



## Trigger marks sensor OBP120-R100-2EP-IO-V31-L



- Miniature design with versatile mounting options
- For detecting black trigger marks on a white background
- DuraBeam Laser Sensors - durable and employable like an LED
- Extended temperature range  
-40 °C ... 60 °C
- High degree of protection IP69K
- IO-Link interface for service and process data

### Laser trigger marks sensor



**IO-Link**

### Function

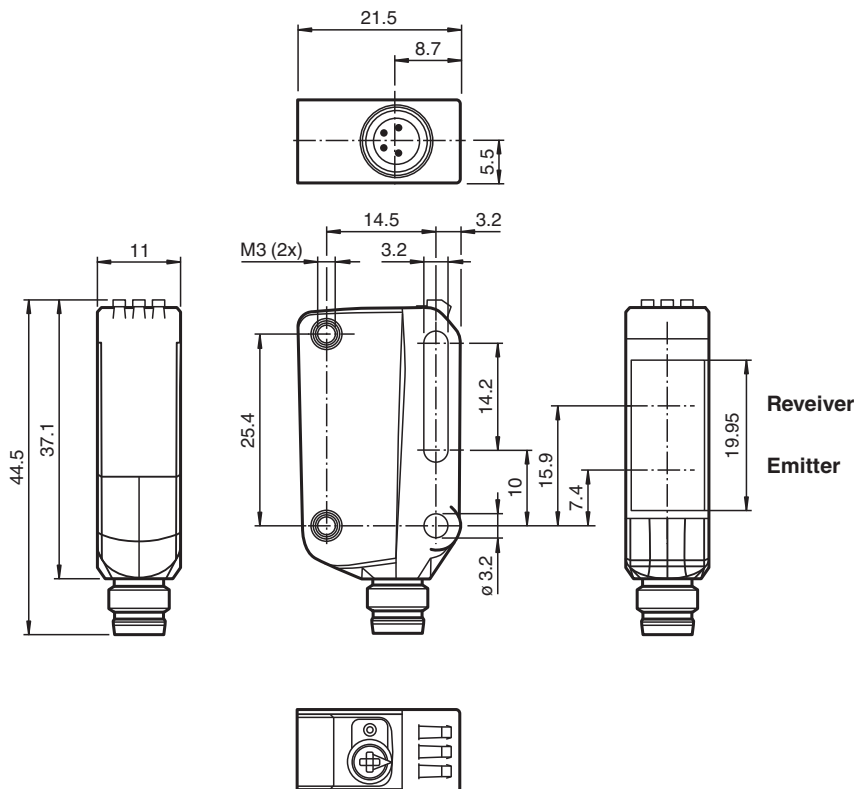
The R100 series miniature optical sensors are the first devices of their kind to offer an end-to-end solution in a small single standard design — from thru-beam sensor through to a distance measurement device. As a result of this design, the sensors are able to perform practically all standard automation tasks.

The entire series enables sensors to communicate via IO-Link.

The DuraBeam laser sensors are durable and can be used in the same way as a standard sensor.

The use of Multi Pixel Technology gives the standard sensors a high level of flexibility and enables them to adapt more effectively to their operating environment.

### Dimensions



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Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

Pepperl+Fuchs Group  
www.pepperl-fuchs.com

USA: +1 330 486 0001  
fa-info@us.pepperl-fuchs.com

Germany: +49 621 776 1111  
fa-info@de.pepperl-fuchs.com

Singapore: +65 6779 9091  
fa-info@sg.pepperl-fuchs.com

**PEPPERL+FUCHS**

## Technical Data

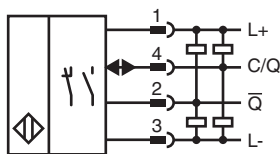
|                                             |                |                                                                                                                                                                                                                                       |
|---------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General specifications</b>               |                |                                                                                                                                                                                                                                       |
| Detection range                             |                | 25 ... 120 mm                                                                                                                                                                                                                         |
| Adjustment range                            |                | 25 ... 120 mm                                                                                                                                                                                                                         |
| Reference target                            |                | standard white, 100 mm x 100 mm                                                                                                                                                                                                       |
| Light source                                |                | laser diode                                                                                                                                                                                                                           |
| Light type                                  |                | modulated visible red light                                                                                                                                                                                                           |
| Laser nominal ratings                       |                |                                                                                                                                                                                                                                       |
| Note                                        |                | LASER LIGHT , DO NOT STARE INTO BEAM                                                                                                                                                                                                  |
| Laser class                                 |                | 1                                                                                                                                                                                                                                     |
| Wave length                                 |                | 680 nm                                                                                                                                                                                                                                |
| Beam divergence                             |                | > 5 mrad d63 < 1 mm in the range of 50 mm ... 250 mm                                                                                                                                                                                  |
| Pulse length                                |                | 1.6 µs                                                                                                                                                                                                                                |
| Repetition rate                             |                | approx. 28.5 kHz                                                                                                                                                                                                                      |
| max. pulse energy                           |                | 10.4 nJ                                                                                                                                                                                                                               |
| Optical resolution                          |                | Trigger mark [black, 6%] of 1 mm-wide on a white background [white, 90%]; Contrast difference of min. 50%                                                                                                                             |
| Diameter of the light spot                  |                | < 1 mm at a distance of 60 mm                                                                                                                                                                                                         |
| Opening angle                               |                | approx. 0.3 °                                                                                                                                                                                                                         |
| Ambient light limit                         |                | EN 60947-5-2 : 40000 Lux                                                                                                                                                                                                              |
| Teach-in                                    |                | static and dynamic Teach-In                                                                                                                                                                                                           |
| <b>Functional safety related parameters</b> |                |                                                                                                                                                                                                                                       |
| MTTF <sub>d</sub>                           |                | 560 a                                                                                                                                                                                                                                 |
| Mission Time (T <sub>M</sub> )              |                | 20 a                                                                                                                                                                                                                                  |
| Diagnostic Coverage (DC)                    |                | 0 %                                                                                                                                                                                                                                   |
| <b>Indicators/operating means</b>           |                |                                                                                                                                                                                                                                       |
| Operation indicator                         |                | LED green:<br>constantly on - power on<br>flashing (4Hz) - short circuit<br>flashing with short break (1 Hz) - IO-Link mode                                                                                                           |
| Function indicator                          |                | LED yellow:<br>constantly on - object detected<br>constantly off - object not detected                                                                                                                                                |
| Control elements                            |                | Teach-In key                                                                                                                                                                                                                          |
| Control elements                            |                | 5-step rotary switch for operating modes selection                                                                                                                                                                                    |
| <b>Electrical specifications</b>            |                |                                                                                                                                                                                                                                       |
| Rated operating voltage                     | U <sub>e</sub> | 10 ... 30 V DC                                                                                                                                                                                                                        |
| Ripple                                      |                | max. 10 %                                                                                                                                                                                                                             |
| No-load supply current                      | I <sub>0</sub> | < 20 mA at 24 V supply voltage                                                                                                                                                                                                        |
| Protection class                            |                | III                                                                                                                                                                                                                                   |
| <b>Interface</b>                            |                |                                                                                                                                                                                                                                       |
| Interface type                              |                | IO-Link ( via C/Q = pin 4 )                                                                                                                                                                                                           |
| IO-Link revision                            |                | 1.1                                                                                                                                                                                                                                   |
| Device profile                              |                | Smart Sensor                                                                                                                                                                                                                          |
| Device ID                                   |                | 0x110C01 (1117185)                                                                                                                                                                                                                    |
| Transfer rate                               |                | COM2 (38.4 kBit/s)                                                                                                                                                                                                                    |
| Min. cycle time                             |                | 2.3 ms                                                                                                                                                                                                                                |
| Process data width                          |                | Process data input 1 Bit<br>Process data output 2 Bit                                                                                                                                                                                 |
| SIO mode support                            |                | yes                                                                                                                                                                                                                                   |
| Compatible master port type                 |                | A                                                                                                                                                                                                                                     |
| <b>Output</b>                               |                |                                                                                                                                                                                                                                       |
| Switching type                              |                | The switching type of the sensor is adjustable. The default setting is:<br>C/Q - Pin4: NPN normally open / light-on, PNP normally closed / dark-on, IO-Link<br>/Q - Pin2: NPN normally closed / dark-on, PNP normally open / light-on |
| Signal output                               |                | 2 push-pull (4 in 1) outputs, short-circuit protected, reverse polarity protected, overvoltage protected                                                                                                                              |
| Switching voltage                           |                | max. 30 V DC                                                                                                                                                                                                                          |

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Technical Data

|                                   |                  |                                                                                                                                                             |
|-----------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switching current                 |                  | max. 100 mA , resistive load                                                                                                                                |
| Usage category                    |                  | DC-12 and DC-13                                                                                                                                             |
| Voltage drop                      | U <sub>d</sub>   | ≤ 1.5 V DC                                                                                                                                                  |
| Switching frequency               | f                | 3300 Hz                                                                                                                                                     |
| Response time                     |                  | 125 µs                                                                                                                                                      |
| <b>Conformity</b>                 |                  |                                                                                                                                                             |
| Communication interface           |                  | IEC 61131-9                                                                                                                                                 |
| Product standard                  |                  | EN 60947-5-2                                                                                                                                                |
| Laser safety                      |                  | EN 60825-1:2014                                                                                                                                             |
| <b>Approvals and certificates</b> |                  |                                                                                                                                                             |
| Protection class                  |                  |                                                                                                                                                             |
| Rated insulation voltage          | U <sub>i</sub>   | 30 V                                                                                                                                                        |
| Rated impulse withstand voltage   | U <sub>imp</sub> | 800 V                                                                                                                                                       |
| UL approval                       |                  | E87056 , cULus Listed , class 2 power supply , type rating 1                                                                                                |
| FDA approval                      |                  | IEC 60825-1:2014 Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3 as described in Laser Notice 56, dated May 8, 2019. |
| <b>Ambient conditions</b>         |                  |                                                                                                                                                             |
| Ambient temperature               |                  | -40 ... 60 °C (-40 ... 140 °F)                                                                                                                              |
| Storage temperature               |                  | -40 ... 70 °C (-40 ... 158 °F)                                                                                                                              |
| Pollution degree                  |                  | 3                                                                                                                                                           |
| <b>Mechanical specifications</b>  |                  |                                                                                                                                                             |
| Degree of protection              |                  | IP67 / IP69 / IP69K                                                                                                                                         |
| Connection                        |                  | M8 x 1 connector, 4-pin                                                                                                                                     |
| Material                          |                  |                                                                                                                                                             |
| Housing                           |                  | PC (Polycarbonate)                                                                                                                                          |
| Optical face                      |                  | PMMA                                                                                                                                                        |
| Mass                              |                  | approx. 10 g                                                                                                                                                |
| Dimensions                        |                  |                                                                                                                                                             |
| Height                            |                  | 44.5 mm                                                                                                                                                     |
| Width                             |                  | 11 mm                                                                                                                                                       |
| Depth                             |                  | 21.5 mm                                                                                                                                                     |

Connection Assignment



Connection Assignment



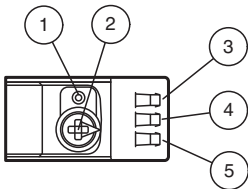
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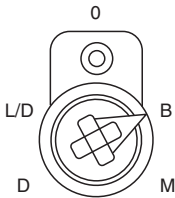
Wire colors in accordance with EN 60947-5-2

|   |    |         |
|---|----|---------|
| 1 | BN | (brown) |
| 2 | WH | (white) |
| 3 | BU | (blue)  |
| 4 | BK | (black) |

Assembly



|   |                                |
|---|--------------------------------|
| 1 | Teach-in button                |
| 2 | Mode rotary switch             |
| 3 | Operating indicator / dark on  |
| 4 | Signal indicator               |
| 5 | Operating indicator / light on |



|     |                     |
|-----|---------------------|
| B   | Teach-In background |
| M   | Teach-In mark       |
| D   | Teach-In dynamic    |
| L/D | Switching type      |
| o   | Keylock             |

Safety Information



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## Interface

### IO-Link Function

The IO-Link operating mode is indicated by the green LED indicator with a short interruption ( $f = 1 \text{ Hz}$ ). IO-Link communication simultaneously provides process data (measurement data from the sensor) and access to service data.

The service data contains the following information:

#### Identification

- Manufacturer information
- Product ID
- User-specific ID

#### Device parameters

- Teach-in parameters
- Operating parameters
- Configuration parameters
- Device commands

#### Diagnostic messages and warnings

## Commissioning

### Teach-In Using the Rotary Switch

The settings for the following teach-ins can be adjusted directly on the device:

- Two-value teach-in
- Dynamic teach-in

Use the rotary switch to select the required teach-in mode.

#### Two-Value Teach-In

Align the light beam of the sensor to the background at the required operating distance.

##### Teaching in a Background:

1. Turn the rotary switch to the "B" (Background) position.
2. Press the "TI" button until the yellow and green LEDs flash in phase (approx. 1 s).
3. Release the "TI" button. Teach-in starts. => Yellow and green LEDs flash out of phase.
4. Wait until the green LED lights up permanently and the yellow LED flashes quickly.

The sensor is now ready for the 2<sup>nd</sup> teach-in value (mark) to be taught in.

##### Teaching in a Mark:

1. Turn the rotary switch to the "M" (Mark) position.
2. Position the mark in front of the light beam of the sensor at the required operating distance.
3. Press the "TI" button until the yellow and green LEDs flash in phase (approx. 1 s).
4. Release the "TI" button. Teach-in starts.
5. Wait until the green LED lights up permanently.

The teach-in process is now complete.

Alternatively, you can teach in the mark before the background.

**Note:** To exit two-value teach-in mode, a teach-in must always be performed in both the "B" and "M" rotary switch positions.

##### Teaching in a Mark Without a Background:

You can teach in an object as the background ("B") and as the mark ("M") if it is located at the required operating distance. Proceed as described for the two-value teach-in process.

- The sensor detects the object as a mark. => Sensor switches on.
- A lighter object color is detected as the background. => Sensor switches off.

#### Dynamic Teach-In

Requirement: The moving object to be detected has areas with sufficient contrast difference (mark/background).

1. Align the light beam of the sensor to the section of the object that will be used as the background at the required operating distance.
2. Turn the rotary switch to the "D" (Dynamic) position.

##### Starting the Teach-In Process:

1. Press the "TI" button until the yellow and green LEDs flash in phase (approx. 1 s).
2. Release the "TI" button. The dynamic teach-in process starts. => The green LED lights up permanently, while the yellow LED flashes quickly.
3. For each change in contrast, move the object between the mark and the background.

##### Ending the Dynamic Teach-In Process:

1. Press the "TI" button again until the yellow and green LEDs flash in phase (approx. 1 s).
2. Wait until the green LED lights up permanently.

The teach-in process is now complete.

#### Teach-in Errors

The teach-in may not be set correctly if there is insufficient contrast difference between the mark and the background. If so, the yellow and green LEDs flash quickly in antiphase (8 Hz).

After the visual error message has been acknowledged, the sensor continues to operate using its last valid settings.

#### Sensor Operation with Taught-In Values

For the sensor to use the taught-in values in the application, set the rotary switch to the "O" (Operate) position.

#### Switching between Light on/Dark on

Set the rotary switch to "L/D" (Light on / Dark on).

##### Changing the Switching Type:

Press the "TI" button for > 1 s.

=> Changeover successful: The respective operating indicator LED (L/D) lights up green.

##### Resetting the Switching Type:

Press the "TI" button for > 4 s.

=> Reset successful: The respective operating indicator LED (L/D) lights up green. The operating indicator is reset to the last active switching type.

#### Resetting to Default Settings

Set the rotary switch to "O."

Press the "TI" button for > 10 s until the yellow and green LEDs go out.

Release the "TI" button. The yellow LED lights up.

After completing the reset, the sensor will immediately operate with the factory settings.

## Parameterization

For parameterization and diagnosis, the sensor can be addressed via the integrated IO-Link interface. This interface transmits process data in a cyclic manner, and diagnosis data acyclically.

For this, connect the sensor to an IO-Link primary device and connect the relevant primary device port to the IO-Link device. When communication is established successfully, the green operation display LED flashes briefly every 1 s. The sensor can then be configured or diagnosed by the overlying application and send its process data.

The sensor parameters are device-specific and are described in the standardized IO Device Description file (IODD). The IODD can be read into different engineering tools using IODD support from different system providers. The sensor can then be configured or diagnosed using the relevant tool and a user interface generated from the IODD.

The IODD file, the FDT framework application and the IODD interpreter are available in the corresponding product description under Software on our homepage [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).