

Photoelectric Background Suppression PointSpotsensors with IO-Link communication



Description

The PD30CTBS25BPxxIO are a part of the latest generation of high performance photoelectric sensors designed to solve most detection tasks due to the new IO-Link features.

The sensors are implemented in the compact 10 x 20 x 30 mm ABS housing that are acknoledged world wide.

New implemented functions with weight on functionality, reliability, Predictive maintenance make these sensors ideal for Industry 4.0.

Benefits

- Background Suppression PointSpot sensor with IO-Link with a adjustable distance of 25 to 250 mm, either by trimmer or via IO-Link.
- Application functions: Pattern Recognition, Speed & Length, Divider function and Object & Gap Monitoring.
- **Neighbour Immunity**, selectable up to 3 sensors
- 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, windows and foreground suppression (FGS) 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 various selectable process data such as received signal level.





Pattern Recognition: An easy way to verify that a product is manufactured to the specification e.g. Furniture production where tabs or holes has to be with a defined pattern.

Speed and Length: Monitor the speed and length of an object on a conveyour for e.g. sorting on size.

Divider function: A de-central counting function that gives a signal when a preset count level is reached e.g. when a certain items are packed in a carton box it ask for a new box.

Object and Gap Monitoring: Function that can sort out good objects and gaps between them so e.g. a packaging machine only reveive objects with the correct size and gaps.

Main functions

- Detects presence or absence of objects that cut off the light from the emitter
- The detection distance is very independent of the colour of the object to detect.
- The PointSpot light source removes halo light and increases detection reliability.
- The sensor can be operated in IO-Link mode once connected to an IO-Link master or in standard I/O mode.



- Received sensing distance as process data.
- Neighbor inference protection.
- · Sensing distance by potentiometer, teach by wire or by IO-link parameter.
- Quality of Run and Quality of Teach result.
- Temperature date for preventive maintenance.
- Front-end check for preventive maintenance.

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
- Special functions: Pattern Recognition, Speed & Length, Divider function and Object & Gap Monitoring.

References

Product selection key

PD30CTBS25

Enter the code option instead of \Box

Code	Option	Description
Р	-	Sensing principle: Photoelectric sensor
D	-	Rectangular housing
30	-	Length of housing
С	-	Plastic housing
т	-	Top trimmer
В	-	Background suppression
S	-	PointSpot
25	-	Sensing distance: 250 mm
В	-	Selectable functions: NPN, PNP, Push-Pull, External Input (only pin 2) or External teach input (only pin 2)
Р	-	Selectable: N.O. or N.C.
	A2	Cable, 2 m
	M5	Connector M8
IO	-	IO-Link version

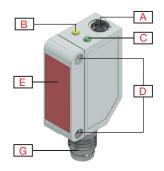
Type selection

Connec- tion	Housing	Light type	Code
Cable	Plastic housing	Red PointSpot	PD30CTBS25BPA2IO
Plug	Plastic housing	Red PointSpot	PD30CTBS25BPM5IO



Structure





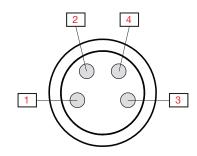


Fig. 1 Cable

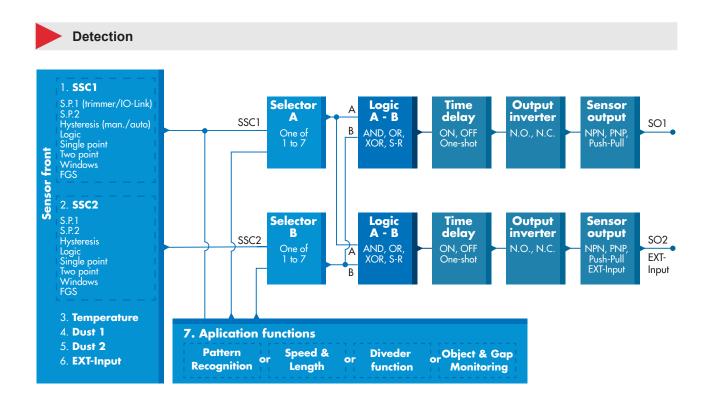
Fig. 2 Plug

Fig. 3 "M8-plug" Pin numbers

Α	Sensitivity adjustment (Top trimmer)	G	M8, 4-pin male connector
В	Yellow LED	1	Brown
С	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		



Sensing





Naximum detection distance \$ 250 mm % reflectivity, Size 200x200 mm Maximum detection distance \$ 250 mm Grey object 18% reflection \$ 250 mm Grey object 18% reflection \$ 250 mm Black object 6% reflection \$ 250 mm Cutoff distance value will also be used when an object cannot be detected. • IO-Link Adjustment (SSC1) • Trimmer Input (SSC1) • Trimmer Input (SSC1) • Trimmer Input (SSC1) • Tach by wire (SSC1) • Tach by wire (SSC1) • Factory settings: Trimmer Input Single-turn potentiometer \$ 17 mm Grey object 18% reflection \$ 17 mm Grey object 18% reflection \$ 19 mm Black object 6% reflection \$ 10 m / Red modulated PointSpot • 0.8° @ half sensing distance Ight spot size Ø 3.1 mm @ 125 mm Emitter beam angle ± 0.7° @ 125 mm \$ 25 275 mm Factory settings: SP1 250 and SP2				
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Automatic Factory settings: 17 mm This function can increase the immunity towards unstable targets and electromagnetic disturbances: Value can be set from 1 to 255	Manual • 2 mm 275 mm			
This function can increase the immunity towards unstable targets and electromagnetic disturbances: Value can be set from 1 to 255				
electromagnetic disturbances: Value can be set from 1 to 255	Automatic			
electromagnetic disturbances: Value can be set from 1 to 255.				
	Detection filter	electromagnetic disturbances: Value can be set from 1 to 255.		
Factory settings: 1				
(1 is max. operating frequency and 255 is min. operating frequency)				



Mutual Inteference Protection	 MIP Off One channel 2 channels - CH A 2 channels - CH B 3 channels - CH A 3 channels - CH B 3 channels - CH B 3 channels - CH C 	Factory settings: MIP Off
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Application functions

Selectable dedicated applications	 No application Pattern Recognition Speed and Length Divider function Object and Gap Monitoring 	Factory settings: No application
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Pattern Recognition

Function description	The Pattern recognition function detects a pattern (e.g. a row of holes or pins) and compare the order with a pre-teached reference pattern.	
Conditions Two sensors (Main sensor and Trigger sensor) are needed		
Settings	 The Trigger sensor has to detect the full length of the body that contains the pattern. The Main sensor has to be aimed at the e.g. holes or pins that constitute the pattern. 	

Speed and Length

Function description	This function is designed to monitor the length of an object as well as the speed of a conveyour belt. The actual value if the length in [mm] and the speed in [mm/s] are directly available on the IO-Link master.	
Conditions	Two sensors (Main sensor and Trigger sensor) are needed for this function.	
Settings	Distance between sensors.	25 150 mm <i>Factory settings:</i> 100 mm

Divider function

Function description	This function can be used to e.g. monitor how many items that are packed into a carton box. Once the preset number is reached the sensor gives an output so the full box can be replaced.		
Conditions	Only one sensor is needed for this function.		
	A counter value must be set in the sensor.		
Settings	Counter limit.	160 000	
		Factory settings: 5	



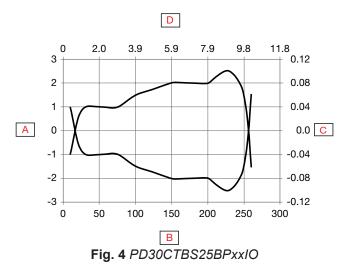
Object and Gap Monitoring

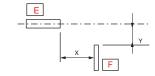
Function description	This function is designed to monitor, that the length of an object and the gap between the following object on a conveyer belt, are witin certain limits.			
Conditions	Only one sensor is needed for thi	Only one sensor is needed for this function.		
	An acceptable minimum and maximum time [ms] mus be set for both the object size a gap size between two objects represented by the time it takes to pass the sensor.			
	Object minimum time.	1060 000 ms <i>Factory settings:</i> 500 ms		
Settings	Object maximum time.	1060 000 ms <i>Factory settings:</i> 10 000 ms		
	Gap minimum time.	1060 000 ms <i>Factory settings:</i> 500 ms		
	Gap maximum time. 1060 000 ms <i>Factory settings:</i> 10 00			
Outputs	Output 1 is active when an object is outside the set limits. Output 2 is active when the gap between two objects is outside the set limits.			

Alarm settings

	SSC1	SSC2
Safe limits	• 0 100 % of actual SP	• 0 100 % of actual SP
	Factory settings: 5%	Factory settings: 5%
Dust alarm	Safe limits are used for dust alarm leve	el.
	• High threshold -50 +150 °C	
	• Low threshold -50 +150 °C	
Temperature alarm	Factory settings:	
	High value 70 °C	
	Low value -20 °C	

Detection diagram





Α	Detection width (mm)	D	Sensing range (inches)
В	Sensing range (mm)	E	Sensor
С	Detection width (inches)	F	Object 25 x 25 mm, White 90%

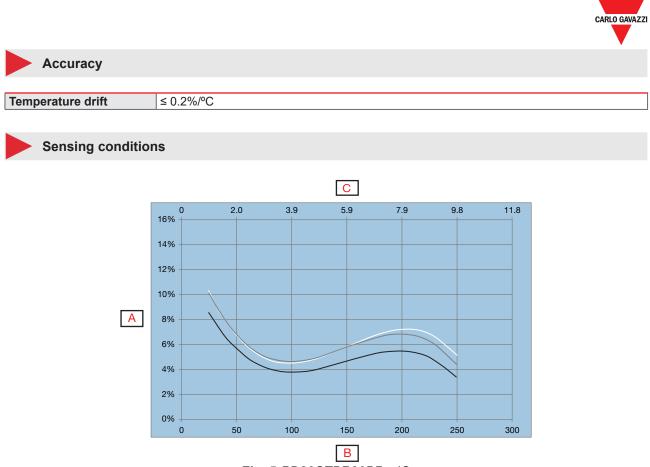


Fig. 5 PD30CTBR20BPxxIO

Α	Distance from background (%)	(Black on white 6%/90%)
В	White background 90% (mm)	(Grey on white 18%/90%)
С	White background 90% (inches]	(White on white 90%/90%)



Features

Pow

Power Supply

Rated operational voltage (U _B)	10 30 VDC (ripple included)
Ripple (U _{rop})	≤ 10%
No load oursely oursent (L)	≤ 45 mA @ U _β min.
No load supply current (I _o)	\leq 20 mA @ U _B max.
Power-ON delay (t _v)	≤ 150 ms

Input selector

	Channel A	Channel B
	Deactivated	Deactivated
	• SSC1	• SSC1
	• SSC2	• SSC2
Input coloctor	• Dust alarm 1	• Dust alarm 1
Input selector	• Dust alarm 2	• Dust alarm 2
	Temperature alarm	Temperature alarm
	• External input	External input
	Application functions	Application functions
	Factory settings: SSC1	Factory settings: SSC1

Logic functions

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



Ti

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



	For SO1 Pin 4 Black wire	For SO2 Pin 2 White wire
	 Disabled output 	 Disabled output
	• NPN	• NPN
	• PNP	• PNP
Sensor output	• Push-Pull	• Push-Pull
Sensor output		 External input, active high
		 External input, active low
		External teach
		Mute input
	Factory settings: PNP	Factory settings: PNP
	For SO1 Pin 4 Black wire	For SO2 Pin 2 White wire
Output Inverter	• N.O.	• N.O.
Output inventer	• N.C.	• N.C.
	Factory settings: N.O.	Factory settings: N.C.
Rated operational current (I)	≤ 100mA (continuous) pr. output	
	100 mA @ 100 nF Load (Short-time) p	r. output
OFF-state current (I,)	≤ 50 µA	
Minimum operational current (I _m)	> 0,5 mA	
Voltage drop (U _d)	≤ 1.0 VDC @ 100 mA	
Protection	Short circuit, reverse polarity, transient	ts
	DC-12	Control of resistive loads and solid-
Utilization category		state loads with optical isolation
	DC-13	Control of electromagnets
Capacitive load	100 nF @ 100 mA, 24 VDC	

• Operation diagram

For default factory sensor

Tv = Power-ON delay

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

Response times

Operating frequency (f)	≤ 500 Hz	
Paananaa timaa	≤ 1 ms	OFF-ON (t _{on})
Response times	≤ 1 ms	ON-OFF (t _{OFF})

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	OFF	OFF	OFF (Not stable) SSC1
Flashing 1 Hz (10% or 90% du- tycycle)	-	ON	Connected via IO-Link
-	Flashing 10 Hz 50% dutycycle	ON	Output short-circuit
-	Flashing 0.520 Hz 50% dutycycle	ON	Timer triggered 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.
		O-Link mode only	
Flashing 1 HZ ON 900 ms OFF 100 ms	-	ON	Sensor is in IO-Link mode.
	g 2 Hz itycycle	ON	Find my sensor

*See operation diagram



LED indication

LED indication selection	
	 Find my sensor Factory settings: LED indication active

Environmental

Ambient temperature	-25° +60°C (-13° +140°F)	Operating ¹⁾	
Amplent temperature	-40° +85°C (-40° +185°F)	Storage ¹⁾	
Ampliant humidity you we	35% 95%	Operating ²⁾	
Ambient humidity range	35% 95%	Storage ²⁾	
Ambient light	≤ 5 000 lux	@ 3000 3200 °K	
Vibration	10150 Hz, 1.0 mm/15 g	EN 60068-2-6	
Shock	30 g _n / 11 ms, 3 pos, 3 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 (with 500 Ω) 1.2/50 μs		
Pollution degree	3	IEC60664, 60664A; EN60947-1	
Overvoltage category	III IEC60664; EN60947-1		
Degree of protection	IP67 IEC60539; EN60947-1		
NEMA Enclosure Types	1	NEMA 250	

 $^{\scriptscriptstyle 1)}$ Do not bend the cable in temperatures below -10°C

²⁾ With no icing or condensation



Electrostatic discharge immunity test	± 8 kV @ air discharge or ± 4 kV @ contact discharge	IEC 61000-4-2; EN60947-1	
Electromagnetic field immunity	10 V/m	IEC 61000-4-3; EN60947-1	
Fast transient immunity	±2 kV / 5 kHz	IEC 61000-4-4; EN60947-1	
Wire-conducted noise	10 Vrms	IEC 61000-4-3; EN60947-1	
Power frequency magnetic field im- munity test	Continuous: >30 A/m, 28 µ tesla Short-time: >300 A/m, 280 µ tesla	IEC 61000-4-8; EN60947-1	



Diagnostic parameters

Function	Unit	Range				
Sensor Diagnostics						
Frontend Failure	0	0 or 1				
Memory Failure	0	0 or 1				
Temperature Diagnostics						
Current temperature	[°C]	-50 +150				
Maximum temperature - All time high	[°C]	-50 +150				
Minimum temperature - All time low	[°C]	-50 +150				
Maximum temperature - Since last power-up	[°C]	-50 +150				
Minimum temperature - Since last power-up	[°C]	-50 +150				
Minutes above Maximum Temperature	[min]	0 2 147 483 647				
Minutes below Minimum Temperature	[min]	0 2 147 483 647				
Operating Diagnostic						
Operating Hours	[h]	0 2 147 483 647				
Number of Power Cycles	[cycles]	0 2 147 483 647				
Detection counter SSC1	[cycles]	0 2 147 483 647				
Maintenaince event counter	[cycles]	0 2 147 483 647				
Download counter	[counts]	065 536				
Quality of Teach	-	0 255%				
Quality of Run	-	0 255%				
Excess gain		0.00 1 000.00				
Error Count	[counts]	065 536				
Device Status	0 = Device is operating properly 1 = Maintenance required 2 = Out-of-specification 3 = Functional-Check 4 = Failure Factory settings: 0					

Events Configuration

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



Observation menu

Process Data	Factory default setting
	Analogue value Inactive
	Analogue value normal <i>Factory settings</i>
Analogue value	Analogue value as Object Length
	Analogue value as Object Speed
	Analogue value as Counter value
Excess gain	Inactive
SO1, Switching output 1	Active
SO2, Switching output 2	Active
SSC1, Sensor switching channel 1	Inactive
SSC2, Sensor switching channel 2	Inactive
DA1, Dust alarm SSC1	Inactive
DA2, Dust alarm SSC2	Inactive
TA, Temperature alarm	Inactive
SC, Short circuit	Inactive
AFO1, Application functions output 1	Inactive

Process data structure

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

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	DA2	DA1	SSC2	SSC1
Byte 3	7	6	5	4	3	2	1	0
	AFO1	-	-	-	-	-	SO2	SO1

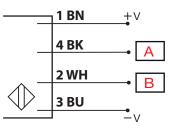


Mechanics/electronics

Connection

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

Wiring



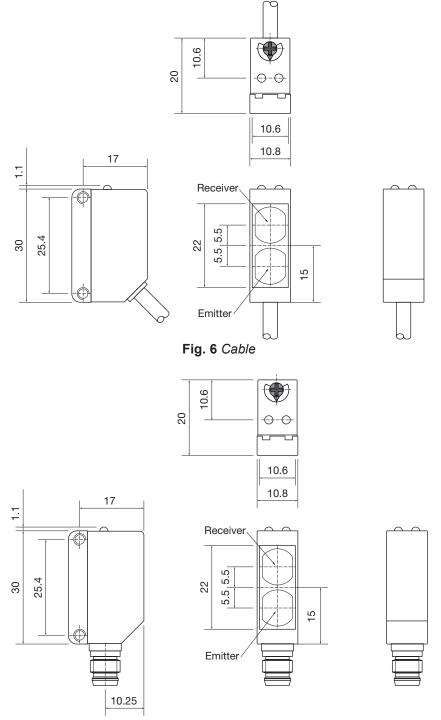
BN	BK	WH	BU	А	В
Brown	Black	White	Blue	OUT/IO-Link	IN/OUT

Housing

Body	ABS		
Front glass	PMMA, Red		
Trimmer shaft	POM, Grey		
Indication	TPU, Transparent		
Sealing	NBR70		
Dimensions	10 x 30 x 20 mm		
Maight	≤ 50 g	Cable version	
Weight	≤ 20 g	Plug version	



Dimensions







Compatibility and conformity

Approvals and markings

General reference	Sensor designed according to EN60947-5-2		
MTTF _d	138.5 years EN ISO 13849-1, SN 29500		
CE-marking	CE		
Approvals			



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



Delivery contents and accessories

Delivery contents

- Photoelectric switch: PD30CTBS25BPxxIO
- Screwdriver
- Packaging: Plastic bag



Accessories

- Mounting bracket: APD30-MB1 or APD30-MB2 to be purchased separately
- Connector type: CO..54NF... series to be purchased separately



Further information

Information	Where to find it	QR
IO-Link manual	http://cga.pub/?93ec5c	
Mounting brackets	http://cga.pub/?6fa29a	
Connectors	http://cga.pub/?0aae3e	



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Carlo Gavazzi: PD30CTBS25BPA2IO PD30CTBS25BPM5IO