ICF12, ICF18, ICF30
Full-Metal

Launch Presentation

February 2023

ICF Inductive Sensor
Contents

INTRODUCTION

ICF Inductive Sensor
Introduction

What is it?

An inductive sensor family offering

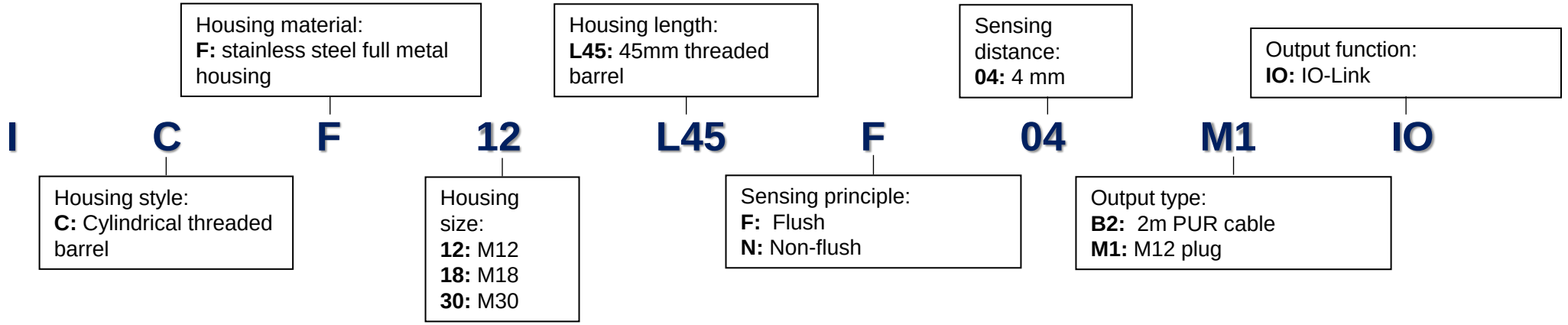
- Reduced risk of physical damage due to a full stainless steel housing (including the sensing face)
- Excellent performance in F&B industry applications requiring washdown, extreme temperatures, and chemical resistance
- Additional insight due to new IO-Link features

Why?

The existing ICS-FB family will be replaced by this new, higher performing ICF family. New capabilities within the ICF family will be beneficial and appealing to OEMs with food & beverage, pharmaceutical, agriculture, and machining applications. This new family will allow Carlo Gavazzi to gain inductive sensor market share.

THE PRODUCT

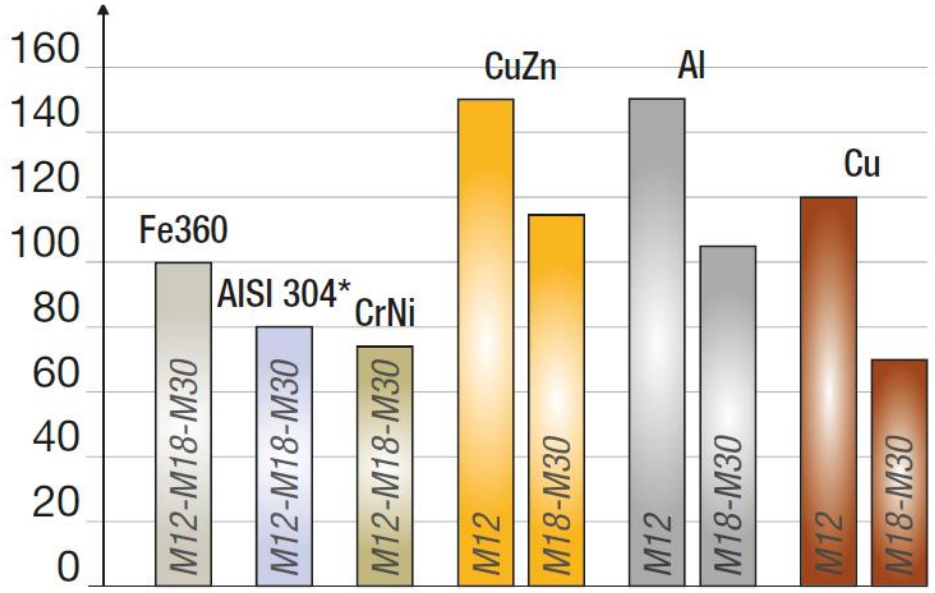
ICF Inductive Sensor
Part Number



Housing	Mounting	Connection	Rated operating distance Sn	Output type	Ordering no.
M12	Flush	Cable	Configurable: 33%, 50%, 75% or 100% of the maximum Sn **Factory setting: 100%**	Configurable: NPN/PNP/push-pull NO/NC **Factory setting: PNP, NO**	**ICF12L45F04B2IO**
		Plug			**ICF12L45F04M1IO**
	Non-flush	Cable			**ICF12L45N08B2IO**
		Plug			**ICF12L45N08M1IO**
M18	Flush	Cable	Configurable: 33%, 50%, 75% or 100% of the maximum Sn **Factory setting: 100%**	Configurable: NPN/PNP/push-pull NO/NC **Factory setting: PNP, NO**	**ICF18L45F08B2IO**
		Plug			**ICF18L45F08M1IO**
	Non-flush	Cable			**ICF18L45N14B2IO**
		Plug			**ICF18L45N14M1IO**
M30	Flush	Cable	Configurable: 33%, 50%, 75% or 100% of the maximum Sn **Factory setting: 100%**	Configurable: NPN/PNP/push-pull NO/NC **Factory setting: PNP, NO**	**ICF30L45F15B2IO**
		Plug			**ICF30L45F15M1IO**
	Non-flush	Cable			**ICF30L45N22B2IO**
		Plug			**ICF30L45N22M1IO**

ICF Inductive Sensor
Reduction Factors

- The specific operating distance Sn refers to defined measuring conditions
- The following approximate reduction factors must be considered. The operating distance is **reduced by the use of metals and alloys** other than Fe360



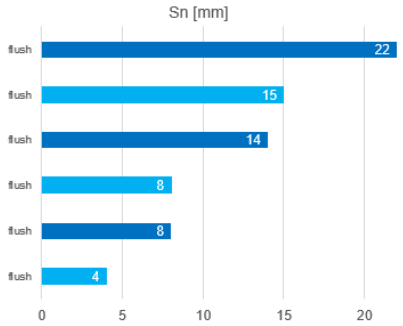
Fe360	Steel
AISI 304	Stainless steel
CrNi	Chrome(20%)-nickel(80%)
CuZn	Brass
Al	Aluminium
Cu	Copper
Sr	Effective operating distance

For Stainless steel the Sr depends on target thickness:

Sensor	Target thickness	Sr (%)
ICF12 Flush	1 mm	75
	2 mm	105
ICF12 Non-flush	1 mm	10
	2 mm	60
ICF18 Flush	1 mm	80
	2 mm	100
ICF18 Non-flush	1 mm	60
	2 mm	90
ICF30 Flush	1 mm	50
	2 mm	70
ICF30 Non-flush	1 mm	30
	2 mm	50

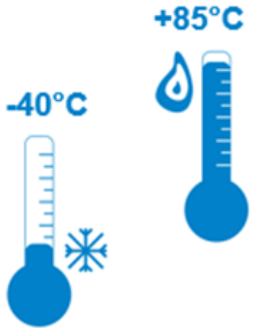
ICF Inductive Sensor
Features

Long Sensing Ranges



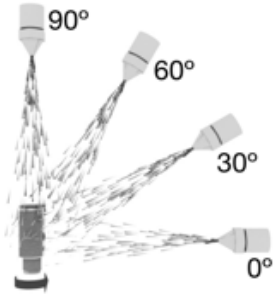
Long sensing ranges allow for safer operation so the moving target can be positioned farther away from the sensor

Extended Temperature Range



Continuous operation between -40C to +85C (-40 to +185F); Resistant up to 100C for up to 15 minutes

Ingress Protection IP68 & IP69K



- 10 to 15 cm from the nozzle
- 14 to 16 l/min
- 100 bar pressure
- 80 °C temperature
- 30s per position (total of 120 s)

LED Monitoring

High visibility LEDs enable status checks. Visual adjustment indicator helps to ensure a safe detection of the target during the installation on the machine

Traceability

Permanently legible laser engraved information on the housing to assure traceability

Pressure on Sensing Face

Can withstand pressure on the sensing face

Impact Resistant

1 J (EN 60068-2-75 Ehc test, vertical hammer) Drop the 100 g steel ball vertically from 1 m height onto the sensing surface for three times

Vibration & Mechanical Shock Resistant

25 g (EN 60068-2-6 Fc)

IK10 (EN 50102)
Drop the 1000 g steel ball vertically from 2 m height onto the sensing surface for three times

Shock Resistant

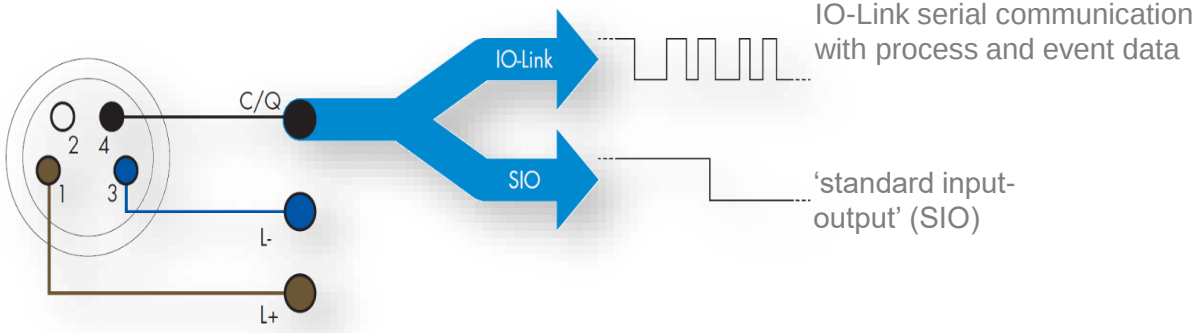
Shock resistance: 100 g
Continuous shocks: 40 g
(EN 60068-2-27 Ea)

Certifications

CE, cULus, ECOLAB

ICF Inductive Sensor
IO-Link Basics

- Globally recognized communication protocol **IEC 61131-9**
- **Point-to-Point** serial communication interface
- Data transmission via a **standard, unshielded cable**



- Sensor waits for '**handshake**' signal from an IO-Link master
- If signal is not received, sensor operates in standard I/O **SIO mode**
- Still access to the **intelligence** inside the sensor in an IO-Link environment or traditional operation

- IO-Link communication between sensor and master:
  - Cyclical = process data & value status – exchanged regularly
  - Acyclical data = parameter configuration, identification data, diagnostic information and events (errors messages and warnings) – exchanged upon request

ICF Inductive Sensor
1) Configurable Sensors

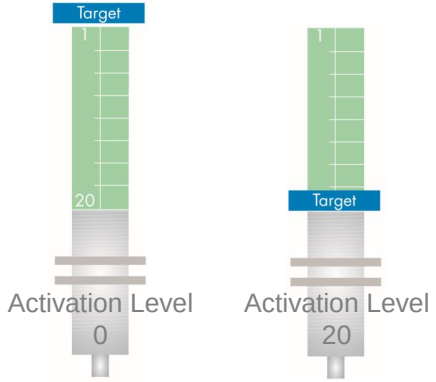
Output	• Logic: normally open / normally closed • Mode: PNP, NPN, push-pull
Sensing Mode	• Single point, window, or two point
Sensing Setpoint	• 33% / 50% / 75% / 100% of sensing range
Frequency Setpoint	• 1 to 7000 Hz
Hysteresis	• Standard ~ 10% or Extended ~ 20%
LED Indication	• Inactive, active, find my sensor
Timers	• Disabled, T-ON delay, T-OFF delay, T-ON & T-OFF delay, one-shot leading edge, one-shot trailing edge • 1 to 32767 milliseconds / seconds / minutes
Temp Alarm	• Warning and fault events • Min and max thresholds for temperature alarm • -32768 to +32767 deg C
Event Configurator	• Selection of IO-Link event data
Divider Operation	• 1 to 32767
Process Data	• Selection of active process data

ICF Inductive Sensor
2) Advanced Detection

TEMPERATURE ALARM

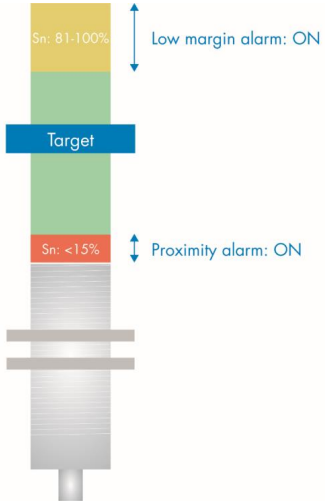
- Temperature is constantly monitored inside the sensor (will always be higher than ambient)
- Alarm sent if temperature exceeds the individually set max or min alarm levels
- When temperature alarm is triggered, the sensor will show this both an IO-Link event and by LED (even in SIO mode if temperature alarm is enabled)
- Change in temperature of a single or multiple sensors can give early warning of a larger issue (blocked fan, broken AC, etc.)

ACTIVATION LEVEL



- Rough indication of target position via an 8 bit analog value (0-20 range)
- Target out of the sensing range = 0
- Target enters sensing range = 1
- Larger values (up to 20) indicate the target is closer to the sensing face

LOW MARGIN ALARM



- Recommended working range for stable operation of an inductive sensor is less than 80% of the nominal sensing range in order to accommodate environmental changes or voltage fluctuations
- High value 1 = target is beyond the recommended working range (between 81% - 100%)
- Low value 0 = target is within recommended working range (between 0 – 80%)

PROXIMITY ALARM

- High value 1 = target is veery close to the sensing face

ICF Inductive Sensor
3) Reduced Inventory

DETECTION MODE
- Presence Detection – presence of a metal target
- Frequency Detection - control the speed of a revolving or cycling target

SWITCHING MODE
- Single point
- Two point
- Window

TIME DELAY
- Units set in ms, sec, or min with values from 1 to 32,767
- On delay, off delay, on delay & off delay, one-shot leading edge, one-shot trailing edge, direct (no delays)

OUTPUT INVERTER
- Normally open (NO)
- Normally closed (NC)

OUTPUT
- PNP, NPN, push-pull, disabled

ICF Inductive Sensor

4) Automatic Parameter Setting

- **Device identification** – sensor parameters / configurations and unique internal ID can be accessed via IO-Link

- **Automatic parameter settings** – setup of a new sensor is smooth and easy using previously stored parameters. Once a sensor has been replaced, the IO-Link master transmits parameters stored from the previous sensor.

YL2… & YN1…
IO-Link Masters

ICF Inductive Sensor
5) Advanced Diagnostics

Max & Min Temperatures

- Highest and lowest internal temperatures since start-up
- Current internal temperature

Detection Counter

- Number of detections made by sensor since start-up

Switching Frequency

- Frequency at which the sensor is activated

ICF Inductive Sensor
6) Plug & Play

- **Backwards compatible** – can be used in a traditional or IO-Link environment
- **Manufacturer independent** – IO-Link globally recognized communication standard; IO-Link master and sensors can be mixed and matched
- **Fieldbus independent** – IO-Link masters are a ‘translator’ giving visibility into sensor intelligence to industry-leading protocols (EtherNet/IP, PROFINET IO, MODBUS TCP, and OPC UA to the cloud)

YL2… & YN1…
IO-Link Masters

SCTL55
IO-Link Configurator

ICF Inductive Sensor
7) Multi-Function Device

Divider Function

- Allows the user to setup how many activation are needed to change the output
- If a gear has 8 teeth and the sensor divider is set to 8, the output will change each time the gear has completed a full revolution. When combined with time, this allows the user to directly measure the speed of a gear with a cost effective inductive sensor.

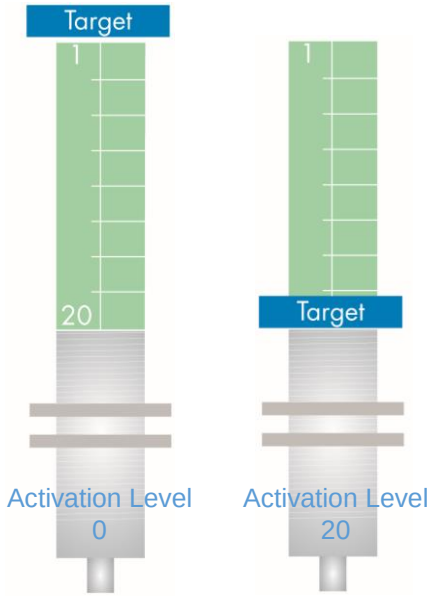
ICF Inductive Sensor
8) Predictive Maintenance

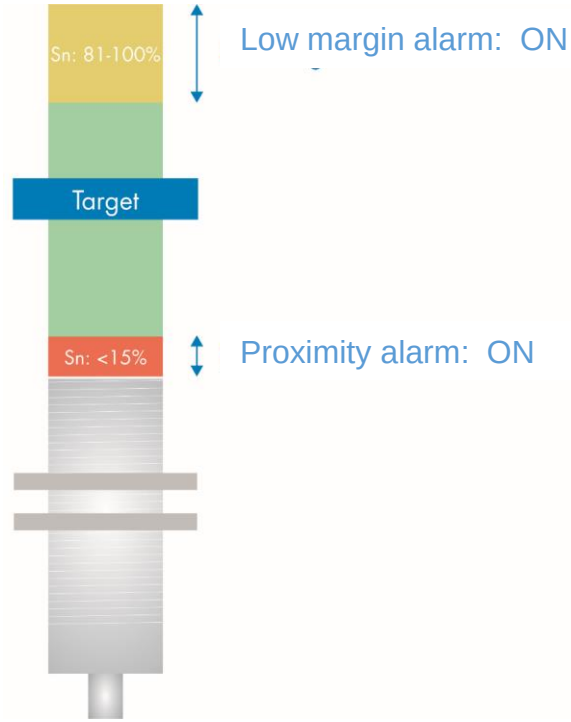
Predictive Maintenance

Condition monitoring of detection quality through

- Proximity alarm
- Low margin alarm
- Activation level
- Temperature monitoring
- Over-speed and under-speed detection

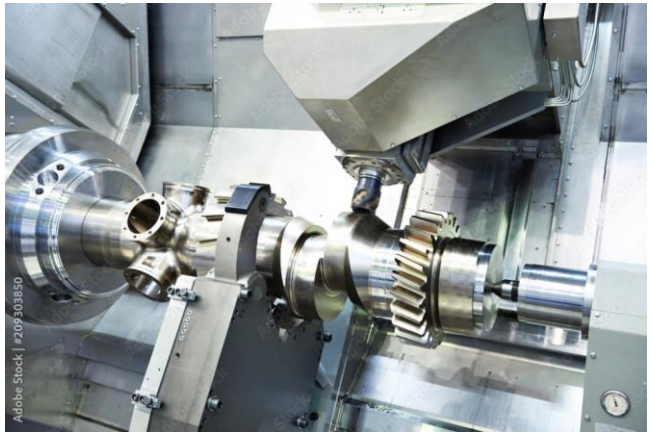
Allow customers to predict and schedule maintenance prior to sensor failure





APPLICATIONS

ICF Inductive Sensor
Industries & Applications



Machine Tool

Food & Beverage

Agriculture

Pharmaceutical

Mobile Equipment

Metal Working

ICF Inductive Sensor
Application Examples – Food & Beverage Conveyors

Customer Need

The food industry requires a high level of hygiene and cleanliness in equipment that must withstand daily wash-downs at high temperatures, high pressure cleaning and harsh detergents.

Benefit	ICF Sensor Feature
Longer lifetime due to the ability to withstand extreme conditions (exposure to chemicals, cleaning, extended temperature ranges)	- Extended temperature range (-40 to 85C and even short exposures of 15min at 100C) - Pressure on sensing face (260 bar for M12, 200 bar for M18, 100 bar for M30 housing) - Washdown capabilities (IP68, IP69K) - Ecolab approved
Increased uptime due to intelligent monitoring	- Temperature alarm for over or under monitoring - IO-Link cyclic process data can monitor quality of the detection - Ability to activate 'find my sensor' via IO-Link to quickly identify specific sensors
Prevent machine downtime	- IO-Link cyclic process data monitors the quality of detection allowing predictable maintenance scheduling - Clearly visible LEDs with diagnostic functions - Extended sensing range up to 22mm allows the target to be positioned farther away from the moving target
Higher efficiency / quality production	- Accurate and reliable detection across a wide temperature range due to advanced microprocessor-based electronics - Ability to customize output, timers, sensing range, etc. due to IO-Link

ICF Inductive Sensor
Application Examples – Agriculture

Customer Need

Agricultural machinery needs reliable and durable parts and components able to work long hours in difficult outdoor conditions, exposed to every kind of stress. The harsh environmental conditions, such as high vibration, could damage the sensor causing the machine to stop.

Benefit	ICF Sensor Feature
Longer lifetime due to the ability to withstand extreme conditions (exposure to chemicals, cleaning, extended temperature ranges)	- Extended temperature range (-40 to 85C) - Pressure on sensing face (260 bar for M12, 200 bar for M18, 100 bar for M30 housing) - Impact resistance up to 1 J due to single piece stainless steel AISI304 housing - Increased shock (100g) and vibration (25g) resistance - Washdown capabilities (IP68, IP69K)
Prevent machine downtime	- Clearly visible LEDs with diagnostic functions - Extended sensing range up to 22mm allows the target to be positioned farther away from the moving target
Higher efficiency / quality production	- Accurate and reliable detection across a wide temperature range due to advanced microprocessor-based electronics - Ability to customize output, timers, sensing range, etc. due to IO-Link

ICF Inductive Sensor
Application Examples – CNC Machine Tooling

Customer Need

The production of automated doors requires a metal working machine where the metal sheet is cut, folded, perforated, often with coolant flow under pressure. The maintenance of this machine is a fundamental part of the production of casing / chassis.

Benefit	ICF Sensor Feature
Longer lifetime due to the ability to withstand extreme conditions (exposure to chemicals, cleaning, extended temperature ranges)	- Extended temperature range (-40 to 85C and even short exposures of 15min at 100C) - Pressure on sensing face (260 bar for M12, 200 bar for M18, 100 bar for M30 housing) - Impact resistance up to 1 J due to single piece stainless steel AISI304 housing - Increased shock (100g) and vibration (25g) resistance - Washdown capabilities (IP68, IP69K)
Increased uptime due to intelligent monitoring	- Proximity alarm if a target is too close to sensing face - Low margin alarm if a target is too far away from the sensing face - Activation level provides an analog estimation of target position - Temperature alarm for over or under monitoring - Cyclic process data can monitor quality of the detection - Ability to activate 'find my sensor' via IO-Link to quickly identify specific sensors
Prevent machine downtime	- IO-Link cyclic process data monitors the quality of detection allowing predictable maintenance scheduling - Clearly visible LEDs with diagnostic functions - Extended sensing range up to 22mm allows the target to be positioned farther away from the moving target
Higher efficiency / quality production	- Accurate and reliable detection across a wide temperature range due to advanced microprocessor-based electronics - Ability to customize output, timers, sensing range, etc. due to IO-Link

CONCLUSIONS

ICF Inductive Sensor
Features & Benefits

Customer issue	Our solution – ICF	Achieved benefits
Stringent cleaning requirements in F&B industry with detergents and disinfectants	IP68 and IP69K protection degree and Ecolab Certified	Sensor capable of withstanding vigorous cleaning processes at high temp and pressure
Understand sensor status or ongoing issues such as overload / short-circuit	**High visibility LEDs** for status/ power/ overload/ short circuit	Clearly visible switching and operating status from for easy identification and diagnostics
Damaged sensors due to high pressure and high temperature washdown cycles	IP69K and can withstand short exposure (15min) at 100°C for cleaning processes	Reliable detection even with frequent and hard washdown cycles
Moving parts & mechanical tolerances cause the sensors to be hit by the target	Extended sensing distance **up to 22 mm** allows sensor to be positioned further away from the moving target	Longer installation tolerances allow better protection. Longer life-time and reduced downtime
Very low and high temps stress sensor components, reducing machine uptime	Continuous operation in extreme temperatures from **-40 to +85°C**	Reliable detection even in harsh winter and when installed next to a hot source
Moving parts & mechanical tolerances cause sensors to be hit by the metal target or an object	Sensor face resistant up to **260** bar pressure for M12, **200** bar for M18 and **100** bar for M30 versions	Further mechanical protection of the sensor thanks to the high impact resistance. Longer life-time and lower downtime
Challenging to find the position of the sensor in a wide/complex installation	Via IO-Link it is possible to activate "**find my sensor**" option and make the sensor visible thanks to the blinking LEDs	Avoid wasting time searching the desired sensor and increase machine uptime
Moving parts & mechanical tolerances cause the sensors to be hit by the metal target or an object	Via IO-link the following process data are available: low margin alarm, proximity alarm and activation level	Machine condition monitoring implementation