

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 a fire, damage, or a malfunction.

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.
- 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 or 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, 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 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 conductor 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.

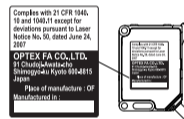
Don't use the sensor on transient state after power on (approx. 300ms).

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.



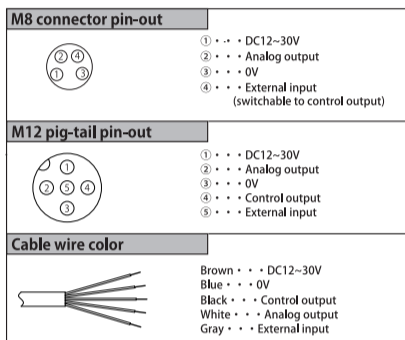
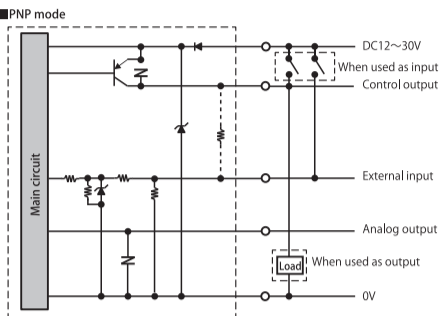
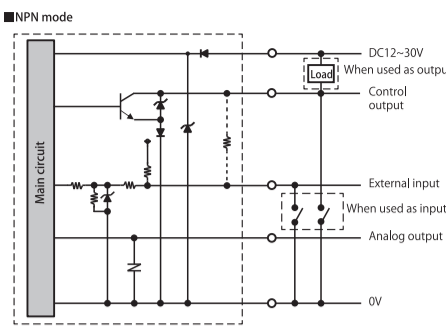
## SPECIFICATIONS

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*3	3% or less (moving average performed: 64 times/256 times, distance: 1 m to 2.5 m, typical example)	
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)*5	
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%*6 DC10~30V including ripple (P-P)10%	
Current consumption	60mA Max.*7	
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 60947-5-2 / 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	

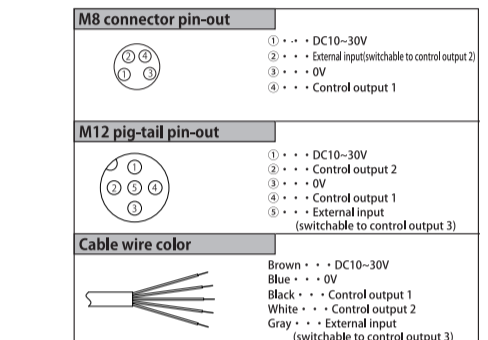
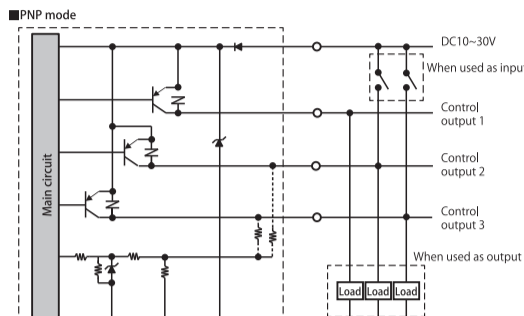
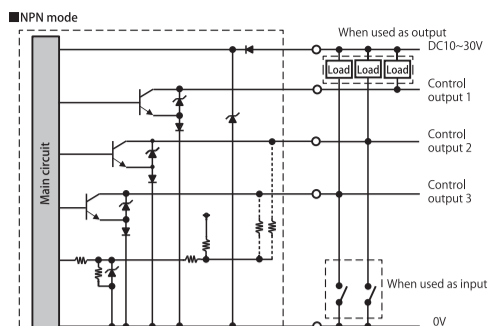
- \*1 These products are Classified as CLASS 1 by IEC 60825-1:2007 according to Laser Notice No.50, FDA Guidance Document.
- \*2 Defined with center strength 1/e<sup>2</sup>(13.5%) at the center. There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object close to the detection area.
- \*3 With a reflectance of 6% for black paper, 18% for gray paper, and 90% for white paper
- \*4 Analog output type have 2 lit at same time. M8 connector type (TOF-DL250DC) has 2 for 2 control outputs.
- \*5 Analog output type have 1. M8 connector type (TOF-DL250DC) has 2. Other types have 3 control outputs.
- \*6 Use power supply with DC12.0V Min. to get sufficient output for analog output.
- \*7 Excluding load current for control output.
- \*8 Except for deviations pursuant to laser notice No.50.

## Circuit diagram

### ■ Analog output type



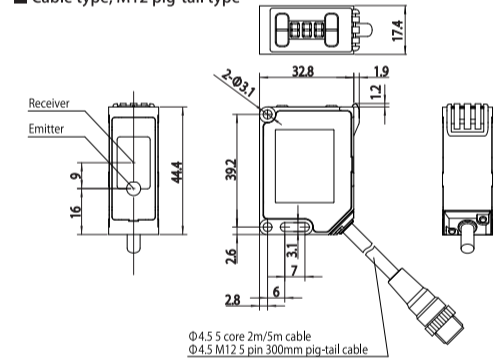
### ■ Control output type



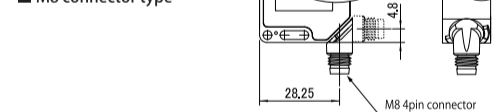
## Dimensions

### ● Without mounting bracket

#### ■ Cable type, M12 pig-tail type

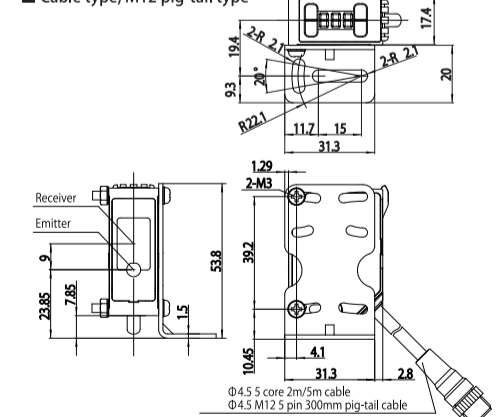


### ■ M8 connector type



### ● With mounting bracket

#### ■ Cable type, M12 pig-tail type

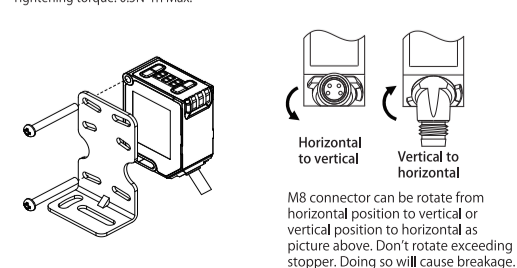


### ■ M8 connector type



## Installation

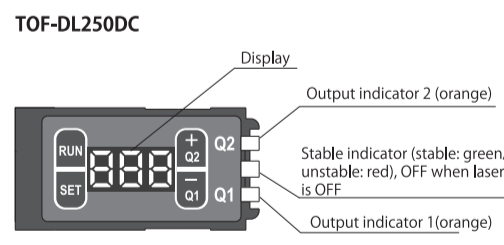
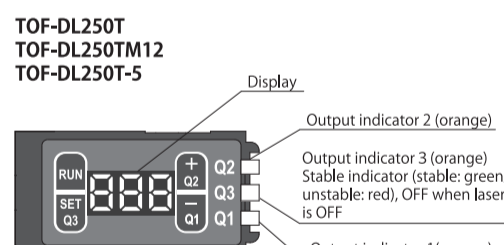
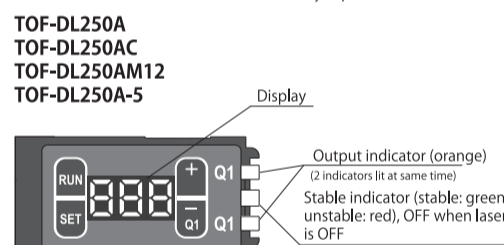
Tightening torque: 0.5N·m Max.



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.

## Name of the parts and setup

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



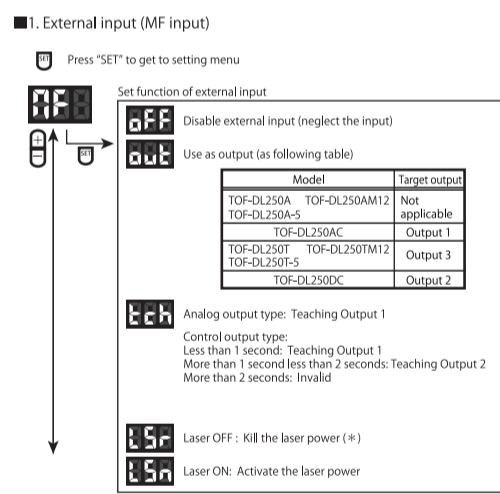
Button	Function while sensing	Function while setting
+		Increase setting value
-/Q1	By pressing 1 second or more, Teaching of Output 1 will be done for current distance. Then, the display shows "tc1" and the threshold level. * For TOF-DL250AC, external input to be set "out".	Decrease setting value
RUN	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.

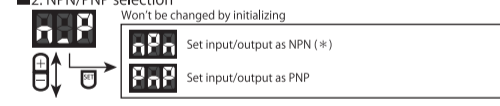
## Extension mode

You can get to "Extension mode" by clicking "RUN" button or "SET" button.

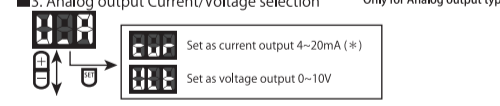
### ■ 1. External input (MF input)



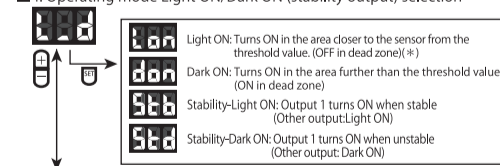
### ■ 2. NPN/PNP selection



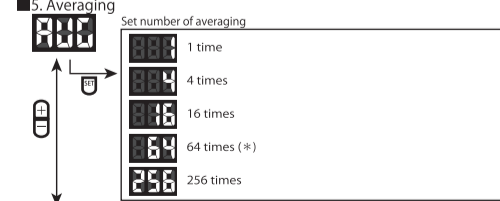
### ■ 3. Analog output Current/Voltage selection



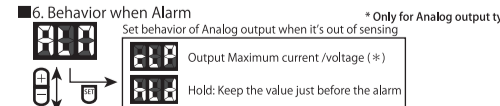
### ■ 4. Operating mode Light ON/Dark ON (stability output) selection



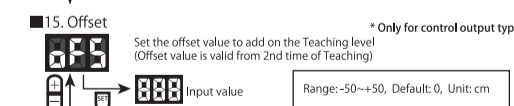
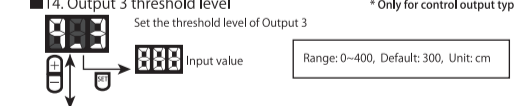
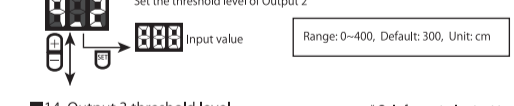
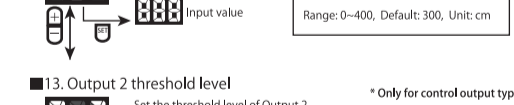
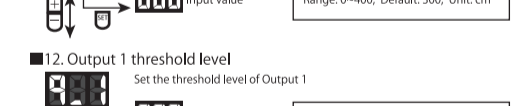
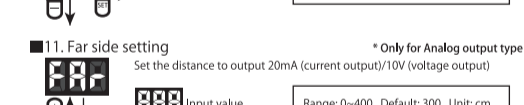
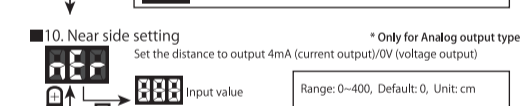
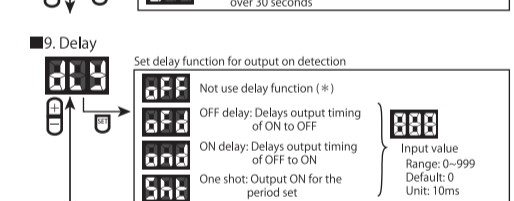
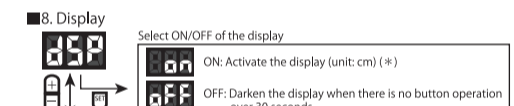
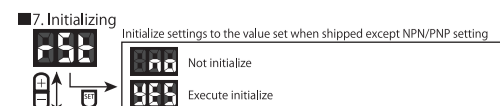
### ■ 5. Averaging



### ■ 6. Behavior when Alarm



### ■ 7. Initializing



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.

**OPTEX FA CO., LTD.**  
 91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN  
 TEL: +81-(0)75-325-1314 FAX: +81-(0)75-325-2936  
<http://www.optex-fa.com>

Long Distance BGS Laser Sensor

# TOF-DL250G Series

TOF-DL250GC

IO-Link setting file (IODD file) can be downloaded from our web site.  
<https://www.optex-fa.com>



**OPTEX FA CO., LTD.**

- Thank you for purchasing this Long Distance BGS Laser Sensor TOF-DL250G Series.
- Before using this product, please read this manual carefully to ensure proper use.
- Read this manual thoroughly, and then keep this manual at hand so that it can be used whenever necessary.
- The warranty period of this product is one year after delivery. However, any fault attributable to natural disasters or any other similar disasters or modification or repair will be excluded from the scope of the warranty.

## Safety Precautions

Safety precautions for ensuring safe operation of this product are displayed as follows with the following symbols.

Precautions listed here describe important information about safety. Make sure to follow them accordingly.

### Safety Symbols

<b>WARNING</b>	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.
<b>CAUTION</b>	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.
  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.
- This product cannot be used as safety device for the purpose of protecting the human body.

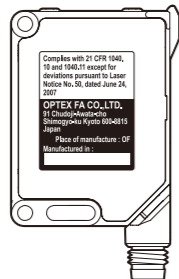
### CAUTION

- 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 to wire the product correctly. Incorrect wiring can damage the product or cause a malfunction.
- 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 emits a visible laser beam and is classified as a Class 1 Laser Product by the JIS C6802:2014/IEC 60825-1:2007 and 2014 Laser Product Safety Standards.

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.

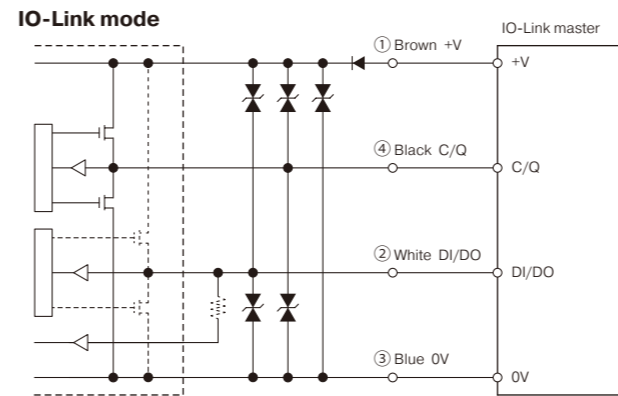


## 1. Specifications

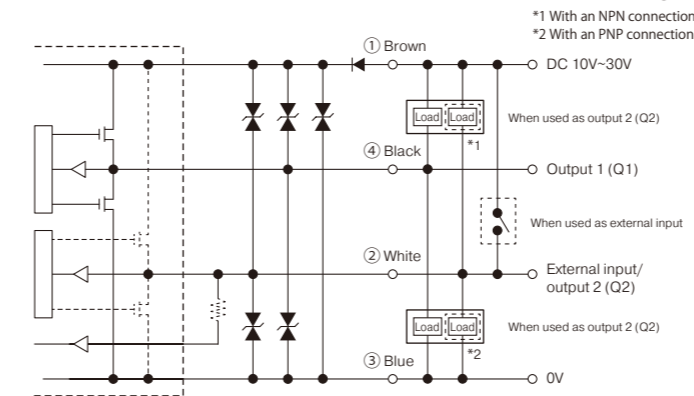
Type	IO-Link type	
Model	TOF-DL250GC	
Measurement range*1	0.25 to 2.5 m	
Light source	Medium/Wavelength	Red semiconductor laser, Wavelength: 650 nm
	Output	Average: 390 μW or less, Maximum: 64mW
Pulse width/Frequency	7ns, 11.11MHz	
	Laser class	CLASS 1 (IEC/JIS/FDA*2)
Spot size*3	ø10 mm (At a distance of 2.5 m)	
Sampling period / Response time	200 μs / 0.5 ms or less (When performing moving average once)	
Hysteresis	Typical value: 3% or less (Moving average performed: 64 or 256 times, Distance: 1 to 2.5 m)	
Sensitivity adjustment	Teaching (Manual adjustment possible after teaching)	
Indicators	Light receiving 1 (Orange), Light receiving 2 (Orange), Power/IO-Link (Green)	
Digital display	7-segment, 3-digit LED display (Display unit: cm)	
External input	Laser OFF input / Teaching input (Selectable by setting)	
Control output	Push/Pull*4, NPN/PNP open collector (Selectable by setting) Max. 100 mA / 30 VDC, Residual voltage 1.8 V Max.	
No. of outputs	2*5	
Output mode	Invertible by setting	
IO-Link	Specification	Ver. 1.1
	Transmission rate	COM 3 (230.4 kbps)
	Process data length	4 byte
	Min. cycle time	1.0 ms
Connection type	Connector type: M8, 4-pin	
Protection circuit	Reverse connection protection, Overcurrent protection	
Supply voltage	IO-Link: 18 to 30 VDC, SIO: 10 to 30 VDC, including 10% ripple (p-p)	
Current consumption	60 mA or less*6	
Applicable regulations	EMC	EMC directive (2014/30/EU)
	RoHS	RoHS directive (2011/65/EU), China RoHS (Directive 32)
	Safety	FDA regulations (21 CFR 1040.10 and 1040.11*7)
Applicable standards	EN 60947-5-2/IEC 60825-1	
Cross-talk prevention	Up to 2 units	
Ambient temperature/humidity	-10 to +50°C (No freezing) / 35 to 85% RH (No condensation)	
Storage temperature/humidity	-40 to +70°C (No freezing) / 35 to 95% RH (No condensation)	
Ambient illuminance	Sunlight: 4,000 lx or less, Fluorescent lamp: 3,000 lx or less (at receiving window)	
Vibration resistance	10 to 55 Hz, double amplitude 1.5 mm, 2 hours in each of the XY and Z directions	
Shock resistance	500 m/s <sup>2</sup> (Approx. 50 G), 3 times in each of the XY and Z directions	
Degree of protection	IP67	
Material	Housing: PC, Front cover: PMMA	
Weight	Approx. 30 g	
Included accessories	Mounting bracket: BEF-WK-190, Mounting screws (M3 × 20 mm)	

- \*1. For black paper (6% reflectance), gray paper (18% reflectance), and white paper (90% reflectance).
- \*2. In accordance with the FDA provisions of Laser Notice No. 50, the laser is classified as Class 1 per the IEC 60825-1:2007 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. Default state of IO-Link type is Push/Pull.
- \*5. Default state of Output 2 is not assigned.
- \*6. Not including control output load current.
- \*7. Excluding differences per Laser Notice No. 50.

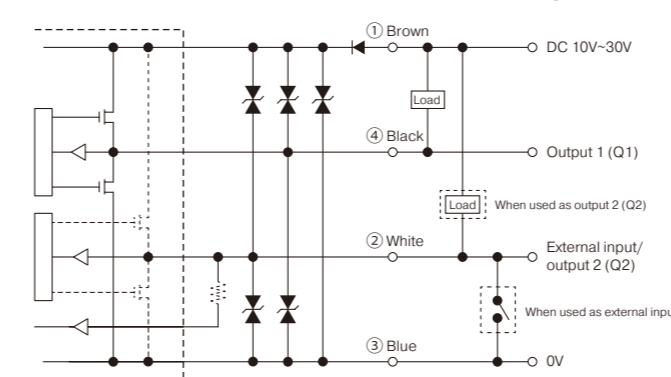
## 2. Circuit diagram



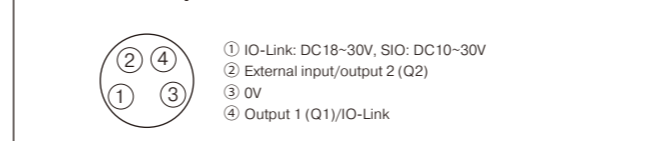
### SIO mode (standard I/O mode) with the push-pull/PNP setting



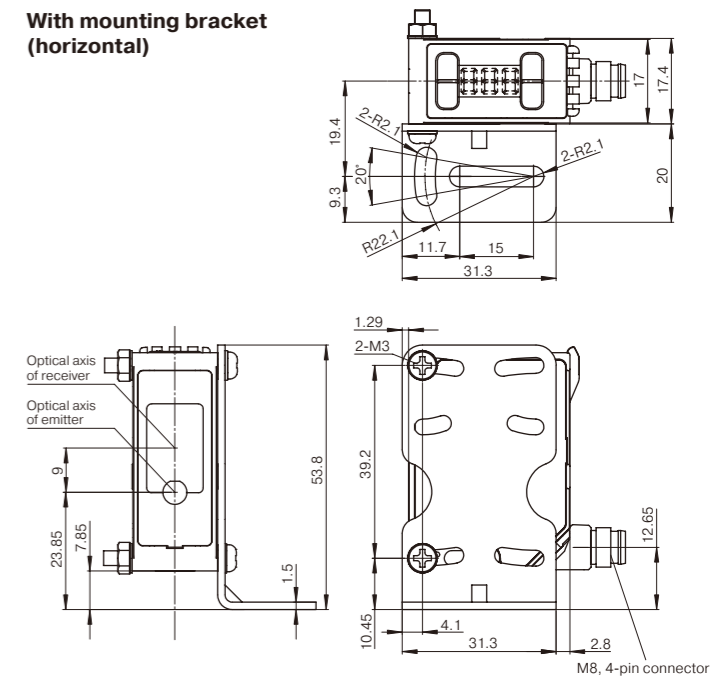
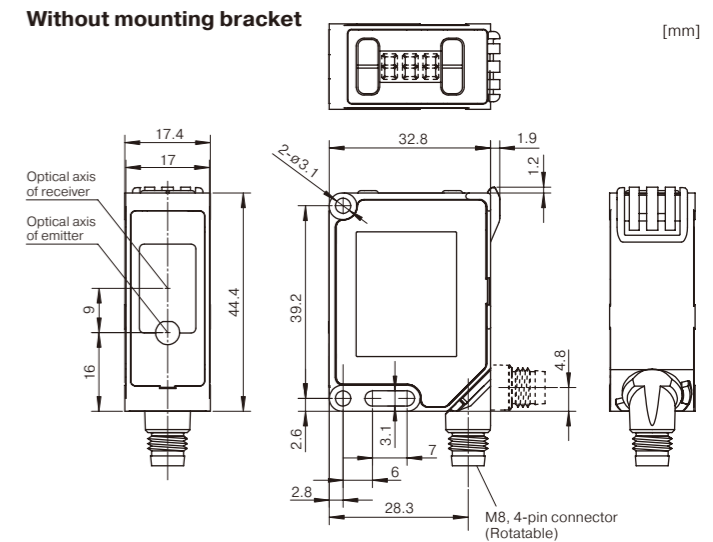
### SIO mode (standard I/O mode) with the NPN setting



### M8 connector pin-out

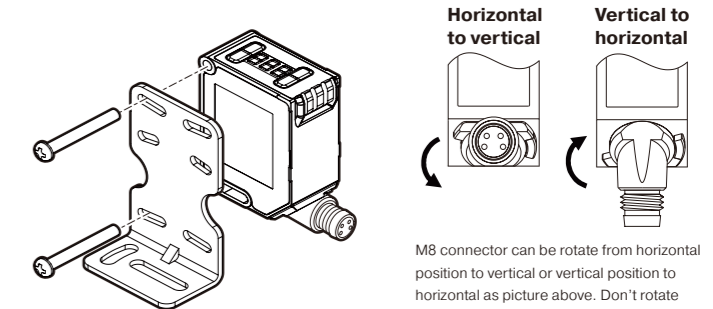


## 3. Dimensions



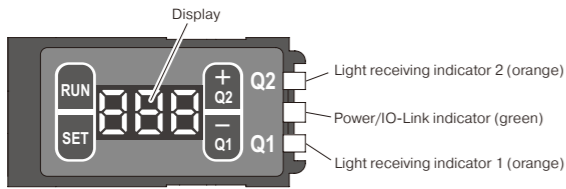
## 4. Installation

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.

## 5. Name of the parts and setup



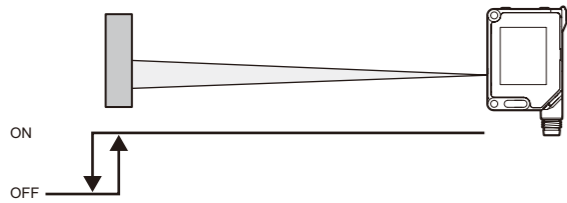
Button	Function while sensing	Function while setting
RUN	Go to setting mode By pressing 1 second or more, Keys will be locked and the display shows "Loc". While keys are locked, by pressing 1 second or more, key-lock will be released and the display shows "uLc".	Back to "RUN" (sensing) mode
SET	Go to setting mode	Fix the setting value
+Q2	Holding down this button for 1 second or more teaches the current measured value to output 2 (Q2) as the threshold. (When this is finished, the display shows "t21" or "t22" followed by the threshold.)	Increase setting value
-Q1	Holding down this button for 1 second or more teaches the current measured value to output 1 (Q1) as the threshold. (When this is finished, the display shows "t11" or "t12" followed by the threshold.)	Decrease setting value

## 6. Teaching

There are three types of teaching: "1-point teaching", "window teaching", and "2-point teaching". Use the type of teaching that matches your application.

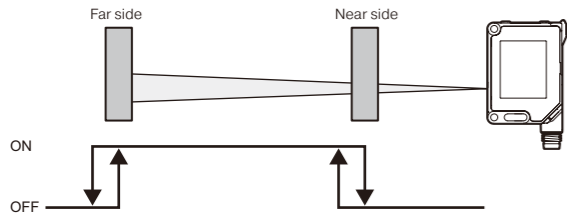
### Output operation in 1-point teaching

Place the object for detection and perform teaching to set the threshold to the distance at which it is barely possible to detect the object.



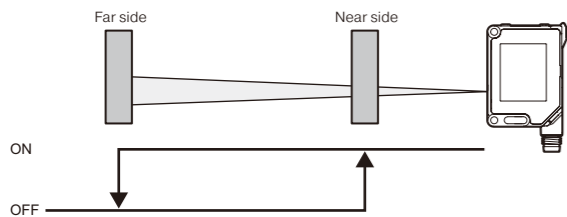
### Output operation in window teaching

Place the object for detection at the near side and at the far side and perform teaching with the object at each side to set the sensor so that the object is detected while it is within this range.



### Output operation in 2-point teaching

Place the object for detection at the near side and at the far side and perform teaching with the object at each side to set the sensor so that the signal turns ON with the object at the near side when the object comes close to the sensor and the signal turns OFF with the object at the far side when the object moves away from the sensor.



## Output 1 (Q1) teaching operation

\* To teach output 2 (Q2), press the  $\left[ \begin{smallmatrix} + \\ Q2 \end{smallmatrix} \right]$  button, and then perform the same operation as described here.

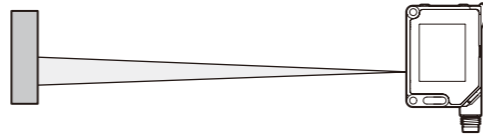
### Procedure for 1-point teaching

As shown under "8. Function details" on the right, select "SPt" for "qc1" to enable 1-point teaching.

\* "SPt" is selected in the factory default settings.

\* To perform 1-point teaching for output 2 (Q2), select "SPt" for "qc2".

- Place the object for detection at the position where you want to detect it.



- Hold down the  $\left[ \begin{smallmatrix} - \\ Q1 \end{smallmatrix} \right]$  button for 1 second or longer. The display shows "t11" followed by the threshold, at which point teaching is complete.

\* You can also use a numeric value to specify the threshold with "qF1" under "8. Function details" on the right. (For output 2 (Q2), use "qF2".)

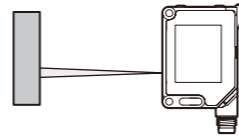
### Procedure for window teaching and 2-point teaching

As shown under "8. Function details" on the right, select "WdW" for "qc1" to enable window teaching or "2Pt" for "qc1" to enable 2-point teaching.

\* "SPt" is selected in the factory default settings.

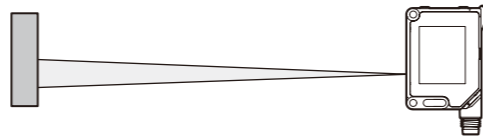
\* To perform teaching for output 2 (Q2), select "WdW" or "2Pt" for "qc2".

- Place the object for detection at the near-side (or far-side) position.



- Hold down the  $\left[ \begin{smallmatrix} - \\ Q2 \end{smallmatrix} \right]$  button for 1 second or longer. The display shows "t11" (or "t21" for output 2 (Q2)) followed by the threshold, at which point the first threshold has been registered.

- Place the object for detection at the far-side (or near-side) position.



- Hold down the  $\left[ \begin{smallmatrix} - \\ Q1 \end{smallmatrix} \right]$  button for 1 second or longer. The display shows "t12" (or "t22" for output 2 (Q2)) followed by the threshold, at which point the second threshold has been registered and teaching is complete.

\* You can also use numeric values to specify the thresholds with "qn1" and "qF1" under "8. Function details" on the right. (For output 2 (Q2), use "qn2" and "qF2".)

## 7. Locking button operations

### Button lock

Hold down the RUN button for 1 second or longer to lock (Loc) or unlock (uLc) button operations.

- $\left[ \begin{smallmatrix} L \\ o \\ c \end{smallmatrix} \right]$  Button operations are locked
- $\left[ \begin{smallmatrix} u \\ L \\ c \end{smallmatrix} \right]$  Button operations are unlocked (\*)

## 8. Function details

You can get to "Function details" by clicking "RUN" button or "SET" button.

("\*" means default value)

### 1. Pin ② external I/O setting

Press "SET" to get to setting menu

Set the pin ② (white lead wire) external I/O

- $\left[ \begin{smallmatrix} o \\ f \\ f \end{smallmatrix} \right]$  Do not use pin ② as external I/O
- $\left[ \begin{smallmatrix} E \\ i \\ n \end{smallmatrix} \right]$  Make it possible to use the external input function in IO-Link communication
- $\left[ \begin{smallmatrix} L \\ S \\ r \end{smallmatrix} \right]$  Set to laser OFF input
- $\left[ \begin{smallmatrix} T \\ e \\ c \\ h \end{smallmatrix} \right]$  Set to teaching input for output 1 (Q1)
- $\left[ \begin{smallmatrix} Q \\ r \\ R \end{smallmatrix} \right]$  Set to measurement quality alarm output. The receiving light level decreases due to the conditions of the object for detection, causing the measurement quality to decrease. The alarm is output when the measurement quality falls to or below the threshold.
- $\left[ \begin{smallmatrix} Q \\ L \\ 2 \end{smallmatrix} \right]$  Set to output 2 (Q2; to generate output, setting with IO-Link Index is required) (\*)
- $\left[ \begin{smallmatrix} Q \\ n \\ 1 \end{smallmatrix} \right]$  Output internal output Qint1 to an external device
- $\left[ \begin{smallmatrix} Q \\ n \\ 2 \end{smallmatrix} \right]$  Output internal output Qint2 to an external device
- $\left[ \begin{smallmatrix} Q \\ L \\ 1 \end{smallmatrix} \right]$  Generate output with the same operation as output 1 (Q1)
- $\left[ \begin{smallmatrix} Q \\ b \\ 1 \end{smallmatrix} \right]$  Inverted output of output 1 (Q1)

### 2. Output selection

Set the electrical output characteristic

- $\left[ \begin{smallmatrix} n \\ P \\ n \end{smallmatrix} \right]$  Set the control output to NPN.
- $\left[ \begin{smallmatrix} P \\ P \\ P \end{smallmatrix} \right]$  Set the control output to PUSH/PULL. (\*)
- $\left[ \begin{smallmatrix} P \\ n \\ P \end{smallmatrix} \right]$  Set the control output to PNP.

### 3. Averaging

Set the number of times over which to average the measured values (moving average)

- $\left[ \begin{smallmatrix} S \\ 1 \\ 2 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} S \\ 5 \\ 1 \\ 2 \end{smallmatrix} \right]$  Settable values: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512
- Default: 64 (\*)

### 4. Initializing

Initialize the settings

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not initialize the settings (\*)
- $\left[ \begin{smallmatrix} Y \\ E \\ S \end{smallmatrix} \right]$  Initialize the settings to return the sensor to the factory default settings

※ "2. Output selection" will not be initialized.

### 5. Display

Select the display's brightness

- $\left[ \begin{smallmatrix} o \\ n \end{smallmatrix} \right]$  Keep the display bright at all times (\*)
- $\left[ \begin{smallmatrix} o \\ f \\ f \end{smallmatrix} \right]$  Darken the display if there are no button operations for 30 seconds

### 6. Output 1 (Q1) setting

Enable/disable output 1 (Q1) and set its teaching mode

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not use output 1 (Q1)
- $\left[ \begin{smallmatrix} S \\ P \\ t \end{smallmatrix} \right]$  Set the teaching mode of output 1 (Q1) to 1-point teaching (\*)
- $\left[ \begin{smallmatrix} W \\ d \\ W \end{smallmatrix} \right]$  Set the teaching mode of output 1 (Q1) to window teaching
- $\left[ \begin{smallmatrix} 2 \\ P \\ t \end{smallmatrix} \right]$  Set the teaching mode of output 1 (Q1) to 2-point teaching

### 7. Output 2 (Q2) setting

Enable/disable output 2 (Q2) and set its teaching mode

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not use output 2 (Q2)
- $\left[ \begin{smallmatrix} S \\ P \\ t \end{smallmatrix} \right]$  Set the teaching mode of output 2 (Q2) to 1-point teaching (\*)
- $\left[ \begin{smallmatrix} W \\ d \\ W \end{smallmatrix} \right]$  Set the teaching mode of output 2 (Q2) to window teaching
- $\left[ \begin{smallmatrix} 2 \\ P \\ t \end{smallmatrix} \right]$  Set the teaching mode of output 2 (Q2) to 2-point teaching

### 8. Output 1 (Q1) output mode setting

Set the output mode of output 1 (Q1)

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not invert output 1 (Q1; light ON operation) (\*)
- $\left[ \begin{smallmatrix} i \\ n \\ v \end{smallmatrix} \right]$  Invert output 1 (Q1; dark ON operation)

※ This is not linked with the detection indicator.

### 9. Output 2 (Q2) output mode setting

Set the output mode of output 2 (Q2)

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not invert output 2 (Q2; light ON operation) (\*)
- $\left[ \begin{smallmatrix} i \\ n \\ v \end{smallmatrix} \right]$  Invert output 2 (Q2; dark ON operation)

※ This is not linked with the detection indicator.

### 10. Output 1 (Q1) timer function setting

Set the timer function of output 1 (Q1) (Unit: 10ms)

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not use the timer function (\*)
- $\left[ \begin{smallmatrix} o \\ n \\ d \end{smallmatrix} \right]$  Output 1 (Q1) operates with an ON delay
- $\left[ \begin{smallmatrix} o \\ f \\ f \end{smallmatrix} \right]$  Output 1 (Q1) operates with an OFF delay
- $\left[ \begin{smallmatrix} o \\ n \\ F \end{smallmatrix} \right]$  Output 1 (Q1) operates with an ON delay + OFF delay
- $\left[ \begin{smallmatrix} S \\ h \\ t \end{smallmatrix} \right]$  Output 1 (Q1) operates with a one shot timer

※ Time delay is not linked with the detection indicator.

### 11. Output 2 (Q2) timer function setting

Set the timer function of output 2 (Q2) (Unit: 10ms)

- $\left[ \begin{smallmatrix} n \\ o \end{smallmatrix} \right]$  Do not use the timer function (\*)
- $\left[ \begin{smallmatrix} o \\ n \\ d \end{smallmatrix} \right]$  Output 2 (Q2) operates with an ON delay
- $\left[ \begin{smallmatrix} o \\ f \\ f \end{smallmatrix} \right]$  Output 2 (Q2) operates with an OFF delay
- $\left[ \begin{smallmatrix} o \\ n \\ F \end{smallmatrix} \right]$  Output 2 (Q2) operates with an ON delay and an OFF delay
- $\left[ \begin{smallmatrix} S \\ h \\ t \end{smallmatrix} \right]$  Output 2 (Q2) operates with a one shot timer

※ Time delay is not linked with the detection indicator.

### 12. Offset

Teach to the value obtained by offsetting the current value by this setting value (Unit: mm)

- $\left[ \begin{smallmatrix} - \\ 9 \\ 9 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} 1 \\ 0 \\ 0 \end{smallmatrix} \right]$  Setting range: -99 to 100
- Default: 0 (\*)

### 13. Output 1 (Q1) threshold level

Specify the output 1 (Q1) threshold with a numeric value (unit: cm)

- $\left[ \begin{smallmatrix} 0 \\ 0 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} 3 \\ 3 \\ 0 \end{smallmatrix} \right]$  Setting range: 0 to 330
- Default: 300 (\*)

### 14. Output 1 (Q1) near-side threshold setting

Specify the output 1 (Q1) near-side threshold with a numeric value  
This can be set when "qc1" is set to "WdW" or "2Pt" (Unit: cm)

- $\left[ \begin{smallmatrix} 0 \\ 0 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} 3 \\ 3 \\ 0 \end{smallmatrix} \right]$  Setting range: 0 to 330
- Default: 0 (\*)

### 15. Output 2 (Q2) threshold level

Specify the output 2 (Q2) threshold with a numeric value (unit: cm)

- $\left[ \begin{smallmatrix} 0 \\ 0 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} 3 \\ 3 \\ 0 \end{smallmatrix} \right]$  Setting range: 0 to 330
- Default: 300 (\*)

### 16. Output 2 (Q2) near-side threshold setting

Specify the output 2 (Q2) near-side threshold with a numeric value  
This can be set when "qc2" is set to "WdW" or "2Pt" (Unit: cm)

- $\left[ \begin{smallmatrix} 0 \\ 0 \end{smallmatrix} \right]$  ...  $\left[ \begin{smallmatrix} 3 \\ 3 \\ 0 \end{smallmatrix} \right]$  Setting range: 0 to 330
- Default: 0 (\*)

After finishing the settings, press the "RUN" button to return to the normal measurement display. Also, the sensor will automatically return to the measurement display if no operations are performed on the setting menu for approx. 30 seconds.

※ When the sensor is set to a value that only exists in IO-Link, the display shows  $\left[ \begin{smallmatrix} - \\ - \\ - \end{smallmatrix} \right]$

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

\* This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

• Support for the China RoHS directive  
 For details on the support for the China RoHS directive (the Administrative Measure on the Control of Pollution Caused by Electronic Information Products), see the following website.  
[https://www.optex-fa.com/rohs\\_cn/](https://www.optex-fa.com/rohs_cn/)

## OPTEX FA CO., LTD.

[Headquarters]  
 91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN  
 TEL +81-75-325-1314 FAX +81-75-325-2936

<https://www.optex-fa.com>

Long distance laser BGS sensor

# TOF-DL250G SERIES

IO-Link setting file (IOPD file) can be downloaded from our web site.  
<https://www.optex-fa.com>



OPTEX FA CO.,LTD.

## Communication specifications

Min. cycle time	1.0 ms		
Baud rate	COM 3 (230.4kbps)		
M-Sequence code in Pre-operate mode	0		
M-Sequence code in Operate mode	0		
ISDU support	Yes		
IO-Link revision	1.1		
Inputting process data length	4 byte		
Outputting process data length	0 byte		
Vendor ID	dec: 1076	hex: 0x0434	
Device ID	dec: 65539	hex: 0x010003	

## Process Data Format

Upper byte								Lower byte							
bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Distance data between sensor and object															

Upper byte								Lower byte									
bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0		
Spare value								Output status									
								Qint8	Qint7	Qint6	Qint5	Qint4	Qint3	Qint2	Qint1	QL2	QL1

## Service Data

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
12 0x0C	Device Access Locks	Record	2 Byte	r/w			
2 0x02	Data Storage Lock	Bit (1)	1 Bit	r/w			
4 0x04	Local User Interface Lock	Bit (3)	1 Bit	r/w			
13 0x0D	Profile Characteristic	Array	10 Byte	ro	Unsigned Integer16 [5]		
14 0x0E	PDInput Descriptor	Array	6 Byte	ro	Octet String [2]		
15 0x0F	PDOOutput Descriptor	Array	3 Byte	ro	Octet String [1]		
17 0x11	Vendor Text	String	64 Byte	ro	www.optex-fa.com		
19 0x13	Product ID	String	18 Byte	ro	20262		
20 0x14	Product Text	String	45 Byte	ro	Photoelectric Proximity Sensor		
21 0x15	Serial Number	String	8 Byte	ro	LOT(4 digits) + 262 + Serial (4digits) + F		
22 0x16	Hardware Version	String	4 Byte	ro	MP01		
23 0x17	Firmware Version	String	19 Byte	ro	.*.*.R		
24 0x18	Application Specific Tag	String	32 Byte	r/w	*****		
36 0x24	Device Status	Uint	8 Byte	ro	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure 5..255 = Reserved		
40 0x28	Process Data Input	PD In	4 Byte	ro			
58 0x3A	Teach-in Channel	Uint	8 Bit	r/w	0	0 = default Qint. = Qint. 1 1 = Qint. 1 2 = Qint. 2 3 = Qint. 3 4 = Qint. 4 5 = Qint. 5 6 = Qint. 6 7 = Qint. 7 8 = Qint. 8	
59 0x3B	Teach-in State	Record	1 Byte	ro			
1 0x01	Teach flag SP2	Bit (6)	1 Bit	ro	true = Teachpoint 2 successfully taught false = Teachpoint 2 not taught		
2 0x02	Teach flag SP1	Bit (4)	1 Bit	ro	true = Teachpoint 1 successfully taught false = Teachpoint 1 not taught		
3 0x03	Teach state	Bit (0)	4 Bit	ro	0 = IDLE 1 = SP1 SUCCESS 2 = SP2 SUCCESS 5 = BUSY 7 = ERROR		
60 0x3C	Qint.1 SP1 / SP2	Record	4 Byte	r/w			
1 0x01	Qint.1 SP1 sensing range	Bit (16)	16 Bit	r/w	200	200...3300	[mm]
2 0x02	Qint.1 SP2 sensing range	Bit (0)	16 Bit	r/w	200	200...3300	[mm]
61 0x3D	Qint.1 configuration	Record	4 Byte	r/w			
1 0x01	Switchpoint logic	Bit (24)	8 Bit	r/w	0	0 = Not inverted	

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
2 0x02	Switchpoint mode	Bit (16)	8 Bit	r/w	1	0 = Deactivated 1 = Single point mode 2 = Window mode 3 = Two point mode	
3 0x03	Switchpoint hysteresis	Bit (0)	16 Bit	r/w	0		
62 0x3E	Qint.2 SP1 / SP2	Record	4 Byte	r/w			
63 0x3F	Qint.2 configuration	Record	4 Byte	r/w			
64 0x40	Device specific name	String	32 Byte	r/w	*****		
89 0x59	Measurement averaging	Uint	8 Bit	r/w	6	0 = 1 value 1 = 2 values 2 = 4 values 3 = 8 values 4 = 16 values 5 = 32 values 6 = 64 values 7 = 128 values 8 = 256 values 9 = 512 values	
90 0x5A	Teach-in offset	Int	16 Bit	r/w	0	-100...100	
97 0x61	Sender off	Uint	8 Bit	r/w	0	0 = Sender active 1 = Sender not active	
121 0x79	Pin 2 configuration	Uint	8 Bit	r/w	34	0 = Deactivated / no function 1 = External input 16 = Sender off 17 = Teach-in 33 = Quality of run alarm output 34 = Switching signal QL2 35 = Detection output Qint. 1 36 = Detection output Qint. 2 39 = Switching signal QL1 40 = Switching signal QL1/	
153 0x99	Temperature	Record	5 Byte	ro			
1 0x01	Current temperature	Bit (32)	8 Bit	ro		[°C]	
2 0x02	Max. temperature all time	Bit (24)	8 Bit	ro	20		
3 0x03	Min. temperature all time	Bit (16)	8 Bit	ro	20		
4 0x04	Max. temperature since last reset	Bit (8)	8 Bit	ro	20		
5 0x05	Min. temperature since last reset	Bit (0)	8 Bit	ro	20		
155 0x9B	Remaining sender lifetime	Uint	16 Bit	ro	0...5000 65535	Shows the predicted number of days until the sender unit (e.g. laser, LED) reaches its end of lifetime (= data sheet performance values can no longer be guaranteed). Value 65535 = Calculation not possible e.g. due to missing history. [d]	
175 0xAF	Quality of run	Uint	8 Bit	ro	0	[%]	
176 0xB0	Quality of run alarm threshold	Uint	8 Bit	r/w	50	0...90	[%]
178 0xB2	Maintenance prediction	Uint	16 Bit	ro	0...5000 65535	Shows the predicted number of days until a maintenance service is required. Value 65535 = Calculation not possible e.g. due to missing history. [d]	
179 0xB3	Alarm thresholds for diagnostic parameters	Record	9 Byte	r/w			
1 0x01	Temperature threshold	Bit (64)	8 Bit	r/w	80	-127...127	Related to index 153 dez, sub-index 1 [°C]
2 0x02	Remaining sender lifetime threshold	Bit (48)	16 Bit	r/w	30	0...5000	Related to index 155dez [d]
3 0x03	Maintenance prediction threshold	Bit (32)	16 Bit	r/w	30	0...5000	Related to index 178 dez [d]
4 0x04	Operating hours threshold	Bit (0)	32 Bit	r/w	40000	0...1000000	Related to index 190 dez, sub-index 2 [h]
190 0xBE	Operating hours	Record	8 Byte	ro			
1 0x01	Total operating hours	Bit (32)	32 Bit	ro	0...1000000	Continuous counting of number of hours in which the sensor was powered-up. [h]	
2 0x02	Operating hours since last service	Bit (0)	32 Bit	ro	0...1000000	Operating hours since last reset to 0 via System Command 0xD2.	
204 0xCC	Find me	Uint	8 Bit	r/w	0	0 = Find me deactivated 1 = Find me activated	
219 0xDB	Article No.	Record	7 Byte	ro			
1 0x01	Article No. IO-Link device	Bit (0)	7 Byte	ro	0000000		
226 0xE2	System state	Record	2 Byte	ro		Communication and sensor application status	
1 0x01	Input signal state Pin 2	Bit (7)	1 Bit	ro	true = External input HIGH false = External input LOW		
2 0x02	Quality of run alarm	Bit (6)	1 Bit	ro	true = Alarm active false = Alarm not active		
227 0xE3	Notification handling	Uint	8 Bit	r/w	0	0 = All enabled 1 = All disabled 2 = Events enabled, PD invalid flag disabled 3 = Events disabled, PD invalid flag enabled	Does not affect the event "DS_UPLOAD_REQ"
229 0xE5	Distance to object	Record	3 Byte	ro		Read current distance to object / distance to background.	
1 0x01	Distance	Bit (8)	16 Bit	ro	0...30000	[mm]	
2 0x02	Distance qualifier	Bit (0)	8 Bit	ro	0 = Distance in range 1 = Distance over-run 2 = Distance under-run 3 = No distance information		
235 0xEB	Eco mode	Uint	8 Bit	r/w	0	0 = Off 1 = On	By enabling Eco-mode, the display will go dark 30 seconds after the last key operation.

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
1081 0x439	Input selector 1	Uint	8 Bit	r/w	0	0 = Qint. 1 1 = Qint. 2 2 = Qint. 3 3 = Qint. 4 4 = Qint. 5 5 = Qint. 6 6 = Qint. 7 7 = Qint. 8 64 = Ext.input 1	
1082 0x43A	Input selector 2	Uint	8 Bit	r/w	64	0 = Qint. 1 1 = Qint. 2 2 = Qint. 3 3 = Qint. 4 4 = Qint. 5 5 = Qint. 6 6 = Qint. 7 7 = Qint. 8 64 = Ext.input 1	
1083 0x43B	Logic 1	Uint	8 Bit	r/w	0	0 = DIRECT 1 = AND 2 = OR 3 = Window mode 4 = Hysteresis	
1084 0x43C	Logic 2	Uint	8 Bit	r/w	0	0 = DIRECT 1 = AND 2 = OR 3 = Window mode 4 = Hysteresis	
1085 0x43D	Timer 1 mode	Uint	8 Bit	r/w	0	0 = Deactivated 1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay 4 = Impulse (one shot)	
1086 0x43E	Timer 2 mode	Uint	8 Bit	r/w	0	0 = Deactivated 1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay 4 = Impulse (one shot)	
1087 0x43F	Time 1 setup	Uint	16 Bit	r/w	1	1...30000	Timer 1 setup time in ms [ms]
1088 0x440	Time 2 setup	Uint	16 Bit	r/w	1	1...30000	Timer 2 setup time in ms [ms]
1089 0x441	Inverter 1	Uint	8 Bit	r/w	0	0 = Not inverted 1 = Inverted	
1090 0x442	Inverter 2	Uint	8 Bit	r/w	0	0 = Not inverted 1 = Inverted	
1820 0x500	Qint.3 SP1 / SP2	Record	4 Byte	r/w			
1821 0x501	Qint.3 configuration	Record	4 Byte	r/w			
1822 0x502	Qint.4 SP1 / SP2	Record	4 Byte	r/w			
1823 0x503	Qint.4 configuration	Record	4 Byte	r/w			
1824 0x504	Qint.5 SP1 / SP2	Record	4 Byte	r/w			
1825 0x505	Qint.5 configuration	Record	4 Byte	r/w			
1826 0x506	Qint.6 SP1 / SP2	Record	4 Byte	r/w			
1827 0x507	Qint.6 configuration	Record	4 Byte	r/w			
1828 0x508	Qint.7 SP1 / SP2	Record	4 Byte	r/w			
1829 0x509	Qint.7 configuration	Record	4 Byte	r/w			
1830 0x50A	Qint.8 SP1 / SP2	Record	4 Byte	r/w			
1831 0x50B	Qint.8 configuration	Record	4 Byte	r/w			

Note: ro = read only, r/w = read/write

## Events

Code dec hex	Description	Type
16912 0x4210	Device temperature over-run	Warning
16928 0x4220	Device temperature under-run	Warning
6147 0x1803	Short circuit on Qx	Warning
65425 0xFF91	New parameters	Notification
6149 0x1805	Quality of run alarm	Warning
6150 0x1806	Teach / value out of specified range	Notification
6146 0x1802	Alarm temperature threshold	Warning
6145 0x1801	Alarm sender lifetime threshold	Warning
6144 0x1800	Alarm maintenance prediction threshold	Warning
6148 0x1804	Alarm operating hours	Warning

## Errors

Code dec hex	Additional Code	Description
128 0x80	17 (0x11)	Index not available
128 0x80	18 (0x12)	Subindex not available
128 0x80	32 (0x20)	Service temporarily not available
128 0x80	34 (0x22)	Service temporarily not available - device control
128 0x80	35 (0x23)	Access denied
128 0x80	48 (0x30)	Parameter value out of range
128 0x80	51 (0x33)	Parameter length over-run
128 0x80	52 (0x34)	Parameter length under-run
128 0x80	53 (0x35)	Function not available
128 0x80	54 (0x36)	Function temporarily unavailable
128 0x80	65 (0x41)	Inconsistent parameter set

## System command

Index No. dec hex	Name	Access	Code	Description	Remark [Unit]
2 0x02	System Command	wo	160(0xA0)	Single Value Teach SP1	
			161(0xA1)	Single Value Teach SP2	
			130(0xB2)	Restore Factory Settings	
			228(0XE4)	Reset diagnostics parameter	

Note: wo = write only

## OPTEX FA CO.,LTD.

[Headquarters]

91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN

TEL +81-75-325-1314 FAX +81-75-325-2936

<https://www.optex-fa.com>

Long distance laser BGS sensor

# TOF-DL250G SERIES

IO-Link setting file (IOPD file) can be downloaded from our web site.  
<https://www.optex-fa.com>



OPTEX FA CO.,LTD.

## Communication specifications

Min. cycle time	1.0 ms		
Baud rate	COM 3 (230.4kbps)		
M-Sequence code in Pre-operate mode	0		
M-Sequence code in Operate mode	0		
ISDU support	Yes		
IO-Link revision	1.1		
Inputting process data length	4 byte		
Outputting process data length	0 byte		
Vendor ID	dec: 1076	hex: 0x0434	
Device ID	dec: 65539	hex: 0x010003	

## Process Data Format

Upper byte								Lower byte							
bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Distance data between sensor and object															

Upper byte								Lower byte									
bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0		
Spare value								Output status									
								Qint8	Qint7	Qint6	Qint5	Qint4	Qint3	Qint2	Qint1	QL2	QL1

## Service Data

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
12 0x0C	Device Access Locks	Record	2 Byte	r/w			
2 0x02	Data Storage Lock	Bit (1)	1 Bit	r/w			
4 0x04	Local User Interface Lock	Bit (3)	1 Bit	r/w			
13 0x0D	Profile Characteristic	Array	10 Byte	ro	Unsigned Integer16 [5]		
14 0x0E	PDInput Descriptor	Array	6 Byte	ro	Octet String [2]		
15 0x0F	PDOOutput Descriptor	Array	3 Byte	ro	Octet String [1]		
17 0x11	Vendor Text	String	64 Byte	ro	www.optex-fa.com		
19 0x13	Product ID	String	18 Byte	ro	20262		
20 0x14	Product Text	String	45 Byte	ro	Photoelectric Proximity Sensor		
21 0x15	Serial Number	String	8 Byte	ro	LOT(4 digits) + 262 + Serial (4digits) + F		
22 0x16	Hardware Version	String	4 Byte	ro	MP01		
23 0x17	Firmware Version	String	19 Byte	ro	*.*.*.R		
24 0x18	Application Specific Tag	String	32 Byte	r/w	*****		
36 0x24	Device Status	Uint	8 Byte	ro	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure 5..255 = Reserved		
40 0x28	Process Data Input	PD In	4 Byte	ro			
58 0x3A	Teach-in Channel	Uint	8 Bit	r/w	0	0 = default Quint. = Quint. 1 1 = Quint. 1 2 = Quint. 2 3 = Quint. 3 4 = Quint. 4 5 = Quint. 5 6 = Quint. 6 7 = Quint. 7 8 = Quint. 8	
59 0x3B	Teach-in State	Record	1 Byte	ro			
1 0x01	Teach flag SP2	Bit (6)	1 Bit	ro	true = Teachpoint 2 successfully taught false = Teachpoint 2 not taught		
2 0x02	Teach flag SP1	Bit (4)	1 Bit	ro	true = Teachpoint 1 successfully taught false = Teachpoint 1 not taught		
3 0x03	Teach state	Bit (0)	4 Bit	ro	0 = IDLE 1 = SP1 SUCCESS 2 = SP2 SUCCESS 5 = BUSY 7 = ERROR		
60 0x3C	Quint.1 SP1 / SP2	Record	4 Byte	r/w			
1 0x01	Quint.1 SP1 sensing range	Bit (16)	16 Bit	r/w	200	200...3300	[mm]
2 0x02	Quint.1 SP2 sensing range	Bit (0)	16 Bit	r/w	200	200...3300	[mm]
61 0x3D	Quint.1 configuration	Record	4 Byte	r/w			
1 0x01	Switchpoint logic	Bit (24)	8 Bit	r/w	0	0 = Not inverted	

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
2 0x02	Switchpoint mode	Bit (16)	8 Bit	r/w	1	0 = Deactivated 1 = Single point mode 2 = Window mode 3 = Two point mode	
3 0x03	Switchpoint hysteresis	Bit (0)	16 Bit	r/w	0		
62 0x3E	Quint.2 SP1 / SP2	Record	4 Byte	r/w			
63 0x3F	Quint.2 configuration	Record	4 Byte	r/w			
64 0x40	Device specific name	String	32 Byte	r/w	*****		
89 0x59	Measurement averaging	Uint	8 Bit	r/w	6	0 = 1 value 1 = 2 values 2 = 4 values 3 = 8 values 4 = 16 values 5 = 32 values 6 = 64 values 7 = 128 values 8 = 256 values 9 = 512 values	
90 0x5A	Teach-in offset	Int	16 Bit	r/w	0	-100...100	
97 0x61	Sender off	Uint	8 Bit	r/w	0	0 = Sender active 1 = Sender not active	
121 0x79	Pin 2 configuration	Uint	8 Bit	r/w	34	0 = Deactivated / no function 1 = External input 16 = Sender off 17 = Teach-in 33 = Quality of run alarm output 34 = Switching signal QL2 35 = Detection output Quint. 1 36 = Detection output Quint. 2 39 = Switching signal QL1 40 = Switching signal QL1/	
153 0x99	Temperature	Record	5 Byte	ro			
1 0x01	Current temperature	Bit (32)	8 Bit	ro		[°C]	
2 0x02	Max. temperature all time	Bit (24)	8 Bit	ro	20		
3 0x03	Min. temperature all time	Bit (16)	8 Bit	ro	20		
4 0x04	Max. temperature since last reset	Bit (8)	8 Bit	ro	20		
5 0x05	Min. temperature since last reset	Bit (0)	8 Bit	ro	20		
155 0x9B	Remaining sender lifetime	Uint	16 Bit	ro	0...5000 65535	Shows the predicted number of days until the sender unit (e.g. laser, LED) reaches its end of lifetime (= data sheet performance values can no longer be guaranteed). Value 65535 = Calculation not possible e.g. due to missing history. [d]	
175 0xAF	Quality of run	Uint	8 Bit	ro	0	[%]	
176 0xB0	Quality of run alarm threshold	Uint	8 Bit	r/w	50	0...90	[%]
178 0xB2	Maintenance prediction	Uint	16 Bit	ro	0...5000 65535	Shows the predicted number of days until a maintenance service is required. Value 65535 = Calculation not possible e.g. due to missing history. [d]	
179 0xB3	Alarm thresholds for diagnostic parameters	Record	9 Byte	r/w			
1 0x01	Temperature threshold	Bit (64)	8 Bit	r/w	80	-127...127	Related to index 153 dez, sub-index 1 [°C]
2 0x02	Remaining sender lifetime threshold	Bit (48)	16 Bit	r/w	30	0...5000	Related to index 155dez [d]
3 0x03	Maintenance prediction threshold	Bit (32)	16 Bit	r/w	30	0...5000	Related to index 178 dez [d]
4 0x04	Operating hours threshold	Bit (0)	32 Bit	r/w	40000	0...1000000	Related to index 190 dez, sub-index 2 [h]
190 0xBE	Operating hours	Record	8 Byte	ro			
1 0x01	Total operating hours	Bit (32)	32 Bit	ro	0...1000000	Continuous counting of number of hours in which the sensor was powered-up. [h]	
2 0x02	Operating hours since last service	Bit (0)	32 Bit	ro	0...1000000	Operating hours since last reset to 0 via System Command 0xD2.	
204 0xCC	Find me	Uint	8 Bit	r/w	0	0 = Find me deactivated 1 = Find me activated	
219 0xDB	Article No.	Record	7 Byte	ro			
1 0x01	Article No. IO-Link device	Bit (0)	7 Byte	ro	0000000		
226 0xE2	System state	Record	2 Byte	ro		Communication and sensor application status	
1 0x01	Input signal state Pin 2	Bit (7)	1 Bit	ro	true = External input HIGH false = External input LOW		
2 0x02	Quality of run alarm	Bit (6)	1 Bit	ro	true = Alarm active false = Alarm not active		
227 0xE3	Notification handling	Uint	8 Bit	r/w	0	0 = All enabled 1 = All disabled 2 = Events enabled, PD invalid flag disabled 3 = Events disabled, PD invalid flag enabled	Does not affect the event "DS_UPLOAD_REQ"
229 0xE5	Distance to object	Record	3 Byte	ro		Read current distance to object / distance to background.	
1 0x01	Distance	Bit (8)	16 Bit	ro	0...30000	[mm]	
2 0x02	Distance qualifier	Bit (0)	8 Bit	ro	0 = Distance in range 1 = Distance over-run 2 = Distance under-run 3 = No distance information		
235 0xEB	Eco mode	Uint	8 Bit	r/w	0	0 = Off 1 = On	By enabling Eco-mode, the display will go dark 30 seconds after the last key operation.

Index No. dec hex	Name	Format (Offset)	Length	Access	Default value	Value / Range [Unit]	Remark [Unit]
1081 0x439	Input selector 1	Uint	8 Bit	r/w	0	0 = Quint. 1 1 = Quint. 2 2 = Quint. 3 3 = Quint. 4 4 = Quint. 5 5 = Quint. 6 6 = Quint. 7 7 = Quint. 8 64 = Ext.input 1	
1082 0x43A	Input selector 2	Uint	8 Bit	r/w	64	0 = Quint. 1 1 = Quint. 2 2 = Quint. 3 3 = Quint. 4 4 = Quint. 5 5 = Quint. 6 6 = Quint. 7 7 = Quint. 8 64 = Ext.input 1	
1083 0x43B	Logic 1	Uint	8 Bit	r/w	0	0 = DIRECT 1 = AND 2 = OR 3 = Window mode 4 = Hysteresis	
1084 0x43C	Logic 2	Uint	8 Bit	r/w	0	0 = DIRECT 1 = AND 2 = OR 3 = Window mode 4 = Hysteresis	
1085 0x43D	Timer 1 mode	Uint	8 Bit	r/w	0	0 = Deactivated 1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay 4 = Impulse (one shot)	
1086 0x43E	Timer 2 mode	Uint	8 Bit	r/w	0	0 = Deactivated 1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay 4 = Impulse (one shot)	
1087 0x43F	Time 1 setup	Uint	16 Bit	r/w	1	1...30000	Timer 1 setup time in ms [ms]
1088 0x440	Time 2 setup	Uint	16 Bit	r/w	1	1...30000	Timer 2 setup time in ms [ms]
1089 0x441	Inverter 1	Uint	8 Bit	r/w	0	0 = Not inverted 1 = Inverted	
1090 0x442	Inverter 2	Uint	8 Bit	r/w	0	0 = Not inverted 1 = Inverted	
1820 0x500	Quint.3 SP1 / SP2	Record	4 Byte	r/w			
1821 0x501	Quint.3 configuration	Record	4 Byte	r/w			
1822 0x502	Quint.4 SP1 / SP2	Record	4 Byte	r/w			
1823 0x503	Quint.4 configuration	Record	4 Byte	r/w			
1824 0x504	Quint.5 SP1 / SP2	Record	4 Byte	r/w			
1825 0x505	Quint.5 configuration	Record	4 Byte	r/w			
1826 0x506	Quint.6 SP1 / SP2	Record	4 Byte	r/w			
1827 0x507	Quint.6 configuration	Record	4 Byte	r/w			
1828 0x508	Quint.7 SP1 / SP2	Record	4 Byte	r/w			
1829 0x509	Quint.7 configuration	Record	4 Byte	r/w			
1830 0x50A	Quint.8 SP1 / SP2	Record	4 Byte	r/w			
1831 0x50B	Quint.8 configuration	Record	4 Byte	r/w			

Note: ro = read only, r/w = read/write

## Events

Code dec hex	Description	Type
16912 0x4210	Device temperature over-run	Warning
16928 0x4220	Device temperature under-run	Warning
6147 0x1803	Short circuit on Qx	Warning
65425 0xFF91	New parameters	Notification
6149 0x1805	Quality of run alarm	Warning
6150 0x1806	Teach / value out of specified range	Notification
6146 0x1802	Alarm temperature threshold	Warning
6145 0x1801	Alarm sender lifetime threshold	Warning
6144 0x1800	Alarm maintenance prediction threshold	Warning
6148 0x1804	Alarm operating hours	Warning

## Errors

Code dec hex	Additional Code	Description
128 0x80	17 (0x11)	Index not available
128 0x80	18 (0x12)	Subindex not available
128 0x80	32 (0x20)	Service temporarily not available
128 0x80	34 (0x22)	Service temporarily not available - device control
128 0x80	35 (0x23)	Access denied
128 0x80	48 (0x30)	Parameter value out of range
128 0x80	51 (0x33)	Parameter length over-run
128 0x80	52 (0x34)	Parameter length under-run
128 0x80	53 (0x35)	Function not available
128 0x80	54 (0x36)	Function temporarily unavailable
128 0x80	65 (0x41)	Inconsistent parameter set

## System command

Index No. dec hex	Name	Access	Code	Description	Remark [Unit]
2 0x02	System Command	wo	160(0xA0)	Single Value Teach SP1	
			161(0xA1)	Single Value Teach SP2	
			130(0xB2)	Restore Factory Settings	
			228(0XE4)	Reset diagnostics parameter	

Note: wo = write only

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[Headquarters]

91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN

TEL +81-75-325-1314 FAX +81-75-325-2936

<https://www.optex-fa.com>