Product description
The nano 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 conditionally upon the adjusted detect distance. Via the Teach-in procedure, the detect distance and operating mode can be adjusted. One 2-colour LED indicates operation and the state of the switched output.

Safety notes
- Read the operating instructions prior to start-up.
- Connection, installation and adjustment works should be carried out by expert personnel only.
- No safety Component in accordance with the EU Machine Directive.

Use for intended purpose only
nano ultrasonic sensors are used for non-contact detection of objects.

Installation
- Mount the sensor at the installation site.
- Connect a connection cable to the M12 device plug.
- Connect the power supply.
- Connect Teach-in to +UB for about 13 s, until the sensors switches on, the sensor detects its actual operating temperature and transmits it to the internal temperature compensation. The adjusted value is taken over after 45 seconds.
- If the sensor was switched off for at least 30 minutes and after power on the switched output is not set for 30 minutes a new adjustment of the internal temperature compensation to the actual mounting conditions takes place.
- The sensors of the nano family have a blind zone. Within this zone a distance measurement is not possible.

Start-up
- Connect the power supply.
- Carry out sensor adjustment in accordance with the diagram.
- Set NOC/NCC flashes.
- Until the switched output.
- The actual interference.

Start-up
- Connect Teach-in for about 3 s to +UB, until LED flashes yellow.
- Place object at position 1.
- LED flashes green/yellow.
- Connect Teach-in for about 3 s to +UB, until LED flashes green/yellow.
- Connect Teach-in for about 3 s to +UB, until LED flashes green/yellow.
- LED flashes green/yellow.
- Place object at position 1.
- Connect Teach-in for about 10 s to +UB until both LEDs stop flashing.
- Connect Teach-in for about 3 s to +UB, until LED flashes green/yellow.
- Connect Teach-in for about 3 s to +UB, until LED flashes green/yellow.
- LED flashes green/yellow.
- Place object at position 1.
- LED flashes green/yellow.
- To change output characteristic connect Teach-in for about 1 s to +UB.
- Wait for 10 s.

Normal operating mode
Set switched output

Factory setting
- Detect point operation.
- Switched output on NOC.
- Detect distance at operating range.

Operating modes
Three operating modes are available for the switched output:
- Operation with one detect point
  - The switched output is set when the object falls below the set detect point.
- Window mode
  - The switched output is set when the object is within the set window.
- Two-way reflective barrier
  - The switched output is set when the object is between sensor and fixed reflector.

Notes
- Every time the power supply is switched on, the sensor detects its actual operating temperature and transmits it to the internal temperature compensation. The adjusted value is taken over after 45 seconds.
- If the sensor was switched off for at least 30 minutes and after power on the switched output is not set for 30 minutes a new adjustment of the internal temperature compensation to the actual mounting conditions takes place.
- The sensors of the nano family have a blind zone. Within this zone a distance measurement is not possible.

In the normal operating mode, an illuminated yellow LED signals that the switched output is switched through.
- In the “Two-way reflective barrier” operating mode, the object has to be within the range of 0-85 % of the set distance.
- In the “Set detect point - method A” Teach-in procedure the actual distance to the object is taught to the sensor as the detect 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 detect 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.
### Technical data

<table>
<thead>
<tr>
<th>Blind zone</th>
<th>Operating range</th>
<th>Maximum range</th>
<th>Angle of beam spread</th>
<th>Resolution, sampling rate</th>
<th>Reproducibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>250 mm</td>
<td>40 mm</td>
<td>240 mm</td>
<td>69 µm</td>
<td>± 0.15 %</td>
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</table>

See detection zone

### Detection zones

- **See detection zone**
- **350 mm**
- **See detection zone**

### Transducer frequency

- **380 kHz**
- **500 kHz**

### Resolution, sampling rate

- **69 µm**
- **69 µm**

### Reproducibility

- **± 0.15 %**
- **± 0.15 %**

### Accuracy

- ± 1 % (temperature drift internally compensated)
- ± 1 % (temperature drift internally compensated)

### Operating voltage $U_{b}$

- 10 - 30 V DC, reverse polarity protection
- 10 - 30 V DC, reverse polarity protection

### Voltage ripple

- ±10 %
- ±10 %

### No-load current consumption

- ≤ 25 mA
- ≤ 35 mA

### Housing

- Brass sleeve, nickel-plated, plastic parts: PBT
- Ultrasonic transducer: polyurethane foam
- Epoxy resin with glass content

### Max. tightening torque of nuts

- 1 Nm
- 1 Nm

### Class of protection per EN 60 529

- IP 67
- IP 67

### Norm conformity

- EN 60947-5-2
- EN 60947-5-2

### Type of connection

- 4-pin M12 circular plug
- 4-pin M12 circular plug

### Indicators

- LED yellow/green
- LED yellow/green

### Controls

- Teach-in via pin 2
- Teach-in via pin 2

### Programmable

- Teach-in
- Teach-in

### Operating temperature

- -40°C to +85°C
- -40°C to +85°C

### Storage temperature

- -25°C to +70°C
- -25°C to +70°C

### Weight

- 15 g
- 15 g

### Switching hysteresis

- 2 mm
- 2 mm

### Switching frequency

- 25 Hz
- 20 Hz

### Switching from 1 to 2 ms

- 24 ms
- 30 ms

### Response time

- ≤ 300 ms
- ≤ 300 ms

### Time delay before availability

- ≤ 300 ms
- ≤ 300 ms

### Switched output

<table>
<thead>
<tr>
<th>Order no.</th>
<th>nano-15/CD</th>
<th>nano-24/CD</th>
<th>nano-15/CE</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pnp, U2=2V, Imax = 200 mA</td>
<td>pnp, U2=2V, Imax = 200 mA</td>
<td>npn, G=2V, Imax = 200 mA</td>
<td>npn, G=2V, Imax = 200 mA</td>
</tr>
</tbody>
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### The sensor can be reset to its factory setting (see »Further settings«).