

TOF type with built-in digital panel

# TOF-DL series



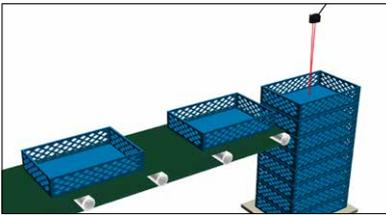
## The World's Smallest TOF Sensor lineup with analog output type

- | Analog output type and 3-control-output type
- | The world's smallest TOF sensor
- | Built-in digital display for simple setup

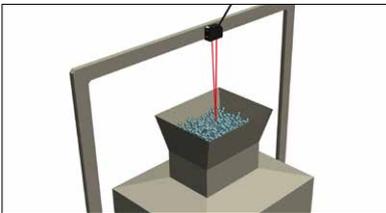


|                  |   |   |
|------------------|---|---|
| Related products | Long-range detection<br><b>C-R</b><br>● P.224 | High-accuracy measurement<br><b>CD22</b><br>● P.464 |
|                  |   |   |

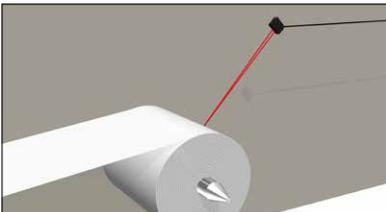
Level control for lifts



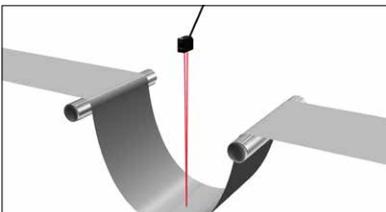
Measuring of material level in tank



Monitoring of remaining non-woven fabrics



Loop control for sheet materials



### Selection table

| Type      | Sensing distance | Interface   | Model<br>Pig tail types are shown in parentheses |
|-----------|------------------|---|--|
| Laser TOF | 0.25 to 2.5 m    | Analog output<br>Control output<br>External input | <b>TOF-DL250A</b><br>(TOF-DL250AM12)             |
|           |                  | Control output x 3<br>External input              | <b>TOF-DL250T</b><br>(TOF-DL250TM12)             |

● For the pig tail type, please order a connector cable.

### Options/Accessories

#### Connector cable



#### DOL-1205-G02M

Cable length: 2 m

\*5 m and 10 m cables are separately available.  
\*Robot cables are also available.



World's smallest\*1

Size: 17 × 32.8 × 44.4 (W × D × H) mm

# Detect from up to 2.5 m away. “Visualize” distances with the TOF-DL compact sensor.

The FASTUS TOF-DL Series is the world's smallest TOF sensor\*1. This ultra-compact laser distance sensor is capable of detecting at distances of up to 2.5 m.

With a built-in digital display, configuring settings is simple. Notably, the TOF-DL Series is most useful with applications requiring height and target distance control, such as level and position detection and loop control at a manufacturing site.

\*1 Optex FA examination performed November 2016.

Photoelectric Sensors

Specialized Photoelectric Sensors

Laser Displacement Sensors

Long-range BGS Sensors

TOF-L

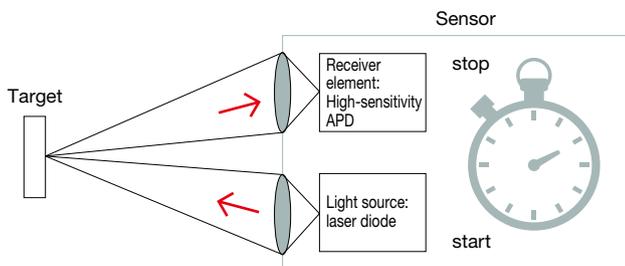
TOF-DL

TOF-3V

BGS-2V

## TOF (Time Of Flight) principle

The TOF principle measures the time it takes a pulse-emitted laser to hit a target and return, and the measurement is then converted into distance. With strong resistance to influences from the target's surface conditions, this principle is capable of producing stable detection.

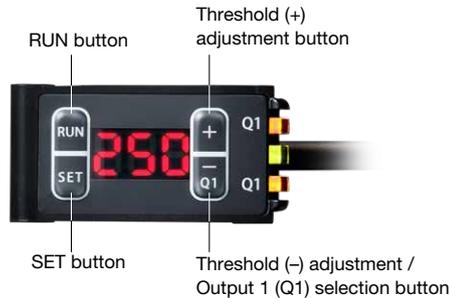


## Features

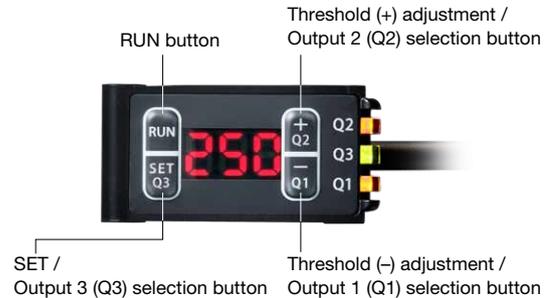
### Easy-to-See Digital Display

With its ultra-compact size, the TOF-DL Series is equipped with a three-digit, easy-to-see digital display. The display allows users to check the distance showing numerical values. This digital display also makes threshold adjustments easy.

#### ■ Analog output type



#### ■ 3-control-output type



### Easy-to-See Indicators and Stability Output

The indicators used on the TOF-DL Series allow for easy visibility from any angle.

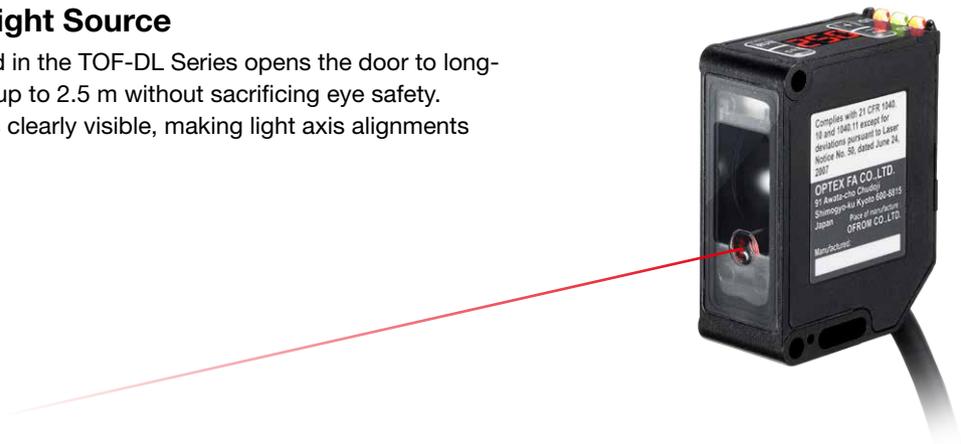
In addition, users are able to switch output 1 to Stability Output. Stability Output turns ON (Central indicator = Green) when detection is stable and turns OFF (Central indicator = Red) when detection is not possible.



Indicators visible from any direction

### Class 1 Laser Light Source

The Class 1 laser used in the TOF-DL Series opens the door to long-distance detecting at up to 2.5 m without sacrificing eye safety. In addition, the spot is clearly visible, making light axis alignments easy.



## Specifications

| Type                            |                              | Analog output type   | 3-control-output type  |
|---------------------------------|------------------------------|--|--|
| Model <sup>1</sup>              | Cable type                   | <b>TOF-DL250A</b>  | <b>TOF-DL250T</b>  |
|                                 | Pig tail type                | <b>TOF-DL250AM12</b>   | <b>TOF-DL250TM12</b>   |
| Sensing distance <sup>2</sup>   |                              | 0.25 to 2.5 m  |  |
| Light source                    | Medium/Wavelength            | Red semiconductor laser, wavelength: 650 nm  |  |
|                                 | Average output               | 390 μW or less   |  |
| Laser class                     |                              | Class 1 (IEC/JIS/FDA <sup>3</sup> )  |  |
| Spot size <sup>4</sup>          |                              | ø10 mm (At a distance of 2.5 m)  |  |
| Sampling period / Response time |                              | 200 μs / 500 μs or less (When performing moving average once)  |  |
| Hysteresis                      |                              | 15% or less  |  |
| Distance adjustment             |                              | Teaching (Manual adjustment possible after teaching)   |  |
| Indicators                      |                              | Output indicator (Orange),<br>Stability indicator / laser off indicator:<br>(Green) / (Red) / (Off)          | Output 1 indicator (Orange),<br>Output 2 indicator (Orange),<br>Output 3 indicator / Stability indicator /<br>Laser off indicator:<br>(Orange) / (Green) / (Red) / (Off) |
| Digital display                 |                              | 7-segment, 3-digit LED display (Display unit: cm)  |  |
| External input                  |                              | Laser OFF input / Teaching input (Selectable by setting)   |  |
| Control output                  | No. of outputs               | 1  | 3 (Output 3 available by switching external input)   |
|                                 | Stability output             | Output 1 switchable to stability output (Selectable by setting)  |  |
|                                 | Type                         | Open collector (NPN/PNP selectable by setting), Max. 100 mA / 30 VDC, residual voltage 1.8 V Max.            |  |
|                                 | Output mode                  | Light ON / Dark ON selectable (Output 1 through 3 will be set to same output mode for 3-control-output type) |  |
| Analog output                   | Current output               | 4 to 20 mA, Load impedance: 300 Ω or less  | Not equipped   |
|                                 | Voltage output               | 0 to 10 V, Output impedance: 100 Ω or less   |  |
| Connection type                 |                              | Cable type: ø4.5 mm, 2 m cable, Pig tail type: Cable with M12 5-pin connector, 300 mm                        |  |
| Protection circuit              |                              | Reverse connection protection, Overcurrent protection  |  |
| Rating                          | Supply voltage               | 12 to 30 VDC, including 10% ripple (p-p) <sup>5</sup>  | 10 to 30 VDC, including 10% ripple (p-p)   |
|                                 | Current consumption          | 60 mA or less <sup>6</sup>   |  |
| Applicable regulations          | EMC                          | EMC directive (2014/30/EU)   |  |
|                                 | RoHS                         | RoHS directive (2011/65/EU), China RoHS (Directive 32)   |  |
|                                 | Safety                       | FDA regulations (21 CFR 1040.10 and 1040.11 <sup>7</sup> )   |  |
| Applicable standards            |                              | EN 60947-5-7 / IEC 60825-1   | EN 60947-5-2 / IEC 60825-1   |
| Environmental resistance        | Ambient temperature/humidity | -10 to +50°C (No freezing) / 35 to 85% RH (No condensation)  |  |
|                                 | Ambient illuminance          | Sunlight: 4,000 lx or less, Fluorescent lamp: 3,000 lx or less   |  |
|                                 | Vibration resistance         | 10 to 55 Hz, double amplitude 1.5 mm, 2 hours in each of the XY and Z directions                             |  |
|                                 | Shock resistance             | 500 m/s <sup>2</sup> (Approx. 50 G), 3 times in each of the XY and Z directions                              |  |
|                                 | Degree of protection         | IEC standard, IP67   |  |
| Material                        |                              | Housing: PC, Front cover: PMMA   |  |
| Weight (Incl. cable)            |                              | Cable type: 88 g, Pig tail type: 48 g  |  |
| Included accessories            |                              | Mounting bracket: BEF-WK-190, Mounting screws (M3 × 20 mm)   |  |

\*1 Connector type (M8, 4-pin) also available (Built to order).

\*2 For black paper (6% reflectance), gray paper (18% reflectance), and white paper (90% reflectance).

\*3 In accordance with the FDA provisions of Laser Notice No. 50, the laser is classified as Class 1 per the IEC 60825-1:2007 and 2014 standards.

\*4 Defined with 1/e<sup>2</sup> (13.5%) of the center strength at the maximum detection distance. The sensor may be affected by light leakage at spot sizes other than the default and when there is a highly reflective object close to the detection area.

\*5 For analog output types, use a power supply voltage of 12.0 VDC or higher to obtain normal output.

\*6 Not including control output load current. \*7 Excluding differences per Laser Notice No. 50.

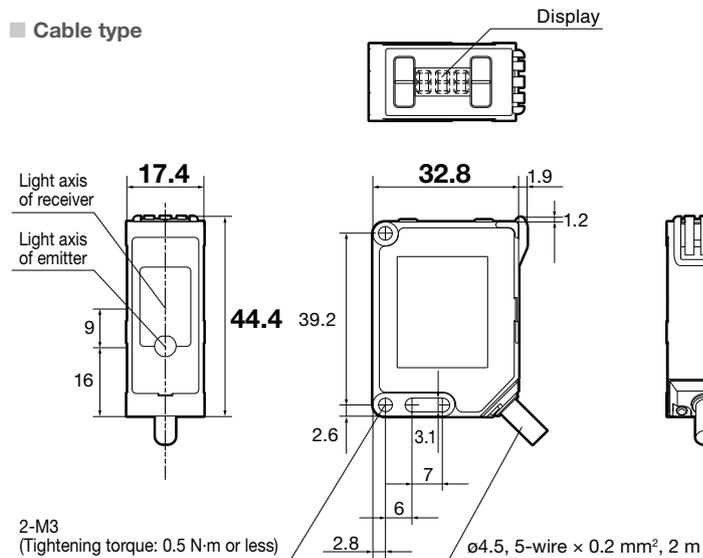
● Note that specifications are subject to change without prior notice for product improvement purposes.

**Dimensions**

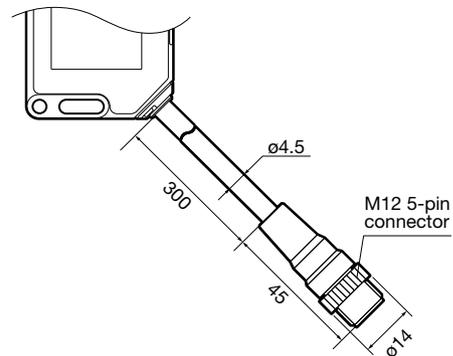
**Sensor**

(Unit: mm)

■ Cable type



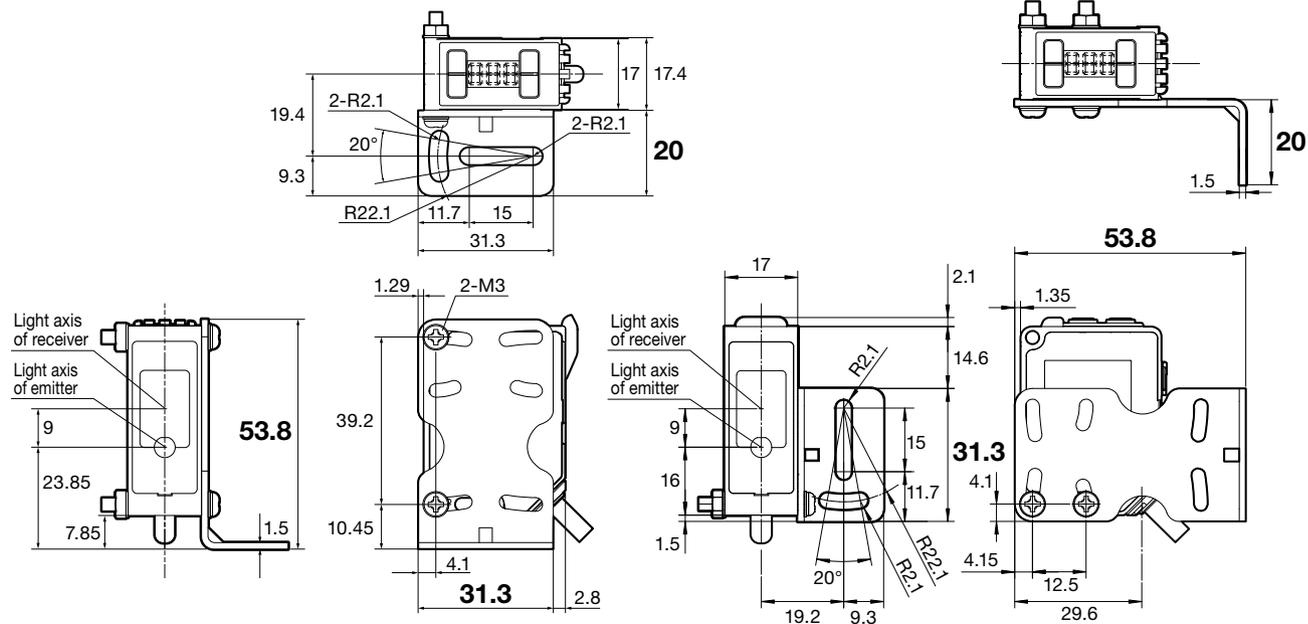
■ Pig tail type



**Mounting bracket**

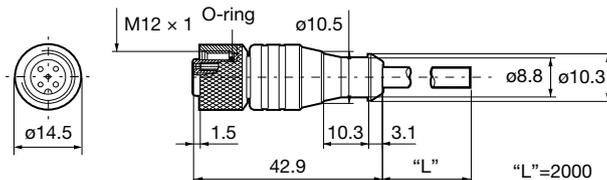
■ BEF-WK-190: Floor-mounted

■ Wall-mounted



**Connector cable**

■ DOL-1205-G02M



Cable section material: PVC  
Conductor cross-section: 5-wire x 0.5 mm²

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Laser Displacement Sensors

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TOF-L

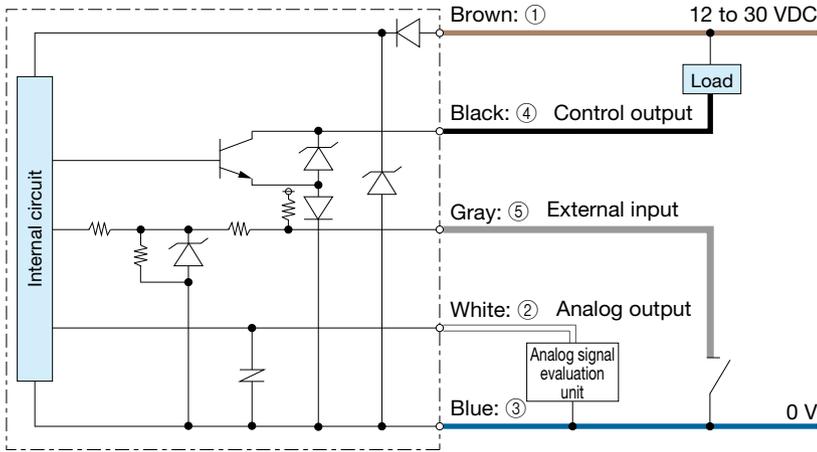
TOF-DL

TOF-3V

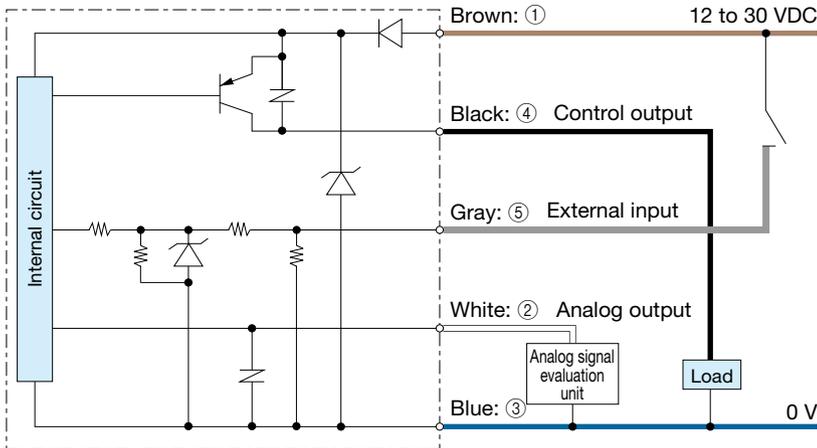
BGS-2V

## I/O circuit diagram

### Analog output type: With the NPN setting



### Analog output type: With the PNP setting



### Pig tail type pin No.

■ ① to ⑤ are connector pin No.



- ① 12 to 30 VDC
- ② Analog output
- ③ 0 V
- ④ Control output
- ⑤ External input

### Notes

- When using a switching regulator for the power supply, be sure to ground the frame ground terminal.
- Wiring sensor cables with high-voltage or power supply lines can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 300 ms).

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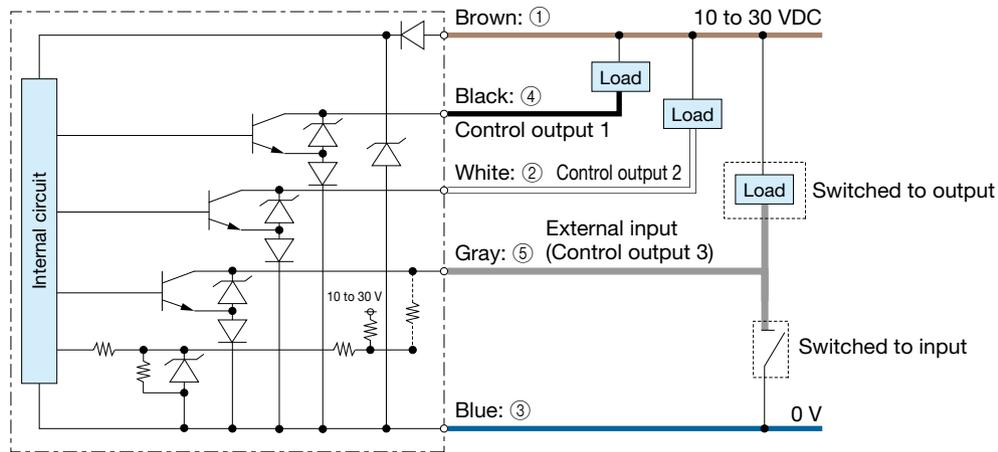
TOF-DL

TOF-3V

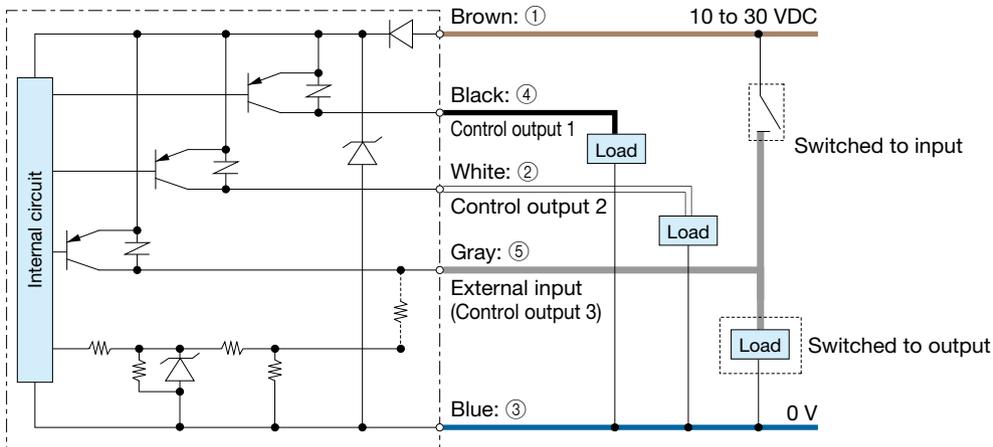
BGS-2V

## I/O circuit diagram

## ■ 3-control-output type: With the NPN setting



## ■ 3-control-output type: With the PNP setting



## Pig tail type pin No.

■ ① to ⑤ are connector pin No.



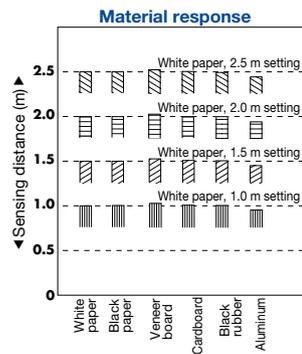
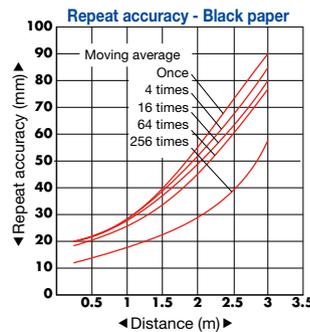
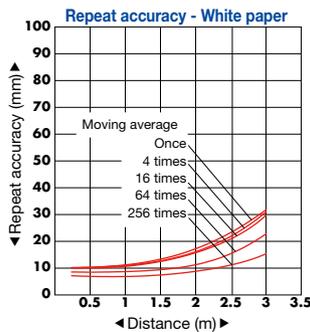
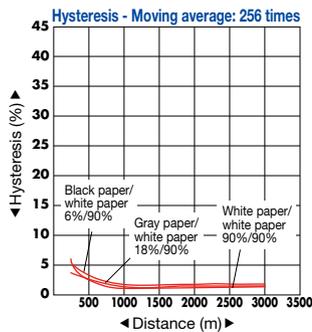
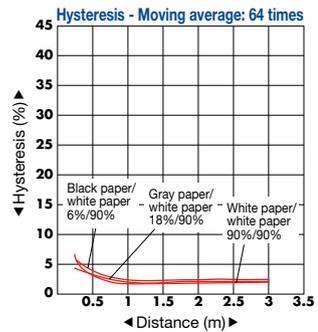
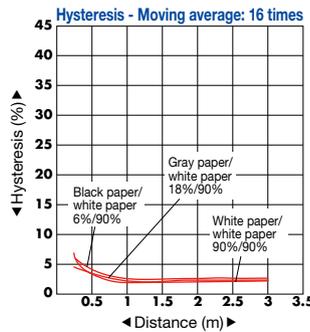
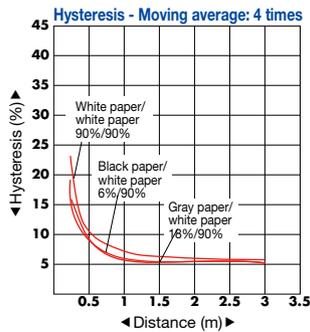
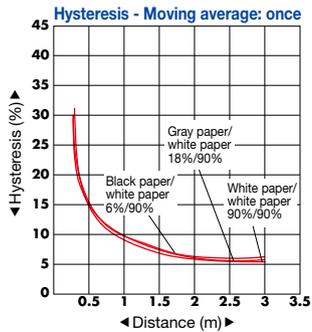
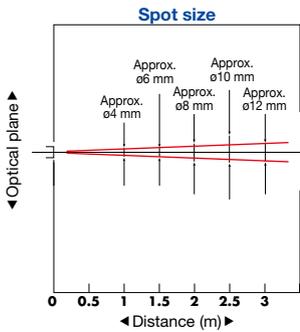
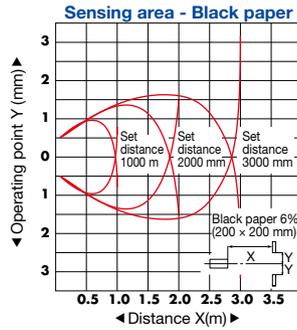
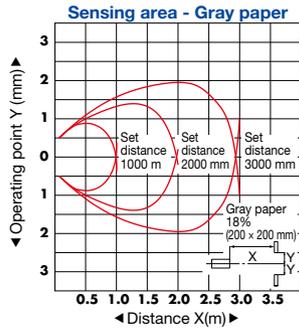
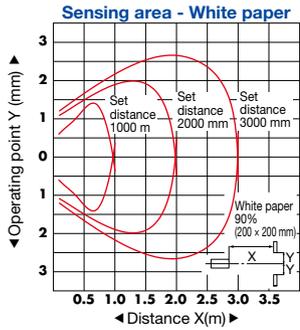
- ① 10 to 30 VDC
- ② Control output 2
- ③ 0 V
- ④ Control output 1
- ⑤ External input (Control output 3)

## Notes

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- Wiring sensor cables with high-voltage or power supply lines can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 300 ms).

Typical characteristic data

TOF-DL250



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TOF-L

TOF-DL

TOF-3V

BGS-2V