

364

New model

TOF long-range type

**TOF-L** series

Got a tough application and you're not sure if the TOF-L laser can solve it? Contact Ramco today!

## Ultra-compact long-distance detection sensor

Max. sensing distance of 4.5 m \*With white paper (90%)

The world's smallest TOF sensor

Capable of stable detection even over long distances



FASTUS is a product brand of Optex FA.

Related products

Long-distance measurement type  
**TOF-DL**  
● P.370



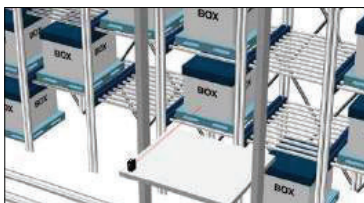
Low-cost type  
**TOF-3V**  
● P.378



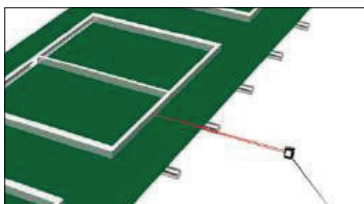
Presence of workpiece in cell production line



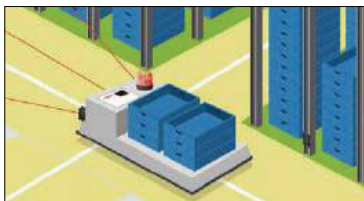
Inventory verification in automated warehouses




Long distance detection of metal frames



Positioning of AGV



### Selection table

| Type | Sensing distance   | Model (Models in parentheses are pig tail types) |                                      |
|------|--|--|--------------------------------------|
|      |  | NPN type   | PNP type                             |
| BGS  |  0 to 4.5 m | <b>TOF-L450DN</b><br>(TOF-L450DM12N)             | <b>TOF-L450DP</b><br>(TOF-L450DM12P) |

● For the pig tail type, please purchase an optional joint 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.

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TOF-L

TOF-DL

TOF-3V

BGS-2V



## A compact and low-cost TOF sensor that changes the definition of long-distance detection.

In general, long-distance detection sensors are large and heavy. The FASTUS TOF-L series is a photoelectric sensor with a built-in amplifier that aims to change that characterization. In addition to being the world's smallest TOF sensor<sup>\*1</sup>, the TOF-L series also features a high-sensitivity APD in the light receiving element for high-speed responses of 0.5 ms and maximum detection distances of up to 4.5 m<sup>\*2</sup>.

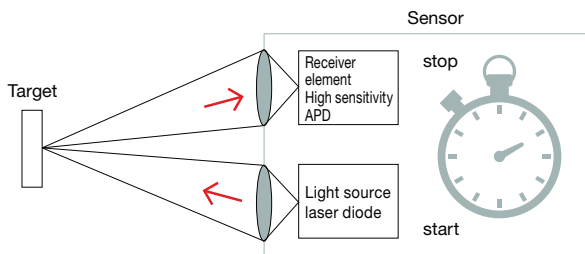
<sup>\*1</sup> Among sensors that employ the TOF method. Optex FA examination performed September 2015.

<sup>\*2</sup> With white paper (90%)

### TOF (Time Of Flight) method

This method measures the time it takes a pulse-emitted laser to hit a target and return, and this measurement is then converted into distance.

With big tolerance to influences from the target's surface conditions, this method is capable of producing stable detection.



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TOF long-range type **TOF-L** series

## Features

## The world's smallest TOF sensor

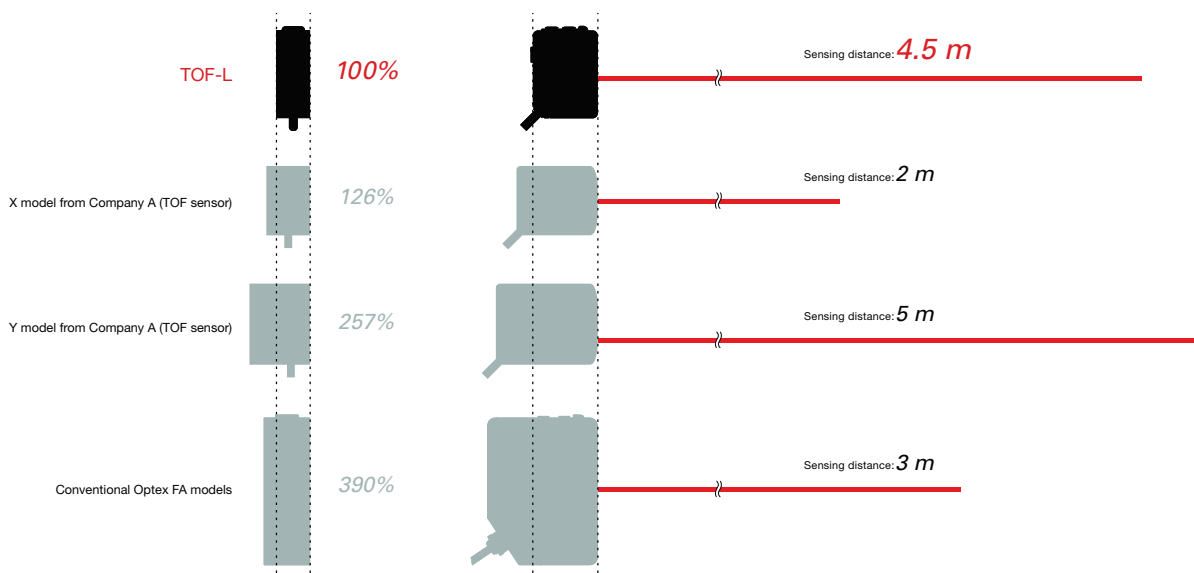
At just 17 × 32.8 × 44.4 (W × D × H) mm, the TOF-L series photoelectric sensor is the world's smallest TOF sensor<sup>\*1</sup>. In addition to measuring only about one-fourth the volume of conventional sensors for significantly more compactness, the TOF-L is capable of long-distance detection at distances up to 4.5 m.

<sup>\*1</sup> Among sensors that employ the TOF method. Optex FA examination performed September 2015.

## Size comparison (body volume comparison)

## Sensing distance comparison (white paper 90%)

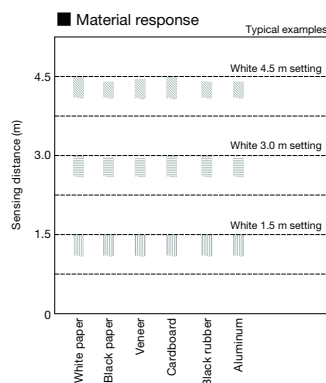
- Size comparison with conventional Optex FA models and other manufacturer models, assuming the TOF-L series as "100%."



## Capable of stable detection even over long distances

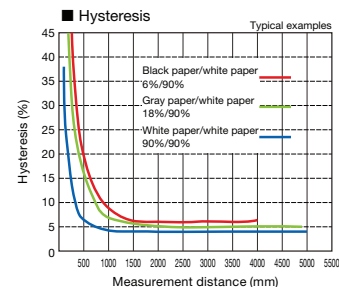
## Stable detection even with glossy or low-reflectance workpieces

By relying on distance to a workpiece rather than differences in the amount of received light for turning ON/OFF, the TOF-L series makes it possible to achieve stable long-distance detection with a variety of workpieces, including low-reflectivity targets such as black rubber and glossy targets such as metal workpieces.



## Stable detection even when determining height differences

The TOF-L series is capable of low hysteresis for white objects of less than or equal to 5% (typical). The sensor also delivers height difference detection such as when inspecting for the presence of parts from remote locations. In addition, adoption of the TOF method helps reduce black/white errors without sacrificing detection accuracy even over long distances.



## Features a Class 1 laser for the light source

The TOF-L series sensor achieves long-distance detections at distances up to 4.5 m while using a Class 1 laser.

This class of laser is also safe on the eyes, so there's no need for workers to wear eye protection. In addition, the spot beam is clearly visible, making adjustments to the light axis easy.



## Specifications

| Type                           |                              | BGS   |  |
|--------------------------------|------------------------------|---|--|
|                                |                              | Cable type  | Pig tail type                                  |
| Model                          | NPN type                     | <b>TOF-L450DN</b>   | <b>TOF-L450DM12N</b>                           |
|                                | PNP type                     | <b>TOF-L450DP</b>   | <b>TOF-L450DM12P</b>                           |
| Sensing distance <sup>*1</sup> |                              | 0 to 4.5 m  |  |
| Light source                   |                              | Red semiconductor laser, wavelength: 650 nm   |  |
| Laser class                    |                              | CLASS 1 (IEC/JIS/FDA <sup>*2</sup> )  |  |
| Spot size <sup>*3</sup>        |                              | Approx. ø17 mm (at a distance of 4.5 m)   |  |
| Response time                  |                              | 0.5 ms or less  |  |
| Hysteresis                     |                              | 15% or less   |  |
| Distance adjustment            |                              | 4-turn potentiometer  |  |
| Indicators                     |                              | Output 1 indicator (orange), Output 2 indicator (orange)<br>Laser emission indicator/Stability indicator (when stable: green, when unstable: red, laser OFF: OFF) |  |
| External input                 |                              | Laser OFF input   |  |
| Control output                 | Type                         | NPN/PNP open collector output, Max. 100 mA / 30 VDC, residual voltage 1.8 V max.  |  |
|                                | No. of outputs               | 2ch   |  |
| Output mode                    |                              | Light ON / Dark ON selectable (same output mode for Ch. 1 and Ch. 2)  |  |
| Connection type                |                              | Cable length: 2 m (ø4.5 mm)   | Cable with M12, 5-pin connector<br>300 mm long |
| Protection circuit             |                              | Reverse connection protection, Overcurrent protection   |  |
| Rating                         | Supply voltage               | 10 to 30 VDC, including 10% ripple (p-p)  |  |
|                                | Current consumption          | 85 mA or less <sup>*4</sup>   |  |
| Applicable regulations         |                              | EMC directive (2004/108/EC) / FDA regulations (21 CFR 1040.10 and 1040.11 <sup>*5</sup> )   |  |
| Applicable standards           |                              | EN 60947-5-2 / IEC 60825-1  |  |
| Company standards              |                              | Noise resistance: Feilen Level 4 cleared  |  |
| Environmental resistance       | Ambient temperature/humidity | -10 to +50°C (no freezing) / 35 to 85% (no condensation)  |  |
|                                | Ambient illuminance          | Sunlight: Sunlight: 4,000 lx or less (at 1 m), fluorescent lamp: 3,000 lx or less (at 1 m)  |  |
|                                | Vibration resistance         | 10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions   |  |
|                                | Shock resistance             | 500 m/s <sup>2</sup> (approx. 50 G); 3 times in each of the X, Y, and Z directions  |  |
|                                | Degree of protection         | IEC standard, IP67  |  |
| Material                       |                              | Housing: ABS Front cover: PMMA  |  |
| Weight without cable           |                              | Approx. 25 g  |  |
| Included accessories           |                              | Mounting bracket: BEF-WK-190, mounting screws (M3 × 20 mm)  |  |

\*1 Using a 200 × 200 mm white sheet of paper.

\*2 In accordance with the FDA provisions of Laser Notice No. 50, the laser is classified as Class 1 per the IEC 60825-1 standard.

\*3 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.

\*4 Not including control output load current.

\*5 Excluding differences per Laser Notice No. 50.

● Specifications are subject to change without prior notice for product improvement purposes.

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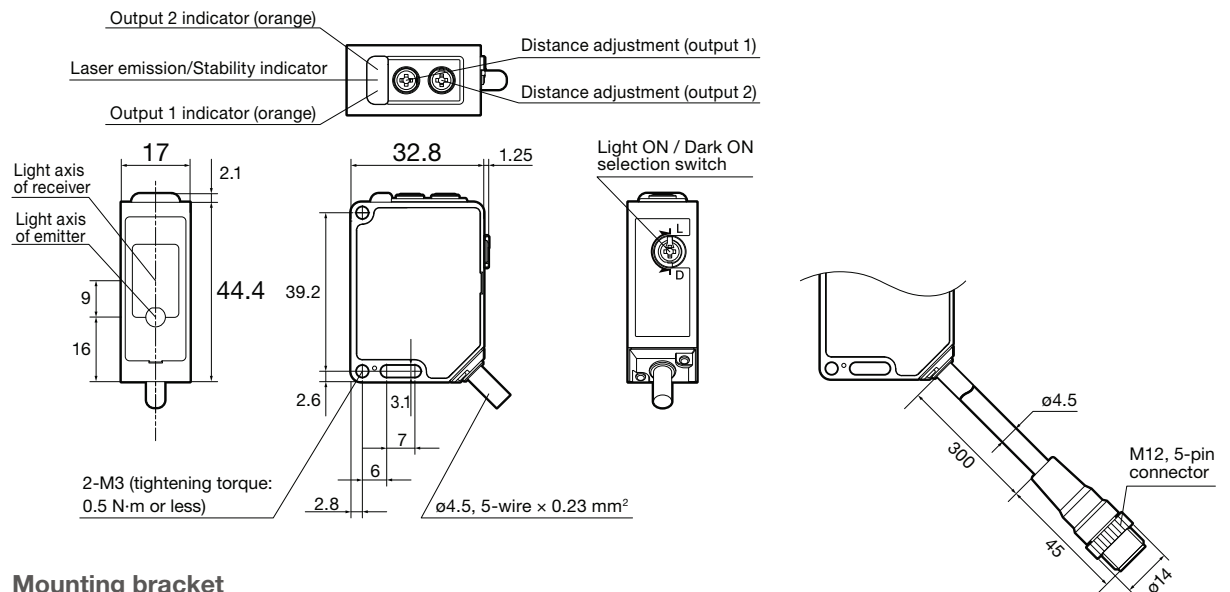
BGS-2V

TOF long-range type **TOF-L** series| **Dimensions****Sensor**

(Unit: mm)

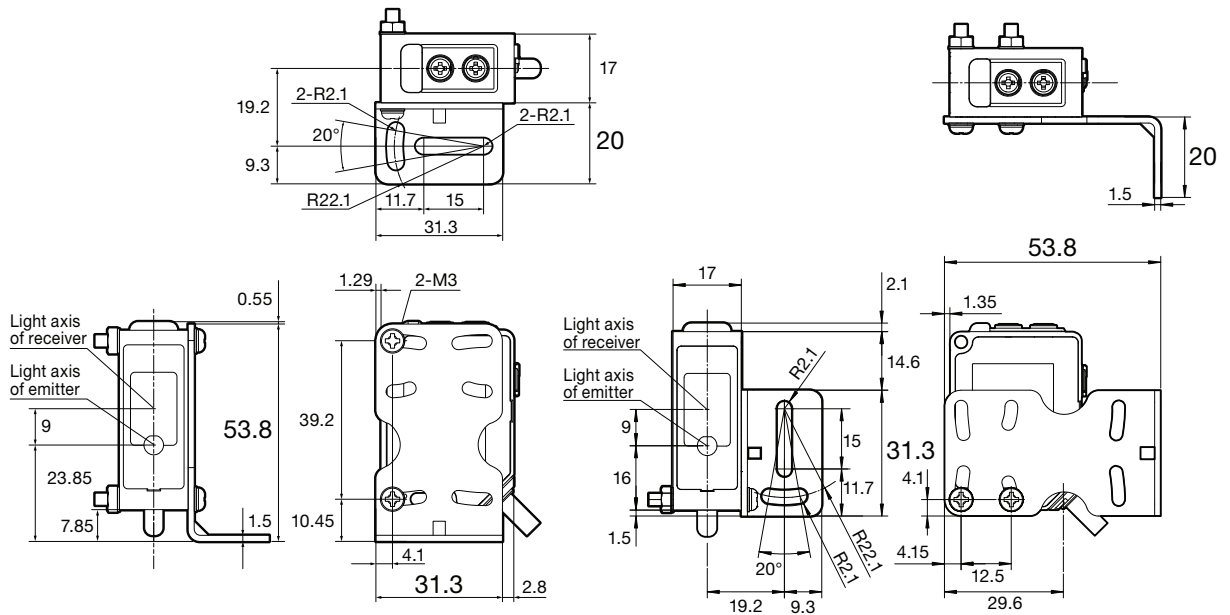
## ■ Cable type

## ■ Pig tail type

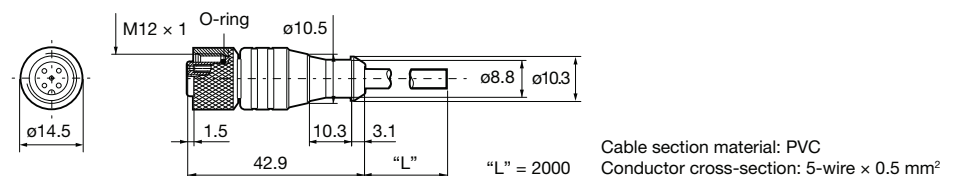
**Mounting bracket**

## ■ BEF-WK-190 floor-mounted

## ■ Wall-mounted

**Connector cable**

## ■ DOL-1205-G02M



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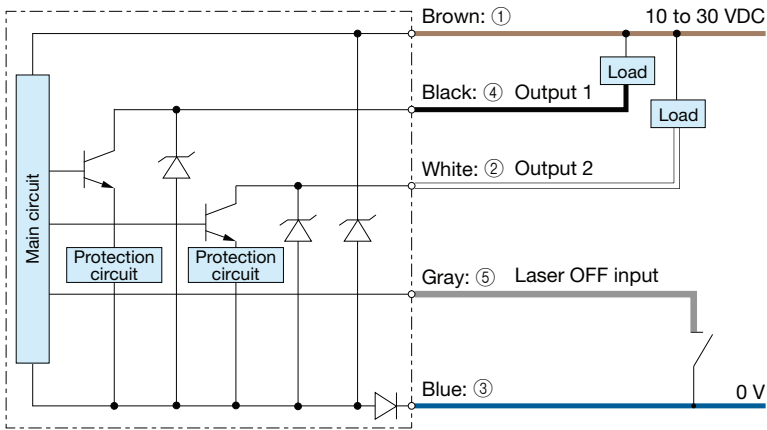
TOF-3V

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## I/O circuit diagram

## ■ NPN output type



## Connector type

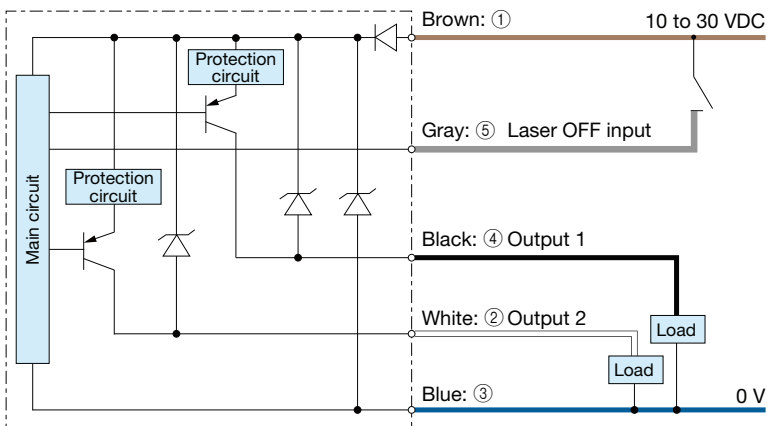
■ ① to ⑤ are connector pin No.

(Pin configuration)



- ① 10 to 30 VDC
- ② Output 2
- ③ 0 V
- ④ Output 1
- ⑤ Laser OFF input

## ■ PNP output type



## Notes

- When using a switching regulator for the power supply, be sure to ground the frame ground terminal.
- Because wiring sensor wires with high-voltage wires or power supply wires 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-L450D□

