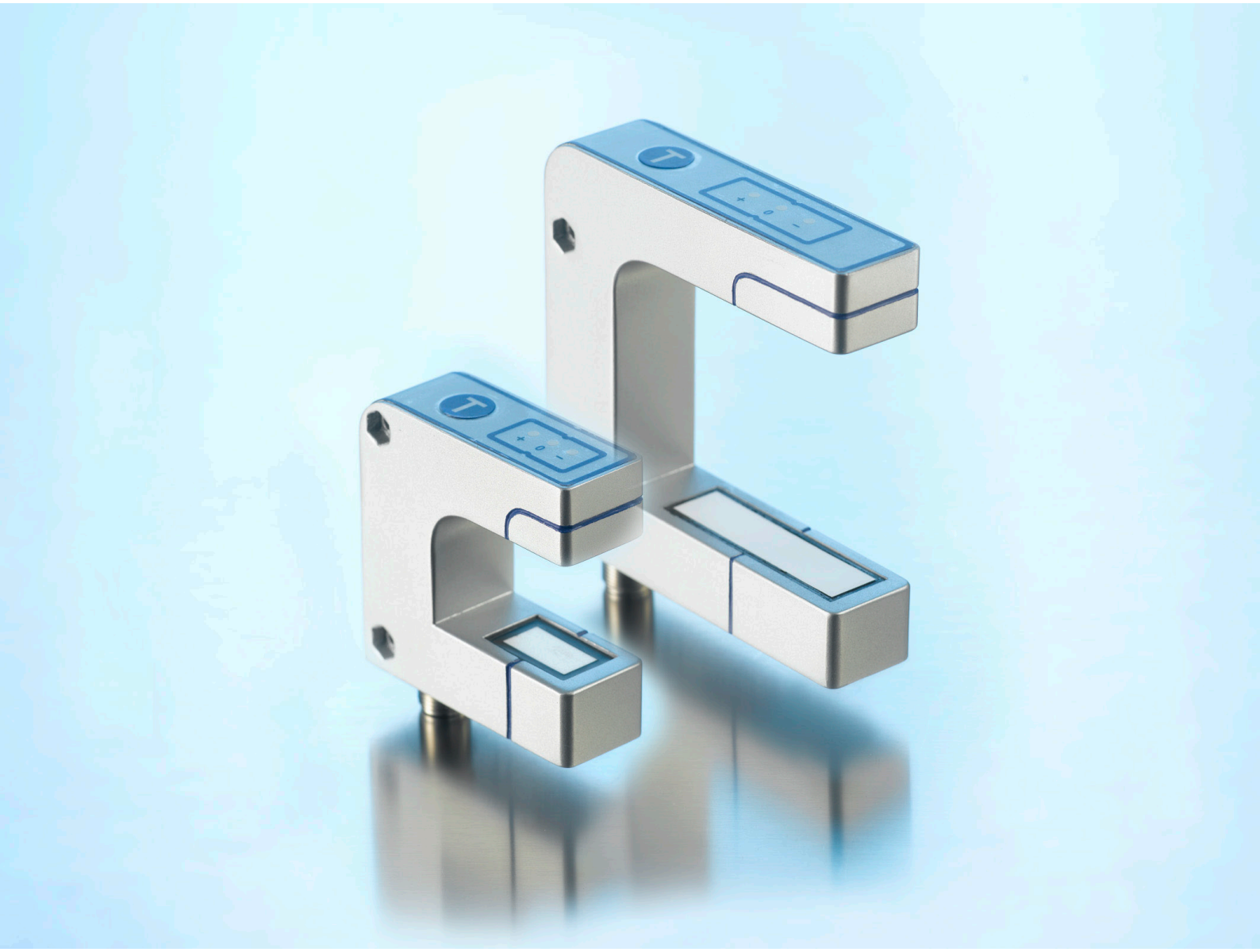
microsonic



IO-Link accompanying document for

bks+3/FIU/A
bks+6/FIU/A

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MV-DO-244878-857548

1 Contents of the IO-Link accompanying document

This IO-Link accompanying document guides the user during start-up and parameterisation of the ultrasonic sensor. It does **not** replace the operating manual enclosed with the ultrasonic sensor. The safety notes and descriptions of installation and start-up contained in the operating manual require compliance.

2 IO-Link in detail

IO-Link is a fieldbus-independent, manufacturer-independent and neutral communication standard which enables seamless communication through all levels of the system architecture down to the sensor.
The IO-Link interface provides direct access to process, service and diagnostic data. The sensor can be parameterised during operation.

Structure of an IO-Link system
An IO-Link system consists of IO-Link devices – usually sensors, actuators or combinations thereof – and a standard 3-wire sensor/actuator cable and an IO-Link master.

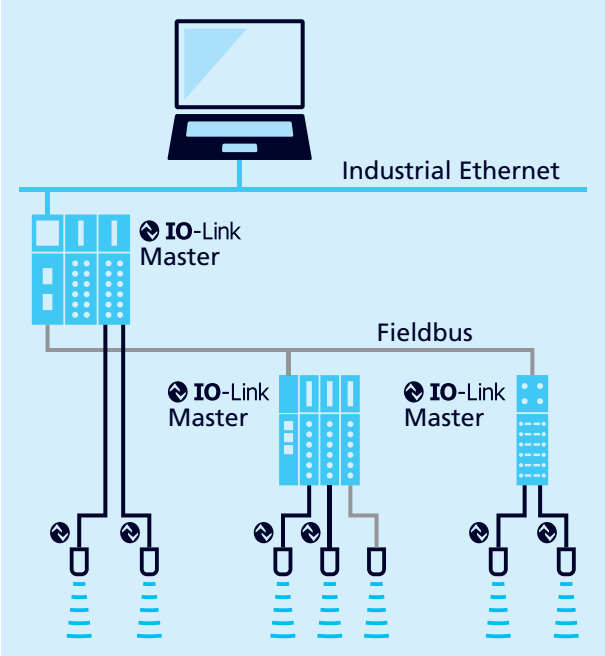


Fig. 1: Structure of an IO-Link system

IODD description file
Each IO-Link-capable sensor has a device-specific description file, the IODD (IO Device Description). The IODD contains parameters in a standardised form and can describe several sensor versions. The parameters included are:

- Communication properties
- Device parameters with permissible and pre-set values
- Identification, process and diagnostic data
- Device data
- Text description
- Product image
- Manufacturer's logo

The current IODD library and information on start-up and parameterisation can be downloaded here: microsonic.de/Service/IO-Link IODD Library.

3 Description of the sensor

Ultrasonic web edge sensor with switching output, analogue output and IO-Link interface

› bks+3/FIU/A
› bks+6/FIU/A

The bks+ ultrasonic web edge sensors are fork sensors for scanning the edges of sound-impermeable and slightly sound-permeable materials such as foil or paper.
The fork's lower leg is equipped with an ultrasonic sensor which cyclically emits short sound impulses, which are detected by the ultrasonic receiver accommodated in the upper fork leg. Material immersing into the fork covers this sound path and thus attenuates the receive signal, which is evaluated by the internal electronics.
An analogue signal and a binary value via IO-Link is output in dependence of the coverage degree.

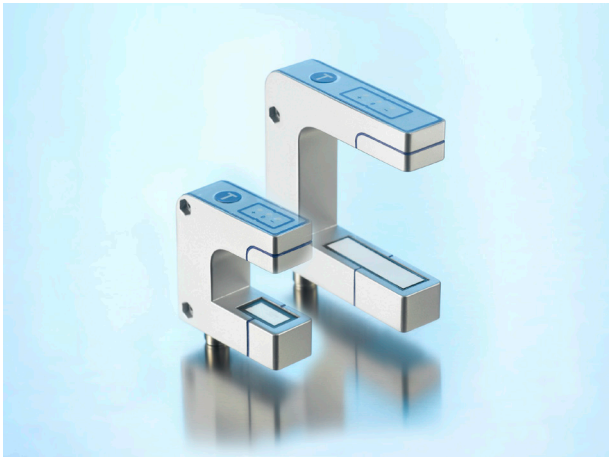


Fig. 2: Web edge sensors bks+3/FIU/A and bks+6/FIU/A

4 IO-Link data of the sensor

The bks+ sensors are IO-Link-capable in accordance with specification 1.1.3. The sensor has an IO-Link communication interface on pin 4 (see Fig. 3).

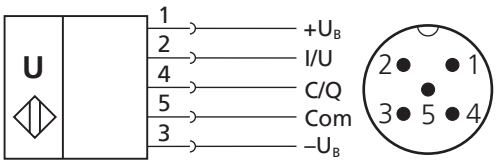


Fig. 3: Connection diagram of the bks+ sensors

Device Profile

0x0010	Measuring and Switching Sensor, 1 channel
0x4000	Identification and Diagnosis
0x8101	Locator

Physical layer

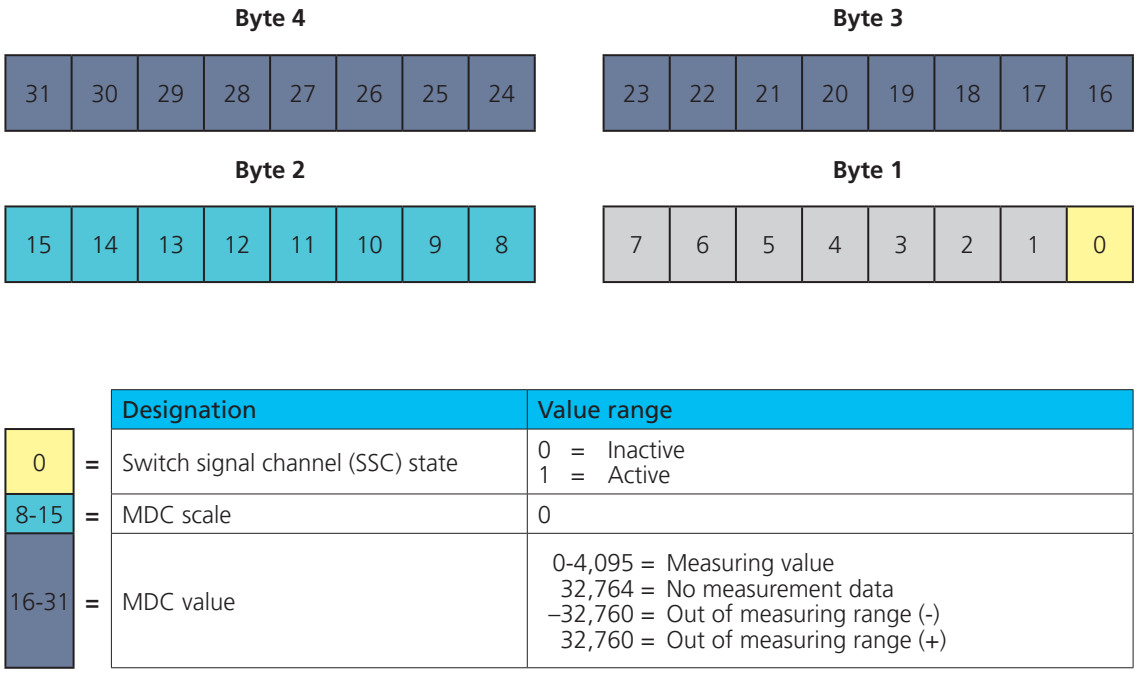
Vendor Name	microsonic GmbH
Vendor ID	419 (0x01a3)
IO-Link Revision	1.1.3
Transmission Rate	230400 bit/s (COM3)
Process data length	32 Bit PDI
IO-Link port type	A (<200 mA)
SIO mode	Yes
Smart sensor profile	Yes
Block Parameter	Yes
Data Storage	Yes

Table 1: IO-Link sensor data

	bks+3	bks+6
Device ID	100 (0x000064)	101 (0x000065)
Product Name	bks+3/FIU/A	bks+6/FIU/A
Product ID	14121	14221
MinCycle Time	4 ms	4 ms

4.1 Process data

The process data is cyclically transmitted data. The process data length of the bks+ sensors is 4 bytes.



		Designation	Value range
0	=	Switch signal channel (SSC) state	0 = Inactive 1 = Active
8-15	=	MDC scale	0
16-31	=	MDC value	0-4,095 = Measuring value 32,764 = No measurement data –32,760 = Out of measuring range (-) 32,760 = Out of measuring range (+)

Fig. 4: Process data structure

4.2 Measurement data channel description

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

Upper limit
The »upper limit« is the largest measured value that the sensor can output.

Unit code
Shows the unique code for the physical unit.
Note: the bks+ sensor provides a measured value with no dimension.

Scale
The scaling of the process data. The specified measured value of the sensor is calculated from

Process data value x $10^{(scale)}$ x [unit code]
= measuring value in mm
Example: 642 x $10^{(-1)}$ x [mm] = 64.2 mm

Table 2: IO-Link parameters – Measurement data channel description

Index	Subindex	Designation	Format	Access	Factory setting	Value range	Resolution
16512	0	Measurement data channel description	Record				
	1	Lower limit	Int32	RO	0		
	2	Upper limit	Int32	RO	4,095		
	3	Unit code	UInt16	RO	1,997		
	4	Scale	Int8	RO	0		

4.3 Switching signal channel and analogue channel

The bks+ sensor has a switching signal channels SSC1 (SSC: Switching signal Channel) and an analogue channel ASC1 (ASC: Analogue Signal Channel). The switching signal channel (see Table 3) contains the values for the switching points SP1 and SP2, the setting of the switching output logic, the definition of the switching mode and the values for the hysteresis.

The analogue channel (see Table 4) contains the setting of the analogue window limits (SP1, SP2), the output characteristic (rising/falling) and the switching between current and voltage.

Table 3: IO-Link parameters – SSC1: Switch signal channel 1 - pin 4 (push-pull)

Switch signal channel	SSC1				
Designation	Index	Sub-index	Factory setting	Value range	Resolution
SP1	60	1	1,535	0...4,095	
SP2	60	2	2,559	0...4.095	
Logic	61	1	0	0 = High active 1 = Low active	
Mode	61	2	2	0 = Deactivated 1 = Single point (SP1: switching point) 2 = Window (SP1, SP2: window mode) 3 = Two point (SP1, SP2: hysteresis mode)	
Hysteresis	61	3	50	0...4,095	
Switch-on delay	100	1	0	0...255	0.1 second
Switch-off delay	100	2	0	0...255	0.1 second

Table 4: IO-Link parameters – ASC1: Analogue signal channel 1 - pin 2 (current/voltage)

Analogue signal	ASC1				
Designation	Index	Sub-index	Factory setting	Value range	Resolution
SP1	160	1	0	0...4,095	
SP2	160	2	4,095	0...4,095	
Output characteristic	161	1	0	0 = Rising 1 = Falling	
Operation mode	161	2	2	1 = Current output 2 = Voltage output	

5 Setting the sensor

The adjustment processes for calibrating the zero position of the web edge to be controlled can be carried out both on the device using the Teach-in button and via the LinkControl software and IO-Link.
The switching points and operating mode are set via the LinkControl software and IO-Link.

5.1 Teach-in via push button and pin 5

Via the Teach-in button on the edge sensor's top or via pin 5 on the device plug, the sensor can be adjusted to the material to be controlled.

➔ Follow the instructions in the sensor operating manual for the Teach-in procedures.

Note
The input options for the push buttons and pin 5 can be defined via the IO-Link parameter index 370. The button and pin 5 can be deactivated to lock the sensor against inputs.

Table 5: IO-Link parameters – User interface mode

Index	Subindex	Designation	Format	Access	Factory setting	Value range
370	0	Control	Record			
	1	Mode	UInt8	RW	3	0 = Teach-in buttons and Teach-in via pin 5 inactive 1 = Teach-in buttons inactive and Teach-in via pin 5 active 2 = Teach-in buttons active and Teach-in via pin 5 inactive 3 = Teach-in buttons and Teach-in via pin 5 active

5.2 Setting the sensor via IO-Link

➔ Overview IO-Link data see Chapter 7.

5.2.1 Adjusting the sensor

To calibrate the zero position of the web edge to be controlled, three different adjusting methods are available:

› Range-Free Adjustment
› Range-Full Adjustment
› Range-Half Adjustment

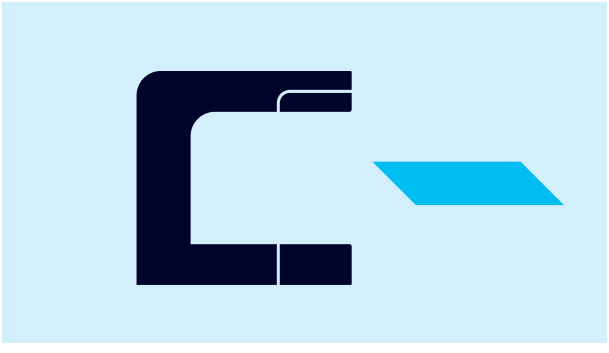
Range-Free Adjustment
The Range-Free Adjustment is used to adjust to the climatic ambient conditions.

Range-Full Adjustment
The Range-Full Adjustment is used for slightly sound-permeable materials. Carry out a practical test to find out whether a material is slightly sound-permeable.

Range-Half Adjustment
The Range-Half Adjustment is used for sound-impermeable materials or if the fork cannot be cleared from the web material.

Carry out a Range-Free Adjustment
1. Completely free the fork from the web material.
2. Write the value 160 in parameter index 2 (System Command).
3. Optional: Read parameter »Adjustment« (index 211).
   value = 0: idle
   value = 1: run
   value = 2: error
   value = 3: successful

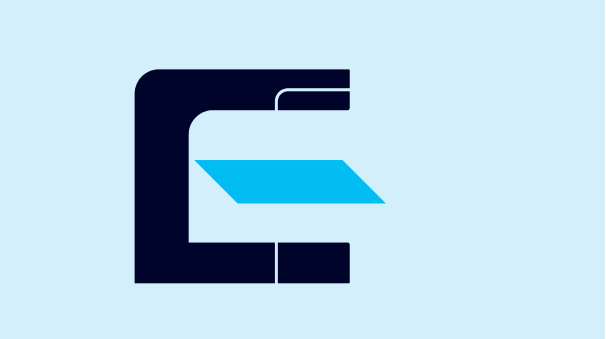
◆ Ready.



Carry out a Range-Full Adjustment

1. Cover the sound path completely with web material.
2. Write the value 161 in parameter index 2 (System Command).
3. Optional: Read parameter »Adjustment« (index 211).
   value = 0: idle
   value = 1: run
   value = 2: error
   value = 3: successful

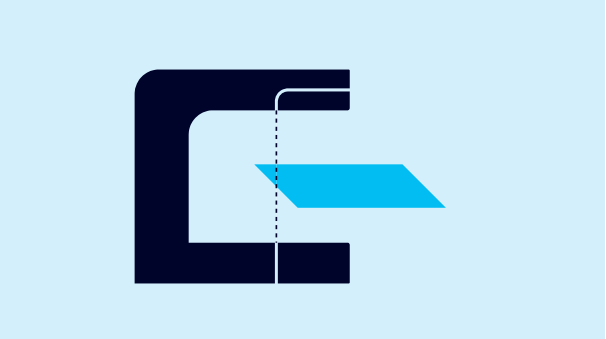
◆ Ready.



Carry out a Range-Half Adjustment

1. Align the web edge inside the fork with the mark to obtain a 50 % coverage of the sound path.
2. Write the value 162 in parameter index 2 (System Command).
3. Optional: Read parameter »Adjustment« (index 211).
   value = 0: idle
   value = 1: run
   value = 2: error
   value = 3: successful

◆ Ready.

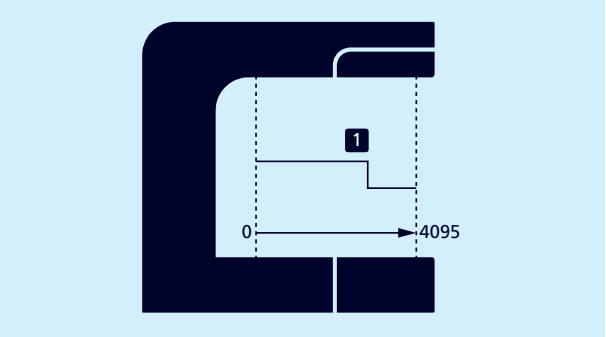


5.2.2 Setting the switching points

Setting switching point SP1 (mode »Single point«)

1. Write the value 1 in parameter index 61 subindex 2 (SSC1 configuration, mode).
2. Write the distance value in the range of 0...4,095 in parameter index 60 subindex 1 (SSC1 parameter, SP1).

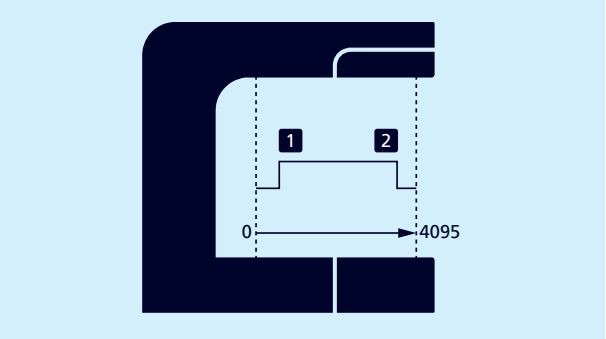
◆ Ready.



Setting switching points SP1/SP2 (mode »window«)

1. Write the value 2 in parameter index 61 subindex 2 (SSC1 configuration, mode).
2. Write the distance value in the range of 0...4,095 in parameter index 60 subindex 1 (SSC1 parameter, SP1).
3. Write the distance value in the range of 0...4,095 in parameter index 60 subindex 2 (SSC1 parameter, SP2).

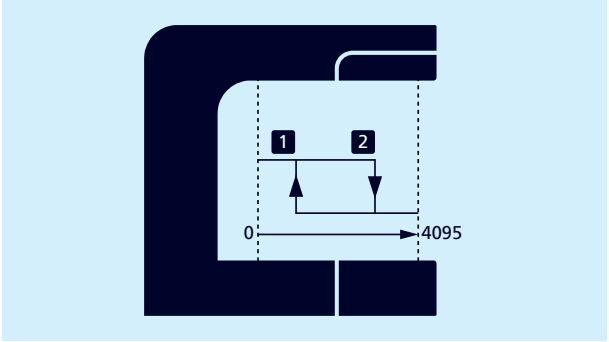
◆ Ready.



Setting switching points SP1/SP2 (mode »Two point«)

1. Write the value 3 in parameter index 61 subindex 2 (SSC1 configuration, mode).
2. Write the distance value in the range of 0...4,095 in parameter index 60 subindex 1 (SSC1 parameter, SP1).
3. Write the distance value in the range of 0...4,095 in parameter index 60 subindex 2 (SSC1 parameter, SP2).

◆ Ready.

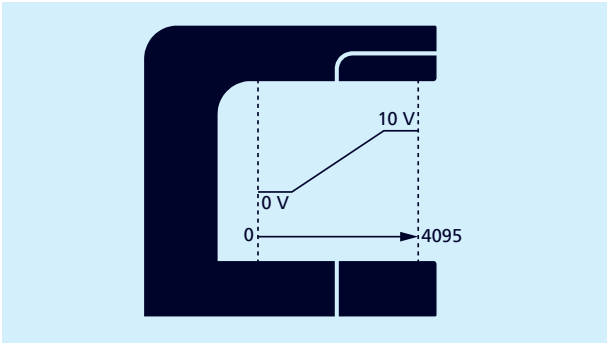


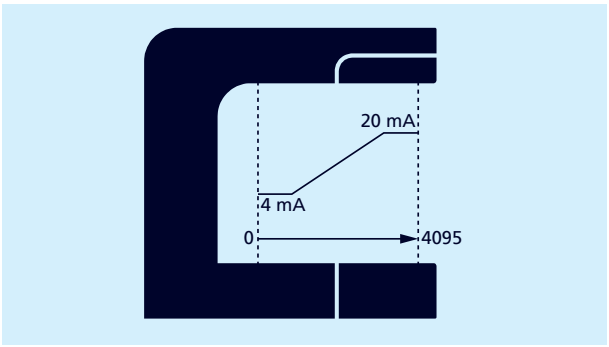
5.2.3 Setting the analogue characteristic curve

Setting the analogue characteristic curve

1. Write the value for 0 V/4 mA in the range of 0...4,095 in parameter index 160 subindex 1 (ASC1 parameter, SP1).
2. Write the value for 10 V/20 mA in the range of 0...4,095 in parameter index 160 subindex 2 (ASC1 parameter, SP2).

◆ Ready.





6 Further settings via IO-Link

6.1 Synchronisation and Multiplex operation

Synchronisation
Synchronisation avoids mutual interference between the sensors and should be used if the installation system prevents maintenance of the specified minimum installation distances (see associated operating manual). All sensors measure at exactly the same time in synchronisation mode.

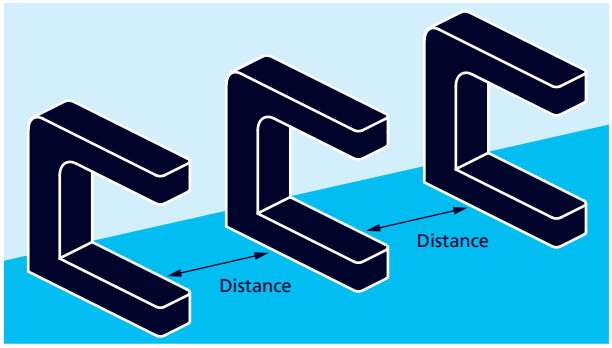


Table 6: IO-Link parameters - Synchronisation and multiplex operation

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
350	0	Synchronisation and multiplex operation	Record			
	1	Mode	UInt8	RW	1	0 = Inactive 1 = Active
	2	Sensor operation	UInt8	RW	0	0 = Synchronisation active 1 = Multiplex address 1 ... 10 = Multiplex address 10
	3	Multiplex number of participants	UInt8	RW	10	2 = 2 participants ... 10 = 10 participants

Activating integrated synchronisation for SIO-Mode
Up to 10 sensors can be synchronised.
1. Connect all sensors that are to be synchronised electrically via pin 5.
2. Set parameter index 350 subindex 1 (mode) to the value 1.
3. Set parameter index 350 subindex 2 (sensor operation) to the value 0.

◆ The integrated synchronisation is active.

Note
Integrated synchronisation is not supported via IO-Link.

Setting Multiplex operation for SIO mode
In multiplex operation, each sensor can only receive echo signals from its own transmission pulse, which completely prevents reciprocal interference between the sensors.
Each sensor is assigned a multiplex address from 1 to 10. The sensors then measure one after the other in ascending order of addresses.

Note
Multiplex operation is not supported via IO-Link.

1. Connect all sensors that are to work in multiplex mode electrically via pin 5.
2. Assign a multiplex address to the sensors via parameter index 350 subindex 2 (sensor operation).
3. Set the number of participants via parameter 350 subindex 3 (number of multiplex participants).

◆ The sensors operate in multiplex operation.

6.2 Filter

The results of the cyclically performed measurements of the ultrasonic sensor are not sent directly to the output, but pass through internal software filters that have the task of filtering out measured value outliers and smoothing and damping the measurement course.
The following filter types are available:

- F00: no filter
- F01: averaging filter
- F02: median filter

In addition, the filter strength can be set from P00 (weak filter effect) to P09 (strong filter effect).
Changes to the filter settings require experience and are usually not necessary for standard applications. Should you have any questions about filter settings, we recommend that you contact microsonic.

Table 7: IO-Link parameters – Filter settings

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
256	0	Filter	Record			
	1	Type	UInt8	RW	0	0 = F00: no filter 1 = F01: averaging filter 2 = F02: median filter
	2	Strength	UInt8	RW	0	0 = P00: weak filter 1 = P01 2 = P02 3 = P03 4 = P04 5 = P05 6 = P06 7 = P07 8 = P08 9 = P09: strong filter

6.3 Temperature compensation

The sensor has an internal temperature compensation, which compensates for the temperature dependence of the sound amplitude in the air. The internally measured temperature (assumed air temperature) is evaluated on the factory side. The temperature compensation can be disabled.

Table 8: IO-Link parameters – Evaluation

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
210	0	Evaluation	Record			
	1	Temperature compensation	UInt8	RW	1	0 = Inactive 1 = Active
	2	Linearisation [1)]	UInt8	RW	1	0 = Inactive 1 = Active

[1)] only at bks+3...

6.3.1 Sensor temperature

Table 9: IO-Link parameters – Temperature

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
2000	0	Temperature	Record			
	1	Sensor temperature	Int16	RO		–400...1,050, resolution 0.1 °C

6.4 LED

Via parameter index 371 (LED) all LEDs of the sensor can be deactivated. The LEDs are switched off 30 seconds after the last actuation of the button or pin 5.

Table 10: IO-Link parameters – LED

Index	Subindex	Designation	Format	Access	Factory setting	Value range
371	0	LED	Record			
	1	Mode	UInt8	RW	1	0 = Inactive, active for Teach-in 1 = Active

6.5 Returning to factory setting

The sensor can be reset to its factory settings. There are also other reset functions with different effects. The corresponding commands are written to the system command index 2:

Device Reset – index 2 = 128
A soft reboot is triggered and the sensor is reset to its initial state. Communication is interrupted by the sensor and then restarted by the master.

Application Reset – index 2 = 129
The parameters of the technology-specific application are set to default values. Identification parameters remain unchanged. An upload to the data memory of the master is carried out if this is activated in the port configuration of the master.

Restore Factory Settings – index 2 = 130
All parameters of the sensor are reset to the factory settings. **Note:** The data memory may be downloaded the next time the device is switched off and on, overwriting the factory settings!

Back-to-box – index 2 = 131
The sensor parameters are set to the factory settings and communication is blocked until the next switch-off and switch-on. **Note:** Disconnect the sensor directly from the master port!

Table 11: System Command – Restore Factory Settings

Index	Designation	Format	Access	Factory setting	Value range
2	System Command	UInt8	WO		128 = Device Reset 129 = Application Reset 130 = Restore Factory Settings 131 = Back-to-box

6.6 Locator (locating the sensor in the system)

The system command index 2 = 126 (Locator Start) activates a flashing signal that can be used to locate the sensor in the system. The green LED »0« then flashes twice per second for a period of 10 minutes. The flashing can be stopped by the system command index 2 = 127 (Locator Stop) before the 10 minutes have elapsed.

Table 12: System Command – Locator Start/Stop

Index	Designation	Format	Access	Factory setting	Value range
2	System command	UInt8	WO		126 = Locator Start 127 = Locator Stop

6.7 Identification

Vendor Name
The manufacturer's name contains the name of the manufacturer.

Vendor Text
The manufacturer's text contains the manufacturer's claim.

Product Name
The product name contains the designation of the sensor used.

Product ID
The product ID contains the article number of the sensor used.

Product Text
The product text describes the sensor used.

Serial Number
The serial number is determined by the manufacturer.

Hardware Revision
The hardware revision shows the hardware revision of the application used by the manufacturer.

Firmware Revision
The firmware revision shows the firmware version of the application used by the manufacturer.

Application-specific Tag
The Application-specific Tag can be used to store explanatory information about the sensor's application.

Function Tag
The function tag can be used to store explanatory information about the sensor function.

Location Tag
The location tag can be used to store explanatory information about the installation location of the sensor.

Table 13: IO-Link parameters – Identification

Index	Designation	Format	Access	Factory setting
16	Vendor Name	String	RO	microsonic GmbH
17	Vendor Text	String	RO	Unser Herz schallt ultra.
18	Product Name	String	RO	bks+3/FIU/A bks+6/FIU/A
19	Product ID	String	RO	bks+3 = 14121 bks+6 = 14221
20	Product Text	String	RO	Ultrasonic sensor
21	Serial Number	String	RO	
22	Hardware Revision	String	RO	
23	Firmware Revision	String	RO	
24	Application-specific Tag	String	RW	***
25	Function Tag	String	RW	***
26	Location Tag	String	RW	***

6.8 Device status

Error Count
The Error Count is incremented as soon as an error is detected in the sensor. The counter is set to 0 every time the operating voltage is switched on.

Device Status
If no events can be read or the sensor is switched from SIO mode into IO-Link mode and the sensor is still to be monitored, we recommend querying this variable cyclically. The device status shows the entire status of the sensor depending on the problem that has occurred.

Detailed Device Status
The detailed device status lists all active error messages and warnings until they are revoked by the sensor as soon as the reason has been rectified.

Table 14: IO-Link parameters – Device status

Index	Designation	Access	Factory setting	Value range	Wertebereich
32	UInt16	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	

6.9 Events

Events are sent from the sensor to the master. This is performed asynchronously via the ISDU channel. The master acknowledges these events in the sensor and stores them in the master memory. There, a PLC can read the events. Several events can be pending in the sensor at the same time. Events are divided into three types:

› **Notifications** are displays of general information or non-critical states of the sensor. They are issued upon every re-occurrence of the sensor state.
› **Warnings** indicate a possible functional restriction of the sensor. These events remain until the reason for the functional restriction has been rectified.
› **Error** events indicate an inoperative sensor. These displays remain pending until the reason for the functional restriction has been rectified.

Table 15: IO-Link Events

Code		Type	Name	Meaning/measure
dezimal	hex			
16384	0x4000	Error	Temperature fault	Overload
16912	0x4210	Warning	Device temperature over-run	The maximum permissible sensor temperature was exceeded.
16928	0x4220	Warning	Device temperature under-run	The minimum permissible sensor temperature was undercut.
36000	0x8ca0	Notification	Teach-in error	A Teach-in procedure was not successful.
36001	0x8ca1	Notification	Teach-in success	A Teach-in procedure was successful.
36003	0x8ca3	Warning	Manual Teach-in in progress	The sensor cannot be used due to a running Teach-in via button or pin 5.

6.10 Data storage

The sensors support data storage in accordance with IO-Link specification 1.1.3. Data storage allows the master to store the entire parameter set of the sensor. If the sensor is replaced, the master writes the data back into the replacement device. Data storage is completely controlled by the master and is a function of the IO-Link to be configured in the master. No further settings need to be made in the sensor for data storage.

Note
The configuration of the IO-Link master is decisive for the handling of the parameter set when storing data.

➔ **Comply with the specifications of the documentation and configuration of the IO-Link master!**

6.11 Block parameterisation

Block parameterisation is a specified IO-Link function. We recommend using this function if several parameters are to be changed simultaneously.
Each individual parameter write access is implemented directly in the sensor. This also includes a consistency test against other parameters and immediate transfer to the application if the check is successful. If parameters are transferred in an unfavourable sequence, the consistency test may fail.

With block parameterisation on the other hand, all parameters are first written and then the consistency test is carried out for all transferred parameters. The parameters are only saved in the sensor if this consistency test was successful. This block parameterisation applies analogously to the reading of parameters.

Table 16: System Command – Block parameterisation

Index	Designation	Format	Access	Factory setting	Value range
2	System Command	UInt8	WO		1 = ParamUploadStart 2 = ParamUploadEnd 3 = ParamDownloadStart 4 = ParamDownloadEnd 5 = ParamDownloadStore 6 = ParamBreak

6.12 Parameter access and error codes

The master issues cyclical requests for the sensor to communicate. The measured value is sent from the sensor to the master with each communication. Part of this communication is the Indexed Service Data Unit channel (ISDU channel). This is used to write data or read data of the sensor acyclically.
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 first processes a transferred parameter when it has been transferred completely. Parameters, diagnostic data, events and commands are sent via this ISDU channel.
If the sensor detects errors during parameter access, it reports these with corresponding error codes.

Table 17: IO-Link error codes

Errorcode		Meaning/measure
decimal	hex	
0	0x0000	No error
32768	0x8000	Application error in the device - no details
32785	0x8011	Index not available
32786	0x8012	Subindex not available
32800	0x8020	Service currently not available
32801	0x8021	The parameter cannot be accessed at the moment, as the device is currently in a local operating mode.
32802	0x8022	The parameter cannot be accessed at the moment because the device is currently in a remote operating mode.
32803	0x8023	Access denied
32816	0x8030	Parameter value outside the valid range
32817	0x8031	Parameter value above the permissible limit
32818	0x8032	Parameter value below the permissible limit
32819	0x8033	Parameter length too small
32820	0x8034	Written parameter length is smaller than allowed
32821	0x8035	Function not available
32822	0x8036	Function currently not available
32832	0x8040	Invalid parameter set
32833	0x8041	Inconsistent parameter set
32898	0x8082	Application not ready

7 Appendix: Overview IO-Link data

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
2		System Command	UInt8	WO		1 = ParamUploadStart 2 = ParamUploadEnd 3 = ParamDownloadStart 4 = ParamDownloadEnd 5 = ParamDownloadStore 6 = ParamBreak 126 = Locator Start 127 = Locator Stop 128 = Device Reset 129 = Application Reset 130 = Restore Factory Settings 131 = Back-to-box 160 = Start Range-Free Adjustment 161 = Start Range-Full Adjustment 162 = Start Range-Half Adjustment
16		Vendor Name	String	RO	microsonic GmbH	
17		Vendor Text	String	RO	Unser Herz schallt ultra.	
18		Product Name	String	RO	bks+3/FIU/A bks+6/FIU/A	
19		Product ID	String	RO	bks+3 = 14121 bks+6 = 14221	
20		Product Text	String	RO	Ultrasonic sensor	
21		Serial Number	String	RO		
22		Hardware Revision	String	RO		
23		Firmware Revision	String	RO		
24		Application-specific Tag	String	RW	***	
25		Function Tag	String	RW	***	
26		Location Tag	String	RW	***	
32		Error Count	UInt16	RO	0	0...65,535
36		Device Status	UInt8	RO	0	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure
37		Detailed Device Status	Array	RO		
40		Process data	Record	RO		
		Bit 0: Switch signal channel (SSC)	Boolean			
		Bit 8-15: MDC scale	Int8			
		Bit 16-31: MDC value	Int16			
60	0	SSC1 parameter	Record			
	1	SP1	Int32	RW	1,535	0...4,095
	2	SP2	Int32	RW	2,559	0...4,095
61	0	SSC1 configuration	Record			
	1	Logic	UInt8	RW	0	0 = High active 1 = Low active
	2	Mode	UInt8	RW	2	0 = Deactivated 1 = Single point (SP1: switching point) 2 = Window (SP1, SP2: window mode) 3 = Two point (SP1, SP2: hysteresis mode)
	3	Hysteresis	Int32	RW	50	0...4,095

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
100	0	SSC1 advanced configuration	Record			
	1	Switch-on delay	UInt8	RW	0	0...255, resolution 0.1 second
	2	Switch-off delay	UInt8	RW	0	0...255, resolution 0.1 second
160	0	ASC1 parameter				
	1	SP1	Int32	RW	0	0...4,095
	2	SP1	Int32	RW	4,095	0...4,095
161	0	ASC1 configuration	Record			
	1	Output characteristic	UInt8	RW	0	0 = Rising 1 = Falling
	2	Operating mode	UInt8	RW	2	1 = current output 2 = voltage outpu
210	0	Evaluation	Record			
	1	Temperature compensation	UInt8	RW	1	0 = Inactive 1 = Active
	2	Linearisation [1)]	UInt8	RW	1	0 = Inactive 1 = Active
211	0	Adjustment	Record			
	1	Adjustment state	UInt8	RO	0	0 = idle 1 = run 2 = error 3 = successful
256	0	Filter	Record			
	1	Type	UInt8	RW	0	0 = F00: no filter 1 = F01: averaging filter 2 = F02: median filter
	2	Strength	UInt8	RW	0	0 = P00: weak filter 1 = P01 2 = P02 3 = P03 4 = P04 5 = P05 6 = P06 7 = P07 8 = P08 9 = P09: strong filter
350	0	Synchronisation and multi-plex operation	Record			
	1	Mode	UInt8	RW	1	0 = Inactive 1 = Active
	2	Sensor operation	UInt8	RW	0	0 = Synchronisation active 1 = Multiplex address 1 2 = Multiplex address 2 3 = Multiplex address 3 4 = Multiplex address 4 5 = Multiplex address 5 6 = Multiplex address 6 7 = Multiplex address 7 8 = Multiplex address 8 9 = Multiplex address 9 10 = Multiplex address 10
	3	Multiplex number of participants	UInt8	RW	10	2 = 2 participants 3 = 3 participants 4 = 4 participants 5 = 5 participants 6 = 6 participants 7 = 7 participants 8 = 8 participants 9 = 9 participants 10 = 10 participants

[1)] only at bks+3...

Index	Sub-index	Designation	Format	Access	Factory setting	Value range
370	0	Control	Record			
	1	Mode	UInt8	RW	3	0 = Teach-in buttons and Teach-in via pin 5 inactive 1 = Teach-in buttons inactive and Teach-in via pin 5 active 2 = Teach-in buttons active and Teach-in via pin 5 inactive 3 = Teach-in buttons and Teach-in via pin 5 active
371	0	LED	Record			
	1	Mode	UInt8	RW	1	0 = Inactive, active for Teach-in 1 = Active
2000	0	Temperature	Record			
	1	Sensor temperature	Int16	RO		–400...1,050, resolution 0.1 °C
2001	0	Cycletimes	Record			
	1	SIO-Mode Cycletime	Int16	RO		
	2	IO-Link Cycletime	Int16	RO		
16512	0	Measurement data channel description	Record			
	1	Lower limit	Int32	RO	0	
	2	Upper limit	Int32	RO	4,095	
	3	Unit code	UInt16	RO	1,997	
	4	Scale	Int8	RO	0	