

IO-Link Data Sheet

esf-1/CDF/A

esf-1/7/CDF/A

esf-1/15/CDF/A

IO-Link Data Sheet



esf-1/CDF/A

Ultrasonic label and splice sensor with pnp and Push-Pull switching output with IO-Link interface. The fork depth is 55 mm.

esf-1/7/CDF/A

Ultrasonic label and splice sensor with pnp and Push-Pull switching output with IO-Link interface. The fork depth is 70 mm.

esf-1/15/CDF/A

Ultrasonic label and splice sensor with pnp and Push-Pull switching output with IO-Link interface. The fork depth is 150 mm.

Pin assignment



IO-Link mode

The sensors esf-1/CDF/A, esf-1/7/CDF/A and esf-1/15/CDF/A are IO-Link capable in accordance with IO-Link specification 1.1. Each sensor has an IO-Link communication interface on pin 4.

Direct access to process and diagnosis data is possible via the IO-Link interface. The parameterization of the sensors is possible during operation.

Physical layer

Vendor Name	microsonic GmbH
Vendor ID	419 (0x01a3)
Device ID	72 (0x000048)
IO-Link Specification	1.1
Transmission Rate	COM 2 (38,400 Bd)
Process Data Length	32 Bit PDI
Minimum Cycle Time	4 ms
IO-Link Port Type	A (<200mA)
SIO Mode Supported	Yes
Smart Sensor Profile	Yes
Block Parameter	Yes
Data Storage	Yes

Product Name	Product ID
esf-1/CDF/A	16950
esf-1/7/CDF/A	16953
esf-1/15/CDF/A	16952

IODD description file

The sensors have a common device description file. The IODD contains:

- › Communication features
- › Device parameter with allowed values and default value
- › Identification-, processing and diagnostic data
- › Device data
- › Text description
- › Picture of the device
- › Logo of the manufacturer

Label and splice sensor

A label sensor has the task to detect labels glued to a backing material. For this purpose, the label sensor evaluates the signal level difference between the backing material and the backing material with labels.

A splice sensor has the task to detect a splice in a web material. The end and beginning of the web material can be joined together as a splice and glued with an adhesive tape, or can be glued overlappingly. For this purpose, the splice sensor evaluates the signal level difference between the web material and the splice.

The signal differences between backing material and backing material with labels or web material and splice can be very slight. To ensure a reliable distinction, the label as well as the splice sensor has to learn each respective material: During the Teach-in process, the ultrasonic transmitter output and amplification factor of the internal analog amplifier will be adjusted to the backing material of the labels or the web material. The determined parameters are

then stored in the parameter material adjustment. The thresholds to detect labels and splices are then calculated and stored in SP1 and SP2. The parameters are newly determined with each Teach-in process.

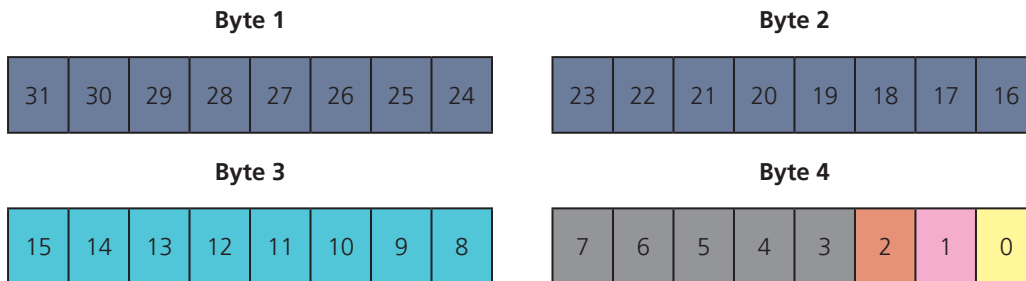
The Teach-in procedure can be carried out manually with the button on the label and splice sensor or with pin 5 via the controls.

Many parameters of the sensor are accessible via IO-Link. The parameter can be read or even partly written. The parameters can be read out to set up a recipe management. Optionally, Teach-in procedures via button or pin 5 can be started with IO-Link.

The label and splice sensor has to be calibrated to every material via the Teach-in procedures. For data storage or recipe management, the material-specific parameters can be read out and written back. It is not recommendable to change the determined parameters via IO-Link afterwards.

Process data

The process data are cyclically transmitted data. The length of the process data of esf-1 sensors are 4 byte.



	Description	Value range
0	1 Initial state (SSC1)	0 = False 1 = True
1	2 Initial state (SSC2)	0 = False 1 = True
2	Web break	0 = False 1 = True
8 - 15	Process data scale	-1
16 - 31	Process data	0...1,023 = Measured value 32,764 = No measurement data -32,760 = Outside the detection range (-) 32,760 = Outside the detection range (+)

Scale

is the scaling of the process data. The measured value of the sensor is calculated as stated

$$\text{Process data} \times 10^{(\text{Scale})} = \text{measured value}$$

For example: $642 \times 10^{-1} = 64,2$

Measurement data channel description

Index	Subindex	Term	Data type	Access	Default value
16512	0	Measurement data channel description	Record		
	1	Lower limit	UInt32	RO	0
	2	Upper limit	UInt32	RO	1,023
	3	Unit code	UInt16	RO	0
	4	Scale	Int8	RO	-1

Lower limit

The lower limit is the smallest measured value that the sensor can output.

Upper limit

The upper limit is the biggest measured value that the sensor can output.

Unit code

The measuring value is dimensionless.

Scale

is the scaling of the process data. The measured value of the sensor is calculated as stated:

$$\text{Process data} \times 10^{(\text{Scale})} = \text{measured value}$$

For example: $642 \times 10^{-1} = 64,2$

Teach-in

Index	Sub-index	Term	Data type	Access	Default value	Value range
2		System Commando	UInt8	WO		75 = Teach-in start 76 = Teach-in next step / end 79 = Teach-in abort
58		Teach-in channel	UInt8	RW	0	0 = SSC 1: Default: pin 4 (push-pull) 1 = SSC 1: Pin 4 (push-pull)
59		Teach-in status	UInt8	RO	0	Bit 0...3: 0 = Idle 1 = SP1 success 2 = SP2 success 3 = SP12 success 4 = Wait for command 5 = Busy 7 = Error
400	0	Teach-in configuration	Record			
	1	Splice threshold	UINT8	RW	20	5...50 %; resolution in %
	2	Teach-in type	UINT8	RW	0	0 = Label dynamic 1 = Label static 2 = Splice
500		Material adjustment	UINT32	RW		

Event number		Event type	Event description
dec	hex		
36003	0x8ca3	Warning	Material adjustment data record does not match the sensor.

System Commando

The system command is used to execute application commands, Teach-in commands and IO-Link specific commands.

Teach-in channel

The target channel of the Teach-in can be selected via this index. SSC1 can be parametericed.

Teach-in status

The Teach-in status indicates the state of the current adjustment.

Splice threshold

The threshold value for the splice is the percentage reduction on SP1, see description Switched Signal Channel (SSC), and the percentage surcharge on SP2, see description SSC. To detect a splice, the measuring value has to be below or above the value of the splice threshold. After changing the splice threshold, the Teach-in procedure for the splice sensor has to be started again.

Teach-in type

0 = Label dynamic

The backing material with labels must be guided through the fork at a constant speed. With this Teach-in type, the parameters for backing material and backing material with labels are determined

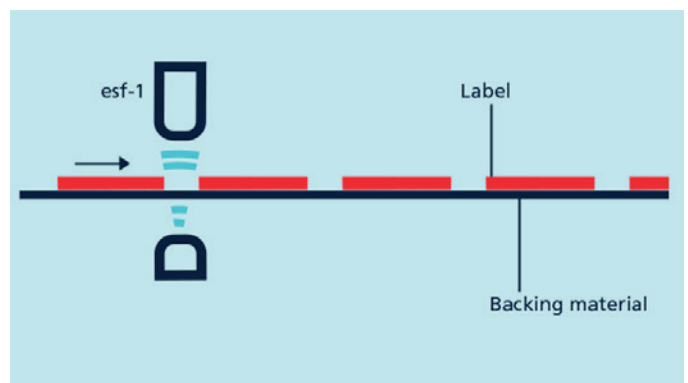
and stored in SSC1 and in material adjustment.

In addition, the threshold values are determined and stored in SSC2 for optional splice evaluation.

1 = Label static

With this static Teach-in for labels, the sensor first learns the backing material, then the backing material with label. The calculated parameters are stored in SSC1.

In addition, the threshold values are determined and stored in SSC2 for optional splice evaluation.

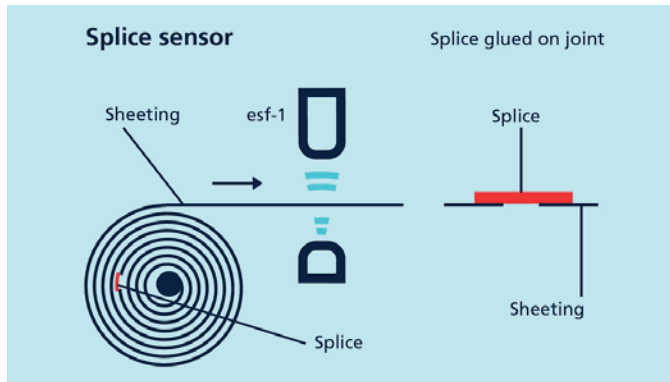


esf-1 as label sensor

Teach-in

2 = Splice

The web material is guided through the fork at a constant speed. The parameters for the backing material are determined and stored in the parameter material adjustment as well as in SSC1 and SSC2.



esf-1 as splice sensor

Material adjustment

The parameter material adjustment is the hardware-specific adjustment from a previous Teach-in procedure. The material adjustment is sensor-specific and should not be transmitted from one sensor to another.

The parameter material adjustment can be used together with the settings of SSC1, SP1 and SP2 as well as SSC2, SP1 and SP2 to create a material management for this sensor. If the material adjustment does not match the sensor or was not generated by the sensor, a warning event (36003) is set by the sensor. This event will not be cancelled until the parameter material adjustment matches the sensor again.

Teach-in - procedure for Teach-in initiated by the master

Teach-in type label dynamic

Initialization

1. In parameter <Teach-in type> (index 400.2) write the value 0 for "Label dynamic".
2. Insert backing material with labels into the fork.

Teach-in process

1. Move the backing material with labels through the fork at approx. 100 ... 200 mm/sec.
2. Write the value 75 for "Teach-in start" in parameter <system command> (index 2).
Read out the parameter <Teach-in status> (index 59).
 - 3.1 If the parameter <Teach-in status> (index 59) contains the value 5, repeat step 3 after a waiting time of e.g. 500 ms.
 - 3.2 If the parameter <Teach-in status> (index 59) contains the value 1, 2 or 3, the process is successfully completed.
End
 - 3.3 If the parameter <Teach-in status> (index 59) contains the value 7, the Teach-in procedure was not successful.
Abort
 - 3.4 If the parameter <Teach-in status> (index 59) still contains the value 5 after a time to be defined (e.g. 10 seconds), continue with step 4.
4. Write the value 79 for "Teach-in abort" in parameter <system command> (index 2).
The sensor aborts the adjustment.
Abort

Teach-in - procedure for Teach-in initiated by the master

Teach-in type label static

Initialization

1. In parameter <Teach-in type> (index 400.2) write the value 1 for "static label".
2. Place 5 to 30 cm of backing material without labels in the fork.

Teach-in procedure

1. Write the value 75 for "Teach-in start" in parameter <system command> (index 2).
2. Move the backing material in the fork slowly back and forth over the length at least 3 times, this process must take at least 3 seconds.
3. Write the value 76 for "Teach-in next step / end" in parameter <system command> (index 2).
4. Place the backing material with labels in the fork. Make sure that the fork now measures a label in the middle.
5. Write the value 76 for "Teach-in next step / end" in parameter <system command> (index 2).
6. Move the label in the fork slowly back and forth over the label length at least 3 times. Make sure that only the label and not the edge of the label is measured.
7. Write the value 76 for "Teach-in next step / end" in parameter <system command> (index 2).
8. Read the parameter <Teach-in status> (index 59).
- 8.1 If the parameter <Teach-in status> (index 59) contains the value 1, 2 or 3, the Teach-in process is successfully completed.
End
- 8.2 If the parameter <Teach-in status> (index 59) contains the value 7, the Teach-in process was not successful.
Abort

Teach-in type splice

Initialization

1. In parameter <Teach-in type> (index 400.2) write the value 2 for "splice".
2. Select the value for the splice threshold in parameter <splice threshold> (index 400.1). The recommended default value is 20%.
3. Insert web material without splice into the sensor.

Teach-in procedure

1. Write the value 75 for "Teach-in start" in parameter <system command> (index 2).
2. Move the web material slowly through the fork, depending on the material, 20 cm (plastic foils) to 2 m (recycled paper).
The process must take at least 3 seconds.
3. Write the value 76 for "Teach-in next step / end" in parameter <system command> (index 2).
4. Read out the parameter <Teach-in status> (Index 59).
- 4.1 If the parameter <Teach-in status> (Index 59) contains the value 1, 2 or 3, the Teach-in process is successfully completed.
End
- 4.2 If the parameter <Teach-in status> (Index 59) contains the value 7, the Teach-in process was not successful.
Abort

SSC - Switched Signal Channel

SSC1 - Switched Signal Channel 1 - Pin 4

Index	Sub-index	Term	Data type	Access	Default value	Value range
60	0	SSC1 parameter	Record			
	1	SP1, setpoint 1	Int16	RW	300	0..1,023; resolution in 0,1
	2	SP1, setpoint 2	Int16	RW	508	0..1,023; resolution in 0,1
61	0	SSC1 configuration	Record			
	1	Logic	UInt8	RW	0	0 = High active 1 = Low active
	2	Mode	UInt8	RW	1	0 = Output deactivated 1 = Only lower threshold (SP1) (label/splice) 2 = Both thresholds (SP1 and SP2) (splice) 130 = Only upper threshold (SP2) (splice)
100	0	SSC1 advanced configuration	Record			
	2	Switch-off delay	UInt8	RW	0	0...255; resolution in measuring repetition rates

SSC2 - Switched Signal Channel 2 - Pin 2

Index	Sub-index	Term	Data type	Access	Default value	Value range
62	0	SSC2 parameter	32-bit	Record		
	1	SP1, setpoint 1	Int16	RW	300	0..1,023; resolution in 0,1
	2	SP2, setpoint 2	Int16	RW	508	0..1,023; resolution in 0,1
63	0	SSC2 Configuration	32-bit	Record		
	1	Logic	UInt8	RW	0	0 = High active 1 = Low active
	2	Mode	UInt8	RW	132	0 = Output deactivated 1 = Only lower threshold (SP1) (label/splice) 2 = Both thresholds (SP1 and SP2) (splice) 130 = Only upper threshold (SP2) (splice) 132 = Web break 134 = Missing label 135 = Mismatched label length
100	0	SSC2 advanced configuration	Record			
	2	Switch-off delay	UInt8	RW		0...255; resolution in measuring repetition rates

SSC - Switched Signal Channel

SP1, Setpoint 1 and SP2, Setpoint 2

SP1 and SP2 are the threshold levels to detect label and splice. These threshold values are determined by a Teach-in procedure.

Mode

is selected by the Teach-in type and can optionally be changed later. The special functions "Web break", "Missing label" and "Mismatched label length" are available for SSC2, which can only be selected via IO-Link.

0 = Output deactivated

The switching output is deactivated and is not set.

1 = Only lower threshold (SP1) (label/splice)

If the measured value of the sensor is below the value of SP1, the output is set. SP2 is not used in this evaluation.

This is the default setting for scanning labels.

2 = Both thresholds (SP1 and SP2) (splice),

If the measured value of the sensor is below the value of SP1 and above the value of SP2, the output is set.

This is the default setting for detecting a splice.

130 = Only upper threshold (SP2) (splice)

If the measured value of the sensor is above the value of SP2, the output is set.

132 = Web break

The output is set as soon as the sensor detects a web break.

134 = Missing label

The output is set if the sensor detects a missing label. The prerequisite for this is a constant material flow at a constant speed.

135 = Mismatched label length

The output is set if the sensor detects a faulty label ($\pm 50\%$ of the usual length). The prerequisite for this is a constant material flow at a constant speed.

Logic

0 = High active

The output is set = $+U_b$

1 = Low active

The output is set = $-U_b$

Switch-off delay

The switch-off delay specified as the number of measurement repetition rate extends the status output set. The measurement repetition rate is dependent on scanned material. With the same switch-off delay, but with different materials, the real switch-off delay varies in ms.

User interface

Index	Sub-index	Term	Data type	Access	Default value	Value range
370	0	Button and pin 5	Record			
	1	Teach-in input	UInt8	RW	1	0 = Inactive 1 = Button and pin 5 active 2 = Only pin 5 active 3 = Only button active
	2	Manual Teach-in mode	UInt8	RW	0	0 = Standard Teach-in methods 1 = QuickTeach label sensor 2 = QuickTeach splice sensor
371	0	LED	Record			
	1	Mode	UInt8	RW	1	0 = off 1 = on 4 = Find me!
372	0	Teach-in feedback	Record			
	1	Mode	UInt8	RW	0	0 = Inactive 1 = Feedback on pin 2 and pin 4 2 = Feedback on pin 2 3 = Feedback on pin 4

Event code		Type	Description
dezimal	hex		
36000	0x8CA0	Notification	Teach-in is not successful.
36001	0x8CA1	Notification	Teach-in is successful.
36004	0x8CA4	Warning	Manual Teach-in is executed.

The sensor has three LEDs, a button and a control input via pin 5.

Teach-in input

- 0 = Inactive
- 1 = Button and pin 5 active
- 2 = Only pin 5 active
- 3 = Only button active

The Teach-in input parameter can be used to switch off specific input options.

Manual Teach-in mode

- 0 = Standard Teach-in methods
- 1 = QuickTeach label sensor
- 2 = QuickTeach splice sensor

The selection of the Teach-in mode facilitates the manual Teach-in of the sensor. If the sensor is only used for one operating mode - label or splice - you can use QuickTeach to set a simplified Teach-in, which you must activate and define once. The QuickTeach label sensor corresponds to the Teach-in type Label dynamic (Index 400.2 = 0). The QuickTeach splice sensor corresponds to the Teach-in type splice (Index 400.2 = 2).

LED mode

- 0 = off
- 1 = on
- 4 = Find me!

The LEDs can be switched off in normal operation and only temporarily activated for a teach-in. In Find me! operation, all LEDs of the sensor flash simultaneously. This helps to locate the sensor in a machine.

Teach-in feedback mode

- 0 = Inactive
- 1 = Feedback on pin 2 and pin 4
- 2 = Feedback on pin 2
- 3 = Feedback on pin 4

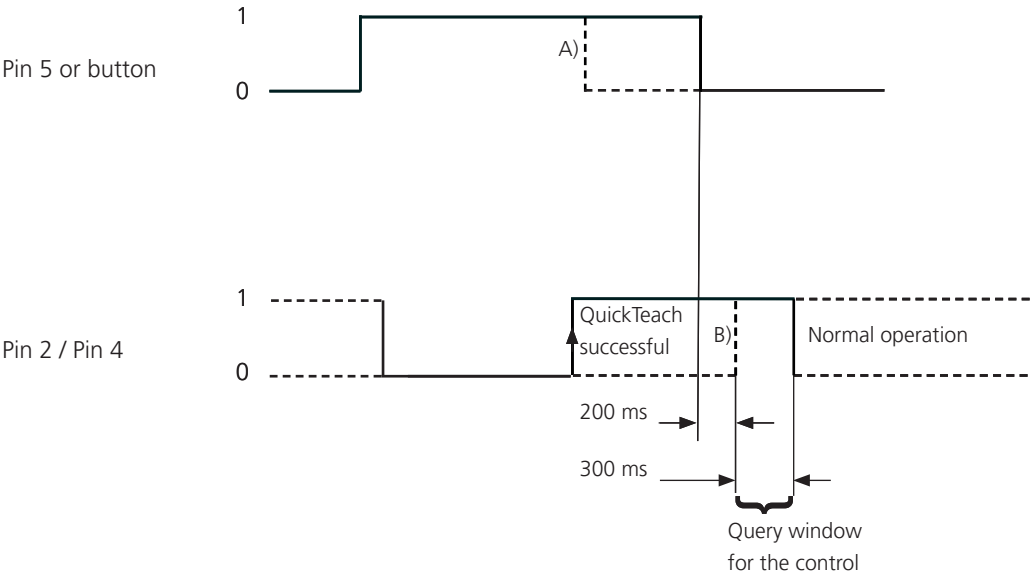
The Teach-in feedback is intended for the QuickTeach in SIO mode: If the controller initiates a QuickTeach in SIO mode via pin 5 (or if the button is pressed), the controller can query at pin 2 and/or pin 4 whether this teach-in was successful.

This function is activated with the parameter Teach-in feedback mode (Index 372.1).

If QuickTeach is successfully performed via pin 5 (or the key), output pin 2, pin 4 or both will be set for 300 ms 200 ms after the end of this process.

User interface

QuickTeach



A) With QuickTeach labels, the controls can reset pin 5 at an early stage as soon as there is a change of flanks "QuickTeach successful" has been detected. Or the controls ask 200 ms after pin 5 has been reset in the 300 ms wide query window whether QuickTeach was successful.

B) With QuickTeach splice, the change of flanks "QuickTeach successful" only occurs 200 ms later after the controls have reset pin 5. In the 300 ms wide query window, the controls can query whether QuickTeach was successful.

Synchronization

Index	Sub-index	Term	Data type	Access	Default value	Value range
350	0	Synchronization	Record			
	1	Mode	UInt8	RW	0	0 = off 1 = on

If several esf-1 sensors are operated in a confined space, they can influence each other. To avoid this, the esf-1 sensors can be synchronized with each other. For this purpose, all Teach-in/Com

control inputs must be connected to each other and mode 1 (= on) must be selected.

Temperature compensation

Index	Sub-index	Term	Data type	Access	Default value	Value range
300	0	Temperatur compensation	Record			
	1	Mode	UInt8	RW	0	0 = off 1 = on

The sensor is equipped with an internal temperature sensor, which can compensate the temperature dependence of the amplitude loss in the air. Normally it is not necessary to activate temperature

compensation. Only when the ambient temperature fluctuates by more than 20 °C in a short time should temperature compensation be switched on as an option.

Sensor diagnosis

Index	Sub-index	Term	Data type	Access	Default value	Value range
2000	0	Temperature	Record			
	1	Sensor temperature	Int16	RO	200	-560...1,560; resolution in 0,1 °C

The sensor displays the current sensor temperature.

Measurement diagnosis

Index	Sub-index	Term	Date type	Access	Default value	Value range
2001	0	Measurement	Record			
	1	Measurement repetition rate in SIO mode	UInt16	RO	30	30...195 resolution in 0,1 ms
	2	Measurement repetition rate in IO-Link mode	UInt16	RO	400	400...13,000 resolution in 0,1 ms
	3	Quality of the last Teach-in	UInt8	RO		0...255: 0 = low quality 255 = high quality

Measurement repetition rate in SIO mode

The value indicates the repetition rate of the sensor when it is operated with the current material adjustment in SIO mode.

Measurement repetition rate in IO-Link mode

The value specifies the repetition rate under IO-Link. This depends on the master, which determines the time.

Quality of the last Teach-in

The quality of the Teach-in is a value to provide a direct comparison between several identical adjustment processes with the same material. The larger it is, the better the adjustment.

Identification

Index	Term	Data type	Access	Default value
13	ProfileCharacteristic	Array UINT16	RO	
14	PDInputDescriptor	Array OctetString3	RO	
16	VendorName	String	RO	microsonic GmbH
17	VendorText	String	RO	Unser Herz schallt ultra.
18	ProductName	String	RO	
19	ProductID	String	RO	
20	ProductText	String	RO	Ultrasonic sensor
21	SerialNumber	String	RO	
23	FirmwareRevision	String	RO	
24	ApplicationSpecificTag	String	RW	***

ProfileCharacteristic

The ProfileCharacteristic is an array of all profiles and function classes supported by the sensor.

PDInputDescriptor

The PDInputDescriptor displays the breakdown of all data present in the PDI in an array.

VendorName

The VendorName contains the name of the manufacturer.

VendorText

The VendorText contains the claim of the manufacturer.

ProductName

The ProductName contains the designation of the sensor used.

ProductID

The ProductID contains the part number of the sensor used.

ProductText

The ProductText describes the sensor used.

SerialNumber

The SerialNumber is defined by the manufacturer.

FirmwareRevision

The FirmwareRevision shows the firmware version of the application used by the manufacturer.

ApplicationSpecificTag

The ApplicationSpecificTag can be used to store information about the location or use of this sensor in the sensor setting.

System Command

Index	Sub-index	Term	Data type	Access	Default value	Value range
2		System Command	UInt8	RW		130 = Restore factory settings

Back to factory setting

If the value 130 is written into index 2, all parameters of the sensor are reset to factory setting.

Parameter access

The sensor is cyclically requested by the master to communicate. With each communication the measured value is sent from the sensor to the master. Part of this communication is the Indexed Service Data Unit channel (ISDU channel). This channel is used to write or read data acyclically to the sensor. This means that writing or reading a parameter can take several communication cycles.

Each communication of the master via the ISDU channel is answered by the sensor. The sensor only processes a parameter after it has been fully transmitted. Parameters, diagnostic data, events and system commands are sent via this ISDU channel.

If the sensor discovers errors during parameter accessing, it reports these with corresponding error codes.

Error Code		Description
dezimal	hex	
0	0x0000	No error
32768	0x8000	Device application error – no details
32785	0x8011	Index not available
32786	0x8012	Subindex not available
32800	0x8020	Service temporarily not available
32801	0x8021	Service temporarily not available – local control
32802	0x8022	Service temporarily not available
32803	0x8023	Access denied
32816	0x8030	Parameter value out of range
32817	0x8031	Parameter value above limit
32818	0x8032	Parameter value below limit
32819	0x8033	Parameter length overrun
32820	0x8034	Parameter length underrun
32821	0x8035	Function not available
32822	0x8036	Function temporarily unavailable
32832	0x8040	Invalid parameter set
32833	0x8041	Inconsistent parameter set
32898	0x8082	Application not ready

Device Access Locks

Index	Sub-index	Term	Data type	Access	Default value	Value range
12		Device Access Locks	UInt16	RW	0	
		Bit 0: Parameter (write) Access Lock		RW	0	0 = off 1 = on
		Bit 2: Local Parameterization Lock		RW	0	0 = off 1 = on
		Bit 3: Local User Interface Lock		RW	0	0 = off 1 = on

The Device Access Locks are a specified IO-Link function. The parameter DeviceAccessLocks enables the control of the device behavior. Device functions can be deactivated via defined bits in this parameter.

Parameter (write) Access Lock

If this bit is set, write access to application parameters and some IO-Link specific parameters is disabled.

Local Parameterization Lock

If this bit is set, the parameterization is disabled via local operating elements such as button / pin 5 on the device.

Local User Interface Lock

If this bit is set, use of the user interface on the device is disabled and the display is switched off.

Events

Code		Type	Description
dezimal	hex		
16384	0x4000	Error	Temperature fault
16912	0x4210	Warning	Device temperature over-run
16928	0x4220	Warning	Device temperature under-run
36000	0x8ca0	Notification	Manual Teach-in is not successful.
36001	0x8ca1	Notification	Manual Teach-in is successful.
36003	0x8ca3	Warning	Material adjustment data record does not match the sensor.
36004	0x8ca4	Warning	Manual Teach-in is executed.

Events are sent from the sensor to the master. This is done asynchronously via the ISDU channel of IO-Link. The master acknowledges these events in the sensor and stores them in the master memory. There a PLC can read out the events. Several events can be present simultaneously in the sensor.

Events are divided into three types.

- "Notifications" are for general information or non-critical states of the sensor and are sent each time the sensor state occurs again.
- "Warnings" indicate a possible functional limitation of the sensor. These events are present until the reason for the function restriction is eliminated or switched off.
- "Error" events indicate a sensor that is not functional. These events are present until the reason for the function restriction is removed or switched off.

Manual Teach-in is successful

A Teach-in via button or pin 5 was executed and successfully completed. The parameters have changed.

Manual Teach-in is not successful

A Teach-in via button or pin 5 was executed and terminated incorrectly. The parameters have not changed.

Material adjustment data record does not match the sensor

The transferred parameter material adjustment does not match with this sensor. The function of the sensor cannot be guaranteed.

Manual Teach-in is executed

At the sensor, a Teach-in is carried out via button or pin 5. (During a Teach-in process, the status of the outputs are frozen.)

Temperature fault

The operating temperature of the sensor has been significantly exceeded, the function cannot be guaranteed. The sensor may be damaged.

Device temperature over-run

The operating temperature of the sensor has been exceeded. A correct functioning of the sensor cannot be ensured.

Device temperature under-run

The operating temperature of the sensor has fallen below the minimum. A correct functioning of the sensor cannot be ensured.

Device status

Index	Sub-index	Term	Data type	Access	Default value	Value range
32		Int16	Error count	RO	0	0...65,535
36		UInt8	Device status	RO	0	0 = Device is OK. 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure
37		Array	Detailed device status	RO	0	

Error count

As soon as an event of the type error is detected in the sensor, the error counter is incremented. The counter is set to 0 each time operating voltage is switched on.

Device status

If no events can be read out or the sensor is switched from SIO mode to IO-Link mode and the sensor is still to be monitored, it is recommended to read this variable cyclically. The device status

shows the entire status of the sensor depending on the problem that has occurred.

Detailed device status

In the detailed device status, all active error and warning events are listed until they are reset by the sensor as soon as the root cause has been eliminated.

Data storage

The sensors support data storage according to IO-Link version 1.1.

Data storage enables the master to store the entire parameter set of the sensor. If the sensor has to be replaced, the data set is loaded from the master into the replacement device.

The data storage is completely controlled by the master and is a function of IO-Link to be configured in the master. Nothing has to be configured in the sensor.

The parameter material adjustment and SP1 as well as SP2 are hardware dependent. After exchanging a sensor it is recommended to carry out the material adjustment again.

Block parameterization

Index	Sub-index	Term	Data type	Access	Default value	Value range
2		System Commando	UInt8	WO		1 = ParamUploadStart 2 = ParamUploadEnd 3 = ParamDownloadStart 4 = ParamDownloadEnd 5 = ParamDownloadStore 6 = ParamBreak

The block parameterization is a specified IO-Link function. The use of this function is recommended if several parameters have to be changed simultaneously.

Each individual parameter write access is immediately implemented in the sensor. This also includes a consistency check against other parameters and immediate transfer to the application if the inspection is successful. If parameters are transferred in an unfavourable sequence, the consistency check may fail.

In block parameterization, on the other hand, all parameters are first written and then the consistency check is performed for all transferred parameters. The parameters are only stored in the sensor if this consistency check was successful.

This block parameterization also applies analogously to reading out parameters.

Appendix: IO-Link data overview

Index	Subindex	Term	Data Type	Access	Default Value	Value Range
2		System Commando	UInt8	WO		1 = ParamUploadStart 2 = ParamUploadEnd 3 = ParamDownloadStart 4 = ParamDownloadEnd 5 = ParamDownloadStore 6 = ParamBreak 75 = Teach-in start 76 = Teach-in next step / end 79 = Teach-in abort 130 = Restore factory settings
12		Device Access Locks	UINT16	RW	0	
		Bit 0: Parameter (write) Access Lock		RW	0	0 = off 1 = on
		Bit 2: Local Parameterization Lock		RW	0	0 = off 1 = on
		Bit 3: Local User Interface Lock		RW	0	0 = off 1 = on
13		ProfileCharacteristic	Array UINT16			
14		PDInputDescriptor	Array Oc- tetString3			
16		VendorName	String		microsonic GmbH	
17		VendorText	String		Unser Herz schallt ultra.	
18		ProductName	String			
19		ProductID	String			
20		ProductText	String		Ultrasonic sensor	
21		SerialNumber	String			
23		FirmwareRevision	String			
24		ApplicationSpecificTag	String		***	
32		Error count	Int16	RO	0	
36		Device status	UInt8	RO	0	0 = Device is OK. 1 = Maintance required 2 = Out of specification 3 = Functional check 4 = Failure
37		Detailed device status	Array	RO	0	
40		Process data input	OctetS- tring4	RO		
58		Teach-in channel	UInt8	RW	0	0 = SSC1: Default: Pin 4 (push-pull) 1 = SSC1: Pin 4 (push-pull)
59		Teach-in status	UInt8	R/O	0	Bit 0..3: 0 = Idle 1 = SP1 success 2 = SP2 success 3 = SP12 success 4 = Wait for command 5 = Busy 7 = Error

Appendix: IO-Link data overview

Index	Sub-index	Term	Data Type	Access	Default Value	Value Range
60	0	SSC1 parameter	Record			
	1	SP1, Setpoint 1	Int16	RW	300	0..1,023; resolution in 0,1
	2	SP1, Setpoint 1	Int16	RW	392	0..1,023; resolution in 0,1
61	0	SCC1 configuration				
	1	Logic	UInt8	RW	0	0 = High active 1 = Low active
	2	Mode	UInt8	RW		0 = Output deactivated 1 = Only low threshold (SP1) (label/splice) 2 = Both thresholds (SP1 and SP2) (splice) 130 = Only high threshold (SP2) (splice)
62	0	SSC2 parameter	Record			
	1	SP1, Setpoint 1	Int16	RW	300	0..1,023; resolution in 0,1
	2	SP2, Setpoint 2	Int16	RW	392	0..1,023; resolution in 0,1
63	0	SSC2 configuration	Record			
	1	Mode	UInt8	RW	132	0 = Output deactivated 1 = Only low threshold (SP1) (label/splice) 2 = Both thresholds (SP1 and SP2) (splice) 130 = Only high threshold (SP2) (splice) 132 = Web break 134 = Missing label 135 = Mismatched label length
	2	Logic	UInt8	RW	0	0 = High active 1 = Low active
100	0	SSC1 advanced configuration	Record			
	1	Switch-On delay	UInt8	RW	0	0...255; resolution in measurement cycle
	2	Switch-Off delay	UInt8	RW	0	0...255; resolution in measurement cycle
101	0	SSC2 advanced configuration	Record			
	1	Switch-On delay	UInt8	RW	0	0...255; resolution in measurement cycle
	2	Switch-Off delay	UInt8	RW	0	0...255; resolution in measurement cycle
300	0	Temperature compensation	Record			
	1	Mode	UInt8	RW	0	0 = off 1 = on
350	0	Synchronization	Record			
	1	Mode	UInt8	RW	0	0 = off 1 = on

Appendix: IO-Link data overview

Index	Sub-index	Term	Data Type	Access	Default Value	Value Range
370	0	Button and pin 5	Record			
	1	Teach-in input	UInt8	RW	1	0 = Inactive 1 = Button and pin 5 active 2 = Only Pin 5 active 3 = Only Taste active
	2	Manual Teach-in mode	UInt8	RW	0	0 = Standard Teach-in methods 1 = QuickTeach label sensor 2 = QuickTeach splice sensor
371	0	LED	Record			
	1	Mode	UInt8	RW	1	0 = off 1 = on 4 = Find me!
372	0	Teach-in feedback	Record			
	1	Mode	UInt8	RW	0	0 = Inactive 1 = Feedback on pin 2 and pin 4 2 = Feedback on pin 2 3 = Feedback on pin 4
400	0	Teach-in configuration	Record			
	1	Splice threshold value	UInt8	RW	20	5..50 %, resolution in 1 %
	2	Teach-in type	UInt8	RW	0	0 = Dynamic label 1 = Static label 2 = Splice dynamic
500		Material adjustment	UInt8	RW		
2000	0	Temperature	Record			
	1	Sensor temperature	Int16	RO	200	-560.. 1,056; resolution in 0,1 °C
2001	0	Measurement	Record			
	1	Measurement repetition rate in SIO mode	UInt16	RO	30	30...195 resolution in 0,1 ms
	2	Measurement repetition rate in IO-Link mode	UInt16	RO	400	400...13,000 resolution in 0,1 ms
	3	Quality of the last Teach-in	UInt8	RO		0...255: 0 = low quality 255 = high quality
16512	0	Measurement data channel description	Record			
	1	Lower limit	UInt32	RO	0	0...1,023
	2	Upper limit	UInt32	RO	1,023	0...1,023
	3	Unit code	UInt16	RO	0	
	4	Scale	Int8	RO	-1	

Appendix: IO-Link data overview

Events

Code		Type	Description
16384	0x4000	Error	Temperature fault
16912	0x4210	Warning	Device temperature over-run
16928	0x4220	Warning	Device temperature under-run
36000	0x8ca0	Notification	Manual Teach-in is not successful.
36001	0x8ca1	Notification	Manual Teach-in is successful.
36003	0x8ca3	Warning	Material adjustment data record does not match the sensor.
36004	0x8ca4	Warning	Manual Teach-in is executed.

Error Codes

Error Code		Term
dezimal	hex	
0	0x0000	No error
32768	0x8000	Device application error – no details
32785	0x8011	Index not available
32786	0x8012	Subindex not available
32800	0x8020	Service temporarily not available
32801	0x8021	Service temporarily not available – local control
32802	0x8022	Service temporarily not available
32803	0x8023	Access denied
32816	0x8030	Parameter value out of range
32817	0x8031	Parameter value above limit
32818	0x8032	Parameter value below limit
32819	0x8033	Parameter length overrun
32820	0x8034	Parameter length underrun
32821	0x8035	Function not available
32822	0x8036	Function temporarily unavailable
32832	0x8040	Invalid parameter set
32833	0x8041	Inconsistent parameter set
32898	0x8082	Application not ready