

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



# Ultra-compact long-distance detection sensor

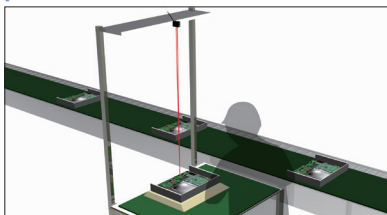
- | Max. sensing distance of 4.5 m \*With white paper (90%)
- | Compact design TOF sensor
- | Capable of stable detection even over long distances



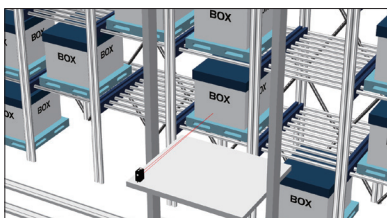
FASTUS is a product brand of Optex FA.

Related products	Long-distance measurement type <b>TOF-DL</b> ● P.370	Low-cost type <b>TOF-3V</b> ● P.378

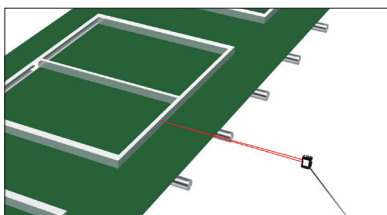
Presence of workpiece in cell production line



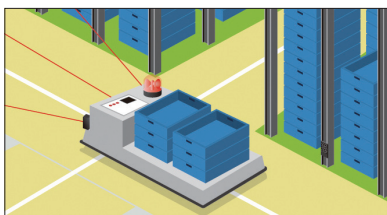
Inventory verification in automated warehouses



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> ( <b>TOF-L450DM12N</b> )	<b>TOF-L450DP</b> ( <b>TOF-L450DM12P</b> )

● 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.



# 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. Despite its compact size, 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.\*

\* With white paper (90%)

Photoelectric Sensors

Specialized Photoelectric Sensors

Laser Displacement Sensors

Long-range BGS Sensors

TOF-L

TOF-DL

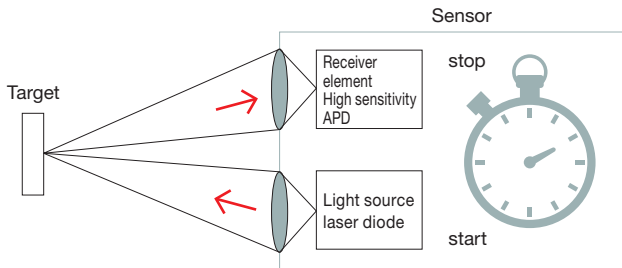
TOF-3V

BGS-2V

## 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.

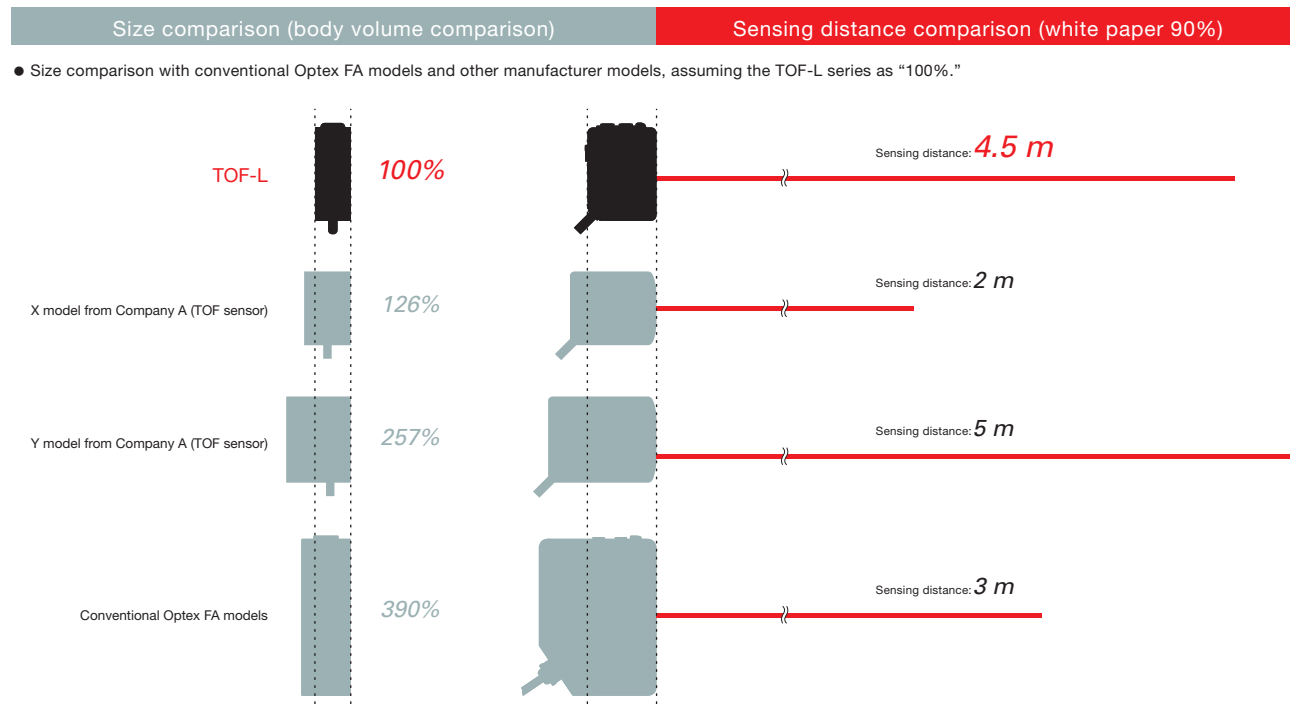
With big tolerance to influences from the target's surface conditions, this method is capable of producing stable detection.



## Features

### The world's smallest TOF sensor

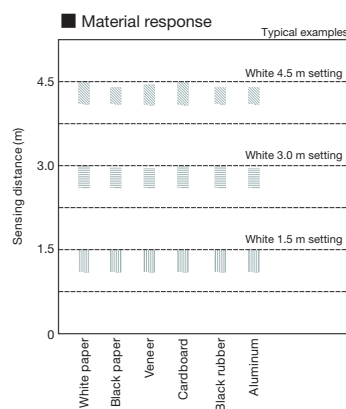
At just 17 × 32.8 × 44.4 (W × D × H) mm, the TOF-L series photoelectric sensor is compact design TOF sensor. In addition to measuring only about one-fourth the volume of conventional sensors for significantly more compactness, the TOF-L is capable of long-distance detection at distances up to 4.5 m.



### Capable of stable detection even over long distances

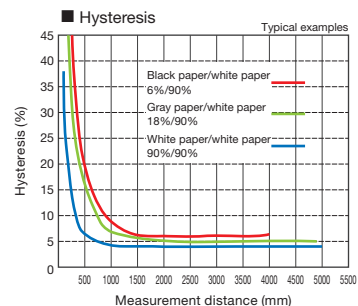
#### Stable detection even with glossy or low-reflectance workpieces

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 <sup>*1</sup>		8% or less (Distance: 1 to 4 m)	
Distance adjustment		4-turn potentiometer	
Indicators		Output 1 indicator (orange), Output 2 indicator (orange) 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 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.

Photoelectric  
SensorsSpecialized  
Photoelectric  
SensorsLaser  
Displacement  
SensorsLong-range  
BGS Sensors

TOF-L

TOF-DL

TOF-3V

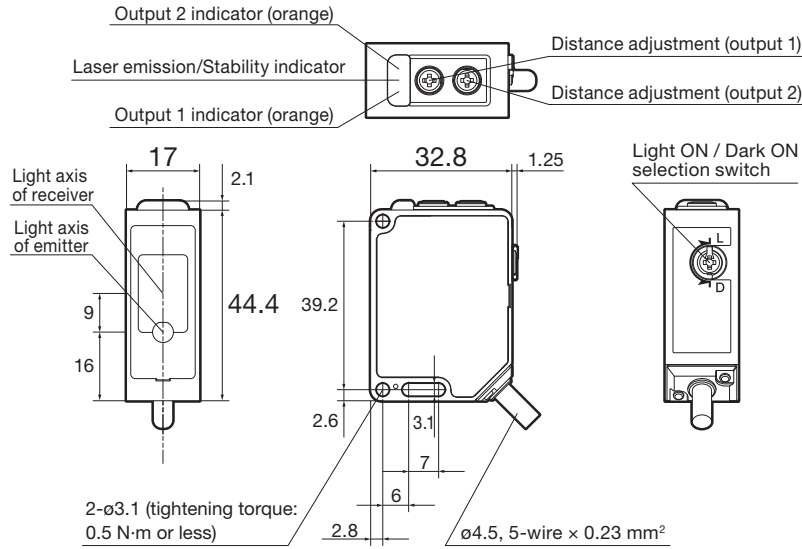
BGS-2V

**Dimensions**

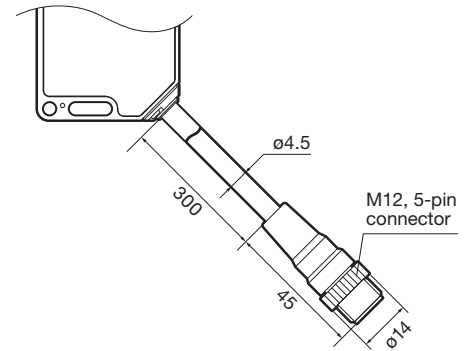
**Sensor**

(Unit: mm)

■ Cable type

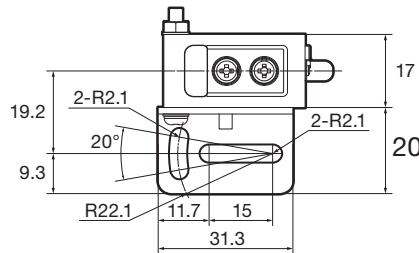


■ Pig tail type

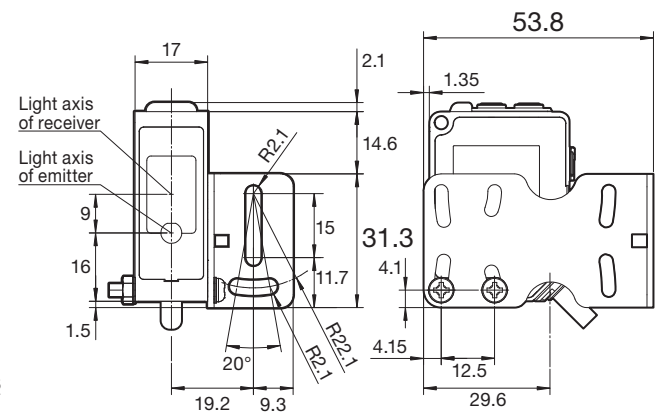
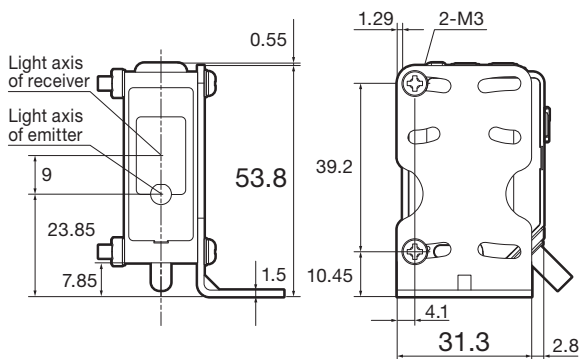
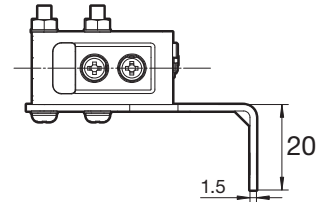


**Mounting bracket**

■ BEF-WK-190 floor-mounted

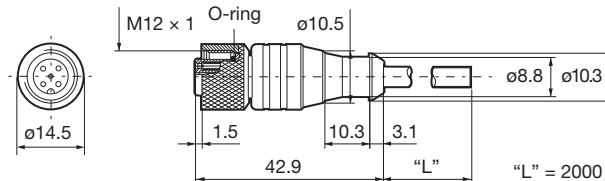


■ Wall-mounted



**Connector cable**

■ DOL-1205-G02M



Cable section material: PVC  
Conductor cross-section: 5-wire x 0.5 mm<sup>2</sup>

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TOF-L

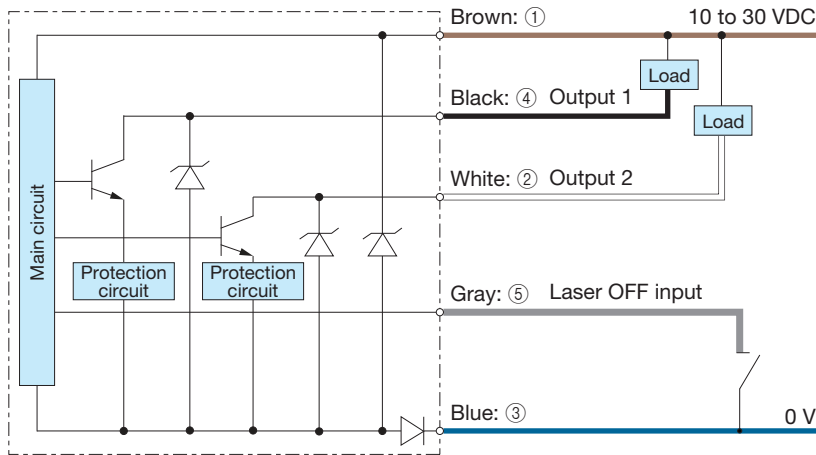
TOF-DL

TOF-3V

BGS-2V

## I/O circuit diagram

### NPN output type



### Connector type

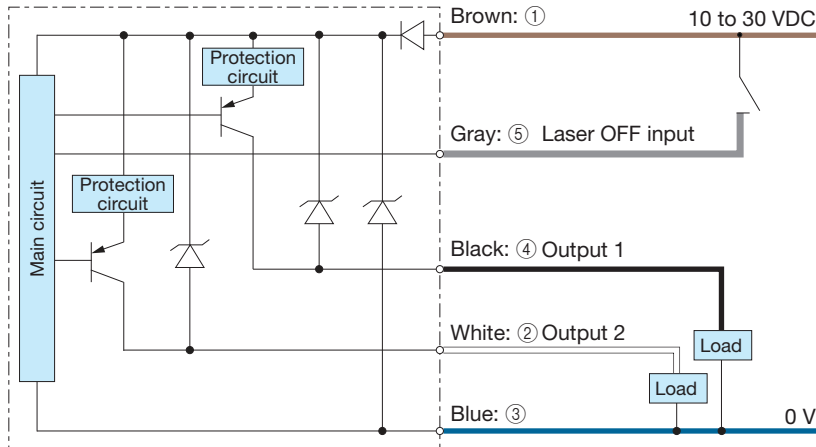
■ ① to ⑤ are connector pin No.

(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. 800 ms).

## Typical characteristic data

### TOF-L450D□

