CALIS – Firmware V3.x

Revision A | 2024-12-19

Overview

CALIS Level Sensors can be used in IO-Link and non-IO-Link environments.

For non-IO-Link usage, the sensor features one digital output that switches on at a certain fill level and one analog current output, whose value scales continuously with the fill level.

The related parameters can be configured before/during deployment via IO-Link:

- Container teach-in with 2 to 6 reference points
- Set point of the digital output

IO-Link Communication

If the sensor detects IO-Link communication, it automatically switches to the IO-Link communication mode. The IO-Link standard offers different communication mechanisms:

- **Acyclic Data** (Indexed Service Data Units): Used to configure basic settings during commissioning.
- **Cyclic Process Data**: Used to receive the sensor's state and influence its behavior during runtime.
- **Events**: The sensor will report events in case of error.

In IO-Link applications the fill level is provided via cyclic Process Data for processing by a PLC.

> **INFO**
>
> Process Data, ISDUs and events of the sensor, their respective numeric indices, offsets, and values, are described in the IODD file of the sensor. It is highly recommended to use this file when integrating the sensor in an application.

Device Variants

Product ID	Name	Description
CAS-MQEU-M01	CALIS Level Sensor	ToF Level Sensor with M22 flange and M12 connector

IO-Link Interface

IO-Link Specification: V1.1.3 (June 2019)

Property	Value
Vendor ID	1239
Device Family	CALIS series
Device Name	CALIS Level Sensor
Device ID	2305
IODD	IODDfinder

Communication Interface

Property	Value
IO-Link Version	V1.1
Bitrate	COM2
Minimum Cycle Time	14800 µs
Process Data Input Bits	64
SIO Supported	Yes
ISDU Supported	Yes
Data Storage	Yes
Block Parameter	Yes
Supported Profiles	FW-Update (49)

Process Data

> **NOTE**
>
> IO-Link Bit Offset counts from the last byte of the data array.

Process Data Input

64 bit / 8 bytes

Byte	0	1	2	3	4	5	6	7
Bit Offset			40	32		16		0
Data	reserved		Pin 4		Distance (mm)		Fill Level (%)	

Field Reference

Bit Offset	Name	Datatype	Values	Info
0	Fill Level	16-bit IntegerT	-32768 ... 32767 [0.01 %]	Fill level in 0.01% (-327.68% ... +327.67%)
16	Distance	16-bit UIntegerT	0 ... 65535 [mm]	Measured distance in mm
32	Pin 4	8-bit UIntegerT	0 - Output OFF, 1 - Output ON	State of digital output on Pin 4 (whether fill level is greater than set point)

Process Data Output

None.

Events & Commands

Events

Event Code	Type	Definition and recommended maintenance action
6144	Error	Output Overload – Output current too high – max. 200 mA
16912	Warning	Device temperature overrun – Clear source of heat
20496	Error	Component malfunction – Repair or exchange
20752	Warning	Primary supply voltage overrun – Check valid voltage range
20753	Warning	Primary supply voltage underrun – Check valid voltage range
25376	Error	Parameter error – Check datasheet and values

Commands

ISDU Index 2 – System Command

General Commands

Value	Name	Description
128	Device Reset	A warm start is triggered and the device will be set to an initial state. The communication will be interrupted by the device and then reinitiated by the master.
129	Application Reset	The parameter of the technology-specific application are set to default values. Identification parameters remain unchanged. An upload to the data storage of the master will be executed, if activated in the port configuration of the master.
130	Restore Factory Settings	The parameter of the device are reset to factory settings. Note: A download of the data storage may be executed on the next power cycle and overwrite the factory default settings!
131	Back-to-box	The parameter of the device are set to factory default values and communication will be inhibited until the next power cycle. Note: Directly detach the device from the master port!

Calibration Commands

Value	Name	Description
164	Calibrate Low Level	Stores the current distance as Low Level reference point
165	Calibrate High Level	Stores the current distance as High Level reference point
167	Set Additional Reference 1	Stores the current distance as additional reference point 1
168	Set Additional Reference 2	Stores the current distance as additional reference point 2
169	Set Additional Reference 3	Stores the current distance as additional reference point 3
170	Set Additional Reference 4	Stores the current distance as additional reference point 4

ISDU Indices

Access Rights: **ro** – Read Only, **rw** – Read/Write, **wo** – Write Only

System Command

Name	Index	Bytes	Access	Values	Description
System Command	2	1	wo	see Events & Commands	

Identification

Name	Index	Bytes	Access	Values	Description
Vendor Name	16	23	ro	CAPTRON Electronic GmbH	
Product Name	18	5	ro	CALIS	
Product Text	20	17	ro	order ID	
Product ID	19	12	ro	CAS-MQEU-M01	
Serial Number	21	13	ro		
Hardware Revision	22	4	ro	0001	
Firmware Revision	23	4	ro	V3.x	
Application-specific Tag	24	32	rw		
Function Tag	25	32	rw		
Location Tag	26	32	rw		
Hardware Identification Key	17342	9	ro	A0001001C	

Measurement Configuration

Name	Index	Bytes	Access	Values	Description
Overfill Warning Distance	333	2	rw	0 ... 1200 [mm]	

Container Teach-In

High Fill Level

Name	Index	Bytes	Access	Values	Description
Container High Fill Level	287	1	rw	0 ... 100 [%]	Fill level in percent of High Level reference point.
Distance "High Level"	289	2	rw	0 ... 1200 [mm]	Sensor value for High Level reference point. Will be set to current distance when triggering "Calibrate High Level" command.

Low Fill Level

Name	Index	Bytes	Access	Values	Description
Container Low Fill Level	286	1	rw	0 ... 100 [%]	Fill level in percent of Low Level reference point.
Distance "Low Level"	288	2	rw	0 ... 1200 [mm]	Sensor value for Low Level reference point. Will be set to current distance when triggering "Calibrate Low Level" command.

Additional Reference Point 1

Name	Index - Subindex	Bytes	Access	Values	Description
Level	328 - 1	1	rw	-1 - not set, 0 ... 100 [%]	Fill level in percent for optional additional reference point 1.
Distance	328 - 2	4	rw	0 - not set, 1 ... 1200 [mm]	Distance for optional additional reference point 1.

Additional Reference Point 2

Name	Index - Subindex	Bytes	Access	Values	Description
Level	329 - 1	1	rw	-1 - not set, 0 ... 100 [%]	Fill level in percent for optional additional reference point 2.
Distance	329 - 2	4	rw	0 - not set, 1 ... 1200 [mm]	Distance for optional additional reference point 2.

Additional Reference Point 3

Name	Index - Subindex	Bytes	Access	Values	Description
Level	330 - 1	1	rw	-1 - not set, 0 ... 100 [%]	Fill level in percent for optional additional reference point 3.
Distance	330 - 2	4	rw	0 - not set, 1 ... 1200 [mm]	Distance for optional additional reference point 3.

Additional Reference Point 4

Name	Index - Subindex	Bytes	Access	Values	Description
Level	331 - 1	1	rw	-1 - not set, 0 ... 100 [%]	Fill level in percent for optional additional reference point 4.
Distance	331 - 2	4	rw	0 - not set, 1 ... 1200 [mm]	Distance for optional additional reference point 4.

Pin 4 Configuration

Name	Index	Bytes	Access	Values	Description
Pin 4 Function	316	1	rw	0 - NPN, 1 - PNP, 2 - PushPull	**NPN** : Output signal is pulled down to 0V when output is on. **PNP** : Output signal is pushed up to +VDC when output is on. **PushPull** : Output signal is pushed up to +VDC when output is on and is pulled down to 0V when it is off.
Output Function	319 - 1	1	rw	0 - NO (Normally Open), 1 - NC (Normally Closed)	**NO** : Output will close when fill level is above set point. **NC** : Output will open when fill level is above set point.
Output Set Point	319 - 2	1	rw	0 ... 100 [%]	Fill level above which Output will switch ON. With a value of 100%, Output will never switch on.
Output Hysteresis	319 - 3	1	rw	0 ... 100 [%]	Output will switch OFF when fill level is below Set Point minus this value.
Output Minimum Impulse Time	319 - 4	4	rw	10 ... 300000 [ms]	The minimal time (ms) the output signal will toggle when set or reset point is crossed.

LED

Name	Index	Bytes	Access	Values	Description
LED Brightness	285	1	rw	1 ... 100 [%]	Brightness of LED in percent.

Observation & Diagnosis

Name	Index	Bytes	Access	Values	Description
Supply Voltage	256	2	ro	0 ... 65535 [0.001 V]	
Sensor Temperature	257	2	ro	-32768 ... 32767 [0.1 °C]	
Device Status	36	1	ro	0 ... 4	Device Status according to IO-Link Specification B.2.20
Detailed Device Status	37	24	ro		Device Status according to IO-Link Specification B.2.21
Error Code	282	2	ro	0 ... 65535	See Diagnostics
Charge Code	280	4	ro	0 ... 4294967295	

Self-Diagnosis and Errors

CALIS Level Sensors include the following diagnosis features:

- **Monitoring** of Supply and internal Voltages and MCU Temperature
- **Overload Detection** on digital and analog outputs

Error Codes

Blink Code	IO-Link Error Code	Description
1	0x0001	Internal error
2	0x0002	Error with intermediate voltage
4	0x0008	Supply voltage overrun / underrun
5	0x0010	Container overfill / Sensor error
8	0x0080	Parameter memory error
9	0x0100	Parameter error
12	0x0800	LED error
13	0x1000	Overload on digital output
15	0x4000	Temperature overrun

References

- IO-Link Interface and System Specification V1.1.3

Revision History

Rev. A – 2024-12-19

- Initial version