4th Generation TRIPLESHIELD™

CA12.A...IO,

Smart Capacitive Sensors with IO-Link

Launch Presentation

March 2024

Introduction

Why this launch?

- In the Printing industry where large-scale Inkjet printers are used there are a demand for monitoring the ink level in the ink buffer containers. If the ink buffer container runs dry, then the big printing job must be discarded and started all over again e.g. Printing on Ceramic Tiles on a large-scale ink-jet printing machine where the tiles are moved on the internal conveyor.
- With this new CA12K…IO sensor with PEEK housing we have achieved just that – the ink does not stick to the surface of the Peek Material however 2 sensors can control the filling process without involving the PLC of the printer.
- The sensor family consist of variants, PBT, AISI316L stainless Steel and the Peek Version, allowing the sensor to be used in various applications, such as the semiconductor industry where the distance between the wafers are small as well as detecting Metalized glass on assembly conveyors for mobile phones.

Introduction

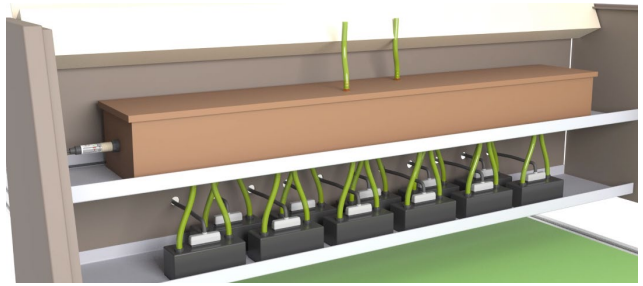
Why this launch?

- We continue the predictive maintenance functions of the CA18…IO and CA30…IO sensors so costly valuable downtime can be avoided:
  - Quality of Run
  - Quality of Teach
  - Temperature
  - Dust alarm
- Thanks to the IO-Link functions we have limited the part range to:
  - Flush, Non-flush versions
  - Cable and M12 4-pin connector versions in
  - Stainless Steel AISI316L, PBT and PEEK sensor housings
  - Featuring IP67 + IP68 approvals
- The CA12…IO sensors can operate in both IO-Link environments, where the sensing performance needs to be monitored and logged, and in traditional automation systems.

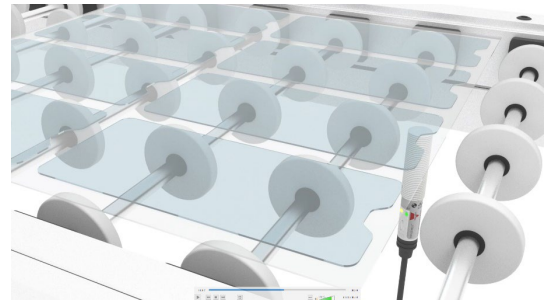
Introduction

Typical applications

Ink detection for Tile Printers

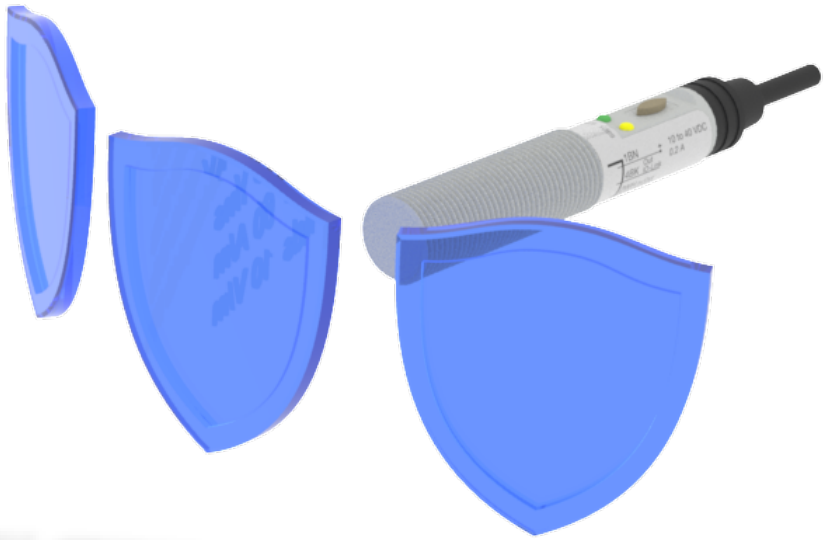


Metal coated glass detection



4th Generation TRIPLESHIELD™ - CA12…IO

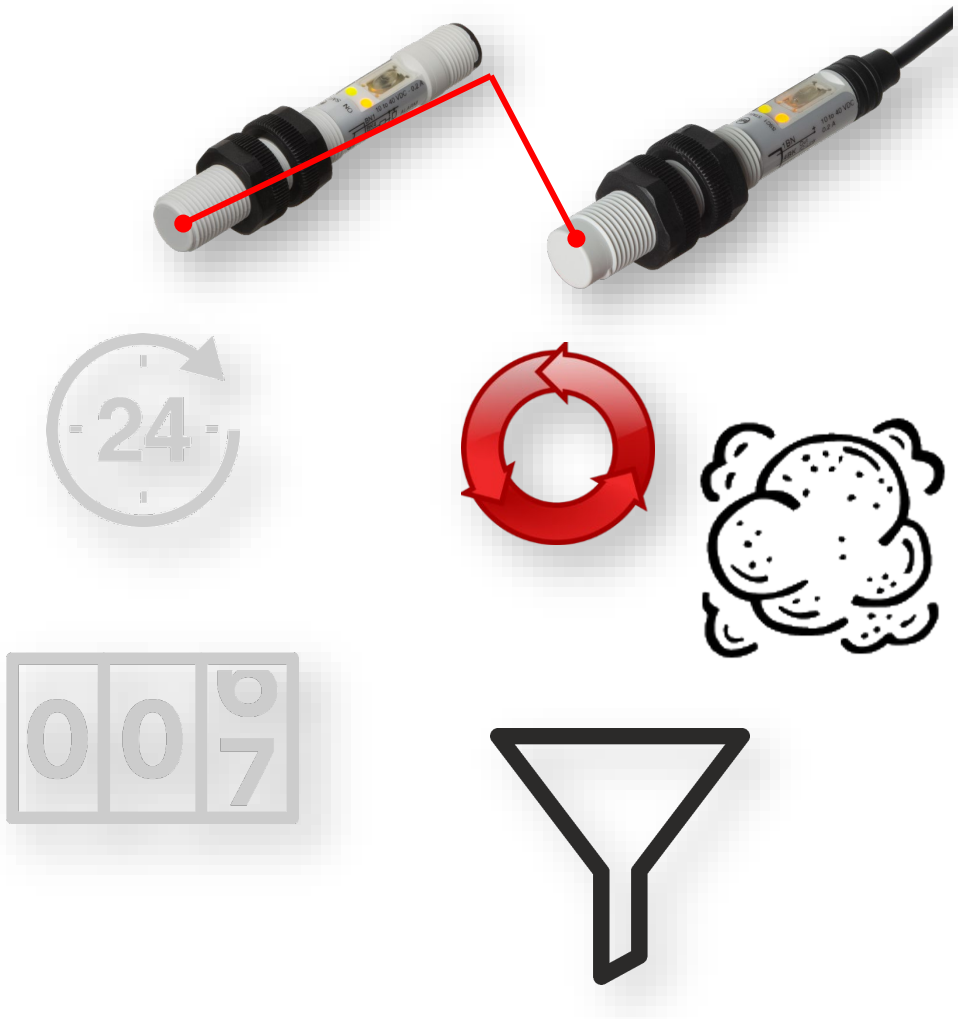
IP67, IP68/60 min
Surge 1 kV
Shock 30 G
Vibration 15 G
Rough handling shock 1 m
Electrostatic discharge 30 kV
Electrical fast transients/burst ±4 kV
Wire conducted disturbances 10 Vrms
Power-frequency magnetic fields 600 A/m
Radiated RF electromagnetic fields 10 V/m



IO-Link Communication

Predictive Maintenaince

- Temperature Alarm output
- Dust Alarm Output
- Operating hours
- Number of Power Cycles
- Detection counter
- Download Counter
- Filter Scaler

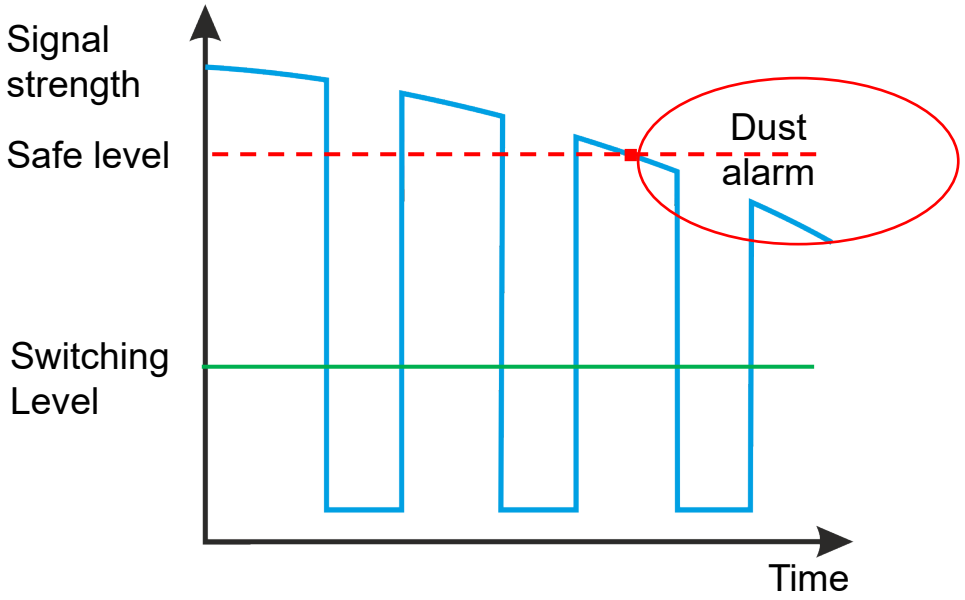


IO-Link functions

Dust alarm

- Dust Alarm activation:
  - The sensor must be in an “ON” state, and
  - The signal strength bust be below safe level default 2 times the standard hysteresis for more than the time set for “Dust response time” default 2 sec.

- Dust Alarm de-activation:
  - The sensor must be in an “ON” state, and
  - The excess gain level must be higher than the safe level default 2 times the standard hysteresis for more than the time set for “Dust reset time” default 2 sec.



Reduced sensor/machine set-up time

Application Modes (Predefined settings optimized for)

- Plastic Industry
  - Adjustment optimized for low dielectric objects
  - Filter scaler is set at maximum with lowest sensing speed

- Level control
  - Adjustment optimized for high dielectric objects
  - Filter scaler is set at maximum with lowest sensing speed

Reduced sensor/machine set-up time

QoT (Quality of Teach)

- The QoT shows how well the teach procedure was carried out
- The QoT evaluates ratio between TeachPoint1 (TP1), TeachPoint2 (TP2), Hysteresis, Safe limits, and summarize it in a single value
- QoT can vary from 0 … 255 %.
- The QoT value is updated after each teach procedure
- Examples of QoT is listed in the table below

QoT Values	Definition
> 150%	Excellent teach conditions, the sensor is not expected to have any maintenance issues.
100%	Good teach conditions, the sensor has been taught with the safe limits set at standard safe limits • Long term reliability is expected for all environmental conditions. • Maintenance is not expected to be required.
50%	Average teach conditions • Short-term reliability and maintenance is expected due to environmental conditions. • Reliable detection can be expected with restricted environmental influence.
0%	Poor teach result - Unreliable working sensing conditions are expected.

Reduced sensor/machine set-up time

Predictive Maintenance

- QoR (Quality of Run)
  - The Quality of Run inform the user about the current sensor performance
  - The QoR evaluates Maximum and Minimum signal, Hysteresis, Set Points and Safe Limits, and summarize it in a single value.
  - QoR can vary from 0 … 255 %.
  - The QoR value is updated for every detection cycle.
  - Examples of QoR is listed in the table below.

QoR Values	Definition
> 150%	Excellent sensing conditions, the sensor is not expected to have any maintenance issues.
100%	Good sensing conditions, the sensor performs as well as when the setpoints were taught or set-up manually with a safety margin of twice the standard hysteresis. • Long term reliability is expected for all environmental conditions. • Maintenance is not expected to be required.
50%	Average sensing conditions • Short-term reliability and maintenance is expected due to environmental conditions. • Reliable detection can be expected with restricted environmental influence.
0%	Poor to unreliable working sensing conditions are expected.

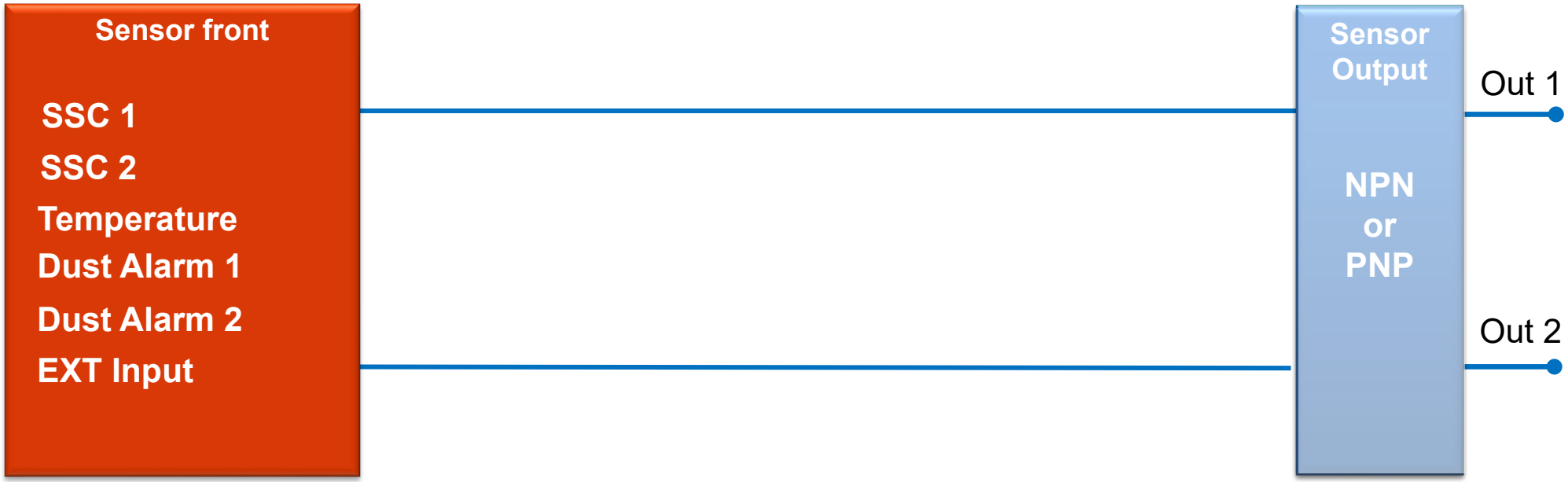
IO-Link functions

Two Individual SSC Functions:

- SSC1 (Switching Sensor Channel)
- SSC2 (Switching Sensor Channel)
- Temperature Alarm Setpoints
- Dust Alarm 1 – for SSC1
- Dust Alarm 2 – for SSC2
- External input

} Can work as two independent sensors in just one housing

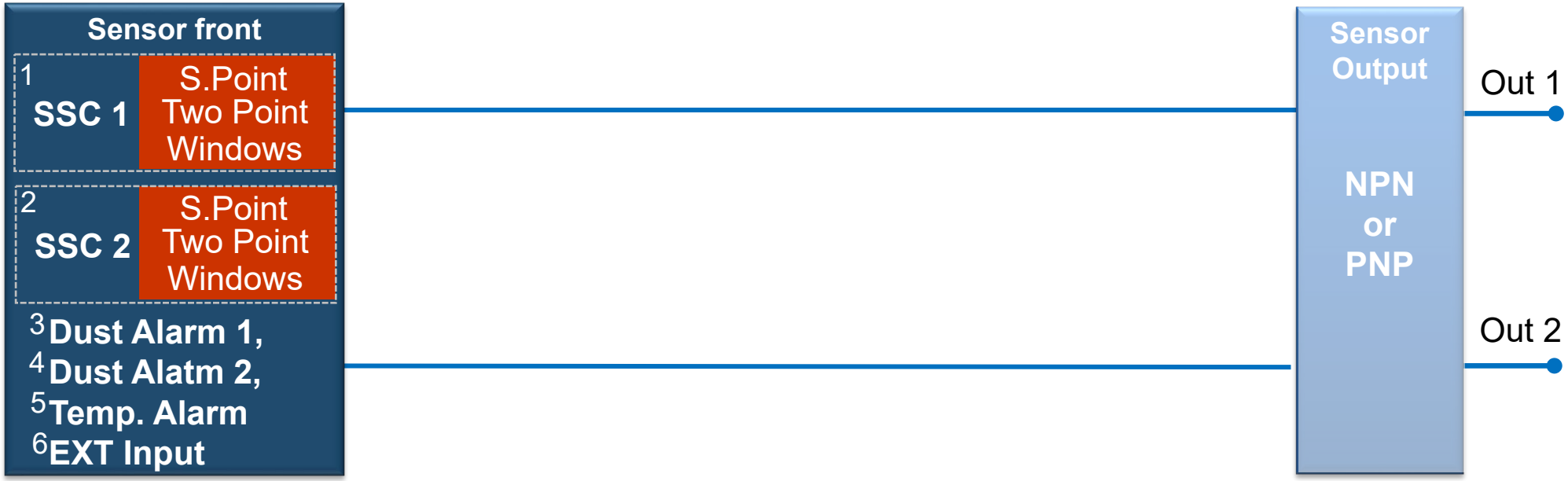
All mentioned functions can be selected individually for Out 1 or Out 2



IO-Link functions

The SSC outputs can be set in 3 different modes

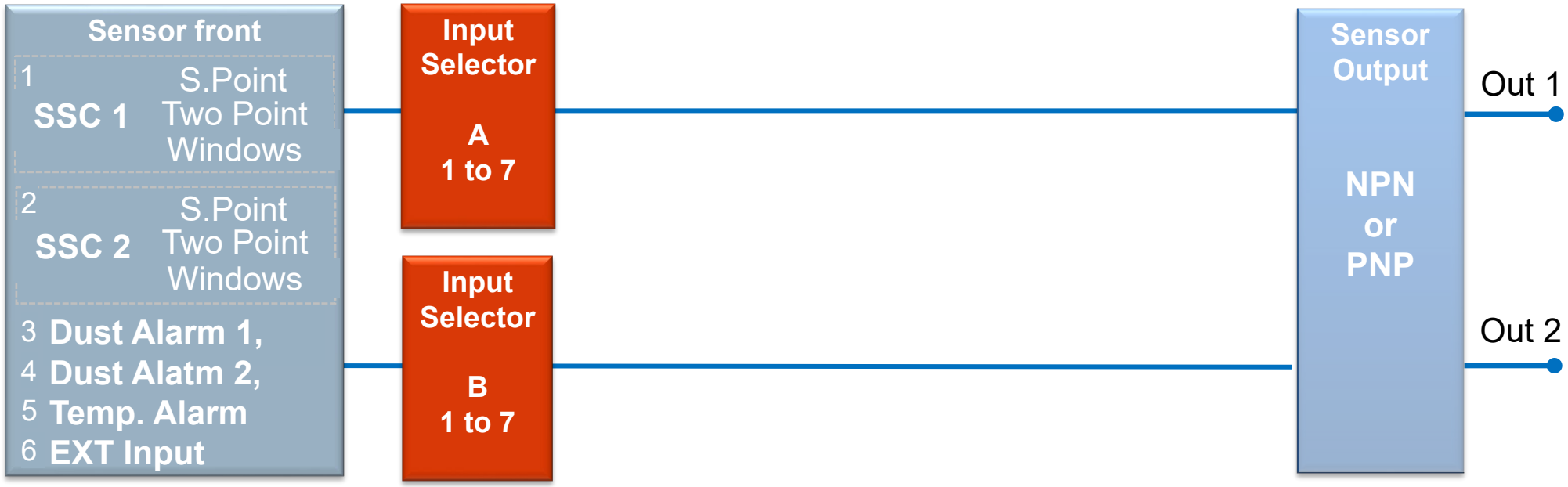
- Single Point Mode - SP1, Trimmer or IO-Link Parameter
- Two Point Mode - SP1 and SP2, IO-Link Parameter
- Windows Mode - SP1 and SP2, IO-Link Parameter



IO-Link functions

Input Selector

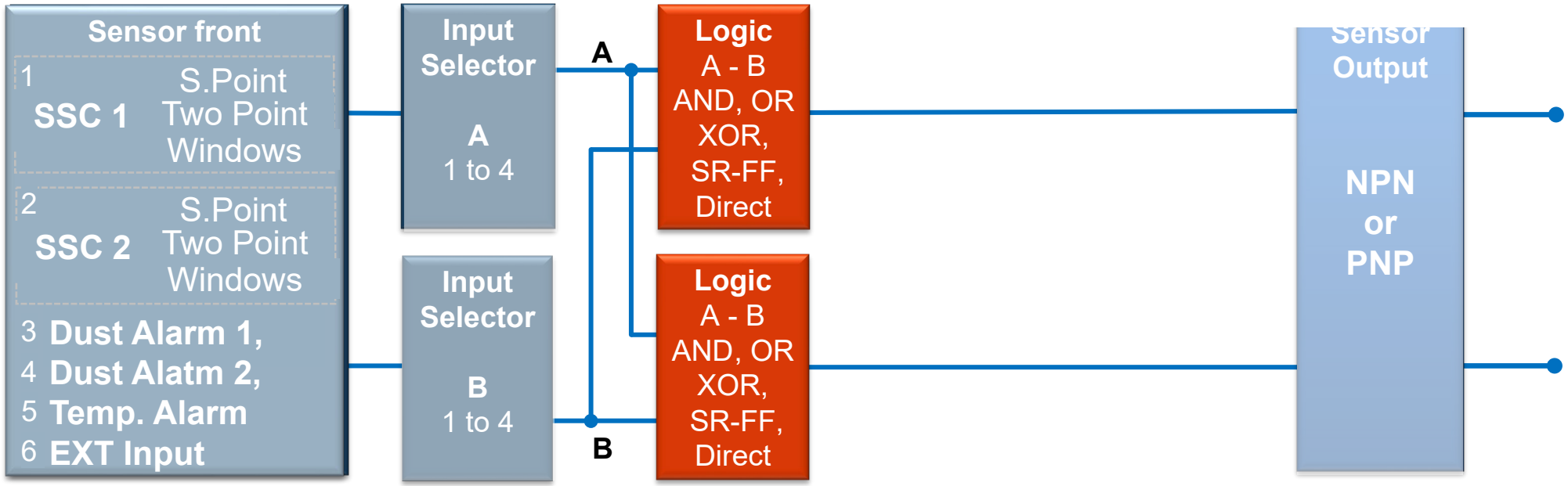
- Selector A or B can select the six options individually:
  - SSC1 or SSC2,
  - Dust alarm 1 or 2,
  - Temperature Alarm,
  - External Input



IO-Link functions

Logic Function Block:
Perform a logic function between the functions selected in channel A and B

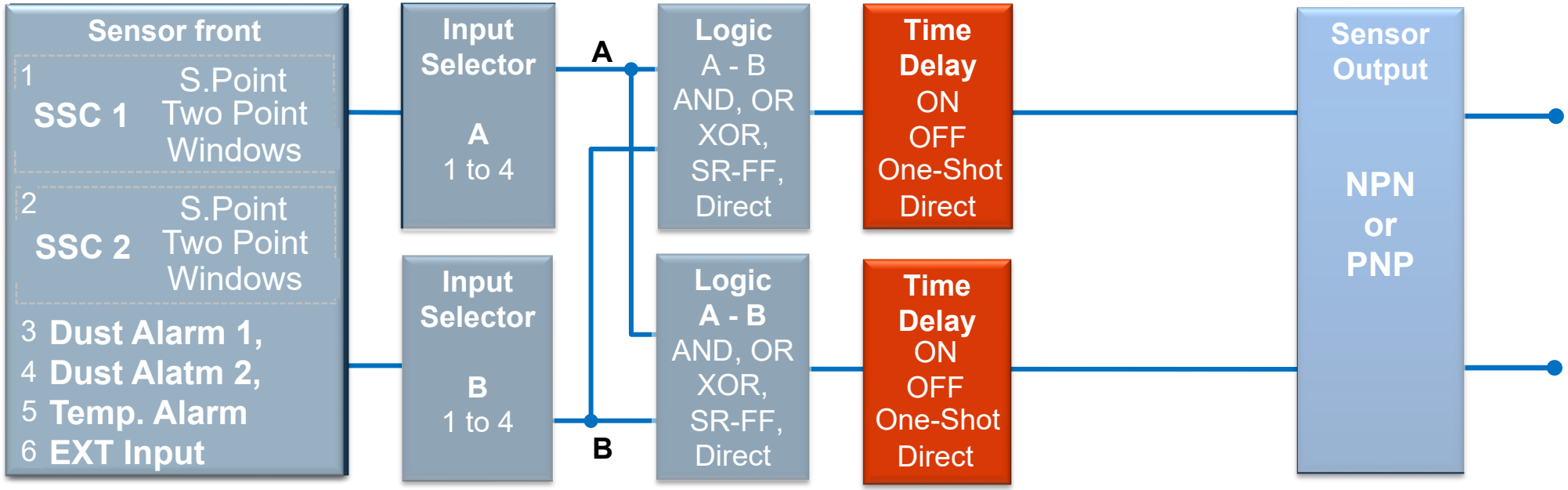
- AND,
- OR,
- XOR,
- Gated Set-reset function or
- Direct



IO-Link functions

Individually time delays for channel A or B can be added:

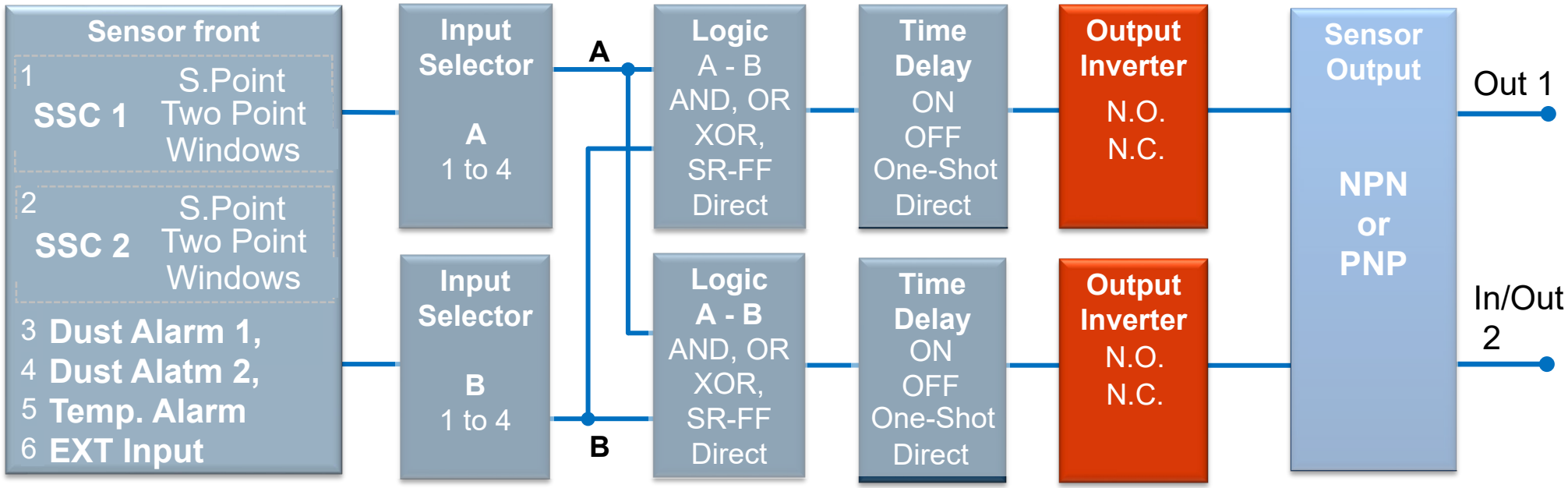
- On delay
- Off delay
- On delay and Off delay
- One-Shot leading edge or One-shot trailing edge
- Direct (no delays)
- The Units can be set in ”ms”, ”s” or ”min” and the value from 0 to 32.767



IO-Link functions

The two output can be configured individually:

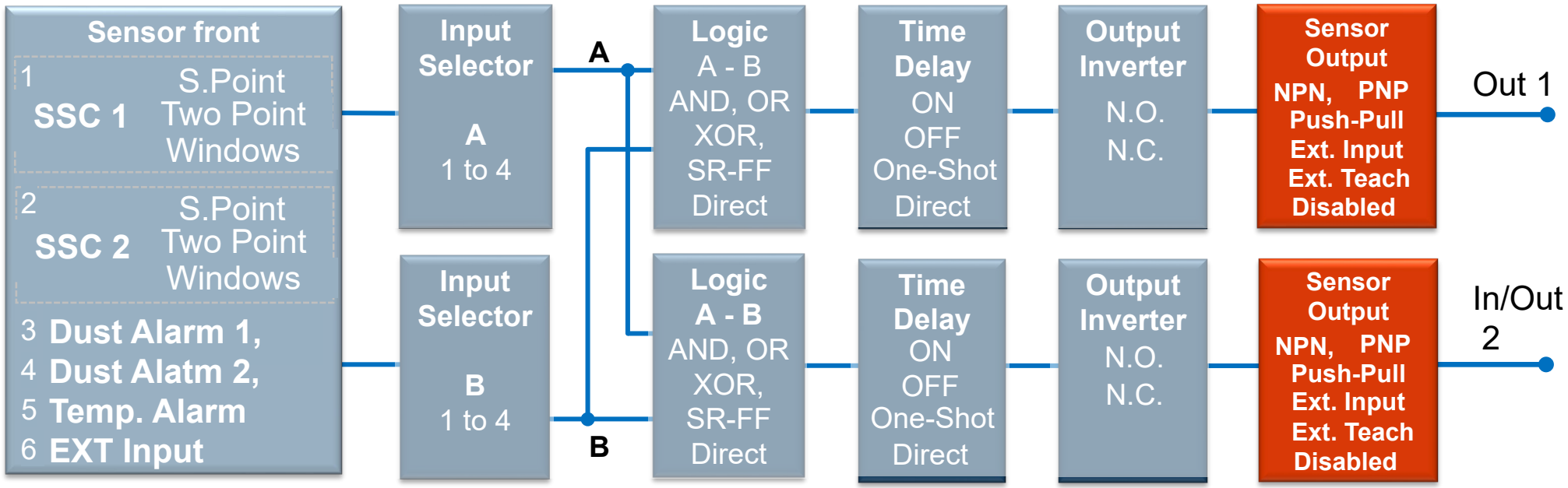
- Normally Open N.O.
- Normally Closed N.C.



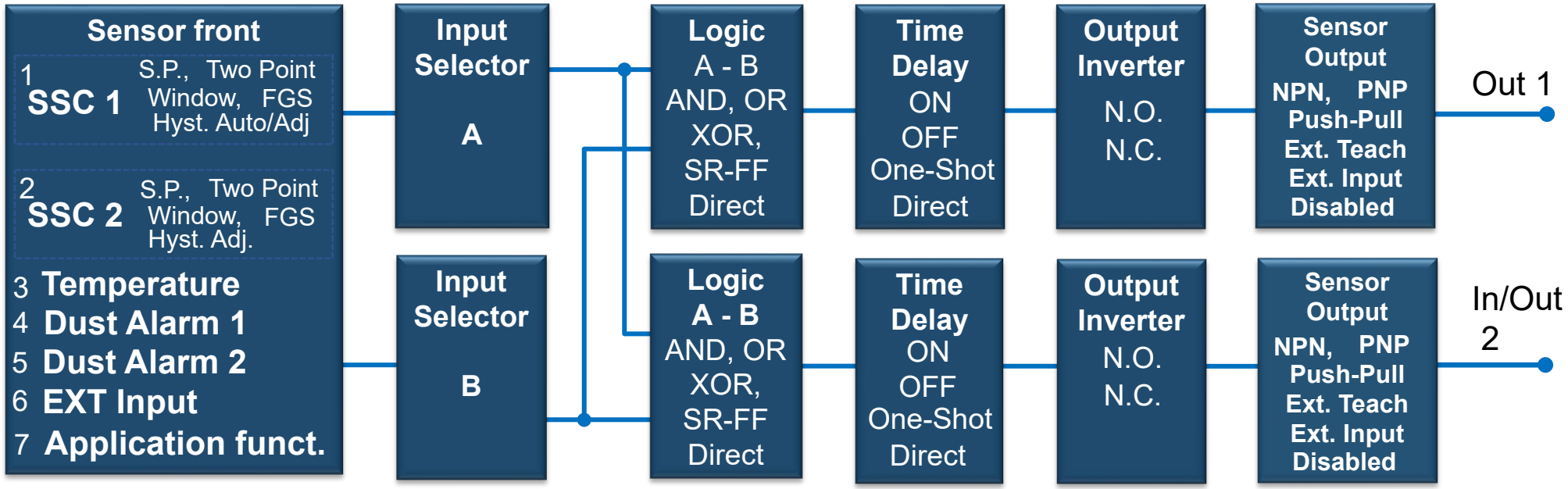
IO-Link functions

The outputs can be configured as:

- NPN
- PNP
- Push-Pull
- Digital Logic input (Active high, Pull-Down)
- Digital logic input (Active low, Pull-Up)
- External Teach-in input
- Disabled



IO-Link functions



The market

Applications – Detecting Ink presence in Industrial Ink Jet printers

Subject:	Ink detection
Industry:	Conveyor – Printing lines
Product:	CA12K…IO
Customer:	OEMs

The market

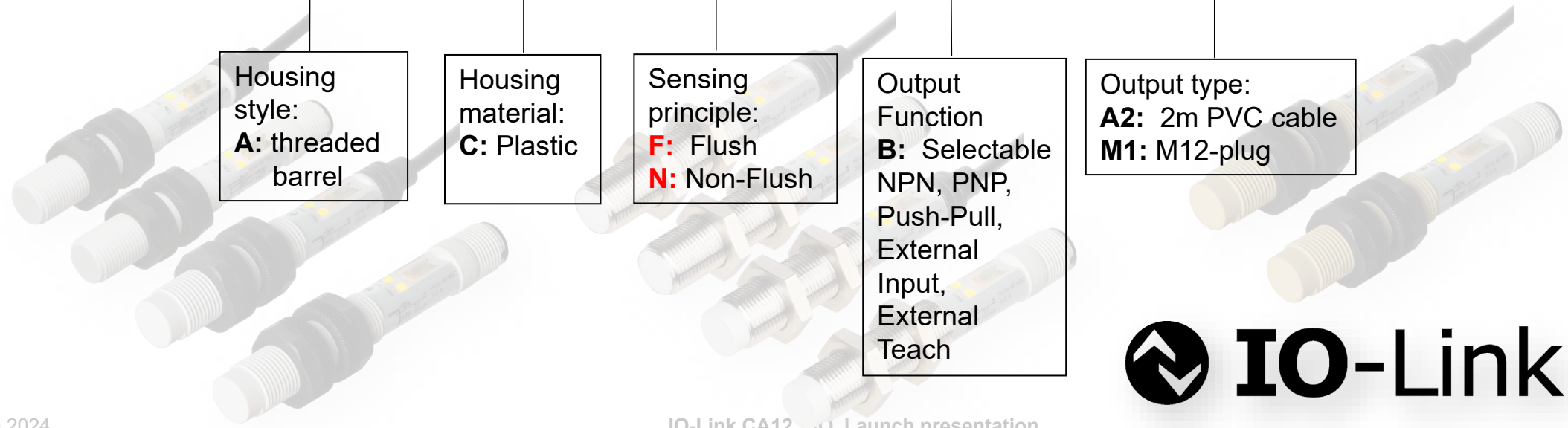
Applications – Detecting metal-coted glass on conveyor e.g. Solar panels; Mobile phone glass

Subject:	Glass detection
Industry:	Conveyor - Assembly lines
Product:	CA12…IO
Customer:	OEMs

The product

Item Number Code

C	A	12	C	A	N	08	B	P	A2	IO
Sensor type **C:** Capacitive	Housing style: **A:** threaded barrel	Housing size: **12:** M12	Housing material: **C:** Plastic	Sensing Face **A:** Axial	Sensing principle: **F:** Flush **N:** Non-Flush	Sensing distance in mm:	Output Function **B:** Selectable NPN, PNP, Push-Pull, External Input, External Teach	Output function **P:** NO or NC	Output type: **A2:** 2m PVC cable **M1:** M12-plug	Output function: **IO:** IO-Link



IO-Link

The product

Part Numbers

Housing		Mounting	Sn	Cable	Plug
PBT	M12	Flush	4 mm	CA12CAF04BPA2IO	CA12CAF04BPM1IO
		Non-Flush	8 mm	CA12CAN08BPA2IO	CA12CAN08BPM1IO
Stainless Steel AISI 316L / PBT	M18	Flush	4 mm	CA12EAF04BPA2IO	CA12EAF04BPM1IO
		Non-Flush	8 mm	CA12EAN08BPA2IO	CA12EAN08BPM1IO
PEEK / PBT	M18	Flush	-	-	-
		Non-Flush	8 mm	CA12KAN08BPA2IO	CA12KAN08BPM1IO

The market

Certifications

According to Low Voltage Directive 2014/35/EU
According to EMC Directive 2014/30/EU
According to RoHS Directive 2011/65/EU
e.g. EU_DOC_CA12CAF04BPA2IO.pdf

North America: UL508 Underwrites Laboratories Inc.
UL508_E353577_V01_S06.PDF

Environmental Management System: ISO 14001:2015

Quality Management System: ISO 9001:2015

The market

Marketing tools

Data Sheets
The datasheet is available in the Download area of the Carlo Gavazzi web site.
It is available in Chinese, German, Danish, Spanish, French, Italian and English languages

CA12CAxxxBPxxIO.pdf	CN, DE, DK, ES, FR, IT, UK
CA12EAxxxBPxxIO.pdf	CN, DE, DK, ES, FR, IT, UK
CA12KAxxxBPxxIO.pdf	CN, DE, DK, ES, FR, IT, UK

CA12CAxxBPxxIO - IO-Link

Capacitive Proximity Sensors with IO-Link communication

Benefits

- **A complete family.** Available in M12 in a robust PBT housing with an operation of 0.5-4 mm flush or 0.5-8 mm non-flush.
- **Enhanced EMC performance:** 4th Generation TRIPLESHIELD™
- **Easy customization to specific OEM requests:** different cable lengths and materials, special labelling: customized pig-tail solutions with special cables and connectors are possible on request..
- **The output** can be operated either as a 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 shot.
- **Logging functions:** Temperature, detecting counter, power cycle and operating hours.
- **Detection modes** Single point, two point and windows mode.
- **Analogue output:** In IO-Link mode the sensor will generate 16 bit analogue process data output representing the dielectric value measured by the sensor.

IO-Link

Description

The new generation of CA12CA...IO sensors are 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 4th Generation of TRIPLESHIELD™ technology provides increased immunity to electromagnetic interference (EMI), especially to frequency drives, and improves immunity to humidity and dust.
On-board IO-Link communication opens up a variety of functions, such as easy communication and customization of advanced parameter settings.

Applications

- Detection of glass in production of e.g., Solar panels, Mobile phones or Windows glass containing a tiny layer of metal coating.

24/01/2024 CA12CAxxBPxxIO ENG Carlo Gavazzi Industri A/S 1

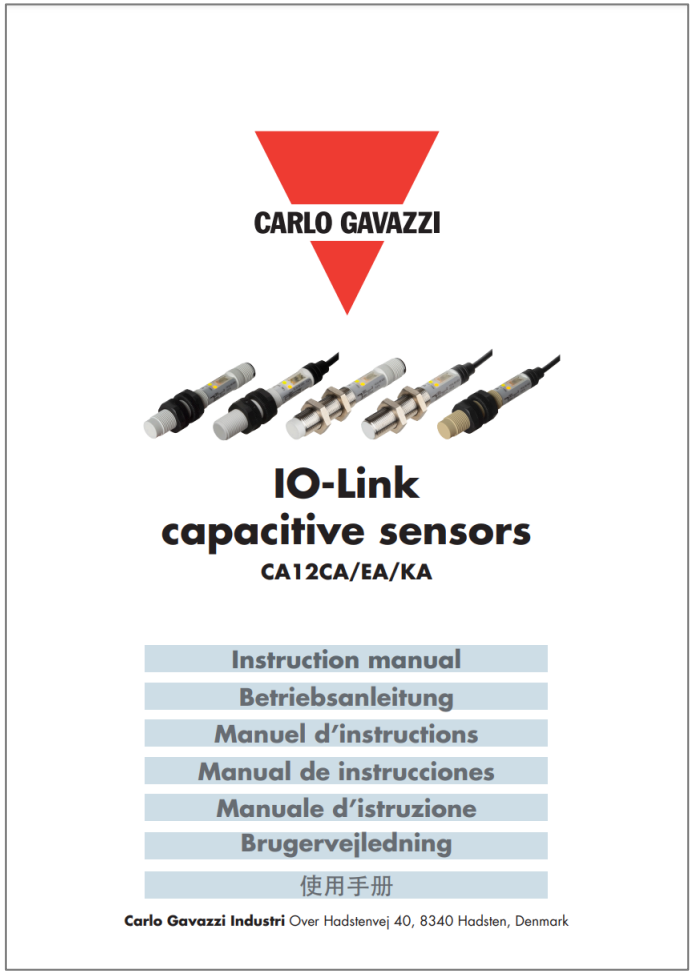
Link to the datasheet download area

The market

Marketing tools

Instruction manual
The Instruction manual is available in the Download area of the Carlo Gavazzi web site.
The multilanguage consists of Chinese, German, Danish, Spanish, French, Italian and English languages

CA12_IO-Link_MUL.pdf CN, DE, DK, ES, FR, IT, UK



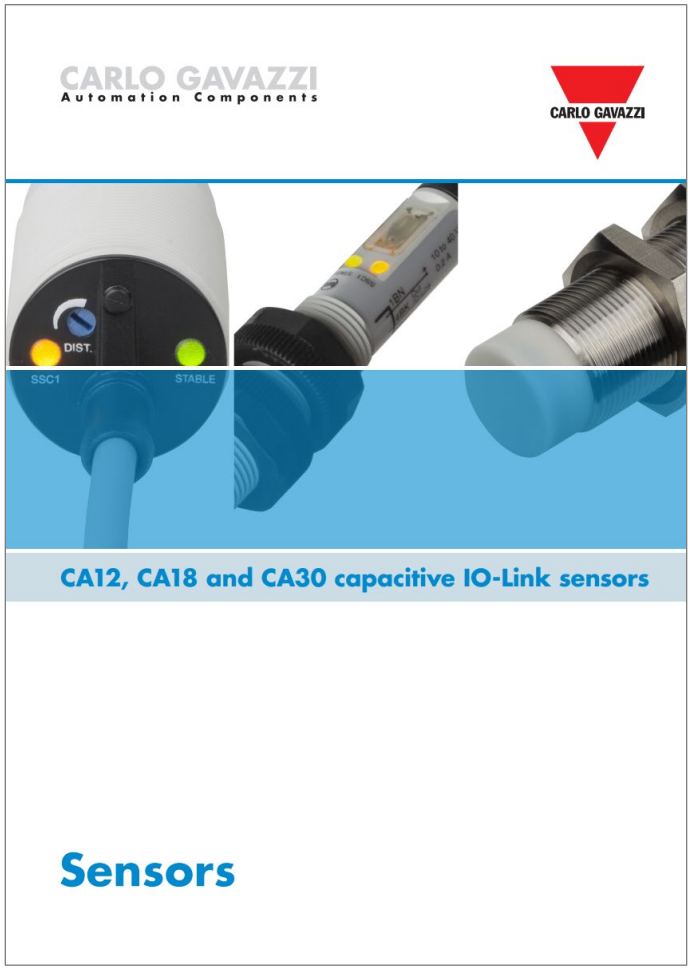
Link to the datasheet download area

The market

Marketing tools

Product brochure
The brochure is available in 7 languages the Download area of the Carlo Gavazzi web site

CN	BRO_CA12_18_30_IO-Link.pdf
DE	BRO_CA12_18_30_IO-Link.pdf
DK	BRO_CA12_18_30_IO-Link.pdf
ES	BRO_CA12_18_30_IO-Link.pdf
FR	BRO_CA12_18_30_IO-Link.pdf
IT	BRO_CA12_18_30_IO-Link.pdf
UK	BRO_CA12_18_30_IO-Link.pdf



The market

Certifications

Declaration of Reliability (MTTF):

MTTF_CA12CAF04BPA2IO.pdf
MTTF_CA12CAF04BPM1IO.pdf
MTTF_CA12CAN08BPA2IO.pdf
MTTF_CA12CAN08BPM1IO.pdf

MTTF_CA12EAF04BPA2IO.pdf
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MTTF_CA12EAN08BPA2IO.pdf
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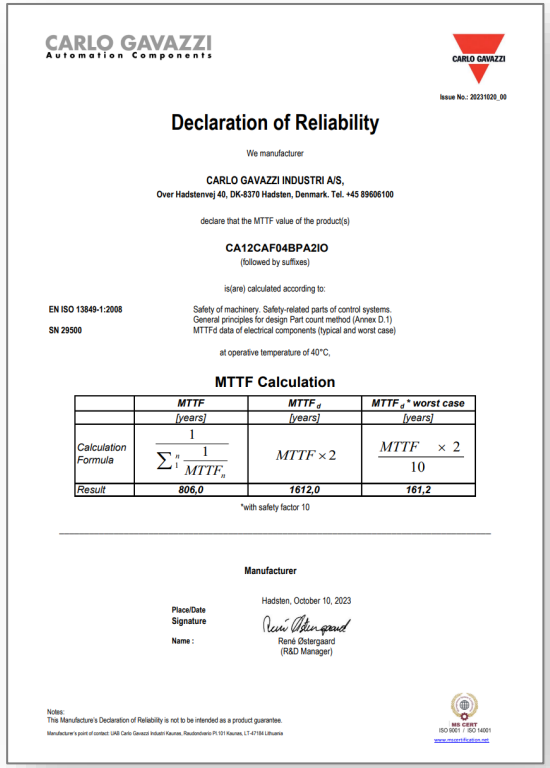

CARLO GAVAZZI
Automation Components

Issue No.: 20231020_00

Declaration of Reliability

We manufacturer

CARLO GAVAZZI INDUSTRI A/S,
Over Hadstenvej 40, DK-8370 Hadsten, Denmark. Tel. +45 89606100

declare that the MTTF value of the product(s)

CA12CAF04BPA2IO
(followed by suffixes)

is(are) calculated according to:

EN ISO 13849-1:2008	Safety of machinery. Safety-related parts of control systems. General principles for design Part count method (Annex D.1)
SN 29500	MTTFd data of electrical components (typical and worst case)

at operative temperature of 40°C,

MTTF Calculation

	MTTF *[years]*	***$MTTF_d$*** *[years]*	***$MTTF_d$ * worst case*** *[years]*
Calculation Formula	$\frac{1}{\sum_1^n \frac{1}{MTTF_n}}$	$MTTF \times 2$	$\frac{MTTF \times 2}{10}$
Result	***806,0***	***1612,0***	***161,2***

*with safety factor 10

Manufacturer

Place/Date: Hadsten, October 10, 2023
Signature:
Name: René Østergaard (R&D Manager)

Notes:
This Manufacturer's Declaration of Reliability is not to be intended as a product guarantee.
Manufacturer's point of contact: UAB Carlo Gavazzi Industri Kaunas, Raudondvario Pl 101 Kaunas, LT-47184 Lithuania

MG CERT ISO 9001 / ISO 14001
www.mgcertification.net

Housing materials used on the various sensor types

PBT

Stainless Steel & PBT

PEEK & PBT

The market (Working)

Main competitors Plastic housing w. IO-Link

Carlo Gavazzi
CA12xBP...IO

IFM
K500x

Balluff
BCSM12K4D2...

Turck
BCT-M12-IOL...
NCT-M12-IOL...

X-Ref

Conclusions

***4th Generation TRIPLESHIELD™* - now with IO-Link**

- Capacitive Sensor Families in M12 housings in PBT, Stainless Steel or PEEK material
- Teach function (push button or remote tesch)
- Few competitors with PEEK material
- Input selector: SSC1, SSC1, DA1, DA2, TA, Ext. Input
- Output configuration: NPN, PNP, Push-Pull, External Input, NO or NC
- Logic functions: AND, OR, X-OR and Gated SR-FF
- Time delays: TON, TOFF, One Shot leading or trailing edge, ms, s, or Min.
- ***4th Generation TRIPLESHIELD™***
- Increased ElectroMagnetic Immunity, best on the market!
- Increased Degree of Protection IP68
- Increased Dust and Humidity compensation

Conclusions

Carlo Gavazzi CA12… Capacitive IO-Link sensor family

PBT

Stainless Steel & PBT

PEEK & PBT

The most flexible capacitive sensor world-wide