

Contact Ramco for technical and application support

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.

1. Locations where dust, salt, iron powders, or vapor (steam) is present.
2. Locations subjected to corrosive gases or flammable gases.
3. Locations where water, oil, or chemical splashes may occur.
4. Locations where heavy vibrations or impacts may occur.
5. Locations where the ambient temperature exceeds the rated range.
6. Locations subject to rapid temperature changes (or where condensation occurs).
7. Locations with strong electric or magnetic fields.
8. 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 in no way be performed by the customer. Contact the Optex FA sales office.

In case water enters the product. If water or any other liquid 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.

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 μ W 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 μ s	
Response time	0.5ms Max. (averaging number: 1)	
Indicator	Output indicator (Orange LED*3)/ 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 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 ² 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/e²(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 lit 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.

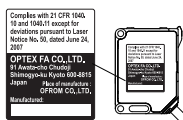
*6 Excluding load current for control output.

*7 Except for deviations pursuant to laser notice No.50.

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.

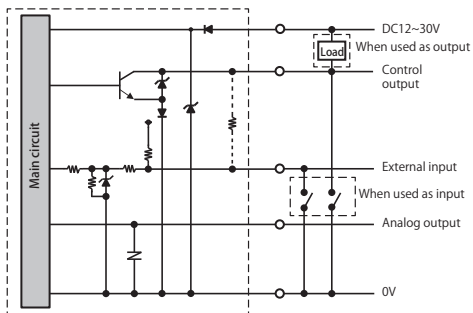
When exporting this product to USA, it's necessary to follow laser regulation of USA FDA. This product has been already reported to CDHR (Center for Devices and Radio-logical Health). For details, contact our customer service.



Circuit diagram

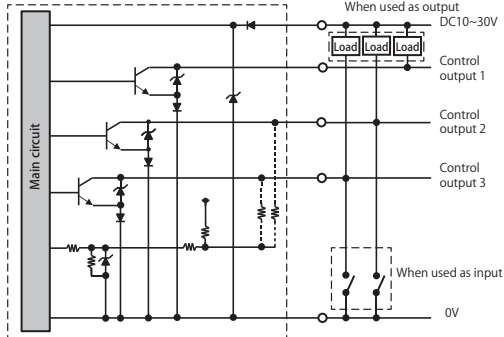
■ Analog output type

■ NPN mode

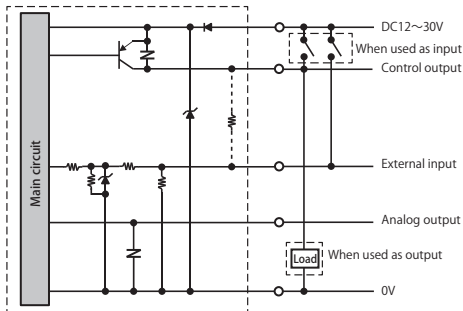


■ Control output type

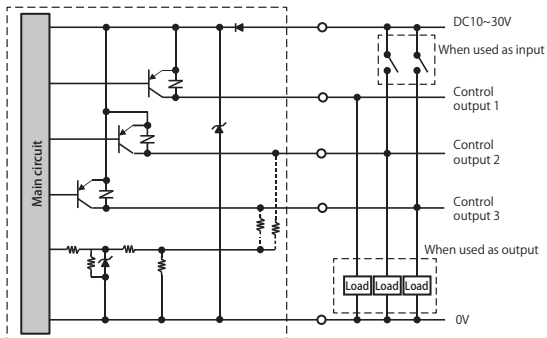
■ NPN mode



■ PNP mode



■ PNP mode



M8 connector pin-out



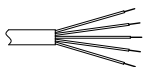
- ① . . . DC12~30V
- ② . . . Analog output
- ③ . . . 0V
- ④ . . . External input (switchable to control output)

M12 pig-tail pin-out



- ① . . . DC12~30V
- ② . . . Analog output
- ③ . . . 0V
- ④ . . . Control output
- ⑤ . . . External input

Cable wire color



- Brown . . . DC12~30V
- Blue . . . 0V
- Black . . . Control output
- White . . . Analog output
- Gray . . . External input

M8 connector pin-out



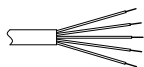
- ① . . . DC10~30V
- ② . . . Control output 1
- ③ . . . 0V
- ④ . . . External input (switchable to control output 2)

M12 pig-tail pin-out



- ① . . . DC10~30V
- ② . . . Control output 2
- ③ . . . 0V
- ④ . . . Control output 1
- ⑤ . . . External input (switchable to control output 3)

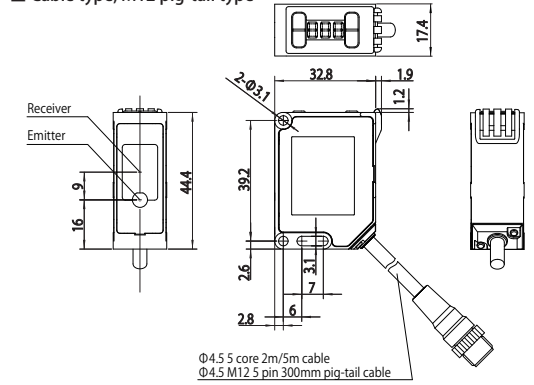
Cable wire color



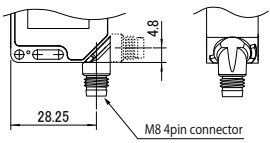
- Brown . . . DC10~30V
- Blue . . . 0V
- Black . . . Control output 1
- White . . . Control output 2
- Gray . . . External input (switchable to control output 3)

Dimensions

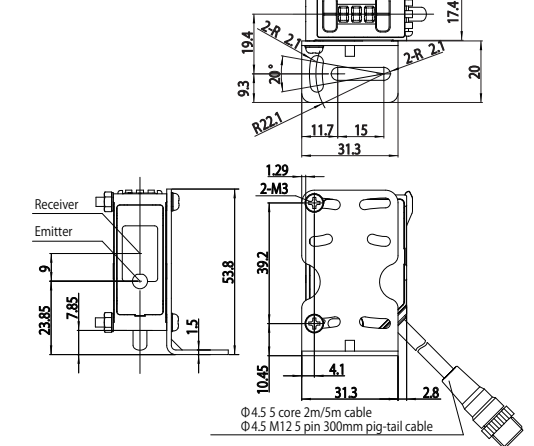
- Without mounting bracket [mm]
- Cable type, M12 pig-tail type



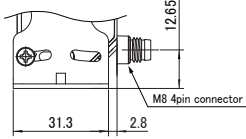
- M8 connector type



- With mounting bracket
- Cable type, M12 pig-tail type

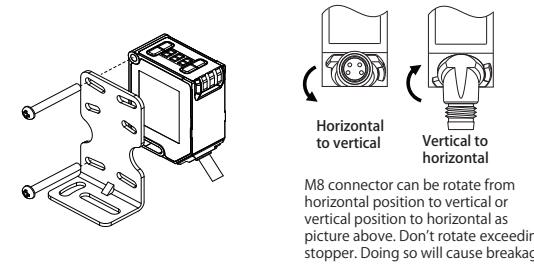


- M8 connector type



Installation

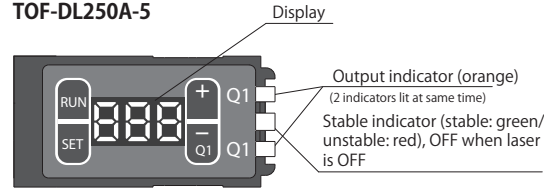
Tightening torque: 0.5N•m Max.



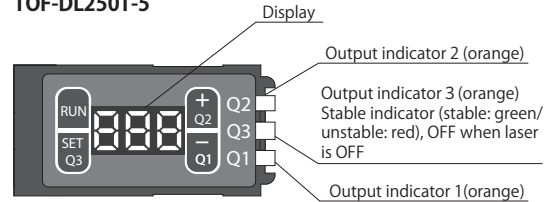
Name of the parts and setup

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

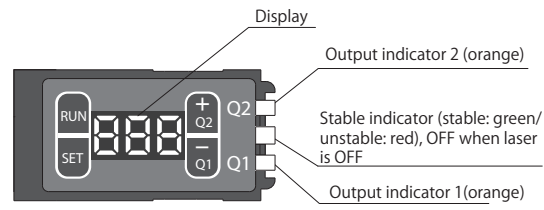
- TOF-DL250A
- TOF-DL250AC
- TOF-DL250AM12
- TOF-DL250A-5



- TOF-DL250T
- TOF-DL250TM12
- TOF-DL250T-5



- TOF-DL250DC



Button	Function while sensing	Function while setting
+		Increase setting value
-/Q1	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".	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 "uLc".	Back to "RUN" (sensing) mode
SET	Go to setting mode	Fix the setting value
Q2(*)	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".	
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)

1. External input (MF input)

Press "SET" to get to setting menu

Set function of external input

OFF Disable external input (neglect the input)

OUT Use as output (as following table)

Model	Target output
TOF-DL250A TOF-DL250AM12	Not applicable
TOF-DL250A-5	Output 1
TOF-DL250AC	Output 1
TOF-DL250T TOF-DL250TM12	Output 3
TOF-DL250T-5	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 and less than 2 seconds: Teaching Output 2
More than 2 seconds: Invalid

LSF Laser OFF : Kill the laser power (*)

LSN Laser ON: Activate the laser power

2. NPN/PNP selection

Won't be changed by initializing

NPN Set input/output as NPN (*)

PNP Set input/output as PNP

3. Analog output Current/Voltage selection

* Only for Analog output type

CUR Set as current output 4~20mA (*)

VOL Set as voltage output 0~10V

4. Operating mode Light ON/Dark ON (stability output) selection

LOn Light ON: Turns ON when the distance exceeds threshold (*)

DOn Dark ON: Turns ON when the distance is less than threshold

StbL Stability-Light ON: Output 1 turns ON when stable (Other output: Light ON)

StbD Stability-Dark ON: Output 1 turns ON when unstable (Other output: Dark ON)

5. Averaging

Set number of averaging

1 1 time

4 4 times

16 16 times

64 64 times (*)

256 256 times

6. Behavior when Alarm

* Only for Analog output type

ALP Output Maximum current /voltage (*)

HLd Hold: Keep the value just before the alarm

7. Initializing

Initialize settings to the value set when shipped except NPN/PNP setting

NO Not initialize

YES Execute initialize

8. Display

Select ON/OFF of the display

ON ON: Activate the display (unit: cm) (*)

OFF OFF: Darken the display when there is no button operation over 30 seconds

9. Delay

Set delay function for output on detection

OFF Not use delay function (*)

OFFd OFF delay: Delays output timing of ON to OFF

ONd ON delay: Delays output timing of OFF to ON

One One shot: Output ON for the period set

Input value
Range: 0~999
Default: 0
Unit: 10ms

10. Near side setting

Set the distance to output 4mA (current output)/0V (voltage output)

000 Input value

Range: 0~400, Default: 0, Unit: cm

11. Far side setting

Set the distance to output 20mA (current output)/10V (voltage output)

000 Input value

Range: 0~400, Default: 300, Unit: cm

12. Output 1 threshold level

Set the threshold level of Output 1

000 Input value

Range: 0~400, Default: 300, Unit: cm

13. Output 2 threshold level

Set the threshold level of Output 2

000 Input value

Range: 0~400, Default: 300, Unit: cm

14. Output 3 threshold level

Set the threshold level of Output 3

000 Input value

Range: 0~400, Default: 300, Unit: cm

15. Offset

Set the offset value to add on the Teaching level (Offset value is valid from 2nd time of Teaching)

000 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



●Specifications are subject to change without notice

●For more information, questions and comments regarding products, please contact us below.

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