



Instruction Manual
optoNCDT ILR 1191

ILR 1191-300

Laser-based distance sensor

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Certified acc. to DIN EN ISO 9001: 2008

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1. Safety

The handling of the sensor assumes knowledge of the instruction manual.

1.1 Symbols Used

The following symbols are used in this instruction manual:



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a situation which, if not avoided, may lead to property damage.



Indicates a user action.



Indicates a user tip.

1.2 Warnings



Caution - use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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

Safety devices must not be defeated or otherwise rendered ineffective.

> Danger of injury



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.

> Damage to or destruction of the sensor

Avoid shock and vibration to the sensor.

> Damage to or destruction of the sensor

Protect the cables against damage.

> Failure of the measuring device

Do not turn the module on if there is fogging or soiling on its optical parts.

> Failure of the measuring device

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

i Information and warning signs must not be removed.

1.3 Notes on CE Identification

The following applies to optoNCDT ILR 1191:

- EU directive 2004/108/EC
- EU directive 2011/65/EU, "RoHS" category 9

Products which carry the CE mark satisfy the requirements of the quoted EU directives and the European standards (EN) listed therein. The EU declaration of conformity is kept available according to EU regulation, article 10 by the authorities responsible at

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The sensor is designed for use in industry and satisfies the requirements of the standards

- EN 61326-1: 2006
- EN 61010-1: 2001

The system satisfies the requirements if they comply with the regulations described in the instruction manual for installation and operation.

1.4 Proper Use

- The sensors are be used for
 - Process monitoring in steel works and rolling mills
 - Fill-level measurement
 - Monitoring of moving objects
 - Positioning of cranes and loading equipment
 - Measurement of otherwise inaccessible target points, for example, inside of hollow bodies such as tubes or containers
 - Position monitoring of road vehicles and ships
 - Speed measurement of vehicles and ships
- The measuring system may only be operated within the limits specified in the technical data, see Chap. 3.
- The sensors may only be used in such a way that does not endanger persons or cause damage to the machine due to malfunctions or total failure of the sensor.
- Additional precautions for safety and damage prevention must be taken for safety-related applications.

1.5 Proper Environment

- Protection class: IP 67
- Operating temperature: -40 up to +60 °C (-40 to +140 °F)
- Storage temperature: -40 up to +70 °C (-40 to +158 °F)
- Humidity: < 65 % (no condensation)
- Ambient pressure: atmospheric pressure

2. Laser Class

The optoNCDT ILR 1191 sensor operates with semiconductor lasers for measurement and adjustment of the sensor.

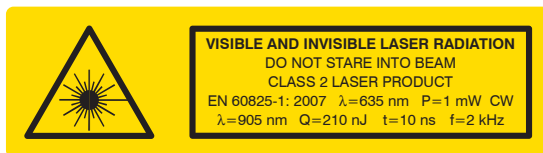
	Laser class	Laser type, wavelength
Measuring laser	1 (I) EN60825-1:2003-10	infrared, 905 nm, invisible beam divergence: 1.7 mrad
Pilot laser for mounting/adjustment	2 (II) EN60825-1:2007 / IEC825-1	red, 635 nm, visible

Class 1/2 (I/II) lasers are not notifiable and a laser protection officer is not required either.

The housing of the optical sensors may only be opened by the manufacturer. For repair and service purposes the sensors must always be sent to the manufacturer.

The laser warning labels for Germany have already been applied. Those for other non German-speaking countries an IEC standard label and the label for USA are included in delivery and the versions applicable to the user's country must be applied before the equipment is used for the first time.

The following warning label is attached on the sensor housing (bottom side):



IEC label



Only for USA

i If both warning labels are disguised in operation mode the user must add additional warning labels.

During operation of the sensor the pertinent regulations according to EN 60825-1 on “radiation safety of laser equipment” must be fully observed at all times. The sensor complies with all applicable laws for the manufac-

turer of laser devices.

Although the laser output is low looking directly into the laser beam must be avoided. Due to the visible light beam eye protection is ensured by the natural blink reflex.

- i** Do not look directly into the laser beam!
Close your eyes or turn away promptly if laser radiation strikes your eyes.

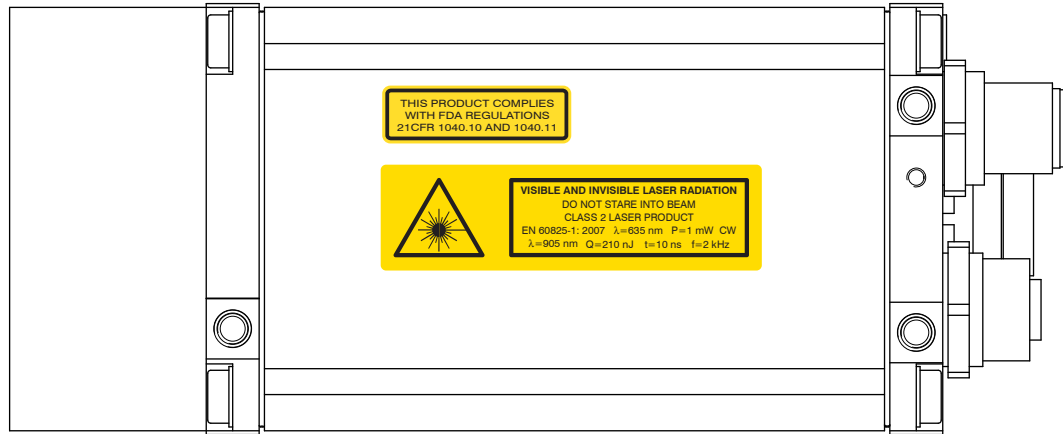


Fig. 1 True reproduction of the sensor with its actual location of the warning label

3. Functional Principle, Technical Data

The optoNCDT ILR 1191 is a laser-based distance sensor for non-contact and precise distance and displacement measurements from 0.5 m up to 3.000 m. The sensor is designed for very large measuring ranges, with and without reflector. Due to the very high measuring rate of the sensor, moving objects can be measured easily. The sensor operates according to the laser pulse runtime principle and is therefore particularly well suited to applications with large distances. Commissioning of the sensor is straightforward due to a variety of interfaces and easy mounting options. The optoNCDT ILR 1191 is fitted with an integrated heater for outdoor use. A pilot laser is also integrated for mounting and adjustment.

The sensor measures distances to moving and static targets:

- with measuring range from 0.5 m up to 300 m on diffuse reflective surfaces with 90 % reflectivity,
- with measuring range from 300 m up to 3.000 m on reflector surfaces, for example Scotchlite series 3290,

The sensor is used for speed measurement from 0 m/s up to 100 m/s (at 0.5 m up to 700 m distance).

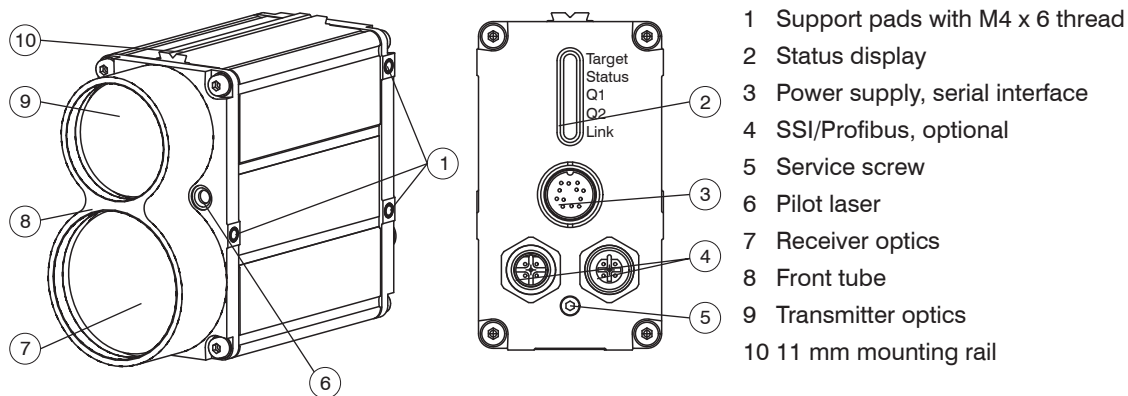


Fig. 2 Elements of a sensor

With the help of a visible red laser sighting point (pilot laser) a given target can be unequivocally identified. The actual range of measurement depends on the reflectivity and the surface quality of a target being measured. The sensor is available with RS232 or RS422, depending on the customer's request. Product manufacturing includes the installation of a requested configuration. Once installed, the interface cannot be replaced

with another type.

The sensor contains two switching outputs and one external trigger input and trigger output (all of them parameterizable).

A distance measurement can be triggered:

- via RS232 interface or RS422 interface
- via Profibus DP-V0
- by an external source (in external trigger mode).

3.1 Status Display

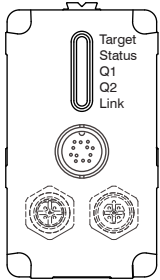
LED	Function	Display	Status	
	Target ¹	Reflectivity	off red flashing red yellow green green flashing	no signal very weak signal weak signal signal available good signal very good signal
	Status	Operating state	off red green	no supply voltage technical defect; supply voltage on ready
	Q1	Switching output 1	off yellow	off supply voltage
	Q2	Switching output 2	off yellow	off supply voltage
	Link	Status Interface	off red yellow green	no field bus Profibus error supply voltage on; Profibus inactive supply voltage on; Profibus works

Fig. 3 Status display - functions

1) In the DM operation mode (single distance measurement) the target characteristics are not displayed, see Chap. 10.3.16.

3.2 Technical Data

Model	ILR 1191-300
Measuring range ¹ distance	0.5 up to 300 m for natural, diffuse reflecting surfaces, from 300 m up to max. 3.000 m with target board
Linearity ²	±20 mm (at measurement output 100 Hz) ±60 mm (at measurement output 2 kHz)
Resolution	1 mm
Repeatability	≤ 5 mm
Response time distance	0.5 ms
Measuring range ³ speed	0 ms ⁻¹ up to 100 ms ⁻¹
Response time speed	0.1 s up to 0.5 s
Laser class acc IEC 825-1 / EN 60825	Measuring laser 905 nm, laser class 1 (I) Pilot laser 635 nm, laser class 2 (II), P ≤ 1 mW
Laser divergence	1.7 mrad
Light spot geometry	45 x 41 mm at 10 m
Operating temperature	-40 °C ... +60 °C (-40 °F ... +140 °F)
Storage temperature	-40 °C ... +70 °C (-40 °F ... +158 °F)
Humidity	15 % ... 90 % (non-condensing)
Switching outputs	2 x High Side Switch, max. 0.2 A, short circuit proof; switching point and hysteresis programmable, LOW < 1 V, with R _L < 100 kOhm, residual current about 5 μA HIGH = supply voltage - 1 V
Trigger input	trigger edge and – delay programmable, trigger pulse max. 30 V

Model	ILR 1191-300
Trigger output	HIGH = 4 V / max. 50 mA, trigger signal is output with each measurement, LOW < 0.5 V
Serial interface	RS232 and RS422 with 9.6 kBaud up to 460.8 kBaud, format 8N1, ASCII SSI interface (RS422), 24 bit Gray code, transfer rate: 50 kHz up to 1 MHz, 25 μ s pause
Profibus	Profibus RS485 DP-V0 Slave acc. to IEC 61158/ IEC 61784 transfer rate: 9.6 kBaud up to 12 MBaud
Operation mode	single / continuous measurement, external triggering, speed measurement
Analog output	4 mA ... 20 mA, $R_L \leq 500$ Ohm, 16 bit DAC, temperature stability typic 20 ppm/°C
Supply voltage	10 ... 30 VDC
Max. power consumption	< 5 W without heating, 11.5 W with heating at 24 V
Connectors	1 x 12-pole (Binder series 723) M16, 2 x 5-pole (Binder series 766) M12 B-coded
Protection class	IP 67
Dimensions	136 mm x 57 mm x 104 mm
Housing material	aluminium strangeness profile, powder-coated
Weight	800 g (depends on equipment)
EMC	EN 61326-1: 2006 and EN 61010-1: 2001

- 1) Depending on target reflectivity, stray light effects and atmospheric conditions
- 2) Statistical spread of 95 %
- 3) Distance range to the target being measured: 0.5 m up to 700 m to the sensor

3.3 Models, Equipment Features

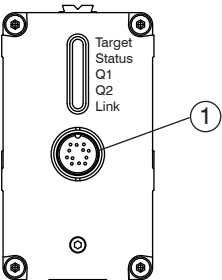
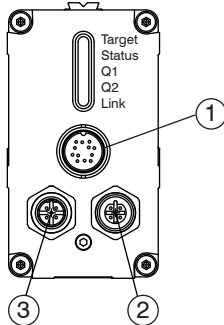
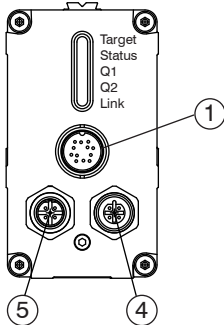
Model	ILR 1191-300(01)	ILR 1191-300(02)	ILR 1191-300(03)	ILR 1191-300(04)
Interface	RS232	RS422	RS232	RS232
	Analog output 4 ... 20 mA			
	-	-	SSI	Profibus
Interface				
Connections	[1] Supply voltage / interface		[1] Supply/RS232 [2] SSI, M12 female [3] M12 male, dummy	[1] Supply/RS232 [4] Profibus- OUT, M12 female [5] Profibus- IN, M12 male

Fig. 4 Rear panel of the various sensor models

Notice: For reasons of sealing, plug [3] is also installed for ILR 1191-300(03) (SSI).

4. Delivery

4.1 Supplied Items, Unpacking

1 Sensor optoNCDT ILR 1191-300

1 Instruction manual

1 CD-ROM with GSD file and instruction manual

Optional accessories, separately packed:

1 Power supply-/output cable PC11xx with 2 m up to 30 m length (subject to order)

1 Profibus IN/OUT cable PBC11xx with 5 m and 10 m

1 Female cable connector for power supply/SSI

1 Female and male cable connector for Profibus

Check for completeness and shipping damage immediately after unpacking. In case of damage or missing parts, please contact the manufacturer or supplier.

4.2 Storage

Storage temperature: - 40 up to +70 °C (-40 up to +158 °F)

Humidity: 15 up to 90 % (non-condensing)

5. Installation and Mounting

The sensor optoNCDT ILR 1191-300 is an optical sensor for measurements with millimeter accuracy. Make sure it is handled carefully when installing and operating.

5.1 Sensor Mounting

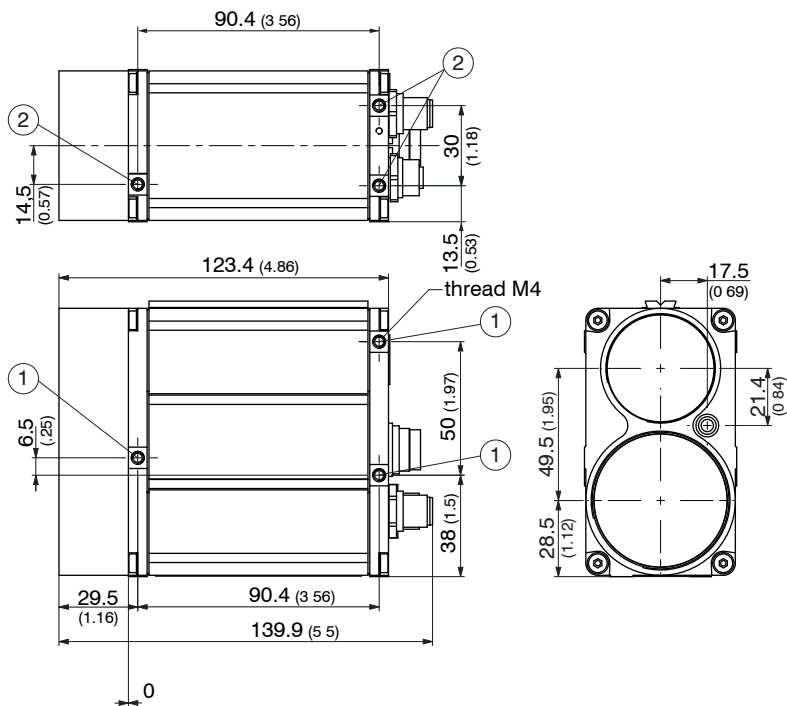


Fig. 5 Dimensional drawing sensor, dimensions in mm, not to scale

The laser beam must be directed perpendicularly onto the surface of the target. In case of misalignment it is possible that the measurement results will not always be accurate. Measurements against tilted targets are possible but depend on the surface characteristics of the target.

For integration of the sensor, two different versions of mechanical attachment are available:

- Attachment to a lateral surface. The sensor provides three support pads, see Fig. 5, reference 1, with mounting holes M4 x 6.
- Attachment to casing bottom. The sensor provides three support pads, see Fig. 5, reference 2, with mounting holes M4 x 6.

The sensor will be aligned by a visible laser beam (pilot laser) with the target. To align the sensor, please comply with the “Instructions for Operation“, see Chap. 9.

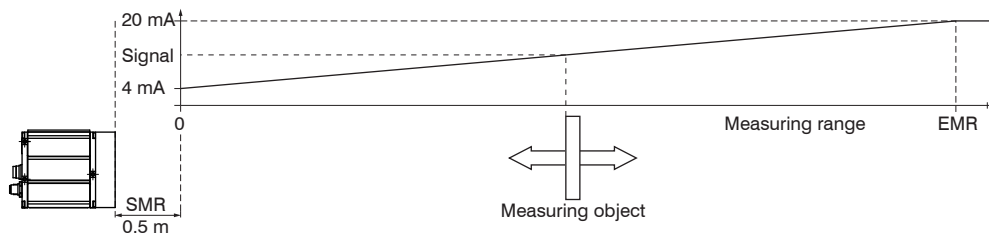


Fig. 6 Start of measuring range and signal characteristic

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

The zero-point of the sensor is identical with the outer surface plane of the front cover plate.

5.2 Reflector Mounting

The sensor measures distances to moving and static targets:

- in the range from 0.5 m up to 300 m for natural, diffuse reflecting surfaces with a reflectivity of 90 %,
- between 300 m and 3.000 m to a reflector (for example Scotchlite Engineer Grade type I, series 3290, from 3M)

The pilot laser, see Fig. 2, reference 6, supports the sensor alignment to a given target during commissioning. It qualifies as a class 2 (II) laser device and operates at 635 nm (red) in the visible range. The pilot laser

is not aligned to emit in a direction parallel with the measurement laser. Instead, its beam intersects with that of the measurement laser at a distance of 75 m. The tolerance on pilot laser position in relation to the invisible measurement laser as a function of the distance to a target being measured is shown in the following drawing, see Fig. 7.

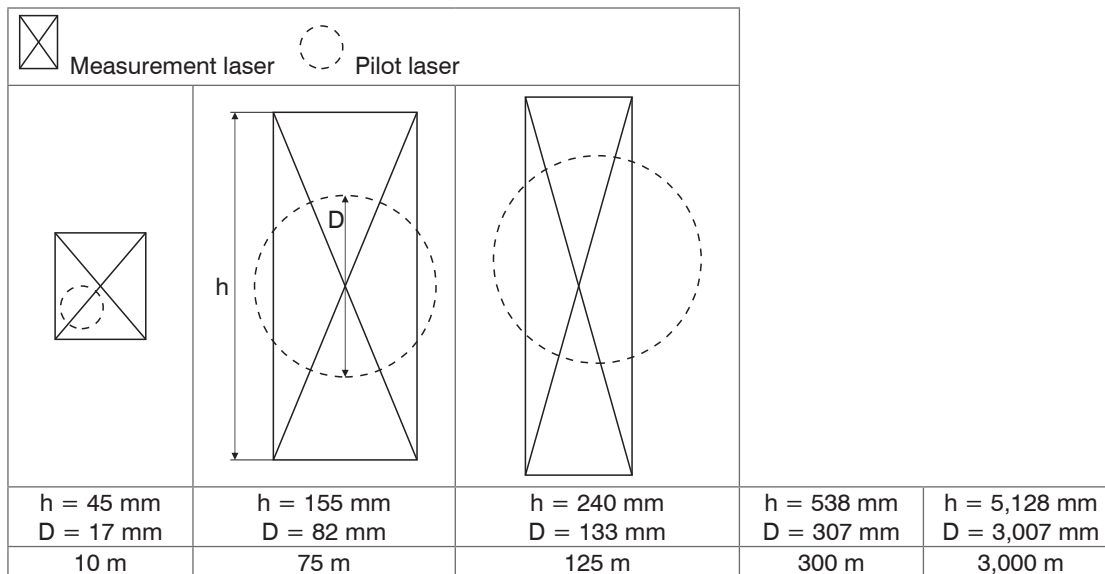


Fig. 7 Tolerance on pilot laser position relative to measurement laser

When aligning check as follows:

- ➡ Move the sensor at a very short distance to the reflector (for example < 1 m). The light spot is located in the lower left corner of the reflector.
- ➡ Move the sensor with the longest range to the reflector. Check the position of the light spot at the reflector and set it if necessary.

5.3 Electrical Connections

NOTICE

Avoid exposed cable ends.

So you prevent any kind of short circuits. The wiring of outputs with input signals can damage the sensor!

Depending on the implemented configuration version of the various sensor models, different terminal facilities are available for connections. All models share the same type of main connector port/interface, see [Fig. 4](#).

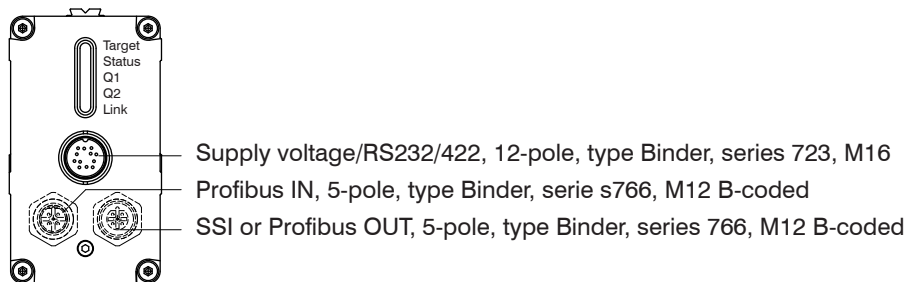


Fig. 8 Connectors on the rear side of the sensor, depends on sensor type

The connectors are located on the rear side of the sensor.

5.3.1 Power Supply, RS232/422

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

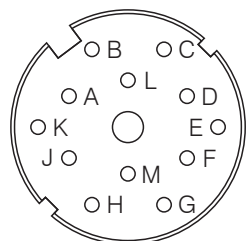
This connector type guarantees optimized screening and a high IP degree. The required counterpart is an adequate female cable connector with grading ring.

Different cable sets with open ends are optionally available.

Bending radius of the supply and output cable PC11x (available as an optional accessory):

- 47 mm (once)
- 116 mm (permanent)

Pin	Core color	RS232	RS422	Description
A	white	TxD	RX+	RS232 transmission data/RS422 receipt +
B	brown	RxD	RX-	RS232 transmission data/RS422 receipt -
C	green	TRIG	TRIG	Trigger input/output
D	yellow	Signal	Signal	Analog signal 4 ... 20 mA
E	grey	n.c.	TX-	RS422 transmission data -
F	pink	n.c.	TX+	RS422 transmission data +
G	red	VCC	VCC	Supply voltage 10 ... 30 VDC
H	black	n.c.	n.c.	Not connected
J	violet	ground	ground	Ground
K	grey/pink	Q 2	Q 2	Switching output 2
L	red/blue	ground	ground	Ground
M	blue	Q 1	Q 1	Switching output 1



View on solder pin side,
12-pole female cable connector

Fig. 9 Pin assignment for power supply and serial interface

5.3.2 Analog Output

Properties: current output

- 4 mA ... 20 mA
- Programmable distance intervals
- Behavior in error mode: 3 mA or 21 mA
- Resolution: 16 bit DA converter
- Load: 500 Ohm against GND
- Accuracy: $\pm 0.15\%$
- Temperature stability: 20 ppm/K typical

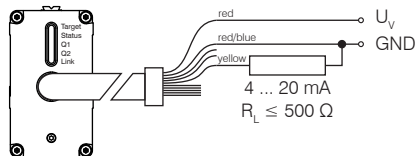


Fig. 10 Wiring analog output

The analog output allows standardized analog data transfers from or to a remote location over greater distances using a two-wire transmission line. The current which is injected into this line at levels from 4 mA to

20 mA is proportional to the measured distance within a selectable distance interval.

Parameter settings can be made via the serial interface. The command to achieve this is QAx_y (where “_” is equivalent to space, 0x20 hex.), see Chap. 10.3.14.

Parameter settings for current output in the event of measurement failure can be made using the command SEx, see Chap. 10.3.12.

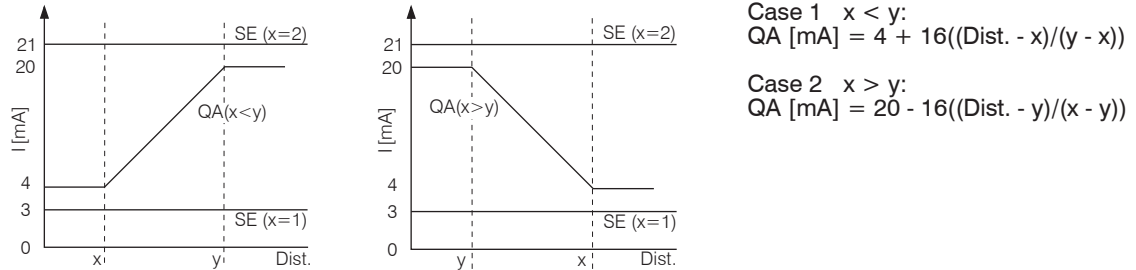


Fig. 11 Signal diagram analog output with $x < y$ and $x > y$, definition: $x \neq y$

i In the DT operation mode (continuous distance measurement), the analog output is updated with each new measurement. In between the old value is hold. In the VM operation mode (single speed measurement) the analog output shortly provides the distance information. In the VT operation mode (continuous speed measurement) the analog output provides the distance information.

Examples:

- The distance of a moving target is to be measured in a range of 60 m up to 220 m. At a distance of 60 m the sensor is to output 4 mA.
 Command to the sensor: QA60 220
- The distance of a moving target is to be measured in a range of 20 m up to 250 m. At a distance of 20 m the sensor is to output 20 mA.
 Command to the sensor: QA250 20

5.3.3 RS232/RS422 Interface

Properties:

- Interface settings: asynchronous, 8 data bit, no parity, 1 stop bit, 115.2 kBaud
- Format/Syntax, communication protocol: 7-bit ASCII
- Proprietary communication protocol

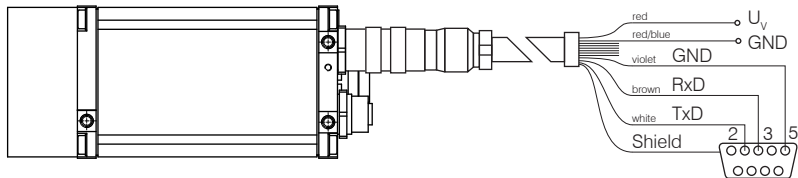


Fig. 12 Wiring RS232 at 9-pole Sub-D female cable connector

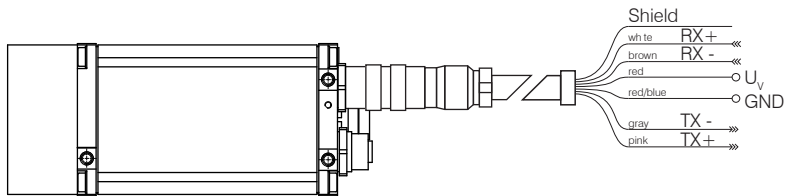


Fig. 13 Wiring RS422

5.3.4 Switching Outputs Q1 and Q2

Properties of both outputs (High-Side-Switch):

- Signal level HIGH = supply voltage - 1 V
- Signal level LOW < 1 V
- Switching point and hysteresis programmable, invertible, logic behavior programmable
- Rated for loads up to 0.2 A
- Short circuit proof

The purpose of Q1 and Q2 is to represent distance readings as logic operation data. They report events of positive or negative deviation of a preset switching range with a certain amount of hysteresis. Accordingly, they are perfectly suited for direct reprocessing of monitored quantities such as filling level or for detection of

objects. Parameter settings are made via the serial interface. The command to achieve this is Q1w_x_y_z or Q2w_x_y_z (where “_” is equivalent to space, 0x20 hex), see Chap. 10.3.13. The logic behavior of the switching output is determined through the parameter “z”, see Fig. 15.

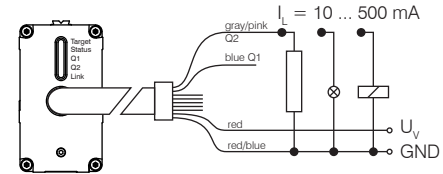
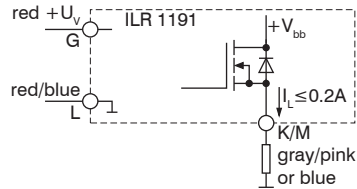
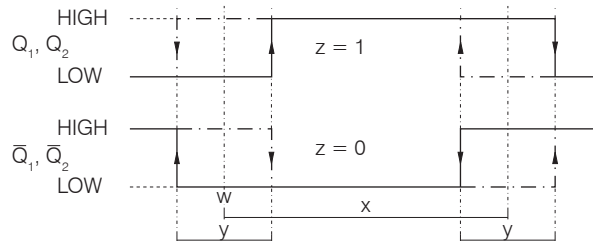


Fig. 14 Wiring switching outputs



w Alarm center

x Alarm width; $x \geq 0$; $x \geq y$

y Alarm hysteresis; $y \geq 0$

z Switching state; $z = 0$ or 1

LOW equal with a voltage of < 1 V

HIGH equal with a voltage of $VCC - 1$ V

Fig. 15 Behavior of the digital switching outputs

lf:

- $z = 1$, increasing distance
 - Output switches from LOW to HIGH, if $w + y/2$ is exceeded,
 - Output switches from HIGH to LOW, if $w + x + y/2$ is exceeded.
- $z = 0$, decreasing distance
 - Output switches from HIGH to LOW, if $w + x - y/2$ is fallen below.
 - Output switches from LOW to HIGH, if $w - y/2$ is fallen below.

5.3.5 Trigger In/Out

i The trigger input can be used as trigger output also.

Properties trigger input:

- Trigger voltage 3 ... 30 VDC
- LOW level < 2 V
- Edge triggering
- Trigger function is active in the DF operation mode, see Chap. 10.2.3

Properties trigger output:

- HIGH level 4 V
- LOW level < 0.5 V
- Trigger signal is output with each measurement, synchronization of more devices

The trigger input allows a single distance measurement to be triggered by an external signal that is applied as a voltage pulse. Selectable parameter settings are a value for delay in triggering (Trigger Delay) and the edge on which triggering is to occur (Trigger Level).

Parameter settings for trigger input can be made via the serial interface. The command to achieve this is TDx_y (where “_” is equivalent to space, 0x20 hex), see Chap. 10.3.11.

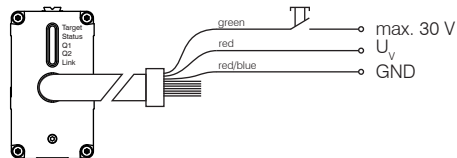


Fig. 16 Wiring trigger input

5.4 SSI Interface

➡ Read this chapter, if you work with a ILR 1191-300(03) sensor.

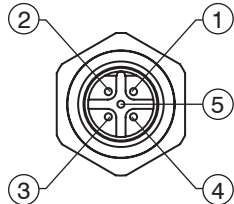
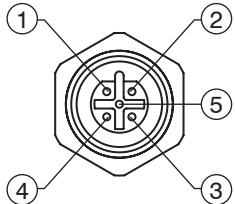
Connection to the SSI interface is accomplished via a 5-pole, B-encoded M12 male connector. Use shielded cables for connection.

Pin	Assignment SSI	
1	SSI D+	
2	SSI D-	
3	SSI C+	
4	SSI C-	
5	Screen	

5.5 Profibus

➡ Read this chapter, if you work with a ILR 1191-300(04) sensor.

Connection to the Profibus is accomplished via a 5-pole, B-encoded M12 male connectors. Use shielded cables for connection.

Pin	Assignment Profibus IN		Assignment Profibus OUT	
1	n.c.		Supply +5 V	
2	A		A	
3	n.c.		Ground	
4	B		B	
5	Screen		Screen	

For operation via Profibus, other Profibus participants may connect to the 5-pole male connectors (A-cable, B-cable). The Profibus may terminate or continue at the 5-pole male connector Profibus OUT. Some kind of termination device must always be provided at the end of the Profibus. Supply voltage for the bus terminator is available at Profibus-OUT. The 5 V are electrically isolated from the supply voltage (VCC) and rated for loads up to 100 mA. The termination impedance is available as an optional accessory.

6. RS232 and RS422 Interface

6.1 Properties

- Interface settings: asynchronous, 8 data bits, no parity, 1 stop bit, 115.2 kBaud
- Communication protocol format/syntax: 7-bit ASCII
- Proprietary communication protocol
- Commands are case-sensitive (no distinction between small lettering and capital lettering)
- Period "." (0x2E) serves as decimal separator for output of numbers
- Enter (0x0D) is used as command (send command) termination character
- With multi-value parameters, space (0x20) is used between each two values
- A parameterization command with new parameters triggers a response command with these parameters
- A parameterization command without new parameters triggers a response command with (most recent) parameters
- A parameterization command with parameters out of valid setting ranges triggers a response command with (most recent) parameters
- An unknown command and a faulty parameter format are quitted via "?" (0x3F)

The easiest way to start and parameterize the sensors is by using a PC with RS232 communication port and a terminal program, see Chap. 11. The communications protocol is available in ASCII format.

6.2 Commands

Command group	Command	Description	Standard(s)	Range(s)
Operation mode	DM	Single distance measurement	-	-
	DT	Continuous distance measurement	-	-
	DF	Single distance measurement with external triggering	-	-
	VM	Single speed measurement	-	-
	VT	Continuous speed measurement	-	-
Status	TP	Internal sensor temperature in °C	-	-
	PA	Display all parameter	-	-
	HW	Hardware diagnosis	-	-
Setup parameter	PR	Reset to factory settings	-	-
	DR	Triggers a cold start	-	-

Command group	Command	Description	Standard(s)	Range(s)
Setup parameter	ASs	Autostart function	ID	ID, ID?, DM, DT, DF, VM, VT, TP, HW, PA, MF, TD, SA, SF, MW, OF, SE, Q1, Q2, QA, BR, SD, TE, BB, AB, SC, PL, AS
	MFx	Measuring frequency [Hz]	2000	1 ... 2000
	TDx y	External trigger delay [ms] and level [edge]	00.00 0	0 ... 300.00 0 or 1
	SAx	Average	20	1...30000
	SFx	Scale factor	1	± 0.001 ... 10
	MWx y	Measuring window at beginning and end	-5000.000 +5000.000	± float 32 ± float 32
	OFx	Distance offset	0.000	± float 32
	SO	Single distance measurement and acceptance as distance offset	-	-
	SEx	Error Mode for Q1, Q2 and QA	1	0 ... 2
	QAx y	Analog output with lower and upper limit	1.000 300.000	± float 32 ± float 32
	Q1w x y z	Switching output Q1 with threshold, range, hysteresis and switching state	0.000	± float 32
			0.000	± float 32
			0.000	± float 32
	1	0 oder 1		
	Q2 w x y z	Switching output Q2 with threshold, range, hysteresis and switching state	0.000	± float 32
0.000			± float 32	
0.000			± float 32	
1			0 oder 1	
BRx	Baud rate	115200	9600, 19200, 38400, 57600, 115200, 230400 oder 460800	

Command group	Command	Description	Standard(s)	Range(s)
Setup parameter	SDx y	Output format of serial interface	0	0 ... 2
			0	0 ... 3
	TEx	Terminating character for output via serial interface	0	0 ... 9
	SCx	SSI format	0	0 ... 1
	PLx	Pilot laser	2	0...3
	BBx	Fieldbus baud rate	0	0
	AB	Bus address	0	0

6.3 Data Decoding Binary Format

6.3.1 Displacement Measurement

	Distance	Signal	Temperature
Byte	3	1	2
MSB	Bit 7	Bit 7	Bit 7
MSB of	Byte 2 is always 1	Byte 0 is always 0	Byte 1 and 0 are always 0
Coding	Two's complement		
Scaling factor	Binary value in decimal value: 1/1000	Binary value in decimal value: 128	Binary value in decimal value: 1/10

		Distance (3 byte)																		Signal (1 byte)													
		Byte 2						Byte 1						Byte 0						Byte 0													
Bit		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data		1	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X

		Temperature (2 byte)															
		Byte 1							Byte 0								
Bit		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data		0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X

Example distance:

1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	1	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

: 1000 = 75.858

The unit depends on the set scaling factor, see Chap. 10.3.5.

Example signal:

0	0	0	0	1	1	0	0
---	---	---	---	---	---	---	---

x 128 = 1536

The signal range is 0 ... 6000 (table, see Chap. 10.3.16).

Example temperature:

0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

: 10 = 33.1

Unit: °C

6.3.2 Speed Measurement

	Speed
Byte	3
MSB	Bit 7
MSB of	Byte 2 is always 1
Coding	Two's complement
Scaling factor	Binary value in decimal value: 1/1000

		Speed (3 byte)																								Distance			
		Byte 2								Byte 1								Byte 0								Byte 2 - 0			
Bit		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7...0	7...0	7...0	
Data		1	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0	X	0	X

		Signal								Temperature			
		Byte 0								Byte 1 - 0			
Bit		7 ... 0								7 ... 0		7 ... 0	
Data		0	X	X	X	X	X	X	X	0	X	0	X

Example speed:

1	0	0	0	0	1	0	1	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

 : 1000 = 85.567

The unit depends on the set scaling factor, see Chap. 10.3.5.

7. SSI Interface

➡ Read this chapter, if you work with a ILR 1191-300(03) sensor.

Optionally, the sensor can be equipped with an SSI data interface (SSI = Synchronous Serial Interface). At the request on a SSI clock generator a distance measurement cycle will start, sending related data which are present at the shift register bit-by-bit to a controller. Depending on the length and quality of selected data lines, actual transfer rates may range from 50 kHz to 1 MHz with 25 μ s pause time between two bit sequences.

- The data length is 24 bits plus one validity bit.
- The format can be binary or gray-encoded.
- For parameter settings via the serial interface, the SCx command is available

SCx	x=0...binary, 25 bit, 1 validity bit
	x=1...gray, 25 bit, 1 validity bit

Bit sequence:

24	23	2	1	0
MSB	Bits 1 – 24 distance depending on preset scale factor			LSB	Error bit

8. Profibus Interface

➡ Read this chapter, if you work with a ILR 1191-300(04) sensor.

8.1 ID Number

The sensor has been registered under ID number OAA2_{HEX} with Profibus Nutzerorganisation e.V. (Profibus user organization, registered society).

8.2 Connection Requirements

The sensor may be connected to any kind of Profibus DP structure, the requirement being that the selected Profibus DP master is capable of sending a parameterization telegram, and the master's pertaining editing tool (typically, editing software) will support the representation of parameters that are contained in the respective device master file (GSD file).

The GSD file is named ILR90AA2.GSD. A GSD file includes the two files ILR 1191.dib and ILR 1191.bmp. These are intended for representation of the sensor in the editing tool. For integration of these files, please consult the special editing tool documentation.

8.3 Slave Address

To facilitate multiple-participant bus communication, the Profibus slave address can be set in a range of 0 to 125. A desired address can be set via the Profibus, using the SSA command. For information on how to change the slave address via the editing tool, you should consult the special editing tool documentation. Address 4 is set in as-shipped state of the sensor.

The slave address is permanently maintained in the EEPROM. It will also be preserved in the event of a voltage failure.

Where more than one slave (ILR 1191) are to share a common Profibus, the various slaves must be connected one after the other and be assigned different addresses.

8.4 Bus Termination

For sensor operation, an external bus terminator must be installed. A voltage supply of 5 V required for the terminator is available at Profibus-OUT. This 5 V supply is electrically isolated from general voltage supply (VCC) and rated for a current load up to 100 mA. The terminating resistor is available as an optional accessory item.

8.5 Baud Rate

The sensor has its own device for automatic detection of the following baud rates: 9.6 / 19.2 / 93.75 / 187.5 / 500 k baud and 1.5 / 3 / 6 / 12 Mbaud.

8.6 Segment Length

The maximum allowed segment length between to Profibus participants depends on the selected baud rate. The following rules on segment lengths must be fulfilled:

Baud rate	Segment length
9.6 ... 93.75 kBaud	1,200 m
187.5 kBaud	1,000 m
500 kBaud	400 m
1.5 MBaud	200 m
3 ... 12 MBaud	100 m

To comply with these segment rules, use of cable type A is strongly recommended.

Distinguishing features of cable type A are:

- Wave resistance 135 to 165 Ohm
- Capacitance per unit length ≤ 30 pf/m
- Loop resistance ≤ 110 Ohm/km
- Cable wire diameter > 0.64 mm
- Cable wire cross-section > 0.34 mm²

9. Operation

- ➡ Insert connector in main connection port and interface.
- ➡ Install and firmly screw Profibus and SSI connectors.
- ➡ Protect all cable ends, which you don't use, before you turn on the power supply. So you avoid short circuits.

The user is required to implement:

- the application-specific wiring,
- the application-specific parameterization of the Profibus, the slave address.
- ➡ Turn-on the voltage supply for the sensor. The Status LED must light green.
- ➡ Make sensor parameter settings via RS232/RS422.
- ➡ Start the distance measurement.
- ➡ Install the sensor using the pilot laser as part of preparative actions in the designated working site, oriented onto the target and keep it in a stable position. The target to be measured should preferentially have a homogeneous, white surface.
- ➡ Lock the sensor.

The sensor provides a visible laser beam (pilot laser) for greater convenience in alignment. Its visibility is conditional on the amount of ambient light present and on the type of surface of the target to be measured.

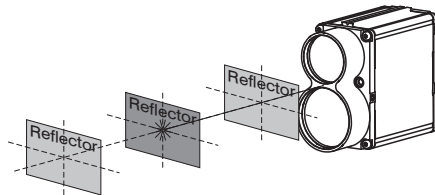


Fig. 17 Measurement against a reflector

10. Control Commands

The easiest way to trigger and parameterize the sensors is by using a PC with RS232 communication port and a terminal program, see Chap. 11. The communications protocol is available in ASCII format.

Before an operating session begins, desired parameter settings can be made in a smart selection procedure until the measuring module is optimally adapted to the particular measuring site conditions and the measuring job. All valid settings will be preserved on turning the sensor off. They can only be replaced with new value entries or changed back to their standard values by running an initialization routine.

Command entries are not case-sensitive. This means that small and capital lettering can be used for commands. Any command which is to be sent to the sensor must be terminated by a hexadecimal 0Dh (carriage return) character.

Where decimal digits are to be entered, they must be separated by period (2Eh).

For command parameter entries, one must distinguish between parameter settings and parameter queries. Querying is achieved with a command in simple format, for example analog output: QA[Enter].

For parameter setting, a new value must be added after the command with no delimitation sign in between, for example: QA50 250[Enter].

With multi-value parameters, space (0x20) is used between each two values.

10.1 Identification

In response to an ID command, the sensor outputs its manufacturing data in this order: product type, firmware version, firmware data, firmware time, fabrication number, date of manufacture and time of manufacture.

Example:

```
ILR1191 1.1.16(R) 27.03.2007 11:31 060001 11.04.2007 08:56
```

10.2 Operation Modes

•
I The sign ESC (1Bh) finishes the data output. Now the sensor waits for a new command.

10.2.1 DM – Single Distance Measurement

The sensor performs exactly one measurement, on completion of which it will wait for next instructions.

The length of time, with measurement requires depends on the number of the averaged measuring values, see parameter SA, and the preset measuring frequency, see parameter MF.

Example:

- Averaging of 5 measuring values, SA5
- Measuring frequency: 1 measurements per second, MF1
- Continuity of measurement = 5 seconds

10.2.2 DT – Continuous Distance Measurement

The sensor performs continuous distance measurement until halted by a special command (RS232/RS422: Escape = 0x1B).

The output rate of measured values depends on the number of the averaged measuring values, see parameter SA, and the preset measuring frequency, see parameter MF.

Example:

- Averaging of 5 measuring values, SA5
- Measuring frequency: 50 measurements per second, MF50
- Output rate of measured values = 10 measuring values per second

•
I In the mode DT the analog output will be actualized with every new measuring value. In between the old value is kept.

10.2.3 DF – Single Distance Measurement with External Triggering

The sensor is be located in the mode DF. It will then perform exactly one measurement cycle on receipt of an external trigger signal and wait in DF mode for the next trigger event to arrive. This mode must be terminated with the help of a special command (RS232/RS422: Escape = 0x1B).

Apply the trigger event to the external trigger input, see Chap. 5.3.5.

The interval between two single measurements depends on

- the number of the averaged measuring values, see parameter SA,
- the preset measuring frequency, see parameter MF, and
- and the preset trigger delay, see parameter TD.

10.2.4 VM – Single Speed Measurement

The sensor performs 25 single measurement cycles, on completion of which it will use the 25 single readings to calculate a resulting speed.

The length of time, which measurement requires, depends on

- the number of averaged measuring values, see parameter SA,
- the preset measuring frequency, see parameter MF.

Example:

- Averaging of 1 measuring value, SA1
- Measuring frequency: 50 measurements per second, MF50
- Continuity of measurement = about 0.5 seconds

10.2.5 VT – Continuous Speed Measurement

The sensor performs continuous measurement in packages of 25 single measurement cycles. This measuring mode must be halted with a special command (RS232/RS422: Escape = 0x1B).

The time interval between single measurements depends on

- the number of averaged measuring values, see parameter SA,
- the preset measuring frequency, see parameter MF

Example:

- Averaging of 1 measuring value, SA1
- Measuring frequency : 50 measurements per second, MF50
- Output rate of measured values = 2 measuring values per second

i

In the mode VT the analog output submits the distance information.

10.3 Parameter

- Parameter settings can be made via this serial interface.
- 0x0D as termination character will cause the command to be transmitted to the sensor.
- For commands with one parameter, the parameter can be defined either directly or separated by space (0x20).
- For commands including several parameters, each two parameters must be separated by space (0x20).

10.3.1 AS – Autostart Function

Format ASx [Enter]

This function defines how the sensor will behave after a cold start. Once a cold start was triggered, the sensor will automatically perform this command and transmit related data via the serial interface.

Request	AS
Set	ASx
Parameter value range x:	ID, ID?, DM, DT, DF, VM, VT, TP, HW, PA, MF, TD, SA, SF, MW, OF, SE, Q1, Q2, QA, BR, SD, TE, BB, AB, SC, PL, AS
Standard	ID

10.3.2 PL – Pilot Laser

Format: PLx [Enter]

PLx defines parameter settings for pilot laser behavior.

Request	PL	
Set	PLx	
Parameter value range x:	0	Off
	1	On
	2	Flashing (2 Hz)
	3	Flashing (5 Hz)
Standard	2	

During the measurement the PL-sight laser is automatically disabled.

10.3.3 PR – Reset to Factory Settings

Format: PR [Enter]

Resets all parameters to their factory settings.

Except is the baud rate.

Parameter for firmware version 1.1.16:

measure frequency[MF]	2000(max2000)hz
trigger delay/level[TD]	0.00msec 0
average value[SA]	20
scale factor[SF]	1.000000
measure window[MW]	-5000.000 5000.000
distance offset[OF]	0.000
error mode[SE]	1
digital out[Q1]	0.000 0.000 0.000 1
digital out[Q2]	0.000 0.000 0.000 1
analog out[QA]	1.000 300.000
RS232/422 baud rate[BR]	115200
RS232/422 output format[SD]	dec (0), value (0)
RS232/422 output terminator[TE]	0Dh 0Ah (0)
SSI output format[SC]	bin (0)
visier pointer[PL]	2
autostart command[AS]	DT

10.3.4 DR - Trigger Cold Start

Format: DR [Enter]

Performs a cold start of the sensor, simulating an actual operating voltage break situation. This command may prove useful after changes in the autostart command.

10.3.5 SF – Scale Factor

Format: SFx [Enter]

The command allows a measured output value and the analog signal to be scaled via parameter settings for a scale factor x.

Request	SF
Set	SFx
Parameter value range x:	-10 ... -0.001 and 0.001 ... 10; resolution: 0.000001
Standard	1.000000

SF allows also the output of the distance value in a different unit of measurement. The scale factor can also be negative.

Examples:

Scale factor	Output	Unit of measurement
SF1	114.123	m
SF1.0936	124.805	yard
SF3.28084	377.419	feet
SF0.3937	44.930	100 inch

10.3.6 OF – Offset

Format: OFx [Enter]

The command parameterizes a user-adapted offset x, which is added to the measured value.

Request	OF
Set	OFx
Parameter value range x:	float32; resolution: 0.001
Standard	0.000

The sensor performs no plausibility check on a preset offset value.

10.3.7 SO – Set Offset

Format: SO [Enter]

The command performs one single distance measurement, then sets it as –OF (offset). Function SO can only be carried out. It does not represent a parameter in the actual sense of the word.

Use the command SO for example for doing measurements.

Output value [m] = Measured value - OF

Use the command OF0 for finishing the relative measurement.

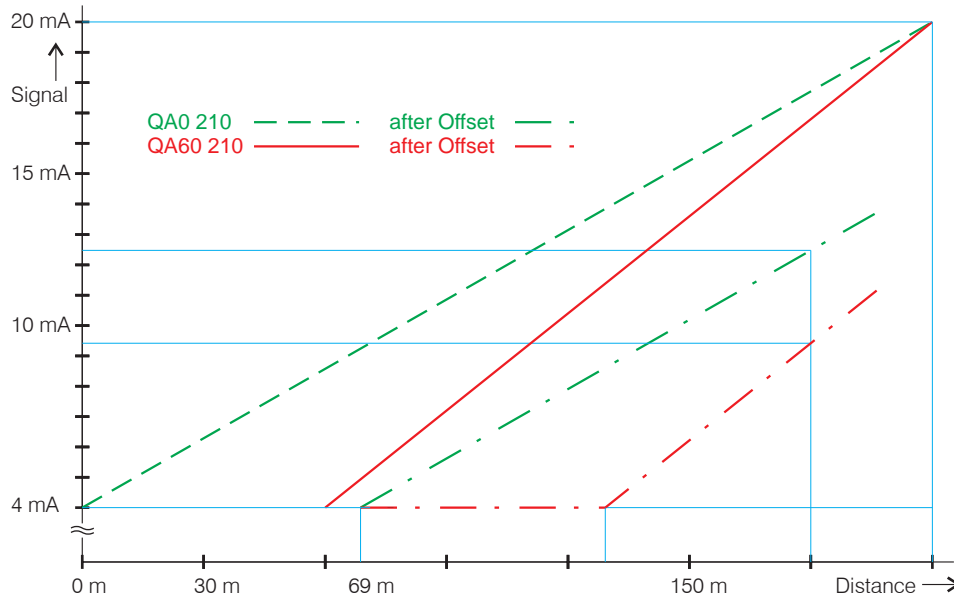


Fig. 18 Analog output with offset displacement at 69 m

10.3.8 MW – Measurement Window

Format: MWx y [Enter]

Parameterizes a metrological range by definition of a starting point x and an end point as limits for output of measured values.

Examples of measurement window application:

- Masking out sources of interference before or behind a selected range for measurement
- Definition of a desired range for measurement

A target which is detected before or behind a preset measurement window will create an invalid measured value output.

Request	MW
Set	MWx y
Parameter value range x:	float32; resolution: 0.001
Parameter value range y:	float32; resolution: 0.001
Standard	-5000.000 ... 5000.000

The sensor performs no check for plausibility of a preset measurement window.

10.3.9 SA – Average Value

Format: SAx [Enter]

Parameterizes the number of single measured values to be averaged for a result of measurement. SA is directly dependent on MF, see Chap. [10.3.10](#).

Request	SA
Set	SAx
Parameter value range x:	1 ... 30000; resolution: 1
Standard	20

10.3.10 MF – Measurement Frequency [Hz]

Format: MFx [Enter]

Parameterizes the number x of measuring values to be emitted per second.

Request	MF
Set	MFx
Parameter value range x:	1 ... 2000; resolution: 1
Standard	2000

For example, MF1000 means that 1000 measuring values will be emitted each second. The time to measure and, hence, the transmission of a measured result via the serial interface additionally depend on the setting for parameter SA.

$$\text{Data rate} = \text{Measurement frequency} / \text{Number of average value}$$

Examples:

MF1000, SA1000: Data rate = 1 (1 measured value per second at the serial interface)

MF2000, SA1000: Data rate = 2 (2 measured values per second at the serial interface)

MF2000, SA20000: Data rate = 0.1 (1 measured value at the serial interface every 10 s)

10.3.11 TD – Trigger Delay, Trigger Level

Format: TDx y [Enter]

Parameterizes behavior in external trigger mode (DF).

- x designates the delay in triggering a single measurement, in units of a millisecond.
- y designates the edge on arrival of which measurement will be triggered:
 - 0 means that measurement is triggered on a falling edge (high-to-low transition)
 - 1 means that measurement is triggered on a rising edge (low-to-high transition)

Request	TD
Set	TDx y
Parameter value range x:	0 ... 300.00 msec; resolution: 0.01 msec
Parameter value range y:	0 oder 1
Standard	0.00 msec 0

10.3.12 SE – Error Mode

Format: SEx [Enter]

Parameterizes the behavior of the two switching outputs Q1 and Q2 and that of the analog output QA in the event of failure to measure plus the state on completion of a single distance measurement.

Request	SE			
Set	SEx			
Value range	Parameter x	Q1, Q2 (z=0)	Q1, Q2 (z=1)	QA
	0	Latest value	Latest value	Latest value
	1	High	Low	3 mA
	2	Low	High	21 mA
Standard	1			

The sensor performs no check for plausibility of a selected error mode.

10.3.13 Q1, Q2 – Switching Output

Format: Q1w x y z respectively Q2w x y z [Enter]

Q1/Q2 parameterizes the behavior of the switching outputs Q1 or Q2, see Chap. 5.3.4.

Parameterizes a measurement range's starting point w, on reaching of which the output will be triggered, the length x of the measurement range, the hysteresis y and logic behavior z.

Request	Q1/Q2	
Set	Q1w x y z or Q2w x y z	
Parameter value range w:	float32; resolution: 0.001	
Parameter value range x:	float32; resolution: 0.001	
Parameter value range y:	float32; resolution: 0.001	
Parameter value range z:	0 oder 1	
Standard	1.000 300.000	

The sensor performs no check for plausibility of QA settings.

10.3.14 QA – Analog Output

Format: QAx y [Enter]

QA parameterizes the behavior of the QA analog output, see Chap. 5.3.2.

i The parameter SF affects the analog output.

Available for setting are the lower limit x and the upper limit y of a current range from 4 to 20 mA. The scale factor SF, see Chap. 10.3.5, does not affect the limits.

The lower limit may both be smaller and greater than the upper limit, accordingly, the current range will reverse, see Chap. 5.3.2.

Inputs of identical limits will be ignored and not accepted.

Request	QA
Set	QAx y
Parameter value range x:	float32; resolution: 0.001
Parameter value range y:	float32; resolution: 0.001
Standard	1.000 300.000

The sensor performs no check for plausibility of QA settings.

10.3.15 BR – Baud Rate

Format: BRx [Enter]

The command facilitates conversion to other serial baud rate x.

Following a change in the baud rate, a cold start is not necessarily required.

Request	BR
Set	BRx
Parameter value range x:	9600, 19200, 38400, 57600, 115200, 230400 oder 460800
Standard	115200

10.3.16 SD – Serial Interface Termination Character

Format: SDx y [Enter]

Parameterizes the format x and content y of serial interface outputs for distance and speed measurement.

The format of transmission can be

- decimal (ASCII),
- hexadecimal (ASCII) and
- binary, see Chap. 6.3.

Content means that signal strength and/or temperature are available items for output in addition to the actual measuring value output.

Request	SD	
Set	SDx y	
Parameter value range x:	0	decimal
	1	hexadecimal
	2	binary
Parameter value range y:	0	Measuring value
	1	Measuring value, signal strength
	2	Measuring value, sensor temperature
	3	Measuring value, signal strength, sensor temperature
Standard	0 0	

Example: The sensor shall transmit the measuring value and the signal strength decimally.

Command to the sensor: SD0 1.

The value of the signal strength informs, analog to the LED “Target“, about the reflection characteristics of the target.

Signal strength	LED Target	Status
	off	no signal
< 600	red, flashing	very weak signal
600 ... 1000	red	weak signal
1000 ... 1500	yellow	signal available
1500 ... 3400	green	good signal
3400 ... 6000	green, flashing	very good signal

10.3.17 TE – Serial Interface Termination Character

Format: TEx [Enter]

Parameterizes the serial interface termination character for distance and speed measurement.

i As a necessary requirement, output format SD0 y must be set, see Chap. [10.3.16](#).

Request	TE		
Set	TEx		
Parameter value range x:	x	Hex code	Description
	0	0x0D0A	CR LF
	1	0x0D	CR
	2	0x0A	LF
	3	0x02	STX
	4	0x03	ETX
	5	0x09	Tabulator
	6	0x20	Space
	7	0x2C	Comma
	8	0x3A	Colon
	9	0x3B	Semicolon
Standard	0x0D0A		

10.3.18 SC – Format SSI

Format: SCx [Enter]

Parameterizes the format x of SSI code, see Chap. 7.

Request	SC
Set	SCx
Parameter value range x:	0 or 1
Standard	0

10.3.19 TP - Inner Sensor Temperature

Format: TP [Enter]

TP queries the value of the inner sensor temperature in °C.

The sensor outputs the inner appliance temperature via the serial interface and also the profibus.

Temperature values are output in degrees Celsius (°C).

10.3.20 PA – All Parameter Display

Format: PA [Enter]

A complete list of parameters is output via the serial interface.

Example:

measure frequency[MF]	2000(max2000)hz
trigger delay/level[TD]	0.00msec 0
average value[SA]	20
scale factor[SF]	1.000000
measure window[MW]	-5000.000 5000.000
distance offset[OF]	1.000
error mode[SE]	1
digital out[Q1]	20.000 10.000 1.000 1
digital out[Q2]	1.000 30.000 0.500 1
analog out[QA]	1.000 300.000
RS232/422 baud rate[BR]	115200
RS232/422 output format[SD]	dec (0), value (0)
RS232/422 output terminator[TE]	0Dh 0Ah (0)
SSI output format[SC]	bin (0)
visier pointer[PL]	2
autostart command[AS]	DT

10.3.21 HW – Hardware Diagnosis

Format HW [Enter]

Outputs a specific sensor list of characteristics and measured quantities.

11. Hyperterminal

You can receive data and configure the controller through the RS232 interface with the Windows HyperTerminal®. All you need is a free COM port (for example COM1) on your PC and the commands described in the foregoing chapters.

The RS232 interface are popular in industrial applications. Use an adequate USB TO RS232 converter, in the case of your PC/notebook is just equipped with USB interfaces.

Preparation Measuring

- ➡ Connect your controller to a free COM port of the host computer.
- ➡ Start the program HyperTerminal® (Menu Start > Programs > Accessory > Communication > HyperTerminal)
- ➡ Type in the name of the connection and click on the “OK” button.



Fig. 19 Connection establishment with the program HyperTerminal®

- ➡ Select the interface and click on the “OK” button.



Fig. 20 Definition of the serial interface



Fig. 21 Definition of the serial interface

- ➔ Define the following interface parameters:
 - Baud rate: 115.200 Baud,
 - Data format: 8 Data bits
 - Parity: None
 - Start/Stopbit: 1
 - Flow control: No
- ➔ Then click on the “OK“ button.
- ➔ Type the command “ID“ and press the button “ENTER“.

The sensor reads out the parameters via the serial interface, see Fig. 20. With pressing the “ESC“- button the data output will be finished and the sensor waits for further instructions.


```

1191d - HyperTerminal
File Edit View Call Transfer Help
D 0003.703
D 0003.666
D 0003.709
D 0003.719
D 0003.672
D 0003.705
measure frequency[MF].....1(max2000)hz
trigger delay/level[TD].....0.00msec 0
average value[SA].....1
scale factor[SF].....1.000000
measure window[MW].....-5000.000 5000.000
distance offset[OF].....-2.371
error mode[SE].....1
digital out[Q1].....2.000 0.600 0.100 0
digital out[Q2].....1.000 100.000 1.000 0
analog out[QA].....2.000 7.000
RS232/422 baud rate[BR].....115200
RS232/422 output format[SD].....dec (0), value (0)
RS232/422 output terminator[TE]..0Dh 0Ah (0)
SSI format[SC].....bin (0)
pilot laser [PL].....2
autostart command[AS].....DT
-
Connected 03:51:48 Auto detect 115200 8-N-1 SCROLL CAPS NUM Capture Print echo

```

Fig. 22 User interface in terminal operation

- **i** A currently entered command will only be displayed if “Local echo” is enabled. This function can be accessed via file menu File > Properties > “Settings” tag > ASCII Setup.
- ➡ Save finally, unless performed earlier, the current hyperterminal configuration. For more convenience you don’t have to reconfigure the interface for each new hyperterminal session.

12. Malfunctions, Error Messages

12.1 Malfunctions

Error	Cause	Action for removal
No data via RS232 or RS422	Faulty interface configuration	Check interface configuration
Device error (External diagnosis)	Hardware problems	Reship sensor for repair, contact technical support

12.2 Operating Advice

Code	Cause	Action for removal
E02	No target	Check for measuring distance
E04	Laser defect	Reship sensor for repair, contact technical support

12.3 Error Messages

Error message	Method	Action for removal
Red status LED of status display lights	Read error message via RS232 or RS422 interface	Reship sensor for repair, contact technical support

13. Decommissioning, Disposal

- ➡ Disconnect the power supply- and output cable and the serial interface cables on the sensor.
- ➡ Do the disposal according to the legal regulations (see directive 2002/96/EC).

14. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON. The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to MICRO-EPSILON.

This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties. No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full.

MICRO-EPSILON will specifically not be responsible for eventual consequential damages.

MICRO-EPSILON always strives to supply the customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved.

For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.

15. Optional Accessory

PC1100-3/RS232	Power supply-/Output cable-RS232, length 3 m
PBC1100-I/O-5	Profibus In-Out-cable, length 5 m
PBC1100-I-5	Profibus In-cable, length 5 m
PBC1100-I-10	Profibus In-cable, length 10 m
PBC1100-O-5	Profibus Out-cable, length 5 m
PBC1100-O-10	Profibus Out-cable, length 10 m
PBFC1100	Profibus female connector
PBMC1100	Profibus male connector
PBLR1100	Profibus load resistance
ILR-M-PB/USB	Profibus/USB-module + service software
ILR-MP1191	Mounting plate for ILR 1191
ILR-AA1191	Aligning aid for ILR 1191
ILR-PT1191	Protection tube, 100 mm, for ILR 1191

16. Factory Settings

Measurement frequency [MF] 2000 Hz

Tigger delay, level [TD] 0.0 msec 0

Average value [SA] 20

Scale factor [SF] 1

Measurement window [MW] -5000.0 ... 5000.0

Offset [OF] 0.0

Error Mode [SE] 1

Switching output [Q1] 0.0 0.0 0.0 1

Switching output [Q2] 0.0 0.0 0.0 1

Analog output [QA] 1.0 300.0

Transmission rate RS232/422 [BR] 115200

Output format RS232/422 [SD] 0 0

Termination character RS232/422 [TE] 0

Format SSI [SC] 0

Pilot laser [PL] 2

Autostart [AS] DT

17. Maintenance

Please note:

- ➡ Remove dust from optical surfaces (transmitter and receiver optics) with a blower brush.
 - ➡ Do not use cleaners that contain organic solvents, when wiping optical surfaces down.
 - ➡ Contact the manufacturer in the case of stubborn contamination or soiling.
-
- Do not use solvents of any kind to perform cleaning of the sensor.
 - You are prohibited from opening the sensor.
 - You are prohibited from loosening any screws at the sensor.

For necessary repair work, you should carefully pack the sensor and reship it to MICRO-EPSILON stating the conditions in which it has operated (applications, connections and environmental conditions):

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