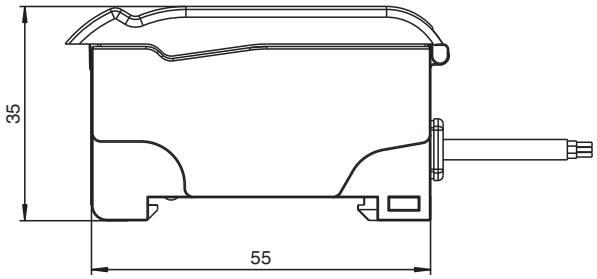
# Fiber optic sensor

## SU18/35/40a/110/115/126a

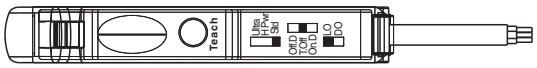
- Basic line for DIN rail installation
- High power version
- Sleek design
- 3 response times selectable
- Protected against mutual interference (no cross-talk)
- Self diagnosis function

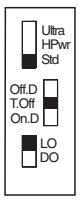
Fiber optic sensor for glass fiber optics and plastic fiber optics

## Dimensions








Ultra = Ultra
HPwr = High-Power
Std = Standard
Off.D = Off Delay
T.Off = Timer off
On.D = On Delay
LO = Light on
DO = Dark on

## Technical Data

| | | |
|---|---|---|
| **General specifications** | | |
| Sensor range | | up to 460 mm (KLR-C02-2,2-2,0-K146) |
| Detection range | | up to 1500 mm (KLE-C01-2,2-2,0-K116) |
| Light source | | LED |
| Light type | | modulated visible red light , 640 nm |
| Ambient light limit | | 10000 Lux |
| **Functional safety related parameters** | | |
| $MTTF_d$ | | 690 a |
| Mission Time ($T_M$) | | 20 a |
| Diagnostic Coverage (DC) | | 0 % |

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## Technical Data

| | | |
|---|---|---|
| **Indicators/operating means** | | |
| Operation indicator | | LED green, statically lit Power on , Undervoltage indicator: Green LED, pulsing (approx. 0.8 Hz) , short-circuit : LED green flashing (approx. 4 Hz) |
| Function indicator | | LED yellow: static illumination switching state, flashes when falling short of the operating reserve |
| Control elements | | Teach-In key<br>slide switch 2 positions: light/dark switching<br>slide switch 3 positions: timer function - timer off, on delay 40 ms, off-delay 40 ms<br>slide switch 3 positions: operating mode - Standard, High Power, Ultra |
| **Electrical specifications** | | |
| Operating voltage | $U_B$ | 10 ... 30 V DC |
| Ripple | | 10 % |
| No-load supply current | $I_0$ | ≤ 30 mA |
| **Output** | | |
| Stability alarm output | | 1 push-pull (4 in 1) output NPN/PNP , short-circuit protected |
| Switching type | | light/dark on, switchable |
| Signal output | | 1 push-pull (4 in 1) output NPN/PNP , short-circuit protected |
| Switching voltage | | max. 30 V DC |
| Switching current | | max. 100 mA , resistive load |
| Voltage drop | $U_d$ | ≤ 2 V DC at 100 mA ; ≤ 0.7 V at 10 mA |
| Switching frequency | f | Standard mode: 3 kHz , High power mode: 1 kHz , Ultra mode: 100 Hz |
| Response time | | Standard mode: 160 µs , High power mode: 500 µs , Ultra mode: 5 ms |
| Repeat accuracy | R | ≤ 0.5 % of adjusted sensor range |
| **Conformity** | | |
| Product standard | | EN 60947-5-2 |
| **Approvals and certificates** | | |
| UL approval | | cULus Listed, Class 2 Power Source, Type 1 enclosure |
| CCC approval | | CCC approval / marking not required for products rated ≤36 V |
| **Ambient conditions** | | |
| Ambient temperature | | -10 ... 55 °C (14 ... 131 °F) |
| Storage temperature | | -20 ... 70 °C (-4 ... 158 °F) |
| **Mechanical specifications** | | |
| Housing width | | 9 mm |
| Housing height | | 34.5 mm |
| Housing depth | | 62.3 mm |
| Degree of protection | | IP50 |
| Connection | | 2 m PVC cable, 4 x 0,14 $mm^2$ |
| Material | | |
| Housing | | PC |
| Mass | | 45 g |

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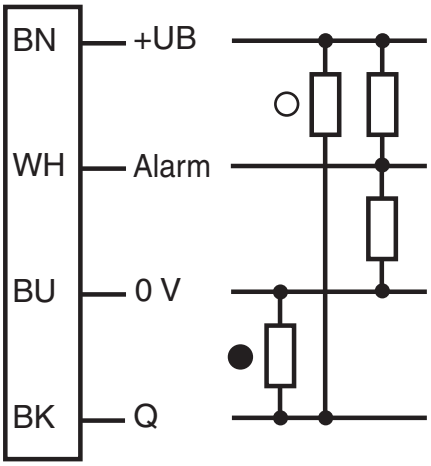
## Connection Assignment



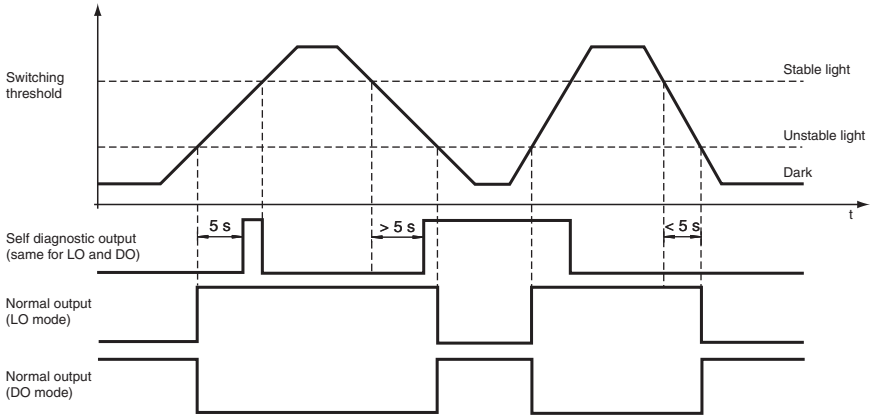

Selfdiagnostic output
refer to low-side
output (npn)

○ = Light on
● = Dark on

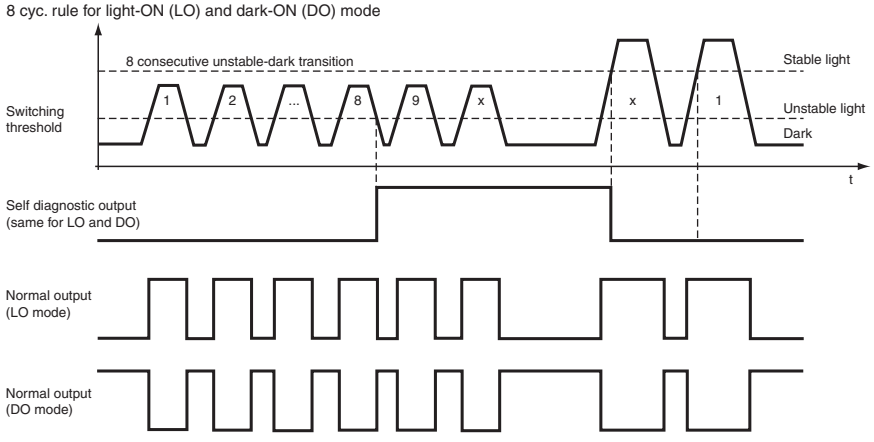
## Characteristic Curve

### Self-Diagnostic definition and operation:

5 sec. rule for light-ON (LO) and dark-ON (DO) mode




8 cyc. rule for light-ON (LO) and dark-ON (DO) mode

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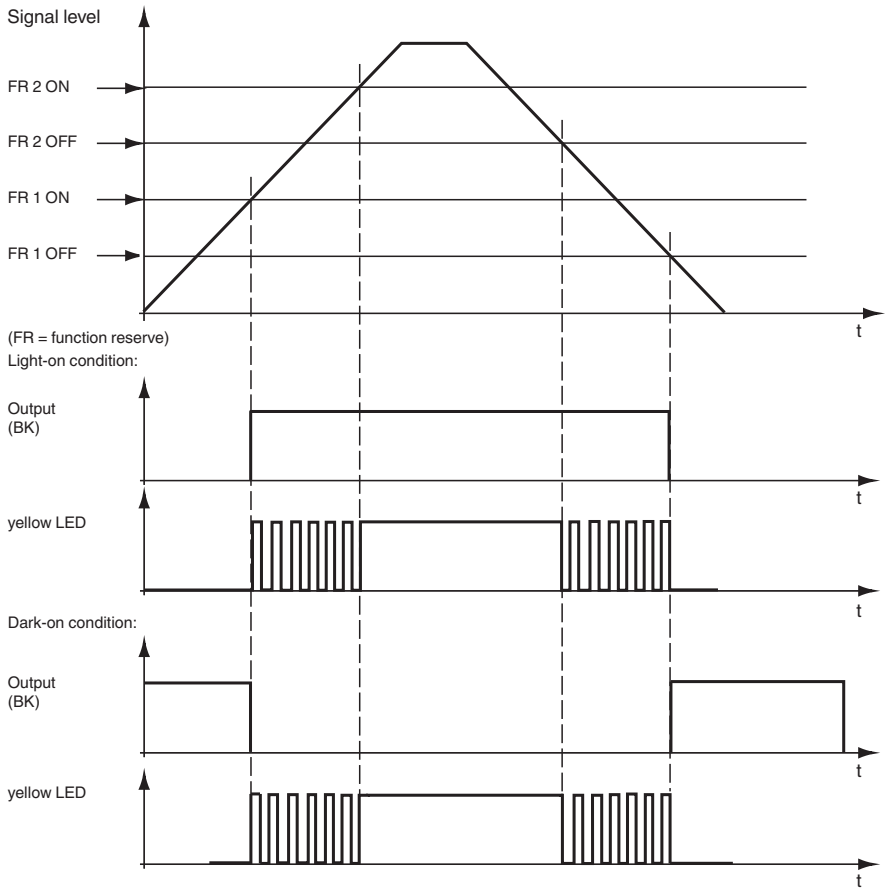
## Characteristic Curve

### LED indicators and operating chart:




## Accessories

| | | |
|---|---|---|
|  | **KLR-C02-2,2-2,0-K146** | Plastic fiber optic - diffuse |
|  | **KLR-C02-2,2-2,0-K70** | Plastic fiber optic - diffuse |
|  | **KLR-C02-1,0-2,0-K75** | Plastic fiber optic - diffuse |
|  | **KLR-C09-1,25-2,0-K76** | Plastic fiber optic - diffuse |
|  | **KLR-C09-1,25-2,0-K74** | Plastic fiber optic - diffuse |
|  | **KLR-C16-2,2-2,0-K71** | Plastic fiber optic - diffuse |
|  | **KLR-A32-2,2-2,0-K83** | Plastic fiber optic - diffuse |
|  | **KHR-C02-2,2-2,0-K131** | Plastic fiber optic - diffuse |

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## Accessories

| | | |
|---|---|---|
|  | **KHTR-C02-2,2-2,0-K88** | Plastic fiber optic - diffuse |
|  | **KLE-C01-2,2-2,0-K116** | Plastic fiber optic - thru-beam |
|  | **KLE-C01-2,2-2,0-K103** | Plastic fiber optic - thru-beam |
|  | **KLE-C01-2,2-2,0-K102** | Plastic fiber optic - thru-beam |
|  | **KLE-C01-2,2-2,0-K101** | Plastic fiber optic - thru-beam |
|  | **KLE-C01-2,2-2,0-K113** | Plastic fiber optic - thru-beam |
|  | **KLE-C01-1,0-2,0-K120** | Plastic fiber optic - thru-beam |
|  | **KHE-C01-2,2-2,0-K122** | Plastic fiber optic - thru-beam |
|  | **KHTE-C01-2,2-2,0-K118** | Plastic fiber optic - thru-beam |
|  | **LHE 00-1,1-1,0-20M4** | Glass fiber optic - thru-beam with silicon covering |

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# Teach-In

## Teach-in procedures

**2-Point Teach*:**

1. Place the first target to be learned.
2. Press and hold the Teach button for > 2 seconds to enter Teach mode.
3. Press for another 3 second, both LEDs switch off for 1 second to indicate that you are now in 2-point teach mode.
4. Remove the target (to teach the background) or move the target further away.
5. Press the Teach button for < 2 seconds to end Teach mode.
   Both LEDs will indicate fast in-phase blinking and then alternate blinking to signal end of Teach mode. 2-Point Teach is completed.

* Remarks: The 2-point Teach-in can be used for thru-beam and diffuse mode applications.
The teach-in takes in this case in the reverse order.

1. Object absent (light path free).
2. Object present.

**Dynamic Teach:**

1. Press and hold the Teach button for > 2 seconds to enter Teach mode. Both LEDs will indicate fast in-phase blinking follow by slow in-phase blinking.
2. Pass a moving target.
3. Press and hold the Teach button for < 2 seconds to end Teach mode. Both LEDs will indicate alternate blinking to signal end of Teach mode.

**Maximum Teach:**

1. Remove target
2. Press and hold the Teach button for > 2 seconds to enter Teach mode. Both LEDs will indicate fast in-phase blinking follow by slow in-phase blinking.
3. Press and hold the Teach button for > 2 seconds to end Teach mode. Both LEDs will indicate fast in-phase blinking and then alternate blinking to signal end of Teach mode.

**Position Teach:**

1. Place a target.
2. Press and hold the Teach button for > 2 second to enter Teach mode. Both LEDs will indicate fast in-phase blinking follow by slow in-phase blinking. If the target is too near (strong signal), the fast blinking will last slightly longer follow by slow blinking.
3. Press and hold the Teach button for > 2 seconds to end Teach mode. Both LEDs will indicate fast in-phase blinking and then alternate blinking to signal end of Teach mode.

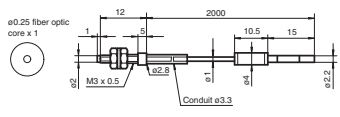
**Indications for the Green and Yellow LEDs in detection mode (normal operation):**

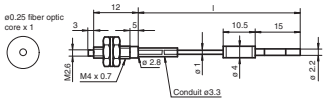
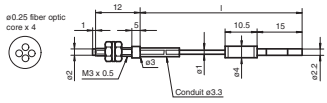
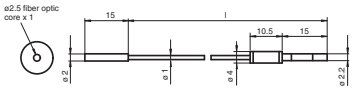
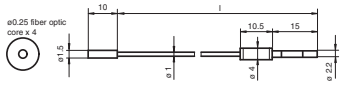
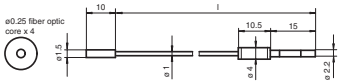
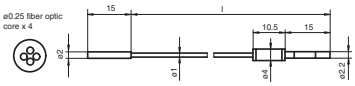
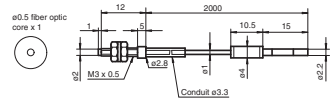
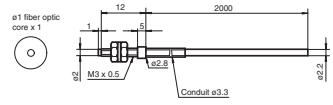
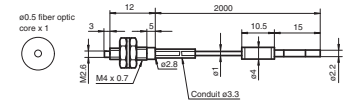
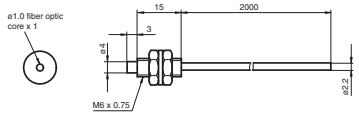
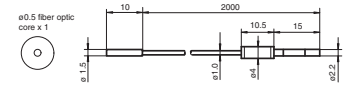
- Yellow LED is stable ON to indicate that signal received is > FR2.
- Yellow LED will flash at 4 Hz to indicate function reserve, FR1 < signal level < FR2.
- Green LED stable ON to indicate power supply is ON, sensor is ready.
- Green LED will flash once for each key actuation, e.g. actuation of the Teach button.
- Green LED will flash at 4 Hz to indicate a short-circuit fault at the output(s).
- Green LED will flash at 0.8 Hz dual flashing to indicate an under-voltage fault at the power supply.

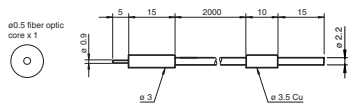
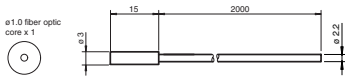
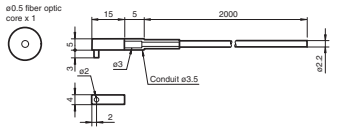
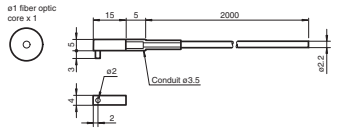
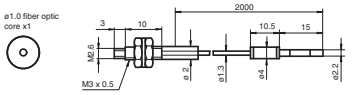
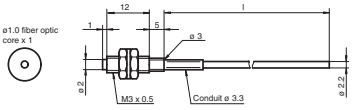
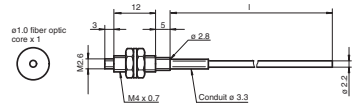
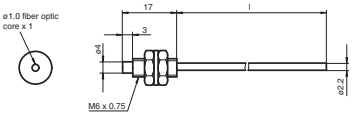
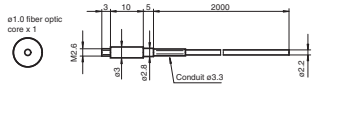
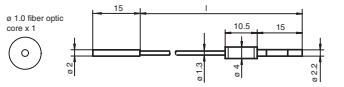
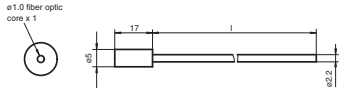
**Indications for the Green and Yellow LEDs in the Teach Mode:**

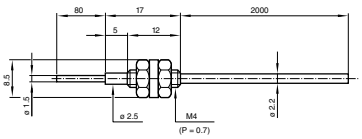
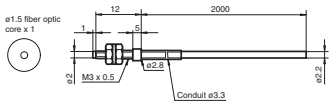
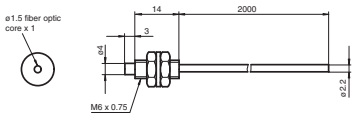
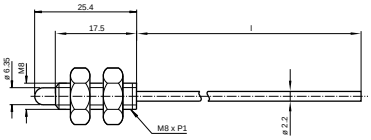
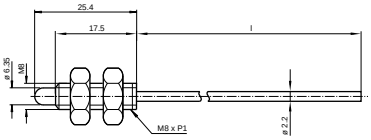
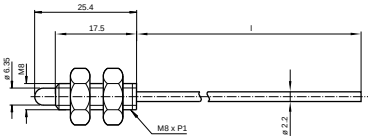
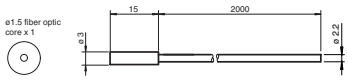
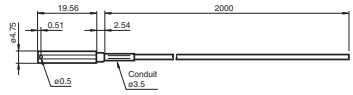
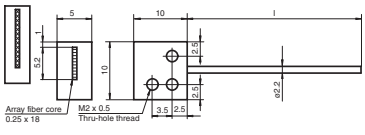
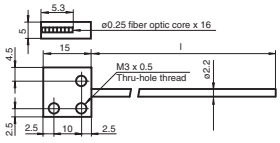
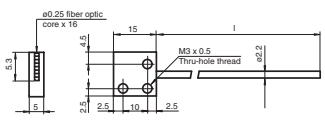
- Yellow & Green LEDs in-phase blinking indicates that the sensor has entered the Teach Mode.
- Slow Yellow & Green LEDs in-phase blinking indicates that the sensor is ready or it is waiting to learn new information about the target and/or the background.
- Fast Yellow & Green LEDs in-phase blinking means that the sensor is in the progress of learning new target. When the learning is complete, slow in-phase blinking will be resumed as before.
- Green & Yellow LEDs flash alternately at 8 Hz indicates there has been a Teach fault or Teach error.
- Green & Yellow LEDs flash alternately at 2.5 Hz indicates the end of successful Teach.

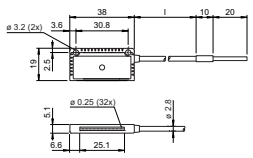
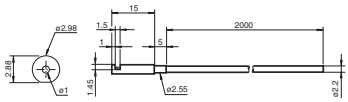
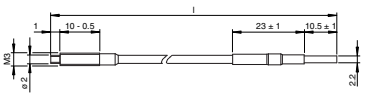
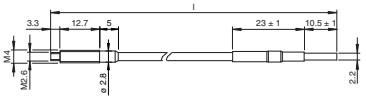
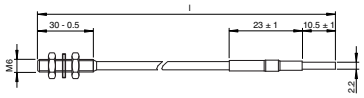
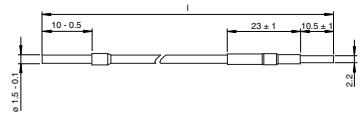
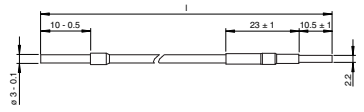
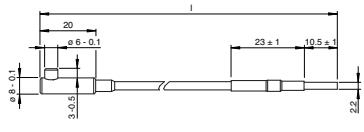
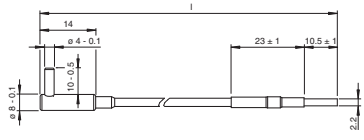
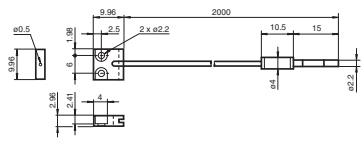
# Selection table - thru-beam fiber optic cable

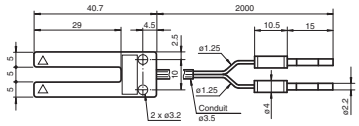
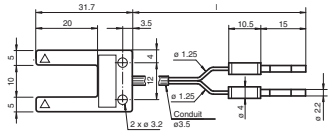
| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Highly precise | | | | | | | | | | |
| Threaded | M3 | KLE-C01-1.0-2.0-K120 | PMMA | Ultra: 80 mm<br>HiPwr: 45 mm<br>Std: 20 mm | 0.25 mm | 0.05 mm | 2 m | min. 10 mm |  | |

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Threaded | M4 | KLE-C01-1.0-2.0-K119 | PMMA | Ultra: 80 mm<br>HiPwr: 45 mm<br>Std: 20 mm | 0.25 mm | 0.05 mm | 2 m | min. 10 mm |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06/<br>Side view / Periscope with K-LA02 |
| Threaded | M3 x 0.5 | KLE-C04-1.0-2.0-K104 | PMMA | Ultra: 300 mm<br>HiPwr: 165 mm<br>Std: 70 mm | 4 x 0.25 mm | 0.12 mm | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 2 mm | KLE-C01-1.0-2.0-K105 | PMMA | Ultra: 80 mm<br>HiPwr: 45 mm<br>Std: 20 mm | 0.25 mm | 0.05 mm | 2 m | min. 10 mm |  | |
| Cylindrical | dia. 1.5 mm | KLE-C01-1.0-2.0-K107 | PMMA | Ultra: 80 mm<br>HiPwr: 45 mm<br>Std: 20 mm | 0.25 mm | 0.05 mm | 2 m | min. 10 mm |  | |
| Cylindrical | dia. 1.5 mm | KLE-C04-1.0-2.0-K108 | PMMA | Ultra: 300 mm<br>HiPwr: 165 mm<br>Std: 70 mm | 4 x 0.25 mm | 0.12 mm | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 2 mm | KLE-C04-1.0-2.0-K106 | PMMA | Ultra: 300 mm<br>HiPwr: 165 mm<br>Std: 70 mm | 4 x 0.25 mm | 0.05 mm | 2 m | min. 15 mm |  | |
| Highly flexible | | | | | | | | | | |
| Threaded | M3 | KHE-C01-1.0-2.0-K125 | PMMA | Ultra: 210 mm<br>HiPwr: 120 mm<br>Std: 50 mm | 0.5 mm | 0.15 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |
| Threaded | M3 | KHE-C01-2.2-2.0-K122 | PMMA | Ultra: 800 mm<br>HiPwr: 480 mm<br>Std: 200 mm | 1 mm | 0.25 mm | 2 m | min. 2 mm |  | only 2 mm Bend radius |
| Threaded | M4 x 0.7 /M2.6 | KHE-C01-1.0-2.0-K124 | PMMA | Ultra: 210 mm<br>HiPwr: 120 mm<br>Std: 50 mm | 0.5 mm | 0.15 mm | 2 m | min. 1 mm |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06<br>Side view / Periscope with K-LA02/<br>only 1 mm Bend radius |
| Threaded | M6 | KHE-C01-2.2-2.0-K121 | PMMA | Ultra: 800 mm<br>HiPwr: 480 mm<br>Std: 200 mm | 1.0 mm | 0.25 mm | 2 m | min. 2 mm |  | only 2 mm Bend radius |
| Cylindrical | dia. 1.5 mm | KHE-C01-1.0-2.0-K139 | PMMA | Ultra: 210 mm<br>HiPwr: 120 mm<br>Std: 50 mm | 0.5 mm | 0.05 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Cylindrical | dia. 3 mm | KHE-C01-2.2-2.0-K126 | PMMA | Ultra: 210 mm<br>HiPwr: 120 mm<br>Std: 50 mm | 0.5 mm | 0.15 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |
| Cylindrical | dia. 3 mm | KHE-C01-2.2-2.0-K123 | PMMA | Ultra: 800 mm<br>HiPwr: 480 mm<br>Std: 200 mm | 1 mm | 0.25 mm | 2 m | min. 2 mm |  | only 2 mm Bend radius |
| Right angle | dia. 15 x 5 | KHE-C01-2.2-2.0-K137 | PMMA | Ultra: 140 mm<br>HiPwr: 80 mm<br>Std: 35 mm | 0.5 mm | 0.15 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |
| Right angle | dia. 15 x 5 | KHE-C01-2.2-2.0-K140 | PMMA | Ultra: 600 mm<br>HiPwr: 350 mm<br>Std: 150 mm | 1 mm | 0.25 mm | 2 m | min. 2 mm |  | only 2 mm Bend radius |
| Flexible | | | | | | | | | | |
| Threaded | M3 x 0.5 /M2.6 | KLE-C01-1.3-2.0-K112 | PMMA | Ultra: 800 mm<br>HiPwr: 480 mm<br>Std: 200 mm | 1 mm | 0.25 mm | 2 m | min. 25 mm |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06<br>Side view / Periscope with K-LA02 |
| Threaded | M3 x 0.5 | KLE-C01-2.2-2.0-K103 | PMMA | Ultra: 920 mm<br>HiPwr: 520 mm<br>Std: 220 mm | 1 mm | 0.25 mm | 2 m | min. 25 mm |  | |
| Threaded | M4 x 0.7 /M2.6 | KLE-C01-2.2-2.0-K102 | PMMA | Ultra: 920 mm<br>HiPwr: 520 mm<br>Std: 220 mm | 1 mm | 0.25 mm | 2 m | min. 25 mm |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06<br>Side view / Periscope with K-LA02 |
| Threaded | M6 | KLE-C01-2.2-2.0-K100 | PMMA | Ultra: 920 mm<br>HiPwr: 520 mm<br>Std: 220 mm | 1 mm | 0.32 mm | 2 m | min. 25 mm |  | |
| Threaded | M2.6 | KLE-C01-2.2-2.0-K113 | PMMA | Ultra: 800 mm<br>HiPwr: 480 mm<br>Std: 200 mm | 1 mm | 0.25 mm | 2 m | min. 25 mm |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06<br>Side view / Periscope with K-LA02 |
| Cylindrical | dia. 2 mm | KLE-C01-1.3-2.0-K114 | PMMA | Ultra: 920 mm<br>HiPwr: 520 mm<br>Std: 220 mm | 1 mm | 0.25 mm | 2 m | min. 25 mm |  | |
| Cylindrical | dia. 5 mm | KLE-C01-2.2-2.0-K101 | PMMA | Ultra: 920 mm<br>HiPwr: 520 mm<br>Std: 220 mm | 1 mm | 0.32 mm | 2 m | min. 25 mm |  | |
| Bendable tip | | | | | | | | | | |

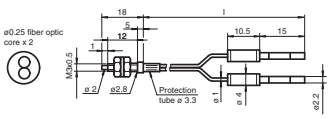
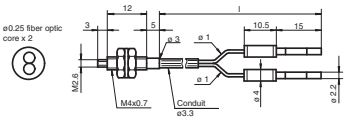
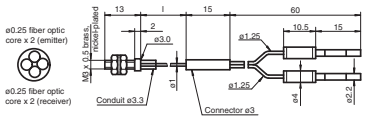
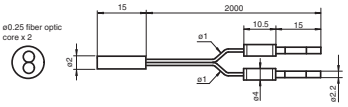
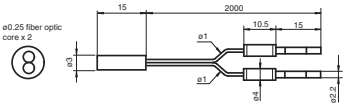
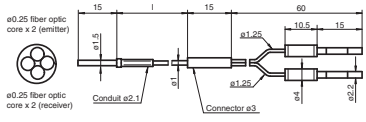
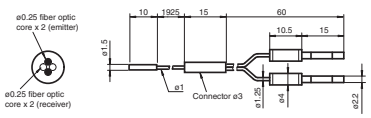
| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Threaded | M4 | KLE 00-2.2-2.0-K55 | PMMA | Ultra: 872 mm<br>HiPwr: 500 mm<br>Std: 228 mm | 1 mm | | 2 m | min. 25 mm |  | |
| High detection range | | | | | | | | | | |
| Threaded | M3 | KLE-C01-2.2-2.0-K116 | PMMA | Ultra: 1500 mm<br>HiPwr: 950 mm<br>Std: 450 mm | 1.5 mm | 0.35 mm | 2 m | min. 40 mm |  | |
| Threaded | M6 | KLE-C01-2.2-2.0-K115 | PMMA | Ultra: 1500 mm<br>HiPwr: 950 mm<br>Std: 450 mm | 1.5 mm | 0.35 mm | 2 m | min. 40 mm |  | |
| Threaded | M8 x 1 | FEF-PLT1 | PMMA | Ultra: 25620 mm<br>HiPwr: 15070 mm<br>Std: 6000 mm<br>calculated values related on 2 m Fiber optic length | 1 mm | | 1 m | min. 25 mm |  | Narrow beam |
| Threaded | M8 x 1 | FEF-PLT1-L2 | PMMA | Ultra: 25620 mm<br>HiPwr: 15070 mm<br>Std: 6000 mm<br>calculated values related on 2 m Fiber optic length | 1 mm | | 2 m | min. 25 mm |  | Narrow beam |
| Threaded | M8 x 1 | FEF-PLT1-L5 | PMMA | Ultra: 25620 mm<br>HiPwr: 15070 mm<br>Std: 6000 mm<br>calculated values related on 2 m Fiber optic length | 1 mm | | 4 m | min. 25 mm |  | Narrow beam |
| Cylindrical | dia. 3 mm | KLE-C01-2.2-2.0-K117 | PMMA | Ultra: 1360 mm<br>HiPwr: 820 mm<br>Std: 400 mm | 1.5 mm | 0.35 mm | 2 m | min. 25 mm |  | |
| Side view / Periscope | | | | | | | | | | |
| Cylindrical | dia. 4.75 mm | KHE-C01-2.2-2.0-K136 | PMMA | Ultra: 200 mm<br>HiPwr: 110 mm<br>Std: 50 mm | 0.5 mm | 0.15 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |
| Array | | | | | | | | | | |
| Rectangular | 3 x M2 x 0.5 | KLE-A16-2.2-2.0-K109 | PMMA | Ultra: 420 mm<br>HiPwr: 240 mm<br>Std: 100 mm | 16 x 0.25 mm | 0.05 mm | 2 m | min. 25 mm |  | |
| Rectangular | 3 x M3 x 0.5 | KLE-A16-2.2-2.0-K110 | PMMA | Ultra: 420 mm<br>HiPwr: 240 mm<br>Std: 100 mm | 16 x 0.25 mm | 0.05 mm | 2 m | min. 25 mm |  | |
| Rectangular | 3 x M3 x 0.5 | KLE-A16-2.2-2.0-K111 | PMMA | Ultra: 420 mm<br>HiPwr: 240 mm<br>Std: 100 mm | 16 x 0.25 mm | 0.05 mm | 2 m | min. 25 mm |  | |

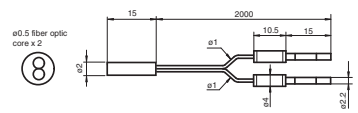
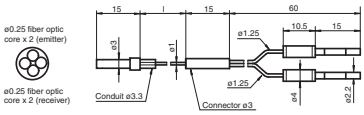
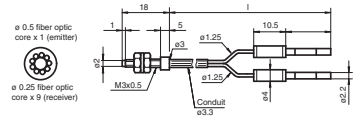
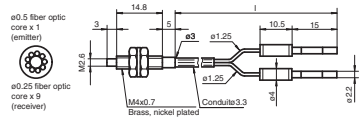
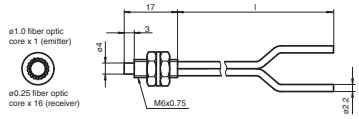
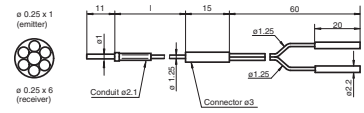
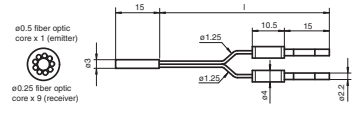
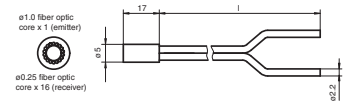
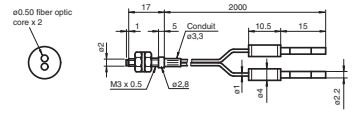
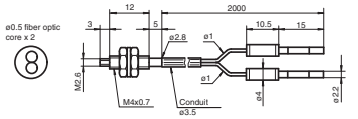
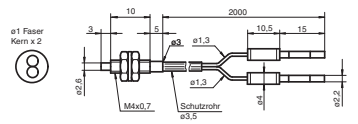
| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Rectangular | 2 x 3.2 mm | KLE-A32-2,2-2,0-K142 | PMMA | Ultra: 140 mm<br>HiPwr: 80 mm<br>Std: 35 mm | 32 x 0.25 mm | | 2 m | min. 25 mm |  | |
| High temperature resistance | | | | | | | | | | |
| Cylindrical | dia. 3 mm | KHTE-C01-2.2-2.0-K118 | PMMA | Ultra: 475 mm<br>HiPwr: 270 mm<br>Std: 115 mm | 1 mm | 0.35 mm | 2 m | min. 25 mm |  | - 55°C ... + 115 °C |
| Sturdy design | | | | | | | | | | |
| Threaded | M3 | LHE 00-1.1-1.0-14M3 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Threaded | M4 x 0.7 /M2.6 | LHE 00-1.1-1.0-20M4 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | 4 x high Detection range with Auxiliary lens K-LA01/<br>8 x high Detection range with Auxiliary lens K-LA06<br>Side view / Periscope with K-LA02/<br>- 40°C ... + 180 °C |
| Threaded | M6 | LHE 00-1.1-1.0-G | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Cylindrical | dia. 1.5 mm | LHE 00-1.1-1.0-10C1.5 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Cylindrical | dia. 3 mm | LHE 00-1.1-1.0-15C3 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Right angle | Bar 3 mm | LHE 00-1.1-1.0-WC3 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Right angle | Bar 10 mm | LHE 00-1.1-1.0-K9 | glass | Ultra: 710 mm<br>HiPwr: 420 mm<br>Std: 195 mm | 1.1 mm | | 1 m | 4 mm static |  | - 40°C ... + 180 °C |
| Special design | | | | | | | | | | |
| Rectangular | 2 x 2.2 mm | KHE-A01-1.0-2.0-K138 | PMMA | Ultra: 100 mm<br>HiPwr: 60 mm<br>Std: 25 mm | 0.5 mm | 0.05 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|---|
| Slot | 2 x 3.2 mm | KLE-C02-1.25-2.0-K134 | PMMA | 5 mm | 2 x 0.25 mm | | 2 m | min. 10 mm |  | |
| Slot | 2 x 3.2 mm | KLE-C02-1.25-2.0-K135 | PMMA | 10 mm | 2 x 0.25 mm | | 2 m | min. 10 mm |  | |

Std: Standard Mode, 160 µs
HiPwr: HighPower Mode, 500 µs
Ultra: Ultra Mode, 5 ms

## Selection table - diffuse mode fiber optic cable

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross-section | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|
| Highly precise | | | | | | | | | |
| Threaded | M3 x 0.5 | KLR-C02-1.0-2.0-K75 | PMMA | Ultra: 12 mm<br>HiPwr: 6 mm<br>Std: 4 mm | 2 x 0.25 m | 2 m | min. 10 mm |  | |
| Threaded | M4 x 0.7 | KLR-C02-1.0-2.0-K73 | PMMA | Ultra: 12 mm<br>HiPwr: 6 mm<br>Std: 4 mm | 2 x 0.25 mm | 2 m | min. 10 mm |  | |
| Threaded | M3 x 0.5 | KLR-C04-1.25-2.0-K78 | PMMA | Ultra: 25 mm<br>HiPwr: 18 mm<br>Std: 8 mm | 4 x 0.25 m | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 2.0 mm | KLR-C02-1.0-2.0-K91 | PMMA | Ultra: 12 mm<br>HiPwr: 6 mm<br>Std: 4 mm | 2 x 0.25 mm | 2 m | min. 10 mm |  | |
| Cylindrical | dia. 3.0 mm | KLR-C02-1.0-2.0-K90 | PMMA | Ultra: 12 mm<br>HiPwr: 6 mm<br>Std: 4 mm | 2 x 0.25 mm | 2 m | min. 10 mm |  | |
| Cylindrical | dia. 1.5 mm | KLR-C04-1.25-2.0-K80 | PMMA | Ultra: 25 mm<br>HiPwr: 18 mm<br>Std: 8 mm | 4 x 0.25 mm | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 1.5 mm | KLR-C04-1.0-2.0-K133 | PMMA | Ultra: 25 mm<br>HiPwr: 18 mm<br>Std: 7 mm | 4 x 0.25 mm | 2 m | min. 15 mm |  | |

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross-section | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|
| Cylindrical | dia. 2.0 mm | KLR-C02-1.0-2.0-K87 | PMMA | Ultra: 85 mm<br>HiPwr: 52 mm<br>Std: 25 mm | 2 x 0.5 mm | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 3.0 mm | KLR-C04-1.25-2.0-K79 | PMMA | Ultra: 25 mm<br>HiPwr: 18 mm<br>Std: 8 mm | 4 x 0.25 mm | 2 m | min. 15 mm |  | |
| Coaxial | | | | | | | | | |
| Threaded | M3 x 0.5 | KLR-C09-1.25-2.0-K76 | PMMA | Ultra: 100 mm<br>HiPwr: 60 mm<br>Std: 30 mm | 1 x 0.5 mm Emitter<br>9 x 0.25 mm Receiver | 2 m | min. 15 mm |  | only 0.5 mm light spot at 8 mm<br>with auxiliary lens K-LA03 |
| Threaded | M4 x 0.7 /M2.6 | KLR-C09-1.25-2.0-K74 | PMMA | Ultra: 100 mm<br>HiPwr: 60 mm<br>Std: 30 mm | 1 x 0.5 mm Emitter<br>9 x 0.25 mm Receiver | 2 m | min. 15 mm |  | only 0.7 mm light spot at 10 mm with auxiliary lens K-LA04/<br>2 x high Detection range with Auxiliary lens K-LA01/<br>3 x high Detection range with Auxiliary lens K-LA06 |
| Threaded | M6 x 0.75 | KLR-C16-2.2-2.0-K71 | PMMA | Ultra: 300 mm<br>HiPwr: 190 mm<br>Std: 85 mm | 1 x 1.0 mm Emitter<br>16 x 0.25 mm Receiver | 2 m | min. 25 mm |  | |
| Cylindrical | dia. 1.0 mm | KLR-C06-1.25-2.0-K81 | PMMA | Ultra: 70 mm<br>HiPwr: 45 mm<br>Std: 20 mm | 1 x 0.25 mm Emitter<br>6 x 0.25 mm Receiver | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 3.0 mm | KLR-C09-1.25-2.0-K77 | PMMA | Ultra: 110 mm<br>HiPwr: 60 mm<br>Std: 30 mm | 1 x 0.5 mm Emitter<br>9 x 0.25 mm Receiver | 2 m | min. 15 mm |  | |
| Cylindrical | dia. 5.0 mm | KLR-C16-2.2-2.0-K72 | PMMA | Ultra: 300 mm<br>HiPwr: 190 mm<br>Std: 85 mm | 1 x 1.0 mm Emitter<br>16x 0.25 mm Receiver | 2 m | min. 25 mm |  | |
| Highly flexible | | | | | | | | | |
| Threaded | M3 | KHR-C02-1.0-2.0-K96 | PMMA | Ultra: 40 mm<br>HiPwr: 25 mm<br>Std: 12 mm | 2 x 0.5 mm | 2 m | min. 1 mm |  | |
| Threaded | M4 | KHR-C02-1.0-2.0-K95 | PMMA | Ultra: 40 mm<br>HiPwr: 25 mm<br>Std: 12 mm | 2 x 0.5 mm | 2 m | min. 1 mm |  | |
| Threaded | M4 | KHR-C02-1.3-2.0-K92 | PMMA | Ultra: 210 mm<br>HiPwr: 130 mm<br>Std: 60 mm | 2 x 1.0 mm | 2 m | min. 2 mm |  | |

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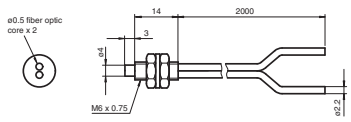
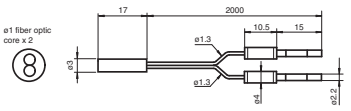
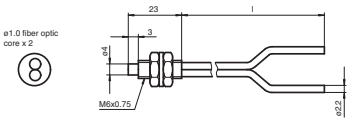
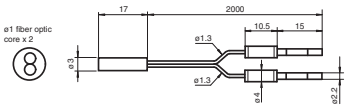
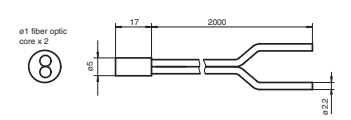
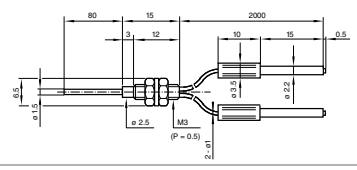
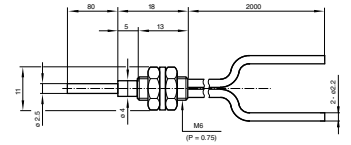
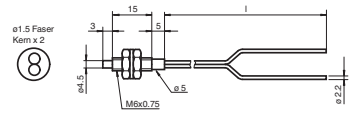
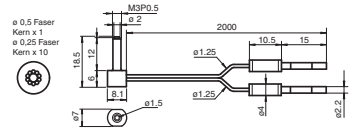
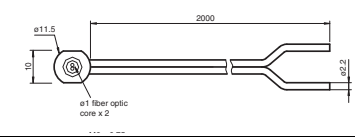
| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross-section | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|
| Threaded | M6 | KHR-C02-2.2-2.0-K94 | PMMA | Ultra: 40 mm<br>HiPwr: 25 mm<br>Std: 12 mm | 2 x 0.5 mm | 2 m | min.<br>1 mm |  | |
| Cylindrical | dia.<br>3.0 mm | KHR-C02-1.3-2.0-K93 | PMMA | Ultra: 200 mm<br>HiPwr: 130 mm<br>Std: 60 mm | 2 x 1.0 mm | 2 m | min.<br>2 mm |  | |
| Flexible | | | | | | | | | |
| Threaded | M6 x 0.75 | KLR-C02-2.2-2.0-K70 | PMMA | Ultra: 280 mm<br>HiPwr: 180 mm<br>Std: 80 mm | 2 x 1.0 mm | 2 m | min.<br>25 mm |  | |
| Cylindrical | dia.<br>3.0 mm | KLR-C02-1.3-2.0-K86 | PMMA | Ultra: 280 mm<br>HiPwr: 180 mm<br>Std: 80 mm | 2 x 1.0 mm | 2 m | min.<br>25 mm |  | |
| Cylindrical | dia.<br>5.0 mm | KLR-C02-2.2-2.0-K85 | PMMA | Ultra: 280 mm<br>HiPwr: 180 mm<br>Std: 80 mm | 2 x 1.0 mm | 2 m | min.<br>25 mm |  | |
| Bendable tip | | | | | | | | | |
| Threaded | M3 x 0.5 | KLR 00-1.0-2.0-K58 | PMMA | Ultra: 68 mm<br>HiPwr: 40 mm<br>Std: 20 mm | | 2 m | min.<br>15 mm |  | |
| Threaded | M6 | KLR 00-2.2-2.0-K57 | PMMA | Ultra: 210 mm<br>HiPwr: 130 mm<br>Std: 60 mm | | 2 m | min.<br>15 mm |  | |
| High detection range | | | | | | | | | |
| Threaded | | KLR-C02-2,2-2,0-K146 | PMMA | Ultra: 460 mm<br>HiPwr: 270 mm<br>Std: 150 mm | | 2 m | mind.<br>40 mm |  | |
| Threaded | | KLR-C10-1,25-2,0-K144 | PMMA | Ultra: 95 mm<br>HiPwr: 60 mm<br>Std: 30 mm | | 2 m | mind.<br>15 mm |  | |
| Side view / Periscope | | | | | | | | | |
| Threaded | M6 | KHR-C02-2.2-2.0-K131 | PMMA | Ultra: 210 mm<br>HiPwr: 135 mm<br>Std: 60 mm | 2 x 1.0 mm | 2 m | min.<br>2 mm |  | only 2 mm Bend radius |

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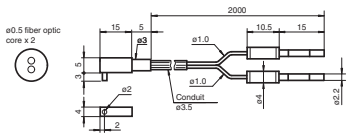
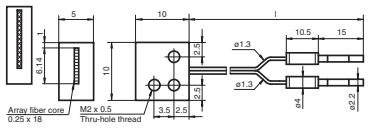
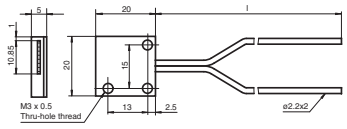
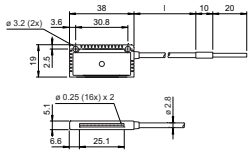
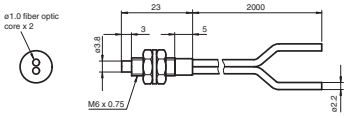
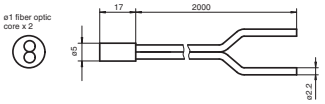
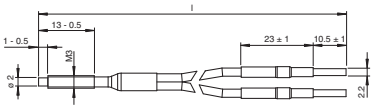
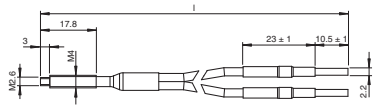
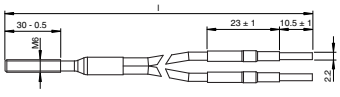
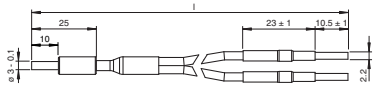
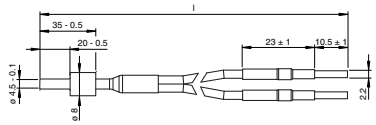
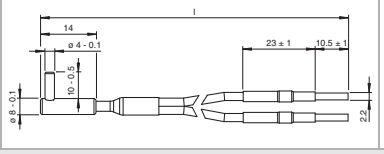
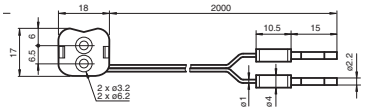
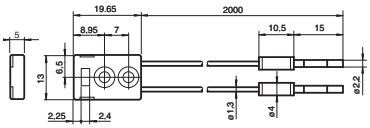
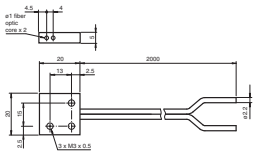
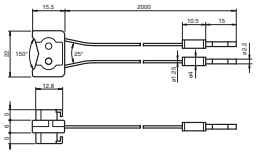
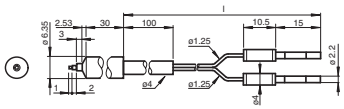
| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross-section | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|
| Threaded | dia. 5.0 mm | KHR-C02-1.0-2.0-K132 | PMMA | Ultra: 52 mm<br>HiPwr: 33 mm<br>Std: 15 mm | 2 x 0.5 mm | 2 m | min. 1 mm |  | only 1 mm Bend radius |
| Array | | | | | | | | | |
| Rectangular | 3 x M2 x 0.5 | KLR-A18-1.3-2.0-K82 | PMMA | Ultra: 86 mm<br>HiPwr: 55 mm<br>Std: 25 mm | 18 x 0.25 m m | 2 m | min. 25 mm |  | |
| Rectangular | 3 x M3 x 0.5 | KLR-A32-2.2-2.0-K83 | PMMA | Ultra: 120 mm<br>HiPwr: 78 mm<br>Std: 35 mm | 10.85 mm | 2 m | min. 25 mm |  | |
| Rectangular | 2 x 3.2 m m | KLR-A32-2,2-2,0-K141 | PMMA | Ultra: 120 mm<br>HiPwr: 78 mm<br>Std: 35 mm | 16 x 0.25 mm | 2 m | mind. 25 mm |  | |
| High temperature resistance | | | | | | | | | |
| Threaded | M6 | KHTR-C02-2.2-2.0-K88 | PMMA | Ultra: 280 mm<br>HiPwr: 180 mm<br>Std: 80 mm | 2 x 1.0 mm | 2 m | min. 25 mm |  | - 55°C ... + 115°C |
| Cylindrical | dia. 5.0 mm | KHTR-C02-2.2-2.0-K89 | PMMA | Ultra: 280 mm<br>HiPwr: 180 mm<br>Std: 80 mm | 2 x 1.0 mm | 2 m | min. 25 mm |  | - 55°C ... + 115°C |
| Sturdy design | | | | | | | | | |
| Threaded | M3 x 0.5 | LHR 00-0.8-1.0-14M3 | glass | Ultra: 195 mm<br>HiPwr: 100 mm<br>Std: 40 mm | 0.8 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |
| Threaded | M4 x 0.7 | LHR 00-0.8-1.0-20M4 | glass | Ultra: 195 mm<br>HiPwr: 100 mm<br>Std: 40 mm | 0.8 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |
| Threaded | M6 | LHR 00-1.1-1.0-G | glass | Ultra: 230 mm<br>HiPwr: 156 mm<br>Std: 70 mm | 1.1 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |
| Cylindrical | dia. 3 mm | LHR 00-1.1-1.0-Z1 | glass | Ultra: 230 mm<br>HiPwr: 156 mm<br>Std: 70 mm | 1.1 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |
| Cylindrical | dia. 4.5 mm | LHR 00-1.1-1.0-K1 | glass | Ultra: 230 mm<br>HiPwr: 156 mm<br>Std: 70 mm | 1.1 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |

| Head shape | Mounting | Model number | Core | Detection distance * | Fiber cross-section | Fiber optic length | Bend radius | Dimensions | Special features |
|---|---|---|---|---|---|---|---|---|---|
| Right angle | 10 mm Bar | LHR 00-1.1-1.0-K9 | glass | Ultra: 230 mm HiPwr: 156 mm Std: 70 mm | 1.1 mm | 1 m | 4 mm static |  | - 40°C ... + 180°C |
| Special design | | | | | | | | | |
| Rectangular | | KHR-C02-1.0-2.0-K129 | PMMA | 5 ~ 10 mm | 2 x 0.5 mm | 2 m | min. 1 mm |  | crossed beam to background blanking<br><br>only 1 mm Bend radius |
| Rectangular | | KLR-C02-1.3-2.0-K130 | PMMA | 1 ~ 8 mm | 2 x 1.0 mm | 2 m | min. 25 mm |  | crossed beam to background blanking |
| Rectangular | 3 x M3 x 0 .5 | KHR-A02-2.2-2.0-K127 | PMMA | Ultra: 175 mm HiPwr: 112 mm Std: 50 mm | 2 x 1.0 mm | 2 m | min. 2 mm |  | only 2 mm Bend radius |
| Rectangular | | KLR-C02-1.25-2.0-K128 | PMMA | 4~26 mm | 2 x 0.5 mm | 2 m | min. 15 mm |  | Level measurement |
| Cylindrical | | KLR-C02-1,25-2,0-K147 | PMMA | | | 2 m | mind. 40 mm |  | Fluid detection |

Std: Standard Mode, 160 µs
HiPwr: HighPower Mode, 500 µs
Ultra: Ultra Mode, 5 ms

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