



# More Precision

**optoNCDT** // Laser Triangulation Displacement Sensors





- *Non-contact and wear-free*
- *Large stand off*
- *Tiny measuring spot for small targets*
- *High speed measurement*
- *High precision*
- *Almost all targets can be measured*

**The optoNCDT product group represents the highest precision in laser-based optical displacement and position measurement.**

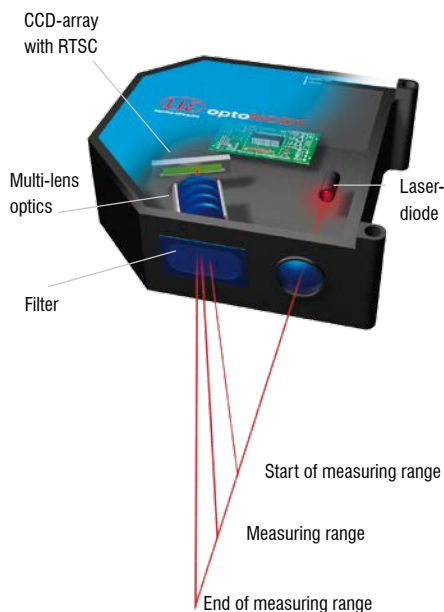
Laser-based optical displacement sensors measure from a large distance to the target using a very small spot which enables measurements on the very small parts. The large measurement distance in turn enables measurements to be taken against difficult target surfaces such as hot metals.

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.

**Leadership in laser displacement measurement**

Micro-Epsilon has a long-standing success of developing laser displacement sensors. Already a pioneer in the field of CCD sensors, Micro-Epsilon has continually raised the bar in industrial laser displacement measurement. The current optoNCDT range now offers numerous series, each of which is amongst the best in its class.



**Measurement principle: Laser triangulation**

Laser triangulation sensors operate with a laser diode which projects a visible light spot onto the surface of 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 16x0 Series an analogue PSD module is used as the position-sensitive measuring element, whereas with the remaining sensors CMOS elements and CCD elements are used.



**LASER RADIATION**  
Do not stare into the beam  
CLASS 2 LASER PRODUCT  
IEC 60825-1: 2008-05  
P≤1mW; λ=670nm

IEC - Standard

optoNCDT sensors use a semiconductor laser with a wavelength of 670nm (visible/red). The maximum optical output power is 1mW. The sensor is classified as laser class II. A warning sign is attached to the sensor housing. The optoNCDT 1700BL uses a semiconductor laser with a wavelength of 405nm.

## General information

page 4 - 7

### optoNCDT Laser triangulation sensors

- Advantages and special features
- Typical applications



## High Performance with integrated Controller

page 16 - 17

### Series 1700

- Ranges 2 - 750mm
- Resolution from 0.025 $\mu$ m
- No external controller



## Laser Sensors for shiny metallic and rough Surfaces

page 20 - 23

### Series 1700LL / 2300LL

- Ranges 2 - 50mm
- LL option for metallic or rough surfaces



## Blue Laser Technology

page 30 - 33

### Series 1700BL / 2300BL

- Ranges 2 - 1000mm
- Resolution from 0.03 $\mu$ m
- Suitable for red glowing metals, silicon and organic matters



## Compact & Low Cost

page 8 - 15

### Series 1302 / 1402 / 1402(025) / 1402SC

- Ranges 5 - 600mm
- Resolution from 1 $\mu$ m
- For tiny installation rooms



## Highest Precision Sensors

page 18 - 19

### Series 2300

- Ranges 2 - 200mm
- Resolution from 0.03 $\mu$ m
- Unmatched accuracy
- Measuring rate up to 49kHz



## Large Stand Off

page 24 - 29

### Series 1710-50 / 1710-1000 / 2310

- Ranges 10 - 1000mm
- Resolution from 0.5 $\mu$ m
- Large stand off



## High Speed PSD Sensors

page 34 - 35

### Series 1610 / 1630

- Ranges 4 - 100mm
- Resolution from 0.2 $\mu$ m
- Up to 100kHz true analogue frequency response



### Designed for industrial applications

The sensors in the optoNCDT product range are designed for industrial applications. Due to their robust construction and user friendly technical features, they achieve precise measurement results even in harsh ambient conditions. Each series is available in a number of measurement ranges, covering one of the widest laser measurement product ranges in the market.

### Analogue and digital output types

The optoNCDT sensors are equipped with a number of outputs to fulfil many industrial user requirements. Both analogue and digital interfaces are available, to maximise flexibility of sensor integration to your existing production environments. Sensors with USB interfaces can be configured using an external PC and software supplied as standard.

### Compact with integrated controller

Despite their very compact dimensions, Series 1302, 1402, 1700, 1700LL and 2300 have a fully integrated controller. As a result, simple, rapid installation and wiring is possible. The sensors can be integrated easily into the tightest installation space.

### 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. For integration with robot systems, robot-compatible cables for the 1302, 1402, 1700, 1700LL and 2300 Series can be supplied as an option.

### High measuring rate

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 high-speed 16x0 Series achieves measuring rates of up to 100kHz (-3dB).

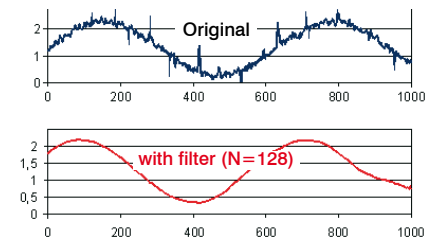
### Certified quality: Calibration certificate

To document the performance capability of the optoNCDT sensors, each sensor is calibrated before delivery and supplied with its own calibration certificate. This document is supplied with the sensor and is used as proof to the achieved measurement precision. [available for all series except 1302]

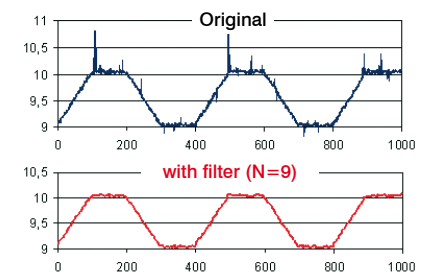


### Adjustable filter functions

A number of filters are available in order to obtain optimum results for each application: sliding mean, recursive mean and median. The filters are applied directly to the measurement results inside the controller before output. [available for all series except 16x0]



Vibration measurement with sliding mean



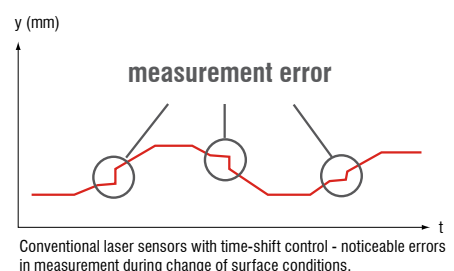
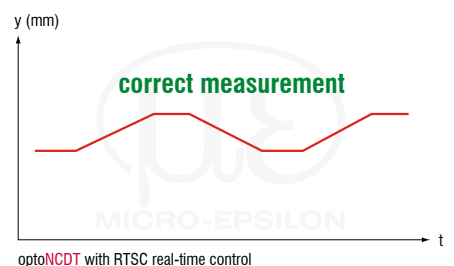
Profile measurement with median

### A world first: Real Time Surface Compensation (RTSC)

Through the unique RTSC function, the amount of reflection from the target surface is compensated 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 Micro-Epsilon sensors, this innovative real-time control always achieves optimum results, even with rapidly changing surface types.



### Comparison: optoNCDT with RTSC and conventional sensor



Conventional laser sensors with time-shift control - noticeable errors in measurement during change of surface conditions.

Standard, commercially-available laser triangulation sensors normally operate with a time-shift control, which builds on previous measurement cycles. In this case, the amount of reflection from previous measurements is used to derive the degree of reflection for the next measurement. With changing or textured surfaces the measurement results therefore deviate noticeably from the actual measurement value, whereas optoNCDT is controlled in real time and as such, is adjusted to the optimum reflection conditions without needing to apply averaging filters.

[available for 1710-50 and for all series except 1302, 1402, 16x0]



### Measurement with multiple sensors

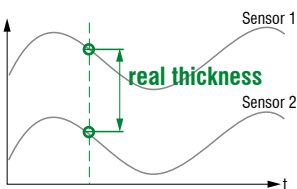
For many applications, it is necessary to measure or acquire data simultaneously using multiple sensors. The following range of functions are available to support synchronised measurements.

#### Genuine synchronisation of two sensors

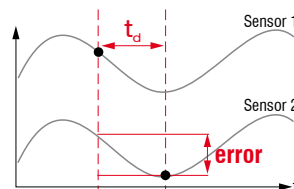
A „true synchronous“ measurement is required to precisely acquire moving or oscillating objects during thickness or differential measurements. In this case, one optoNCDT acts as the master, which provides the corresponding cycle pulse for the second sensor (slave). This function facilitates the genuine synchronous pulsing of two sensors.

[available for 1710-50, for all series 1700 and 2300]

#### 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

#### IF2008 Interface Card for synchronous data acquisition

The IF2008 Interface Card is designed for the data acquisition of up to eight sensors (6x digital, 2x analogue) and two encoder. This enables the simultaneous evaluation of multiple signals. Here, the sensors can be located opposite one another, e.g. for thickness measurement, or mounted in one plane, e.g. for differential height measurement. The interface card reads out the data from all the connected devices simultaneously and passes them to an external PC for further processing.

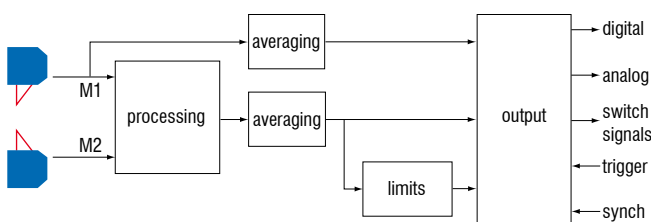
Whereas the simultaneous measurement method is intended for opaque targets, alternating synchronisation, which prevents possible interference, can be set up for transparent objects.

[technical data on page 34]

#### CSP 2008: Controller for up to six sensors

The CSP2008 controller can be used to process between two and six digital or analogue input signals (2 x internal plus 4 x external via EtherCAT modules from Beckhoff of almost all Micro-Epsilon displacement sensors). EtherCAT can also be used as an external interface for connecting further sensors and I/O modules. The controller has a high luminance display so that measured values can be easily read, even from a long distance.

[technical data on page 35]



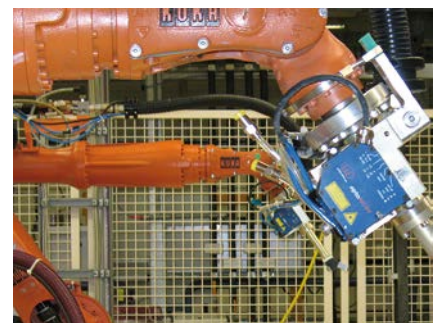
Thickness measurement with 2 optoNCDT laser sensors



optoNCDT on trimming systems of saw mills



Profile measurement of marine propellers



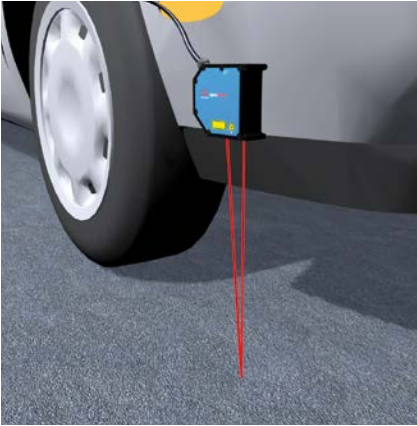
optoNCDT on robots in car production



Strip thickness measurement with two sensors



High speed measurement of black rubber

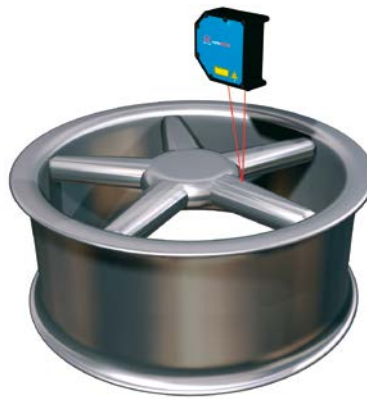
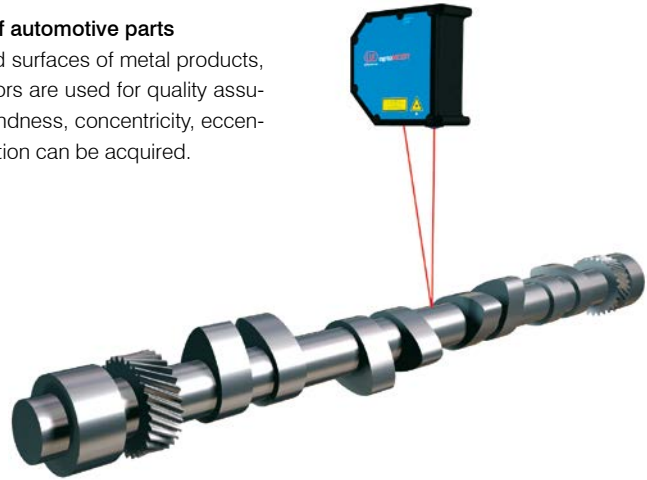


#### Distance of vehicle to road surface

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. For these applications, special models with increased resistance to extraneous light and vibration are available.

#### Measurement of automotive parts

On the machined surfaces of metal products, optoNCDT sensors are used for quality assurance. Here, roundness, concentricity, eccentricity and deflection can be acquired.



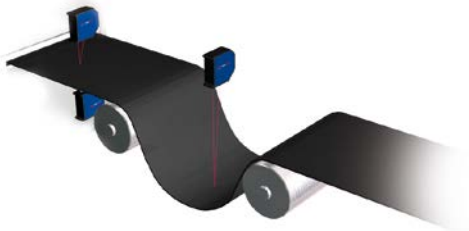
#### Shape conformance on aluminum wheels

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



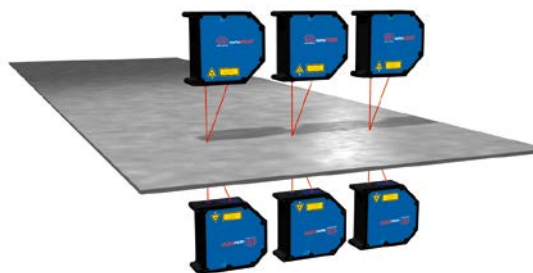
#### Car Body positioning in production lines

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 sprayed surfaces.



#### Deflection

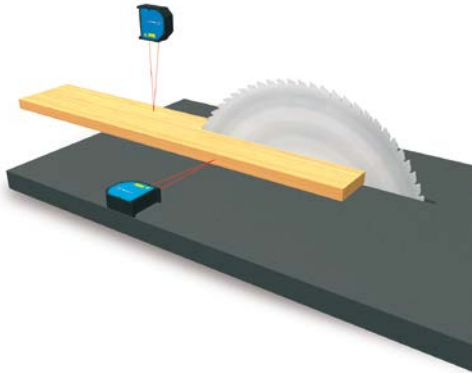
Black rubber, an extremely difficult material to measure, is already measured directly after the calender with optoNCDT sensors. The sensors provide an error-free production of the rubber web.



#### Synchronous thickness measurement

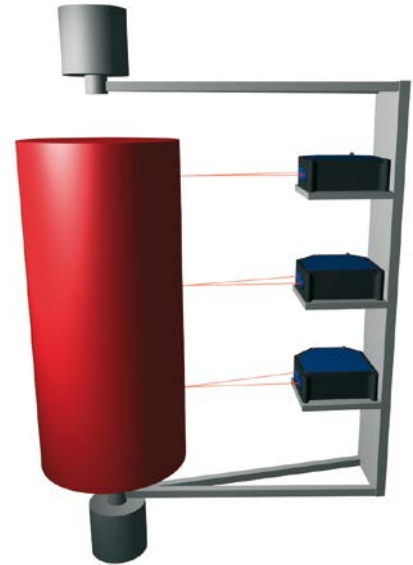
optoNCDT sensors are ideally suited to the thickness measurement of a variety of (web) materials. Due to the high measuring rate and the possibility of synchronising multiple sensors, even moving and oscillating targets can be reliably acquired.





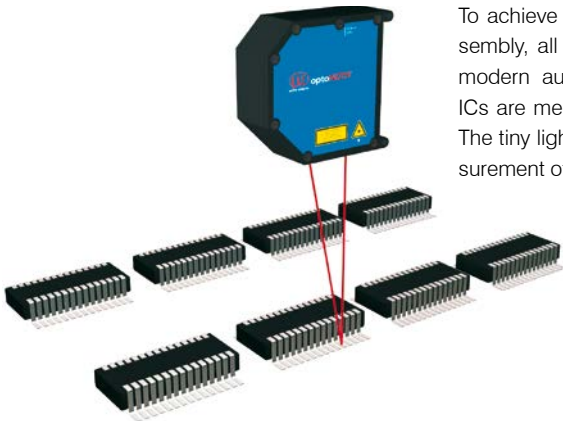
## Dimension measurement in wood production

optoNCDT sensors are used in woodworking plants to ensure the dimensional conformance of the work pieces. Here, both treated and untreated pieces are acquired.



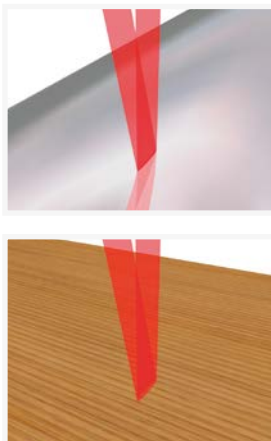
## Contour measurement

During the production of ceramic catalytic converters for the automotive industry the billets are measured for roundness and diameter at multiple radial tracks for classification. Using the IF2008 interface card, the encoder and sensor signals are synchronised and mapped to obtain precise profile.



## Flatness measurement of IC pins

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









## optoNCDT LL series - Anti speckle sensor

The distance information for the triangulation principle is obtained via the reflection of the laser beam. Thereby, surface roughness in the sub-micrometre range causes interference in the laser spot, whereby false measurement results can be obtained. This physical effect is particularly predominant in shiny, highly polished objects and cannot be avoided using currently available products on the market. The optoNCDT LL also makes reliable measurements on shiny metallic objects thanks to a small laser line. The oval point-shaped laser beam has now been widened using a special cylindrical lens and projected onto the target. The light spot is absorbed by a receiving array and evaluated. As the light spot is averaged using a special software algorithm, interference is completely filtered out.

Another application area for the optoNCDT LL is structured surfaces, where the distance and not the structure itself needs to be measured. The distance information is not influenced by the structure of the surface but instead provides a constantly reliable value of the distance from the target. The optoNCDT LL sensors have the advantages of the integrated controller, thus making mounting of the sensor in confined spaces, or on robots much more practical.

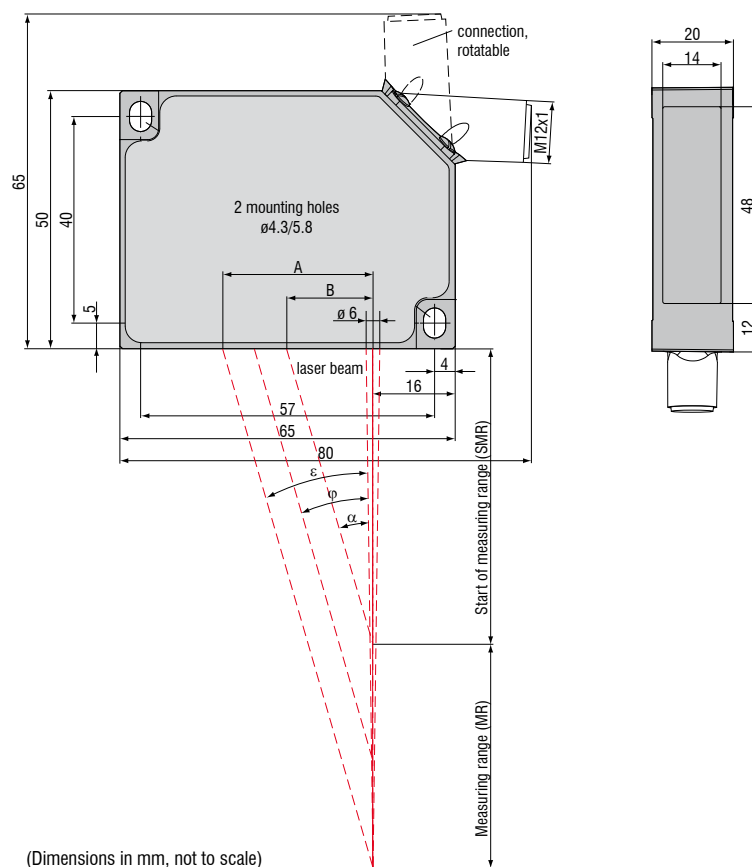




-  **Four models with measuring ranges from 20mm to 200mm**
-  **Ideal for OEM applications**
-  **Measuring rate up to 750Hz**
-  **Analogue (U/I) and digital output**
-  **Trigger input and teach-in**
-  **High flex cables for dragchain or robot use**

The miniaturised optoNCDT 1302 is a low-cost laser sensor for common measuring tasks. The extremely small design facilitates its integration even in areas with limited space. Despite the small dimensions, the 1302 series provides precise measurement results and is suitable for machine integration and automation technology.

optoNCDT 1302



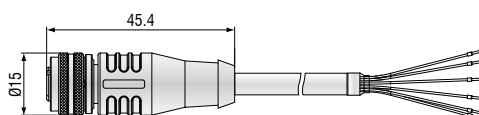
MR	SMR	$\alpha$	$\phi$	$\varepsilon$	A	B
20	30.0	31.2	27.9	25.8	24.2	18.2
50	45.0	25.1	19.6	16.9	28.9	21.1
100	50.0	23.1	14.4	11.3	30.1	21.3
200	60.0	20.1	9.4	6.8	30.8	22.0



Model		ILD 1302-20	ILD 1302-50	ILD 1302-100	ILD 1302-200
Measuring range		20mm	50mm	100mm	200mm
Start of measuring range		30mm	45mm	50mm	60mm
Midrange		40mm	70mm	100mm	160mm
End of measuring range		50mm	95mm	150mm	260mm
Linearity		40µm	100µm	200µm	400µm
		±0.2 % FSO			
Resolution	averaged with averaging factor 64	4µm	10µm	20µm	40µm
		0.02 % FSO			
	dynamic 750Hz	10µm	25µm	50µm	100µm
		0.05 % FSO			
Measuring rate		750Hz			
Light source		semiconductor laser <1mW, 670nm (red)			
Laser safety class		class 2 IEC 60825-1 : 2008-05			
Spot diameter	SMR	210µm	1100µm	1400µm	2300µm
	MMR	530µm	110µm	130µm	2200µm
	EMR	830µm	1100µm	1400µm	2100µm
Protection class		IP 67			
Vibration		15g / 10Hz...1kHz			
Shock		15g / 6ms (IEC 68-2-29)			
Weight (without cable)		approx. 83g			
Temperature stability		0.03 % FSO/°C		0.08 % FSO/°C	
Operating temperature		0...+50°C			
Storage temperature		-20...+70°C			
Output	analogue	4...20mA (1...5V with cable PC 1402-3/U)			
	digital	RS422			
Control I/O		1x open collector output (switching output, switch, error); 1x input (teach in, trigger); 1x laser on/off			
Power supply		11...30VDC, 24VDC / 50mA			
Controller		integrated signal processor			
Electromagnetic compatibility (EMC)		EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)			

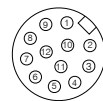
FSO = Full scale output All specifications apply for a diffusely reflecting matt white ceramic target  
SMR = Start of measuring range; MMR = Midrange; EMR = End of measuring range

#### Connector axial



#### 12-pin-connector









(view on solder termination side of male inserts)



Pin	Description		colour PC1402-x/I
3	RS422 Rx+	serial input	green
4	RS422 Rx-	serial input	yellow
5	RS422 Tx+	serial output	grey
6	RS422 Tx-	serial output	pink
7	+ U B	11-30VDC type 24V	red
8	Laser off	switch input	black
9	Teach in	switch input	violet
10	Error	switch output	brown
11	I OUT	4 ... 20mA	white
12	GND	supply and signal ground	blue
1/2	n.c.		

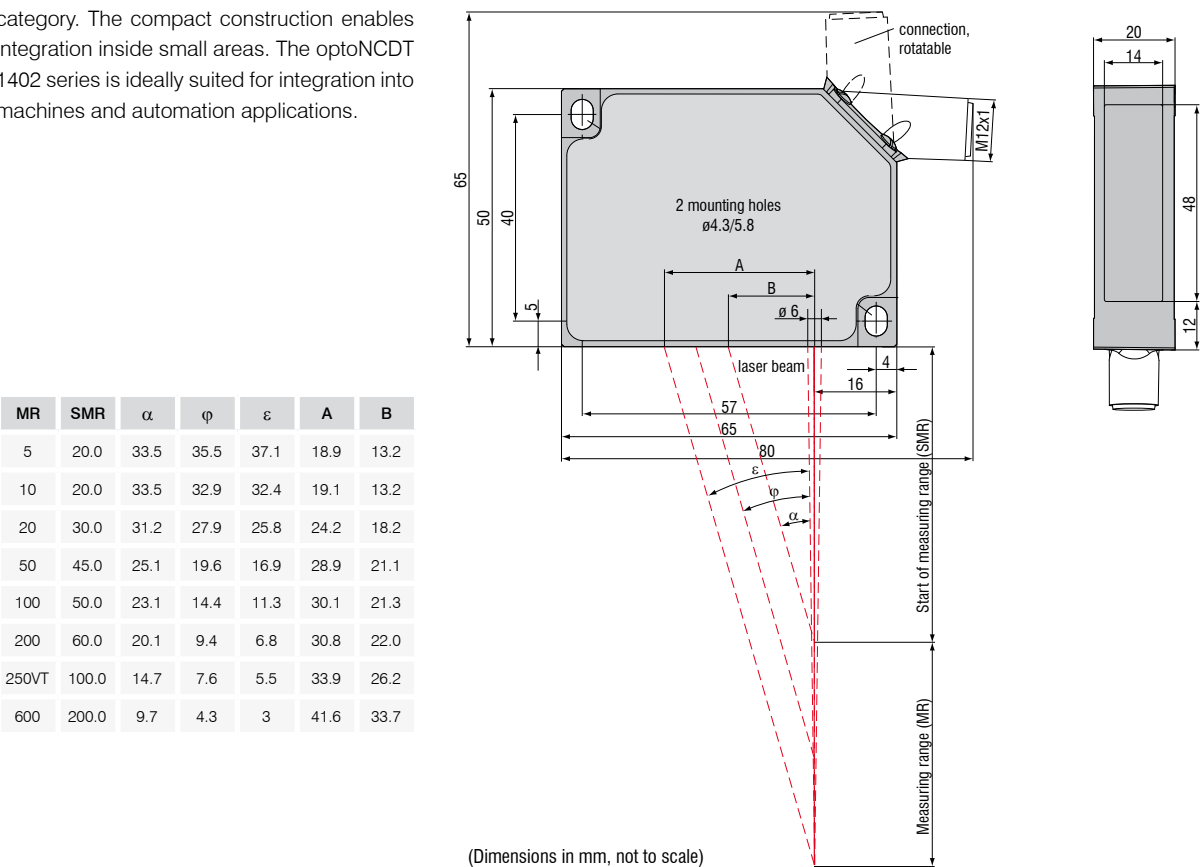
The cable screen is connected with the sensor housing. The interface and power supply cable are robot rated and UL certified. At one end there is a 12pin M12 connector, the other end is open.



-  Nine models with measuring ranges from 5mm to 600mm
-  Ideal for OEM applications
-  Adjustable measuring rate up to 1.5kHz
-  Analogue (U/I) and digital output
-  Trigger input and teach-in
-  Adjustable filter functions Peak selection (firmware)
-  High flex cables for dragchain or robot use
-  Calibration certificate included

The miniature optoNCDT 1402 series is the leading sensor in this price/ performance category. The compact construction enables integration inside small areas. The optoNCDT 1402 series is ideally suited for integration into machines and automation applications.

optoNCDT 1402



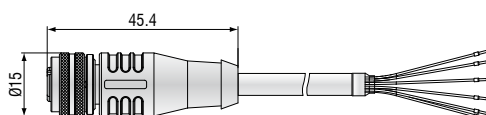
Model		ILD 1402-5	ILD 1402-10	ILD 1402-20	ILD 1402-50	ILD 1402-100	ILD 1402-200	ILD 1402-250VT	ILD 1402-400	ILD 1402-600
Measuring range		5mm	10mm	20mm	50mm	100mm	200mm	250mm	400mm	600mm
Start of measuring range		20mm	20mm	30mm	45mm	50mm	60mm	100mm	200mm	200mm
Midrange		22.5mm	25mm	40mm	70mm	100mm	160mm	225mm	400mm	500mm
End of measuring range		25mm	30mm	50mm	95mm	150mm	260mm	350mm	600 mm	800mm
Linearity <sup>1)</sup>		5...9µm	5...18µm	7...36µm	12...90µm	20...180µm	40...360µm	50...1200µm	120...2000µm	120...3000µm
		≤0.18% FSO						≤0.5% FSO		
Resolution <sup>2)</sup>	averaged with averaging factor 64	0.6µm	1µm	2µm	5µm	10µm	13µm	32µm	80µm	80µm
		0.01% FSO								
	dynamic	1...3µm	2...5µm	5...10µm	6...25µm	12...50µm	13...100µm	32...300µm	80...480µm	80...600µm
	1.5 kHz	0.02...0.05% FSO						0.02...0.12% FSO		
Measuring rate, programmable		1.5kHz; 1kHz; 750Hz; 375Hz; 50Hz								
Light source		semiconductor laser <1mW, 670nm (red)								
Laser safety class		class 2 IEC 60825-1 : 2008-05								
Spot diameter	SMR	110µm	110µm	210µm	1100µm	1400µm	2300µm	5000µm	2.6 x 5mm	2.6 x 5mm
	MMR	380µm	650µm	530µm	110µm	130µm	2200µm	5000µm	2.6 x 5mm	2.6 x 5mm
	EMR	650µm	1200µm	830µm	1100µm	1400µm	2100µm	5000µm	2.6 x 5mm	2.6 x 5mm
Protection class		IP 67								
Vibration		15g / 10Hz ... 1kHz						20g / 10Hz...1kHz	15g / 10Hz...1kHz	
Shock		15g / 6ms (IEC 68-2-29)								
Weight (without cable)		appr. 83g						appr. 130g		
Temperature stability		0.03 % FSO/°C				0.08 % FSO/°C				
Operation temperature		0 ... +50°C								
Storage temperature		-20 ... +70°C								
Output	analogue	4 ... 20mA (1 ... 5V with cable PC 1402-3/U); free scalable within the nominal range								
	digital	RS422 / 14bit								
Control I/O		1x open collector output (switching output, switch, error); 1x input (teach in, trigger); 1x laser on/off								
Supply		11 ... 30VDC, 24VDC / 50mA								
Controller		integrated signal processor								
Software		free setup and aquisition tool + SDK (software development kit)								
Electromagnetic compatibility (EMC)		EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)								

FSO = Full scale output All specifications apply for a diffusely reflecting matt white ceramic target

<sup>1)</sup> values apply for 0 - 30% FSO and 30 - 100 % FSO <sup>2)</sup> resolution digital output 14bit

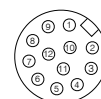
SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

#### Connector axial



#### 12-pin-connector

(view on solder termination side of male inserts)



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7	+U B	11-30DV 24V MP	red
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11	I OUT	4 ... 20mA	white
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1/2	n.c.		

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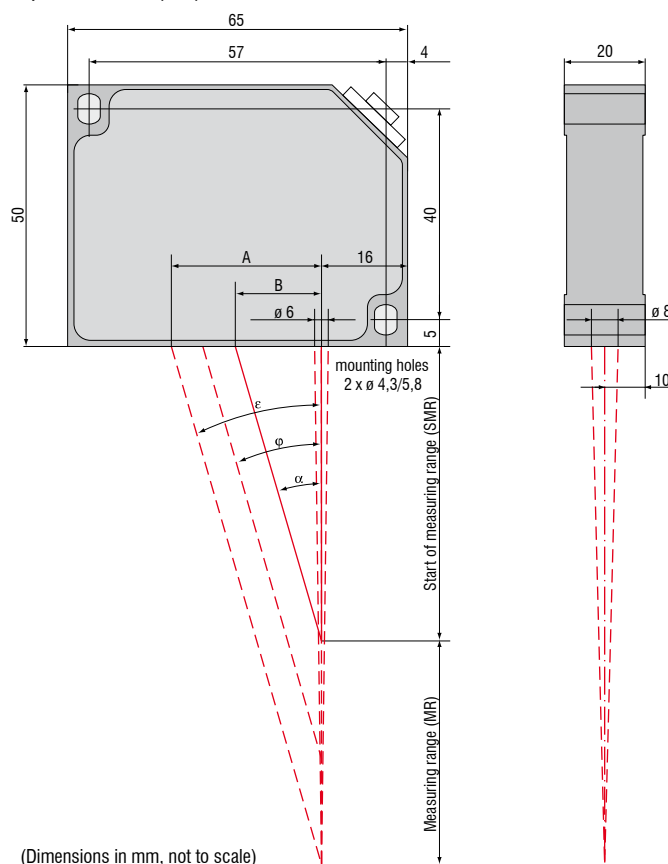


	Compatible with optoNCDT 1401
	Eight models with measuring ranges from 5mm to 600mm
	Adjustable measuring rate up to 1.5kHz
	Analogue (U/I) and digital output
	Trigger input and teach-in
	Adjustable filter functions Peak selection (firmware)
	High flex cables for drag chain or robot use
	Calibration certificate included

The optoNCDT 1402(025) has been designed as a drop in replacement for the former optoNCDT 1401 series. Similar to the former sensor, this series has a 7 pin connector and RS232 or analogue outputs as standard (user selectable).

The mating electrical connector is included in the scope of supply.

optoNCDT 1402(025)



MR	SMR	$\alpha$	$\varphi$	$\varepsilon$	A	B
5	20.0	33.5	35.5	37.1	18.9	13.2
10	20.0	33.5	32.9	32.4	19.1	13.2
20	30.0	31.2	27.9	25.8	24.2	18.2
50	45.0	25.1	19.6	16.9	28.9	21.1
100	50.0	23.1	14.4	11.3	30.1	21.3
200	60.0	20.1	9.4	6.8	30.8	22.0
400	200.0	9.7	5.3	3.8	41.4	33.7
600	200.0	9.7	4.3	3	41.6	33.7



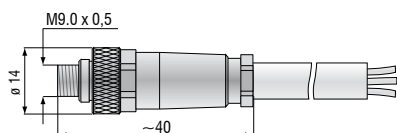
Model		ILD 1402-5(025)	ILD 1402-10(025)	ILD 1402-20(025)	ILD 1402-50(025)	ILD 1402-100(025)	ILD 1402-200(025)	ILD 1402-400(025)	ILD 1402-600(025)
Measuring range		5mm	10mm	20mm	50mm	100mm	200mm	400mm	600mm
Start of measuring range		20mm	20mm	30mm	45mm	50mm	60mm	200mm	200mm
Midrange		22.5mm	25mm	40mm	70mm	100mm	160mm	400mm	500mm
End of measuring range		25mm	30mm	50mm	95mm	150mm	260mm	600mm	800mm
Linearity <sup>1)</sup>		5...9µm	5...18µm	7...36µm	12...90µm	20...180µm	40...360µm	120...1200µm	120...3000µm
		≤0.18% FSO						≤0.5% FSO	
Resolution <sup>2)</sup>	averaged with averaging factor 64	0.6µm	1µm	2µm	5µm	10µm	13µm	80µm	80µm
		0,01% FSO.							
	dynamic 1.5 kHz	1...3µm	2...5µm	5...10µm	6...25µm	12...50µm	13...100µm	80...480µm	80...600µm
		0.02...0.05% FSO						0.02...0.12% FSO	
Measuring rate, programmable		1.5kHz; 1kHz; 750Hz; 375Hz; 50Hz							
Light source		semiconductor laser <1mW, 670nm (red)							
Laser safety class		class 2 IEC 60825-1 : 2008-05							
Spot diameter	SMR	110µm	110µm	210µm	1100µm	1400µm	2300µm	2.6 x 5mm	2.6 x 5mm
	MMR	380µm	650µm	530µm	110µm	130µm	2200µm	2.6 x 5mm	2.6 x 5mm
	EMR	650µm	1200µm	830µm	1100µm	1400µm	2100µm	2.6 x 5mm	2.6 x 5mm
Protection class		IP 67							
Vibration		15g / 10Hz ... 1kHz							
Shock		15g / 6ms (IEC 68-2-29)							
Weight (without cable)		appr. 83g						appr. 130g	
Operation temperature		0 ... +50°C							
Storage temperature		-20 ... +70°C							
Measurement output	analogue	4 ... 20mA (1 ... 5V with cable PC 1401-3/U); free scalable within the nominal range							
	digital	RS232 / 14bit							
Control I/O		1x open collector output (switching output, switch, error); 1x input (teach in, trigger); 1x laser on/off							
Supply		11 ... 30VDC, 24VDC / 50mA							
Controller		integrated signal processor							
Software		free setup and aquisition tool + SDK (software development kit)							
Electromagnetic compatibility (EMC)		EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)							

FSO = Full scale output All specifications apply for a diffusely reflecting matt white ceramic target

<sup>1)</sup> values apply for 0 - 30% FSO and 30 - 100 % FSO <sup>2)</sup> resolution digital output 14bit

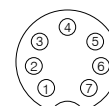
SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

#### Connector axial (included)



#### 7-pin-connector

(view on solder termination  
side of male inserts)



#### Pin connection current/RS232 7x1x0.14

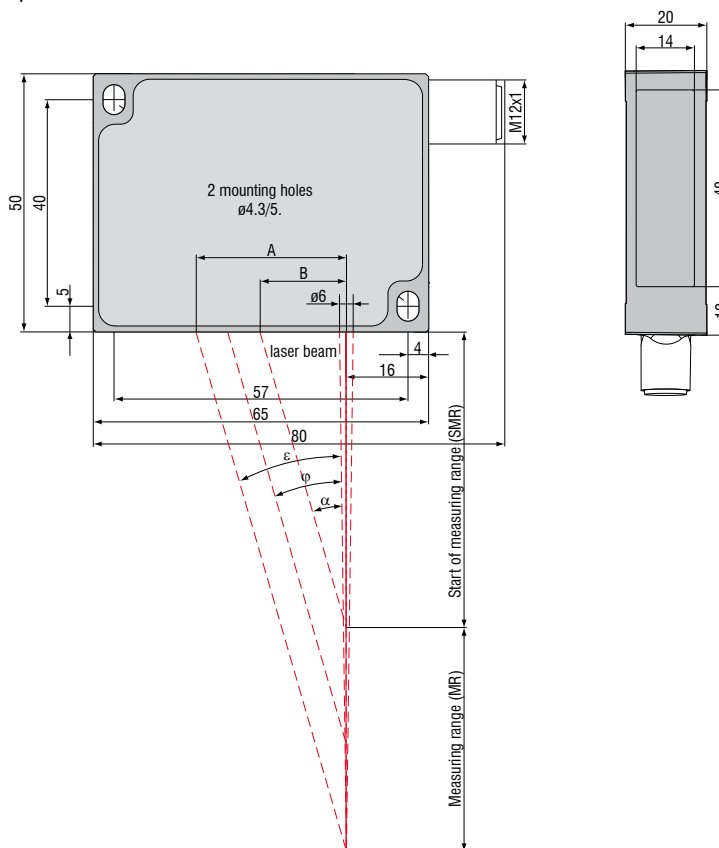
Pin	Description
1	Error
2	Laser on/off
3	RX232
4	TX232
5	4 ... 20 mA
6	GND
7	Supply 11 ... 30 VDC



	Eight models with measuring ranges from 5mm to 600mm
	Ideal for OEM applications
	Adjustable measuring rate up to 1.5kHz
	Analogue (U/I) and digital output
	Trigger input
	Adjustable filter functions Peak selection (firmware)
	Telemetry qualified by low power consumption
	Protection class IP69K for harsh environments

The optoNCDT 1402SC sensor is protected to IP69K and is available in all measuring ranges between 5mm and 600mm. Due to its very robust design, the sensor is suitable for the food industry, outdoor use or for demanding process manufacturing applications. The housing for this model comprises V4A steel and complies with all food industry requirements. In this version, the sensor is resistant to high pressure jet washing and to aggressive cleaning detergents and disinfection agents, including hydrogen peroxide and other alkaline-based cleaning materials and cleaning materials that contain chlorine. The sensor electronics are similar to those used by the optoNCDT 1402 standard model.

optoNCDT 1402SC



(Dimensions in mm, not to scale)

MR	SMR	$\alpha$	$\varphi$	$\varepsilon$	A	B
5	20.0	33.5	35.5	37.1	18.9	13.2
10	20.0	33.5	32.9	32.4	19.1	13.2
20	30.0	31.2	27.9	25.8	24.2	18.2
50	45.0	25.1	19.6	16.9	28.9	21.1
100	50.0	23.1	14.4	11.3	30.1	21.3
200	60.0	20.1	9.4	6.8	30.8	22.0
250VT	100.0	14.7	7.6	5.5	33.9	26.2
600	200.0	9.7	4.3	3	41.6	33.7

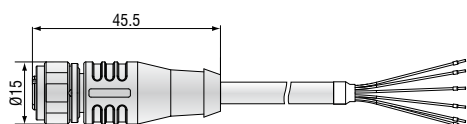
Model		ILD 1402-5SC	ILD 1402-10SC	ILD 1402-20SC	ILD 1402-50SC	ILD 1402-100SC	ILD 1402-200SC	ILD 1402-600SC	
Measuring range		5mm	10mm	20mm	50mm	100mm	200mm	600mm	
Start of measuring range		20mm	20mm	30mm	45mm	50mm	60mm	200mm	
Midrange		22.5mm	25mm	40mm	70mm	100mm	160mm	500mm	
End of measuring range		25mm	30mm	50mm	95mm	150mm	260mm	800mm	
Linearity <sup>1)</sup>		5...9µm	5...18µm	7...36µm	12...90µm	20...180µm	40...360µm	120...3000µm	
		≤0.18% FSO							≤0.5% FSO
Resolution <sup>2)</sup>	averaged with averaging factor 64	0.6µm	1µm	2µm	5µm	10µm	13µm	80µm	
		0.01% FSO							
	dynamic 1.5 kHz	1...3µm	2...5µm	5...10µm	6...25µm	12...50µm	13...100µm	80...600µm	
		0.02...0.05% FSO							0.02...0.12% FSO
Measuring rate, programmable		1.5kHz; 1kHz; 750Hz; 375Hz; 50Hz							
Light source		semiconductor laser < 1mW, 670nm (red)							
Laser safety class		class 2 IEC 60825-1 : 2008-05							
Spot diameter	SMR	110µm	110µm	210µm	1100µm	1400µm	2300µm	2.6 x 5mm	
	MMR	380µm	650µm	530µm	110µm	130µm	2200µm	2.6 x 5mm	
	EMR	650µm	1200µm	830µm	1100µm	1400µm	2100µm	2.6 x 5mm	
Protection class		IP 69 K							
Vibration		15g / 10Hz ... 1kHz							20g / 10Hz...1kHz
Shock		15g / 6ms (IEC 68-2-29)							
Weight (without cable)		appr. 173g							
Temperature stability		0.03 % FSO/°C				0.08 % FSO/°C			
Operation temperature		0 ... +50°C							
Storage temperature		-20 ... +70°C							
Output	analogue	4 ... 20mA (1 ... 5V with cable PC 1402SC-3/U); free scalable within the nominal range							
	digital	RS422 / 14bit							
Control I/O		1x open collector output (switching output, switch, error); 1x input (trigger)							
Supply		11 ... 30VDC, 24VDC / 50mA							
Controller		integrated signal processor							
Software		free setup and aquisition tool + SDK (software development kit)							
Electromagnetic compatibility (EMC)		EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)							

FSO = Full scale output All specifications apply for a diffusely reflecting matt white ceramic target

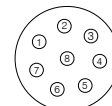
<sup>1)</sup> values apply for 0 - 30% FSO and 30 - 100 % FSO <sup>2)</sup> resolution digital output 14bit

SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

#### Connector axial



#### 8-pin-connector



Pin	Description	colour
1	I <sub>OUT</sub>	white
2	Error	brown
3	RS422 Rx+	green
4	RS422 Rx-	yellow
5	RS422 Tx+	grey
6	RS422 Tx-	pink
7	GND	blue
8	+U <sub>B</sub>	red
	Laser off	
	Teach in	



	Eleven models with measuring ranges from 2mm to 1000mm
	Real Time Surface Compensation
	Adjustable measuring rate up to 2.5kHz
	Analogue (U/I) and digital output
	Adjustable filter functions (firmware)
	High flex cables for dragchain or robot use
	Calibration certificate included

### The benchmark in laser triangulation sensors

The optoNCDT 1700 series is truly a world leading laser displacement sensor. Featuring Real Time Surface Compensation (RTSC), remote software programming and excellent linearity & resolution the optoNCDT 1700 is difficult to match at this price level. Integrated conditioning electronics allows the sensor to have a very unique and compact design.

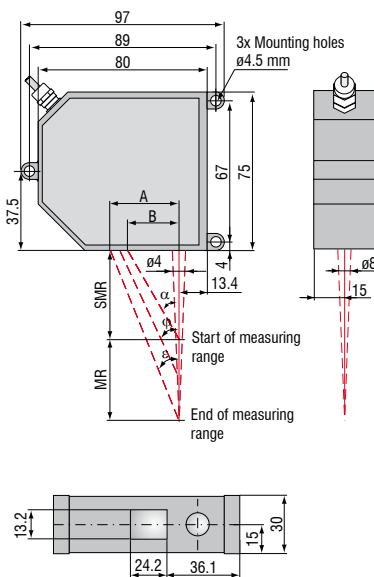
### Adjustable limit switches

As well as for precise measurement, the optoNCDT 1700 sensors are also used for tolerance or limit monitoring. Two switching points are available which can be configured and adjusted via the remote software (USB connection). The switching hysteresis can also be individually adjusted for each limit point.

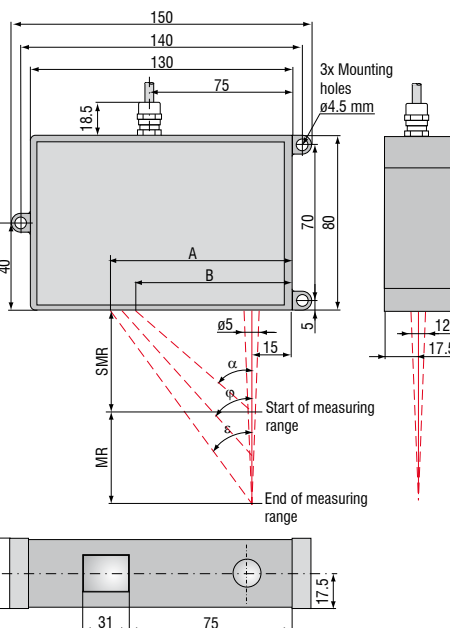
### Adjustable exposure time/measuring rate

For poor reflecting targets, the measuring rate can be reduced to enable a longer exposure time. The set measurement rate always remains constant so that with closed-loop control the system response time is always the same.

optoNCDT 1700 (2/10/20/50/100/200/250VTmm)



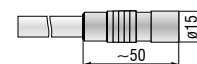
optoNCDT 1700 (40/500/750mm)



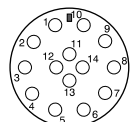
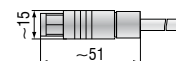
(Dimensions in mm, not to scale. All CAD files are available online.)

MR	SMR	$\alpha$	$\varphi$	$\varepsilon$	A	B
2	24	35°	40°	44.8°	25.8	16.8
10	30	34.3°	35.2°	35.6°	28.7	20.5
20	40	28.8°	27.5°	26.7°	30.1	22.0
50	45	26.5°	23.0°	18.3°	31.5	22.5
100	70	19.0°	15.4°	10.9°	32.6	24.1
200	70	19.0°	9.78°	6.97°	33.1	24.1
250VT	70	19.0°	8.4°	6.0°	33.5	24.1
40	175	22.1°	21.9°	21.8°	101	86
500	200	19.3°	9.8°	7.0°	101	85
750	200	19.3°	7.7°	5.0°	101	85

Connector (sensor side)  
Article Number: 0323272



Connector (sensor cable)  
Article Number: 0323243



14-pin-connector  
(Pin side female cable connector or solder-pin side male cable connector)



Model		ILD 1700-2	ILD 1700-10	ILD 1700-20	ILD 1700-40	ILD 1700-50	ILD 1700-100	ILD 1700-200	ILD 1700-250VT	ILD 1700-500	ILD 1700-750
Measuring range		2mm	10mm	20mm	40mm	50mm	100mm	200mm	250mm	500mm	750mm
Start of measuring range		24mm	30mm	40mm	175mm	45mm	70mm	70mm	70mm	200mm	200mm
Midrange		25mm	35mm	50mm	195mm	70mm	120mm	170mm	195mm	450mm	575mm
End of measuring range		26mm	40mm	60mm	215mm	95mm	170mm	270mm	320mm	700mm	950mm
Linearity		2µm	8µm	16µm	32µm	40µm	80µm	200µm	630µm	400µm	750µm
	FSO	≤0.1%	≤0.08%					≤0.1%	≤0.25%	≤0.08%	≤0.1%
Resolution (at 2.5kHz without averaging)		0.1µm	0.5µm	1.5µm	4µm	3µm	6µm	12µm	50µm	30µm	50µm
Measuring rate		2.5kHz / 1.25kHz / 625Hz / 312.5Hz (adjustable)									
Light source		semiconductor laser < 1mW, 670nm (red)									
Permissible ambient light (at 2.5kHz)		10,000lx							15,000lx	10,000lx	
Laser safety class		class 2 acc. DIN EN 60825-1 : 2008-05									
Spot diameter	SMR	80µm	110µm	320µm	230µm	570µm	740µm	1300µm	1500µm	1500µm	1500µm
	MMR	35µm	50µm	45µm	210µm	55µm	60µm	1300µm	1500µm	1500µm	1500µm
	EMR	80µm	110µm	320µm	230µm	570µm	700µm	1300µm	1500µm	1500µm	1500µm
Temperature stability <sup>1)</sup>		0.025% FSO/°C	0.01 % FSO/°C						0.025% FSO/°C	0.01 % FSO/°C	
Operation temperature		0 ... +50°C							0 ... +55°C	0 ... +50°C	
Storage temperature		-20 ... +70°C									
Output	measurements	selectable: 4 ... 20mA / 0 ... 10V / RS 422 / USB (optional with cable PC1700-3/USB)									
	switching outputs	1 x error or 2 x limit (each pogrammable)									
Switch Input		laser ON-OFF / zero									
Operation		via touch screen on sensor or via PC with ILD 1700 tool									
Power supply		24VDC (11 ... 30VDC), max. 150mA									
Electromagnetic compatibility (EMC)		EN 61000-6-3    EN 61000-6-2									
Sensor cable length (with connector)		0.25m (integrated cable with connector) option: 3m or 10m									
Synchronisation		possible for simultaneous or alternating measurements									
Protection class		IP 65									
Vibration		2g / 20 ... 500Hz									
Shock		15g / 6ms									
Weight (with 0.25m cable)		~ 550g			~ 600g	~ 550g				~ 600g	

FSO = Full Scale Output All specifications apply for a diffusely reflecting white ceramic target

<sup>1)</sup> based on digital output

SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

### Custom Sensor Modifications

For applications where the above standard sensors do not meet your requirements, it may be possible to supply a sensor with modified specification. Please contact us for further information.

### Options

- Non standard measuring range and stand off
- Custom housing or mounting geometry
- Non standard signal interfaces
- Special cable length of electrical connector
- 90° beam deflection
- Vacuum suitability
- Reduced mass
- Increased shock and vibration resistance



	Seven models with measuring ranges from 2 to 200mm
	Adjustable measuring rate up to 49.02kHz
INTER FACE	Ethernet / EtherCAT / RS422 Analogue output 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

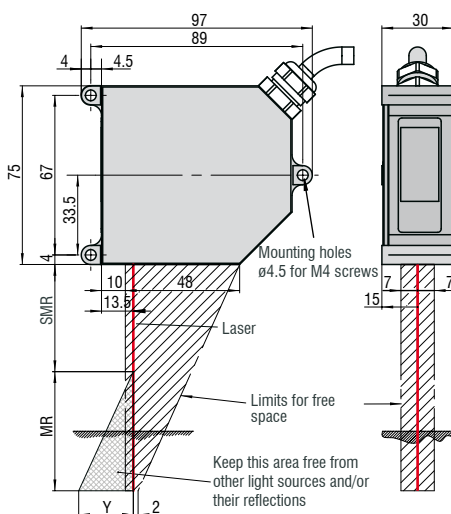
The optoNCDT 2300 is the latest high-end model of laser triangulation sensors from Micro-Epsilon. The new series offers an adjustable measuring rate up to 49.02 kHz. An impressive and worldwide unique fact regarding this sensor class is that the complete electronics has already been integrated in the compact sensor..

The new A-RTSC (Advanced Real-Time-Surface-Compensation) is a further development of the proven RTSC. Therefore, a more precise real-time surface compensation during the measuring process is ensured due to an increased dynamic range. By means of the software, the threshold of the areas for compensation can be set easily.

The data are output via Ethernet, EtherCAT or RS422. The complete sensor configuration is effected via a comfortably designed web interface.

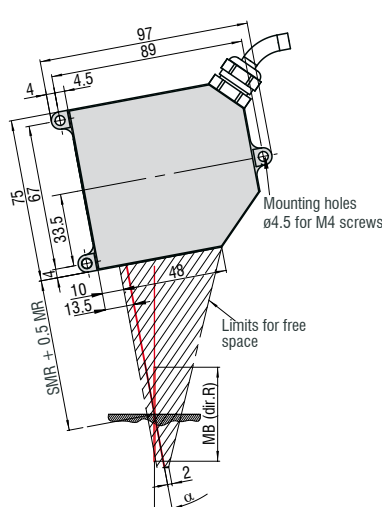
The optoNCDT 2300 is especially used in the case of fast measurements such as vibration monitoring or measurements against challenging surfaces.

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



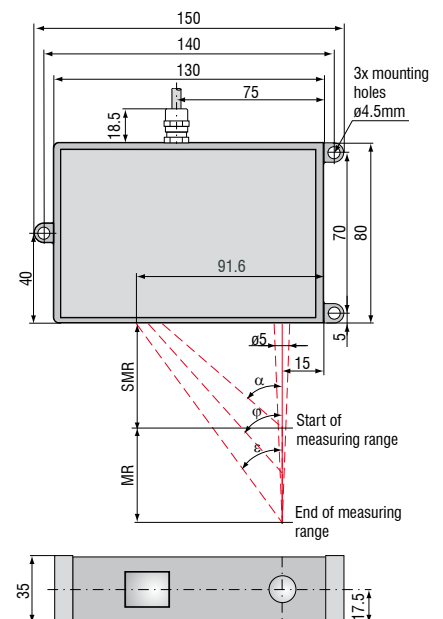
MR	SMR	Y
2	24	1.5
5	24	3.5
10	30	6.5
20	40	10.0
50	45	23.0
100	70	33.5

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



MR	SMR + 0.5 MR	$\alpha$
2	25	20.5 °
5	26.5	20 °
10	35	17.5 °
20	50	13.8 °

**optoNCDT 2300-200**



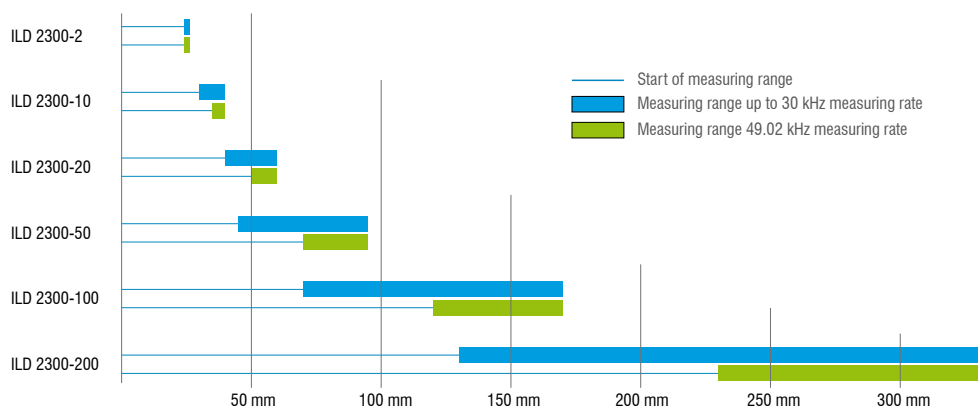
MB	$\alpha$	$\varphi$	$\varepsilon$
40	22.1 °	21.9 °	21.8 °
200	25.1 °	16.7 °	13.1 °

Model		ILD 2300-2	ILD 2300-5	ILD 2300-10	ILD 2300-20	ILD 2300-50	ILD 2300-100	ILD 2300-200
Measuring range <sup>1)</sup>		2 (2) mm	5 (2) mm	10 (5) mm	20 (10) mm	50 (25) mm	100 (50) mm	200 (100) mm
Start of measuring range		24 (24) mm	24 (24) mm	30 (35) mm	40 (50) mm	45 (70) mm	70 (120) mm	130 (230) mm
Midrange		25 (25) mm	26.5 (25) mm	35 (37.5) mm	50 (55) mm	70 (82.5) mm	120 (145) mm	230 (280) mm
End of measuring range		26 (26) mm	29 (26) mm	40 (40) mm	60 (60) mm	95 (95) mm	170 (170) mm	330 (330) mm
Linearity		0.6µm	1.5µm	2µm	4µm	10µm	20µm	60µm
		≤ ±0.03% FSO		≤ ±0.02% FSO		≤ ±0.02% FSO		≤ ±0.03% FSO
Resolution (20kHz)		0.03µm	0.08µm	0.15µm	0.3µm	0.8µm	1.5µm	3µm
		0.0015% FSO						
Measuring rate	adjustable via software 49.02 / 30 / 20 / 10 / 5 / 2.5 / 1.5kHz (49.02kHz with reduced measuring range)							
Permissable ambient light	10,000...40,000lx							
Spot diameter	SMR	55 x 85µm	70 x 80µm	75 x 85µm	140 x 200µm	255 x 350µm	350µm	1300µm
	MMR	23 x 23µm	30 x 30µm	32 x 45µm	46 x 45µm	70 x 70µm	130µm	1300µm
	EMR	35 x 85µm	70 x 80µm	110 x 160µm	140 x 200µm	255 x 350µm	350µm	1300µm
Light source	semiconductor laser <1mW / 670nm (red)							
Protection class	IP 65							
Operation temperature	0 ... +50°C							
Storage temperature	-20 ... +70°C							
Inputs / Outputs	Ethernet / EtherCAT RS422 analogue ouput via CSP2008							
Inputs	Laser on/off; synchronization/trigger input							
Power supply	24 Vdc (11...30V); PV < 3W							
LED	Status / Power / Ethernet / EtherCAT							
Sensor cable	standard	0.25m (with cable connector)						
	option	3 / 6 / 9m with Sub D 15 pin connector						
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 All specifications apply for a diffusely reflecting matt white ceramic target

SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

<sup>1)</sup> Numbers in brackets refer to full measurement rate 49.02 kHz

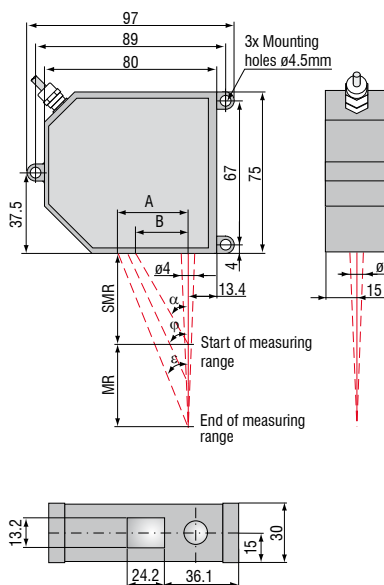




	<b>Laser Line averages across shiny metallic or structured surfaces</b>
	<b>Compact design with integrated controller</b>
	<b>Real Time Surface Compensation</b>
	<b>Adjustable measuring rate up to 2.5kHz</b>
	<b>Analogue (U/I) and digital output</b>
	<b>Adjustable filter functions (firmware)</b>
	<b>High flex cables for dragchain or robot use</b>
	<b>Calibration certificate included</b>

The optoNCDT 1700LL is designed for measurements on shiny and rough surfaces where high accuracy is required. The optoNCDT 1700LL provides precision accuracy with an integrated controller. The laser spot is optically enlarged to make an oval point thus reducing the physical interference making measurements on rough surfaces considerably easier to perform. The 1700LL offers high precision and flexibility with a compact sensor size.

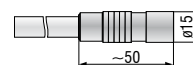
optoNCDT 1700LL (2/10/20/50mm)



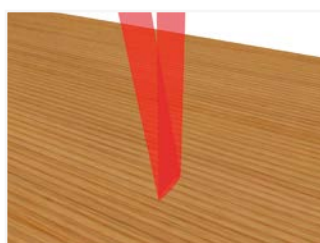
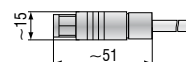
(Dimensions in mm, not to scale. All CAD files are available online.)

MR	SMR	$\alpha$	$\phi$	$\varepsilon$	A	B
2	24	35°	40°	44.8°	25.8	16.8
10	30	34.3°	35.2°	35.6°	28.7	20.5
20	40	28.8°	27.5°	26.7°	30.1	22.0
50	45	26.5°	23.0°	18.3°	31.5	22.5

Connector (sensor side)  
Article Number: 0323243



Connector (sensor cable)  
Article Number: 0323272





Model		ILD1700-2LL	ILD 1700-10LL	ILD 1700-20LL	ILD 1700-50LL
Measuring range		2mm	10mm	20mm	50mm
Start of measuring range		24mm	30mm	40mm	45mm
Midrange		25mm	35mm	50mm	70mm
End of measuring range		26mm	40mm	60mm	95mm
Linearity		2µm	8µm	16µm	40µm
	FSO	≤0.1%	≤0.08%		
Resolution <sup>1)</sup> (at 2.5kHz without averaging)		0.1µm	0.5µm	1.5µm	3µm
Measuring rate		2.5kHz / 1.25kHz / 625Hz / 312.5Hz (adjustable)			
Light source		semiconductor laser <1mW, 670nm (red)			
Permissible ambient light	at 2.5kHz	10,000lx			
Laser safety class		class 2 acc. DIN EN 60825-1 : 2008-05			
Spot diameter	SMR	85 x 240µm	120 x 405µm	185 x 485µm	350 x 320µm
	MMR	24 x 280µm	35 x 585µm	55 x 700µm	70 x 960µm
	EMR	64 x 400µm	125 x 835µm	195 x 1200µm	300 x 1940µm
Temperature stability <sup>2)</sup>		0.025% FSO/°C	0.01 % FSO/°C		
Operation temperature		0 ... +50°C			
Storage temperature		-20 ... +70°C			
Output	measurements	selectable: 4 ... 20mA / 0 ... 10V / RS 422 / USB (optional with cable PC1700-3/USB)			
	switching outputs	1 x error or 2 x limit (each pogrammable)			
Switch Input		laser ON-OFF / zero			
Operation		via touch screen on sensor or via PC with ILD 1700 tool			
Power supply		24VDC (11 ... 30VDC), max. 150mA			
Electromagnetic compatibility (EMC)		EN 61000-6-3 EN 61000-6-2			
Sensor cable length (with connector)		0.25m (integrated cable with connector) option: 3m or 10m			
Synchronisation		possible for simultaneous or alternating measurements			
Protection class		IP 65			
Vibration		2g / 20 ... 500Hz			
Shock		15g / 6ms			
Weight (with 0.25m cable)		~ 550g			

FSO = Full Scale Output All specifications apply for a diffusely reflecting white ceramic target

SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

1) for measurements against high glossy surfaces (targets), resolution depends on the material

2) based on digital output

### Custom Sensor Modifications

For applications where the above standard sensors do not meet your requirements, it may be possible to supply a sensor with modified specification. Please contact us for further information.

### Options

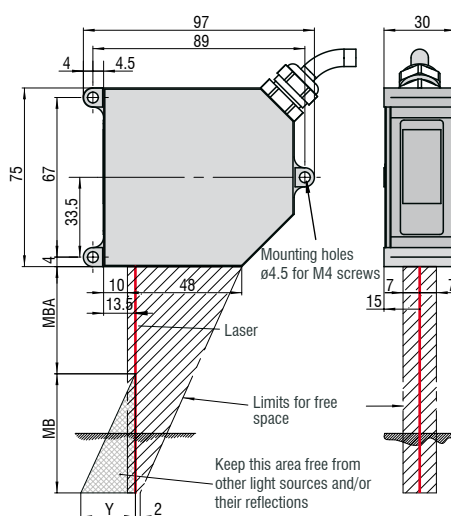
- Non standard measuring range and stand off
- Custom housing or mounting geometry
- Non standard signal interfaces
- Special cable length of electrical connector
- 90° beam deflection
- Vacuum suitability
- Reduced mass
- Increased shock and vibration resistance



	<b>Laser Line averages across shiny metallic or structured surfaces</b>
	<b>Four models with measuring ranges from 2mm to 50mm</b>
	<b>Adjustable measuring rate up to 49.02kHz</b>
<b>INTER FACE</b>	<b>Ethernet / EtherCAT / RS422 Analogue output via C-Box</b>
<b>A-RTSC</b>	<b>Advanced Real-Time-Surface-Compensation</b>
<b>Certified</b>	<b>Calibration certificate included</b>
	<b>Configuration via Web-Interface</b>

The optoNCDT 2300LL series use a very small laser line instead of the common laser spots. Due to this laser line, the optoNCDT 2300LL is very well suited for precise distance and displacement measurement on glossy, porous or rough surfaces. Due to the high measurement rate of up to 49kHz it is possible to reliably apply the sensor in fast processes. The data are output via Ethernet, EtherCAT or RS422. The complete sensor configuration is effected via a comfortably designed web interface.

optoNCDT 2300LL



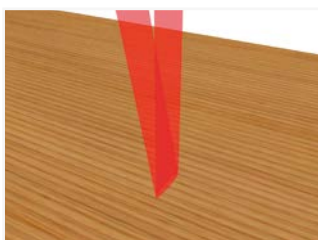
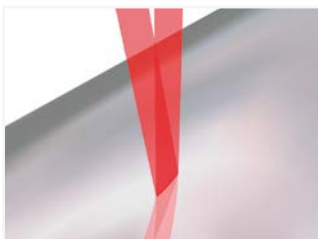
MB	MBA	Y
2	24	1.5
10	30	6.5
20	40	10.0
50	45	23.0

Modell		ILD 2300-2LL	ILD 2300-10LL	ILD 2300-20LL	ILD 2300-50LL
Measuring range <sup>1)</sup>		2 (2) mm	10 (5) mm	20 (10) mm	50 (25) mm
Start of measuring range		24 (24) mm	30 (35) mm	40 (50) mm	45 (70) mm
Midrange		25 (25) mm	35 (37,5) mm	50 (55) mm	70 (82,5) mm
End of measuring range		26 (26) mm	40 (40) mm	60 (60) mm	95 (95) mm
Linearity		0.6µm	2µm	4µm	10µm
		≤ ±0.03% FSO	≤ ±0.02% FSO		
Resolution (20kHz)		0.03µm	0.15µm	0.3µm	0.8µm
		0.0015% FSO			
Measuring rate		adjustable via software 49.02 / 30 / 20 / 10 / 5 / 2.5 / 1.5kHz (49.02kHz with reduced measuring range)			
Permissible ambient light		10,000...40,000lx			
Spot diameter	SMR	85 x 240µm	120 x 405µm	185 x 485µm	350 x 320µm
	MMR	24 x 280µm	35 x 585µm	55 x 700µm	70 x 960µm
	EMR	64 x 400µm	125 x 835µm	195 x 1200µm	300 x 1940µm
Light source		laser diode (670nm) class 2			
Protection class		IP 65			
Operation temperature		0 ... +50°C			
Storage temperature		-20 ... +70°C			
Inputs / Outputs		Ethernet / EtherCAT			
		RS422			
		analogue output via CSP2008 / C-Box			
Inputs		laser on/off; synchronization/trigger input			
Power supply		24Vdc (11...30V); PV < 3W			
LED		status / power / Ethernet / EtherCAT			
Sensor cable	standard	0.25m (with cable connector)			
	option	3 / 6 / 9m with Sub D 15 pin connector			
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 All specifications apply for a diffusely reflecting matt white ceramic target

SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

<sup>1)</sup> Numbers in brackets refer to full measurement rate 49.02kHz

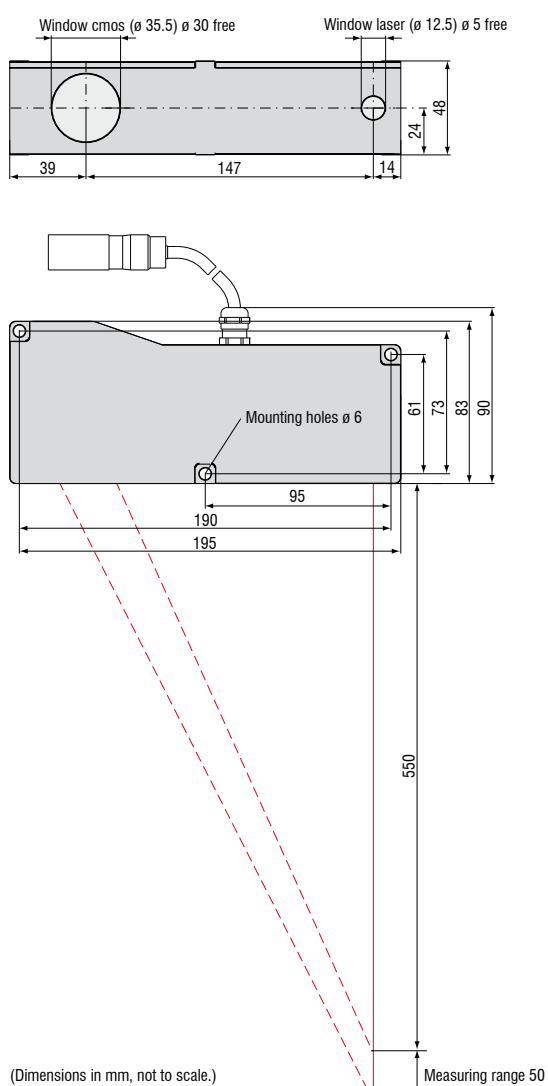




	High accuracy and long standoff distances
	Measurement rate up to 10kHz
	Real Time Surface Compensation
	Analogue and digital output
	Adjustable filter functions (firmware)
	Calibration certificate included

In contrast to conventional laser sensors, the Long-Range series allows accurate measurements to be taken at much longer stand off distances than normal. This is an important advantage, especially if the sensor cannot be mounted close to the target due to the environment the target is within. The long stand off is particularly useful if you need to look through a window at a target in a pressure chamber or similar vessel. A special CCD line and the Real Time Surface Compensation enable the sensor to be used even on changing surfaces.

optoNCDT 1710-50 (50mm)





Model		ILD 1710-50
Measuring range		50mm
Start of measuring range		550mm
Midrange		575mm
End of measuring range		600mm
Linearity	50µm	
	≤0.1% FSO	
Resolution	5µm	
	0.01% FSO (at 2.5kHz without averaging)	
Measuring rate		2.5kHz / 1.25kHz / 625Hz / 312.5Hz (adjustable)
Permissible ambient light		10,000lx
Spot diameter	SMR	400 x 500µm
	MMR	400 x 500µm
	EMR	400 x 500µm
Light source		semiconductor laser < 1mW, 670nm (red)
Laser safety class		class 2 IEC 60825-1 : 2008-05
Protection class		IP 65
Temperature stability		0.01 % FSO/°C
Operation temperature		0 ... 50°C
Storage temperature		-20 ... 70°C
Output	analogue	4 ... 20mA (0 ... 10V)
	digital	RS 422 / USB (optional with cable PC1700-3/USB)
	switching outputs	1 x error or 2 x limit (each programmable)
Switch Input		laser ON-OFF / zero
Operation		via touch screen on sensor or via PC with ILD 1700 tool
Power supply		24VDC (11 ... 30VDC), max. 150mA
Sensor cable length		standard: 0.25m - integrated
Synchronisation		possible for simultaneous or alternating measurements
Electromagnetic compatibility (EMC)		EN 50081-1 and EN 50082-2
Vibration		2g / 20 ... 500Hz
Shock		15g / 6ms
Weight		~800g

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

## Custom Sensor Modifications

For applications where the above standard sensors do not meet your requirements, it may be possible to supply a sensor with modified specification.  
Please contact us for further information.

## Options

- Non standard measuring range and stand off
- Custom housing or mounting geometry
- Measuring rate 2.5 / 5 / 10 / 20kHz
- Non standard signal interfaces
- Special cable length of electrical connector
- Vacuum suitability
- Reduced mass
- Increased shock and vibration resistance



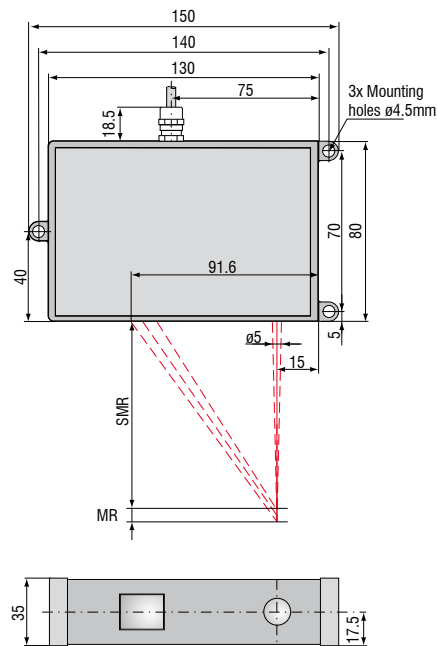
	<b>High accuracy and long standoff distances</b>
	<b>Four models with measuring ranges from 10mm to 50mm</b>
	<b>Adjustable measuring rate up to 49.02kHz</b>
<b>INTER FACE</b>	<b>Ethernet / Ethercat / RS422 Analogue output via C-Box</b>
<b>ARTSC</b>	<b>Advanced Real-Time-Surface-Compensation</b>
<b>Certified</b>	<b>Calibration certificate included</b>
	<b>Thickness measurement of transparent materials</b>
	<b>Configuration via Web-Interface</b>

In contrast to conventional laser sensors, the Long-Range series optoNCDT 2310 allows accurate measurements to be taken at much longer stand off distances than normal.

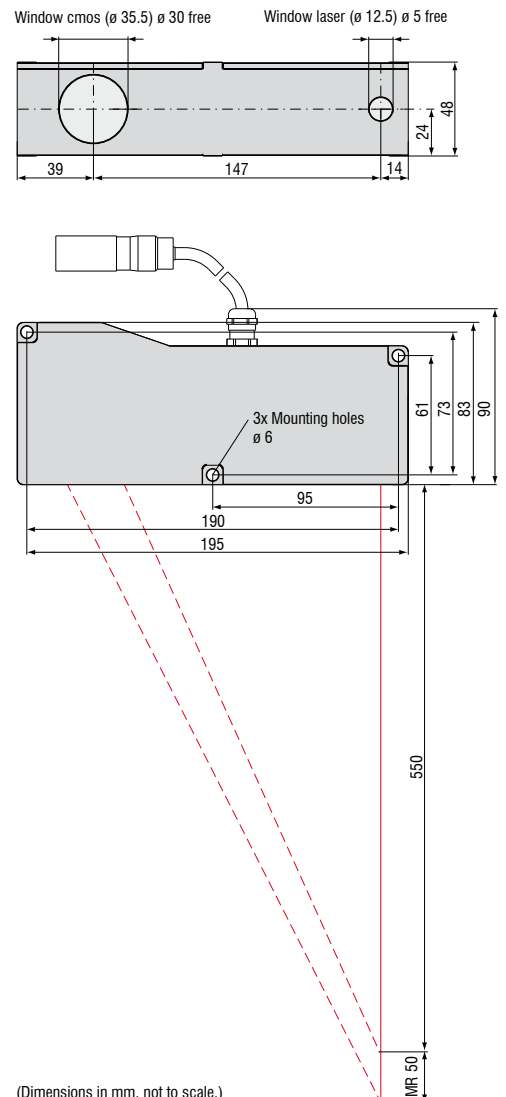
This is an important advantage, especially if the sensor cannot be mounted close to the target due to the environment the target is within. The long stand off is particularly useful if you need to look through a window at a target in a pressure chamber or similar vessel.

The Real Time Surface Compensation enable the sensor to be used even on changing surfaces.

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



optoNCDT 2310-50



(Dimensions in mm, not to scale.)

Model	ILD 2310-10	ILD 2310-20	ILD 2310-40	ILD 2310-50
Measuring range	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	3µm	6µm	12µm	50µm
	≤ ±0.03% FSO	≤ ±0.03% FSO	≤ ±0.03% FSO	≤ ± 0.1% FSO
Resolution	0,5µm	1µm	0.6µm	7.5µm
	0.005% FSO	0.005% FSO (at 10kHz without averaging)	0.0015% FSO	0.015% FSO
Measuring rate	adjustable via software 49.02 / 30 / 20 / 10 / 5 / 2.5 / 1.5kHz (49.02kHz with reduced measuring range)			
Permissible ambient light	10,000...40,000lx			
Spot diameter	SMR	400 x 500µm	200µm	230µm
	MMR	400 x 500µm	60µm	210µm
	EMR	400 x 500µm	200µm	230µm
Light source	laser diode (670nm) class 2			
Protection class	IP 65			
Operation temperature	0 ... +50°C			
Storage temperature	-20 ... +70°C			
Inputs / Outputs	Ethernet / EtherCAT			
	RS422			
Inputs	analogue output via CSP2008 / C-Box			
Power supply	laser on/off; synchronization/trigger input			
LED	24Vdc (11...30V); PV < 3W			
Sensor cable	status / power / Ethernet / EtherCAT			
Electromagnetic compatibility (EMC)	standard: 0.25 m - integrated			
	EN 61326-1: 2006-10			
Vibration	DIN EN 55011: 2007-11 (group 1. class B)			
	EN 61 000-6-2: 2006-03			
Shock	2g / 20 ... 500Hz			
	15g / 6ms / 3 axes			

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








### Custom Sensor Modifications

For applications where the above standard sensors do not meet your requirements, it may be possible to supply a sensor with modified specification. Please contact us for further information.

### Options

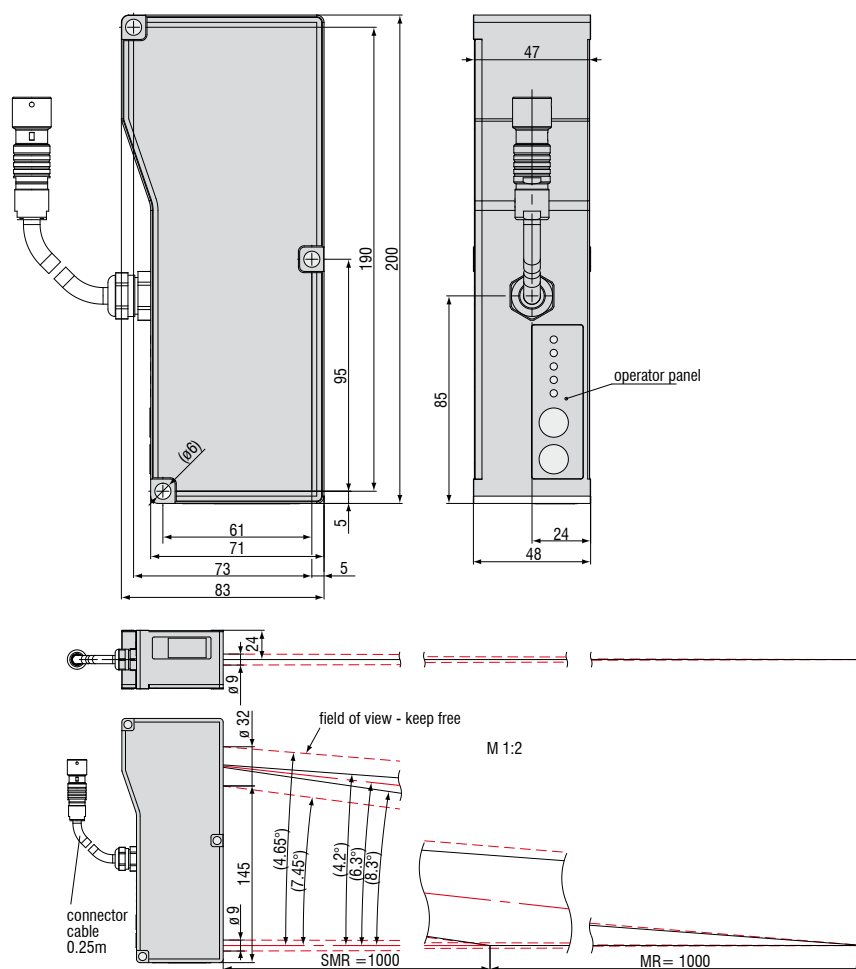
- Non standard measuring range and stand off
- Custom housing or mounting geometry
- Measuring rate 2.5 / 5 / 10 / 20kHz
- Non standard signal interfaces
- Special cable length of electrical connector
- Vacuum suitability
- Reduced mass
- Increased shock and vibration resistance



- |   |  |
|---|--|
|    | <b>High accuracy and long standoff distances</b> |
|    | <b>Model with measuring range up to 1000mm</b>   |
|  <div> 312Hz<br/> 375Hz<br/> 1000Hz </div> | <b>Adjustable measuring rate up to 2.5kHz</b>    |
|    | <b>Real Time Surface Compensation</b>            |
|    | <b>Analogue (U/I) and digital output</b>         |
|    | <b>Adjustable filter functions (firmware)</b>    |
|    | <b>Calibration certificate included</b>          |

The optoNCDT 1710-1000 laser sensors are unrivalled in measurement performance worldwide. The sensor can measure over a working range of 1,000mm. The start of measurement is 1,000mm from the sensor body which means that objects upto 2m in distance can be measured. The controller is integrated into the housing of the sensor which means that external electronic processing is not required. The sensor operates with automatic, real time surface compensation, RTSC which auto adapts the laser intensity to the surface being measured. Additionally built in, programmable limit switch give the sensor further integration flexibility.

optoNCDT 1710-1000



Model		ILD1710-1000
Measuring range		1000mm
Start of measuring range		1000mm
Midrange		1500mm
End of measuring range		2000mm
Linearity $\leq \pm 0.1\%$ FSO		$\pm 1\text{mm}$
Resolution (at 2.5kHz without averaging)		100 $\mu\text{m}$
Measuring rate		2.5kHz / 1.25kHz / 625Hz / 312.5Hz (adjustable)
Light source		semiconductor laser <1mW, 670nm (red)
Permissible ambient light at 2.5kHz		10,000lx
Laser safety class		class 2 IEC 60825-1 : 2008-05
Spot diameter	SMR	2.5...5mm
	MMR	2.5...5mm
	EMR	2.5...5mm
Temperature stability		0.01% FSO/ $^{\circ}\text{C}$
Operation temperature		0 ... 50 $^{\circ}\text{C}$
Storage temperature		-20 ... +70 $^{\circ}\text{C}$
Output	measurements	switchable: 4 ... 20mA / 0 ... 10V / RS 422 / 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 keypad directly on the sensor and/or via PC with ILD1700 Tool
Power supply		24VDC (11 ... 30 VDC), max. 150mA
Electromagnetic compatibility (EMC)		EN 61000-6-3 and EN 61000-6-2
Sensor cable		standard 0.25m integrated
Synchronisation		possible for simultaneous or alternating measurements
Protection class		IP 65
Vibration		2g / 20 ... 500Hz
Shock		15g / 6ms
Weight		~ 0.8kg

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;





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

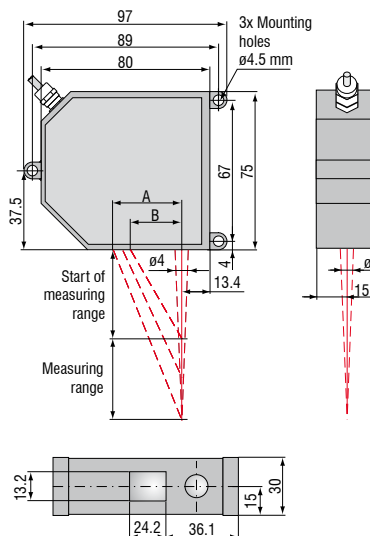
In numerous applications, blue Laser sensors are clearly superior to the standard sensors with a red laser diode. During measurements on metals, particularly on red glowing metals and organic matters such as wood, skin, foodstuffs, veneers etc., the wavelength of the blue laser offers significant benefits.

In contrast to the red laser, the blue laser light does not penetrate the measuring object due to the reduced wavelength.

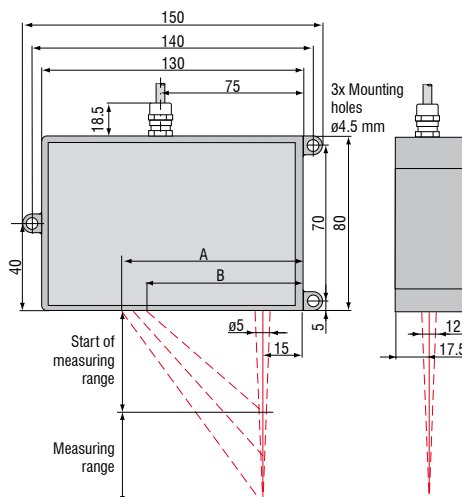
The blue laser generates a minimal laser point on the surface and therefore offers stable and precise results on measuring objects which are usually considered to be critical.

The sensors are equipped with re-designed high-end lenses, a new intelligent laser control and evaluation algorithms.

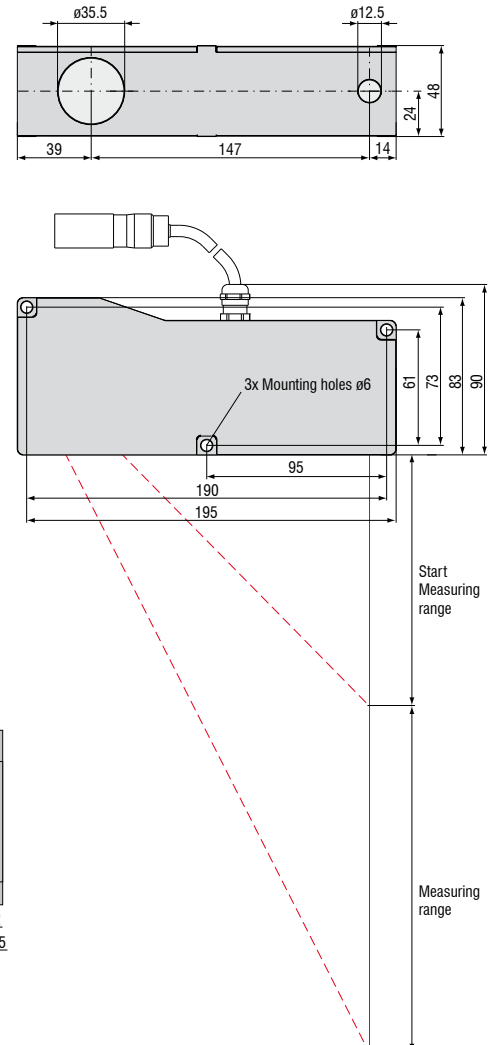
optoNCDT 1700BL (20/200 mm)



optoNCDT 1700BL (500/750 mm)



optoNCDT 1710 (50/1000 mm)



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

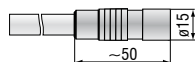


Model		ILD 1700-20BL	ILD 1700-200BL	ILD 1700-500BL	ILD 1700-750BL	ILD 1710-50BL	ILD 1710-1000BL
Measuring range		20mm	200mm	500mm	750mm	50mm	1000mm
Start of measuring range		40mm	100mm	200mm	200mm	550mm	1000mm
Midrange		50mm	200mm	450mm	575mm	575mm	1500mm
End of measuring range		60mm	300mm	700mm	950mm	600mm	2000mm
Linearity		16µm	200µm	400µm	750µm	50µm	± 1mm
		≤ ±0.08% FSO	≤ ±0.1% FSO	≤ ±0.08% FSO	≤ ±0.1% FSO	≤ ±0.1% FSO	≤ ±0.1% FSO
Resolution (at 2.5kHz without averaging)		1,5µm	12µm	30µm	50µm	5µm	100µm
Measuring rate		2.5kHz / 1.25kHz / 625Hz / 312.5Hz (adjustable)					
Light source		semiconductor laser < 1 mW, 405nm (blue violet)					
Permissible ambient light (at 2.5 kHz)		10,000lx					
Laser safety class		class 2 IEC 60825-1 : 2008-05					
Spot diameter	SMR	320µm	1300µm	1500µm	1500µm	400x500µm	2.5...5mm
	MMR	45µm	1300µm	1500µm	1500µm	400x500µm	2.5...5mm
	EMR	320µm	1300µm	1500µm	1500µm	400x500µm	2.5...5mm
Temperature stability <sup>1)</sup>		0.01% FSO/°C					
Operation temperature		0 ... +50 °C					
Storage temperature		-20 ... +70 °C					
Output	measurements	selectable: 4 ... 20mA / 0 ... 10V / RS 422 / USB (option with cable PC1700-3/USB)					
	switching outputs	1 x error or 2 x limit (each programmable)					
Switch input		Laser ON-OFF / Zero					
Operation		via touch screen on sensor or via PC with ILD 1700 tool					
Power supply		24VDC (11 ... 30VDC), max. 150mA					
Sensor cable length (with connector)		standard 0.25m integrated / optional: extension 3m or 10m					
Synchronisation		possible for simultaneous or alternating measurements					
Protection class		IP 65					
Vibration		2g / 20 ... 500Hz					
Shock		15g / 6ms					
Weight (with 25cm cable)		~ 550g	~ 550g	~ 600g	~ 600g	~ 800g	~ 800g

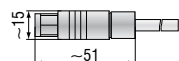
FSO = Full scale output All specifications apply for a diffusely reflecting matt white ceramic target

<sup>1)</sup>based to digital output ; SMR = Start of measuring range MMR = Midrange EMR = End of measuring range

#### Connector (sensor side)



#### Connector (sensor cable)

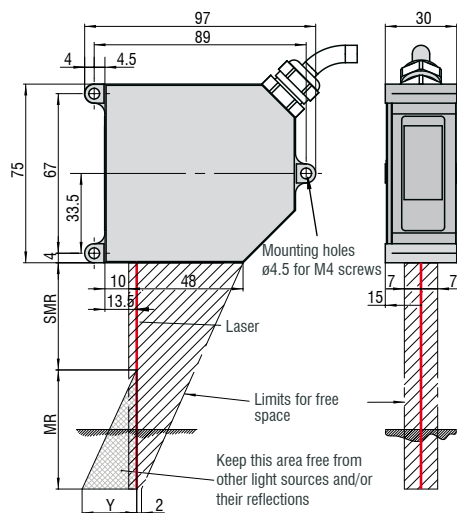




	Three models with measuring ranges from 2mm to 50mm
	Blue Laser Technology (Blue violet laser diode 405nm)
	Adjustable measuring rate up to 49.02kHz
INTER FACE	Ethernet / Ethercat / RS422 Analogue output via C-Box
	Advanced Real-Time-Surface-Compensation
	Calibration certificate included
	Measurement of diffuse and specular surfaces
	Configuration via Web-Interface

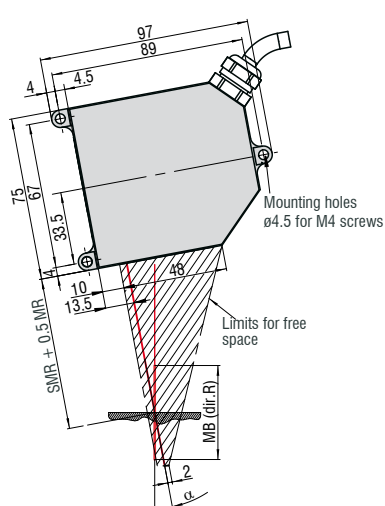
Blue Laser sensors belonging to the series optoNCDT 2300BL are designed for fast distance, displacement and position measurement on red-glowing metals. The blue-violet laser offers decisive advantages. Even in the case of measurements being effected on organic matters such as veneers, wood, or skin, the blue laser makes an important contribution regarding precision. While allowing more stability, the blue laser light does not penetrate the measuring object due to the reduced blue-violet laser.

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



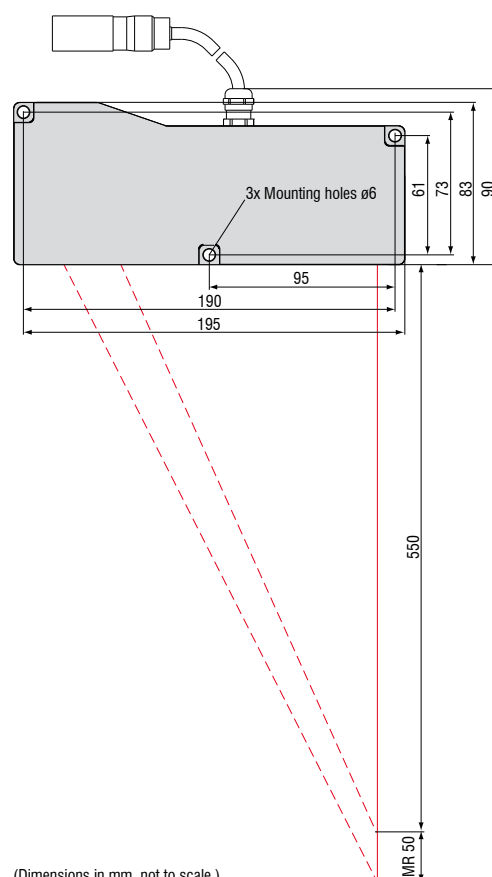
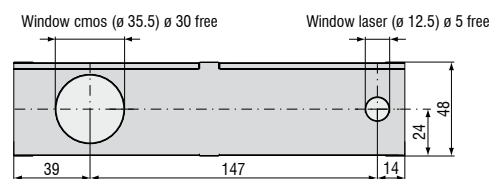
MR	SMR	Y
2	24	1.5
5	24	3.5

**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		ILD 2300-2 BL	ILD 2300-5 BL	ILD 2310-50 BL
Measuring range <sup>1)</sup>		2 (2) mm	5 (2) mm	50 (25) mm
Start of measuring range		24 (24) mm	24 (24) mm	550 (575) mm
Midrange		25 (25) mm	26.5 (25) mm	575 (587.5) mm
End of measuring range		26 (26) mm	29 (26) mm	600 (600) mm
Linearity		0.6µm	1.5µm	40µm
		≤ ±0.03% FSO		≤ ±0.08% FSO
Resolution (20kHz)		0.03µm	0.08µm	7.5µm
		0.0015% FSO		0.015% FSO
Measuring rate		adjustable via software 49.02 / 30 / 20 / 10 / 5 / 2.5 / 1.5kHz (49.02kHz with reduced measuring range)		
Light source		semiconductor laser <1 mW, 405 nm (blue violet)		
Permissible ambient light		10,000lx		
Spot diameter	SMR	70 x 80µm	200 x 200µm	400 ... 500µm
	MMR	20 x 20µm	20 x 20µm	400 ... 500µm
	EMR	80 x 100µm	200 x 400µm	400 ... 500µm
Protection class		IP 65		
Operation temperature		0 ... +50°C		
Storage temperature		-20 ... +70°C		
Inputs / Outputs		Ethernet / EtherCAT		
		RS422 analogue output via CSP2008 / C-Box		
Inputs		Laser on/off; synchronization/trigger input		
Power supply		24 Vdc (11...30V); PV < 3W		
LED		Status / Power / Ethernet / EtherCAT		
Sensor cable	standard	0.25m (with cable connector)		
	option	3 / 6 / 9m with Sub D 15 pin connector		
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		
Weight (with 25cm cable)		550g	550g	~ 800g

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

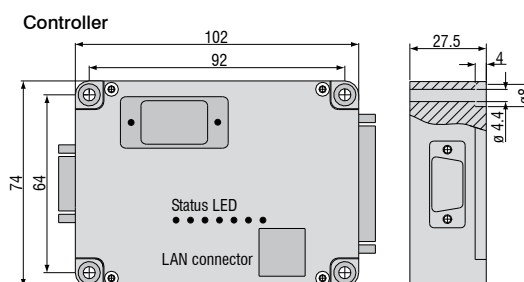
<sup>1)</sup> Numbers in brackets refer to full measurement rate 49.02 kHz



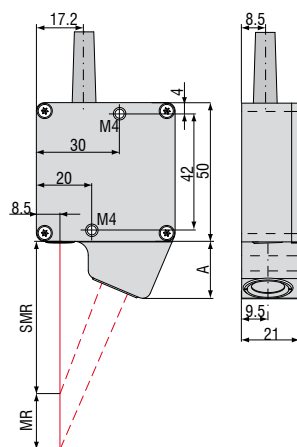
	Nine models with measuring ranges from 4mm to 100mm
	Sensor head and separate controller
	Up to 100kHz (-3dB) true analogue frequency response
INTER FACE	Analogue outputs (U/I) Ethernet

The true analogue optoNCDT 1610/1630 is ideal for high speed measurements such as vibration amplitude, impact and drop tests. The 100kHz (-3dB) frequency response is available for all the measurement ranges from 4mm to 100mm.

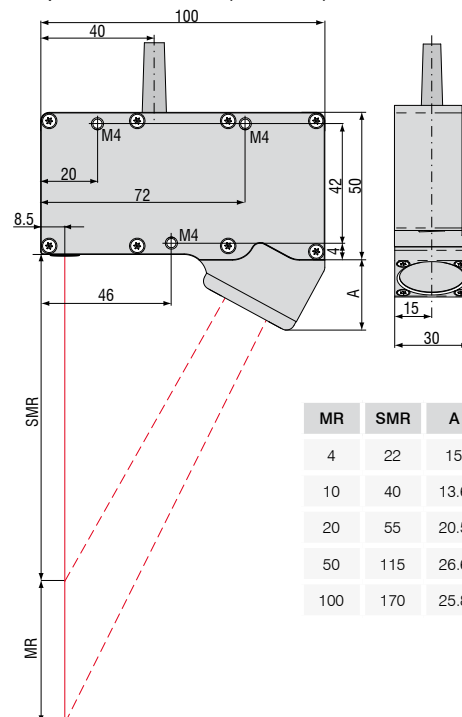
The controller is equipped with both analogue (current, voltage) and Ethernet interfaces.



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



optoNCDT 1610/1630 (50/100mm)



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



Model	LD 1610-4	LD 1610-10	LD 1610-20	LD 1610-50	LD 1610-100
Measuring range	4mm	10mm	20mm	50mm	100mm
Start of measuring range	22mm	40mm	55mm	115mm	170mm
Linearity	8µm	20µm	40µm	100µm	200µm
	≤ 0.2 % FSO				
Resolution (dynamic <sup>1)</sup> )	2.6µm	6.5µm	13.0µm	32.5µm	65µm
Resolution (static <sup>2)</sup> )	0.2µm	0.5µm	1µm	2.5µm	6µm
Spot diameter	0.3mm	0.6mm	0.9mm	1.5mm	1.5mm
Frequency response	10kHz (-3dB)				
Light source	laser, wavelength 670nm, red				
Laser safety class	class 2				
Vibration	10 g ... 1kHz (sensor, 20g option)				
Operation temperature	0° ... +50°C				
Storage temperature	-20° ... +70°C				

Further measuring ranges on request <sup>1)</sup> Measurement on white target with 10kHz <sup>2)</sup> Measurement on white target with 20Hz

Model	LD 1630-4	LD 1630-10	LD 1630-20	LD 1630-50
Measuring range	4mm	10mm	20mm	50mm
Start of measuring range	22mm	40mm	55mm	115mm
Linearity	12µm	30µm	60µm	150µm
	≤ ± 0.3 % FSO			
Resolution (dynamic <sup>1)</sup> )	7µm	17.5µm	35µm	50µm
Resolution (static <sup>2)</sup> )	0.4µm	1µm	2µm	7.5µm
Spot diameter	0.3mm	0.6mm	0.9mm	1.5mm
Frequency response	100kHz (-3dB)			
Light source	laser, wavelength 670nm, red			
Laser safety class	class 2			
Vibration	5g ... 1kHz (sensor, 20g option)			
Operation temperature	0° ... +40°C			
Storage temperature	-30° ... +75°C			

Further measuring ranges on request <sup>1)</sup> Measurement on white target with 100kHz <sup>2)</sup> Measurement on white target with 230Hz

Controller		
Analogue output	displacement	±10V (option 0 ... 10V / 0 ... 5V); 4 ... 20mA
	impedance	appr. 0 Ohm (10mA max.)
	tilt	with 30° object inclination (axis A): appr. 0.5% (white target)
	cut off frequency	DC ... 10kHz / 100kHz
	temperature drift	0.02 % °C FSO
	intensity	0V ... 10V
Digital output	Ethernet (optional)	TCP /IP factory default IP 192.168.122.245 (frequency response 1 - 30kHz)
Switching outputs	MIN	+24V when distance < MIN, LED yellow
	OK	+24V when distance > MIN and < MAX, LED green
	MAX	+24V when distance > MAX, LED orange
	Error	+24 V, LED red
Switching hysteresis		appr. 0.5 % FSO
Ambient light		20,000 LUX
Life time		50,000h laser diode
Isolation voltage		200V DC, 0V
Humidity		up to 90% RH
Protection class		sensor: IP 64, controller: IP 40
Power supply		+24V DC / 200mA (10 ... 30V)
Connector		25 pin Sub D male connector
Cable length (standard)		2m

**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, for snap in mounting on DIN 50022 rail)

**Controller**

- CSP 2008 (controller for processing of multiple sensor signals; analogue and digital interfaces)

**Interface card**

- IF2008 (Interface card for individual signal processing; analogue and digital interfaces)

**Converter**

- IF2004/USB 4 Channel RS422/USB Converter

**Accessories optoNCDT 1302/1402/1402SC****Supply and output cable, rated for moving cable tracks**

(also available in 90° version)

- PC 1402-3/I (3m, output 4 ... 20mA)
- PC 1402-6/I (6m, output 4 ... 20mA)
- PC 1402-3/U (3m, with integral resistance, output 1 ... 5VDC)
- PC 1402-6/U (6m, with integral resistance, output 1 ... 5VDC)
- PC1402-3/IF2008 (3m, supply and output cable)
- PC 1402-3/USB (3m, supply and output cable)
- PC1401/1402-0.2 (0.2m, adapter cable 12-pin to 7-pin)
- PC 1402-3/CSP (3m, required for CSP 2008, optoNCDT 1402 only)

**Supply and output cable, robot rated**

(available in 90° version)

- PCR 1402-3/I (3m)
- PCR 1402-6/I (6m)
- PCR 1402-8/I (8m)

**Supply and output cable 1402SC**

- PC1402SC-3/I (3m, output 4...20 mA)
- PC1402SC-8/I (8m, output 4...20 mA)
- PC1402SC-10/I (10m, output 4...20 mA)
- PC1402SC-3/U (3m, output 1...5 V)
- PC1402SC-6/U (6m, output 1...5 V)
- PC1402SCT-3/I (3m, output 4...20 mA)
- PC1402SC-12/IF2008 (12m, supply and output cable)

**Protective housing**

- SGH ILD 1402(01)
- SGHF ILD 1402(01)

**Accessories optoNCDT 1610 / 1630****Supply and output cable**

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

**Accessories optoNCDT1700/1700LL/1700BL****Supply and output cable (drag chain rated)**

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

**Supply and output cable (robot rated)**

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

**Protective housing**

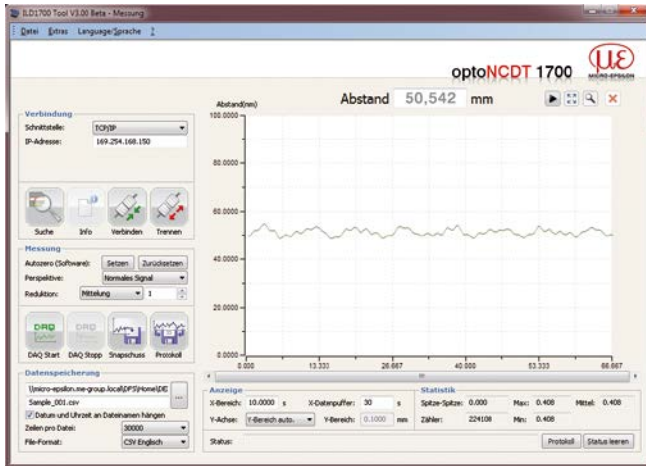
- SGH (size S and M)
- SGHF (size S and M)

**Accessories optoNCDT 2300****Supply and output cable**

- PC2300-0,5Y (Connecting cable to PC or SPS; for operation a PC2300-3/SUB-D will be required)
- PC2300-3/SUB-D (3m; for operation a PC2300-0,5Y will be required)
- PC2300-3/CSP (3m, connecting cable ILD2300 and CSP2008)
- PC2300-10/CSP (10m, connecting cable ILD2300 and CSP2008)
- PC2300-15/CSP (15m, connecting cable ILD2300 and CSP2008)
- PC2300-3/IF2008 (3m, interface and supply cable)
- PC2300-3/OE (3m)
- PC2300-6/OE (6m)
- PC2300-9/OE (9m)
- PC2300-15/OE (15m)

**Protective housing**

- SGH (size S and M)
- SGHF (size S and M)



### Setup and configuration software

ILD Tools is the software included for easy sensor configuration. All 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. ILD Tools also includes a module which can display and save measurement results. The link to the PC is made via the sensor cable with a USB converter. [available for all series except 16x0]

### Driver support for customer software

For the optoNCDT sensors documented DLL drivers are available free of charge, which enables easy integration of the sensors into existing software. Software download free of charge from [www.micro-epsilon.com/download](http://www.micro-epsilon.com/download)

### Protective housing for harsh environment

To protect the laser sensors in extreme environments individual protective housings are available for all sensor models. Three options for the protective housing are offered.

#### Option SGH:

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.

#### Option SGHF:

The SGHF version offers optimum protection for the sensor with integrated compressed air cooling and provides protection against fluids.

SGH ILD 1402(01) & SGHF ILD 1402(01)  
for optoNCDT 1402(025)

SGx ILD size S (140x140x71mm)  
for optoNCDT 1700 / 2300  
dimensions 97x75mm

SGx ILD size M (140x180x71mm)  
for optoNCDT 1700 / 2300  
dimensions 150x80mm



### IF2008 - PCI interface card

The IF 2008 interface card is designed for installation in PCs and enables the synchronous capture of 4 digital sensor signals and 2 encoders. 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.

#### Particular Benefits

- 4x digital signals and two encoders with basic printed circuit board
- Additional expansion board for a total of 6x digital signals, 2x encoder and 2x analogue signals and 8x I/O Signals
- FIFO data memory
- Synchronous data acquisition

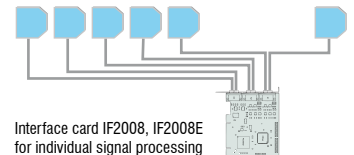


### IF2008E - Expansion board

The IF 2008E expansion board is designed for installation in PCs and enables the synchronous capture of 2 digital sensor signals and 2 encoders as well as 8 I/O-Signals. The expansion board is connected to the basis board IF2008. The absolutely synchronous data acquisition plays an important role particularly for planarity or thickness measurement tasks.

#### Particular Benefits

- Two digital signals, two analogue signals and 8 I/O signals
- Overall with IF2008: 6 digital signals, 2 encoders and 2 analogue signals and 8 I/O Signals
- FIFO data memory
- Synchronous data acquisition



### IF2004/USB 4 Channel RS422/USB Converter

The RS422/USB converter is used for transforming digital signals from up to 4 ILD sensors into USB data signals. Equipped with 4 trigger inputs and 1 trigger output additional USB converters can be adapted.

#### Particular Benefits

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



### C-Box controller for up to 2 displacement signals

The C-Box is a compact controller for the digital-to-analogue conversion of a digital sensor signal and for the evaluation of two digital sensor signals. The output occurs via parameterisable analogue output, Ethernet, RS422 or USB. Besides the averaging and statistics function the measurement of thickness, average, step or tilting is possible. The C-Box may be used with ILD2300 and IFC2451/2471. The digital-to-analogue conversion happens with 16 Bit and 70 kHz maximum.



## CSP2008 - Universal controller for up to six sensor signals

The controller CSP2008 has been designed to process 2 to 6 both optical and other sensors from Micro-Epsilon (6 digital or 4 analogue input signals max., 2x internal + 4x external via EtherCAT modules from the company Beckhoff. EtherCAT is intended as external bus for connecting further sensors and I/O modules. The controller is equipped with a display offering multicolour backlighting which changes its color in the case of exceeding the limit value while a signal is displayed.

### Features

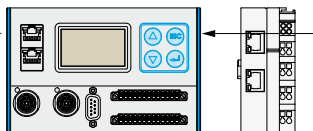
- Real-time processing of input and output signals at up to 100kHz (user selectable)
- Unique user interface for the configuration of the controller via Ethernet on a PC or laptop. All user selectable functions of the controller and the measured values can be viewed, displayed and stored in real time via your own web browser without installing any 3rd part software
- Simple sensor connection with automatic sensor recognition, configuration of the sensor using buttons and display on controller or via web browser
- Modular system upgradable with additional I/O modules for customer-specific requirements. The internal communication between I/O components using EtherCAT connection (CSP 2008 acts as master)
- Extremely flexible and powerful functionality; function modules can be combined in many ways.
- Simple mounting using DIN rail TS 35



### System setup

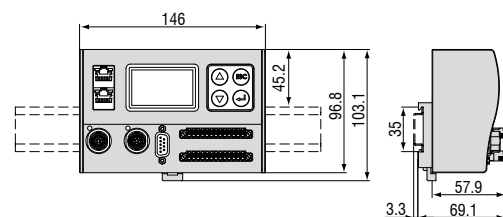
#### Sensors via RS422

optoNCDT 1302  
optoNCDT 1402  
optoNCDT 1700  
optoNCDT 2300  
optoCONTROL 2500  
optoCONTROL 2600  
confocalDT 2451/2471



#### Beckhoff modules for extended inputs / outputs

EK1100, EtherCat bus coupler  
EL4102, Analogue output terminal 0 V bis +10 V, 2 channels (16 Bit), EtherCAT  
EL4132, Analogue output terminal -10 V bis +10 V, 2 channels (16 Bit), EtherCAT  
EL4024, Analogue output terminal 4 ... 20 mA, 4 channels (12 Bit), EtherCAT  
EL2002, Digital output terminal, 24 VDC/ 0,5 A, 2 channels, EtherCAT  
EL2002, Digital output terminal, 24 VDC/ 0,5 A, 2 channels, EtherCAT  
EL2004, Digital output terminal, 24 VDC/ 0,5 A, 4 channels, EtherCAT  
EL3142, Analogue input terminal 0 ... 20 mA, 2 channels (16 Bit), EtherCAT  
EL3162, Analogue input terminal 0 ... 10 V, 2 channels (16 Bit), EtherCAT  
EL1002, Digital input terminal 24 VDC/3 ms, 2 channels, EtherCAT  
EL1012, Digital input terminal 24 VDC/10  $\mu$ s, 2 channels, EtherCAT  
EL1014, Digital input terminal 24 VDC/10  $\mu$ s, 4 channels, EtherCAT  
EL1104, Digital input terminal 24 VDC/3 ms, 4 channels, EtherCAT  
EL5101, Incremental encoder interface, RS485 differential inputs, EtherCAT  
EK1122, 2-Port EtherCAT junction  
RS422 extension terminal



Universal controller with DIN rail TS 35  
(dimensions not to scale)



## High performance sensors made by Micro-Epsilon



Sensors and systems for displacement and position



Sensors and measurement devices for non-contact temperature measurement



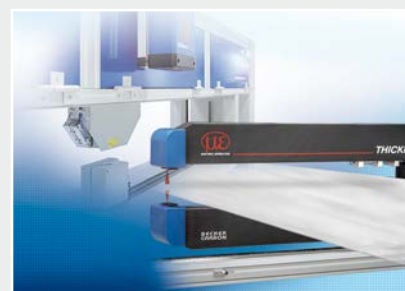
2D/3D profile sensors (laser scanner)



Optical micrometers, fibre optic sensors and fibre optics



Colour recognition sensors, LED analyzers and colour online spectrometer



Measurement and inspection systems



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