microsonic

Operating manual

bks+6/FIU

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

Product Description

The bks+ ultrasonic web edge sensor is a fork sensor 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. The bks+6/FIU optional can be programmed using the LinkControl-Adapter LCA-2 and LinkControl software.

- 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.
- Choosing between rising and falling output characteristic is possible.
- Three LEDs indicate the position of the web material inside the fork.

Safety Notes

- **Read the operating manual prior to start-up.**
- **Connection, installation and adjustment works may only be carried out by expert personnel.**
- **No safety component in accordance with the EU Machine Directive.**

IO-Link

The bks+6/FIU sensors are IO-Link-capable in accordance with IO-Link specification V1.1.

Installation

➔ Mount the sensor at the installation site.

➔ Connect a connection cable to the M12 device plug, see Fig. 1.

Start-Up

➔ Connect the power supply.

➔ Carry out the adjustment to the web material in accordance with Diagram 1.

		colour
1	$+U_B$	brown
3	$-U_B$	blue
4	F IO-Link	black
2	I/U	white
5	Com	grey

Fig. 1: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Synchronisation

If two or more edge sensors are mounted in a distance <50 mm the internal synchronisation should be used. Connect Sync-channels (Pin 5 at the units receptacle) of all sensors.

Factory setting

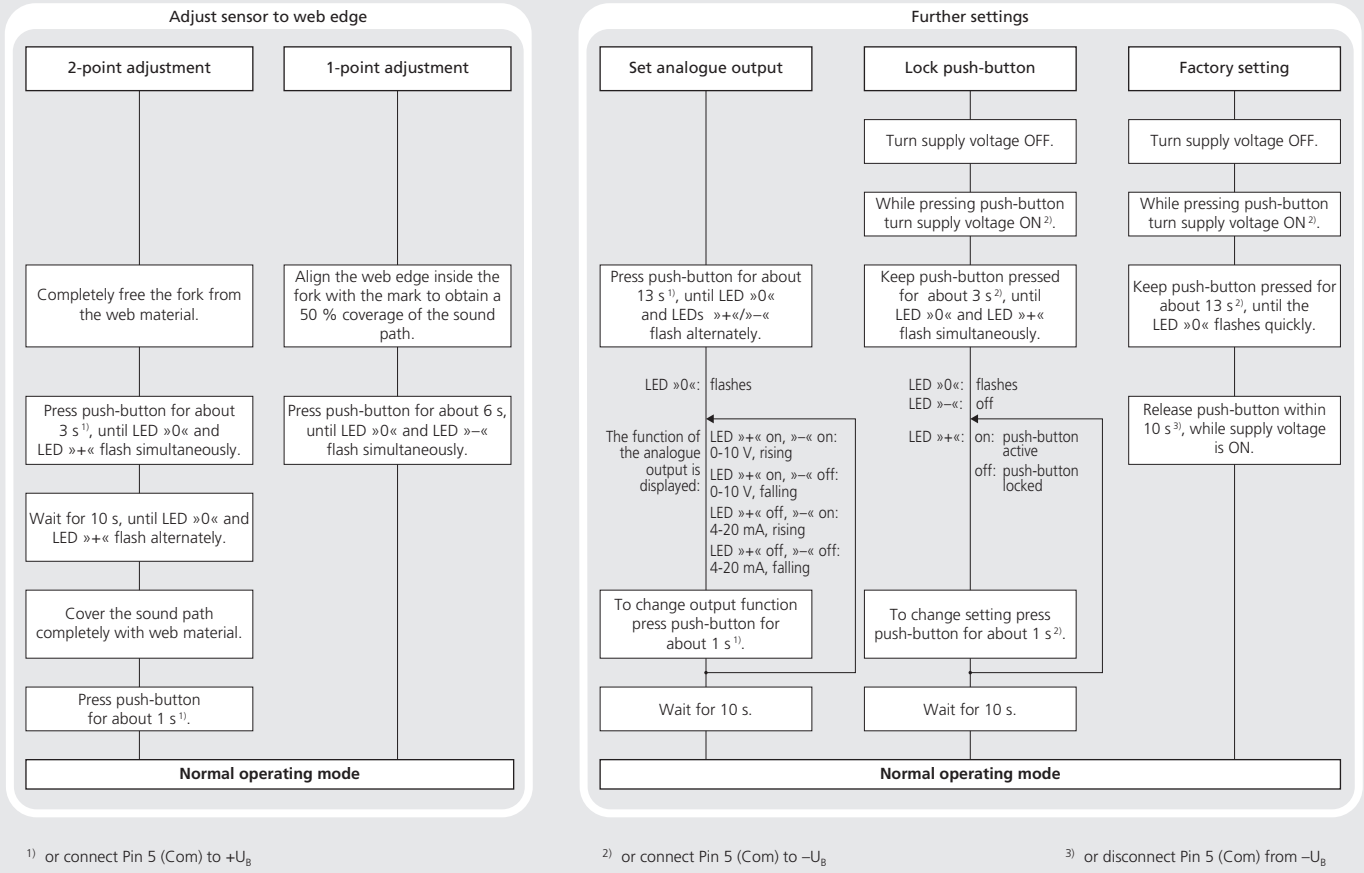
- Analogue output on voltage output
- Rising analogue characteristic (0 V at maximum coverage)
- Switching output on NOC
- Switching output window is ±4.5 mm around zero position.

Maintenance

microsonic sensors are maintenance-free. With heavy dirt deposits, we recommend a cleaning of the white sensor surface.

AbN automation

Diagram 1: Sensor adjustment via Teach-in procedure

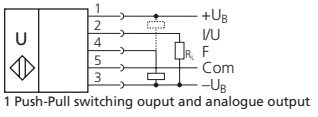


1) or connect Pin 5 (Com) to $+U_B$

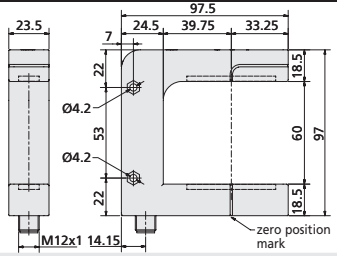
2) or connect Pin 5 (Com) to $-U_B$

3) or disconnect Pin 5 (Com) from $-U_B$

Technical data



1 Push-Pull switching ouput and analogue output



fork width	60 mm
fork depth	73 mm
working range	≥40 mm (±20 mm)
transducer frequency	ca. 310 kHz
resolution	0.01 mm
reproducibility	±0.1 mm
operating voltage U_B	20 to 30 V DC, reverse polarity protection
voltage ripple	±10 %
no-load current consumption	≤60 mA
housing	zinc die cast chromed, plastic parts: PBT
	ultrasonic transducer: polyurethane foam,
	epoxy resin with glass contents
class of protection to EN 60 529	IP 65
type of connection	5-pin M12 initiator plug,
	brass, nickel-plated
controls	Teach-in-button and Teach-in via pin 5
indicators	LED green: centre or within switching window
	LEDs yellow: outside the centre/switching window
programmable	LCA-2 with LinkControl and IO-Link
synchronisation	internal synchronisation up to 10 sensors
operating temperature	+5 to +60 °C
storage temperature	–40 to +85 °C
weight	280 g
response time	6 ms
measurement cycle time	4 ms
time delay before availability	< 300 ms
order no.	**bks+6/FIU**
analogue output	current output 4 to 20 mA
	voltage output 0 to 10 V
	short-circuit-proof, switchable rising/falling
switching output	Push-Pull, U_B –3 V, $-U_B$ +3 V, I_{max} = 100 mA
	switchable NOC/NCC; short-circuit-proof

Notes

- Working range and gradient of the analogue output curve depend on the ultrasonic transducers and cannot be adjusted. The working range always is ≥40 mm.
- For sound-impermeable materials the sensor can be adjusted to the environmental conditions by the 1-point adjustment procedure.
- For slightly sound-permeable materials the sensor has to be set up to the material and the environmental conditions by using the 2-point adjustment. Carry out a practical test to find out whether a material is slightly sound-permeable.
- For optimum measurement results the material to be detected should be kept in a range of ±5 mm around the centre between the upper and lower fork leg.
- The sensor can be reset to its factory settings (see »Further settings«, Diagram 1).
- Using the LinkControl-Adapter LCA-2 (optional accessory) and the LinkControl-Software V7.6 additional sensor parameters can be adjusted and Teach-in procedures can be carried out.
- Depending on the function the ultrasonic transducers in the upper and lower fork leg are mounted with a slope of 2°.

IO-Link Mode

The bks+6/FIU sensors are IO-Link-capable in accordance with IO-Link specification V1.1 and compatible to specification V1.0.

Note
In IO-Link mode Teach-in and LinkControl are not available.

Process data
The bks+ cyclically transmits the value corresponding to the measured coverage degree with a resolution of 0.01 mm.

Service data
The following sensor parameters may be set via IO-Link.

Teach-in via push-button
The push-button can be activated/deactivated for sensor settings with Teach-in.

Temperature compensation
The temperature compensation is used for measurement value correction for varying ambient temperatures and can be disabled.

Analogue output mode
For the analogue output either voltage or current output can be selected.

Rising/falling analogue characteristic
The analogue characteristic can be set on rising (0 V/4 mA at full coverage) or falling characteristic.

Set NOC/NCC
The NCC or NOC output function can be preset for the switching output.

Switching off the LEDs
When activated, the LEDs are turned off 30 seconds after a key press. After a new key press they will run for 30 seconds. This automatic shutdown can be deactivated.

Measurement filter
bks+ ultrasonic sensors provide for a choice of 3 filter settings:

- F00 (no filter)
  Each ultrasonic measurement acts on the output in an unfiltered manner.
- F01 (average value filter)
  Forms approximately the arithmetic mean of several measurements. According to the mean value the output is set. The number of measurements, from which the mean is formed is dependent on the chosen filter strength.
- F02 (median filter)
  Finds the median of several measurements. According to the median the output is set. The number of measurements, for which the median is determined is dependent on the selected filter strength.

Filter strength
For both measurement value filters, a filter strength between P00 (weak filter effect) and P09 (strong filter effect) can be selected.

Switching window
If the web edge is within the switching window the switching output is set. The switching window is defined by the adjusted centre and the width.

Note
The switching window has to be within the operating range.

System commands
With 5 system commands the following settings may be carried out:

- restore IO-Link parameters to their factory settings (system command 130)
- sensor adjustment: fork cleared.
- sensor adjustment: fork 50 % covered
- sensor adjustment: fork 100 % covered
- reset all sensor parameters including the IO-Link parameters to their factory settings (system command 164)

Events
The bks+ sensor sends the following events:

- parameter was changed
- sensor adjustment successful
- sensor adjustment failed

IODD file
The latest IODD file you will find on the internet under www.microsonic.de/en/IODD.

For further informations on IO-Link see www.io-link.com.

IO-Link Data

	bks+6/FIU				
physical layer					
IO-Link revision	V1.1				
compatibilty	V1.0				
block parameter	yes				
data storage	yes				
SIO mode support	yes				
min cycle time	4 ms				
baud rate	COM 2				
format of process data	16 Bit, R, UNI16				
content of process data	Bit 0-15: degree of coverage with 0.01 mm resolution				
service data IO-Link specific	**index**		**access**	**value**	
vendor name	0x10		R	microsonic GmbH	
vendor text	0x11		R	www.microsonic.de	
product name	0x12		R	bks+	
product ID	0x13		R	bks+6/FIU	
product text	0x14		R	Ultraschall-Sensor	
service data sensor specific	**index**	**format**	**access**	**range**	**default**
Teach-in via push-button	0x40	UINT8	R/W	0: activated; 1: deactivated	0
temperature compensation	0x42	UINT8	R/W	0: deactivated; 1: activated	1
analogue output mode	0x44	UINT8	R/W	2: current output, 3: voltage output	3
rising/falling output characteristic curve	0x45	UINT8	R/W	0: rising characteristic curve; 1: falling characteristic curve	0
NCC/NOC	0x46	UINT8	R/W	0: NOC; 1: NCC	0
automatic turning-off LEDs	0x48	UINT8	R/W	0: deactivated; 1: activated	1
measurement filter	0x4D	UINT8	R/W	0-2: F00-F02	0
filter strength	0x4E	UINT8	R/W	0-9: P00-P09	0
centre of switching window	0x4F	INT16	R/W	0-4095 [1]	2047
width of switching window	0x50	UINT16	R/W	0-4095 [1]	1023
system commands	**index**		**access**	**value**	
restore IO-Link parameter	0x02		W	130	
sensor adjustment: fork cleared	0x02		W	161	
sensor adjustment: fork 50 % covered	0x02		W	162	
sensor adjustment: fork 100 % covered	0x02		W	163	
reset to factory setting	0x02		W	164	
events	**code**	**type**		**name**	
	0x8ca0	Notification		parameter was changed	
	0x8ca1	Notification		sensor adjustment successful	
	0x8ca2	Notification		sensor adjustment failed	
observe	**index**	**format**	**access**	**range**	
measurement value	0x54	UINT16	R	0-4095 [1]	

[1] The value range 0-4,095 corresponds with the working range of the sensor.

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