microsonic nero-15-CD Ultrasonic Proximity Switch with One Switching Output User Manual

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microsonic nero-15-CD Ultrasonic Proximity Switch with One Switching Output

The nero sensor is an ultrasonic proximity switch that is designed to measure the distance to an object without making contact. It has one switching output that is conditional upon the adjusted detect distance. The sensor's detection zone must contain the object to be measured. The detect distance and operating mode can be adjusted via the Teach-in procedure. Two LEDs indicate the state of the switching output.

Product Description

The Nero sensor provides a non-contact measurement of the distance to an object. It has a switching output that is set based on the adjusted detect distance. The Teach-in procedure can be used to adjust the detect distance and operating mode. The sensor has two LEDs that indicate the state of the switching output.

Safety Instructions

Prior to start-up, read the operating manual carefully. Connection, installation, and adjustments should only be made by qualified personnel. The nero sensor is not a safety component in accordance with the EU Machine Directive, and it should not be used for personal or machine protection purposes. Use the sensor only for its intended purpose, which is the non-contact detection of objects.

Operating Modes

The nero sensor has three operating modes for the switching output:

- Operation with one switching point: The switching output is set when the object falls below the set switching point.
- Window mode: The switching output is set when the object is inside the set window.
- Two-way reflective barrier: The switching output is set when the object is between the sensor and fixed reflector.

Factory Settings

The nero sensor is delivered factory-made with the following settings:

- Switching point operation
- Switching output on NOC
- Detect distance at an operating range

Minimal Assembly Distances

The minimal assembly distances for two or more sensors are shown in Fig. 2. These distances should not be fallen below in order to avoid mutual interference.

Teach-in Procedure

The Teach-in procedure can be used to adjust the detect distance and operating mode of the nero sensor. The following steps should be followed:

1. Connect Teach-in to +UB. Both LEDs stop shining for one second.
2. Set switching output: Connect Teach-in for about 3 seconds to +UB, until both LEDs flash alternately.
3. Set window mode: Place the object at position 1. Connect Teach-in for about 3 seconds to +UB, until both LEDs flash alternately. Set the window mode by moving the object inside the desired detection zone. The yellow LED will indicate if the switching output is on (NOC) or off (NCC).
4. Set two-way reflective barrier: Place object at position 1. Place reflector at position 1. Connect Teach-in for about 3 seconds to +UB, until both LEDs flash alternately. Set the two-way reflective barrier by moving the object between the sensor and reflector.
5. Set NOC/NCC: Connect Teach-in for about 13 seconds to +UB, until both LEDs flash alternately. The green LED will flash to indicate the current operating mode (NOC or NCC).
6. Place object at position 2. Both LEDs will flash alternately.

Note: The M12 device plug is shown in Fig. 1, and the pin assignment and colour coding of the microsonic connection cable can be found in the figure.

Diagram 1 shows how to set the sensor parameters via the Teach-in procedure.

Operating Manual
Ultrasonic proximity switch with one switching output

- nero-15/CD
- nero-15/CE
- nero-25/CD
- nero-25/CE
- nero-35/CD
- nero-35/CE
- nero-100/CD
- nero-100/CE
- nero-15/WK/CD
- nero-15/WK/CE

- nero-25/WK/CD
- nero-25/WK/CE
- nero-35/WK/CD
- nero-35/WK/CE
- nero-100/WK/CD
- nero-100/WK/CE

Product Description

The nero 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 conditional upon the adjusted detect distance. Via the Teach-in procedure, the detect distance and operating mode can be adjusted. Two LEDs indicate the state of the switching output.

Safety instructions

- Read the operating manual prior to start-up.
- Connection, installation and adjustments may only be carried out by qualified staff.
- 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 nero ultrasonic sensors are used for non-contact detection of objects.

Installation

- Mount the sensor at the place of fitting.
- Connect a connection cable to the M12 device plug, see Fig. 1.
- The assembly distances shown in
  Fig. 2 for two or more sensors should not be fallen below in order to avoid mutual interference.

		colour
1	$+U_B$	brown
3	$-U_B$	blue
4	D/E	black
2	Teach-in	white

Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Start-up

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

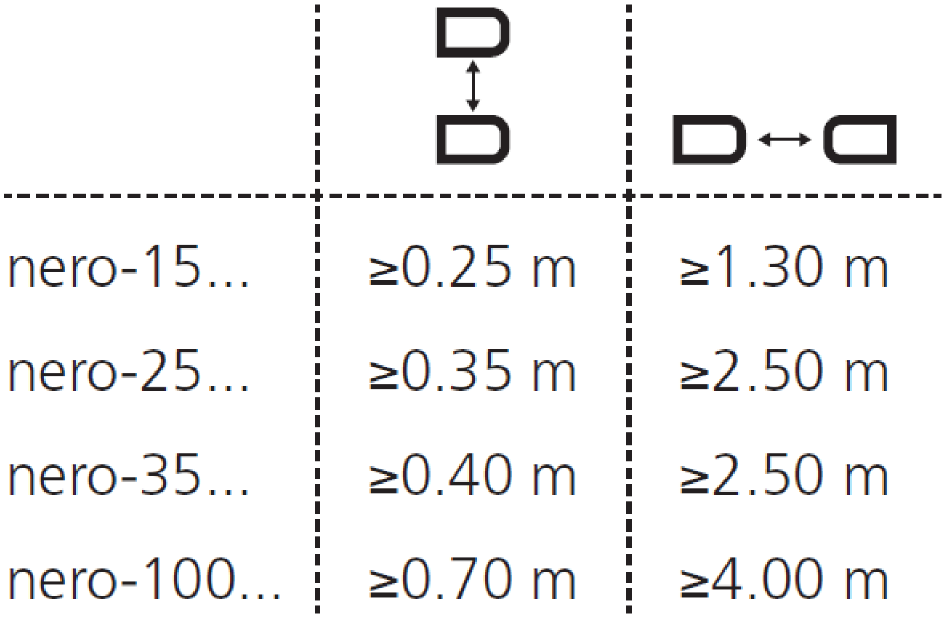
Factory setting nero-sensors are delivered factory made with the following settings:

- Switching point operation
- Switching output on NOC
- Detect distance at operating range

Operating modes

Three operating modes are available for the switching output:

- **Operation with one switching point**
  The switching output is set when the object falls below the set switching point.
- **Window mode**
  The switching output is set when the object is inside the set window.
- **Two-way reflective barrier**
  The switching output is set when the object is between sensor and fixed reflector.



nero-15...	≥0.25 m	≥1.30 m
nero-25...	≥0.35 m	≥2.50 m
nero-35...	≥0.40 m	≥2.50 m
nero-100...	≥0.70 m	≥4.00 m

Checking operation mode

In normal operating mode shortly connect Teach-in to +UB. Both LEDs stop shining for one second. The green LED indicates 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
  To change the operating mode und output function, see Diagram 1.

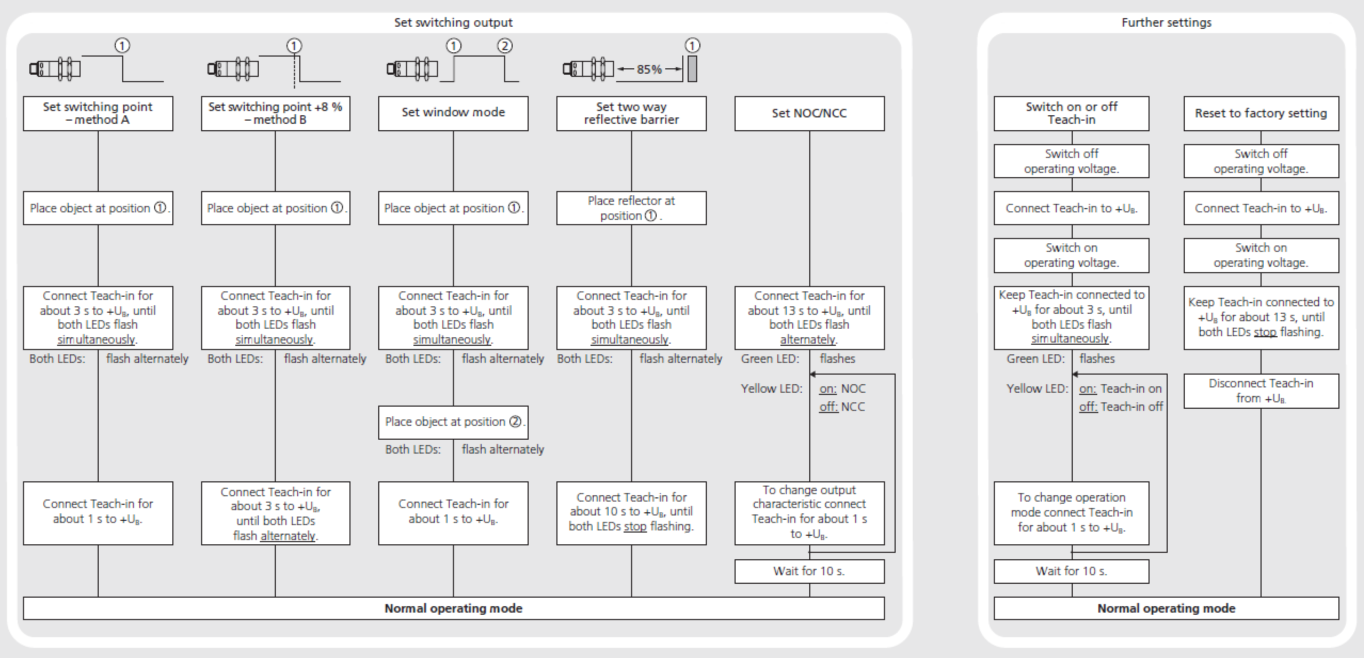
Maintenance

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

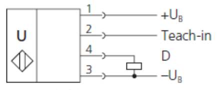
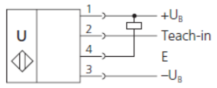
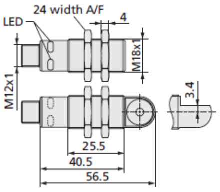
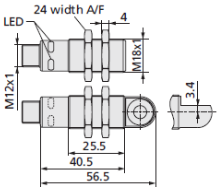
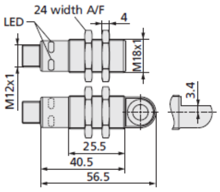
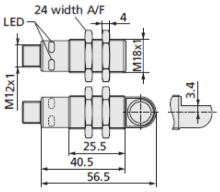
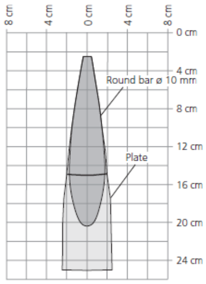
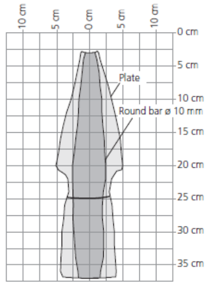
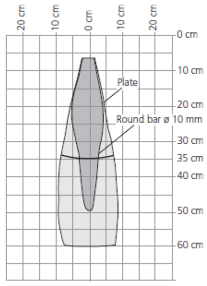
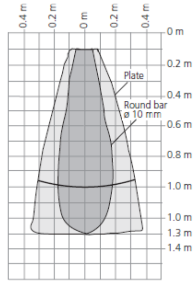
Notes

- The sensors of the Nero family have a blind zone, within which a distance measurement is not possible.
- In the normal operating mode, an illuminated yellow LED signals that the switching output is switched through.
- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0 to 85 % of the set distance.
- 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 (see Fig. 3).
- 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. 3).

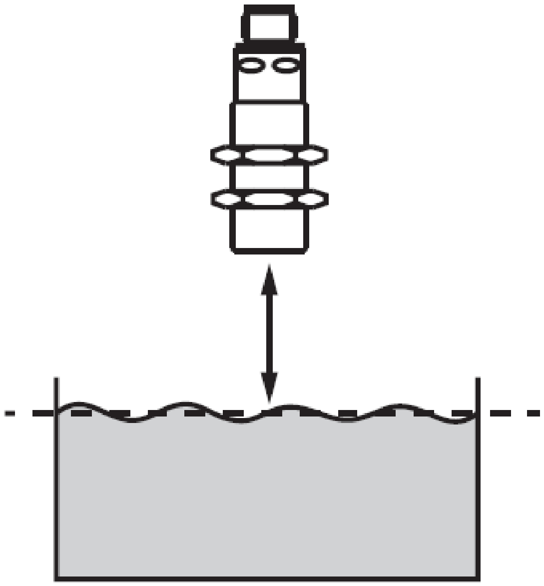
Set sensor parameters via the Teach-in procedure



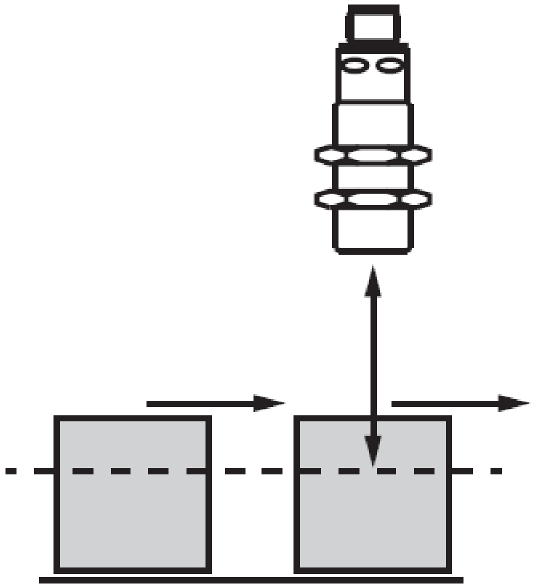
Technichal data

 1 pnp switching output  1 npn switching output	nero-15…	nero-25…	nero-35…	nero-100…
				
blind zone	25 mm	30 mm	65 mm	120 mm
operating range	150 mm	250 mm	350 mm	1,000 mm
maximum range	250 mm	350 mm	600 mm	1,300 mm
angle of beam spread	see detection zone	see detection zone	see detection zone	see detection zone
transducer frequency	380 kHz	320 kHz	400 kHz	200 kHz
resolution	0.2 mm	0.2 mm	0.2 mm	0.2 mm
reproducibility	±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 %/°C	temperature drift 0.17 %/°C	temperature drift 0.17 %/°C	temperature drift 0.17 %/°C
operating voltage U_B	10 bis 30 V DC, reverse polarity protection (Class 2)	10 bis 30 V DC, reverse polarity protection (Class 2)	10 bis 30 V DC, reverse polarity protection (Class 2)	10 bis 30 V DC, reverse polarity protection (Class 2)
voltage ripple	±10 %	±10 %	±10 %	±10 %
no-load current consumption	<40 mA	<40 mA	<40 mA	<40 mA
housing	PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content	PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content	PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content	PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content
max. tightening torque of nuts	1 Nm	1 Nm	1 Nm	1 Nm
class of protection per EN 60529	IP 67	IP 67	IP 67	IP 67
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
type of connection	4-pin M12 circular plug	4-pin M12 circular plug	4-pin M12 circular plug	4-pin M12 circular plug
controls	Teach-in via pin 2	Teach-in via pin 2	Teach-in via pin 2	Teach-in via pin 2
indicators	LED green, LED yellow	LED green, LED yellow	LED green, LED yellow	LED green, LED yellow
programmable	Teach-in	Teach-in	Teach-in	Teach-in
operating temperature	–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
switching hysteresis	2 mm	3 mm	5 mm	20 mm
switching frequency	25 Hz	25 Hz	12 Hz	10 Hz
response time	32 ms	32 ms	64 ms	80 ms
time delay before availability	<300 ms	<300 ms	<300 ms	<300 ms
order no. directly radiating pnp	**nero-15/CD**	**nero-25/CD**	**nero-35/CD**	**nero-100/CD**
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
order no. directly radiating npn	**nero-15/CE**	**nero-25/CE**	**nero-35/CE**	**nero-100/CE**
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
weight	15 g	15 g	15 g	15 g
order no. angular head pnp	**nero-15/WK/CD**	**nero-25/WK/CD**	**nero-35/WK/CD**	**nero-100/WK/CD**
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
order no. angular head npn	**nero-15/WK/CE**	**nero-25/WK/CE**	**nero-35/WK/CE**	**nero-100/WK/CE**
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
weight	20 g	20 g	20 g	20 g

Setting the switching point for different directions of movement of the object
The sensor can be reset to its factory setting (see »Further settings«, Diagram 1).



Set switching point - method A



Set switching point +8 % - method B

Enclosure Type 1
For use only in industrial machinery NFPA 79 applications.

The proximity switches shall be used with a Listed (CYJV/7) cable/connector assembly rated minimum 32 Vdc, minimum 290 mA, in the final installation

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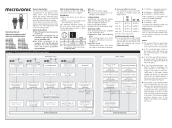
Documents / Resources

	microsonic nero-15-CD Ultrasonic Proximity Switch with One Switching Output [pdf] User Manual nero-15-CD Ultrasonic Proximity Switch with One Switching Output, nero-15-CD, Ultrasonic Proximity Switch with One Switching Output, with One Switching Output, Switching Output