**Manuals+** — User Manuals Simplified.

microsonic

**microsonic nano-15-CF Ultrasonic Proximity Switch**

# microsonic nano-15-CF Ultrasonic Proximity Switch Instruction Manual

**Contents**

# microsonic

**microsonic nano-15-CF Ultrasonic Proximity Switch**

**Specifications**

- Product: Ultrasonic proximity switch with one switching output and IO-Link

- Models: nano-15/CF, nano-24/CF

- Measurement Range: nano-15/CF: 150 mm, nano-24/CF: 250 mm

- IO-Link Capable: Yes, in accordance with IO-Link specification V1.1

- Operating Modes: Switching point operation, Window mode, Two-way reflective barrier

**Product Description**
The nano sensor offers non-contact measurement of the distance to an object within its detection zone. The switching output is set based on the adjusted detect distance. The sensor i IO-Link-capable, allowing for monitoring and parameterization via IO-Link.

**Safety Notes**
Read the operation manual before start-up. Connection, installation, and adjustment should be done by expert personnel only. Use in the area of personal and machine protection is not permitted.

**Proper Use**
nano ultrasonic sensors are used for non-contact detection of objects.

**Start-up**
Use the Teach-in procedure for start-up, refer to Diagram 1 in the manual.

**Operating Modes**
Three operating modes are available for the switching output: Switching point operation, Window mode, and Two-way reflective barrier.

**Maintenance**
The sensors are maintenance-free; however, in case of excess dirt, clean the white sensor surface.

**FAQ**

**Q: How do I set the detect distance and operating mode?**
A: You can adjust the detect distance and operating mode using the Teach-in procedure described in the manual.
**Q: Can the sensor be monitored and parameterized remotely?**
A: Yes, the sensor is IO-Link-capable, allowing for monitoring and parameterization via IO-Link. Refer to the sensor's IO-Link data sheet for detailed information.

**Operation Manual**
Ultrasonic proximity switch with one switching output and IO-Link
nano-15/CF
nano-24/CF



# Product Description

The nano sensor offer 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. Through the teach-in procedure, the detection distance and operating mode can be adjusted.

**IO-Link**

The nanosensor is IO-Link-capable in accordance with IO-Link specification V1.1 and supports Smart Sensor Profile like Digital Measuring Sensor. The sensor can be monitored and parameterized via IO-Link. Detailed information on parameterization via IO-Link can be found in the sensor's IO-Link data sheet at microsonic.de/en/nano.
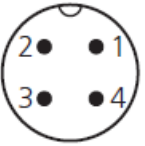
**Safety Notes**

- Read the operation manual prior to start-up.
- Connection, installation and ad justment works should be carried out by expert personnel only.
- No safety component in accordance with the EU Machine Directive, use in the area of per-sonal and machine protection not permitted

**Proper Use**

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, see Fig. 1.
- If necessary, use the alignment assistance (see »Using the Alignment Assistance«).

| | microsonic notation | IO-Link notation | IO-Link Smart Sensor Profile | colour |
|---|---|---|---|---|
| 1 | $+U_B$ | L+ | | brown |
| 2 | Com | NC | | white |
| 3 | $-U_B$ | L− | | blue |
| 4 | F | C/Q | SSC1 | black |

**Start-up**

- Connect the power supply.
- Set the parameters of the sensor by using the Teach-in procedure, see Diagram 1.

**Factory Settings**

nano sensors are delivered factory made with the following settings:

- Switching point operation.
- Switching output on NOC.

**Detect distance:**

- nano-15/CF: 150 mm
- nano-24/CF: 250 mm
- Filter at F01
- Filter strength at P00

**Operating Modes**
Three operating modes are available for the switching output:

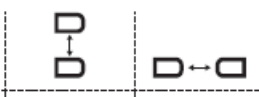- **Operation with one switching point**

  The switching output is set when the object falls below the set switching point.
- **Window mode**
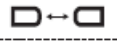
  The switching output is set when the object is within the set window limits.
- **Two-way reflective barrier**

  The switching output is set when the object is between sensor and fixed reflector.

| | | |
|---|---|---|
| nano-15... | ≥0.25 m | ≥1.30 m |
| nano-24... | ≥0.25 m | ≥1.40 m |

Fig. 2:  Minimal assembly distances

## Synchronization

If the assembly distance of multiple sensors falls below the values shown in Fig. 2, internal synchronization should be used (»Teach-in + sync« must be switched on, see Diagram 1). For this purpose set the switching outputs of all sensors in accordance with Diagram 1. Finally interconnect each pin 2 of the sensors to be synchronized.

## 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 the Teach-in procedure**

## Set switching output

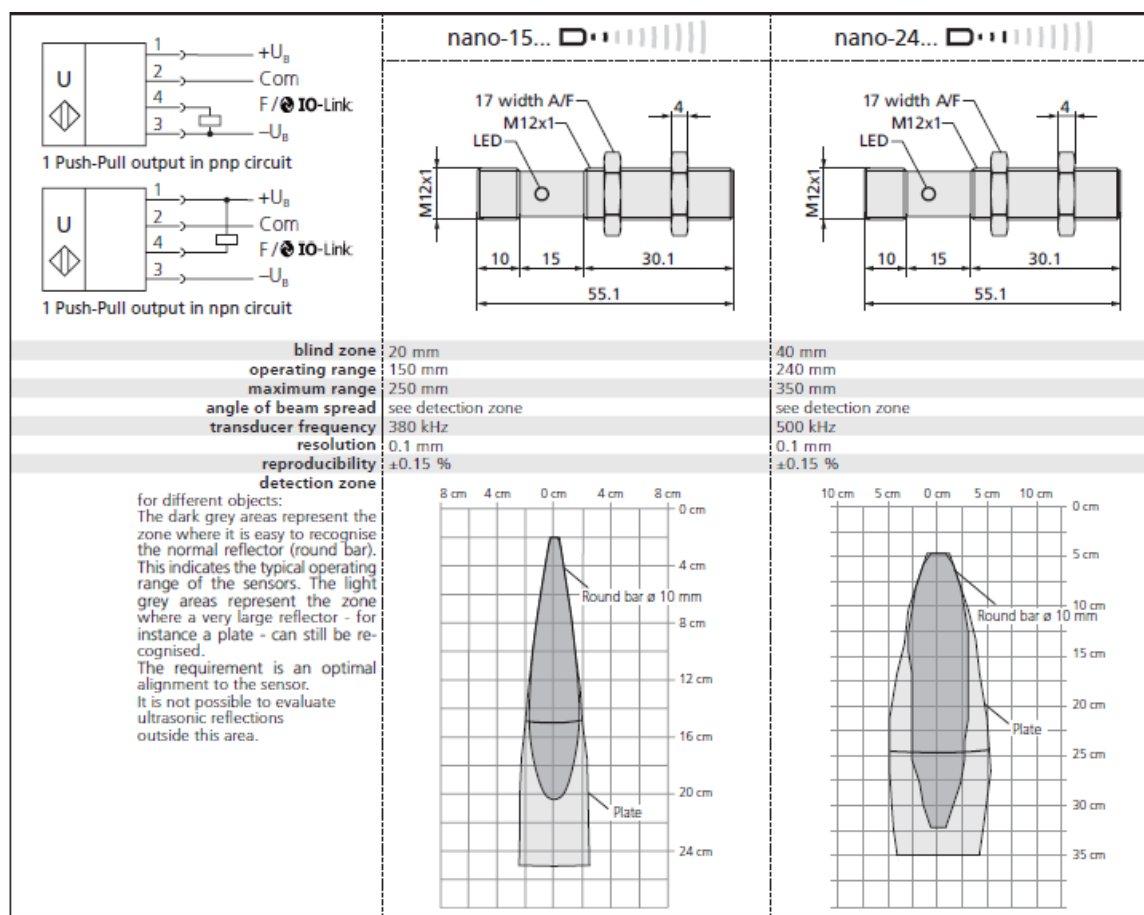| Set switching point– method A | Set switching point +8 % – method B | Set window mode | Set two way reflective barrier | Set NOC/NCC |
|---|---|---|---|---|
| Place object at position ①. | Place object at position ①. | Place object at position ①. | Place reflector at position ①. | |
| Connect Com for about 3 s to +U_B, until both LEDs flash simultaneously. | Connect Com for about 3 s to +U_B, until both LEDs flash simultaneously. | Connect Com for about 3 s to +U_B, until both LEDs flash simultaneously. | Connect Com for about 3 s to +U_B, until both LEDs flash simultaneously. | Connect Com for about 13 s to +U_B, until both LEDs flash alternately. |
| Both LEDs: flash alternately | Both LEDs: flash alternately | Both LEDs: flash alternately | Both LEDs: flash alternately | Green LED: flashes |
| | | Place object at position ②. | | Yellow LED: on: NOC off: NCC |
| | | Both LEDs: flash alternately | | |
| Connect Com for about 1 s to +U_B. | Connect Com for about 3 s to +U_B, until both LEDs flash alternately again. | Connect Com for about 1 s to +U_B. | Connect Com for about 10 s to +U_B, until both LEDs stop flashing. | To change output characteristic connect Com for about 1 s to +U_B. |
| | | | | Wait for 10 s. |

**Normal operating mode**

## Further settings

| Switch on or off Teach-in + Sync | Reset to factory setting |
|---|---|
| Switch off operating voltage. | Switch off operating voltage. |
| Connect Com to –U_B. | Connect Com to –U_B. |
| Switch on operating voltage. | Switch on operating voltage. |
| Keep Com connected to –U_B for about 3 s, until both LEDs flash simultaneously. | Keep Com connected to –U_B for about 13 s, until both LEDs stop flashing. |
| Green LED: flashes | |
| Yellow LED: on: Teach-in + sync on off: Teach-in + sync off | |
| To change operation mode connect Com for about 1 s to –U_B. | Disconnect Com from –U_B within 5 s. |
| Wait for 10 s. | |

**Normal operating mode**

# Technical Data



**1 Push-Pull output in pnp circuit**

1 +U_B
2 Com
4 F / IO-Link
3 –U_B

**1 Push-Pull output in npn circuit**

1 +U_B
2 Com
4 F / IO-Link
3 –U_B

nano-15...

17 width A/F — M12x1 — LED
M12x1
10 | 15 | 30.1
55.1

nano-24...

17 width A/F — M12x1 — LED
M12x1
10 | 15 | 30.1
55.1

| | nano-15... | nano-24... |
|---|---|---|
| blind zone | 20 mm | 40 mm |
| operating range | 150 mm | 240 mm |
| maximum range | 250 mm | 350 mm |
| angle of beam spread | see detection zone | see detection zone |
| transducer frequency | 380 kHz | 500 kHz |
| resolution | 0.1 mm | 0.1 mm |
| reproducibility | ±0.15 % | ±0.15 % |
| detection zone | | |

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 is an optimal alignment to the sensor.
It is not possible to evaluate ultrasonic reflections outside this area.

Round bar ø 10 mm
Plate

| | | |
|---|---|---|
| accuracy | ±1 % (temperature drift internally compensated, may be deactivated [1], 0.17%/K without compensation) | ±1 % (temperature drift internally compensated, may be deactivated [1], 0.17%/K without compensation) |
| operating voltage U_B | 10 to 30 V DC, reverse polarity protection (Class 2) | 10 to 30 V DC, reverse polarity protection (Class 2) |
| voltage ripple | ±10 % | ±10 % |
| no-load current consumption | <30 mA | <40 mA |
| housing | brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content | 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 60529 | 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 |
| controls | Teach-in via pin 2 | Teach-in via pin 2 |
| scope of settings | Teach-in, LinkControl, IO-Link | Teach-in, LinkControl, IO-Link |
| IO-Link | V1.1 | V1.1 |
| indicators | 2 LEDs | 2 LEDs |
| synchronisation | internal synchronisation up to 10 sensors | internal synchronisation up to 10 sensors |
| operating temperature | −25 to +70 °C | −25 to +70 °C |
| storage temperature | −40 to +85 °C | −40 to +85 °C |
| weight | 15 g | 15 g |
| switching hysteresis [1] | 2 mm | 3 mm |
| switching frequency [2] | 25 Hz | 20 Hz |
| response time [2] | 32 ms | 40 ms |
| time delay before availability | <300 ms | <300 ms |
| order no. | nano-15/CF | nano-24/CF |
| switching output | Push-Pull, $U_B$−3 V, −$U_B$+3 V, $I_{max}$ = 100 mA switchable NOC/NCC, short-circuit-proof | Push-Pull, $U_B$−3 V, −$U_B$+3 V, $I_{max}$ = 100 mA switchable NOC/NCC, short-circuit-proof |

[1] Can be programmed via LinkControl and IO-Link.
[2] With LinkControl and IO-Link, the selected filter setting influences the switching frequency and response time.

## Using the Alignment Assistance

With the internal alignment assistance the sensor can be optimally aligned to the object during installation. To do this, proceed as follows (see Fig. 3):

- Mount the sensor loosely at the place of mounting so that it can still be moved.
- Connect Com to +UB shortly. The green LED flashes. The faster the LED flashes, the stronger the received signal.
- Point the sensor at different angles to the object for about 10 seconds so that the sensor can determine the maximum signal level. Align the sensor until the green LED shines constantly.
- Screw the sensor in this position.
- Connect Com to +UB shortly (or wait approx. 120 s) to exit the alignment assistance. The yellow LED flashes 2x.
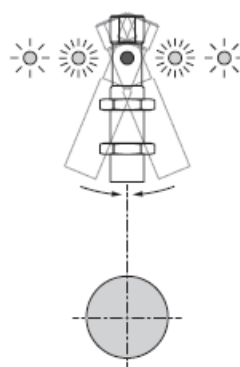


Fig. 3: Align the sensor optimally

**Notes**

- Pin 2 (Com) of the sensor may only be connected during Teach-in procedure or for synchronization.
- The sensors of the nano family have a blind zone. Within this zone a distance measurement is not possible.
- The nano sensors are equipped with an internal temperature compensation. Due to the sensors self-heating, the temperature compensation reaches its optimal working point after approx. 45 seconds of operation.
- The nanosensors have a push-pull switching output.
- In the normal operating mode, an illuminated yellow LED signals that the status of the switching output is high.

If the green LED flashes, the sensor is in IO-Link mode.

- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0 to 92 % 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. 4.

- If the object to be scanned moves into the detection zone 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.

- Using the LinkControl adapter LCA-2 (optional accessory) and the LinkControl software for Windows®, all Teach-in and additional sensor parameter settings can be optionally adjusted. To connect the nanosensor to the LCA-2 adapter the 5G/M12-4G/M12/M8 adapter is required.
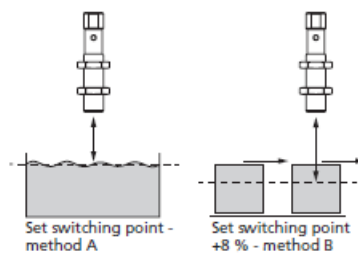


Fig. 4:   Setting the switching point for different directions of movement of the object

- The sensor can be reset to its factory setting (see Diagram 1).

- The nano sensor can be blocked against changes in the sensor via function »Switch on or off Teach-in + sync«, see Diagram 1.

- The latest IODD file and informal tions about startup and configuration of nano sensors via IO-Link, you will find online at: **www.microsonic.de/en/nano**

The content of this document is subject to technical changes. Specifications in this document are presented in a descriptive way only. They do not warrant any product features.

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 mini-mum 32 Vdc, minimum 290 mA, in the final installation.

## Documents / Resources
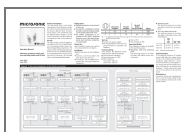
| | |
|---|---|
|  | **microsonic nano-15-CF Ultrasonic Proximity Switch** [pdf] Instruction Manual<br>nano-15-CF, nano-15-CF Ultrasonic Proximity Switch, Ultrasonic Proximity Switch, Proximity Switch, Switch |

## References

- ◣ **microsonic | ultrasonic sensors | Made in Germany**
- **User Manual**