Sensor Mounting

The optoNCDT 1900 sensor is an optical system for measurements with micrometer accuracy. Ensure careful handling during installation and operation!

➡ Mount the sensor only to the existing through-bores (mounting holes) on a flat surface. Any type of clamping is not permitted.

➡ Mount the sensor using two M4 screws or the via the through-bores for M3 using the screws from the accessories.

Measuring Range, Start of Measuring Range
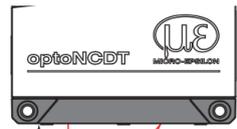
Mounting with diffuse reflection. If the laser beam does not strike the object surface at a perpendicular angle, measurements might be inaccurate.

Digital value [1]	
262077	
98232 (SMR)	
131000 (MMR)	
163768 (EMR)	
262078	

MR = Measuring range
SMR = Start of measuring range
MMR = Mid of measuring range
EMR = End of measuring range

1) For displacement values without zero setting or mastering.

Mounting

Bolt connection

0.75 Nm
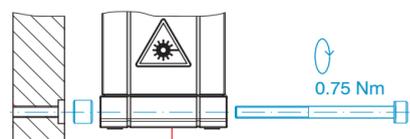
M3 x 40; ISO 4762, A2-70

Direct fastening

2.0 Nm
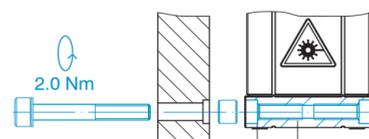
min 10

M4; ISO 4762, A2-70;
Screwing depth min. 10 mm
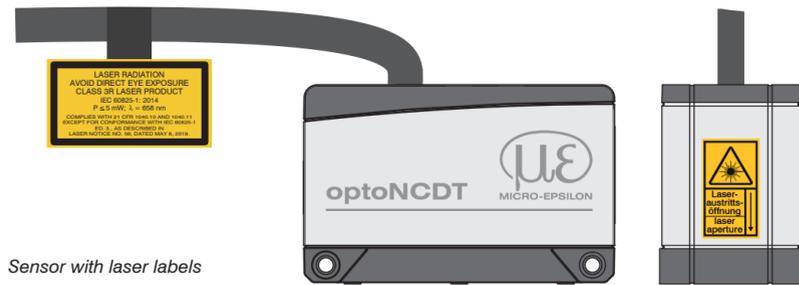
Sensor with laser labels

Drawings, Free Space

70 (2.76)

31 (1.22)

2x ø6 H7 $^{+0,012}_{0}$

2x 6 H7 $^{+0,012}_{0}$

45 (1.77)

11 (.43)

4x M4

4 (.16)

6 (.24)

5 (.20)

2 (.08)

60 (2.36)

X

6 (.24)

6 (.24)

18 (.71)

14 (.55)

32 (1.26)

Y

2 (.08)

Limits for free space

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

Dimensions in mm (inches)
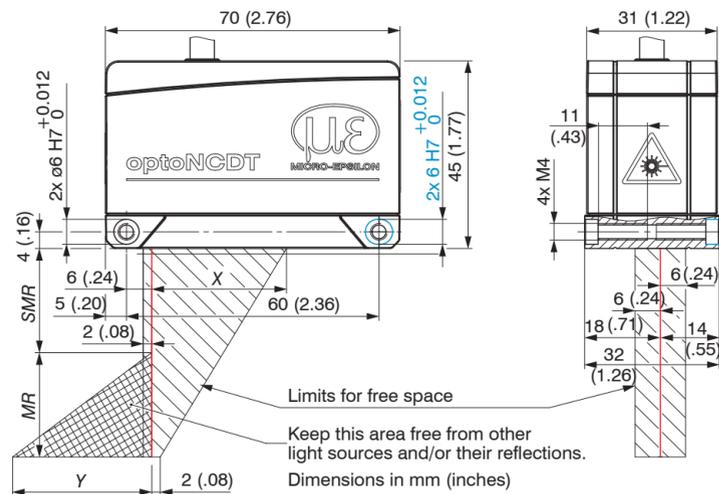
MR	2/2LL	6/6LL	10/10LL	25/25LL	50/50LL	100	200	500
SMR	15	17	20	25	40	50	60	100
X	23	27	33	33	36	37	39	43
Y	3	9	14	33	45	75	130	215

Dimensions in mm

ø6 H7 $^{+0,012}_{0}$

0.02 | A

A

0.02

1.6 ±0.05

ø4.8 (.19)

60 $^{±0,1}$ (2.36)
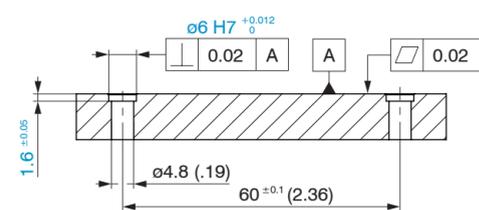
Dimensional drawing, drilling pattern, mounting plate

Alignment by centering elements (optional)

0.3 m

47.5 (1.87)

14 (.55)

M12
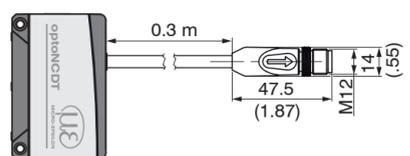
ILD1900-IE with pigtail

Pin assignment

Signal	Wire color PC1900-IE-x/OE-RJ45	Comments	
V_+	Red	Power supply	11 ... 30 VDC, typ. 24 VDC
GND	Blue	Reference ground	
Laser on/off +	Black	Switching input	Laser in the sensor is active if both pins are connected to each other.
Laser on/off -	Violet		

Open end connections, PC1900-IE-x/OE-RJ45

Signal	Pin	Comments	
V_+	1	Power supply	11 ... 30 VDC, typ. 24 VDC
GND	2	Reference ground	
Laser on/off +	7	Switching inputs	
Laser on/off -	8		
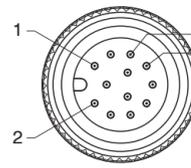
Pigtail connections on the sensor, 12-pin connector, M12, pin side pigtail cable connector

Supply voltage

Nominal value: 24 V DC (11 ... 30 V, P < 3 W).

Industrial Ethernet with PoE

Sensor supply is via a PoE-capable switch. Phantom powering (PoE) is possible via the

- PC1900-IE-x/RJ45 [1]
- PC1900-IE-x/OE-RJ45

cables.

1) PoE is not possible with PROFINET operation.

Industrial Ethernet without PoE

Sensor supply is via the PC1900-IE-x/OE-RJ45 cable.

Sensor pin	PC1900-IE-x/OE-RJ45 Color	Power supply
1	Red	V_+
2	Blue	GND

11 ... 30 VDC   ILD1900-IE

As an alternative to PoE, the sensor can be supplied with the optional PS2020 power supply unit.

Voltage supply only for measuring devices, not to be used for drives or similar sources of impulse interference at the same time. MICRO-EPSILON recommends using an optional available power supply unit PS2020 for the sensor.

➡ Only turn on the power supply after wiring has been completed.

➡ Connect the inputs Pin 1 and Pin 2 at the sensor with a 24V power supply.

Laser Safety

The optoNCDT 1900 operates with a semiconductor laser with a wavelength of 670 nm (visible/red) or 658 nm (visible/red). Operation of the laser is indicated visually by the LED `state` on the sensor. During operation of the sensor, the pertinent regulations according to IEC 60825-1 on „Safety of laser products" must be fully observed at all times. The sensor complies with all applicable laws for the manufacturer of laser devices. Please observe national regulations, e. g., Laser Notice No. 56 for the USA.

ⓘ If both warning labels are covered over when the unit is installed, the user must ensure that supplementary labels are applied.
Observe the national laser protection regulations.

Laser Class 2

The sensors fall within laser class 2. The laser is operated on a pulsed mode, the maximum optical power is ≤ 1 mW. The pulse frequency depends on the adjusted measuring rate (0.25 ... 10 kHz). The pulse duration of the peaks is regulated depending on the measuring rate and reflectivity of the target and can be 4 up to 3995 μs.

LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
IEC 60825-1: 2014
P≤1mW; λ=670nm
COMPLIES WITH 21 CFR 1040.10 AND 1040.11
EXCEPT FOR CONFORMANCE WITH IEC 60825-1
ED. 3, AS DESCRIBED IN
LASER NOTICE NO. 56, DATED MAY 8, 2019.

⚠ CAUTION
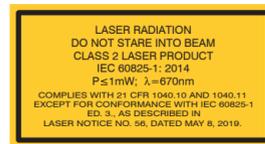
Laser radiation. Irritation or injury of the eyes possible. Close your eyes or immediately turn away if the laser beam hits the eye.

Laser warning sign on the sensor housing   *Laser labels on the sensor cable*

Laser Class 3R

The sensors fall within laser class 3R. The laser is operated on a pulsed mode, the maximum optical power is ≤ 5 mW. The pulse frequency depends on the adjusted measuring rate (0.25 ... 10 kHz). The pulse duration of the peaks is regulated depending on the measuring rate and reflectivity of the target and can be 4 up to 3995 μs.

LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT
IEC 60825-1: 2014
P ≤ 5 mW; λ = 658 nm
COMPLIES WITH 21 CFR 1040.10 AND 1040.11
EXCEPT FOR CONFORMANCE WITH IEC 60825-1
ED. 3, AS DESCRIBED IN
LASER NOTICE NO. 56, DATED MAY 8, 2019.

⚠ CAUTION

Laser radiation. Irritation or injury of the eyes possible. Use suitable protective equipment and close your eyes or immediately turn away if the laser beam hits the eye.

Laser warning sign on the sensor housing   *Laser labels on the sensor cable*

Accordingly, the following applies: The accessible laser radiation is harmful to the eyes. Looking directly into the laser beam is harmful to the eyes with laser class 3R devices. Reflections of shiny or mirroring surfaces are also harmful to the eyes.

Class 3R laser sensors require a laser protection officer. Mark the laser area recognizable and everlasting. During operation the laser area has to be restricted and marked.

Electrical Connections

RJ45 Connection, PoE, Laser On/Off via Software

PC1900-IE-x/RJ45

PoE Switch

PLC

PC / Ethernet

RJ45 Connection, PoE, Laser On/Off via Hardware

PC1900-IE-x/OE-RJ45

PoE Switch

Laser On/Off

PC / Ethernet

PLC
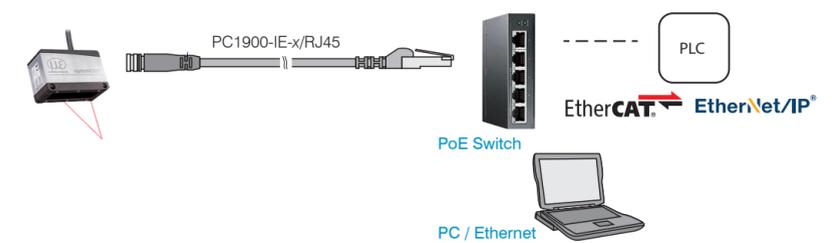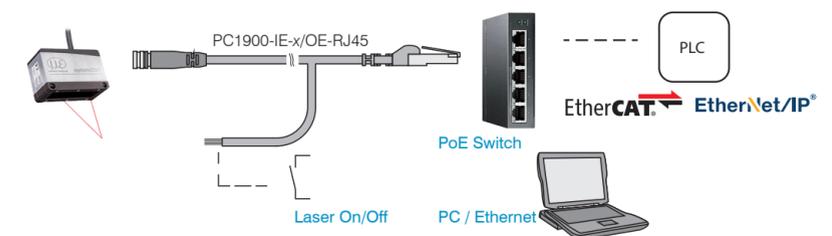
RJ45 Connection, Supply via Optional Power Supply Unit, Laser On/Off via Hardware
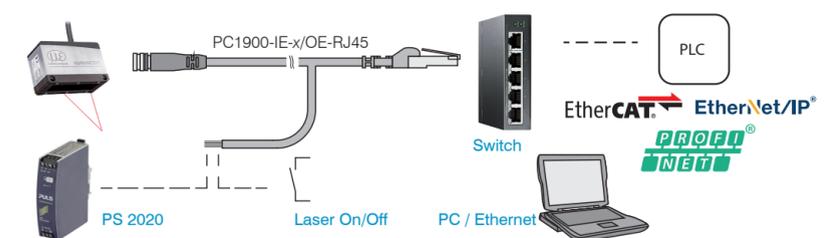
PC1900-IE-x/OE-RJ45

Switch

PS 2020

Laser On/Off

PC / Ethernet

PLC

Operating Instructions
optoNCDT 1900 / 1900LL
EtherCAT
EtherNet/IP
PROFINET

Intended Use

The optoNCDT 1900 is designed for use in industrial and laboratory applications. It is used for measuring displacement, distance and position as well as in quality control and dimensional testing.

The sensor must only be operated within the limits specified in the technical data, see operating instructions, Chap 3.3. The sensor must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the sensor. Take additional precautions for safety and damage prevention in case of safety-related applications.

Warnings

Avoid unnecessary laser radiation to be exposed to the human body.

➡ Switch off the sensor for cleaning and maintenance.

➡ Switch off the sensor for system maintenance and repair if the sensor is integrated into a system.

Caution - use of controls or adjustments or performance of procedures other than those specified may cause harm.

Connect the power supply according to the safety regulations for electrical equipment. The supply voltage must not exceed the specified limits.
> Risk of injury, damage to or destruction of the sensor.

Avoid constant exposure of the sensor to splashes of water. Avoid exposure of sensor to aggressive media (detergents, cooling emulsions).
> Damage to or destruction of the sensor

Avoid shock and vibration to the sensor. Protect the sensor cable against damage.
> Damage to or destruction of the sensor, failure of the measuring device.

Control and Display Elements

State LED	Meaning
Green	Measuring object within the measuring range
Yellow	Measuring object in the mid of the measuring range
Red	No distance value available, e.g. target outside the measuring range, too low reflection
Yellow flashing, 1 Hz	Bootloader
Yellow flashing, 8 Hz	Installation active
State LED lights up (green, yellow or red) and briefly flashes yellow at intervals of approx. 1 sec.	Ethernet setup mode
Off	Laser switched off
LED RUN/SF/MS	**Meaning**
	depending on Industrial Ethernet operation (IE)
LED ERR/BF/NS	**Meaning**
	depending on Industrial Ethernet operation (IE)

Select button	Meaning
	- Switching operating mode (with EtherCAT only) - Resetting to factory setting

Quick Guide

Structure of the Components

➡ Mount the sensor and connect the components to one another.

Initial Operation

➡ Connect the sensor to a power supply if PoE is not used.

Operation via Web Interface

The sensors start with the last stored operating mode. Standard is Industrial Ethernet (IE). A web server is implemented in the sensor; the web interface displays, among other things, the current settings of the sensor. Operation is only possible while there is an Ethernet connection to the sensor.

EtherCAT		EtherNet/IP	PROFINET
Ethernet setup mode	**Ethernet over EtherCAT (EoE)**	ⓘ An ILD1900-IE with EtherNet/IP is delivered in DHCP mode without IP address. A DHCP server is required, to assign an temporary IP address to the sensor. Subsequently, it is also possible to assign a static IP address.	ⓘ An ILD1900-IE with PROFINET has no IP address by default. The static IP address and the device name are assigned via DCP (Discovery and Configuration Protocol). The IP address and the device name can be assigned, e.g., via the TIA Portal software.
➡ Switch to the Ethernet setup mode. Details can be found in section `Switch between Industrial Ethernet Operation and Ethernet Setup Mode`. The standard IP address is 169.254.168.150. Note: As IP setting of the network card to which the sensor is connected, we recommend a static configuration with 169.254.168.1 as IP address and the subnet mask 255.255.0.0.	➡ Parallel to the EtherCAT operation you can adjust the sensor. ➡ Enable the EoE in your PLC software. `Virtual Ethernet Port` is a name in TwinCAT®. ➡ Assign a MAC address and an IP address to the slave.	➡ Assign an IP address to the sensor. You can find an example of this in the appendix of the operating instructions.	➡ Assign an IP address to the sensor. You can find an example of this in the appendix of the operating instructions.

Turning on the Laser

The measuring laser on the sensor is switched on via a software command or a switching input. This allows to switch off the sensor for maintenance purposes or similar. Response time: after the laser is switched on, the sensor needs depending on the measuring rate five cycles to send correct measured data.

Laser on/off via software, Supply with PoE	Laser on/off via hardware, Supply with PoE	Laser on/off via hardware, Supply without PoE
The measuring laser on the sensor is activated via a software command. Activation using the PC1900-IE-x/OE-RJ45 cable is possible.	The measuring laser on the sensor is activated via a switch or similar. Activation using the PC1900-IE-x/OE-RJ45 cable is possible.	A switching transistor with open collector (for example in an optocoupler), a relay contact or a digital TTL or HTL signal are suitable for switching.

The inputs are not electrically separated.

24 V logic (HTL): Low level ≤ 3 V; High level ≥ 8 V (max 30 V)

internal pull-up resistor, an open input is detected as High.
Max. switching frequency 10 Hz

The ground of the logic circuit must be galvanically connected to "Laser on/off -".

No external resistance is required for current limitation. For permanent "Laser on", connect the black and violet wires.

Switch between EtherCAT Operation and Ethernet Setup Mode

The sensor starts in the last stored operating mode. It is factory set to EtherCAT. Access via Ethernet is possible in the Ethernet setup mode.

➡ Press and hold the `Select` button on the sensor before switching on the power supply on the sensor. Release the button again as soon as the `State` LED flashes yellow. Press the button again for approx. 10 to 15 seconds until the `State` LED flashes red.

Within the time $t_2... t_3$ the red flashing with 8 Hz starts after 10 seconds. The key must be released again after 15 seconds at the latest. When the `Select` key is released at the latest at time t_3, the `State` LED starts to flash yellow at 8 Hz.

t_0:	Supply voltage is applied.
t_1:	The `State` LED starts flashing yellow, the `Select` button can be released
t_2:	Within 15 sec. $(t_2 - t_1)$, press `Select` button again and hold for further 10 ... 15 sec. $(t_3 - t_2)$
$t_3... t_4$:	Switches from EtherCAT to Ethernet setup mode, duration max. 1 min.
t_4:	Sensor starts in Ethernet setup mode, the `State` LED lights up briefly at intervals of approx. 1 sec.
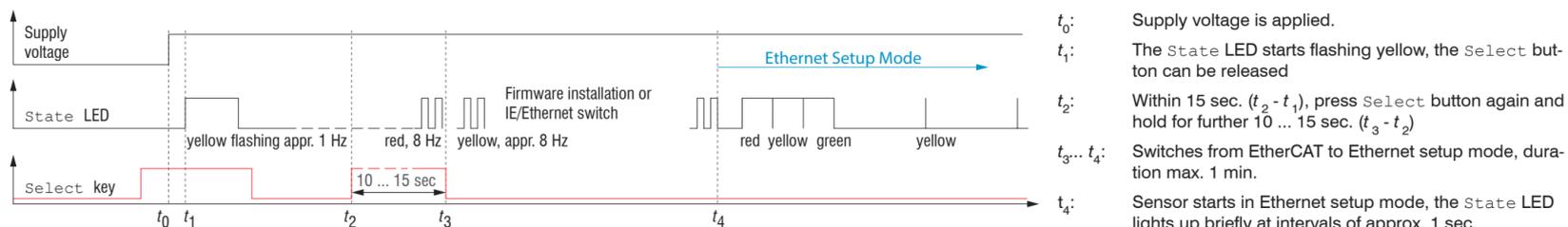
Flowchart for starting a sensor in Ethernet setup mode

After completion of the firmware installation/switch, the sensor reboots at time t_4.

Switch between Ethernet Setup Mode and EtherCAT

The sensor starts in the last stored operating mode. With the `select` button, you can set the sensor to the EtherCAT mode.

➡ Press and hold the `Select` button on the sensor before switching on the power supply on the sensor. Release the button again as soon as the `State` LED flashes yellow. Press the button again for approx. 10 to 15 seconds until the `State` LED flashes red.

Within the time $t_2... t_3$ the red flashing with 8 Hz starts after 10 seconds. The key must be released again after 15 seconds at the latest. When the `Select` key is released at the latest at time t_3, the `State` LED starts to flash yellow at 8 Hz.

t_0:	Supply voltage is applied
t_1:	The `State` LED starts flashing yellow, the `Select` button can be released
t_2:	Within 15 sec. $(t_2 - t_1)$, press `Select` button again and hold for further 10 ... 15 sec. $(t_3 - t_2)$
$t_3... t_4$:	Switches from Ethernet setup mode to EtherCAT, duration max. 1 min.
t_4:	Sensor starts in EtherCAT operating mode.

Flowchart for starting a sensor in EtherCAT operation

After completion of the firmware installation/switch, the sensor reboots at time t_4.

Proper Environment

- Protection class: IP67 (applies only when sensor cable is plugged in)
Lenses are excluded from the protection class. Contamination of the lenses causes impairment or failure of the function.

- Temperature range
  ▪ Operation: 0 ... +50 °C
  ▪ Storage: -20 ... +70 °C

- Humidity: 5 ... 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure

Access via Web Interface

➡ Start your web browser.

➡ Type the IP address of the sensor into the address bar.

Interactive web pages you can use to configure the sensor are now displayed in the web browser. The web interface does not guarantee real-time measurements. The currently running measurement can be controlled using the function buttons in the `Chart type` section.
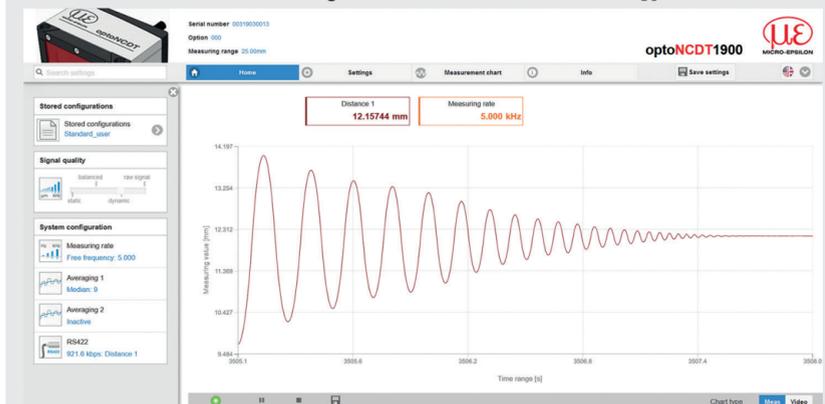
In the top navigation bar, other functions (settings, measurement chart etc.) are available. The appearance of the websites can change dependent of the functions. Each page contains dynamic parameter descriptions and tips on completing the web page.

After parameterization, store all settings permanently in a parameter set so that they are available again the next time the sensor is switched on. To do this, use the `Save settings` button.

Positioning the Target

➡ Position the target as centrally as possible within the measuring range.

The `state` LED on the sensor indicates the position of the target to the sensor.

LED	Color		Meaning
state	◯	Off	Laser beam is switched off.
	🟢	Green	Measuring object within the measuring range
	🟡	Yellow	Target is in the mid of measuring range.
	🔴	Red	No distance value available, e.g. target outside the measuring range, too low reflection

Saving the Settings, Continuing Industrial Ethernet Operation

➡ Go to `Settings > System settings > Load & Save` or click the `Save settings` button.

The sensor now also saves the settings for use in Industrial Ethernet operation.

For sensors with operation mode EtherCAT:

➡ Go to `Settings > System settings > Boot mode`. Select the entry `Industrial Ethernet`.

The sensor disconnects from the browser and boots automatically with the Industrial Ethernet firmware. The boot process can take up to one minute.

Alternatively, you can return to the Industrial Ethernet operation via the `select` button. Details can be found in section `Switch between Ethernet Setup Mode` and `EtherCAT`.

Continue working in your PLC environment.

You can find more information about the sensor in the operating instructions. They are available online at:

https://www.micro-epsilon.com/distance-sensors/laser-sensors/optoncdt-1900/

or with the QR code at right: