MICRO-EPSILON

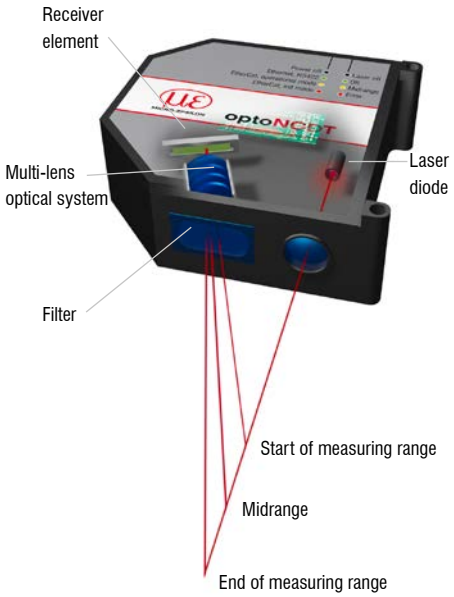
More Precision

optoNCDT // Laser displacement sensors (triangulation)

- *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.



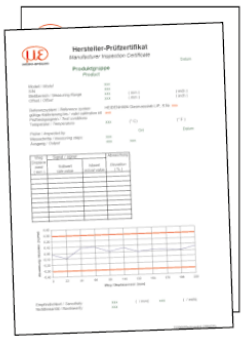
optoNCDT stands for high precision laser triangulation sensors

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.



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	Measuring ranges	*Resolution / Repeatability*	*Linearity*	*Measuring rate*	*Laser*	*Targets*	
Compact Class							
optoNCDT 1320	10 - 100 mm	> 1 µm *	0.10 %	up to 2 kHz	red	all common targets	8 - 9
optoNCDT 1420	10 - 500 mm	> 0.5 µm *	from 0.08 %	up to 4 kHz	red		10 - 11
optoNCDT 1420 CL1	10 - 200 mm	> 0.5 µm *	from 0.08 %	up to 4 kHz	red class 1		12 - 13
High Speed PSD Sensor							
optoNCDT 1610 / 1630	4 - 100 mm	> 0.2 µm *	0.2 %	up to 100 kHz	red	all common targets	14 - 15
Industry Standard							
optoNCDT 1750	2 - 750 mm	> 0.1 µm *	from 0.06 %	up to 7.5 kHz	red	all common targets	16 - 17
High Performance Sensors							
optoNCDT 2300	2 - 300 mm	> 0.03 µm	from 0.02 %	up to 49.14 kHz	red	all common targets	18 - 19
Sensors with Small Laser Line							
optoNCDT 1750LL	2 - 50 mm	> 0.1 µm *	from 0.06 %	up to 7.5 kHz	red	shiny / structured	20 - 21
optoNCDT 2300LL	2 - 50 mm	> 0.03 µm	from 0.02 %	up to 49.14 kHz	red		22 - 23
Long-Range Sensors							
optoNCDT 1710-50	50 mm	7.5 µm	0.1 %	up to 2.5 kHz	red	all common targets	24 - 25
optoNCDT 2310	10 - 50 mm	> 0.5 µm	0.03 %	up to 49.14 kHz	red		26 - 27
optoNCDT 1710 - 1000	1000 mm	100 µm	0.1 %	up to 2.5 kHz	red		28 - 29
Blue Laser Sensors							
optoNCDT 1700BL	20 - 1000 mm	> 1.5 µm	from 0.08 %	up to 2.5 kHz	blue	red-hot glowing / transparent / organic	30 - 31
optoNCDT 2300BL	2 - 50 mm	> 0.03 µm	from 0.03 %	up to 49.14 kHz	blue		32 - 33
optoNCDT 2300-2DR	2 mm	0.03 µm	0.03 %	up to 49.14 kHz	blue	reflecting / transparent	34 - 35

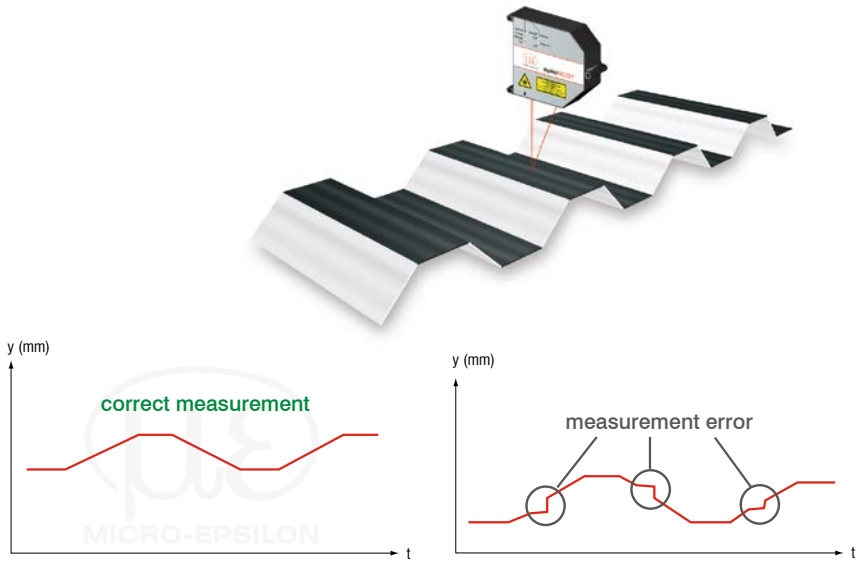
Accessories	
Cables and protection housings	36 - 37
Interface converters and signal processing units	38 - 39

*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.

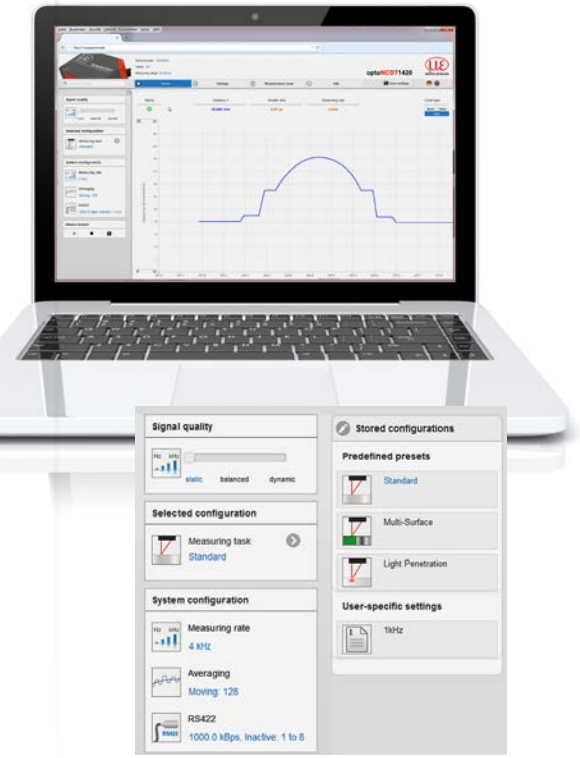
The exposure time or the amount of light produced by the laser is optimally matched to the reflection characteristics of the target surface.

Unique to optoNCDT 1700, 1750 and 2300 laser sensors, this innovative real-time control always achieves 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.

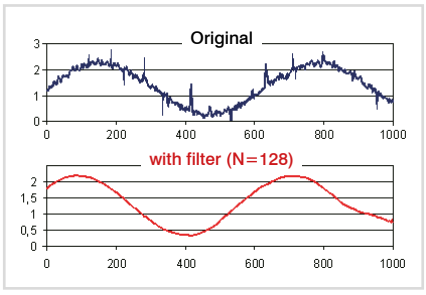
Compact with integrated controller
Despite their very compact dimensions, the ILD series have a fully integrated controller. As a result, simple, rapid installation and wiring is possible. The sensors can be integrated easily even into restricted installation space.

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.

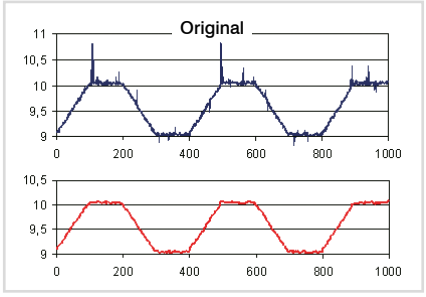
Analog and digital output types
The optoNCDT sensors are equipped with different outputs to fulfil industrial user requirements. As well as analog interfaces, digital interfaces are also available for direct connection with the existing production environment. For further signal processing, interface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

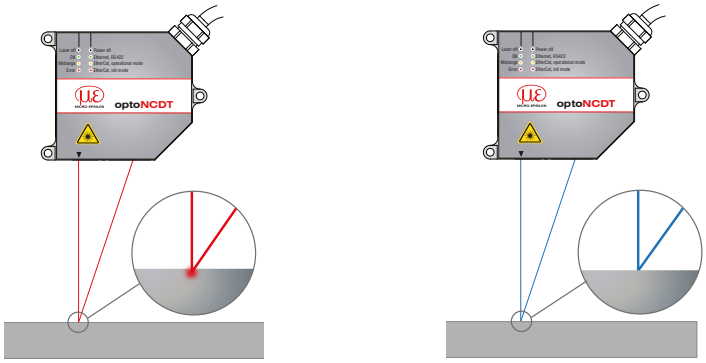


Profile measurement with median

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.

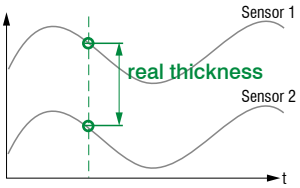


The red laser penetrates the surfaces of some materials which produces a blurry image on the sensor element. Sensors with blue laser light do not penetrate the material and are imaged sharply onto the receiver element.

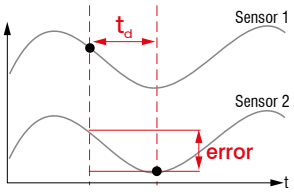
Synchronous measurement with multiple sensors

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 1700, 1750 and 2300 models]

Synchronisation 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

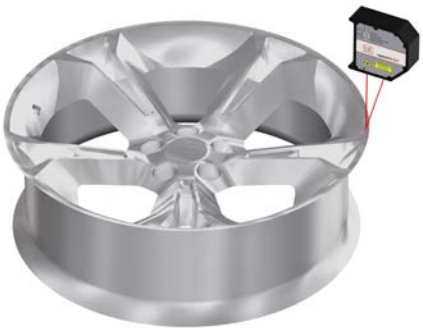
For applications where the above standard sensors do not meet your requirements, it is possible to supply a sensor with modified optical system, design or equipment.
Please contact us - we will be pleased to advise you.

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

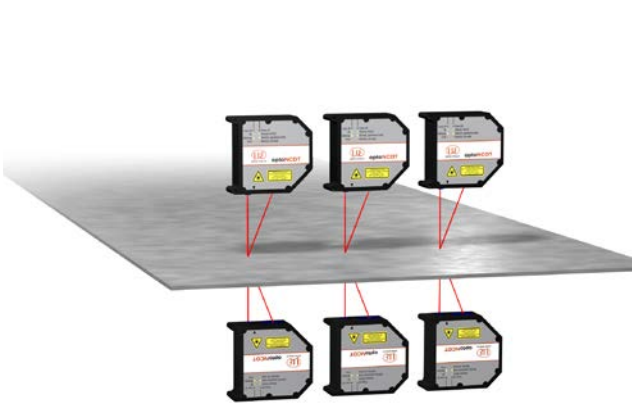
Distance of vehicle to road surface
In road tests, pitching and rolling movements, spring compression during braking and other quantities are measured with optoNCDT sensors. optoNCDT is particularly suitable here due to its compact construction and the possibility of powering the sensor from the vehicle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

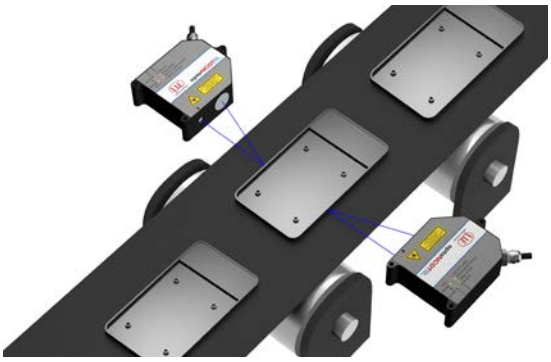


Shape conformance on aluminum wheels
After casting, aluminum wheels are measured for a range of properties, e.g. hub depth, roundness and bulging.

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.

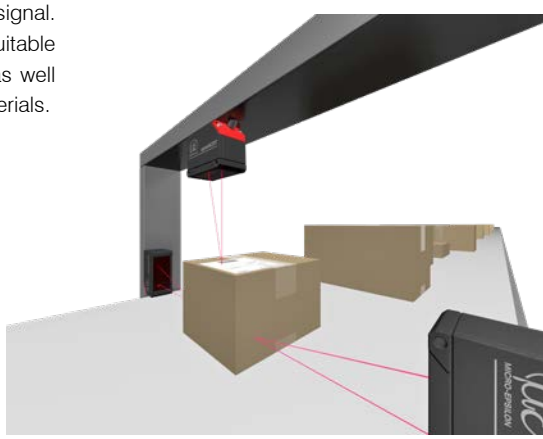


Synchronous thickness measurement
optoNCDT sensors are ideally suited to the thickness measurement of a variety of (web) materials. Due to the high measuring rate and the possibility of synchronizing multiple sensors, even moving and oscillating targets can be reliably acquired.



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.

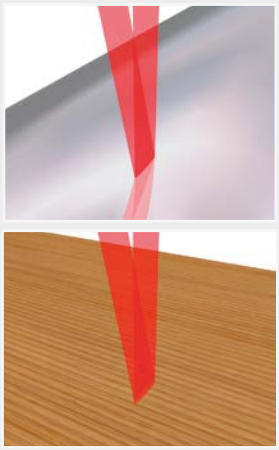
Package dimensions

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.



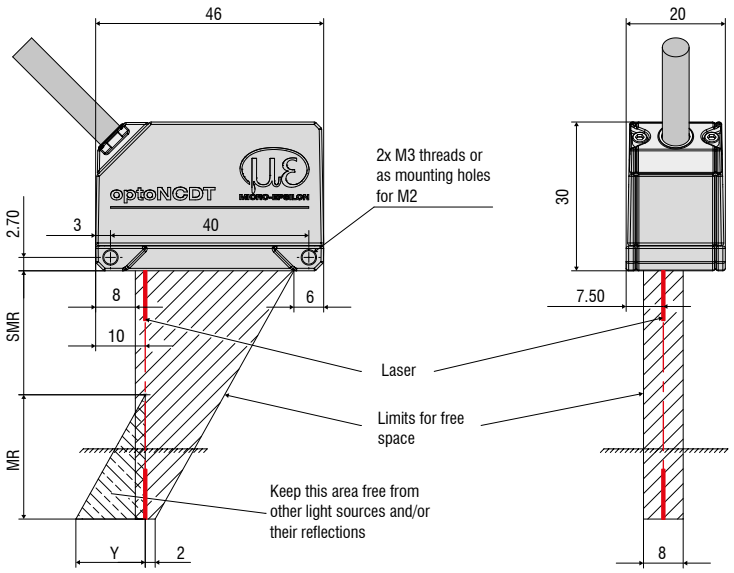
- Ideal for serial and OEM applications
- Compact design with integrated controller
- Measuring rate up to 2 kHz
- Analog and digital output
- Trigger input and teach-in
- Plug & Play via select button
- Application-specific presets for fast sensor settings
- ATC Auto Target Compensation

The optoNCDT 1320 is a new laser triangulation sensor with compact size. This series provides the ideal entry-level sensor for precise measurement of displacement, distance and position. This series measures displacement, distance and position. The controller is integrated in the housing which considerably simplifies the installation procedure. Due to its extremely compact size, the sensor 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. The 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 due to unique ease of use

The optoNCDT 1320 models enable quick sensor commissioning using the multifunction sensor button. An intuitive web interface enables the user to carry out extended sensor settings. The settings for the measurement task can be quickly selected using predefined presets. Using 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
Midrange	MMR	25 mm	37.5 mm	60 mm	100 mm
End of measuring range	EMR	30 mm	50 mm	85 mm	150 mm
Linearity		≤ ± 10 µm	≤ ± 25 µm	≤ ± 50 µm	≤ ± 100 µm
		≤ ± 0.10 % FSO			
Repeatability [1]		1 µm	2.5 µm	5 µm	10 µm
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		10,000 lx			
Spot diameter ± 10 %	SMR	90 x 120 µm	100 x 140 µm	90 x 120 µm	750 x 1100 µm
	MMR	45 x 40 µm	120 x 130 µm	230 x 240 µm	
	EMR	140 x 160 µm	390 x 500 µm	630 x 820 µm	
	smallest diameter	45 x 40 µm with 24 mm	55 x 50 µm with 31 mm	70 x 65 µm with 42 mm	-
Protection class		IP65			
Laser safety class		class 2 in accordance with DIN EN 60825-1 : 2008-05			
Temperature stability		± 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 (according to IEC 60068-2-6)			
Shock		15 g / 6 ms / 3 axes (according to IEC 60068-2-29)			
Weight	without cable	approx. 30 g			
	with 3 m cable	approx. 145 g			
Displays		2 x 3 color LEDs for power and status			
Operation	button	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			
Electronics		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 12bit; [4] Connection to PC via IF2001/USB (optionally available)

- Ideal for serial and OEM applications
- Compact design with integrated controller
- Measuring rate up to 4 kHz
- Analog (U/I) and digital output
- 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.

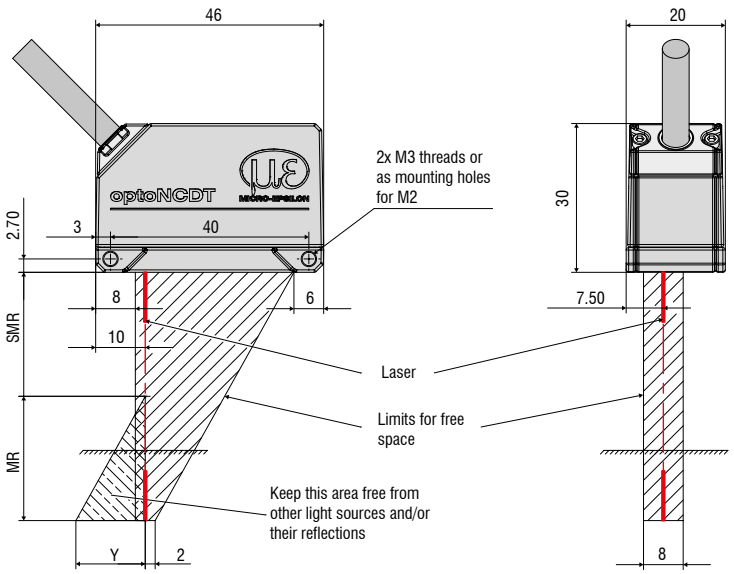
Unique ease of use, individual results

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 sensors 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



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
Midrange	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 [1]		≤ ± 8 µm	≤ ± 20 µm	≤ ± 40 µm	≤ ± 80 µm	≤ ± 160 µm	≤ ± 500 µm
		≤ ± 0,08 % FSO					≤ ± 0,1 % FSO
Repeatability [2]		0.5 µm	1 µm	2 µm	4 µm	8 µm	20... 40 µm
Measuring rate [3]		0.25 kHz / 0.5 kHz / 1 kHz / 2 kHz / 4 kHz					
Light source		semiconductor laser <1 mW, 670 nm (red)					
Permissible ambient light		10,000 lx					
Spot diameter ± 10 %	SMR	90 x 120 µm	100 x 140 µm	90 x 120 µm	750 x 1100 µm	750 x 1100 µm	750 x 1100 µm
	MMR	45 x 40 µm	120 x 130 µm	230 x 240 µm			
	EMR	140 x 160 µm	390 x 500 µm	630 x 820 µm			
	smallest diameter	45 x 40 µm with 24 mm	55 x 50 µm with 31 mm	70 x 65 µm with 42 mm	-	-	-
Protection class		IP65					
Laser safety class		Class 2 in accordance with DIN EN 60825-1 : 2008-05					
Temperature stability		± 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 / 16bit					
Vibration		20 g / 20 ... 500 Hz (in accordance with IEC 60068-2-6)					
Shock		15 g / 6 ms / 3 axes (according to IEC 60068-2-29)					
Weight	with 3 m cable	approx. 145 g					
	with pigtail	approx. 60 g					
Displays		2 x 3 color LEDs for power and status					
Operation	button	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		3m integrated, open ends					
		0.3m pigtail with 12-pole M12 connector					
Electronics		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: 2kHz, 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)

- Ideal for serial and OEM applications
- Laser class 1
- Compact design with integrated controller
- Measuring rate up to 4kHz
- Analog and digital output
- 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 µW, which is significantly lower than laser class 2.

Use in automotive production

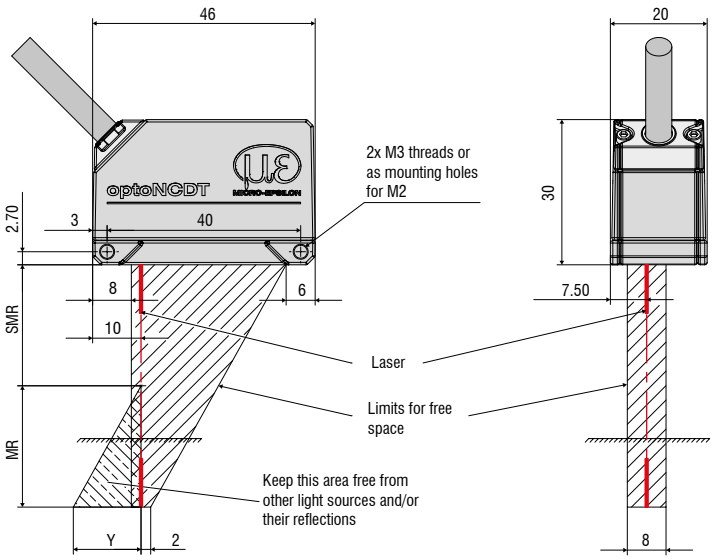
Particularly in the field of automotive production, increased demands are being placed on manufacturers to take adequate safety precautions in their production plants, including the use of laser class 1 sensors if people are working in close proximity to laser sensors. For example, this is the case when 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 µW. 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	-	-
Midrange	MMR	25 mm	37.5 mm	60 mm	-	-
End of measuring range	EMR	30 mm	50 mm	85 mm	-	-
Linearity [1]		≤ ± 8 µm	≤ ± 20 µm	≤ ± 40 µm	-	-
		≤ ± 0.08 % FSO				
Repeatability [2]		0.5 µm	1 µm	2 µm	-	-
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		10,000 lx				
Spot diameter ± 10 %	SMR	90 x 120µm	100 x 140 µm	90 x 120 µm	-	-
	MMR	45 x 40µm	120 x 130 µm	230 x 240 µm		
	EMR	140 x 160µm	390 x 500 µm	630 x 820 µm		
	smallest diameter	45 x 40µm with 24mm	55 x 50 µm with 31 mm	70 x 65 µm with 42 mm	-	-
Protection class		IP65				
Laser safety class		Class 1 in accordance with DIN EN 60825-1 : 2015-07				
Temperature stability		± 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 ... 20mA (1 ... 5 V with cable PCF1420-3/U); 12 bit; freely scalable within the measuring range [4]				
	digital	RS422 / 16bit				
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				
Displays		2 x 3 color LEDs for power and status				
Operation	button	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				
Electronics		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)

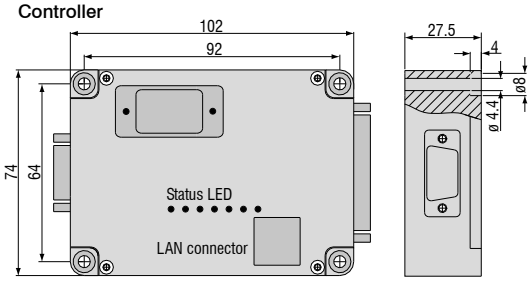
- Nine models with measuring ranges from 4 mm to 100 mm
- Sensor head and separate controller
- Up to 100 kHz (-3dB) true analog frequency response
- INTERFACE: Analog outputs (U/I) Ethernet

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.

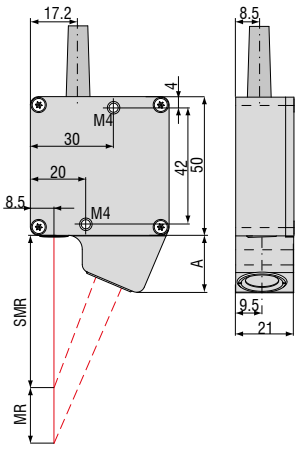
The LD 1610 series achieves a frequency response of 10kHz (-3dB) while the LD 1630 series is suitable for measurements up to 100 kHz (-3dB).

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

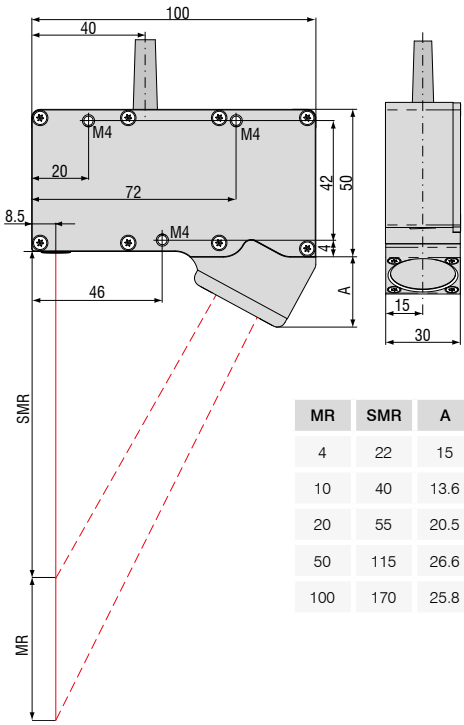
Controller



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, static [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, static[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, 20g 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	± 10 V (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 V ... 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		50,000 h (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

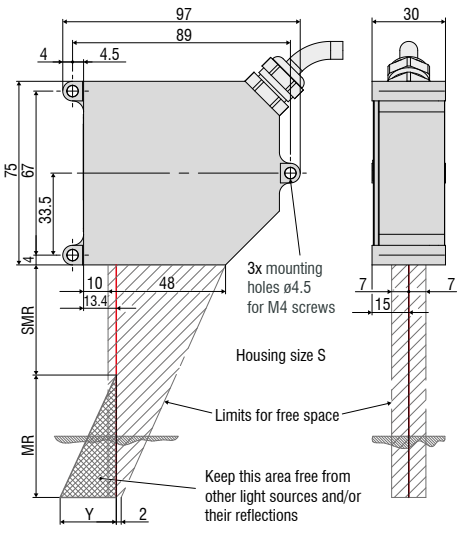
- **Compact design with integrated controller**
- **Measuring rate up to 7.5 kHz**
- **Analog and digital output**
- **Trigger input/teach-in/zero-setting/ mastering/synchronization**
- **Configuration via web interface or Plug & Play**
- **Application-specific presets and individual sensor settings**
- **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 extremely compact size, the sensor can also be integrated into restricted installation spaces.

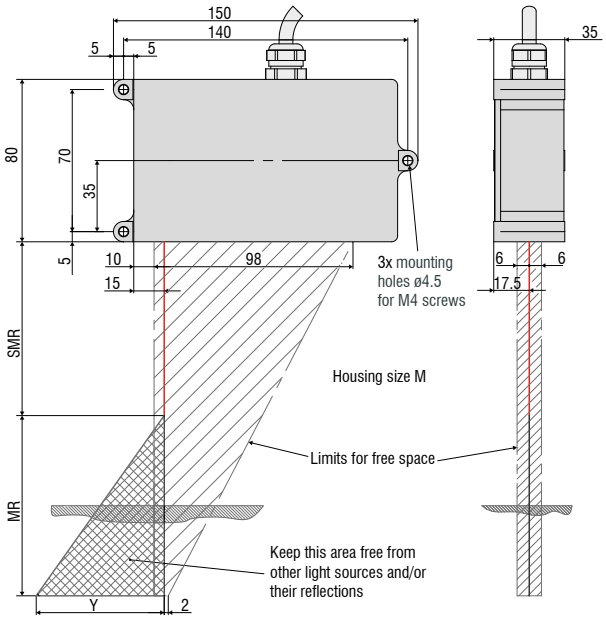
The optoNCDT 1750 laser stands out due to its real-time surface compensation feature. The real-time surface compensation feature (RTSC) determines the amount of reflection from the target surface during continuous exposure and in real-time. The exposure time or the amount of light produced by the laser 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)

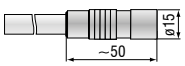


optoNCDT 1750 (500/750 mm)

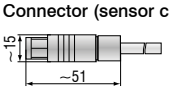


MR	SMR	Y
2	24	2
10	30	7
20	40	12
50	45	25
100	70	35
200	70	70
500	200	180
750	200	270

Connector (sensor side)



Connector (sensor cable)



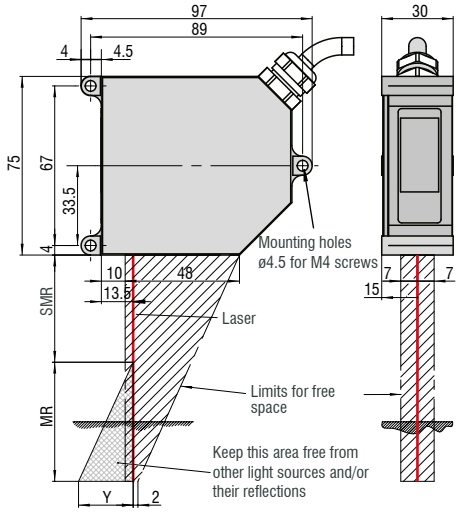
Model		ILD1750-2	ILD1750-10	ILD1750-20	ILD1750-50	ILD1750-100	ILD1750-200	ILD1750-500	ILD1750-750
Measuring range		2 mm	10 mm	20 mm	50 mm	100 mm	200 mm	500 mm	750 mm
Start of measuring range		24 mm	30 mm	40 mm	45 mm	70 mm	70 mm	200 mm	200 mm
Midrange		25 mm	35 mm	50 mm	70 mm	120 mm	170 mm	450 mm	575 mm
End of measuring range		26 mm	40 mm	60 mm	95 mm	170 mm	270 mm	700 mm	950 mm
Linearity		≤ ± 1.6 µm	≤ ± 6 µm	≤ ± 12 µm	≤ ± 30 µm	≤ ± 60 µm	≤ ± 160 µm	≤ ± 350 µm	≤ ± 670 µm
		≤ ± 0.08 % FSO	≤ ± 0.06 % FSO				≤ ± 0.08 % FSO	≤ ± 0.07 % FSO	≤ ± 0.09 % FSO
Repeatability [2]		0.1 µm	0.4 µm	0.8 µm	2 µm	4 µm	8 µm	20 µm	30 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 : 2015-07							
Spot diameter	SMR	80 µm	110 µm	320 µm	570 µm	740 µm	1300 µm	1500 µm	
	MMR	35 µm	50 µm	45 µm	55 µm	60 µm	1300 µm	1500 µm	
	EMR	80 µm	110 µm	320 µm	570 µm	700 µm	1300 µm	1500 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)							
Measurement value output	analog	4 … 20 mA; 0 … 5 V / 0 … 10 V; 16 bit; freely scalable within the measuring range							
	digital	RS422 / 18 bit							
Operation	button	select & function buttons for interface selections, mastering (zero), teach, presets, quality slider, frequency selection, factory settings							
	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							
	option	Extension: 3 / 10 m							
Synchronization		possible for simultaneous or alternating measurements							
Protection class		IP65							
Vibration		2g / 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
- Adjustable measuring rate up to 49.14 kHz
- Ethernet / EtherCAT / RS422 Analog ouput via C-Box
- Advanced Real Time Surface Compensation
- Calibration certificate included
- Measurement of diffuse and specular surfaces
- Thickness measurement of transparent materials
- Configuration via web interface

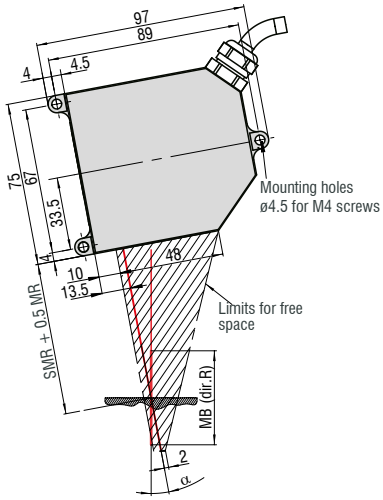
The optoNCDT 2300 is the new, high performance version of Micro-Epsilon laser triangulation sensors and offers an adjustable measuring rate of up to 49.14 kHz. The entire electronics is already integrated in a compact sensor housing which is a worldwide unique feature of this sensor class. The new A-RTSC (Advanced Real Time Surface Compensation) feature is a development of the company's 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 using 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



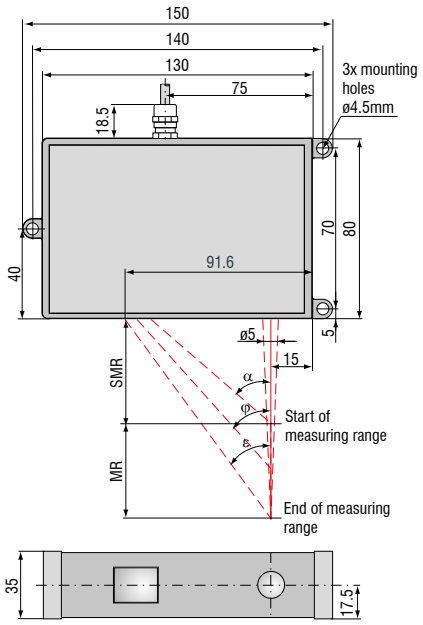
MR	SMR	Y
2	24	1.5
5	24	3.5
10	30	6.5
20	40	10.0
50	45	23.0
100	70	33.5

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 °

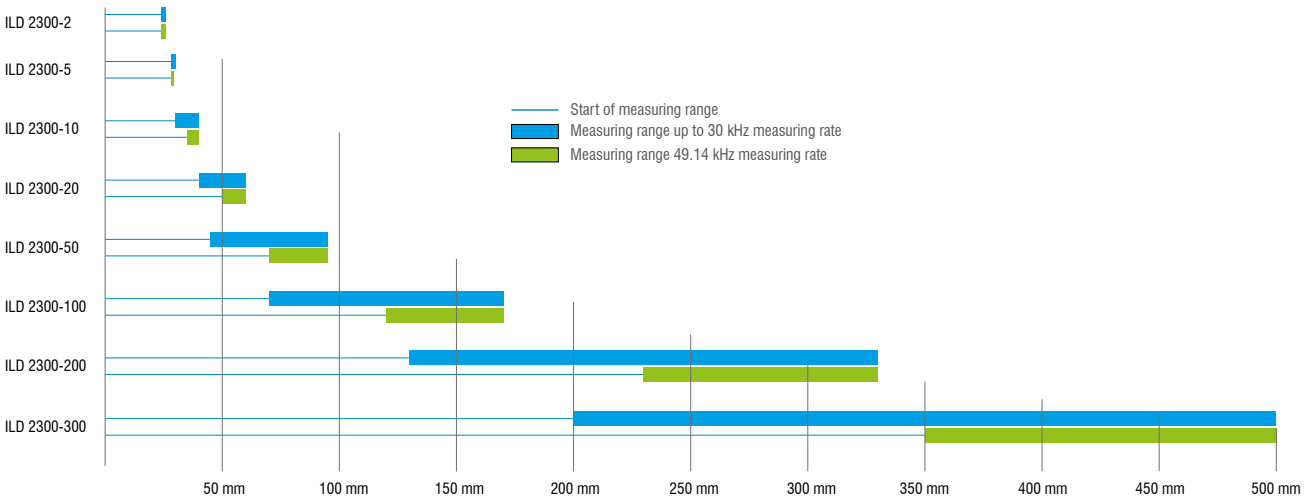
optoNCDT 2300-200 /2300-300



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
Midrange	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		≤ ± 0.6 µm	≤ ± 1.5 µm	≤ ± 2 µm	≤ ± 4 µm	≤ ± 10 µm	≤ ± 20 µm	≤ ± 60 µm	≤ ± 90 µm
		≤ ± 0.03 % FSO		≤ ± 0.02 % FSO		≤ ± 0.02 % FSO		≤ ± 0.03 % FSO	
Resolution (with 20 kHz)		0.03 µm	0.08 µm	0.15 µm	0.3 µm	0.8 µm	1.5 µm	3 µm	4.5 µm
		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 µm	70 x 80 µm	75 x 85 µm	140 x 200 µm	255 x 350 µm	350 µm	1300 µm	580 x 860 µm
	MMR	23 x 23 µm	30 x 30 µm	32 x 45 µm	46 x 45 µm	70 x 70 µm	130 µm	1300 µm	380 x 380 µm
	EMR	35 x 85 µm	70 x 80 µm	110 x 160 µm	140 x 200 µm	255 x 350 µm	350 µm	1300 µm	470 x 530 µm
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 V							
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							

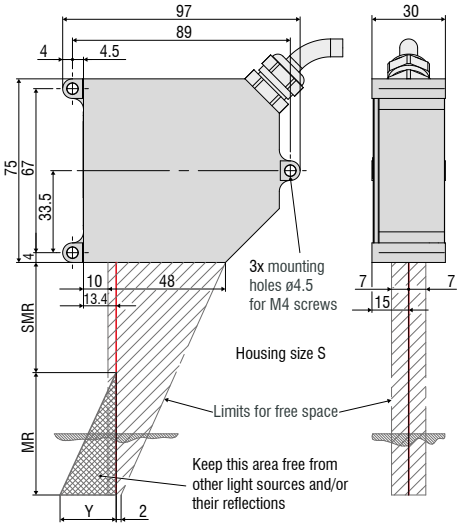
FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz



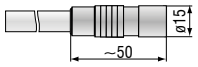
- Laser Line averages across shiny metallic or structured surfaces
- Four models with measuring ranges from 2 mm to 50 mm
- RTSC Real Time Surface Compensation
- 312Hz 375Hz 1000Hz Adjustable measuring rate up to 7.5 kHz
- Analog Digital Analog (U/I) and digital output
- Filter inside Adjustable filter functions (firmware)
- 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.

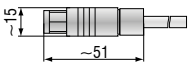
optoNCDT 1750LL (2/10/20/50 mm)

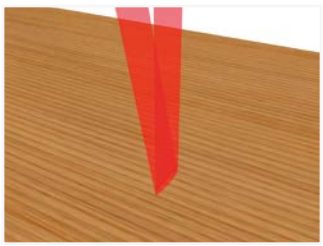


Connector (sensor side)



Connector (sensor cable)





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
Midrange		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 : 2015-07			
Spot diameter	SMR	85 x 240 µm	120 x 405 µm	185 x 485 µm	350 x 320 µm
	MMR	24 x 280 µm	35 x 585 µm	55 x 700 µm	70 x 960 µm
	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)			
Measurement value output	analog	4 … 20 mA; 0 … 5 V / 0 … 10 V; 16 bit; freely scalable within the measuring range			
	digital	RS422 / 18bit			
Operation	button	select & function buttons for interface selections, mastering (zero), teach, presets, quality slider, frequency selection, factory settings			
	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			
	option	extension: 3 / 10 m			
Synchronization		possible for simultaneous or alternating measurements			
Protection class		IP65			
Vibration		2 g / 20 ... 500 Hz			
Shock		15g / 6 ms			
Weight (with 25 cm cable)		approx. 550 g			

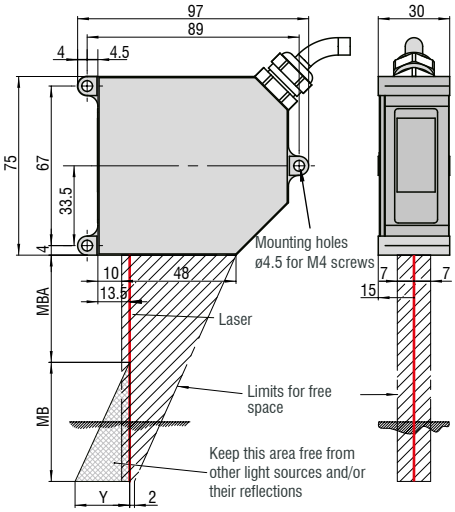
FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
[1] based on digital output
[2] Connection to PC via IF2001/USB (optionally available)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range

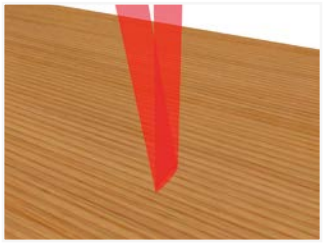
- Laser Line averages across shiny metallic or structured surfaces
- Four models with measuring ranges from 2 mm to 50 mm
- Adjustable measuring rate up to 49.14 kHz
- INTER FACE: Ethernet / EtherCAT / RS422 Analog ouput via C-Box
- A-RTSC: Advanced Real-Time-Surface-Compensation
- Certified: Calibration 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 extremely 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 using a user-friendly web interface.

optoNCDT 2300LL





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
Midrange	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		≤ ± 0.6 µm	≤ ± 2 µm	≤ ± 4 µm	≤ ± 10 µm
		≤ ± 0.03 % FSO	≤ ± 0.02 % FSO		
Resolution (with 20 kHz)		0.03 µm	0.15 µm	0.3 µm	0.8 µm
		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 µm	120 x 405 µm	185 x 485 µm	350 x 320 µm
	MMR	24 x 280 µm	35 x 585 µm	55 x 700 µm	70 x 960 µm
	EMR	64 x 400 µm	125 x 835 µm	195 x 1200 µm	300 x 1940 µm
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 (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			

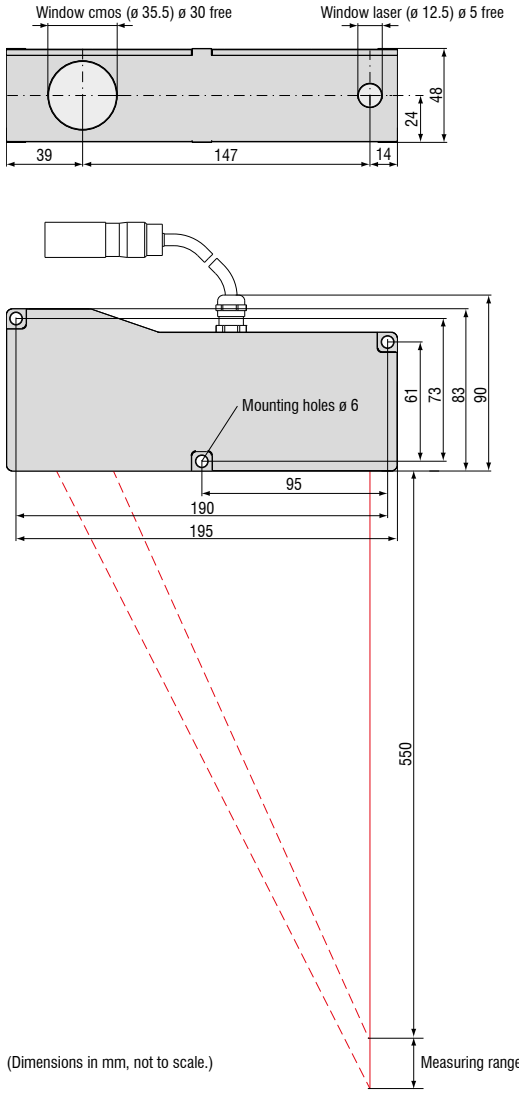
FSO = Full Scale Output; The specified data apply to a white, diffuse reflecting surface (reference: ceramics)
SMR = start of measuring range; MMR = midrange; EMR = end of measuring range
[1] Range specifications: value in brackets is valid for a measuring rate of 49.14 kHz

- High accuracy and long standoff distances
- Adjustable measurement rate up to 2.5 kHz
- Real Time Surface Compensation
- Analog and digital output
- Adjustable filter functions (firmware)
- 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)



(Dimensions in mm, not to scale.)

Model		ILD1710-50
Measuring range		50 mm
Start of measuring range		550 mm
Midrange		575 mm
End of measuring range		600 mm
Linearity		≤ ± 50 µm
		≤ ± 0.1% FSO
Resolution		7.5 µm
		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 µm
	MMR	400 x 500 µm
	EMR	400 x 500 µm
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

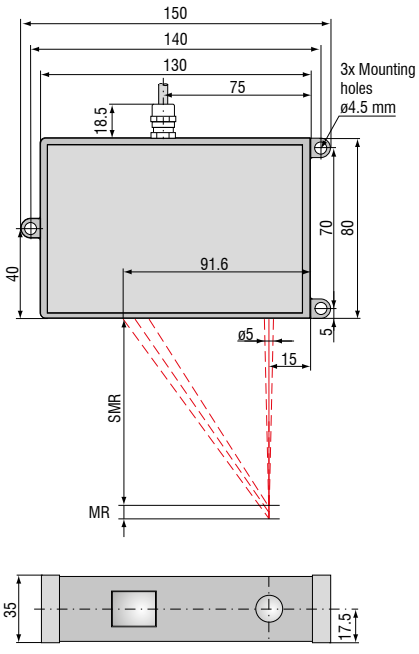
FSO = Full Scale Output; All specifications apply for a diffusely reflecting matt white ceramic target;
SMR = start of measuring range MMR = midrange EMR = end of measuring range

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

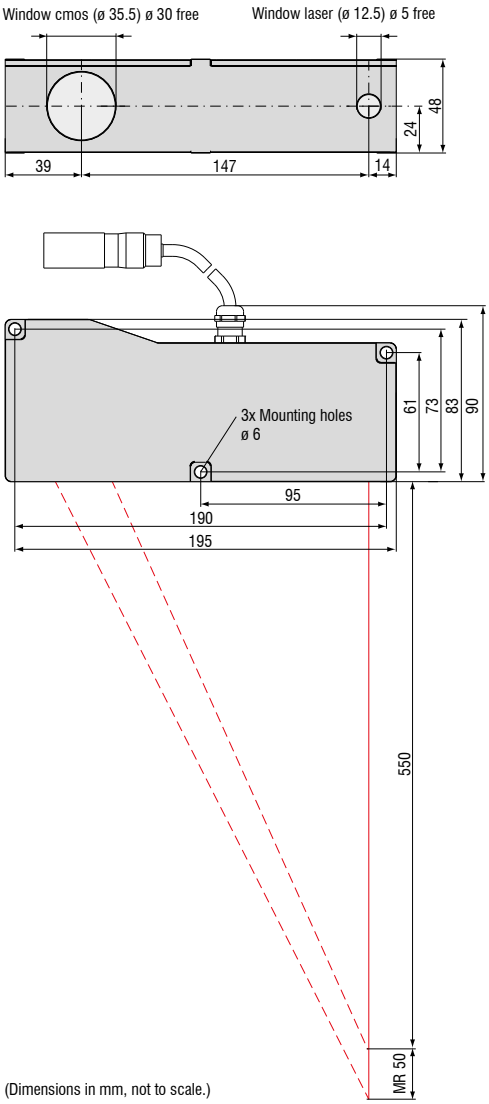
The optoNCDT 2310 long-range laser sensors are designed for large measurement distances combined with high precision.

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.)

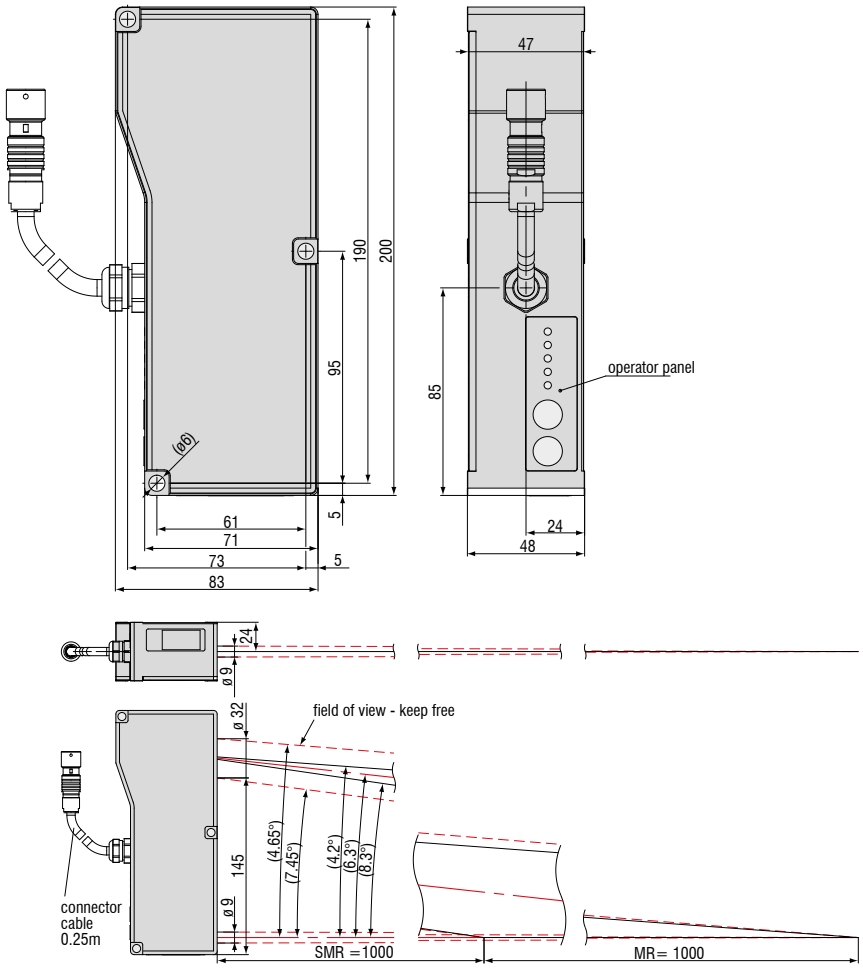
Model		ILD2310-10	ILD2310-20	ILD2310-40	ILD2310-50
Measuring range [1]		10 (5) mm	20 (10) mm	40 (20) mm	50 (25) mm
Start of measuring range		95 (100) mm	90 (100) mm	175 (195) mm	550 (575) mm
Midrange		100 (102.5) mm	100 (105) mm	195 (205) mm	575 (587.5) mm
End of measuring range		105 (105) mm	110 (110) mm	215 (215) mm	600 (600) mm
Linearity		≤ ± 3 µm	≤ ± 6 µm	≤ ± 12 µm	≤ ± 50 µm
		≤ ± 0.03 % FSO	≤ ± 0.03 % FSO	≤ ± 0.03 % FSO	≤ ± 0.1 % FSO
Resolution		0.5 µm	1 µm	2 µm	7.5 µm
		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 µm	200 µm	230 µm	400 ... 500 µm
	MMR	400 x 500 µm	60 µm	210 µm	400 ... 500 µm
	EMR	400 x 500 µm	200 µm	230 µm	400 ... 500 µm
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 - 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		2g / 20 … 500Hz			
Shock		15g / 6ms / 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
- Adjustable measuring rate up to 2.5 kHz
- Real Time Surface Compensation
- Analog (U/I) and digital output
- Adjustable filter functions (firmware)
- 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



Model		ILD1710-1000
Measuring range		1000 mm
Start of measuring range (offset distance)		1000 mm
Midrange		1500 mm
End of measuring range		2000 mm
Linearity		≤ ± 1 mm
		≤ ± 0.1 % FSO
Resolution (at 2.5 kHz without averaging)		100 µm
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 2 x 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

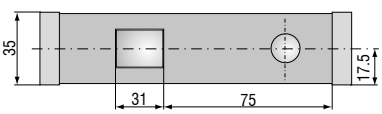
- Six models with measuring ranges from 20 mm to 1000 mm
- Blue Laser Technology (Blue violet laser diode 405 nm)
- Real Time Surface Compensation
- Adjustable measuring rate up to 2.5 kHz
- Analog (U/I) and digital output
- Adjustable filter functions (firmware)
- High flex cables for dragchain or robot use
- Calibration certificate included

Equipped with a blue-violet laser diode (405nm), the optoNCDT 1700BL sensor achieves high accuracies on red-hot glowing metals and organic materials.

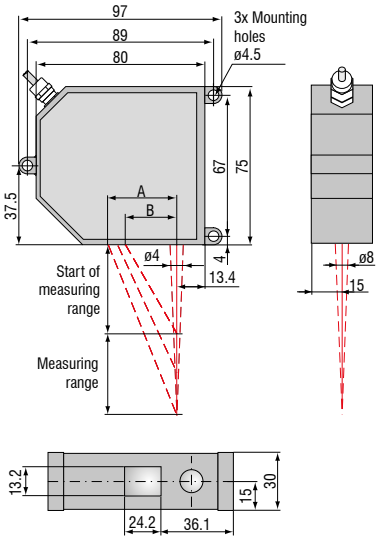
In numerous applications, Blue Laser sensors are superior to standard sensors that use a red laser diode. In contrast to a red laser, the reduced wavelength of the blue laser light does not penetrate materials such as wood, skin and foods. The blue laser generates a minimal laser point on the surface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

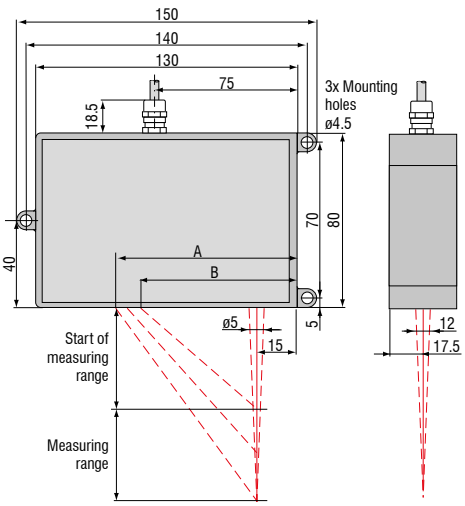
MR	SMR	A	B
20	40	30.1	22.0
200	100	35.4	25.1
500	200	101	85
750	200	101	85



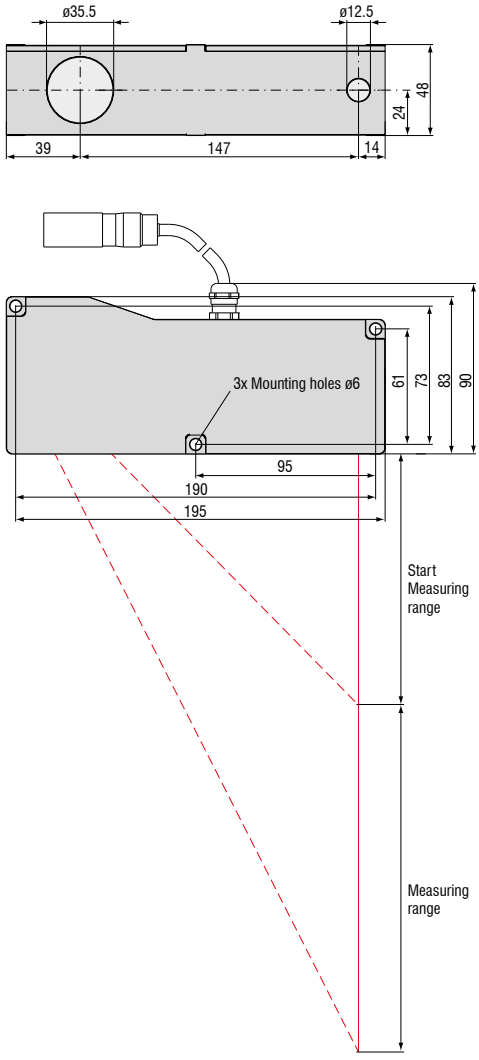
optoNCDT 1700BL (20/200 mm)



optoNCDT 1700BL (500/750 mm)



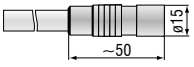
optoNCDT 1710 (50/1000 mm)



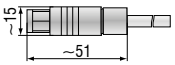
Model		ILD 1700-20BL	ILD 1700-200BL	ILD 1700-500BL	ILD 1700-750BL	ILD 1710-50BL	ILD 1710-1000BL
Measuring range		20 mm	200 mm	500 mm	750 mm	50 mm	1000 mm
Start of measuring range		40 mm	100 mm	200 mm	200 mm	550 mm	1000 mm
Midrange		50 mm	200 mm	450 mm	575 mm	575 mm	1500 mm
End of measuring range		60 mm	300 mm	700 mm	950 mm	600 mm	2000 mm
Linearity		≤ ± 16 µm	≤ ± 200 µm	≤ ± 400 µm	≤ ± 750 µm	≤ ± 50 µm	≤ ± 1 mm
		≤ ± 0.08 % FSO	≤ ± 0.1 % FSO	≤ ± 0.08 % FSO	≤ ± 0.1 % FSO	≤ ± 0.1 % FSO	≤ ± 0.1 % FSO
Resolution (at 2.5 kHz without averaging)		1.5 µm	12 µm	30 µm	50 µm	5 µm	100 µm
Measuring rate		2.5 kHz / 1.25 kHz / 625 Hz / 312.5 Hz (adjustable)					
Light source		semiconductor laser < 1 mW, 405 nm (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	320 µm	1300 µm	1500 µm	1500 µm	400 x 500 µm	2.5…5 mm
	MMR	45 µm	1300 µm	1500 µm	1500 µm	400 x 500 µm	2.5…5 mm
	EMR	320 µm	1300 µm	1500 µm	1500 µm	400 x 500 µm	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 RS 422 / 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 (with connector)		standard 0.25 m integrated / option: 3 m or 10m 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. 550 g	approx. 550 g	approx. 600 g	approx. 600 g	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

Connector (sensor side)



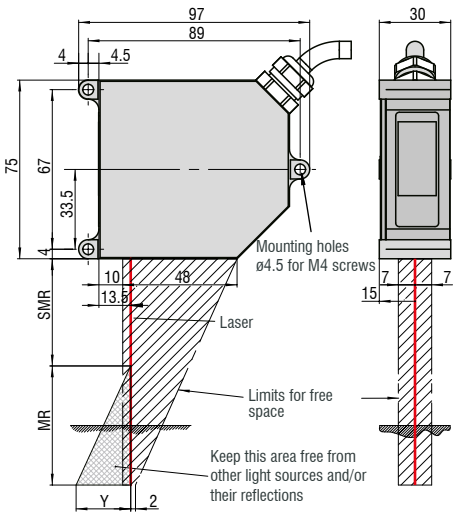
Connector (sensor cable)



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

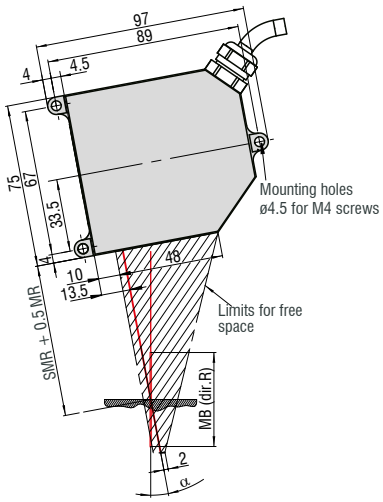
Blue Laser sensors in the optoNCDT 2300BL series are designed for high speed displacement, distance and position measurements on red-hot glowing metals and organic materials. In numerous applications, Blue Laser sensors are superior to standard sensors that use a red laser diode. In contrast to a red 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 2300-2BL / 2300-5BL
Diffuse reflection



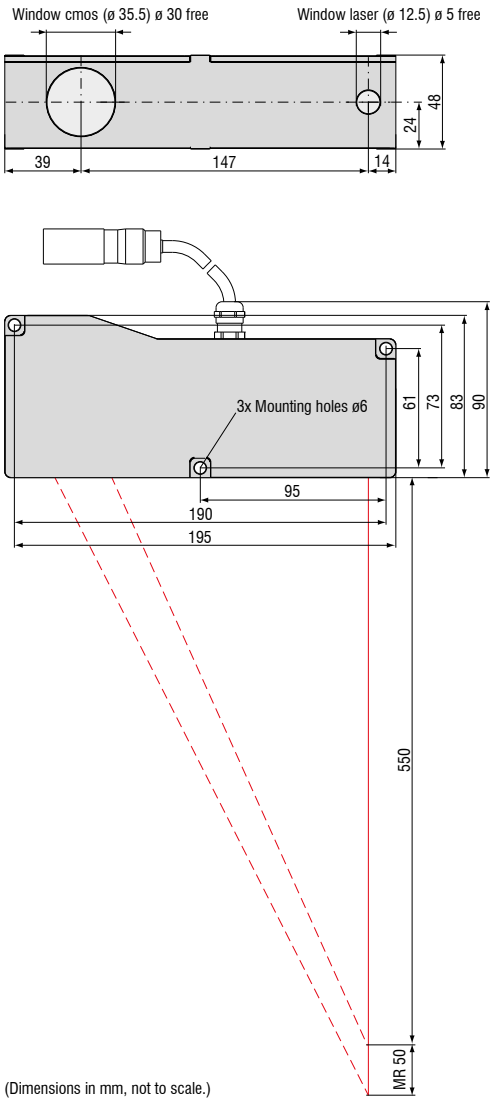
MR	SMR	Y
2	24	1.5
5	24	3.5

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



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

optoNCDT 2310-50BL



(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
Midrange	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		≤ ± 0.6 µm	≤ ± 1.5 µm	≤ ± 40 µm
		≤ ± 0.03 % FSO		≤ ± 0.08 % FSO
Resolution (with 20 kHz)		0.03 µm	0.08 µm	7.5 µm
		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 µm	200 x 200 µm	400 ... 500 µm
	MMR	20 x 20 µm	20 x 20 µm	400 ... 500 µm
	EMR	80 x 100 µm	200 x 400 µm	400 ... 500 µm
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 25 cm 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

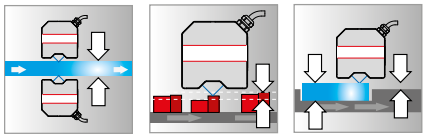
- Blue Laser Technology (Blue violet laser diode 405 nm)
- Adjustable measuring rate up to 49.14 kHz
- INTER FACE: Ethernet / EtherCAT / RS422 Analog ouput via C-Box/2A
- A-RTSC: Advanced Real-Time-Surface-Compensation
- Certified: Calibration certificate included
- Configuration via web interface

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

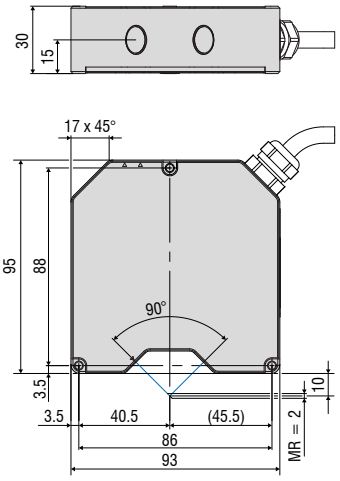
The optoNCDT 2300-2DR offers an adjustable measuring rate up to 49 kHz and so is suitable for dynamic high speed process monitoring. The new A-RTSC (Advanced Real Time Surface Compensation) feature is a development of the proven RTSC technology and enables more precise real time surface compensation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



Model		ILD 2300-2DR
Measuring range [1]		2 mm (1 mm)
Start of measuring range		9 mm (9 mm)
Midrange		10 mm (9.5 mm)
End of measuring range		11 mm (10 mm)
Linearity		≤ ± 0.6 µm
		≤ ± 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 µm
	MMR	8.5 x 11 µm
	EMR	22.4 x 23.7 µm
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)
Displays	status LED	off = Laser OFF red = poor target; out of range yellow = MMR green = ok
	power LED	off = Power OFF green = Ethernet / RS422
Sensor cable	standard	0.25m (with connector)
	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 V AC, 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

- IF2008 (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...5V DC)*
- 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)
- PC1420-6/IF2008 (6 m, supply and output cable)
- PCF1420-10/IF2008 (10 m, interface and supply cable)

* 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

- PC 1605-3 (3 m)
- PC 1605-6 (6 m)
- PC 1607-5/BNC (5 m, BNC connector)

Accessories for optoNCDT 1750 / 1750LL / 1700BL

Supply and output cable (drag-chain suitable)

- PC 1700-3 (3 m)
- PC 1700-10 (10 m)
- PC 1700-10/IF2008 (10 m, for use with interface card IF2008)
- PC 1700-3/T (3 m, for use with trigger box)
- PC 1700-10/T (10 m, for use with trigger box)
- PC 1700-3/USB (3 m, with USB-RS422-converter, power supply 90 ... 230 V AC)

Supply and output cable (suitable for use with robots)

- PCR 1700-5 (5 m)
- PCR 1700-10 (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

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)
- PC 2300-3/IF2008 (interface and supply cable)
- PC 2300-3/OE (3 m)
- PC 2300-6/OE (6 m)
- PC 2300-9/OE (9 m)
- PC 2300-15/OE (15 m)

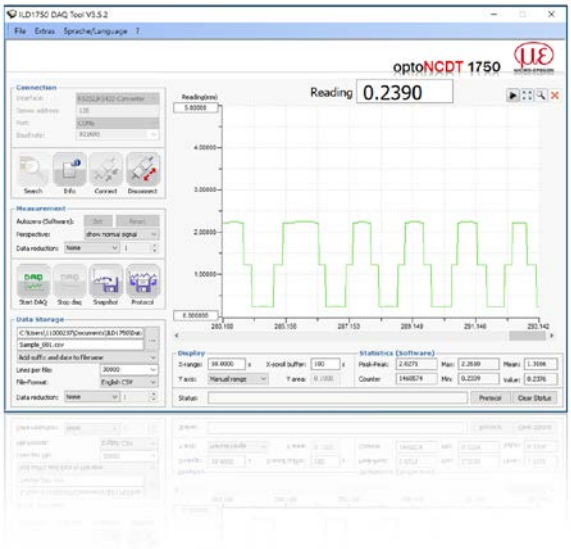
* other cable lengths on request

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 sent 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 environment

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.

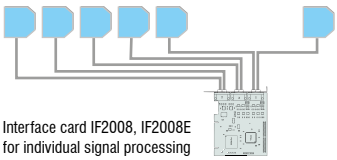
SGHF-HT model
This water-cooled protection housing with window and compressed-air connection is designed for measurement tasks in ambient temperatures up to 200 °C.
Suitable for all long-range sensors
optoNCDT 1710
optoNCDT 1750-500 and optoNCDT 1750-750
optoNCDT 2310
optoNCDT 2300-200
Maximum ambient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

SGHx ILD size S (140 x 140 x 71 mm)
for optoNCDT 1750 / 2300 dimensions 97 x 75 mm

SGHx ILD size M (140 x 180 x 71 mm)
for optoNCDT 1750 / 2300 dimensions 150 x 80 mm

IF2008 - 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 the PC in blocks.



Interface card IF2008, IF2008E
for individual signal processing

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
- Additional expansion board for a total of 6x digital signals, 2x encoders, 2x analog signals and 8x I/O signals
- FIFO data memory
- Synchronous data acquisition

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 features 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.

High performance sensors made by Micro-Epsilon

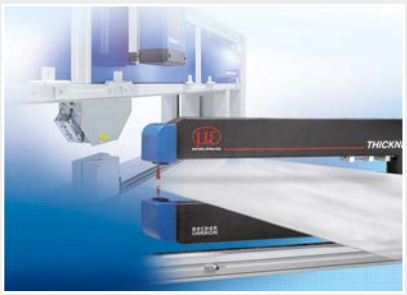
Sensors and systems for displacement and position

Sensors and measurement devices for non-contact temperature measurement

2D/3D profile sensors (laser scanner)

Optical micrometers, fiber optic sensors and fiber optics

Color recognition sensors, LED analyzers and color inline spectrometer



Measurement and inspection systems

Modifications reserved / Y9761188-J061049MLO

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