**Model Number**
ML9-54-G/82b/103/143
Retroreflective sensor with 4-pin, M8 x 1 connector

**Features**
- Ultra bright LEDs for power on, pre-fault indication and switching state
- Flashing power on LED in case of short-circuit
- TEACH-IN
- Automatic adjustment in case of soiling in contrast detection mode
- Not sensitive to ambient light, even with switched energy saving lamps
- Protected against mutual interference (no cross-talk)
- Protection class II

**Dimensions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>10.1</td>
</tr>
<tr>
<td>Height</td>
<td>15.4</td>
</tr>
<tr>
<td>Depth</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Electrical connection**

<table>
<thead>
<tr>
<th>Option</th>
<th>82b/103</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+UB</td>
</tr>
<tr>
<td>2</td>
<td>Alarm-Out</td>
</tr>
<tr>
<td>3</td>
<td>0 V</td>
</tr>
<tr>
<td>4</td>
<td>Q</td>
</tr>
</tbody>
</table>

**Pinout**

- 1: LED green
- 2: LED yellow
- 3: Teach-In

**Indicators/operating means**

- 1: Light on
- 2: Dark on
### Technical data

#### General specifications

- **Effective detection range**: 0 ... 3.5 m in TEACH mode, 0 ... 5.7 m in normal mode
- **Reflector distance**: 0 ... 3.5 m in TEACH mode, 0 ... 5.7 mm in normal mode
- **Threshold detection range**: 7.6 m
- **Reference target**: H85-2 reflector
- **Light source**: LED
- **Light type**: modulated visible red light, 660 nm
- **Polarization filter**: yes
- **Angle deviation**: max. ± 1°
- **Diameter of the light spot**: approx. 40 mm at detection range 1 m
- **Angle of divergence**: 1.7°
- **Ambient light limit**: 40000 Lux

#### Functional safety related parameters

- **MTTF<sub>d</sub>**: 1050 a
- **Mission Time (T<sub>M</sub>)**: 20 a
- **Diagnostic Coverage (DC)**: 0 %

#### Indicators/operating means

- **Operation indicator**: LED green, statically lit Power on, Undervoltage indicator: Green LED, pulsing (approx. 0.6 Hz), short-circuit: LED green flashing (approx. 4 Hz)
- **Function indicator**: LED yellow: switching state; Stability control; Teach-In
- **Control elements**: Teach-In key
- **Contrast detection levels**: 10 % - clean, water filled PET bottles

#### Electrical specifications

- **Operating voltage** ($U_0$): 10 ... 30 V DC, class 2
- **Ripple**: max. 10 %
- **No-load supply current** ($I_0$): < 20 mA at 24 V DC

#### Output

- **Pre-fault indication output**: 1 PNP function reserve output (alarm), short-circuit protected, protected from reverse polarity, open collector
- **Switching type**: dark on
- **Signal output**: 1 PNP output, short-circuit protected, reverse polarity protected, open collector
- **Switching voltage**: max. 30 V DC
- **Switching current**: max. 100 mA
- **Switching frequency ($f$)**: 1000 Hz
- **Response time**: 500 µs

#### Ambient conditions

- **Ambient temperature**: -20 ... 60 °C (-4 ... 140 °F)
- **Storage temperature**: -40 ... 75 °C (-40 ... 167 °F)

#### Mechanical specifications

- **Degree of protection**: IP67
- **Connection**: M8 x 1 connector, 4-pin
- **Material**
  - **Housing**: PC (glass-fiber-reinforced Makrolon)
  - **Optical face**: PMMA
  - **Connector**: plastic
- **Mass**: approx. 25 g

#### Compliance with standards and directives

- **Standard conformity**
  - **Product standard**: EN 60947-5-2:2007
  - **IEC 60947-5-2:2007**
- **Standards**: EN 50178, UL 508

#### Approvals and certificates

- **Protection class**: II, rated voltage ≤ 50 V AC with pollution degree 1-2 according to IEC 60664-1 functional insulation acc. to DIN EN 50178
- **UL approval**: cULus
- **CCC approval**: CCC approval / marking not required for products rated ≤36 V

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### Accessories

- **OMH-ML9**
  Mounting bracket
- **OMH-ML9-01**
  Threaded bolt M3
- **V31-GM-2M-PVC**
  Female cordset, M8, 4-pin, PVC cable
- **V31-WM-2M-PVC**
  Female cordset, M8, 4-pin, PVC cable
- **V31-GM-5M-PUR**
  Female cordset, M8, 4-pin, PUR cable
- **V31-WM-5M-PUR**
  Female cordset, M8, 4-pin, PUR cable

Other suitable accessories can be found at www.pepperl-fuchs.com
Adjustment instructions for devices with Teach-In

After the operating voltage has been applied, the LED is lit green. The sensor is automatically set to a state of maximum sensitivity (state as supplied) or the state of the most recent Teach-In setting.

Assemble the appropriate reflector opposite the light barrier.

Teach-In using the Teach key
- Align the sensor to an appropriate reflector.
- Press the Teach key - as confirmation, the green display LED is briefly turned off once.
• Hold the Teach key down until the yellow and green display LED is flashing at regular intervals (about 2.5 Hz). Then release the Teach key.
• During the internal set-up of the sensor, the green and yellow display LEDs flash alternately (about 2.5 Hz).
• Teach-In successful: The green and yellow display LEDs are lit. Contrast detection 10% is activated. The device is ready for operation.
• Teach-In not successful: The green and yellow display LEDs flash alternately and rapidly (about 8 Hz) for about 5 seconds. Then the sensor goes to the state with maximum sensitivity. After this happens, repeat the Teach-In procedure, starting with step 1.