



**WTB4FP-2216D250A00**

W4

**PHOTOELECTRIC SENSORS**

**SICK**  
Sensor Intelligence.



## Ordering information

| Type               | part no. |
|--------------------|----------|
| WTB4FP-2216D250A00 | 1120899  |

Other models and accessories → [www.sick.com/W4](http://www.sick.com/W4)

Illustration may differ



## Detailed technical data

## Features

|  |   |
|--|---|
| <b>Functional principle</b>  | Photoelectric proximity sensor  |
| <b>Functional principle detail</b>   | Background suppression, MultiSwitch, NarrowBeam, distance value                       |
| <b>Sensing range</b>   |   |
| Sensing range min.   | 4 mm  |
| Sensing range max.   | 100 mm  |
| Adjustable switching threshold for background suppression                        | 15 mm ... 100 mm  |
| Reference object   | Object with 90% remission factor (complies with standard white according to DIN 5033) |
| Minimum distance between set sensing range and background (black 6% / white 90%) | 5 mm, at a distance of 40 mm  |
| Recommended sensing range for the best performance                               | 30 mm ... 60 mm   |
| <b>Distance value</b>  |   |
| Measuring range  | 15 mm ... 100 mm  |
| Resolution   | 1 mm  |
| Repeatability  | 0,3 mm ... 1,5 mm <sup>1) 2) 3)</sup>   |
| Accuracy   | Typ. 0.8 mm at 15 ... 60 mm distance <sup>1)</sup>                                    |

<sup>1)</sup> 6% ... 90% remission factor.

<sup>2)</sup> Equivalent to 1 σ.

<sup>3)</sup> See repeatability characteristic lines.

|  |   |  |
|--|---|--|
|  | Distance value output   | Typ. 2.0 mm at 60 ... 100 mm distance <sup>1)</sup>  |
|  | Update rate of the distance value   | 20 ms  |
| <b>Emitted beam</b>                          |   |  |
|  | Light source  | PinPoint LED   |
|  | Type of light   | Visible red light  |
|  | Shape of light spot   | Point-shaped   |
|  | Light spot size (distance)  | Ø 2 mm (50 mm)   |
|  | Maximum dispersion of the emitted beam around the standardized transmission axis (squint angle) | < +/- 1.5° (at Ta = +23 °C)  |
| <b>Key LED figures</b>                       |   |  |
|  | Normative reference   | EN 62471:2008-09   IEC 62471:2006, modified  |
|  | LED risk group marking  | Free group   |
|  | Wave length   | 635 nm   |
|  | Average service life  | 100,000 h at Ta = +25 °C   |
| <b>Smallest detectable object (MDO) typ.</b> |   | 0.1 mm (At 50 mm distance (object with 90% remission (complies with standard white according to DIN 5033)))                                |
| <b>Adjustment</b>                            |   |  |
|  | Teach-in button   | BluePilot: For setting the sensing range   |
|  | IO-Link   | For configuring the sensor parameters and Smart Task functions   |
| <b>Display</b>                               |   |  |
|  | LED blue  | BluePilot: Display of mode, display of output states Q <sub>L1</sub> (LED 1-3 permanently on) and Q <sub>L2</sub> (LED 5-7 permanently on) |
|  | LED green   | Operating indicatorStatic on: power on/Flashing: IO-Link mode  |
|  | LED yellow  | Status of received light beamStatic on: object presentStatic off: object not present   |
| <b>Special applications</b>                  |   | Detecting flat objects, Detecting small objects  |

<sup>1)</sup> 6% ... 90% remission factor.

<sup>2)</sup> Equivalent to 1 σ.

<sup>3)</sup> See repeatability characteristic lines.

### Safety-related parameters

|                                     |           |
|-------------------------------------|-----------|
| <b>MTTF<sub>D</sub></b>             | 642 years |
| <b>DC<sub>avg</sub></b>             | 0 %       |
| <b>T<sub>M</sub> (mission time)</b> | 20 years  |

### Communication interface

|                        |  |
|------------------------|--|
| <b>IO-Link</b>         | ✓, IO-Link V1.1  |
| Data transmission rate | COM2 (38,4 kBaud)  |
| Cycle time             | 2.3 ms   |
| Process data length    | 16 Bit   |
| Process data structure | Bit 0 = switching signal Q <sub>L1</sub><br>Bit 1 = switching signal Q <sub>L2</sub><br>Process data structure: A: Bit 2 ... 15 = Current receiver level (live). Process data structure B: Bit 2 ... 15 = Distance to object. Can be switched between A and B via IO-Link. |

|                             |          |
|-----------------------------|----------|
| VendorID                    | 26       |
| DeviceID HEX                | 0x8002C2 |
| DeviceID DEC                | 8389314  |
| Compatible master port type | A        |
| SIO mode support            | Yes      |

## Electronics

|  |   |
|--|---|
| <b>Supply voltage <math>U_B</math></b> | 10 V DC ... 30 V DC <sup>1)</sup>   |
| <b>Ripple</b>                          | $\leq 5 \text{ V}_{\text{pp}}$  |
| <b>Usage category</b>                  | DC-12 (According to EN 60947-5-2)<br>DC-13 (According to EN 60947-5-2)  |
| <b>Current consumption</b>             | $\leq 25 \text{ mA}$ , without load. At $U_B = 24 \text{ V}$  |
| <b>Protection class</b>                | III   |
| <b>Digital output</b>                  |   |
| Number                                 | 2 (individually adjustable)   |
| Type                                   | Push-pull: PNP/NPN  |
| Switching mode                         | Light switching   |
| Signal voltage PNP HIGH/LOW            | Approx. $U_B - 2.5 \text{ V} / 0 \text{ V}$   |
| Signal voltage NPN HIGH/LOW            | Approx. $U_B / < 2.5 \text{ V}$   |
| Output current $I_{\text{max.}}$       | $\leq 100 \text{ mA}$   |
| Circuit protection outputs             | Reverse polarity protected<br>Overcurrent protected<br>Short-circuit protected  |
| Response time                          | $\leq 1,000 \mu\text{s}$ <sup>2)</sup>  |
| Repeatability (response time)          | 360 $\mu\text{s}$   |
| Switching frequency                    | 500 Hz <sup>3)</sup>  |
| <b>Pin/Wire assignment</b>             |   |
| Function of pin 4/black (BK)           | Digital output, light switching, object present $\rightarrow$ output $Q_{L1}$ HIGH; IO-Link communication C <sup>4)</sup> |
| Function of pin 4/black (BK) – detail  | The pin 4 function of the sensor can be configured<br>Additional possible settings via IO-Link                            |
| Function of pin 2/white (WH)           | Digital output, light switching, object present $\rightarrow$ output $Q_{L2}$ HIGH <sup>4)</sup>                          |
| Function of pin 2/white (WH) – detail  | The pin 2 function of the sensor can be configured<br>Additional possible settings via IO-Link                            |

<sup>1)</sup> Limit values.<sup>2)</sup> Signal transit time with resistive load in switching mode.<sup>3)</sup> With light/dark ratio 1:1.<sup>4)</sup> This switching output must not be connected to another output.

## Mechanics

|                               |                           |
|-------------------------------|---------------------------|
| <b>Housing</b>                | Rectangular               |
| <b>Design detail</b>          | Flat                      |
| <b>Dimensions (W x H x D)</b> | 16 mm x 40.1 mm x 12.1 mm |
| <b>Connection</b>             | Male connector M8, 4-pin  |
| <b>Material</b>               |                           |

|   |                  |
|---|------------------|
| Housing   | Plastic, VISTAL® |
| Front screen  | Plastic, PMMA    |
| Male connector  | Plastic, VISTAL® |
| <b>Weight</b>   | Approx. 30 g     |
| <b>Maximum tightening torque of the fixing screws</b> | 0.4 Nm           |

## Ambient data

|  |   |
|--|---|
| <b>Enclosure rating</b>                    | IP66 (EN 60529)<br>IP67 (EN 60529)  |
| <b>Ambient operating temperature</b>       | -40 °C ... +60 °C   |
| <b>Ambient temperature, storage</b>        | -40 °C ... +75 °C   |
| <b>Typ. Ambient light immunity</b>         | Artificial light: ≤ 50,000 lx<br>Sunlight: ≤ 50,000 lx  |
| <b>Shock resistance</b>                    | 30 g, 11 ms (3 positive and 3 negative shocks along X, Y, Z axes, 18 total shocks (EN60068-2-27)) |
| <b>Vibration resistance</b>                | 10 Hz ... 1,000 Hz (Amplitude 1 mm, 3 x 30 min (EN60068-2-6))                                     |
| <b>Air humidity</b>                        | 35 % ... 95 %, relative humidity (no condensation)  |
| <b>Electromagnetic compatibility (EMC)</b> | EN 60947-5-2  |
| <b>Resistance to cleaning agent</b>        | ECOLAB  |
| <b>UL File No.</b>                         | NRKH.E181493 & NRKH7.E181493  |

## Smart Task

|                            |   |
|----------------------------|---|
| <b>Smart Task name</b>     | Base logics   |
| <b>Logic function</b>      | Direct<br>AND<br>OR<br>Window<br>Hysteresis   |
| <b>Timer function</b>      | Deactivated<br>Switch-on delay<br>Off delay<br>ON and OFF delay<br>Impulse (one shot) |
| <b>Inverter</b>            | Yes   |
| <b>Switching frequency</b> | SIO Logic: 450 Hz <sup>1)</sup><br>IOL: 450 Hz <sup>2)</sup>                          |
| <b>Response time</b>       | SIO Logic: 1100 µs <sup>1)</sup><br>IOL: 1100 µs <sup>2)</sup>                        |
| <b>Repeatability</b>       | SIO Logic: 400 µs <sup>1)</sup><br>IOL: 450 µs <sup>2)</sup>                          |
| <b>Switching signal</b>    | Switching signal Q <sub>L1</sub><br>Switching signal Q <sub>L2</sub>                  |
|                            | Switching output<br>Switching output  |

<sup>1)</sup> Use of Smart Task functions without IO-Link communication (SIO mode).<sup>2)</sup> Use of Smart Task functions with IO-Link communication function.

## Diagnosis

|                           |  |
|---------------------------|--|
| <b>Device temperature</b> |  |
|---------------------------|--|

|  |                                      |
|--|--------------------------------------|
| Measuring range                                    | Very cold, cold, moderate, warm, hot |
| <b>Device status</b>                               | Yes                                  |
| <b>Detailed device status</b>                      | Yes                                  |
| <b>Operating hour counter</b>                      | Yes                                  |
| <b>Operating hours counter with reset function</b> | Yes                                  |
| <b>Quality of teach</b>                            | Yes                                  |

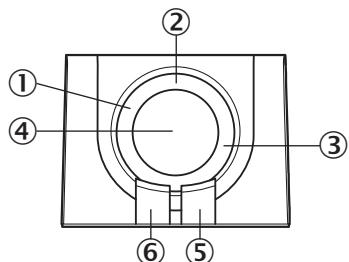
## Certificates

|   |   |
|---|---|
| <b>EU declaration of conformity</b>       | ✓ |
| <b>UK declaration of conformity</b>       | ✓ |
| <b>ACMA declaration of conformity</b>     | ✓ |
| <b>Moroccan declaration of conformity</b> | ✓ |
| <b>China-RoHS</b>                         | ✓ |
| <b>ECOLAB certificate</b>                 | ✓ |
| <b>cULus certificate</b>                  | ✓ |
| <b>EAC certificate / DoC</b>              | ✓ |
| <b>IO-Link</b>                            | ✓ |

## Classifications

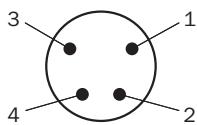
|                       |          |
|-----------------------|----------|
| <b>ECLASS 5.0</b>     | 27270904 |
| <b>ECLASS 5.1.4</b>   | 27270904 |
| <b>ECLASS 6.0</b>     | 27270904 |
| <b>ECLASS 6.2</b>     | 27270904 |
| <b>ECLASS 7.0</b>     | 27270904 |
| <b>ECLASS 8.0</b>     | 27270904 |
| <b>ECLASS 8.1</b>     | 27270904 |
| <b>ECLASS 9.0</b>     | 27270904 |
| <b>ECLASS 10.0</b>    | 27270904 |
| <b>ECLASS 11.0</b>    | 27270904 |
| <b>ECLASS 12.0</b>    | 27270903 |
| <b>ETIM 5.0</b>       | EC002719 |
| <b>ETIM 6.0</b>       | EC002719 |
| <b>ETIM 7.0</b>       | EC002719 |
| <b>ETIM 8.0</b>       | EC002719 |
| <b>UNSPSC 16.0901</b> | 39121528 |

display and adjustment elements

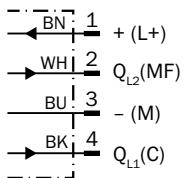


- ① LED blue
- ② indicator switching output mode
- ③ indicator distance mode
- ④ Teach-in button
- ⑤ LED yellow
- ⑥ LED green

Connection type Male connector M8, 4-pin



Connection diagram Cd-488



Truth table Push-pull: PNP/NPN - light switching Q<sub>L1</sub>

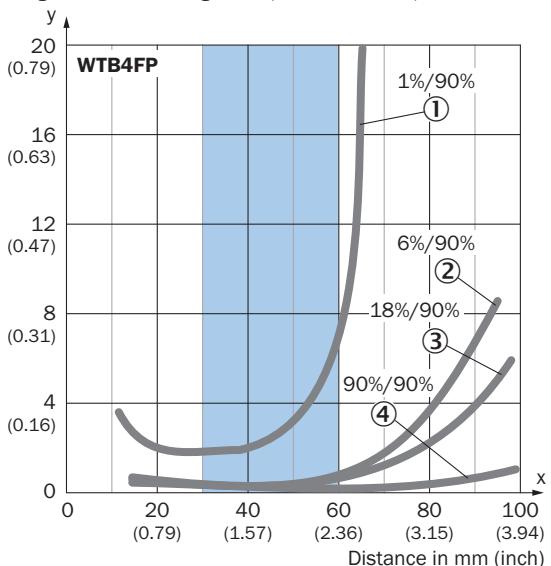
| Light switching Q <sub>L1</sub> (normally open (upper switch), normally closed (lower switch)) |                                 |                              |
|--|---------------------------------|------------------------------|
|  | Object not present → Output LOW | Object present → Output HIGH |
| Light receive  | ✗                               | ✓                            |
| Light receive indicator  | ✗                               | ✗                            |
| Load resistance to L+  | ⚡                               | ✗                            |
| Load resistance to M   | ✗                               | ⚡                            |
|  |                                 |                              |

Truth table Push-pull: PNP/NPN - light switching Q<sub>L2</sub>

| Light switching Q <sub>L2</sub> (normally open (upper switch), normally closed (lower switch)) |                                 |                              |
|--|---------------------------------|------------------------------|
|  | Object not present → Output LOW | Object present → Output HIGH |
| Light receive  | ✗                               | ✓                            |
| Light receive indicator  | ✗                               | ✗                            |
| Load resistance to L+  | ⚡                               | ✗                            |
| Load resistance to M   | ✗                               | ⚡                            |
|  |                                 |                              |

## Characteristic curve

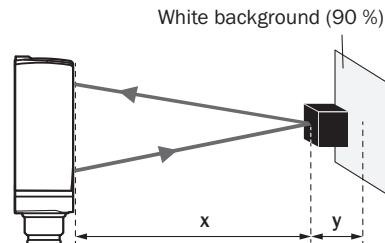
Minimum distance in mm (y) between the set sensing range and white background (90 % remission)



Recommended sensing range for the best performance

- ① ultra-black object, 1% remission factor
- ② Black object, 6% remission factor
- ③ Gray object, 18% remission factor
- ④ White object, 90% remission factor

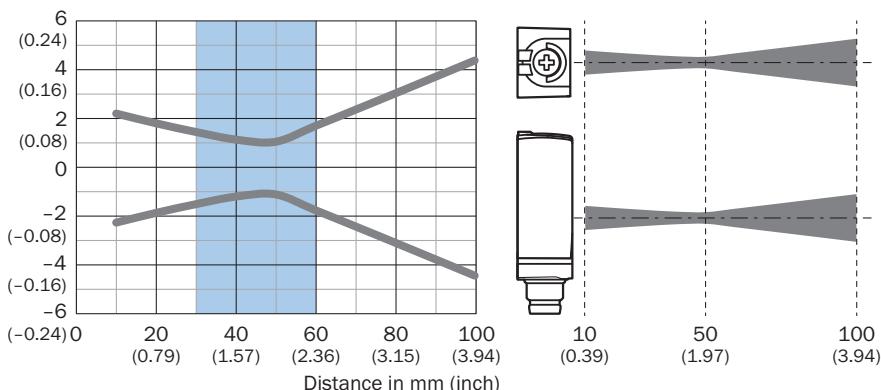
Example:  
Safe suppression of the background



White background (90 %)  
Black object (6 % remission)  
Set sensing range  $x = 40$  mm  
Needed minimum distance to white background  $y = 0.5$  mm

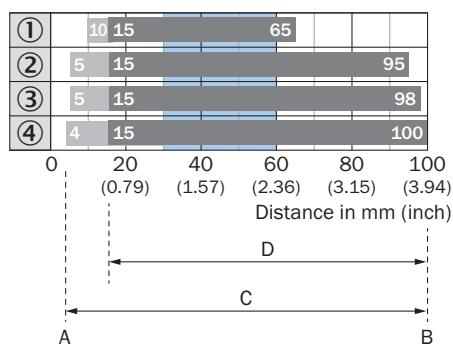
## Light spot size

Dimensions in mm (inch)



Recommended sensing range for the best performance

## Sensing range diagram



A = Sensing range min. in mm

B = Sensing range max. in mm

C = Viewing range

D = Adjustable switching threshold for background suppression

■ Recommended sensing range for the best performance

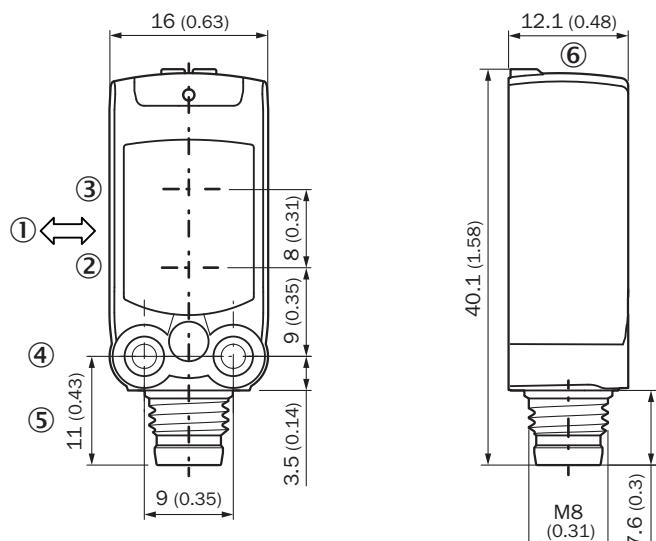
① ultra-black object, 1% remission factor

② Black object, 6% remission factor

③ Gray object, 18% remission factor

④ White object, 90% remission factor

## Dimensional drawing



Dimensions in mm (inch)

① Standard direction of the material being detected

② Center of optical axis, sender

③ Center of optical axis, receiver

④ M3 mounting hole

⑤ Connection

⑥ display and adjustment elements

## Recommended accessories

Other models and accessories → [www.sick.com/W4](http://www.sick.com/W4)

|   | Brief description   | Type       | part no. |
|---|---|------------|----------|
| Mounting systems  |   |            |          |
|  | <ul style="list-style-type: none"><li><b>Description:</b> Mounting bracket for wall mounting</li><li><b>Material:</b> Stainless steel</li><li><b>Details:</b> Stainless steel 1.4571</li><li><b>Items supplied:</b> Mounting hardware included</li><li><b>Suitable for:</b> W4S, W4F, W4S</li></ul>           | BEF-W4-A   | 2051628  |
| connectors and cables   |   |            |          |
|  | <ul style="list-style-type: none"><li><b>Connection type head A:</b> Male connector, M8, 4-pin, straight, A-coded</li><li><b>Description:</b> Unshielded</li><li><b>Connection systems:</b> Screw-type terminals</li><li><b>Permitted cross-section:</b> 0.14 mm<sup>2</sup> ... 0.5 mm<sup>2</sup></li></ul> | STE-0804-G | 6037323  |

## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

**For us, that is "Sensor Intelligence."**

## WORLDWIDE PRESENCE:

Contacts and other locations [www.sick.com](http://www.sick.com)