
www.microdetectors.com
CR
REFLEX
CR0/0T-1V
1645
Made in Italy
1
2
3
4
24 VDC
NC / NO
0V
Push-Pull

SUMMARY

1.0 ABOUT THIS DOCUMENT

Please read careful this document before installation, start-up, use and maintenance of **CR0** 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 **CR0** retro-reflective area sensors.

1.1 Explanation of symbols

Warning
A warning sign indicates the presence 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 to achieve better performances.

Symbol
The symbol identifies optical devices that have the reflex function.

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
CR0 works in DC and with a low voltage (the maximum value is 30VDC); the proper operation is guarantee only in the range indicated in the technical data.
With voltages below $16V_{DC}$ all outputs remain in the OFF state, with voltages in excess of $30V_{DC}$ permanently, 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 the following documentation).

Warning
Some optics emit visible light that do not have dangerous levels; the device is classified RG0 (Exempt Group) according to IEC 62471 standard: 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 at 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 or similar panels which may change the beam angle of the area sensor.
Prevent the area sensor 's optical window from getting scratched or tarnished.
Do not expose the area sensor to strong natural or artificial light sources, including stroboscopic light.
Do not expose the area sensor directly to optical beams projected by other optical devices.
Ensure that the ambient temperature does not exceed the stated limits.
Keep 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

CR0 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 that returns from the reflector.
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 side is in polycarbonate and the bottom side is in black **PBT**, the optical window is in **PMMA**. Protection degree is **IP67**.
In all models of the series, **CR0** have two **LEDs** indicators: **Red** and **Green** in combination, indicate the states of the sensor (alignment, state optics and fault indication), they are arranged at the top of the curtain, the light is intense and diffused in all directions, this ensures a great visibility in all conditions.
All models in the **CR0** have an optic composed of a continuous array of **9x9mm** lenses with a step of **10mm**, **CR0** have seven lenses. The optical window has a height of **69mm**; the total height of the curtain is **107mm**.
Emitter and Receiver are alternate with the following sequence is: **E1**, **R1**, **E2**, **R2**, **E3**, **R3**, **E4** with reference the cable side. This allows to realize a continuous succession of **six pairs** of reflex elements; the emitted light is **polarized** and has a wave length of **617nm.**
The working distance is **0.2...4.5m** with reflector **RL106G** and lower with smaller reflectors, the best detection capability is **6mm**.
All models of **CR0** series have a teach button (inductive teach could also be available) in the top of the curtain dedicated to the activation of menu functions: two levels of **Teach-in** and **Blanking**.
The **Teach_S** (standard teach) select an excess gain equal to **1.5 times** the threshold, the **Teach_F** (fine teach) select an excess gain equal to **1.1 times** the threshold; the latter should be used only if the system and the environment in which the product is used are clean and with an high mechanical stability.
The sensor does not use automatic systems of signal tracking, but its repeatability is based on a sophisticated control of thermal drift.

The **Blanking** of the beams, allows gradually eliminate pairs of beams; the active couples (E+R) may range from a maximum of six to a minimum of one.

This sensors has a standard output with M12 male flying connector (240 mm pigtail).
The **CR0** models have four interface circuits which can be combined in different ways depending on the model and the number of output cables:
a) Supply 15...30V

b) IO_Link output (C/Q), PNP/NPN/PUSH- PULL

c) Auxiliary output (Q): PNP/NPN/PUSH- PULL

d) Auxiliary input, output mode selection LIGHT/DARK (NC/NO), remote Teach or more.

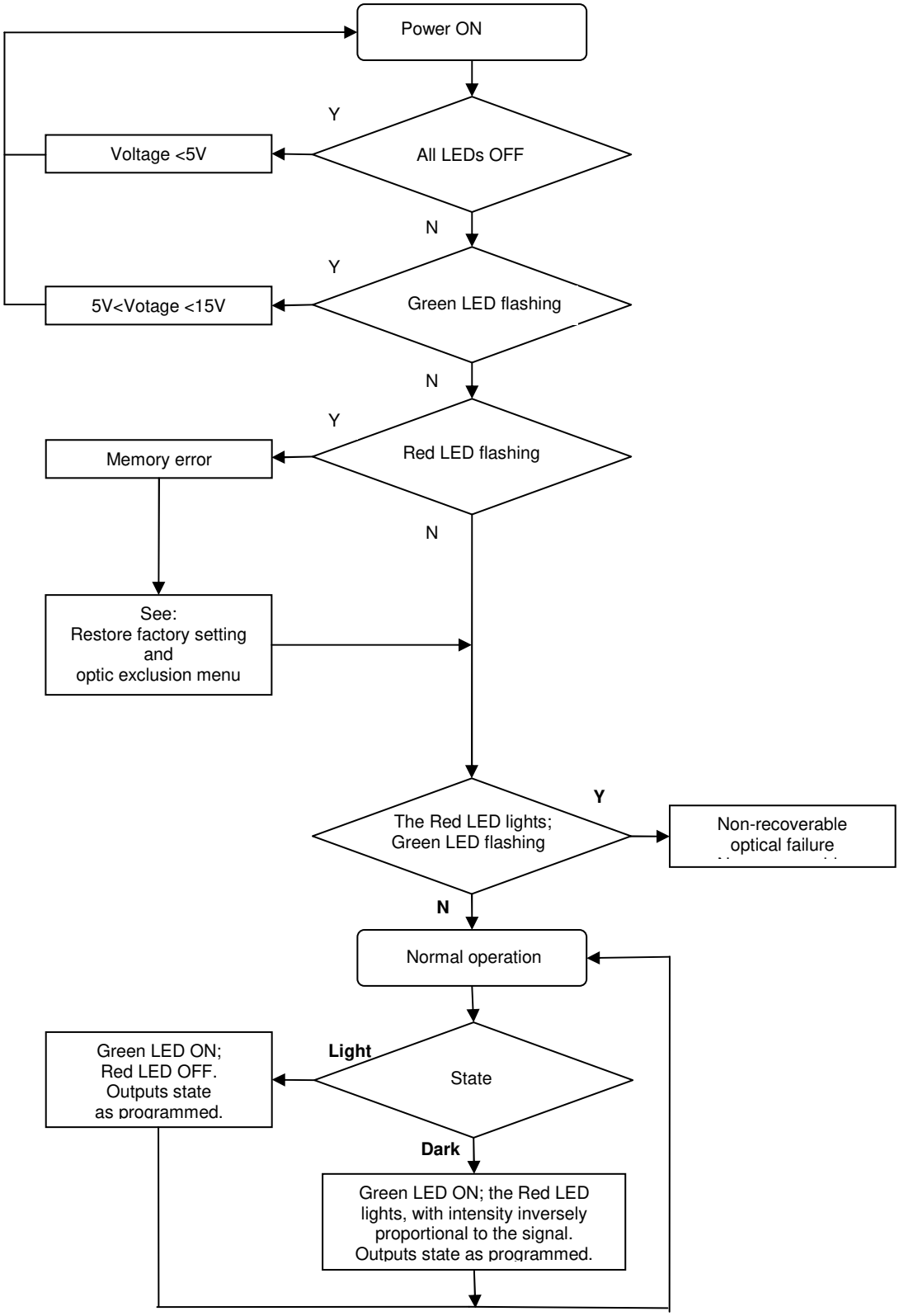
3.2 Available models

MODEL	OPTICAL PITCH	OPTICAL HEIGHT	BODY HEIGTH	OPTICS	SENSING RANGE	RESPONSE TIME	CONNECTOR	POLES	Interface	
CODE ARTICLE	P	h	H		Sn	Tr			INPUTS	OUTPUTS
	mm	mm	mm	N°	m	ms		No		
CR0/0I-1V	10	69	109	7	0.2... 4.5	1.75/2.4	M12	4	d)	b,c) IO_Link
CR0/0B-1V	10	69	109	7	0.2... 4.5	1.2	M12	5	d) NC/NO	b) PNP; c) NPN
CR0/0T-1V	10	69	109	7	0.2... 4.5	1.2	M12	4	d) NC/NO	b) Push-Pull
CR0/BP-1V	10	69	109	7	0.2... 4.5	1.2	M12	4	None	b) PNP-NO; c) PNP-NC
CR0/BN-1V	10	69	109	7	0.2... 4.5	1.2	M12	4	None	b) NPN-NO; c) NPN-NC
CR0/0P-1V	10	69	109	7	0.2... 4.5	1.2	M12	4	d) NC/NO	c) PNP
CR0/0N-1V	10	69	109	7	0.2... 4.5	1.2	M12	4	d) NC/NO	c) NPN

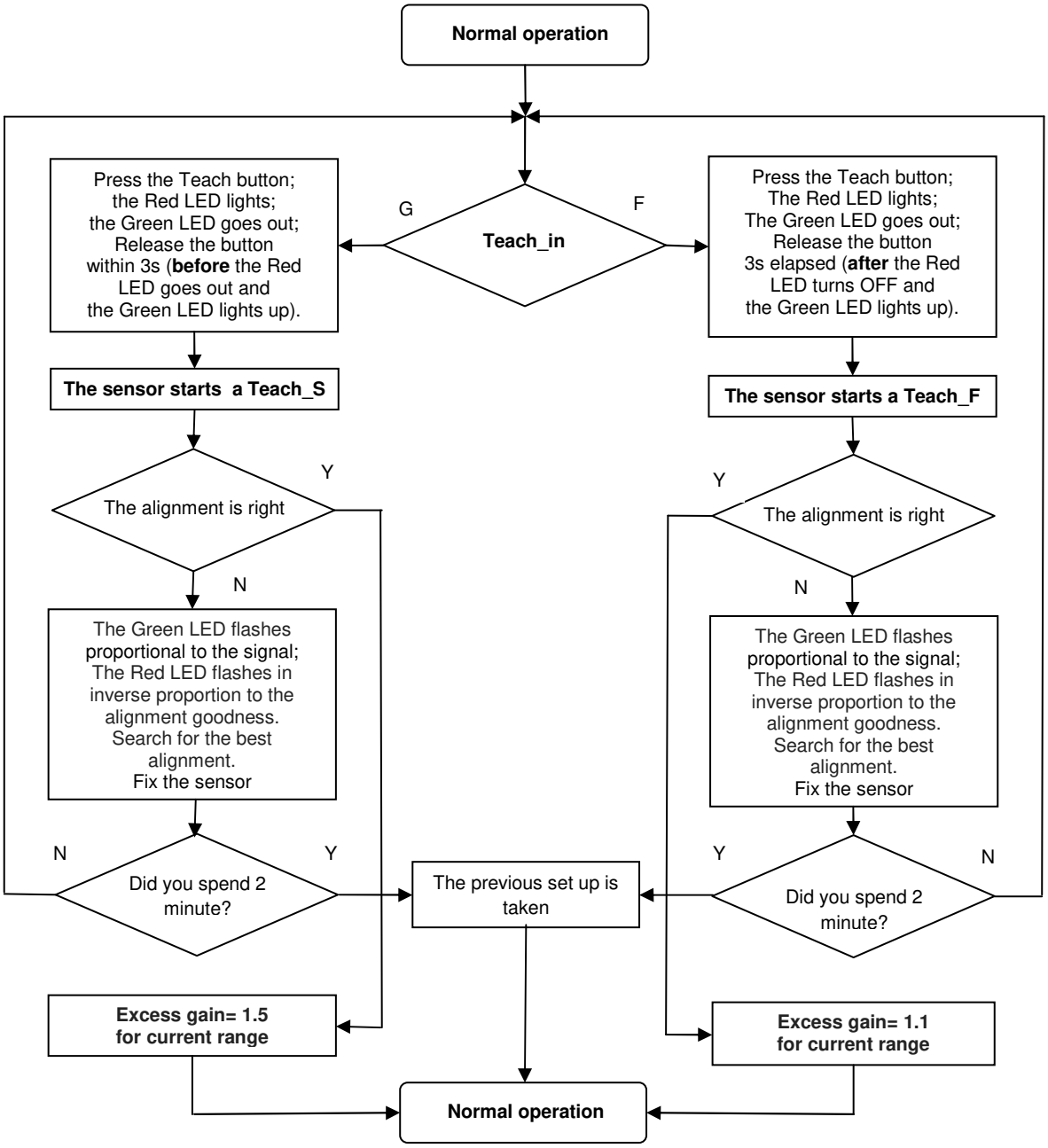
Tab.:1

3.3 Functions description

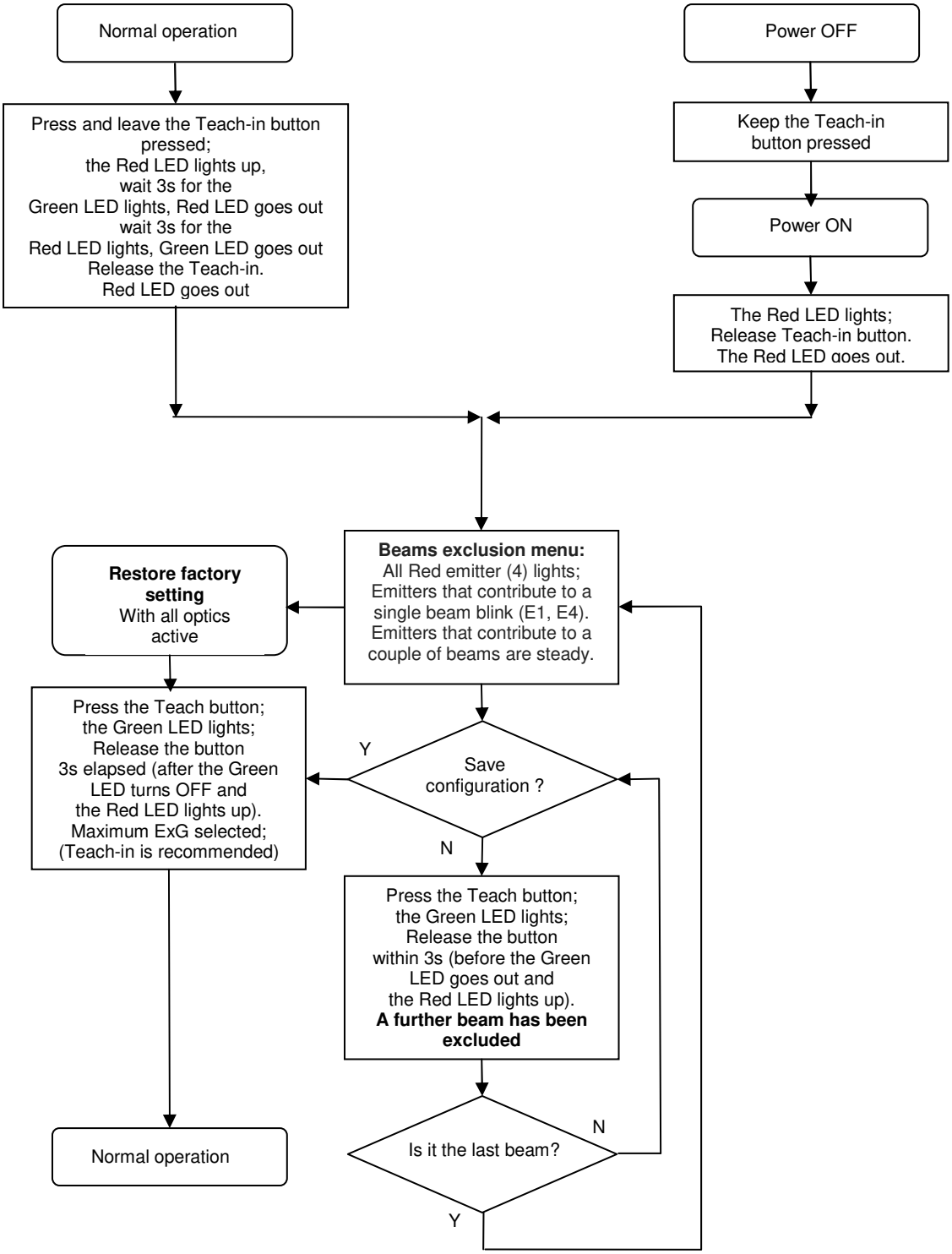
3.3.1 Behavior at power-on



3.3.2Teach in

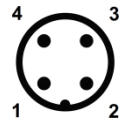

Normal operation
Teach_in
G
F
Press the Teach button;
the Red LED lights;
the Green LED goes out;
Release the button
within 3s (before the Red
LED goes out and
the Green LED lights up).
Press the Teach button;
The Red LED lights;
The Green LED goes out;
Release the button
3s elapsed (after the Red
LED turns OFF and
the Green LED lights up).
The sensor starts a Teach_S
The sensor starts a Teach_F
The alignment is right
Y
N
The alignment is right
Y
N
The Green LED flashes
proportional to the signal;
The Red LED flashes in
inverse proportion to the
alignment goodness.
Search for the best
alignment.
Fix the sensor
The Green LED flashes
proportional to the signal;
The Red LED flashes in
inverse proportion to the
alignment goodness.
Search for the best
alignment.
Fix the sensor
N
Y
Did you spend 2
minute?
The previous set up is
taken
Y
N
Did you spend 2
minute?
Excess gain= 1.5
for current range
Excess gain= 1.1
for current range
Normal operation

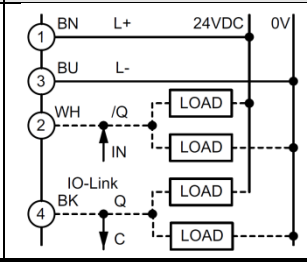
3.3.3 Beams exclusion menu (blanking) and restore factory setting.



3.1 Electrical drawing

SERIE CR0	REFLEX CURTAIN	CR0/0I MODEL IO-Link interface
M12, 4 poles Male connector	Wiring	Connector



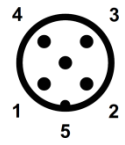


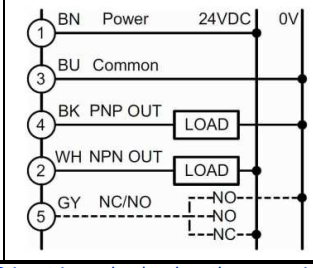
Pin	Color	Signal	Description
1	BN	L+	Power supply input from 16 to 30V
2	WH	In/Q	Multifunction I / O
3	BU	L-	Supply voltage reference
4	BK	C/Q	IO-Link interface

NOTE: Pin 2 is a multifuncion programmable I/O

Tab.:2

SERIE CR0	REFLEX CURTAIN	CR0/0B MODEL PNP and NPN outputs, NC/NO selectable
M12, 5 poles Male connector	Wiring	Connector



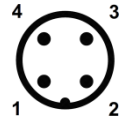


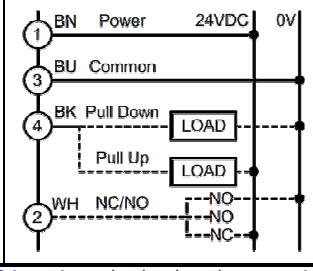
Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	NPN Out	Apply a load connected at the positive, maximum current 100mA
3	BU	0V	Supply voltage reference
4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.
5	GY or YE/GR	NC/NO	Input for outputs logic 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 the output as DARK ON. If it is connected to the positive, it selects the output as LIGHT ON. Enabling the button it is possible to execute the teach.

Tab.:3

SERIE CR0	REFLEX CURTAIN	CR0/0T MODEL Push Pull output, NC/NO selectable
M12, 4 poles Male connector	Wiring	Connector



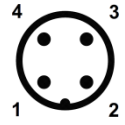


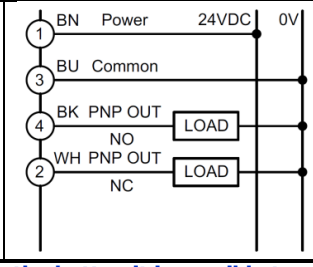
Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	NC/NO	Input for outputs logic selection.
3	BU	0V	Supply voltage reference.
4	BK	Push Pull Out	Apply a Pull up or a Pull down load

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 the Push driver is Dark switching and the Pull driver is Light switching. If it is connected to the positive the Push driver is Light switching and the Pull driver is Dark switching.

Tab.:4

SERIE CR0	REFLEX CURTAIN	CR0/BP MODEL PNP outputs NO and NC
M12, 4 poles Male connector	Wiring	Connector



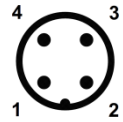


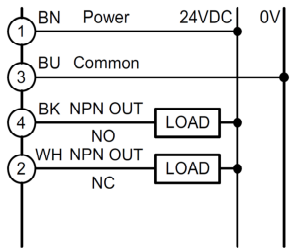
Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	PNP Out NC	Apply a load connected to the common, maximum current 100mA.
3	BU	0V	Supply voltage reference
4	BK	PNP Out NO	Apply a load connected to the common, maximum current 100mA.

NOTE: Enabling the button it is possible to execute the teach.

Tab.:5

SERIE CR0	REFLEX CURTAIN	CR0/BN MODEL NPN outputs NO and NC
M12, 4 poles Male connector	Wiring	Connector



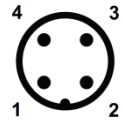


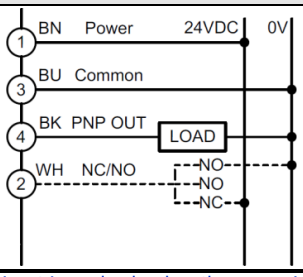
Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	NPN Out NC	Apply a load connected to the positive, maximum current 100mA.
3	BU	0V	Supply voltage reference
4	BK	NPN Out NO	Apply a load connected to the positive, maximum current 100mA.

NOTA: Enabling the button it is possible to execute the teach.

Tab.:6

SERIE CR0	REFLEX CURTAIN	CR0/0P MODEL PNP output, NC/NO selectable
M12, 4 poles Male connector	Wiring	Connector



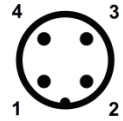


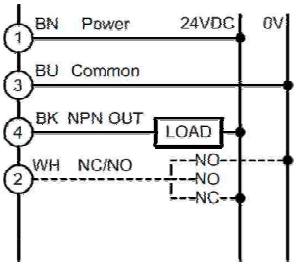
Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	NC/NO	Input for outputs logic selection.
3	BU	0V	Supply voltage reference.
4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.

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 the output as DARK ON. If it is connected to the positive, it selects the output as LIGHT ON.

Tab.:7

SERIE CR0	REFLEX CURTAIN	CR0/0N MODEL NPN output, NC/NO selectable
M12, 4 poles Male connector	Wiring	Connector





Pin	Color	Signal	Description
1	BN	24V$_{DC}$	Power supply input from 16 to 30V.
2	WH	NC/NO	Input for outputs logic selection.
3	BU	0V	Supply voltage reference.
4	BK	NPN Out	Apply a load connected to the positive, maximum current 100mA.

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 the output as DARK ON. If it is connected to the positive, it selects the output as LIGHT ON.

Tab.:8

4.0 TECHNICAL SPECIFICATIONS

OPTICAL BEHAVIOR					
PARAMETERS		**Min.**	**Nom.**	**Max.**	**NOTE**
Standard detection range[1]	**m**	**0**		**5.0**	Depend on reflector type (see Tab.: 10)
Standard reflector range (excess gain≥1.5)[1]	**m**	**0.20**		**5.0**	Standard displacement between sensor and reflector (see Tab.: 10)
Reflector range with excess gain = 1[1]	**m**	**0.15**		**5.5**	Min/Max displacement between sensor and reflector (see Tab.: 10)
Aperture angle	**°**			**2.5**	
Detection capability	**mm**	**6**			Diameter of a testing rod normal to the area (see Tab.: 12)
Wavelength LEDs	**nm**		**617**		Red/Orange color, vertically polarized
Margin for a Teach_S			**1.5**		Ratio between taught Light level and Light threshold
Hysteresis for a Teach_S	**%**		**20**		Ratio between Light threshold level and Dark threshold
Margin for a Teach_F			**1.1**		Ratio between taught Light level and Light threshold
Hysteresis for Teach F	**%**		**10**		Ratio between Light threshold level and Dark threshold
Immunity for artificial light, direct	**Klux**		**50**		Incandescent lamp
Immunity for artificial light, direct	**Klux**		**5**		Fluorescent lamp

Tab.:9

NOTEs: **1)** It depends on the dimension and type of reflector, too close to the sensor the granularity of the reflector determine instability with vibration. Fine granularity increase minimum, area and type determine maximum. The best compromise is an active area size of 20x80mm and a prismatic cell size of 4mm. The factory setting is performed to the maximum range, it is necessary to always perform a calibration. If the indicated margins are unavailable, the teach function is interrupted.

RANGE WITH SPECIFIC REFLECTORS					
Reflectors	**ExG 1 (m)**	**ExG ≥1.5 (m)**	**ExG 1 (m)**	**Reflector active area (mm)**	**Reflector Size (mm)**
RL106G	**0.15**	**0.2...4.5**	**5.5**	**36 x 136**	**42 x 182**
RL135	**0.25**	**0.3...4**	**5**	**16 x 72**	**20 x 100**
RL100DCR0	**0.25**	**0.3...2.5**	**3**	**40 x 150**	**40 x 150**

Tab.:10

IDENTIFICATION OF THE ELEMENTS OF AN APPLICATION

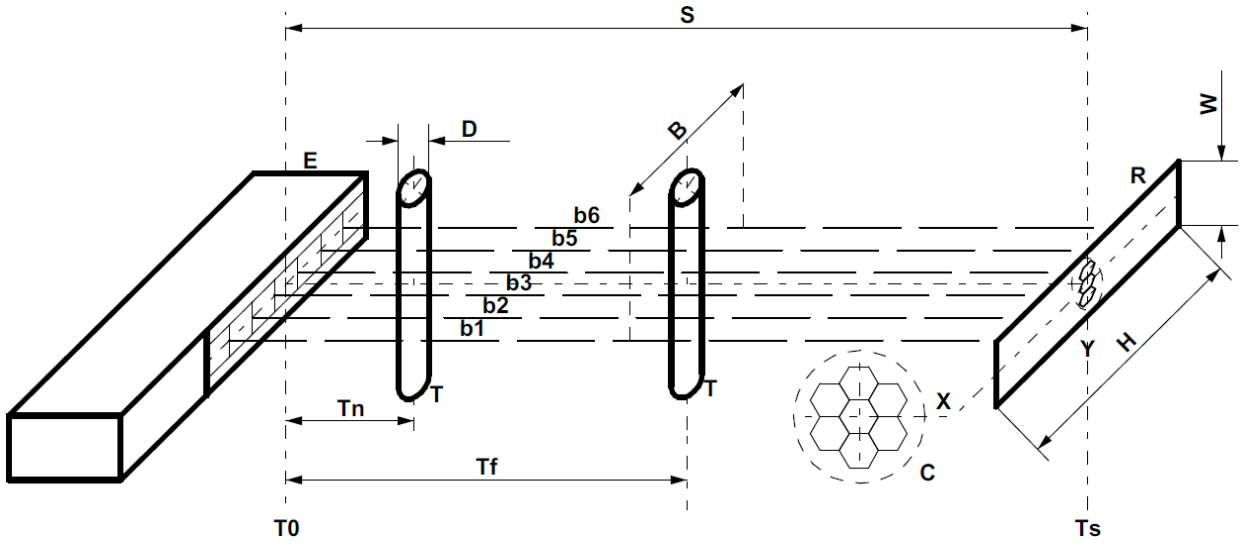


Fig.:1

E	Polarized reflex array sensor
R	Reflector, only the corner type is capable of handling polarized light
H	Length of the active surface of the reflector (dimensions optimized for best compromise range and resolution) 80mm
W	Width of the active surface of the reflector (dimensions optimized for best compromise range and resolution) 20mm
C	Best orientation of the reflective cells to obtain the minimum dark area (minimum S), optimum cell dimension:4mm
S	Distance between sensor and reflector (length of controlled area), from Smin (dark zone) to Smax (maximum range)
b1...b6	Pair of beams (emitted / reflected) determined by the array formed by four emitters and three receivers
B	Width of the controlled area (varies slightly according to dimension Tx) on average 60mm
T	Test rod of D diameter, the minimum diameter intercepted with continuity is indicated as MDO
D	Diameter of the test rod
T0	Minimum distance (T sliding to the front of E) , normally here MDO is worse than what you get between Tn and Tf.
Tn	Minimum distance assumed by T where you start to get the best MDO, in some cases Tn and Tf coincide
Tf	Distance assumed by T beyond which MDO is worse than what is obtained between Tn and Tf
Ts	The maximum distance taken by T (close the reflector surface) the MDO increases linearly between Tf and Ts

Tab.:11

DEFINITION OF THE MINIMUM DETECTABLE OBJECT WITHOUT INTERRUPTION DETERMINED BY THE DISTANCE OF THE REFLECTOR AND POSITION THE SAME OBJECT

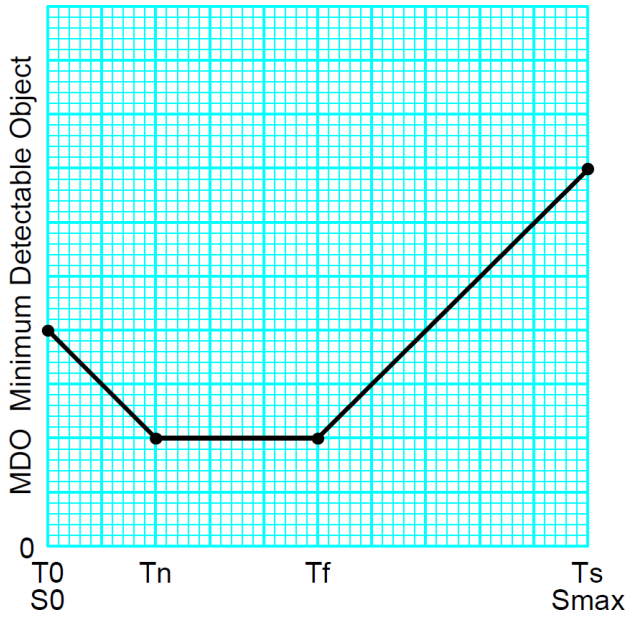


Fig.:2 Shape of the characteristic curve and identification of reference points on the graph.

Range (m)	MDO @ Tx (mm)								
	FineTeach				Standard Teach				
Smax	T0	Tn	Tf	Ts	T0	Tn	Tf	Ts	
0.5	0	250	250	500	0	0	100	500	Tx
	3.5	3	3	6	5	5	5	12	MDO
1	0	150	200	1000	0	0	100	1000	Tx
	3	3	3	4	5	5	5	14	MDO
1.5	0	200	600	1500	0	0	50	1500	Tx
	3.5	3	3	7	4.5	4.5	4.5	18	MDO
2	0	300	500	2000	0	150	250	2000	Tx
	4	2,5	2,5	7	6	4.5	4.5	18	MDO
2.5	0	400	700	2500	0	300	300	2500	Tx
	4,5	2,5	2,5	7	6	4.5	4.5	22	MDO
3	0	400	1400	3000	0	300	600	3000	Tx
	4,5	2.5	2.5	8	7	5	5	30	MDO
4	0	400	1500	4000	0	400	900	4000	Tx
	4.5	2.5	2.5	10	7	5	5	30	MDO

Tab.:12

Between T0 ... Tn and Tf ... Ts MDO varies in a quasi-linear way, so formulas can be used to obtain an approximate MDO value in these traits.

Formula for calculating an MDO for a Tx between Tf and Ts

$$(((MDO_{Ts} - MDO_{Tf})/(Ts-Tf))*(Tx-Tf))+MDO_{Tf}$$

Formula for calculating an MDO for a Tx between T0 and Tn

$$(((MDO_{Tn} - MDO_{T0})/Tn)*Tx)+MDO_{T0}$$

Tab.:13

ELECTRICAL MECHANICAL BEHAVIOR					
PARAMETERS		**Min.**	**Nom.**	**Max.**	**NOTES**
Power supply					
Operatin voltage	**V**	**16**	**24**	**30**	From PELV power supply according to EN 60204-1 Chap.6.4
Ripple	**V**			**1.2**	Supply voltage must stay within the stated limits
No load supply current	**mA**	**50**		**100**	Maximum current with the minimum voltage range (constant power)
Digital Outputs					
Output type (model **0I**)			**C/Q**		IO-Link, COM3, 2ms cycle, 4 wires, pin 2 as output or input
Output type (model **0B**)			**1xPNP, 1xNPN**		Completely protected, selectable NO or NC, 5 wires
Output type (model **0T**)			**1xPush-Pull**		Completely protected, selectable NO o NC, 4 wires
Output type (model **BP**)			**1xPNP NO; 1xPNP NC**		Completely protected, 4 wires
Output type (model **BN**)			**1xNPN NO, 1xNPN NC**		Completely protected, 4 wires
Output type (model **0P**)			**1xPNP**		Completely protected, selectable NO o NC, 4 wires
Output type (model **0N**)			**1xNPN**		Completely protected, selectable NO o NC, 4 wires
Current	**mA**			**100**	Higher values are interpreted as overload or short circuit
Voltage drop @100mA	**V**	**1.5**		**3**	Reduction in output voltage compared to the supply voltage
Resistive load (at 24V)	**Ω**	**280**			Lower values are interpreted as short circuit
Leakage current, models **0I**, **0B**, **BP**, **BN**	**µA**			**100**	Value at which the OFF state of the load must be guaranteed
Leakage current, models **0**T, **0P**, **0N**	**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
Response times					
Time delay before availability	**ms**			**300**	All outputs are in the OFF state during this time
Teach-in	**s**			**1**	
Outputs response time	**ms**			**1.2**	All emission LEDs active (4 LEDs)
Switghing frequency	**Hz**	**400**			All emission LEDs active (4 LEDs)
Output response time (formula)	**ms**	**((N_{LED}*0.1)+0.2)*2**			N_{LED}: number of active LEDs (maximum 4, not in Blanking)
Input levels					
Low level	**V**	**0**		**0.8**	Normally connected to common
Open level	**V**	**1.3**	**1.9**	**2.35**	Normally leaved open
High level	**V**	**5.8**		**30**	Normally connected to supply voltage
Integration time	**ms**		**20**		The input state must persist for at least this time
Input current for low level	**µA**	**-250**		**520**	Outgoing or incoming current
Input current for high level	**mA**	**0.52**		**1.2**	Incoming current
Teach-in time					
Short push time	**s**	**1**		**3**	
Long push time	**s**	**8**			
Environmental parameters					
Enclosure rating			**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**		**70**	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 rule
Shock			**Sec. IEC 60947-5-2**		It complies with limits and conditions stated in the rule
Sensing range correction factors					
Environmental factors			**0.50 / 0.25**		In presence of dust, fog, smoke (approximate values)
Connections					
Cable sections	**mm^2**		**0.34**		To be respected to guarantee the maximum indicated length
Total length of power cables	**m**			**100**	With cable of the indicated sections, standard models
Length of interconnect cables	**m**			**20**	Lenght of the connections: output, input, IO-Link
Size/Materials					
Housing section	**mm**		**20 (frontal) x 36**		Painted aluminum, blue color **RAL5002**
Total height	**mm**		**107**		
Fixing groove, for T shaped insert	**mm**		**2/10/6.5**		In the rear part of the sensor: depth/width/opening width
Width of the frontal window	**mm**		**15mm**		Active width: 9mm central, material: PMMA
Height of the frontal window			**104mm**		Active height: 69mm top
Number/Size of the lenses			**7/ 9*9mm**		Central part of the window, see Pict.: 1
Top closure	**N°**		**1**		Material: PC, transparent
Bottom closure	**N°**		**1**		Material: PBT + 30%GF, black colour
Closing screws	**N°**		**2+2**		M2, FE37 burnished
Connectors/Cables					
Models 0I, 0T, BP, BN, 0P, 0N			**1xM12, 4p, male**		Pigtail length 240mm, PVC, Ø 4,7mm, 0,34mm^2
Models 0B			**1xM12, 5p, male**		Pigtail length 240mm, PVC, Ø 4,7mm, 0,34mm^2

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5.0 START-UP INSTRUCTIONS

5.1 Mechanical mounting of CR models

It is extremely important to fix the sensors and the reflectors to a rigid structure, not subject to deformation or to strong vibrations.
Choose the position of the sensor so as not to expose it to strong sources of natural or artificial light and to light interference with other sensors in the visible emission.

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.
Choose the most suitable reflector to the required detection capabilities and sensing range.

Mount the sensor with the optical axes as much as possible perpendicular to the reflector surface. The mutual distance depends on the type of reflector and must be included in the field of specification. To secure the sensors to a support, use the corresponding inserts to be applied in the rear groove and the brackets in the normal provisioning.

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

Though used polarized light, the light beams can in part be deflected by reflective surfaces parallel and near to the beams, this can lead to a missed detections of the interruption of direct path of the of the optical beam, or incorrect calibration values that may generate unstable operation, so all reflective surfaces and reflective objects should maintain a minimum distance from the direct path of the rays. This distance depend on the aperture angle of optics.
Keep in mind that even if a surface is black, if it is shiny, it can be highly reflective.
If you can't eliminate or reduce the effect of a reflective surface, it is important that this effect remains stable or that the system behaves in an acceptable and predictable manner.
Temporarily block the sensor and reflector so that they are aligned and parallel to each other.

5.2 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 1000µF.
Connect the supply cables directly to the source and not downstream of other power or highly inductive devices.
Run the cables of the sensor in dedicated raceways or where only signals run; do not use raceways already carrying power cables.
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, power supply and loads 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 sensor is needed. Before starting this phase, make sure that the outputs' switch cannot lead to any danger.

Make the minimum electrical connections for proper operation, connect the power cables, connected to the necessary inputs devices; suitably connected the NC / NO input if it is available, this status is only acquired at power on.

5.3 Alignment of CR0 models

Applied the supply voltage, the Green LED must be switched on, if it is off or flashes the supply voltage is not sufficient.
Verify that the emission optics are active and therefore emit a red light, if necessary make a teach-in (even without visibility of the reflector) with the purpose to activate the alignment function. If possible, observe the reflector from a point near the optical axis and corrects the alignment so that the light stain completely illuminate the reflector, simultaneously or alternatively use the alignment function of the Red and Green LED (reduce the red light to a minimum).
Fix the sensor and run now a Teach_F and check the status of the LEDs, if the Red LED is off and the Green on, the alignment was acceptable and the Teach was successful. If both LEDs are still blinking it means that the alignment is incorrect, so try to get a better alignment then run a second Teach S or F. After successfully aligned, permanently block the sensor and verify that the sensor detects properly as expected. If possible, urging the structure, verify that the vibrations do not cause unstable operation.
If the LEDs show no recognizable behaviors check the error codes in **Chapter 5.5**

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.
If the range is short, the graininess of the reflector can cause instability, check the behaviour of the system by shifting the reflector, as an alternative use of reflective paper composed of micro prisms.
Please do not forget to reconnect all the cables and to control the correct functioning of the application.

5.4 Display indications and diagnostics.

MEANINGS OF LEDs SIGNALLING MODES	
☼	Indication of full light and steady
✥	Indication of low intensity or intermittently with fast periodic flashing
◐	Indication of slow continuous flashing
●	Off

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	LEDs INDICATIONS				
GN	●	No power supply or below 5V. Memory reading error.	RD	●	Light state. No power supply.
	◐	Power supply below 16V. Emission LEDs failed.		◐	Memory reading error.
	✥	Alignment. Outputs in short circuit		✥	Alignment. Some optics in Dark
	☼	Normal operation.		☼	Many or all optics in the DARK Fault or outputs in short circuit

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COMBINED INDICATIONS

GN	●◐	●	◐	☼	☼	↑✥	✥
RD	●	◐	☼	●	✥	↓✥	☼
STATUS	Power						Out
	OFF or LOW	MEMORY ERROR	FAULT	LIGHT	DARK	ALIGNEMENT	OVERLOAD

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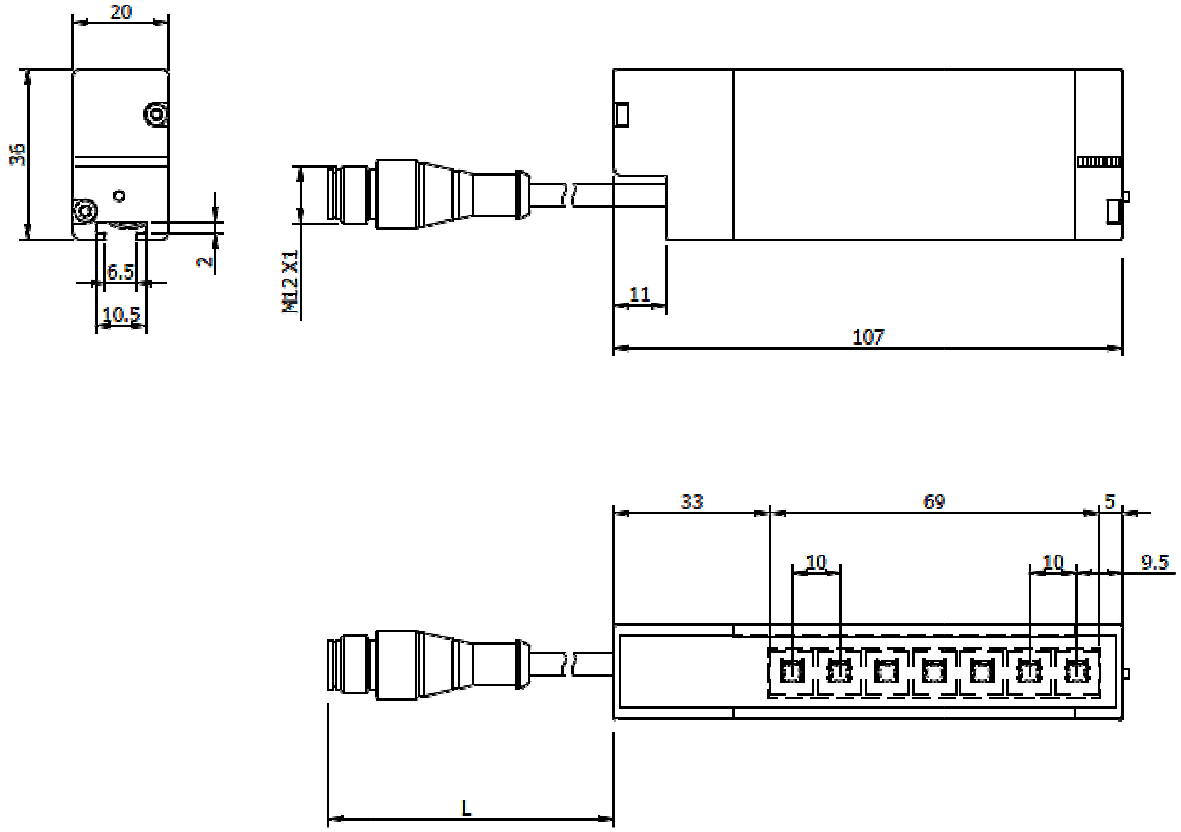
6.0 MECHANICAL DIMENSIONS OF LIGHT CURTAINS AND STANDARD ACCESSORIES

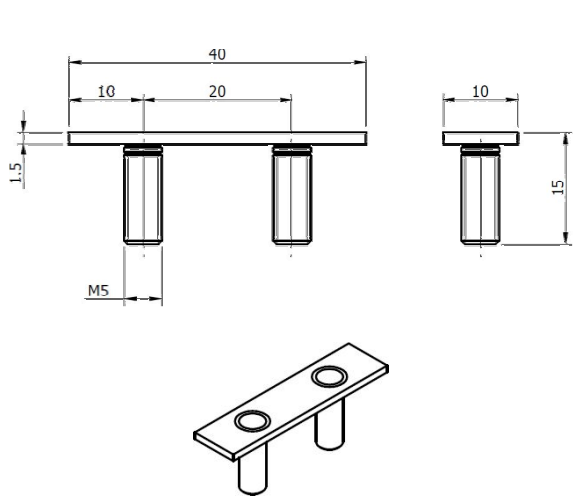
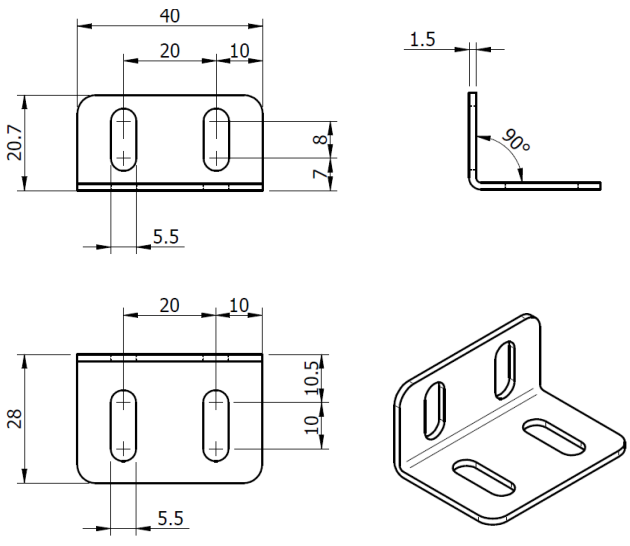
6.1 Mechanical dimensions of CR0/**-1V reflex curtains



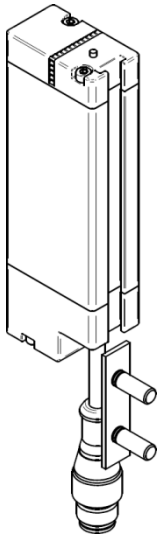
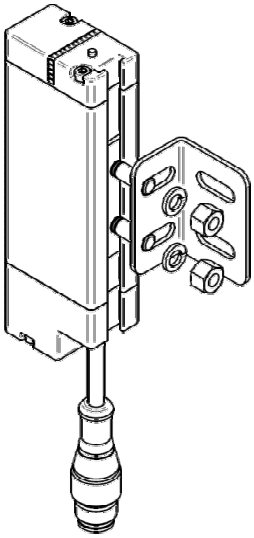
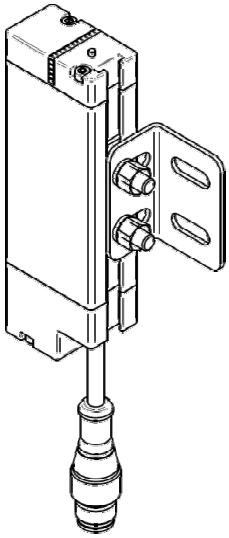
Pict.: 1
Pigtail cable length **L= 240mm**

6.2 Standard Mounting accessories

One unit is supplied by type

Kit mounting accessories ST151	
	
Pict.: 2 **T**-shaped insert, with two M5 nuts and two split washers.	**Pict.: 3** **L**-shaped mounting bracket

7.0 INSTALLATION

Securing CR0 light curtains with accessories' kit ST151		
		
Place the T-shaped insert	Mount the L-shaped bracket on the T-shaped insert	Secure light curtains to the wall

Pict.: 2

8.0 LIST OF AVAILABLE ACCESSORIES

M12 CONNECTORS, 4 POLES, WITH CABLE	
CD12M/0B-020A1	M12 connector, straight, 4 poles, female, 2m PVC cable
CD12M/0B-050A1	M12 connector, straight, 4 poles, female, 5m PVC cable
CD12M/0B-100A1	M12 connector, straight, 4 poles, female, 10m PVC cable
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
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
STANDARD MOUNTING KIT FOR LIGHT CURTAINS	
ST151	Kit with T-shaped insert with four M5 screws complete with nuts and washers and an L-shaped bracket
VIBRATION DAMPING SUPPORTS	
ST 4V S	Kit of 4 vibration-damping supports

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9.0 PACKAGE CONTENT

Each package has the following content:

- A retroreflective area sensor.
- An accessories' kits ST151 (T-shaped insert and L-shaped bracket)
- Reflector R106G
- Multilingual installation short manual.

10.0 CONTROL OF THE INSTALLED RETROREFLECTIVE AREA SENSOR

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 emitted light.
- 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.