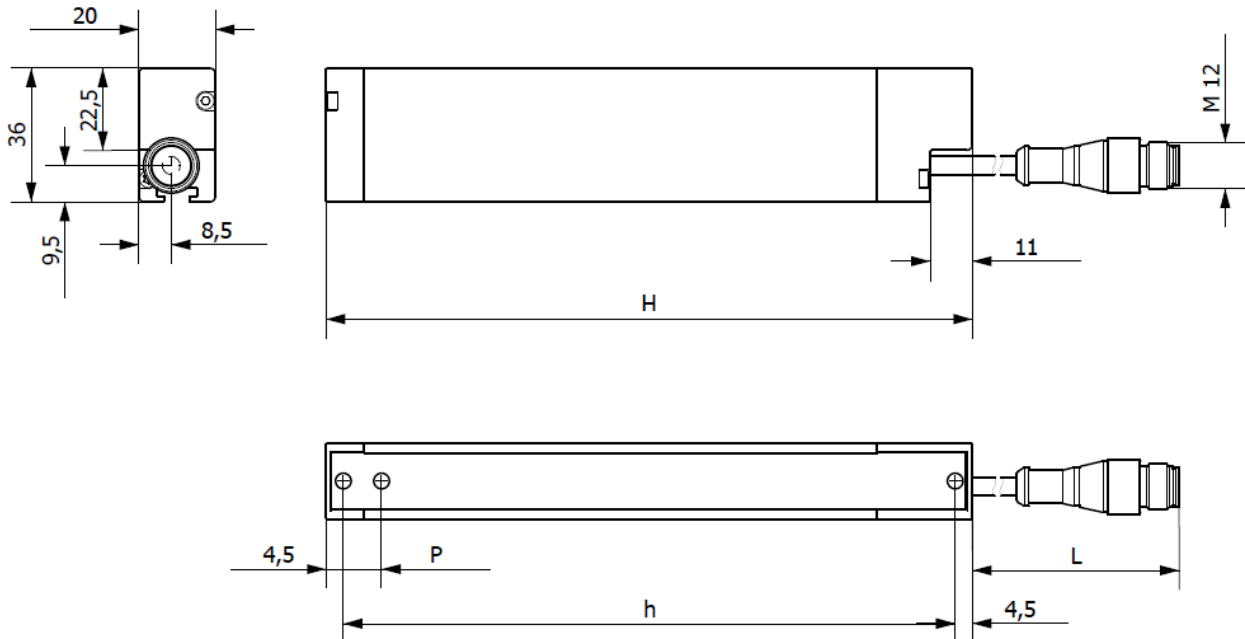
**NOTES:**

1) Qa and W are also dependent on the interweaving extension, the table values are calculated with a maximum of 8 crossed beams, the plot value is automatically assigned during teach, and depends on Re. For Re equal to 1m and 0.5m respectively, for pitch 10mm and 5mm, is already assigned the maximum of 8. For lower Re the number of crossed beams is reduced gradually and therefore the values of Qa and W increase.

**Tab.: 6.2**

**7.0 MECHANICAL DIMENSIONS OF LIGHT CURTAINS AND STANDARD ACCESSORIES**


**7.1 Mechanical dimensions of CX2 light curtains**



**Fig.: 7.1.**

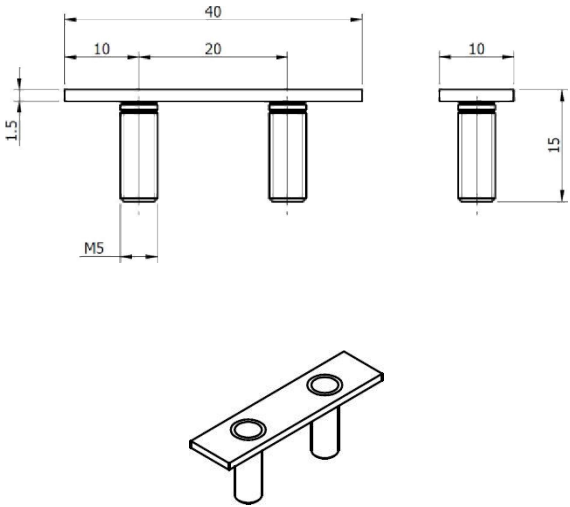
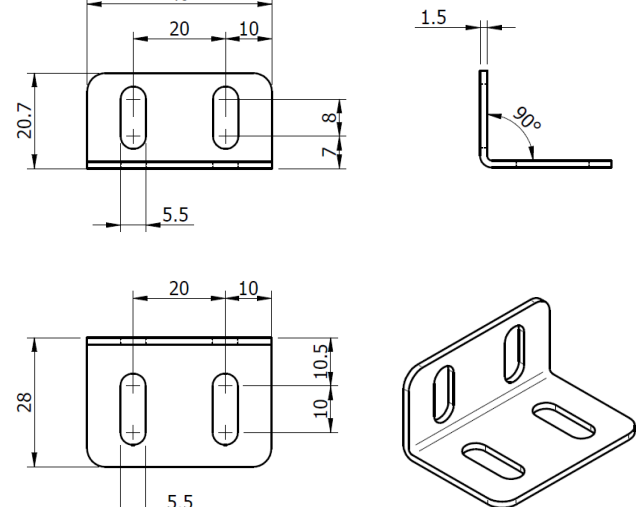
For Dimensions P, h and H see Tab.:1

Length pig-tail L= 240mm

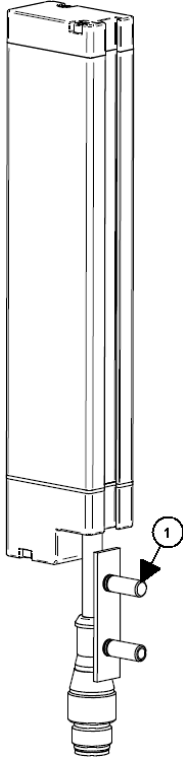
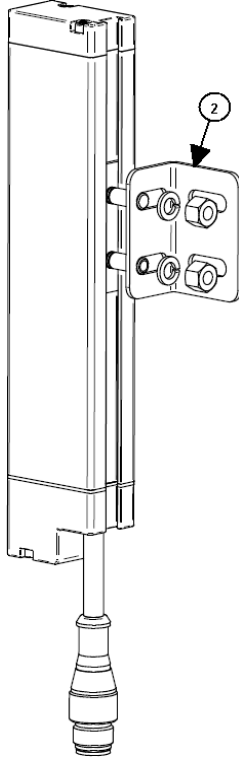
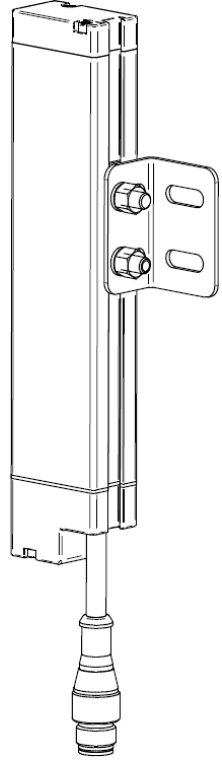
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	<b>Installation and Operation Manual</b>	<b>ENGLISH</b>


### 7.1 Standard Mounting accessories

For the quantity see Chapter:3 Tab.:1;

Kit mounting accessories ST151	
	
<b>Fig.: 7.2</b> T-shaped insert, with two M5 nuts and two split washers	<b>Fig.: 7.3</b> L-shaped mounting bracket

### 8.0 MOUNTING OF CX2 LIGHT CURTAINS

Securing CX2 light curtains with accessories' kit ST151.		
For ST151 quantities see Chapter 3, Tab.:1.		
		
Place the T-shaped insert (1)	Mount the L-shaped bracket (2) using the T-shaped insert	Secure light curtains to the wall
<b>Fig.:7.4</b>		

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		<p style="text-align: center;"><b>Installation and Operation Manual</b></p>

## 9.0 PACKAGE CONTENT

Each package with a kit for a light curtains' pair has the following content:

- A pair of light curtains composed of emitter and receiver.
- A number of accessories' kits ST151 (T-shaped insert and L-shaped bracket) according to the H height (see **Chapter 3, Tab.:1**).
- An installation manual in Italian and one in English.

## 10.0 CONTROL OF THE INSTALLED LIGHT CURTAINS

### 10.1 Purpose of controls.

The controls described here below are meant to ensure the functional and reliable performances required.

### 10.2 Preliminary controls before start-up

- All devices must be correctly installed and well secured.
- The maximum response time must be adequate to the application. Make sure that the sensor's response time is compatible with the specific application, detecting objects of minimum and maximum size, in different positions and, if possible, with even faster movements compared to what the application allows.
- Make sure that no optically interfering devices are in the visual field of the sensor. Make sure that other devices do not undergo interferences by the emitter.
- Make sure that sensors are not exposed to any substance which might dirty or damage the optics.
- Make sure that technical documentation is available for operators in charge of maintenance.

### 10.3 Controls device efficiency

- State and efficiency of the device can be checked using a test stick, which must be detected in a way that is repetitive in time.
- Make sure that there are no damages nor dirt on optical windows' surface. Scratches and tarnished surfaces can negatively affect the light curtain's resolution.
- If necessary, clean the optical surface with a humid antistatic cloth. Do not use any alcohol, nor solvents, nor abrasive substances.

## 11.0 CE-CONFORMITY DECLARATION

CX2 curtains comply with the following directives and norms:

- EMC Directive **2014-30-UE**
- Harmonised norm **IEC 60947-5-2: 2007-A1:2012**
- Harmonised norm **IEC 60947-5-7: 2003**

## 12.0 WARRANTY

For every new CX light curtain, in normal using conditions, M.D. Micro Detectors guarantees the absence of defects in materials and in manufacturing for a period of **36 (thirtysix) months**.

For this period of time, M.D. Micro Detectors commits itself in eliminating any possible breakdown of the products, by repairing or by replacing the defective parts. Materials and labour are completely free of charge in this case.

M.D. Micro Detectors reserves the right to replace the whole defective device with another which is exactly the same or has equal characteristics, instead of repairing it.

Warranty is valid under the following conditions:

- Not more than **36 months** have elapsed from the date of manufacture.
- The device and its components are in the same conditions in which they were delivered by M.D. Micro Detectors.
- Breakdown or malfunctioning is not directly or indirectly due to:
  - use for improper purposes;
  - no respect of instructions;
  - negligence, inexperience, incorrect maintenance;
  - repairs, modifications, adaptations not executed by M.D. Micro Detectors personnel, tampering, etc.;
  - accidents or impacts (also due to transport or force majeure);
  - other events not depending on M.D. Micro Detectors.

**The respect of all norms, indications and prohibitions contained in this document is essential to the correct functioning of light curtains.**

**Therefore, if these indications are not respected, even partially, M.D. Micro Detectors will not be held responsible under any circumstances for any possible consequence.**