

 Micro Detectors Italian Sensors Technology	M.D. Micro Detectors Strada S. Caterina, 235 41122 Modena Italy Tel. +39 059 420411 Fax +39 059 253973 www.microdetectors.com info@microdetectors.com	CX1 SERIES LIGHT CURTAINS	LANGUAGE
		Installation and Operation Manual	ENGLISH



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1.0 GENERAL

Please attentively read this manual before installation, start-up, use and maintenance of **CX1** 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 **CX1** 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_{DC}** and **30V_{DC}**. Under **15V_{DC}** voltage all outputs are in an OFF state. Over **30V_{DC}** **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 **RGO** (exempt) according to IEC 62471: 2006-07.



Warning

Please make sure that light curtains are used in proper environmental conditions. Manual or automatic calibration must always be carried out aiming for the best possible alignment. More than one calibration 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

CX1 light curtains are photoelectric devices built according to the **IEC 60497-5-2** norms 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 **RAL5002** aluminium, painted in blue, size **20x36 mm**, (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**.

All models of **CX1** series are equipped with 2 sets of 3 LEDs each: green (emitter) or blue (receiver), yellow and red, on the top and on the bottom of the front side. This allows at least one set of LED to be perfectly visible in all applications (see chapter 4, tables 6, 7, 8 and 9 for the meaning of indications).

For models consisting of just one motherboard, the two sets of LED give the same information. For models consisting of one motherboard and one (or more) slave board(s), all red LEDs indicate the Dark state (LEDs on) or Light state (LEDs off) related to their single board. Intermediate slave boards have just one red LED, the motherboard and the last slave board mount only the relative bottom and top three LEDs.

This model is not required the wiring cables between emitter and receiver, as it uses a optical synchronization. The last lens of the emitter, on the opposite side of the cable, transmits to the corresponding optical receiver the synchronization signal, if the optical path of this beam is interrupted, the system behaves as all the optics are disrupted and the response time DARK / LIGHT increases with respect to the normal functioning to allow the system to find the synchronization. If this parameter is critical in the specific application, it is recommended to use this model only when you can keep the last optical always free. In the CX1 models the optics interweaving function of the fixed value 5 + 1 + 5 is always active, but is not present a sensitivity equalizer function, therefore the detection capacity depends only on the pitch and the diameter of the optical beams, and you can get a theoretical value which is the half of a pitch; also the minimum flow rate has a limit, even small depending on the angle of the beams, see Tab.: 1; Cap.: 3. With an appropriate sensitivity adjustment it is possible to reduce these parameters. In this series are available 5mm pitch with optical heights of 160, 320, 480mm and 10mm pitch with optical heights 160, 320, 480, 640, 800, 960mm, this dimension is used to create also the item codification referred to the height: 016 ... 096. In all models the optical axis of the first and last lens are positioned at 4.5 mm from the edge of the body, so the body is always higher 9mm than the optic.

Nominal sensing distance is **3m** maximum with a **5mm**-pitch and **6m** with a **10mm** – pitch.

All the receivers models have a two digital outputs PNP and NPN and a input for the NO/NC selectable, the outputs are completely protected and the max. current is 100 mA.

All receivers are equipped with an **NC/NO** input selection which is read only at **Power ON** this input can be left open or always connected to the common, or connected to the positive; in the first case the output will be **NO (DARK-ON)** whereas in the second the output will be **NC (LIGHT-ON)**.

In all devices, the green or blue LED is off when supply voltage is lower than 5 V, it blinks when supply voltage is between 5 and 15V, and it is steady when supply voltage is higher and the system can function properly.

In all receivers, when the yellow LED is on it indicates the ON output state. A weak LED light indicates a short circuit or overload state. The red LEDs are switched on with a proportional intensity according to the number of the optics in the DARK state. On the other hands they are off in LIGHT state.

The CX series are not equipped with an adjustment tool installed on the sensor housing.

In the CX1E0 emitter models the adjustment of the emitted power is possible only by applying a variable voltage on the POTENTIOMETER input. If the voltage has a value between 0 and 2.8V the emitter uses a stored value, if the voltage is applied between 2.8 and 12V the emitter emits a power proportional to this variation range, in this case the yellow LED blinks; if power is interrupted in these conditions the emitter stores a new value. If the values must be unchanged it is necessary to bring the voltage on the POTENTIOMETER below the value of 2.8V before turning off or on the device.

The **ST140 accessory**, connected in series to the emitter supply connector, allow a fine adjustment.

The red LED is ON if the piloting current voltage of the IR LED is very low or if one or more IR LEDs are out of order.

The emitter model has a **TEST** input. If the input is open or connected to the common it allows the emission and the yellow LED is on, if connected to the positive inhibits the emission and the yellow LED is off.

These sensors have a standard output with M12 plug connector (220mm *-pigtail*), with 4 or 5 pins. Despite the cable, the sensor **does not** need to be installed in a bigger space.

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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 hosing height "H" of light curtains normally is $H=(h+9mm)$.

MODEL	MODELS	Synchronization	Optical height	Light curtain height	Last optic	Beams	Sensing distance	Response time	Inputs/Outputs	NOTES	
			P	h	H	N°	Sn	Tr			
CODE ARTICLE	EMITTER RECEIVER		mm	mm	mm	N°	m	ms			
CX1E0RB/05-016V	CX1E0/05-016V	WITH LAST OPTICAL	5	160	169	33	0,3 ... 3	17	Test; Trimmer	Only detection with cross-beams Will be provided two kits of ST151	
	CX1RB/05-016V								NC/NO; PNP; NPN		
CX1E0RB/05-032V	CX1E0/05-032V		5	320	329	65	0,3 ... 3	34	Test; Trimmer	Only detection with cross-beams Will be provided four kits of ST151	
	CX1RB/05-032V								NC/NO; PNP; NPN		
CX1E0RB/05-048V	CX1E0/05-048V		5	480	489	97	0,3 ... 3	68	Test; Trimmer	Only detection with cross-beams Will be provided four kits of ST151	
	CX1RB/05-048V								NC/NO; PNP; NPN		
CX1E0RB/10-016V	CX1E0/10-016V		WITH LAST OPTICAL	10	160	169	17	0,3 ... 6	9	Test; Trimmer	Only detection with cross-beams Will be provided two kits of ST151
	CX1RB/10-016V									NC/NO; PNP; NPN	
CX1E0RB/10-032V	CX1E0/10-032V			10	320	329	33	0,3 ... 6	17	Test; Trimmer	Only detection with cross-beams Will be provided four kits of ST151
	CX1E0/10-032V									NC/NO; PNP; NPN	
CX1E0RB/10-048V	CX1E0/10-048V			10	480	489	49	0,3 ... 6	26	Test; Trimmer	Only detection with cross-beams Will be provided four kits of ST151
	CX1RB/10-048V									NC/NO; PNP; NPN	
CX1E0RB/10-064V	CX1E0/10-064V			10	640	649	65	0,3 ... 6	34	Test; Trimmer	Only detection with cross-beams Will be provided six kits of ST151
	CX1RB/10-064V									NC/NO; PNP; NPN	
CX1E0RB/10-080V	CX1E0/10-080V			10	800	809	81	0,3 ... 6	43	Test; Trimmer	Only detection with cross-beams Will be provided six kits of ST151
	CX1RB/10-080V									NC/NO; PNP; NPN	
CX1E0RB/10-096V	CX1E0/10-096V	10		960	969	97	0,3 ... 6	68	Test; Trimmer	Only detection with cross-beams Will be provided six kits of ST151	
	CX1RB/10-096V								NC/NO; PNP; NPN		

Tab.:1; Chapter.:3

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4.0 START-UP INSTRUCTIONS

4.1 Mechanical mounting of CX1 models

Verified to have available an accessory adjustment **ST140** or an equivalent system (see Fig. 1, Chap. 4).

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.

Mount the emitter in front of the receiver, at the same height from the reference plane, following the same orientation, for example, if the array is vertical, the output cables of the transmitter and receiver must be on the same side. In this model, the last optic of the emitter (on opposite side of the cable) transmits, to the corresponding optical receiver, a synchronization signal, if the optical path of this beam is interrupted, the system behaves as all the optics are disrupted

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

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 reflective surfaces and objects should be placed at a minimum safe distance from the optical beam path.

Keep in mind that even if an area is black, if it's shiny, it can be highly reflective.

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.

You must temporarily block the Emitter and the Receiver so that they are aligned with and parallel to each other.



Danger!

To carry out the following operations it is necessary to power the Emitter and the Receiver. Therefore, make sure that any switching of the outputs can safely be performed in this phase.

Assemble the minimum electrical connections for a correct functioning, connect the power supply cables and the interconnection cables if existing; apply the necessary devices at the inputs. It is better not to activate the automatic Teach-In when the system is switched on, but interpose a push-button to the Teach input. Check that the Test input is not set on the positive voltage. For models with Trimmer input, insert the accessory in series with the emitter power supply cable, the current value must be set at minimum so as to force the Emitter to use the registered value. Correctly connect the NC/NO input of the receiver, this input state is read only at **Power ON**.

4.2 Alignment of CX1E0RB models

Once the system is running, the digital potentiometer indicates the value zero, if it is used an analog potentiometer, it is useful to bring it to the minimum level, the green LEDs of the two elements must be on, if they are blinking it means that the power supply is not enough. On the Emitter the yellow LED should be permanently switched on, if it is off verify again that the Test input is not on positive state. The red LED must be off, if it is on, it means that a value of LED IR driving current out of scale is stored as a result of a previous regulation, or there is a fault.

Make sure that the optical beam path is free (and stays free) and start increasing the driving voltage of the Trimmer input. Once the minimum threshold voltage has been achieved, the emitter switches the driving from the registered value to the actual value at the Trimmer input, considering the threshold value as zero point, in this precise time because the current become nothing, the receiver is in the DARK mode, the yellow LED of emitter starts blinking to indicate that the current control is passed to the trimmer, the receiver, if it was previously in the LIGHT state, it switches into the DARK state, now increase the value of the trimmer until the receiver switches to LIGHT, red LEDs are off; the yellow LED of the receiver will be always on (output ON) or off (output OFF) depending on the LIGHT or DARK state combined with the state of the NC / NO.

If the receiver is not in LIGHT mode and the red LED emitter blinks with even low intensity it means that one or more IR LEDs are permanently damaged and it is not possible to go further.

If there are no faults, then it is possible to go on.

In this condition, the system is in a critical point (without signal margin, apart hysteresis) and it is possible to verify if the alignment can be still improved, forcing some small changes on the Alignment Test, if it is possible to correct it then improve it.

Now progressively increase voltage by rotating the trimmer clockwise until the receiver is in a LIGHT state. Keep on increasing voltage until you get 10% signal more than the threshold value .

Please note that the Trimmer input can be directly driven either by an external stabilised voltage or by simply dividing the supply voltage with a potentiometer. IR LED power can be adjusted using the driving voltage only between 2,8V and 12V. Between 0 and 2,8V the emitter uses the last registered value and from 2,8V to 12V the emitter adjusts power considering 2,8V as 0V and 12V or more as the maximum values. Driving voltage must be filtered, but it does not have to remain stable in time and temperature because the emitter can register a value and always use it. To complete this model, **ST140** adjustment accessory can be provided for use during installation or maintenance.

See electrical schemes in **Chapter 4, Fig.1**

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4.3 Alignment control of CX1 models

Controllate che il margine di segnale raggiunto con la taratura sia sufficiente ad avere un stabile modo di lavoro, appurate questo alterando leggermente l'allineamento o sollecitando la struttura e verificando che il sistema rimanga in luce. In caso di dubbio rieseguite più volte la procedura di taratura.

Verificate l'efficacia della calibratura controllando che vengano intercettati gli oggetti più piccoli e più veloci.

Per memorizzare la calibratura, lasciate il Trimmer nella posizione ottimale trovata e interrompete l'alimentazione, ad esempio staccando il connettore di alimentazione del Trimmer, scollegate il Trimmer dall'emettitore e ripristinate il collegamento diretto con l'alimentazione, se la tensione di alimentazione è presente l'emettitore entrerà in funzione con il valore di calibratura memorizzato.

Fissate saldamente la coppia di sensori.



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 safety in general.

Please do not forget to reconnect the cables and to control the correct functioning of the application.

4.4 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 2200µF for absorptions up to 1A, for higher absorptions add 2200µF 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 safety light curtains in dedicated raceways or where only signals run; do not use raceways already carrying power 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.

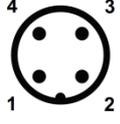
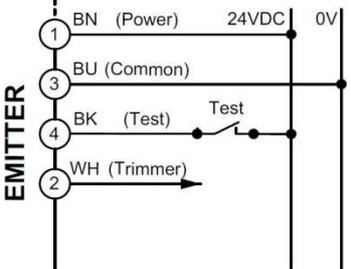
Before inserting the connector, check that the mains voltage and the supply voltage are within the required limits, apply the connector and check again that the supply voltage has a correct nominal value and remains within the limits defined in all working conditions. Check the limits in the two extreme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

In the following tables the colours of the cables and LEDs are indicated with the abbreviations defined in IEC 60707 in English

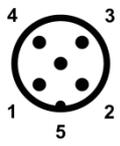
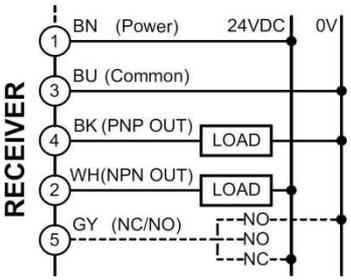
BK	BN	RD	YE	OG	GN	BU	GY	WH	PK	VT
Black	Brown	Red	Yellow	Orange	Green	Blue	Gray	White	Pink	Violet

Chapter 4, Tab.1

4.5 Wiring diagrams

CX1 SERIES	 EMITTER	CX1E0 MODEL Emitter with adjustment by external trimmer																						
M12, 4 pole Male connector	Wiring	Connector																						
		<table border="1"> <thead> <tr> <th>Pin</th> <th>Color</th> <th>Signal</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td align="center">1</td> <td align="center">BN</td> <td align="center">24V_{DC}</td> <td>Power supply input from 16,8 to 30V</td> </tr> <tr> <td align="center">2</td> <td align="center">WH</td> <td align="center">Trimmer</td> <td>To adjust apply a voltage from 2.8V to 12V or use special accessory.</td> </tr> <tr> <td align="center">3</td> <td align="center">BU</td> <td align="center">0V</td> <td>Supply voltage reference</td> </tr> <tr> <td align="center">4</td> <td align="center">BK</td> <td align="center">Test</td> <td>Test input: if it is connected to the positive it interrupts the emission</td> </tr> </tbody> </table>	Pin	Color	Signal	Description	1	BN	24V _{DC}	Power supply input from 16,8 to 30V	2	WH	Trimmer	To adjust apply a voltage from 2.8V to 12V or use special accessory.	3	BU	0V	Supply voltage reference	4	BK	Test	Test input: if it is connected to the positive it interrupts the emission		
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3	BU	0V	Supply voltage reference																					
4	BK	Test	Test input: if it is connected to the positive it interrupts the emission																					
<p>NOTE: Output power can be adjusted either by applying a voltage from 2.8 V to 12V to pin 2 or by connecting ST140 adjustment accessory to the supply cable in series. For input voltages below 2.8 V, the transmitter uses the previously registered value. The presence of an input voltage above 2.8 V is indicated by a blinking yellow LED. In these conditions, if the device is turned off, the last value is registered and the accessory can be removed. If pin 4 is connected to the positive, emission is interrupted.</p>																								

Chapter 4, tab. 2

CX1 SERIES	 RECEIVER	CX1RB MODEL Receiver with PNP and NPN outputs																										
M12, 5 pole Male connector	Wiring	Connector																										
		<table border="1"> <thead> <tr> <th>Pin</th> <th>Color</th> <th>Signal</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td align="center">1</td> <td align="center">BN</td> <td align="center">24V_{DC}</td> <td>Power supply input from 16,8 to 30V</td> </tr> <tr> <td align="center">2</td> <td align="center">WH</td> <td align="center">NPN Out</td> <td>Apply a load connected to the positive, maximum current 100mA.</td> </tr> <tr> <td align="center">3</td> <td align="center">BU</td> <td align="center">0V</td> <td>Supply voltage reference</td> </tr> <tr> <td align="center">4</td> <td align="center">BK</td> <td align="center">PNP Out</td> <td>Apply a load connected to the common, maximum current 100mA.</td> </tr> <tr> <td align="center">5</td> <td align="center">GY</td> <td align="center">NC/NO</td> <td>Input outputs logic selection</td> </tr> </tbody> </table>	Pin	Color	Signal	Description	1	BN	24V _{DC}	Power supply input from 16,8 to 30V	2	WH	NPN Out	Apply a load connected to the positive, maximum current 100mA.	3	BU	0V	Supply voltage reference	4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.	5	GY	NC/NO	Input outputs logic selection		
Pin	Color	Signal	Description																									
1	BN	24V _{DC}	Power supply input from 16,8 to 30V																									
2	WH	NPN Out	Apply a load connected to the positive, maximum current 100mA.																									
3	BU	0V	Supply voltage reference																									
4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.																									
5	GY	NC/NO	Input outputs logic selection																									
<p>NOTE: The NC/NO input is read only when the sensor is switched on. If it is left open or permanently wired to the common, it selects outputs as DARK ON. If it is connected to the positive, it selects outputs as LIGHT ON.</p>																												

Chapter 4, Tab. 3

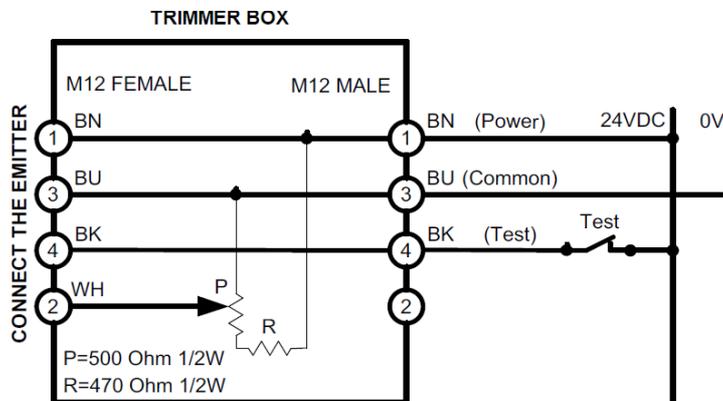


Fig.:1; Cap.:4

The easiest way to adjust the emitter **CX1E0** model is to use an external trimmer with the circuit diagram shown in the figure. A drawback of this solution can be the poor stability of the calibration value if the 24V power supply is not perfectly stable, but this can be partially overcome by registering the value as soon as possible. The standard accessory for this application is the **ST140**, a more complex device, which uses a digital trimmer to accurately adjust the output power.

4.6 Panel indications and diagnostics

Two groups of three LED indicators each (green, yellow and red) are on the front panel. The two groups provide the same indications. They are located respectively on the upper and lower part and have different signalling modes which are explained in the table here below. 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.

For curtains with one master board and more than one slave board, the central slave boards will be provided just with the red LEDs showing the DARK/LIGHT state for each board.

LEDs have different signalling modes which are explained in the table here below.

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

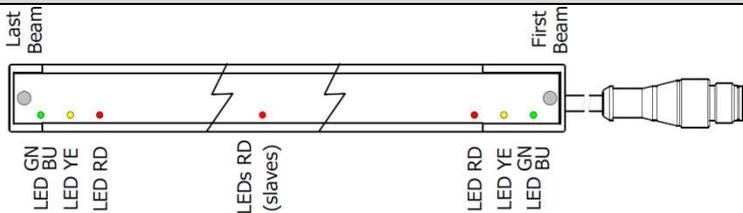
Tab.:4; Chapter.:4

CX1 EMITTERS		
GN		No power supply
		Supply voltage below 15V, insufficient
		Supply voltage above 16V, sufficient
YE		Emission stopped (CX1E0 test)
		The trimmer determines the emission (CX1E0).
		Emission enabled with the registered data (if the red LED is not on)
RD		Under normal operating conditions
		Breakdown of some IR LEDs
		Emission turned off, calibration error Value too high or too low

Tab.:5; Chapter.:4

CX1 RECEIVERS		
BU		No power supply
		Supply voltage below 15V, insufficient
		Optical synchronism signal too low
		Supply voltage above 16V, sufficient
YE		Digital output OFF
		Digital output(s) on
		Outputs shorted or overloaded
RD		LIGHT state (all beams are free)
		Some beams are in DARK
		Many or all of the beams are interrupted

Tab.:6; Chapter.:4

COMBINED INDICATIONS												
												
EMITTER							RECEIVER					
												
							NO NC NO NC C.C.					
GN	BU											
YE												
RD												
STATE												
		FAILURE	ON TEST	EMISSION	CALIBRATION	FAILURE	Power OFF/LOW	DARK	LIGHT	Out SHORT CIRCUIT		

Tab.:7; Chapter.:4

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5.0 TECHNICAL SPECIFICATIONS

CX1E*R*/**..*** MODELS		TECHNICAL SPECIFICATIONS			
PARAMETRI		Min.	Nom.	Max.	NOTES
Power supply					
Supply voltage	V _{DC}	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		1,5	Excluding the load
Absorbed power, Emitter	W	1		2,5	Excluding the external trimmer
Digital Outputs					
Output type	N°	1xPNP, 1xNPN			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
Reaction times					
Time delay before availability	s		2		Outputs are in OFF state because the power supply has been applied
Riaggancio sincronismo	ms	11		22	Ripresa da interruzione dell'ottica di sincronizzazione
Response time with 17 beams	ms			9	
Response time with 33 beams	ms			17	
Response time with 49 beams	ms			26	
Response time with 65 beams	ms			34	
Response time with 81 beams	ms			43	
Response time with 97 beams	ms			68	
Input at two levels (NC/NO and Test)					
Low or open level	V	0	open	5,8	R: Select NO (Dark ON). E: not on Test
High level	V	5,8		30	R: Select NC (Light ON). E: on Test
Integration time inputs	ms		20		The state must persist at least for the required time
Trimmer Analog Input					
Low band	V	0	open	2,8	No adjustment by the sensor, use the registered value
High band	V	2,8		12	The sensor uses the input level and it registers the value when switched off
Out of band	V	12		30	The sensor considers these values as equal to 12V
Input current					
Input current for low level	μA	-250		520	Outgoing or incoming current
Input current for high level	mA	0,52		1,2	Incoming current
Caratteristiche ottiche					
Nominal Operating distance	m	0,3	3		Optical beams with 5mm pitch
Nominal Operating distance	m	0,3	6		Optical beams with 10mm pitch
Wavelength of IR LED	nm		850		Optical beams with 5mm pitch
Wavelength of IR LED	nm		880		Optical beams with 10mm pitch
Aperture angle	deg		±30°		Optical beams with 5mm pitch
Aperture angle	deg		±15°		Optical beams with 10mm pitch
Ambient					
Artificial light immunity		Sec. IEC 60947-5-2			It complies with limits and conditions stated in the norm
Natural light immunity		Sec. IEC 60947-5-2			It complies with limits and conditions stated in the norm
Models with standard protection		IP67			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		Sec. IEC 60947-5-2			It complies with limits and conditions stated in the norm
Impact		Sec. IEC 60947-5-2			It complies with limits and conditions stated in the norm
Range correction factors					
Use of diverter mirrors		0,85			For each diversion with a mirror
Environmental factors		0,50 / 0,25			For the presence of dust, vapours / mist, fumes (indicative values)
Connections					
Cables' section	mm ²		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 ComER (a wire and common ground)
Dimensions					
Housing section	mm	20 (frontale) x 35			Painted aluminium, colour: opaque blue RAL5002
Groove for fixing	mm	2/10/6,5			Rear groove, depth / width / width of entry
Front window width	mm	15mm			Central width: 13mm; material PC
Outer closings	N°	2			Material: Black PBT + 30% GF
Closing screws	N°	2+2			2M, FE37, burnished
Connectors/Cable					
CX1E Models		1xM12, 4p, Male			External cable 220mm, PUR, Ø 4,7mm, 0,34mm ²
CX1R Models		1xM12, 5p, Male			External cable 220mm, PUR, Ø 5mm, 0,34mm ²

Tab.:1; Chapter :5

6.0 MECHANICAL DIMENSIONS OF LIGHT CURTAINS AND STANDARD ACCESSORIES

6.1 Mechanical dimensions of CX1 light curtains

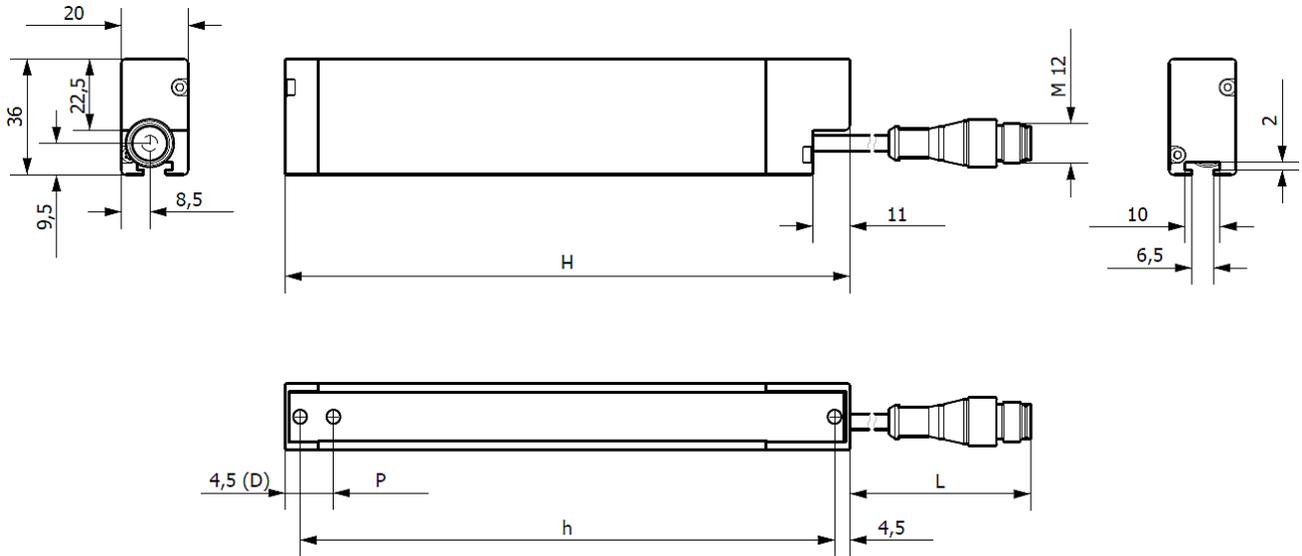
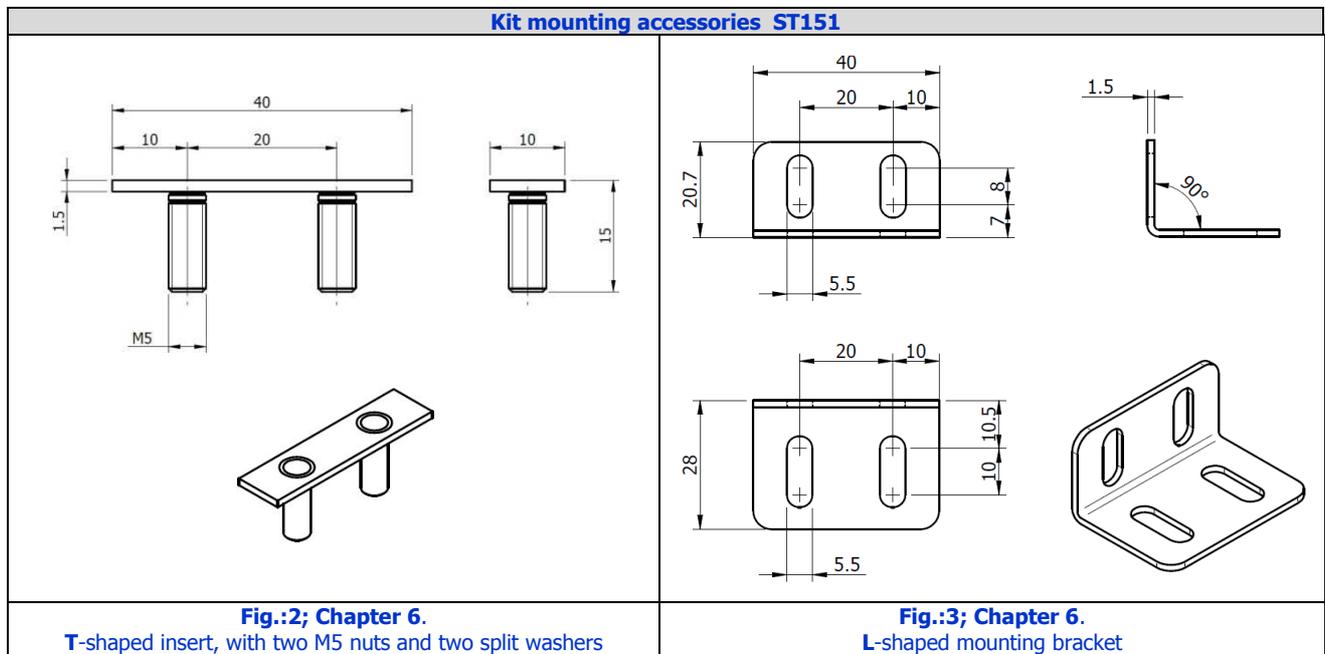


Fig.:1; Chapter 6.
For Dimensions **P**, **h** and **H** see **Tab.:1; Chapter 3**
Length pig-tail **L= 220mm**

6.2 Standard Mounting accessories

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



7.0 MOUNTING OF CX1 LIGHT CURTAINS

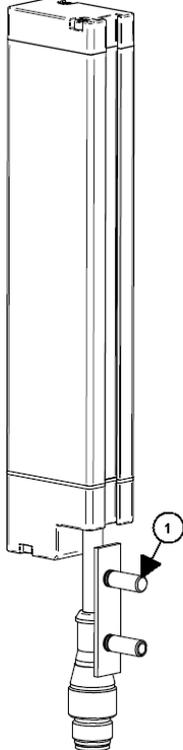
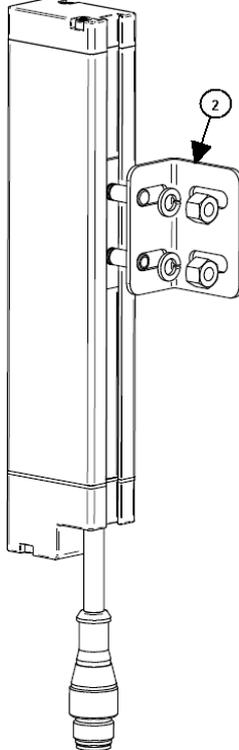
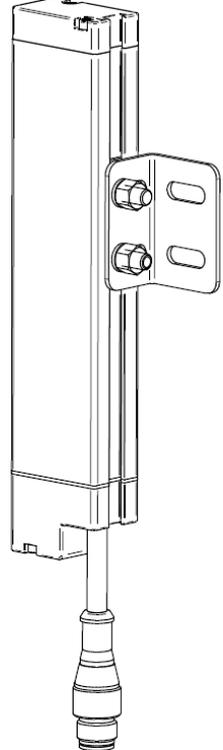
<p align="center">Securing CX1 light curtains with accessories' kit ST151. For ST151 quantities see Tab.:1; Chapter 3.</p>		
		
<p>Place the T-shaped insert (1)</p>	<p>Mount the L-shaped bracket (2) using the T-shaped insert</p>	<p>Secure light curtains to the wall</p>

Fig.:1; Chapter:7.

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8.0 LIST OF AVAILABLE ACCESSORIES

M12 CONNECTORS, 4 POLES, WITH CABLE	
CD12M/OB-050A5	M12 connector, straight, 4 poles, female, 5m PUR cable
CD12M/OB-100A5	M12 connector, straight, 4 poles, female, 10m PUR cable
CD12M/OB-150A5	M12 connector, straight, 4 poles, female, 15m PUR cable
M12 CONNECTORS, 5 POLES, WITH CABLE	
CD12M/OH-050A5	M12 connector, straight, 5 poles, female, 5m PUR cable
CD12M/OH-100A5	M12 connector, straight, 5 poles, female, 10m PUR cable
CD12M/OH-150A5	M12 connector, straight, 5 poles, female, 15m PUR cable
KIT PER FISSAGGIO BARRIERE FORNITE COME STANDARD	
ST151	Kit with T-shaped insert with two M5 nuts and two split washers and L bracket mounting, see Fig.:2 and 3 of Chapter.:6
VIBRATION DAMPING SUPPORTS	
ST 4V S	Kit of 4 vibration-damping supports for models with optical height of 150
ST 8V S	Kit of 8 vibration-damping supports for models with optical height from 300 to 1050
ST 12V S	Kit of 12 vibration-damping supports for models with optical height from 1200 to 1500
EXTERNAL POTENTIOMETER FOR ADJUSTMENT	
ST140	Adjustment module for CX1E0 models, M12 flying connector with 5 poles
SB141	Adjustment module with DIN rail

Tab.:1; Chapter.:8

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 **Tab.:1; Chapter 3**).
- Multilingual installation short manual

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 of 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

CX1 curtains comply with the following directives and norms:

- EMC 2004/108/CE Directive
- 2011/65/EU RoHS Directive
- IEC 60947-5-2 (3.1 edition, 2012-09)
- IEC 60947-5-7 harmonised norm (2003-06)
- EN 50581 harmonised norm (2012-09)

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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 24 (twenty-four) 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:

- M.D. Micro Detectors must be informed of the breakdown by the user within twenty-four months from product delivery.
- 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.

Devices or parts will be repaired at M.D. Micro Detectors' laboratories, to which the material must be delivered or sent. Shipping costs and the risk of damaging or losing the material during transport will be at the Customer's charge.

All replaced products and parts are owned by M.D. Micro Detectors.

M.D. Micro Detectors does not acknowledge other warranties nor rights except for those explicitly described. Therefore, costs, activity interruptions or other elements or circumstances related to non-functioning products or parts of them will not be refunded.

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.