F 10 – family of sub-miniature sensors
Small housings, great performance

Typical F 10

- Sub-miniature sensor for installation in the smallest of spaces and in moving machine parts
- The world’s smallest laser sensor with background suppression, adjustable via teach-in
- Sensors as LED or laser versions
- F 10 Bluelight: specially designed for scanning solar wafers and strongly light-absorbing objects
- User-friendly commissioning via electronic teach-in button or control wire
- Well thought-out mounting accessories for rapid and simple integration

Simple mounting:
Mounting using a dovetail that permits fine retro-adjustment of the sensor is particularly recommended when space is limited.

Special characteristics:
The glass-fibre-reinforced plastic housing with its integrated mounting sleeve, dovetail guide on the back, and laser-marked indelible type code are characteristic of the F 10.

Mini-sensor with maximum ease-of-use:
Simple commissioning with an electronic teach-in button and easily visible status LEDs is by no means typical for housings of this size.

made in Germany
The sensors of the F 10 series, available as LED and laser versions, form one of the most comprehensive series on the market in sub-miniature housings. Their precise background suppression, adjustable via teach-in, makes the sensors unique. The light spot of the F 10 laser sensors also remains so focused that small parts in the millimetre range can still be reliably detected even at long distances – for example, a wire with a diameter of 0.5 mm at a distance of 60 mm. One highlight of the new F 10 LED sensors is the F 10 Bluelight with its blue transmission LED, specially developed for detecting solar wafers and strongly light-absorbing objects using the scanning principle.

The F 10 sensors not only impress through their excellent performance data, but also through their unmistakable design with special features – unique in this size of housing. The dovetail mounting system considerably simplifies fine adjustment, particularly in difficult installation locations, and the various connection variants allow rapid commissioning and replacement. The mounting holes of the sub-miniature sensors are reinforced with metal eyelets. A small sensor that will give users great pleasure!

### F 10 Product Overview

<table>
<thead>
<tr>
<th>Type of light</th>
<th>Adjustment</th>
<th>Scanning distance/range</th>
<th>Special features</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td><strong>Photoelectric proximity sensors with background suppression</strong></td>
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<td></td>
</tr>
<tr>
<td>FT 10-RLH</td>
<td>Laser</td>
<td>Teach-in</td>
<td>60 mm</td>
<td>The only scanner with scanning distance adjustment</td>
</tr>
<tr>
<td>FT 10-RLHR</td>
<td>Laser</td>
<td>Teach-in</td>
<td>60 mm</td>
<td>Broad-beam light spot</td>
</tr>
<tr>
<td>FT 10-B-RLF</td>
<td>Laser</td>
<td>Fixed focus</td>
<td>15 mm / 30 mm</td>
<td></td>
</tr>
<tr>
<td>FT 10-RH</td>
<td>LED</td>
<td>Teach-in</td>
<td>70 mm</td>
<td></td>
</tr>
<tr>
<td>FT 10-RF</td>
<td>LED</td>
<td>Fixed focus</td>
<td>15 mm / 30 mm / 50 mm</td>
<td>Blue transmission LED for strongly light-absorbing objects</td>
</tr>
<tr>
<td>FT 10-BF Bluelight</td>
<td>LED, blue</td>
<td>Fixed focus</td>
<td>30 mm / 50 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Retroreflective photoelectric sensors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR.10-RL</td>
<td>Laser</td>
<td>Teach-in</td>
<td>2 m</td>
<td>Long range, precise small-part detection</td>
</tr>
<tr>
<td>FR.10-R</td>
<td>LED</td>
<td>Teach-in</td>
<td>1.6 m</td>
<td>Long range</td>
</tr>
<tr>
<td><strong>Through-beam photoelectric sensors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS/FE 10-RL</td>
<td>Laser</td>
<td>Teach-in</td>
<td>3 m</td>
<td>Sensor pair; very accurate object positioning</td>
</tr>
<tr>
<td>FS.10-RL/FE 10-RL</td>
<td>Laser</td>
<td>Teach-in</td>
<td>3 m</td>
<td>Transmitter/receiver; very accurate object positioning</td>
</tr>
</tbody>
</table>
FT 10-RLH
Laser photoelectric proximity sensor with background suppression

PRODUCT HIGHLIGHTS

- Sub-miniature sensor with laser light and adjustable background suppression
- Precise and reliable switching behaviour, even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Particularly suitable for detecting the smallest of parts and for installation in extremely confined spaces

<table>
<thead>
<tr>
<th>Optical data</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning distance</td>
<td>6 … 60 mm¹</td>
</tr>
<tr>
<td>Adjustment range</td>
<td>10 … 60 mm¹</td>
</tr>
<tr>
<td>Type of light</td>
<td>Laser, red, 655 nm</td>
</tr>
<tr>
<td>Light spot size (total detection area)</td>
<td>1 x 3 mm²</td>
</tr>
<tr>
<td>Laser Class (DIN EN 60825-1:2008-5)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Indicator LED, green</td>
</tr>
<tr>
<td></td>
<td>Indicator LED, yellow</td>
</tr>
<tr>
<td></td>
<td>Scanning distance adjustment</td>
</tr>
<tr>
<td></td>
<td>Adjustment possibilities</td>
</tr>
<tr>
<td></td>
<td>Default settings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
</tr>
<tr>
<td>IP 67³</td>
</tr>
<tr>
<td>Material, housing</td>
</tr>
<tr>
<td>Material, front screen</td>
</tr>
<tr>
<td>Type of connection</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
</tr>
<tr>
<td>Weight (plug device)</td>
</tr>
<tr>
<td>Weight (cable device)</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
</tr>
</tbody>
</table>

Electrical data

| Operating voltage, \( +U_b \) | 10 … 30 V DC² |
| No-load current, \( I_b \) | \( \leq 12 \, mA \) |
| Output current, \( I_e \) | \( \leq 50 \, mA \) |
| Protective circuits | Reverse-polarity protection, \( U_p \) / short-circuit protection (Q) |
| Protection Class | 2 |
| Switching output, Q | PNP/NPN (see Selection Table) |
| Output function | N.O. |
| Switching frequency, \( f \) (1:1:1) | \( \leq 1000 \, Hz \) |
| Response time | 500 \( \mu s \) |
| Control input, IN (only 4-pin design) | \( +U_b = \) teach-in |
| | \( -U_b = \) button locked |
| | Open = normal operation |

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 … 60 mm</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-RLH-PS-E4</td>
<td>600-11130</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-RLH-NS-E4</td>
<td>600-11131</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-RLH-PS-K4</td>
<td>600-11132</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-RLH-NS-K4</td>
<td>600-11133</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FT 10-RLH-PS-KM4</td>
<td>600-11134</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FT 10-RLH-NS-KM4</td>
<td>600-11135</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RLH-PS-KM3</td>
<td>600-11146</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RLH-NS-KM3</td>
<td>600-11147</td>
</tr>
<tr>
<td>6 … 60 mm</td>
<td>NPN</td>
<td>Pigtail, 500 mm with M8 plug, 3-pin</td>
<td>FT 10-RLH-PS-KM3-X07</td>
<td>600-11158</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBD F 10 for all types

¹ Reference material white, 90 % reflectivity
² Max. 10 % ripple, within \( U_b \) ~ 50 Hz / 100 Hz
³ With connected IP 67 plug
Plug connection

| LED 2  | 8  |
| LED 1  | 2.6 |
| Receiver | 2.8 |
| Emitter | 14.6 |
| Width  | 21.1 |
| Height | 9 |

Cable connection

| LED 2  | 8  |
| LED 1  | 2.6 |
| Receiver | 2.8 |
| Emitter | 14.6 |
| Width  | 21.1 |
| Height | 9 |

Connection, 4-pin

| IN  | 2 WH |
| Q   | 4 BK  |
| -U_2| 3 BU  |

Connection, 3-pin

| IN  | 2 WH |
| Q   | 4 BK  |
| -U_3| 3 BU  |

Reference material

<table>
<thead>
<tr>
<th>Material</th>
<th>Detection range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (90%)</td>
<td>6 … 60 mm</td>
</tr>
<tr>
<td>Grey (18%)</td>
<td>7 … 60 mm</td>
</tr>
<tr>
<td>Black (6%)</td>
<td>7 … 60 mm</td>
</tr>
</tbody>
</table>

Accessories

| Connection cables | From Page A-34 |
| Brackets          | From Page A-4  |
**FT 10-RLHR**

Laser photoelectric proximity sensor with background suppression

### PRODUCT HIGHLIGHTS

- Sub-miniature sensor with wide laser light spot and adjustable background suppression
- Precise and reliable switching behaviour, even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Particularly suitable for installation in the smallest of spaces
- Simple operation via electronic Teach-in button or control line

### Optical data

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>6 … 60 mm&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustment range</td>
<td>10 … 60 mm&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Type of light</td>
<td>Laser, red, 655 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>See diagram</td>
</tr>
<tr>
<td>Laser Class (DIN EN 60825-1:2008-5)</td>
<td>1</td>
</tr>
</tbody>
</table>

### Functions

- Indicator LED, green
- Indicator LED, yellow
- Scanning distance adjustment
- Adjustment possibilities
- Default settings
- Operating voltage indicator
- Switching output indicator
- Via Teach-in button and control input
- Button lock via control input
- Max. scanning distance and N.O.

### Electrical data

<table>
<thead>
<tr>
<th>Operating voltage, +U&lt;sub&gt;b&lt;/sub&gt;</th>
<th>10 … 30 V DC&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-load current, I&lt;sub&gt;0&lt;/sub&gt;</td>
<td>≤ 12 mA</td>
</tr>
<tr>
<td>Output current, I&lt;sub&gt;e&lt;/sub&gt;</td>
<td>≤ 50 mA</td>
</tr>
<tr>
<td>Protective circuits</td>
<td>Reverse-polarity protection, U&lt;sub&gt;p&lt;/sub&gt; / short-circuit protection (Q)</td>
</tr>
<tr>
<td>Protection Class</td>
<td>2</td>
</tr>
<tr>
<td>Switching output, Q</td>
<td>PNP/NPN (see Selection Table)</td>
</tr>
<tr>
<td>Output function</td>
<td>≤ 1000 Hz</td>
</tr>
<tr>
<td>Switching frequency, f (t&lt;sub&gt;i&lt;/sub&gt;/t&lt;sub&gt;p&lt;/sub&gt; 1:1)</td>
<td>500 µs</td>
</tr>
<tr>
<td>Response time</td>
<td>+U&lt;sub&gt;b&lt;/sub&gt; = teach-in</td>
</tr>
<tr>
<td>Control input, IN (only 4-pin design)</td>
<td>-U&lt;sub&gt;b&lt;/sub&gt; = button locked</td>
</tr>
<tr>
<td></td>
<td>Open = normal operation</td>
</tr>
</tbody>
</table>

### Mechanical data

- Dimensions: 21.1 x 14.6 x 8 mm
- Enclosure rating: IP 67<sup>3</sup>
- Material, housing: PUR
- Material, front screen: PMMA
- Type of connection: See Selection Table
- Ambient temperature: operation: -20 … +50 °C
- Ambient temperature: storage: -20 … +80 °C
- Weight (plug device): Ca. 3 g
- Weight (cable device): Ca. 22 g
- Weight (pigtail): Ca. 10 g

### Types of connection

- PNP
- NPN
- Plug, M5x0.5, 4-pin
- Plug, M5x0.5, 4-pin
- Cable, 2 m, 4-wire
- Cable, 2 m, 4-wire
- Pigtail, 200 mm with M8 plug, 4-pin
- Pigtail, 200 mm with M8 plug, 4-pin
- Pigtail, 200 mm with M8 plug, 3-pin
- Pigtail, 200 mm with M8 plug, 3-pin

### Part numbers and article numbers

- FT 10-RLHR-PS-E4: 600-11136
- FT 10-RLHR-NS-E4: 600-11137
- FT 10-RLHR-PS-K4: 600-11138
- FT 10-RLHR-NS-K4: 600-11139
- FT 10-RLHR-PS-KM4: 600-11140
- FT 10-RLHR-NS-KM4: 600-11141
- FT 10-RLHR-PS-KM3: 600-11148
- FT 10-RLHR-NS-KM3: 600-11149

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<sup>1</sup> Reference material white, 90 % reflectivity
<sup>2</sup> Max. 10 % ripple, within U<sub>b</sub> ~ 50 Hz / 100 Hz
<sup>3</sup> With connected IP 67 plug

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Including dovetail clamp mounting MBD F 10 for all types
### Plug connection

![Plug connection diagram]

### Cable connection

![Cable connection diagram]

<table>
<thead>
<tr>
<th>Connection, 4-pin</th>
<th>Connection, 3-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image of 4-pin connection]</td>
<td>![Image of 3-pin connection]</td>
</tr>
</tbody>
</table>

### Light spot size

![Light spot size graph]

### Reference material

<table>
<thead>
<tr>
<th>Material</th>
<th>Detection range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (90%)</td>
<td>6 … 60 mm</td>
</tr>
<tr>
<td>Grey (18%)</td>
<td>7 … 60 mm</td>
</tr>
<tr>
<td>Black (6%)</td>
<td>7 … 60 mm</td>
</tr>
</tbody>
</table>

### Accessories

- Connection cables: From Page A-34
- Brackets: From Page A-4
FT 10-B-RLF
Laser photoelectric proximity sensor with background suppression, fixed focus

**PRODUCT HIGHLIGHTS**

- Sub-miniature sensor with laser light and precise fixed background suppression
- Reliable switching behaviour even with varying object surfaces and colours
- Particularly suitable for detecting the smallest of parts and for installation in extremely confined spaces
- Tamper-proof sensor design – no misalignment possible
- Robust, glass-fibre-reinforced plastic housings

### Optical data

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 ... 15 mm</td>
<td>Indicator LED, green</td>
</tr>
<tr>
<td>6 ... 30 mm</td>
<td>Indicator LED, yellow</td>
</tr>
<tr>
<td>Laser, red, 655 nm</td>
<td>Adjustment possibilities</td>
</tr>
</tbody>
</table>

**Type of light**

- Laser, red, 655 nm

**Light spot size (total detection area)**

- 1 x 3 mm²

**Laser Class (DIN EN 60825-1:2008-5)**

- 1

### Electrical data

<table>
<thead>
<tr>
<th>Operating voltage, +U_b</th>
<th>No-load current, I_b</th>
<th>Output current, I_e</th>
<th>Protective circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 ... 30 V DC²</td>
<td>≤ 12 mA</td>
<td>≤ 50 mA</td>
<td>Reverse-polarity protection, U_b / short-circuit protection (Q)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection Class</th>
<th>Switching output, Q</th>
<th>Output function</th>
<th>Switching frequency, f (t/i tp: 1:1)</th>
<th>Response time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNP/NPN (see Selection Table)</td>
<td>N.O./N.C.</td>
<td>≤ 1000 Hz</td>
<td>500 μs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control input, IN</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(only 4-pin design)</td>
<td>FT 10-B-RLF1-PS-E4</td>
</tr>
</tbody>
</table>

### Mechanical data

- Dimensions: 21.1 x 14.6 x 8 mm
- Enclosure rating: IP 67³
- Material, housing: PUR
- Material, front screen: PMMA
- Type of connection: See Selection Table
- Ambient temperature: operation: -20 ... +50 °C
- Weight (plug device): Ca. 3 g
- Weight (cable device): Ca. 22 g
- Weight (pigtail): Ca. 10 g

### Operating range

<table>
<thead>
<tr>
<th>Operating range</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 ... 15 mm</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-B-RLF1-PS-E4</td>
</tr>
<tr>
<td>6 ... 15 mm</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-B-RLF1-NS-E4</td>
</tr>
<tr>
<td>6 ... 30 mm</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-B-RLF2-PS-E4</td>
</tr>
<tr>
<td>6 ... 30 mm</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-B-RLF2-NS-E4</td>
</tr>
<tr>
<td>6 ... 15 mm</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-B-RLF1-PS-K4</td>
</tr>
<tr>
<td>6 ... 15 mm</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-B-RLF1-NS-K4</td>
</tr>
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<td>Cable, 2 m, 4-wire</td>
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<tr>
<td>6 ... 15 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FT 10-B-RLF1-PS-KM4</td>
</tr>
<tr>
<td>6 ... 15 mm</td>
<td>NPN</td>
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</tr>
</tbody>
</table>

**Notes:**

1. Reference material white, 90 % reflectivity
2. Max. 10 % ripple, within U_p, ~ 50 Hz / 100 Hz
3. With connected IP 67 plug
<table>
<thead>
<tr>
<th>Operating range</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 … 15 mm</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF1-PS-KM3</td>
<td>600-11142</td>
</tr>
<tr>
<td>6 … 15 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF1-NS-KM3</td>
<td>600-11143</td>
</tr>
<tr>
<td>6 … 30 mm</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF2-PS-KM3</td>
<td>600-11144</td>
</tr>
<tr>
<td>6 … 30 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF2-NS-KM3</td>
<td>600-11145</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBDF 10 for all types

<table>
<thead>
<tr>
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<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
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<tr>
<td>6 … 15 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF1-NS-KM3</td>
<td>600-11143</td>
</tr>
<tr>
<td>6 … 30 mm</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF2-PS-KM3</td>
<td>600-11144</td>
</tr>
<tr>
<td>6 … 30 mm</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-B-RLF2-NS-KM3</td>
<td>600-11145</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBDF 10 for all types

**Reference material**

<table>
<thead>
<tr>
<th>Material</th>
<th>Detection range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (90 %)</td>
<td>6 … 15 mm / 30 mm</td>
</tr>
<tr>
<td>Grey (18 %)</td>
<td>7 … 15 mm / 30 mm</td>
</tr>
<tr>
<td>Black (6 %)</td>
<td>7 … 15 mm / 30 mm</td>
</tr>
</tbody>
</table>

**Accessories**

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection cables</td>
<td>A-34</td>
</tr>
<tr>
<td>Brackets</td>
<td>A-4</td>
</tr>
</tbody>
</table>
FT 10-RH
Photoelectric proximity sensor with background suppression

PRODUCT HIGHLIGHTS

- Sub-miniature sensor with precise adjustable background suppression
- Precise and reliable switching behaviour even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Static and dynamic teach-in via electronic teach-in button or control line

### Optical data

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning distance</td>
<td>5 … 70 mm¹</td>
</tr>
<tr>
<td>Adjustment range</td>
<td>10 … 70 mm¹</td>
</tr>
<tr>
<td>Used light</td>
<td>LED, red, 650 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>0,45 mm²</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ 2 mm²²</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ 3 mm²²</td>
</tr>
<tr>
<td>Grey/white shift (18%/90%)</td>
<td>≤ 4 mm²²</td>
</tr>
<tr>
<td>Black/white shift (6%/90%)</td>
<td></td>
</tr>
</tbody>
</table>

### Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator LED, green</td>
<td></td>
</tr>
<tr>
<td>Indicator LED, yellow</td>
<td></td>
</tr>
<tr>
<td>Scanning distance adjustment</td>
<td></td>
</tr>
<tr>
<td>Teach-in modes</td>
<td></td>
</tr>
<tr>
<td>Default settings</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical data

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage, +Uᵦₜ</td>
<td>10 … 30 V DC¹</td>
</tr>
<tr>
<td>No-load current, I₀</td>
<td>≤ 20 mA</td>
</tr>
<tr>
<td>Output current, Iₑ</td>
<td>≤ 50 mA</td>
</tr>
</tbody>
</table>
| Protective circuits       | Reverse-polarity protection, Uᵦₑ /
                           | short-circuit protection (Q) |
| Protection class          | 2                      |
| Power On Delay            | < 300 ms               |
| Switching output, Q       | N.O./N.C.              |
| Output function           |                          |
| Switching frequency, f (t/tp 1:1) | ≤ 1000 Hz           |
| Response time             | 500 µs                 |
| Control input, IN⁴        | +Uᵦₑ = teach-in
                           | -Uᵦₑ = button locked
                           | Open = normal operation |

### Mechanical data

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>21,1 x 14,6 x 8 mm</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP 67⁶</td>
</tr>
<tr>
<td>Material, housing</td>
<td>PUR</td>
</tr>
<tr>
<td>Material, front screen</td>
<td>PMMA</td>
</tr>
<tr>
<td>Type of connection</td>
<td>See Selection Table</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
<td>-20 … +60 °C</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
<td>-20 … +80 °C</td>
</tr>
<tr>
<td>Weight (plug device)</td>
<td>approx. 3 g</td>
</tr>
<tr>
<td>Weight (cable device)</td>
<td>approx. 22 g</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
<td>approx. 10 g</td>
</tr>
</tbody>
</table>

### Mechanical data

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
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<tr>
<td>Material, housing</td>
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<td>Material, front screen</td>
<td>PMMA</td>
</tr>
<tr>
<td>Type of connection</td>
<td>See Selection Table</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
<td>-20 … +60 °C</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
<td>-20 … +80 °C</td>
</tr>
<tr>
<td>Weight (plug device)</td>
<td>approx. 3 g</td>
</tr>
<tr>
<td>Weight (cable device)</td>
<td>approx. 22 g</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
<td>approx. 10 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 … 70 mm¹</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-RH-PS-E4</td>
<td>600-11000</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FT 10-RH-NS-E4</td>
<td>600-11004</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-RH-PS-K4</td>
<td>600-11001</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-RH-NS-K4</td>
<td>600-11005</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-RH-PS-KM4</td>
<td>600-11002</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-RH-NS-KM4</td>
<td>600-11006</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-RH-PS-KM3</td>
<td>600-11003</td>
</tr>
<tr>
<td>5 … 70 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-RH-NS-KM3</td>
<td>600-11007</td>
</tr>
</tbody>
</table>

¹ Reference material white, 90 % reflectivity ² At maximum scanning distance ³ In constant environmental conditions ⁴ Max. 10 % ripple within Uᵦₑ ~ 50 Hz / 100 Hz ⁵ Only 4-pin design ⁶ With connected IP 67 plug

Including dovetail clamp mounting MBD F 10 for all types

Version: 07/2015. Subject to changes; diagrams similar
### Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>From Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection cables</td>
<td>A-34</td>
</tr>
<tr>
<td>Brackets</td>
<td>A-4</td>
</tr>
</tbody>
</table>

### Reference Material and Detection Range

<table>
<thead>
<tr>
<th>Reference Material</th>
<th>Detection Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (90 %)</td>
<td>5 … 70 mm</td>
</tr>
<tr>
<td>Grey (18 %)</td>
<td>8 … 70 mm</td>
</tr>
<tr>
<td>Black (6 %)</td>
<td>8 … 70 mm</td>
</tr>
</tbody>
</table>

### Light Spot Size

![Light Spot Size Graph](image)

### Connection, 4-pin

![Connection, 4-pin Diagram](image)

### Connection, 3-pin

![Connection, 3-pin Diagram](image)
FT 10-RF
Photoelectric proximity sensor with background suppression, fixed focus

PRODUCT HIGHLIGHTS

• Sub-miniature sensor with precise fixed background suppression
• Economical multi-purpose sensor
• Reliable switching behaviour even with varying object surfaces and colours
• Tamper-proof sensor design – no misalignment possible
• Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Used light</th>
<th>Light spot size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 … 15 mm¹</td>
<td>LED, red, 650 nm</td>
<td>See diagram</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Functions

<table>
<thead>
<tr>
<th>Indicator LED, green</th>
<th>Operating voltage indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator LED, yellow</td>
<td>N.O. / N.C. via control input³</td>
</tr>
</tbody>
</table>

Adjustment possibilities

<table>
<thead>
<tr>
<th>Adjustment possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage indicator</td>
</tr>
<tr>
<td>Switching output indicator</td>
</tr>
</tbody>
</table>

Electrical data

<table>
<thead>
<tr>
<th>Operating voltage, +Uₚ</th>
<th>No-load current, I₀</th>
<th>Output current, Iₑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 … 30 V DC²</td>
<td>≤ 20 mA</td>
<td>≤ 50 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protective circuits</th>
<th>Power On Delay</th>
<th>Switching output, Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse-polarity protection, Uᵢₑ / short-circuit protection (Q)</td>
<td>≤ 300 ms</td>
<td>PNP/NPN (see Selection Table)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output function</th>
<th>Switching frequency, f (tᵢ/tp 1:1)</th>
<th>Response time</th>
<th>Control input, IN³</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.O. / N.C.</td>
<td>≤ 1000 Hz</td>
<td>500 µs</td>
<td>+Uᵢₑ = N.C., -Uᵢₑ / Open = N.O.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Enclosure rating</th>
<th>Material, housing</th>
<th>Material, front screen</th>
<th>Type of connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>21,1 x 14,6 x 8 mm</td>
<td>IP 67⁴</td>
<td>PUR</td>
<td>PMMA</td>
<td>See Selection Table</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient temperature: operation</th>
<th>Ambient temperature: storage</th>
<th>Weight (cable device)</th>
<th>Weight (pigtail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 … +60 °C</td>
<td>-20 … +80 °C</td>
<td>approx. 22 g</td>
<td>approx. 10 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNP</td>
<td>FT 10-RF1-PS-K⁴</td>
<td>600-11008</td>
</tr>
<tr>
<td>NPN</td>
<td>FT 10-RF1-NS-K⁴</td>
<td>600-11011</td>
</tr>
<tr>
<td>NPN</td>
<td>FT 10-RF1-NS-KM⁴</td>
<td>600-11013</td>
</tr>
<tr>
<td>NPN</td>
<td>FT 10-RF1-PS-KM³</td>
<td>600-11010</td>
</tr>
</tbody>
</table>

1 Reference material white, 90 % reflectivity
2 Max. 10 % ripple within Uᵢₑ ~ 50 Hz / 100 Hz
3 Only 4-pin design
4 With connected IP 67 plug
<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 … 30 mm²</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RF2-PS-KM3</td>
<td>600-11016</td>
</tr>
<tr>
<td>2 … 30 mm²</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RF2-NS-KM3</td>
<td>600-11019</td>
</tr>
<tr>
<td>2 … 50 mm²</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RF3-PS-KM3</td>
<td>600-11022</td>
</tr>
<tr>
<td>2 … 50 mm²</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FT 10-RF3-NS-KM3</td>
<td>600-11025</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBD F 10 for all types

### Cable connection

#### Connection, 4-pin

#### Connection, 3-pin

#### Light spot size

#### Reference material

<table>
<thead>
<tr>
<th>Detection range</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT 10-RF1</td>
<td>Connection cables</td>
</tr>
<tr>
<td>2 … 15 mm</td>
<td>Brackets</td>
</tr>
<tr>
<td>FT 10-RF2</td>
<td>From Page A-34</td>
</tr>
<tr>
<td>2 … 30 mm</td>
<td>From Page A-4</td>
</tr>
<tr>
<td>FT 10-RF3</td>
<td>2 … 50 mm</td>
</tr>
<tr>
<td>3 … 15 mm</td>
<td>5 … 50 mm</td>
</tr>
<tr>
<td>FT 10-RF3</td>
<td>4 … 30 mm</td>
</tr>
<tr>
<td>5 … 30 mm</td>
<td>7 … 50 mm</td>
</tr>
<tr>
<td>FT 10-RF3</td>
<td>4 … 15 mm</td>
</tr>
<tr>
<td>5 … 30 mm</td>
<td>7 … 50 mm</td>
</tr>
<tr>
<td>FT 10-RF3</td>
<td>5 … 30 mm</td>
</tr>
<tr>
<td>7 … 50 mm</td>
<td>7 … 50 mm</td>
</tr>
</tbody>
</table>

Version: 07/2015. Subject to changes; diagrams similar
FT 10-BF
Bluelight photoelectric proximity sensor with background suppression, fixed focus

PRODUCT HIGHLIGHTS

- Sub-miniature sensor with blue transmission LED and precise fixed background suppression
- Reliable switching behaviour with strongly light-absorbing objects, e.g. solar wafers
- Reliable operation without reflector - even with critical surfaces
- Tamper-proof sensor design - no misalignment possible
- Simple mounting and adjustment through innovative dovetail clamp mounting

<table>
<thead>
<tr>
<th>Optical data</th>
<th>Functions</th>
<th>Mechanical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning distance</td>
<td>2 … 30 mm¹ / 2 … 50 mm¹</td>
<td>Indicator LED, green</td>
</tr>
<tr>
<td>Optimum scanning distance</td>
<td>15 … 20 mm</td>
<td>Indicator LED, yellow</td>
</tr>
<tr>
<td>Used light</td>
<td>LED, blue, 450 nm</td>
<td>Adjustment possibilities</td>
</tr>
<tr>
<td>LED risk group (DIN 62471)</td>
<td>2</td>
<td>Operating voltage indicator</td>
</tr>
<tr>
<td>Light spot size</td>
<td>See diagram</td>
<td>Switching output indicator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical data</th>
<th>Mechanical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage +U₀</td>
<td>10 … 30 V DC²</td>
</tr>
<tr>
<td>No-load supply current I₀</td>
<td>≤ 20 mA</td>
</tr>
<tr>
<td>Output current Ie</td>
<td>≤ 50 mA</td>
</tr>
<tr>
<td>Protective circuits</td>
<td>Reverse-polarity protection, +U₀ / short-circuit protection (Q)</td>
</tr>
<tr>
<td>Protection class</td>
<td>2</td>
</tr>
<tr>
<td>Power On Delay</td>
<td>&lt; 300 ms</td>
</tr>
<tr>
<td>Switching output, Q</td>
<td>PNP/NPN (see Selection Table)</td>
</tr>
<tr>
<td>Output function</td>
<td>N.O. / N.C.</td>
</tr>
<tr>
<td>Switching frequency f (tᵢ/tp 1:1)</td>
<td>800 Hz</td>
</tr>
<tr>
<td>Response time</td>
<td>625 µs</td>
</tr>
<tr>
<td>Control input, IN¹</td>
<td>+U₀ = N.C.</td>
</tr>
<tr>
<td></td>
<td>-U₀ / Open = N.O.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Enclosure rating</th>
<th>Material, housing</th>
<th>Material, front screen</th>
<th>Type of connection</th>
<th>Ambient temperature: operation</th>
<th>Ambient temperature: storage</th>
<th>Weight (cable device)</th>
<th>Weight (pigtail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.1 x 14.6 x 8 mm</td>
<td>IP 67²</td>
<td>PUR</td>
<td>PMMA</td>
<td>See Selection Table</td>
<td>-20 … +50 °C</td>
<td>-20 … +80 °C</td>
<td>approx. 22 g</td>
<td>approx. 10 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scanning distance</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 … 30 mm¹</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-BF2-PS-K4</td>
<td>600-11026</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-BF2-NS-K4</td>
<td>600-11029</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-BF2-PS-KM4</td>
<td>600-11027</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-BF2-NS-KM4</td>
<td>600-11030</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-BF2-PS-KM3</td>
<td>600-11028</td>
</tr>
<tr>
<td>2 … 30 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-BF2-NS-KM3</td>
<td>600-11031</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-BF3-PS-K4</td>
<td>600-11036</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FT 10-BF3-NS-K4</td>
<td>600-11039</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-BF3-PS-KM4</td>
<td>600-11037</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 4-pin</td>
<td>FT 10-BF3-NS-KM4</td>
<td>600-11040</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-BF3-PS-KM3</td>
<td>600-11038</td>
</tr>
<tr>
<td>2 … 50 mm¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with MB plug, 3-pin</td>
<td>FT 10-BF3-NS-KM3</td>
<td>600-11041</td>
</tr>
</tbody>
</table>

¹ Reference material white, 90 % reflectivity ² Max. residual ripple 10 %, within +U₀ approx. 50 Hz/100 Hz ³ Only 4-pin design ⁴ With connected IP 67 plug

Including dovetail clamp mounting MBD F 10 for all types
Cable connection

Connection, 4-pin
Connection, 3-pin

Light spot size

Accessories

<table>
<thead>
<tr>
<th>Connection cables</th>
<th>From Page A-34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brackets</td>
<td>From Page A-4</td>
</tr>
</tbody>
</table>
## Optical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit range</td>
<td>0.1 … 2.5 m&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Operating range</td>
<td>0.1 … 2 m&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Type of light</td>
<td>Laser, red, 655 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>See diagram</td>
</tr>
<tr>
<td>Laser Class (DIN EN 60825-1:2008-5)</td>
<td>1</td>
</tr>
</tbody>
</table>

## Functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator LED</td>
<td>green</td>
</tr>
<tr>
<td>Indicator LED</td>
<td>yellow</td>
</tr>
<tr>
<td>Sensitivity adjustment</td>
<td>Teach-in modes</td>
</tr>
<tr>
<td>Adjustment possibilities</td>
<td>Operating voltage indicator</td>
</tr>
<tr>
<td>Default settings</td>
<td>Switching output indicator</td>
</tr>
<tr>
<td></td>
<td>Via Teach-in button and control input</td>
</tr>
<tr>
<td></td>
<td>Mode 1: during running process</td>
</tr>
<tr>
<td></td>
<td>Mode 2: during standing process</td>
</tr>
<tr>
<td></td>
<td>N.O. / N.C. via Teach-in button and control input</td>
</tr>
<tr>
<td></td>
<td>Button lock via control input</td>
</tr>
<tr>
<td></td>
<td>Max. range and N.O.</td>
</tr>
</tbody>
</table>

## Electrical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage, +U&lt;sub&gt;b&lt;/sub&gt;</td>
<td>10 … 30 V DC&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>No-load current, I&lt;sub&gt;b&lt;/sub&gt;</td>
<td>≤ 12 mA</td>
</tr>
<tr>
<td>Output current, Ie</td>
<td>≤ 50 mA</td>
</tr>
<tr>
<td>Protective circuits</td>
<td>Reverse-polarity protection, U&lt;sub&gt;b&lt;/sub&gt; / short-circuit protection (Q)</td>
</tr>
<tr>
<td>Protection Class</td>
<td>2</td>
</tr>
<tr>
<td>Switching output, Q</td>
<td>PNP/NPN (see Selection Table)</td>
</tr>
<tr>
<td>Output function</td>
<td>N.O. / N.C.</td>
</tr>
<tr>
<td>Switching frequency, f (t/i&lt;sub&gt;1&lt;/sub&gt;:t&lt;sub&gt;p&lt;/sub&gt; 1:1)</td>
<td>≤ 1000 Hz</td>
</tr>
<tr>
<td>Response time</td>
<td>500 µs</td>
</tr>
<tr>
<td>Control input, IN (only 4-pin design)</td>
<td>+U&lt;sub&gt;b&lt;/sub&gt; = teach-in</td>
</tr>
<tr>
<td></td>
<td>-U&lt;sub&gt;b&lt;/sub&gt; = button locked</td>
</tr>
<tr>
<td></td>
<td>Open = normal operation</td>
</tr>
</tbody>
</table>

## Mechanical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>21.1 x 14.6 x 8 mm</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP 67&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Material, housing</td>
<td>PUR</td>
</tr>
<tr>
<td>Material, front screen</td>
<td>PMMA</td>
</tr>
<tr>
<td>Type of connection</td>
<td>See Selection Table</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
<td>-20 … +50 °C</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
<td>-20 … +80 °C</td>
</tr>
<tr>
<td>Weight (plug device)</td>
<td>Ca. 3 g</td>
</tr>
<tr>
<td>Weight (cable device)</td>
<td>Ca. 22 g</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
<td>Ca. 10 g</td>
</tr>
</tbody>
</table>

---

<sup>1</sup> Reference material: R5/L reflector  
<sup>2</sup> Max. 10 % ripple, within U<sub>b</sub> ~ 50 Hz / 100 Hz  
<sup>3</sup> With connected IP 67 plug

---

### Operating range

<table>
<thead>
<tr>
<th>Range</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 … 2 m</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FR 10-RL-PS-E4</td>
<td>603-31000</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FR 10-RL-NS-E4</td>
<td>603-31001</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FR 10-RL-PS-K4</td>
<td>603-31002</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FR 10-RL-NS-K4</td>
<td>603-31003</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FR 10-RL-PS-KM4</td>
<td>603-31004</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FR 10-RL-NS-KM4</td>
<td>603-31005</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FR 10-RL-PS-KM3</td>
<td>603-31006</td>
</tr>
<tr>
<td>0.1 … 2 m</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FR 10-RL-NS-KM3</td>
<td>603-31007</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBD F 10 for all types
## FR 10-R

Retroreflective photoelectric sensor

### Optical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td>0.1 ... 1.6 m¹</td>
</tr>
<tr>
<td>Used light</td>
<td>LED, red, 650 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>See diagram</td>
</tr>
<tr>
<td>Polarising filter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Functions

| Indicator LED green        | Operating voltage indicator |
| Indicator LED yellow       | Switching output indicator |
| Sensitivity adjustment    | Via Teach-in button and control input¹ |
| Teach-in modes            | Mode 1: during running process |
|                          | Mode 2: during standing process |
| Adjustment possibilities  | N.O./N.C. via Teach-in button and control input¹ |
|                          | Button lock via control input¹ |

### Electrical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage, +Uₖ</td>
<td>10 ... 30 V DC²</td>
</tr>
<tr>
<td>No-load current, I₀</td>
<td>≤ 20 mA</td>
</tr>
<tr>
<td>Output current, Iₑ</td>
<td>≤ 50 mA</td>
</tr>
<tr>
<td>Protective circuits</td>
<td>Reverse-polarity protection, Uₖ / short-circuit protection (Q)</td>
</tr>
<tr>
<td>Protection class</td>
<td>2</td>
</tr>
<tr>
<td>Power On Delay</td>
<td>&lt; 300 ms</td>
</tr>
<tr>
<td>Switching output, Q</td>
<td>N.O./N.C.</td>
</tr>
<tr>
<td>Output function</td>
<td>≤ 1000 Hz</td>
</tr>
<tr>
<td>Switching frequency, f (t/tₚ 1:1)</td>
<td>500 µs</td>
</tr>
<tr>
<td>Response time</td>
<td>+Uₖ = teach-in</td>
</tr>
<tr>
<td>Control input, IN¹</td>
<td>-Uₖ = button locked</td>
</tr>
<tr>
<td></td>
<td>Open = normal operation</td>
</tr>
</tbody>
</table>

### Mechanical data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure rating</td>
<td>IP 67⁺</td>
</tr>
<tr>
<td>Material, housing</td>
<td>PUR</td>
</tr>
<tr>
<td>Material, front screen</td>
<td>PMMA</td>
</tr>
<tr>
<td>Type of connection</td>
<td>See Selection Table</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
<td>-20 ... +60 °C</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
<td>-20 ... +80 °C</td>
</tr>
<tr>
<td>Weight (cable device)</td>
<td>approx. 22 g</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
<td>approx. 10 g</td>
</tr>
</tbody>
</table>

### Operating range

<table>
<thead>
<tr>
<th>Range</th>
<th>Switching output</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Article number-Nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FR 10-R-PS-K4</td>
<td>603-11001</td>
</tr>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>NPN</td>
<td>Cable, 2 m, 4-wire</td>
<td>FR 10-R-NS-K4</td>
<td>603-11004</td>
</tr>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FR 10-R-PS-KM4</td>
<td>603-11002</td>
</tr>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FR 10-R-NS-KM4</td>
<td>603-11005</td>
</tr>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FR 10-R-PS-KM3</td>
<td>603-11003</td>
</tr>
<tr>
<td>0.1 ... 1.6 m¹</td>
<td>NPN</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FR 10-R-NS-KM3</td>
<td>603-11006</td>
</tr>
</tbody>
</table>

1 Reference material reflector RS ² Max. 10 % ripple within Uₖ, ~ 50 Hz / 100 Hz ³ Only 4-pin design ⁴ With connected IP 67 plug

Including dovetail clamp mounting MBD F 10 for all types

---

### PRODUCT HIGHLIGHTS

- Sub-miniature sensor for installation in the smallest of spaces
- Despite very small sensor housing very long operating range of 1.6 m
- Fast response time: only 500 µs
- Static and dynamic teach-in via electronic teach-in button or control line
- Simple mounting and adjustment through innovative dovetail clamp mounting

---

1 Reference material reflector RS ² Max. 10 % ripple within Uₖ, ~ 50 Hz / 100 Hz ³ Only 4-pin design ⁴ With connected IP 67 plug
Cable connection

Connection, 4-pin

Connection, 3-pin

Light spot size

Reflector / Reflective foil

<table>
<thead>
<tr>
<th>Reflector / Reflective foil</th>
<th>Operating range (min./max. reflector distance)</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>R5</td>
<td>0.1 … 1.6 m</td>
<td>Reflectors</td>
</tr>
<tr>
<td>R1</td>
<td>0.1 … 1 m</td>
<td>Brackets</td>
</tr>
<tr>
<td>R2-2LB1</td>
<td>0.15 … 0.5 m</td>
<td></td>
</tr>
<tr>
<td>R3-2LK1</td>
<td>0.15 … 0.5 m</td>
<td></td>
</tr>
<tr>
<td>RF-100 KL*</td>
<td>0.15 … 1 m</td>
<td></td>
</tr>
</tbody>
</table>

From Page A-34

From Page A-4
# FS/FE 10-RL

Laser through-beam photoelectric sensor

## Optical data

<table>
<thead>
<tr>
<th>Limit range</th>
<th>0 ... 5 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td>0 ... 3 m</td>
</tr>
<tr>
<td>Type of light</td>
<td>Laser, red, 655 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>See diagram</td>
</tr>
<tr>
<td>Laser Class</td>
<td>(DIN EN 60825-1:2008-5)</td>
</tr>
</tbody>
</table>

## Functions

| Indicator LED, green |
| Indicator LED, yellow |
| Sensitivity adjustment |
| Teach-in modes |
| Adjustment possibilities (receiver) |
| Default settings |

## Electrical data

| Operating voltage, \( +\text{UB} \) | 10 ... 30 V DC¹ |
| No-load current, \( I_0 \) | ≤ 12 mA |
| Output current, \( I_{\text{e}} \) | ≤ 50 mA |
| Reverse-polarity protection, \( +\text{UB} \) / short-circuit protection (Q) | 2 |
| Protection Class | PNP/NPN (see Selection Table) |
| Switching output, Q | N.O. / N.C. |
| Output function | ≤ 4000 Hz |
| Switching frequency, \( f \) (t/tp: 1:1) | 125 μs |
| Control input, IN (receiver) (only 4-pin design) | +\( U_p \) = teach-in |
| -\( U_p \) = button locked |
| Open = normal operation |
| Control input, Test (transmitter) | +\( U_p \) = Test (transmitter off) |
| -\( U_p \) / Open = normal operation |

## Mechanical data

| Dimensions | 21.1 x 14.6 x 8 mm |
| Enclosure rating | IP 67² |
| Material, housing | PUR |
| Material, front screen | PMMA |
| Type of connection | See Selection Table |
| Ambient temperature: operation | -20 ... +50 °C |
| Ambient temperature: storage | -20 ... +80 °C |
| Weight (plug device) | Ca. 6 g |
| Weight (cable device) | Ca. 44 g |
| Weight (pigtail) | Ca. 20 g |

## Operating range

<table>
<thead>
<tr>
<th>Part number</th>
<th>Design</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS/FE 10-RL-PS-E4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51000</td>
</tr>
<tr>
<td>FS/FE 10-RL-NS-E4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51001</td>
</tr>
<tr>
<td>FS/FE 10-RL-PS-K4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51002</td>
</tr>
<tr>
<td>FS/FE 10-RL-NS-K4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51003</td>
</tr>
<tr>
<td>FS/FE 10-RL-PS-KM4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51004</td>
</tr>
<tr>
<td>FS/FE 10-RL-NS-KM4</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51005</td>
</tr>
<tr>
<td>FS/FE 10-RL-PS-KM3</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51006</td>
</tr>
<tr>
<td>FS/FE 10-RL-NS-KM3</td>
<td>Sensor pair (transmitter &amp; receiver)</td>
<td>611-51007</td>
</tr>
</tbody>
</table>

¹ Max. 10% ripple, within \( +\text{UB} \) = 50 Hz / 100 Hz
² With connected IP 67 plug

Including dovetail clamp mounting MBD F 10 for all types

**PRODUCT HIGHLIGHTS**

- Sub-miniature sensor for installation in the smallest of spaces
- Bright, precise laser light spot for optimum small-part detection and simple alignment
- High switching frequency for detection in even the fastest processes
- User-friendly operation via electronic Teach-in button or control line
- Robust, glass-fibre-reinforced plastic housings
## Plug connection

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 2</td>
<td>8</td>
</tr>
<tr>
<td>LED 1</td>
<td>14.6</td>
</tr>
<tr>
<td>Receiver</td>
<td>18.3</td>
</tr>
<tr>
<td>Emitter</td>
<td>2.8</td>
</tr>
<tr>
<td>M5x0.8</td>
<td></td>
</tr>
</tbody>
</table>

## Cable connection

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 2</td>
<td>8</td>
</tr>
<tr>
<td>LED 1</td>
<td>14.8</td>
</tr>
<tr>
<td>Receiver</td>
<td>18.3</td>
</tr>
<tr>
<td>Emitter</td>
<td>2.8</td>
</tr>
<tr>
<td>M5x0.5</td>
<td></td>
</tr>
</tbody>
</table>

## Connection, transmitter, 4-pin

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Uα</td>
<td>1 BN</td>
</tr>
<tr>
<td>TEST 2 WH</td>
<td></td>
</tr>
<tr>
<td>4 BK</td>
<td></td>
</tr>
<tr>
<td>-Uβ</td>
<td>3 BU</td>
</tr>
</tbody>
</table>

## Connection, receiver, 4-pin

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Uα</td>
<td>1 BN NPN</td>
</tr>
<tr>
<td>IN 2 WH</td>
<td></td>
</tr>
<tr>
<td>Q 4 BK</td>
<td></td>
</tr>
<tr>
<td>-Uβ</td>
<td>3 BU PNP</td>
</tr>
</tbody>
</table>

## Connection, transmitter, 3-pin

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Uα</td>
<td>1 BN</td>
</tr>
<tr>
<td>TEST 4 BK</td>
<td></td>
</tr>
<tr>
<td>-Uβ</td>
<td>3 BU</td>
</tr>
</tbody>
</table>

## Connection, receiver, 3-pin

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Uα</td>
<td>1 BN NPN</td>
</tr>
<tr>
<td>Q 4 BK</td>
<td></td>
</tr>
<tr>
<td>-Uβ</td>
<td>3 BU PNP</td>
</tr>
</tbody>
</table>

## Light spot size

<table>
<thead>
<tr>
<th>Size [mm]</th>
<th>Distance [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>

## Accessories

- Connection cables
- Brackets

From Page A-34
From Page A-4
**FS 10-RL / FE 10-RL**  
Laser through-beam photoelectric sensor

### PRODUCT HIGHLIGHTS

- Sub-miniature sensor for installation in the smallest of spaces
- Bright, precise laser light spot for optimum small-part detection and simple alignment
- High switching frequency for detection in even the fastest processes
- User-friendly operation via electronic Teach-in button or control line
- Robust, glass-fibre-reinforced plastic housings

### Optical data

<table>
<thead>
<tr>
<th>Limit range</th>
<th>0 ... 5 m</th>
<th>Operating range</th>
<th>0 ... 3 m</th>
<th>Type of light</th>
<th>Laser, red, 655 nm</th>
<th>Light spot size</th>
<th>See diagram</th>
<th>Laser Class (DIN EN 60825-1:2008-5)</th>
<th>1</th>
</tr>
</thead>
</table>

### Functions

- Indicator LED, green
- Indicator LED, yellow
- Sensitivity adjustment
- Teach-in modes
- Adjustment possibilities (receiver)
- Default settings
- Operating voltage indicator
- Switching output indicator
- Via Teach-in button and control input
- Mode 1: during running process
- Mode 2: during standing process
- N.O. / N.C. via Teach-in button and control input
- Button lock via control input
- Max. range and N.O.

### Electrical data

<table>
<thead>
<tr>
<th>Operating voltage, +Uᵢ</th>
<th>10 ... 30 V DC¹</th>
<th>No-load current, I₀</th>
<th>≤ 12 mA</th>
<th>Output current, Iₑ</th>
<th>≤ 50 mA</th>
<th>Protective circuits</th>
<th>Reverse-polarity protection, Uᵢ / short-circuit protection (Q)</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching output, Q</td>
<td>PNP/NPN (see Selection Table)</td>
<td>Output function</td>
<td>N.O. / N.C.</td>
<td>Switching frequency, f (tᵢ/tp 1:1)</td>
<td>≤ 4000Hz</td>
<td>Response time</td>
<td>125 µs</td>
<td>---</td>
</tr>
<tr>
<td>Control input, IN (receiver) (only 4-pin design)</td>
<td>+Uᵢ = Teach-in; -Uᵢ = button locked; Open = normal operation</td>
<td>Control input, Test (transmitter)</td>
<td>+Uᵢ = Test (transmitter off); -Uᵢ / Open = normal operation</td>
<td>Dimensions</td>
<td>Enclosure rating</td>
<td>IP 67²</td>
<td>Material, housing</td>
<td>PUR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>---</td>
</tr>
</tbody>
</table>

### Mechanical data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>21.1 x 14.6 x 8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure rating</td>
<td>IP 67²</td>
</tr>
<tr>
<td>Material, housing</td>
<td>PUR</td>
</tr>
<tr>
<td>Material, front screen</td>
<td>PMMA</td>
</tr>
<tr>
<td>Type of connection</td>
<td>See Selection Table</td>
</tr>
<tr>
<td>Ambient temperature: operation</td>
<td>-20 ... +50 °C</td>
</tr>
<tr>
<td>Ambient temperature: storage</td>
<td>-20 ... +80 °C</td>
</tr>
<tr>
<td>Weight (plug device)</td>
<td>Ca. 6 g</td>
</tr>
<tr>
<td>Weight (cable device)</td>
<td>Ca. 44 g</td>
</tr>
<tr>
<td>Weight (pigtail)</td>
<td>Ca. 20 g</td>
</tr>
</tbody>
</table>

¹ Max. 10 % ripple, within Uᵢ, ~ 50 Hz / 100 Hz
² With connected IP 67 plug

### Operating range

<table>
<thead>
<tr>
<th>Part number</th>
<th>Design</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE 10-RL-PS-E4</td>
<td>Receiver</td>
<td>602-71000</td>
</tr>
<tr>
<td>FS 10-RL-E4</td>
<td>Transmitter</td>
<td>601-61000</td>
</tr>
<tr>
<td>FE 10-RL-NS-E4</td>
<td>Receiver</td>
<td>602-71001</td>
</tr>
<tr>
<td>FE 10-RL-PK4</td>
<td>Receiver</td>
<td>602-71002</td>
</tr>
<tr>
<td>FS 10-RL-K4</td>
<td>Transmitter</td>
<td>601-61002</td>
</tr>
<tr>
<td>FS 10-RL-NS-K4</td>
<td>Receiver</td>
<td>602-71003</td>
</tr>
<tr>
<td>FS 10-RL-PS-KM4</td>
<td>Receiver</td>
<td>602-71004</td>
</tr>
<tr>
<td>FS 10-RL-KM4</td>
<td>Transmitter</td>
<td>601-61004</td>
</tr>
<tr>
<td>FS 10-RL-NS-KM4</td>
<td>Receiver</td>
<td>602-71005</td>
</tr>
<tr>
<td>FS 10-RL-PS-KM3</td>
<td>Receiver</td>
<td>602-71006</td>
</tr>
<tr>
<td>FS 10-RL-KM3</td>
<td>Transmitter</td>
<td>601-61005</td>
</tr>
</tbody>
</table>

### Switching output

<table>
<thead>
<tr>
<th>Operating range</th>
<th>Type of connection</th>
<th>Part number</th>
<th>Design</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ... 3 m</td>
<td>–</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FE 10-RL-PS-E4</td>
<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>PNP</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FS 10-RL-E4</td>
<td>Transmitter</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>NPN</td>
<td>Plug, M5x0.5, 4-pin</td>
<td>FE 10-RL-NS-E4</td>
<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>PNP</td>
<td>Cable, 2 m, 4-wire</td>
<td>FE 10-RL-PK4</td>
<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>–</td>
<td>Cable, 2 m, 4-wire</td>
<td>FS 10-RL-K4</td>
<td>Transmitter</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>NPN</td>
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<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 4-pin</td>
<td>FS 10-RL-PS-KM4</td>
<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>–</td>
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<td>FS 10-RL-KM4</td>
<td>Transmitter</td>
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<tr>
<td>1 ... 3 m</td>
<td>NPN</td>
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<td>Receiver</td>
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<tr>
<td>1 ... 3 m</td>
<td>PNP</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FE 10-RL-PS-KM3</td>
<td>Receiver</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>–</td>
<td>Pigtail, 200 mm with M8 plug, 3-pin</td>
<td>FS 10-RL-KM3</td>
<td>Transmitter</td>
</tr>
<tr>
<td>1 ... 3 m</td>
<td>–</td>
<td>–</td>
<td>–</td>
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### Type of connection

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<tr>
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<tr>
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<td>–</td>
<td>–</td>
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<th>Part number</th>
<th>Design</th>
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<td>Receiver</td>
<td>602-71008</td>
</tr>
</tbody>
</table>

Including dovetail clamp mounting MBD F 10 for all types

### Plug connection

- **Connection, transmitter, 4-pin**

  ![Diagram of plug connection](image1)

- **Connection, receiver, 4-pin**

  ![Diagram of cable connection](image2)

### Cable connection

- **Connection, transmitter, 3-pin**

  ![Diagram of plug connection](image3)

- **Connection, receiver, 3-pin**

  ![Diagram of cable connection](image4)

### Light spot size

![Graph of light spot size](image5)

### Accessories

- **Connection cables**
  - From Page A-34
- **Brackets**
  - From Page A-4