microsonic

Operation Manual

Ultrasonic proximity switch with one switching output

zws-7/CD/QS   zws-7/CE/QS
zws-15/CD/5ms.a   zws-15/CE/5ms.a

Product Description

The zws sensor offers a non-contact measurement of the distance to an object which must be positioned within the sensor's detection zone. The switching output is set in dependence of the adjusted switching distance.Due to the short response time and the high switching frequency these zws sensors are applicable to the detection of quick processes. For the zws-7, the faster variant, please see the notes for installation and operation.
Via the push-button, the detect distance and operating mode can be adjusted (teach-in, see Diagram 1). Two LEDs indicate operation and the state of the switching output.

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.

Use for intended purpose only

pico+ ultrasonic sensors are used for non-contact detection of objects.

Installation

→ Mount the sensor at the installation site with the aid of the enclosed mounting plate (see Fig. 1). Maximum torque of attachment screw: 0,5 Nm
→ Connect a connection cable to the M8 device plug.
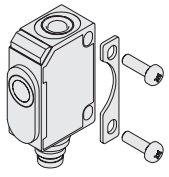→ Avoid mechanical load on the connector.

Fig. 1: Attachment with mounting plate

Start-Up

→ Connect the power supply.
→ Carry out the adjustment in accordance with Diagram 1.

Factory Setting

zws-sensors are delivered with the following settings:
- Operation with one switching point
- Switching output on NOC
- Switching point at operating range

		colour
1	$+U_B$	brown
3	$-U_B$	blue
4	D	black
2	sync	white

Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Operating modes

Three operating modes are available for the switching output:
- **Operation with one switching point**
  The switching output is set if the object falls below the set switching point.
- **Window mode**
  The switching output is set if the object is within the set window margins.

- **Two-way reflective barrier**
  The switching output is set if there is no object between sensor and reflector.

Checking operation mode

→ In normal operating mode shortly press the push-button. The green LED stops shining for one second, then it will show the current operating mode:
- 1x flashing = operation with one switching point
- 2x flashing = window mode
- 3x flashing = reflective barrier

After a break of 3 s the green LED shows the output function:
- 1x flashing = NOC
- 2x flashing = NCC

Synchronisation

You can synchronise as many sensors as you like.
→ Apply a square-wave signal to the sync-input with pulse width t_i and repetition rate t_p (Fig. 3 and technical data).
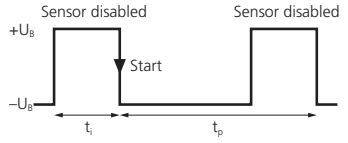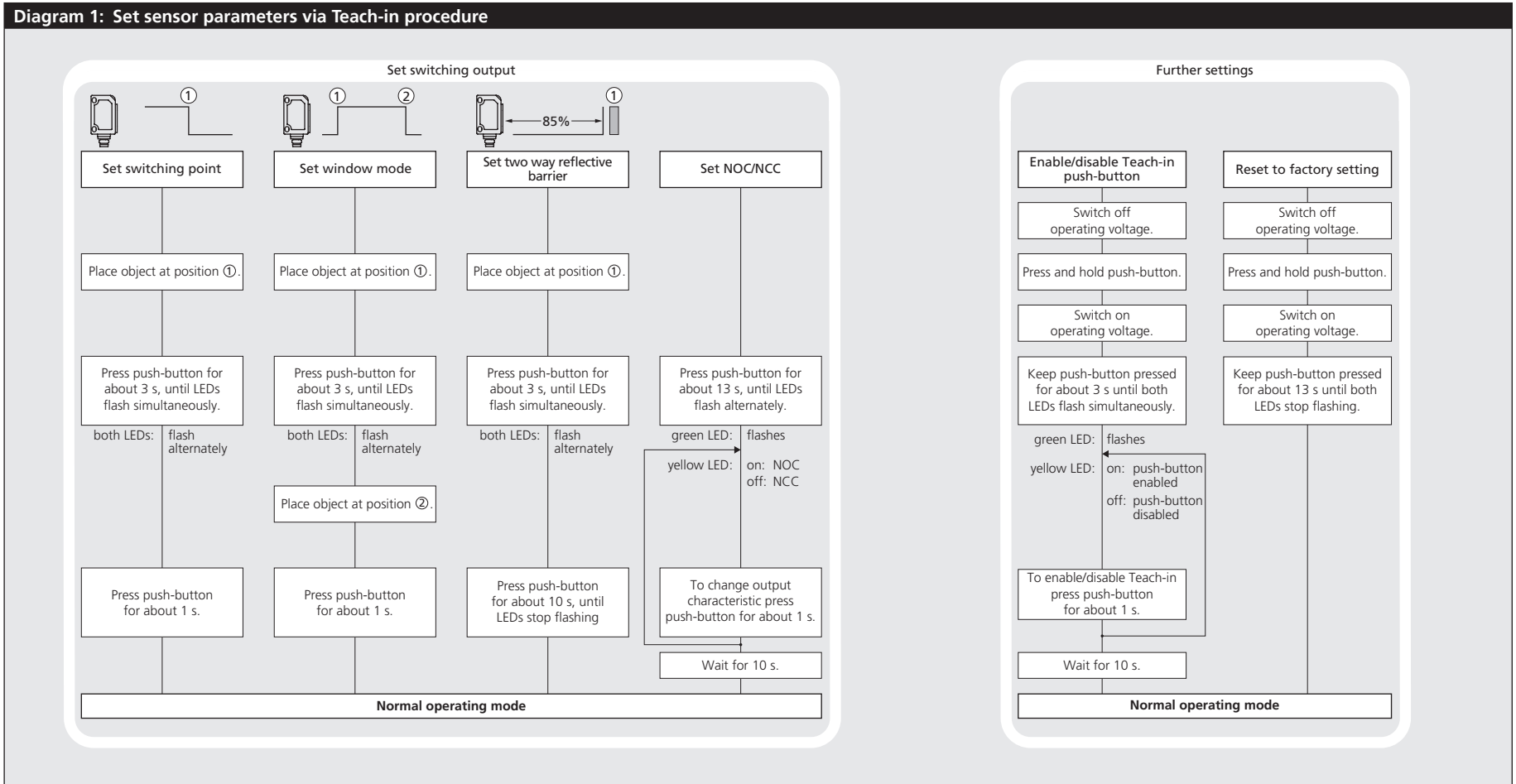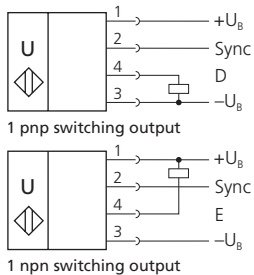A high level on the sync-input will disable the sensor.

Fig. 3: External synchronisation signal

Maintenance

microsonic sensors are maintenance-free. In case of excess caked-on dirt we recommend cleaning the white sensor surface.
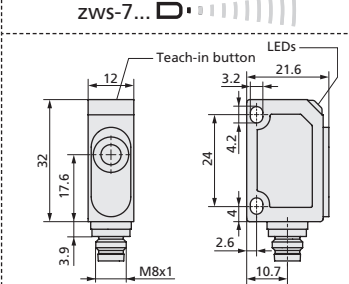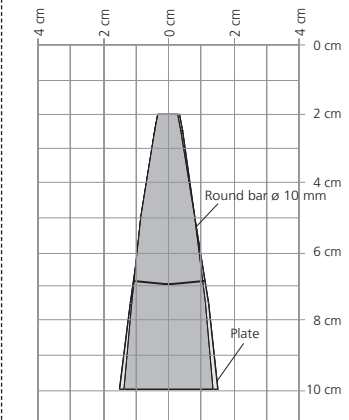

Diagram 1: Set sensor parameters via Teach-in procedure

Set switching output

Set switching point
↓
Place object at position ①.
↓
Press push-button for about 3 s, until LEDs flash simultaneously.
↓
both LEDs: flash alternately
↓
Press push-button for about 1 s.

Set window mode
↓
Place object at position ①.
↓
Press push-button for about 3 s, until LEDs flash simultaneously.
↓
both LEDs: flash alternately
↓
Place object at position ②.
↓
Press push-button for about 1 s.

Set two way reflective barrier (←85%→)
↓
Place object at position ①.
↓
Press push-button for about 3 s, until LEDs flash simultaneously.
↓
both LEDs: flash alternately
↓
Press push-button for about 10 s, until LEDs stop flashing

Set NOC/NCC
↓
Press push-button for about 13 s, until LEDs flash alternately.
↓
green LED: flashes
yellow LED: on: NOC / off: NCC
↓
To change output characteristic press push-button for about 1 s.
↓
Wait for 10 s.

Normal operating mode

Further settings

Enable/disable Teach-in push-button
↓
Switch off operating voltage.
↓
Press and hold push-button.
↓
Switch on operating voltage.
↓
Keep push-button pressed for about 3 s until both LEDs flash simultaneously.
↓
green LED: flashes
yellow LED: on: push-button enabled / off: push-button disabled
↓
To enable/disable Teach-in press push-button for about 1 s.
↓
Wait for 10 s.

Reset to factory setting
↓
Switch off operating voltage.
↓
Press and hold push-button.
↓
Switch on operating voltage.
↓
Keep push-button pressed for about 13 s until both LEDs stop flashing.

Normal operating mode

Technical data

1 pnp switching output

1 npn switching output

	zws-7...D	zws-15...D
	LEDs	LEDs
	Teach-in button	Teach-in button

	zws-7...D	zws-15...D
blind zone	20 mm	20 mm
operating range	70 mm	150 mm
maximum range	100 mm	250 mm
angle of beam spread	see detection zone	see detection zone
transducer frequency	380 kHz	380 kHz
resolution	0.2 mm	0.2 mm
reproducibility	±0.15 %	±0.15 %
detection zones		

for different objects:
The dark grey areas represent the zone where it is easy to recognise the normal reflector (round bar). This indicates the typical operating range of the sensors. The light grey areas represent the zone where a very large reflector – for instance a plate – can still be recognised. The requirement here is for an optimum alignment to the sensor. It is not possible to evaluate ultrasonic reflections outside this area.

Round bar ø 10 mm

Plate

Round bar ø 10 mm

Plate

	zws-7...D	zws-15...D
accuracy	Temperature drift 0,17 %/°C	Temperature drift 0,17 %/°C
operating voltage U_B	20 to 30 V DC, reverse polarity protection, Class 2	20 to 30 V DC, reverse polarity protection, Class 2
voltage ripple	±10 %	±10 %
no-load current consumption	<30 mA	<30 mA
housing	ABS	ABS
	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content
class of protection to EN 60529	IP 67	IP 67
norm conformity	EN 60947-5-2	EN 60947-5-2
type of connection	4-pin M8 initiator plug	4-pin M8 initiator plug
controls	Teach-in push-button	Teach-in push-button
indicators	LED green (operation)	LED green (operation)
	LED yellow (state of output)	LED yellow (state of output)
programmable	no	no
synchronisation	external	external
pulse width synchronisation signal t_i	>150 µs	>150 µs
cycle time synchronisation signal t_p	2 ms < t_p < 1 s	5 ms < t_p < 1 s
operating temperature	−25 to +70 °C	−25 to +70 °C
storage temperature	−40 to +85 °C	−40 to +85 °C
weight	10 g	10 g
switching hysteresis	2 mm	2 mm
switching frequency	250 Hz	100 Hz
response time	<3 ms	<7 ms
switch-off delay time	<3 ms	<7 ms
time delay before availability	<300 ms	<300 ms
order no.	**zws-7/CD/QS**	**zws-15/CD/5ms.a**
switching output	pnp, U_B–2 V, I_{max} = 200 mA	pnp, U_B–2 V, I_{max} = 200 mA
	switchable NOC/NCC, short-circuit-proof	switchable NOC/NCC, short-circuit-proof
order no.	**zws-7/CE/QS**	**zws-15/CE/5ms.a**
switching output	npn, −U_B+2 V, I_{max} = 200 mA	npn, −U_B+2 V, I_{max} = 200 mA
	switchable NOC/NCC, short-circuit-proof	switchable NOC/NCC, short-circuit-proof

Notes

- The zws sensor has a blind zone, within which distance measurements are not possible.
- The zws-7 sensor has no temperature compensation.
- In the normal operating mode, an illuminated yellow LED signals the switching output is switched through.
- The sensor got to know the distance to the object at the teach-in stage. For objects that move into the sound field from the side (see Fig. 4), an 8-10 % greater distance should be set for reliable object detection by the sensor.
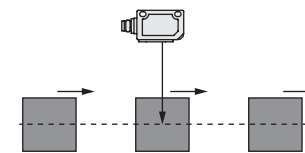

Fig. 4: Setting the switching point

- The zws-7 has a very short measurement cycle time of only 2 ms. Under unfavourable conditions this can lead to the sensor wrongly responding to echoes from existing measurements. To avoid this, there has to be an unobstructed space extending to a depth of 500 mm in front of the sensor. Only the objects to be detected are to be within the sensor's 20 to 100 mm operating area (see Fig. 5).
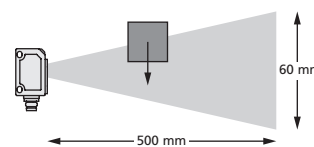

Fig. 5: Unobstructed space in front of the sensor

- With the zws-7, it is vital that the objects to be detected enter the sound fields from the sides.
- If the unobstructed 500 mm space cannot be provided or should the sensor be used in the «Two-way reflective barrier» mode, then a plane reflector at a specific distance to the sensor must be fitted (see Fig. 6). The size of the reflector and its working clearance from the sensor can be taken from the table in Fig. 7.
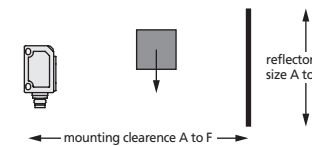

reflector-size A to F

mounting clearence A to F

Fig. 6: Sensor/reflector working clearance

A	366 mm	60 mm x 60 mm
B	194 mm	60 mm x 60 mm
C	137 mm	50 mm x 50 mm
D	108 mm	40 mm x 40 mm
E	91 mm	40 mm x 40 mm
F	79 mm	30 mm x 30 mm

Fig. 7: Working clearance and reflector sizes

- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0-85 % of the set distance.
- If the push-button is not pressed for 2 minutes during the teach-in setting, the settings made hitherto are deleted.
- The sensor can be reset to its factory setting, see »Further settings«, Diagram 1.