LD30ETBI10BPxxIO - IO-Link

Photoelectric Time Of Flight Sensors with IO-Link communication



Description

The LD30ETBI10BP..IO stainless steel sensors are built with high-quality materials and designed for harsh environments.
They are designed for use in environments where high-pressure cleaning, cleaning agents and disinfectants are used on a daily basis.
The strong stainless steel (AISI316L) together with high-quality plastic materials like PEEK, PPSU, and PES sealings of FKM ensure a safe and excellent mechanical resistance.
The sensor housing has the IP69K rating as well as approval by ECOLAB for cleaning and disinfection agents.
The compact sensor design is ideally suited to confined spaces.

Benefits

- **Long range Background suppression** TOF (Time of Flight) sensor with IO-Link with a adjustable distance of 50 to 1.000 mm, either by potentiometer or via IO-Link.
- **Infrared laser class 1** assure a reliable detection.
- **Easy customization** to specific OEM requests by use of the build in IO-Link functionalities.
- **The output can be operated** either as a standard switching output or in IO-Link mode.
- **Fully configurable via output IO-Link v 1.1.** Electrical outputs can be configured as PNP / NPN / Push-Pull / External input, normally open or normally closed.
- **Timer functions** can be set, such as ON-delay, Off-delay, and one shots.
- **Logging functions:** Temperatures, detecting counter, power cycles and operating hours.
- **Detection modes** Single point, two point and windows mode.
- **Logic functions:** AND, OR, XOR and Gated SR-FF.
- **Analogue output:** In IO-Link mode the sensor will generate 16 bit analogue process data output representing the distance to the object.
- IO-Link
- LASER 1

Applications

- The sensor has multiple detects functions e.g. in single point mode the presence or absence of objects are detected while cutting off the background information.
- The detection distance is very independent of the colour of the objects to be detected.
- The “analogue” distance from the sensor to the object is available via the IO-Link communication.

Main functions

- The sensor can be operated in IO-Link mode once connected to an IO-Link master or in standard I/O mode.

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Adjustable parameters via IO-Link interface:

- Sensing distance and hysteresis.
- Sensing modes: single point or two point or window mode.
- Timer functions, e.g.: On-delay, Off delay, One shot leading edge or trailing edge.
- Logic functions such as: AND, OR, X-OR and SR-FF.
- External input.
- Logging functions: Maximum temperatures, minimum temperatures, operating hours, operating cycles, power cycles, minutes above maximum temperature, minutes below minimum temperature, etc.
- Auto hysteresis

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References

Product selection key

LD30ETBI10BP ☐ IO

Enter the code option instead of ☐

Code	Option	Description
L	-	Sensing principle: Photoelectric sensor
D	-	Rectangular housing
30	-	Length of housing
E	-	Stainless steel
T	-	Top trimmer
B	-	Diffuse reflective, Background suppression
I	-	infrared light
10	-	Sensing distance: 1000 mm
B	-	**Selectable functions:** NPN, PNP, Push-Pull, External Input (only pin 2) or External teach input (only pin 2)
P	-	**Selectable:** N.O. or N.C.
☐	A2	Cable, 2 m
	M5	Connector M8
IO	-	IO-Link version

Type selection

Connec-tion	Housing	Code
Cable	Stainless steel	**LD30ETBI10BPA2IO**
Plug	Stainless steel	**LD30ETBI10BPM5IO**

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Structure

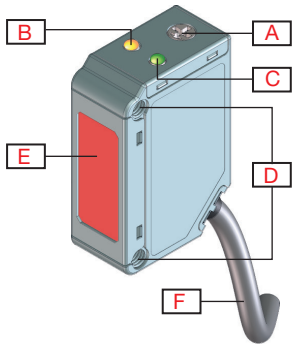


Fig. 1 *Cable*

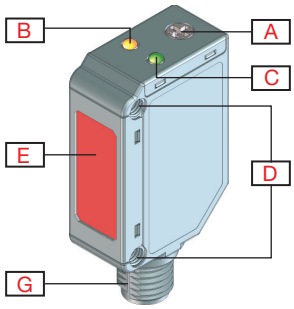


Fig. 2 *Plug*

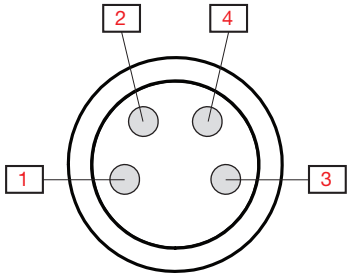


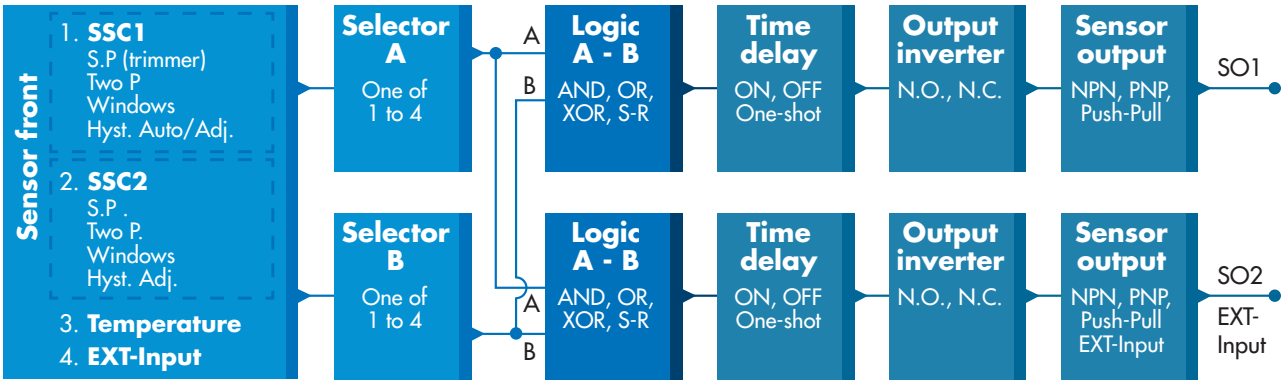
Fig. 3 *"M8-plug" Pin numbers*

A	Sensitivity adjustment (|Back trimmer)	**G**	M8, 4-pin male connector
B	Yellow LED	**1**	Brown
C	Green LED	**2**	White
D	M3 Fixing holes for sensor mounting	**3**	Blue
E	Sensing window	**4**	Black
F	2 m, 4 wire PVC Ø 3.3 mm cable		

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Sensing

Detection



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Sensor switching channel SSC1 and SSC2	**SSC1** • Enabled • Disabled ***Factory settings:*** *Enabled*	**SSC2** • Enabled • Disabled ***Factory settings:*** *Enabled*
Switching mode	**SSC1** • Deactivated • Single point mode • Two point mode • Windows mode ***Factory settings:*** *Single point mode*	**SSC2** • Deactivated • Single point mode • Two point mode • Windows mode ***Factory settings:*** *Single point mode*
Rated operating distance (S_n)	1000 mm	Reference target, white paper with 90 % reflectivity, Size 200x200 mm
Maximum detection distance	< 1000 mm	White object 90% reflection
	< 1000 mm	Grey object 18% reflection
	< 1000 mm	Black object 6% reflection
Sensitivity control	Adjustable by potentiometer, external teach or by IO-Link settings • Potentiometer disabled (SSC1) • Potentiometer enabled (SSC1) • External teach ***Factory settings:*** *Potentiometer enabled*	
Sensitivity adjustment	50 mm ... 1000 mm	Single-turn potentiometer
	210°	Electrical adjustment
	240°	Mechanical adjustment
Blind zone	0 mm	White object 90% reflection
	0 mm	Grey object 18% reflection
	0 mm	Black object 6% reflection
Light source	940 nm	Infrared
Light type	Laser modulated	
Laser class	1	
Detection angle	± 1.2°	@1000 mm
Light spot size	Ø 18 mm	@500 mm (|approximation)
Emitter beam angle	± 1.1°	@500 mm
Adjustable distance	50-1000 mm ***Factory settings:*** *SP1 1000 and SP2 750*	White object 90% reflection
	50-1000 mm ***Factory settings:*** *SP1 1000 and SP2 750*	Grey object 18% reflection
	50-1000 mm ***Factory settings:*** *SP1 1000 and SP2 750*	Black object 6% reflection
Hysteresis (H) **Manual** **Automatic**	Adjustable by IO-Link 5 - 2000 mm (default 50 mm) ≤10% @ Sn (On all objects)	
Detection filter	This function can increase the immunity towards unstable targets and electromagnetic disturbances: Value can be set from 1 to 255. ***Factory settings:*** *1* (1 is max. operating frequency and 255 is min. operating frequency)	

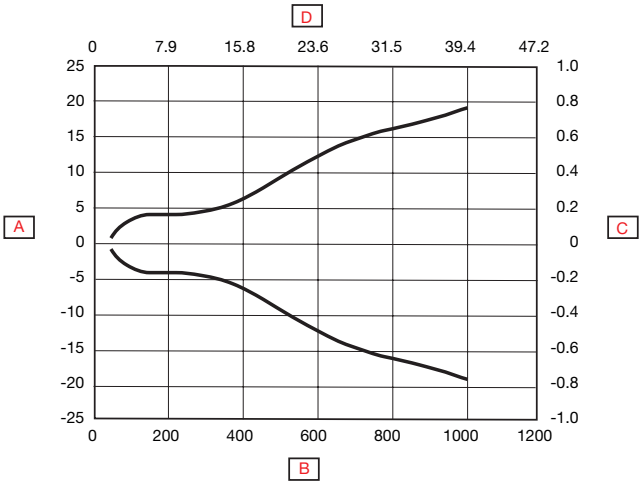
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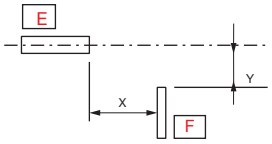
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Alarm settings

Temperature alarm	• High threshold -50 to +150 °C • Low threshold -50 to +150 °C ***Factory settings:*** *High value 70 °C* *Low value -20 °C*

Detection diagram





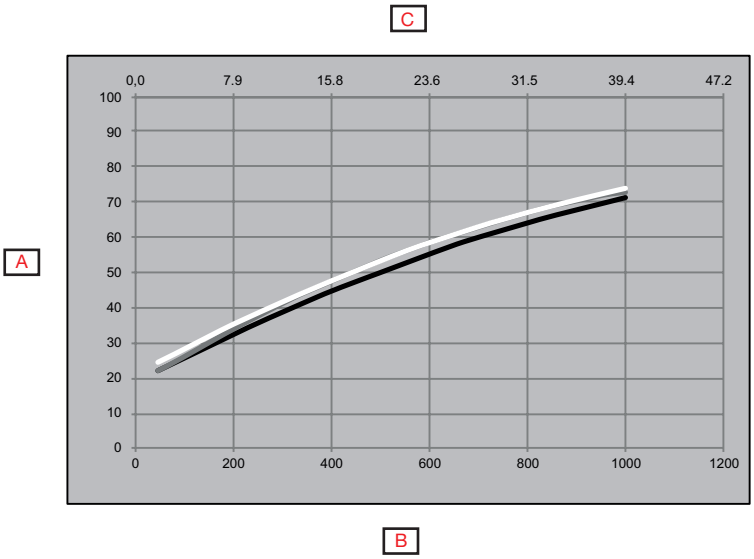
A	Detection width (mm)	**D**	Sensing range (inches)
B	Sensing range (mm)	**E**	Sensor
C	Detection width (inches)	**F**	Object 25 x 25 mm, White 90%

Accuracy

Temperature drift	≤ 0.05%/ºC

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Sensing conditions



A	Distance from background (mm)		(Black on white 6%/90%)
B	White background 90% (mm)		(Grey on white 18%/90%)
C	White background 90% (inches]		(White on white 90%/90%)

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Features

Power Supply

Rated operational voltage (U_B)	10 ... 30 VDC (ripple included)
Ripple (U_{rpp})	≤ 10%
No load supply current (I_o)	≤ 25 mA @ U_B min.
	≤ 12 mA @ U_B max.
Power-ON delay (t_v)	≤ 300 ms

Input selector

Input selector	**Channel A** • Deactivated • SSC1 • SSC2 • Temperature alarm • External input ***Factory settings:*** *SSC1*	**Channel B** • Deactivated • SSC1 • SSC2 • Temperature alarm • External input ***Factory settings:*** *SSC1*

Logic functions

Logic functions	**Channel A + B for SO1** • Direct • AND • OR • X-OR • SR-FF ***Factory settings:*** *Direct*	**Channel A + B for SO2** • Direct • AND • OR • X-OR • SR-FF ***Factory settings:*** *Direct*

Time delays

Timer mode	**For SO1** • Disabled • Power-ON delay • Power-OFF delay • Power-ON delay and Power-OFF delay • One-shot leading edge • One-shot trailing edge ***Factory settings:*** *Disabled*	**For SO2** • Disabled • Power-ON delay • Power-OFF delay • Power-ON delay and Power-OFF delay • One-shot leading edge • One-shot trailing edge ***Factory settings:*** *Disabled*
Timer scale	**For SO1** • [ms] • [s] • [min] ***Factory settings:*** *ms*	**For SO2** • [ms] • [s] • [min] ***Factory settings:*** *ms*
Timer value	**For SO1** • 0 ... 32 767 ***Factory settings:*** *0*	**For SO2** • 0 ... 32 767 ***Factory settings:*** *0*

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Output Inverter

Output Inverter	**For SO1 Pin 4 Black wire:** • N.O. • N.C. ***Factory settings:*** *N.O.*	**For SO2 Pin 2 White wire:** • N.O. • N.C. ***Factory settings:*** *N.C.*

Sensor Output

Switching Output Stage SO1 and SO2	**For SO1 Pin 4 Black wire:** • NPN • PNP • Push-Pull ***Factory settings:*** *PNP*	**For SO2 Pin 2 White wire:** • NPN • PNP • Push-Pull • External input, active high • External input, active low • External teach ***Factory settings:*** *PNP*

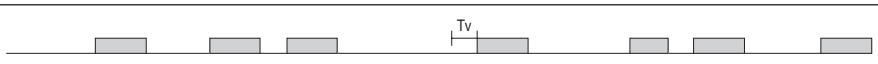
Outputs

Rated operational current (I_e)	≤ 100 mA from -25 ... 40°C (SO1 + SO2) 50 mA @ ≥40°C (SO1 + SO2)	
OFF-state current (I_r)	≤ 100 µA	
Minimum operational current (I_m)	> 0,5 mA	
Voltage drop (U_d)	≤ 1.0 VDC @ 100 mA DC	
Protection	Short circuit, reverse polarity, transients	
Utilization category	DC-12	Control of resistive loads and solid-state loads with optical isolation
	DC-13	Control of electromagnets
Capacitive load	100 nF @ 100 mA	

Operation diagram

For default factory sensor

Tv = Power-ON delay

Power supply	ON	
Target (Object)	Present	
Break output (N.C.)	ON	
Make output (N.O.)	ON	

Response times

Operating frequency (f)	≤ 5 Hz	
Response times	≤ 100 ms	OFF-ON (t_{ON})
	≤ 100 ms	ON-OFF (t_{ON})

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Indication

Green LED	Yellow LED	Power	Function
SIO and IO-Link mode			
ON	ON	ON	ON (stable)* SSC1
ON	OFF	ON	OFF (stable)* SSC1
OFF	ON	-	ON (Not stable) SSC1
OFF	OFF	-	OFF (Not stable) SSC1
-	Flashing 10 Hz 50% dutycycle	ON	Output short-circuit
-	Flashing (0.5…20 Hz)	ON	Timer indication
SIO mode only			
-	Flashing 1 HZ ON 100 ms OFF 900 ms	ON	External teach by wire. Only for single point mode
-	Flashing 1 HZ ON 900 ms OFF 100 ms	ON	Teach time window (3 - 6 sec)
-	Flashing 10 HZ ON 50 ms OFF 50 ms Flashing for 2 sec	ON	Teach time out (12 sec)
-	Flashing 2 HZ ON 250 ms OFF 250 ms Flashing for 2 sec	ON	Teach successful
IO-Link mode only			
Flashing 1 HZ ON 900 ms OFF 100 ms	-	ON	Sensor is in IO-Link mode
Flashing 2 Hz 50% dutycycle		ON	Find my sensor

**See operation diagram*

LED indication

LED indications	• LED Indication disabled • LED Indication enabled • Find my sensor ***Factory settings:*** *LED Indication enabled*

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Environmental

Ambient temperature	-25°... +50°C (-13°... +122°F)	Operating [1]
	-40° ... +70°C (-40° ... +158°F)	Storage [1]
Ambient light	≤ 50 000 lux (indirect) @ <5°	@ 3000 … 3200 °K
	≤ 5 000 lux (direct) @ <5°	
Vibration	10 ...150 Hz, 1.0 mm/15 g	EN 60068-2-6
Shock	30 g_n / 11 ms, 6 pos, 6 neg per axis	EN60068-2-27
Drop test	2 x 1 m and 100 x 0.5 m	EN 60068-2-31
Rated insulation voltage (U_i)	50 VDC	
Dielectric insulation voltage	≥ 500 VAC rms	50/60 Hz for 1 min.
Rated impulse withstand voltage	1 kV	1.2/50 µs
Pollution degree	3	EN60947-1
Overvoltage category	III	IEC60664; EN60947-1
Degree of protection	IP68 @ 2 m and 20 h	IEC60539; EN60947-1
	IP69K	DIN 40050-9
NEMA Enclosure Types	1, 2, 4, 4x, 5, 6, 6P	NEMA 250
Ambient humidity range	35% ... 95%	Operating [2]
	35% ... 95%	Storage [2]

[1] *Do not bend the cable in temperatures below -10°C*
[2] *With no icing or condensation*

EMC

Electrostatic discharge immunity test	± 8 kV @ air discharge or ± 4 kV @ contact discharge	IEC 61000-4-2
Radiated radio-frequency electromagnetic field immunity test (80 MHz ... 1 GHz and 1..4 GHz ... 2 GHz)	10 V/m	IEC 61000-4-3
Electrical fast transient/Burst immunity test	±2 kV / 5 kHz using the capacitive coupling clamp	IEC 61000-4-4
Conducted disturbances induced by radio-frequency fields immunity test (150 kHz ... 80 MHz)	10 Vrms	IEC 61000-4-6
Power frequency magnetic field immunity test	30 A/m 38 µT	IEC 61000-4-8

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Diagnostic parameters

Function	Unit	Range
Values stored in the sensor (Saved every hour)		
Operating Hours	[h]	0 … 2 147 483 647
Number of Power Cycles	[cycles]	0 … 2 147 483 647
Maximum temperature - All time high	[°C]	-50 ... +150
Minimum temperature - All time low	[°C]	-50 ... +150
Detection counter SSC1	[cycles]	0 … 2 147 483 647
Minutes above Maximum Temperature	[min]	0 … 2 147 483 647
Minutes below Minimum Temperature	[min]	0 … 2 147 483 647
Values stored in the sensor (Saved with events)		
Download counter	[counts]	0 …65 536
Values not saved in sensor		
Maximum temperature - Since last power-up	[°C]	-50 ... +150
Minimum temperature - Since last power-up	[°C]	-50 ... +150
Current temperature	[°C]	-50 ... +150

Events Configuration

Events	Factory default setting
Temperature fault event	Inactive
Temperature over-run	Inactive
Temperature under-run	Inactive
Short circuit	Inactive

Process data configuration

Process Data	Factory default setting
Analogue value	Active
SO1, Switching output 1	Active
SO2, Switching output 2	Active
SSC1, Sensor switching channel 1	Inactive
SSC2, Sensor switching channel 2	Inactive
TA, Temperature alarm	Inactive
SC, Short circuit	Inactive

Process data structure

4 Bytes, Analogue value 16 ... 31 (16 bit)

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Byte 0	31	30	29	28	27	26	25	24
	MSB	-	-	-	-	-	-	-
Byte 1	23	22	21	20	19	18	17	16
	-	-	-	-	-	-	-	**LSB**
Byte 2	15	14	13	12	11	10	9	8
	-	-	-	-	**SC**	**TA**	**SSC2**	**SSC1**
Byte 3	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	**SO2**	**SO1**

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Mechanics/electronics

Connection

Cable	2 m, 4-wire 4 x 0.14 mm², Ø = 3.3 mm, PVC, Black
Plug	M8, 4-pin, male

Wiring

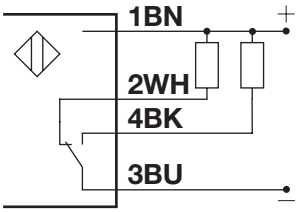


Fig. 4 *NPN*

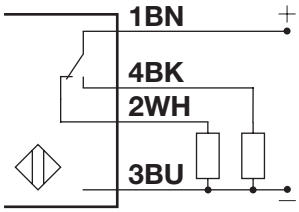


Fig. 5 *PNP*

BN	WH	BK	BU
Brown	White	Black	Blue

Housing

Body	Stainless steel, AISI316L	
Front glass	PPSU, Red	
Trimmer shaft	PEEK, Light grey	
Indication	PES, Transparent	Polyethersulfone
Sealing	FKM	Fluoroelastomer
Cable gland	FKM	Fluoroelastomer
Dimensions	11 x 31.5 x 21 mm	
Weight	≤ 100 g	Cable version
	≤ 65 g	Plug version

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Dimensions

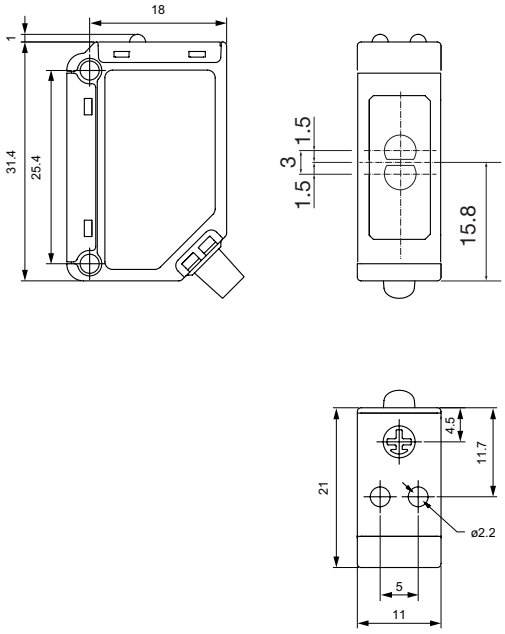


Fig. 6 *Cable*

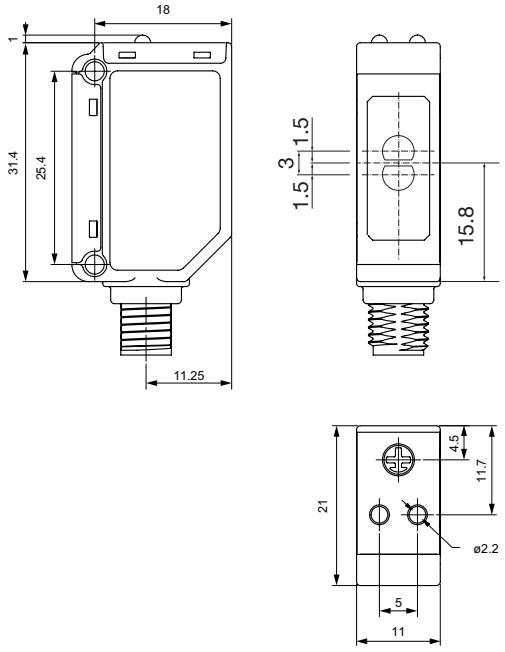


Fig. 7 *Plug*

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Compatibility and conformity

Approvals and markings

General reference	Sensor designed according to EN60947-5-2	
MTTF$_d$	132.3 years @ 40°C (+104°F)	ISO 13849-1, SN 29500
CE-marking	CE	
Approvals	c UL us (UL508 + C22.2)	
Other Approvals	ECOLAB	Topax 56, Topaz AC1, Topaz MD3, Topaz CL1, Topactiv OKTO, P3-hypochloran
	LASER 1	Class 1 laser according to IEC 60825-1:2014 Complies with IEC / EN 60825-1:2014 and 21 CFR 1040.10 1040.11 except for deviations pursuant to Laser Notice No. 56, dated January 19, 2018

IO-Link

IO-Link revision	1.1
Transmission rate	COM2 (38.4 kbaud)
SDCI-Norm	IEC 61131-9
Profile	Smart sensor profile 2nd edition, common profile
Min. cycle time	5 ms
SIO mode	Yes
Min. master port class	A (4-pin)
Process data length	32 bit

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Delivery contents and accessories

Delivery contents

- Photoelectric switch: LD30ETBI10BPxxIO
- Screwdriver
- Packaging: Carton box
- Mounting bracket: APD30-MB1

Accessories

- Mounting bracket: APD30-MB2 to be purchased separately
- Connector type: CON.54NF..W series to be purchased separately

Further information

Information	Where to find it	QR
IO-Link manual	http://cga.pub/?c0e592	
Mounting brackets	http://cga.pub/?6fa29a	
Connectors	http://cga.pub/?3abadc	

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