
CX
AREA SENSOR

SUMMARY

1.0 GENERAL

Please attentively read this manual before installation, start-up, use and maintenance of **CX0** 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 **CX0** light curtains.

1.2 Explanation of symbols

Warning
A warning sign indicates actual of 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 it 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 **RG0** (exempt) according to IEC 62471.

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.

3.0 PRODUCT DESCRIPTION

3.1 Short description

CX0 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** aluminum, 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 **CX0** 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.
In all **CX0** models optics are completely crossed. Optical paths are defined by means of parallel rays and by rays departing from each single emitter and reaching each single receiver. This close optical net allows to detect objects with a diameter that is at least the **½ optic pitch. CX0** models can also detect sheets that are not completely matt and of different sizes according to the sensing range, with extremely low thickness.

The thick optical grid limits the usable height to a min. acceptable distance. Therefore the housing of **CX0** models is **169 mm** or **329 mm** high max. Apart from some exceptions, in all models the axis of the first and last optic are at 4.5 mm from the housing edge. The centre-to-centre distance between the first and the last optic can be either **160 mm** (model code **016**) or **320 mm** (model code **032**).

Models **016** have an optical pitch of either **5 mm (with 32 beams)** or **10 mm (with 17 beams)**. Models **032** have an optical pitch of **10 mm (with 32 beams)**.
Maximum nominal sensing distance is **6 m for the pitch of 5mm and 3m for the pitch of 10mm** . The minimum sensing distance at which all detecting nominal features are guaranteed depends on the height: for **016** models it is **0.5m**, whereas for **032** models it is **1m**. Detection is still possible at **0.1** or **0.2m** distance, even though with reduced performances.
The intertwining complete allows to realize devices that work without synchronization or better with an intrinsic optical synchronization. These models can only indicate if there are interrupted beams or not, without identifying which ones are interrupted, therefore they can only drive the digital outputs and define only two states: **DARK** or **LIGHT**.

The CX series are not equipped with an adjustment tool installed on the sensor housing.
In couples **CX0E0 / CX0RB** the adjustment is made by connecting, the input named **Trimmer** of the emitter, to a variable voltage, in these pairs does not exists an interconnection wire between emitter and receiver.

The couples **CX0E1 / CX0RP** are equipped with an automatic adjustment function, that is activated by connecting the **Teach G/F** input of the emitter to the common (**Fine** adjustment) or to the positive (**Gross** adjustment), in these pairs exists an interconnection wire **ComER** between emitter and receiver.
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 **CX0E0** emitters, if the **Trimmer** voltage is between 0 and 2,8V the emitter will use a recorded value. whereas if it is between 2,8 and 10V the emitter emits a power which is proportional to the variation field, in this case **the yellow LED blinks**, under these conditions, if the power is interrupted, the emitter records a new value. In order to keep the recorded value unchanged, the voltage on the Trimmer input must be lower than 2,8V before the device is switched ON or OFF.
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.
This 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.

In the **CX0E1** emitter models, if the **TEACH G/F** input is always connected to the positive or to the common, the emitter power is automatically adjusted when the device is switched on. The adjustment time depends on the operative distance. It will be few seconds for a short detecting distance and increase up to 15 seconds for the max. detecting distance, during the Teach process **the yellow LED blinks.**
In any case, the adjustment must be carried out in perfect or at least good alignment conditions.

In the **CX0E1** emitter models, If the adjustment does not reach a sufficient level to determine a LIGHT state, the red LED goes on, the IR LED current is brought down to zero and the receiver is in a dark state. This happens when optics are not visible because they are covered by an obstacle, or due to some breakdown. If no breakdown has occurred, adjustment must simply be repeated under better visibility conditions to ensure the correct functioning of the device.

CX0RB receivers have a PNP and an NPN output, whereas **CX0RP** receivers only have a PNP output. Outputs are completely protected and the max. current is 100 mA.

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. 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.
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.

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	Optical Pitch	Optical height	Light curtain height	Last optic	Beams	Sensing distance	Response time	Inputs/Outputs	NOTES
CODE ARTICLE	EMITTER RECEIVER	P mm	h mm	H mm	D mm	N°	Sn m	Tr ms		
CX0E0RB/05-016V	CX0E0/05-016V CX0RB/05-016V	5	160	169	9,5	32	0,3 ... 3	0,15 ... 6,6	Test; Trimmer NC/NO; PNP; NPN	Only detection with cross-beams Will be provided **one** kit of ST151
CX0E1RP/05-016V	CX0E1/05-016V CX0RP/05-016V1	5	160	169	9,5	32	0,3 ... 3	0,15 ... 6,6	Teach G/F NC/NO; PNP	Only detection with cross-beams Will be provided **one** kit of ST151
CX0E0RB/10-016V	CX0E0/10-016V CX0RB/10-016V	10	160	169	4,5	17	0,5 ... 6	0,15 ... 3,6	Test; Trimmer NC/NO; PNP; NPN	Only detection with cross-beams Will be provided **one** kits of ST151
CX0E1RP/10-016V	CX0E1/10-016V CX0RP/10-016V1	10	160	169	4,5	17	0,5 ... 6	0,15 ... 3,6	Teach G/F NC/NO; PNP	Only detection with cross-beams Will be provided **one** kit of ST151
CX0E0RB/10-032V	CX0E0/10-032V CX0RB/10-032V	10	320	329	14,5	32	1 ... 6	0,15 ... 6,6	Test; Trimmer NC/NO; PNP; NPN	Only detection with cross-beams Will be provided **two** kits of ST151
CX0E1RP/10-032V	CX0E1/10-032V CX0RP/10-032V1	10	320	329	14,5	32	1 ... 6	0,15 ... 6,6	Teach G/F NC/NO; PNP	Only detection with cross-beams Kit supply with **two** of ST151

Tab.1, chapter 3

Notes:

- Working distances less than the minimum are possible if one accepts sensing capabilities in excess of half the pitch.
- Response times indicated in the table equal minimum / maximum response times when switching from LIGHT to DARK.
- For further information and details see **chapter 5, tab.1 and chapter 6, Fig.1, 2, 3.**

4.0 START-UP INSTRUCTIONS

4.1 Mechanical mounting of CX0 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.
Keep in mind that the devices are not suitable for outdoor installation, IP67 despite being declared, it is not guaranteed that the long exposure to the weather does not cause water penetration and performance degradation.
Place Emitter and Receiver in front of each other, at the same height over the reference surface. On the CX0 models it is not necessary to keep the same orientation. For example, one of the two elements can be turned upside down without preventing the correct functioning of the light curtain.
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 CX0E1RP models (with Teach-in)

At switch on, the green and blue LED of the two elements must be already switched on. If it blinks, it means that the supply voltage is not enough. On the Emitter, only the green and the yellow LEDs should be switched on. If also the red LED is on, it means either that an out-of-scale IR-Led driving current value of the IR LEDs has been registered as a result of an incorrect Teach-In or that a breakdown occurred.
If the red LED blinks, even at low intensity, it means that one or more IR LED have been permanently damaged.
On the Receiver, the red LED is on (at low or high intensity) if the current value registered by the Emitter is not enough to have a LIGHT state. The red LED is off if the state is LIGHT.
The yellow LED on the Receiver is always on (ON output) or off (OFF output) according to whether state is LIGHT or DARK, in combination with the NC/NO input state.

Make sure that the optical beam path is free (and stays free) and activate Teach by temporarily connecting the input to the positive voltage or to the common. The emitter sets the driving voltage of IR LEDs at minimum, then it makes it progressively increase. During this time, the yellow LED of the emitter blinks and the red LED of the receiver is on until the receiver gets in LIGHT state. Then the yellow LED of the Emitter stops blinking and stays on, whereas the red LED of the receiver turns off. If the red LEDs of the emitter and of the receiver stay on, it means that, although the IR LED current has reached its highest level, the receiver is not in a LIGHT state. Try to repeat the operation described above and if nothing changes check connections as well as distance and alignment.

4.3 Alignment of CX0E0RB models (with external trimmer)

When switching on these models, the green and blue LED of the two elements must be on. If it blinks, it means that supply voltage is insufficient. On the emitter the green and the yellow LED should be on. If also the red LED is on, it means either that an out-of-scale IR LED current value has been registered as a result of a previous adjustment, or that a breakdown occurred . If the red LED blinks, even at low intensity, it means that one or more IR LED have been permanently damaged.
On the Receiver, the red LED is on (at low or high intensity) if the current value registered by Emitter is not enough to have a LIGHT state. The red LED is off if the state is LIGHT. The yellow LED on the Receiver is always on (ON output) or off (OFF output) according to whether state is LIGHT or DARK, in combination with the NC/NO input state.
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. Since voltage is now zero, the receiver is dark, the yellow LED of the emitter starts to blink, showing that voltage is now controlled by the Trimmer. The receiver, which was before in LIGHT state, is now in DARK state.
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**

4.4 Alignment control of CX0 models

Make sure that the signal level achieved with the Fine or Gross 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. If you have any doubt, repeat the adjustment several times.
In CX0E0 models you can remove the **ST140** and force the emitter to register the adjustment value. To do this, disconnect the supply cable from the **ST140** input, then disconnect it from the emitter and directly connect the emitter to the power supply.
Both sensors must be firmly secured.

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.

4.5 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. The pin assignment is adopted following the **IEC 60947-5-2**

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

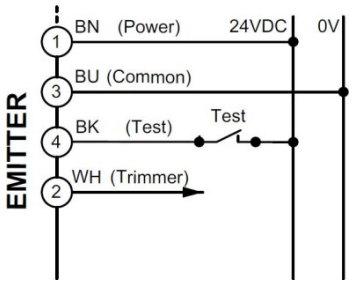
Some of the cables in the market may follow the pin assignment following the **DIN 47100**

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

Chapter 4, Tab.1

4.6 Wiring diagrams

CX0 SERIES	EMITTER	CX0E0 MODEL Emitter with adjustment by external trimmer
M12, 4 pole Male connector	Wiring	Connector

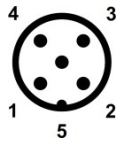


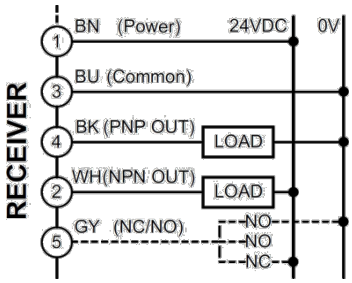
Pin	Color	Signal	Description
1	BN	$24V_{DC}$	Power supply input from 16,8 to 30V
2	WH	Trimmer	To adjust apply a voltage from 2.8V to 12V or use special accessory.
3	BU	0V	Supply voltage reference
4	BK	Test	Test input: if it is connected to the positive it interrupts the emission

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.

Chapter 4, tab. 2

CX0 SERIES	RECEIVER	CX0RB MODEL Receiver with PNP and NPN outputs
M12, 5 pole Male connector	Wiring	Connector





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

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.

Chapter 4, Tab. 3

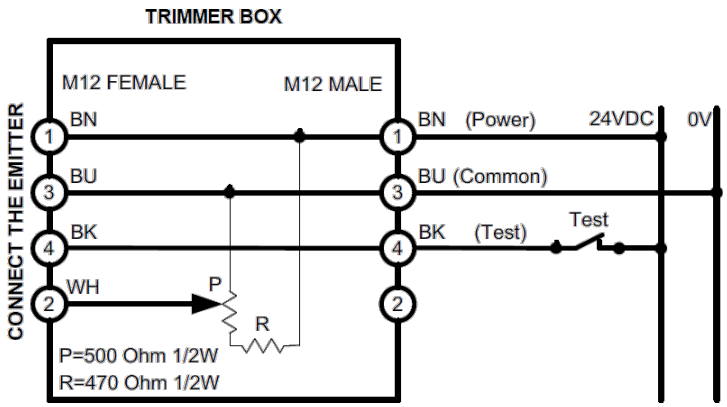
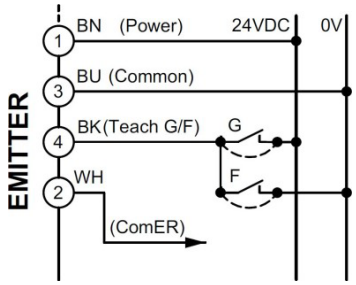


Fig.:1; Chap.:4

The easiest way to adjust the emitter CX0E0 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.

CX0 SERIES	EMITTER	CX0E1 MODEL Emitter with Teach-in
M12, 4 pole Male connector	Wiring	Connector

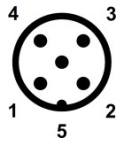


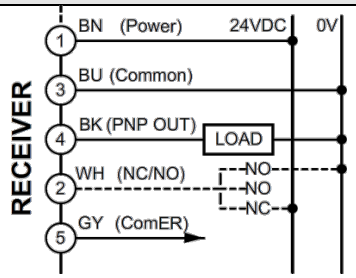
Pin	Color	Signal	Description
1	BN	$24V_{DC}$	Power supply input from 16,8 to 30V
2	WH	ComER	Connection to the receiver
3	BU	0V	Supply voltage reference
4	BK	Teach G/F	Automatic Teach-in input

NOTE: The ComER cable must be connected to the same receiver signal.
Applying the positive or common to the Teach G/F input, the process of automatic calibration begins. If this input is permanently connected to the positive or common, calibration is performed automatically only when the sensor is switched on. During calibration, the yellow LED blinks.

Chapter 4, Tab. 4

SERIE CX0	RECEIVER	CX0RP MODEL Receiver with output PNP and Teach-in function
M12, 5 pole male connector	Wiring	Connector





Pin	Color	Signal	Description
1	BN	$24V_{DC}$	Power supply input from 16,8 to 30V
2	WH	NC/NO	Output logical selection input
3	BU	0V	Supply voltage reference
4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.
5	GY	ComER	Connection to the emitter

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. The ComER cable must be connected to the same emitter signal.

Chapter 4, Tab.5

4.7 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.

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

Chapter 4, Tab.:6

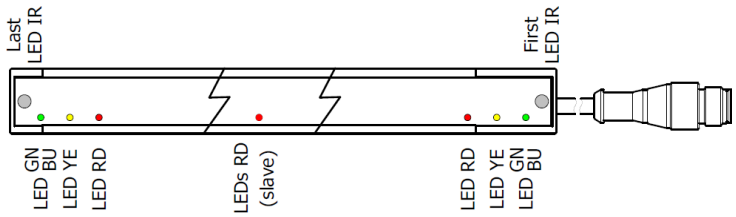
		CX0 EMITTERS
GN	●	No power supply
	◐	Supply voltage below 15V, insufficient
	☼	Supply voltage above 16V, sufficient
YE	●	Emission stopped (CX0E0 test)
	◐	The trimmer determines the emission (CX0E0). There is currently a Teach (CX0E1)
	☼	Emission enabled with the registered data (if the red LED is not on)
RD	●	Under normal operating conditions
	✥	Breakdown of some IR LEDs
	☼	Emission turned off, calibration error Value too high or too low

Chapter 4, Tab. 7

		CX0 RECEIVERS
GN	●	No power supply
	◐	Supply voltage below 15V, insufficient
	☼	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

Chapter 4, Tab.8

COMBINED INDICATIONS



		EMITTER					RECEIVER					
								NO	NC	NO	NC	C.C.
GN	BU	☼	☼	☼	☼	☼	● ◐	☼	☼	☼	☼	☼
YE		☼	●	☼	◐	☼	●	☼	●	●	☼	✥
RD		☼	●	●	●	✥	●	✥ ☼		●		● ✥ ☼
STATE		BLOCKED OR BROKEN	ON TEST	EMISSION	ADJUST-MENT	BREAK-DOWN	Power OFF	DARK		LIGHT		Out SHORT CIRCUIT

Chapter 4, Tab. 9

5.0 TECHNICAL SPECIFICATIONS.

CX0E*R*/**-*** MODELS		TECHNICAL SPECIFICATIONS			
PARAMETERS		**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 (CX0RB model)	N°	1xPNP, 1xNPN			Completely protected outputs
Output type (CX0RP model)	N°	1xPNP			Completely protected output
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	ms		200		Outputs are in OFF state because the power supply has been applied
Duration of the Adjustment process (CX0E1)	s	1		15	Depending on the distance between Emitter and Receiver
DARK response time with 17 beams	ms	0,15		3,6	The more beams are darkened, the less time is needed
LIGHT response time with 17 beams	ms	0,5		5,3	It does not depend on the beams
Highest switching frequency with 17 beams	Hz			280	
DARK response time with 32 beams	ms	0,15		6,6	The more beams are darkened, the less time is needed
LIGHT response time with 32 beams	ms	1		11	It does not depend on the beams
Highest switching frequency with 32 beams	Hz			83	
Input at three levels (Teach G/F)					
Low level	V	0		0,8	Valid at switch-on going before through the open level
Open level	V	1,3	1,9	2,35	Always valid
High level	V	5,8		30	Valid at switch-on going before through the open level
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
Optical characteristics					See table: 2, 3, 4 and Fig. 1
Ambient					
Artificial light immunity		Acc. to IEC 60947-5-2			It complies with limits and conditions stated in the norm
Natural light immunity		Acc. to 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		Acc. to IEC 60947-5-2			It complies with limits and conditions stated in the norm
Impact		Acc. to 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 (front) 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					
CX0E Models		1xM12, 4p, Male			External cable 220mm, PUR, Ø 4,7mm, 0,34mm^2
CX0R Models		1xM12, 5p, Male			External cable 220mm, PUR, Ø 5mm, 0,34mm^2

Chapter 5, Tab.1

CX2E*R*/05-016V MODELS (pitch 5mm)					
OPTICAL PARAMETERS		**Min.**	**Nom.**	**Max.**	**NOTES**
Nominal Operative Domain	**m**	**0,1**	**3**		Distance between emitter and receiver (Re)
Emitted wavelength of IR LED	**nm**		**850**		
Optics diameter	**mm**		**2**		See Fig.:1, Do
Aperture angle	**deg**		**±30°**		
Threshold level for Teach G			**0,33**		Ratio between threshold value and light status signal
Best detecting capacity with Teach G	**mm**		**2,5**		Using a rod with the specified diameter, **see Fig.:1 andTab.:4, Cg**
Threshold level for Teach F			**0,8**		Ratio between threshold value and light status signal
Best detecting capacity with Teach F	**mm**		**1,5**		Using a rod with the specified diameter, **see Fig.:1 e Tab.:4, Cf**
Immunity to artificial light direct/indirect	**lux**		**20.000/60.000**		Incandescent Lamp, standard adjustment (Teach G)
Immunity to artificial light direct/indirect	**lux**		**1000/2000**		Incandescent Lamp, fine adjustment (Teach F)
Immunity to artificial light direct/indirect	**lux**		**3000/10000**		Fluorescent Lamp, standard adjustment (Teach G)
Immunity to artificial light direct/indirect	**lux**		**350/500**		Fluorescent Lamp, fine adjustment (Teach F)

Tab.:2; Cap.:5; refer to the models of Tab.:1; Chapter 3

CX2E*R*/10-***V MODELS (pitch 10mm)					
OPTICAL PARAMETERS		**Min.**	**Nom.**	**Max.**	**NOTES**
Nominal Operative Domain model **016**	**m**	**0,3**	**6**		Distance between emitter and receiver See Fig.:1, Re
Nominal Operative Domain model **032**	**m**	**0,5**	**6**		Distance between emitter and receiver See Fig.:1, Re
Emitted wavelength of IR LED	**nm**		**880**		
Optics diameter	**mm**		**4**		See Fig.:1, Do
Aperture angle	**deg**		**±15°**		
Threshold level for Teach G			**0,33**		Ratio between threshold value and light status signal
Best detecting capacity with Teach G	**mm**		**5**		Using a rod with the specified diameter, **see Fig.:1 andTab.:4, Cg**
Threshold level for Teach F			**0,8**		Ratio between threshold value and light status signal
Best detecting capacity with Teach F	**mm**		**3**		Using a rod with the specified diameter, **see Fig.:1 e Tab.:4, Cf**
Immunity to artificial light direct/indirect	**lux**		**10000/30000**		Incandescent Lamp, standard adjustment (Teach G)
Immunity to artificial light direct/indirect	**lux**		**1000/10000**		Incandescent Lamp, fine adjustment (Teach F)
Immunity to artificial light direct/indirect	**lux**		**3000/10000**		Fluorescent Lamp, standard adjustment (Teach G)
Immunity to artificial light direct/indirect	**lux**		**350/1000**		Fluorescent Lamp, fine adjustment (Teach F)

Tab.:3; Cap.:5; refer to the models of Tab.:1; Chapter 3

5.1 Detection capability.

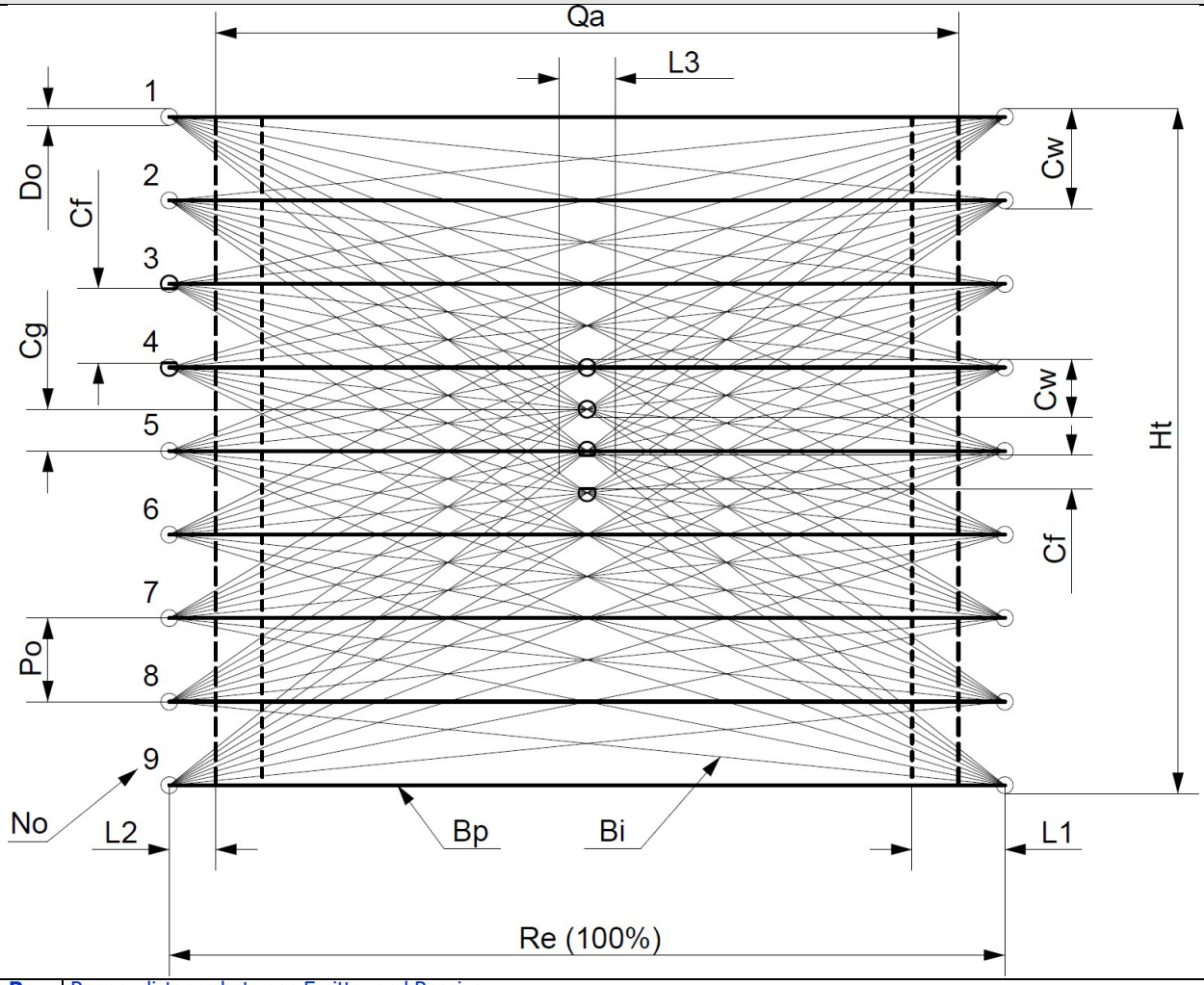
The optical crossed beams allow the detection of extremely thin sheets (metal sheets, sheets of paper, envelopes) and objects having smaller diameter than the pitch of the optics. In column **A** is shown as a percentage of the Re range, the width **Qa** of the area with the best resolution. In column **B** it is shown the minimum width of a sheet detectable in the central portion in height of the area Qa x Ht. In the columns C and D, it is reported the detection capability for small diameter objects for the entire area **Qa x Ht**; this capability is less effective at the exact center of Qa and close to the border (the internal edges of the area Qa) and it depends on the type of the adjustment.
Outside the Qa x Ht area, the detection capability is shown in column **E**, this is slightly dependent on the type of adjustment. If the sensors are not adjusted and the excess gain is high, the detection capability in the entire area is the one reported in column **F**. For the models provided by trimmer, the references to Teach_F and Teach_G adjustments, are purely indicative, because the excess gain can be varied continuously.

DETECTION CAPABILITY														
REF. ►	**A**			**B**			**C**		**D**		**E**		**F**	
PITCH ►	**5mm**	**10mm**	**10mm**	**5mm**	**10mm**	**10mm**	**5mm**		**10mm**		**5mm**	**10mm**	**5mm**	**10mm**
N° OF BEAMS ►	**32**	**17**	**32**	**32**	**17**	**32**	**32**		**17 e 32**		**32**	**17 e 32**	**32**	**17 e 32**
BEAMS MODE	**AREA**			**MDW**			**MDO (Qa)**		**MDO (Qa)**		**MDO* (Re)**	**MDO* (Re)**	**MDO* (Re)**	**MDO* (Re)**
	Qa			**L3**			**Cf** Teach_F	**Cg** Teach_G	**Cf** Teach_F	**Cg** Teach_G	**Cf**	**Cf**	**Cw**	**Cw**
											Cg	**Cg**	**Non tarata**	
	(% Re)			**(% Re)**			**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
Complete Interweave	**Re x 0,9677**	**Re x 0,9375**	**Re x 0,9677**	**Re x 0,0161**	**Re x 0,0313**	**Re x 0,0161**	**1,5...2**	**2,5**	**3...4**	**5**	**5**	**10**	**6**	**12**

Tab.:4; Chap.:5, see also **Fig.:1**.

MDW : minimum width of the sheet detectable in Qa and central in height
MDO : minimum diameter detectable in the area Qa x Ht with Fine (Cf) and Gross (Cg) adjustment
MDO*: minimum diameter detectable in the entire area Re x Ht (including the area with less resolution outside to Qa)

DETECTION CAPABILITY



Re	Range, distance between Emitter and Receiver
No	Number of optics
Do	Diameter of the optics (of the beam), **2mm** for the pitch 5mm, **4mm** for pitch 10mm
Po	Optical pitch, **5** or **10mm**
Bp	Parallel beams, in these models any beams in dark, parallel or crossed, determines the dark state
Bi	Crossed beams, complete interweave, all the optics participate to the interweave
Qa	Widht of the area (**QaxHt**) in which is guaranteed the specified detection capability (in some zones it is better than the one specified)
Ht	Total height of the controlled area: **Ht = Po * (No -1)**
L6	Minimum detectable width of a thin and opaque sheet, parallel to the beams, in the center of the area **Qa * Ha**
Cf	Detection capability with **Fine** adjustment, it is different for each zone
Cg	Detection capability with **Grossa** adjustment, it is different for each zone
Cw	Detection capability with high excess gain, it is different for each zone

Fig.:1; Cap.:5. The number of the optics is indicative, the represented interweave includes all the optics

6.0 MECHANICAL DIMENSIONS OF LIGHT CURTAINS AND STANDARD ACCESSORIES

6.1 Mechanical dimensions of CX0 light curtains

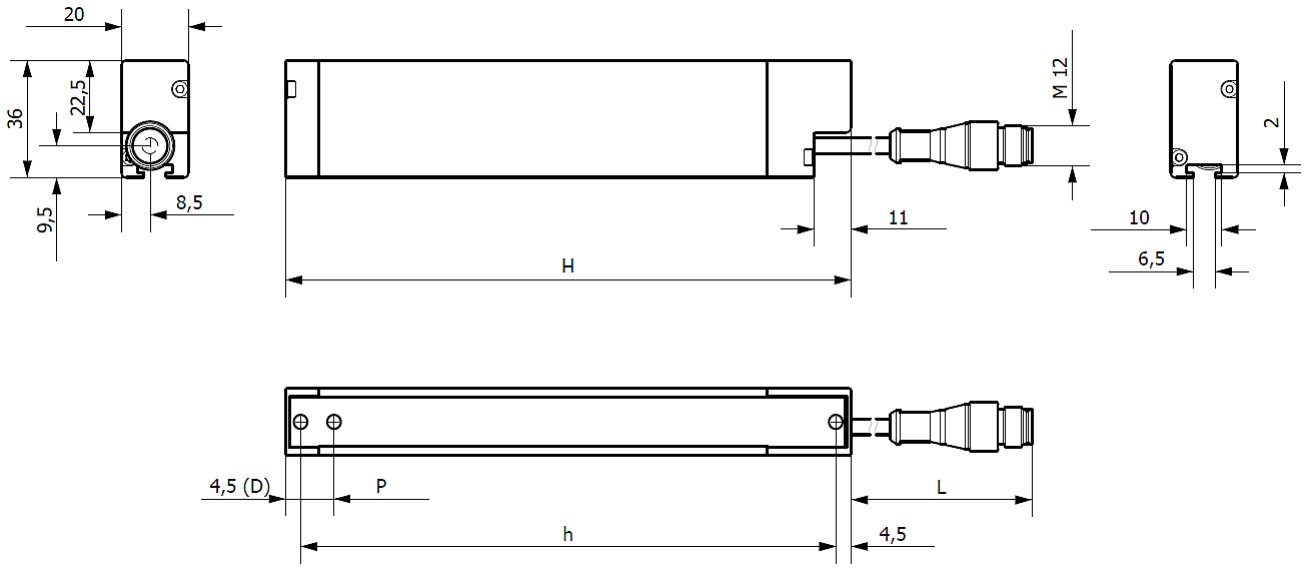


Fig.:1; Chapter 6.
For Dimensions **P**, **h** and **H** see **Tab.:1; Chapter 3**
In models with optics 32, the last optics is at a distance **D = (4.5 + P)** from the edge.
Length pig-tail **L= 220mm**

6.2 Standard Mounting accessories

One kit is provided for models **016**, two kits are provided for models **032**

Kit mounting accessories ST151

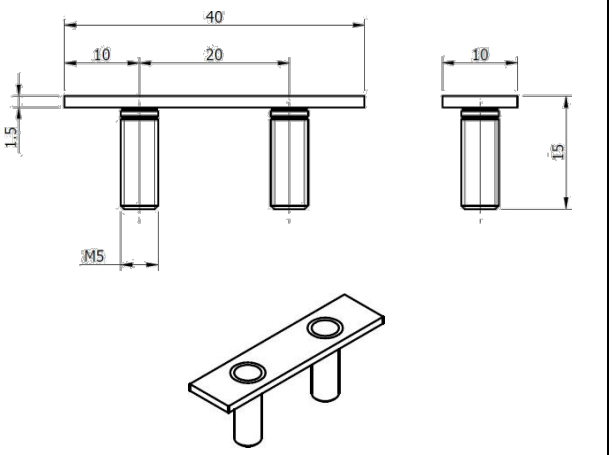


Fig.:2; Chapter 6.
T-shaped insert, with two M5 nuts and two split washers

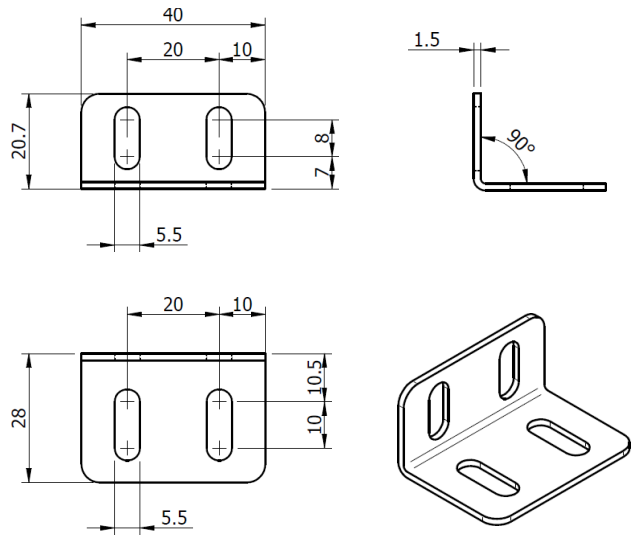
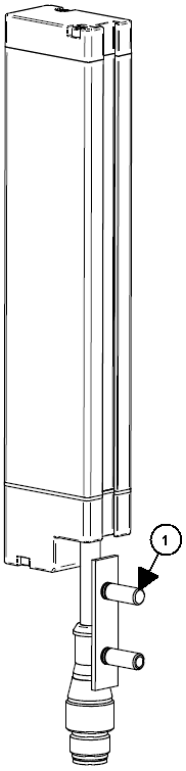


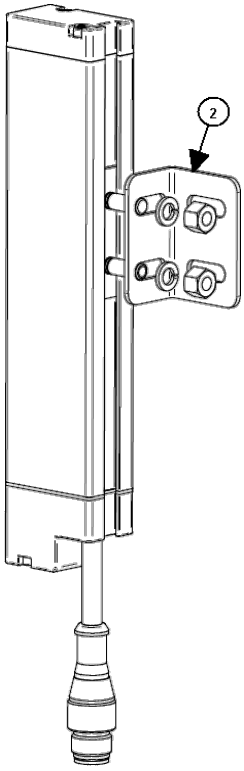
Fig.:3; Chapter 6.
L-shaped mounting bracket

7.0 MOUNTING OF CX0 LIGHT CURTAINS

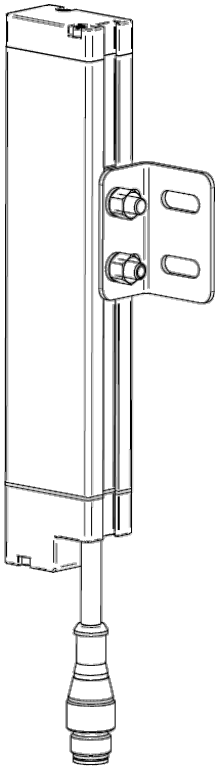
Securing CX0 light curtains with accessories' kit ST151.
For ST151 quantities see **Tab.:1; Chapter 3**.



Place the T-shaped insert (1)



Mount the L-shaped bracket (2) using the T-shaped insert



Secure light curtains to the wall

Fig.:1; Chapter 7.

8.0 LIST OF AVAILABLE ACCESSORIES

M12 CONNECTORS, 4 POLES, WITH CABLE	
CD12M/0B-050A5	M12 connector, straight, 4 poles, female, 5m PUR cable
CD12M/0B-100A5	M12 connector, straight, 4 poles, female, 10m PUR cable
CD12M/0B-150A5	M12 connector, straight, 4 poles, female, 15m PUR cable
M12 CONNECTORS, 5 POLES, WITH CABLE	
CD12M/0H-050A5	M12 connector, straight, 5 poles, female, 5m PUR cable
CD12M/0H-100A5	M12 connector, straight, 5 poles, female, 10m PUR cable
CD12M/0H-150A5	M12 connector, straight, 5 poles, female, 15m PUR cable
STANDARD MOUNTING KIT FOR LIGHT CURTAINS	
ST151	Kit with T-shaped insert with two M5 nuts and two split washers and L bracket mounting, see Fig.:2 e 3 di Cap.: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 CX0E0 models, M12 flying connector with 5 poles

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 few 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

CX0 curtains comply with the following directives and norms:
- EMC Directive
- Harmonised norm **IEC 60947-5-2**
- Harmonised norm **IEC 60947-5-7**

The complete version of the CE Conformity Declaration is available on the website: https://www.datasensing.com

12.0 WARRANTY

For every new CX light curtain, in normal using conditions, Datasensing S.r.l. guarantees the absence of defects in materials and in manufacturing for a period of **36** (thirty-six) **months**.
For this period of time, Datasensing S.r.l. 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.
Datasensing S.r.l. 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:
- the product has to be rendered within **36 months** from production date.
- The device and its components are in the same conditions in which they were delivered by Datasensing S.r.l..
- 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 Datasensing S.r.l. personnel, tampering, etc.;
- accidents or impacts (also due to transport or force majeure);
- other events not depending on Datasensing S.r.l..

Devices or parts will be repaired at Datasensing S.r.l.' 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 Datasensing S.r.l..
Datasensing S.r.l. 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, Datasensing S.r.l. will not be held responsible under any circumstances for any possible consequence.

NOTE: The minimum distance between the "Proximity Switch Metal Enclosure" and any "External uninsulated live part" shall be at least 12.7 mm