# Capacitive Proximity Sensor

## 4th Generation of *TRIPLESHIELD*™

# 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 (4th generation *TRIPLESHIELD*™)



## 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 4th Generation of *TRIPLESHIELD*™ 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

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

## Part selection

| Connection | Rated operating distance | Mounting | Part number |
|---|---|---|---|
| Cable | 8 mm | Flush | **CA18CBF08BPA2IO** |
| | 12 mm | Non-flush | **CA18CBN12BPA2IO** |
| Connector | 8 mm | Flush | **CA18CBF08BPM1IO** |
| | 12 mm | Non-flush | **CA18CBN12BPM1IO** |



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# Features

## Main operational data

| | |
|---|---|
| **Functional principle** | Capacitive sensor |
| **Functional principle details** | • Flush<br>• Non-flush<br>• 2 outputs<br>• Teach settings |
| **Switching modes** | Sensor switching channel 1 & 2:<br>• Deactivated<br>• **Single point mode ***<br>• Windows mode<br>• 2 point mode |
| **Sensing** | |
| Rated operating distance ($S_n$) | **8 mm** * Flush<br>**12 mm** * Non-flush |
| Sensing range | Flush<br>2…10 mm via trimmer, teach by wire or IO-Link<br>Setpoint 1: **1000** * and Setpoint 2: **10000** * (higher number = better signal)<br>Non-flush<br>3…15 mm via trimmer, teach by wire or IO-Link<br>Setpoint 1: **1000** * and Setpoint 2: **10000** * (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)<br>36 x 36 mm ST37, 1 mm thick, grounded (Non-flush) |
| Hysteresis | Adjustable via IO link (1…100%)<br>• **4% (Flush)** *<br>• **15% (Non-flush)** * |
| Operating frequency | 50 Hz |
| Response times | $t_{ON}$ (OFF-ON): **< 10 ms** *, $t_{OFF}$ (ON-OFF): **< 10 ms** * |
| Repeat accuracy (R) | ≤ 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)


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## Electrical data

| | |
|---|---|
| **Power supply** | |
| Operating voltage range ($U_B$) | 10 - 40 VDC (Ripple included) |
| Ripple ($U_{rpp}$) | ≤ 10% |
| No load supply current ($I_o$) | ≤ 20 mA |
| Rated insulation voltage ($U_i$) | 50 VDC |
| Power-ON delay | 300 ms |
| **Outputs** | |
| Sensor output 1 (SO1) | NPN**, PNP *,** Push-Pull**; N.O. ***, N.C. |
| Sensor output 2 (SO2) | NPN**, PNP *,** Push-Pull, External input, External teach**;** N.O., **N.C. *** |
| Rated operational current ($I_e$) | ≤ 200 mA (continuous) pr output |
| OFF-state current ($I_r$) | ≤ 100 µA |
| Minimum operational current ($I_m$) | > 0,5 mA |
| Voltage drop ($U_d$) | ≤ 1,0 VDC @ 200 mA DC |
| Capacitive load | ≤100 nF |
| **Utilization category** | 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”


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## Environmental data

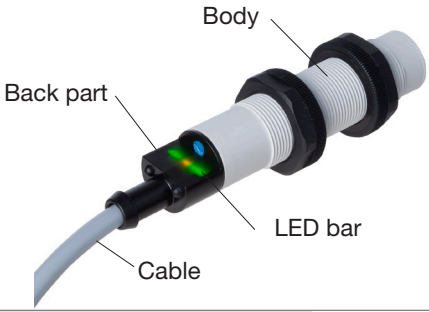
| | |
|---|---|
| **Ambient temperatures** | |
| Operating | -30°C... +85°C (-22°F... +185°F)* |
| Storage | -40°C ... +85°C (-40°F ... +185°F)* |
| Max. temp. on sensing face | 120°C (+248°F) |
| **Ambient humidity range** | |
| Operating | 35% - 95%** |
| Storage | 35% - 95%** |
| **Mechanical influences** | |
| Vibration | 10 - 150 Hz,1.0 mm/15 g (EN IEC 60068-2-6) |
| Shock | 30 $g_n$ / 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) |
| **Categorization** | |
| 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) |
| **Safety (electrical)** | |
| Protections | Short circuits, reverse polarity and transients |
| Rated insulation voltage ($U_i$) | 50 VDC |
| Dielectric insulation voltage | ≥ 1 kVAC rms, 50/60 Hz for 1 min |
| Rated impulse withstand voltage | > 2 kV (with 500 Ω) |
| **EMC immunity standard** | EN IEC 60947-5-2 / EN IEC 61000-6-2 |
| **EMC immunity test** | |
| 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


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# Structure

## Housing

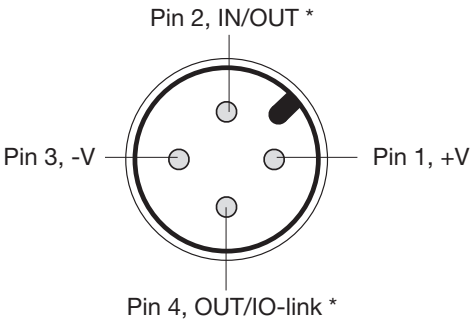






| | |
|---|---|
| **Housing** | |
| Housing | Cylindrical with threaded barrel |
| Body | PBT grey, 30% glass-reinforced |
| Trimmer shaft | Nylon, blue |
| Back part | PA12, transparent, black |
| Finger nuts | PBTP, glass reinforced |
| **Dimensions** | M18 x 1 |
| Thread length | 47 mm (Non-flush)<br>55 mm (Flush) |
| Total length | 95.5 mm |
| **Weight** | ≤ 150 g, cable version<br>≤ 75 g, plug version |
| **Connection** | |
| Cable | 2 m, 4 wire, 4 x 0.34 mm², Ø5.2 mm Oil proof PVC, grey |
| Plug | M12 x 1, 4 pin male connector |
| **Tightening torque** | ≤ 2,6 Nm |

## Connection and wiring





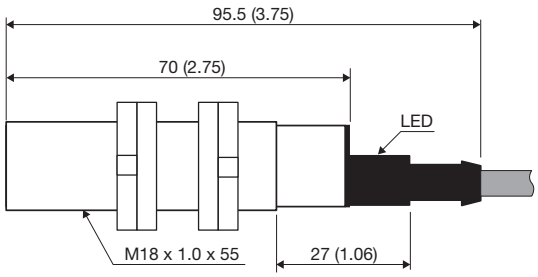


* The outputs can be configured via IO-Link

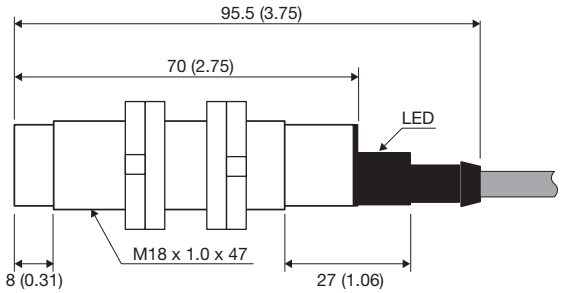

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## Dimensions in mm (inches)

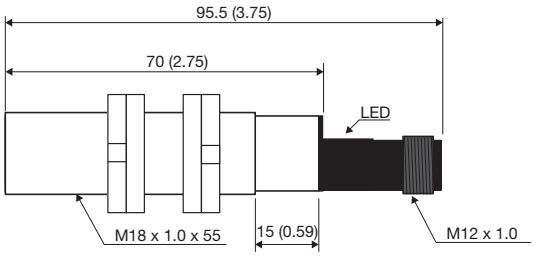
### Cable version flush



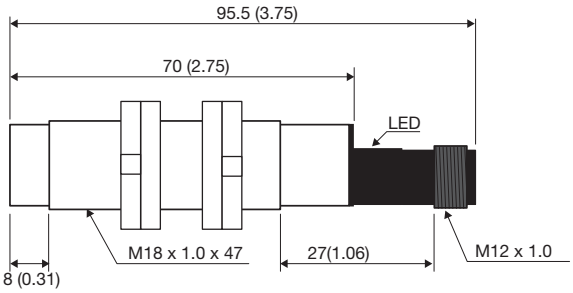

### Cable version non-flush




### Plug version flush




### Plug version non-flush




## LED indication

| | | |
|---|---|---|
| **LED bar graph** | 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 |
| **LED settings** | • LED indication inactive,<br>• LED indication active, single LED<br>• **LED indication active, centered LEDs ***<br>• LED indication active, all LEDs<br>• Find-my-sensor | |

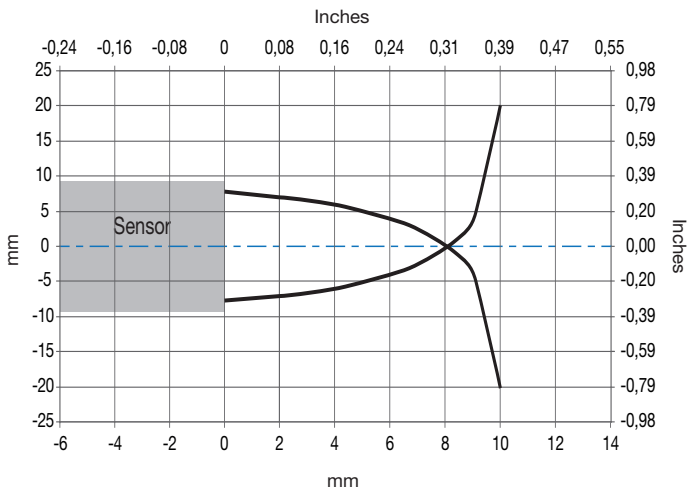
* **Factory settings** - see options in “Smart functions - IO-Link selectable”


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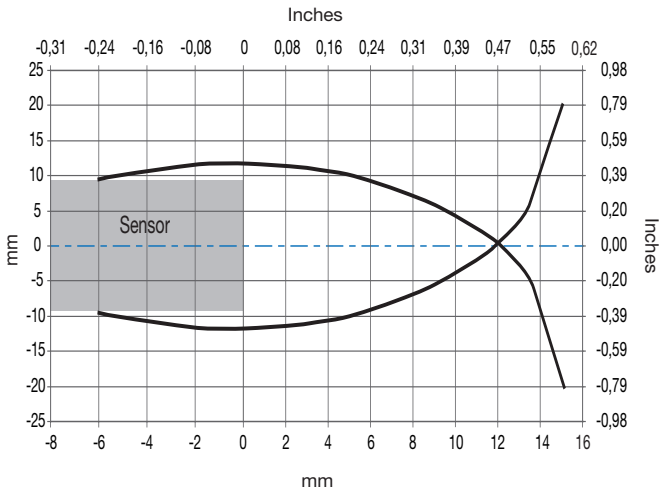
# Sensing

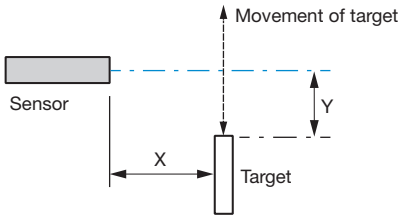
## Detection diagram

**Flush**




**Non-flush**






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# Compatibility and conformity

## Approvals and markings

| General reference | Sensor designed according to EN IEC 60947-5-2 and EN IEC 60947-1 |
|---|---|
| $MTTF_d$ | 97.1 years @ 40°C (+104°F) (EN ISO 13849-1, SN 29500) |
| CE-marking | CE |
| Approvals | cULus (UL508) Report Reference E353577 |
| ECOLAB | ECOLAB |
| CFP quantification | Cable: 44,96 Kg $CO_2$e<br>Plug: 44,41 Kg $CO_2$e |

## IO-Link

| IO-Link information | |
|---|---|
| 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 lenght | 32 bit |


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# IO-Link functions

## Smart functions - IO-Link selectable

| | |
|---|---|
| **Input selector** | Channel A + B:<br>• Deactivated<br>1. **SSC1 *** (Channel A & B) (SSC = Switching Signal Channel)<br>2. SSC2<br>3. Dust alarm 1<br>4. Dust alarm 2<br>5. Temperature alarm<br>6. External input |
| **Logic functions** | Channel A + B for SO1 & SO2 (SO = Sensor Output)<br>• **Direct ***<br>• AND<br>• OR<br>• X-OR<br>• SetReset-FlipFlop |
| **Timer mode** | For SO1 & SO2<br>• **Disabled ***<br>• ON delay<br>• OFF delay<br>• ON delay and OFF delay<br>• One-shot leading edge<br>• One-shot trailing edge |
| **Output Inverter** | • **N.O. *** (SO1)<br>• **N.C. *** (SO2) |
| **Sensor output / Input** | • Disabled output<br>• **PNP ***<br>• NPN<br>• Push-pull<br>• External Input,active high<br>• External Input,active low<br>• Teach-in |
| **Alarms** | |
| Safe limits | 0 - 100% of actual SP. SSC1 and SSC2<br>**8% (Flush) ***<br>**12% (Non-flush) *** |
| Dust alarm | Safe limits are used for dust alarm level |
| Temperature alarm | High threshold -50 - +125 °C **85°C ***<br>Low threshold -50 - +125 °C **-30°C *** |
| **Diagnostic parameters** | • Sensor diagnostics<br>• Temperature diagnostics<br>• Operating diagnostics: Operating hours, Number of power cycles, Quality of teach, Quality of run, Excess gain<br>• Error count<br>• Device status |
| **Events** | Maintenance, temperature and short circuit events |

*** Factory settings**

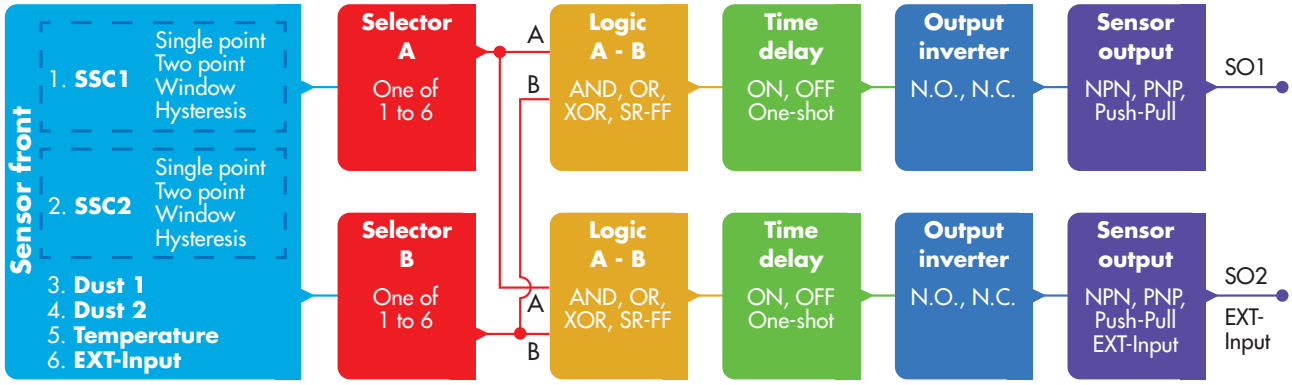


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## Smart functions - IO-Link selectable (cont.)

| | |
|---|---|
| **LED settings** | • LED indication inactive,<br>• LED indication active, single LED bar graph<br>• **LED indication active, centered LED * bar graph**<br>• LED indication active, full LED bar graph<br>• Find-my-sensor |
| **Observations** | Readable via IO-link:<br>• Analog values<br>• Short circuit<br>• Switching outputs<br>• Switching channels<br>• Temperature alarm<br>• Dust alarms |

*** Factory settings**





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# 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

| | | |
|---|---|---|
| **User manual** | http://cga.pub/?f19ed4 | |
| **Mounting brackets** | http://cga.pub/?68adbc | |
| **Connectors** | http://cga.pub/?ed457b | |
| **Carlo Gavazzi website** | www.gavazziautomation.com | |

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


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