

SPECTRO Series

► SPECTRO-1-POF-IR

- Big assortment of plastic optic fibers of POF Series available (diffuse reflection or through-beam sensor types)
- Working range for diffuse reflection types: typ. 1 mm ... 100 mm
Working range for through-beam types: typ. 1 mm ... 500 mm (depends on the optic fiber type used)
- IR LED, 860 nm (AC-, DC-operation, can be switched or OFF in case of luminous objects)
- High scan frequency
- Gray scale detection (12-bit resolution)
- Insensitive to outside light (in AC-operation)
- Brightness correction can be activated (STAT/DYN)
- Averaging can be activated (from 1 up to over 32000 values)
- TEACH via PC or PLC
- 2 digital inputs (0V/+Ub)
- 2 digital outputs (max. 60 kHz switching frequency)
- 1 analog output (0V...+10V or 4...20mA), selectable via software
- Switching state indication by means of 2 yellow LEDs
- RS232 interface (USB or ETHERNET converter available)
- Parameterizable via Windows® software, scope function
- Temperature compensated (from 0°C to 60°C)
- Automatic threshold correction can be activated
- Switching threshold can be parameterized relative or absolute
- Various switching threshold functions (window, upper/lower threshold)
- Intensity control of luminous objects (LEDs, halogen lamps, displays, ...)
- Connection of an external IR laser light source ELS-IRL is possible



Design

Product name:

SPECTRO-1-POF-IR (infrared LED)
(incl. Windows® PC software SPECTRO1-Scope)

Fiber optics adapter for connection of fiber optics of POF Series (cf. separate data sheet)

Transmitter side

Receiver side

4-pol. fem. connector
Binder series 707
(connection to external
IR laser light source
ELS-IRL, laser class 3B)

Mounting
possibility

Mounting
possibility

Sturdy aluminum housing,
anodized in black

Accessories: (p. 10-15)

Overview: Fiber optics POF Series
POF-SPX-d2.2-(1.0)-... (fiber optics)
KL-M18/20-SPX (optical frontend)
External IR laser light source
Laser safety goggles (3B)
Laser pen (3B)

LED display:
Switching state indication
by means of
2 yellow LEDs

Fixation of fiber optics by means of
grub screw with slit (at both sides)

8-pole fem. connector
Binder series 712
(connection to PLC)

Connecting cable:
cab-las8/SPS

4-pole fem. connector
Binder Series 707
(RS232 interface)

Connecting cable:
cab-las4/PC or
cab-4/USB or
cab-4/ETH

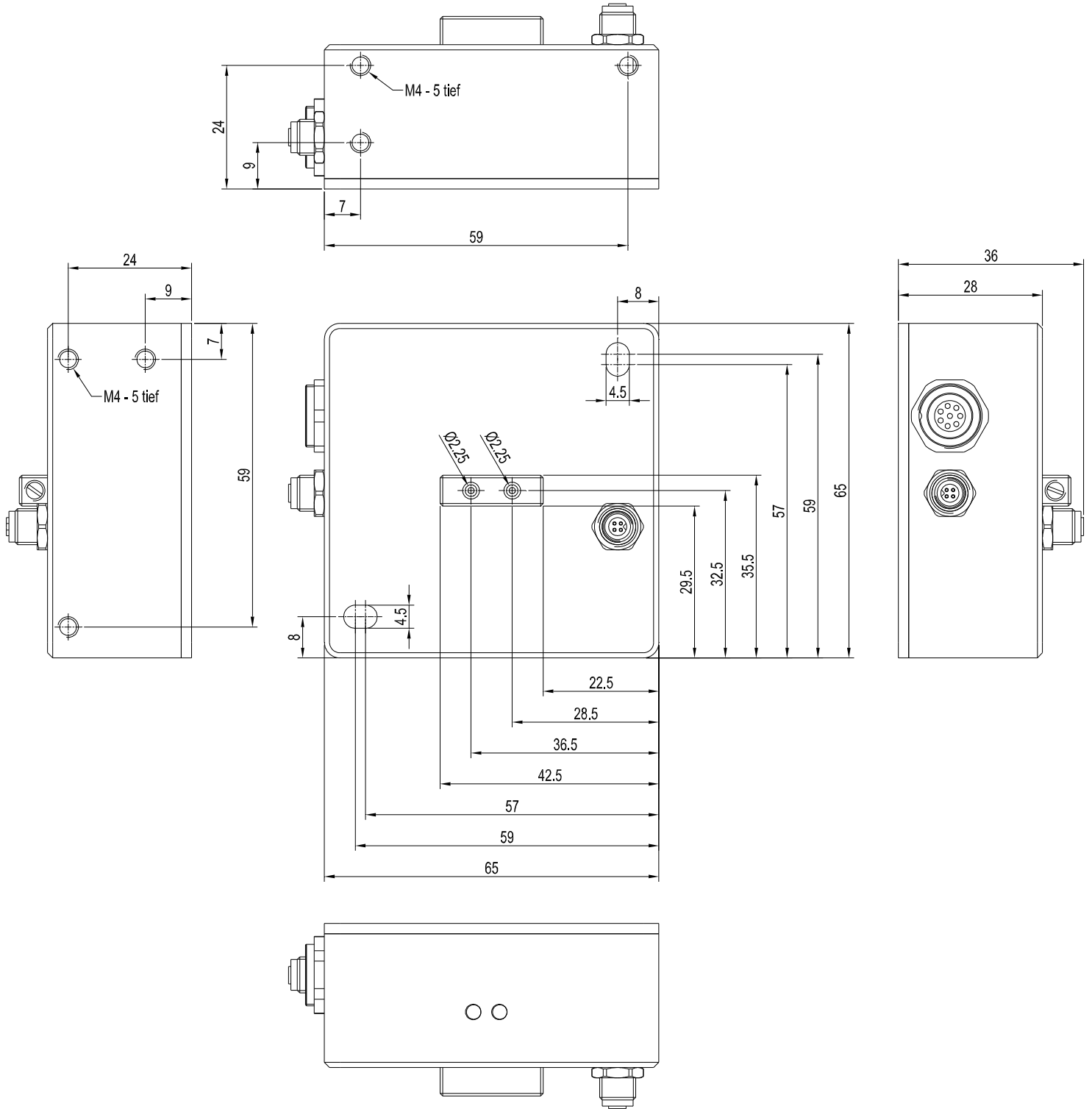




Technical Data

Model	SPECTRO-1-POF-IR		
Voltage supply	+24VDC (± 10%), reverse polarity protected, overcurrent protected		
Current consumption	< 160 mA (in case of use with external infrared laser light source ELS-IRL: < 500 mA)		
Max. switching current	100 mA, short circuit proof		
Switching state indication	2 yellow LED visualize the physical state of the outputs OUT0 and OUT1		
Digital inputs (2x)	IN0 and IN1 (Pin 3 and 4): digital (0V/+24V)		
Digital outputs (2x)	OUT0 and OUT1 (Pin 5 and 6): digital (0V/+24V), npn-/pnp-able (bright-/dark-switching, can be switched)		
Analog output (1x)	ANALOG (Pin 8): voltage 0 ... +10V or current 4 ... 20mA, adjustable via PC software		
Interface	RS232		
Pulse lengthening	0 ... 100 ms, adjustable via PC software		
Averaging	max. 32768 values, adjustable via PC software		
Scan frequency (LED mode AC, DC or OFF, can be switched via PC software)	LED mode AC (depends on parameterization): Frequency [Hz] Digital outputs Analog output Max. 50 000 Off Off Max. 48 000 On Off Max. 42 000 Off On Max. 41 000 On On Measurements were made with the smallest gain at the receiver (AMP1). At the highest gain (AMP8), the frequency is reduced by a factor of 10.	LED mode DC / OFF (depends on parameterization): Frequency [Hz] Digital outputs Analog output Max. 175 000 Off Off Max. 135 000 On Off Max. 100 000 Off On Max. 85 000 On On The frequency is independent of the gain set at the receiver.	
Switching frequency	max. 60 kHz		
Analog band width	max. 90 kHz (-3 dB)		
Transmitter (light source)	IR LED (860 nm)		
Transmitter control	can be switched via PC software: AC operation (LED MODE-AC), DC operation (LED MODE-DC), OFF operation (LED MODE-OFF)		
Object distance (measuring range)	with reflected light fiber optics: typ. 1 mm ... 100 mm (depends on selected fiber optics of POF Series) with transmitted light fiber optics: typ. 1 mm ... 500 mm (depends on selected fiber optics of POF Series)		
Receiver	photo diode		
Receiver gain setting	8 steps (AMP1 ... AMP8), adjustable via PC software		
Ambient light	max. 5000 Lux		
Size of light spot	typ. Ø 1 mm ... Ø 20 mm (depends on selected fiber optics of POF series)		
Reproducibility	2 digits at 12-bit A/D conversion		
Housing dimensions	LXWxH approx. 65 mm x 65 mm x 36 mm (incl. adaptor for plastic optic fibers, without flange connectors)		
Housing material	aluminum, anodized in black		
Enclosure rating	IP64		
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w to PC/RS232 interface: cab-las4/PC or cab-las4/PC-w to PC/USB interface: cab-4/USB or cab-4/USB-w to PC/Ethernet interface: cab-4/ETH		
Type of connector	connection to PLC: 8-pole fem. connector (Binder 712) connection to PC: 4-pole fem. connector (Binder 707) connection to external infrared laser light source ELS-IRL or ELS-IRL-FIO: 4-pole fem. connector (Binder 707)		
Operating temp. range	-20°C ... +55°C		
Storage temperature range	-20°C ... +85°C		
EMC test acc. to	DIN EN 60947-5-2		
External light source	possibility of connection of an external laser light source (each class 3B laser product): infrared laser light source ELS-IRL (with integrated optics)		

Dimensions



All dimensions in mm



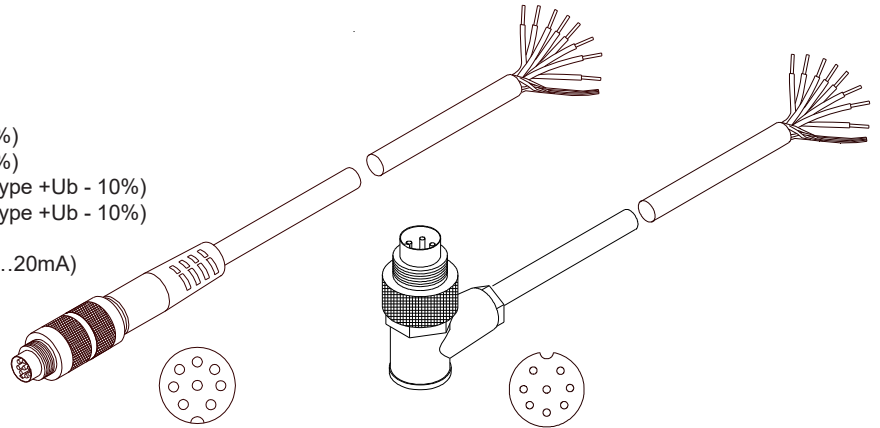
Connector Assignment

Connection to PLC:

8-pole fem. connector Binder series 712

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC ($\pm 10\%$)
3	green	IN0 (Digital 0: 0 ... 1V, Digital 1: +Ub - 10%)
4	yellow	IN1 (Digital 0: 0 ... 1V, Digital 1: +Ub - 10%)
5	grey	OUT0 (Digital 0: Type 0 ... 1V, Digital 1: Type +Ub - 10%)
6	pink	OUT1 (Digital 0: Type 0 ... 1V, Digital 1: Type +Ub - 10%)
7	blue	not connected
8	red	ANALOG (voltage 0...+10V or current 4...20mA)

Connecting cable:
 cab-las8/SPS-(length)
 cab-las8/SPS-w-(length)
 (standard length 2m)



cab-las8/SPS-...
 (max. length 25m, outer jacket: PUR)

cab-las8/SPS-w-...
 (max. length 25m, outer jacket: PUR)

Connection to PC:

4-pole fem. connector Binder Series 707

Pin:	Assignment:
1	+24VDC (+Ub, OUT)
2	GND (0V)
3	RxD
4	TxD

Connection via RS232 interface at the PC:

Connecting cable:
 cab-las4/PC-(length)
 cab-las4/PC-w-(length) (angle type 90°)
 (standard length 2m)

alternative:

Connection via USB interface at the PC:

USB converter (incl. driver software):
 cab-4/USB-(length)
 cab-4/USB-w-(length) (angle type 90°)
 (standard length 2m)

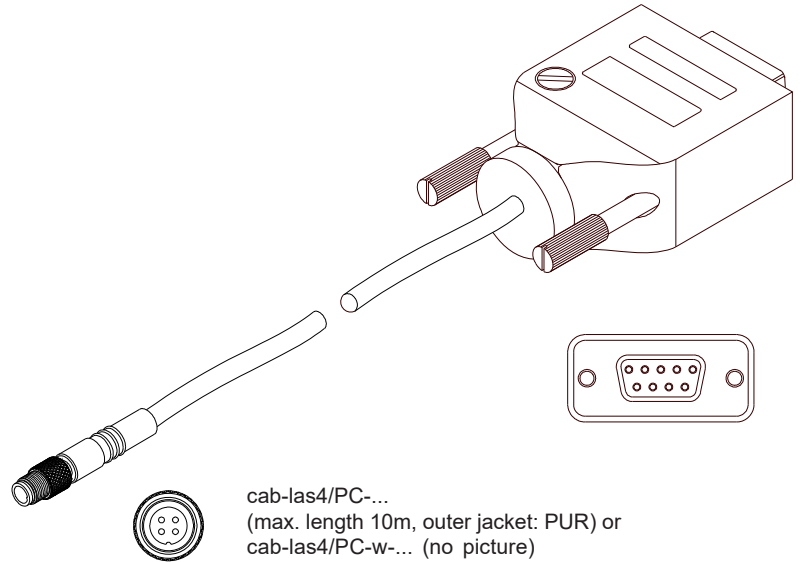
alternative:

Connection to local network via Ethernet bus:

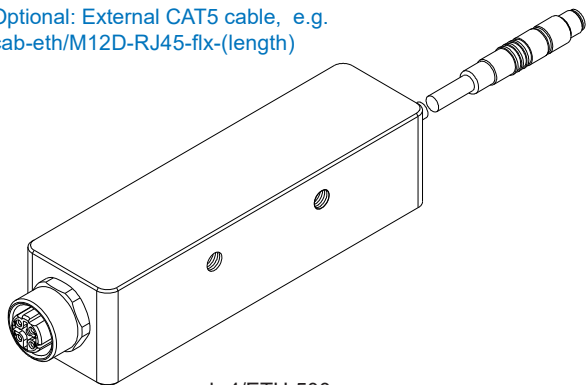
Ethernet converter (incl. software „SensorFinder“):
 cab-4/ETH-500
 (standard length 0.5m)

Optional: External CAT5 cable, e.g.

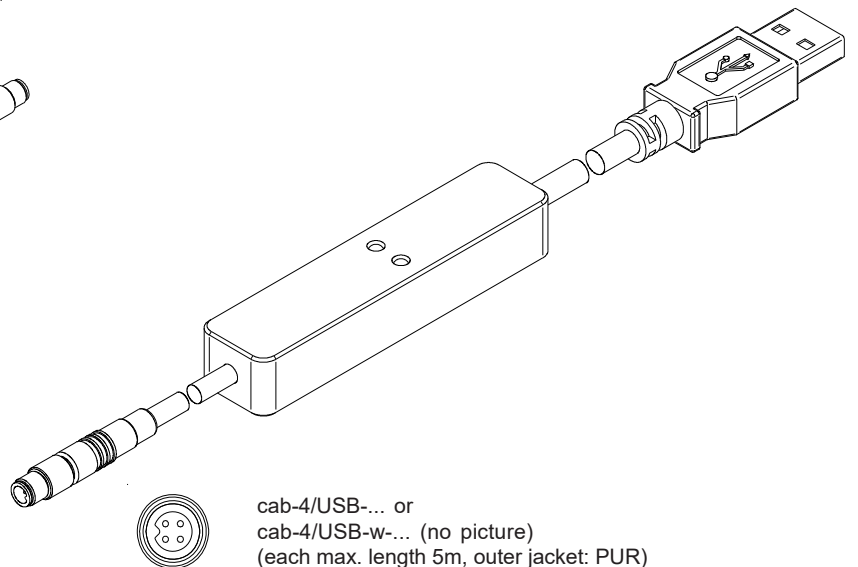
cab-eth/M12D-RJ45-flx-(length)



cab-las4/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las4/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-4/ETH-500
 (length 0.5m, outer jacket: PUR)
 4-pole M12 fem. conn. (D-coded)
 for connection of an external
 CAT5 cable, e.g.
 cab-eth/M12D-RJ45-flx-(length)



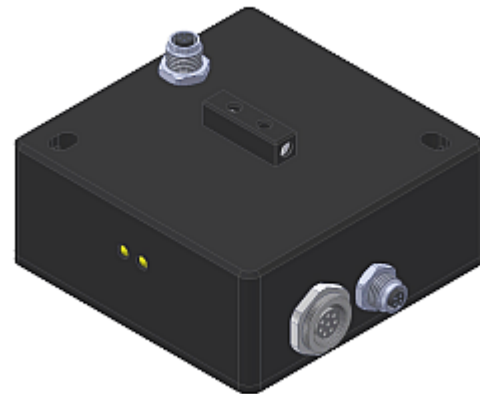
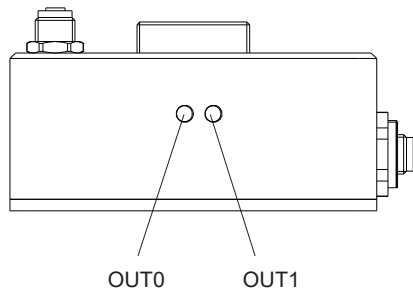
cab-4/USB-... or
 cab-4/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



LED Display

LED display:

By means of the two LEDs the physical state of the two outputs OUT0 and OUT1 is visualized:



Measuring Principle

Measuring principle of the sensors of SPECTRO-1 series:

The sensors of the SPECTRO-1 series are of single-channel design, i.e. they acquire the analog signal that comes from a receiver and evaluate this signal. Various light sources such as white light, UV light, IR light, or a laser can be used as a transmitter. The receiver is correspondingly matched to the transmitter. The acquired analog signal is provided through a voltage output and a current output.

The software can be used to select various evaluation modes for the analog signal. The status of the analog signal is provided through 2 digital outputs in accordance with the selected evaluation mode. A digital input allows external "teaching" of the sensor. An additional input allows the "freezing" of the analog output signal upon a positive input edge.

The SPECTRO-1 sensor allows highly flexible signal acquisition. The sensor, for example, can be operated in alternating-light mode (AC mode), which means the sensor is not influenced by external light, or in constant-light mode (DC mode), which provides outstanding high-speed sensor operation. An OFF function deactivates the sensor's integrated light source and changes to DC mode, which allows the sensor to detect so-called "self-luminous objects". With the stepless adjustment of the integrated light source, the selectable gain of the receiver signal, and an INTEGRAL function the sensor can be adjusted to almost any surface or any "self-luminous object".

A micro-controller performs 12-bit analog/digital conversion of the analog signal, which allows recording and evaluation of the signal. Furthermore the SPECTRO-1 sensor offers various options for intelligent signal processing such as e.g. dirt accumulation compensation.

Parameters and measurement values can be exchanged between PC and sensor either through RS232 or Ethernet (using an Ethernet converter). Through the interface all the parameters can be stored in the non-volatile EEPROM of the sensor.

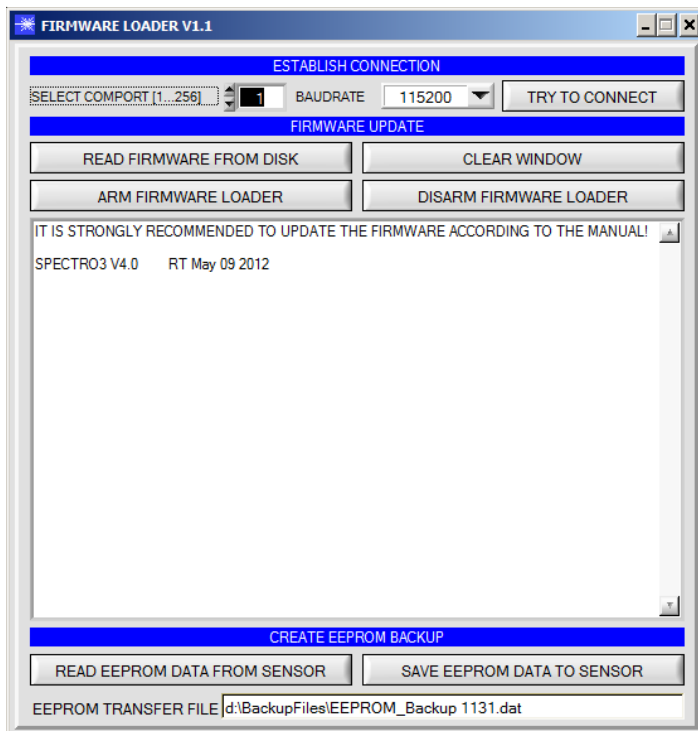
The PC software facilitates the parameterisation, diagnostics, and adjustment of the sensor system (oscilloscope function). The software furthermore provides a data recorder function that automatically records data and stores them on the hard disk of the PC.

SPECTRO-1 sensors are temperature-compensated over a range of 0°C to 80°C.



Firmware Update

Firmware update by means of the software „FirmwareLoader“:



The software „Firmware Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

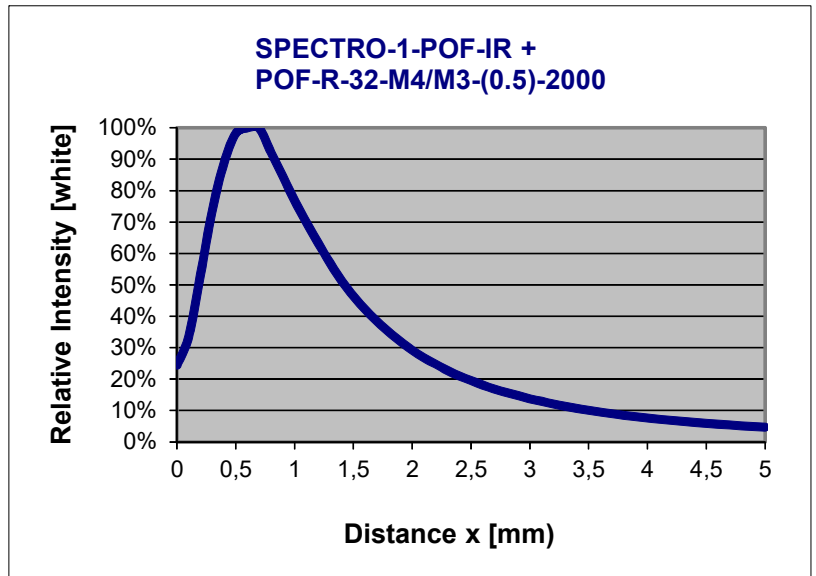
An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.



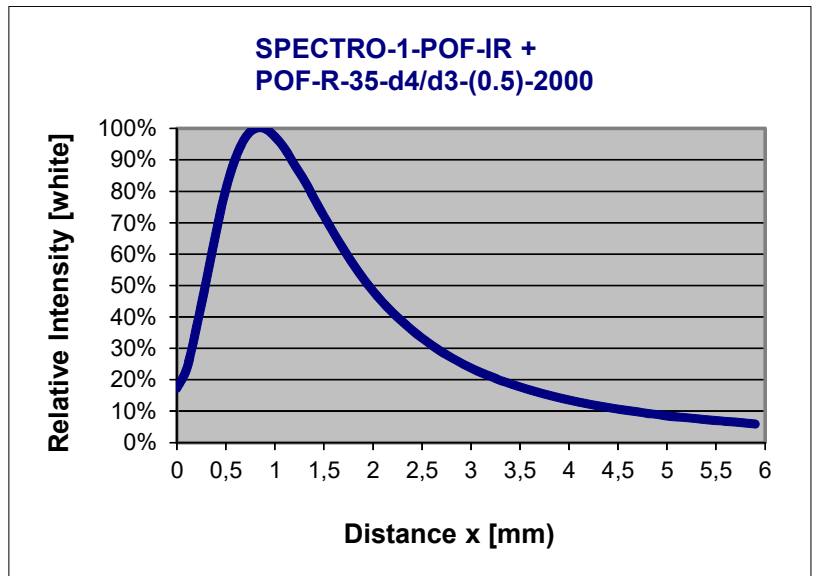
Diagrams

Diagrams: RELATIVE INTENSITY depending on the distance of the object (white paper) to the optical fiber head

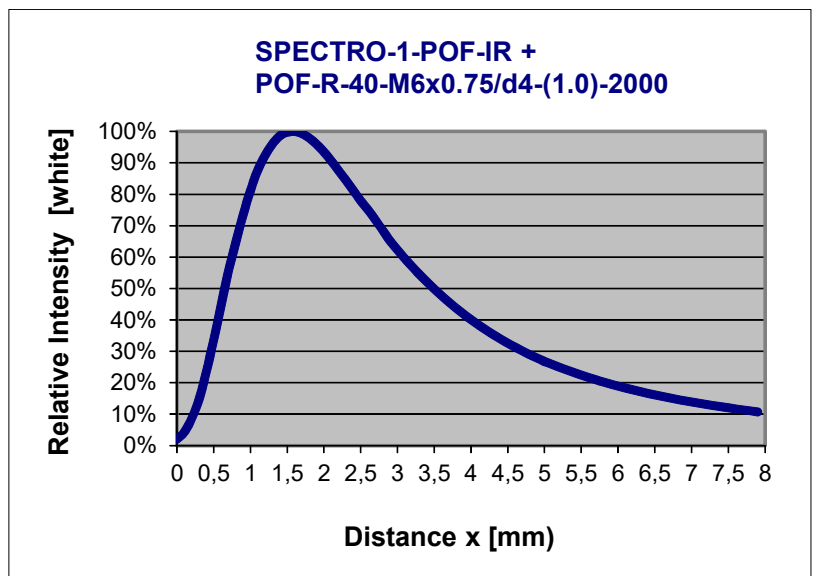
Relative Intensity
SPECTRO-1-POF-IR with optical fiber
POF-R-32-M4/M3-(0.5)-2000
100% at an object distance of 0.6 mm
(INTENSITY 4040)



Relative Intensity
SPECTRO-1-POF-IR with optical fiber
POF-R-35-d4/d3-(0.5)-2000
100% at an object distance of 0.8 mm
(INTENSITY 3705)



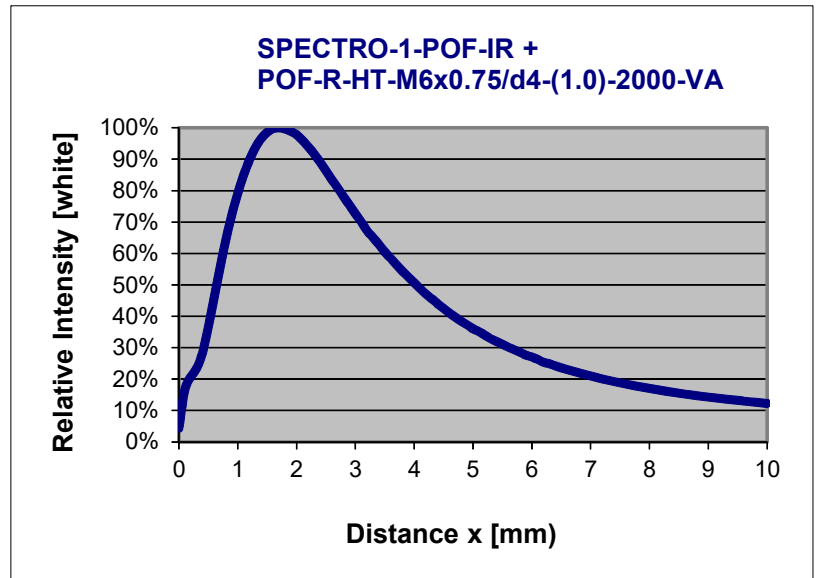
Relative Intensity
SPECTRO-1-POF-IR with optical fiber
POF-R-40-M6x0.75/d4-(1.0)-2000
100% at an object distance of 1.6 mm
(INTENSITY 3822)





Diagrams

Diagrams: RELATIVE INTENSITY depending on the distance of the object (white paper) to the optical fiber head



Relative Intensity
 SPECTRO-1-POF-IR with optical fiber
 POF-R-HT-M6x0.75/d4-(1.0)-2000-VA
 100% at an object distance of 1.7 mm
 (INTENSITY 3957)



POF Series

Plastic Optic Fibers

The plastic optic fibers of POF Series are used for **contactless detecting, counting, controlling, positioning** as well as **scanning of micro objects at processing stations, feed and automatic systems.**

- Big assortment of sensors (diffuse reflection or through-beam)
- Small sensing heads with different lines of sight (axial, angular, flexible)
- Trouble-free shortening of the plastic optic fibers
- Small bending radius, low weight
- Possible application in explosion-hazardous areas
- No interference by magnet or high-frequency fields (welding plants, switchgear et al.)
- Sturdy, flexible, vibration-proof
- For temperatures from -55°C to +80°C (or +350°C with HT type)



Characteristics:

Our plastic optic fiber systems consist of an optoelectronic fiber optic sensor (e.g. SPECTRO-1-POF, SPECTRO-1-POF-IR, SPECTRO-3-POF-SL, SPECTRO-3-POF-SLA, SPECTRO-3-POF-SLE) and a flexible plastic optic fiber with a sensing head.

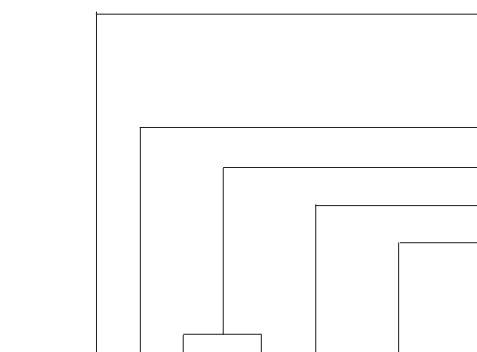
The principle of operation is similar to a through-beam sensor or a diffuse reflection sensor.

The optoelectronic fiber optic sensor includes transmitter, receiver, evaluation electronics and amplifier. It uses e.g. white light or IR light, which is transmitted through the fiber by the principle of total internal reflection (see figure "reflection inside a plastic optic fiber").

We offer a wide choice of sensing heads that can be adapted to suit varying field conditions. E.g. as a diffuse reflection sensor or as a through-beam sensor with axial or radial light emission or with a 90mm flexible stainless steel sleeve which is even capable of „looking“ round corners, if needed.

The advantages of plastic optic fibers are the small bending radii. The fiber optics are bendable in any directions within the stated bending radii. It is also possible to cut the fibers in the field to any desired length using the fiber cutting tool (POF-CUTTER).

Order code:



POF-D-80-d2.5/d1-(0.5)-2000

Order code plastic optic fibers (example)

(For detailed description of the various types of plastic optic fibers, please cf. catalog „POF Series“)

Function principle of the plastic optic fiber

(D = through-beam operation, D/90 = through-beam operation, angular 90°)

R = reflective light operation, R/90 = reflective light operation, angular 90°)

Working range (scanning range) (in mm)

Sensor head type (e.g. d2.5/d1 = sensor head case style Ø 2.5mm and Ø 1mm)

Cross section of fiber bundle (in mm)

Total length of optic fiber (in mm)

Special versions:

-HT: Sensor head for use in applications with high temperature (up to 350°C)

-VA: Stainless steel sheathing (VA / SUS) of the optical fibers

-CSC: Cross section converter

-SPX: Simplex (plastic optic fiber in simple version without a sensor head)



(For detailed description of the various types of plast optic fibers, please cf. catalog „POF Series“)

Diffuse reflection sensors:

Reflective light fiber optics - optics axial	Catalog
POF-R-12-18x14x6-(0.5)-2000	page 4
POF-R-25-d4/d1.5-(1.1)-1000	page 4
POF-R-30-M6x0.75/d2.5-(1.0)-2000	page 5
POF-R-32-d3-(0.5)-2000	page 5
POF-R-32-M4/M3-(0.5)-2000	page 6
POF-R-35-d4/d3-(0.5)-2000	page 6
POF-R-35-M4/d3-(0.5)-2000	page 7
POF-R-40-M6x0.75/d4-(1.0)-2000	page 7
POF-R-45-M4/d2.5-(0.5)-2000	page 8
POF-R-55-M4/M3-(0.5)-2000	page 8
POF-R-60-M5x0.5-(0.5)-2000	page 9
POF-R-75-d6/d4-(1.0)-2000	page 9
POF-R-75-M6/d4.5-(1.0)-2000	page 10
POF-R-90-M4-(1.0)-2000	page 10
POF-R-110-20x20x5-(1.1)-2000	page 11
POF-R-110-d3-(1.0)-2000	page 11
POF-R-110-M6/d2.5-(1.1)-2000	page 12
POF-R-125-M3/d2-(0.5)-2000	page 12

POF-R-125-M4/d2.5-(0.5)-2000	page 13
POF-R-220-M6-(1.1)-2000	page 13
POF-R-230-15x9.5x5.2-(1.1)-2000	page 14
POF-R-400-M6/d4.5-(1.0)-2000	page 14

Reflective light fiber optics - high temperature resistant	
POF-R-HT-M6x0.75/d4-(1.0)-2000-VA	page 15

Reflective light fiber optics - optics angular 90°	
POF-R/90-12-24x21x4-(0.5)-2000	page 16
POF-R/90-25-d3/d1.5-(0.5)-2000	page 16
POF-R/90-45-d5/d2-(1.1)-2000	page 17
POF-R/90-85-M8/d4-(1.0)-2000	page 17

Reflective light fiber optics - simplex:	
POF-SPX1-d2.2-(1.0)-(Länge)	page 18

Through-beam sensors:

Through beam fiber optics - optics axial	Catalog
POF-D-40-d1-(0.5)-500	page 19
POF-D-80-15x15x5-(0.5)-2000	page 19
POF-D-100-d3/d1.5-(0.5)-2000	page 20
POF-D-100-d4/d3-(0.5)-2000	page 20
POF-D-100-M3/d2-(0.5)-2000	page 21
POF-D-100-M4/d1.2-(1.0)-2000	page 21
POF-D-120-M4/M2.6-(1.0)-2000	page 22
POF-D-140-d1.5-(0.5)-2000	page 22
POF-D-140-M3/d0.88-(0.5)-2000	page 23
POF-D-140-M3/d2-(0.5)-2000	page 23
POF-D-140-M4/M2.6-(1.0)-2000	page 24
POF-D-200-M4/d3-(1.0)-2000	page 24
POF-D-290-d3/d2-(1.1)-2000	page 25
POF-D-400-M4/d1.48-(1.0)-2000	page 25
POF-D-440-M4/d3-(1.0)-2000	page 26
POF-D-530-M4/M2.6-(1.0)-2000	page 26
POF-D-800-d2.5-(1.0)-2000	page 27
POF-D-1400-12x8x3-(0.5)-2000	page 27

POF-D-14000-M14-(1.0)-10000	page 28
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Through beam fiber optics - optics angular 90°	
POF-D/90-100-d4-(1.0)-2000	page 28
POF-D/90-180-d2/d1-(1.0)-2000	page 29
POF-D/90-200-d2.5/d1.5-(1.0)-2000	page 29
POF-D/90-200-M4/d3-(1.0)-2000	page 30
POF-D/90-230-M4/M2.6-(1.0)-2000	page 30
POF-D/90-350-69x20x5-(1.1)-2000	page 31
POF-D/90-400-12x8.5x3-(0.5)-2000	page 31
POF-D/90-700-d4-(1.1)-2000	page 32
POF-D/90-800-12x8x3-(0.5)-2000	page 32
POF-D/90-1500-31x13.5x4.2-(1.1)-2000	page 33
POF-D/90-CSC-31x13.5x4.2-(2.2x11)-2000	page 34

Through beam fiber optics - simplex:	
POF-SPX2-d2.2-(1.0)-(Länge)	Seite 35

Accessories:

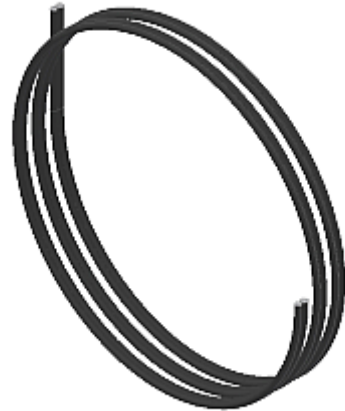
Fiber cutting tool	Catalog
POF-CUTTER	page 35

Reduction sleeve (included in scope of delivery)	
POF-SLV-2.2/1.1	page 36
POF-SLV-2.2/1.3	page 36



Through-beam POF

POF-SPX2-d2.2-(1.0)-(length) (Item no. see below)



POF = Plastic optical fiber
 SPX2 = Simplex, fiber 2-fold
 d2.2 = Sheath Ø 2.2mm
 (1.0) = Fiber cross section 1.0mm (transmitter and receiver)
 (length) = Length as per request (e.g. 1000mm, 2000mm)

Design sheath: 2x Ø 2.2mm
 Design fiber: 2x Ø 1.0mm
 Bending radius (rigid/flexible): 10mm/--
 Temperature: -20°C...+50°C
 Enclosure rating: IP67

POF-SPX2-d2.2-(1.0)-1000 (Item no. 802079)
POF-SPX2-d2.2-(1.0)-2000 (Item no. 803822)



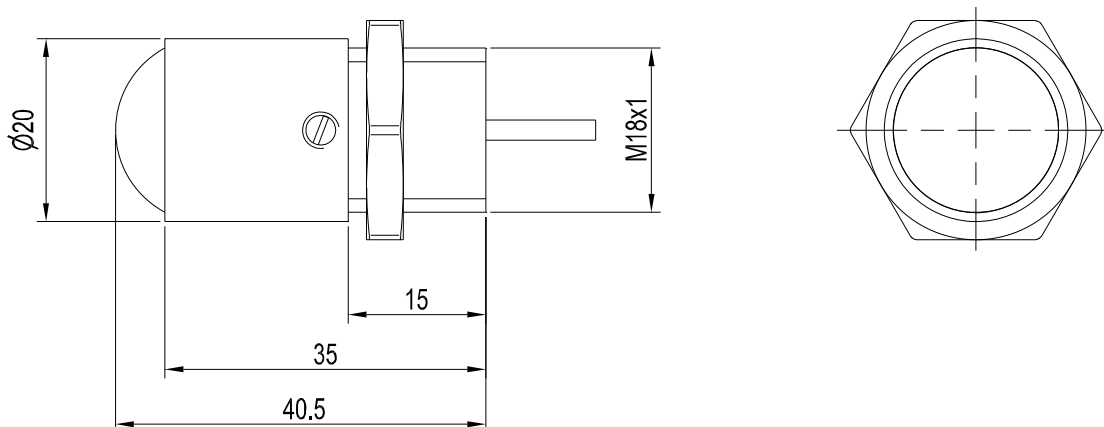
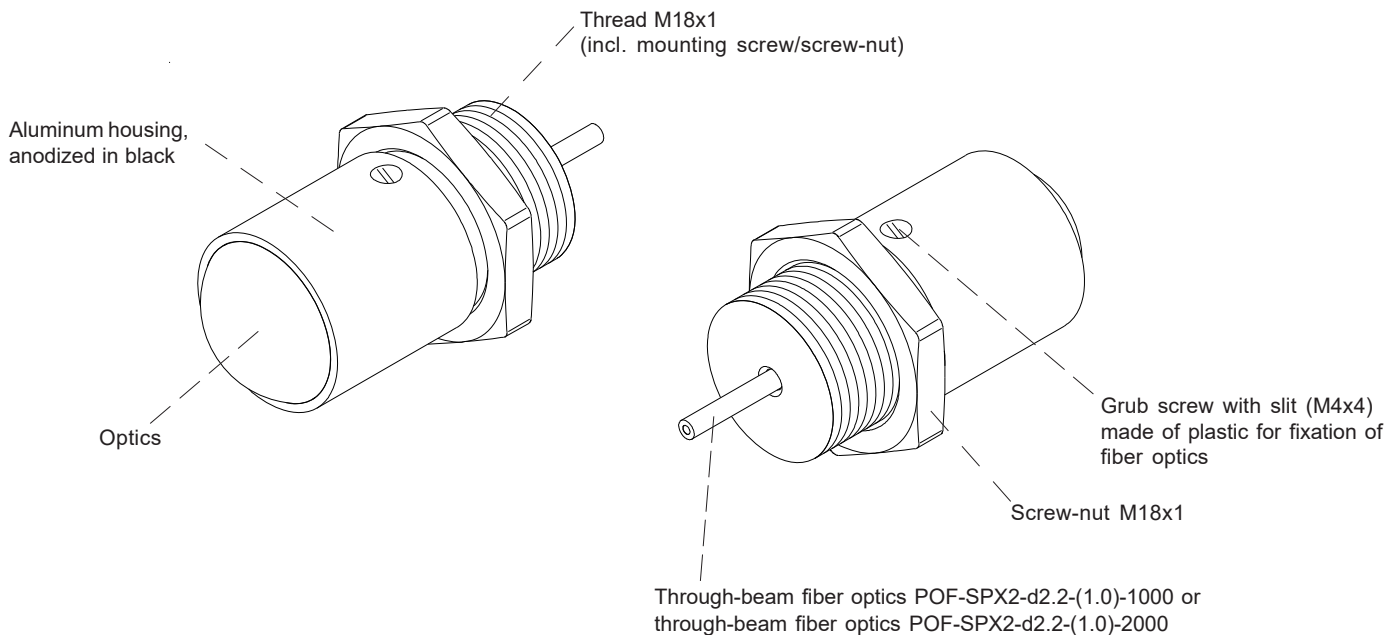
Optical Frontend

KL-M18/20-SPX (Item no. 803821)

- Optical frontend suitable for **through-beam fiber optics**
Durchlicht-Lichtleiter POF-SPX2-d2.2-(1.0)-(length)
(fiber optics are available in various lengths)
- Big working distance: typ. 100 mm ... 3000 mm
- Also suitable for detection of highly absorbent objects
(e.g. black painted parts)
- Minimal color change at a change in the distance
- Focusable
- Scratch resistant glass optics
- Sturdy aluminum housing, anodized in black



For operation with a through-beam fiber optics POF-SPX2-d2.2-(1.0)-(length) **2pcs. of KL-M18/20-SPX** are necessary!



Alle Abmessungen in mm

External Light Source

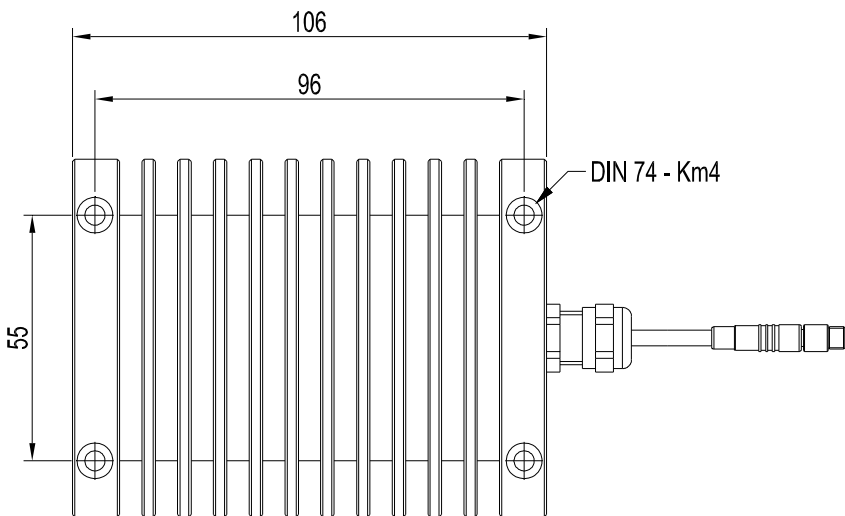
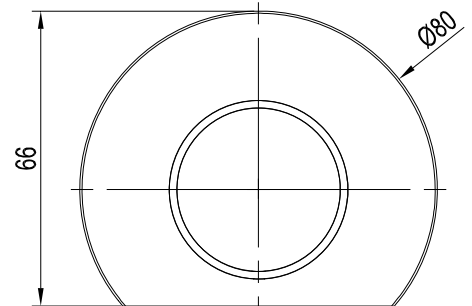
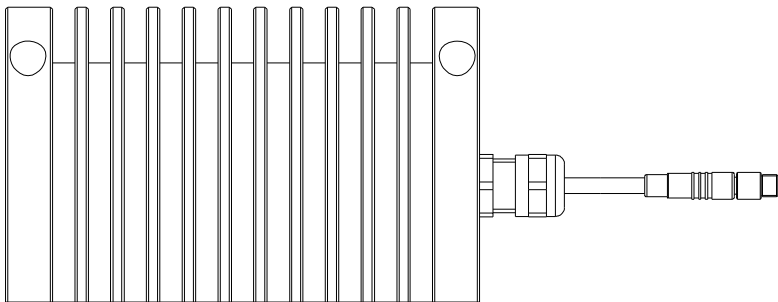
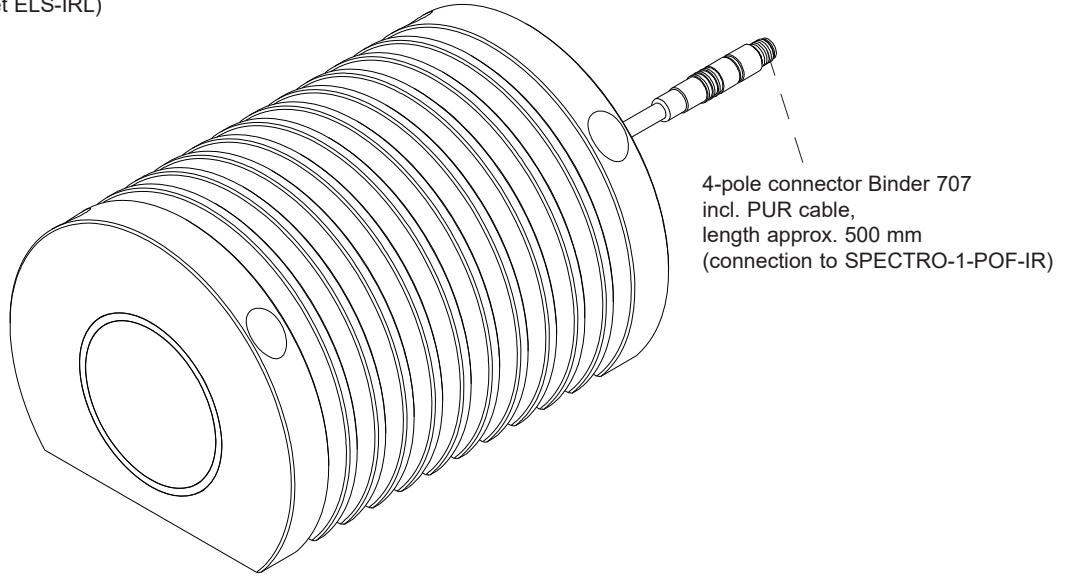
ELS-IRL

External IR laser light source (class 3B)

(please order separately, also cf. data sheet ELS-IRL)

Invisible laser radiation
**AVOID EXPOSURE
 TO BEAM.**
 Class 3B laser product.
 (DIN EN 60825-1: 2001-11)

$P_o = 500 \text{ mW}$
 $P_p = 1 \text{ W}$
 $t = 4 \mu\text{s} - 500 \mu\text{s}$
 $F = 145 \text{ Hz}$
 $\lambda = 980 \text{ nm}$



All dimensions in mm



Accessories

Laser safety goggles:

LUMI-SG-IRL-3B
(suitable for class 3B laser products)



Laser pen:

LUMI-LP-IRL/UV/VIS-3B
(suitable for class 3B laser products)

