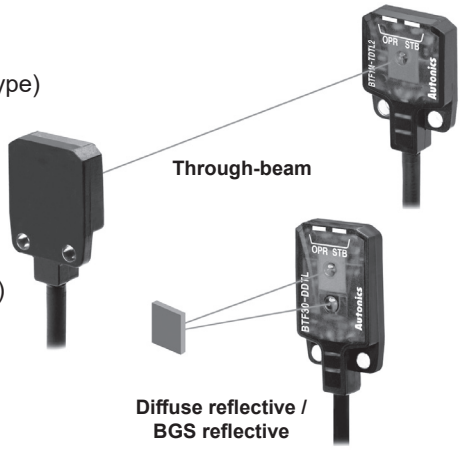
Ultra-slim and Amplifier Built-in Type

■ Features

- Ultra-thin size of only 3.7mm
  - W13 × H19 × L3.7mm (through-beam type)
  - W13 × H24 × L3.7mm (diffuse reflective type, BGS reflective type)
- Detection methods and minimum target size
  - Through-beam type (BTF1M): Ø2mm
  - Diffuse reflective type (BTF30): Ø0.2mm (at distance 10mm)
  - BGS reflective type (BTF15): Ø0.2mm (at distance 10mm)
- Detecting distance may vary by environmental factors
- Maximum detection distance: 1m (through-beam type)
- Stability indicator (green LED) and operation indicator (red LED)
- Stainless steel 304 mounting brackets
- IP67 protection structure (IEC standard)



Please read "Safety Considerations" in the instruction manual before using.

CE

■ Specifications

Model							
NPN open collector output		**BTF1M-TDTL**	**BTF1M-TDTD**	**BTF30-DDTL**	**BTF30-DDTD**	**BTF15-BDTL**	**BTF15-BDTD**
PNP open collector output		**BTF1M-TDTL-P**	**BTF1M-TDTD-P**	**BTF30-DDTL-P**	**BTF30-DDTD-P**	**BTF15-BDTL-P**	**BTF15-BDTD-P**
Sensing type		Through-beam		Diffuse reflective		BGS reflective	
Sensing distance		1m		5 to 30mm※1		1 to 15mm※1	
Sensing target		Opaque material over Ø2mm		Translucent, opaque materials			
Min. sensing target		Opaque material of Ø2mm		Ø0.2mm (sensing distance 10mm)		Ø0.2mm non-illuminated objects (sensing distance 10mm)	
Hysteresis		—		Max. 20% at sensing distance		Max. 5% at sensing distance	
Reflectivity characteristics (black/white error)		—		—		Max. 15% of maximum sensing distance	
Response time		Max. 1ms					
Power supply		12-24VDC⎓ ±10% (ripple P-P: max. 10%)					
Current consumption		Max. 20mA (this is for each emitter and receiver of throught-beam type.)					
Light source		Red LED (650nm)					
Operation mode		Light ON	Dark ON	Light ON	Dark ON	Light ON	Dark ON
Control output		NPN or PNP open collector output • Load voltage: max. 26.4VDC⎓ • Load current: max. 50mA • Residual voltage - NPN: max. 1VDC⎓, PNP: max. 2VDC					
Protection circuit		Power reverse polarity protection circuit, output short over current protection circuit					
Indicator		Operation indicator: red LED, stability indicator: green LED					
Connection		Cable type					
Insulation resistance		Over 20MΩ (at 500VDC megger)					
Noise immunity		±240V the square wave noise (pulse width:1μs) by the noise simulator					
Dielectric strength		1,000VAC 50/60Hz for 1 minute					
Vibration		1.5mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours					
Shock		500m/s² (approx. 50G) in each X, Y, Z direction for 3 times					
Environment	Ambient illumination	Sunlight: max. 10,000lx, incandescent lamp: max. 3,000lx (receiver illumination)					
	Ambient temperature	-25 to 55℃, storage: -40 to 70℃					
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH					
Protection		IP67 (IEC standards)					
Material		Case: polybutylene terephthalate, sensing part: polymethyl methacrylate, bracket: SUS304 (steel use stainless 304), bolt: carbon steel, sleeve: SUS304 (steel use stainless 304)					
Cable		Ø2.5mm, 3P, 2m (emitter of through-beam type: Ø2.5mm, 2P, 2m) (AWG 28, core diameter: 0.08mm, number of core: 19, insulator out diameter: Ø0.9mm)					
Accessory		Fixing bracket, M2 bolt: 4		Fixing bracket, M2 bolt: 2			
Approval		CE					
Weight※2		Approx. 70g (approx. 40g)		Approx. 40g (approx. 25g)			

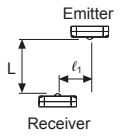
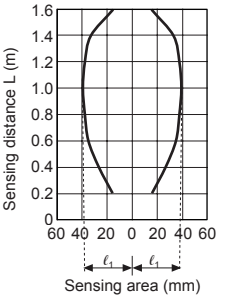
※1: Non-glossy white paper 50×50mm.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation.

▣ Feature Data

◎ Through-beam type

● BTF1M-TDTL / BTF1M-TDTL-P

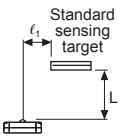
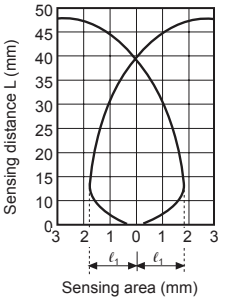
Sensing area characteristic

Measuring method	Data
	

◎ Diffuse reflective type

● BTF30-DDTL / BTF30-DDTL-P

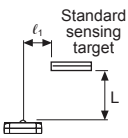
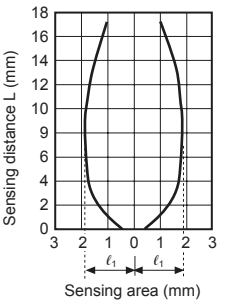
Sensing area characteristic

Measuring method	Data
	

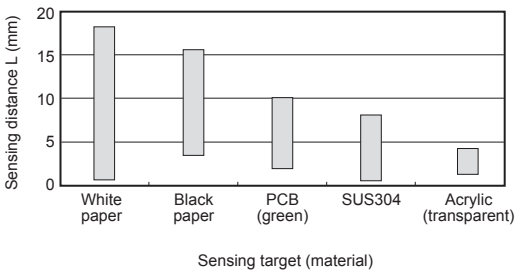
◎ BGS reflective type

● BTF15-BDTL / BTF15-BDTL-P

Sensing area characteristic

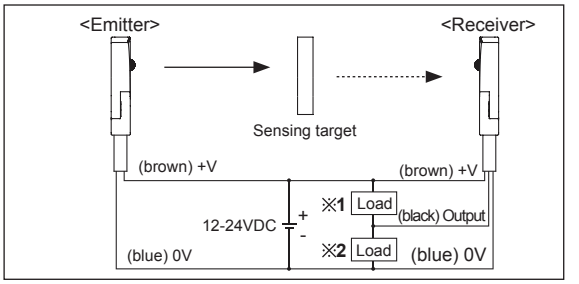
Measuring method	Data
	

Sensing distance by material

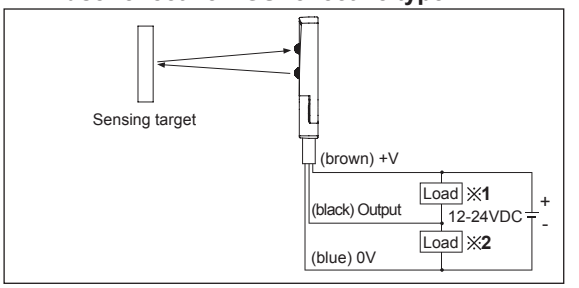


▣ Connections

● Through-beam type



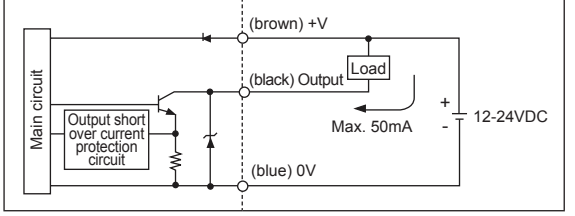
● Diffuse reflective/BGS reflective type



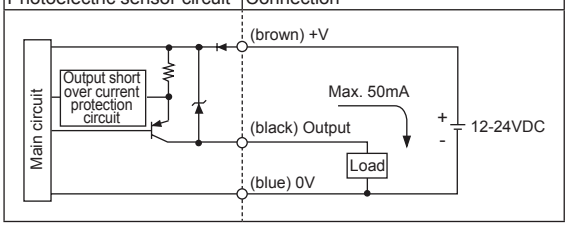
※1: Load connection for NPN output
※2: Load connection for PNP output

▣ Control Output Circuit Diagram

● NPN open collector output

Photoelectric sensor circuit	Connection
	

● PNP open collector output

Photoelectric sensor circuit	Connection
	

※If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit.

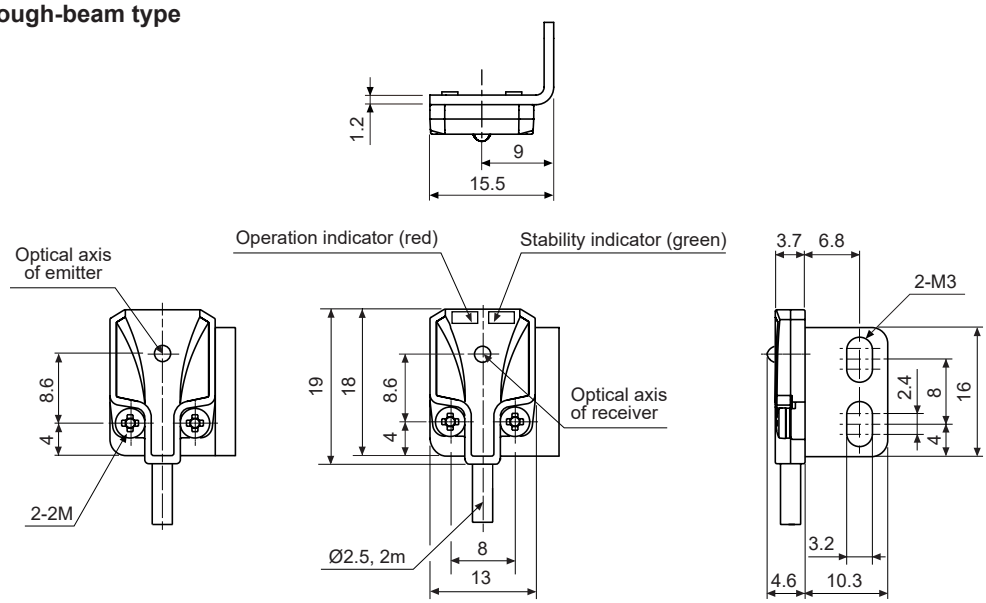
▣ Operation Mode

Operation mode	Light ON	Dark ON
Receiver operation	Received light Interrupted light	Received light Interrupted light
Operation indicator (red LED)	ON OFF	ON OFF
Transistor output	ON OFF	ON OFF

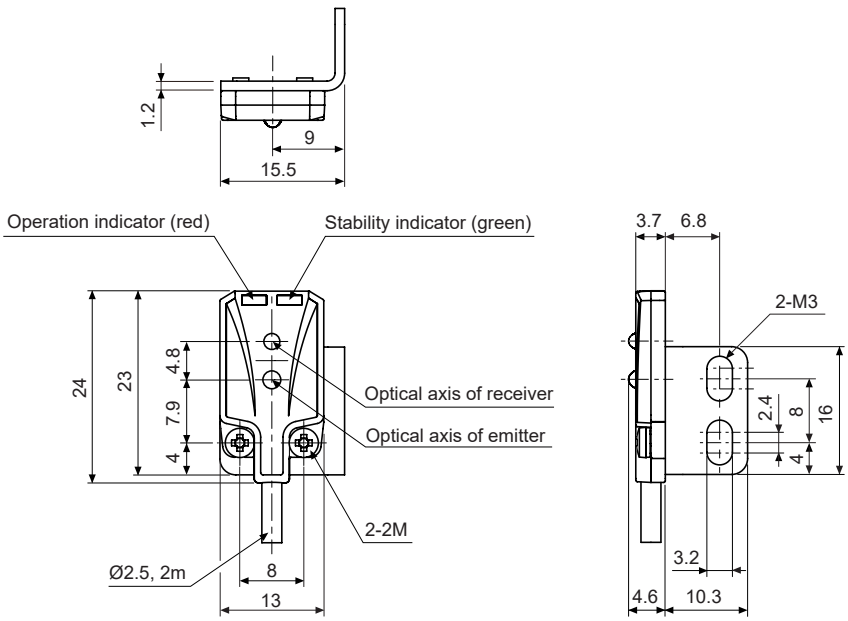
▣ Dimensions

(unit: mm)

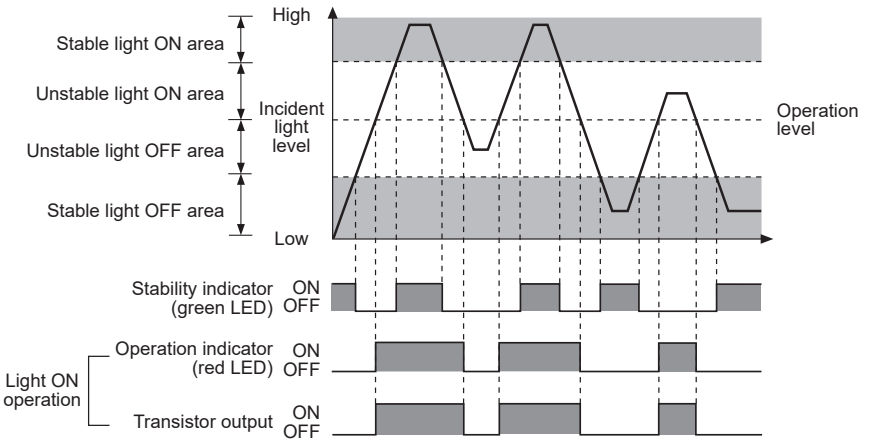
● **Through-beam type**



● **Diffuse reflective/BGS reflective type**



▣ Operation Timing Diagram



※The waveform of 'Operation indicator' and 'Transistor output' are for Light ON operation.
The waveform are reversed for Dark ON operation.

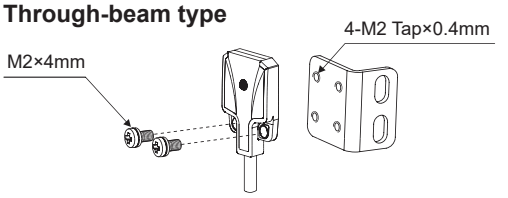
▣ Installation and Adjustment

◎ For mounting

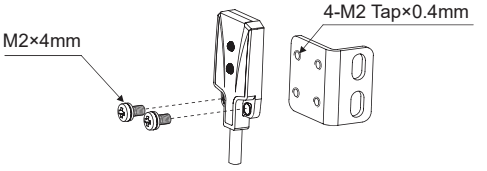
When using photoelectric sensors closely over two units, it may result in malfunction due to mutual interference. When installing the product, tighten the screw with a tightening torque of 0.3N·m.

※Do not impact on the unit with hard objects and do not bend the cable part too much. It may cause damage to waterproof function.

● Through-beam type

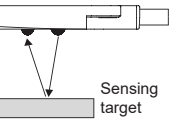


● Diffuse reflective/BGS reflective type

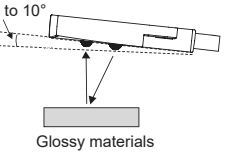


※ Notice for BGS reflective type

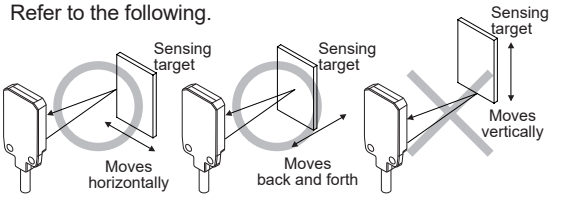
1) Make sure that the sensing side of this sensor is parallel with the surface of each sensing object.



2) If the sensing object has glossary surface or high reflection, the sensor tilts from 5 to 10˚as shown in the figure.
Make sure whether the sensor is influenced by any background objects.



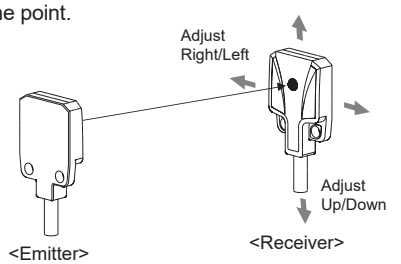
3) Make sure to install the sensor in the proper direction with considering moving direction of sensing objects.
Refer to the following.



◎ Optical axis adjustment

● Through-beam type

Set the emitter and the receiver facing each other and adjust these up·down, right·left after checking the point of operating the stability indicator. Fix the emitter and the receiver at the center of the point.



● Diffuse reflective/BGS reflective type

After placing a sensing target, fix it in the middle of position where the stability indicator operates when adjusting the sensor to up·down, right·left. Make sure that the sensing side of the sensor is parallel with the surface of each sensing target.

