Operating Manual
bks+3/FIU
Ultrasonic web edge sensor with analogue output and IO-Link interface

Sensor adjustment with Teach-in procedure

<table>
<thead>
<tr>
<th>2-point adjustment</th>
<th>1-point adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely free the fork from the web material.</td>
<td>Align the web edge inside the fork with the mark to obtain a 50 % coverage of the sound path.</td>
</tr>
<tr>
<td>Press push-button for ca. 3 s, until the green LED and +LED flash simultaneously.</td>
<td>Press push-button for ca. 6 s, until the green LED and -LED flash simultaneously.</td>
</tr>
<tr>
<td>Wait for 2 s.</td>
<td>Press push-button for ca. 1 s, until the green LED and +LED flash simultaneously.</td>
</tr>
<tr>
<td>Cover the sound path completely with web material.</td>
<td>The function of the analogue output is displayed.</td>
</tr>
<tr>
<td>Press push-button for ca. 1 s.</td>
<td>Garbage collection starts.</td>
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<tr>
<td>Adjust sensor to web edge</td>
<td>Further settings</td>
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</table>

Set analogue output

- Press push-button for ca. 13 s, until the green LED and +LED flash simultaneously.
- Press push-button for ca. 3 s, until the green LED and +LED simultaneously flash.
- Press push-button for ca. 13 s, until the green LED and +LED flashes.

Lock push-button

- Turn supply voltage OFF.
- While pressing the push-button turn supply voltage ON.
- Keep push-button pressed for ca. 3 s, until the green LED and +LED simultaneously flash.
- Release push-button within 5 s, whilst supply voltage is ON.

Factory setting

- Turn supply voltage OFF.
- While pressing the push-button turn supply voltage ON.
- Keep push-button pressed for ca. 13 s, until the green LED and +LED flashes.
- Release push-button within 5 s, whilst supply voltage is ON.

Installation

- Mount the sensor at the installation site.
- Connect a connection cable to Pin 5 at the M12 device plug.
- Connect the power supply.
- Carry out the adjustment in accordance with the diagram.

Synchronisation

- If two or more edge sensors are mounted in a distance < 400 mm the internal synchronisation should be used.
- Connect Sync-channels (Pin 5 at the units receptacle) of all sensors.

Safety Notes

- Read the operating instructions 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.

Notes

- For optimum measurement results the material to be detected should be kept in a range of ± 5 mm around the zero position.
- The sensor can be reset to its factory settings (see »Further settings«).
- Carry out the adjustment only after reaching the operating temperature (approx. 20 min).
- Using the LinkControl-Adapter LCA-2 (optional accessory) and the LinkControl-Software V7.6 all Teach-in- and additional sensor parameter settings may be made.
- Depending on the function the ultrasonic transducers in the upper and lower fork leg are mounted with a slope of 2°.

Product description

The bks+ ultrasonic web edge sensor is a fork sensor for scanning the edges of sound-impermeable 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 is output in dependence of the coverage degree.

Using the LinkControl-Adapter LCA-2 and LinkControl software, the switched output can be programmed in window mode around the zero position.

Safety Notes

- The function of the ultrasonic transducers in the upper and lower fork 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 is output in dependence of the coverage degree.

Using the LinkControl-Adapter LCA-2 and LinkControl software, the switched output can be programmed in window mode around the zero position.

Synchronisation

- If two or more edge sensors are mounted in a distance < 400 mm the internal synchronisation should be used.
- Connect Sync-channels (Pin 5 at the units receptacle) of all sensors.

Notes

- 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«).
- Carry out the adjustment only after reaching the operating temperature (approx. 20 min).
- Using the LinkControl-Adapter LCA-2 (optional accessory) and the LinkControl-Software V7.6 all Teach-in- and additional sensor parameter settings may be made.
- Depending on the function the ultrasonic transducers in the upper and lower fork leg are mounted with a slope of 2°.

IO-Link

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

Maintenance

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

Technical data

- Operating range: 5 mm to 43 mm
- Resolution: 20 to 30 V DC, reverse polarity protection ≤ ± 10 %
- No-load current consumption: ≤ 60 mA
- Type of connection: 5-pin M12 Initiator plug, brass, nickel-plated brass;
- Ultrasonic transducer: polyurethane foam, epoxy resin with glass contents
- Ultrasound: 170 kHz
- Class of protection: to EN 60 529
- Housing: brass, nickel-plated brass;
- Sensor: IP 65
- Fork width: 43 mm
- Fork depth: 30 mm
- Operating voltage: U_RL ≤ 0,005 V
- Synchronisation: external synchronisation up to 10 sensors
- Operating temperature: 45°C to +60°C
- Storage temperature: 20°C to +85°C
- Weight: 170 g
- Response time: 5.1 ms
- Repetition rate: 4 ms
- Time delay before availability: ≤ 280 ms
- Factory settings (see »Further settings«)
- Circuit/short-circuit-proof, switchable rising falling
- Switched output: Push-Pull, U_L, U_H, U_R, U_S, U_S, U_P, U_P, U_P
- Switchable NO/NC/CNC, short-circuit-proof
- Switchable NO/NC/CNC, short-circuit-proof

Further settings

- Connect Pin5 (Sync/Com) to +U_R
- Disconnect Pin5 (Sync/Com) from -U_R

Further settings

- Connect Pin5 (Sync/Com) to +U_R
- Disconnect Pin5 (Sync/Com) from -U_R
The bks+ sensors are IO-Link-capable in accordance with IO-Link specifications V1.1 and compatible to V1.0.

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

Process data
The bks+ cyclically transmits the value corresponding to the measured coverage degree with a resolution of 0.003 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.

Linearisation of the output characteristic
To increase the absolute accuracy in the edge areas, the linearisation of the output characteristic can be disabled.

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 the function output 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 switched output.

Switching off the LEDs
When activated, the LEDs are switched 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
The bks+ ultrasonic sensors provide for a choice of 3 filter settings:
- F00 (no filter)
- F01 (average value filter)
- F02 (median filter)

Filter strength
For each measurement value filter, 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 center and the width.

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