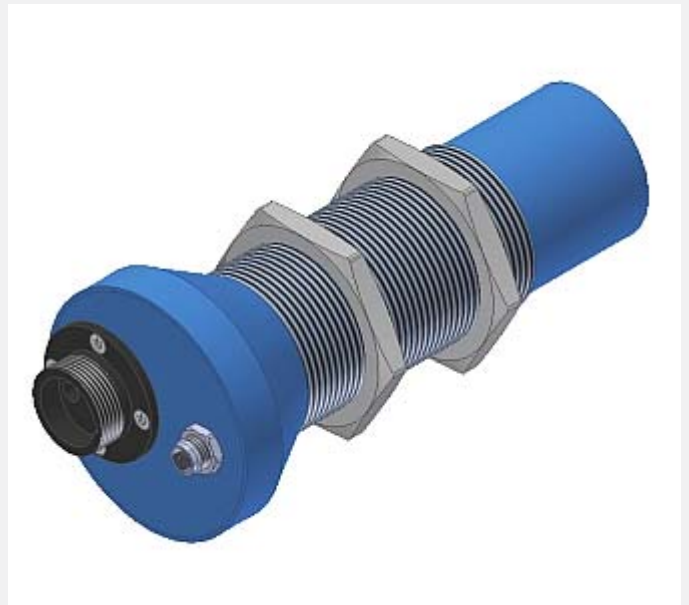


SPECTRO Series

► SPECTRO-3-FIO-MSM-DIG

- Big working range: typ. 1 mm ... 500 mm (depends on fiber optics and attachment optics)
- Big assortment of fiber optics (reflected or transmitted light)
- $L^*a^*b^*$, $L^*C^*h^*$, $L^*u^*v^*$, L^*u^*v' and xyY evaluation (CIE standard)
- Up to 31 colors (max. 48 in group mode) can be stored
- RS232 interface (USB or Ethernet adapter is available)
- Super-bright white-light LED (AC-/DC-operation or OFF for luminous objects can be switched)
- Color measurement (contrast detection, and gray scale detection)
- Insensitive to outside light (in AC-operation)
- Scan frequency max. 35 kHz, switching frequency typ. 60 kHz
- Several TEACH functions (via PC, PLC, or push button)
- Various evaluation algorithms can be activated
- "BEST HIT" mode ("human color assessment")
- Switching state display by means of 5 yellow LEDs
- Parameterizable via Windows® software, scope function
- Temperature compensated
- Averaging can be activated (from 1 up to over 32000 values)
- Color control of luminous objects (LEDs, halogen lamps, displays, ...)
- 3-color filter detector (true color detector: "human color perception")
- Possibility for connection of external white-light source ELS-WHT-1P



Design

Product name:

SPECTRO-3-FIO-MSM-DIG

(incl. Windows® PC software SPECTRO3-MSM-DIG-Scope)

Sturdy aluminum housing,
anodized in blue

Accessories: (cf. p. 12-21)

Fiber optics
Attachment optics
Fiber optics mounting
External light source
Special fiber optics
Mounting flanges

Fiber optics adaptor for
connection of
fiber optics of FIO Series
(cf. separate data sheet)

4-pole fem. connector
Binder Series 707
(connection to external
white light source
ELS-WHT-1P)

* former product name:
SPECTRO-3-ELS

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

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

LED display:
Switching state
indication by means
of 5 yellow LEDs

TEACH button
(external teaching
via input IN0)

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

Connecting cable:
cab-las8/SPS

Mounting screws
(M34)

Sensor

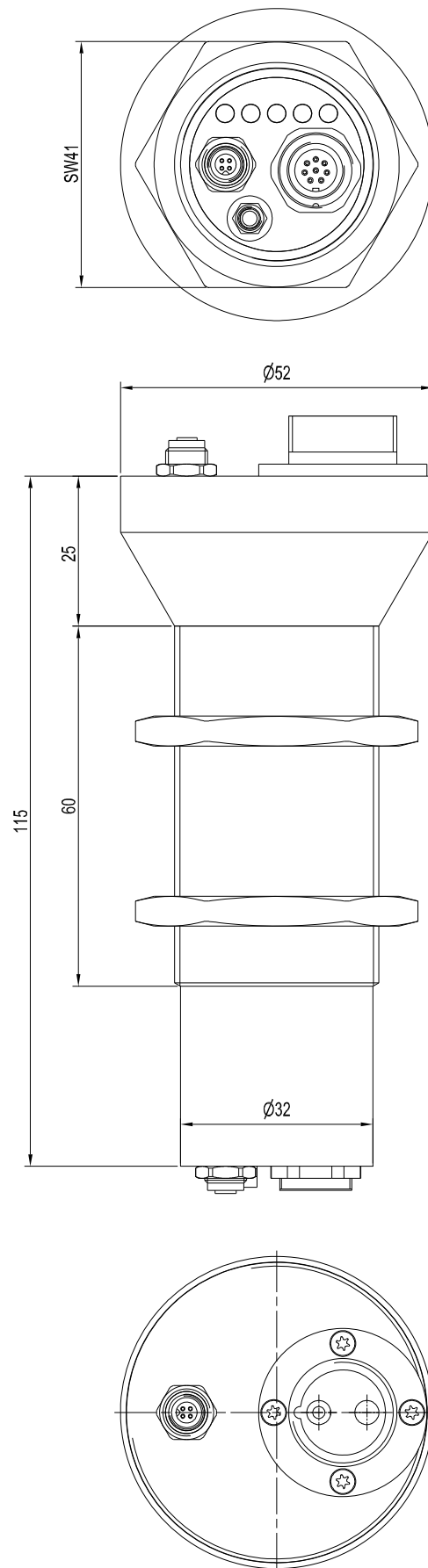
Instruments



Technical Data

| Model | SPECTRO-3-FIO-MSM-DIG |
|-----------------------------------|---|
| Voltage supply | +24VDC ($\pm 10\%$), reverse polarity protected, overcurrent protected |
| Current consumption | < 160 mA (with connected external light source ELS-WHT-1P: < 500 mA) |
| Max. switching current | 100 mA, short circuit proof |
| Switching state indication | 5 yellow LED visualize the physical state of the outputs OUT0 ... OUT4 |
| Input digital (1x) | IN0 (Pin 3), digital (0V/+24V) or teach button at the housing |
| Outputs digital (5x) | OUT0 ... OUT4 (Pin 4 ... 8): digital (0V/+24V), npn/pnp-able (bright/dark-switching, can be switched) |
| Interface | RS232 |
| Pulse lengthening | 0 ... 100 ms, adjustable via PC software |
| Averaging | max. 32768 values, adjustable via PC software |
| Scan frequency | LED operation, can be switched via PC software: AC operation: max. 20 kHz (depends on parameterization) DC and OFF operation: max. 35 kHz (depends on parameterization) |
| Switching frequency | typ. 60 kHz |
| Transmitter (light source) | super-bright white-light LED |
| Transmitter control | can be switched via PC software: AC operation (LED MODE-AC), DC operation (LED MODE-DC), OFF operation (LED MODE-OFF) or PULSE operation (LED MODE -PULSE) |
| Object distance (measuring range) | with reflected light fiber optics: typ. 1 mm ... 500 mm (depends on fiber optics and attachment optics) with transmitted light fiber optics: typ. 10 mm ... 500 mm (depends on fiber optics and attachment optics) |
| Receiver | 3-color filter detector (TRUE COLOR detector, "human color perception"), color filter curves acc. to CIE 1931 |
| Receiver gain setting | 8 steps (AMP1 ... AMP8), adjustable via PC software |
| Ambient light | max. 5000 Lux |
| Size of light spot | circular: typ. $\varnothing 0.2$ mm ... $\varnothing 20$ mm or rectangular: typ. 3 mm x 0.5 mm ... 6 mm x 1 mm depends on fiber optics and attachment optics (cf. catalog FIO series) |
| Reproducibility | in the X, Y color range each 1 digit at 12-bit A/D conversion |
| Temperature drift X,Y | $\Delta X/\Delta T$; $\Delta Y/\Delta T$ typ. 0,2 digits/ $^{\circ}$ C (< 0,01% / $^{\circ}$ C) |
| Measurement accuracy | $\Delta E = 0.7$ |
| Resolution | $\Delta E \geq 0.01$ in case of color space L*u*v': $\Delta u'v' = 0.001$ |
| Color spaces | L*a*b* , L*C*h* , L*u*v* , L*u'v' , and xyY (CIE standard) |
| Color memory capacity | non-volatile EEPROM with parameter sets for max. 31 colors (max. 48 in group mode) |
| Housing dimensions | length approx. 115 mm x $\varnothing 32$ mm (threaded M34x1.5) or $\varnothing 52$ mm (optics holding device), without connectors |
| Housing material | aluminum, anodized in blue (fiber optics adaptor: 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 white light source ELS-WHT-1P: 4-pol. fem. connector (Binder 707) |
| Operating temp. range | -20 $^{\circ}$ C ... +55 $^{\circ}$ C |
| Storage temperature range | -20 $^{\circ}$ C ... +85 $^{\circ}$ C |
| EMC test acc. to | DIN EN 60947-5-2 |
| External light source | possibility of connection of an external white light source type ELS-WHT-1P |

Dimensions



All dimensions in mm



Connector Assignment
Connection to PLC:**8-pole fem. connector Binder Series 712**

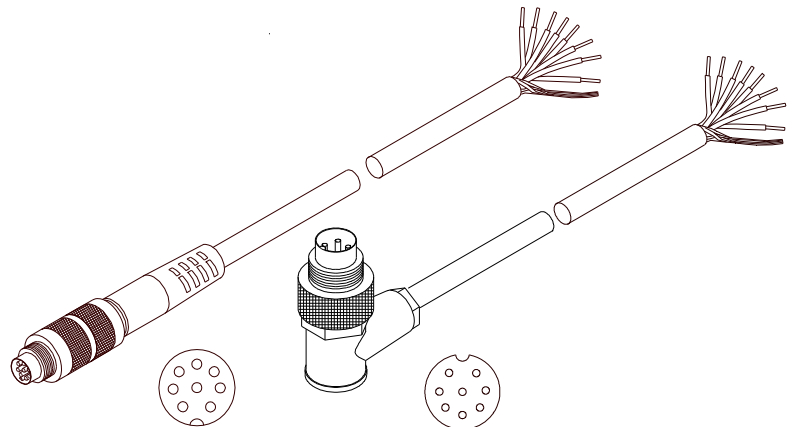
| Pin: | Color: | Assignment: |
|------|--------|--|
| 1 | white | GND (0V) |
| 2 | brown | +24VDC ($\pm 10\%$) |
| 3 | green | IN0 |
| 4 | yellow | OUT0 (Digital 0: typ. 0...1V, Digital 1: typ. +Ub - 10%) |
| 5 | grey | OUT1 (Digital 0: typ. 0...1V, Digital 1: typ. +Ub - 10%) |
| 6 | pink | OUT2 (Digital 0: typ. 0...1V, Digital 1: typ. +Ub - 10%) |
| 7 | blue | OUT3 (Digital 0: typ. 0...1V, Digital 1: typ. +Ub - 10%) |
| 8 | red | OUT4 (Digital 0: typ. 0...1V, Digital 1: typ. +Ub - 10%) |

Connecting cable:

cab-las8/SPS-(length)

cab-las8/SPS-w-(length) (angle type, 90°)

(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:****Connecting cable (incl. driver software):**

cab-4/USB-(length)

cab-4/USB-w-(length) (angle type 90°)

(standard length 2m)

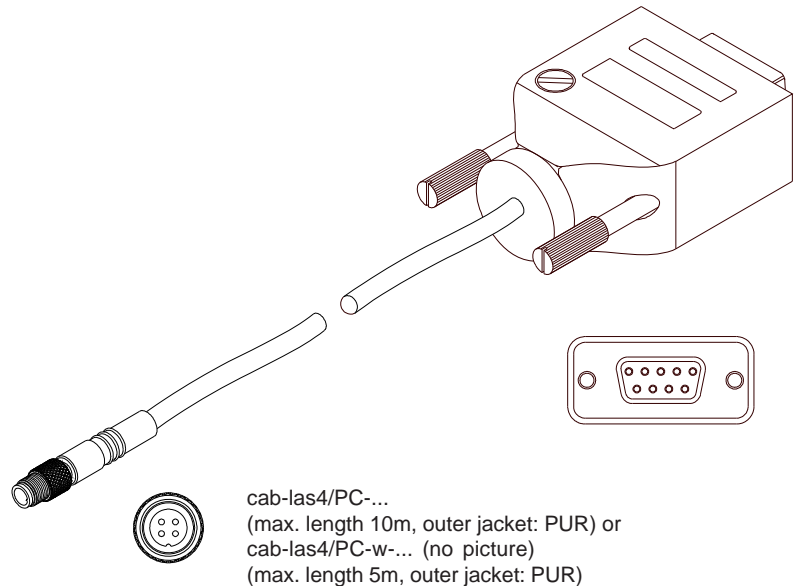
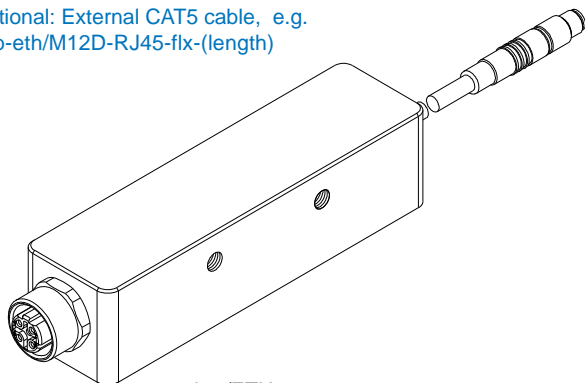
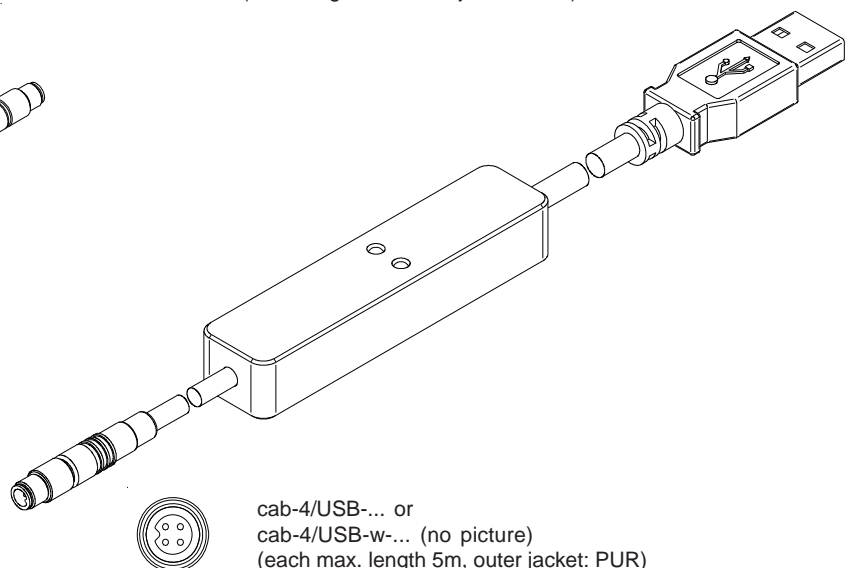
alternative:**Connection to local network via Ethernet bus:****Adapter (incl. software „SensorFinder“):**

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)



Measuring Principle

Measuring principle of the color sensors of SPECTRO-3-MSM-DIG series:

The SPECTRO-3-MSM-DIG provides highly flexible signal acquisition. For example, the sensor can be operated in alternating-light mode (AC mode), which makes the sensor insensitive to extraneous light. It also can be set to constant-light mode (DC mode), which makes the sensor extremely fast. With the stepless adjustment of the integrated light source as well as the selectable gain of the receiver signal and an INTEGRAL function the sensor can be set to almost any surface or any "self-luminous object".

When the integrated light source of the SPECTRO-3-MSM-DIG color sensor is activated, the sensor detects the radiation that is diffusely reflected from the object. As a light source the SPECTRO-3-MSM-DIG color sensor uses LEDs (in case of color sensor type -VISUV additionally UV LEDs) with adjustable transmitter power. An integrated 3-fold receiver for the red, green, and blue content of the light that is reflected from the object, or the light that is emitted by a "self-luminous object", is used as a receiver.

The color sensors of the SPECTRO-3-MSM-DIG series can be taught up to 31 colors that are provided directly at the outputs, and up to 48 colors that are output by means of grouping. For each of these taught colors it is possible to set tolerances. Evaluation of the taught colors is performed either with the "FIRST HIT" or with the "BEST HIT" mode. With "FIRST HIT" the first hit in the teach table is output, and with "BEST HIT" the best hit in the teach table is output. Raw data are represented with 12 bit resolution.

Color detection either operates continuously or is started through an external PLC trigger signal. The respective detected color either is provided as a binary code at the 5 digital outputs or can be sent directly to the outputs, if only up to 5 colors are to be detected. At the same time the detected color code is visualised by means of 5 LEDs at the housing of the SPECTRO-3-MSM-DIG.

[Please note: Visualisation by means of LEDs not available with SPECTRO-3-JR-MSM-DIG and SPECTRO-3-MSM-DIG-VIS or -VISUV types.]

With a TEACH button at the sensor housing the color sensor can be taught up to 31 colors (max. 48 colors in group mode). For this purpose the corresponding evaluation mode must be set with the software. The TEACH button is connected in parallel to the input IN0 (green wire at cable cab-las8/SPS). **[Please note: TEACH button not available with SPECTRO-3-JR-MSM-DIG and SPECTRO-3-MSM-DIG-VIS or -VISUV types.]**

Parameters and measurement values can be exchanged between a PC and the SPECTRO-3-MSM-DIG color sensor through the serial RS232 interface. All the parameters for color detection also can be saved to the non-volatile EEPROM of the SPECTRO-3-MSM-DIG color sensor through this serial RS232 interface. When parameterisation is finished, the color sensor continues to operate with the current parameters in STAND-ALONE mode without a PC.

Possible firmware updates can be easily performed through the RS232 interface, even with the sensor system in installed condition (a firmware update is performed via the software „FirmwareLoader“).



Visualization

Visualization of the color code:

[not available with SPECTRO-3-JR-MSM-DIG and SPECTRO-3-MSM-DIG-VIS or -VISUV types.]

The color code is visualised by way of 5 yellow LEDs at the housing of the SPECTRO-3-MSM-DIG color sensor. At the same time in the binary mode (OUT BINARY) the color code indicated on the LED display is output as 5-bit binary information at the digital outputs OUT0 to OUT4 of the 8-pole SPECTRO-3/PLC socket.

The SPECTRO-3-MSM-DIG color sensor is able to process a maximum of 31 colors (color code 0 ... 30) in accordance with the corresponding rows in the COLOR TEACH TABLE. An "error" respectively a "not detected color" is displayed by the lighting of all LED (OUT0 ... OUT4 digital outputs are set to HIGH-level).

In the DIRECT mode (OUT DIRECT HI or OUT DIRECT LO) the maximum numbers of colors to be taught is 5 (color no. 0, 1, 2, 3, 4). If DIRECT HI is activated, the specially digital output is set to HI, while the other 4 are set to LO. If the current color does not correspond with any of the teach-in colors, all digital outputs are set to LOW (no LED is lighting).

If DIRECT LO is activated, the specially digital output is set to LO, while the other 4 are set to HI. If the current color does not correspond with any of the teach-in colors, all digital outputs are set to HIGH (all LED are lighting).

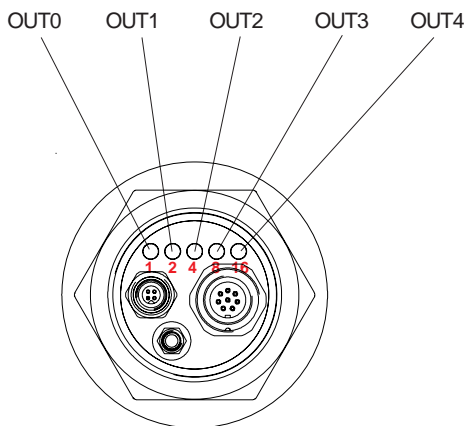
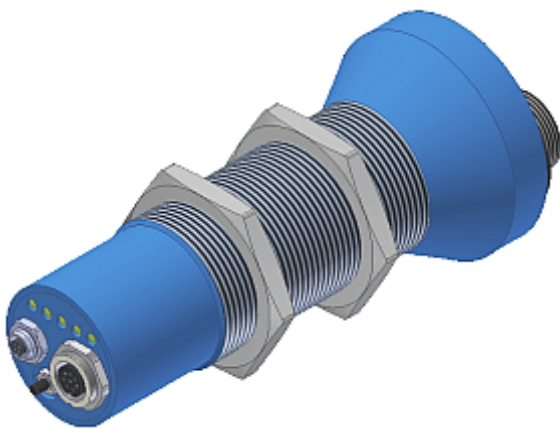


LED Display

LED display:

The color code is visualized by means of 5 yellow LEDs at the housing of the color sensor. At the same time the color code indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

In the DIRECT mode the maximum number of color codes to be taught is 5. These 5 color codes can be directly output at the 5 digital outputs. The respective detected color code is displayed by means of the 5 yellow LEDs at the color sensor housing.

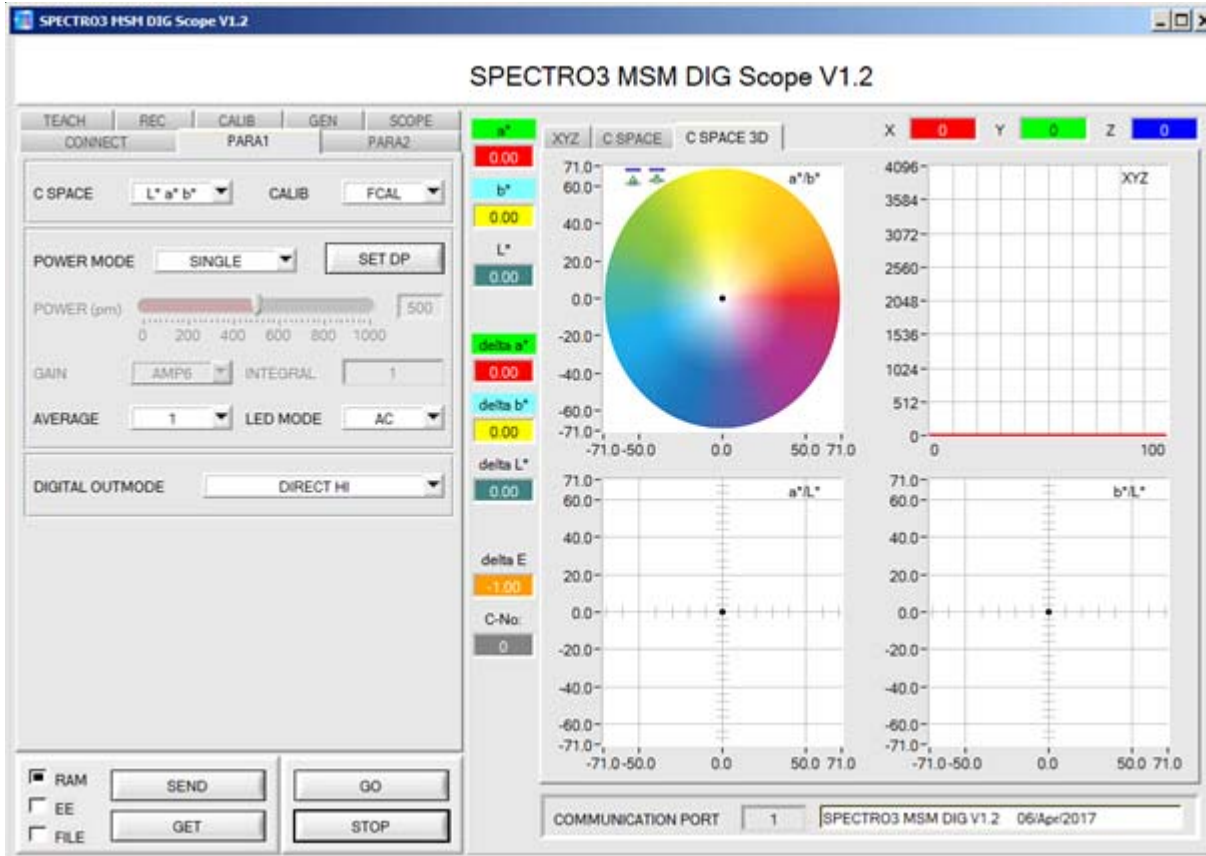


| | | |
|-----------|----------------------------|-----------|
| ○ ○ ○ ○ ○ | ● ○ ○ ○ ○ | ○ ● ○ ○ ○ |
| 0 | 1 | 2 |
| ● ● ○ ○ ○ | ○ ○ ● ○ ○ | ● ○ ● ○ ○ |
| 3 | 4 | 5 |
| ○ ● ● ○ ○ | ● ● ● ○ ○ | ○ ○ ○ ● ○ |
| 6 | 7 | 8 |
| ● ○ ○ ● ○ | ○ ● ○ ● ○ | ● ● ○ ● ○ |
| 9 | 10 | 11 |
| ○ ○ ● ● ○ | ● ○ ● ● ○ | ○ ● ● ● ○ |
| 12 | 13 | 14 |
| ● ● ● ● ○ | ○ ○ ○ ○ ● | ● ○ ○ ○ ● |
| 15 | 16 | 17 |
| ○ ● ○ ○ ● | ● ● ○ ○ ● | ○ ○ ● ○ ● |
| 18 | 19 | 20 |
| ● ○ ● ○ ○ | ○ ● ● ○ ○ | ● ● ● ○ ○ |
| 21 | 22 | 23 |
| ○ ○ ○ ● ● | ● ○ ○ ● ● | ○ ● ○ ● ● |
| 24 | 25 | 26 |
| ● ● ○ ● ● | ○ ○ ● ● ● | ● ○ ● ● ● |
| 27 | 28 | 29 |
| ○ ● ● ● ● | ● ● ● ● ● | |
| 30 | Error or „not detected“ | |


Parameterization
Windows® user interface:

(The current software version is available for download on our website.)

The color sensor is parameterized under Windows® with the SPECTRO3-MSM-DIG-Scope software. The Windows® user interface facilitates the teach-in process at the color sensor and supports the operator in the task of adjustment and commissioning of the color sensor.



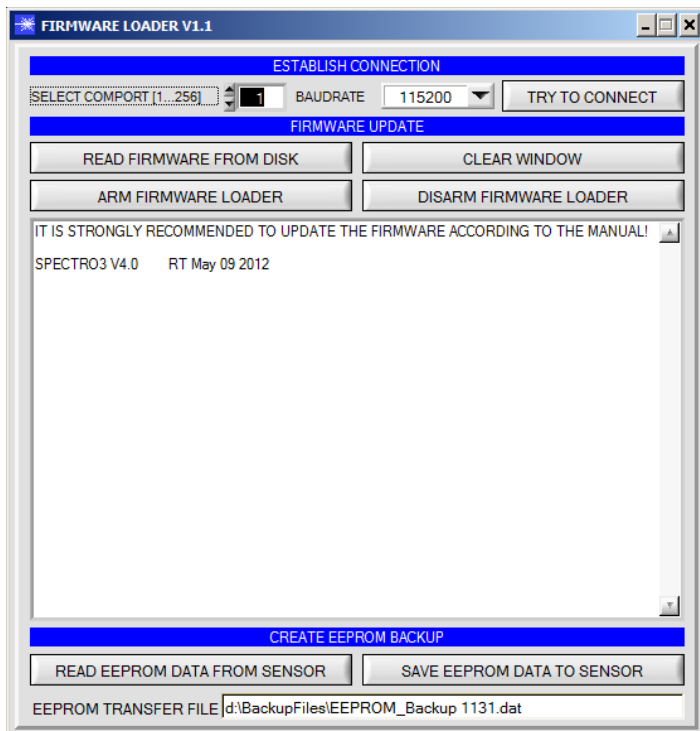
The RS232 interface (tab PARA1 or PARA2) is used for setting parameters such as:

- POWER MODE: Light power of the LED
- SET DP: Set Double Parameter
- LED MODE: Triggering of the internal light source (AC, DC)
- GAIN: Used for setting the gain of the receiver (AMP1 ... AMP8)
- AVERAGE: Number of scanning values (measurement values, 1 ... 32768) over which the raw signal measured at the receiver is averaged. A higher AVERAGE default value reduces noise of the raw signals at the receiver unit and there will be a decrease of the maximal available switching frequency of the sensor.
- INTEGRAL: Number of scan values (measurement values) over which the raw signal measured at the receiver is summed up. This integral function allows the reliable detection even of extremely weak signals
- C SPACE: Selection of a color space ($L^*a^*b^*$, $L^*C^*h^*$, $L^*u^*v^*$, $L^*u^*v^*$, or xyY) for the calculation of the color stimulus specification
- DIGITAL OUTMODE: Triggering of the five digital outputs (OUT0 ... OUT4)
- EVALUATION MODE: Evaluation mode (FIRST HIT or BEST HIT)
- TRIGGER: Continuous or external or self trigger (CONT, EXT1, EXT2, TRANS)
- EXTEACH: In all the evaluation modes teaching of a color can be performed externally through IN0 or by means of the button at the sensor housing [Please note: TEACH button not available with SPECTRO-3-JR-MSM-DIG and SPECTRO-3-MSM-DIG-VIS or -VISUV types.]
- INTLIM: Minimum intensity required for color evaluation
- MAXCOL-No.: Number of colors to be checked
- Tab TEACH: Opens a window where you can teach colors to the TEACH TABLE
- Tab CALIB: Selection of calibration mode (FCAL = factory calibration or UCAL = user calibration).
- Tab SCOPE: Visualises an oscilloscope
- Tab GEN: Displays the current temperature value TEMP in the sensor housing
- Tab REC: Data recorder



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.

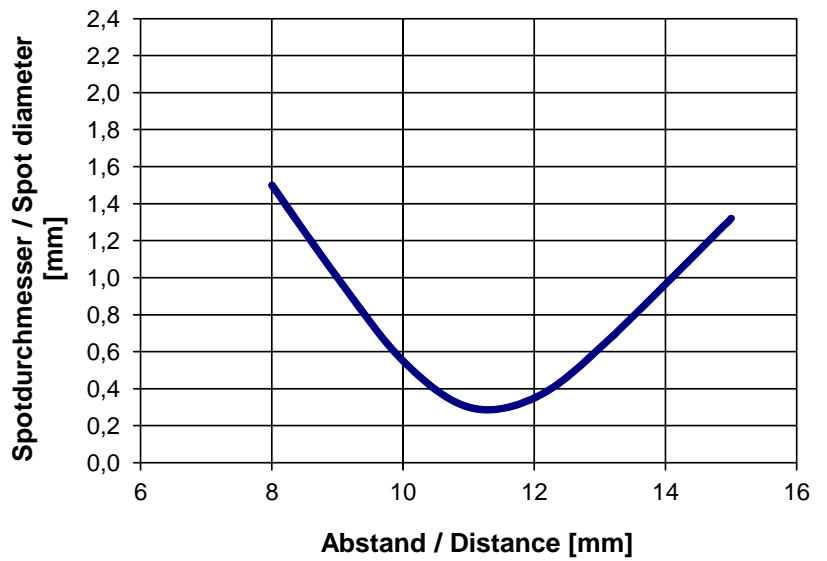


Diagrams

Diagrams: SPOT DIAMETER depending on distance

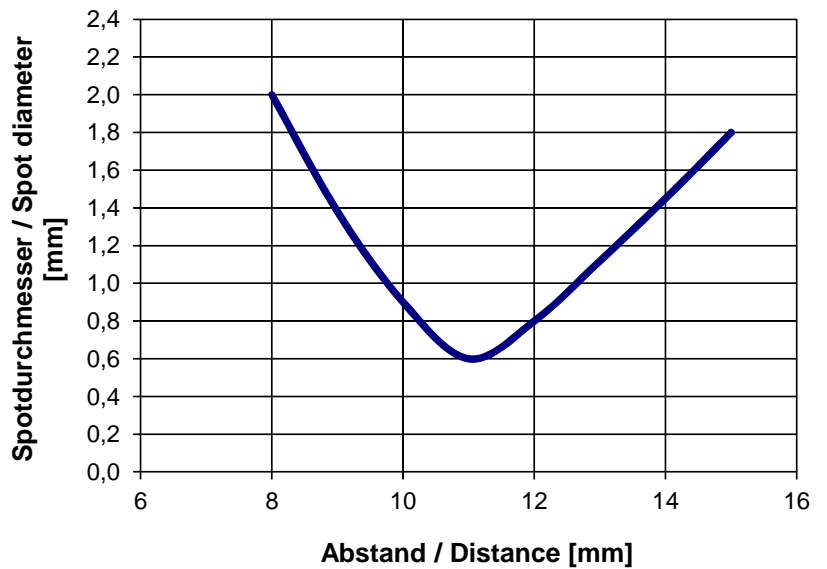
SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG
with fiber optics R-S-A1.1-(0.6)-1200-67°
and attachment optics KL-4
(fiber optics fixed at limit stop into attachment optics)



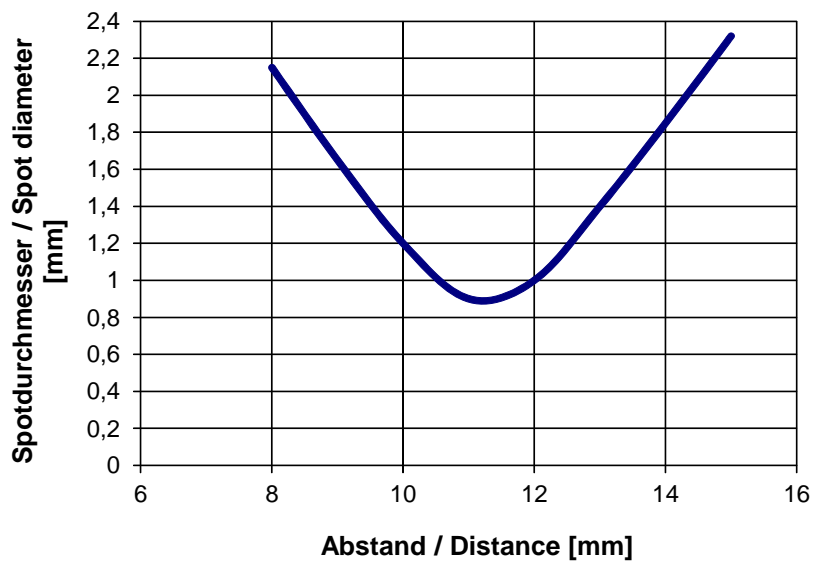
SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG
with fiber optics R-S-A1.1-(1.1)-1200-67°
and attachment optics KL-4
(fiber optics fixed at limit stop into attachment optics)



SPOT DIAMETER [distance], typ.

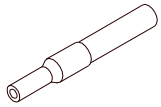
SPECTRO-3-FIO-MSM-DIG
with fiber optics R-S-A1.1-(1.5)-1200-67°
and attachment optics KL-4
(fiber optics fixed at limit stop into attachment optics)





Diagrams

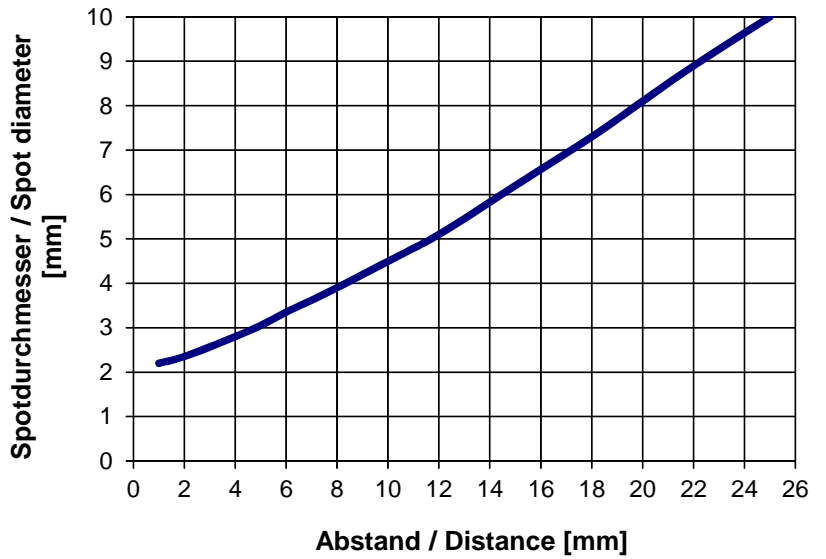
Diagrams: SPOT DIAMETER depending on object distance



Faserbündel Ø 2.5 mm

SPOT DIAMETER [distance], typ.

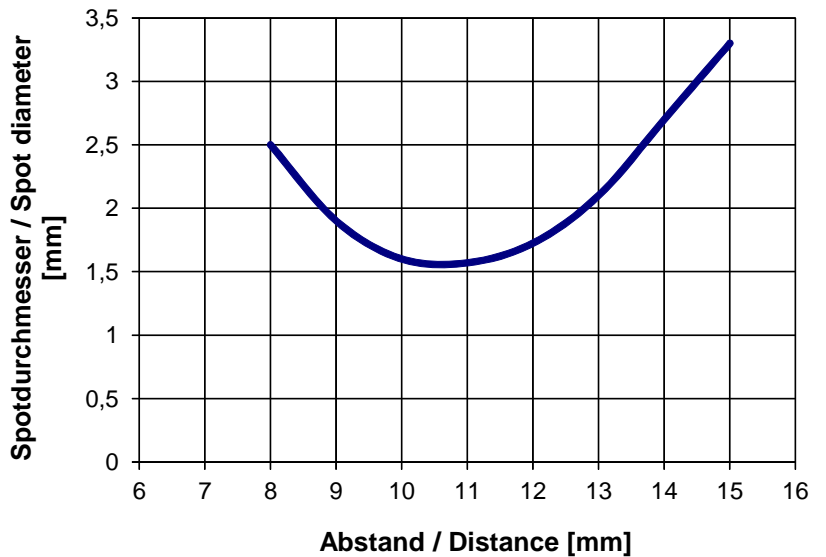
SPECTRO-3-FIO-MSM-DIG with fiber optics R-P-A2.0-(2.5)-600-67°



SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG with fiber optics R-S-A2.0-(2.5)-1200-67° and attachment optics KL-3

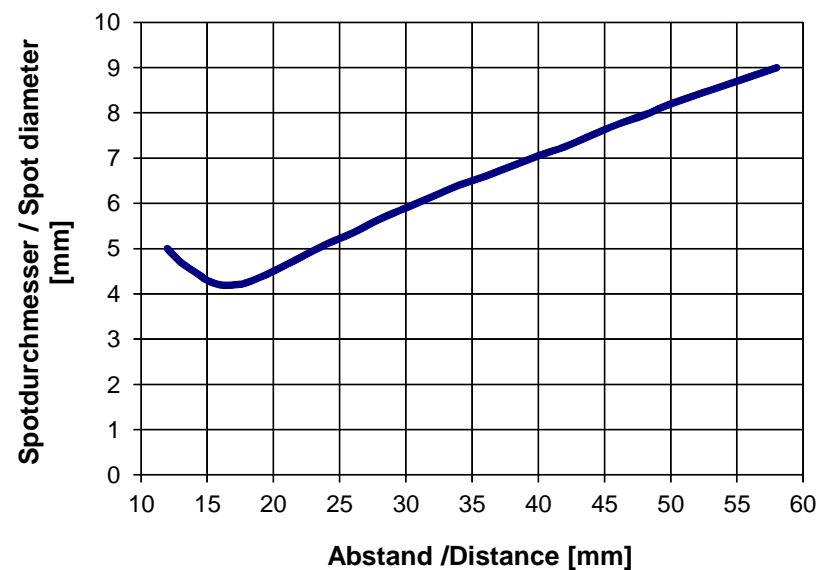
(fiber optics is inner stop fixed to attachment optics)



SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG with fiber optics R-S-A2.0-(2.5)-1200-67° and attachment optics KL-M18-A2.0

(fiber optics is inner stop fixed to attachment optics)



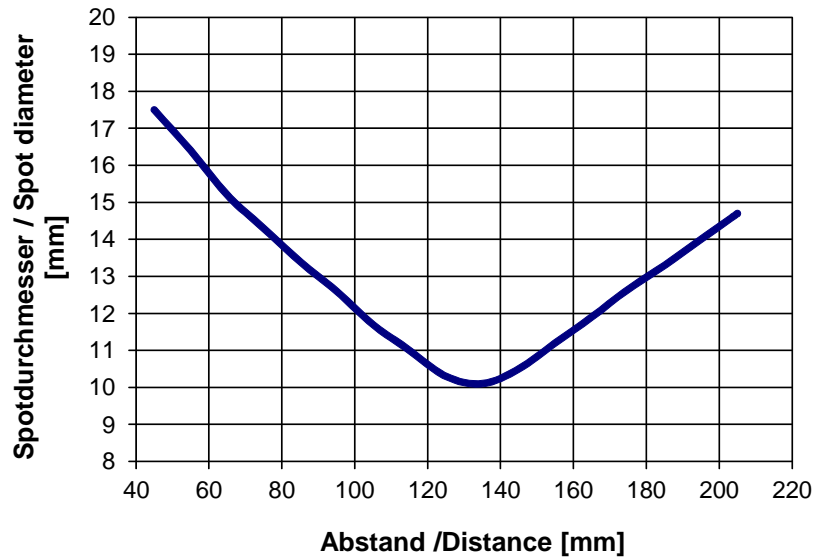


Diagrams

Diagrams: SPOT DIAMETER depending on object distance

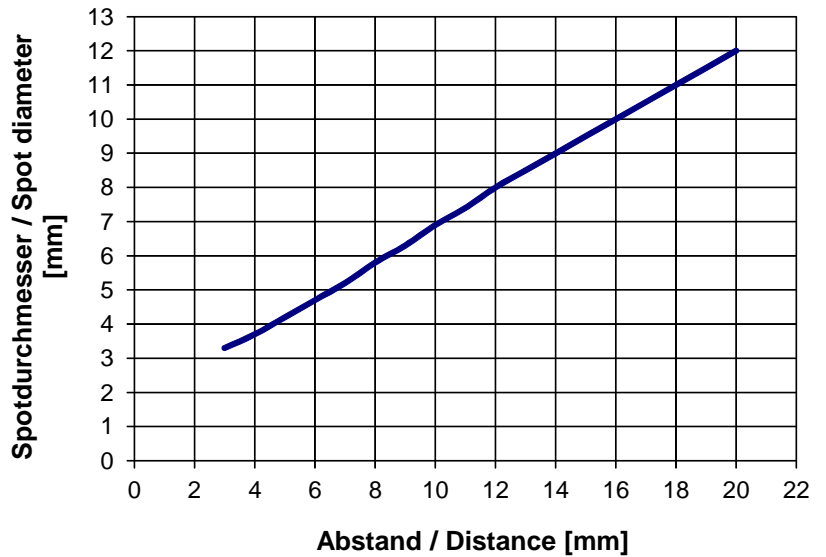
SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG with fiber optics R-S-A2.0-(2.5)-1200-67° and attachment optics KL-M34-A2.0 (fiber optics is inner stop fixed to attachment optics)

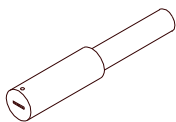


SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG with fiber optics R-S-A3.0-(3.0)-1200-67°



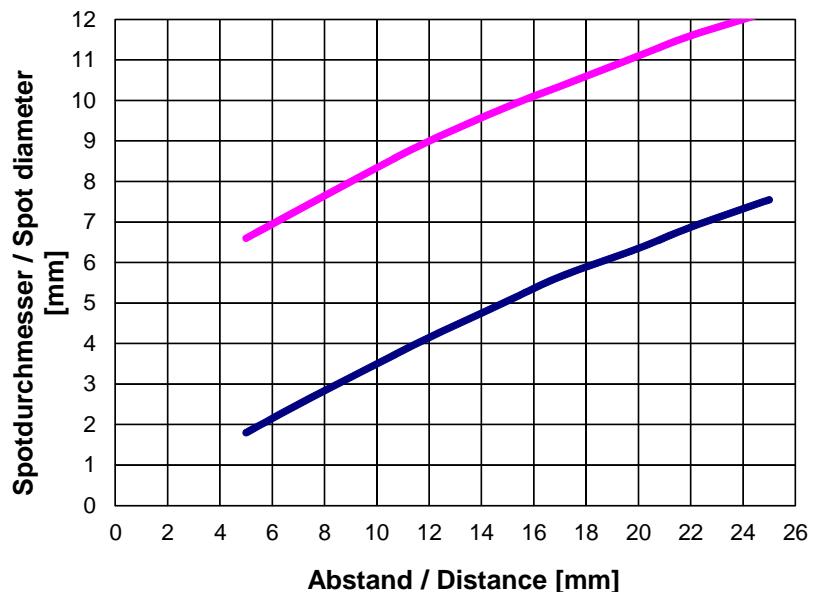
◆ short semiaxis
● long semiaxis



Fiber gap 6 mm x 1 mm

SPOT DIAMETER [distance], typ.

SPECTRO-3-FIO-MSM-DIG with fiber optics R-S-R2.1-(6x1)-1200-67°





Fiber Optics

Field of use:

Optical fibers offer solutions for difficult tasks in optoelectronics. They can be used universally and allow flexible applications.

Advantages:

- Highest quality
- Selection from different fiber types
- Thermal stability
- Great variety of available standard sensor heads
- Special designs
- Various attachment optics available



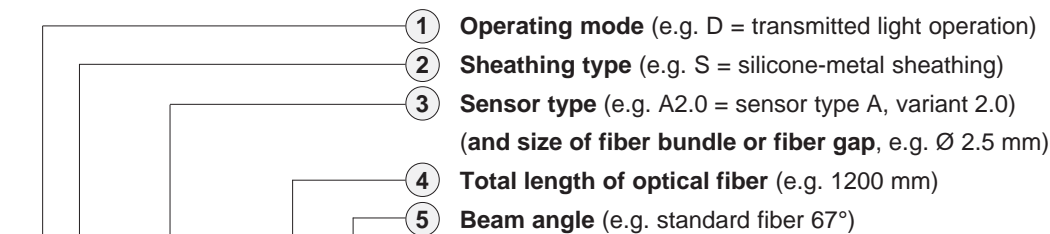
Characteristics:

Light-conducting glass fibers are optical components that allow the transmission of light through any curved path based on the principle of total reflection.

The individual fiber is composed of high-break core glass and low-break cladding glass. The light beams entering the core glass within the critical angle are guided through the fiber by way of reflection at the core/cladding contact surfaces (step index fiber).

The highly flexible optical fibers are made of bundled individual glass fibers. The ends are each glued into a sensor head and a connector. The faces are optically polished. For protection against mechanical, chemical, or thermal destruction the optical fibers are provided with a corresponding protective sheath.

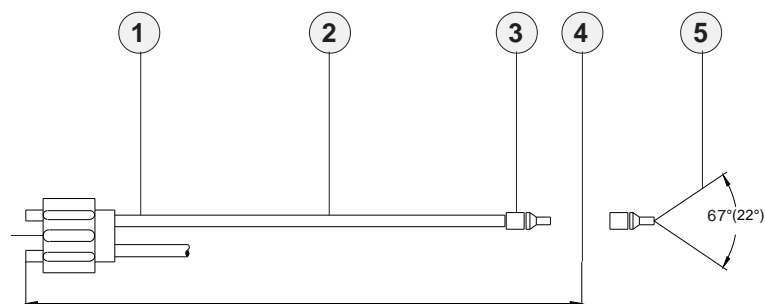
Order Code:



D-S-A2.0-(2.5)-1200-67°

Order code for optical fiber

(For detailed description of the various types of fiber optics, please cf. catalog „FIO Series“)



Dimensions of adapter

Attachment optics (e.g. focus lens, reflex optics, prism optics)

Fiber optics for reflex light operation

Fiber optics for transmitted light operation

Mounting hints

- cf. catalog FIO Series
- cf. catalog FIO Series
- cf. catalog FIO Series
- cf. catalog FIO Series
- cf. catalog FIO Series



Optical Frontends

Overview: Optical frontends for fiber optics



KL-1-A2.0



KL-2-A2.0



KL-3-A2.0
KL-4-A1.1
KL-5-R1.1
KL-8-R2.1
KL-9-A3.0



KL-3/90°-A2.0
KL-8/90°-A2.0



KL-M12/90°-XL-A2.0



KL-90-A2.0



KL-52-XL-A3.0



KL-M8-A1.1



KL-M12-A1.1
KL-M12-A2.0
KL-M12-A3.0
KL-M12-R1.1



KL-M12-XL-A1.1
KL-M12-XL-A2.0
KL-M12-XL-R1.1



KL-M18-A1.1
KL-M18-A2.0
KL-M18-A3.0
KL-M18-M5.0
KL-M18-M6.0
KL-M18-M8.0
KL-M18-R1.1
KL-M18-R2.1



KL-M18-XL-A1.1
KL-M18-XL-A2.0
KL-M18-XL-A3.0
KL-M18-XL-M5.0
KL-M18-XL-M6.0
KL-M18-XL-M8.0
KL-M18-XL-R1.1
KL-M18-XL-R2.1



KL-M34-A1.1
KL-M34-A2.0
KL-M34-A3.0
KL-M34-M5.0
KL-M34-M6.0
KL-M34-M8.0
KL-M34-R1.1
KL-M34-R2.1



KL-M34-XL-A1.1
KL-M34-XL-A2.0
KL-M34-XL-A3.0
KL-M34-XL-M5.0
KL-M34-XL-M6.0
KL-M34-XL-M8.0
KL-M34-XL-R1.1
KL-M34-XL-R2.1



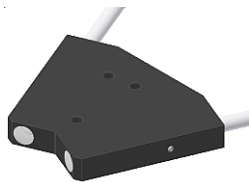
KL-M34/62-A1.1
KL-M34/62-A2.0
KL-M34/62-A3.0
KL-M34/62-R1.1
KL-M34/62-R2.1



KL-D-0°/2.5°-300-A2.0



KL-D-0°/40°-9-A2.0
KL-D-0°/42°-9-A2.0



KL-D-0°/45°-30-A2.0
KL-D-0°/45°-30-A3.0



KL-D-5°-85-POL-A2.0
KL-D-5°-85-POL-A3.0



KL-D-6°-200-A2.0



KL-D-10°-45-POL°-A3.0



KL-D-14°-84-A2.0



KL-D-17°-49-A2.0



KL-D-20°-31-A2.0



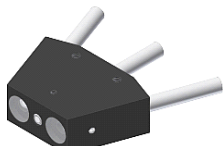
KL-D-20°-20-POL-A3.0



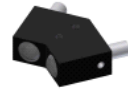
KL-D-28°-26-A2.0



KL-D-40°-13-A2.0



KL-D-40°-23-5/DIF-A2.0
KL-D-40°-23-5/DIF-A3.0



KL-D-45°-14-A2.0



KL-D-M12-0°/30°-9-A2.0
KL-D-M12-0°/30°-9-A3.0



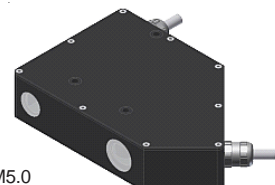
KL-D-M12-XL-0°/30°-30-A2.0



KL-M34/90°-XL



KL-M18-XL-0°/(17°-60°)-30-M5.0



KL-D-0°/45°-85-1200-A3.0





Optical Frontends

Optical frontends for reflected light or transmitted light fiber optics:

| Part number: | Suitable for fiber optics type: (R, T = reflected light, D= transmitted light) | Characteristics: |
|---------------------------------|---|--|
| KL-1-A2.0 (2 pcs. necessary) | D-S-A2.0-(2.5)-...-67° or 22° | Transmitter/receiver distance typ. 50 mm ... 200 mm |
| KL-2-A2.0 | R-S-A2.0-(2.5)-...-67° or 22° | Transmitter/receiver distance max. 300 mm, beam divergency ± 7,5° |
| KL-2-A2.0 (2 pcs. necessary) | D-S-A2.0-(2.5)-...-67° or 22° | Transmitter/receiver distance max. 300 mm, beam divergency ± 7,5° |
| KL-3-A2.0 | R-S-A2.0-(2.5)-...-67° or 22° | Working distance typ. 10 mm ... 20 mm |
| KL-D-3/30-R/D-A2.0 | R/D-S-A2.0-(2.5)-1200-67° <i>Special version*</i> | Working distance typ. 30 mm |
| KL-4-A1.1 | R-S-A1.1-(0.6)-...-67° or 22° | Working distance typ. 10 mm ... 15 mm |
| KL-4-A1.1 | R-S-A1.1-(1.1)-...-67° or 22° | Working distance typ. 10 mm ... 15 mm |
| KL-4-A1.1 | R-S-A1.1-(1.5)-...-67° or 22° | Working distance typ. 10 mm ... 15 mm |
| KL-5-R1.1 | R-S-R1.1-(3x0.5)-...-67° or 22° | Working distance typ. 8 mm ... 20 mm |
| KL-8-R2.1 | R-S-R2.1-(6x1)-...-67° or 22° | Working distance typ. 8 mm ... 25 mm |
| KL-8-N-R2.1 | R-S-R2.1-(6x1)-...-67° or 22° | Working distance typ. 8 mm ... 25 mm <i>with guide slot (adjustment aid)</i> |
| KL-9-A3.0 | R-S-A3.0-(3.0)-...-67° or 22° | Working distance typ. 8 mm ... 25 mm |
| KL-90-A2.0 (2 pcs. necessary) | D-S-A2.0-(2.5)-...-67° or 22° | Working distance typ. 20 mm ... 100 mm - <i>prismatic optics</i> |
| KL-52-XL-A3.0 | R-S-A3.0-(3.0)-...-67° | Optics diameter 52 mm |
| KL-M8-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 8 mm ... 20 mm |
| KL-M12-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 8 mm ... 40 mm |
| KL-M12-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 8 mm ... 40 mm |
| KL-M12-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 8 mm ... 40 mm |
| KL-M12-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 8 mm ... 40 mm |
| KL-M12-XL-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 10 mm ... 100 mm |
| KL-M12-XL-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 10 mm ... 100 mm |
| KL-M12/90°-XL-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 10 mm ... 100 mm |
| KL-M12-XL-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 10 mm ... 100 mm |
| KL-M18-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 20 mm ... 60 mm |
| KL-M18-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 20 mm ... 60 mm |
| KL-M18-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 20 mm ... 60 mm |
| KL-M18-M5.0 | T-S-M5.0-(5.0)-...-67° <i>Special version*</i> | Working distance typ. 20 mm ... 60 mm |
| KL-M18-M6.0 | T-S-M6.0-(6.0)-...-67° <i>Special version*</i> | Working distance typ. 20 mm ... 60 mm |
| KL-M18-M8.0 | T-S-M8.0-(8.0)-...-67° <i>Special version*</i> | Working distance typ. 20 mm ... 60 mm |
| KL-M18-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 20 mm ... 60 mm |
| KL-M18-R2.1 | R-S-R2.1-(6x1)-...-67° | Working distance typ. 20 mm ... 60 mm |
| KL-M18-XL-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-M5.0 | T-S-M5.0-(5.0)-...-67° <i>Special version*</i> | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-M6.0 | T-S-M6.0-(6.0)-...-67° <i>Special version*</i> | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-M8.0 | T-S-M8.0-(8.0)-...-67° <i>Special version*</i> | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL-R2.1 | R-S-R2.1-(6x1)-...-67° | Working distance typ. 10 mm ... 200 mm |
| KL-M18-XL--0°/(17°-60°)-30-M5.0 | 2x T-S-M5.0-(5.0)-...-67° <i>Special version*</i> | Angle between the two fiber optics is adjustable from 17° to 60° |

*Special version:

Version is different to the standard version (e.g. no standard fiber adapter) and therefore is suitable only for certain sensors or applications



Optical Frontends

Optical frontends for reflected light or transmitted light fiber optics:

| Part number: | Suitable for fiber optics type: (R, T = reflected light, D= transmitted light) | Characteristics: |
|----------------------------|---|--|
| KL-M34-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 100 mm ... 250 mm |
| KL-M34-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 100 mm ... 250 mm |
| KL-M34-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 100 mm ... 250 mm |
| KL-M34-M5.0 | T-S-M5.0-(5.0)-...-67° <i>Special version*</i> | Working distance typ. 100 mm ... 250 mm |
| KL-M34-M6.0 | T-S-M6.0-(6.0)-...-67° <i>Special version*</i> | Working distance typ. 100 mm ... 250 mm |
| KL-M34-M8.0 | T-S-M8.0-(8.0)-...-67° <i>Special version*</i> | Working distance typ. 100 mm ... 250 mm |
| KL-M34-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 100 mm ... 250 mm |
| KL-M34-R2.1 | R-S-R2.1-(6x1)-...-67° | Working distance typ. 100 mm ... 250 mm |
| KL-M34-XL-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-M5.0 | T-S-M5.0-(5.0)-...-67° <i>Special version*</i> | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-M6.0 | T-S-M6.0-(6.0)-...-67° <i>Special version*</i> | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-M8.0 | T-S-M8.0-(8.0)-...-67° <i>Special version*</i> | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-(M25x1.5)-M8.0 | T-S-M8.0-(8.0)-...-67° <i>Special version*</i> | as above but with cable screw fitting M25x1.5 |
| KL-M34-XL-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 50 mm ... 400 mm |
| KL-M34-XL-R2.1 | R-S-R2.1-(6x1)-...-67° | Working distance typ. 50 mm ... 400 mm |
| KL-M34/62-A1.1 | R-S-A1.1-(1.5)-...-67° | Working distance typ. 80 mm ... 200 mm |
| KL-M34/62-A2.0 | R-S-A2.0-(2.5)-...-67° | Working distance typ. 80 mm ... 200 mm |
| KL-M34/62-A3.0 | R-S-A3.0-(3.0)-...-67° | Working distance typ. 80 mm ... 200 mm |
| KL-M34/62-R1.1 | R-S-R1.1-(3x0.5)-...-67° | Working distance typ. 80 mm ... 200 mm |
| KL-M34/62-R2.1 | R-S-R2.1-(6x1)-...-67° | Working distance typ. 80 mm ... 200 mm |
| KL-D-0°/2.5°-300-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 100 mm ... 500 mm |
| KL-D-0°/40°-9-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-0°/42°-9-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-0°/45°-30-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-0°/45°-30-A3.0 | D-S-A3.0-(3.0)-...-67° | (to be supplemented) |
| KL-D-5°-85-POL-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-5°-85-POL-A3.0 | D-S-A3.0-(3.0)-...-67° | (to be supplemented) |
| KL-D-6°-200-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 100 mm ... 230 mm |
| KL-D-14°-84-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 60 mm ... 120 mm |
| KL-D-14°-84-A2.0-T400 | D-S-A2.0-(2.5)-1200-67°-T400 | Working distance typ. 60 mm ... 120 mm <i>thermally stable up to 400°C</i> |
| KL-D-17°-49-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 30 mm ... 80 mm |
| KL-D-20°-31-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 10 mm ... 50 mm |
| KL-D-28°-26-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 20 mm ... 50 mm |
| KL-D-28°-26-KG2-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 20 mm ... 50 mm |
| KL-D-30°-23-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 20 mm ... 30 mm |
| KL-D-30°-23-KG2-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 20 mm ... 30 mm |
| KL-D-40°-13-A2.0 | D-S-A2.0-(2.5)-...-67° | Working distance typ. 15 mm ... 25 mm |
| KL-D-40°-23-5/DIF-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-40°-23-5/DIF-A3.0 | D-S-A3.0-(3.0)-...-67° | (to be supplemented) |
| KL-D-45°-14-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-M12-0°/30°-9-A2.0 | D-S-A2.0-(2.5)-...-67° | (to be supplemented) |
| KL-D-M12-0°/30°-9-A3.0 | D-S-A3.0-(3.0)-...-67° | (to be supplemented) |
| KL-D-M12-XL-0°/30°-30-A2.0 | D-S-A2.0-30°/30-A2.0 <i>Special version*</i> | Working distance typ. 10 mm ... 100 mm |

*Special version:

Version is different to the standard version (e.g. no standard fiber adapter) and therefore is suitable only for certain sensors or applications


Optical Frontends

Optical frontends for reflected light fiber optics in Y-shape (67°/67°, for use with an external light source):

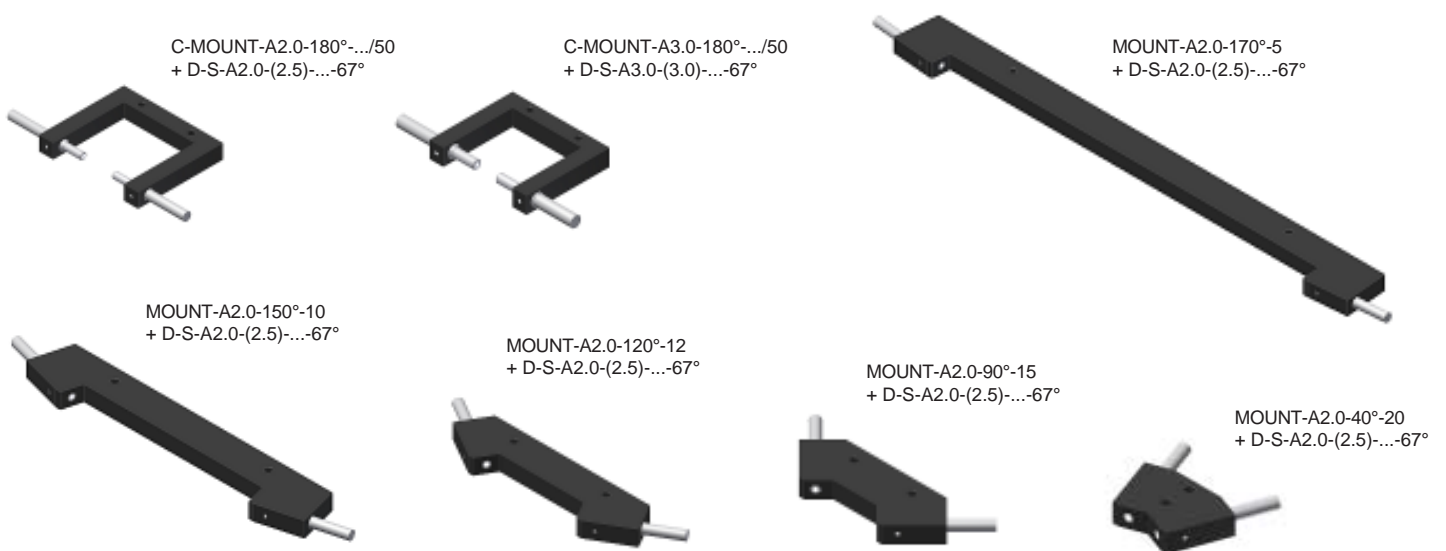
| Part number: | Suitable for fiber optics type: (R = reflected light) | Characteristics: |
|----------------|--|-------------------------------------|
| KL-3-A2.0 | R-S-A2.0-(2.5)-1200-Y-67°/67° | Working range typ. 10 mm ... 20 mm |
| KL-4-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 10 mm ... 15 mm |
| KL-5-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-8-R2.1 | R-S-R2.1-(6x1)-1200-Y-67°/67° | Working range typ. 8 mm ... 25 mm |
| KL-9-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 8 mm ... 25 mm |
| KL-M8-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-M12-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-M12-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-M12-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-M12-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 8 mm ... 20 mm |
| KL-M12-XL-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 30 mm ... 200 mm |
| KL-M12-XL-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 30 mm ... 200 mm |
| KL-M12-XL-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 30 mm ... 200 mm |
| KL-M18-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 10 mm ... 60 mm |
| KL-M18-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 10 mm ... 80 mm |
| KL-M18-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 10 mm ... 80 mm |
| KL-M18-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 10 mm ... 60 mm |
| KL-M18-R2.1 | R-S-R2.1-(6x1)-1200-Y-67°/67° | Working range typ. 10 mm ... 80 mm |
| KL-M18-XL-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M18-XL-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M18-XL-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M18-XL-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M18-XL-R2.1 | R-S-R2.1-(6x1)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M34-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 50 mm ... 200 mm |
| KL-M34-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 50 mm ... 250 mm |
| KL-M34-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M34-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 50 mm ... 200 mm |
| KL-M34-R2.1 | R-S-R2.1-(6x1)-1200-Y-67°/67° | Working range typ. 50 mm ... 300 mm |
| KL-M34/62-A1.1 | R-S-A1.1-(1.5)-1200-Y-67°/67° | Working range typ. 80 mm ... 200 mm |
| KL-M34/62-A2.0 | R-S-A2.0-(2.0)-1200-Y-67°/67° | Working range typ. 80 mm ... 200 mm |
| KL-M34/62-A3.0 | R-S-A3.0-(3.0)-1200-Y-67°/67° | Working range typ. 80 mm ... 200 mm |
| KL-M34/62-R1.1 | R-S-R1.1-(3x0.5)-1200-Y-67°/67° | Working range typ. 80 mm ... 200 mm |
| KL-M34/62-R2.1 | R-S-R2.1-(6x1)-1200-Y-67°/67° | Working range typ. 80 mm ... 200 mm |



Fiber Optics Fixtures

Mounting brackets (fixtures) for transmitted light fiber optics with sensor head type „A2.0“, „A3.0“, or „R2.1“:

| Part number: | Suitable for fiber optics type: (D= transmitted light) | Characteristics: |
|--------------------------|---|---|
| C-MOUNT-A2.0-180°-22/50 | D-S-A2.0-(2.5)-...-67° | Transmitter/receiver distance 22 mm, fork width/depth: 50/50 mm |
| C-MOUNT-A2.0-180°-60/50 | D-S-A2.0-(2.5)-...-67° | Transmitter/receiver distance 60 mm, fork width/depth: 60/50 mm |
| C-MOUNT-A2.0-180°-100/50 | D-S-A2.0-(2.5)-...-67° | Transmitter/receiver distance 100 mm, fork width/depth: 100/50 mm |
| C-MOUNT-A3.0-180°-16/50 | D-S-A3.0-(3.0)-...-67° | Transmitter/receiver distance 16 mm, fork width/depth: 50/50 mm |
| C-MOUNT-A3.0-180°-60/50 | D-S-A3.0-(3.0)-...-67° | Transmitter/receiver distance 60 mm, fork width/depth: 94/50 mm |
| C-MOUNT-A3.0-180°-100/50 | D-S-A3.0-(3.0)-...-67° | Transmitter/receiver distance 100 mm, fork width/depth: 100/50 mm |
| MOUNT-A2.0-170°-5 | D-S-A2.0-(2.5)-...-67° | Angle of incidence 85° to the vertical in a distance of 5 mm to the object, gloss control of extremely rough surfaces |
| MOUNT-A3.0-170°-5 | D-S-A3.0-(3.0)-...-67° | Angle of incidence 85° to the vertical in a distance of 5 mm to the object, gloss control of extremely rough surfaces |
| MOUNT-A2.0-150°-10 | D-S-A2.0-(2.5)-...-67° | Angle of incidence 75° to the vertical in a distance of 10 mm to the object, gloss control of rough surfaces |
| MOUNT-A3.0-150°-10 | D-S-A3.0-(3.0)-...-67° | Angle of incidence 75° to the vertical in a distance of 10 mm to the object, gloss control of rough surfaces |
| MOUNT-A2.0-120°-12 | D-S-A2.0-(2.5)-...-67° | Angle of incidence 60° to the vertical in a distance of 12 mm to the object, gloss control of matt to light glossy surfaces |
| MOUNT-A3.0-120°-12 | D-S-A3.0-(3.0)-...-67° | Angle of incidence 60° to the vertical in a distance of 12 mm to the object, gloss control of matt to light glossy surfaces |
| MOUNT-R1.1-120°-12 | D-S-R1.1-(3x0.5)-...-67° | Angle of incidence 60° to the vertical in a distance of 12 mm to the object, gloss control of matt to light glossy surfaces |
| MOUNT-R2.1-120°-12 | D-S-R2.1-(6x1)-...-67° | Angle of incidence 60° to the vertical in a distance of 12 mm to the object, gloss control of matt to light glossy surfaces |
| MOUNT-A2.0-90°-15 | D-S-A2.0-(2.5)-...-67° | Angle of incidence 45° to the vertical in a distance of 15 mm to the object, gloss control of matt to glossy surfaces |
| MOUNT-A3.0-90°-15 | D-S-A3.0-(3.0)-...-67° | Angle of incidence 45° to the vertical in a distance of 15 mm to the object, gloss control of matt to glossy surfaces |
| MOUNT-A2.0-40°-20 | D-S-A2.0-(2.5)-...-67° | Angle of incidence 20° to the vertical in a distance of 20 mm to the object, gloss control of very glossy surfaces |
| MOUNT-A3.0-40°-20 | D-S-A3.0-(3.0)-...-67° | Angle of incidence 20° to the vertical in a distance of 20 mm to the object, gloss control of very glossy surfaces |





Fiber Optics Fixtures

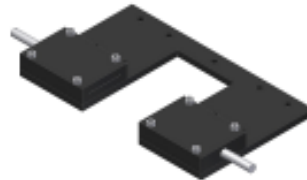
Mounting brackets (fixtures) for transmitted light fiber optics with sensor head type „Q....“ (cross-section converter):

Part number: Suitable for fiber optics type: Characteristics:
(D= transmitted light)

| | | |
|-----------------------|--------------------------|---|
| C-MOUNT-Q1-180°-50/50 | D-S-Q1-(5x0.5)-...-67° | Width of measuring range: 5 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |
| C-MOUNT-Q2-180°-50/50 | D-S-Q2-(10x0.3)-...-67° | Width of measuring range: 10 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |
| C-MOUNT-Q3-180°-50/50 | D-S-Q3-(18x0.3)-...-67° | Width of measuring range: 18 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |
| C-MOUNT-Q4-180°-50/50 | D-S-Q4-(28x0.2)-...-67° | Width of measuring range: 28 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |
| C-MOUNT-Q5-180°-50/50 | D-S-Q5-(38x0.15)-...-67° | Width of measuring range: 38 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |
| C-MOUNT-Q6-180°-50/50 | D-S-Q6-(48x0.15)-...-67° | Width of measuring range: 48 mm, transmitter/receiver distance: 50 mm, distance beginning of measurement range (inner side) to inner edge of housing: 50 mm |



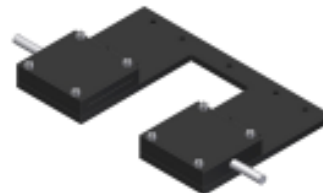
KL-50/50-5
+ D-S-Q1-(5x0.5)-...-67°



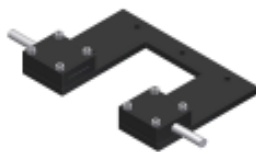
KL-50/50-28
+ D-S-Q4-(28x0.2)-...-67°



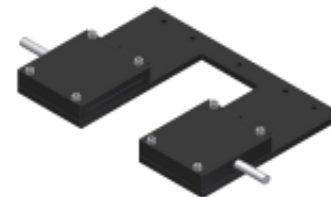
KL-50/50-10
+ D-S-Q2-(10x0.3)-...-67°



KL-50/50-38
+ D-S-Q5-(38x0.15)-...-67°



KL-50/50-18
+ D-S-Q3-(18x0.3)-...-67°



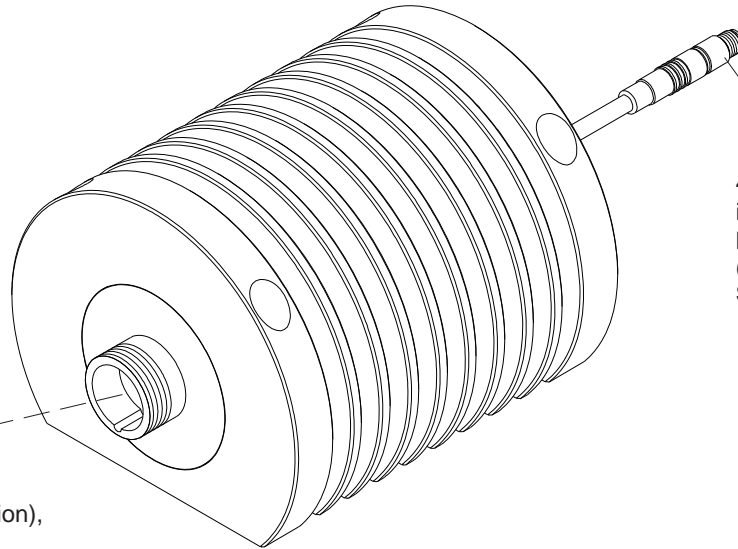
KL-50/50-48
+ D-S-Q6-(48x0.15)-...-67°



External Light Source

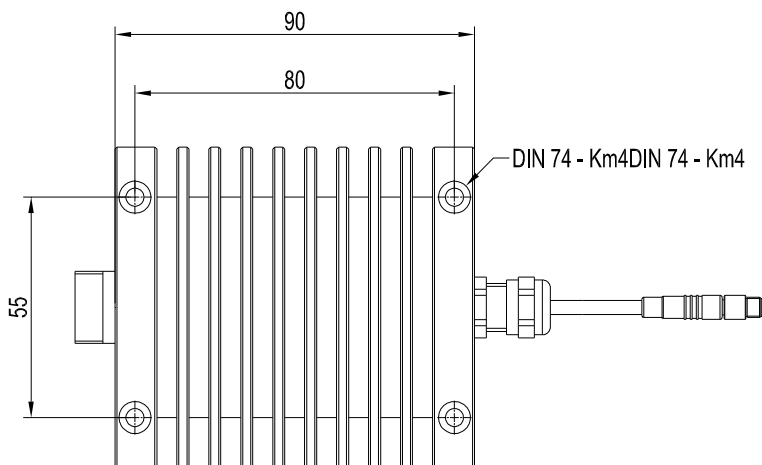
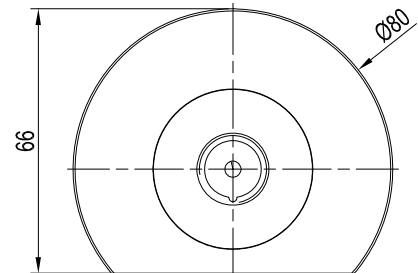
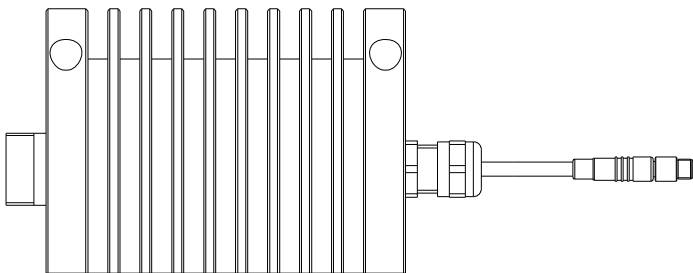
ELS-WHT-1P

Externals white-light source (lighting unit)
(please order separately)



4-pole connector Binder 707
incl. PU cable,
length approx. 500 mm
(connection to
SPECTRO-3-FIO-MSM-DIG)

Fiber optics adapter (1-pole)
for reflex light fiber optics (Y-version),
type **R-S-...-1200-Y-67°/67°**
(various sensor head types
available, cf. page 20)



All dimensions in mm



Special Fiber Optics

Special fiber optics (reflex light, Y-version)

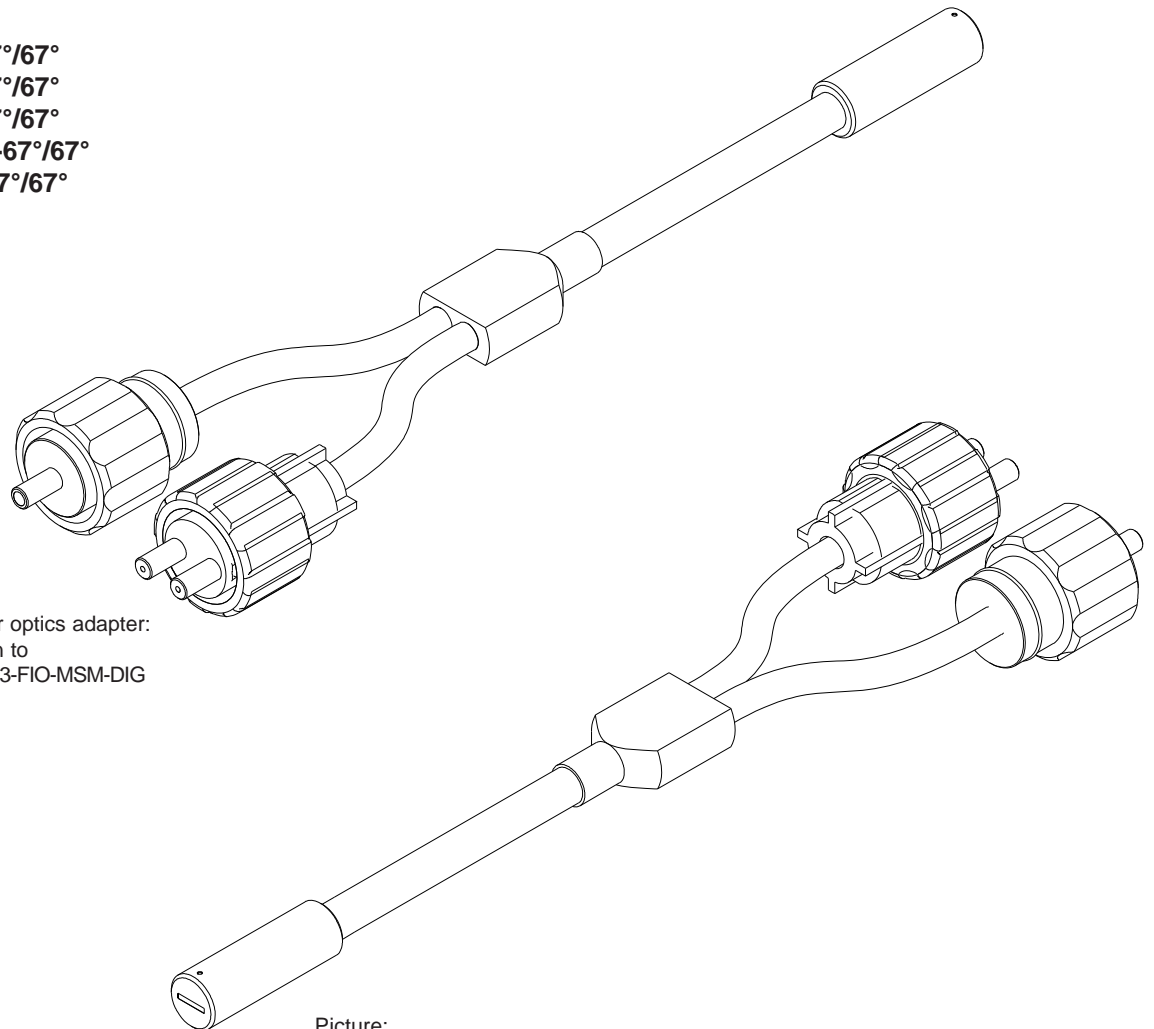
for use with external white-light source ELS-WHT-1P and color sensor SPECTRO-3-FIO-MSM-DIG:

(please order separately)

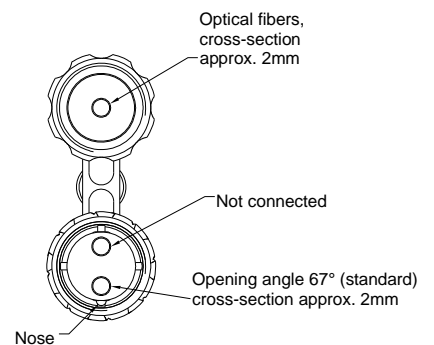
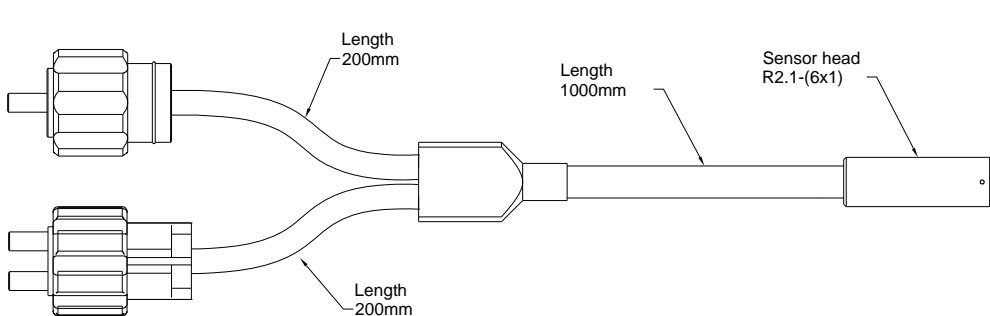
- R-S-A1.1-(1.5)-1200-Y-67°/67°
- R-S-A2.0-(2.5)-1200-Y-67°/67°
- R-S-A3.0-(3.0)-1200-Y-67°/67°
- R-S-R1.1-(3x0.5)-1200-Y-67°/67°
- R-S-R2.1-(6x1)-1200-Y-67°/67°

1-pole fiber optics adapter:
Connection to
ELS-WHT-1P

2-pole fiber optics adapter:
Connection to
SPECTRO-3-FIO-MSM-DIG

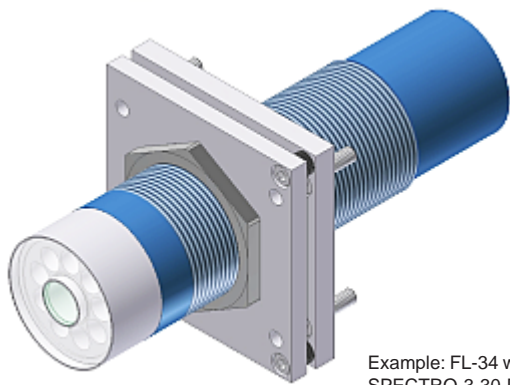
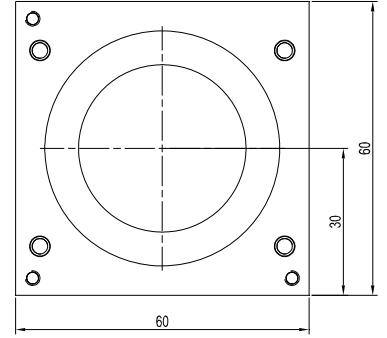
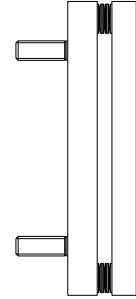
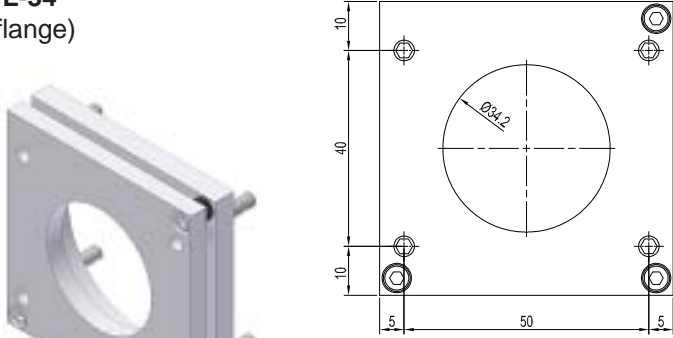


Picture:
R-S-R2.1-(6x1)-...-Y-67°/67°

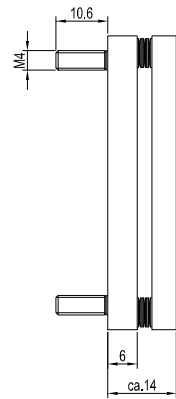


Mounting Accessories

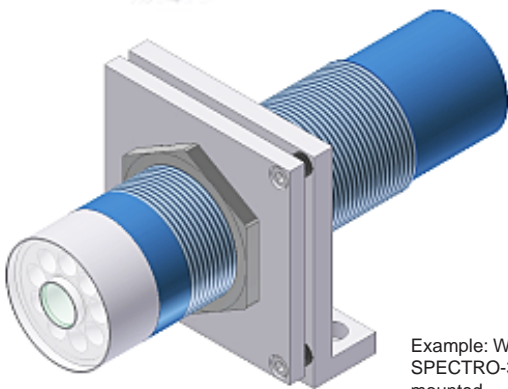
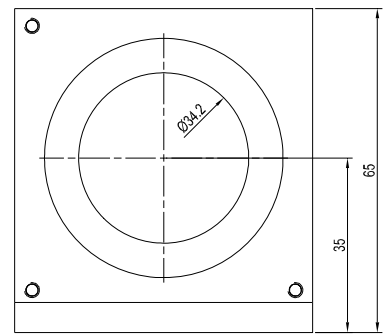
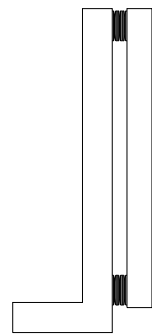
FL-34
(flange)



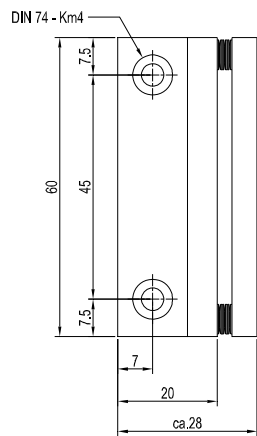
Example: FL-34 with SPECTRO-3-30-DIL mounted



WFL-34
(flange, angle type 90°)



Example: WFL-34 with SPECTRO-3-30-DIL mounted



(All dimensions in mm)