en 04-2015/09   50123666

## Dimensioned drawing
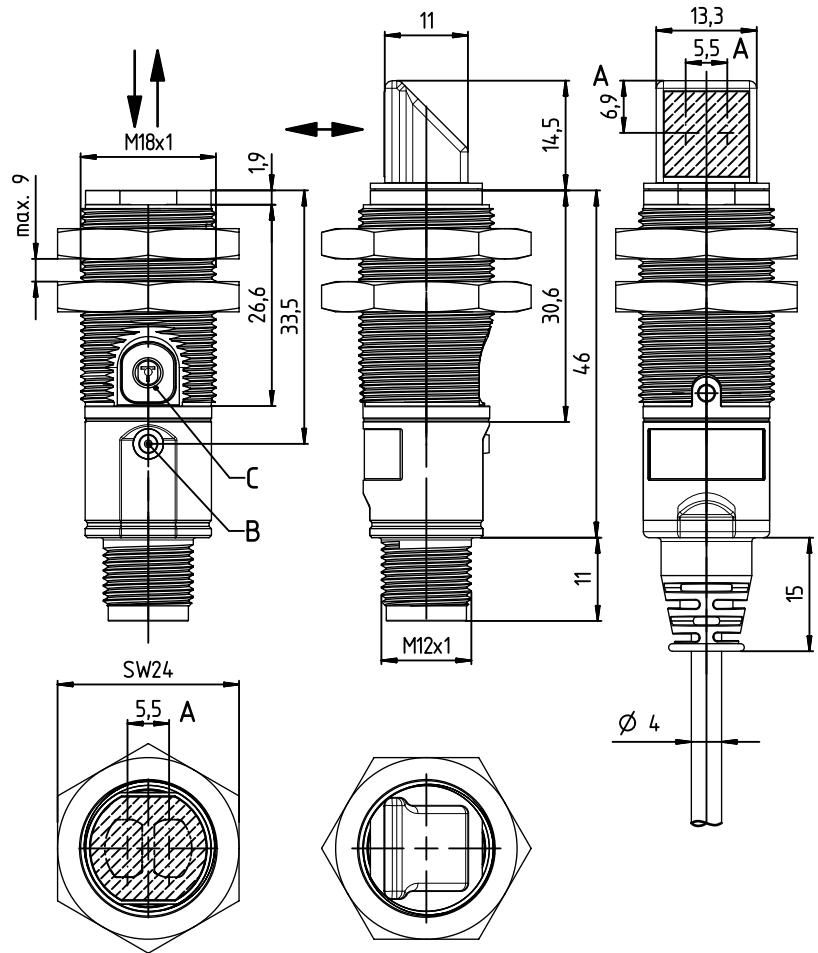


**A** Optical axes
**B** Indicator diode
**C** Teach button

**1 … 280 mm**
**2 … 120 mm**
**(with 90° angular optics)**

10 - 30 V DC

500 Hz

- Reflection light scanner with fading
- V-optics allow for reliable detection of dark objects in the short range
- Scanning range adjustment via teach-in
- Visible red light
- Axial and 90° light beam gate for flexible integration
- Active suppression of extraneous light A$^2$LS
- Fast alignment through *brightVision®*
- Simple fine adjustment via *omni-mount*
- Sturdy plastic housing with stainless steel threaded sleeve with cylindrical M18x1 design
- Full control through green and yellow indicator LEDs

CE   c(UL)us LISTED

IEC 60947...   IEC 60947...   III   IP 67

## Electrical connection
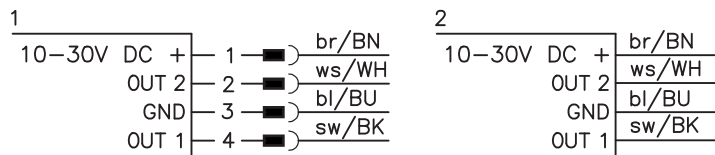


## Accessories:

**(available separately)**

- Mounting systems (BT D18M.5, BT 318…)
- M12 connectors (KD …)
- Ready-made cables (K-D …)

We reserve the right to make changes • DS_FT328_en_50123666.fm

# Specifications

## Optical data

| | |
|---|---|
| Scanning range limit [1] | axial optics: 1 … 280 mm |
| | 90° optics: 2 … 120 mm |
| Scanning range [2] | see tables |
| Light source | LED (modulated light) |
| Wavelength | 620 nm (visible red light) |

## Timing

| | |
|---|---|
| Switching frequency | 500 Hz |
| Response time | 1 ms |
| Delay before start-up | ≤ 300 ms |

## Electrical data

| | |
|---|---|
| Operating voltage $U_B$ [3] | 10 … 30 VDC (incl. residual ripple) |
| Residual ripple | ≤ 15 % of $U_B$ |
| Open-circuit current | ≤ 20 mA |
| Switching output …/4P… | 2 PNP transistor outputs |
| | pin 2: PNP dark switching, pin 4: PNP light switching |
| …/2N… | 2 NPN transistor outputs |
| | pin 2: NPN dark switching, pin 4: NPN light switching |
| Signal voltage high/low | ≥ ($U_B$-2.5V)/≤ 2.5V |
| Output current | max. 100 mA [4] |

## Indicators

| | |
|---|---|
| Green LED | ready |
| Yellow LED | reflection (object detected) |

## Mechanical data

| | |
|---|---|
| Housing | plastic with stainless steel threaded sleeve |
| Optics cover | plastic |
| Weight | 30 g with M12 connector |
| | 80 g with 2 m cable |
| Connection type | M12 connector, 4-pin |
| | cable 2 m, 4 x 0.20 mm² |

## Environmental data

| | |
|---|---|
| Ambient temp. (operation/storage) | -40 °C … +60 °C/-40 °C … +70 °C |
| Protective circuit [5] | 2, 3 |
| VDE safety class | III |
| Degree of protection | IP 67 |
| Light source | exempt group (in acc. with EN 62471) |
| Standards applied | IEC 60947-5-2 |
| Certifications | UL 508, C22.2 No.14-13 [3] [6] |

1) Scanning range limit: typical scanning range
2) Scanning range: ensured scanning range
3) For UL applications: for use in class 2 circuits according to NEC only
4) Sum of the output currents for both outputs, 50 mA when ambient temperatures > 40 °C
5) 2=polarity reversal protection, 3=short circuit protection for all outputs
6) These proximity switches shall be used with UL Listed Cable assemblies rated 30V, 0.5A min, in the field installation, or equivalent (categories: CYJV/CYJV7 or PVVA/PVVA7)

**Fading**: black/white error < 50 %

The black/white error is calculated from the scanning range against white and the reduction of the scanning range against black:

$$\text{Black/white error} = \frac{\text{Reduction of the scanning range against black}}{\text{Scanning range against white}} \times 100\%$$

### Example axial optics:

Setting: "teach on object" at 160 mm on white 90 %
- **Detection**:
  Black object, 6 %, is detected at approx. 100 mm, the black/white error here is:
  60 mm / 160 mm = approx. 38 %
Setting: "teach on object" at 120 mm on black 6 %
- **Situation in background**:
  White object, 90 %, is no longer detected at distance > 200 mm, the black/white error here is: 80 mm / 200 mm = 40 %

### Example 90° angular optics

Setting: "teach on object" at 85 mm on white 90 %
- **Detection**:
  Black object, 6 %, is detected at approx. 50 mm, the black/white error here is:
  35 mm / 85 mm = approx. 41 %
Setting: "teach on object" at 65 mm on black 6 %
- **Situation in background**:
  White object, 90 %, is no longer detected at distance > 110 mm, the black/white error here is: 45 mm / 110 mm = 41 %

# Tables

**Axial optics:**

| | | | |
|---|---|---|---|
| 1 | 1 | 215 | 280 |
| 2 | 1 | 190 | 245 |
| 3 | 3 | 150 | 190 |
| 4 | 5 | 125 | 160 |

**90° optics:**

| | | | |
|---|---|---|---|
| 1 | 2 | 100 | 120 |
| 2 | 5 | 92 | 110 |
| 3 | 7 | 76 | 92 |
| 4 | 8 | 65 | 80 |

| | |
|---|---|
| 1 | white 90 % |
| 2 | gray 50 % |
| 3 | gray 18 % |
| 4 | black 6 % |

☐ Scanning range [mm]
▨ Typ. scanning range limit [mm]

# Diagrams

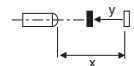**Axial optics:**

Typ. black/white behavior
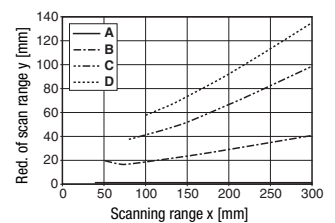
**90° optics:**

Typ. black/white behavior
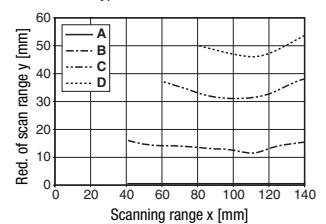
| | |
|---|---|
| A | white 90 % |
| B | gray 50 % |
| C | gray 18 % |
| D | black 6 % |

# Remarks

**Operate in accordance with intended use!**

↳ This product is not a safety sensor and is not intended as personnel protection.
↳ The product may only be put into operation by competent persons.
↳ Only use the product in accordance with the intended use.

● With the set scanning range, a tolerance of the scanning range limits is possible depending on the reflection properties of the material surface.
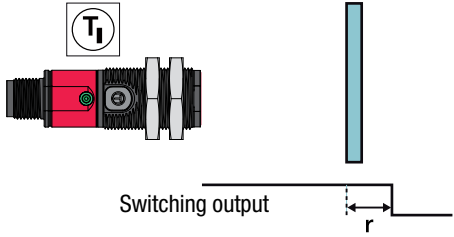
## Order guide
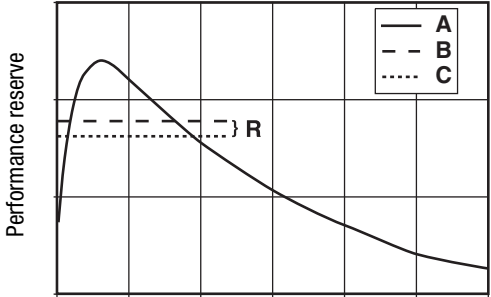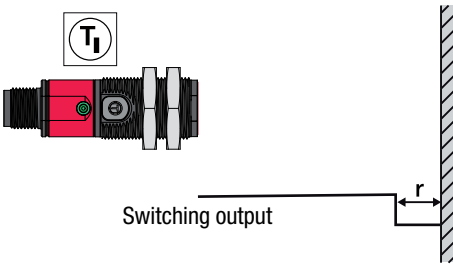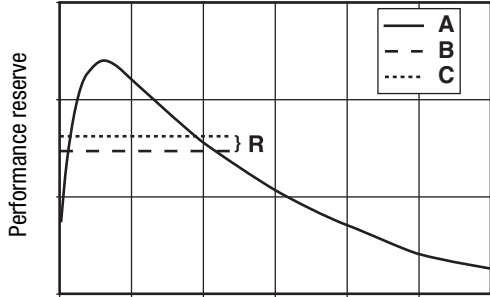
The sensors listed here are preferred types; current information at www.leuze.com.

| | | Designation | Part no. |
|---|---|---|---|
| **Sensors with axial optics** | | | |
| With M12 connector | Pin 4: PNP light switching, pin 2: PNP dark switching | FT328.3/4P-M12 | 50122717 |
| | Pin 4: NPN light switching, pin 2: NPN dark switching | FT328.3/2N-M12 | 50122719 |
| With cable, 2 m | Pin 4: PNP light switching, pin 2: PNP dark switching | FT328.3/4P | 50122718 |
| | Pin 4: NPN light switching, pin 2: NPN dark switching | FT328.3/2N | 50122720 |
| **Sensors with 90° angular optics** | | | |
| With M12 connector | Pin 4: PNP light switching, pin 2: PNP dark switching | FT328.W3/4P-M12 | 50122713 |
| | Pin 4: NPN light switching, pin 2: NPN dark switching | FT328.W3/2N-M12 | 50122715 |
| With cable, 2 m | Pin 4: PNP light switching, pin 2: PNP dark switching | FT328.W3/4P | 50122714 |
| | Pin 4: NPN light switching, pin 2: NPN dark switching | FT328.W3/2N | 50122716 |
| **Accessories for optimum fastening** | | | |
| Mounting system *omni-mount* | | BT318B-OM | 50121904 |
| Mounting bracket for standard mounting | | BT D18M.5 | 50113548 |
| Mounting bracket for *omni-mount* | | BT D21M | 50117257 |

## Part number code

```
F T 3 2 8 . W3 / 4 P - M 1 2
```

| **Operating principle** | |
|---|---|
| FT | Reflection light scanner with fading |

| **Series** | |
|---|---|
| 328 | 328 Series |

| **Equipment** | |
|---|---|
| .3 | Axial optics, teach-in via teach button |
| .W3 | 90° angular optics, teach-in via teach button |

| **Switching output/function /OUT1OUT2 (OUT1 = Pin 4, OUT2 = Pin 2)** | |
|---|---|
| 4 | PNP, light switching |
| P | PNP, dark switching |
| 2 | NPN, light switching |
| N | NPN, dark switching |
| X | Pin not used |

| **Electrical connection** | |
|---|---|
| -M12 | M12 connector, 4-pin |
| N/A | Cable, standard length 2 m |

# Teach-in method

| Teach | Operating level 1 | Operating level 2 |
|---|---|---|
| Standard Teach | **Teach on object:**<br><br>With this teach event, the object is located in front of the sensor. The switching threshold is set by the teach so that the object is detected with tight signal reserve **R**. Thus, the object is detected even if the distance increases by the value **r** with respect to the distance during the teach.<br><br>Switching output<br><br>Performance reserve / Distance<br><br>**A** Signal - object<br>**B** Teach on object<br>**C** Switching threshold | **Teach on background:**<br><br>This teach is only suitable for applications with a fixed background. The teach is performed directly on the background without an object. The switching threshold is set to a value that is just above the background signal (signal reserve **R**). Thus, objects can be detected up to a distance of **r** in front of the background.<br><br>Switching output<br><br>Performance reserve / Distance<br><br>**A** Signal - background<br>**B** Teach on background<br>**C** Switching threshold |

## *Operation via teach button*

### Teach in operating level 1

- Press teach button until the **yellow** LED flashes.
- Release teach button.
- Ready.

**2 … 7 s**

LED **yellow**
flashes at 3 Hz
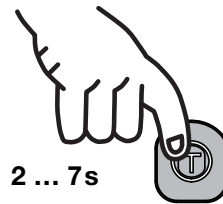
### Teach in operating level 2

- Press teach button until **green** and **yellow** LEDs flash **alternately**.
- Release teach button.
- Ready.

**7 … 12 s**

flashes **yellow** and **green** **alternately** with 3 Hz
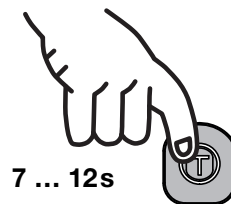
## *Adjusting the switching behavior of the switching output – light/dark switching*

This function permits inversion of the sensors' switching logic.

- Press teach button until the **green** LED flashes.
- Release teach button.
- The LED then displays the changed switching logic **for 2 s**:

| | |
|---|---|
| **YELLOW** | = switching outputs **light switching** |
| **Continuous light** | (in the case of complementary sensors, Q1 (pin 4) light switching, Q2 (pin 2) dark switching), this means output active when object is detected. |
| **GREEN** | = switching outputs **dark switching** |
| **Flashing light** | (in the case of complementary sensors, Q1 (pin 4) dark switching, Q2 (pin 2) light switching), this means output inactive when object is detected. |

- Ready.

**> 12 s**

LED **green**
flashes at 3 Hz

or
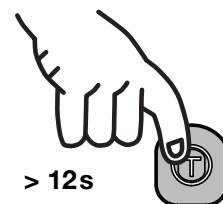
**2 s YELLOW = light switching**

flashes **GREEN for 2 s = dark switching**