LD-E

Laser Displacement

Operation Manual

www.deltaww.com

Revision History

Version	Change Description	Release Date
V1.0	Initial Release.	2022/4/15
V3.0	1. Corrected some panel icons and operation icons. 2. Added analog output and position display functions in the advanced mode of section 2.1. 3. Added panel operation icons for analog output and position display in the operation mode of section 2.1. 4. Added functions for 1034H & 1036H in Communication Address of section 4.1 and corrected some description fields. 5. Added CRC check code steps and examples in the Communication Protocol of section 4.2. 6. Added UL certification in Chapter 5. 7. Changed the name of Chapter 6 to "Cautions". 8. Added "Caution of laser displacement " in Chapter 6.	2025/1/2

LD-E Laser Displacement

Operation Manual

Table of Content

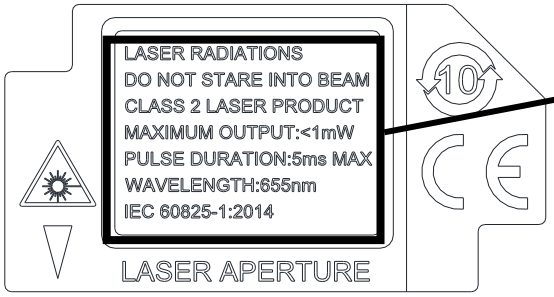
Chapter 1 Product Profile

1.1 Packaging

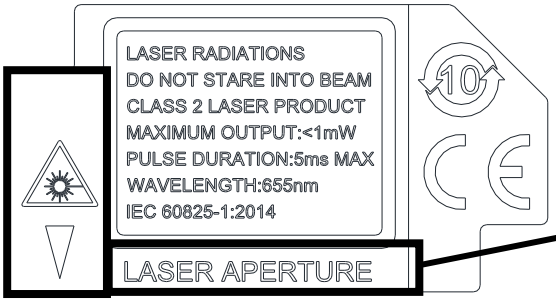
The following is included:

1) Laser displacement Sensor
2) Laser label
3) Simple instruction sheet

➢ Laser Label Description



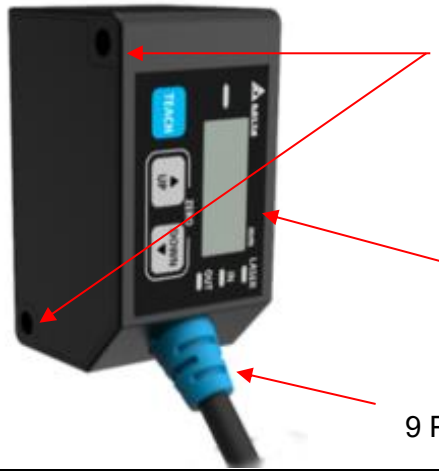
LASER RADIATIONS
DO NOT STARE INTO BEAM
Class 2 LASER PRODUCT
MAXIMUM OUTPUT: <1mW
PULSE DURATION: 5ms MAX.
WAVELENGTH:655nm
IEC 60825-1:2014



LASER APERTURE: Laser radiation is emitted from this aperture.

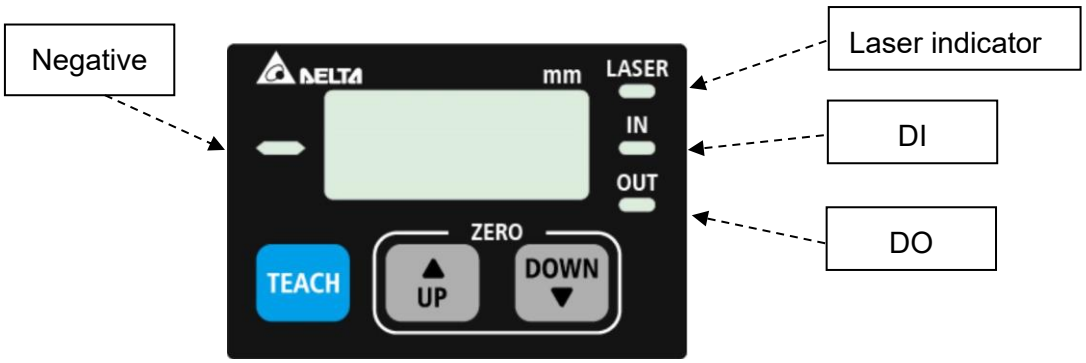
1.2 Part Names and Functions

◎ **Exterior**

Positive	Side
	

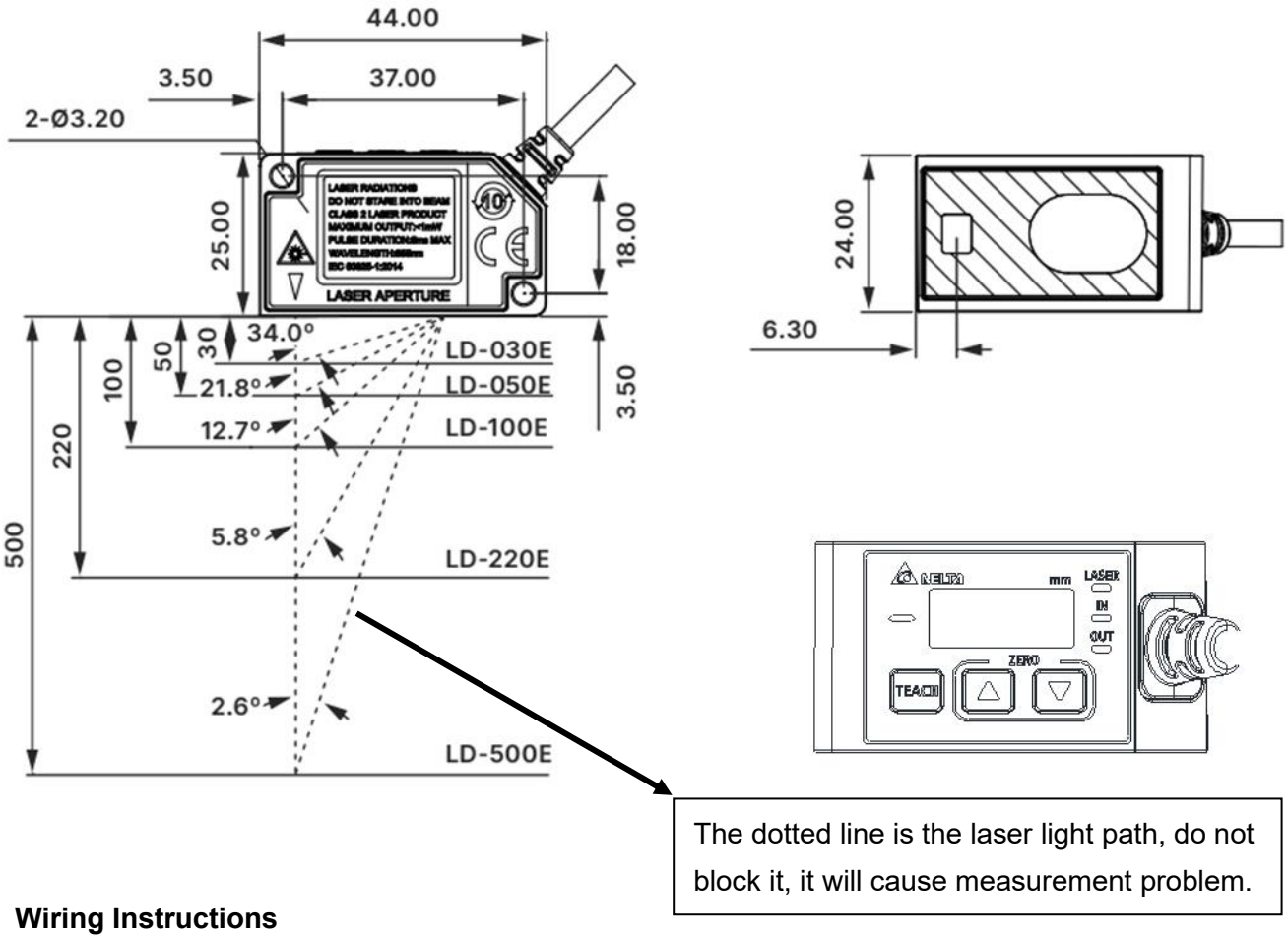
◎ **Laser Indicator**

Indicator	Color	Description
Laser indicator	Blue light	Start (laser on)
OUT	Green light	DO
IN	Yellow light	DI
Negative	Red light	Negative



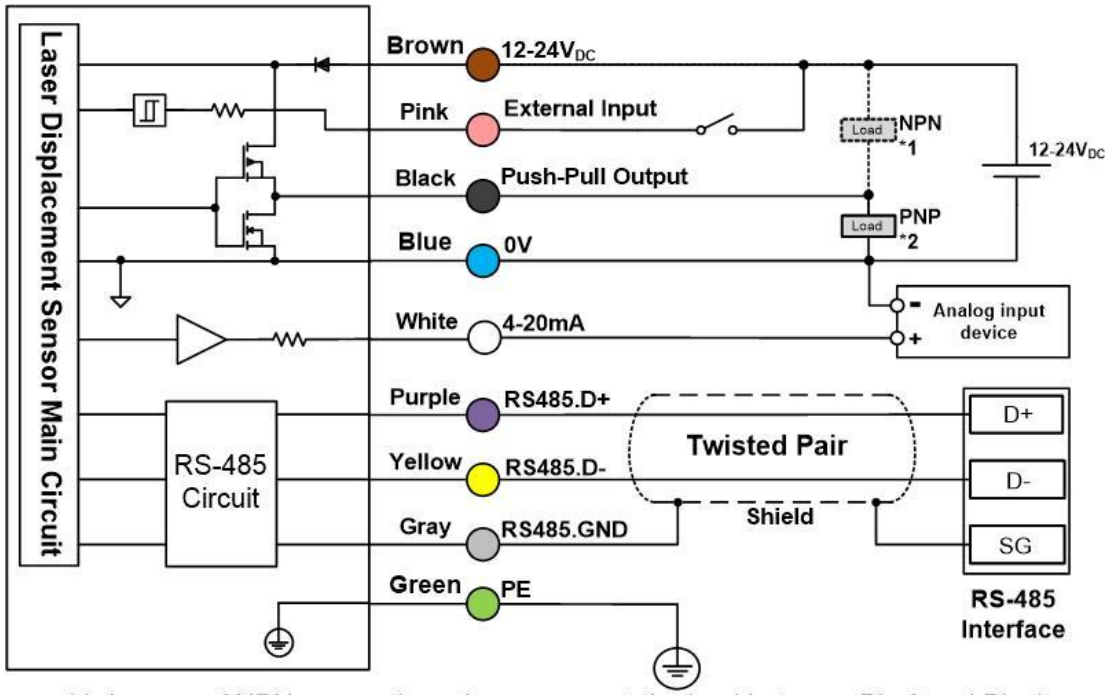
1.3 Installation

◎ **Dimension (unit: mm)**



The dotted line is the laser light path, do not block it, it will cause measurement problem.

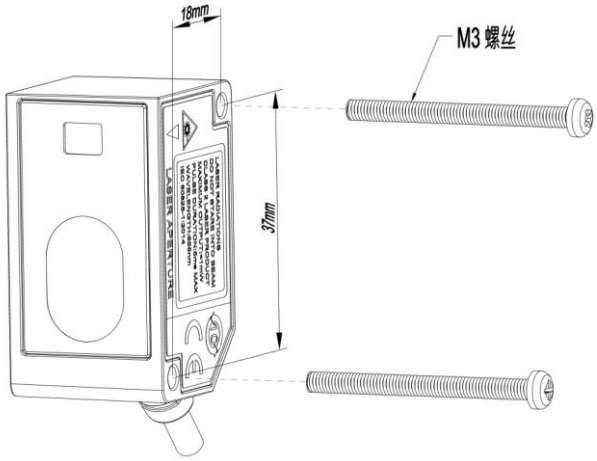
◎ **Wiring Instructions**



*1. In case of NPN connection, please connect the load between Pin 3 and Pin 1.
*2. In case of PNP connection, please connect the load between Pin 3 and Pin 4.

◎ **Mounting**

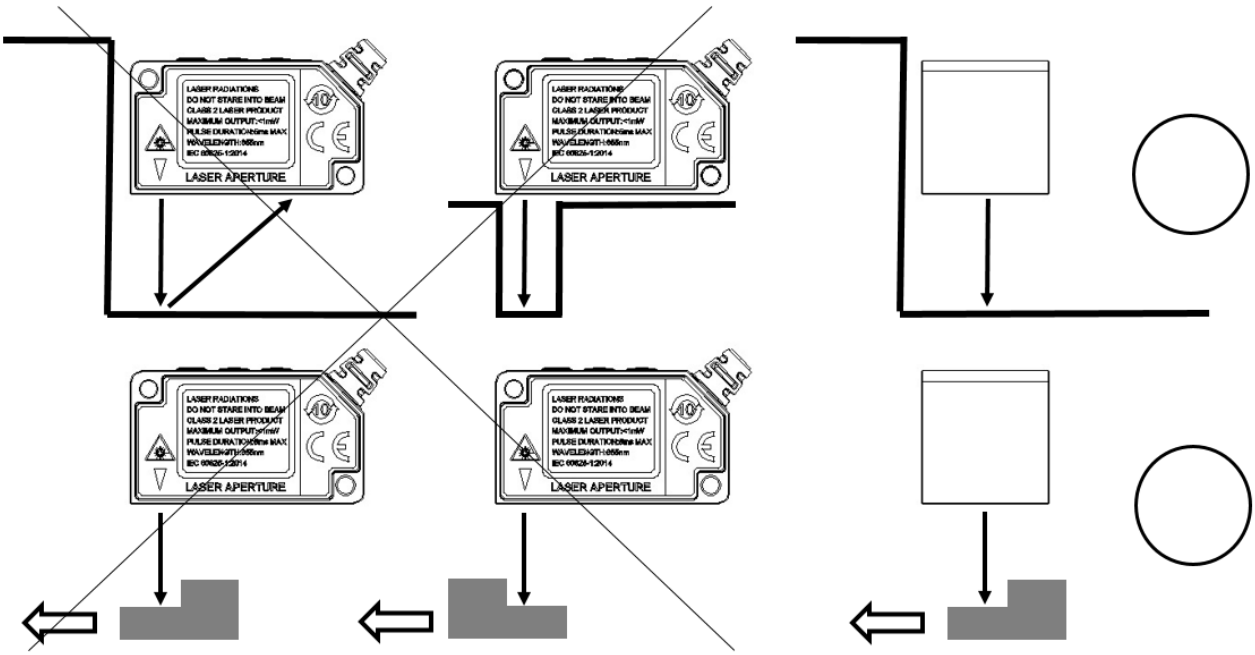
Use M3 screws (provided by the user) for installation, and apply a tightening torque of 0.5 N·m.



◎ **Caution on Mounting Direction**

For best product performance, please note the following instructions when installing products.

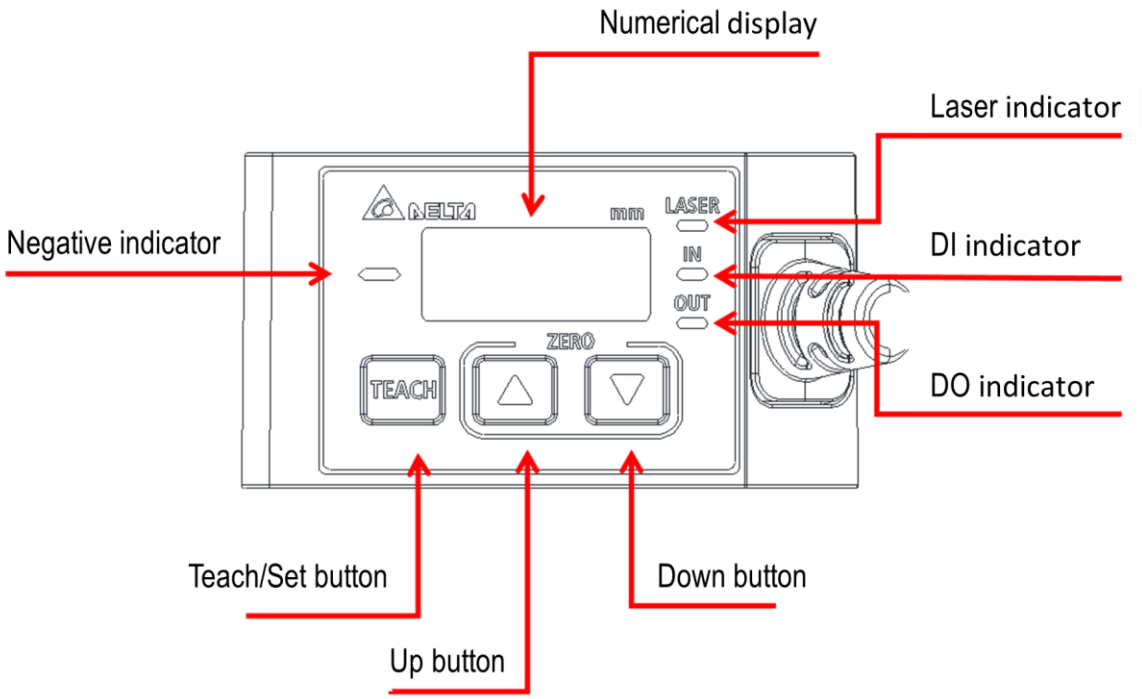
1) When products cling to devices, install the products in parallel with the devices to assure product performance.
2) When the shape of an inspection object is extrusive, ensure the product's lighting route is vertical to the inspection object's path to assure product performance.



Chapter 2 Settings and Measurements

2.1 Display operation

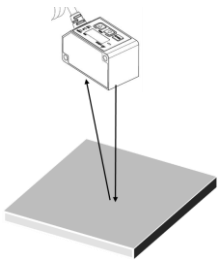
◎ **Display instruction**

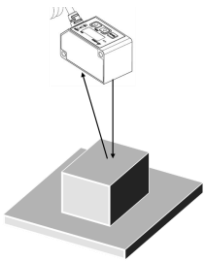


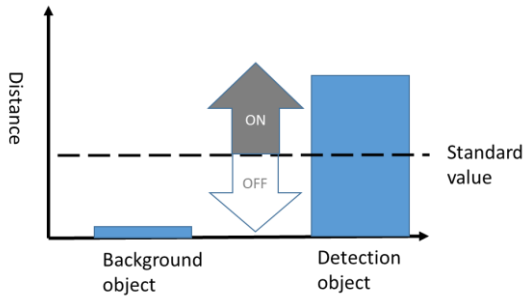
Basic teaching (2-point teaching)

- The teaching point of second point is greater than the first point 2 hysteresis (Hys) size.

1. 2.







1. In a state of background, press TEACH .

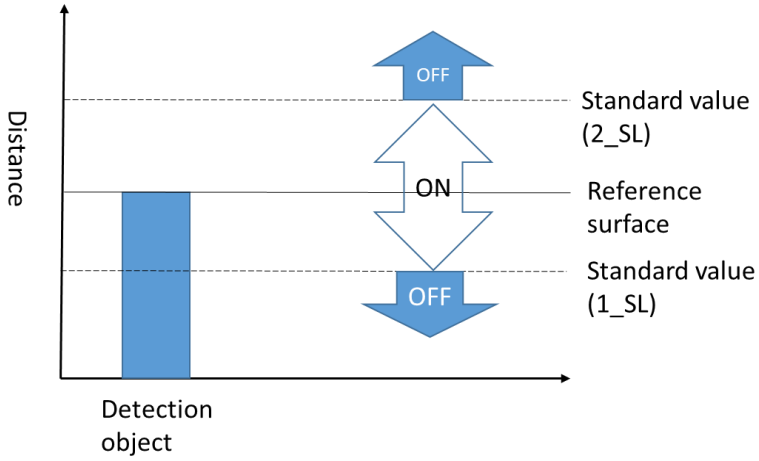
2. When there is a detection object, press TEACH

3. When the object can be detected

When the object cannot be detected

Single-point teaching (window comparison mode)

- Single-point teaching is used for the distance between the reference plane of the detection object, the method of setting the upper and lower limits, and the output between the upper and lower limits.
- First, switch to the **Advanced Mode**, set the detection output to _P_1 (singe-point teaching)
- After the reference plane of the detection object is taught
- 1_SL = The height of the detection object minus 2 times the hysteresis
- 2_SL = The height of the detection object plus 2 times the hysteresis



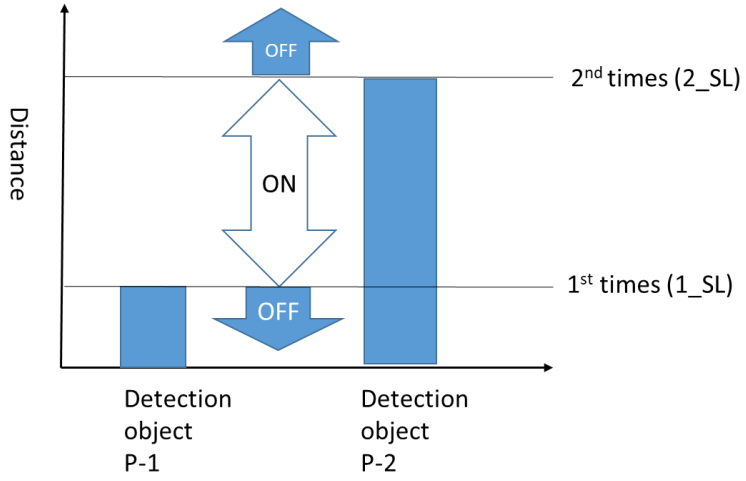
1. With the detection object, press TEACH twice. (1st time: TEACH mode, 2nd time: teaching)

2. After teaching, press TEACH once to leave.

When the object cannot be detected

2-point teaching (window comparison mode)

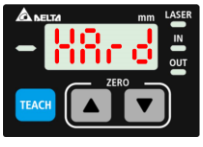
- Execute 2-point teaching and set the reference value.
- First, switch to the **Advanced Mode**, set the detection output to _P_2 (2-point teaching)
- When executing, use detection objects with different distances (P-1, P-2)



1. When there is a detection object (P-1), press TEACH twice. (1st time: TEACH mode, 2nd time: teaching)

2. With the detection object (P-2), press the third TEACH

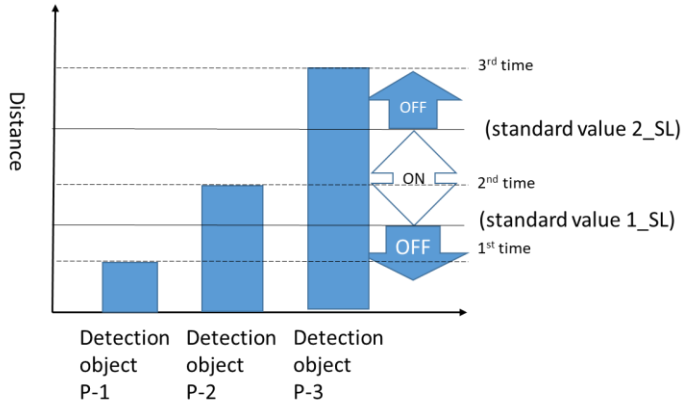
When the object can be detected, press the fourth TEACH to leave.

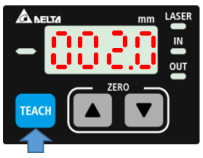


When the object cannot be detected, press the fourth TEACH to leave.

3-point teaching (window comparison mode)

- Before executing 3-point teaching, set the reference value 1_SL between 1st time and 2nd time and set the reference value 2_SL between 2nd time and 3rd time.
- First, switch to the **Advanced Mode**, set the detection output to _P_3 (3-point teaching)
- Lower Reference Limit (1_SL): The average value of the first and second teaching values.
  Upper Reference Limit (2_SL): The average value of the second and third teaching values.





1. When there is a detection object (P-1), press TEACH twice. (1st time: TEACH mode, 2nd time: teaching)

2. With the detection object (P-2), press the third TEACH

3. With the detection object (P-3), press the fourth TEACH

When the object can be detected, press the fifth TEACH to leave.

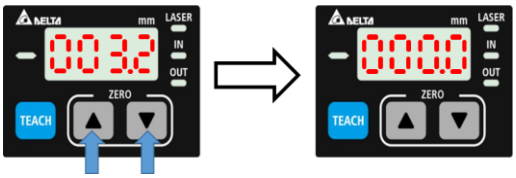
When the object cannot be detected, press the fifth TEACH to leave.

◎ **Set the zero value**

The operation on the main screen is as follows

<Set the zero value>

Press the up button ▲ and down button ▼ at the same time for 3 seconds.



<Remove the zero value>

Press the up button ▲ and down button ▼ at the same time for 6 seconds.

◎ **Advanced Mode**

Mode Introduction

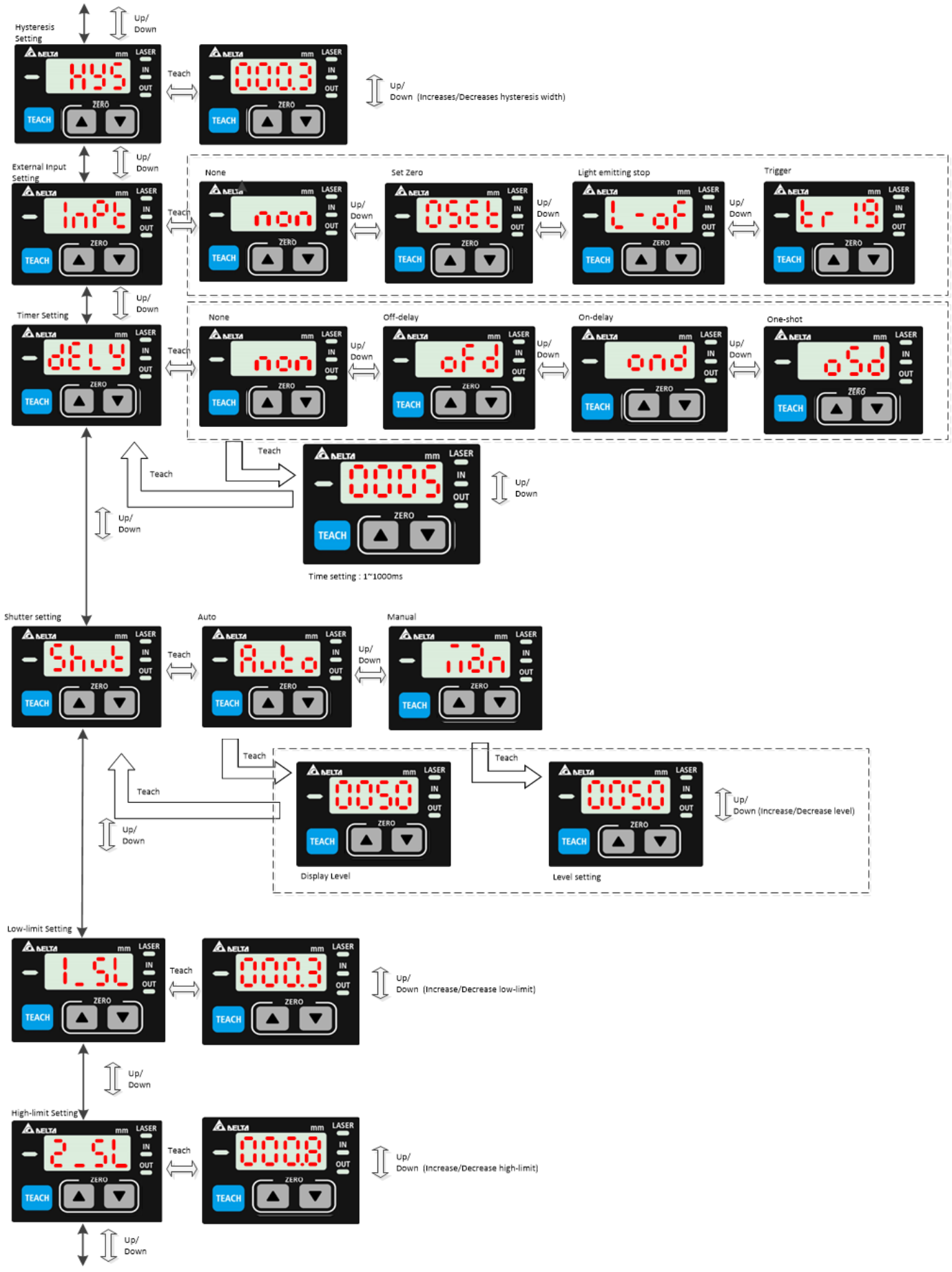
Press the down button  for 3 seconds to get in the menu of advanced settings. After entering, press the down button  for 3 seconds to return to the measurement screen. For item selection, please refer to the **Procedure** in the next section.

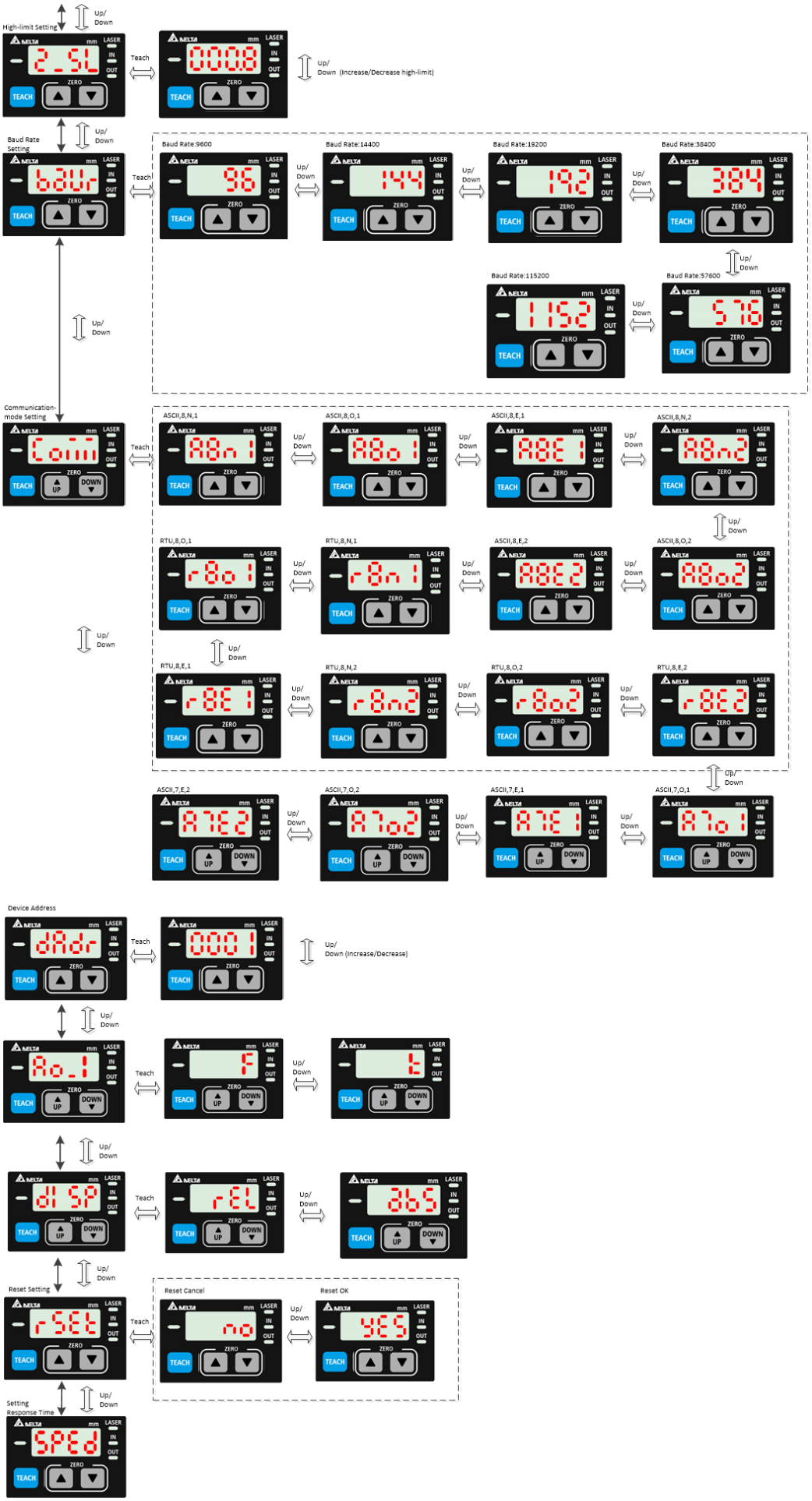
Item	Initial state	Content
Response speed setting		Response time setting: "FASt": high speed 1.5ms, " Std": standard 3ms, "HrSo": High precision 5ms
Moving average setting		Average speed setting: "0001": average 1 time, "0002": average 2 times, "0004": average 4 times, "0008": average 8 times, "0016": average 16 times, "0032": average 32 times, "0064": average 64 times, "0128": average 128 times, "0256": average 256 times, "0512": average 512 times.
Median filter setting		Median filter window frame setting: "0001": window frame size 1, "0003": window frame size3, "0005": window frame size 5, "0007": window frame size 7, "0009": window frame size 9, "0011": window frame size 11, "0013": window frame size 13, "0015": window frame size 15
Output setting		Select the action mode of control output: "L-on": when light is on, "d-on": when not receiving light on
Detection output setting		Detection output setting: "_J__": General teaching mode "_P_1": Single-point teaching mode "_P_2": 2-point teaching mode "_P_3": 3-point teaching mode
Hysteresis setting		Hysteresis setting: The maximum limitation of 1_SL is 2_SL + Hys The minimum limitation of 1_SL is 1_SL - Hys
External input setting		External input setting: " non": no function, "OSEt": zero, "L-oF": laser off "tr 1S": update data only when triggered
Timer setting		Timer setting:The timer setting interval is 0~1000ms " non": no timing, " ond" : delay action

		“ oFd”: postpone disconnecting, “ oSd”: single trigger (specific introduction can refer to timer setting)
Exposure setting		Exposure energy setting: “Auto”: Automatically adjust the received energy according to non-reflective objects. Press TEACH to view the current percentage of energy. “ MAn”: Manually adjust the received energy. Press TEACH to set the received energy percentage.
Adjust the negative limit		Output to set the negative limit: The adjustment range is the minimum value of the measurable range.
Adjust the positive limit		Output to set the positive limit: The adjustment range is the maximum value of the measurable range.
Baud rate setting		Baud rate setting: “ 1152”: 115200 bps, “ 576”: 57600 bps, “ 384”: 38400 bps “ 192” : 19200 bps, “ 144”: 14400 bps, “ 96” : 9600 bps
Communication format setting		Communication format setting: “8n 1” : ASCII,8,N,1 “8o 1” : ASCII,8,O,1 “8E 1” : ASCII,8,E,1 “8n2” : ASCII,8,N,2 “8o2” : ASCII,8,O,2 “8E2” : ASCII,8,E,2 “r8n 1” : RTU,8,N,1 “r8o 1” : RTU,8,O,1 “r8E 1” : RTU,8,E,1 “r8n2” : RTU,8,N,2 “r8o2” : RTU,8,O,2 “r8E2” : RTU,8,E,2 “7o 1” : ASCII,7,O,1 “7E 1” : ASCII,7,E,1 “7o2” : ASCII,7,O,2 “7E2” : ASCII,7,E,2
Station number setting		Communication station number setting: 1~127 can be set
Analog output setting		Analog output setting: “ F” : Current Output in Positive Direction: The Greater the Distance, the Higher the Current “ t” : Current Output in Negative Direction: The Shorter the Distance, the Higher the Current
Position display setting		Position display Setting: “ rEL” : Display the relative position “ Abs” : Display the absolute position
Reset setting		Reset setting: “ no”: setting cancel, “ YES”: restore default settings

Procedure


Measurement
Setting Response Time
Down : Push 3 sec
Fast
Standard
High Resolution
Teach
Up/ Down
Setting Average Times
Average Times: 1~512
Setting Median Window
Window: 1~15
Output Operation Setting
Light-on
Dark-on
Sensing Output Setting
Normal Setting Mode
1-point teaching (Window Comparator Mode)
2-point teaching (Window Comparator Mode)
3-point teaching (Window Comparator Mode)
Hysteresis Setting
Up/ Down (Increases/Decreases hysteresis width)

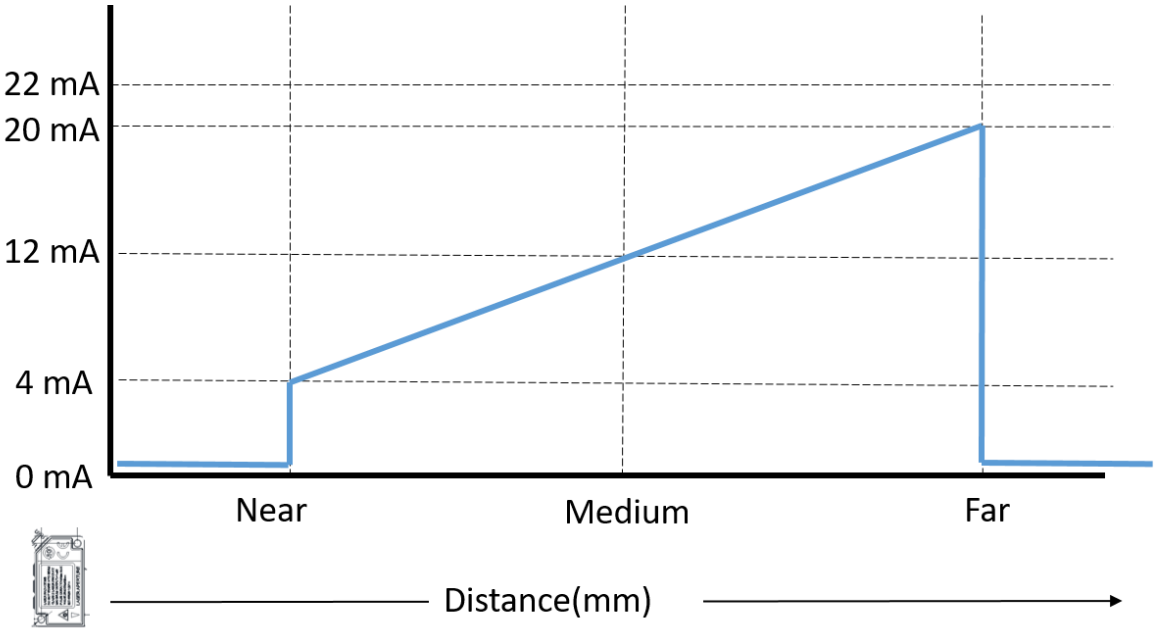

Hysteresis Setting
Up/ Down
Teach
Up/ Down (Increases/Decreases hysteresis width)
External Input Setting
None
Set Zero
Light emitting stop
Trigger
Timer Setting
Off-delay
On-delay
One-shot
Time setting : 1~1000ms
Shutter setting
Auto
Manual
Display Level
Level setting
Up/ Down (Increase/Decrease level)
Low-limit Setting
Up/ Down (Increase/Decrease low-limit)
High-limit Setting
Up/ Down (Increase/Decrease high-limit)


High-limit Setting
Up/ Down
Teach
Up/ Down (Increase/Decrease high-limit)
Baud Rate Setting
Baud Rate:9600
Baud Rate:14400
Baud Rate:19200
Baud Rate:38400
Baud Rate:115200
Baud Rate:57600
Communication-mode Setting
ASCII,8,N,1
ASCII,8,O,1
ASCII,8,E,1
ASCII,8,N,2
RTU,8,O,1
RTU,8,N,1
ASCII,8,E,2
ASCII,8,O,2
RTU,8,E,1
RTU,8,N,2
RTU,8,O,2
RTU,8,E,2
ASCII,7,E,2
ASCII,7,O,2
ASCII,7,E,1
ASCII,7,O,1
Device Address
Up/ Down (Increase/Decrease)
Reset Setting
Reset Cancel
Reset OK
Setting Response Time

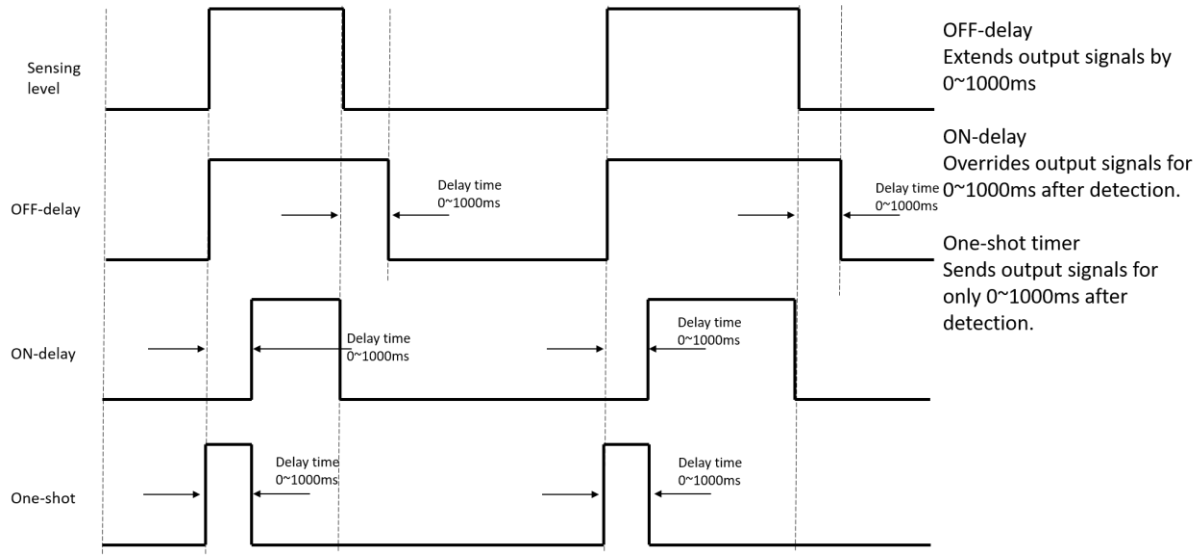
◎ **Analog output**

The analog output range is 4-20mA.

Distance from the closest distance to the farthest distance (absolute distance).



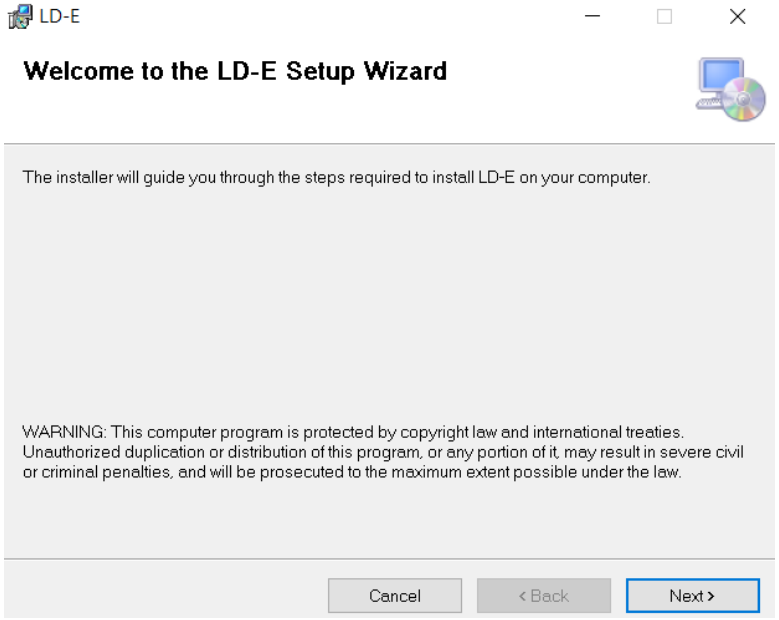
◎ **Digital output timer function setting**



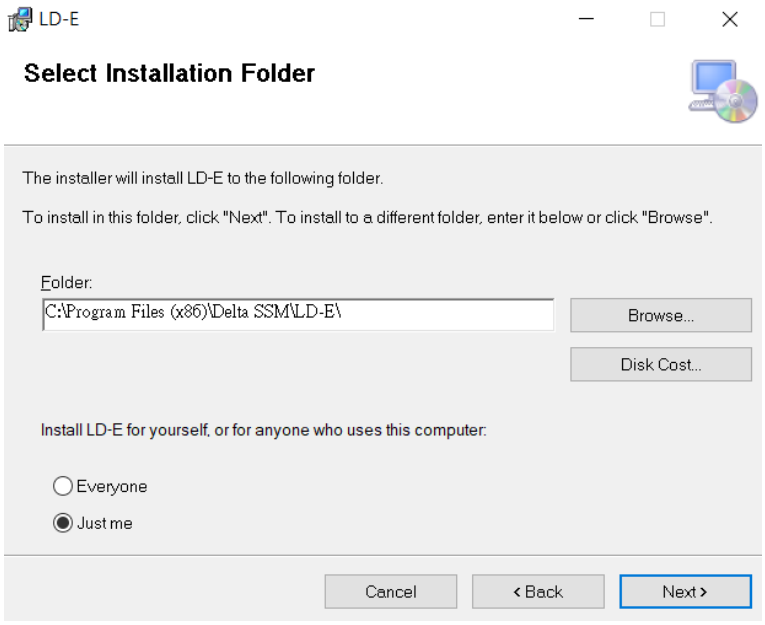
Chapter 3 Software Operation

3.1 Communication Setting

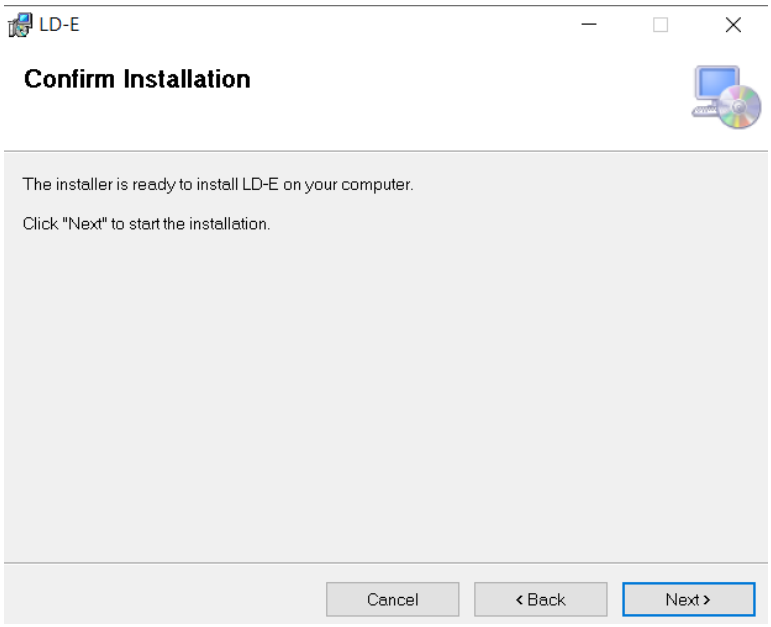
◎ **Execute the laser displacement installation file**



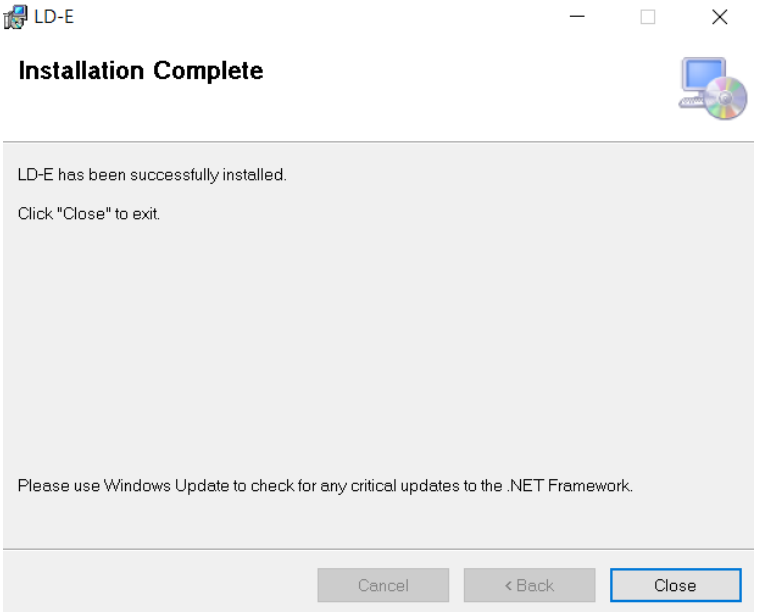
→ Next



→ Next

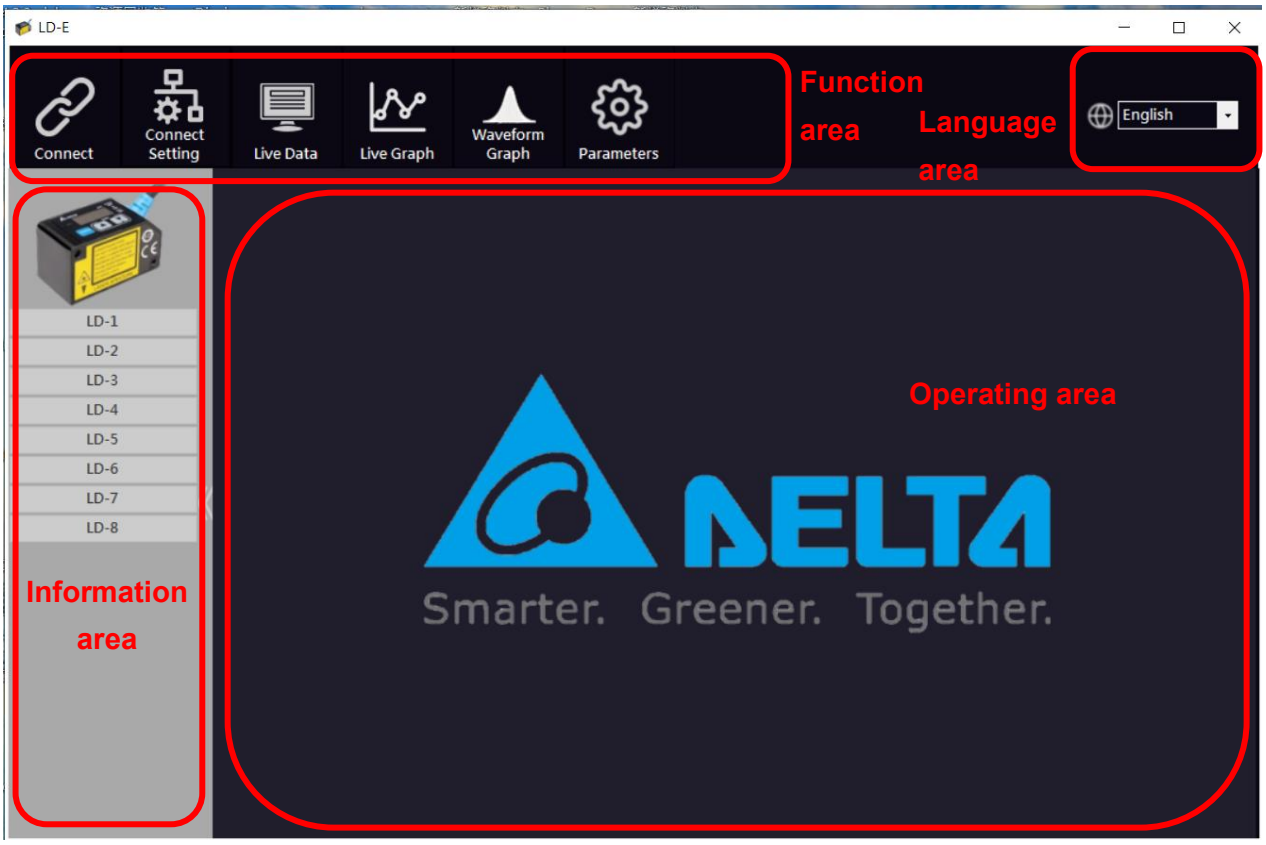

LD-E
Confirm Installation
The installer is ready to install LD-E on your computer.
Click "Next" to start the installation.
Cancel
< Back
Next >

→ Next


LD-E
Installation Complete
LD-E has been successfully installed.
Click "Close" to exit.
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel
< Back
Close

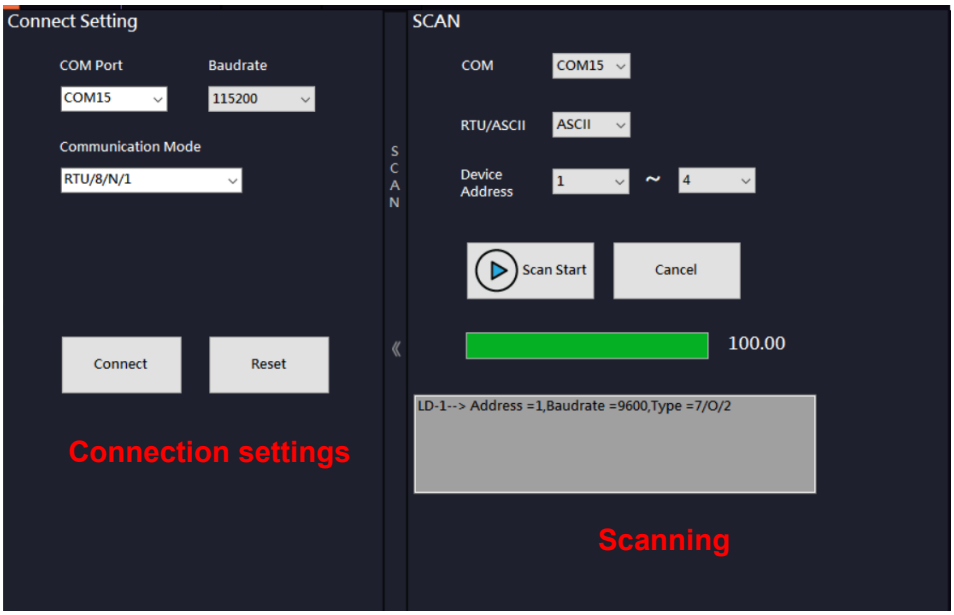
→ Close

◎ **Open the desktop shortcut executable**



Area	Description
Function	Each function display. Communication setting, real-time data, real-time data waveform, waveform acquisition, parameter setting and reading.
Language	Language switch. English, Traditional Chinese, Simplified Chinese.
Information	Laser displacement information display. Station number, model, serial number, firmware version, communication format.
Operation	Display an operation interface according to the selected function area.

◎ **Communication setting operation area**

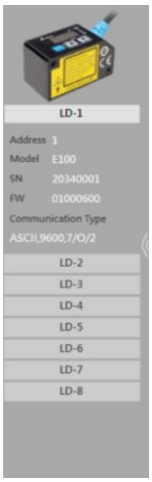


Connection settings	Connect after setting up according to the communication format
Scanning	Step1: Set up the port Step2: Select RTU/ASCII mode Step3: Select the station number range Step4: Start scanning

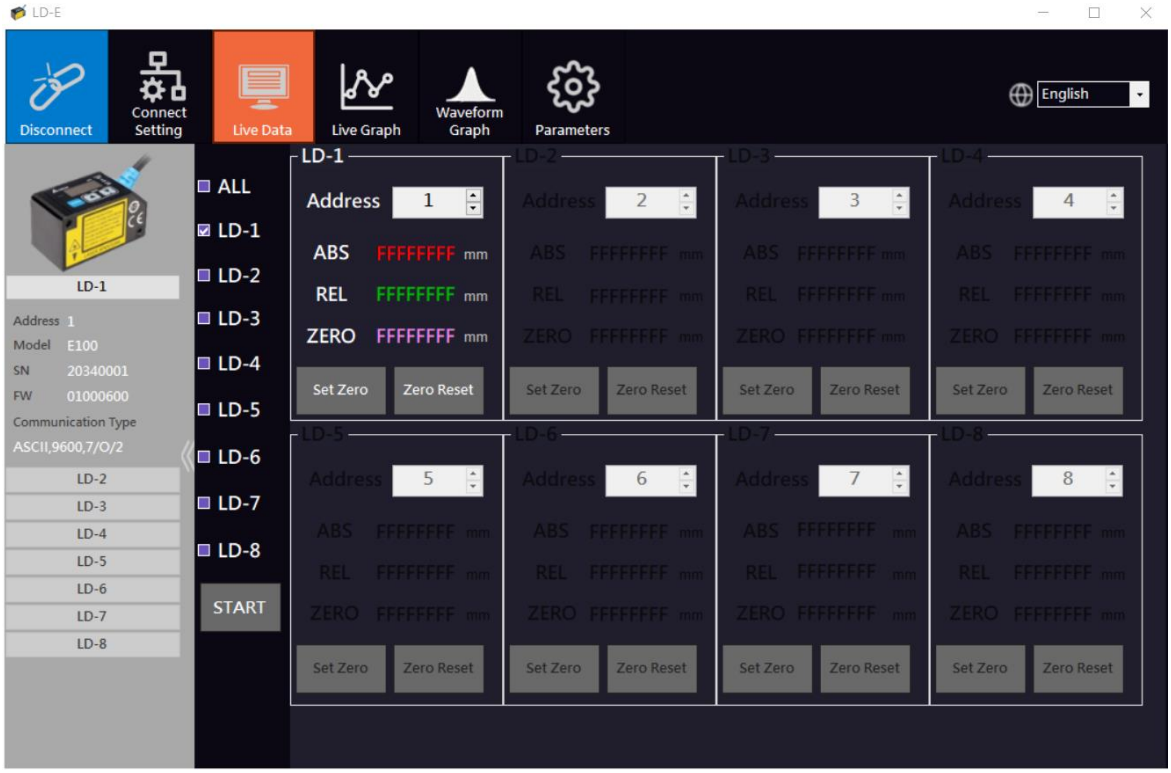
◎ **Information area**

After scanning, the information of each LD on the same BUS will be displayed in the information area, up to 8 units.

Note: The station number needs to be different.

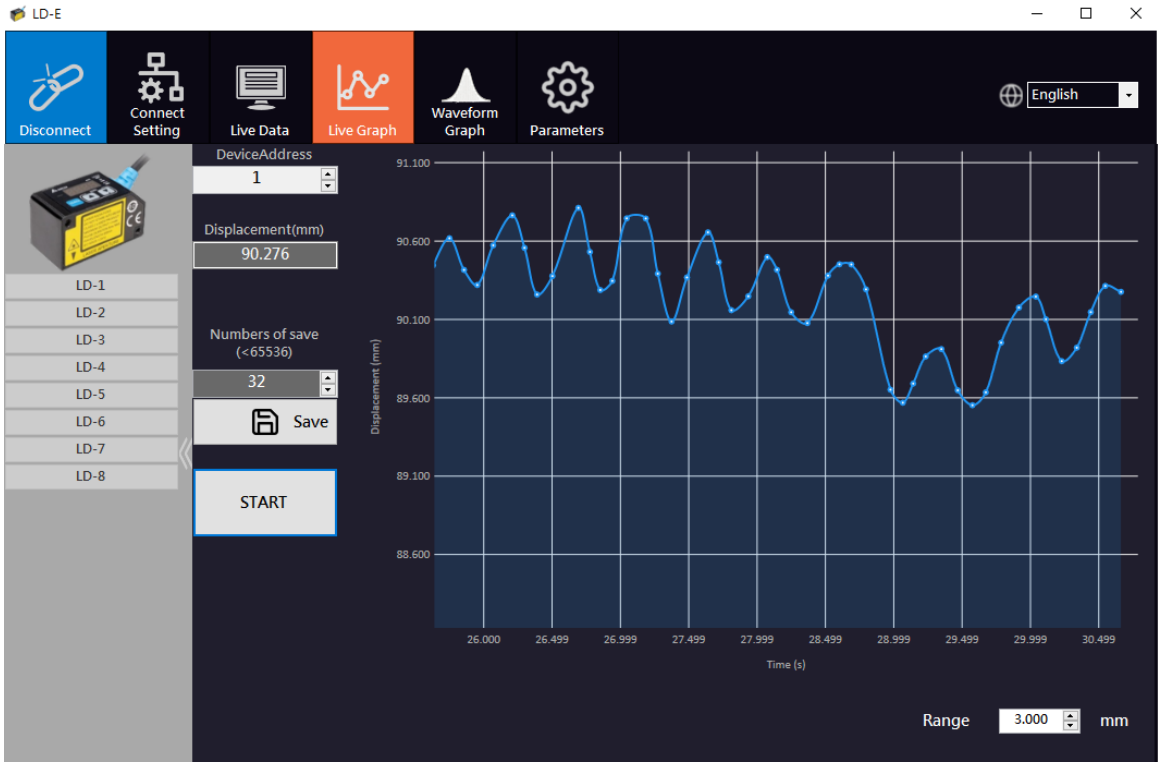


◎ **Real-time data operation area**



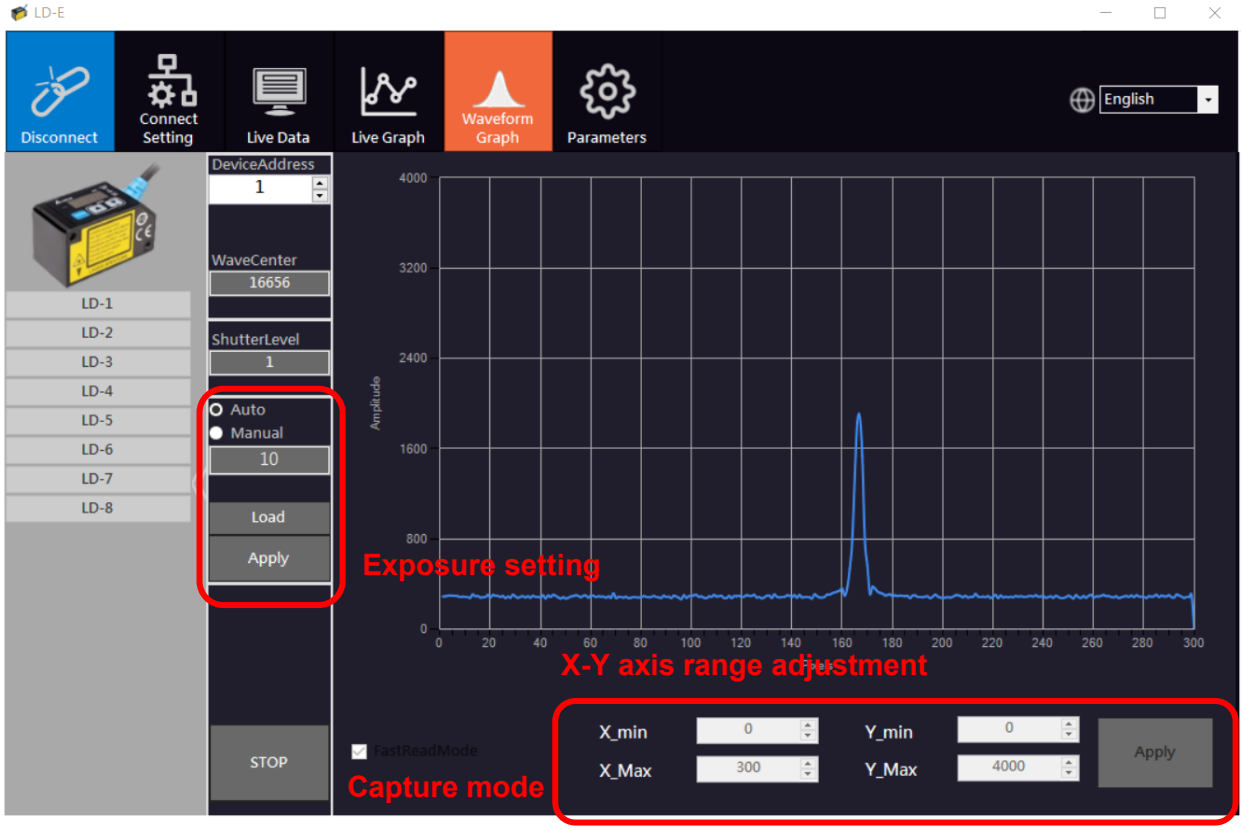
Start	Start to read the data, and the data will be read according to the selected LD.
Zero	The LD is reset to zero.
Reset to zero	The zero point is reset to default value. The default values are different for each model.

◎ **Real-time graphics operation area**



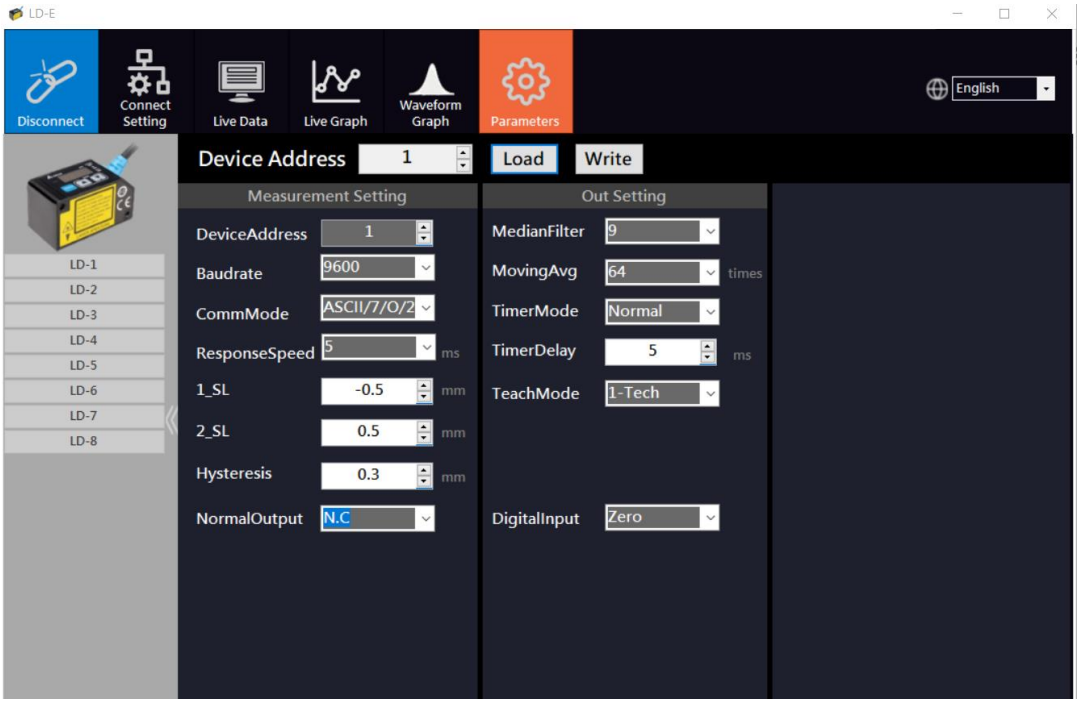
Station No.	Set the station number of the laser displacement, and only one data can be displayed at a time.
Displacement	Display the absolute displacement of the laser
Storage quantity setting	Can store the relationship between time and location
Save	Start saving
Start	Start position measurement and draw graphics
Measuring range	Graphic display measurement range size

◎ **Wave operation area**



Station No.	Set the station number of the laser displacement, and only one data can be displayed at a time.
Wave Center	Display wave weight position
Shutter Level	Show exposure
Exposure setting	Can be set to use manual or automatic exposure, manual exposure can set the exposure level (0~100)
Start	Start measuring
Capture mode	Check: Quick capture mode (after firmware V1.00.00)
X-Y axis range adjustment	The range can be adjusted according to the monitoring interval.

◎ **Parameter reading and writing operation area**



Station No.	Set the station number of the laser displacement, and only one data can be displayed at a time.
Load、Write	After loading the device parameters, modifications can be made. Then, click on "Write"

Chapter 4 Communication Settings

4.1 Communication Address

◎ RS485 Communication Mode

◎ Baud Rate Supported: 9,600, 14400, 19200, 38400, 57600, 115200bps

◎ Communication Mode Supported: 8,N,1、8,N,2、8,O,1、8,O,2、8,E,1、8,E,2、7,O,1、7,E,1、7,O,2、7,E,2

◎ Communications Protocol: Modbus RTU, ASCII

◎ Communication Address Supported: 1 to 127

◎ Function Code: 03H: Read the contents of the register, 06H: Write 1 byte to the address

Address	Function code	Name	Description
1000H (R/W)	(03H,06H)	Device address	Device address:1~127
1002H (R/W)	(03H,06H)	Communication baud rate	0x01: 9600 0x02: 14400 0x03: 19200 0x04: 38400 0x05: 57600 0x06: 115200 (Default)
1003H (R/W)	(03H,06H)	Communication format	0x01: ASCII, 8, N, 1 0x02: ASCII, 8, O, 1 0x03: ASCII, 8, E, 1 0x04: ASCII, 8, N, 2 0x05: ASCII, 8, O, 2 0x06: ASCII, 8, E, 2 0x07: RTU, 8, N, 1 (Default) 0x08: RTU, 8, O, 1 0x09: RTU, 8, E, 1 0x0A: RTU, 8, N, 2 0x0B: RTU, 8, O, 2 0x0C: RTU, 8, E, 2 0x0D: ASCII, 7, O, 1 0x0E: ASCII, 7, E, 1 0x0F: ASCII, 7, O, 2

			0x10: ASCII, 7, E, 2
1004H~1005H (R)	(03H)	Absolute position	Displacement absolute position output: LD-030E: 25000~35000μm LD-050E: 35000~65000μm LD-100E: 65000~135000μm LD-220E: 120000~320000μm LD-500E: 300000~700000μm
1006H~1007H (R)	(03H)	Relative position	Relative position of displacement = Absolute position - Zero position
1008H (R/W)	(03H,06H)	Set the zero value	0x00: Turn off zero function 0x01: Set the zero
1009H~ 100AH (R)	(03H)	Zero position	Zero position
100BH (R/W)	(03H,06H)	One_SL position	Comparator lower limit position (unit:0.1mm)
100CH			Reserved
100DH (R/W)	(03H,06H)	Two_SL position	Comparator upper limit position (unit:0.1mm)
100EH			Reserved
100FH (R/W)	(03H)	Weight position	Weight position on PD
1010H (R)	(03H)	Exposure class	Exposure level in auto exposure mode (1~100)
1011H (R/W)	(03H,06H)	Reaction speed	0x01: 1.5ms (Default) 0x03: 3ms 0x05: 5ms
1012H (R/W)	(03H,06H)	Moving average setting	0x01: None 0x02: 2 times on average 0x04: 4 times on average 0x08: 8 times on average 0x10: 16 times on average 0x20: 32 times on average 0x40: 64 times on average 0x80: 128 times on average (Default) 0x100: 256 times on average 0x200: 512 times on average
1013H (R/W)	(03H,06H)	Median filter setting	0x01: Window size 1 0x03: Window size 3 0x05: Window size 5 0x07: Window size 7 (Default) 0x09: Window size 9 0x0B: Window size 11 0x0D: Window size 13 0x0F: Window size 15

1014H (R/W)	(03H,06H)	Output delay mode setting	0x01: Normal output mode (Default) 0x02: Off-delay 0x03: On-delay 0x04: One-shot
1015H (R/W)	(03H,06H)	Output delay time	Range: 0x0000~0x03E8: (0~1000ms) 0x05 (Default)
1016H (R/W)	(03H,06H)	Action output Normally open/closed	0x01: Normally closed (Default) 0x02: Normally open
1017H (R/W)	(03H,06H)	External input function	0x01: No function (Default) 0x02: Zero function 0x03: Turn off the laser 0x04: Trigger function
1018H (R/W)	(03H,06H)	Hysteresis setting (Hys)	Default: 3 LD-030E、LD-050E: unit: 0.01mm LD-500E、LD-220E、LD-100E: unit: 0.1mm
1019H (R/W)	(03H,06H)	Automatic/ manual adjustment of exposure level	0x01: Automatic adjustment 0x02: Manual adjustment
101AH (R/W)	(03H,06H)	Manual exposure setting hierarchy	Exposure level setting in manual mode 0x01~0x64 (1~100)
101BH (R/W)	(03H,06H)	Detection output setting	0x00: General detection mode 0x01: Single-point teaching (window comparison mode) 0x02: 2-point teaching (window comparison mode) 0x03: 3-point teaching (window comparison mode)
101CH ~ 101DH (R)	(03H)	Read firmware version	Read firmware version
101EH (R)	(03H)	DO status read	0x00 : Not output 0x01: Start output
101FH (R)	(03H)	DI status read	0x00 : Not input 0x01: Start input
10C7H (R)	(06H)	Restore factory settings	0x01: Restore factory settings
1034H (R/W)	(03H,06H)	Exception waiting time	Default: 6
1036H (R/W)	(03H,06H)	Position display setting	1: Relative position (Default) 0: Absolute position

4.2 Communication Protocol

ASCII Mode

Read Command			Read Command Response			Write Command			Write Command Response		
STX	' : '		STX	' : '		STX	' : '		STX	' : '	
ADR 1	'0'		ADR 1	'0'		ADR 1	'0'		ADR 1	'0'	
ADR 0	'1'		ADR 0	'1'		ADR 0	'1'		ADR 0	'1'	
CMD 1	'0'		CMD 1	'0'		CMD 1	'0'		CMD 1	'0'	
CMD 0	'3'		CMD 0	'3'		CMD 0	'6'		CMD 0	'6'	
Starting data address	'1'		Number of data (count by byte)	'0'		Starting data address	'1'		Starting data address	'1'	
	'0'			'4'			'0'			'0'	
	'0'		Start address data 1004H	'D'			'0'			'0'	
	'4'			'0'			'0'			'0'	
Number of data (word/Bit)	'0'			'F'		Data content	'0'		Data content	'0'	
	'0'			'5'			'0'			'0'	
	'0'		Address data 1005H	'0'			'0'			'0'	
	'2'			'0'			'1'			'1'	
LRC 1	'E'			'0'		LRC1	'E'		LRC1	'E'	
LRC 0	'6'			'0'		LRC 0	'8'		LRC 0	'8'	
END 1	CR		LRC 1	'3'		END 1	CR		END 1	CR	
END 0	LF		LRC 0	'3'		END 0	LF		END 0	LF	
			END 1	CR							
			END 0	LF							

LRC checksum:

LRC check is the added sum from "Address" to "Data content". For example, 01H + 03H + 10H+ 04H + 00H + 02H = 1AH, then take the complementary of 2, E6H.

RTU Mode

Read Command			Read Command Response			Write Command			Write Command Response		
ADR	01H		ADR	01H		ADR	01H		ADR	01H	
CMD	03H		CMD	03H		CMD	06H		CMD	06H	
Starting data address	10H		Number of data (count by byte)	04H		Starting data address	10H		Starting data address	10H	
	04H						00H			00H	
Number of data (word/Bit)	00H		Start address data 1004H	D0H		Data content	00H		Data content	00H	
	02H			F5H			01H			01H	
CRC 1	81H		Address data1005H	00H		CRC 1	1DH		CRC 1	1DH	
CRC 0	0AH			00H		CRC 0	0AH		CRC 0	0AH	
			CRC 1	D2H							
			CRC 0	C1H							

CRC (Cyclical Redundancy Check) is obtained by the following steps.

1. Load in a 16-bit register FFFFH as the CRC register.

2. Do an exclusive OR operation of the first byte of the data and low byte of CRC register, and place the operation result back to the CRC register.

3. Right shift the bits in the CRC register and fill the high bits with "0". Check the removed lowest bit.

4. If the removed lowest bit is "0", repeat step 3. Otherwise, do an exclusive OR operation of the CRC register and the value A001H and place the operation result back to the CRC register.

5. Repeat step 3 and 4 until the 8 bits (1 byte) are all right shifted.

6. Repeat step 2 and 5 and calculate all the bits to obtain CRC check.

Please be aware of the high/low byte transmission order in the CRC register.

● Example:

Read absolute position command:	01 03 10 04 00 02 81 0A
Response:	01 03 04 18 3A 00 02 5D 5F

About above example, the absolute position is 0x0002183A = 137274μm

Chapter 5 Specifications

Model	Detection distance	Repeatability	Interface	Detection method
LD-030E(1)-M22	25~35mm	5μm	Digital I/O Modbus RS485	Triangular measurement
LD-050E(1)-M22	35~65mm	15μm		
LD-100E(1)-M22	65~135mm	70μm		
LD-220E(1)-M22	120~320mm	200μm		
LD-500E(1)-M22	300~700mm	(300~500mm)300μm (500~700mm)800μm		

Features (all models)

Laser Displacement					
Detection method	Triangular measurement				
Model	LD-030E(1)-M22	LD-050E(1)-M22	LD-100E(1)-M22	LD-220E(1)-M22	LD-500E(1)-M22
Reference Distance	30mm	50mm	100mm	220mm	500mm
Measurement Range	±5mm	±15mm	±35mm	±100mm	±200mm
Light spot diameter (center position)	Approximately 100 x 100 μm	Approximately 80 x 70 μm	Approximately 136 x 110 μm	Approximately 290 x 238 μm	Approximately 541 x 330 μm
Interface	Communication method: Digital I/O, Modbus and RS485				
	Support: 9,600, 14400, 19200, 38400, 57600, 115200bps (Default: 15200bps)				
	Support format: RTU/ASCII 8,N,1、8,N,2、8,O,1、8,O,2、8,E,1、8,E,2、7,O,1、7,E,1、7,O,2、7,E,2				
Light Source	Laser CLASS 2, Max. output 1mW, Max pulse Duration 5ms ,emission peak wavelength: 655nm				
Input Voltage	12~24VDC ± 10%				
Analog Output	Current range: 4~20mA (normal)/ 22mA (abnormal) Load impedance : ≦300Ω				
Digital Output	Optional function: Measuring range /Comparison output, Push-Pull Output, <100mA				
Digital Input	Optional function: Zero point /Teaching, High-level ≧2V, Low-level ≦0.8V				
Repeatability	5μm	15μm	70μm	200μm	(300~500mm)300μm (500~700mm)800μm
Linearity	+-0.1%F.S	+-0.2% F.S	+-0.1% F.S	+-0.2% F.S	(300~500mm)

					+/-0.4% F.S (500~700mm) +/-0.5% F.S
Temperature characteristic	0.03%F.S./ ºC				
Sampling Frequency	1.5ms/ 3ms/ 5ms (Default: 1.5ms)				
Indicator	Laser launch: blue light, DO: green light, DI: yellow light				
Protection Mechanism	Reverse voltage protection, Output overcurrent protection, Input surge protection, Output surge protection				
Operating Temperature	-10ºC ~ 50 ºC				
Storage Temperature	-25 ºC ~ 65 ºC				
Ambient Humidity	30~85%				
Enclosure Rating	IP67				
Ambient Light Resistance	3000 lux or less				
Vibration Resistance	10~55 Hz, 1.5mm, 3 axes for 2 hours				
Insulating Resistance	20 MΩ or more(500VDC)				
Withstand Voltage	500 VAC 50/60 Hz 1min				
Certifications	UL, CE				
Materials	Optical window: PC; Case: Aluminum; Cable: PUR				
Cables	Length: 2m				
Dimensions	44 x 25 x 24mm				

Chapter 6 Cautions

◎ **General Precautions**

- At startup and during operation, be sure to monitor this product is at normal operation.
- We recommend that you take safety measures to avoid any damage if a problem occurs.
- If the product is modified or used diff from in the specifications, its performance cannot be guaranteed.
- Do not install at the same height as the beam path and human eye.
- Do not deliberately irradiate the human body.
- Do not use this product for protecting the human body.
- Pay heed to the path that the laser beam passes through.
- Avoid direct or indirect entrance of laser light into the eye.
- Do not use this product into rapid temperature change environment, product may occur failure.

◎ **Safety Information for LD-E series**

	● This product is just to detect object. Do not use this product to protect a human body or a part of human body. ● Use correct power source and voltage. Otherwise, product failure may result.

◎ **Caution of laser displacement**

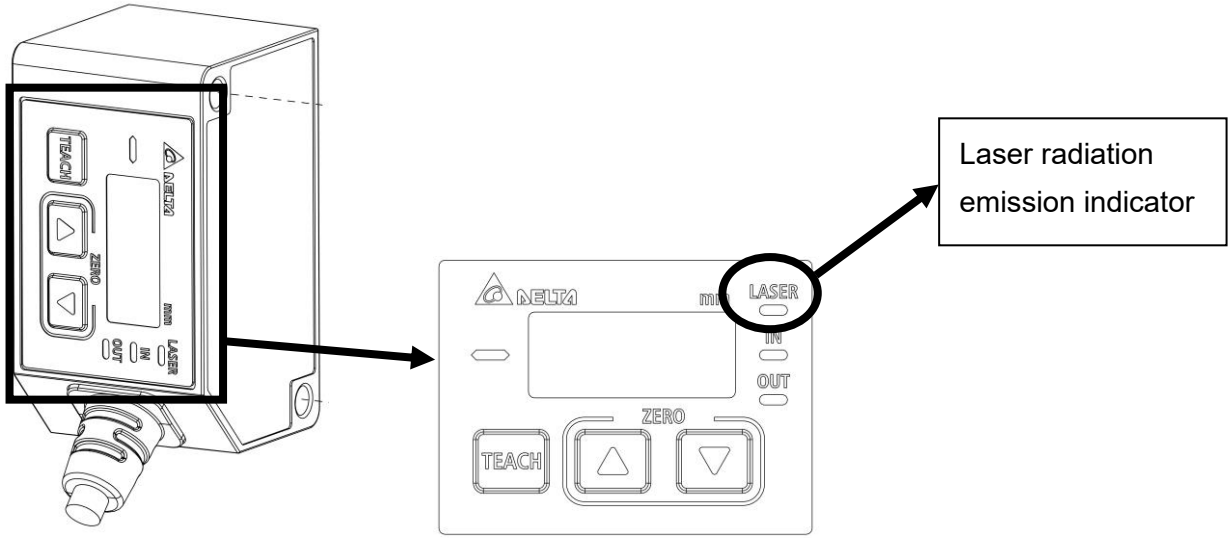
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- If you do not use, control, adjust, or perform operations as required, there is the possibility of exposure to radiation.
- The product doesn't have automatically stop laser emitting device after dismantling, therefore please do not disassemble it.
- Class 2 laser product due to the possibility of human injury (eyes, skin, etc.), please be sure the followings:
  - Do not stare into the beam.
  - Do not direct the beam at other people or into area where other people unknow laser work in.
  - Be careful of the path of laser beam.
  - Do not install at the same height as the beam path and human eye.
- This product has been developed / produced for industrial use only
- Make sure that the power supply is OFF before starting the wiring.
- If the wiring is performed incorrectly, it will cause a failure.
- Do not run the wires together with high-voltage lines or power lines, or put them in the same raceway. This can cause malfunction due to induction.
- Verify that the supply voltage variation is within the rating.

- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- If noise generating devices (switching regulators, inverter motors, etc.) are used around the sensor mounting area, make sure to connect the frame ground (FG) terminal of the device.
- For cable extension, a cable of 0.3 mm² or larger can be used.
- Make sure that stress by forcible bend or pulling is not applied to the sensor cable joint.
- When wiring a sensor that is fixed in place, do not pull the cable with a force of 3KG or more.
- Please avoid using it in environments with severe vibrations.
- Although it depends on the type, light from rapid start type or high frequency lighting type fluorescent lights, sunlight and etc. may affect the sensing, therefore make sure to prevent direct incident light.
- This product is suitable for indoor use only.
- Keep water, oil, fingerprints and etc. which reflect light, or dust, particles or etc. which interrupts the light, away from the emitting / receiving surfaces of this product. If contaminants adhere to the surface, wipe off with a dust-free soft cloth, or lens cleaning paper.
- Do not use the sensor in locations where there is excessive vapor, dust or etc. or in an atmosphere where corrosive gases, etc. is generated.
- Take care that the product does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid or alkaline.
- Make sure to turn OFF the power supply, before cleaning the light emitting / receiving windows of the sensor head.

◎ **Safety measures for the laser**

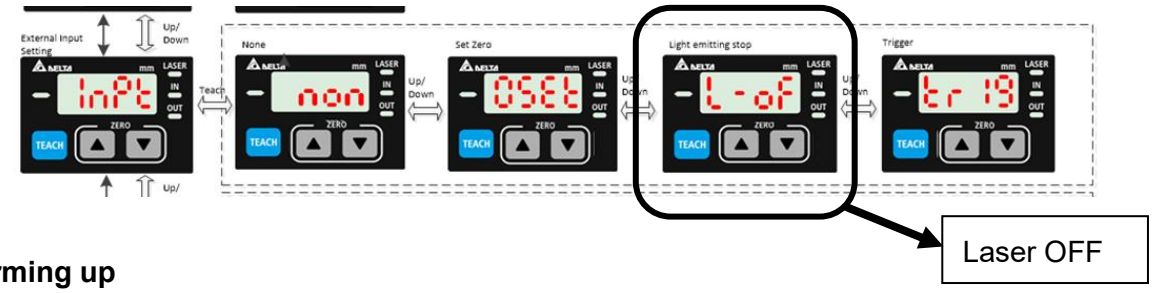
➢ **Laser radiation emission indicator**

The laser radiation emission indicator is turn blue light. It is turn off when laser emission is stopped.



➢ **Laser emission stop input**

When laser emission stop input is set as an external input, laser emission can be stopped by turning on the external input. External input setting can see the user manunal 2.1 **Procedure**

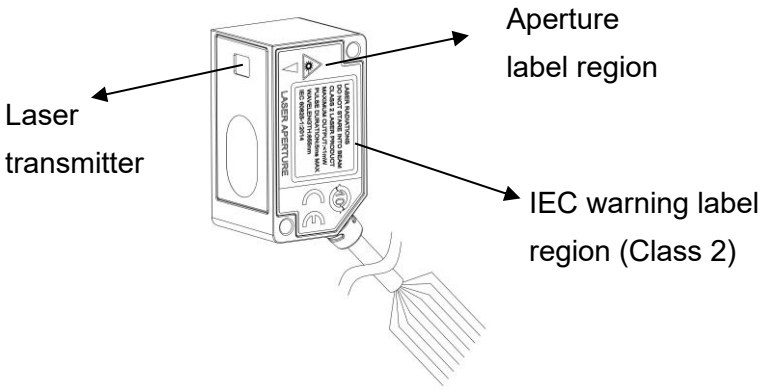


➢ **Warming up**

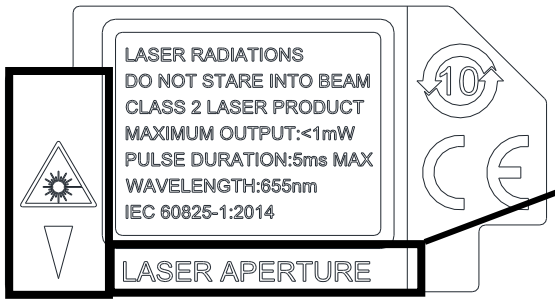
If you need more stable measurement data, we suggest you leave about 30 minute after turning on the power.

➢ **Laser warning labels**

The following diagrams show theof position of laser warning lable on to the LD-E series.

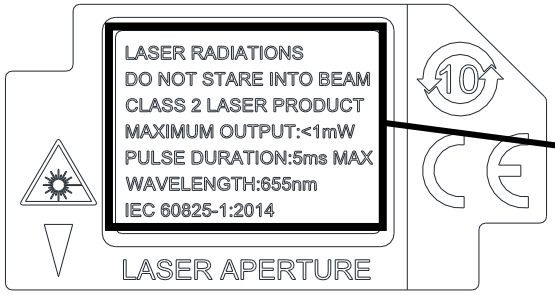


◎ **Aperture label region**



LASER APERTURE: Laser radiation is emitted from this aperture.

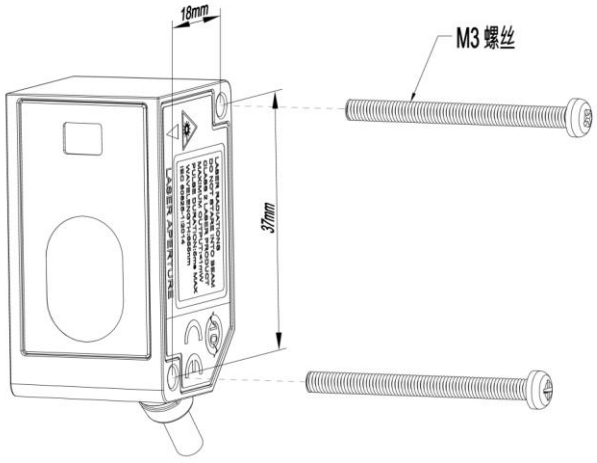
◎ **IEC warning/explanatory lable region (class 2)**



LASER RADIATIONS
DO NOT STARE INTO BEAM
Class 2 LASER PRODUCT
MAXIMUM OUTPUT: <1mW
PULSE DURATION: 5ms MAX.
WAVELENGTH:655nm
IEC 60825-1:2014

◎ **Mounting**

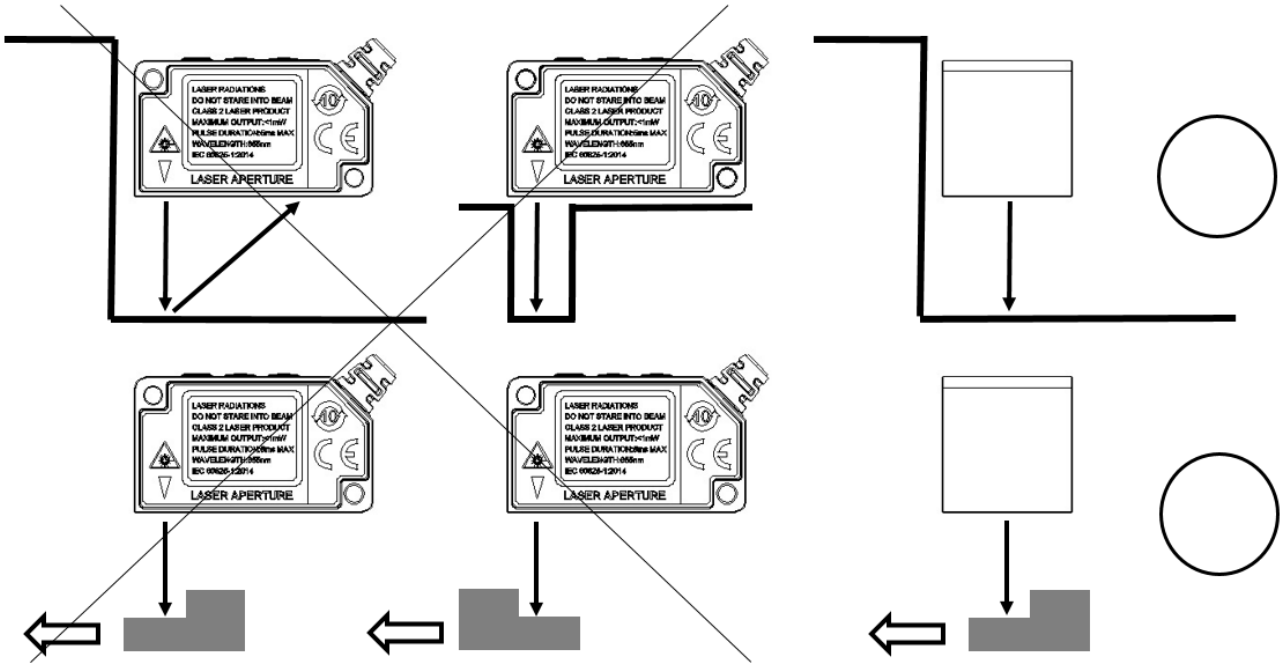
Use M3 screws (provided by the user) for installation, and apply a tightening torque of 0.5 N·m.



◎ **Caution on Mounting Direction**

For best product performance, please note the following instructions when installing products.

1) When products cling to devices, install the products in parallel with the devices to assure product performance.
2) When the shape of an inspection object is extrusive, ensure the product's lighting route is vertical to he inspection object's path to assure product performance.



Chapter 7 Warranty

All products from Delta Electronics Inc. undergo detailed inspection before shipment. If you have any problems, please contact your local branch or distributor and detail the failure.

◎ **Warranty Term**

➢ This Limited Warranty shall last for 18 months from shipment to purchaser.

◎ **Warranty Conditions**

➢ Our company will replace products free of charge once it becomes apparent that the company might be blamed for faults within the warranty period. However, the following conditions are not covered by the warranty:

1) Any product failure caused by improper conditions, environment, operation and operation methods not described in operation manual and user manual.
2) Any failure due to product defects, such as customer's equipment and software.
3) It is not caused by the modification or repair of products by Delta specialist.
4) It is not the damage caused by maintenance or replacement of expendable parts in accordance with operation manual and user manual.
5) Not Delta's responsibility: any natural physical disaster, such as fire, earthquake, flood or other external factor, such as abnormal voltage.

➢ Product warranty is limited to the above mentioned content. We are not responsible for any other minor loss (such as equipment damage and business) and any other damage due to product failure.