microsonic

Operating Instructions

Fast ultrasonic proximity switch with one switched 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 switched output is set in dependence of the adjusted detect 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). Two LEDs indicate operation and the state of the switched 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.

Installation

■ Mount the sensor at the installation site with the aid of the enclosed mounting plate.
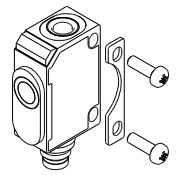Maximum torque of attachment screw: 0,5 Nm

Fig. 1: Attachment with mounting plate

■ Connect a connection cable to the M8 device plug.
■ Avoid mechanical load on the connector.

Start-Up

■ Connect the power supply.
■ Carry out the adjustment in accordance with the diagram.

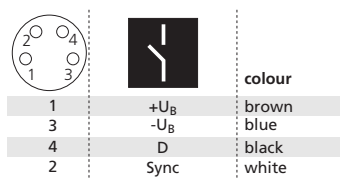|		colour
1	$+U_B$	brown
3	$-U_B$	blue
4	D	black
2	Sync	white

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

Factory Setting

■ Operation with one detect point
■ Switched output on NOC
■ Detect points at operating range

Operating modes

Three operating modes are available for the switched output:

■ Operation with one detect point
The switched output is set if the object falls below the set detect point.
■ Window mode
The switched output is set if the object is within the set window margins.
■ Two-way reflective barrier
The switched output is set if the object is between sensor and reflector.

Synchronization

You can synchronize 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).
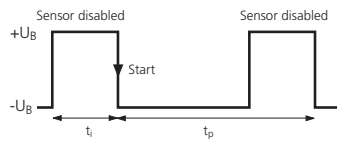A high level on the sync-input will deactivate the sensor.

Fig.3: External synchronization signal

Checking operation mode

■ In normal mode shortly press the push-button.
The green LED stops shining for one second, then it will show the current operating mode:

1 x flashing = operation with one switching point
2 x flashing = window mode
3 x flashing = reflective barrier

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

Maintenance

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

Notes

■ The zws sensor has a blind zone, within which distance measurements are not possible.
■ In the normal operating mode, an illuminated yellow LED signals the switched 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, an 8-10 % greater distance should be set for reliable object detection by the sensor.
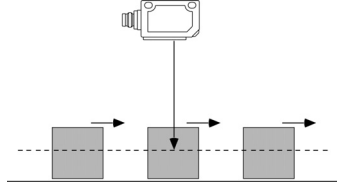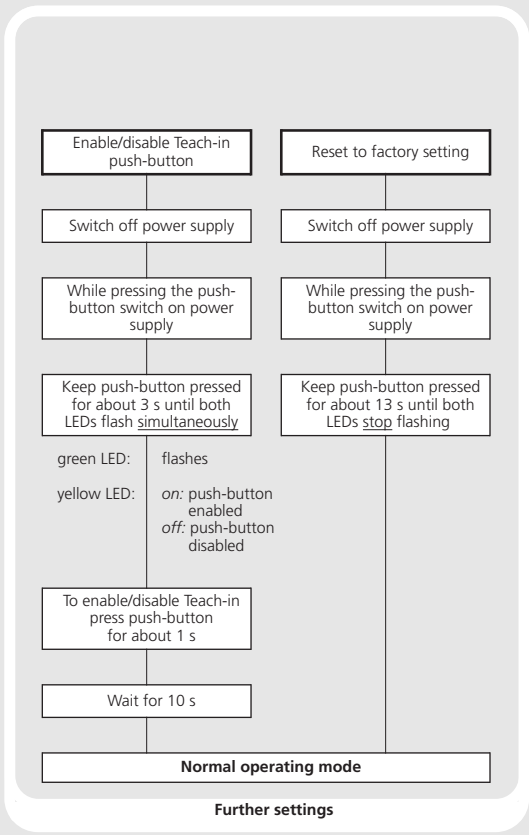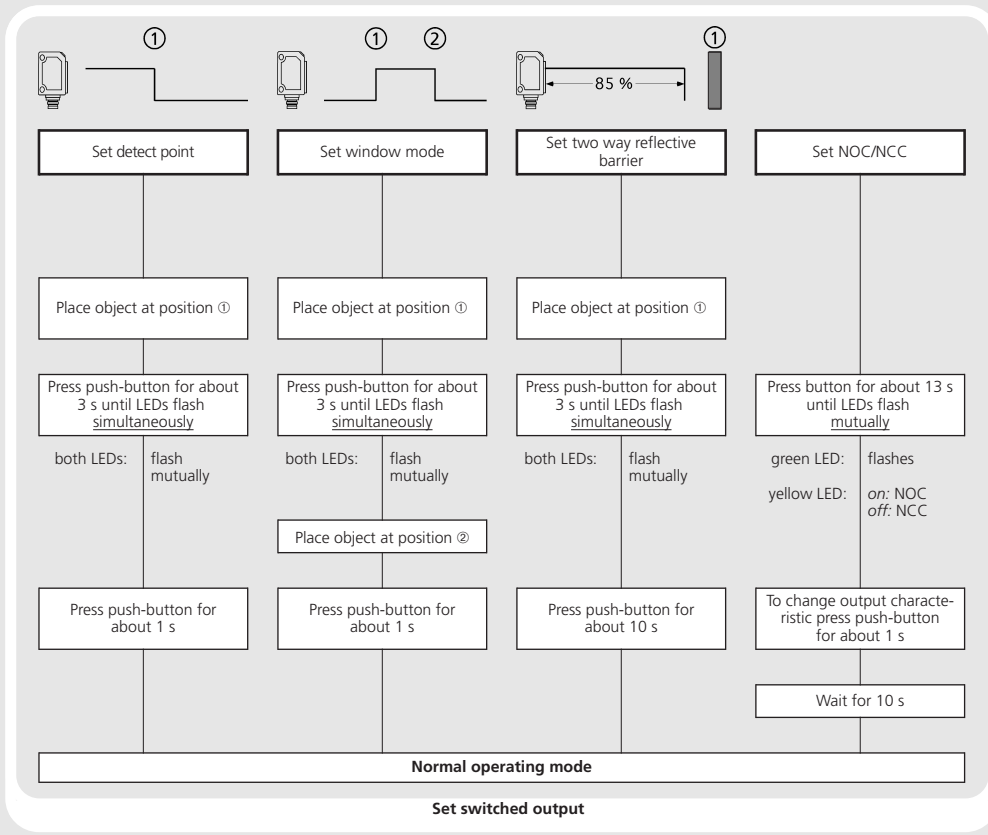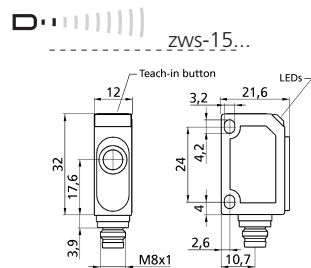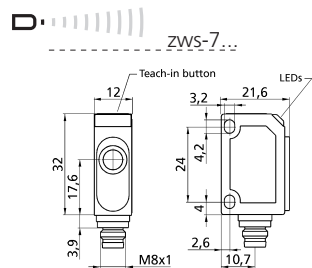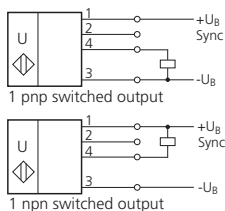

Fig. 4: Setting the switching point

■ 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 exis-
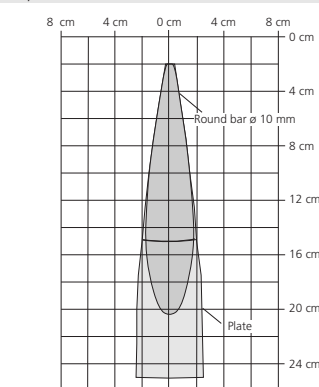

Sensor adjustment with Teach-in procedure

Set switched output

Set detect point	Set window mode	Set two way reflective barrier	Set NOC/NCC
Place object at position ①	Place object at position ①	Place object at position ①	
Press push-button for about 3 s until LEDs flash <u>simultaneously</u>	Press push-button for about 3 s until LEDs flash <u>simultaneously</u>	Press push-button for about 3 s until LEDs flash <u>simultaneously</u>	Press button for about 13 s until LEDs flash <u>mutually</u>
both LEDs: flash mutually	both LEDs: flash mutually	both LEDs: flash mutually	green LED: flashes / yellow LED: *on:* NOC *off:* NCC
	Place object at position ②		
Press push-button for about 1 s	Press push-button for about 1 s	Press push-button for about 10 s	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	Reset to factory setting
Switch off power supply	Switch off power supply
While pressing the push-button switch on power supply	While pressing the push-button switch on power supply
Keep push-button pressed for about 3 s until both LEDs flash <u>simultaneously</u>	Keep push-button pressed for about 13 s until both LEDs <u>stop</u> flashing
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	

Normal operating mode

Technical data

1 pnp switched output

1 npn switched output

zws-7...

Teach-in button — LEDs
12 — 3,2 — 21,6
32 — 17,6 — 24 — 4,2 — 4
3,9 — M8x1 — 2,6 — 10,7

zws-15...

Teach-in button — LEDs
12 — 3,2 — 21,6
32 — 17,6 — 24 — 4,2 — 4
3,9 — M8x1 — 2,6 — 10,7

	zws-7...	zws-15...
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, sampling rate	0,20 mm	0,20 mm
reproducibility	± 0,15 %	± 0,15 %

retection zones for different objects:
The dark grey areas are determined with a thin round bar (10 mm dia.) and indicate the typical operating range of a sensor. In order to obtain the light grey areas, a plate (100 x 100 mm) is introduced into the beam spread from the side. In doing so, the optimum angle between plate and sensor is always employed. This therefore indicates the maximum detection zone of the sensor. It is not possible to evaluate ultrasonic reflections outside this area.

4 cm 2 cm 0 cm 2 cm 4 cm
0 cm / 2 cm / 4 cm / 6 cm / 7 cm / 8 cm / 10 cm
Round bar ø 10 mm
Plate

8 cm 4 cm 0 cm 4 cm 8 cm
0 cm / 4 cm / 8 cm / 12 cm / 16 cm / 20 cm / 24 cm
Round bar ø 10 mm
Plate
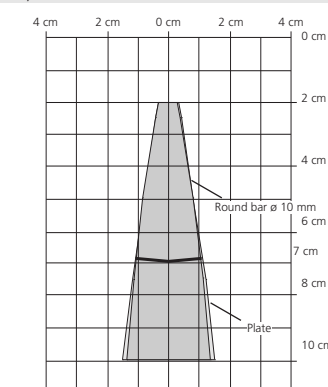
	zws-7...	zws-15...
accuracy	Temperature drift 0,17 % / °C	Temperature drift 0,17 % / °C
operating voltage U_B	20 - 30 V DC, reverse polarity protection	20 - 30 V DC, reverse polarity protection
voltage ripple	±10 %	±10 %
no-load current consumption	< 30 mA	< 30 mA
housing	ABS	ABS
	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content
class of protection to EN 60 529	IP 67	IP 67
type of connection	4-pin M8 initiator plug	4-pin M8 initiator plug
controls	Yes, Teach-in push-button	Yes, 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	Yes, external	Yes, external
pulse width synchronization signal t_p	> 150 µs	> 150 µs
repetition rate synchronization signal t_p	2 ms < t_p < 1 s	5 ms < t_p < 1 s
operating temperature	-25°C to +70°C	-25°C to +70°C
storage temperature	-40°C to +85°C	-40°C 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
norm conformity	EN 60947-5-2	EN 60947-5-2
order no.	**zws-7/CD/QS**	**zws-15/CD/5ms.a**
switched 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**
switched 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

CE

2014/30/EU

ting 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 20-100 mm operating area.
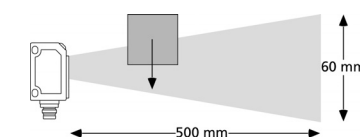

60 mm
500 mm

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. The size of the reflector and its working clearance from the sensor can be taken from the table in Fig.7.
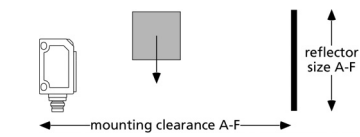

reflector size A-F
mounting clearance A-F

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.
- The zws-7 sensor has no temperature compensation.
- 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.