Laser displacement sensor

Operatinginstruction

NPN type (current/voltage/double switching output type)

- brown DC12~24V (2CH/ analog current output type) DC18~24V (analog voltage output type)
- Black switch output 1
- White switch output 2
- pink MF
- Blue 0V
- Gray analog output
- Bare wire analog grounding

Main circuit / Defense / Defense / Defense / MF

PNP type (current/voltage dual switching output type)

- brown DC12~24V (2CH/A type) DC18~24V (V-type)
- Black switch output 1
- White switch output 2
- Pink MF
- Blue 0V
- Gray analog output
- Bare wire analog grounding

Main circuit / Defense / Defense

* Only available for analog output models.

NPN (RS485 communication type)

- Brown DC12~24V
- Black switch output 1
- Pink MF
- Grey RS485(A+)
- Shielded RS485(B-) → 485 device
- Blue 0V

Main circuit / Defense

PNP (RS485 communication type)

- Brown DC12~24V
- Black switch output 1
- pink MF
- Grey RS485(A+)
- Shielded RS485(B-) → 485 device
- Blue 0V

Main circuit / Defense

MF input (Multi-function input)

In the menu external input select: Zero, Teach, Stop laser.
NPN type: Grey MF wire connected to the negative terminal of the power supply (0V) is more than 20ms and disconnected for triggering once.
PNP model: The grey MF wire is connected to the positive electrode of the power supply (24V) for more than 20ms and disconnected for triggering once.

Note 1. Check whether the cables are correctly connected before switching on the power. In particular, the white line (analog output line) must not touch other lines.
2. The blue wire (0V) and the shielded wire (mode is not grounded) are connected in the internal circuit.
However, please use the blue wire (OV) to connect the negative terminal of the power supply, and the shielded wire (analog ground) is used to simulate the output.

- ● Please confirm whether the product meets your needs.
Please read this manual thoroughly before use and strictly follow
- ● the instructions below.
- ● Please read the precautions in the instructions carefully and use it after understanding the relevant content.

| ⚠ warn | Indicates that the use of this product without following the specified operating instructions may result in a degree of personal injury or property damage. |

⚠ warn

- ●The light source of this product uses a visible semiconductor laser. Do not directly or indirectly reflect a laser beam from a reflecting object into the eye. There is a risk of blindness if the laser beam enters the eye.
- ●This product does not have explosion-proof structure. Do not use in flammable, explosive, explosive gas or explosive liquid environment.
- ●Do not remove or alter this product as it is not designed to automatically turn off the laser emission when the body is turned on. Disassembly or modification of this product by the client may result in personal injury, fire or electric shock.
- ●Use of controls, adjustments or procedures other than those specified herein may result in a dangerous release of radiation.
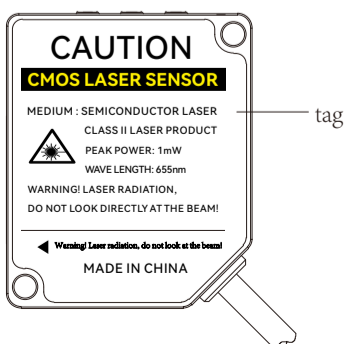
⚠ Look out

- ●It is dangerous to connect or disconnect interfaces when the power is on. Be sure to turn off the power before operation
- ●Failure may occur when installed in the following locations.
1. Places covered with dust or steam
2, where corrosive gases will be generated
3, will directly receive the spatter of water or oil location
4,Places that have suffered severe vibration or shock
- ● This product is not suitable for outdoor use
- ● Do not use the sensor in an unstable state shortly after the power is turned on (about 15 minutes of warm up time)
- ● If switching power regulator must be used, please ground the grounding terminal
- ● Do not connect with high voltage cable or power line, operation failure will lead to induction or damage failure
Because each product is different, there may be slight differences in the detection characteristics of the workpiece.
- ● Do not use this product in water.
- ● Please do not disassemble, repair or modify this product without authorization, otherwise it may lead to electric shock, fire or injury to the human body.
- ● Dust off the transmitting or receiving elements to maintain proper detection. In addition, avoid direct impact of foreign objects on the product.
- ● Operate within the rated range

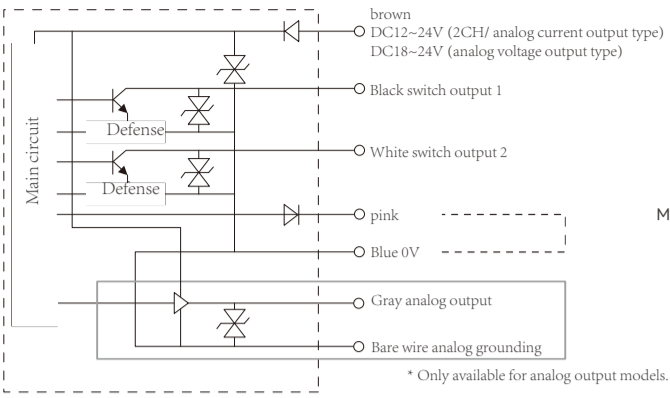| ⚠ | This product cannot be used as a safety device to protect the human body |

Laser use precautions

Laser tag
The product is classified as a Class 2 (ⅡI) laser product by the JISC6802/IEC/FDA laser safety standard.
If the white laser label on the machine is covered when installing the product, attach the attached laser label in a visible position.
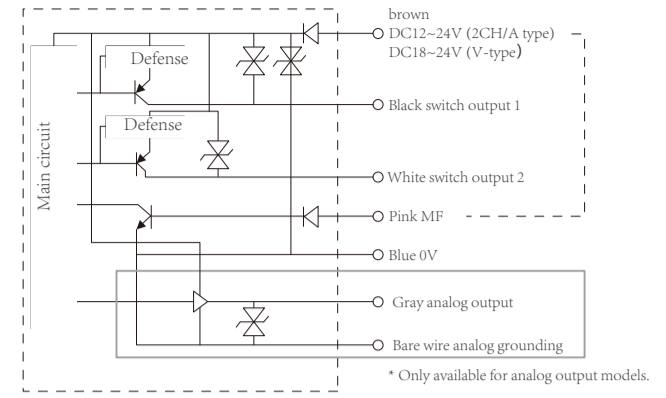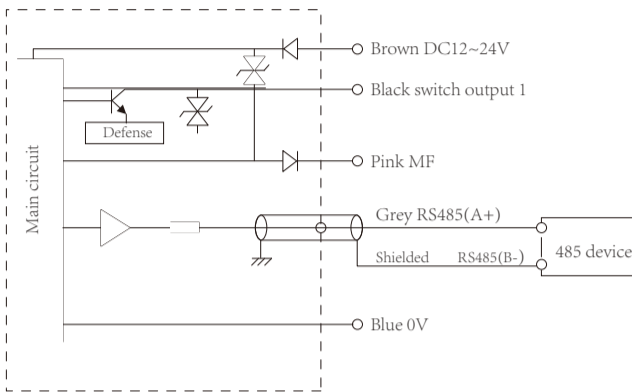

- tag

specification

Measuring range specification

Detection distance		30mm	50mm	85mm	120mm	250mm
Detection Range (F.S.)		±4mm	±10mm	±20mm	±60mm	±150mm
illuminant		Red semiconductor laser				
		Wavelength: 655mm Maximum power: lmv				
Laser type	IEC/JIS	CLASS2				
	FDA	CLASS II				
Spot size *1	Close range	0.15×0.15mm	0.6×1.2mm	0.9×1.5mm	1.2×1.8mm	1.5×2.5mm
	Central position	0.1×0.1mm	0.5×1.0mm	0.75×1.25mm	1.0×1.5mm	1.75×3.5mm
	Long distance	0.15×0.15mm	0.4×0.9mm	0.6×1.0mm	0.5×0.8mm	2.0×4.5mm
Linear accuracy		±0.1% F.S. (F.S.=8mm)	±0.1% F.S. (F.S.=20mm)	±0.1% F.S. (F.S.=40mm)	±0.1% F.S. (F.S.=120mm)	±0.3% F.S. (F.S.=300mm)
Resolution		2μm (4μm in fast mode)	5μm (8μm in fast mode)	10μm (15μm in fast mode)	30μm (45μm in fast mode)	75μm (150μm in fast mode)
Response time	High speed	max. 2ms				max. 2.5ms
	Standard	max. 11.5ms				max. 15.5ms
	High precision	max. 36.5ms				max. 48.5ms
Sampling period		550μs (250mm model: 750μs)				
Temperature drift characteristic		±0.08%F.S./°C				
Pilot lamp	Output light	ON: Indicators Q1 and Q2 (yellow) are on				
MF input (Multi-function input)		In the menu external input select: Zero, Teach, Stop laser.				
		PN model: Grey MF wire connected to the negative terminal of the power supply (0V) is more than 20ms and disconnected for triggering once. PNP model: The grey MF wire is connected to the positive electrode of the power supply (24V) for more than 20ms and disconnected for triggering once.				
Protection circuit		Reverse connection protection, overcurrent protection				
Protection class		IP64				
Use ambient temperature/humidity		-10+45℃ (no icing)/35~85RH(no frost)				
Storage ambient temperature/humidity		-20~60℃ (no icing)/35~95RH(no frost)				
Ambient illumination		Sunlight: less than 100001x Incandescent lamp: less than 30001x				
Vibration resistance		10-55Hz double amplitude 1.5mm XYZ for 2 hours in all directions				
Impact resistance		About 50G(500m/s)X, Y, Z three times in each direction				
Internal circuit stability time		Approx. 1.5s				
Preheating time		max.15 minutes				
material		Case: Aluminum lens :PMMA				
weight	Cable type	65g(without cable)				
	Plug-in type	90g				

● Output specification

Model number	Analog current output type	Analog voltage output type	RS485 communication type
Supply voltage	DC12 ~ 24V (+10%/—5%)	DC18 ~ 24V (+10%/—5%)	DC12 ~ 24V (+10%/—5%)
Current consumption	max.60mA includes analog output values	max.40mA	
exportation — Switching output 1	NPN/PNP max.100mA/DC30V Residual voltage 1.8V		—
exportation — Switching output 2	NPN/PNP max.100mA/DC30V Residual voltage 1.8V		
exportation — Analog output	4~20mA Load impedance: 0~10V below 300 Ω	0~10V Output impedance: 100 Ω	—
communication	—		RS485
Connection type — Cable type *3	Phi 56 core 2 m long cable (PVC)AWG24		Phi 58 core 2 m long cable (PVC)AWG24
Connection type			

< test condition >
No specially specified test conditions are, the use of ambient temperature :23 C (normal temperature), the voltage in the power supply; DC24V, response time: high resolution mode, sampling period :550 μ s, detection distance: central position, test target :50x50mm white ceramic.
*1 is defined by the central beam intensity of 1/e2(13.5%). False detection may occur when there is light leakage outside the defined spot size range, or when there is an object around the beam with a higher reflectivity than the object being measured.

Mounting (diffuse reflection type)

In order to obtain a good detection position, install the detection surface as close as possible to the detection center of the sensor.
Install the sensor using M4 screws with a tightening force smaller than 0.8N-m.
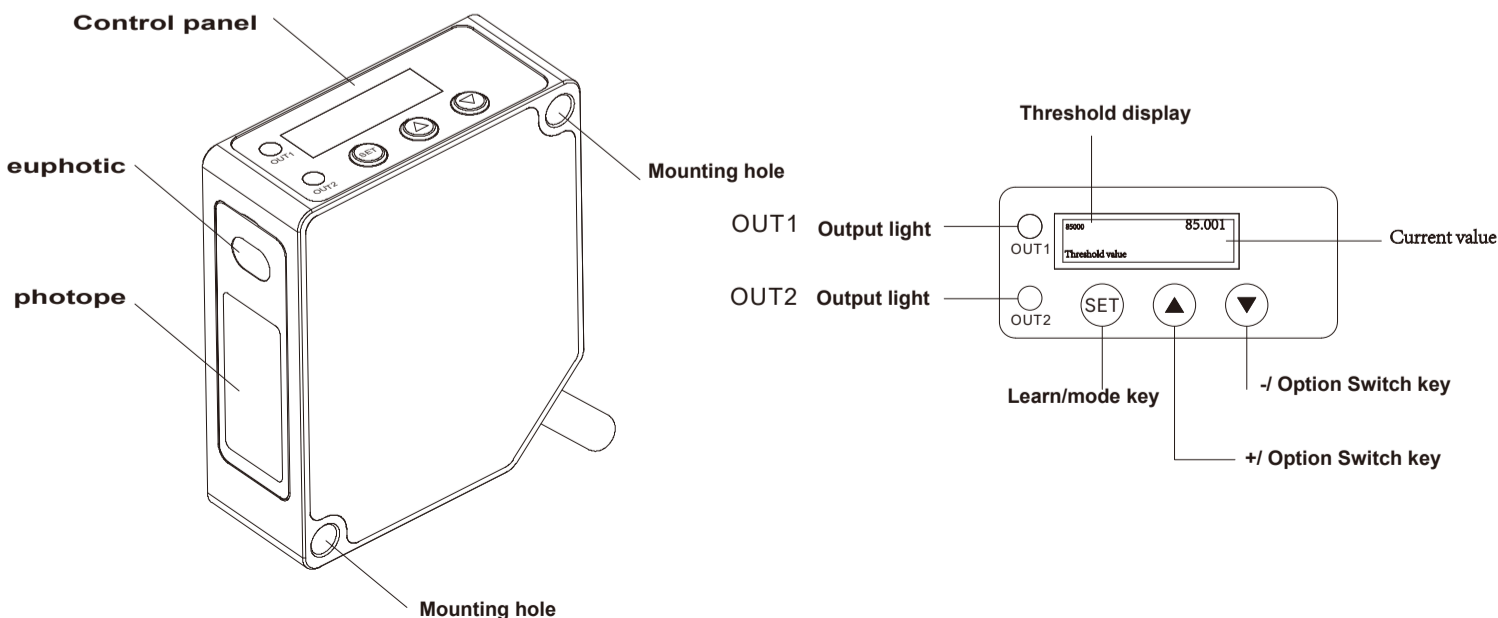For the installation method of the positive reflection type, please refer to the positive reflection type manual.
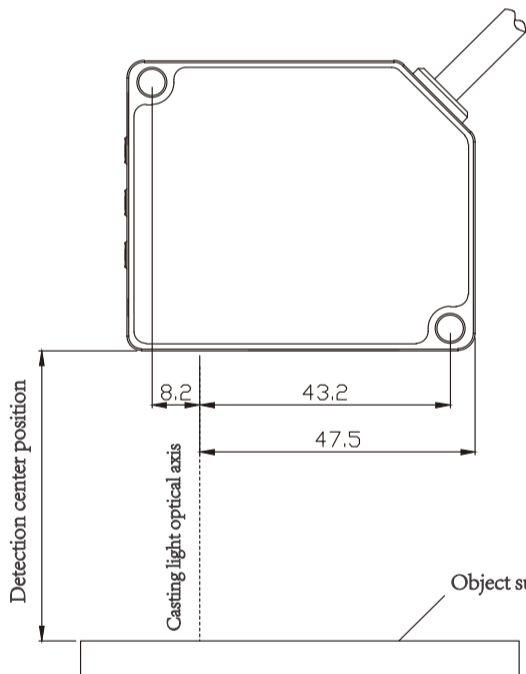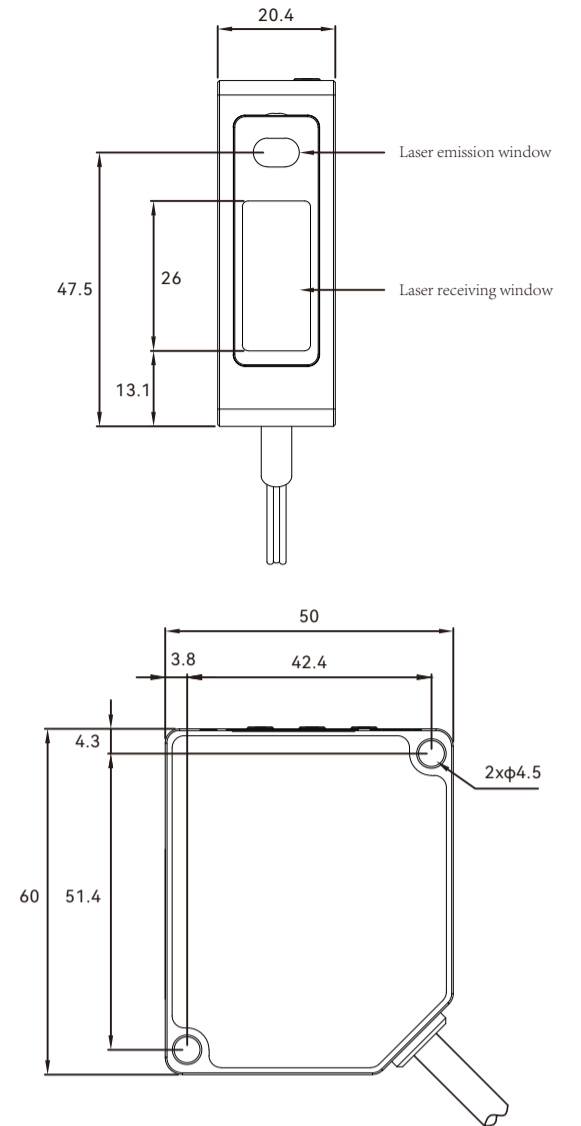

· When mounting, keep the lens surface of the sensor parallel to the surface of the object.
· Please note that when there is light leakage outside the spot or an object with a higher reflectivity than the measured object is present around the beam, the measurement error may be caused.

Object surface

Unit (mm)

Name of operating unit

Control panel
euphotic
photope
Mounting hole
Mounting hole

OUT1 Output light
OUT2 Output light
SET — Learn/mode key
▲ +/ Option Switch key
▼ -/ Option Switch key

Threshold display
Current value

Outline dimensional drawing

20.4
47.5
26
13.1
Laser emission window
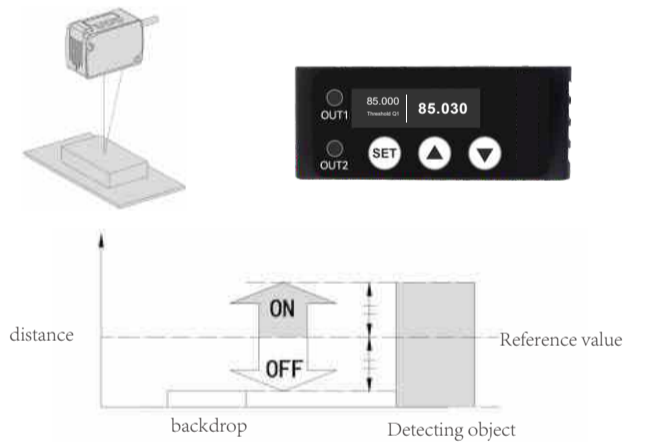Laser receiving window

50
3.8
42.4
4.3
2xφ4.5
60
51.4

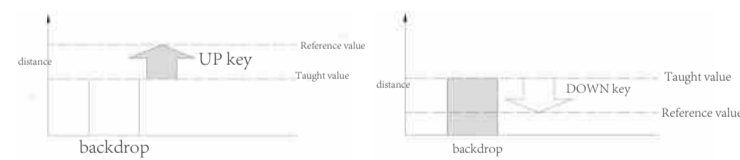## Function setting procedure

indoctrination
*2 teaching points:
Basic instruction method
① In the state of no object, press the "SET "key.
② In the state of an object, press the "SET "key.
③ Complete the calibration. (When the difference between two teachings is small, the return difference is too small, and it is necessary to expand the difference and teach again)

OUT1 85.000 85.030 Threshold value
OUT2 SET ▲ ▼

distance
ON
OFF
Reference value
backdrop   Detecting object

* Qualified Teaching
In the case of small objects and backgrounds, how to use this teaching method is very convenient.

distance UP key Reference value / Taught value
backdrop
< in case of background reference >

distance DOWN key Taught value / Reference value
backdrop
< In the case of detecting objects as benchmarks >

① In the state of the background object or in the state of the detected object, press the "SET" key.
② When the background object is the reference, press the " ▲ " key to set the reference value in the sensor. The value set in the checked object after pressing the " ▼ " key when the checked object is the base.
③ Complete the calibration.

*1 point teaching (window comparison mode)
- The method of setting the upper and lower limits is applied instead of the 1-point instruction for the distance from the datum surface of the detected object. This function is used to distinguish between the upper and lower limits.
- In the case of 1-point teaching (window compare mode), please set it to [1-point teaching (window compare mode)] in the detection output setting of PRO mode.
- For setting method, please refer to "PRO Mode Operation Instructions"

OFF
Base value 2_SL
distance ON Datum plane
OFF
Base value 1_SL
Detecting object
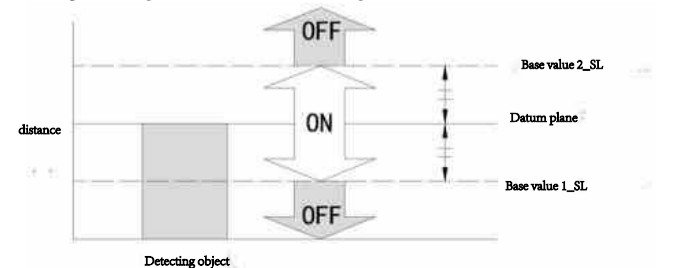
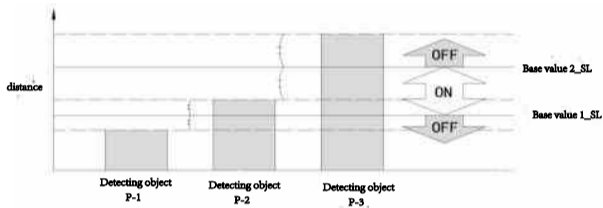① In the case of detection objects, press the "SET" key 2 times
② teaching is completed

*2 point teaching (window comparison mode)
- Implement the 2-point instruction to set the benchmark value range method.
- In the case of implementing 2-point teaching (window comparison mode), please set it to [2-point teaching (window comparison mode)] in the detection output setting of PRO mode. Refer to the "Operation Instructions for the Mode PRO" for setting methods.
- When performing the instruction, please use a constant distance detection object (P-1, P-2).
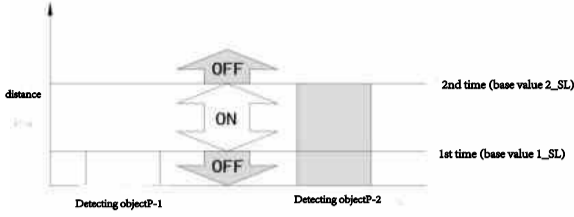
① Under the condition of detecting object P-1, press the "SET" key (the first time).
② Under the condition of detecting object P-2, press the "SET" key (2nd time).
③ Complete the calibration.

* 3-point teaching (window comparison mode)
- Perform the 3-point (P-1, P-2, P-3) instruction as shown in the figure below, set the reference value 1SL between the 1st and 2nd times, set the reference value 2SL between the 2nd and 3rd times, and let the method of setting the reference value range.
- In the case of 3-point teaching (window compare mode), please set it to [3-point Teaching (Window compare mode)] in the menu detection output setting.
- After teaching, P-1, P-2, P-3 will be automatically arranged in order from smallest to largest.

① In the presence of detection object P-1 state, press the "SET" key (the first time)
② In the state of detecting object P-2, press the "SET" key (the second time)
③ In the presence of detection object P-3 state, press the "SET" key (3rd time)
④ Complete calibration.

Function setting procedure

●Threshold fine-tuning function

* Usually detect mode
- Press the "▲" key or "▼" key to change the threshold directly.
* Window comparison mode
- Press the "▲" key or "▼" key to change the threshold directly.
- Press the "▲" key and "▼" key at the same time to switch between threshold 1 and threshold 2

* Switch quantity setting
- Analog output type has two channels of switching output, namely switching output Q1 and switching output Q2; 485 communication type only switch output Q1.
- Switch output Q1 and switch output Q2 can set the threshold respectively, while long press the "▲" key and "▼" key for 3 seconds to switch the switch output Q1 or switch output Q2.

Key lock function
- Press the "SET" key and "▼" key at the same time to press the lock
- Press the "SET" key and "▼" key at the same time to unlock

Zero function
- Zero function is the function that forces the measurement value to "zero." When setting zero, the screen has a vertical line,
As shown below:

Press the SET key and "▲" key at the same time to reset the Settings
Press the SET key and "▲" key at the same time to zero and cancel
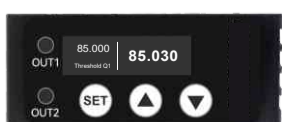
Note: Zeroing can only be performed if the display mode is set to reverse mode.

Menu setting

Press and hold the "SET" key for 3 seconds under the distance display interface to enter the menu setting mode.
In the menu setting mode, hold down "SET" for 3 seconds to exit the menu setting mode.
In the menu setting mode, stop for 20 seconds without pressing any button, you can automatically exit the menu setting mode.
After entering the menu setting mode, press the "▲" key or ▼ key to switch the menu up and down.
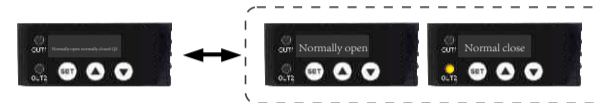Press the SET key to access the corresponding menu item.

1, working mode: standard, high speed, high precision
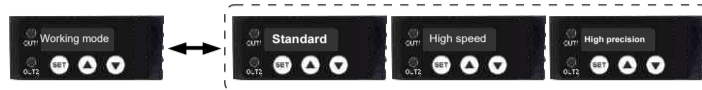
2, normally open and normally closed Q1: press "SET" key to enter, "▲" or "▼" switch selection, press "SET" to confirm.

3, normally open and normally closed Q2: press the "SET" key to enter, "▲" or "▼" switch selection, press "SET" to confirm. (Only analog output versions have this menu)

4, detection output: normal mode, one point teaching, two points teaching, three points teaching.


5, simulation selection: 0-10V, 4-20mA. (Only analog output versions have this menu)

6, the difference: equivalent to the fine tuning of sensitivity, the detection of small differences can be adjusted to the lowest.

7, external input: when selecting the corresponding function.
-NPN Model: Grey MF cable connected to the negative terminal of the power supply (0V) for more than 20ms when disconnected, trigger once.
-PNP model: The gray MF cable is triggered once when it is connected to the positive electrode of the power supply (24V) for more than 20ms.
* Zero: the current value is cleared to zero, and the ± value is displayed in the range (zero is only valid in the reverse display mode);
- Instruction: can be used by pressing the "SET" key once;
- Stop laser: the sensor stops emitting laser and does not work;
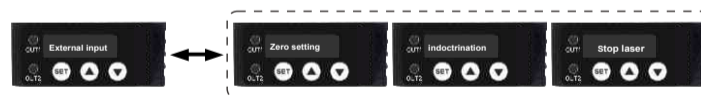
8, output timing: output delay, delayed output, single output, output extension, no timing, default no timing.
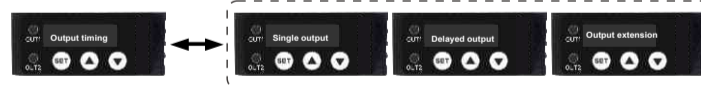
9, display mode: standard [display actual distance], reverse [GFL-G85 as an example to display +20 to -20] offset [display 0 to 40].
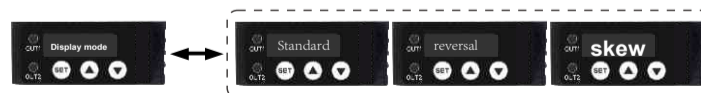
10, hold: The default is to keep off, can be selected to keep open. That is, when the current detection value exceeds the range, the output voltage or current can be maintained. [Common application is to maintain 0 or 5v after exceeding the range].

11, the screen selection: steady on, timing screen.

12. Language

13, address (only 485 version has this menu)

14. Baud rate(only 485 version has this menu)

15, reset press "SET" to enter the default display return, you can switch to confirm the reset, press "SET" to ensure that the display has restored factory Settings.

Press "SET" and "▼" keys at the same time: keyboard lock on/off.

GFL-G series MODBUS protocol

● Communication specification

Communication mode	RS485
Synchronous mode	asynchronous
Baud rate	9.6/19.2/38.4/57.6/115.2/256kbps
Data length	8-bit
Stop bit	one-bit
Parity check	There is no

04H instruction (read input register)

1. Communication frame format

1byte	1byte	2byte	2byte	2byte
Address code	Function code	Register address	Number of registers N	CRC code

2.Response frame format

1byte	1byte	1byte	2N byte	2byte
Address code	Function code	Number of bytes 2N	Register value	CRC code

3.Travel frame format

1byte	1byte	1byte	2byte
Address code	Error code	Exception code	CRC code

Read data

Address code	Function code	Register address	Number of registers N	CRC code	Function description
0x01	0x04	0x0000	0x0002	0x71CB	acquisition-distance
0x01	0x04	0x0001	0x0001	0x600A	Get - Work mode
0x01	0x04	0x0002	0x0001	0x900A	Get - Normally open normally closed
0x01	0x04	0x0003	0x0001	0xC1CA	Get - Detect the output
0x01	0x04	0x0004	0x0002	0x300A	Acquisition - should be poor
0x01	0x04	0x0005	0x0001	0x21CB	Get - External input
0x01	0x04	0x0006	0x0001	0xD1CB	Get - Output timing
0x01	0x04	0x0007	0x0001	0x800B	Get - Output timing time
0x01	0x04	0x0008	0x0001	0xB008	Get - Display mode
0x01	0x04	0x0009	0x0001	0xE1C8	grab-hold
0x01	0x04	0x000A	0x0001	0x11C8	Get - Screen selection
0x01	0x04	0x000B	0x0002	0x0009	Get - Zero value
0x01	0x04	0x000C	0x0002	0xB1C8	Obtain - Threshold 1
0x01	0x04	0x000D	0x0002	0xE008	Obtain - Threshold 2
0x01	0x04	0x000E	0x0002	0x1008	Get - Baud rate

respond

Address code	Function code	Number of bytes 2N	Register value	CRC	Response description
0x01	0x04	0x04			distance
0x01	0x04	0x02	0x0000	0xB930	High precision
			0x0001	0x78F0	Standard
			0x0002	0x38F1	High speed
0x01	0x04	0x02	0x0000	0xB930	Normally open
			0x0001	0x78F0	Normal close
0x01	0x04	0x02	0x0000	0xB930	Usual detection
			0x0001	0x78F0	A little teaching
			0x0002	0x38F1	Two-point teaching
			0x0003	0xF931	Three-point teaching
0x01	0x04	0x04			Accept an assignment
0x01	0x04	0x02	0x0000	0xB930	Zero setting
			0x0001	0x78F0	indoctrination
			0x0002	0x38F1	Stop laser
0x01	0x04	0x02	0x0000	0xB930	Random time
			0x0001	0x78F0	Output extension
			0x0002	0x38F1	Delayed output
			0x0003	0xF931	Single output
0x01	0x04	0x02			Timing time
0x01	0x04	0x02	0x0000	0xB930	routine
			0x0001	0x78F0	reversal
			0x0002	0x38F1	skew
0x01	0x04	0x02	0x0000	0xB930	Keep open
			0x0001	0x78F0	Hold off
0x01	0x04	0x02	0x0000	0xB930	Timing screen
			0x0001	0x78F0	Steady on
0x01	0x04	0x04			Zero setting
0x01	0x04	0x04			Threshold 1
0x01	0x04	0x04			Threshold 2
0x01	0x04	0x04	0x000012C0		4800
			0x00002580		9600
			0x00009600		38400
			0x0001C2000xFB24		115200
			0x0003E800		256000

Operating function

Address code	Functional abum	Register address	Register address	Number of bytes	Register value	CRC	Function setting
0x01	0x10	0x0000	0x0001	0x02	0x0000	0xA650	Discontinuous output
					0x0001	0x6790	Discontinuous output
0x01	0x10	0x0001	0x0001	0x02	0x0000	0xA781	High precision
					0x0001	0x6641	Standard
					0x0002	0x2640	High speed
0x01	0x10	0x0002	0x0001	0x02	0x0000	0xA7B2	Normally open
					0x0001	0x6672	Normal close
0x01	0x10	0x0003	0x0001	0x02	0x0000	0xA663	Usual destruction
					0x0001	0x67A3	A little teaching
					0x0002	0x27A2	Two-point teaching
					0x0003	0xE662	Three-point teaching
0x01	0x10	0x0004	0x0002	0x04			Accept an assignment
0x01	0x10	0x0005	0x0001	0x02	0x0000	0xA605	Zero setting
					0x0001	0x67C5	indoctrination
					0x0002	0x27C4	Stop laser
0x01	0x10	0x0006	0x0001	0x02	0x0000	0xA636	Random time
					0x0001	0x67F6	Extended output
					0x0002	0x27F7	Delayed output
					0x0003	0xE637	Single output
0x01	0x10	0x0007	0x0001	0x02			Timing time
0x01	0x10	0x0008	0x0001	0x02	0x0000	0xA718	routine
					0x0001	0x66D8	reversal
					0x0002	0x26D9	skew
0x01	0x10	0x0009	0x0001	0x02	0x0000	0xA6C9	Keep open
					0x0001	0x6709	Hold off
0x01	0x10	0x000A	0x0001	0x02	0x0000	0xA6FA	Timing screen
					0x0001	0x673A	Steady on
0x01	0x10	0x000B	0x0001	0x02	0x0001	0x66EB	Zero - Current measurement value
0x01	0x10	0x000C	0x0002	0x04			Threshold - Input threshold
0x01	0x10	0x000D	0x0002	0x04			Threshold - Input threshold
0x01	0x10	0x000E	0x0002		0x000012C0	0x7ED3	4800
					0x00002580	0x6913	9600
					0x00009600	0x1D83	38400
					0x0001C200	0x7283	115200
					0x0003E800	0xCC23	256000
0x01	0x10	0x000F	0x0001	0x02	0x0000	0xA6AF	resetting

respond

Address code	Function code	Register address	Register address	CRC
0x01	0x10	0x0000	0x0001	0x01C9
0x01	0x10	0x0001	0x0001	0x5009
0x01	0x10	0x0002	0x0001	0xA009
0x01	0x10	0x0003	0x0001	0xF1C9
0x01	0x10	0x0004	0x0002	0x4008
0x01	0x10	0x0005	0x0001	0x11C8
0x01	0x10	0x0006	0x0001	0xE1C8
0x01	0x10	0x0007	0x0001	0xB008
0x01	0x10	0x0008	0x0001	0x800B
0x01	0x10	0x0009	0x0001	0xD1CB
0x01	0x10	0x000A	0x0001	0x21CB
0x01	0x10	0x000B	0x0001	0x700B
0x01	0x10	0x000C	0x0002	0x81CB
0x01	0x10	0x000D	0x0002	0xD00B
0x01	0x10	0x000E	0x0002	0x200B
0x01	0x10	0x000F	0x0001	0x31CA

Communication case (set baud rate to 115200)

Send command

01 10 00 00 0E 00 02 04 00 00 25 80 69 13

Address code	Function code	Register address	Register count	Number of bytes	Register value	CRC
0x01	0x10	0x000E	0x0002	0x04	0x00002580	0x6913

Feedback information

01 10 00 00 0E 00 02 20 0B

Address code	Function code	Register address	Register count	CRC
0x01	0x10	0x000E	0x0002	0x200B

Note: The sensor address code can be set in the function menu, and the CRC needs to change the address code at the same time.

Communication example (Get distance)

Send command

01 04 00 00 00 02 71 CB

Address code	Function code	Register address	Number of registers N	CRC
01	04	0000	0002	71CB

Feedback information

01 04 04 00 01 19 36 21 C2

Address code	Function code	Number of bytes	Register value - Distance value	Check code
01	04	04	00 01 19 36	21 C2

00 01 1936 indicates the distance information in um. The distance converted to decimal is 71990um=71.990mm

10H instruction (write multiple hold registers)

1. Communication frame format

1byte	1byte	2byte	2byte	1byte	N*2 byte	2byte
Address code	Function code	Register address	Number of registers N	Number of bytes 2N	Number of bytes 2N	CRC code

2. Response frame format

1byte	1byte	2byte	2byte	2byte
Address code	Function code	Register address	Number of registers N	CRC code

3, error frame format

1byte	1byte	1byte	2byte
Address code	Error code	Exception code	CRC code