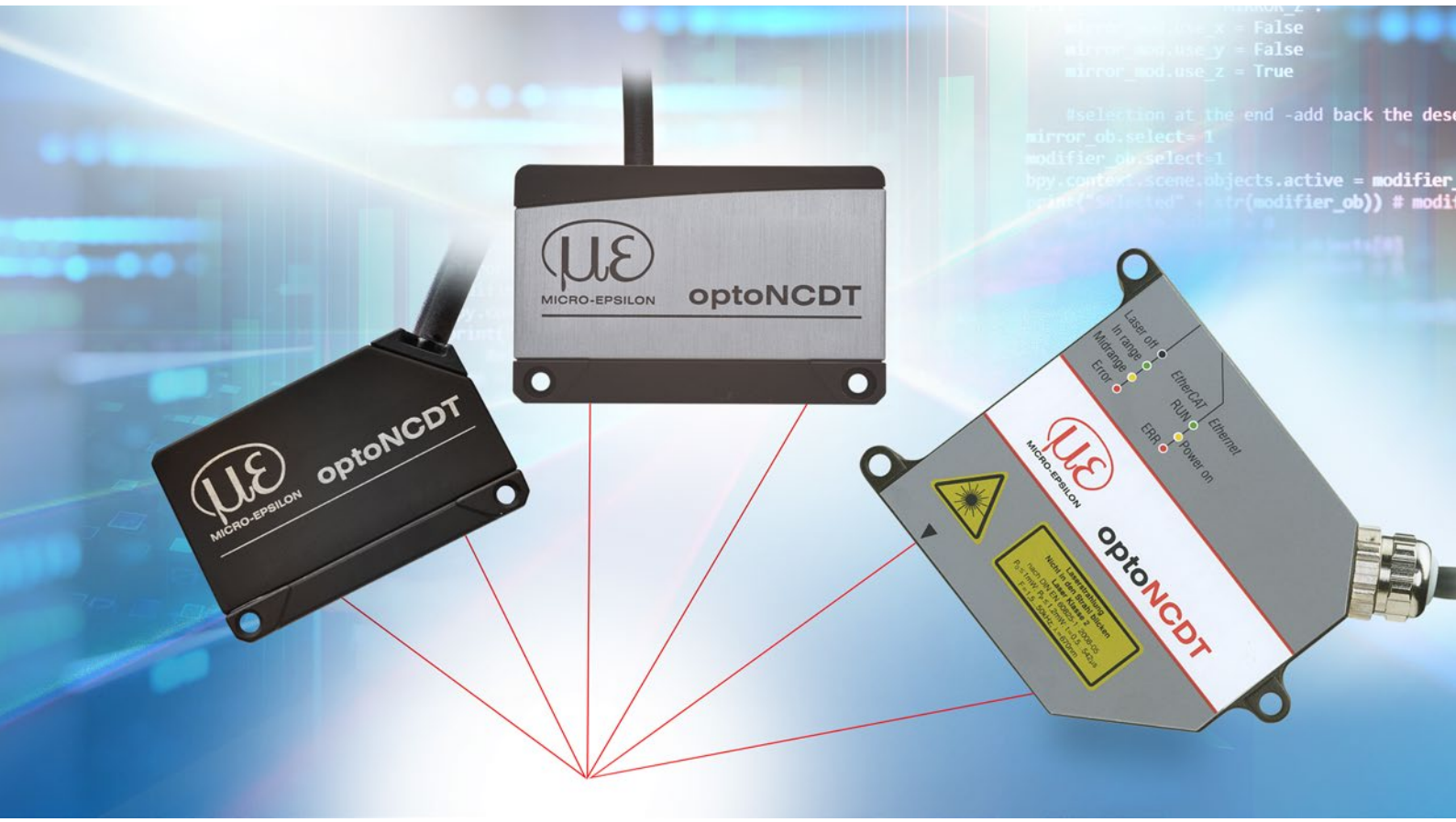
MICRO-EPSILON

# More Precision

## optoNCDT // Laser displacement sensors (triangulation)



# High precision laser sensors in miniature design
# optoNCDT 1220 / 1320 / 1420

*designed for advanced*
**AUTOMATION**

- Measuring rate up to 8 kHz
- Analog (U/I) / RS422 / PROFINET / EtherNet/IP / EtherCAT
- Active Surface Compensation
- Repeatability 0.5 µm
- Ideal for series and OEM applications
- Low weight, ideal for high accelerations

**Best in Class:**
**Compact, precise and faster**

The optoNCDT 1x20 laser sensors are among the best in their class. The sensors offer a unique combination of speed, size and performance. The laser sensors are used for the precise measurement of displacement, distance and position in all fields of automation technology, such as machine building, 3D printers and robotics.

The optoNCDT 1x20 sensors use an intelligent surface control feature. The Active Surface Compensation (ASC) ensures stable measurement results regardless of changing colors or brightness of the target surface.

**Ideal for industrial series applications**

Different output signals enable the sensor to be integrated into plant and machine control systems. As well as analog voltage and current outputs, a digital RS422 interface provides distance information from the sensor.

Due to the universal setting and evaluation possibilities, the optoNCDT 1x20 sensors meet all the requirements for use in industrial series and OEM applications.

| Model | Technology | Measuring range | Repeatability | Linearity |
|---|---|---|---|---|
| optoNCDT 1220 | | 10 - 500 mm | 1 µm | 0.10 % |
| optoNCDT 1320 | | 10 - 500 mm | 1 µm | 0.10 % |
| optoNCDT 1420 | | 10 - 500 mm | 0.5 µm | from 0.08 % |
| optoNCDT 1420LL | | 10 - 50 mm | 0.5 µm | from 0.08 % |
| optoNCDT 1420CL1 | | 10 - 50 mm | 0.5 µm | from 0.08 % |

**Highest precision in a minimum of space**

Compact size combined with low weight opens up new fields of application. The selectable connector type, i.e. cable or pigtail, together with compact size reduce the sensor installation effort to a minimum.

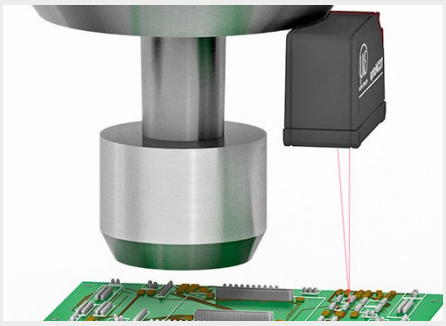
**Now even more powerful!**

The optoNCDT 1x20 sensors have been optimized for industrial series use. Furthermore, the robust IP67 sensor housing allows use in industrial environments, even with high accelerations. A high-performance D/A converter enables 16 bit resolution at the analog output. Therefore, the sensor achieves even more precise measurement results. With the doubled measuring rate, even faster measurements can now be performed.

## Application examples

Dimension control of turned parts

Monitoring the expansion of battery cells



Distance control of print heads

# Technical data
# optoNCDT 1420

## optoNCDT 1420 (General technical data)

| Model | | ILD1420-xx |
|---|---|---|
| Measuring rate [1] | | 6 adjustable stages: 8 kHz / 4 kHz / 2 kHz / 1 kHz / 0.5 kHz / 0.25 kHz |
| Supply voltage | | 11 ... 30 VDC |
| Power consumption | | < 2 W (24 V) |
| Signal input | | 1 x HTL laser on/off; 1 x HTL multifunction input: trigger in, zero setting, teach |
| Digital interface [2] | | RS422 (16 bit) / EtherCAT / PROFINET / EtherNet/IP |
| Analog output [3] | | 4 ... 20 mA / 1 … 5 V with PCF1420-3/U cable (16 bit, freely scalable within the measuring range) |
| Switching output | | 1 x error output: npn, pnp, push pull |
| Connection | | integrated cable 3 m, open ends, min. bending radius 30 mm (fixed installation) or integrated pigtail 0.3 m with 12-pin M12 plug (see accessories for suitable connection cable) |
| Installation | | Screw connection via two mounting holes |
| Temperature range | Storage | -20 … +70 °C (non-condensing) |
| | Operation | 0 … +50 °C (non-condensing) |
| Shock (DIN EN 60068-2-27) | | 15 g / 6 ms in 3 axes, 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 500 Hz in 3 axes, 2 directions and 10 cycles each |
| Protection class (DIN EN 60529) [4] | | IP67 |
| Material | | Aluminum housing |
| Weight | | approx. 60 g (incl. pigtail), approx. 145 g (incl. cable) |
| Control and indicator elements [5] | | Select button: zero, teach, factory setting; web interface for setup: selectable presets, peak selection, video signal, freely selectable averaging, data reduction, setup management; 2 x color LEDs for power / status |

[1] Factory setting 4 kHz, modifying the factory setting requires the IF2001/USB converter (see accessories)
For models with laser class 1 the maximum measuring rate is 4 kHz
[2] For EtherCAT, PROFINET and EtherNet/IP, connection via interface module is required (see accessories)
[3] For models with laser class 1 the D/A conversion is done with 12 bit
[4] Models with laser class 1 have the protection class IP65
[5] Access to web interface requires connection to PC via IF2001/USB (see accessories)

## Laser point - optoNCDT 1420

| Model | | ILD1420-10 | ILD1420-25 | ILD1420-50 | ILD1420-100 | ILD1420-200 | ILD1420-500 |
|---|---|---|---|---|---|---|---|
| Measuring range | | 10 mm | 25 mm | 50 mm | 100 mm | 200 mm | 500 mm |
| Start of measuring range | | 20 mm | 25 mm | 35 mm | 50 mm | 60 mm | 100 mm |
| Mid of measuring range | | 25 mm | 37.5 mm | 60 mm | 100 mm | 160 mm | 350 mm |
| End of measuring range | | 30 mm | 50 mm | 85 mm | 150 mm | 260 mm | 600 mm |
| Linearity [1] | | < ±8 µm | < ±20 µm | < ±40 µm | < ±80 µm | < ±160 µm | < ±500 … ±1000 µm |
| | | < ±0.08 % FSO | | | | | < ±0.1 … ±0.2 % FSO |
| Repeatability [2] | | 0.5 µm | 1 µm | 2 µm | 4 µm | 8 µm | 20 … 40 µm |
| Temperature stability [3] | | ±0.015 % FSO / K | | | ±0.01 % FSO / K | | |
| Light spot diameter [4] | SMR | 90 x 120 µm | 100 x 140 µm | 90 x 120 µm | 750 x 1100 µm | 750 x 1100 µm | 750 x 1100 µm |
| | MMR | 45 x 40 µm | 120 x 130 µm | 230 x 240 µm | | | |
| | EMR | 140 x 160 µm | 390 x 500 µm | 630 x 820 µm | | | |
| | smallest Ø | 45 x 40 µm with 24 mm | 55 x 50 µm with 31 mm | 70 x 65 µm with 42 mm | - | - | - |
| Light source | | Semiconductor laser < 1 mW, 670 nm (red) | | | | | |
| Laser class | | Class 2 in accordance with IEC 60825-1: 2014 | | | | | |
| Permissible ambient light [5] | | 50,000 lx | | | 30,000 lx | 10,000 lx | |

[1] FSO = Full Scale Output; the specified data apply to white, diffuse reflecting surfaces (Micro-Epsilon reference ceramic for ILD sensors)
[2] Measuring rate 2 kHz, median 9
[3] The specified value is only achieved by mounting on a metallic sensor holder. Good heat dissipation from the sensor to the holder must be ensured.
[4] ±10 %; SMR = Start of measuring range; MMR = Mid of measuring range; EMR = End of measuring range
[5] Illuminant: light bulb

## Laser line - optoNCDT 1420LL

| Model | | ILD1420-10LL | ILD1420-25LL | ILD1420-50LL |
|---|---|---|---|---|
| Measuring range | | 10 mm | 25 mm | 50 mm |
| Start of measuring range | | 20 mm | 25 mm | 35 mm |
| Mid of measuring range | | 25 mm | 37.5 mm | 60 mm |
| End of measuring range | | 30 mm | 50 mm | 85 mm |
| Linearity [1] | | < ±8 µm | < ±20 µm | < ±40 µm |
| | | < ±0.08 % FSO | | |
| Repeatability [2] | | 0.5 µm | 1 µm | 2 µm |
| Temperature stability [3] | | ±0.015 % FSO / K | | |
| Light spot diameter [4] | SMR | 140 x 720 µm | 220 x 960 µm | 240 µm x 1250 µm |
| | MMR | 65 x 680 µm | 80 x 970 µm | 130 µm x 1450 µm |
| | EMR | 140 x 660 µm | 240 x 1000 µm | 380 µm x 1650 µm |
| | smallest Ø | 65 x 680 µm with 25 mm | 80 x 970 µm with 37.5 mm | 110 x 1400 µm with 52.5 mm |
| Light source | | Semiconductor laser < 1 mW, 670 nm (red) | | |
| Laser class | | Class 2 in accordance with IEC 60825-1: 2014 | | |
| Permissible ambient light [5] | | 50,000 lx | | |

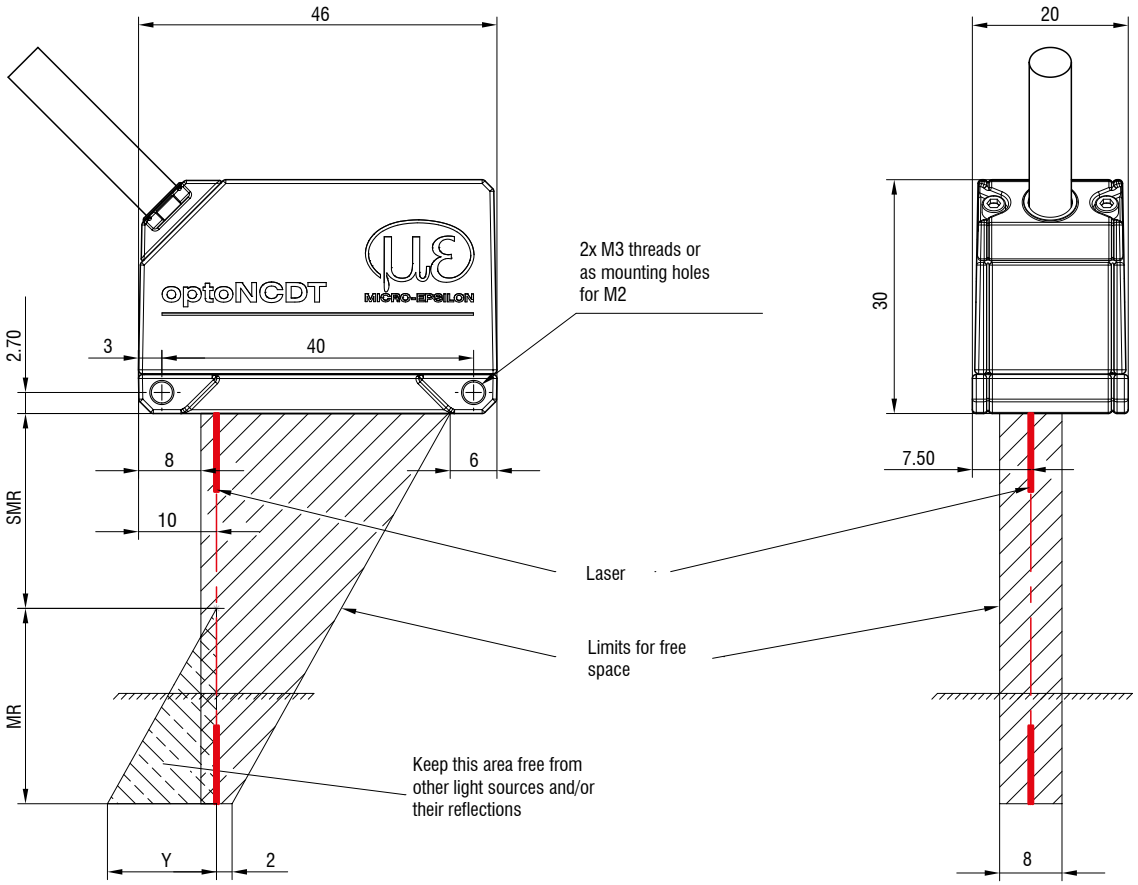
[1] FSO = Full Scale Output; the specified data apply to white, diffuse reflecting surfaces (Micro-Epsilon reference ceramic for ILD sensors)
[2] Measuring rate 2 kHz, median 9
[3] The specified value is only achieved by mounting on a metallic sensor holder. Good heat dissipation from the sensor to the holder must be ensured.
[4] ±10 %; SMR = Start of measuring range, MMR = Mid of measuring range, EMR = End of measuring range
Light spot diameter with line-shaped laser determined based on the emulated 90/10 knife-edge method
[5] Illuminant: light bulb

## Laser class 1 - optoNCDT 1420 CL1

| Model | | ILD1420-10CL1 | ILD1420-25CL1 | ILD1420-50CL1 |
|---|---|---|---|---|
| Measuring range | | 10 mm | 25 mm | 50 mm |
| Start of measuring range | | 20 mm | 25 mm | 35 mm |
| Mid of measuring range | | 25 mm | 37.5 mm | 60 mm |
| End of measuring range | | 30 mm | 50 mm | 85 mm |
| Linearity [1] | | < ±8 µm | < ±20 µm | < ±40 µm |
| | | < ±0.08 % FSO | | |
| Repeatability [2] | | 0.5 µm | 1 µm | 2 µm |
| Temperature stability [3] | | ±0.015 % FSO / K | | |
| Light spot diameter [4] | SMR | 90 x 120 µm | 100 x 140 µm | 90 x 120 µm |
| | MMR | 45 x 40 µm | 120 x 130 µm | 230 x 240 µm |
| | EMR | 140 x 160 µm | 390 x 500 µm | 630 x 820 µm |
| | smallest Ø | 45 x 40 µm with 24mm | 55 x 50 µm with 31 mm | 70 x 65 µm with 42 mm |
| Light source | | Semiconductor laser < 0.39 mW, 670 nm (red) | | |
| Laser class | | Class 1 in accordance with DIN EN 60825-1: 2015-07 | | |
| Permissible ambient light [5] | | 15,000 lx | | |

[1] FSO = Full Scale Output; the specified data apply to white, diffuse reflecting surfaces (Micro-Epsilon reference ceramic for ILD sensors)
[2] Measuring rate 2 kHz, median 9
[3] The specified value is only achieved by mounting on a metallic sensor holder. Good heat dissipation from the sensor to the holder must be ensured.
[4] ±10 %; SMR = Start of measuring range, MMR = Mid of measuring range, EMR = End of measuring range
[5] Illuminant: light bulb

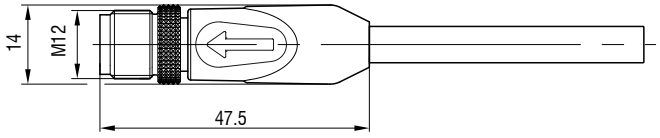
# Dimensions
## optoNCDT 1220 / 1320 / 1420



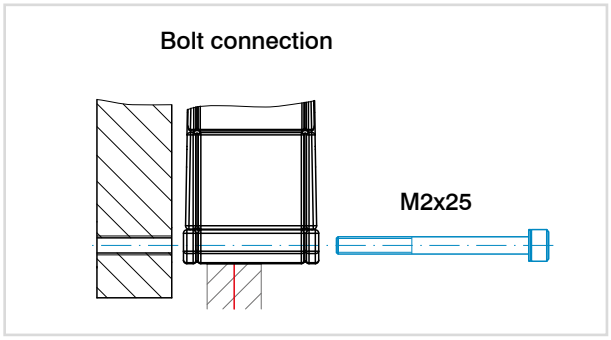

| MR | SMR | Y |
|---|---|---|
| 10 | 20 | 10 |
| 25 | 25 | 21 |
| 50 | 35 | 28 |
| 100 | 50 | 46 |
| 200 | 60 | 70 |
| 500 | 100 | 190 |

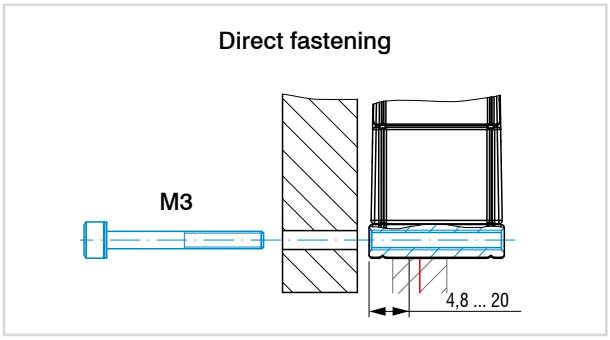
(Dimensions in mm, not to scale)
MR = measuring range; SMR = start of measuring range;
MMR = mid of measuring range; EMR = end of measuring range

### Connector (sensor side)



## Installation options




## Accessories for optoNCDT 1220/1320/1420

**Power supply unit**
PS2020 (power supply 24 V / 2.5 A, input 100 - 240 VAC, output 24 VDC / 2.5 A, mounting onto symmetrical standard rail 35 mm x 7.5 mm, DIN 50022)

**Protective film**
Transparent protective film 32 x 11 mm for ILD1x20

## Scope of supply

- 1 ILD1x20 sensor
- 1 Assembly instructions
- 1 digital calibration protocol accessible via web interface
- Accessories (2x M2 screws and 2 washers)

## Article designation

| ILD1420- | 10 | LL | CL1 |
|---|---|---|---|
| | | | **Laser class**<br>No indication: class 2 (standard)<br>CL1: Class 1 (only with ILD1420) |
| | | **Laser type**<br>No indication: Red laser point (standard)<br>LL: Laser Line (only with ILD1420) | |
| | **Measuring range** in mm | | |

**Series**
ILD1220: Compact laser displacement sensor for OEM and serial applications
ILD1320: Compact laser triangulation displacement sensor
ILD1420: Smart laser triangulation displacement sensor

# Connection possibilities
# optoNCDT 1220 / 1320 / 1420

## Sensors with integrated cable

Cable diameter: 5.40 ±0.2 mm
Drag chain: no
Robot: no
Temperature range: -25 … 105 °C (moving)
-40 … 105 °C (not moving)
Bending radius: > 27 mm (fixed installation)
> 54 mm (dynamic)

| Sensor | Cables | Type | Connection possibilities and accessories | |
|---|---|---|---|---|
| ILD1220-xx | **Integrated cable**<br>Length 2 m | Open ends | **Supply voltage connection**<br>Power supply unit PS2020 | |
| ILD1320-xx<br>ILD1420-xx<br>ILD1420-xxLL | **Integrated cable**<br>Length 3 m | | **Interface module of RS422 to USB**<br>IF2001/USB<br>IC2001/USB | |
| | | | **Interface module for Industrial Ethernet connection**<br>IF2035-PROFINET<br>IF2035-EIP<br>IF2035-EtherCAT | |

## Drag-chain suitable extension and adapter cables

Cable diameter: 6.0 ±0.2 mm
Drag chain: yes
Robot: no (optional on request)
Temperature range: -40 … 90 °C
Bending radius: > 30 mm (fixed installation)
> 60 mm (dynamic)

| Sensor | Cables | Type | Connection possibilities and accessories | |
|---|---|---|---|---|
| ILD1420-xx<br>ILD1420-xxLL | **Extension cable pigtail**<br>Length 3 m / 6 m / 10 m / 15 m<br>*Art. no.* *Designation*<br>29011067 PCF1420-3/I<br>29011068 PCF1420-6/I<br>29011069 PCF1420-10/I<br>29011070 PCF1420-15/I<br>29011071 PCF1420-3/U<br>29011072 PCF1420-6/U<br>29011073 PCF1420-10/U<br>29011074 PCF1420-15/U | Open ends | **Supply voltage connection**<br>Power supply unit PS2020 | |
| | | | **Interface module of RS422 to USB**<br>IF2001/USB<br>IC2001/USB | |
| | | | **Interface module for Industrial Ethernet connection**<br>IF2035-PROFINET<br>IF2035-EIP<br>IF2035-EtherCAT | |
| | **Adapter cable for PC interface card**<br>Length 3 m / 6 m / 10 m<br>*Art. no.* *Designation*<br>29011079 PCF1420-3/IF2008<br>29011088 PCF1420-6/IF2008<br>29011089 PCF1420-10/IF2008 | Sub-D | **Interface card for synchronous data acquisition**<br>IF2008PCIe / IF2008E | |
| | | | **4-fold interface module from RS422 to USB**<br>IF2004/USB | |
| | **Adapter cable for sensor calculation**<br>Length 3 m / 6 m / 9 m<br>*Art. no.* *Designation*<br>29011171 PCF1420-3/C-Box<br>29011172 PCF1420-6/C-Box<br>29011170 PCF1420-9/C-Box | Sub-D | **Controller for D/A conversion and evaluation of up to 2 sensor signals**<br>Dual Processing Unit | |
| | **Adapter cable for sensor calculation**<br>Length 2 m<br>*Art. no.* *Designation*<br>29011149 PCE1420-2/M12 | M12 | **Interface module for Ethernet connection of up to 8 sensors**<br>IF2008/ETH | |

## Other cables

Cable diameter: 6.7 mm
Drag chain: yes
Robot: no
Temperature range: -40 … 80 °C
Bending radius: > 27 mm (fixed installation)
> 51 mm (dynamic)

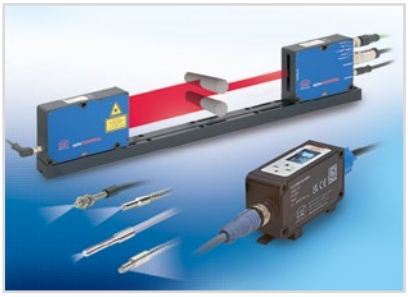
| Input | Cables | Type | Connection possibilities and accessories | |
|---|---|---|---|---|
| 2 x Sub-D<br><br>(PCF1420-x/ IF2008) | **Adapter cable for the connection of two sensors per Sub-D connector**<br>Length 0.1 m<br><br>*Art. no.* 2901528<br>*Designation* IF2008-Y-adapter cable<br> | Sub-D | **Interface card for synchronous data acquisition**<br>IF2008PCIe / IF2008E | |
| | | | **4-fold interface module from RS422 to USB**<br>IF2004/USB | |

## Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Sensors and measurement devices for non-contact temperature measurement

Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers

3D measurement technology for dimensional testing and surface inspection

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