Notes on Product Marking

The product meets the requirements of CE and UKCA. All specifications and safety instructions described in the operating instructions must be observed.

Laser Safety

The optoNCDT ILR1171 works with a semi-conductor laser at a wavelength of 905 nm (invisible/infrared). The maximum optical power is ≤ 1 mW.

The sensors fall within laser class 1.

The accessible radiation is harmless under predictable conditions. For class 1 laser devices, impairment of color vision and disturbances, e.g., from a glare effect, cannot be excluded.
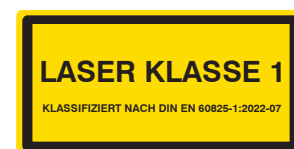
Consequently, you can use Class 1 laser equipment without further protective measures.

Lasers of Class 1 are not subject to notification and a laser protection officer is not required.

The following warning labels must be attached to the cover (front side) of the sensor housing. The IEC laser warning labels have already been attached. For other non German speaking countries, an IEC standard label and a German label are included in delivery and the versions valid for the user´s country must be attached before the device is put into operation for the first time.

| CLASS 1 LASER PRODUCT | LASER KLASSE 1 |
| IEC / EN 60825-1:2014 | KLASSIFIZIERT NACH DIN EN 60825-1:2022-07 |

Laserhinweisschild IEC   *Laserhinweisschild, deutsch*

Sensor with laser labels

The housing of the optical sensors may only be operated by the manufacturer, see operating instructions, Chap. 11.

For repair and service purposes, the sensors must always be sent to the manufacturer.

Proper Environment

- Protection class: IP67
- Temperature range:
  - Operation: -40 ... +60 °C (-40 ... +140 °F) [1]
  - Storage: -40 ... +70 °C (-40 ... +158 °F)
- Humidity: 15 ... 90 % RH (non-condensing)
- Ambient pressure: Atmospheric pressure

1) The heating element ensures the temperature range of operation of the components and free optics (no condensation) of the optoNCDT ILR1171.

Unpacking/Included in Delivery

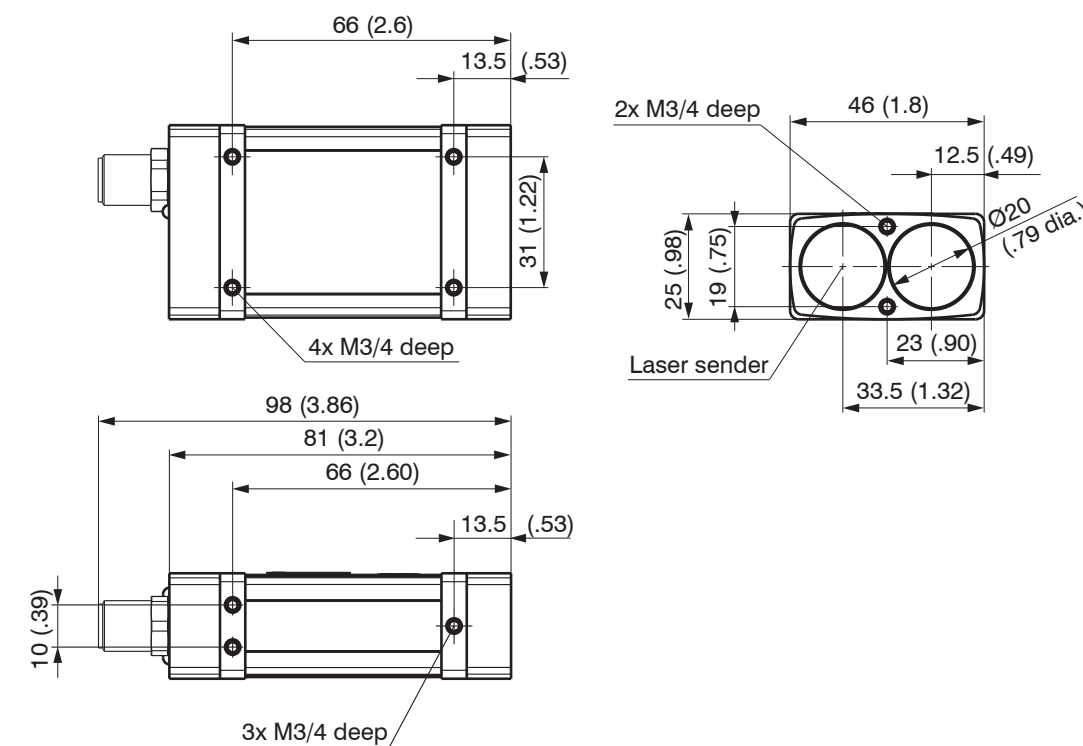1 Sensor ILR1171-125
1 Assembly Instructions
1 German laser label
1 IEC laser label

Installation and Assembly, Dimensional Drawings

The sensor optoNCDT ILR1171 is an optical sensor for measurements with millimeter accuracy.

i Ensure careful handling during installation and operation!

Dimensional drawing optoNCDT ILR1171, dimensions in mm (inches, rounded off)

The optoNCDT ILR1171 can be screwed on 3 positions:
- front with 2 screws M3
- bottom side with 4 screws M3
- one small side with 3 screws M3

i Mount the sensor only to the existing through-bores on a flat surface. Any type of clamping is not permitted.
Never exceed the specified torques.
Choose the length depending on the counter piece.

Bolt connection [1]

Position	Bolt length	Screwing depth	Quantity	Screw	Torque
Front side	10 mm	4 mm	2	M3 ISO 4762-A2	1.7 Nm for strength class 70 2.3 Nm for strength class 80
Bottom side	10 mm	4 mm	4		
One small side	10 mm	4 mm	3		

Installation conditions

1) Recommendation: Test under use conditions!

MICRO-EPSILON recommends using screws with washer and ring washer.

The zero point for measurement is identical with the housing front face.

Operating Elements

1 n.c.
2 Measurement control LED, multicolor
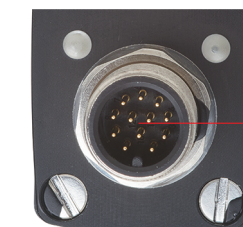3 12-pin M12-A female connector, type Binder

Operating elements of the sensor optoNCDT ILR1171

The optoNCDT ILR1171 has a measurement control LED. The LED is flashing green during measuring without a failure.

The LED is flashing red if a failure is happened.

Pin Assignment

All models share the same type of main connector port/interface.

Supply voltage/RS232/422 12-pin M12-A female connector, type Binder

Connector on the rear side of the sensor

The connector is located on the rear side of the sensor.

The assignment of the power supply/serial interface results from a 12-pole round-type (flange mount) series 723 connector from Binder.

This connector type guarantees optimized screening and a high IP degree. The required counterpart is an adequate female cable connector.

MICRO-EPSILON recommends the optionally available supply and output cable PC1171-x.

Bending radius of the PC1171-x: 47 mm (once); 116 mm (permanent)

Pin	Signal	Description	Wire color PC1171
1	Q1	Switching output Q1	Brown
2	VDC-	GND (supply voltage)	Blue
3	RS422 / RS232	Pin for RS422 or RS232	White
4	TX+	RS422 transmission data + RS232 transmission data	Green
5	RX-	RS422 receiving data -	Pink
6	TX-	RS422 transmission data -	Yellow
7	Q2	Switching output Q2	Black
8	RX+	RS422 receiving data + RS232 receiving data	Gray
9	VDC+	Supply voltage 10 ... 30 VDC	Red
10	TRIGIO	Trigger signal IN / OUT	Violet
11	QA	Analog output	Gray/pink
12	GND	GND (Qx, RS232, RS422, trigger)	Red/blue
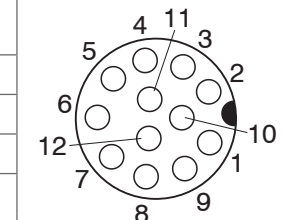
View on solder pin side, 12-pol female cable connector

Pin Assignment optoNCDT ILR1171 M12-A female connector, type Binder

Inverse polarity protection is provided. Overvoltage protection is provided up to a maximum of 42 V DC.

i Check the connection of pin 3 (white) before using the RS232 or RS422 serial interface.
- When using the RS232, pin 3 is not connected to pin 12 GND).
- When using the RS422, connect pin 3 to pin 12 (GND).

i The shield of the cable should be connected to the connector housing.
Open, unused cable wires must be insulated.

MICRO-EPSILON

Assembly Instructions
optoNCDT ILR1171

Intended Use

The optoNCDT ILR1171 is designed for use in industrial and laboratory applications (research and development facilities). It is used for process monitoring in steel works and rolling mills, fill-level measurement, monitoring of moving objects, positioning of cranes and loading equipment, position monitoring of road vehicles and ships, speed measurement of vehicles and ships. 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

Connect the power supply according to the safety regulations for electrical equipment.
> Risk of injury
> Damage to or destruction of the sensor

Refrain from using the sensor in an explosive environment.
> Damage to or destruction of the sensor and/or other proximate equipment

Cable connectors must not be plugged or unplugged, as long as voltage is supplied. Remember to turn voltage supply off before you begin working on cable connections. The supply voltage must not exceed the specified limits. Avoid shocks and impacts to the sensor.
> Damage to or destruction of the sensor

Protect the cables against damage. Do not turn the module on if there is fogging or soiling on its optical parts. Do not touch any of the module's optical parts with bare hands. Proceed with care when removing dust or contamination from optical surfaces.
> Failure of the measuring device

Avoid measurements against the sun or onto surfaces with low reflectivity in very bright environments. Avoid measurements through glass, optical filters, Plexiglas or other translucent materials.
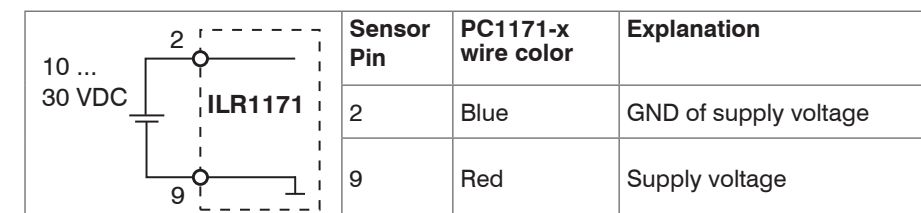> Incorrect measurement

i Information and warning signs must not be removed.

Supply Voltage

Nominal value 24 VDC (10 ... 30 V)

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

⯈ Connect the `2 (blue)` and `9 (red)` inputs on the sensor to a 24 V voltage supply.

	Sensor Pin	PC1171-x wire color	Explanation
10 ... 30 VDC **ILR1171**	2	Blue	GND of supply voltage
	9	Red	Supply voltage

Supply voltage connection

ⓘ Use the voltage supply only for measuring devices, not for drives or similar sources of impulse interference at the same time.
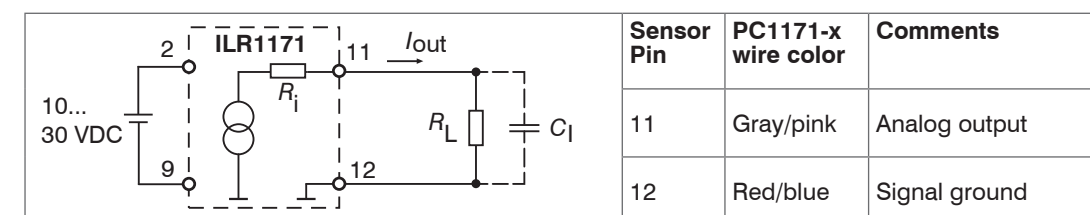
MICRO-EPSILON recommends using the optionally available PS2020 power supply for the sensor.

Analog Output

The sensor produces a current output of 4 ... 20 mA.

ⓘ The output may not be used continuously in short-circuit operation without a load resistor. Continuous short-circuit operation leads to thermal overloading and thus causes the output to switch off automatically.

⯈ Connect the `11 (gray/pink)` and `12 (red/blue)` inputs on the sensor to a measuring device.

	Sensor Pin	PC1171-x wire color	Comments
10... 30 VDC **ILR1171** R_I R_L C_I I_{out}	11	Gray/pink	Analog output
	12	Red/blue	Signal ground

Analog output switching

Analog Output Properties		
- 4 ... 20 mA	- Behavior when error reported: 3 mA	Load $R_L < V_+$ - 1 V / 20 mA
- R_I 30 Ohm	- Accuracy: 0.1 % FSO	@10 V: R_L < 450 Ohm
- Distance range limits adjustable	- Resistant to short circuits	@24 V: R_L < 1150 Ohm
- Resolution: 16 bit DA converter	- FSO = Full Scale Output	@30 V: R_L < 1450 Ohm

The current impressed in the line is proportional to the measured distance. You can find more details on this in the analog output section, see operating instructions, appendix.

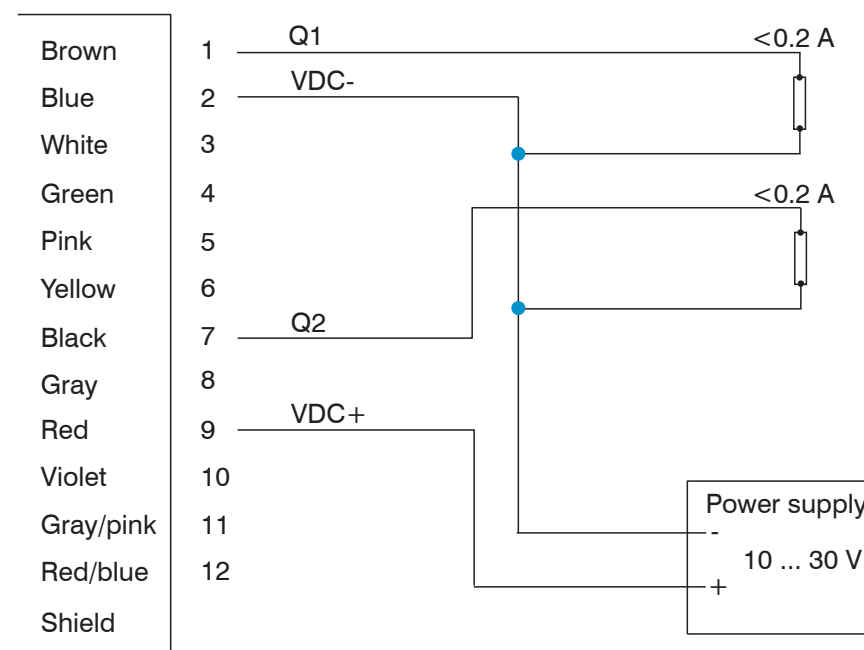ⓘ The measured values are always output via the analog output.

Switching Output

Switching outputs `Q1` and `Q2` show the distance information as logical switching information. They signalize whether the preset hysteresis switching range is exceeded or fallen short of.

Thus, they are ideally suitable for direct further processing of monitored values such as fill level or object detection. Parameterization is done via the serial interface.

A load resistor of > 150 Ohms/ 6 W (max. supply voltage of 30 V; max. load current of 0.2 A) must be switched against VDC- (GND of supply voltage) at the switching output. It is important that the load current of 0.2 A is not exceeded.

ⓘ Typical resistance: 1 kOhm against VDC (not against GND)

Brown	1	Q1		<0.2 A
Blue	2	VDC-		
White	3			
Green	4			<0.2 A
Pink	5			
Yellow	6			
Black	7	Q2		
Gray	8			
Red	9	VDC+		
Violet	10			
Gray/pink	11			Power supply
Red/blue	12			10 ... 30 V
Shield				+

Pin assignment and wiring of switching outputs Q1 and Q2

`Q1/Q2` parameterizes the behavior of the switching outputs.
The parameters include the beginning *w* of the measuring range (switching threshold) when the output switches, the length *x* of the switching range, the switching hysteresis *y* as well as the logic behavior *z* (switching state).

Q_1, Q_2 HIGH / LOW z ... w ... x ... y

$\overline{Q}_1, \overline{Q}_2$ HIGH / LOW z
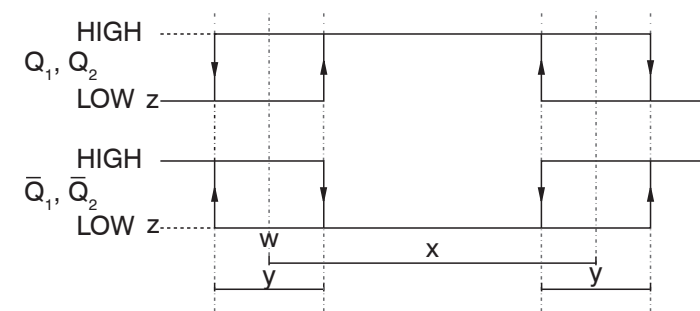
Low = 0   U < 1 V
High = 1   U = Supply voltage - 1 V

Switching behavior of Q1 or Q2 respectively

Variable	Description	Specification
w	Switching threshold	-9999,999 ... +9999,999
x	Switching range	x > 0; x > y
y	Switching hysteresis	y ≥ 0
z	Switching state	z = 0 or 1

Trigger Input/Output

The optoNCDT ILR1171 trigger could be used as input or output, see operating instructions.

RS422 Connection with USB Converter IF2001/USB

The RS422 interface can be used for configuration as well as for permanent data transmission, even over longer distances. It is interference-resistant and suitable for industrial applications. Distances of up to 1200 m are possible with a twisted-pair cable.

For the connection between sensor and PC, the lines must be crossed.

ⓘ Only disconnect or connect the sub-D connection between the RS422 and USB converter IF2001/USB when no voltage is flowing.

Characteristics

- Maximum input voltage RX+, RX- : ±14 V_{max} internally terminated with 120 Ohm
- Output voltage TX: ±2 V, differential at 2 x 50 Ohm

Parameter

- Baud rate 115200 baud
- Data bits: 8
- Parity: None
- Start/stop bit: 1
- Handshake: No
- Command protocol: ASCII

ⓘ The RS422 interface is widely used in industrial applications.
Use a suitable USB converter, e.g. the optional available IF2001/USB, if your PC/notebook only has USB ports.

Sensor			Terminal, PLC, IF2001/USB Converter from MICRO-EPSILON	
Pin	Wire color PC1171-x	Function	Function	
8	Gray	Rx+	Tx+	
5	Pink	Rx-	Tx-	
6	Yellow	Tx-	Rx-	
4	Green	Tx+	Rx+	
12	Red/ blue	GND	GND	

Crossed data lines on receive and transmit side

Symmetrical differential signals according to EIA-422, not electrically separated from the voltage supply. Use a shielded cable with twisted wires, e. g. PC1171-x, available as an optional accessory.

Quick Guide

Initial Operation

The sensor is ready to use after approx. 2 s, digital accuracy is immediate.

The sensor typically requires a warm-up time of 5 min for reproducible measurements via the analog output.

⯈ Connect the sensor to a PC/notebook via an RS422 converter and connect the power supply.

⯈ Launch a terminal program (e.g. Bra@s Terminal, Tera Term, Putty).

⯈ The program will now search for connected ILR1171 sensors.

Using the ILR1171 via the Serial Interface with a Terminal Program

The optoNCDT ILR1171 is parameterized via a serial interface.

Prerequisite for programming via UART is a connection provided by a terminal program (e.g. Bra@s Terminal, Tera Term, Putty).

The set parameters are stored in an EEPROM.

When restarting, the last entered data will be available.

Basic settings for communication:

Baud rate:	115200
Parity:	none
Data bits:	8
Stop bits:	1

⯈ Select the appropriate COM port where the sensor is connected to the PC.

Retrieving Parameters

⯈ Type `PARAMETER <CR>`

Setting Parameters

⯈ Type `PARAMETER VALUE <CR>`

For further documentation about possible parameter and their values please consult operating instructions.

`<CR> = 0x0d`

Start Distance Measurement (Operation Mode)

⯈ Type `DT <CR>`

Abort distance measurement and enable command input (setup mode)

⯈ Type `<ESC>` key (=0x1b).

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