



TEACH-IN  
EXTENDED

**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

**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

**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.

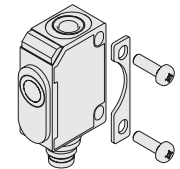


Fig. 1: Attachment with mounting plate

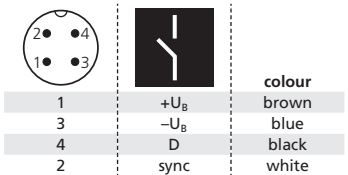


Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

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

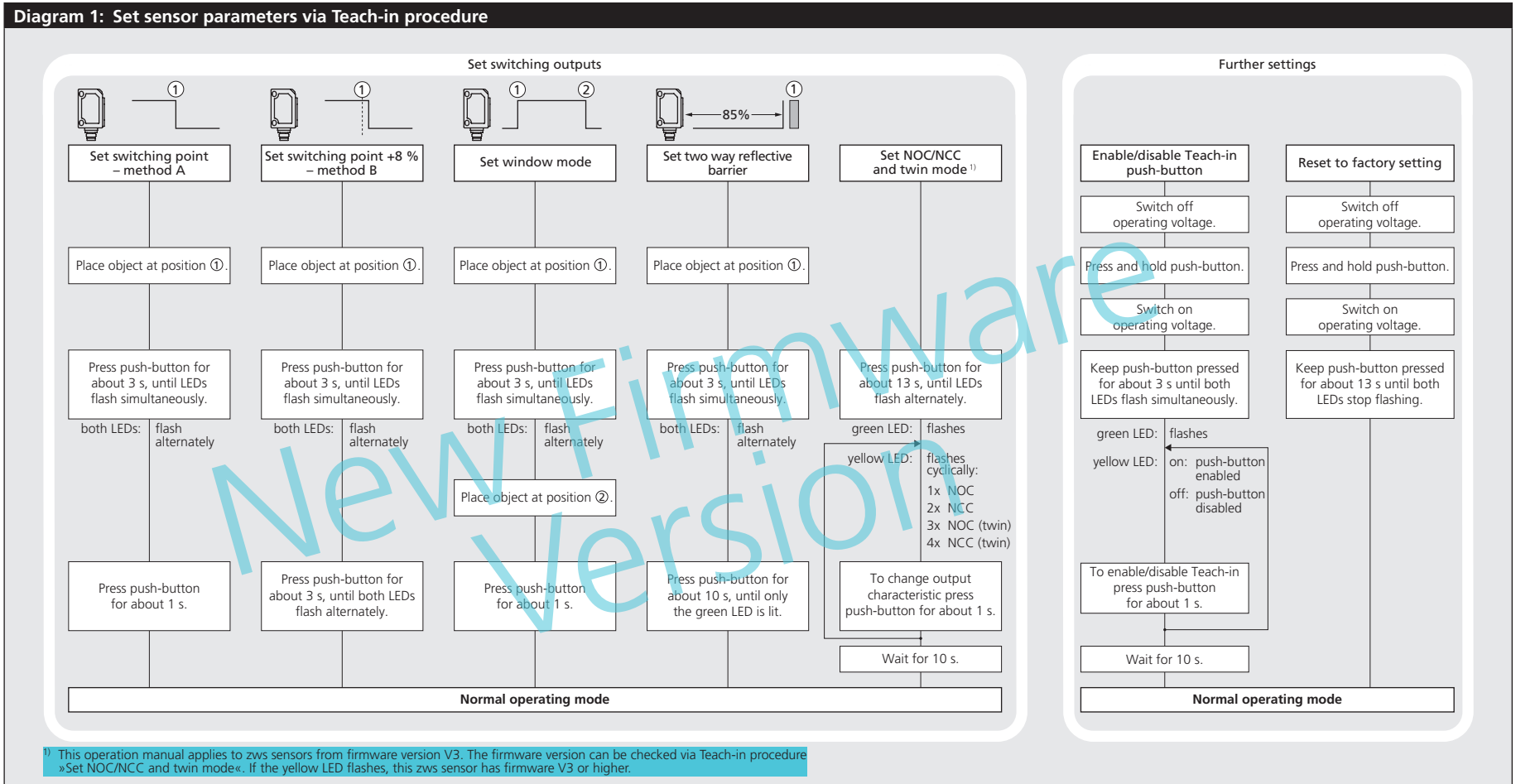
- Operating modes**  
Three operating modes are available for the switching output:
- **Operation with one switching point**  
The switching output is set if the object falls below the set switching point.
  - **Window mode**  
The switching output is set if the object is within the set window limits.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



**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.



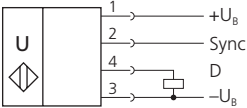
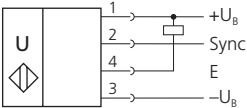
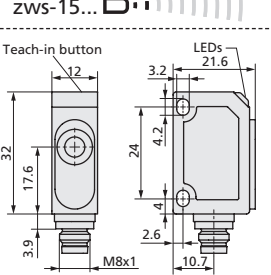
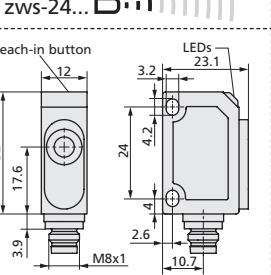
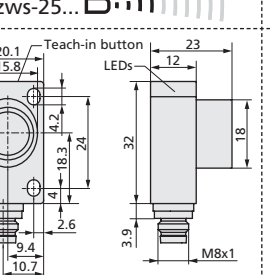
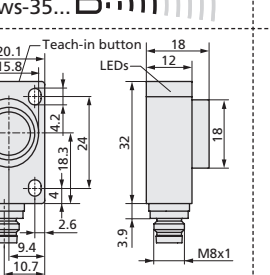
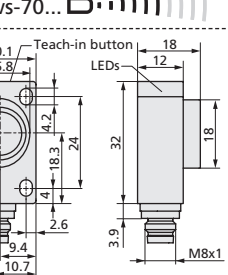
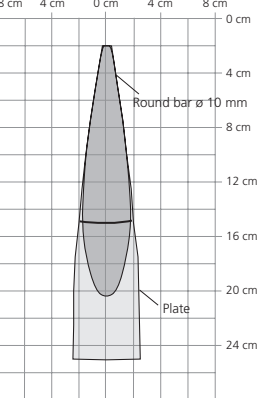
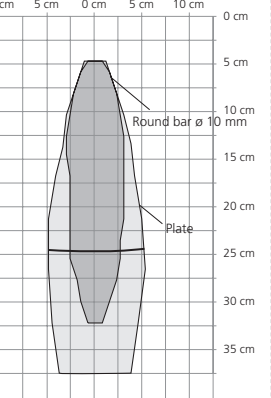
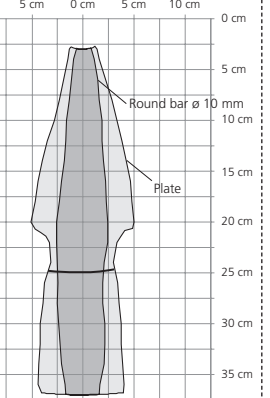
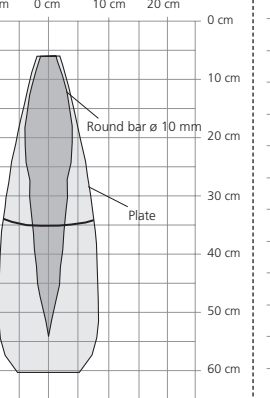
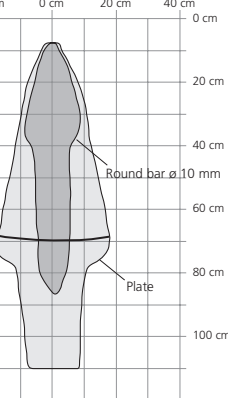
		
zws-15...	≥0.25 m	≥1.30 m
zws-24...	≥0.25 m	≥1.40 m
zws-25...	≥0.35 m	≥2.50 m
zws-35...	≥0.40 m	≥2.50 m
zws-70...	≥0.70 m	≥4.00 m

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.

<sup>1)</sup> 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

 <p>1 pnp switching output</p>  <p>1 npn switching output</p>	<p><b>zws-15...</b></p> 	<p><b>zws-24...</b></p> 	<p><b>zws-25...</b></p> 	<p><b>zws-35...</b></p> 	<p><b>zws-70...</b></p> 
<p><b>blind zone</b>  <b>operating range</b>  <b>maximum range</b>  <b>angle of beam spread</b>  <b>transducer frequency</b>  <b>resolution</b>  <b>reproducibility</b>  <b>detection zones</b></p>	<p>20 mm  150 mm  250 mm  see detection zone  380 kHz  0.20 mm  ±0.15 %</p>	<p>50 mm  240 mm  350 mm  see detection zone  320 kHz  0.20 mm  ±0.15 %</p>	<p>30 mm  250 mm  350 mm  see detection zone  320 kHz  0.20 mm  ±0.15 %</p>	<p>64 mm  350 mm  600 mm  see detection zone  400 kHz  0.20 mm  ±0.15 %</p>	<p>120 mm  700 mm  1000 mm  see detection zone  300 kHz  0.20 mm  ±0.15 %</p>
<p>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.</p>					
<p><b>accuracy</b>  <b>operating voltage</b> <math>U_B</math>  <b>voltage ripple</b>  <b>no-load current consumption</b>  <b>housing</b>  <b>class of protection to EN 60529</b>  <b>type of connection</b>  <b>controls</b>  <b>indicators</b>  <b>synchronisation</b>  <b>pulse width synchronisation signal</b> <math>t_s</math>  <b>cycle time synchronisation signal</b> <math>t_c</math>  <b>operating temperature</b>  <b>storage temperature</b>  <b>weight</b>  <b>switching hysteresis</b>  <b>switching frequency</b>  <b>response time</b>  <b>switch-off delay time</b>  <b>norm conformity</b></p>	<p>Temperature drift 0.17 %/K  20 to 30 V DC, reverse polarity protection  ±10 %  &lt;25 mA  ABS  ultrasonic transducer: polyurethane foam, epoxy resin with glass content  IP 67  4-pin M8 initiator plug  Teach-in push-button  LED green (operation)  LED yellow (state of output)  twin mode <sup>1)</sup> or external  &gt;150 µs  10 ms &lt; <math>t_c</math> &lt; 1 s  -25 to +70 °C  -40 to +85 °C  10 g  2 mm  25 Hz (19 Hz in twin mode <sup>2)</sup>)  30 ms (39 ms in twin mode <sup>2)</sup>)  &lt;300 ms  EN 60947-5-2</p>	<p>Temperature drift 0.17 %/K  20 to 30 V DC, reverse polarity protection  ±10 %  &lt;25 mA  ABS  ultrasonic transducer: polyurethane foam, epoxy resin with glass content  IP 67  4-pin M8 initiator plug  Teach-in push-button  LED green (operation)  LED yellow (state of output)  twin mode <sup>1)</sup> or external  &gt;150 µs  10 ms &lt; <math>t_c</math> &lt; 1 s  -25 to +70 °C  -40 to +85 °C  11 g  2 mm  25 Hz (19 Hz in twin mode <sup>2)</sup>)  30 ms (39 ms in twin mode <sup>2)</sup>)  &lt;300 ms  EN 60947-5-2</p>	<p>Temperature drift 0.17 %/K  20 to 30 V DC, reverse polarity protection  ±10 %  &lt;25 mA  ABS  ultrasonic transducer: polyurethane foam, epoxy resin with glass content  IP 67  4-pin M8 initiator plug  Teach-in push-button  LED green (operation)  LED yellow (state of output)  twin mode <sup>1)</sup> or external  &gt;150 µs  10 ms &lt; <math>t_c</math> &lt; 1 s  -25 to +70 °C  -40 to +85 °C  11 g  2 mm  31 Hz (22 Hz in twin mode <sup>2)</sup>)  24 ms (33 ms in twin mode <sup>2)</sup>)  &lt;300 ms  EN 60947-5-2</p>	<p>Temperature drift 0.17 %/K  20 to 30 V DC, reverse polarity protection  ±10 %  &lt;25 mA  ABS  ultrasonic transducer: polyurethane foam, epoxy resin with glass content  IP 67  4-pin M8 initiator plug  Teach-in push-button  LED green (operation)  LED yellow (state of output)  twin mode <sup>1)</sup> or external  &gt;150 µs  16 ms &lt; <math>t_c</math> &lt; 1 s  -25 to +70 °C  -40 to +85 °C  5 mm  15 Hz (10 Hz in twin mode <sup>2)</sup>)  48 ms (69 ms in twin mode <sup>2)</sup>)  &lt;300 ms  EN 60947-5-2</p>	<p>Temperature drift 0.17 %/K  20 to 30 V DC, reverse polarity protection  ±10 %  &lt;25 mA  ABS  ultrasonic transducer: polyurethane foam, epoxy resin with glass content  IP 67  4-pin M8 initiator plug  Teach-in push-button  LED green (operation)  LED yellow (state of output)  twin mode <sup>1)</sup> or external  &gt;150 µs  14 ms &lt; <math>t_c</math> &lt; 1 s  -25 to +70 °C  -40 to +85 °C  10 mm  17 Hz (12 Hz in twin mode <sup>2)</sup>)  42 ms (60 ms in twin mode <sup>2)</sup>)  &lt;300 ms  EN 60947-5-2</p>
<p><b>order no.</b>  <b>switching output</b>  <b>order no.</b>  <b>switching output</b></p>	<p><b>zws-15/CD/QS</b>  pnp, <math>U_B</math>-2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof  <b>zws-15/CE/QS</b>  npn, <math>-U_B</math>+2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof</p>	<p><b>zws-24/CD/QS</b>  pnp, <math>U_B</math>-2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof  <b>zws-24/CE/QS</b>  npn, <math>-U_B</math>+2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof</p>	<p><b>zws-25/CD/QS</b>  pnp, <math>U_B</math>-2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof  <b>zws-25/CE/QS</b>  npn, <math>-U_B</math>+2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof</p>	<p><b>zws-35/CD/QS</b>  pnp, <math>U_B</math>-2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof  <b>zws-35/CE/QS</b>  npn, <math>-U_B</math>+2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof</p>	<p><b>zws-70/CD/QS</b>  pnp, <math>U_B</math>-2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof  <b>zws-70/CE/QS</b>  npn, <math>-U_B</math>+2 V, <math>I_{max}</math> = 200 mA  switchable NOC/NCC, short-circuit-proof</p>

<sup>2)</sup> 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.

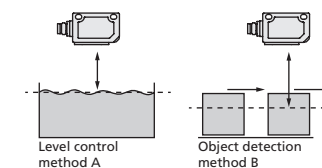


Fig. 4: Set the switching point for different directions of movement of the object

- 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.



Operation Manual  
Ultrasonic proximity switch  
with one switching output

- zws-15/CD/QS

zws-24/CD/QS

zws-25/CD/QS

zws-35/CD/QS

zws-70/CD/QS
- zws-15/CE/QS

zws-24/CE/QS

zws-25/CE/QS

zws-35/CE/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.
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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.

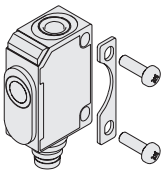


Fig. 1: Attachment with mounting plate

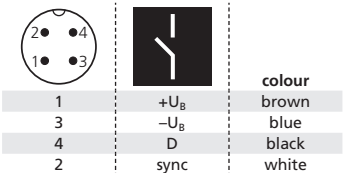


Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

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 an 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

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.

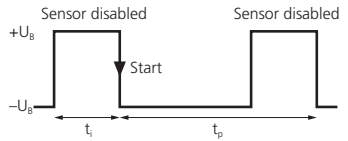
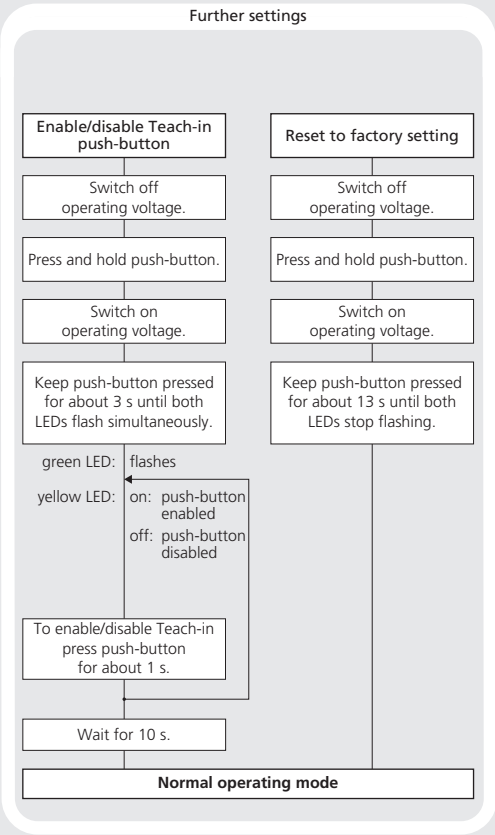
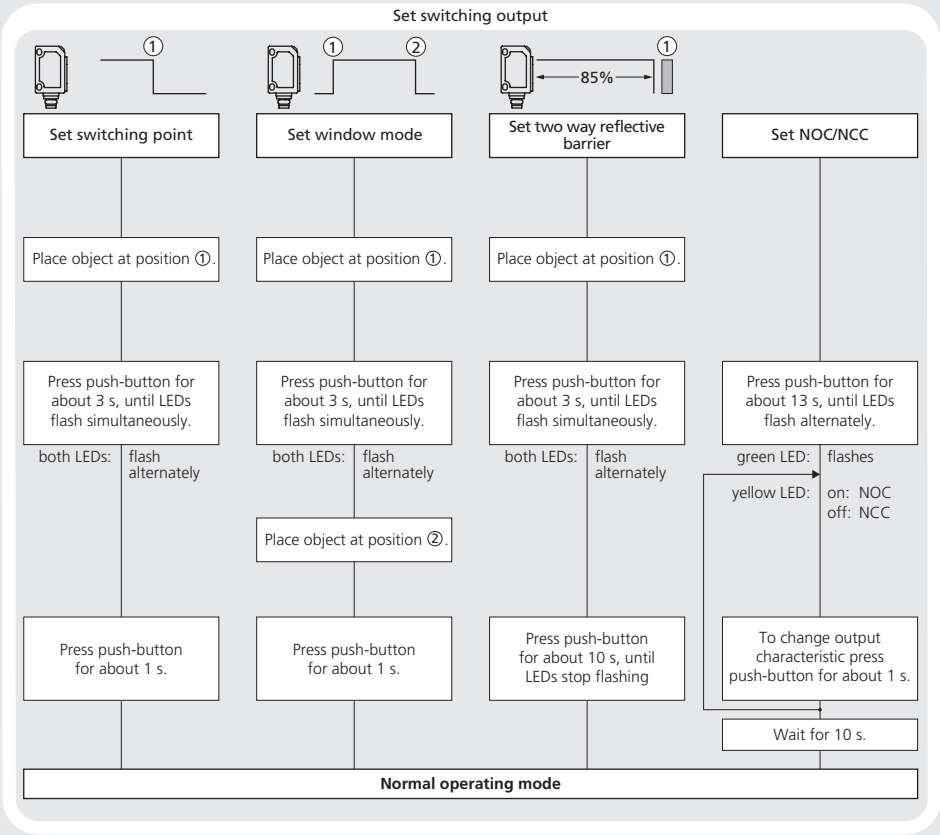


Fig. 3: External synchronisation signal

Diagram 1: Set sensor parameters via Teach-in procedure



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.

# Technical Data

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## 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.

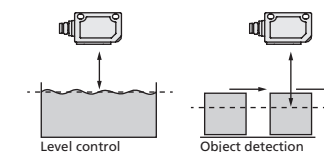


Fig. 5: Set the switching point for different directions of movement of the object

- 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.