microsonic

Operation Manual

Ultrasonic proximity switch with one switching output

zws-15/CD/QS **zws-15/CE/QS**
zws-24/CD/QS **zws-24/CE/QS**
zws-25/CD/QS **zws-25/CE/QS**
zws-35/CD/QS **zws-35/CE/QS**
zws-70/CD/QS **zws-70/CE/QS**

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 detect distance. Via the push-button, the detect distance and operating mode can be adjusted (Teach-in). Two LEDs indicate operation and the state of the switching output.

Safety Notes

- Read the operation 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, use in the area of personal and machine protection not permitted

Use for intended purpose only

zws 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.

Start-Up

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

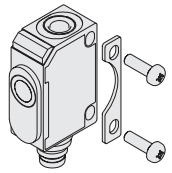


Fig. 1: Attachment with mounting plate

		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

zws sensors are delivered with the following settings:

- Operation with one switching point
- Switching output on NOC
- Switching point at operating range

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

Checking operating 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
- 3x flashing = NOC (twin)
- 4x flashing = NCC (twin)

Mutual Influencing and Synchronization

If two or more sensors are mounted too close to one another and the minimum assembly distances (see Fig. 3) between the sensors are not reached they can influence one another. There are two methods available to avoid this.

- If only two sensors are operating, the twin mode can be selected at one of the two sensors via the sensor setting »Set NOC/NCC and twin mode«. The other sensor stays at the standard NOC/NCC setting. For the sensor in twin mode, response delay is slightly increased und therefore the switching frequency reduced.
- If more than two sensors are operating close to one another, the sensors can be synchronised by the accessory SyncBox2.

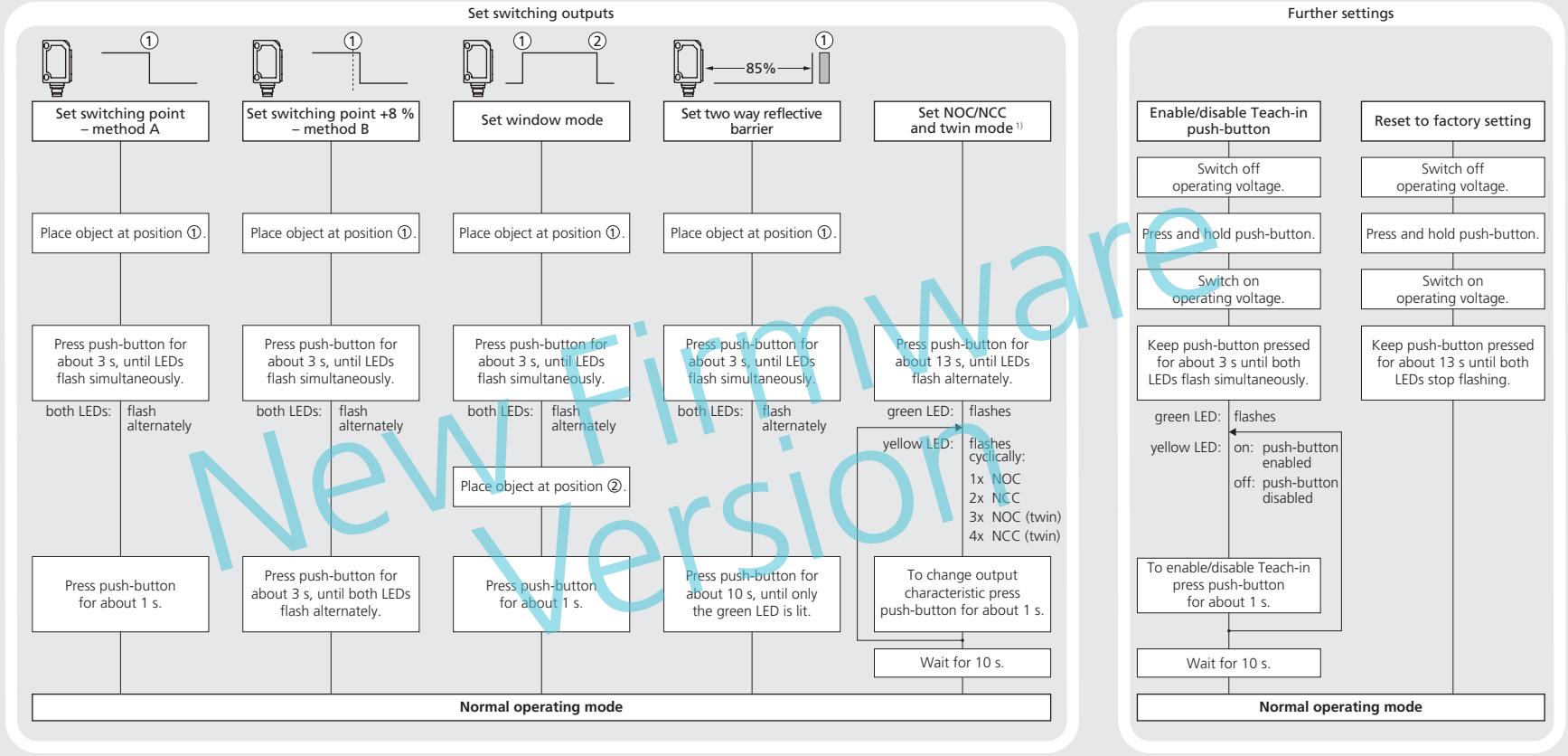
	⊐ ↕ ⊐	⊐ ↔ ⊐
zws-15...	≥0.25 m	≥1.30 m
zws-24...	≥0.25 m	≥1.40 m
zws-25...	≥0.35 m	≥2.50 m
zws-35...	≥0.40 m	≥2.50 m
zws-70...	≥0.70 m	≥4.00 m

Fig. 3: Minimum assembly distances for Sync

Maintenance

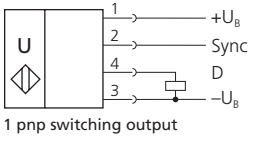
microsonic sensors are maintenance-free. In case of excess caked-on dirt we recommend cleaning the white sensor surface.

Diagram 1: Set sensor parameters via Teach-in procedure

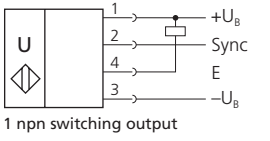


1) This operation manual applies to zws sensors from firmware version V3. The firmware version can be checked via Teach-in procedure »Set NOC/NCC and twin mode«. If the yellow LED flashes, this zws sensor has firmware V3 or higher.

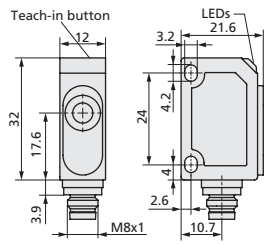
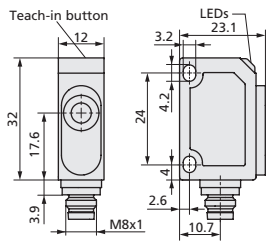
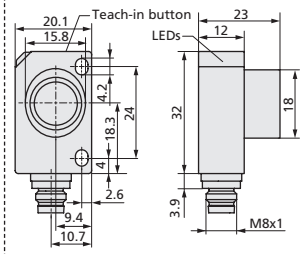
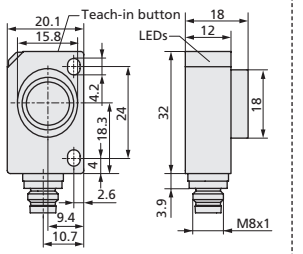
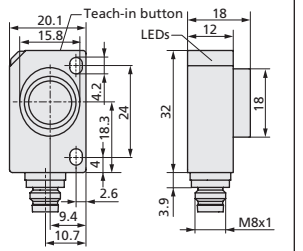
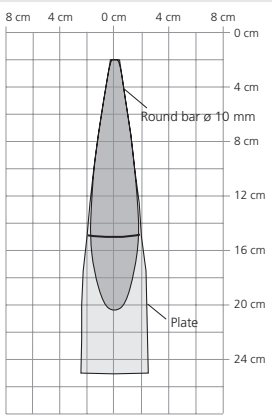
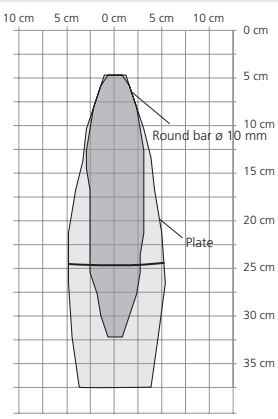
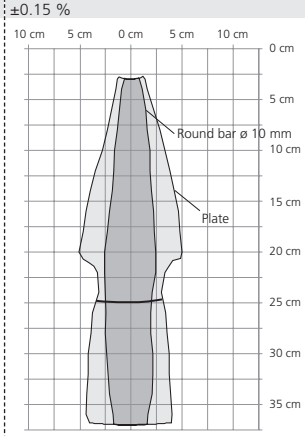
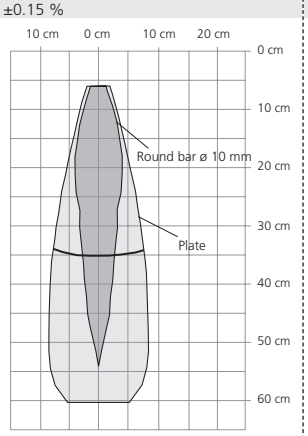
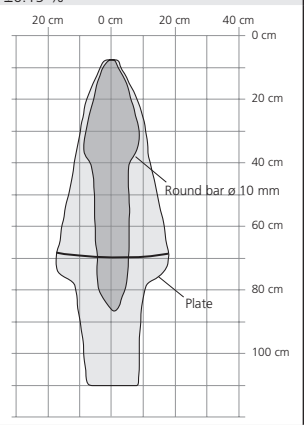
Technical Data



1 pnp switching output



1 npn switching output

	zws-15...	zws-24...	zws-25...	zws-35...	zws-70...
					
blind zone	20 mm	50 mm	30 mm	64 mm	120 mm
operating range	150 mm	240 mm	250 mm	350 mm	700 mm
maximum range	250 mm	350 mm	350 mm	600 mm	1000 mm
angle of beam spread	see detection zone	see detection zone	see detection zone	see detection zone	see detection zone
transducer frequency	380 kHz	500 kHz	320 kHz	400 kHz	300 kHz
resolution	0.20 mm	0.20 mm	0.20 mm	0.20 mm	0.20 mm
reproducibility	±0.15 %	±0.15 %	±0.15 %	±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.					
accuracy	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K
operating voltage U_B	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection
voltage ripple	±10 %	±10 %	±10 %	±10 %	±10 %
no-load current consumption	<25 mA	<25 mA	<25 mA	<25 mA	<25 mA
housing	ABS	ABS	ABS	ABS	ABS
	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	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	IP 67	IP 67	IP 67
type of connection	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug
controls	Teach-in push-button	Teach-in push-button	Teach-in push-button	Teach-in push-button	Teach-in push-button
indicators	LED green (operation)	LED green (operation)	LED green (operation)	LED green (operation)	LED green (operation)
	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)
synchronisation	twin mode [1] or external	twin mode [1] or external	twin mode [1] or external	twin mode [1] or external	twin mode [1] or external
pulse width synchronisation signal t_i	>150 µs	>150 µs	>150 µs	>150 µs	>150 µs
cycle time synchronisation signal t_p	10 ms < t_p < 1 s	10 ms < t_p < 1 s	10 ms < t_p < 1 s	16 ms < t_p < 1 s	14 ms < t_p < 1 s
operating temperature	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C
storage temperature	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C
weight	10 g	10 g	11 g	11 g	11 g
switching hysteresis	2 mm	2 mm	2 mm	5 mm	10 mm
switching frequency	25 Hz (19 Hz in twin mode [2])	25 Hz (19 Hz in twin mode [2])	31 Hz (22 Hz in twin mode [2])	15 Hz (10 Hz in twin mode [2])	17 Hz (12 Hz in twin mode [2])
response time	30 ms (39 ms in twin mode [2])	30 ms (39 ms in twin mode [2])	24 ms (33 ms in twin mode [2])	48 ms (69 ms in twin mode [2])	42 ms (60 ms in twin mode [2])
switch-off delay time	<300 ms	<300 ms	<300 ms	<300 ms	<300 ms
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
order no.	**zws-15/CD/QS**	**zws-24/CD/QS**	**zws-25/CD/QS**	**zws-35/CD/QS**	**zws-70/CD/QS**
switching output	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof
order no.	**zws-15/CE/QS**	**zws-24/CE/QS**	**zws-25/CE/QS**	**zws-35/CE/QS**	**zws-70/CE/QS**
switching output	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof

[2] For information on twin mode, see section »Mutual Influencing and Synchronization«

Notes

- The zws sensor has a blind zone, within which distance measurements are not possible.
- The sensor has no temperature compensation.
- In the normal operating mode, an illuminated yellow LED signals the switching output is switched through.
- In the »Set switching point – method A« Teach-in procedure the actual distance to the object is taught to the sensor as the switching point. If the object moves towards the sensor (e.g. with level control) then the taught distance is the level at which the sensor has to switch the output.
  If the object to be scanned moves into the detection area from the side, the »Set switching point +8 % – method B« Teach-in procedure should be used. In this way the switching distance is set 8 % further than the actual measured distance to the object. This ensures a reliable switching distance even if the height of the objects varies slightly, see Fig. 4.

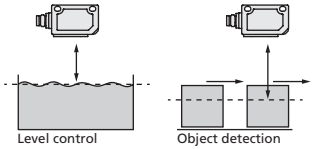


Fig. 4: Set the switching point for different directions of movement of the object

- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0 to 85 % of the set distance.
- If the push-button is not pressed for 8 minutes during the Teach-in setting, the settings made until now are deleted.

This operation manual applies to zws sensors from firmware version V3. The firmware version can be checked via Teach-in procedure »Set NOC/NCC and twin mode«. If the yellow LED flashes, this zws sensor has firmware V3 or higher.

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➔ 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.

Start-Up

➔ Connect the power supply.

➔ Carry out the adjustment in accordance with Diagram 1.

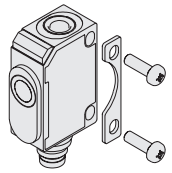

Fig. 1: Attachment with mounting plate

		colour
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4	D	black
2	sync	white

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

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  The switching output is set if the object falls below the set switching point.
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  The switching output is set if there is an object between sensor and reflector.

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➔ 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.

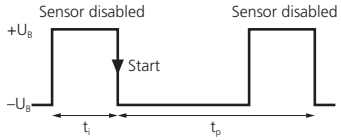


Fig. 3: External synchronisation signal

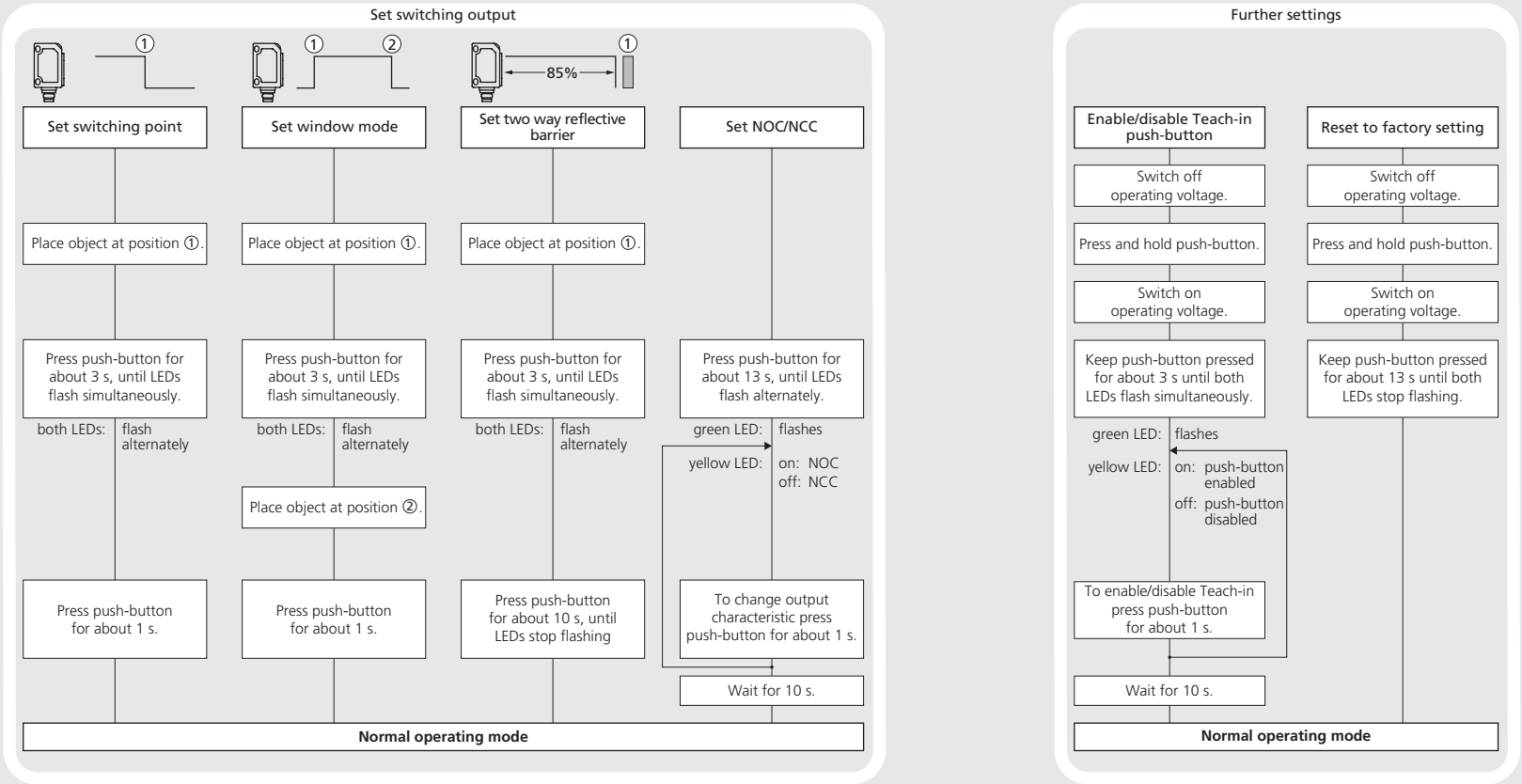
	⊐ ↕ ⊐	⊐ ↔ ⊐
zws-15...	≥0.25 m	≥1.30 m
zws-24...	≥0.25 m	≥1.40 m
zws-25...	≥0.35 m	≥2.50 m
zws-35...	≥0.40 m	≥2.50 m
zws-70...	≥0.70 m	≥4.00 m

Fig. 4: Minimum assembly distances for Sync

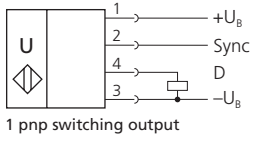
Maintenance

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

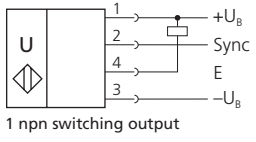
Diagram 1: Set sensor parameters via Teach-in procedure



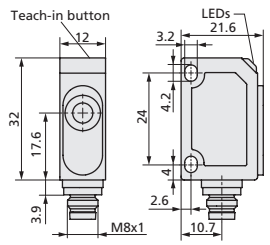
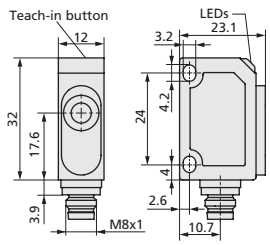
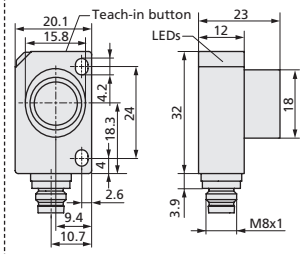
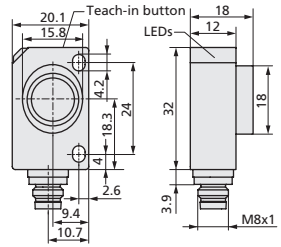
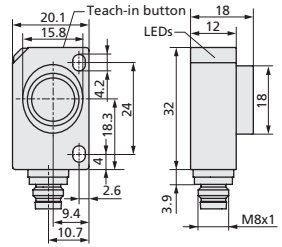
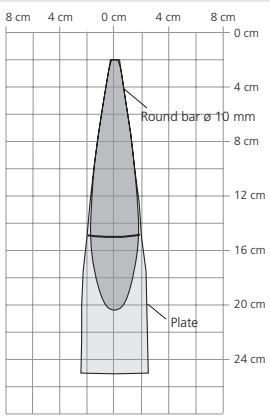
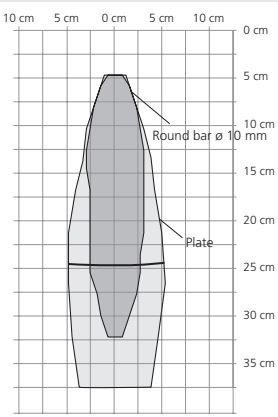
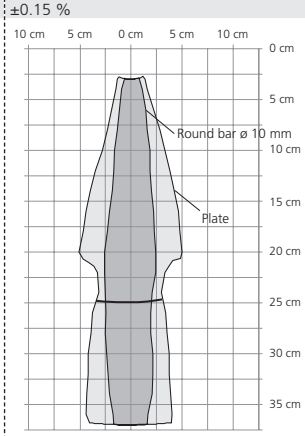
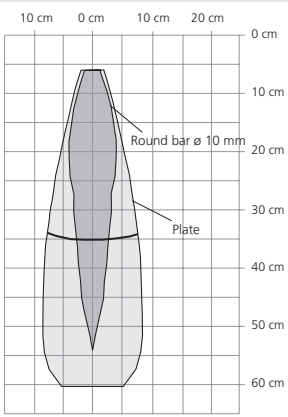
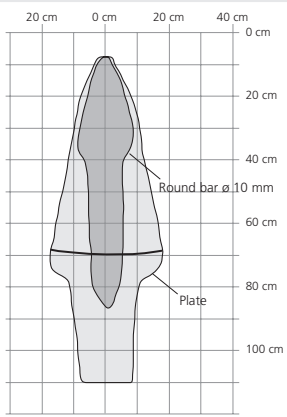
Technical Data



1 pnp switching output



1 npn switching output

	zws-15...	zws-24...	zws-25...	zws-35...	zws-70...
					
blind zone	20 mm	50 mm	30 mm	64 mm	120 mm
operating range	150 mm	240 mm	250 mm	350 mm	700 mm
maximum range	250 mm	350 mm	350 mm	600 mm	1000 mm
angle of beam spread	see detection zone	see detection zone	see detection zone	see detection zone	see detection zone
transducer frequency	380 kHz	500 kHz	320 kHz	400 kHz	300 kHz
resolution	0.20 mm	0.20 mm	0.20 mm	0.20 mm	0.20 mm
reproducibility	±0.15 %	±0.15 %	±0.15 %	±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.					
accuracy	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K
operating voltage U_B	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection	20 to 30 V DC, reverse polarity protection
voltage ripple	±10 %	±10 %	±10 %	±10 %	±10 %
no-load current consumption	<25 mA	<25 mA	<25 mA	<25 mA	<25 mA
housing	ABS	ABS	ABS	ABS	ABS
	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	ultrasonic transducer: polyurethane foam, epoxy resin with glass content	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	IP 67	IP 67	IP 67
type of connection	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug	4-pin M8 initiator plug
controls	Teach-in push-button	Teach-in push-button	Teach-in push-button	Teach-in push-button	Teach-in push-button
indicators	LED green (operation)	LED green (operation)	LED green (operation)	LED green (operation)	LED green (operation)
	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)	LED yellow (state of output)
synchronisation	external	external	external	external	external
pulse width synchronisation signal t_i	>150 µs	>150 µs	>150 µs	>150 µs	>150 µs
cycle time synchronisation signal t_p	8 ms < t_p < 1 s	10 ms < t_p < 1 s	10 ms < t_p < 1 s	16 ms < t_p < 1 s	14 ms < t_p < 1 s
operating temperature	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C
storage temperature	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C
weight	10 g	10 g	11 g	11 g	11 g
switching hysteresis	2 mm	2 mm	2 mm	5 mm	2 mm
switching frequency	25 Hz	25 Hz	31 Hz	15 Hz	11 Hz
response time	24 ms	24 ms	20 ms	48 ms	36 ms
switch-off delay time	<300 ms	<300 ms	<300 ms	<300 ms	<300 ms
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
order no.	**zws-15/CD/QS**	**zws-24/CD/QS**	**zws-25/CD/QS**	**zws-35/CD/QS**	**zws-70/CD/QS**
switching output	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B–2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof
order no.	**zws-15/CE/QS**	**zws-24/CE/QS**	**zws-25/CE/QS**	**zws-35/CE/QS**	**zws-70/CE/QS**
switching output	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	npn, –U_B+2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof

Notes

- The zws sensor has a blind zone, within which distance measurements are not possible.
- The standard sensor has no temperature compensation.
- In the normal operating mode, an illuminated yellow LED signals the switching output is switched through.
  In the Teach-in procedure the actual distance to the object is taught to the sensor as the switching point. If the object moves towards the sensor (e.g. with level control) then the taught distance is the level at which the sensor has to switch the output. If the object to be scanned moves into the detection area from the side, an 8 to 10 % greater distance should be set for reliable object detection by the sensor, see Fig. 5.

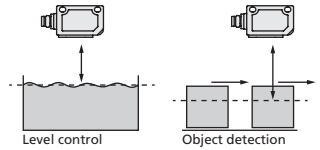


Fig. 5: Set the switching point for different directions of movement of the object

- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0 to 85 % of the set distance.
- If the push-button is not pressed for 10 minutes during the Teach-in setting, the settings made until now are deleted.
- The sensor can be reset to its factory setting, see »Further settings«, Diagram 1.

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