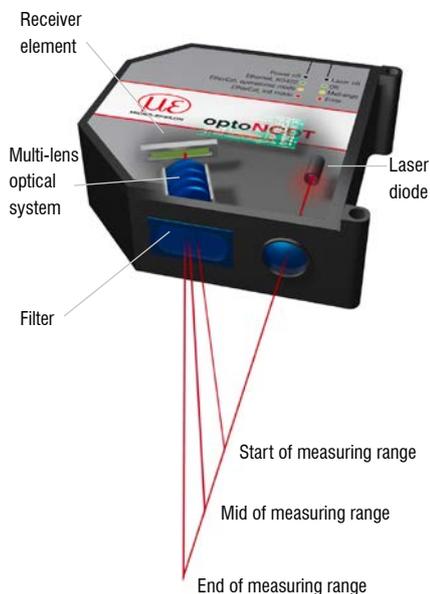# MICRO-EPSILON

# More Precision

- *Non-contact and wear-free*

- *Large distance from the measurement object*

- *Small light spot for smallest parts*

- *Precise measurement results with high dynamics*

- *Almost independent of surface properties*

### Measuring principle: laser triangulation

The sensor operates with a laser diode, which projects a visible light spot onto the measurement target. The light reflected from the spot is imaged by an optical receiving system onto a position-sensitive element. If the light spot changes its position, this change is imaged on the receiving element and evaluated. With the 1610 series, an analog PSD module is used as position-sensitive measuring element, whereas CMOS elements and CCD elements are used with the other high-performance sensors.

### optoNCDT stands for high precision laser triangulation sensors

optoNCDT sensors are setting milestones for industrial laser displacement measurement. Micro-Epsilon laser sensors stand out due to size, measuring rate, software and, above all, due to precision. The current optoNCDT range now offers numerous series, each of which is amongst the best in its class.

Laser-based optical displacement sensors measure from a large distance to the target using a very small spot which enables measurements on the very small parts. The large measurement distance in turn enables measurements to be taken against difficult target surfaces such as hot metals. The non-contact principle enables wear-free measurements as the sensors are not subject to any physical contact with the target. Furthermore, the laser triangulation principle is ideal for very fast measurements with high accuracy and resolution.

### Certified quality: calibration protocol

To document the performance capability of the optoNCDT sensors, each sensor is calibrated before delivery and supplied with its own calibration protocol. This document is supplied with the sensor and is used as proof to the achieved measurement precision.





Receiver element

Multi-lens optical system

Laser diode

Filter

Start of measuring range

Mid of measuring range

End of measuring range

| | *Measuring range* | *Resolution / Repeatability* | *Linearity* | *Measuring rate* | *Laser* | *Targets* | Page |
|---|---|---|---|---|---|---|---|
| **Compact Class** | | | | | | | |
| **optoNCDT 1220** | 10 - 50 mm | 3.7 $\mu$m * | 0.10 % | up to 1 kHz | red | | **8 - 9** |
| **optoNCDT 1320** | 10 - 100 mm | 1 $\mu$m * | 0.10 % | up to 2 kHz | red | all common targets | **10 - 11** |
| **optoNCDT 1420** | 10 - 500 mm | 0.5 $\mu$m * | from 0.08 % | up to 4 kHz | red | | **12 - 13** |
| **optoNCDT 1420 CL1** | 10 - 200 mm | 0.5 $\mu$m * | from 0.08 % | up to 4 kHz | red class 1 | | **14 - 15** |
| **High Speed PSD Sensor** | | | | | | | |
| **optoNCDT 1610 / 1630** | 4 - 100 mm | 0.2 $\mu$m | 0.2 % | up to 100 kHz | red | all common targets | **16 - 17** |
| **Industry Standard** | | | | | | | |
| **optoNCDT 1750** | 2 - 750 mm | 0.1 $\mu$m * | from 0.06 % | up to 7.5 kHz | red | all common targets | **18 - 19** |
| **High Performance Sensors** | | | | | | | |
| **optoNCDT 2300** | 2 - 300 mm | 0.03 $\mu$m | from 0.02 % | up to 49.14 kHz | red | all common targets | **20 - 21** |
| **Sensors with Small Laser Line** | | | | | | | |
| **optoNCDT 1750LL** | 2 - 50 mm | 0.1 $\mu$m * | from 0.06 % | up to 7.5 kHz | red | shiny / structured | **22 - 23** |
| **optoNCDT 2300LL** | 2 - 50 mm | 0.03 $\mu$m | from 0.02 % | up to 49.14 kHz | red | | **24 - 25** |
| **Long-Range Sensors** | | | | | | | |
| **optoNCDT 1710-50** | 50 mm | 7.5 $\mu$m | 0.1 % | up to 2.5 kHz | red | | **26 - 27** |
| **optoNCDT 2310** | 10 - 50 mm | 0.5 $\mu$m | 0.03 % | up to 49.14 kHz | red | all common targets | **28 - 29** |
| **optoNCDT 1710 - 1000** | 1000 mm | 100 $\mu$m | 0.1 % | up to 2.5 kHz | red | | **30 - 31** |
| **Blue Laser Sensors** | | | | | | | |
| **optoNCDT 1710BL** | 50 / 1000 mm | 1.5 $\mu$m | from 0.08 % | up to 2.5 kHz | blue | | **32 - 33** |
| **optoNCDT 1750BL** | 20 - 750 mm | 0.8 $\mu$m * | from 0.06 % | up to 7.5 kHz | blue | red-hot glowing / transparent / organic | **34 - 35** |
| **optoNCDT 2300BL** | 2 - 50 mm | 0.03 $\mu$m | from 0.03 % | up to 49.14 kHz | blue | | **36 - 37** |
| **optoNCDT 2300-2DR** | 2 mm | 0.03 $\mu$m | 0.03 % | up to 49.14 kHz | blue | reflecting / transparent | **38 - 39** |

*corresponds to repeatability

**One of a kind:**
**Real Time Surface Compensation (RTSC) for maximum speed**
The unique RTSC function compensates for the amount of reflection from the target surface during continuous exposure and in real-time.

The exposure time or the amount of light produced by the laser is optimally matched to the reflection characteristics of the target surface.

All optoNCDT 17x0 and 2300 laser sensors are equipped with this innovative real-time control and therefore always achieve optimum results, even with rapidly changing surface types.
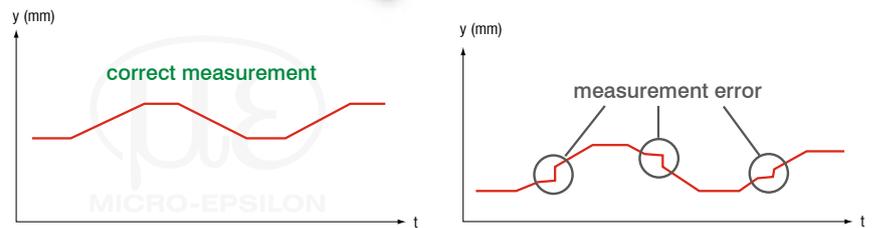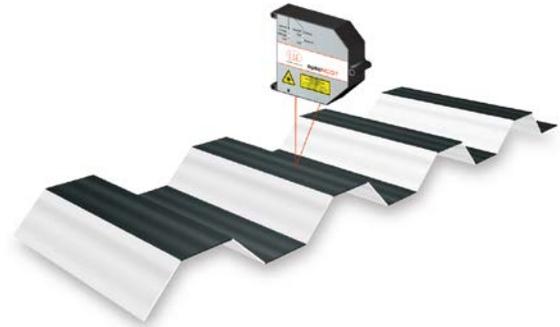


Comparison: optoNCDT with RTSC and conventional sensor

### Unique ease of use via web interface
All optoNCDT 1320, 1420, 1750 and 2300 laser sensors are operated using an intuitive web interface. The sensor is connected to a PC. This web interface enables the user to make settings for the processing of measured values and signals, e.g. peak selection, filter and masking features for the video signal.



### Designed for industrial applications
The sensors in the optoNCDT product range are designed for industrial applications. Due to their robust construction and technical features, they achieve precise measurement results even in harsh ambient conditions. Each series is available in a number of different measuring ranges which cover almost all common measuring distances.
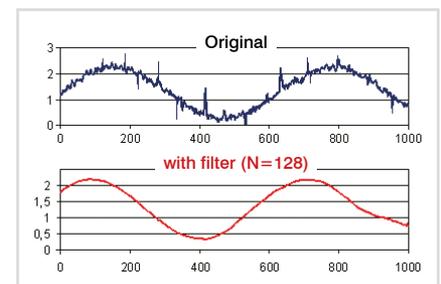
### Compact with integrated controller
Despite their very compact dimensions, the ILD series have a fully integrated controller. As a result, simple, rapid installation and wiring is possible. The sensors can be integrated easily even into restricted installation space.
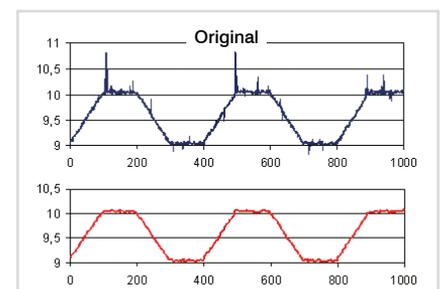
### High measuring rates
High measuring rates are required for fast moving targets or measurements on difficult surfaces. Sensors in the 2300 Series achieve a measuring rate of up to 49 kHz. The analog 1630 high-speed series achieves measuring rates of up to 100 kHz.

### Analog and digital output types
The optoNCDT sensors are equipped with different outputs to fulfil industrial user requirements. As well as analog interfaces, digital interfaces are also available for direct connection with the existing production environment. For further signal processing, interface converters and signal processing units are available.

### Cables suitable for drag chain systems
All sensor cables for optoNCDT sensors are rated for use in drag chains and are therefore suitable for various fields of applications. Cables suitable for use with robots are available for any ILD series.

### Adjustable filter functions
A number of filters are available in order to obtain optimum results for each application: moving average, recursive average and median. The filters are applied directly to the measurement results.



Vibration measurement with moving average



Profile measurement with median

## Innovative Sensors with Blue Laser Technology

The optoNCDT BL models are equipped with a blue laser diode and are used when standard sensors with a red laser diode are operating at their performance limits.

Due to its shorter wavelength, the blue laser does not penetrate the target surface, projecting a small light spot on the surface and therefore providing stable and precise results. This technology is preferably used with organic and (semi-)transparent objects, as well as for red-hot glowing metals.
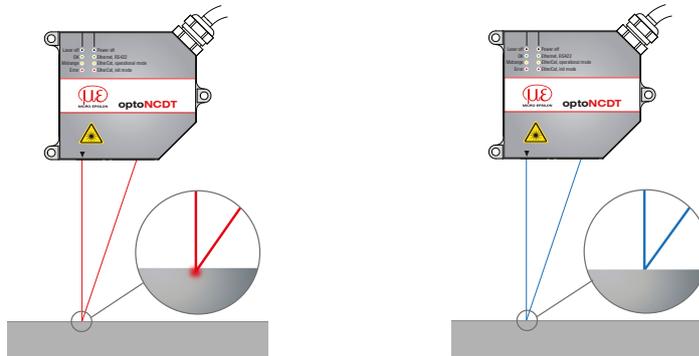
The red laser penetrates the surfaces of some materials which produces a blurry image on the sensor element. Sensors with blue laser light do not penetrate the material and are imaged sharply onto the receiver element.

## Synchronous measurement with multiple sensors

For many applications, it is necessary to measure or acquire data simultaneously using multiple sensors. Micro-Epsilon offers different signal processing units to support synchronized measurements. A „true synchronous" measurement is required to precisely acquire moving or oscillating objects during thickness or differential measurements. In this case, one optoNCDT acts as the master, which provides the corresponding cycle pulse for the second sensor (slave). This function facilitates the genuine synchronous pulsing of two sensors.

[available for all 17x0 and 2300 models]

**Synchronisiation at thickness measurements of two sensors**
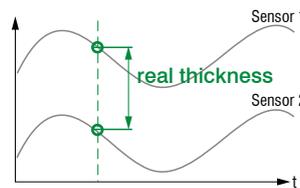
Genuine synchronisation during thickness measurement using two optoNCDT sensors with simultaneous data acquisition
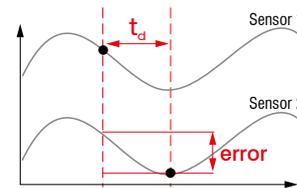
Conventional laser sensor with usual time offset erroneous measurement

## Customer-specific sensor modifications

For applications where the above standard sensors do not meet your requirements, it is possible to supply a sensor with modified optical system, design or equipment. Please contact us - we will be pleased to advise you.

### Options

- Modified offset and measuring range
- Custom housing or mounting geometry
- Optional interfaces
- Special cable length
- 90° beam deflection
- Vacuum suitability
- Reduced mass
- Increased shock and vibration resistance
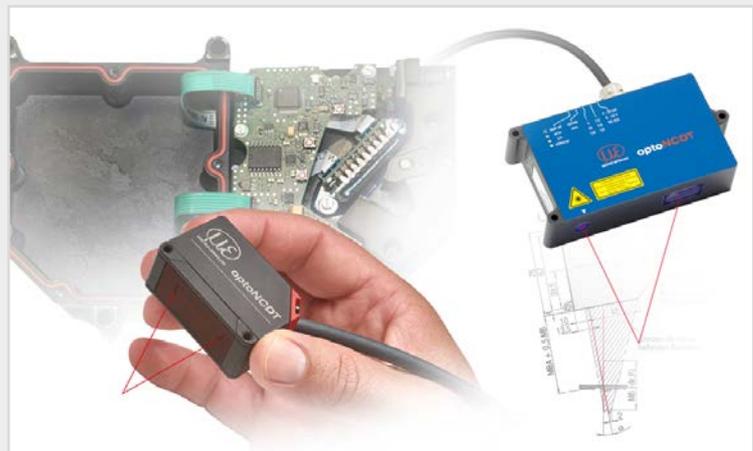
**Distance of vehicle to road surface**

In road tests, pitching and rolling movements, spring compression during braking and other quantities are measured with optoNCDT sensors. optoNCDT is particularly suitable here due to its compact construction and the possibility of powering the sensor from the vehicle power supply.

**Car body positioning in production lines**

For automated processing of car bodies or vehicles, an exact determination of the position relative to the processing tool is necessary (drilling, punching, fitting, subassemblies). With its Real Time Surface Compensation, the optoNCDT sensor is ideally suited to the high-precision acquisition of painted surfaces.

**Shape conformance on aluminum wheels**

After casting, aluminum wheels are measured for a range of properties, e.g. hub depth, roundness and bulging.

**Distance measurement in dispenser systems**

Determining the exact distance value is a critical factor with dispensers for solder paste and adhesives. Compact laser sensors from Micro-Epsilon rapidly detect the exact distance from the printed circuit board.
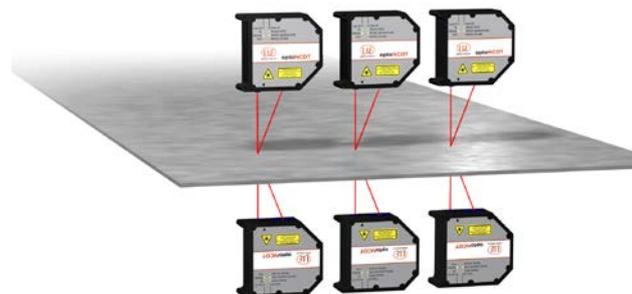
**Synchronous thickness measurement**

optoNCDT sensors are ideally suited to the thickness measurement of a variety of (web) materials. Due to the high measuring rate and the possibility of synchronizing multiple sensors, even moving and oscillating targets can be reliably acquired.
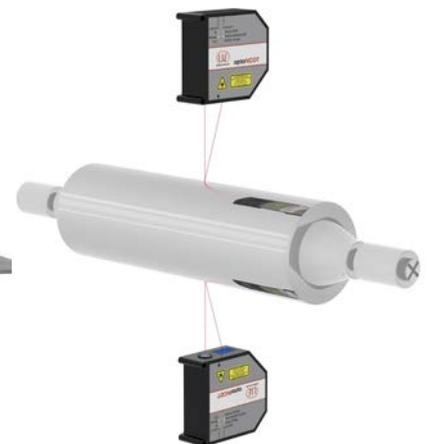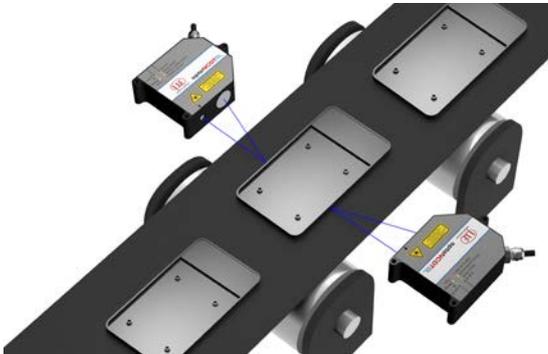
## Blue Laser Sensors for Dimensional Inspection

With certain measurement objects, the red laser beam penetrates the object. This effect does not occur with Blue Laser sensors as their laser point is sharply imaged onto the surface. Therefore, the sensors provide a stable and low-noise measurement signal. Blue Laser sensors are particularly suitable for detecting red-hot glowing metals as well as (semi-) transparent and organic materials.
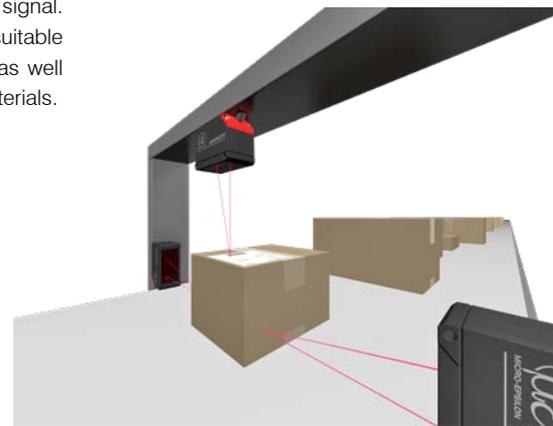
## Flatness measurement of IC pins

To achieve the best quality during board assembly, all IC pins must lie in one plane. In modern pick-and-place machines, the ICs are measured directly before placement. The tiny light spot diameters enable the measurement of the smallest pin geometries.

## Package dimensions

In fully-automated logistics processes, the dimensions of packages are checked. Due to the large measuring range and the high measuring rate, compact laser sensors from Micro-Epsilon are used for automated, dimensional inspection.

## optoNCDT LL for shiny metallic surfaces

The surface roughness of an object to be measured causes interferences in the laser point. This physical effect is particularly strong in shiny metallic objects and impedes an exact measurement.

optoNCDT LL (Laser Line) sensors compensate for this effect with an oval-shaped laser spot of just a few mm in width which is similar to a short 'laser line'. Interferences caused by surface roughness, defects, indentations or holes are filtered out using the oval-shaped light spot combined with special software algorithms. Furthermore, this type of sensor is suitable for distance measurements on structured surfaces i.e. when the distance to the surface and not the structure itself needs to be measured.
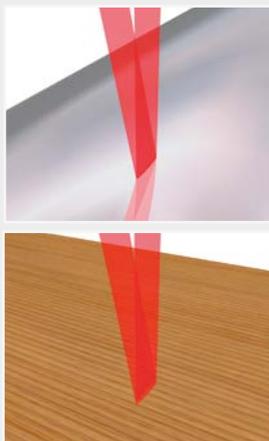
| | Ideal for serial and OEM applications |
| --- | --- |
| | **Compact design with integrated controller** |
| 250Hz 500Hz 1000Hz | **Measuring rate up to 1 kHz** |
| $A$nalog | **Analog output** |
| select | **Plug & Play via select button** |
| **ATC** | **Auto Target Compensation** |

The optoNCDT 1220 is a new laser triangulation sensor with compact size for precise displacement, distance and position measurements. This sensor offers high accuracy and adjustable measuring rates up to 1 kHz.

Due to its extremely compact size with integrated controller, the sensor can also be installed in restricted spaces. Its low weight makes this laser sensor ideally suitable for applications where high accelerations occur e.g. on the robot gripper or in industrial printers.

The integrated Auto Target Compensation (ATC) provides stable distance signal control regardless of target color or brightness. Commissioning is quick and easy via function keys or the web interface.

The combination of compact design, versatility and measurement accuracy enables an excellent price/performance ratio, especially in OEM projects involving large quantities.

46

20

2.70

3

40

2x M3 threads or as mounting holes for M2

SMR

8

6

30

7.50

10

Laser

Limits for free space

MR

Keep this area free from other light sources and/or their reflections

Y

2

8
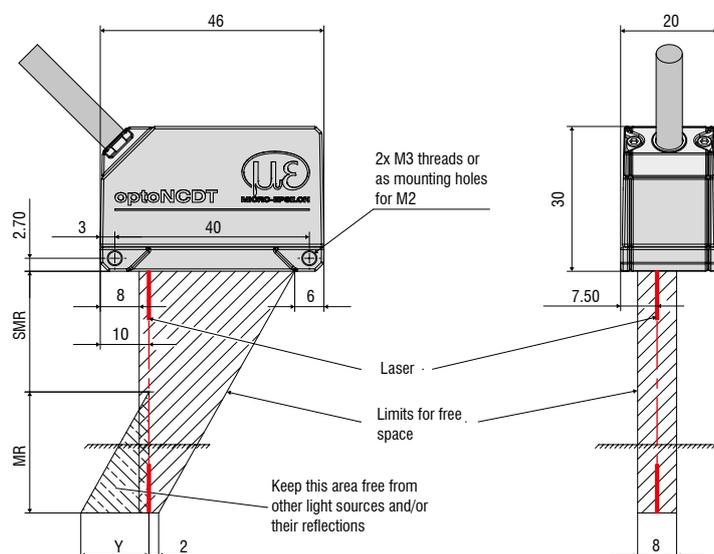
| MR | SMR | Y |
| --- | --- | --- |
| 10 | 20 | 10 |
| 25 | 25 | 21 |
| 50 | 35 | 28 |

| Model | | ILD1220-10 | ILD1220-25 | ILD1220-50 |
|---|---|---|---|---|
| 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 |
| Measuring rate [1] | | 0.25 kHz / 0.5 kHz / 1 kHz | | |
| Linearity | | $< \pm 10\,\mu m$ | $< \pm 25\,\mu m$ | $< \pm 50\,\mu m$ |
| | | $< \pm 0.10$ % FSO | | |
| Repeatability [2] | | $< 3.7\,\mu m$ | $< 9.2\,\mu m$ | $< 18.4\,\mu m$ |
| Temperature stability | | $\pm 0.03$ % FSO / K | | |
| Light spot diameter ($\pm 10$ %) | SMR | $90 \times 120\,\mu m$ | $100 \times 140\,\mu m$ | $90 \times 120\,\mu m$ |
| | MMR | $45 \times 40\,\mu m$ | $120 \times 130\,\mu m$ | $230 \times 240\,\mu m$ |
| | EMR | $140 \times 160\,\mu m$ | $390 \times 500\,\mu m$ | $630 \times 820\,\mu m$ |
| | smallest diameter | $45 \times 40\,\mu m$ with 24 mm | $55 \times 50\,\mu m$ with 31 mm | $70 \times 65\,\mu m$ with 42 mm |
| Light source | | Semiconductor laser < 1 mW, 670 nm (red) | | |
| Laser safety class | | Class 2 in accordance with DIN EN 60825-1 : 2015-07 | | |
| Permissible ambient light [3] | | 20,000 lx | | |
| Supply voltage | | 11 … 30 VDC | | |
| Power consumption | | < 2 W (24 V) | | |
| Analog output | | 4 ... 20 mA (freely scalable within the measuring range) | | |
| Switching output | | 1 x error output npn, pnp, push pull | | |
| Connection | | integrated cable 2 m, open ends, minimum bending radius 30 mm (fixed installation) | | |
| Mounting | | Screw connection via two mounting holes | | |
| Temperature range | Storage | -20 ... +70 °C (non-condensing) | | |
| | Operation | 0 ... +50 °C (non-condensing) | | |
| Shock (DIN-EN 60068-2-29) | | 15 g / 6 ms in 3 axes | | |
| Vibration (DIN-EN 60068-2-6) | | 20 g / 20 … 500 Hz | | |
| Protection class (DIN-EN 60529) | | IP65 | | |
| Material | | Aluminum housing | | |
| Weight | | approx. 30 g (without cable), approx. 110 g (incl. cable) | | |
| Control and display elements | | Select button for zero / teach / factory settings web interface for setup [4] 2 x 3 color LEDs for power and status | | |

FSO = Full Scale Output

SMR = start of measuring range; MMR = midrange; EMR = end of measuring range

[1] Factory setting 1 kHz; modifying the factory settings requires the IF2001/USB converter (optionally available)

[2] Measuring rate 1 kHz, median 9

[3] Illuminant: light bulb

[4] Connection to PC via IF2001/USB (optionally available)

| | |
|---|---|
| | **Ideal for serial and OEM applications** |
| | **Compact design with integrated controller** |
| 312Hz 375Hz 1000Hz | **Measuring rate up to 2 kHz** |
| $A$nalog $D$igital | **Analog and digital output** |
| $T$rigger $T$eachIn | **Trigger input and teach-in** |
| select | **Plug & Play via select button** |
| | **Application-specific presets for fast sensor settings** |
| ATC | **Auto Target Compensation** |

The optoNCDT 1320 is very compact laser triangulation sensor intended for entry-level precision measurement tasks. This series is used to measure displacement, distance and position. The controller is integrated in the housing which considerably simplifies the installation procedure. Since the sensor is extremely compact, it can also be integrated into restricted installation space. Due to its low weight, the optoNCDT 1320 is ideally suitable for applications where high accelerations occur, e.g., on the robot arm or in pick-and-place machines.

The optoNCDT 1320 offers high accuracy and adjustable measuring rates up to 2 kHz, whereas the integrated Auto Target Compensation (ATC) provides stable distance signal control regardless of target color or brightness. Very small objects can be detected reliably due to the small and sharply projected measurement spot size.

### Plug & Play with unique ease of use

The optoNCDT 1320 models enable quick sensor commissioning using the multifunction sensor button. An intuitive web interface offers extended sensor settings. The settings for the measurement task can be quickly selected via predefined presets. With the "Standard", "Changing surfaces" and "Material with penetration" settings, precise measurement results are easily achieved without any complex optimization. The quality slider enables the sensor to be adapted to static and dynamic processes.

| MR | SMR | Y |
|---|---|---|
| 10 | 20 | 10 |
| 25 | 25 | 21 |
| 50 | 35 | 28 |
| 100 | 50 | 46 |

| Model | ILD1320-10 | ILD1320-25 | ILD1320-50 | ILD1320-100 |
|---|---|---|---|---|
| Measuring range | 10 mm | 25 mm | 50 mm | 100 mm |
| Start of measuring range    SMR | 20 mm | 25 mm | 35 mm | 50 mm |
| Mid of measuring range    MMR | 25 mm | 37.5 mm | 60 mm | 100 mm |
| End of measuring range    EMR | 30 mm | 50 mm | 85 mm | 150 mm |
| Linearity | $\leq \pm 10\,\mu m$ | $\leq \pm 25\,\mu m$ | $\leq \pm 50\,\mu m$ | $\leq \pm 100\,\mu m$ |
| | $\leq \pm 0.10\ \%$ FSO | | | |
| Repeatability [1] | $1\,\mu m$ | $2.5\,\mu m$ | $5\,\mu m$ | $10\,\mu m$ |
| Measuring rate [2] | 0.25 kHz / 0.5 kHz / 1 kHz / 2 kHz | | | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | | |
| Permissible ambient light | 30,000 lx | | | 20,000 lx |
| Spot diameter ±10 %    SMR | 90 x 120 $\mu m$ | 100 x 140 $\mu m$ | 90 x 120 $\mu m$ | 750 x 1100 $\mu m$ |
|    MMR | 45 x 40 $\mu m$ | 120 x 130 $\mu m$ | 230 x 240 $\mu m$ | |
|    EMR | 140 x 160 $\mu m$ | 390 x 500 $\mu m$ | 630 x 820 $\mu m$ | |
|    smallest diameter | 45 x 40 $\mu m$ with 24 mm | 55 x 50 $\mu m$ with 31 mm | 70 x 65 $\mu m$ with 42 mm | - |
| Protection class | IP65 | | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | | | |
| Temperature stability | $\pm 0.03\ \%$ FSO/°C | | | |
| Operating temperature | 0 ... +50 °C (non-condensing) | | | |
| Storage temperature | -20 ... +70 °C (non-condensing) | | | |
| Control inputs/outputs | 1x HTL Laser on/off; 1 x HTL Multifunction input Trigger in / zero setting / mastering / teach (1x error output npn, pnp, push pull) | | | |
| Measurement value output    analog | 4 ... 20 mA; 12 bit; freely scalable within the measuring range [3] | | | |
|    digital | RS422 / 16 bit | | | |
| Signal processing | 14 bit | | | |
| Vibration | 20 g / 20 ... 500 Hz (in accordance with IEC 60068-2-6) | | | |
| Shock | 15 g / 6 ms / 3 axes (in accordance with IEC 60068-2-29) | | | |
| Weight    without cable | approx. 30 g | | | |
|    with 3 m cable | approx. 145 g | | | |
| Display | 2 x 3 color LEDs for power and status | | | |
| Operation    Key | Select button for zero / teach / factory settings | | | |
|    Web interface | selectable presets [4] | | | |
| Supply voltage | 11 … 30 VDC | | | |
| Power consumption | < 2 W (24 V) | | | |
| Sensor cable | 3 m integrated, open ends | | | |
| Controller | integrated signal processor | | | |
| Electromagnetic compatibility (EMC) | EN 61 000-6-3 / DIN EN 61326-1 (Class B) EN 61 000-6-2 / DIN EN 61326-1 | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Measuring rate 1 kHz, median 9; [2] Factory setting 1 kHz; modifying the factory settings requires the IF2001/USB converter (optionally available);
[3] The D/A conversion is executed at 12 bit; [4] Connection to PC via IF2001/USB (optionally available)

| | |
|---|---|
| | **Ideal for serial and OEM applications** |
| | **Compact design with integrated controller** |
| 312Hz 375Hz 1000Hz | **Measuring rate up to 4 kHz** |
| *A*nalog *D*igital | **Analog (U/I) and digital output** |
| *T*rigger *T*eachIn | **Trigger input / teach-in zero-setting / mastering** |
| | **Configuration via web interface or Plug & Play** |
| | **Application-specific presets and individual setups** |
| ATC | **Auto Target Compensation** |

The optoNCDT 1420 offers a unique combination of speed, size, performance and application versatility in the range of compact triangulation sensors. The sensor with integrated controller is used in restricted installation space or dynamic applications. The selectable connector type, i.e. cable or pigtail, together with compact size reduce the sensor installation effort to a minimum.

The Auto Target Compensation (ATC) provides stable distance signal control. The high-performance optical system projects the small light spot sharply onto the measurement object which enables to even detect smallest components and every little detail reliably.

### Highest precision in a minimum of space
Compact size combined with low weight opens up new fields of application. Analog and digital output signals enable to integrate the sensor into plant or machine control systems. The triangulation sensor achieves a high measurement accuracy with measuring rates of up to 4 kHz.

### Unique ease of use, individual results
All optoNCDT 1420 models are operated using an extended web interface. The settings for the measurement task can be quickly selected using predefined presets. The quality slider enables the sensor to be adapted to static and dynamic processes.

Up to eight user-specific sensor settings can be stored and exported in the setup management. The video signal display, the signal peak selection and a freely adjustable signal averaging enable to optimize the measurement task.

The ROI function (region of interest) allows e.g. for interfering signals in the background to be filtered out. The remaining signal peak is optimally corrected.

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



2x M3 threads or as mounting holes for M2

Laser

Limits for free space

Keep this area free from other light sources and/or their reflections
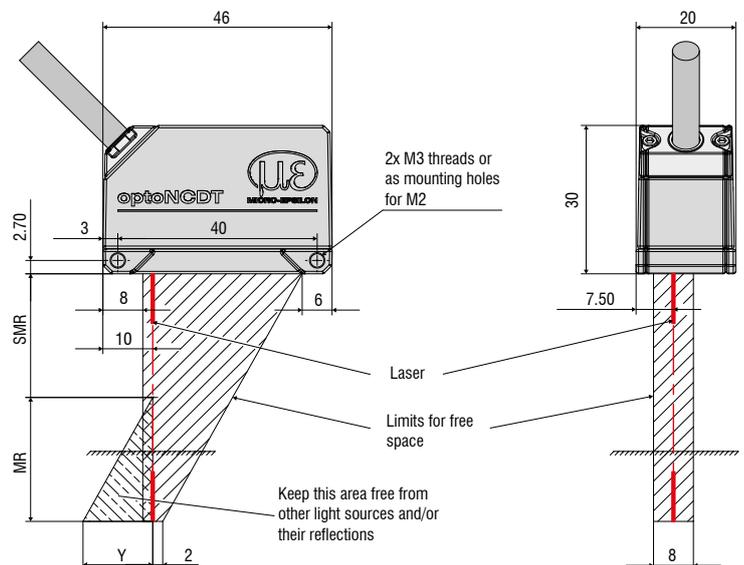
| Model | ILD1420-10 | ILD1420-25 | ILD1420-50 | ILD1420-100 | ILD1420-200 | ILD1420-500 |
|---|---|---|---|---|---|---|
| Measuring range | 10 mm | 25 mm | 50 mm | 100 mm | 200 mm | 500 mm |
| Start of measuring range    SMR | 20 mm | 25 mm | 35 mm | 50 mm | 60 mm | 100 mm |
| Mid of measuring range    MMR | 25 mm | 37.5 mm | 60 mm | 100 mm | 160 mm | 350 mm |
| End of measuring range    EMR | 30 mm | 50 mm | 85 mm | 150 mm | 260 mm | 600 mm |
| Linearity | $\leq \pm 8\,\mu m$ | $\leq \pm 20\,\mu m$ | $\leq \pm 40\,\mu m$ | $\leq \pm 80\,\mu m$ | $\leq \pm 160\,\mu m$ | $\leq \pm 500\,\mu m$ |
| | $\leq \pm 0.08\ \%$ FSO | | | | | $\leq \pm 0.1\ \%$ FSO |
| Repeatability [1] | $0.5\,\mu m$ | $1\,\mu m$ | $2\,\mu m$ | $4\,\mu m$ | $8\,\mu m$ | $20 \ldots 40\,\mu m$ |
| Measuring rate [2] | 0.25 kHz / 0.5 kHz / 1 kHz / 2 kHz / 4 kHz | | | | | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | | | | |
| Permissible ambient light | 50,000 lx | | | 30,000 lx | 10,000 lx | |
| Spot diameter ±10 %   SMR | 90 x 120 $\mu m$ | 100 x 140 $\mu m$ | 90 x 120 $\mu m$ | 750 x 1100 $\mu m$ | 750 x 1100 $\mu m$ | 750 x 1100 $\mu m$ |
|   MMR | 45 x 40 $\mu m$ | 120 x 130 $\mu m$ | 230 x 240 $\mu m$ | | | |
|   EMR | 140 x 160 $\mu m$ | 390 x 500 $\mu m$ | 630 x 820 $\mu m$ | | | |
|   smallest diameter | 45 x 40 $\mu m$ with 24 mm | 55 x 50 $\mu m$ with 31 mm | 70 x 65 $\mu m$ with 42 mm | - | - | - |
| Protection class | IP65 | | | | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | | | | | |
| Temperature stability | $\pm 0.03\ \%$ FSO/°C | | | | | |
| Operating temperature | 0 ... +50 °C (non-condensing) | | | | | |
| Storage temperature | -20 ... +70 °C (non-condensing) | | | | | |
| Control inputs/outputs | 1x HTL Laser on/off; 1 x HTL Multifunction input Trigger in / zero setting / mastering / teach (1x error output npn, pnp, push pull) | | | | | |
| Measurement value output   analog | 4 … 20 mA (1 … 5 V with cable PCF1420-3/U); 12 bit; freely scalable within the measuring range [3] | | | | | |
|   digital | RS422 / 16 bit | | | | | |
| Vibration | 20 g / 20 … 500 Hz (in accordance with IEC 60068-2-6) | | | | | |
| Shock | 15 g / 6 ms / 3 axes (in accordance with IEC 60068-2-29) | | | | | |
| Weight   with 3 m cable | approx. 145 g | | | | | |
|   with pigtail | approx. 60 g | | | | | |
| Display | 2 x 3 color LEDs for power and status | | | | | |
| Operation   Key | Select button for zero / teach / factory settings | | | | | |
|   Web interface | application-specific presets; peak selection, video signal; freely selectable averaging possibilities; data reduction; setup management [4] | | | | | |
| Supply voltage | 11 … 30 VDC | | | | | |
| Power consumption | < 2 W (24 V) | | | | | |
| Sensor cable | 3 m integrated, open ends | | | | | |
| | 0.3 m pigtail with 12-pole M12 connector | | | | | |
| Controller | integrated signal processor | | | | | |
| Electromagnetic compatibility (EMC) | EN 61 000-6-3 / DIN EN 61326-1 (Class B) EN 61 000-6-2 / DIN EN 61326-1 | | | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics);
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Measuring rate 2 kHz, median 9
[2] Factory setting 2 kHz; modifying the factory settings requires the IF2001/USB converter (optionally available)
[3] The D/A conversion is executed with 12 bit
[4] Connection to PC via IF2001/USB (optionally available)

| | Ideal for serial and OEM applications |
|---|---|
| | **Laser class 1** |
| | **Compact design with integrated controller** |
| 312Hz 375Hz 1000Hz | **Measuring rate up to 4kHz** |
| $A$nalog $D$igital | **Analog and digital output** |
| $T$rigger $T$eachIn | **Trigger input / teach-in zero-setting / mastering** |
| | **Configuration via web interface or Plug & Play** |
| ATC | **Auto Target Compensation** |

optoNCDT CL1 laser sensors are used in measurement tasks which require laser class 1. With this laser class, the radiated power is at max. 390 $\mu$W, which is significantly lower than laser class 2.

### Use in automotive production

Particularly in the field of automotive production, increased demands are being placed on manufacturers to take adequate safety precautions in their production plants, including the use of laser class 1 sensors if people are working in close proximity to laser sensors. For example, this is the case when handling equipment for the attachment or installation of interior parts is used while laser sensors precisely align these parts.

### Use in pharmaceutical and medical engineering

In medical engineering, laser sensors are often used to determine distances to very sensitive surfaces. Laser class 2 sensors can under certain circumstances cause a chemical or thermal reaction of the surface.

Here, optoNCDT 1420 CL1 sensors use only about one third of the energy of a laser class 2 sensor due to their reduced laser power of max. 390 $\mu$W. This enables measurements of even sensitive materials such as substrates without causing any alterations of the target material.
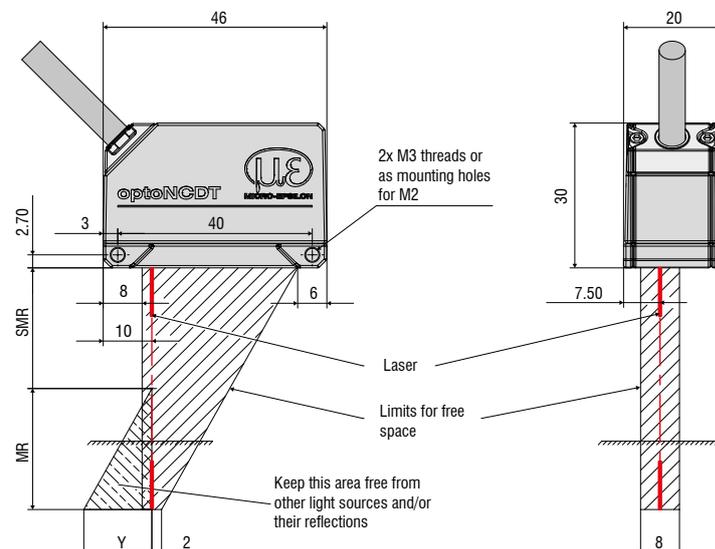
| MR | SMR | Y |
|---|---|---|
| 10 | 20 | 10 |
| 25 | 25 | 21 |
| 50 | 35 | 28 |

| Model | | ILD1420-10CL1 | ILD1420-25CL1 | ILD1420-50CL1 | ILD1420-100CL1 | ILD1420-200CL1 |
|---|---|---|---|---|---|---|
| Measuring range | | 10 mm | 25 mm | 50 mm | 100 mm on request | 200 mm on request |
| Start of measuring range | SMR | 20 mm | 25 mm | 35 mm | - | - |
| Mid of measuring range | MMR | 25 mm | 37.5 mm | 60 mm | - | - |
| End of measuring range | EMR | 30 mm | 50 mm | 85 mm | - | - |
| Linearity [1] | | $\leq \pm 8\,\mu m$ | $\leq \pm 20\,\mu m$ | $\leq \pm 40\,\mu m$ | - | - |
| | | $\leq \pm 0.08\ \%\ FSO$ | | | | |
| Repeatability [2] | | $0.5\,\mu m$ | $1\,\mu m$ | $2\,\mu m$ | - | - |
| Measuring rate [3] | | 0.25 kHz / 0.5 kHz / 1 kHz / 2 kHz / 4 kHz | | | | |
| Light source | | Semiconductor laser < 0.39 mW, 670 nm (red) | | | | |
| Permissible ambient light | | 15,000 lx | | | - | - |
| Spot diameter ±10 % | SMR | $90 \times 120\,\mu m$ | $100 \times 140\,\mu m$ | $90 \times 120\,\mu m$ | | |
| | MMR | $45 \times 40\,\mu m$ | $120 \times 130\,\mu m$ | $230 \times 240\,\mu m$ | - | - |
| | EMR | $140 \times 160\,\mu m$ | $390 \times 500\,\mu m$ | $630 \times 820\,\mu m$ | | |
| | smallest diameter | $45 \times 40\,\mu m$ with 24 mm | $55 \times 50\,\mu m$ with 31 mm | $70 \times 65\,\mu m$ with 42 mm | - | - |
| Protection class | | IP65 | | | | |
| Laser safety class | | Class 1 in accordance with DIN EN 60825-1 : 2015-07 | | | | |
| Temperature stability | | $\pm 0.03\ \%\ FSO/°C$ | | | | |
| Operating temperature | | 0 ... +50 °C (non-condensing) | | | | |
| Storage temperature | | -20 ... +70 °C (non-condensing) | | | | |
| Control inputs/outputs | | 1x HTL Laser on/off; 1 x HTL Multifunction input Trigger in / zero setting / mastering / teach (1x error output npn, pnp, push pull) | | | | |
| Measurement value output | analog | 4…20 mA (1…5 V with cable PCF1420-3/U); 12 bit; freely scalable within the measuring range [4] | | | | |
| | digital | RS422 / 16 bit | | | | |
| Vibration | | 20 g / 20…500 Hz (in accordance with IEC 60068-2-6) | | | | |
| Shock | | 15 g / 6 ms / 3 axes (in accordance with IEC 60068-2-29) | | | | |
| Weight | with 3 m cable | approx. 145 g | | | | |
| | with pigtail | approx. 60 g | | | | |
| Display | | 2 x 3 color LEDs for power and status | | | | |
| Operation | Key | Select button for zero / teach / factory settings | | | | |
| | Web interface | application-specific presets; peak selection, video signal; freely selectable averaging possibilities; data reduction; setup management [5] | | | | |
| Supply voltage | | 11…30 VDC | | | | |
| Power consumption | | < 2 W (24 V) | | | | |
| Sensor cable | | 3 m integrated, open ends | | | | |
| | | 0.3 m pigtail with 12-pole M12 connector | | | | |
| Controller | | integrated signal processor | | | | |
| Electromagnetic compatibility (EMC) | | EN 61 000-6-3 / DIN EN 61326-1 (Class B) EN 61 000-6-2 / DIN EN 61326-1 | | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics);
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Values apply from 0 - 50 % FSO or 50 - 100 % FSO; [2] Measuring rate: 2 kHz, median 9;
[3] Factory setting 2 kHz; modifying the factory settings requires the IF2001/USB converter (optionally available)
[4] The D/A conversion is executed with 12 bit; [5] Connection to PC via IF2001/USB (optionally available)

| | Nine models with measuring ranges from 4 mm to 100 mm |
| --- | --- |
| | Sensor head and separate controller |
| 100 kHz | Up to 100 kHz (-3dB) true analog frequency response |
| INTER FACE | Analog outputs (U/I) Ethernet |

Analog laser triangulation sensors of the optoNCDT 1610 and 1630 series are designed for extremely fast measurement processes. Equipped with a PSD array, the sensors automatically adapt to the reflection factor of the measurement object enabling measurements even on changing surfaces.

The LD 1610 series achieves a frequency response of 10 kHz (-3dB) while the LD 1630 series is suitable for measurements up to 100 kHz (-3dB).

Equipped with analog interfaces (current, voltage) and an optional Ethernet interface, the controller can be easily integrated into diverse systems.

**Controller**
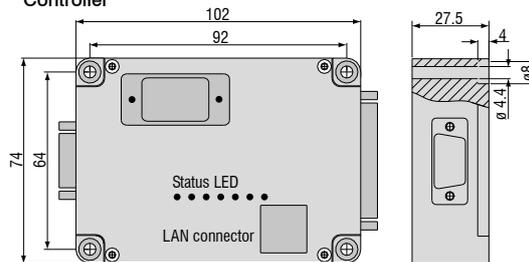


**optoNCDT 1610/1630 (4/10/20 mm)**
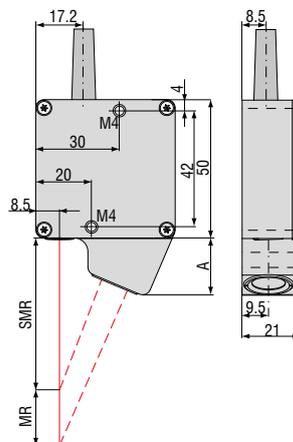


**optoNCDT 1610/1630 (50/100 mm)**



| MR | SMR | A |
| --- | --- | --- |
| 4 | 22 | 15 |
| 10 | 40 | 13.6 |
| 20 | 55 | 20.5 |
| 50 | 115 | 26.6 |
| 100 | 170 | 25.8 |

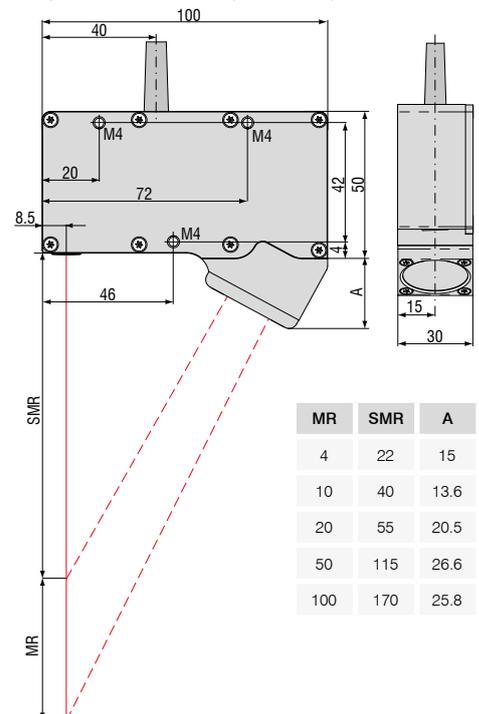| Sensors | LD1610-4 | LD1610-10 | LD1610-20 | LD1610-50 | LD1610-100 |
|---|---|---|---|---|---|
| Measuring range | 4 mm | 10 mm | 20 mm | 50 mm | 100 mm |
| Start of measuring range | 22 mm | 40 mm | 55 mm | 115 mm | 170 mm |
| Linearity | ≤ ± 8 µm | ≤ ± 20 µm | ≤ ± 40 µm | ≤ ± 100 µm | ≤ ± 200 µm |
| | | | ≤ ± 0.2 % FSO | | |
| Resolution (noise, dynamic [1]) | 2.6 µm | 6.5 µm | 13.0 µm | 32.5 µm | 65 µm |
| Resolution (noise, dynamic [2]) | 0.2 µm | 0.5 µm | 1 µm | 2.5 µm | 6 µm |
| Spot diameter | 0.3 mm | 0.6 mm | 0.9 mm | 1.5 mm | 1.5 mm |
| Frequency response | | | 10 kHz (-3dB) | | |
| Light source | | | Laser, wavelength 670 nm, red (visible) | | |
| Laser safety class | | | Class 2 | | |
| Max. Vibration | | | 10 g to 1 kHz (sensor head, 20 g optional) | | |
| Operating temperature | | | 0 ... +50 °C | | |
| Storage temperature | | | -20 ... +70 °C | | |

Other measuring ranges on request [1] Measurement on white target - Frequency response 10 kHz [2] Measurement on white target - Frequency response 20 Hz

| Sensors | LD1630-4 | LD1630-10 | LD1630-20 | LD1630-50 |
|---|---|---|---|---|
| Measuring range | 4 mm | 10 mm | 20 mm | 50 mm |
| Start of measuring range | 22 mm | 40 mm | 55 mm | 115 mm |
| Linearity | ≤ ± 12 µm | ≤ ± 30 µm | ≤ ± 60 µm | ≤ ± 150 µm |
| | | | ≤ ± 0.3 % FSO | |
| Resolution (noise, dynamic [1]) | 7 µm | 17.5 µm | 35 µm | 50 µm |
| Resolution (noise, dynamic [2]) | 0.4 µm | 1 µm | 2 µm | 7.5 µm |
| Spot diameter | 0.3 mm | 0.6 mm | 0.9 mm | 1.5 mm |
| Frequency response | | | 100 kHz (-3dB) | |
| Light source | | | Laser, wavelength 670 nm, red (visible) | |
| Laser safety class | | | Class 2 | |
| Max. Vibration | | | 5 g to 1 kHz (sensor head, 20 g optional) | |
| Operating temperature | | | 0 ... +40 °C | |
| Storage temperature | | | -30 ... +75 °C | |

Other measuring ranges on request [1] Measurement on white target - Frequency response 100 kHz [2] Measurement on white target - Frequency response 230 Hz

| Controller | | |
|---|---|---|
| Analog output | Distance | ±10V (optional 0 ... 10 V / 0 ... 5 V) ; 4 ... 20 mA |
| | Output impedance | approx. 0 Ohm (10 mA max.) |
| | Tilt angle | with 30° object inclination (axis A): approx. 0.5% (white target) |
| | Frequency response | DC ... 10 kHz / 100 kHz |
| | Thermal drift | 0.02 % °C FSO |
| | Light intensity | 0 ... 10 V |
| Digital output | Ethernet (optional) | TCP/IP factory set IP 192.168.122.245 (sampling frequency 1 - 30 kHz) |
| Switching outputs with display | MIN | +24 V when distance < MIN, LED yellow |
| | OK | +24 V when distance > MIN and < MAX, LED green |
| | MAX | +24 V when distance > MAX, LED orange |
| | Error | +24 V, LED red |
| Switching hysteresis | | approx. 0.5 % FSO |
| Permissible ambient light | | 20,000 lux |
| Operating time | | 50,000h (laser diode) |
| Insulation voltage | | 200 VDC, 0 V against housing |
| Humidity | | up to 90% RH, non-condensing |
| Protection class | | Sensor: IP64, controller: IP40 |
| Supply voltage | | 10 ... 30 VDC |
| Max. current consumption | | 200 mA (24 V) |
| Connector | | 25-in D-sub |
| Sensor cable length, standard | | 2 m |

| | |
|---|---|
| | **Compact design with integrated controller** |
| 312Hz 375Hz 1000Hz | **Measuring rate up to 7.5 kHz** |
| *A*nalog *D*igital | **Analog and digital output** |
| *T*rigger *T*eachIn | **Trigger input/teach-in/zero-setting/ mastering/synchronization** |
| | **Configuration via web interface or Plug & Play** |
| | **Application-specific presets and individual sensor settings** |
| RTSC | **Real Time Surface Compensation** |

The optoNCDT 1750 is a powerful laser triangulation sensor which is used in high speed, precise measurements in industrial applications. New evaluation algorithms and enhanced components provide highest accuracy and dynamics. The high-performance optical system generates a small light spot onto the target which enables to even detect smallest components reliably. Due to its compact size, the sensor can also be integrated into restricted installation spaces.

The optoNCDT 1750 laser stands out due to its real-time surface compensation feature. The real-time surface compensation feature (RTSC) determines the amount of reflection from the target surface during continuous exposure and in real-time. The exposure time or the amount of light produced by the laser is optimally matched to the reflection characteristics of the target surface. This enables extremely reliable measurements even on reflecting surfaces.

Different output signals enable to integrate the sensor into plant or machine control systems. As well as analog voltage and current outputs, a digital RS422 interface provides distance information from the sensor. All optoNCDT 1750 models are operated using an intuitive web interface. Due to the selectable setting and evaluation possibilities, the optoNCDT 1750 meets the requirements for use in industrial applications with high dynamics.

**optoNCDT 1750 (2/10/20/50/100/200 mm)**
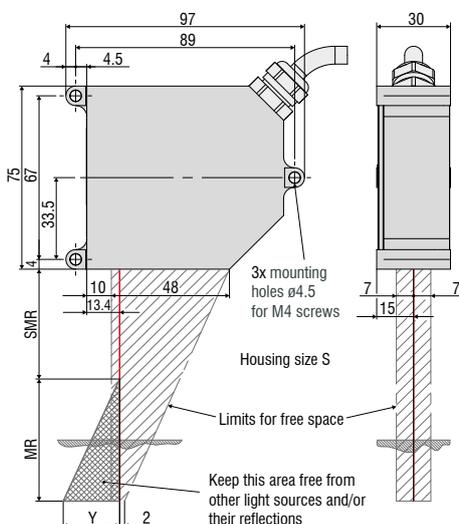
**optoNCDT 1750 (500/750 mm)**
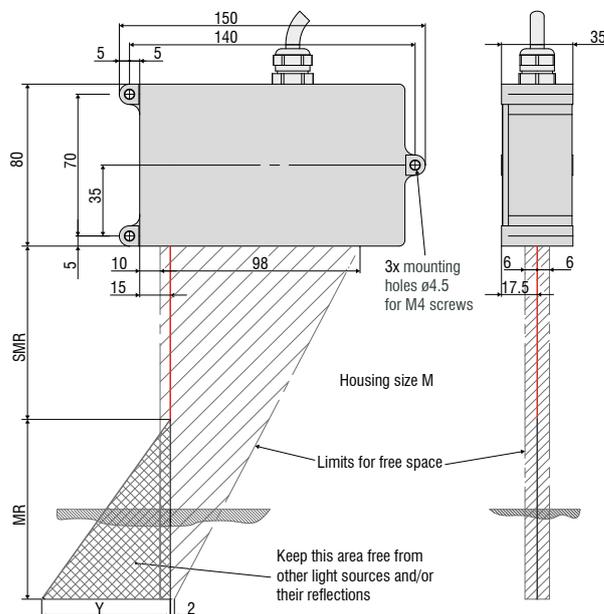
| MR | SMR | Y |
|---|---|---|
| 2 | 24 | 2 |
| 10 | 30 | 7 |
| 20 | 40 | 12 |
| 50 | 45 | 25 |
| 100 | 70 | 35 |
| 200 | 70 | 70 |
| 500 | 200 | 180 |
| 750 | 200 | 270 |

3x mounting holes ø4.5 for M4 screws

Housing size S

Limits for free space

Keep this area free from other light sources and/or their reflections

3x mounting holes ø4.5 for M4 screws

Housing size M

Limits for free space

Keep this area free from other light sources and/or their reflections

**Connector (sensor side)**

ø15

~50

**Connector (sensor cable)**

~15

~51
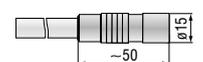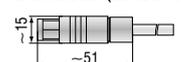
| Model | ILD1750-2 | ILD1750-10 | ILD1750-20 | ILD1750-50 | ILD1750-100 | ILD1750-200 | ILD1750-500 | ILD1750-750 |
|---|---|---|---|---|---|---|---|---|
| Measuring range | 2 mm | 10 mm | 20 mm | 50 mm | 100 mm | 200 mm | 500 mm | 750 mm |
| Start of measuring range | 24 mm | 30 mm | 40 mm | 45 mm | 70 mm | 70 mm | 200 mm | 200 mm |
| Mid of measuring range | 25 mm | 35 mm | 50 mm | 70 mm | 120 mm | 170 mm | 450 mm | 575 mm |
| End of measuring range | 26 mm | 40 mm | 60 mm | 95 mm | 170 mm | 270 mm | 700 mm | 950 mm |
| Linearity | $\leq \pm$ 1.6 $\mu m$ | $\leq \pm$ 6 $\mu m$ | $\leq \pm$ 12 $\mu m$ | $\leq \pm$ 30 $\mu m$ | $\leq \pm$ 60 $\mu m$ | $\leq \pm$ 160 $\mu m$ | $\leq \pm$ 350 $\mu m$ | $\leq \pm$ 670 $\mu m$ |
| | $\leq \pm$ 0.08 % FSO | $\leq \pm$ 0.06 % FSO | | | | $\leq \pm$ 0.08 % FSO | $\leq \pm$ 0.07 % FSO | $\leq \pm$ 0.09 % FSO |
| Repeatability [2] | 0.1 $\mu m$ | 0.4 $\mu m$ | 0.8 $\mu m$ | 2 $\mu m$ | 4 $\mu m$ | 8 $\mu m$ | 20 $\mu m$ | 30 $\mu m$ |
| Measuring rate | continuously adjustable 0.3 .. 7.5 kHz | | | | | | | |
| | 6 adjustable stages: 7.5 kHz / 5 kHz / 2.5 kHz / 1.25 kHz / 625 Hz / 300 Hz | | | | | | | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | | | | | | |
| Permissible ambient light (with 2.5 kHz) | 10,000 lx | | | | | | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2015-07 | | | | | | | |
| Spot diameter SMR | 80 $\mu m$ | 110 $\mu m$ | 320 $\mu m$ | 570 $\mu m$ | 740 $\mu m$ | 1300 $\mu m$ | 1500 $\mu m$ | |
| Spot diameter MMR | 35 $\mu m$ | 50 $\mu m$ | 45 $\mu m$ | 55 $\mu m$ | 60 $\mu m$ | 1300 $\mu m$ | 1500 $\mu m$ | |
| Spot diameter EMR | 80 $\mu m$ | 110 $\mu m$ | 320 $\mu m$ | 570 $\mu m$ | 700 $\mu m$ | 1300 $\mu m$ | 1500 $\mu m$ | |
| Temperature stability [1] | 0.025 % FSO/°C | 0.01 % FSO/°C | | | | | | |
| Operating temperature | 0 ... +50 °C | | | | | | | |
| Storage temperature | -20 ... +70 °C | | | | | | | |
| Control inputs/outputs | 1x HTL/TTL Laser on/off; 1x HTL/TTL multifunction input Trigger in / slave in / zero setting / mastering / teach 2x error outputs (error & limit value): npn, pnp, push pull 1x RS422 synchronization input (trigger in, sync in, master/slave, master/slave alternating) | | | | | | | |
| Measurement value output analog | 4…20 mA; 0…5 V / 0…10 V; 16 bit; freely scalable within the measuring range | | | | | | | |
| Measurement value output digital | RS422 / 16 bit | | | | | | | |
| Operation Keys | Select & function keys for interface selections, mastering (zero), teach, presets, quality slider, frequency selection, factory settings | | | | | | | |
| Operation Web interface | application-specific presets; peak selection, video signal; freely selectable averaging possibilities; data reduction; setup management [2] | | | | | | | |
| Supply voltage | 11…30 VDC | | | | | | | |
| Power consumption | < 3 W (24 V) | | | | | | | |
| Sensor cable Standard | 0.25 m pigtail with 14-pole ODU connector | | | | | | | |
| Sensor cable Option | Extension: 3 / 10 m | | | | | | | |
| Synchronization | possible for simultaneous or alternating measurements | | | | | | | |
| Protection class | IP65 | | | | | | | |
| Vibration | 2 g / 20 … 500 Hz | | | | | | | |
| Shock | 15 g / 6 ms | | | | | | | |
| Weight (with 25 cm cable) | approx. 550 g | | | | | | 600 g | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
[1] Based on digital output
[2] Connection to PC via IF2001/USB (optionally available)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range

**Eight models with measuring ranges from 2 mm to 300 mm**

312Hz 375Hz 1000Hz **Adjustable measuring rate up to 49.14 kHz**

INTER FACE **Ethernet / EtherCAT / RS422 Analog ouput via C-Box**

A-RTSC **Advanced Real Time Surface Compensation**

Certified **Calibration certificate included**

**Measurement of diffuse and specular surfaces**

**Thickness measurement of transparent materials**

**Configuration via web interface**

The optoNCDT 2300 is the new, high performance version of Micro-Epsilon laser triangulation sensors and offers an adjustable measuring rate of up to 49.14 kHz. The entire electronics is already integrated in a compact sensor housing which is a worldwide unique feature of this sensor class. The new A-RTSC (Advanced Real Time Surface Compensation) feature is a development of the already proven RTSC technology and, with its improved dynamic range, enables a more precise real time surface compensation during the measurement process. The threshold value of the compensation range can be easily configured via the software. Data output is via Ethernet, RS422 or EtherCAT. The C-Box enables analog signal output. All sensor configurations are carried out via a user-friendly web interface. The optoNCDT 2300 is particularly used for high speed applications such as the monitoring of vibrations or measurements on challenging surfaces.

**optoNCDT 2300-2 ... 2300-100**
Diffuse reflection
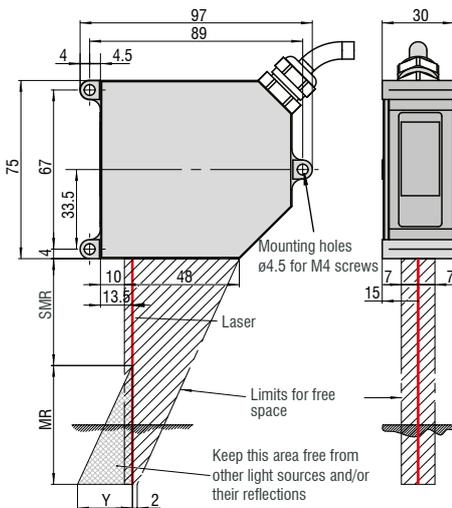


| MR | SMR | Y |
|---|---|---|
| 2 | 24 | 1.5 |
| 5 | 24 | 3.5 |
| 10 | 30 | 6.5 |
| 20 | 40 | 10.0 |
| 50 | 45 | 23.0 |
| 100 | 70 | 33.5 |

**optoNCDT 2300-2 ... 2300-20**
Direct reflection
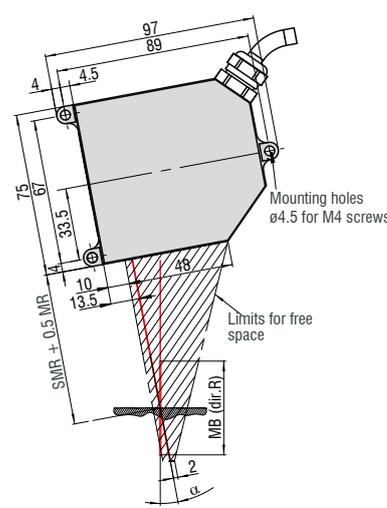


| MR | SMR + 0.5 MR | α |
|---|---|---|
| 2 | 25 | 20.5 ° |
| 5 | 26.5 | 20.5 ° |
| 10 | 35 | 17.5 ° |
| 20 | 50 | 13.8 ° |

**optoNCDT 2300-200 /2300-300**
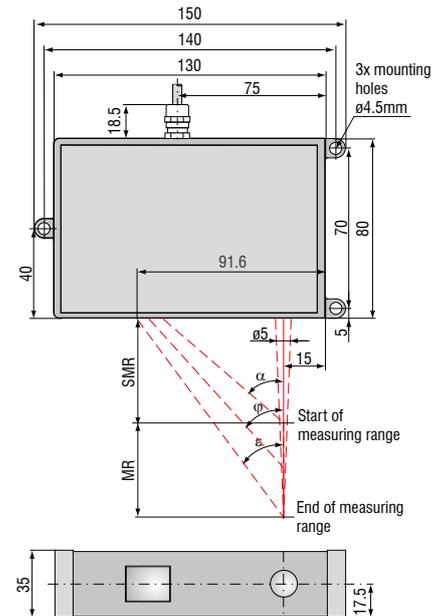


| MR | α | φ | ε | A | B |
|---|---|---|---|---|---|
| 200 | 25.1 ° | 16.7 ° | 13.1 ° | 91.6 | 76 |
| 300 | 18.3 ° | 12.2 ° | 9.6 ° | 99.4 | 81 |

| Model | | ILD2300-2 | ILD2300-5 | ILD2300-10 | ILD2300-20 | ILD2300-50 | ILD2300-100 | ILD2300-200 | ILD2300-300 |
|---|---|---|---|---|---|---|---|---|---|
| Measuring range [1] | | 2 (2) mm | 5 (2) mm | 10 (5) mm | 20 (10) mm | 50 (25) mm | 100 (50) mm | 200 (100) mm | 300 (150) mm |
| Start of measuring range | SMR | 24 (24) mm | 24 (24) mm | 30 (35) mm | 40 (50) mm | 45 (70) mm | 70 (120) mm | 130 (230) mm | 200 (350) mm |
| Mid of measuring range | MMR | 25 (25) mm | 26.5 (25) mm | 35 (37.5) mm | 50 (55) mm | 70 (82.5) mm | 120 (145) mm | 230 (280) mm | 350 (425) mm |
| End of measuring range | EMR | 26 (26) mm | 29 (26) mm | 40 (40) mm | 60 (60) mm | 95 (95) mm | 170 (170) mm | 330 (330) mm | 500 (500) mm |
| Linearity | | $\leq \pm 0.6\,\mu m$ | $\leq \pm 1.5\,\mu m$ | $\leq \pm 2\,\mu m$ | $\leq \pm 4\,\mu m$ | $\leq \pm 10\,\mu m$ | $\leq \pm 20\,\mu m$ | $\leq \pm 60\,\mu m$ | $\leq \pm 90\,\mu m$ |
| | | $\leq \pm 0.03\,\%$ FSO | | $\leq \pm 0.02\,\%$ FSO | | $\leq \pm 0.02\,\%$ FSO | | $\leq \pm 0.03\,\%$ FSO | |
| Resolution (with 20 kHz) | | $0.03\,\mu m$ | $0.08\,\mu m$ | $0.15\,\mu m$ | $0.3\,\mu m$ | $0.8\,\mu m$ | $1.5\,\mu m$ | $3\,\mu m$ | $4.5\,\mu m$ |
| | | 0.0015 % FSO | | | | | | | |
| Measuring rate | | switchable (software) 49.14 / 30 / 20 / 10 / 5 / 2.5 / 1.5 kHz (49.14 kHz with reduced measuring range) | | | | | | | |
| Permissible ambient light | | 10,000 ... 40,000 lx | | | | | | | |
| Spot diameter | SMR | 55 x 85 $\mu m$ | 70 x 80 $\mu m$ | 75 x 85 $\mu m$ | 140 x 200 $\mu m$ | 255 x 350 $\mu m$ | 350 $\mu m$ | 1300 $\mu m$ | 580 x 860 $\mu m$ |
| | MMR | 23 x 23 $\mu m$ | 30 x 30 $\mu m$ | 32 x 45 $\mu m$ | 46 x 45 $\mu m$ | 70 x 70 $\mu m$ | 130 $\mu m$ | 1300 $\mu m$ | 380 x 380 $\mu m$ |
| | EMR | 35 x 85 $\mu m$ | 70 x 80 $\mu m$ | 110 x 160 $\mu m$ | 140 x 200 $\mu m$ | 255 x 350 $\mu m$ | 350 $\mu m$ | 1300 $\mu m$ | 470 x 530 $\mu m$ |
| Light source | | Laser diode (670 nm) class 2 | | | | | | | |
| Protection class | | IP65 | | | | | | | |
| Operating temperature | | 0 ... +50 °C | | | | | | | |
| Storage temperature | | -20 ... +70 °C | | | | | | | |
| Inputs/Outputs | | Ethernet/EtherCAT RS422 analog output via C-Box | | | | | | | |
| Inputs | | Laser on/off Sync/Trigger input | | | | | | | |
| Supply voltage | | 11…30 VDC | | | | | | | |
| Power consumption | | < 3 W (24 V) | | | | | | | |
| LED | | status / power / Ethernet / EtherCAT | | | | | | | |
| Sensor cable | Standard | 0.25 m (with connector) | | | | | | | |
| | Option | 3 / 6 / 9 m with 15-pole sub-D Connector | | | | | | | |
| Synchronization | | possible for simultaneous or alternating measurements | | | | | | | |
| Electromagnetic compatibility (EMC) | | EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, class B) EN 61 000-6-2: 2006-03 | | | | | | | |
| Vibration | | 2 g / 20 ... 500 Hz | | | | | | | |
| Shock | | 15 g / 6 ms / 3 axes | | | | | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz
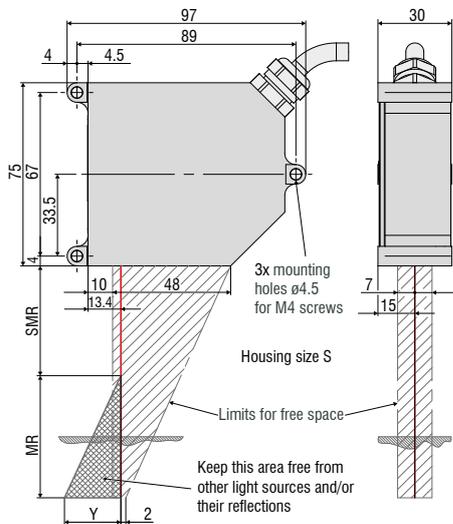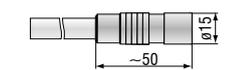
| | Laser Line averages across shiny metallic or structured surfaces |
| Four models with measuring ranges from 2 mm to 50 mm |
| RTSC | Real Time Surface Compensation |
| 312Hz 375Hz 1000Hz | Adjustable measuring rate up to 7.5 kHz |
| Analog Digital | Analog (U/I) and digital output |
| Filter inside | Adjustable filter functions (firmware) |
| S | High flex cables for dragchain or robot use |
| Certified | Calibration certificate included |

The compact optoNCDT 1750LL is perfectly suitable for measurements against shiny and structured surfaces. The point-shaped laser beam is widened using a lens to form an oval point. Therefore, physically induced interferences can be easily filtered enabling measurements on shiny surfaces. Due to its compact size, the sensor can easily be integrated into restricted installation space.

**optoNCDT 1750LL (2/10/20/50 mm)**



97
89
4
4.5
30
75
67
33.5
4
10
13.4
48
SMR
MR
Y
2

3x mounting holes ø4.5 for M4 screws

Housing size S

Limits for free space

Keep this area free from other light sources and/or their reflections

7   7
15

**Connector (sensor side)**

~50
ø15

**Connector (sensor cable)**

~15
~51
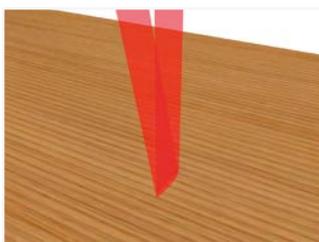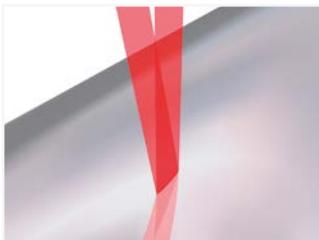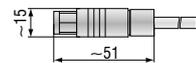
| MR | SMR | Y |
|----|-----|----|
| 2  | 24  | 2  |
| 10 | 30  | 7  |
| 20 | 40  | 12 |
| 50 | 45  | 25 |

| Model | ILD1750-2LL | ILD1750-10LL | ILD1750-20LL | ILD1750-50LL |
|---|---|---|---|---|
| Measuring range | 2 mm | 10 mm | 20 mm | 50 mm |
| Start of measuring range | 24 mm | 30 mm | 40 mm | 45 mm |
| Mid of measuring range | 25 mm | 35 mm | 50 mm | 70 mm |
| End of measuring range | 26 mm | 40 mm | 60 mm | 95 mm |
| Linearity | ≤ ± 1.6 μm | ≤ ± 6 μm | ≤ ± 12 μm | ≤ ± 30 μm |
| | ≤ ± 0.08 % FSO | ≤ ± 0.06 % FSO | | |
| Repeatability [2] | 0.1 μm | 0.4 μm | 0.8 μm | 2 μm |
| Measuring rate | continuously adjustable 0.3 .. 7.5 kHz | | | |
| | 6 adjustable stages: 7.5 kHz / 5 kHz / 2.5 kHz / 1.25 kHz / 625 Hz / 300 Hz | | | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | | |
| Permissible ambient light with 2.5 kHz | 10,000 lx | | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | | | |
| Spot diameter — SMR | 85 x 240 μm | 120 x 405 μm | 185 x 485 μm | 350 x 320 μm |
| Spot diameter — MMR | 24 x 280 μm | 35 x 585 μm | 55 x 700 μm | 70 x 960 μm |
| Spot diameter — EMR | 64 x 400 μm | 125 x 835 μm | 195 x 1200 μm | 300 x 1940 μm |
| Temperature stability [1] | 0.025 % FSO/°C | 0.01 % FSO/°C | | |
| Operating temperature | 0 ... +50 °C | | | |
| Storage temperature | -20 ... +70 °C | | | |
| Control inputs/outputs | 1x HTL/TTL Laser on/off; 1x HTL/TTL multifunction input Trigger in / slave in / zero setting / mastering / teach 2x error outputs (error & limit value): npn, pnp, push pull 1x RS422 synchronization input (trigger in, sync in, master/slave, master/slave alternating) | | | |
| Measured value output — analog | 4 ... 20 mA; 0…5 V / 0…10 V; 16 bit; freely scalable within the measuring range | | | |
| Measured value output — digital | RS422 / 16 bit | | | |
| Operation — Keys | Select & function keys for interface selections, mastering (zero), teach, presets, quality slider, frequency selection, factory settings | | | |
| Operation — Web interface | application-specific presets; peak selection, video signal; freely selectable averaging possibilities; data reduction; setup management [2] | | | |
| Supply voltage | 11…30 VDC | | | |
| Power consumption | < 3 W (24 V) | | | |
| Sensor cable — Standard | 0.25 m pigtail with 14-pole ODU connector | | | |
| Sensor cable — Option | Extension: 3 / 10 m | | | |
| Synchronization | possible for simultaneous or alternating measurements | | | |
| Protection class | IP65 | | | |
| Vibration | 2 g / 20 … 500 Hz | | | |
| Shock | 15 g / 6 ms | | | |
| Weight (with 25cm cable) | approx. 550 g | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
[1] Based on digital output
[2] Connection to PC via IF2001/USB (optionally available)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
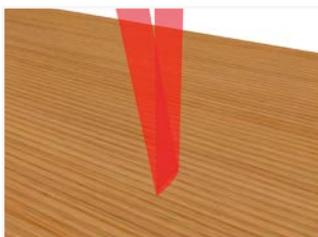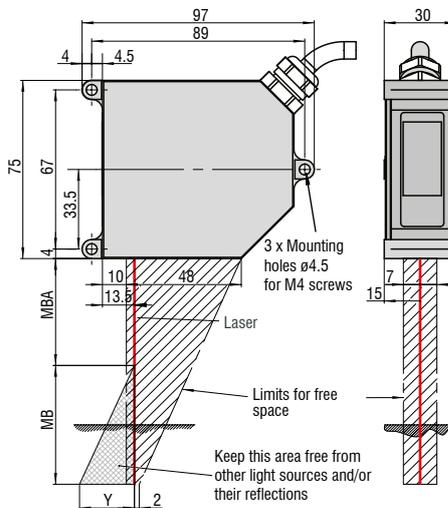
| | Laser Line averages across shiny metallic or structured surfaces |
|---|---|
| | Four models with measuring ranges from 2 mm to 50 mm |
| 312Hz 375Hz 1000Hz | Adjustable measuring rate up to 49.14 kHz |
| INTER FACE | Ethernet / EtherCAT / RS422 Analog ouput via C-Box |
| A-RTSC | Advanced Real-Time-Surface-Compensation |
| Certified | Calibration certificate included |
| | Configuration via web interface |

The optoNCDT 2300LL is ideally suitable for measurements against shiny and structured surfaces. The point-shaped laser beam is widened using a lens to form an oval point. Therefore, physically induced interferences can be easily filtered enabling measurements on shiny surfaces. Due to its compact size, the sensor can easily be integrated into restricted installation space.

The "Advanced Real Time Surface Compensation" (A-RTSC), with its improved dynamic range, enables a more precise real time surface compensation during the measurement process. Data output is via Ethernet, RS422 or EtherCAT. All sensor configurations are carried out via a user-friendly web interface.

**optoNCDT 2300LL**

3 x Mounting holes ø4.5 for M4 screws

Laser

Limits for free space

Keep this area free from other light sources and/or their reflections

| MR | SMR | Y |
|---|---|---|
| 2 | 24 | 1.5 |
| 10 | 30 | 6.5 |
| 20 | 40 | 10.0 |
| 50 | 45 | 23.0 |

| Model | | ILD2300-2LL | ILD2300-10LL | ILD2300-20LL | ILD2300-50LL |
|---|---|---|---|---|---|
| Measuring range [1] | | 2 (2) mm | 10 (5) mm | 20 (10) mm | 50 (25) mm |
| Start of measuring range | SMR | 24 (24) mm | 30 (35) mm | 40 (50) mm | 45 (70) mm |
| Mid of measuring range | MMR | 25 (25) mm | 35 (37.5) mm | 50 (55) mm | 70 (82.5) mm |
| End of measuring range | EMR | 26 (26) mm | 40 (40) mm | 60 (60) mm | 95 (95) mm |
| Linearity | | $\leq \pm 0.6\,\mu m$ | $\leq \pm 2\,\mu m$ | $\leq \pm 4\,\mu m$ | $\leq \pm 10\,\mu m$ |
| | | $\leq \pm 0.03$ % FSO | $\leq \pm 0.02$ % FSO | | |
| Resolution (with 20 kHz) | | $0.03\,\mu m$ | $0.15\,\mu m$ | $0.3\,\mu m$ | $0.8\,\mu m$ |
| | | 0.0015 % FSO | | | |
| Measuring rate | | switchable (software) 49.14 / 30 / 20 / 10 / 5 / 2.5 / 1.5 kHz (49.14 kHz with reduced measuring range) | | | |
| Permissible ambient light | | 10,000 ... 40,000 lx | | | |
| Spot diameter | SMR | 85 x 240 $\mu m$ | 120 x 405 $\mu m$ | 185 x 485 $\mu m$ | 350 x 320 $\mu m$ |
| | MMR | 24 x 280 $\mu m$ | 35 x 585 $\mu m$ | 55 x 700 $\mu m$ | 70 x 960 $\mu m$ |
| | EMR | 64 x 400 $\mu m$ | 125 x 835 $\mu m$ | 195 x 1200 $\mu m$ | 300 x 1940 $\mu m$ |
| Light source | | Laser diode (670 nm) class 2 | | | |
| Protection class | | IP65 | | | |
| Operating temperature | | 0 ... +50 ℃ | | | |
| Storage temperature | | -20 ... +70 ℃ | | | |
| Inputs/Outputs | | Ethernet/EtherCAT RS422 analog output via C-Box | | | |
| Inputs | | Laser on/off Sync/Trigger input | | | |
| Supply voltage | | 11 ... 30 VDC | | | |
| Power consumption | | < 3 W (24 V) | | | |
| LED | | status / power / Ethernet / EtherCAT | | | |
| Sensor cable | Standard | 0.25 m (with connector) | | | |
| | Option | 3 / 6 / 9 m with 15-pole sub-D Connector | | | |
| Synchronization | | possible for simultaneous or alternating measurements | | | |
| Electromagnetic compatibility (EMC) | | EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, class B) EN 61 000-6-2: 2006-03 | | | |
| Vibration | | 2 g / 20 ... 500 Hz | | | |
| Shock | | 15 g / 6 ms / 3 axes | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz
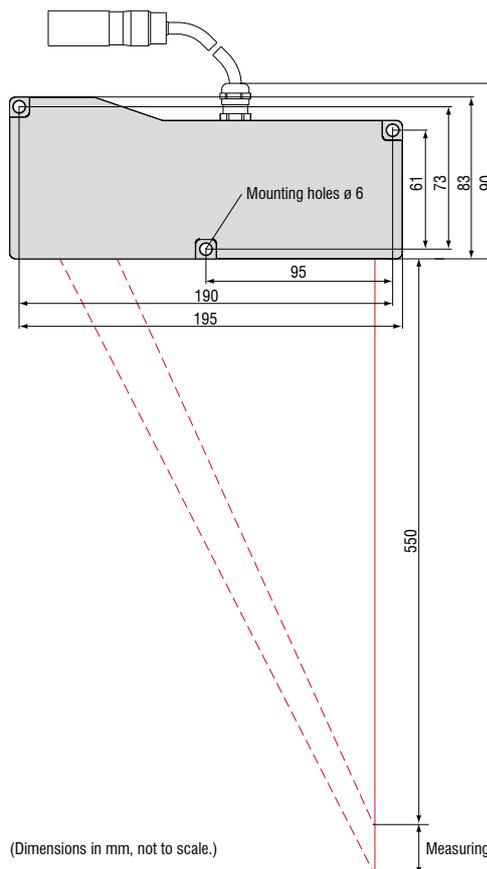
| | High accuracy and long standoff distances |
|---|---|
| 312Hz 375Hz 1000Hz | **Adjustable measurement rate up to 2.5 kHz** |
| *RTSC* | **Real Time Surface Compensation** |
| $A$nalog $D$igital | **Analog and digital output** |
| $F$ilter inside | **Adjustable filter functions (firmware)** |
| Certified | **Calibration certificate included** |

The optoNCDT 1710-50 long-range laser sensors are designed for large measurement distances combined with high precision. They operate according to the triangulation and measure distances without contact on a wide range of material surfaces.

Unlike conventional laser triangulation sensors, the long-range series measures over a large measurement distance and is therefore better protected against possible collisions. The integrated Real Time Surface Compensation enables measurements even on changing surfaces.

**optoNCDT 1710-50 (50 mm)**

Window cmos (ø 35.5) ø 30 free     Window laser (ø 12.5) ø 5 free

48   24

39    147    14

Mounting holes ø 6

61   73   83   90

95

190

195

550

(Dimensions in mm, not to scale.)     Measuring range

| Model | ILD1710-50 | | |
|---|---|---|---|
| Measuring range | 50 mm | | |
| Start of measuring range | 550 mm | | |
| Mid of measuring range | 575 mm | | |
| End of measuring range | 600 mm | | |
| Linearity | $\leq \pm$ 50 $\mu$m | | |
| | $\leq \pm$ 0.1 % FSO | | |
| Resolution | 7.5 $\mu$m | | |
| | 0.015% FSO (at 2.5 kHz without averaging) | | |
| Measuring rate | 2.5 kHz / 1.25 kHz / 625 Hz / 312.5 Hz (adjustable) | | |
| Permissible ambient light | 10,000 lx | | |
| Light spot diameter | SMR | 400 x 500 $\mu$m | |
| | MMR | 400 x 500 $\mu$m | |
| | EMR | 400 x 500 $\mu$m | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | | |
| Protection class | IP65 | | |
| Temperature stability | 0.01 % FSO/°C | | |
| Operating temperature | 0 ... +50 °C | | |
| Storage temperature | -20 ... +70 °C | | |
| Output | analog | 4 ... 20 mA (0 ... 10 V) | |
| | digital | RS422 / USB (optional with cable PC1700-3/USB) | |
| | Switching outputs | 1 x error or 2x limit values (configurable) | |
| Switching input | Laser ON-OFF / Zero | | |
| Operation | via membrane keypad on sensor or via PC with ILD 1700 tool | | |
| Supply voltage | 11 ... 30 VDC | | |
| Max. current consumption | 150 mA (24 V) | | |
| Sensor cable | standard: 0.25 m - integrated | | |
| Synchronization | possible for simultaneous or alternating measurements | | |
| Vibration | 2 g / 20 ... 500 Hz | | |
| Shock | 15 g / 6 ms | | |
| Weight | Sensor | approx. 800 g | |

FSO = Full Scale Output; All specifications apply for a diffusely reflecting matt white ceramic target;
SMR = start of measuring range MMR = midrange EMR = end of measuring range

| | High accuracy and long standoff distances |
| | Four models with measuring ranges from 10 mm to 50 mm |
| 312Hz 375Hz 1000Hz | Adjustable measuring rate up to 49.14 kHz |
| INTER FACE | Ethernet / Ethercat / RS422 Analog ouput via C-Box |
| A-RTSC | Advanced Real-Time-Surface-Compensation |
| Certified | Calibration certificate included |
| | Configuration via web interface |

The optoNCDT 2310 long-range laser sensors are designed for large measurement distances combined with high precision.

They operate according to the triangulation and measure distances without contact on a wide range of material surfaces. Unlike conventional laser triangulation sensors, the long-range series measures over a large measurement distance and is therefore better protected against possible collisions. The integrated Real Time Surface Compensation enables measurements even on changing surfaces.

**optoNCDT 2310-10/2310-20/2310-40**
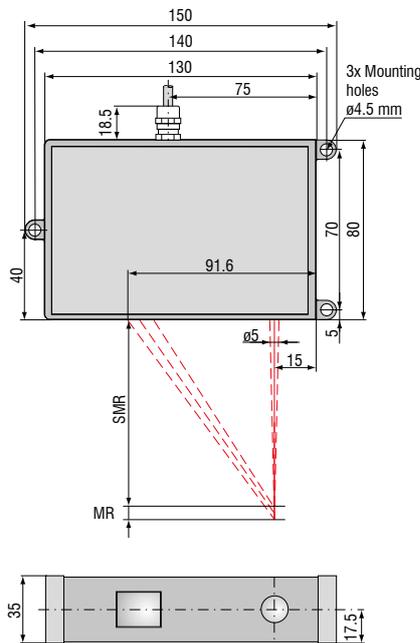


**optoNCDT 2310-50**
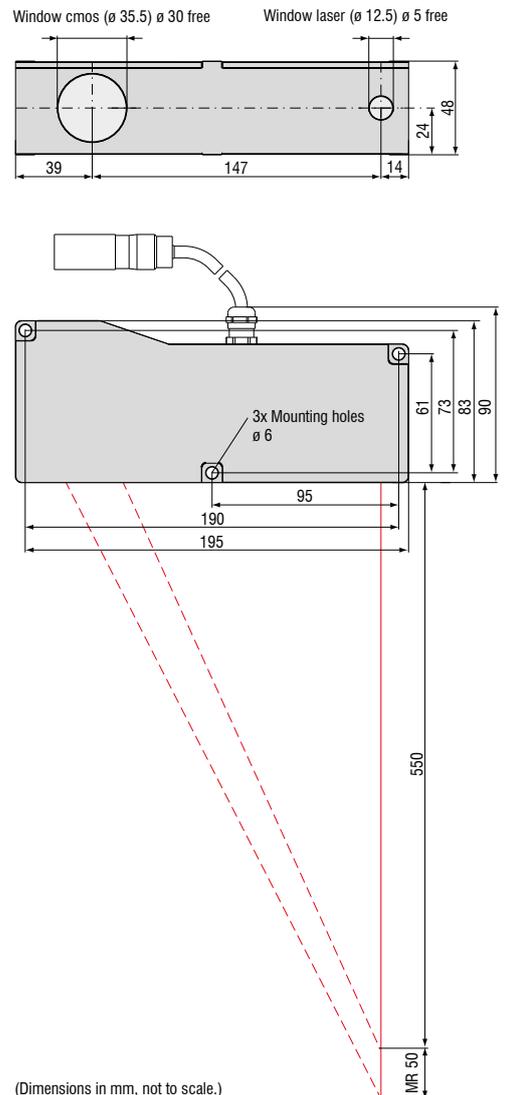


(Dimensions in mm, not to scale.)

| Model | ILD2310-10 | ILD2310-20 | ILD2310-40 | ILD2310-50 |
|---|---|---|---|---|
| Measuring range [1] | 10 (5) mm | 20 (10) mm | 40 (20) mm | 50 (25) mm |
| Start of measuring range | 95 (100) mm | 90 (100) mm | 175 (195) mm | 550 (575) mm |
| Mid of measuring range | 100 (102.5) mm | 100 (105) mm | 195 (205) mm | 575 (587.5) mm |
| End of measuring range | 105 (105) mm | 110 (110) mm | 215 (215) mm | 600 (600) mm |
| Linearity | $\leq \pm 3\,\mu m$ | $\leq \pm 6\,\mu m$ | $\leq \pm 12\,\mu m$ | $\leq \pm 50\,\mu m$ |
| | $\leq \pm 0.03\,\%$ FSO | $\leq \pm 0.03\,\%$ FSO | $\leq \pm 0.03\,\%$ FSO | $\leq \pm 0.1\,\%$ FSO |
| Resolution | $0.5\,\mu m$ | $1\,\mu m$ | $2\,\mu m$ | $7.5\,\mu m$ |
| | 0.005 % FSO | 0.005 % FSO (at 10 kHz without averaging) | 0.005 % FSO | 0.015 % FSO |
| Measuring rate | switchable (software) 49.14 / 30 / 20 / 10 / 5 / 2.5 / 1.5 kHz (49.14 kHz with reduced measuring range) | | | |
| Permissible ambient light | 10,000…40,000 lx | | | |
| Light spot diameter — SMR | 400 x 500 $\mu m$ | 200 $\mu m$ | 230 $\mu m$ | 400 ... 500 $\mu m$ |
| Light spot diameter — MMR | 400 x 500 $\mu m$ | 60 $\mu m$ | 210 $\mu m$ | 400 ... 500 $\mu m$ |
| Light spot diameter — EMR | 400 x 500 $\mu m$ | 200 $\mu m$ | 230 $\mu m$ | 400 ... 500 $\mu m$ |
| Light source | laser diode (670nm) class 2 | | | |
| Protection class | IP65 | | | |
| Operating temperature | 0 ... +50 °C | | | |
| Storage temperature | -20 ... +70 °C | | | |
| Inputs/Outputs | Ethernet/EtherCAT RS422 analog output via C-Box | | | |
| Inputs | Laser on/off Sync/Trigger input | | | |
| Supply voltage | 11 … 30 VDC | | | |
| Power consumption | < 3 W (24 V) | | | |
| LED | status / power / Ethernet / EtherCAT | | | |
| Sensor cable | standard: 0.25 m - integrated | | | |
| Synchronization | possible for simultaneous or alternating measurements | | | |
| Electromagnetic compatibility (EMC) | EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1, class B) EN 61 000-6-2: 2006-03 | | | |
| Vibration | 2 g / 20 ... 500 Hz | | | |
| Shock | 15 g / 6 ms / 3 axes | | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz

| | |
|---|---|
| | **High accuracy and long standoff distances** |
| | **Model with measuring range up to 1000 mm** |
| 312Hz 375Hz 1000Hz | **Adjustable measuring rate up to 2.5 kHz** |
| *RTSC* | **Real Time Surface Compensation** |
| $A$nalog $D$igital | **Analog (U/I) and digital output** |
| $F$ilter inside | **Adjustable filter functions (firmware)** |
| Certified | **Calibration certificate included** |

The optoNCDT 1710-1000 series is extremely versatile due to its well-conceived design with integrated controller. The powerful sensor and its innovative RTSC feature enable measurements against diverse surface types. The 1710-1000 model is designed for measurements with a large distance from the target.

**optoNCDT 1710-1000**



Operator panel

47
190
200
95
85
(ø6)
61
71
73
5
83
5
24
48

24
ø 9
ø 32
Field of view - keep free
145
(4.65°)
(7.45°)
(4.2°)
(6.3°)
(8.3°)
ø 9
Connector cable 0.25m
SMR = 1000
MR = 1000

| Model | ILD1710-1000 | | |
|---|---|---|---|
| Measuring range | 1000 mm | | |
| Start of measuring range (offset distance) | 1000 mm | | |
| Mid of measuring range | 1500 mm | | |
| End of measuring range | 2000 mm | | |
| Linearity | ≤ ± 1 mm | | |
| | ≤ ± 0.1% FSO | | |
| Resolution (at 2.5 kHz without averaging) | 100 $\mu$m | | |
| Measuring rate | 2.5 kHz / 1.25 kHz / 625 Hz / 312.5 Hz (adjustable) | | |
| Light source | Semiconductor laser < 1 mW, 670 nm (red) | | |
| Permissible ambient light | at 2.5 kHz | 10,000 lx | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | | |
| Light spot diameter | SMR | 2.5 ... 5 mm | |
| | MMR | 2.5 ... 5 mm | |
| | EMR | 2.5 ... 5 mm | |
| Temperature stability | 0.01% FSO/°C | | |
| Operating temperature | 0 ... +50 °C | | |
| Storage temperature | -20 ... +70 °C | | |
| Output | Measured values | switchable: 4 ... 20 mA / 0 ... 10 V / RS422 / USB (optional via cable PC1700-3/USB) | |
| | Switching outputs | 1 x error or 2x limit values (configurable) | |
| Switching input | Laser ON-OFF / Zero | | |
| Operation | via membrane keypad on sensor or via PC with ILD 1700 tool | | |
| Supply voltage | 11 ... 30 VDC | | |
| Max. current consumption | 150 mA (24 V) | | |
| Sensor cable | standard 0.25 m integrated | | |
| Synchronization | possible for simultaneous or alternating measurements | | |
| Protection class | IP65 | | |
| Vibration | 2 g / 20 … 500 Hz | | |
| Shock | 15 g / 6 ms | | |
| Weight | ~ 0.8 kg | | |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range

| | Two models with measuring ranges from 50 mm and 1000 mm |
| --- | --- |
| | Blue Laser Technology (Blue violet laser diode 405 nm) |
| RTSC | Real Time Surface Compensation |
| 312Hz 375Hz 1000Hz | Adjustable measuring rate up to 2.5 kHz |
| Analog Digital | Analog (U/I) and digital output |
| Filter inside | Adjustable filter functions |
| S | High flex cables for dragchain or robot use |
| Certified | Calibration certificate included |

Equipped with a blue-violet laser diode (405 nm), the optoNCDT 1710BL sensor achieves high accuracies on red-hot glowing metals and organic materials.

In numerous applications, Blue Laser sensors are superior to standard sensors that use a red laser diode. In contrast to a red laser, the reduced wavelength of the blue laser light does not penetrate materials such as wood, skin and foods. The blue laser generates a minimal laser point on the surface and therefore offers more stable, precise measurements.

The inner workings of the Blue Laser triangulation sensor are a complete re-design. The sensors are equipped with new high-end lenses, new intelligent laser control and evaluation algorithms.
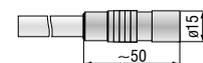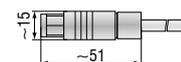
**optoNCDT 1710 (50/1000 mm)**



ø35.5    ø12.5
39    147    14
48
24

3x Mounting holes ø6
61  73  83  90
95
190
195
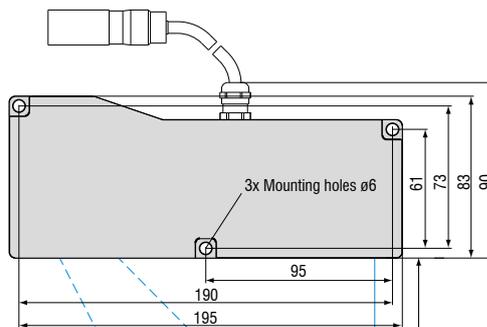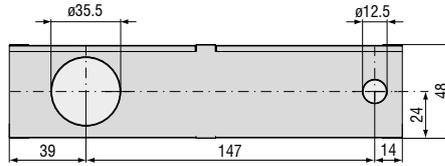
Start Measuring range

Measuring range

**Connector (sensor side)**



~50    ø15

**Connector (sensor cable)**



~15    ~51

| Model | ILD1710-50BL | ILD1710-1000BL |
|---|---|---|
| Measuring range | 50 mm | 1000 mm |
| Start of measuring range | 550 mm | 1000 mm |
| Mid of measuring range | 575 mm | 1500 mm |
| End of measuring range | 600 mm | 2000 mm |
| Linearity | $\leq \pm 50\,\mu m$ | $\leq \pm 1$ mm |
| | $\leq \pm 0.1\%$ FSO | $\leq \pm 0.1\%$ FSO |
| Resolution (at 2.5 kHz without averaging) | $5\,\mu m$ | $100\,\mu m$ |
| Measuring rate | 2.5 kHz / 1.25 kHz / 625 Hz / 312.5 Hz (adjustable) | |
| Light source | Semiconductor laser <1 mW, 405nm (blue violet), laser class 2 | |
| Permissible ambient light (with 2.5 kHz) | 10,000 lx | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2008-05 | |
| Spot diameter — SMR | $400 \times 500\,\mu m$ | 2.5…5 mm |
| Spot diameter — MMR | $400 \times 500\,\mu m$ | 2.5…5 mm |
| Spot diameter — EMR | $400 \times 500\,\mu m$ | 2.5…5 mm |
| Temperature stability [1] | 0.01% FSO/°C | |
| Operating temperature | 0 ... +50 °C | |
| Storage temperature | -20 ... +70 °C | |
| Output — Measured values | switchable: 4 ... 20 mA / 0 ... 10 V / RS422 / USB (optional via cable PC1700-3/USB) | |
| Output — Switching outputs | 1 x error or 2x limit values (configurable) | |
| Switching input | Laser ON-OFF / Zero | |
| Operation | via membrane keypad on sensor or via PC with ILD 1700 tool | |
| Supply voltage | 11 ... 30 VDC | |
| Max. current consumption | 150 mA (24 V) | |
| Sensor cable (with connector) | standard 0.25 m integrated / option: 3 m or 10 m extensions | |
| Synchronization | possible for simultaneous or alternating measurements | |
| Protection class | IP65 | |
| Vibration | 2 g / 20 … 500 Hz | |
| Shock | 15 g / 6 ms | |
| Weight (with 25 cm cable) | approx. 800 g | approx. 800 g |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
[1] Based on digital output
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range

| | Four models with measuring ranges from 20 mm bis 750 mm |
|---|---|
| | Blue Laser Technology (Blue violet laser diode 405 nm) |
| RTSC | Real Time Surface Compensation |
| 312Hz 375Hz 1000Hz | Adjustable measuring rate up to 7.5 kHz |
| Analog Digital | Analog and digital output |
| Trigger TeachIn | Trigger input / teach-in / zero-setting / mastering / synchronization |
| | Configuration via web interface or Plug & Play |
| | Application-specific presets and individual setups |

Blue Laser sensors in the optoNCDT 1750BL series are designed for high speed displacement, distance and position measurements. These sensors are equipped with new high performance lenses, laser control and evaluation algorithms to ensure precise measurements on different surfaces and materials.

The Blue Laser technology patented by Micro-Epsilon offers decisive advantages compared to red-diode laser sensors. Since the blue laser point does not penetrate the surface, the target is sharply imaged onto the sensor element. This makes it possible to achieve high resolution and reliable signal stability.

**optoNCDT 1750BL (20/200 mm)**



**optoNCDT 1750BL (500/750 mm)**
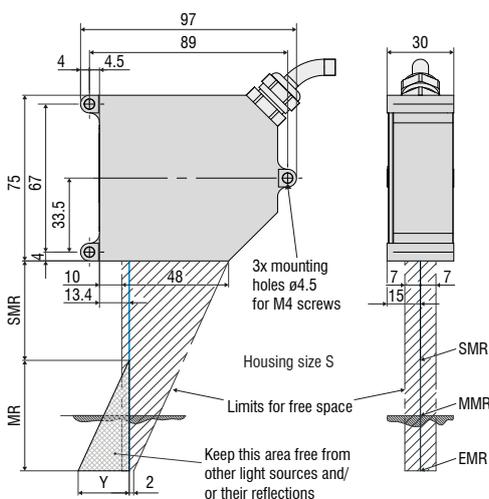


| MR | SMR | Y |
|---|---|---|
| 20 | 40 | 12 |
| 200 | 70 | 70 |
| 500 | 200 | 180 |
| 750 | 200 | 270 |
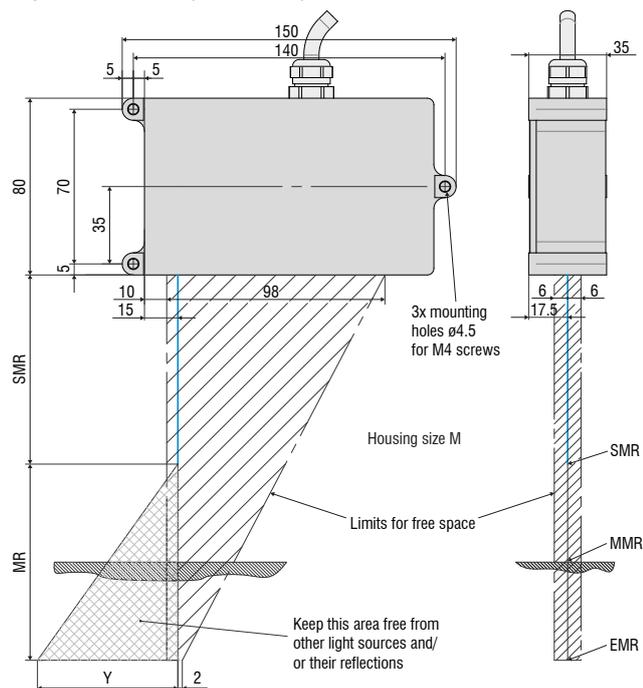
(Dimensions in mm, not to scale)

| Model | ILD1750-20BL | ILD1750-200BL | ILD1750-500BL | ILD1750-750BL |
|---|---|---|---|---|
| Measuring range | 20 mm | 200 mm | 500 mm | 750 mm |
| Start of measuring range | 40 mm | 70 mm | 200 mm | 200 mm |
| Mid of measuring range | 50 mm | 170 mm | 450 mm | 575 mm |
| End of measuring range | 60 mm | 270 mm | 700 mm | 950 mm |
| Measuring rate [1] | continuously adjustable between 0.3 ... 7.5 kHz; 6 adjustable stages: 300 Hz / 625 Hz / 1.25 kHz / 2.5 kHz / 5 kHz / 7.5 kHz | | | |
| Linearity | $< \pm 12\,\mu m$ | $< \pm 160\,\mu m$ | $< \pm 350\,\mu m$ | $< \pm 670\,\mu m$ |
| | $< \pm 0.06\,\%$ FSO | $< \pm 0.08\,\%$ FSO | $< \pm 0.07\,\%$ FSO | $< \pm 0.09\,\%$ FSO |
| Repeatability [2] | $< 0.8\,\mu m$ | $< 15\,\mu m$ | $< 20\,\mu m$ | $< 45\,\mu m$ |
| Temperature stability [3] | $\pm 0.03\,\%$ FSO / K | | | |
| Light spot diameter (± 10 %) — SMR | $320\,\mu m$ | $1300\,\mu m$ | $1500\,\mu m$ | $1500\,\mu m$ |
| Light spot diameter (± 10 %) — MMR | $45\,\mu m$ | | | |
| Light spot diameter (± 10 %) — EMR | $320\,\mu m$ | | | |
| Light source | Semiconductor laser <1 mW, 405 nm (blue violet) | | | |
| Laser safety class | Class 2 in accordance with DIN EN 60825-1 : 2015-07 | | | |
| Permissible ambient light | 10,000 lx | | | |
| Supply voltage | 11 … 30 VDC | | | |
| Power consumption | < 3 W (24 V) | | | |
| Signal input | 1x HTL/TTL multi-function input input trigger in / slave in, zero setting / mastering / teach-in; 1 x RS422 synchronization input trigger in / sync in / master slave / master slave alternating | | | |
| Digital interface | RS422 (16 bit) | | | |
| Analog output | 4 ... 20 mA / 0 … 5 V / 0 … 10 V (16 bit, freely scalable within the measuring range) | | | |
| Switching output | 1 x HTL/TTL laser on/off; 2 x switching output (error & limit value): npn, pnp, push pull | | | |
| Synchronization | possible for simultaneous or alternating measurements | | | |
| Connection | integrated pigtail 0.25 m with 14-pin ODU plug; optional extension to 3 m / 10 m | | | |
| Mounting | Screw connection via three mounting holes | | | |
| Temperature range — Storage | -20 … +70 °C | | | |
| Temperature range — Operation | 0 … +50 °C | | | |
| Shock (DIN-EN 60068-2-29) | 15 g / 6 ms in 3 axes | | | |
| Vibration (DIN-EN 60068-2-6) | 2 g / 20 … 500 Hz | | | |
| Protection class (DIN-EN 60529) | IP65 | | | |
| Material | Die-cast zinc housing | | Aluminum housing | |
| Weight | approx. 550 g (incl. pigtail) | | approx. 600 g (incl. pigtail) | |
| Control and display elements | Select & function keys for interface selections, mastering (zero), teach, presets, quality slider, frequency selection, factory settings; Web interface with application-specific presets; peak selection, video signal; freely selectable averaging possibilities; data reduction; setup management [4] | | | |

FSO = full scale output, SMR = start of measuring range, MMR = mid of measuring range, EMR = end of measuring range

The specified data apply to a white, diffuse reflecting surface (reference: ceramics)

[1] Factory setting 5 kHz; modifying the factory settings requires the IF2001/USB converter (optionally available)

[2] Measuring rate 5 kHz, median 9

[3] Based on digital output

[4] Connection to PC via IF2001/USB (optionally available)

| | Three models with measuring ranges from 2 mm to 50 mm |
|---|---|
| | **Blue Laser Technology** (Blue violet laser diode 405 nm) |
| 312Hz 375Hz 1000Hz | **Adjustable measuring rate up to 49.14 kHz** |
| INTER FACE | **Ethernet / Ethercat / RS422** Analog ouput via C-Box |
| A-RTSC | **Advanced Real-Time-Surface-Compensation** |
| Certified | **Calibration certificate included** |
| | **Measurement of** diffuse and specular surfaces |
| | **Configuration via web interface** |

Blue Laser sensors in the optoNCDT 2300BL series are designed for high speed displacement, distance and position measurements on red-hot glowing metals and organic materials. In numerous applications, Blue Laser sensors are superior to standard sensors that use a red laser diode. In contrast to a red laser, the blue-violet laser light does not penetrate materials such as wood, skin and foods. The blue laser generates a minimal laser point on the surface and therefore offers more stable, precise measurements.
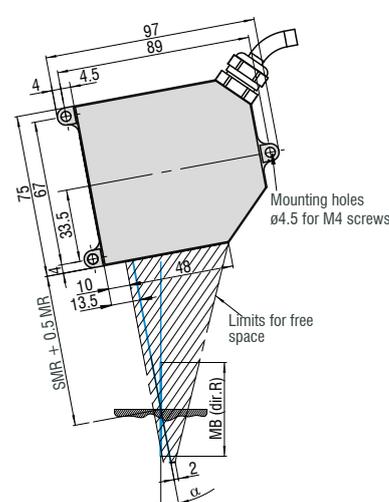
**optoNCDT 2310-50BL**
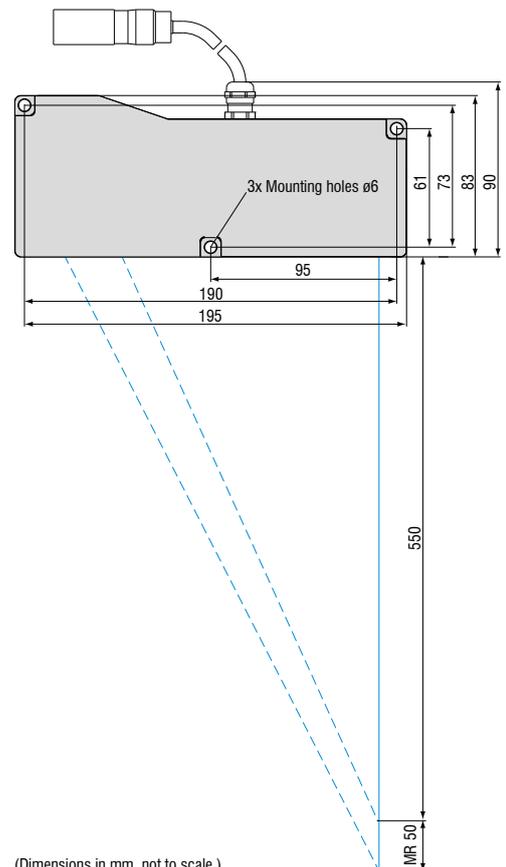


**optoNCDT 2300-2BL / 2300-5BL**
Diffuse reflection
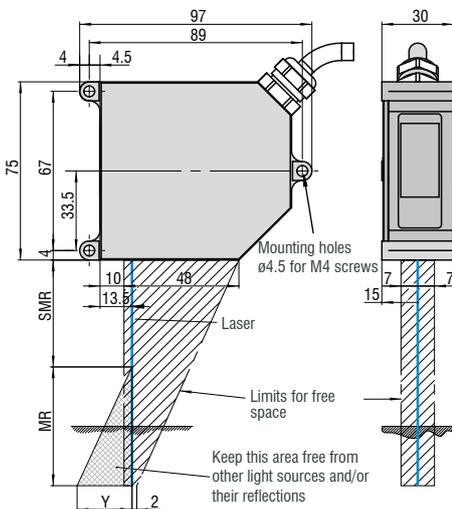


| MR | SMR | Y |
|---|---|---|
| 2 | 24 | 1.5 |
| 5 | 24 | 3.5 |

**optoNCDT 2300-2BL / 2300-5BL**
Direct reflection



| MR | SMR + 0.5 MR | α |
|---|---|---|
| 2 | 25 | 20.5° |
| 5 | 26.5 | 20° |

(Dimensions in mm, not to scale.)

| Model | | ILD2300-2 BL | ILD2300-5 BL | ILD2310-50 BL |
|---|---|---|---|---|
| Measuring range [1] | | 2 (2) mm | 5 (2) mm | 50 (25) mm |
| Start of measuring range | SMR | 24 (24) mm | 24 (24) mm | 550 (575) mm |
| Mid of measuring range | MMR | 25 (25) mm | 26.5 (25) mm | 575 (587.5) mm |
| End of measuring range | EMR | 26 (26) mm | 29 (26) mm | 600 (600) mm |
| Linearity | | $\leq \pm$ 0.6 $\mu m$ | $\leq \pm$ 1.5 $\mu m$ | $\leq \pm$ 40 $\mu m$ |
| | | $\leq \pm$ 0.03 % FSO | | $\leq \pm$ 0.08 % FSO |
| Resolution (with 20 kHz) | | 0.03 $\mu m$ | 0.08 $\mu m$ | 7.5 $\mu m$ |
| | | 0.0015 % FSO | | 0.015 % FSO |
| Measuring rate | | switchable (software) 49.14 / 30 / 20 / 10 / 5 / 2.5 / 1.5 kHz (49.14 kHz with reduced measuring range) | | |
| Light source | | Semiconductor laser <1 mW, 405 nm (blue violet), laser class 2 | | |
| Permissible ambient light | | 10,000 lx | | |
| Spot diameter | SMR | 70 x 80 $\mu m$ | 200 x 200 $\mu m$ | 400 ... 500 $\mu m$ |
| | MMR | 20 x 20 $\mu m$ | 20 x 20 $\mu m$ | 400 ... 500 $\mu m$ |
| | EMR | 80 x 100 $\mu m$ | 200 x 400 $\mu m$ | 400 ... 500 $\mu m$ |
| Protection class | | IP65 | | |
| Operating temperature | | 0 ... +50 °C | | |
| Storage temperature | | -20 ... +70 °C | | |
| Inputs/Outputs | | Ethernet/EtherCAT RS422 analog output via C-Box | | |
| Inputs | | Laser on/off Sync/Trigger input | | |
| Supply voltage | | 11 ... 30 VDC | | |
| Power consumption | | < 3 W (24 V) | | |
| LED | | status / power / Ethernet / EtherCAT | | |
| Sensor cable | Standard | 0.25 m (with connector) | | |
| | Option | 3 / 6 / 9 m with 15-pole sub-D Connector | | |
| Synchronization | | possible for simultaneous or alternating measurements | | |
| Electromagnetic compatibility (EMC) | | EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (group 1. class B) EN 61 000-6-2: 2006-03 | | |
| Vibration | | 2 g / 20 ... 500 Hz | | |
| Shock | | 15 g / 6 ms / 3 axes | | |
| Weight (with 25cm cable) | | 550 g | 550 g | approx. 800 g |

FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz

| | Blue Laser Technology (Blue violet laser diode 405 nm) |
|---|---|
| 312Hz 375Hz 1000Hz | **Adjustable measuring rate up to 49.14 kHz** |
| INTER FACE | **Ethernet / EtherCAT / RS422 Analog ouput via C-Box/2A** |
| A-RTSC | **Advanced Real-Time-Surface-Compensation** |
| Certified | **Calibration certificate included** |
| | **Configuration via web interface** |

### Blue Laser Sensor for direct reflection

The optoNCDT 2300-2DR high precision laser triangulation sensor is designed for highly dynamic measurements on reflective and shiny targets. The sensor can be fixed parallel to the measurement object, which greatly simplifies the installation process. Unlike conventional laser triangulation sensors, the optoNCDT 2300-2DR uses the directly reflected light of the laser. During measurements, the blue laser light is directly reflected by the measurement object onto the receiving optics. Due to the blue laser light, the signal on the receiver element is extremely stable, which means the sensor is able to measure to nanometer resolution. An extremely small laser spot size enables the detection of very small objects.
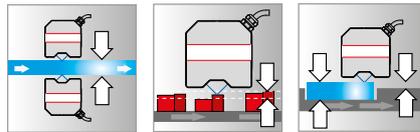
### High speed and precision on reflective, shiny surfaces

The optoNCDT 2300-2DR offers an adjustable measuring rate up to 49 kHz and so is suitable for dynamic high speed process monitoring. The new A-RTSC (Advanced Real Time Surface Compensation) feature is a development of the proven RTSC technology and enables more precise real time surface compensation when measuring onto different surface types.

The sensor is used for production control purposes such as thickness measurement of flat glass, assembly monitoring of extremely small parts and for distance measurements on annealed glass.

### Compact and easy to integrate

The entire electronics is integrated in a compact sensor housing which is a worldwide unique feature of this sensor class. Data output is via Ethernet, RS422 or EtherCAT. If the sensor is operated with the C-Box/2A signal processing unit (optional), an analog output is also available. All sensor configurations are carried out via a user-friendly web interface.
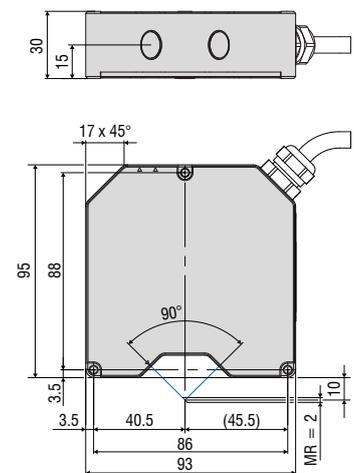
| Model | ILD 2300-2DR |
|---|---|
| Measuring range [1] | 2 mm (1 mm) |
| Start of measuring range | 9 mm (9 mm) |
| Mid of measuring range | 10 mm (9.5 mm) |
| End of measuring range | 11 mm (10 mm) |
| Linearity | $\leq \pm 0.6\ \mu m$ |
| | $\leq \pm 0.03\%$ FSO |
| Resolution (with 20 kHz) | 30 nm |
| | 0.0015 % FSO |
| Measuring rate | switchable (software) 49.14 / 30 / 20 / 10 / 5 / 2.5 / 1.5 kHz (49.14 kHz with reduced measuring range) |
| Permissible ambient light | 10,000 ... 40,000 lx |
| Light spot diameter — SMR | 21.6 x 25 $\mu m$ |
| Light spot diameter — MMR | 8.5 x 11 $\mu m$ |
| Light spot diameter — EMR | 22.4 x 23.7 $\mu m$ |
| Light source | Semiconductor laser <1 mW, 405 nm (blue violet), laser class 2 |
| Protection class | IP65 |
| Operating temperature | 0 ... +50 °C |
| Storage temperature | -20 ... +70 °C |
| Inputs/Outputs | RS422 / Ethernet / EtherCAT |
| Inputs | Laser on/off Synch / Trigger |
| Supply voltage | 11 ... 30 VDC |
| Power consumption | < 2 W (24 V) |
| Display — Status LED | off = Laser OFF<br>red = poor target; out of range<br>yellow = MMR<br>green = ok |
| Display — Power LED | off = Power OFF<br>green = Ethernet / RS422 |
| Sensor cable — Standard | 0.25 m (with connector) |
| Sensor cable — Option | 3/10 m with 15-pole sub-D Connector |
| Electromagnetic compatibility (EMC) | according to EN 55011/12.1998 and EN 50082-2/ 02.1996 |
| Vibration | 2 g / 20 ... 500 Hz |
| Shock | 15 g / 6 ms / 3 axes |

FSO = Full Scale Output
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz

## Accessories for all optoNCDT Series

### Power supply
- PS 2020 (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)

### Controller unit for evaluation and signal conversion
- C-Box/2A (controller for conversion and evaluation of up to 2 sensor signals)

### Interface card
- IF2008PCI / IF2008PCIe (interface card for multiple signal processing; analog and digital interfaces)

### USB converter
- IF2001/USB RS422/USB converter (converter for digital signals in USB)

### USB converter
- IF2004/USB 4-channel RS422/USB converter (converter for up to 4 digital signals in USB)

## Accessories for optoNCDT 1320 / 1420 / 1402CL1

### Supply and output cable (drag-chain suitable)
- PCF1420-1/I (1 m, output 4 ... 20 mA)
- PCF1420-1/I(01) (1 m, output 4...20 mA)
- PCF1420-3/I (3 m, output 4 ... 20 mA)
- PCF1420-6/I (6 m, output 4 ... 20 mA)
- PCF1420-10/I (10 m, output 4 ... 20 mA)
- PCF1420-15/I (15 m, output 4 ... 20 mA)
- PCF1420-3/U (3 m, with integrated resistor, output 1 ... 5 VDC)*
- PCF1420-6/U (6 m, with integrated resistor, output 1 ... 5 VDC)*
- PCF1420-10/U (10 m, with integrated resistor, output 1 ... 5 VDC)*
- PCF1420-15/U (15 m, with integrated resistor, output 1 ... 5 VDC)*
- PCF1420-3/IF2008 (3 m, interface and supply cable)
- PCF1420-6/IF2008 (6 m, interface and supply cable)
- PCF1420-10/IF2008 (10 m, interface and supply cable)
- PCF1420-3/C-Box (3 m)
* on request with output 2 ...10 VDC

### Supply and output cable, suitable for use with robots
(available in 90° version)
- PCR 1402-3/I (3 m)
- PCR 1402-6/I (6 m)
- PCR 1402-8/I (8 m)

## Accessories for optoNCDT 1610/1630

### Supply and output cable
- PC1605-3 (3 m)
- PC1605-6 (6 m)
- PC1607-5/BNC (5 m, BNC connector)

## Accessories for optoNCDT 1750/1750LL/1750BL/1750DR/ 1710/1710BL

### Supply and output cable (drag-chain suitable)
- PC1700-3 (3 m)
- PC1700-10 (10 m)
- PC1700-10/IF2008 (10 m, for use with interface card IF2008)
- PC1750-3/C-Box (3 m)
- PC1750-6/C-Box (6 m)
- PC1750-9/C-Box (9 m)

### Supply and output cable (suitable for use with robots)
- PCR1700-5 (5 m)
- PCR1700-10 (10 m)

### Supply and output cables for temperatures up to 200 °C
- PC1700-3/OE/HT (3 m)
- PC1700-6/OE/HT (6 m)
- PC1700-15/OE/HT (15 m)

### Protection housing
- SGH model (sizes S and M)
- SGHF model (sizes S and M)
- SGHF-HT model

## Accessories for optoNCDT 2300 / 2300LL / 2300BL / 2300-2DR

### Supply and output cable
- PC2300-0,5Y (connection cable to PC or PLC; for operation a PC2300-3/SUB-D will be required)
- PC2300-3/SUB-D (3 m; for operation a PC2300-0,5Y will be required)
- PC2300-3/IF2008 (interface and supply cable)
- PC2300-3/OE (3 m)
- PC2300-6/OE (6 m)
- PC2300-9/OE (9 m)
- PC2300-15/OE (15 m)
- PC2300-3/C-Box/RJ45 (3 m)
* other cable lengths on request

### Protection housing
- SGH model (sizes S and M)
- SGHF model (sizes S and M)
- SGHF-HT model

### Supply and output cables for temperatures up to 200 °C
- PC2300-3/OE/HT (3 m)
- PC2300-6/OE/HT (6 m)
- PC2300-9/OE/HT (9 m)
- PC2300-15/OE/HT (15 m)
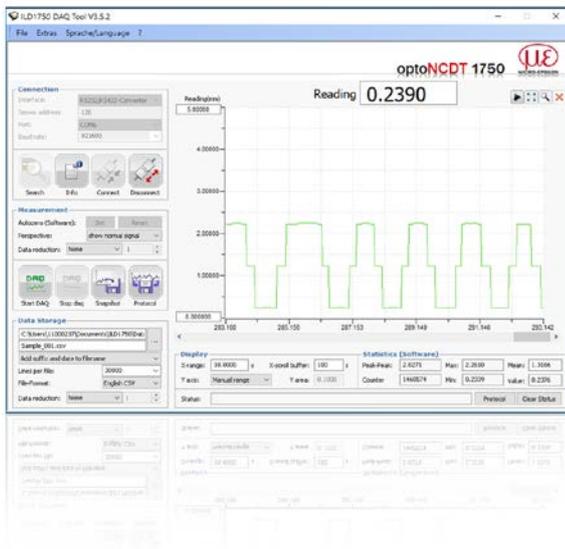
## optoNCDT Demo Tool

The scope of supply includes a software for easy sensor configuration. The settings can be implemented conveniently via a Windows user interface on the PC. The sensor parameters are transmitted to the sensor via the serial port and can also be saved if required. The software is available as single and multi-channel version. The sensor is connected to the PC via the sensor cable using a USB converter.
[for any ILD sensor]

### Free download

Download free of charge from www.micro-epsilon.com/download: software, driver and well-documented driver DLL for easy sensor integration in existing or customer software.

## Protection housing for harsh environments

To protect the laser sensors in extreme environments, individual protective housings are available for all sensor models. There are three different models:

### SGH model:

Completely enclosed housing with an integrated front window, where the sensor measures through the window. The water-resistant housing provides protection against solvents and detergents.

### SGHF model:

With window and compressed-air connection ideal for high ambient temperatures. The integrated air cooling of the housing offers optimum protection for the sensor.

### SGHF-HT model

This water-cooled protection housing with window and compressed-air connection is designed for measurement tasks in ambient temperatures up to 200 °C.
Suitable for all long-range sensors
optoNCDT 1710
optoNCDT 1750-500 and optoNCDT 1750-750
optoNCDT 2310
optoNCDT 2300 - 200
Maximum ambient temperature 200 °C
Maximum temperature of cooling water $T(max) = 10$ °C
Minimum water flow rate $Q(min) = 3$ liters/min



**SGHx ILD size S (140x140x71 mm)**
for optoNCDT 1750 / 2300 dimensions 97x75 mm

**SGHx ILD size M (140x180x71 mm)**
for optoNCDT 1750 / 2300 dimensions 150x80 mm

### IF2008PCI / IF2008 PCIe - PCI Interface card

The IF2008 interface card is designed for installation in PCs and enables the synchronous capture of four digital sensor signals and two encoders. The IF2008E expansion board enables the acquisition of two digital sensor signals, two analog sensor signals and eight I/O signals. The absolutely synchronous data acquisition plays an important role particularly for planarity or thickness measurement tasks. The data are stored in a FIFO memory in order to enable resource-saving processing in blocks in the PC.

#### Special features

- 4x digital signals and 2x encoders with IF2008 basic PCB
- 2x digital signals, 2x analog signals and 8x I/O signals with IF2008E expansion board
- 6x digital signals, 2x encoders, 2x analog signals and 8x I/O signals together with IF2008E
- FIFO data memory
- Synchronous data acquisition
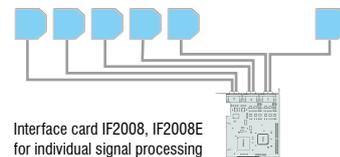


Interface card IF2008, IF2008E for individual signal processing

### IF2001/USB converter RS422 to USB

The RS422/USB converter transforms digital signals from a laser-optical sensor into a USB data packet. The sensor and the converter are connected via the RS422 interface of the converter. Data output is done via USB interface. The converter loops through further signals and functions such as laser on/off, switch signals and function output. The connected sensors and the converter can be programmed through software.

## IF2004/USB: 4-channel converter from RS422 to USB

The RS422/USB converter is used for transforming digital signals from up to four optical sensors into USB data signals. The converter has four trigger inputs and a trigger output for connecting additional converters. Data is output via an USB interface. The connected sensors and the converter can be programmed through software.

### Special features

- 4x digital signals via RS422
- 4x trigger inputs, 1x trigger output
- Synchronous data acquisition
- Data output via USB

## C-Box/2A Controller for conversion and evaluation of up to two sensor signals

C-Box/2A is used for fast D/A conversion of two digital input signals or for evaluating two digital sensor signals. The controller is compatible with the optoNCDT 2300 laser triangulation sensors. Output of the sensor signals is possible via two configurable analog outputs, Ethernet or USB. Handling of the C-Box/2A and of the connected sensors are performed via web interface. Averaging functions, thickness, diameter, step and inclinations can be calculated. The D/A conversion is executed at 16 bit and max. 70 kHz.

## Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement,
distance and position



Sensors and measurement devices for
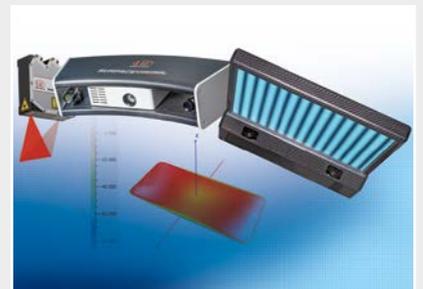non-contact temperature measurement



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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