

# Capacitive Proximity Sensor

## 4<sup>th</sup> Generation of *TRIPLESHIELD*<sup>TM</sup>

### CA18CBxxBPxIO



- LED bar graph for output, signal stability, power ON and easy adjustment
- Available in M18 in a robust PBT housing, flush or non-flush and IO-Link
- Sensing range: 2...10 mm flush or 3...15 mm non-flush
- Sensitivity adjustment either by trimmer, teach-by-wire or by IO-link parameter
- Supply voltage: 10 to 40 VDC
- Output: PNP / NPN / Push-Pull / External input
- Make and break switching function
- Protection: reverse polarity, short circuit and transients
- Cable and plug versions
- Excellent EMC performance (4<sup>th</sup> generation *TRIPLESHIELD*<sup>TM</sup>)



#### Description

The new generation of CA18CB...IO sensors is a complete family of high performance capacitive sensors for detection of most solid or liquid targets in industrial applications such as Plastic & Rubber, Agriculture, Food & Beverage and Materials handling.

The sensor housing has the IP69K rating as well as approval by ECOLAB for cleaning and disinfection agents.

The sensor has a LED bar

graph that visualizes the signal stability and makes adjustment easy.

The 4<sup>th</sup> Generation of *TRIPLESHIELD*<sup>TM</sup> technology provides increased immunity to electromagnetic interference (EMI), especially to frequency drives, and improves immunity to humidity and dust.

The on-board IO-Link communication opens up a variety of functions, such as easy communication and customization of advanced parameter settings.

#### Part selection key

<b>C</b>	-	Capacitive sensor
<b>A</b>	-	Cylindrical housing with threaded barrel
<b>18</b>	-	Housing diameter (mm)
<b>C</b>	-	Plastic housing - PBT
<b>B</b>	-	Bar graph LEDs
<b>X</b>	<b>F</b>	Flush installation
	<b>N</b>	Non-flush installation
<b>X</b>	<b>08</b>	Rated operating distance: 8 mm (Flush)
	<b>12</b>	Rated operating distance: 12 mm (Non-flush)
<b>B</b>	-	<b>Selectable:</b> NPN, PNP, Push-Pull, External Input (only pin 2) or External teach input (only pin 2)
<b>P</b>	-	<b>Selectable:</b> N.O. or N.C., each output
<b>X</b>	<b>A2</b>	Cable, 2 m
	<b>M1</b>	Plug, M12, 4 pins
<b>IO</b>	-	IO-Link

#### Part selection

Connection	Rated operating distance	Mounting	Part number
Cable	8 mm	Flush	<b>CA18CBF08BPA2IO</b>
	12 mm	Non-flush	<b>CA18CBN12BPA2IO</b>
Connector	8 mm	Flush	<b>CA18CBF08BPM1IO</b>
	12 mm	Non-flush	<b>CA18CBN12BPM1IO</b>

## Features

### Main operational data

<b>Functional principle</b>	Capacitive sensor
<b>Functional principle details</b>	<ul style="list-style-type: none"> <li>• Flush</li> <li>• Non-flush</li> <li>• 2 outputs</li> <li>• Teach settings</li> </ul>
<b>Switching modes</b>	Sensor switching channel 1 & 2: <ul style="list-style-type: none"> <li>• Deactivated</li> <li>• <b>Single point mode *</b></li> <li>• Windows mode</li> <li>• 2 point mode</li> </ul>
<b>Sensing</b>	
Rated operating distance ( $S_n$ )	<b>8 mm * Flush</b> <b>12 mm * Non-flush</b>
Sensing range	Flush 2...10 mm via trimmer, teach by wire or IO-Link Setpoint 1: <b>1000 *</b> and Setpoint 2: <b>10000 *</b> (higher number = better signal) Non-flush 3...15 mm via trimmer, teach by wire or IO-Link Setpoint 1: <b>1000 *</b> and Setpoint 2: <b>10000 *</b> (higher number = better signal)
Effective operating distance ( $S_r$ )	$0.9 \times S_n \leq S_r \leq 1.1 \times S_n$
Usable operating dist. ( $S_u$ )	$0.85 \times S_r \leq S_u \leq 1.15 \times S_r^{**}$
Reference target	24 x 24 mm ST37, 1 mm thick, grounded (Flush) 36 x 36 mm ST37, 1 mm thick, grounded (Non-flush)
Hysteresis	Adjustable via IO link (1...100%) <ul style="list-style-type: none"> <li>• <b>4% (Flush) *</b></li> <li>• <b>15% (Non-flush) *</b></li> </ul>
Operating frequency	50 Hz
Response times	$t_{ON}$ (OFF-ON): <b>&lt; 10 ms *</b> , $t_{OFF}$ (ON-OFF): <b>&lt; 10 ms *</b>
Repeat accuracy (R)	$\leq 5\%$

\* **Factory settings** - see options in "Smart functions - IO-Link selectable"

\*\* For flush mounted sensors in conductive material, the usable operating distance ( $S_u$ ) is  $0.80 \times S_r \leq S_u \leq 1.2 \times S_r$  for temperatures exceeding 0°C - 60°C (32°F - 140°F)

## Electrical data

<b>Power supply</b>	
Operating voltage range ( $U_B$ )	10 - 40 VDC (Ripple included)
Ripple ( $U_{rip}$ )	$\leq 10\%$
No load supply current ( $I_o$ )	$\leq 20$ mA
Rated insulation voltage ( $U_i$ )	50 VDC
Power-ON delay	300 ms
<b>Outputs</b>	
Sensor output 1 (SO1)	NPN, <b>PNP</b> *, Push-Pull; <b>N.O.</b> *, N.C.
Sensor output 2 (SO2)	NPN, <b>PNP</b> *, Push-Pull, External input, External teach; N.O., <b>N.C.</b> *
Rated operational current ( $I_o$ )	$\leq 200$ mA (continuous) pr output
OFF-state current ( $I_o$ )	$\leq 100$ $\mu$ A
Minimum operational current ( $I_m$ )	$> 0,5$ mA
Voltage drop ( $U_d$ )	$\leq 1,0$ VDC @ 200 mA DC
Capacitive load	$\leq 100$ nF
<b>Utilization category</b>	DC-12: Control of resistive loads and solid state loads with optical isolation
	DC-13: Control of electromagnets

\* **Factory settings** - see options in "Smart functions - IO-Link selectable"

## Environmental data

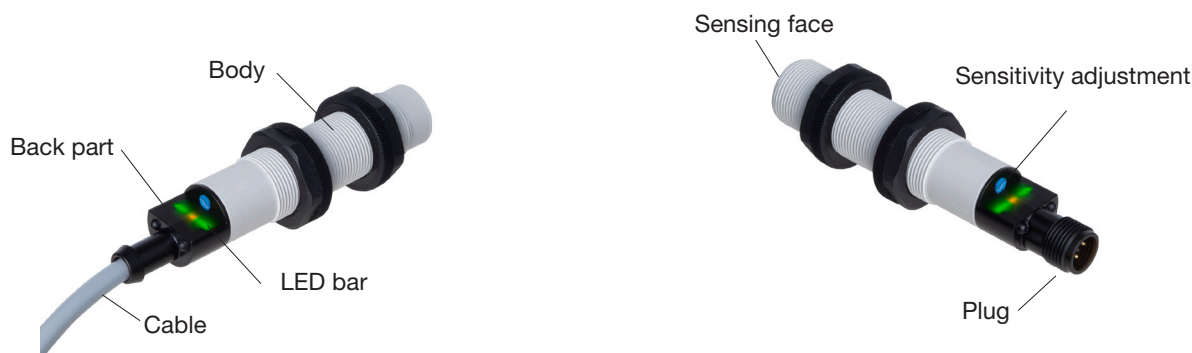
<b>Ambient temperatures</b>	
Operating	-30°C... +85°C (-22°F... +185°F)*
Storage	-40°C ... +85°C (-40°F ... +185°F)*
Max. temp. on sensing face	120°C (+248°F)
<b>Ambient humidity range</b>	
Operating	35% - 95%**
Storage	35% - 95%**
<b>Mechanical influences</b>	
Vibration	10 - 150 Hz, 1.0 mm/15 g (EN IEC 60068-2-6)
Shock	30 g <sub>n</sub> / 11 ms, 3 pos, 3 neg per axis (EN IEC 60068-2-27)
Drop test	2 x 1 m and 100 x 0.5 m (EN IEC 60068-2-31)
<b>Categorization</b>	
Pollution degree	3 (EN IEC 60664, 60664A; EN IEC 60947-1)
Overvoltage category	III (EN IEC 60664; EN IEC 60947-1)
Degree of protection	IP67, IP68/60 min., IP69K (EN IEC 60529; ISO 20653 )
NEMA enclosure type	1, 2, 4, 4X, 5, 6, 6P, 12 (NEMA 250)
<b>Safety (electrical)</b>	
Protections	Short circuits, reverse polarity and transients
Rated insulation voltage (U <sub>i</sub> )	50 VDC
Dielectric insulation voltage	≥ 1 kVAC rms, 50/60 Hz for 1 min
Rated impulse withstand voltage	> 2 kV (with 500 Ω)
<b>EMC immunity standard</b>	EN IEC 60947-5-2 / EN IEC 61000-6-2
<b>EMC immunity test</b>	
Electrostatic discharge	> 40 kV @ air discharge or > 40 kV @ contact discharge (IEC 61000-4-2)
Electromagnetic field	20 V/m (IEC 61000-4-3)
Fast transient	± 4 kV / 5 kHz (IEC 61000-4-4)
Wire conducted noise	20 Vrms (IEC 61000-4-6)
Magnetic field	Continuous: > 60 A/m, 75.9 μ tesla, Short-time > 600 A/m, 759 μ tesla (IEC 61000-4-8)

\* Do not bend the cable in temperatures below -10°C

\*\* With no icing or condensation

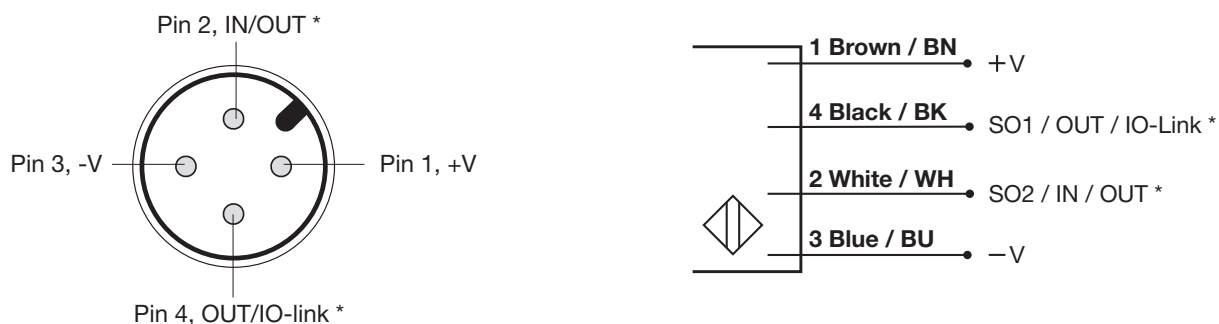
## Structure

### Housing



<b>Housing</b>	
Housing	Cylindrical with threaded barrel
Body	PBT grey, 30% glass-reinforced
Trimmer shaft	Nylon, blue
Back part	PA12, transparent, black
Finger nuts	PBTP, glass reinforced
<b>Dimensions</b>	M18 x 1
Thread length	47 mm (Non-flush) 55 mm (Flush)
Total length	95.5 mm
<b>Weight</b>	≤ 150 g, cable version ≤ 75 g, plug version
<b>Connection</b>	
Cable	2 m, 4 wire, 4 x 0.34 mm <sup>2</sup> , Ø5.2 mm Oil proof PVC, grey
Plug	M12 x 1, 4 pin male connector
<b>Tightening torque</b>	≤ 2,6 Nm

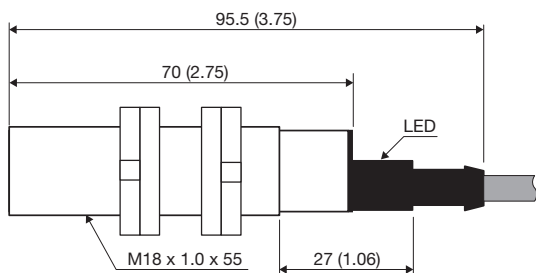
### Connection and wiring



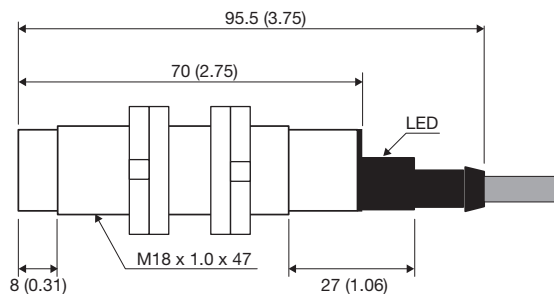
\* The outputs can be configured via IO-Link

## Dimensions in mm (inches)

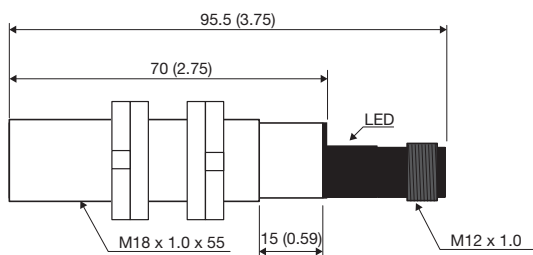
Cable version flush



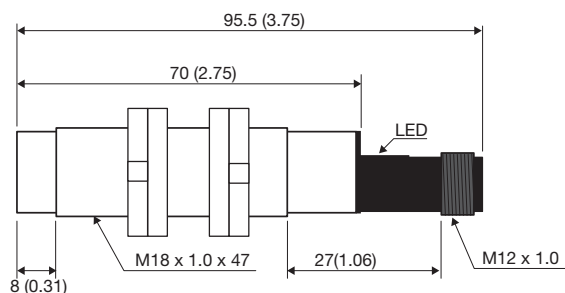
Cable version non-flush



Plug version flush



Plug version non-flush



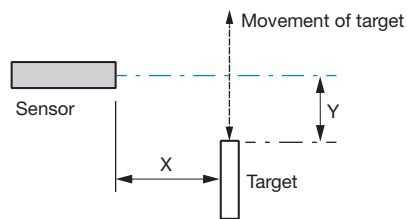
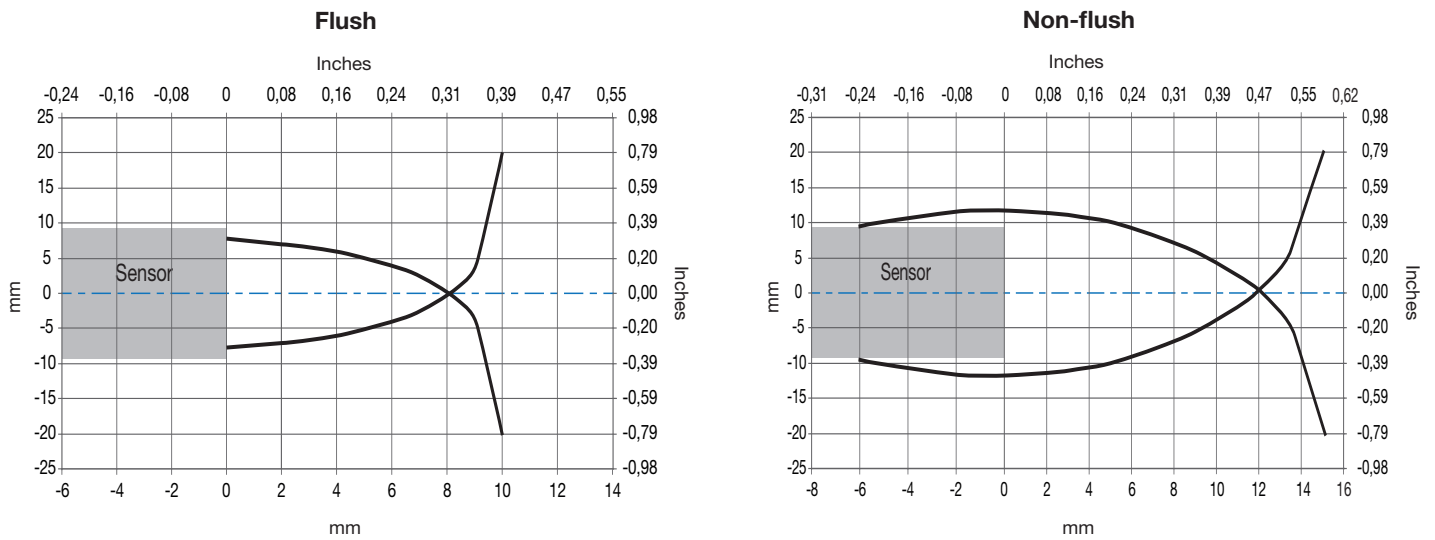
## LED indication

<b>LED bar graph</b>	Yellow LED	Switching state of the sensor ON/OFF
	Green LEDs	Signal stability
	Flashing far right green LED	IO-Link connection
	The entire LED bar flashes	Find my sensor
<b>LED settings</b>	<ul style="list-style-type: none"> <li>• LED indication inactive,</li> <li>• LED indication active, single LED</li> <li>• <b>LED indication active, centered LEDs *</b></li> <li>• LED indication active, all LEDs</li> <li>• Find-my-sensor</li> </ul>	

\* **Factory settings** - see options in "Smart functions - IO-Link selectable"




## Sensing

### Detection diagram



## Compatibility and conformity

### Approvals and markings

<b>General reference</b>	Sensor designed according to EN IEC 60947-5-2 and EN IEC 60947-1
MTTF <sub>d</sub>	97.1 years @ 40°C (+104°F) (EN ISO 13849-1, SN 29500)
CE-marking	
Approvals	 (UL508) Report Reference E353577
ECOLAB	
CFP quantification	Cable: 44,96 Kg CO <sub>2</sub> e Plug: 44,41 Kg CO <sub>2</sub> e

### IO-Link

<b>IO-Link information</b>	
Revision	1.1
Transmission rate	COM2 (38.4 kbaud)
SDCI-Norm	EN 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

## IO-Link functions

### Smart functions - IO-Link selectable

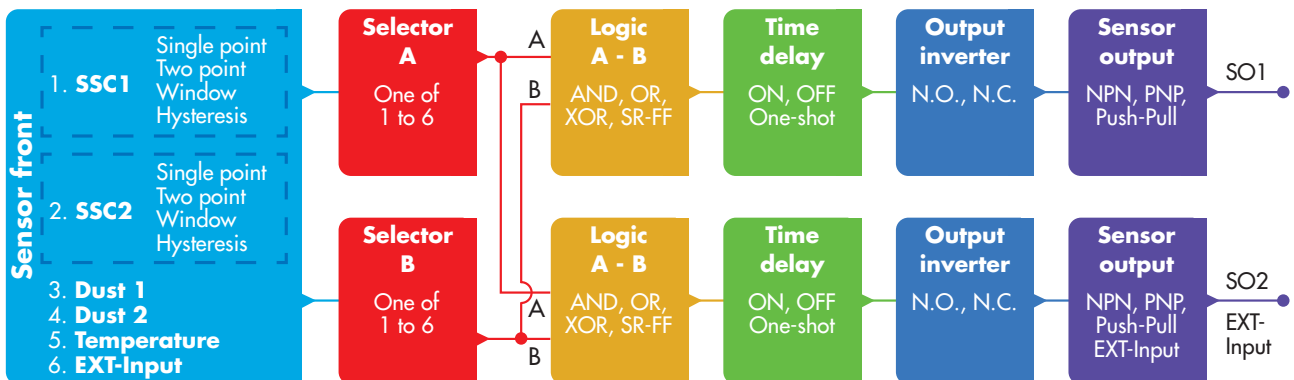
<b>Input selector</b>	Channel A + B: <ul style="list-style-type: none"> <li>Deactivated</li> <li>1. <b>SSC1</b> * (Channel A &amp; B) (SSC = Switching Signal Channel)</li> <li>2. SSC2</li> <li>3. Dust alarm 1</li> <li>4. Dust alarm 2</li> <li>5. Temperature alarm</li> <li>6. External input</li> </ul>
<b>Logic functions</b>	Channel A + B for SO1 & SO2 (SO = Sensor Output) <ul style="list-style-type: none"> <li><b>Direct</b> *</li> <li>AND</li> <li>OR</li> <li>X-OR</li> <li>SetReset-FlipFlop</li> </ul>
<b>Timer mode</b>	For SO1 & SO2 <ul style="list-style-type: none"> <li><b>Disabled</b> *</li> <li>ON delay</li> <li>OFF delay</li> <li>ON delay and OFF delay</li> <li>One-shot leading edge</li> <li>One-shot trailing edge</li> </ul>
<b>Output Inverter</b>	<ul style="list-style-type: none"> <li><b>N.O.</b> * (SO1)</li> <li><b>N.C.</b> * (SO2)</li> </ul>
<b>Sensor output / Input</b>	<ul style="list-style-type: none"> <li>Disabled output</li> <li><b>PNP</b> *</li> <li>NPN</li> <li>Push-pull</li> <li>External Input, active high</li> <li>External Input, active low</li> <li>Teach-in</li> </ul>
<b>Alarms</b>	
Safe limits	0 - 100% of actual SP. SSC1 and SSC2 <b>8% (Flush)</b> * <b>12% (Non-flush)</b> *
Dust alarm	Safe limits are used for dust alarm level
Temperature alarm	High threshold -50 - +125 °C <b>85°C</b> * Low threshold -50 - +125 °C <b>-30°C</b> *
<b>Diagnostic parameters</b>	<ul style="list-style-type: none"> <li>Sensor diagnostics</li> <li>Temperature diagnostics</li> <li>Operating diagnostics: Operating hours, Number of power cycles, Quality of teach, Quality of run, Excess gain</li> <li>Error count</li> <li>Device status</li> </ul>
<b>Events</b>	Maintenance, temperature and short circuit events

\* Factory settings

## Smart functions - IO-Link selectable (cont.)

<b>LED settings</b>	<ul style="list-style-type: none"> <li>• LED indication inactive,</li> <li>• LED indication active, single LED bar graph</li> <li>• <b>LED indication active, centered LED * bar graph</b></li> <li>• LED indication active, full LED bar graph</li> <li>• Find-my-sensor</li> </ul>
<b>Observations</b>	Readable via IO-link: <ul style="list-style-type: none"> <li>• Analog values</li> <li>• Short circuit</li> <li>• Switching outputs</li> <li>• Switching channels</li> <li>• Temperature alarm</li> <li>• Dust alarms</li> </ul>

\* Factory settings



## Delivery contents and accessories

### Delivery contents

- Capacitive sensor: CA18CBxxBPxxIO
- 2 x M18 finger nuts
- Packaging: Carton box
- Screwdriver

### Accessories

- Connector type CONx14NF-... -series.
- Mounting Brackets AMB18-S.. (straight), AMB18-A.. (angled)

### Further information

<b>User manual</b>	<a href="http://cga.pub/?f19ed4">http://cga.pub/?f19ed4</a>	
<b>Mounting brackets</b>	<a href="http://cga.pub/?68adbc">http://cga.pub/?68adbc</a>	
<b>Connectors</b>	<a href="http://cga.pub/?ed457b">http://cga.pub/?ed457b</a>	
<b>Carlo Gavazzi website</b>	<a href="http://www.gavazziautomation.com">www.gavazziautomation.com</a>	

Please refer to the user manual for in-depth explanations.