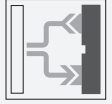




## Fiber optic sensor SU18-40a/102/115/126a

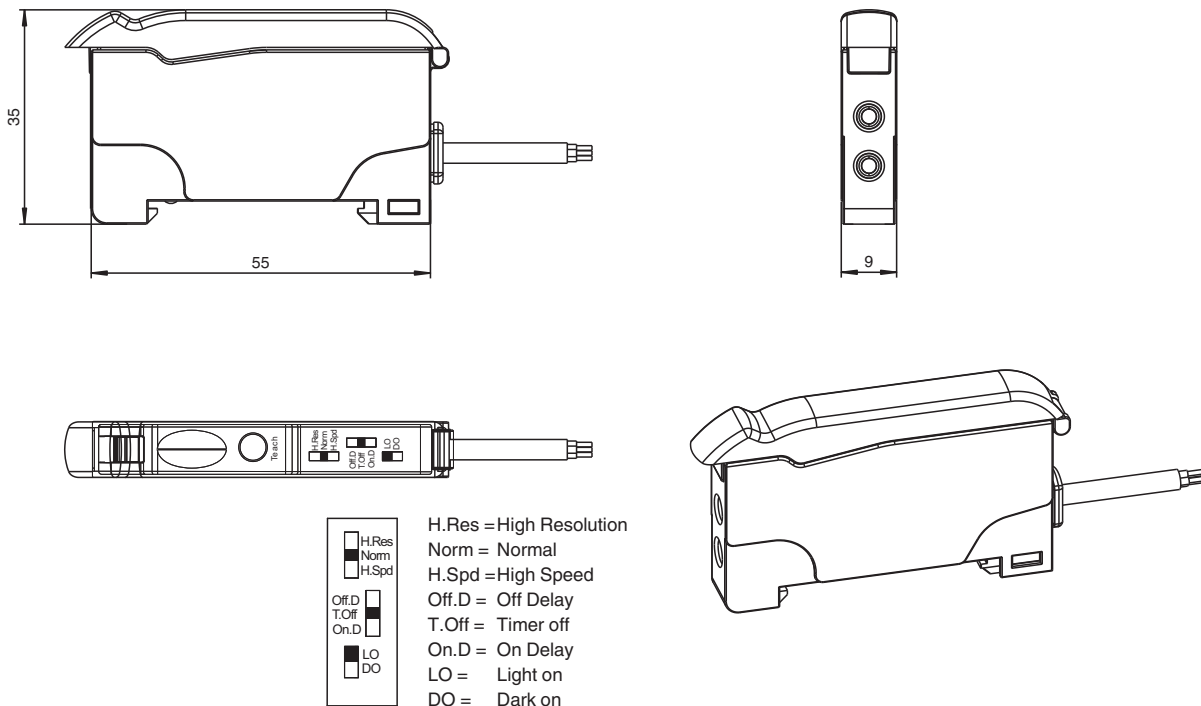


- Basic line for DIN rail installation
- Sleek design
- 3 response times selectable
- High switching frequency
- Self diagnosis function

Fiber optic sensor for glass fiber optic and plastic fiber optic, slim design, range up to 450 mm, red light, 3 response times available, self-diagnostic function, light/dark on, 1 NPN output, fixed cable



### Dimensions



### Technical Data

#### General specifications

|                     |                                      |
|---------------------|--------------------------------------|
| Sensor range        | up to 150 mm (KLR-C02-2,2-2,0-K146)  |
| Detection range     | up to 450 mm (KLE-C01-2,2-2,0-K116)  |
| Light source        | LED                                  |
| Light type          | modulated visible red light , 660 nm |
| Ambient light limit | 10000 Lux                            |

#### Functional safety related parameters

|                                |       |
|--------------------------------|-------|
| MTTF <sub>d</sub>              | 690 a |
| Mission Time (T <sub>M</sub> ) | 20 a  |

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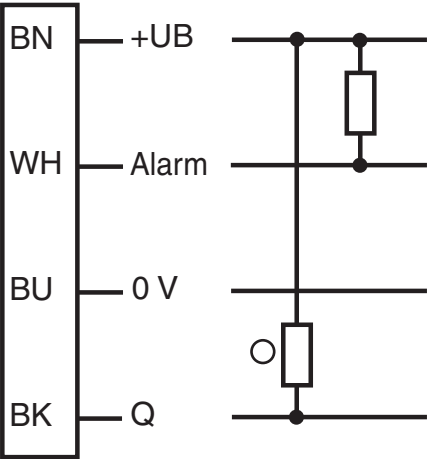
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## Technical Data

|                                   |                                                                                                                                                                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diagnostic Coverage (DC)          | 0 %                                                                                                                                                                                                                                        |
| <b>Indicators/operating means</b> |                                                                                                                                                                                                                                            |
| 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 - normal, high speed , high resolution |
| <b>Electrical specifications</b>  |                                                                                                                                                                                                                                            |
| Operating voltage                 | $U_B$ 10 ... 30 V DC                                                                                                                                                                                                                       |
| Ripple                            | 10 %                                                                                                                                                                                                                                       |
| No-load supply current            | $I_0$ ≤ 30 mA                                                                                                                                                                                                                              |
| <b>Output</b>                     |                                                                                                                                                                                                                                            |
| Stability alarm output            | 1 NPN, short-circuit protected open collector                                                                                                                                                                                              |
| Switching type                    | light/dark on, switchable                                                                                                                                                                                                                  |
| Signal output                     | 1 NPN, short-circuit protected open collector                                                                                                                                                                                              |
| 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 speed mode: 6 kHz , High resolution: 500 Hz                                                                                                                                                                |
| Response time                     | Standard mode: 160 μs , High speed mode: 80 μs , High resolution: 1 ms                                                                                                                                                                     |
| Repeat accuracy                   | $R$ ≤ 0.5 % of adjusted sensor range                                                                                                                                                                                                       |
| <b>Conformity</b>                 |                                                                                                                                                                                                                                            |
| Product standard                  | EN 60947-5-2                                                                                                                                                                                                                               |
| <b>Approvals and certificates</b> |                                                                                                                                                                                                                                            |
| UL approval                       | cULus Listed, Class 2 Power Source, Type 1 enclosure                                                                                                                                                                                       |
| CCC approval                      | CCC approval / marking not required for products rated ≤36 V                                                                                                                                                                               |
| <b>Ambient conditions</b>         |                                                                                                                                                                                                                                            |
| Ambient temperature               | -10 ... 55 °C (14 ... 131 °F)                                                                                                                                                                                                              |
| Storage temperature               | -20 ... 70 °C (-4 ... 158 °F)                                                                                                                                                                                                              |
| <b>Mechanical specifications</b>  |                                                                                                                                                                                                                                            |
| 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 <sup>2</sup>                                                                                                                                                                                                    |
| Material                          |                                                                                                                                                                                                                                            |
| Housing                           | PC                                                                                                                                                                                                                                         |
| Mass                              | 45 g                                                                                                                                                                                                                                       |

Connection Assignment

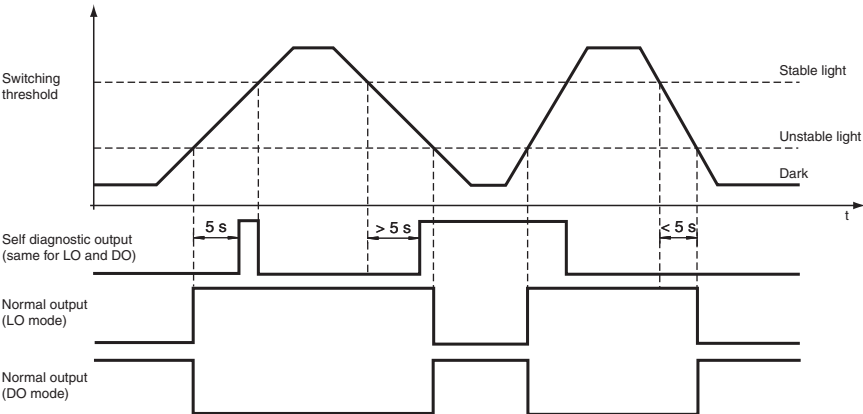


○ = Light on  
● = Dark on

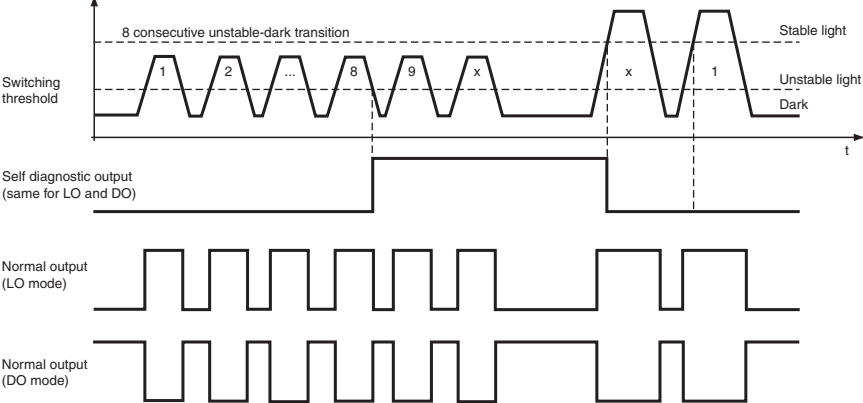
Characteristic Curve

Self-Diagnostic definition and operation:

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



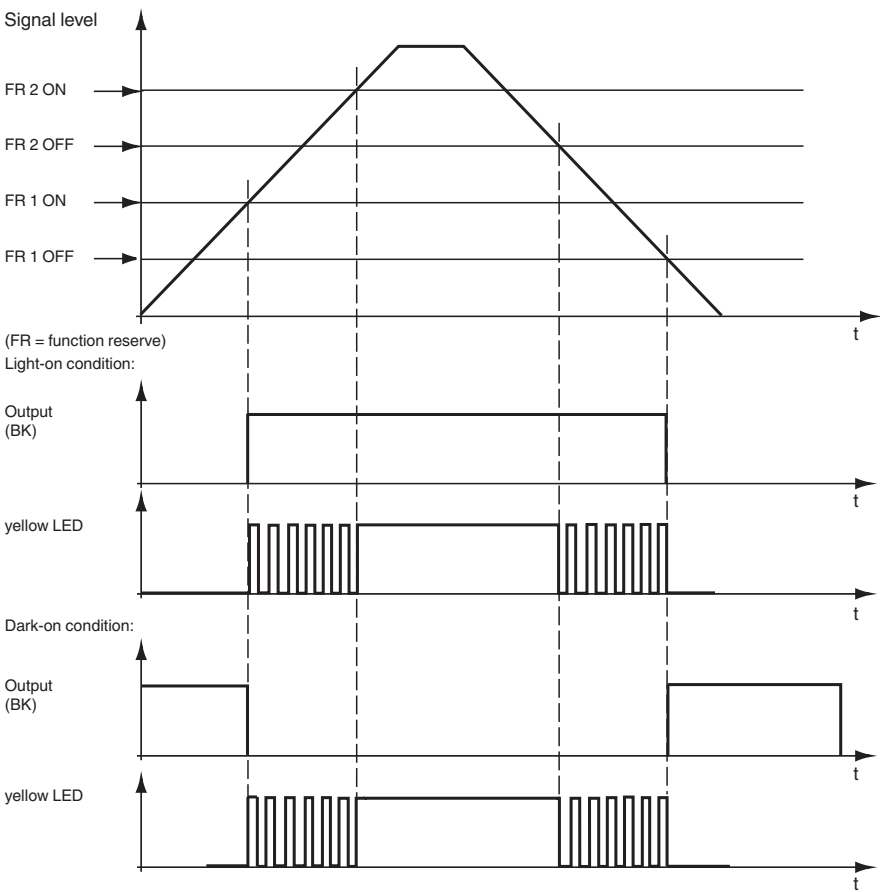
8 cyc. rule for light-ON (LO) and dark-ON (DO) mode



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Characteristic Curve

LED indicators and operating chart:



Accessories

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

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## Accessories

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

## Teach-In

(for Auto Teach version only):

### Dynamic Teach in High Resolution mode:

1. Place a 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. If the target is too near (strong signal), the fast blinking will last slightly longer follow by slow blinking
3. Remove target or move target further away from sensor
4. 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

### Dynamic Teach in Normal mode:

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 to indicate an under voltage fault at the power supply

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

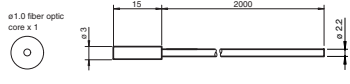
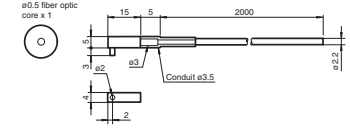
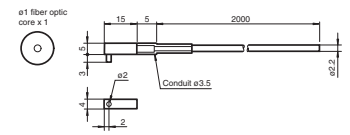
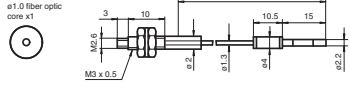
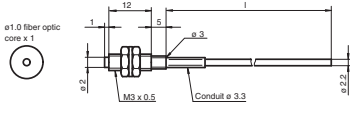
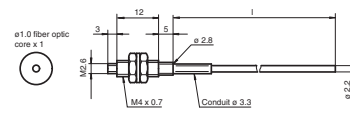
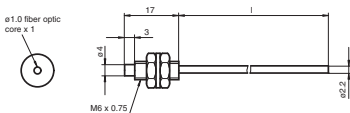
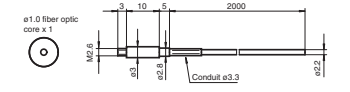
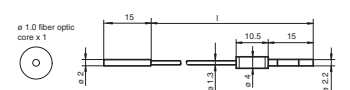
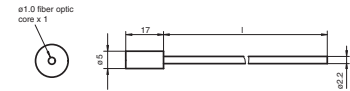
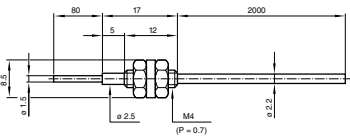
- Yellow & Green LEDs in-phase blinking indicates that the sensor has entered the Teach Mode
- Slow Yellow & Green LEDs in-phase blinking indicates that the sensor is ready or it is waiting to learn new information about the target and/or the background
- Fast Yellow & Green LEDs in-phase blinking means 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

## 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 | 20 mm              | 0.25 mm             | 0.05 mm             | 2 m                | min. 10 mm  |            |                                                                                                                                                      |
| Threaded       | M4       | KLE-C01-1.0-2.0-K119 | PMMA | 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 /<br>Periscope with K-LA02 |

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| Head shape   | Mounting          | Model number         | Core | Detection distance | Fiber cross section | minimum Object size | Fiber optic length | Bend radius   | Dimensions                                                                           | Special features                                                                                                                                    |
|--------------|-------------------|----------------------|------|--------------------|---------------------|---------------------|--------------------|---------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Cylindrical  | dia.<br>3 mm      | KHE-C01-2.2-2.0-K123 | PMMA | 200 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>2 mm  |    | only 2 mm<br>Bend radius                                                                                                                            |
| Right angle  | dia.<br>15 x 5    | KHE-C01-2.2-2.0-K137 | PMMA | 35 mm              | 0.5 mm              | 0.15 mm             | 2 m                | min.<br>1 mm  |    | only 1 mm<br>Bend radius                                                                                                                            |
| Right angle  | dia.<br>15 x 5    | KHE-C01-2.2-2.0-K140 | PMMA | 150 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>2 mm  |    | only 2 mm<br>Bend radius                                                                                                                            |
| Flexible     |                   |                      |      |                    |                     |                     |                    |               |                                                                                      |                                                                                                                                                     |
| Threaded     | M3 x 0.5<br>/M2.6 | KLE-C01-1.3-2.0-K112 | PMMA | 200 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>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 /<br>Periscope with K-LA02 |
| Threaded     | M3 x 0.5          | KLE-C01-2.2-2.0-K103 | PMMA | 220 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>25 mm |   |                                                                                                                                                     |
| Threaded     | M4 x 0.7<br>/M2.6 | KLE-C01-2.2-2.0-K102 | PMMA | 220 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>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 /<br>Periscope with K-LA02 |
| Threaded     | M6                | KLE-C01-2.2-2.0-K100 | PMMA | 220 mm             | 1 mm                | 0.32 mm             | 2 m                | min.<br>25 mm |  |                                                                                                                                                     |
| Threaded     | M2.6              | KLE-C01-2.2-2.0-K113 | PMMA | 200 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>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 /<br>Periscope with K-LA02 |
| Cylindrical  | dia.<br>2 mm      | KLE-C01-1.3-2.0-K114 | PMMA | 220 mm             | 1 mm                | 0.25 mm             | 2 m                | min.<br>25 mm |  |                                                                                                                                                     |
| Cylindrical  | dia.<br>5 mm      | KLE-C01-2.2-2.0-K101 | PMMA | 220 mm             | 1 mm                | 0.32 mm             | 2 m                | min.<br>25 mm |  |                                                                                                                                                     |
| Bendable tip |                   |                      |      |                    |                     |                     |                    |               |                                                                                      |                                                                                                                                                     |
| Threaded     | M4                | KLE 00-2.2-2.0-K55   | PMMA | 228 mm             | 1 mm                |                     | 2 m                | min.<br>25 mm |  |                                                                                                                                                     |

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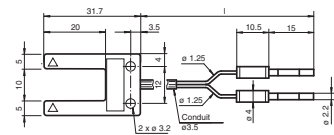
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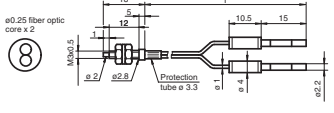
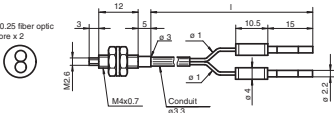
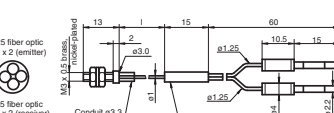
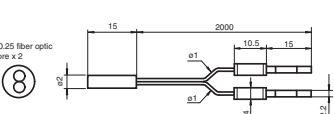
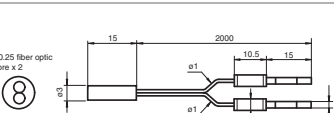
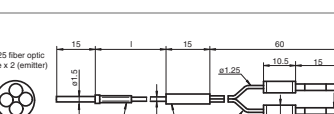
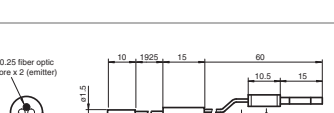
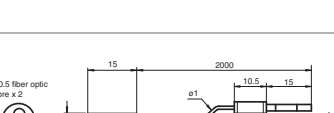
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| Head shape | Mounting   | Model number          | Core | Detection distance | Fiber cross section | minimum Object size | Fiber optic length | Bend radius | Dimensions                                                                         | Special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

## Diffuse Mode Sensor Selection Table

| Head type      | Mounting    | Designation          | Core | Sensing range | Fiber cross-section | Length of fiber optics | Bending radius | Dimensional drawing                                                                  | Special Properties |
|----------------|-------------|----------------------|------|---------------|---------------------|------------------------|----------------|--------------------------------------------------------------------------------------|--------------------|
| High-precision |             |                      |      |               |                     |                        |                |                                                                                      |                    |
| Thread         | M3 x 0.5    | KLR-C02-1.0-2.0-K75  | PMMA | 4 mm          | 2 x 0.25 mm         | 2 m                    | At least 10 mm |    |                    |
| Thread         | M4 x 0.7    | KLR-C02-1.0-2.0-K73  | PMMA | 4 mm          | 2 x 0.25 mm         | 2 m                    | At least 10 mm |    |                    |
| Thread         | M3 x 0.5    | KLR-C04-1.25-2.0-K78 | PMMA | 8 mm          | 4 x 0.25 mm         | 2 m                    | At least 15 mm |   |                    |
| Cylindrical    | Dia. 2.0 mm | KLR-C02-1.0-2.0-K91  | PMMA | 4 mm          | 2 x 0.25 mm         | 2 m                    | At least 10 mm |  |                    |
| Cylindrical    | Dia. 3.0 mm | KLR-C02-1.0-2.0-K90  | PMMA | 4 mm          | 2 x 0.25 mm         | 2 m                    | At least 10 mm |  |                    |
| Cylindrical    | Dia. 1.5 mm | KLR-C04-1.25-2.0-K80 | PMMA | 8 mm          | 4 x 0.25 mm         | 2 m                    | At least 15 mm |  |                    |
| Cylindrical    | Dia. 1.5 mm | KLR-C04-1.0-2.0-K133 | PMMA | 7 mm          | 4 x 0.25 mm         | 2 m                    | At least 15 mm |  |                    |
| Cylindrical    | Dia. 2.0 mm | KLR-C02-1.0-2.0-K87  | PMMA | 25 mm         | 2 x 0.5 mm          | 2 m                    | At least 15 mm |  |                    |
| Cylindrical    | Dia. 3.0 mm | KLR-C04-1.25-2.0-K79 | PMMA | 8 mm          | 4 x 0.25 mm         | 2 m                    | At least 15 mm |  |                    |

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| Head type       | Mounting       | Designation          | Core | Sensing range | Fiber cross-section                         | Length of fiber optics | Bending radius | Dimensional drawing | Special Properties                                                                                                                                                                           |
|-----------------|----------------|----------------------|------|---------------|---------------------------------------------|------------------------|----------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coaxial         |                |                      |      |               |                                             |                        |                |                     |                                                                                                                                                                                              |
| Thread          | M3 x 0.5       | KLR-C09-1.25-2.0-K76 | PMMA | 30 mm         | 1 x 0.5 mm emitter<br>9 x 0.25 mm receiver  | 2 m                    | At least 15 mm |                     | Only 0.5 mm light spot at 8 mm<br>With auxiliary lens K-LA03                                                                                                                                 |
| Thread          | M4 x 0.7 /M2.6 | KLR-C09-1.25-2.0-K74 | PMMA | 30 mm         | 1 x 0.5 mm emitter<br>9 x 0.25 mm receiver  | 2 m                    | At least 15 mm |                     | Only 0.7 mm light spot at 10 mm with auxiliary lens K-LA04/<br>two times higher detection range with auxiliary lens K-LA01/<br>three times higher detection range with auxiliary lens K-LA06 |
| Thread          | M6 x 0.75      | KLR-C16-2.2-2.0-K71  | PMMA | 85 mm         | 1 x 1.0 mm emitter<br>16 x 0.25 mm receiver | 2 m                    | At least 25 mm |                     |                                                                                                                                                                                              |
| Cylindrical     | Dia. 1.0 mm    | KLR-C06-1.25-2.0-K81 | PMMA | 20 mm         | 1 x 0.25 mm emitter<br>6 x 0.25 mm receiver | 2 m                    | At least 15 mm |                     |                                                                                                                                                                                              |
| Cylindrical     | Dia. 3.0 mm    | KLR-C09-1.25-2.0-K77 | PMMA | 30 mm         | 1 x 0.5 mm emitter<br>9 x 0.25 mm receiver  | 2 m                    | At least 15 mm |                     |                                                                                                                                                                                              |
| Cylindrical     | Dia. 5.0 mm    | KLR-C16-2.2-2.0-K72  | PMMA | 85 mm         | 1 x 1.0 mm emitter<br>16 x 0.25 mm Receiver | 2 m                    | At least 25 mm |                     |                                                                                                                                                                                              |
| Highly flexible |                |                      |      |               |                                             |                        |                |                     |                                                                                                                                                                                              |
| Thread          | M3             | KHR-C02-1.0-2.0-K96  | PMMA | 12 mm         | 2 x 0.5 mm                                  | 2 m                    | At least 1 mm  |                     |                                                                                                                                                                                              |
| Thread          | M4             | KHR-C02-1.0-2.0-K95  | PMMA | 12 mm         | 2 x 0.5 mm                                  | 2 m                    | At least 1 mm  |                     |                                                                                                                                                                                              |
| Thread          | M4             | KHR-C02-1.3-2.0-K92  | PMMA | 60 mm         | 2 x 1.0 mm                                  | 2 m                    | At least 2 mm  |                     |                                                                                                                                                                                              |
| Thread          | M6             | KHR-C02-2.2-2.0-K94  | PMMA | 12 mm         | 2 x 0.5 mm                                  | 2 m                    | At least 1 mm  |                     |                                                                                                                                                                                              |
| Cylindrical     | Dia. 3.0 mm    | KHR-C02-1.3-2.0-K93  | PMMA | 60 mm         | 2 x 1.0 mm                                  | 2 m                    | At least 2 mm  |                     |                                                                                                                                                                                              |

| Head type            | Mounting     | Designation           | Core | Sensing range | Fiber cross-section | Length of fiber optics | Bending radius | Dimensional drawing | Special Properties       |
|----------------------|--------------|-----------------------|------|---------------|---------------------|------------------------|----------------|---------------------|--------------------------|
| Flexible             |              |                       |      |               |                     |                        |                |                     |                          |
| Thread               | M6 x 0.75    | KLR-C02-2.2-2.0-K70   | PMMA | 80 mm         | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     |                          |
| Cylindrical          | Dia. 3.0 mm  | KLR-C02-1.3-2.0-K86   | PMMA | 80 mm         | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     |                          |
| Cylindrical          | Dia. 5.0 mm  | KLR-C02-2.2-2.0-K85   | PMMA | 80 mm         | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     |                          |
| Flexible tip         |              |                       |      |               |                     |                        |                |                     |                          |
| Thread               | M3 x 0.5     | KLR 00-1.0-2.0-K58    | PMMA | 20 mm         |                     | 2 m                    | At least 15 mm |                     |                          |
| Thread               | M6           | KLR 00-2.2-2.0-K57    | PMMA | 60 mm         |                     | 2 m                    | At least 15 mm |                     |                          |
| Long detection range |              |                       |      |               |                     |                        |                |                     |                          |
| Thread               |              | KLR-C02-2.2-2.0-K146  | PMMA | 150 mm        |                     | 2 m                    | At least 40 mm |                     |                          |
| Thread               |              | KLR-C10-1.25-2.0-K144 | PMMA | 30 mm         |                     | 2 m                    | At least 15 mm |                     |                          |
| Lateral optical face |              |                       |      |               |                     |                        |                |                     |                          |
| Thread               | M6           | KHR-C02-2.2-2.0-K131  | PMMA | 60 mm         | 2 x 1.0 mm          | 2 m                    | At least 2 mm  |                     | Only 2 mm bending radius |
| Thread               | Dia. 5.0 mm  | KHR-C02-1.0-2.0-K132  | PMMA | 15 mm         | 2 x 0.5 mm          | 2 m                    | At least 1 mm  |                     | Only 1 mm bending radius |
| Array                |              |                       |      |               |                     |                        |                |                     |                          |
| Cubic                | 3 x M2 x 0.5 | KLR-A18-1.3-2.0-K82   | PMMA | 25 mm         | 18 x 0.25 mm        | 2 m                    | At least 25 mm |                     |                          |

| Head type                      | Mounting     | Designation          | Core  | Sensing range | Fiber cross-section | Length of fiber optics | Bending radius | Dimensional drawing | Special Properties                                                        |
|--------------------------------|--------------|----------------------|-------|---------------|---------------------|------------------------|----------------|---------------------|---------------------------------------------------------------------------|
| Cubic                          | 3 x M3 x 0.5 | KLR-A32-2.2-2.0-K83  | PMMA  | 35 mm         | 10.85 mm            | 2 m                    | At least 25 mm |                     |                                                                           |
| Cubic                          | 2 x 3.2 mm   | KLR-A32-2.2-2.0-K141 | PMMA  | 35 mm         | 16 x 0.25 mm        | 2 m                    | At least 25 mm |                     |                                                                           |
| Resistant to high temperatures |              |                      |       |               |                     |                        |                |                     |                                                                           |
| Thread                         | M6           | KHTR-C02-2.2-2.0-K88 | PMMA  | 80 mm         | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     | -55 °C ... +115 °C                                                        |
| Cylindrical                    | Dia. 5.0 mm  | KHTR-C02-2.2-2.0-K89 | PMMA  | 80 mm         | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     | -55 °C ... +115 °C                                                        |
| Robust design                  |              |                      |       |               |                     |                        |                |                     |                                                                           |
| Thread                         | M3 x 0.5     | LHR 00-0.8-1.0-14M3  | Glass | 40 mm         | 0.8 mm              | 1 m                    | 4 mm static    |                     | -40 °C ... +180 °C                                                        |
| Thread                         | M4 x 0.7     | LHR 00-0.8-1.0-20M4  | Glass | 40 mm         | 0.8 mm              | 1 m                    | 4 mm static    |                     | -40 °C ... +180 °C                                                        |
| Thread                         | M6           | LHR 00-1.1-1.0-G     | Glass | 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 | 70 mm         | 1.1 mm              | 1 m                    | 4 mm static    |                     | -40 °C ... +180 °C                                                        |
| Special design                 |              |                      |       |               |                     |                        |                |                     |                                                                           |
| Cubic                          |              | KHR-C02-1.0-2.0-K129 | PMMA  | 5 ~ 10 mm     | 2 x 0.5 mm          | 2 m                    | At least 1 mm  |                     | Crossed light beam for background suppression<br>Only 1 mm bending radius |
| Cubic                          |              | KLR-C02-1.3-2.0-K130 | PMMA  | 1 ~ 8 mm      | 2 x 1.0 mm          | 2 m                    | At least 25 mm |                     | Crossed light beam for background suppression                             |

| Head type   | Mounting     | Designation           | Core | Sensing range | Fiber cross-section | Length of fiber optics | Bending radius | Dimensional drawing | Special Properties       |
|-------------|--------------|-----------------------|------|---------------|---------------------|------------------------|----------------|---------------------|--------------------------|
| Cubic       | 3 x M3 x 0.5 | KHR-A02-2.2-2.0-K127  | PMMA | 50 mm         | 2 x 1.0 mm          | 2 m                    | At least 2 mm  |                     | Only 2 mm bending radius |
| Cubic       |              | KLR-C02-1.25-2.0-K128 | PMMA | 4 ~ 26 mm     | 2 x 0.5 mm          | 2 m                    | At least 15 mm |                     | Fill level measurement   |
| Cylindrical |              | KLR-C02-1.25-2.0-K147 | PMMA |               |                     | 2 m                    | At least 40 mm |                     | Fill level detection     |