



**CARLO GAVAZZI**

# **IO-Link** **inductive sensors**

**ICF12, ICF18, ICF30**

**Instruction manual**

**Manuale d'istruzione**

**Betriebsanleitung**

**Manuel d'instructions**

**Manual de instrucciones**

**Brugervejledning**

**使用手册**



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# 1. Introduction

This manual is a reference guide for Carlo Gavazzi IO-Link inductive proximity sensors ICF12, ICF18 and ICF30. It describes how to install, set up and use the product for its intended use.

## 1.1 Description

Carlo Gavazzi inductive sensors are devices designed and manufactured in accordance with IEC international standards and are subject to the Low Voltage (2014/35/EU) and Electromagnetic Compatibility (2014/30/EU) EC directives.

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Please do not hesitate to make any suggestions for improving this document.

## 1.2 Validity of documentation

This manual is valid only for ICF12, ICF18 and ICF30 inductive sensors with IO-Link and until any new documentation is published.

This instruction manual describes the function, operation and installation of the product for its intended use.

## 1.3 Who should use this documentation

This manual contains important information regarding installation and must be read and completely understood by specialized personnel dealing with these inductive proximity sensors.

We highly recommend that you read the manual carefully before installing the sensor. Save the manual for future use. The installation manual is intended for qualified technical personnel.

## 1.4 Use of the product

Inductive sensors are suitable for non-contact detection of ferrous and non-ferrous metallic objects in general position-sensing and presence-sensing in industrial automation applications. The devices work on the principle of eddy currents and when a metal target approaches the face of the sensor, the magnetic field generated by the sensor interacts with the target and make the sensor change its status. ICF sensors are equipped with IO-Link communication. By using an IO-Link master it is possible to operate and configure these devices.

## 1.5 Safety precautions

This sensor must not be used in applications where personal safety depends on the function of the sensor (The sensor is not designed according to the EU Machinery Directive).

Installation and use must be carried out by trained technical personnel with basic electrical installation knowledge.

The installer is responsible for correct installation according to local safety regulations and must ensure that a defective sensor will not result in any hazard to people or equipment. If the sensor is defective, it must be replaced and secured against unauthorised use.

## 1.6 Other documents

It is possible to find the datasheet, the IODD file and the IO-Link parameter manual on the Internet at <http://gavazziautomation.com>

## 1.7 Acronyms

<b>I/O</b>	Input/Output
<b>PD</b>	Process Data
<b>PLC</b>	Programmable Logic Controller
<b>SIO</b>	Standard Input Output
<b>SP</b>	Setpoint
<b>IODD</b>	I/O Device Description
<b>IEC</b>	International Electrotechnical Commission
<b>NO</b>	Normally Open contact
<b>NC</b>	Normally Closed contact
<b>UART</b>	Universal Asynchronous Receiver-Transmitter
<b>SO</b>	Switching Output
<b>BDC</b>	Binary Data Channel
<b>MSB</b>	Most Significant Bit
<b>LSB</b>	Least Significant Bit

## 2. Product

### 2.1 Main features

New IO-Link Carlo Gavazzi 3-wire DC extended range inductive sensors, built to the highest quality standards, are available in 3 different housings:

ICF12, ICF18 and ICF30 stainless steel cylindrical threaded barrel in M12, M18 and M30 standard housings for flush or non-flush installation, with M12 connector or 2 metres PUR cable.

They can operate in standard I/O mode (SIO), which is the default operation mode. When connected to an IO-Link master, they automatically switch to IO-Link mode and can be operated and easily configured remotely.

Thanks to their IO-Link interface, these devices are much more intelligent and feature many additional configuration options, such as the settable sensing distance and hysteresis and timer functions of the output and advanced functionalities such as temperature alarms, "frequency monitoring" and "divider" functions.

## 2.2 Identification number

Code	Option	Description
<b>I</b>	-	Sensing principle: inductive sensor
<b>C</b>	-	Cylindrical housing with threaded barrel
<b>F</b>	-	Stainless steel full metal housing
□	<b>12</b>	M12 housing
	<b>18</b>	M18 housing
	<b>30</b>	M30 housing
<b>L45</b>	-	Standard housing with thread length of 45 mm
□	<b>F</b>	Flush installation
	<b>N</b>	Non-flush installation
□	-	Maximum sensing distance:
	<b>04</b>	4mm (for ICF12 flush)
	<b>08</b>	8mm (for ICF12 non-flush and ICF18 flush)
	<b>14</b>	14mm (for ICF18 non-flush)
	<b>15</b>	15mm (for ICF30 flush)
□	<b>22</b>	22mm (for ICF30 non-flush)
	<b>M1</b>	M12 plug
□	<b>B2</b>	2 m PUR cable
<b>IO</b>	-	IO-Link

Additional characters can be used for customized versions.

## 2.3 Operating modes

IO-Link inductive sensors are provided with one switching output (SO) and can operate in two different modes: SIO mode (standard I/O mode) or IO-Link mode.

### 2.3.1 SIO mode

When the sensor operates in SIO mode (default), an IO-Link master is not required. The device works as a standard inductive sensor, and it can be operated via a fieldbus device or a controller (e.g. a PLC) when connected to its PNP, NPN or push-pull digital inputs (standard I/O port).

One of the greatest benefits of these inductive sensors is the possibility to configure them via an IO-Link master and then, once disconnected they will keep the last parameters and configuration settings. In this way it is possible, for example, to configure the output of the sensor as a PNP, NPN or push-pull, or to add timer functions such as T-on and T-off delays and satisfy several application requirements with the same sensor.

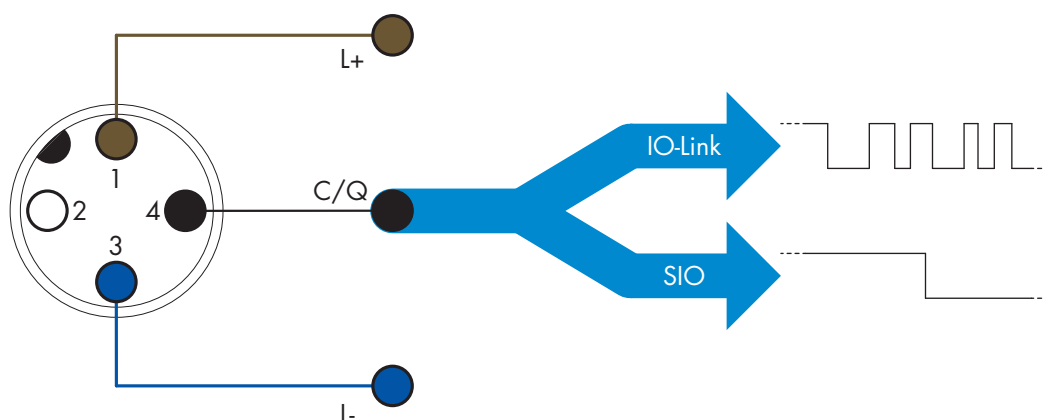
### 2.3.2 IO-Link mode

IO-Link is a standardized IO technology that is recognized worldwide as an international standard (IEC 61131-9).

It is today considered as the “USB interface” for sensors and actuators in the industrial automation environment.

When the sensor is connected to one IO-Link port, the IO-Link master sends a wakeup request (wake up pulse) to the sensor, which automatically switches to IO-Link mode: point-to-point bidirectional communication then starts automatically between the master and the sensor.

IO-Link communication requires only standard 3-wire unshielded cable with a maximum length of 20 m.



IO-Link communication takes place with a 24 V pulse modulation, standard UART protocol via the switching and communication cable (combined switching status and data channel C/Q) PIN 4 or black cable.

For instance an M12 4-pin male connector has:

- Positive power supply: pin 1, brown
- Negative power supply: pin 3, blue
- Digital output 1: pin 4, black
- Digital output 2: pin 2, white

The transmission rate of ICF sensors is 38.4 kBaud (COM2).

Once connected to the IO-Link port, the master has remote access to all the parameters of the sensor and to advanced functionalities, allowing the settings and configuration to be changed during operation, and enabling diagnostic functions, such as temperature warnings and temperature alarms and process data.

Thanks to IO-Link it is possible to see the manufacturer information and part number (Service Data) of the device connected, starting from V1.1. Thanks to the data storage feature it is possible to replace the device and automatically have all the information stored in the old device transferred into the new one.

Access to internal parameters allows the user to see how the sensor is performing, for example by reading the internal temperature.

Event Data allows the user to get diagnostic information such as an error, an alarm, a warning or a communication problem.

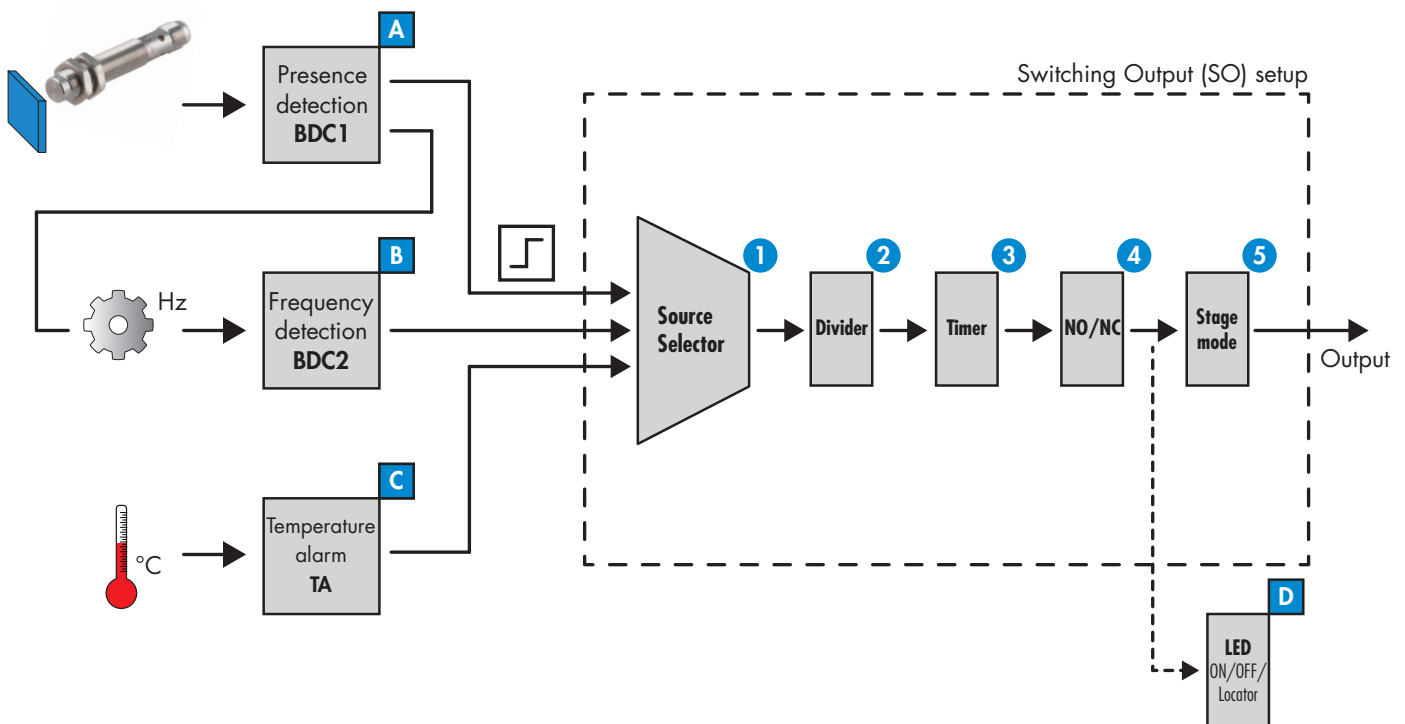
There are two different communication types between the sensor and the master and they are independent of each other:

- Cyclical for process data and value status – this data is exchanged cyclically.
- Acyclical for parameter configuration, identification data, diagnostic information and events (e.g. error messages or warnings) – this data can be exchanged on request.

### 2.3.3 Main features

The sensor measures three different physical values. These values can be independently adjusted and used as source for the Switching Output. After selecting one of these three sources, it is possible to configure the output of the sensor with an IO-Link master, following the five steps shown in the Switching Output setup below.

Once the sensor has been disconnected from the master, it will switch to the SIO mode and keep the last configuration setting.



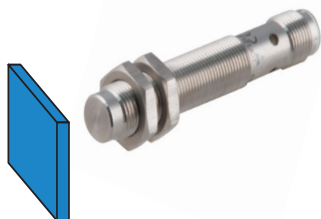
#### A Presence detection (BDC1)

When a metal target approaches the face of the sensor, the magnetic field generated by the sensor interacts with the target and the sensor changes its status.

For presence (or absence of presence) detection of a metal target in front of the face of the sensor, the following settings are available:



## BDC1



- > Setpoint 1(SP1) 100%/75%/50%/33%
- > Setpoint 2(SP2) 100%/75%/50%/33%
- > Switchpoint Logic (inverted/normal)
- > Switchpoint Mode (single point, window, etc..)
- > Switchpoint Hysteresis



### Information:

Can be set at 33%, 50%, 75% or 100% of the maximum rated operating distance.

## B Frequency detection (BDC2)

Measurement of the detection operating frequency.

Thanks to the IO-Link interface, it is possible to set the sensor output to read the frequency and to control the speed of a revolving or cycling mechanism (such as shafts, gears, cams, etc.).

By setting the output of the sensor in "Window mode" and frequency detection, the two setpoints SP1 and SP2 will determine the frequency range within which the output is activated. Out of this range, for frequencies lower than SP1 and higher than SP2, the output is not active, thus protecting the cycling mechanism in case of overspeed and underspeed conditions.

## BDC2



- > Setpoint 1(SP1) (1-7000 Hz)
- > Setpoint 2(SP2) (1-7000 Hz)
- > Switchpoint Logic (inverted/normal)
- > Switchpoint Mode (single point, window, etc..)
- > Switchpoint Hysteresis (1-7000 Hz)



### Information:

Setpoint 1 (SP1) and Setpoint 2 (SP2) can be set between 1 Hz and 7000 Hz.  
Verify the max frequency of the sensor

## Switchpoint logic:

The “Switchpoint Logic” defines how the switching information is transmitted. It is possible to choose between:

- Normal operation
- Inverted operation



### Note:

It is not recommended to use the Switchpoint Logic in inverted operation since it will affect all the following function blocks. If the Normally Open/Normally Closed setup is needed, use of the dedicated NO/NC function block (4) is recommended.

## Switchpoint mode:

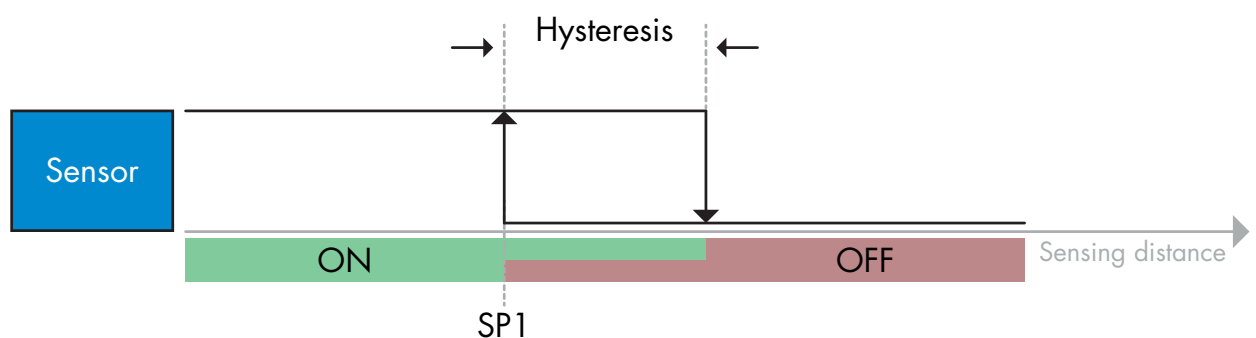
The Switchpoint mode setting can be used to create more advanced output behaviour. The following switchpoint modes can be selected for the switching behaviour of BDC1 and BDC2

### Disabled

BDC can be disabled, but this will also disable the output if it is selected in the source selector (the logic value will always be “0”).

### Single point mode

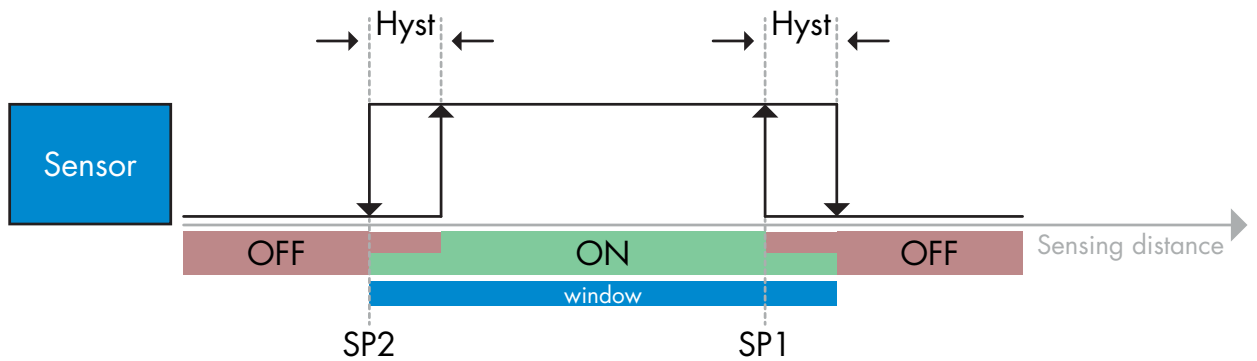
The switching information changes, when the measurement value passes the threshold defined in setpoint SP1, with rising or falling measurement values, taking into consideration the hysteresis.



*Example of presence detection – with non-inverted logic*

### Window mode

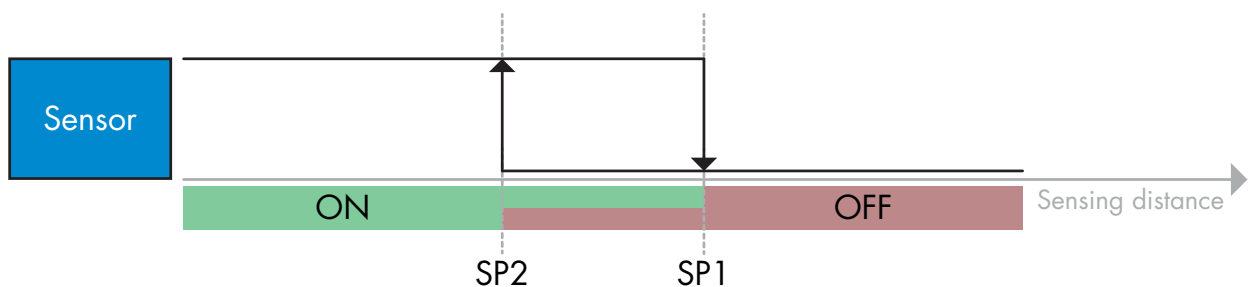
The switching information changes, when the measurement value passes the thresholds defined in setpoint SP1 and setpoint SP2, with rising or falling measurement values, taking into consideration the hysteresis.



Example of presence detection – with non-inverted logic

### Two point mode

The switching information changes when the measurement value passes the threshold defined in setpoint SP1. This change occurs only with rising measurement values. The switching information also changes when the measurement value passes the threshold defined in setpoint SP2. This change occurs only with falling measurement values. Hysteresis is not considered in this case.



Example of presence detection – with non-inverted logic

### Hysteresis settings:

In presence detection (BDC1) the hysteresis can be set between standard (about 10%) and extended (about 20%).



#### Information:

An extended hysteresis in presence detection is generally useful to solve vibration or EMC issues in the application.

In frequency detection (BDC2) the hysteresis can be set between 1 Hz and 7000 Hz.

## C Temperature alarm (TA)

The sensor constantly monitors the internal temperature. Using the temperature alarm setting it is possible to get an alarm from the sensor if temperature thresholds are exceeded.

The temperature alarm has two separate values, one for setting maximum temperature and one for setting minimum temperature.

If a temperature alarm is triggered, the sensor will show this both by LED and via an IO-Link event. It is possible to read the temperature of the sensor via the acyclic IO-Link parameter data.



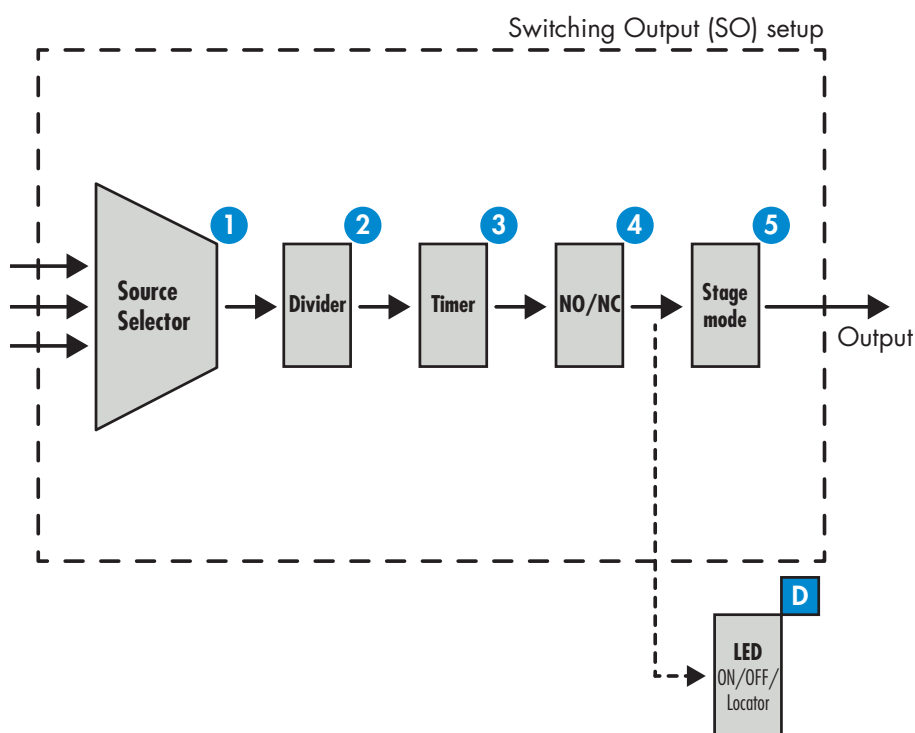
### Note:

The temperature measured by the sensor will always be higher than the ambient temperature, due to internal heating.

The difference between ambient temperature and internal temperature is influenced by how the sensor is installed in the application. If the sensor is installed in a metal bracket the difference will be lower than if the sensor is mounted in a plastic one.

## 2.3.4 Configuration of the Switching Output

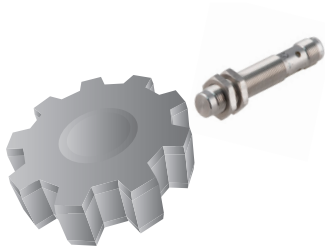
The Switching Output (SO) can be configured following steps 1 to 5



### 1 Source selector

This function block allows the user to associate any one of the three input values to the Switching Output (BDC1, BDC2, or TA).

## 2 Divider



This Divider allows the user to set up how many activations are needed to change the output.

By default this value is set to 1 and each activation causes the output to change. When the value is set to a higher value e.g. the number of teeth on a sprocket, the output will change each time the sprocket has completed one whole revolution. This way the user can directly read the speed of a sprocket.

## 3 Timer

The Timer allows the user to introduce different timer functions by editing the 3 timer parameters:

- Timer mode
- Timer scale
- Timer delay

### Timer mode:

This selects which type of timer function is introduced on the Switching Output. Any one of the following is possible:

#### Disabled

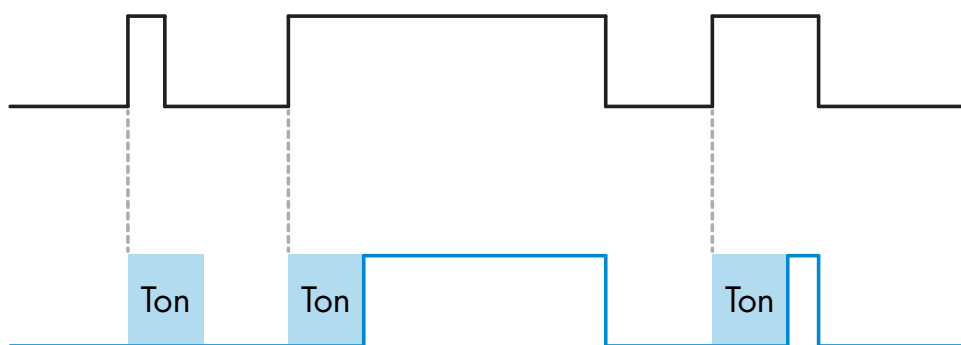
This option disables the timer function no matter how the timer scale and timer delay is set up.

#### Turn On delay (T-on)

The activation of the switching output is generated after the sensor actuation, as shown below.

Presence of target

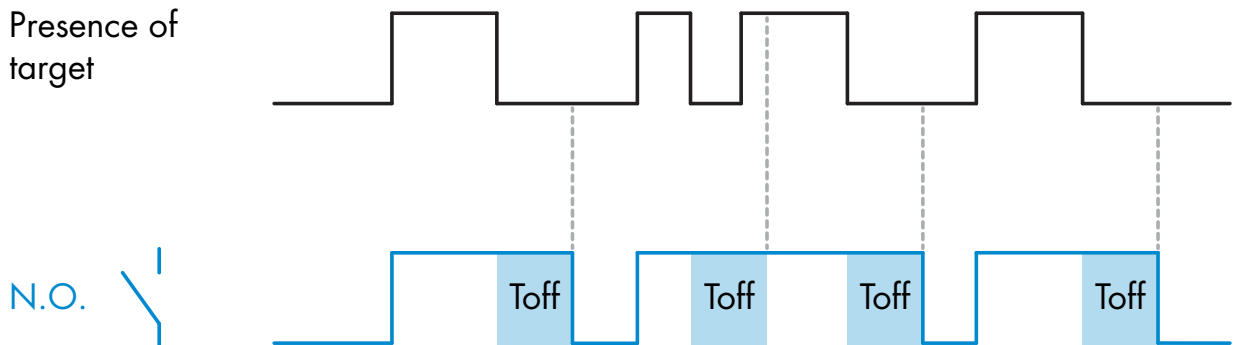
N.O. 



*Example with normally open output*

### Turn Off delay (T-off)

The deactivation of the switching output is delayed compared to the time of removal of the metal target in front of the sensor, as shown below.



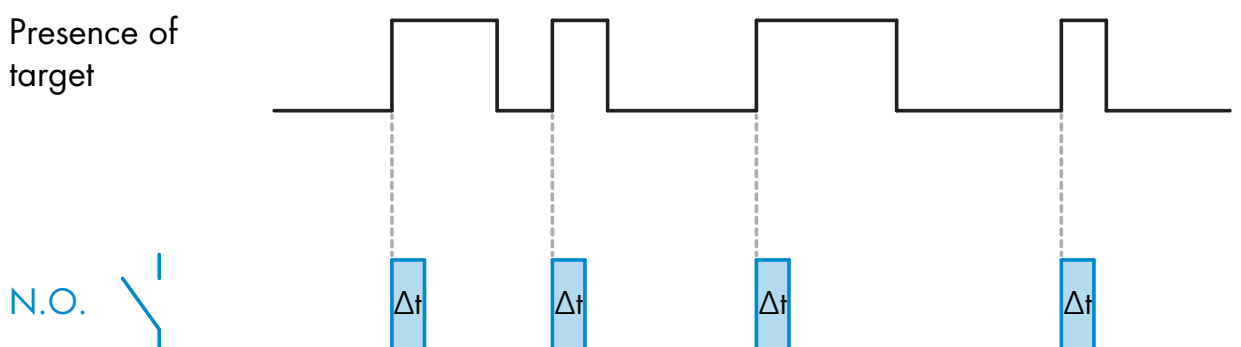
*Example with normally open output*

### T-on and T-off delay

When selected, both T-on and T-off delays can be applied to the generation of the switching output.

### One shot leading edge

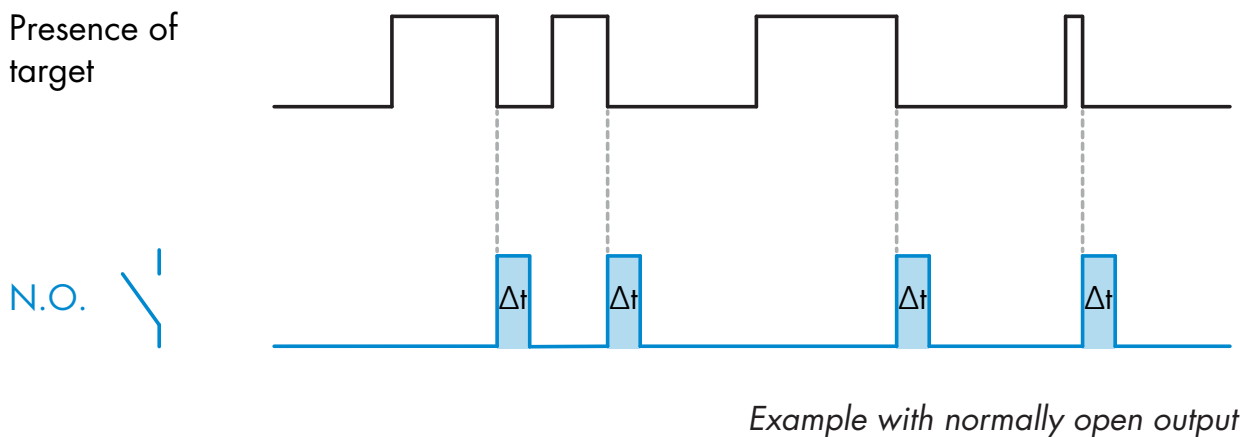
Each time a target is detected in front of the sensor, the switching output generates a pulse of constant length on the leading edge of the detection. See figure below.



*Example with normally open output*

### One shot trailing edge

Similar in function to the one shot leading edge mode, in this mode the switching output is changed on the trailing edge of the activation as shown below.



### Timer scale:

This parameter defines if the delay specified in Timer delay (see below) should be in milliseconds, seconds or minutes

### Timer delay:

This parameter defines the duration of the delay. The delay can be set to any integer value between 1 and 32767

## 4 NO/NC operation

This function allows the user to invert the operation of the switching output between Normally Open and Normally Closed.



### Note:

It is recommended to always use this function block to generate normally open/closed operation instead of the inverter block explained previously under BDC1 and BDC2.

## 5 Output stage mode

In this function block the user can select if the switching output should operate as Disabled, NPN, PNP or Push-Pull configuration.

## **D** LEDs

This parameter allows the user to disable the LED indication in the sensor or to enable the “find my sensor” function to easily identify and locate the sensor on the machine. When this function is activated, the Yellow and Green LEDs flash asynchronously until the function is disabled.

### 2.3.5 Internal sensor parameters

Other than the parameters directly related to output configuration, the sensor also has various internal parameters useful for setup and diagnostics.

#### **Event configuration:**

A temperature event transmitted over the IO-Link interface is turned off by default in the sensor. If the user wants to get information about critical temperatures detected in the sensor application, this parameter allows the enabling or disabling of the following 3 events:

- Temperature fault event: sensor detects temperature outside specified operating range.
- Temperature over-run: sensor detects temperatures higher than set in Temperature Alarm threshold.
- Temperature under-run: sensor detects temperatures lower than set in Temperature Alarm threshold.

#### **Max temperature since start-up:**

From this parameter the user can get information about what the maximum registered temperature has been since start-up.

#### **Min temperature since start-up:**

From this parameter the user can get information about what the minimum registered temperature has been since start-up.

#### **Switching frequency:**

The frequency at which the sensor is activated can be seen from this parameter.

#### **Detection counter:**

This parameter keeps track of how many detections have been made by the sensor since start-up.

#### **Application specific tag:**

The user can enter a name tag for the IO-Link sensor to easily recognize the position of the sensor in the machine.



### 2.3.6 Process data variable

When the sensor is operated in IO-Link mode, the user has access to the cyclic Process Data Variable. By default, the process data shows the following parameters as active: State of the Switching Output [SO], Low Margin Alarm [MA], Proximity Alarm [PA] and Activation Level [AL]. However, by changing the Process Data Configuration parameter, the user can decide to also enable the status of BDC1, BDC2, and Temperature Alarm. In this way several states can be observed in the sensor at the same time.

#### State of the switching output [SO]

---

When the value of this process data bit is High (1) it indicates the target is detected by the sensor.

#### Activation Level [AL]

---

This 8 bit Analogue value (0-20 range) gives a rough indication of the target position. If the target is out of the sensing zone, the value is 0. When the target enters the sensing zone it turns into 1. Bigger values indicate the target is closer to the sensing face.

#### Proximity Alarm [PA]

---

When the value of this process data bit is High (1) it indicates the target is very close to the sensing face.

#### Low Margin Alarm [MA]

---

The recommended working range of an inductive sensor is less than 80% of the nominal sensing range. Operation within this working range helps to ensure stable operation with typical environmental temperature, load, and supply voltage fluctuations and differences due to the manufacturer tolerances. When the value of this process data bit is High (1), it indicates the target is detected by the sensor beyond the recommended working range, so between 81% and 100% of the nominal sensing range. When it is Low (0), it communicates that the target is detected by the sensor and it is between 0 and 80% of the nominal sensing range.

So this process data can be used as a low margin warning indicator.

## Process data configuration:

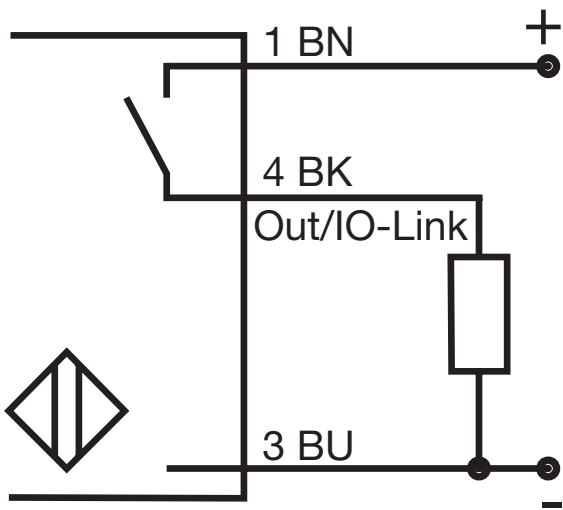
Process data	Factory default setting
SO, switching output	Active
BDC1, presence detection	Inactive
BDC2, frequency detection	Inactive
TA, temperature alarm	Inactive
MA, low margin alarm	Active
PA, proximity alarm	Active
AL, activation level (0-20 range)	Active

## Process data structure:

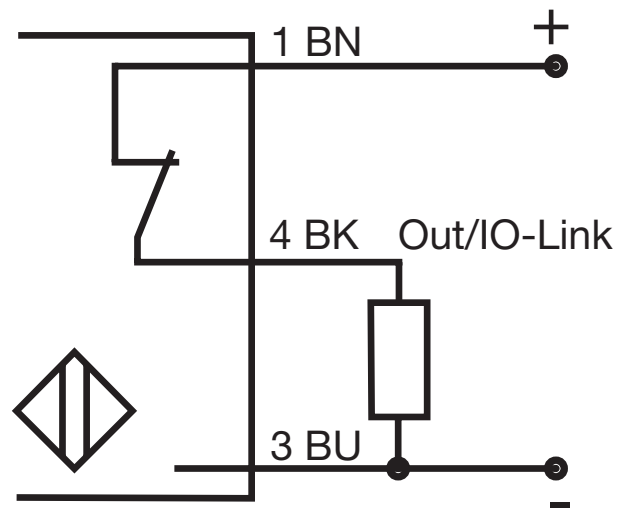
2 Bytes: Activation Level [AL] 8...15 (8 bit)

<b>Byte 0</b>	15 <b>MSB</b>	14 -	13 -	12 -	11 -	10 -	9 -	8 <b>LSB</b>
<b>Byte 1</b>	7 -	6 <b>PA</b>	5 <b>MA</b>	4 <b>TA</b>	3 <b>BDC2</b>	2 <b>BDC1</b>	1 -	0 <b>SO1</b>

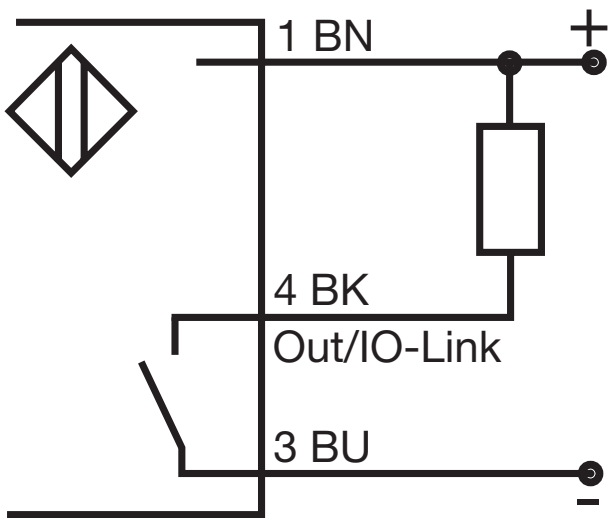
### 3. Wiring diagrams



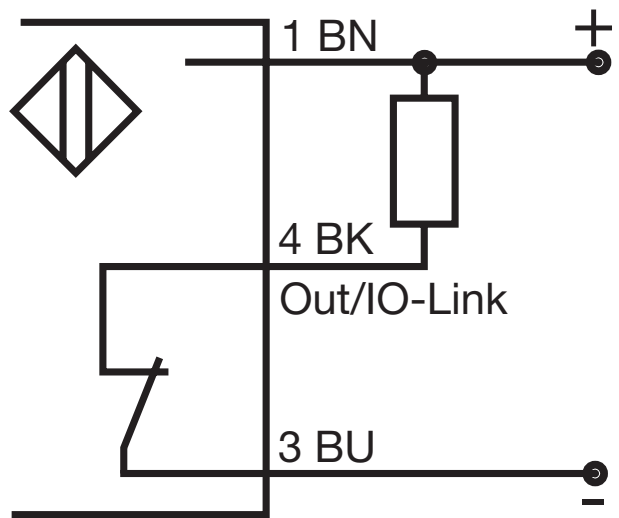
PNP - NO



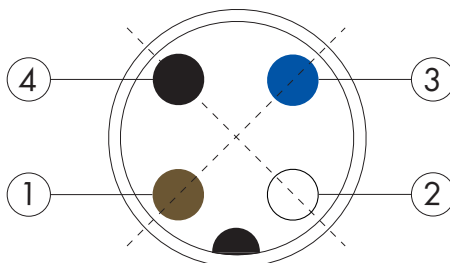
PNP - NC



NPN - NO



NPN - NC



PIN	Colour	Signal	Description
1	Brown	10 to 30 VDC	Device supply
3	Blue	GND	Ground
4	Black	Load	IO-Link / Output / SIO mode

## 4. Commissioning

50 ms after the power supply is switched on, the sensor is operational.

If it is connected to an IO-link master, no additional setting is needed and the IO-Link communication starts automatically after the IO-Link master sends a wakeup request to the sensor.

## 5. Operation

ICF12, ICF18 and ICF30 sensors are equipped with one yellow LED and one green LED

### SIO mode:

Green LED	Yellow LED	Output	Description
ON	OFF	OFF	N.O. output, target not present N.C. output, target present (Sn: <81%)
ON	ON	ON	N.O. output, target present (Sn: <81%) N.C. output, target not present
OFF	OFF	OFF	N.C. output, target present (Sn: 81%-100%)
OFF	ON	ON	N.O. output, target present (Sn: 81%-100%)
-	Blinking	f: 2Hz	Short-circuit or overload
Blinking	-	f: 5Hz	Temperature alarm (if enabled)
Blinking	Blinking	f: 2Hz	Asynchronously flashing, "find my sensor" is enabled

### IO-Link mode:

Green LED	Mode	Description
Blinking	ON for 0.75s OFF for 0.075s	IO-Link communication established with the IO-Link master

Green LED	Yellow LED	Output	Description
ON for 0.75s OFF for 0.075s	OFF	OFF	N.O. output, target not present N.C. output, target present
ON for 0.75s OFF for 0.075s	ON	ON	N.O. output, target present N.C. output, target not present
-	Blinking	f: 2Hz	Short-circuit or overload
Blinking	-	f: 5Hz	Temperature alarm (if enabled)
Blinking	Blinking	f: 2Hz	Asynchronously flashing, "find my sensor" is enabled

Possibility to disable the LED

## 6. IODD file and factory setting

### 6.1 IODD file of an IO-Link device

All features, device parameters and setting values of the sensor are collected in a file called I/O Device Description (IODD file). The IODD file is needed in order to establish communication between the IO-Link master and the sensor.

Every supplier of an IO-Link device has to supply this file and make it available for download on the web site. The file is compressed, so it is important to de-compress it.

The IODD file includes:

- process and diagnostic data
- parameters description with the name, the permitted range, type of data and address (index and sub-index)
- communication properties, including the minimum cycle time of the device
- device identity, article number, picture of the device and Logo of the manufacturer

IODD file are available on the Carlo Gavazzi Website:  
[www.gavazziautomation.com](http://www.gavazziautomation.com)

### 6.2 Factory setting

IO-Link versions of ICF12, ICF18 and ICF30 inductive sensors have the following factory setting:

- "single point mode" operation
- PNP, NO
- Switching distance: 100%
- Switching hysteresis: standard
- LEDs: on
- Presence detection (BDC1)
- Divider is set to 1
- All timers are disabled

## 7. Appendix

### 7.1 Acronyms

<b>R/W</b>	Read and Write
<b>R</b>	Read Only
<b>W</b>	Write Only
<b>StringT (X)</b>	String of ASCII characters, X characters long
<b>IntegerTX</b>	Signed Integer X bits long
<b>UIntegerTX</b>	Unsigned Integer X bits long
<b>OctetStringT (X)</b>	Array of Octets, X octets long
<b>PDV</b>	Process Data Variable

### Device parameters

Parameter Name	Index Hex(Dec)	Subindex Hex(Dec)	Access	Default value	Data range	Data Type (Length)
Vendor Name	0x10(16)	0x00(0)	R	Carlo Gavazzi	-	StringT (13)
Vendor Text	0x11(17)	0x00(0)	R	www.gavazziautomation.com	-	StringT (25)
Product Name	0x12(18)	0x00(0)	R	(Sensor name) e.g. ICF12L45F04M110	-	StringT (20)
Product ID	0x13(19)	0x00(0)	R	(EAN code of product) e.g. 5709870393070	-	StringT (13)
Product Text	0x14(20)	0x00(0)	R	Inductive Proximity Sensor	-	StringT (26)
Serial Number	0x15(21)	0x00(0)	R	(Unique serial number) e.g. LR24101830834	-	StringT (13)
Hardware Revision	0x16(22)	0x00(0)	R	(Hardware revision) e.g. v01.00	-	StringT (6)
Firmware Revision	0x17(23)	0x00(0)	R	(Software revision) e.g. v01.00	-	StringT (6)
Application Specific Tag	0x18(24)	0x00(0)	R/W	***	Any string up to 32 characters	StringT (32)
Error Count	0x20(32)	0x00(0)	R	-	0 to 65535	UIntegerT16
Device Status	0x24(36)	0x00(0)	R	-	0 = Device is operating properly 2 = Out-of-specification 4 = Failure	UIntegerT8
Detailed Device Status						
Temperature fault		0x01(1)	R	-	-	OctetStringT (3)
Temperature over-run	0x25(37)	0x02(2)	R	-	-	OctetStringT (3)
Temperature under-run		0x03(3)	R	-	-	OctetStringT (3)
Process-DataInput	0x28(40)	0x00(0)	R	-	0 to 15	UIntegerT16

## Output setup parameters

Parameter Name	Index Hex(Dec)	Subindex Hex(Dec)	Access	Default value	Data range	Data Type (Length)
Setpoint BDC1	0x3C(60)	0x01(1)	R/W	3	0 = 33 % sensing range 1 = 50 % sensing range 2 = 75 % sensing range 3 = 100 % sensing range	IntegerT16
Setpoint 1						
Setpoint 2		0x02(2)	R/W	0	0 = 33 % sensing range 1 = 50 % sensing range 2 = 75 % sensing range 3 = 100 % sensing range	IntegerT16
Switchpoint BDC1	0x3D(61)	0x01(1)	R/W	0	0 = Normal operation BDC1 1 = Inverted operation BDC1	UIntegerT8
Logic						
Mode		0x02(2)	R/W	1	0 = Deactivated 1 = Single point mode 2 = Window mode 3 = Two point mode	UIntegerT8
Hysteresis		0x03(3)	R/W	0	0 = Standard hysteresis ≈ 10% 1 = Extended hysteresis ≈ 20%	IntegerT16
Setpoint BDC2	0x3E(62)	0x01(1)	R/W	100	1 to 7000 Hz	IntegerT16
Setpoint 1						
Setpoint 2		0x02(2)	R/W	50	1 to 7000 Hz	IntegerT16
Switchpoint BDC2	0x3F(63)	0x01(1)	R/W	0	0 = Normal operation BDC2 1 = Inverted operation BDC2	UIntegerT8
Logic						
Mode		0x02(2)	R/W	1	0 = Deactivated 1 = Single point mode 2 = Window mode 3 = Two point mode	UIntegerT8
Hysteresis		0x03(3)	R/W	10	1 to 7000 Hz	IntegerT16
SIO Channel 1	0x40(64)	0x01(1)	R/W	1	0 = disabled output 1 = PNP output 2 = NPN output 3 = Push-pull output	UIntegerT8
Stage Mode						
Source		0x02(2)	R/W	1	1 = BDC1 2 = BDC2 5 = Temperature Alarm	UIntegerT8
Timer Mode		0x03(3)	R/W	0	0 = disabled 1 = T-ON delay 2 = T-OFF delay 3 = T-ON & T-OFF delay 4 = One-shot leading edge 5 = One-shot trailing edge	UIntegerT8
Timer Scale		0x04(4)	R/W	0	0 = Milliseconds 1 = Seconds 2 = Minutes	UIntegerT8
Delay Duration		0x05(5)	R/W	100	1 to 32767	IntegerT16
Divider		0x06(6)	R/W	1	1 to 32767	IntegerT16
NO/NC Operation		0x08(8)	R/W	0	0 = Normally Open 1 = Normally Closed	UIntegerT8

## Internal sensor parameters

Parameter Name	Index Hex(Dec)	Subindex Hex(Dec)	Access	Default value	Data range	Data Type (Length)
Process Data Configuration	0x46(70)					
Activation Level (AL)		0x01(1)	R/W	1	0 = AL not shown in PDV 1 = AL shown in PDV	RecordT16
Switching Output (SO)		0x02(2)	R/W	1	0 = SO not shown in PDV 1 = SO shown in PDV	
Binary Data Channel 1 (BDC1)		0x04(4)	R/W	0	0 = BDC1 not shown in PDV 1 = BDC1 shown in PDV	
Binary Data Channel 2 (BDC2)		0x05(5)	R/W	0	0 = BDC2 not shown in PDV 1 = BDC2 shown in PDV	
Margin Alarm (MA)		0x06(6)	R/W	1	0 = MA not shown in PDV 1 = MA shown in PDV	
Proximity Alarm (PA)		0x07(7)	R/W	1	0 = PA not shown in PDV 1 = PA shown in PDV	
Temperature Alarm (TA)	0x08(8)	R/W	0	0 = TA not shown in PDV 1 = TA shown in PDV		
Temperature Alarm Threshold	0x48(72)					
High Threshold		0x01(1)	R/W	100	-32768 to 32767 °C	IntegerT16
Low Threshold	0x02(2)	R/W	-30	-32768 to 32767 °C	IntegerT16	
Event Configuration	0x4A(74)					
Temperature fault event		0x02(2)	R/W	0	0 = Fault event disabled 1 = Fault event enabled	RecordT16
Temperature over-run		0x03(3)	R/W	0	0 = Warning event disabled 1 = Warning event enabled	
Temperature under-run	0x04(4)	R/W	0	0 = Warning event disabled 1 = Warning event enabled		
LED Activation	0x4E(78)	0x00(0)	R/W	1	0 = LED indication disabled 1 = LED indication enabled 2 = find my sensor	UIntegerT8
Max temperature since start-up	0xCD(205)	0x00(0)	R	-	-32768 to 32767 °C	IntegerT16
Min temperature since start-up	0xCE(206)	0x00(0)	R	-	-32768 to 32767 °C	IntegerT16
Current temperature	0xCF(207)	0x00(0)	R	-	-32768 to 32767 °C	IntegerT16
Switching frequency	0xD0(208)	0x00(0)	R	-	0 to 32767 Hz	IntegerT16
Detection counter	0xD2(210)	0x00(0)	R	-	0 to 2147483647	IntegerT32



