

Long Distance BGS Laser Sensor

**FASTUS**

# TOF-DL250 series

• TOF-DL250 □ □

## INSTRUCTION MANUAL

- Thank you for purchasing TOF-DL series. We hope you are satisfied with its performance.
- Please read this manual carefully and keep it for future reference.

### ■ Safety Symbols

The safety symbols and their meanings are as follows.

- Warning** Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage.
- Caution** Indicates that any improper operation or handling may result in minor injury or property damage.

### Warning

Do not disassemble, repair, modify, deform under pressure, or attempt to incinerate this product. Doing so may cause injury or fire.

This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in a fire.

Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in a fire.

Do not install this product in any of the following locations. Doing so may cause a fire, damage, or a malfunction.

- Locations where dust, salt, iron powders, or vapor (steam) is present.
- Locations subjected to corrosive gases or flammable gases.
- Locations where water, oil, or chemical splashes may occur.
- Locations where heavy vibrations or impacts may occur.
- Locations where the ambient temperature exceeds the rated range.
- Locations subject to rapid temperature changes (or where condensation occurs).
- Locations with strong electric or magnetic fields.
- Outdoor locations or locations subject to direct sun light.

Do not use this product in a non-industrial environment. Doing so may cause induction or radiation interference.

In the event of a malfunction such as smoke comes out from the product if you detect any malfunction including emission of smoke, abnormal smells or sounds, or the housing becoming very hot, immediately stop operating the product and turn off the power to the controller. Doing so may cause a fire. Repairing the product is dangerous and should not be performed by the customer. Contact the Optex FA sales office.

In case water enters the product, immediately stop operating the product and turn off the power to the controller. Using the product in this condition may cause a fire.

### Caution

Do not drop the product or subject the product to strong impacts. Doing so may damage the product.

The light source of this product applies the visible light semiconductor laser. Do not allow the laser beam to enter an eye, either directly or reflected from reflective object. If the laser beam enters an eye, it may cause damage or problems of the eye.

Follow the instructions in this manual or the specified instruction manual when wiring the product for the correct wiring method. Incorrect wiring can damage the product or cause a malfunction. Output cannot be connected with other LED controller in series, nor in parallel.

Do not excessively twist or apply stress to the cable. Doing so may damage the cable or the connector.

When connecting the cable, make sure to hold it by the connector portion, and do not apply excessive force to the cable.

When disconnecting the connector, be careful not to touch the terminals inside the connector, and do not allow foreign objects to enter the connector.

Route wiring separately from high-voltage circuits and power circuits.

If the wires are routed together, induction may occur, which can cause a malfunction or damage the product. If this is unavoidable, use a conductive object such as a properly grounded conduit as a shield.

Install this product as far away from high-voltage equipment, power equipment, equipment that generates large switching surges, welders, inverter motors, or any equipment that can be a source of noise.

Use the product within the rated ranges.

Install this product and the dedicated controller securely. Failure to ensure secure installation can result in the products falling and becoming damaged.

Make sure to turn the power off before connecting or disconnecting the cable. Connecting or disconnecting while energized may damage the product.

Don't bend the cable when the temperature of the cable or atmosphere is below freezing.

Don't use the sensor on transient state after power on (approx. 300ms).

The sensor performance or digital display values may depend on the individual units or the condition of detecting object.

### Precautions for using laser

This product is classified as Class 1 Laser Product by JIS C6802 :2014/IEC60825-1 :2007 and 2014 Laser Safety Standard.

When exporting this product to USA, it's necessary to follow laser regulation of USA FDA. This product has been already reported to CDRH (Center for Devices and Radio-logical Health). For details, contact our customer service.

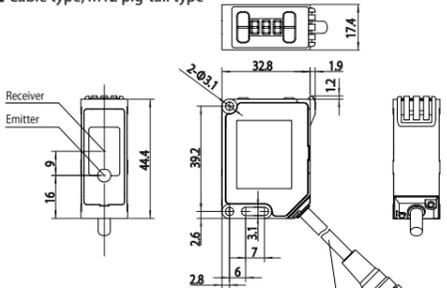


### Dimensions

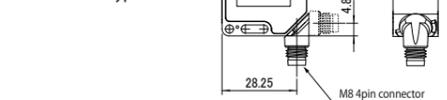
● Without mounting bracket

■ Cable type, M12 pig-tail type

[mm]

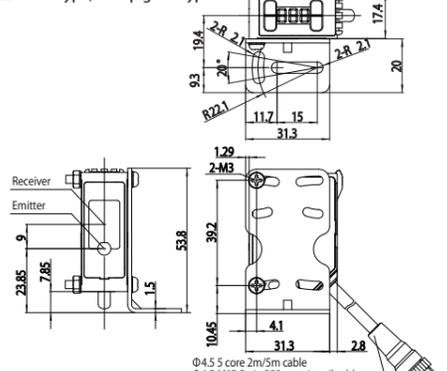


■ M8 connector type

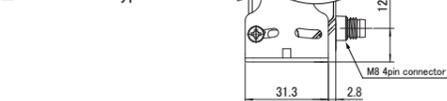


● With mounting bracket

■ Cable type, M12 pig-tail type

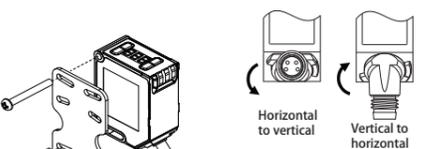


■ M8 connector type



### Installation

Tightening torque: 0.5N·m Max.



M8 connector can be rotate from horizontal position to vertical or vertical position to horizontal as picture above. Don't rotate exceeding stopper. Doing so will cause breakage.

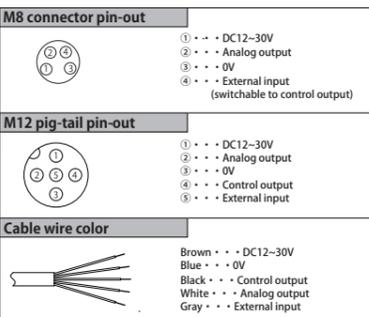
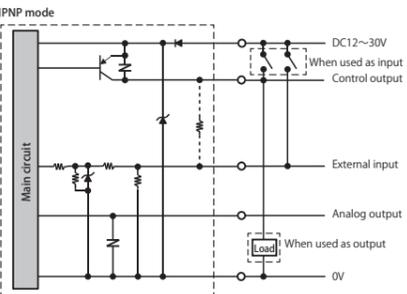
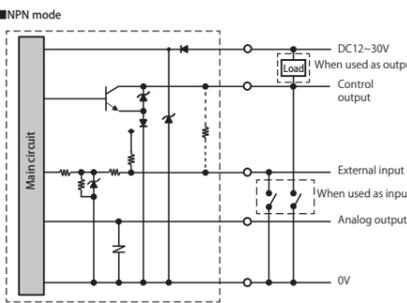
### SPECIFICATIONS

Type	Analog Output Type	Control Output Type
M8 Connector Type	TOF-DL250AC	TOF-DL250DC
2m Cable Type	TOF-DL250A	TOF-DL250T
5m Cable Type	TOF-DL250A-5	TOF-DL250T-5
M12 Pig-tail Type	TOF-DL250AM12	TOF-DL250TM12
Sensing distance	0.25 ~ 2.5m (Reflectance: 6% Black paper/18% Gray paper/90% White paper)	
Light source	Red laser diode (wave length: 650nm, maximum output: 64mW, pulse duration: 7ns, repetition rate: 11.11MHz) average output: 390 μW Max.	
Laser class	CLASS 1 (IEC/JIS/FDA*)	
Spot size*2	Φ 10mm /2.5m	
Hysteresis	15% Max. (Reflectance: 6% Black paper/18% Gray paper/90% White paper)	
Sampling period	200 μS	
Response time	0.5ms Max. (averaging number: 1)	
Indicator	Output indicator (Orange LED*)/ Stable indicator (Green LED)/Unstable indicator (Red LED) (All LED will be OFF when Laser is OFF)	
Digital display	7 segment 3 digit (unit: cm)	
Threshold adjustment	Teaching and +/- buttons	
Output mode	Light ON / Dark ON selectable by setting	
Control output	NPN/PNP (selectable by setting) open collector DC30V, 100mA max. (Residual 1.8V max)*4	
External input	Laser OFF, External teaching	
Analog output	Current: 4~20mA/ Voltage: 0~10V (selectable by setting)	
Power supply	DC12~30V including ripple (P-P)10%*5 DC10~30V including ripple (P-P)10%	
Current consumption	60mA Max.*6	
Applicable regulations	EMC EMC Directive (2014/30/EU) RoHS RoHS Directive (2011/65/EU), China RoHS(MIIT Order No.32) Safety FDA Regulations (21 CFR 1040.10 and 1040.11*)	
Applicable standards	EN 60947-5-7 / IEC 60825-1 EN 60947-5-2 / IEC 60825-1	
Cross talk prevention	Up to 2 units	
Protection circuit	Reverse connection protection, Over current protection	
Ambient Temp./Humid.	-10~50°C/35~85%RH (no condensation)	
Storage Temp./Humid.	-40~70°C/35~95%RH (no condensation)	
Ambient illuminance	Sun light 4,000lx Max. at receiving window Incandescent light 3,000lx Max. at receiving window	
Vibration resistance	10~55Hz amplitude 1.5mm X, Y, Z each 2h	
Shock resistance	500m/s <sup>2</sup> X, Y, Z each 3 times	
Protection category	IP67	
Material	Case: PC / Lens: PMMA	
Weight including cable	M8 connector type: approx. 30g, 2m cable type: approx. 88g, 5m cable type: approx. 188g, M12 pig-tail type: approx. 48g	
Accessories	1 mounting bracket: BEF-WK190, 2 screws: M3 x 20mm	

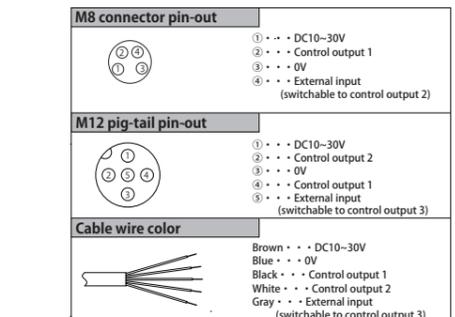
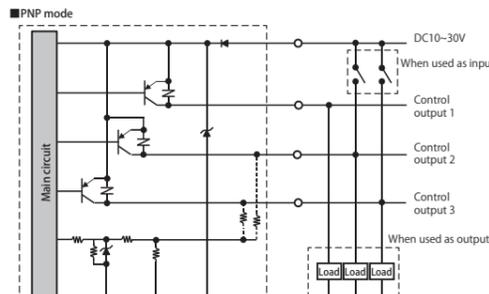
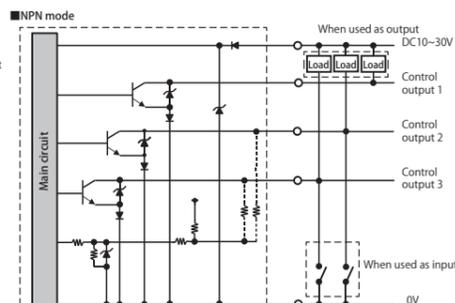
- \*1 These products are Classified as CLASS 1 by IEC 60825-1:2007 according to Laser Notice No.50, FDA Guidance Document.
- \*2 Defined with center strength 1/e<sup>2</sup>(13.5%) at the center. There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object close to the detection area.
- \*3 Analog output type have 2 I/O at same time. M8 connector type (TOF-DL250DC) has 2 for 2 control outputs.
- \*4 Analog output type have 1. M8 connector type (TOF-DL250DC) has 2. Other types have 3 control outputs.
- \*5 Use power supply with DC12.0V Min. to get sufficient output for analog output.
- \*6 Excluding load current for control output.
- \*7 Except for deviations pursuant to laser notice No.50.

### Circuit diagram

#### ■ Analog output type

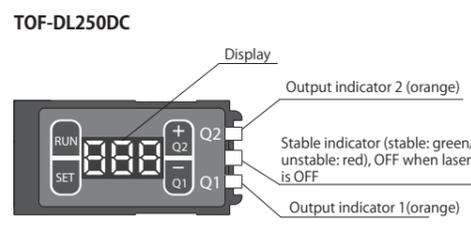
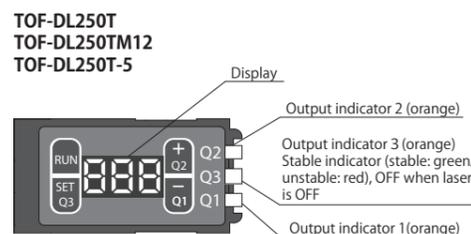
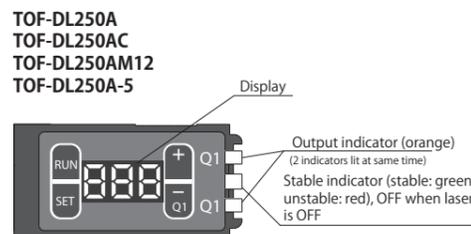


#### ■ Control output type



### Name of the parts and setup

Name and function of buttons and indicators vary depends on the model.



Button	Function while sensing	Function while setting
+	Increase setting value	Increase setting value
-/Q1	Decrease setting value	Decrease setting value
RUN	Go to setting mode. By pressing 1 second or more, Keys will be locked and the display shows "Loc". While keys are locked, by pressing 1 second or more, key-lock will be released and the display shows "Lc".	Back to "RUN" (sensing) mode
SET	Go to setting mode. By pressing 1 second or more, Teaching of Output 2 will be done for current distance. Then, the display shows "tc2" and the threshold level. * For TOF-DL250DC, external input to be set "out".	Fix the setting value
Q2(*)	By pressing 1 second or more, Teaching of Output 1 will be done for current distance. Then, the display shows "tc1" and the threshold level. * For TOF-DL250AC, external input to be set "out".	
Q3(*)	By pressing 1 second or more, Teaching of Output 3 will be done for current distance. Then, the display shows "tc3" and the threshold level. * External input to be set "out".	

\* Valid only for the model that has "Q2" and "Q3" shown on the panel.

### Extension mode

You can get to "Extension mode" by clicking "RUN" button or "SET" button. (\* means default value)

- External input (MF input)**
  - Press "SET" to get to setting menu
  - Set function of external input
 

Model	Target output
TOF-DL250A TOF-DL250AM12	Not applicable
TOF-DL250AC	Output 1
TOF-DL250T TOF-DL250TM12	Output 3
TOF-DL250DC	Output 2
  - tech Analog output type: Teaching Output 1
  - Control output type: Less than 1 second: Teaching Output 1, More than 1 second less than 2 seconds: Teaching Output 2, More than 2 seconds: Invalid
  - LsF Laser OFF: Kill the laser power (\*), LsA Laser ON: Activate the laser power
- NPN/PNP selection**
  - Won't be changed by initializing
  - naN Set input/output as NPN (\*), nAN Set input/output as PNP
- Analog output Current/Voltage selection** (\* Only for Analog output type)
  - awr Set as current output 4~20mA (\*), wvc Set as voltage output 0~10V
- Operating mode Light ON/Dark ON (stability output) selection**
  - lan Light ON: Turns ON when the distance exceeds threshold (\*), dan Dark ON: Turns ON when the distance is less than threshold
  - Stability-Light ON: Output 1 turns ON when stable (Other output: Light ON), Stability-Dark ON: Output 1 turns ON when unstable (Other output: Dark ON)
- Averaging**
  - Set number of averaging
 

1	1 time
4	4 times
16	16 times
64	64 times (*)
256	256 times
- Behavior when Alarm** (\* Only for Analog output type)
  - Output Maximum current /voltage (\*), Hold: Keep the value just before the alarm
- Initializing**
  - Initialize settings to the value set when shipped except NPN/PNP setting
 

na	Not initialize
yes	Execute initialize

- Display**
  - Select ON/OFF of the display
 

an	ON: Activate the display (unit: cm) (*), OFF: Darken the display when there is no button operation over 30 seconds
off	
- Delay**
  - Set delay function for output on detection
 

off	Not use delay function (*), OFF delay: Delays output timing of ON to OFF, ON delay: Delays output timing of OFF to ON, One shot: Output ON for the period set
off	
off	
off	
- Near side setting** (\* Only for Analog output type)
  - Set the distance to output 4mA (current output)/0V (voltage output)
 

888	Input value
Range: 0~400, Default: 0, Unit: cm	
- Far side setting** (\* Only for Analog output type)
  - Set the distance to output 20mA (current output)/10V (voltage output)
 

888	Input value
Range: 0~400, Default: 300, Unit: cm	
- Output 1 threshold level**
  - Set the threshold level of Output 1
 

888	Input value
Range: 0~400, Default: 300, Unit: cm	
- Output 2 threshold level** (\* Only for control output type)
  - Set the threshold level of Output 2
 

888	Input value
Range: 0~400, Default: 300, Unit: cm	
- Output 3 threshold level** (\* Only for control output type)
  - Set the threshold level of Output 3
 

888	Input value
Range: 0~400, Default: 300, Unit: cm	
- Offset** (\* Only for control output type)
  - Set the offset value to add on the Teaching level (Offset value is valid from 2nd time of Teaching)
 

888	Input value
Range: -50~+50, Default: 0, Unit: cm	

By clicking "RUN" button or leave the setting mode for 30 seconds, it will go back to "RUN" (sensing) mode.

- Support for the China RoHS directive
  - For details on the support for the China RoHS directive, see the following website. [http://www.optex-fa.com/rohs\\_cn/](http://www.optex-fa.com/rohs_cn/)
- Specifications are subject to change without notice
- For more information, questions and comments regarding products, please contact us below.

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