SFL LASER RANGING SENSOR

MANUAL

TIANJIN G-TEK SENSOR TECHNOLOGY CO.,LTD

Content

一 Product Profile

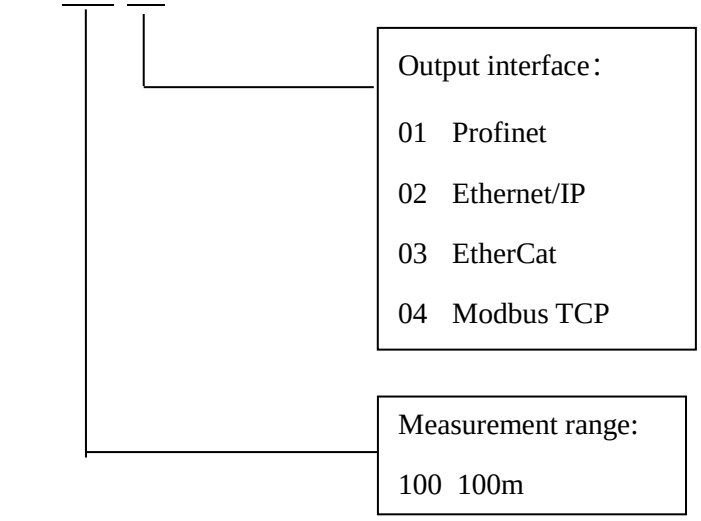
SFL series laser range sensor is a powerful distance measuring instrument, which can be integrated into various industrial applications. Through the reflection of a laser beam, the SFL range sensor can achieve accurate, non-contact long-distance distance measurement.

二 Product Feature

- Measurement principle of phase method to ensure the millimeter level measurement accuracy
- Visible red laser, easy to align and debug
- Measurement range: 0.2m-100m
- Measurement accuracy±2mm，Repetition accuracy±0.5mm（1δ）
- High measuring speed above 300Hz
- Profinet and other communication interface outputs
- Switch output
- Wide range power supply voltage（12-30VDC）
- 6 LEDs for status signals
- 4 buttons for setting parameters
- LCD display, clear and intuitive
- M12 Electrical interface
- IP65 Protection rating
- Excellent anti light interference ability
- Wide operating temperature range（-20℃~55℃）
- Strong anti-electromagnetic interference capability

三 Model instruction

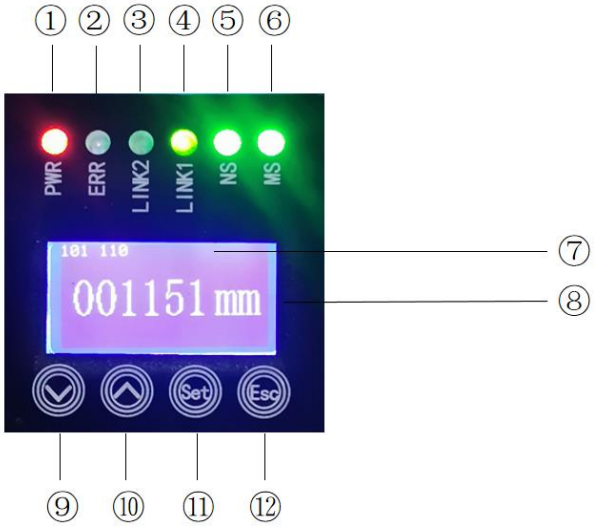
SFL-100-XX



四 Main Parameter

Model	SFL-100-01
Detection range	0.2m~100m
Detection object	Reflective film (diamond grade)
Accuracy (1δ)	±2mm
Repetition accuracy (1δ)	±0.5mm
Response time	<3ms
Light source	650nm red laser (CLASS II)
Light spot	15cm*4cm@100m
Supply voltage	12~30VDC Vp-p < 10%
No-load current	≤ 150 mA@24V
Electrical interface	M12 connector
Display	Parameter setting button； LCD screen, indicator
Communication interface	Profinet （2 way）
Switching	NPN transistor output (load current ≤ 100mA)
Circuit protection	Power reverse polarity protection, power overvoltage protection, output short circuit protection
Anti-optical interference	Sunlight: 100000lux Incandescent lamp: 3000lux
Working temperature	-20℃~55℃
Protection rate	IP65
Dimension	120mm*72mm*96mm

五 Display AND Setting



①~⑥ state indicators, ⑦LCD screen，⑧ LCD screen widow，⑨~⑫ Parameter setting button

5.1 State indicator

①PWR	Power/output indicator	**Indicator OFF**：Power off
		Green indicator ON：Work normally after power-on
		Yellow indicator ON：Work normally and switch output after power-on
		The yellow and green indicator flash alternately：The light spot did not hit the reflective film
②ERR	Fault indicator	**Indicator OFF**：Power off（PWR light off）Or Work normally
		Red indicator ON：Internal failure
③LINK2	Status indicator of Ethernet port 2	**Indicator OFF**：No power supply or no network connection at this port
		Green indicator flash：The Ethernet cable of this port is connected normally
④LINK1	Status indicator of Ethernet port 1	**Indicator OFF**：No power supply or no network connection at this port
		Green indicator flash：The Ethernet cable of this port is connected normally
		Indicator OFF：No power supply or failure of PROFINET communication component inside the product
		Green indicator ON：Normal

⑤NS	Network transmission status indicator	**Green indicator flash**：IO controller in "STOP" state（PLC does not work normally）
		Red indicator single flash：Slave name error（The PLC does not assign the name of the range sensor）
		Red indicator double flash：IP error（PLC does not assign IP address to laser range sensor）
		Red indicator triple flash：PLC Program error（Incorrect data address assigned by PLC）
⑥MS	Internal status indicator	**Indicator OFF**：No power supply or failure of PROFINET communication component inside the product
		Green indicator ON：Normal

5.2 LCD screen

After power on, the screen defaults to the test distance display. Press and hold the set key for more than 2s to enter the setting menu display.

5.3 Parameter Setting

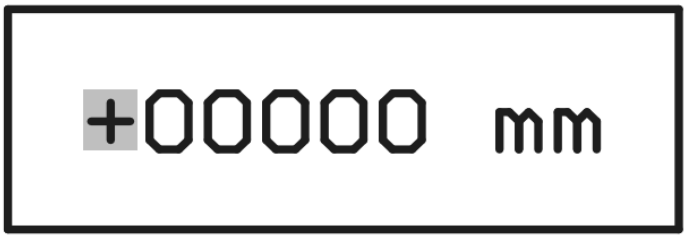
⑨▽ Turn Page Down	Press this key to scroll down or decrease the value
⑩△ Turn Page Up	Press this key to page up or increase the value
⑪SET Menu /Set	Press and hold this key for more than 2s to enter the setting menu; Press this key to set parameters
⑫ESC Return	Press this key to return to the upper menu

Press the Set key for>2s to enter the setting menu. The setting items are "Offset" ->"Resolution" ->"Speed" ->"Distance upper limit" ->"Distance lower limit" ->"Output status"

Jump to the setting item through the Page Up/Page Down key, and press the Set key to enter the submenu of the setting item

5.3.1 Offset Setting

Default distance display ->(long press Set key>2s) ->setting menu page ->(page up/page down) ->offset ->(click Set key) ->zero point menu bar (as shown below)



Meaning of offset: measured distance +set offset=displayed and output distance; The factory default value is 0mm.

After entering the Offset menu , the highlighted part is the bit to be modified. Press Page Up/Page Down to switch this bit, and press Set to set this bit and switch to the next bit to be set; After all the bits are set, the Offset setting is completed, and return to the setting menu page.

The offset setting range is - 120mm~+120mm. When the setting exceeds this range, the setting fails and the offset is still the value before setting

5.3.2 Resolution Setting

Default distance display ->(long press Set key>2s) ->Settings menu item ->(page up/page down) ->Resolution ->(click Set key) ->Resolution menu bar (as shown below)

Meaning of resolution: minimum display change of output data

If the resolution=1mm, the distance data will be changed according to 3000mm-3001mm-3002mm;

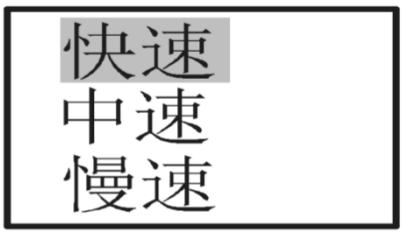
If the resolution=10mm, the distance data will be changed according to 3000mm-3010mm-3020mm;

The factory default value is 1mm.

After entering the resolution menu bar, the highlighted part is the current resolution. Press Page Up/Page Down to switch the resolution, and press “Set” to set the resolution. Automatically return to the setting menu page after setting

5.3.3 Speed Setting

Default distance display ->(long press Set key>2s) ->Settings menu item ->(page up/page down) ->Rate ->(click Set key) ->Rate menu bar (as shown below)



The speed setting can be used to set the measurement time. If the speed setting is slow, the data stability will be better

Fast speed: measuring time 3ms

Medium speed: measuring time 20ms

Slow speed: measuring time 100ms

The factory default is fast speed.

After entering the speed rate menu , the highlighted part is the current speed. Press Page Up/Page Down to switch the speed rate, and press “Set” to set the speed. page after speed setting finishing it will automatically return to the setting menu.

5.3.4 Distance upper limit setting of switching value output

Default distance display ->(Keep pressing Set key>2s) ->Settings menu item ->(page up/page down) ->Distance upper limit ->(click Set key) ->Distance upper limit menu bar (as shown below)

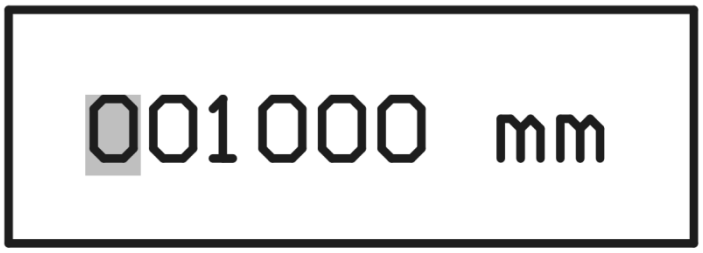
Meaning of upper limit of distance: when the test distance is higher than the upper limit, the switching value output acts

The default value of the upper distance limit is 99000mm, and the highlighted part is the bit to be modified. Press Page Up/Page Down to switch this bit, and press “Set” to set this bit and switch to the next bit to be set; After all the bits are set, the upper limit of distance set is finished and it will return to the setting menu page.

The upper limit of distance is set within the range of 200mm~11990mm. When the upper limit of distance exceeds this range, the setting fails; When the setting value of the upper distance limit is less than the current lower distance limit, the setting fails. The current upper distance limit is still the upper distance limit before setting.

5.3.5 Distance lower limit setting of switching value output

Default distance display ->(Press Set key>2s) ->Settings menu item ->(page up/page down) ->Distance lower limit ->(click Set key) ->Distance lower limit menu bar (as shown below)



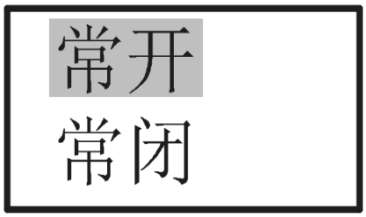
The meaning of the lower limit of distance: when the test distance is lower than the lower limit, the switching value output acts.

The default value of the lower limit is 1000mm, and the highlighted part is the bit to be modified. Press Page Up/Page Down to switch this bit, and press “Set” to set this bit and switch to the next bit to be set; After all the bits are set, the lower distance set is finished and it will return to the setting menu page .

The setting range of the lower distance limit is 200mm~11990mm. When the lower distance limit exceeds this range, the setting fails; When the setting value of the lower distance limit is greater than the current upper distance limit, the setting fails. The lower limit of the current distance is still the lower limit of the distance before setting.

5.3.6 Switch output logic setting

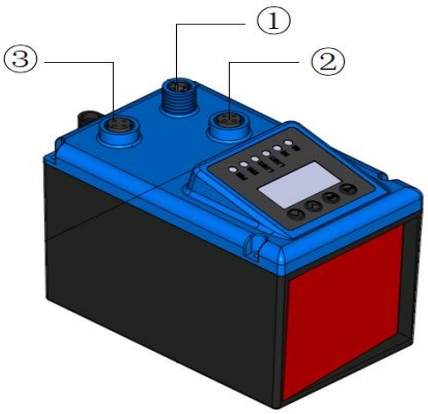
Default distance display ->(Press Set key>2s) ->setting menu item ->(page up/page down) ->output status ->(click Set key) ->output status menu (as shown below)



After entering the output status menu bar, the highlighted part is the current output status. Press Page Up/Page Down to switch the output state, and press “Set” to set the output state. After setting it will automatically return to the setting menu page.

The output logic of the switch signal of the range sensor can be changed by setting to （常开）normally open or normally closed（常闭）

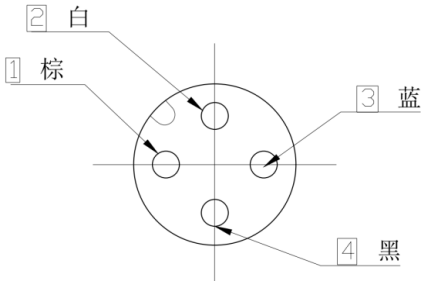
六 Wiring Connection



①: Power connection socket

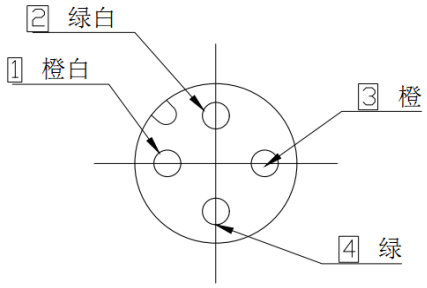
②③：Ethernet cable connection socket

6.1 Power cable connection



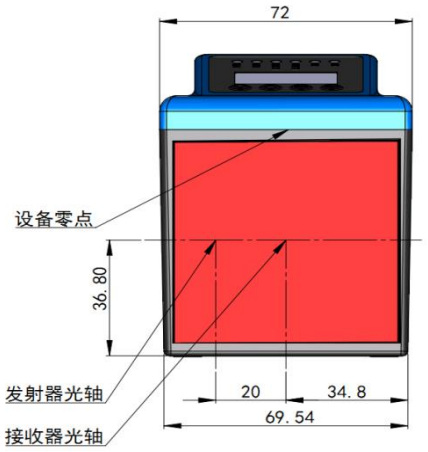
No	Wire color	Signal definition	Function description
1	Brown	V+	Positive direction of power supply
2	White	OUT1	Switch output 1
3	Blue	V-	Negative direction of power supply
4	Black	NC	NC

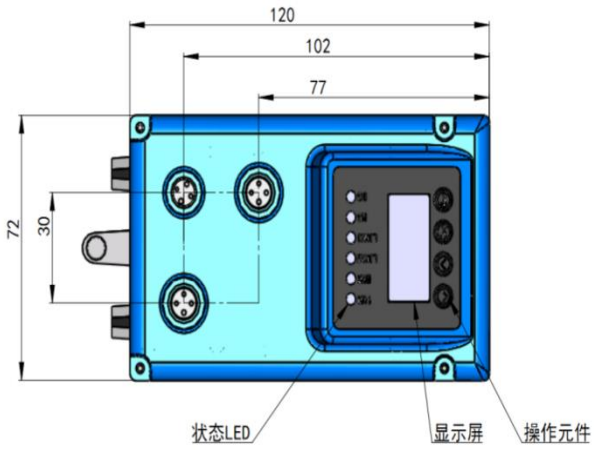
6.2 Ethernet cable connection

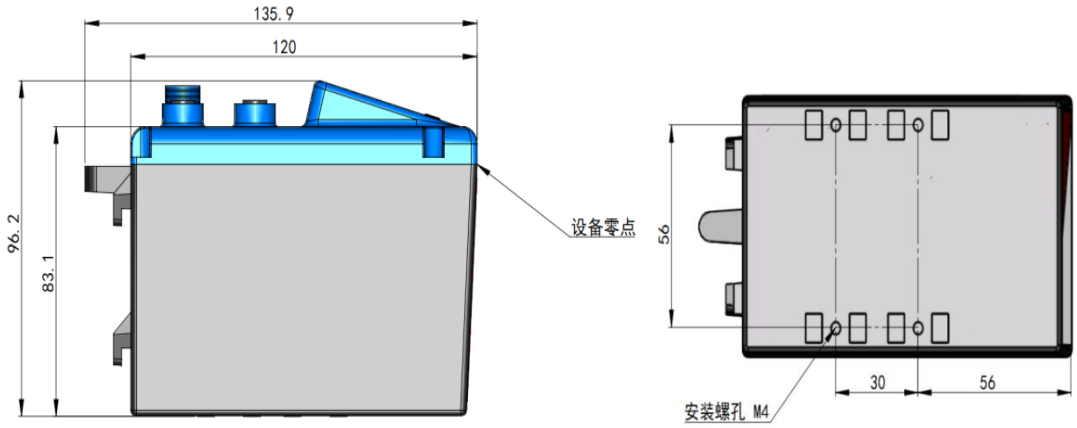


No	Wire color	Signal definition	Function description
1	Orange white	TX+E	Ethernet data sending positive pole
2	Green white	RX+E	Ethernet data receiving positive pole
3	Orange	TX-E	Ethernet data sending Negative pole
4	Green	RX-E	Ethernet data receiving Negative pole

七 Dimension（unit:mm）





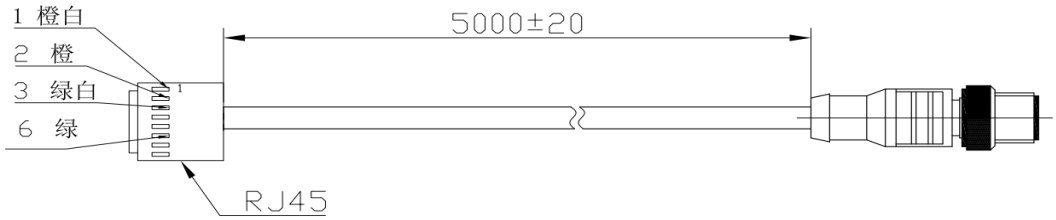


八 Accessories

8.1 M12 cable

Power terminal: A type code M12 four core bus terminal to open type conductor head (PVC wire, including shielding)

Ethernet: Type A code M12 male terminal to RJ45 (UTP-CAT5E network cable)



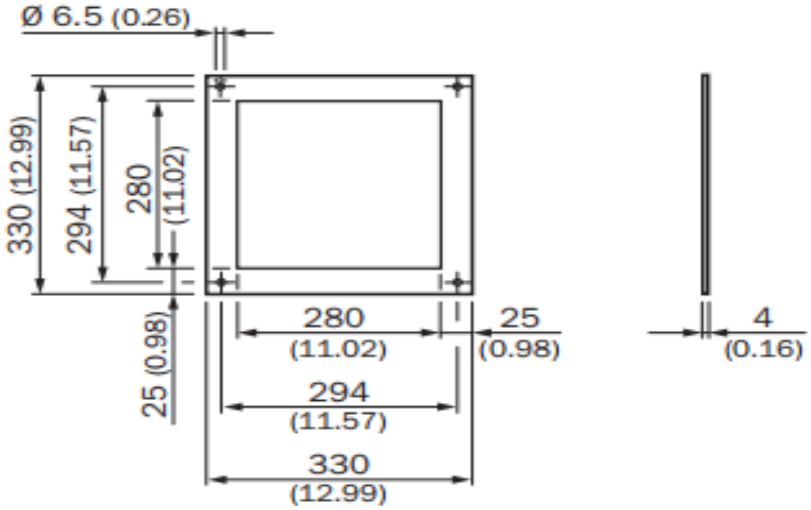
8.2 Reflector

8.2.1 Reflector parameter

Reflector plate: "diamond grade" reflective film

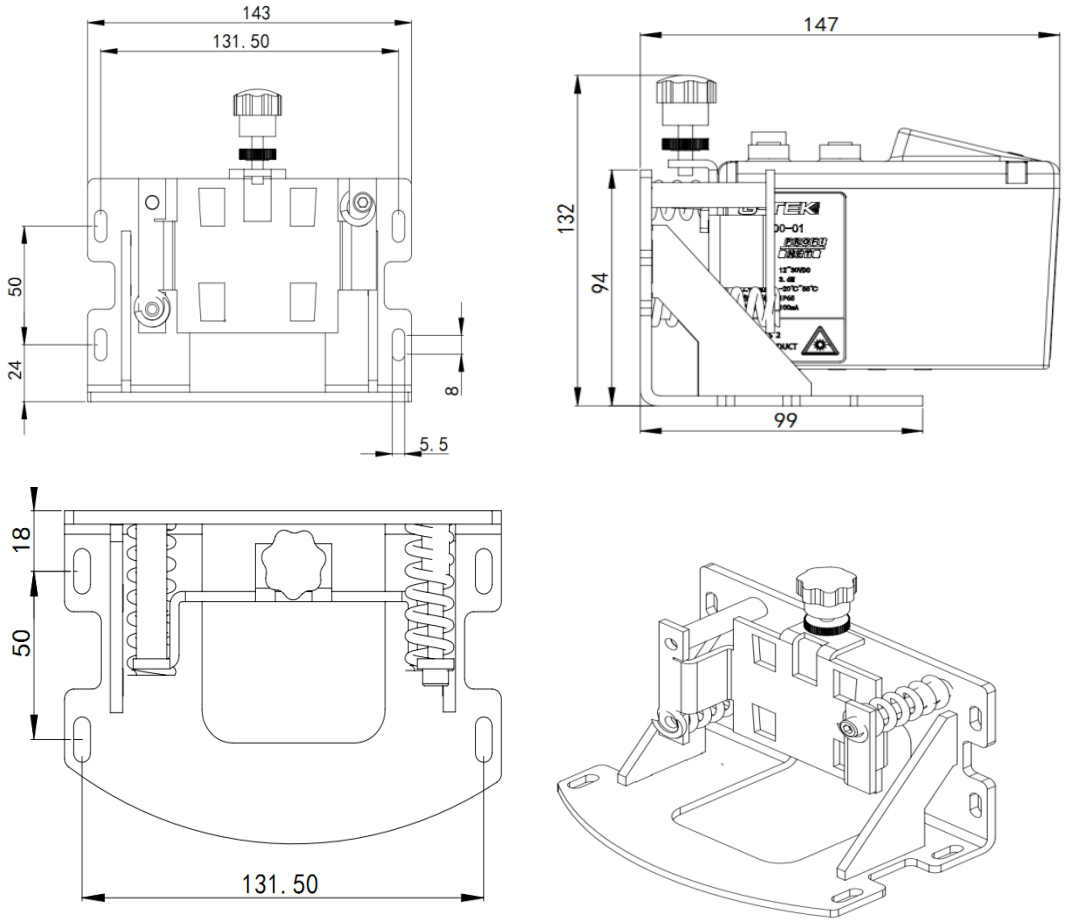
Chassis: aluminum, screwable, fixed with 4 holes; Size 330mm * 330mm

8.2.2 Reflector size (unit:mm)

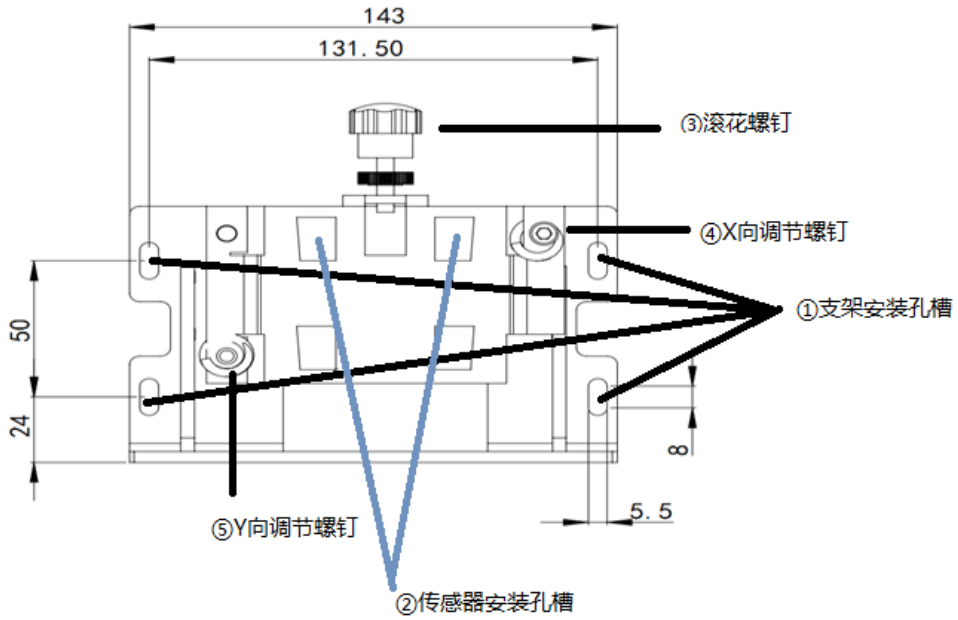


8.3 Installation Bracket

8.3.1 Bracket dimension



8.3.2 Installation instruction



(1) Install the M5 screw through the bracket mounting hole ① to the plane

(2) Install the sensor onto the sensor mounting slot ②, and tighten the knurled screw ③ on the bracket

(3) Turn the screw ④ to adjust the angle of the sensor in the X direction, and turn the screw ⑤ to adjust the angle of the sensor Y

九 IP setting

9.1 Setup Preparation

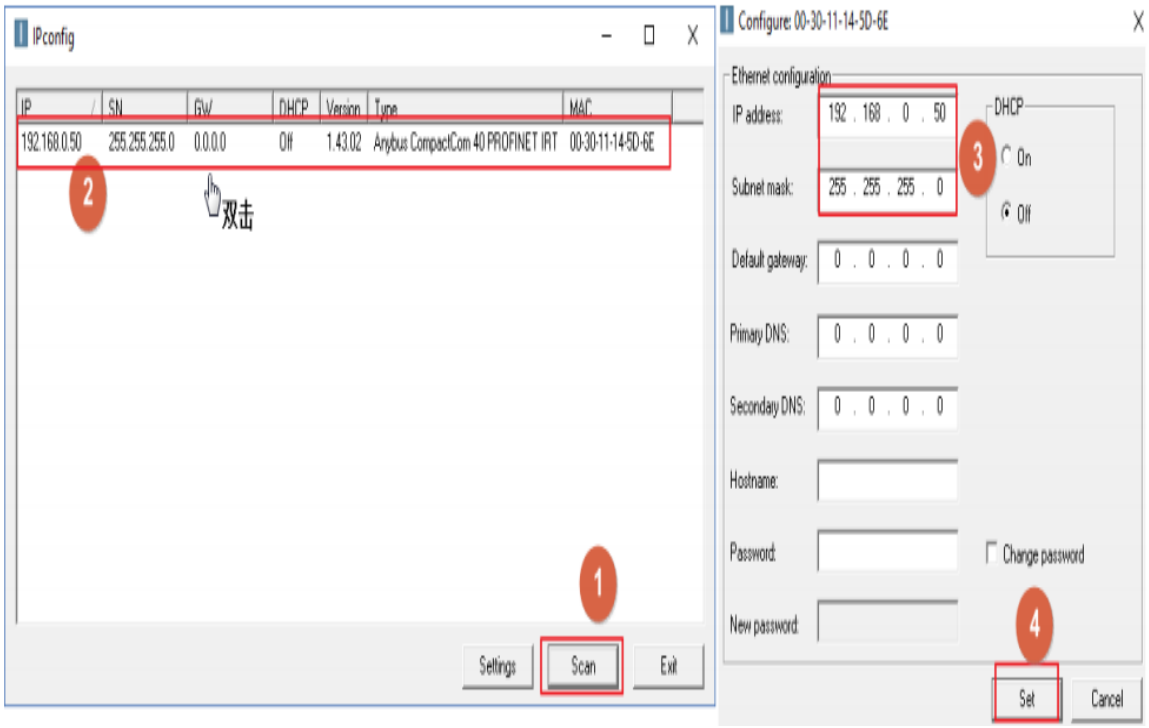
Before setting the IP address, prepare the IP config software. (Please contact the technician to provide the software)

The power port of the laser range sensor is connected to the 24V DC regulated power supply, and the Ethernet port is connected to the PC through the network cable.

Turn on DC power, MS indicator of laser range sensor is green, NS indicator is red and double flashing

9.2 IP Address set

Double click on the PC to open the IP config software, as shown in the following figure



9.2.1 Click "Scan" and the software will identify the current IP address of the laser range sensor (factory default is 192.168.0.6)

9.2.2 Double click the identified IP address of the laser range sensor

9.2.3 Modify the parameters as follows

IP address:192.168.0.50(example)

Subnet mask:255.255.255.0

Note: When setting IP address, it is required to ensure that PC, IO controller (such as PLC) and products are in the same network segment with different addresses.

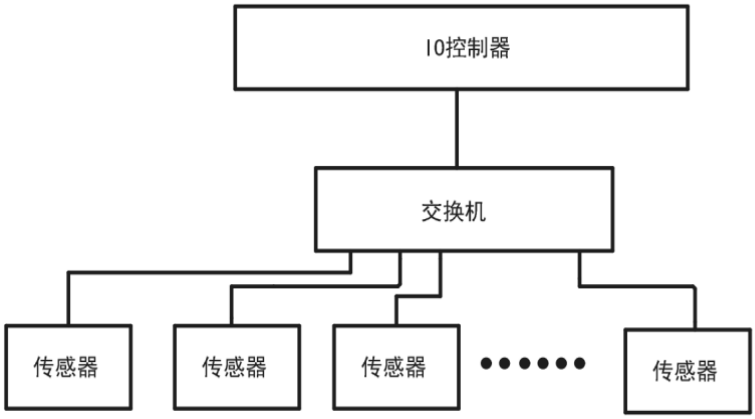
When multiple products are connected to the same IO controller (such as PLC), the IP address of the product should also be set to the same network segment with different addresses.

9.2.4 Click "Set" to finish setting.

十 NETWORKING MODE

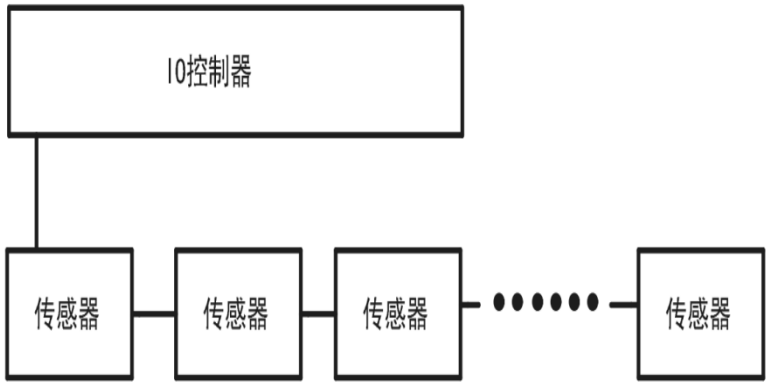
When multiple laser rangefinders are to be used at the same time, star connection or linear connection can be used

10.1 Star connection



Two network ports on the laser range sensor can be used to connect to the switch, and the IO controller (such as PLC) is also connected to the switch

10.2 linear connection



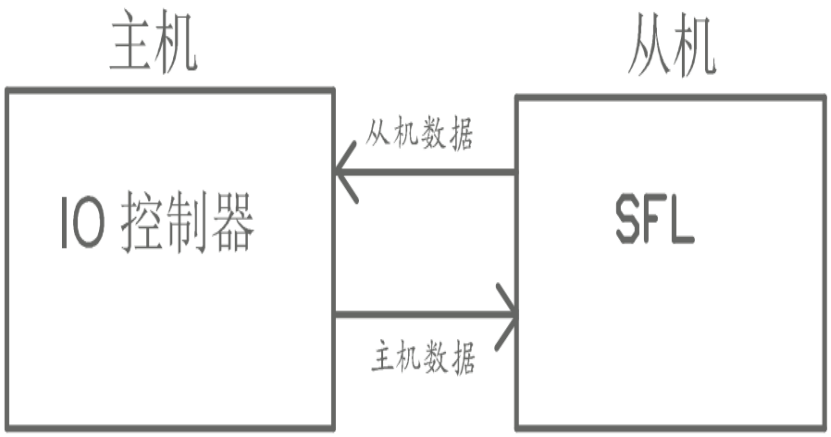
The linear connection does not require a switch. The two network ports on the laser range sensor are connected in series one by one in a cascade manner. Finally, the first range sensor is connected to the IO controller (such as PLC).

Regardless of star connection or linear connection, the IP address of IO controller (such as PLC) and all laser range sensor should be set in the same network

segment, and the IP address should not be duplicate. For the IP address setting method, see “IP Address Settings”

十一 Data Format

The data transmission of laser range sensor and IO controller (such as PLC) adopts big terminal mode. The laser range sensor, as a slave, sends the current measured distance, setting parameters, system status and other information to the IO controller, which acts as the host to set the parameters of the laser range sensor.



11.1 Slave data

The data transmitted by the laser range sensor to the IO controller includes the real-time distance, the current setting parameters and the working state of the sensor, occupying 6 bytes in total

Byte	Meaning	Data type	Analytic method
Byte0 Byte1 Byte2 Byte3	Real time distance (unit：mm)	Unsigned 32-bit Reshaping data	Real time distance =[Byte0：Byte3] Example： Byte0=0x00，Byte1=0x01，Byte2=0x0C Byte3=0xEF Distance： 0x00010CEF=68847（mm）
Byte4	Current Offset (unit：mm)	Signed 8-bit Reshaping data	Offset currently set Example： Byte4=0x03，零点（zero point）=3（mm）

Byte5	Current setting parameters and product working status	Unsigned 8-bit Reshaping data	bit7：bit6 =00 Current measuring speed is fast =01 Current measuring speed is medium =02 Current measuring speed is slow bit5：bit4 =00 Current resolution is 1mm =01 Current resolution is 10mm =02 Current resolution is 100mm bit3 =0 Parameter setting succeeded =1 Incorrect parameter setting bit2：bit1 Not used bit0 =0 Normal operation =1 Internal fault

11.2 Host data

The IO controller can set the parameters of the laser range sensor by sending data.

The specific setting method is as follows

Byte	Meaning	Data type	Analytic method
Byte0	Set Offset (unit：mm)	Signed 8-bit Reshaping data	If you want to set the offset to 10mm， Byte0=10=0x0A （Note：Offset setting range is 120mm~+120mm）
Byte1	User parameter setting and product reset		bit7：bit6 =00 Set the measurement speed to fast =01 Set the measurement speed to medium =02 Set the measurement speed to slow bit5：bit4 =00 Set resolution is 1mm =01 Set resolution is 10mm =02 Set resolution is 100mm bit3：bit1 Not used bit0 =0 Normal operation =1 Remote sensor reset

十二 PLC Connection

Taking Siemens S7-300 PLC as an example, this paper introduces how to realize the connection and data interaction with laser range sensor through the profinet interface of PLC. (The method flow of other brands of PLC is the same, but the specific operation interface will be different according to different PLCs.)

Before operation, confirm the following points:

1. Connect PLC and laser range sensor reliably through Ethernet cable, and provide correct power supply for PLC and laser range sensor.

2. The IP address of the laser rangefinder has been set through Ipconfig

3. Obtain the latest GSD file. The name of the latest version of the GSD file is “GSDML-V2.33-HMS-CompactCom 40 PIR-20220311.xml”, and do not modify the name of the GSD file.

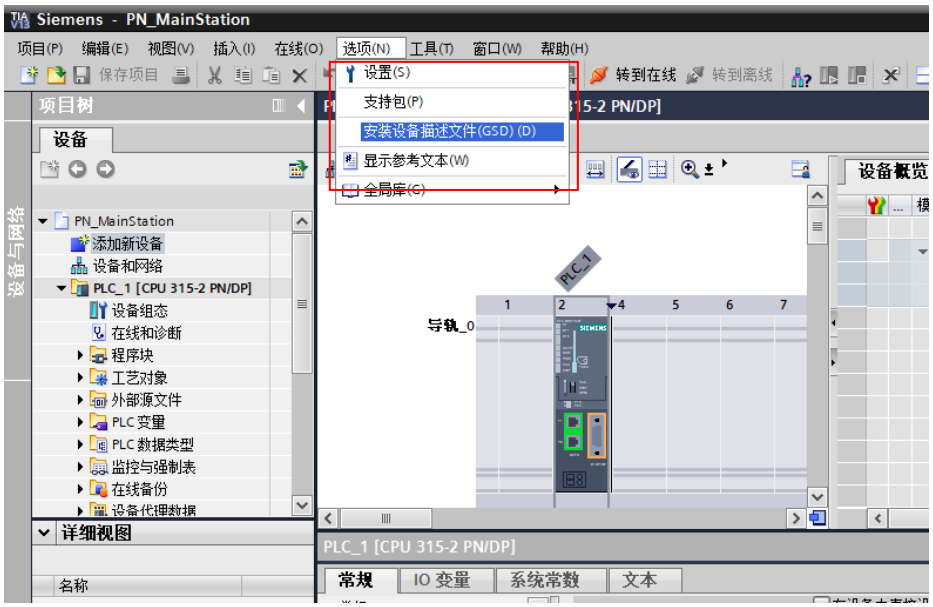
After the above confirmation is correct, follow the steps below to connect the laser range sensor to the PLC.

12.1 Create project and configure PLC

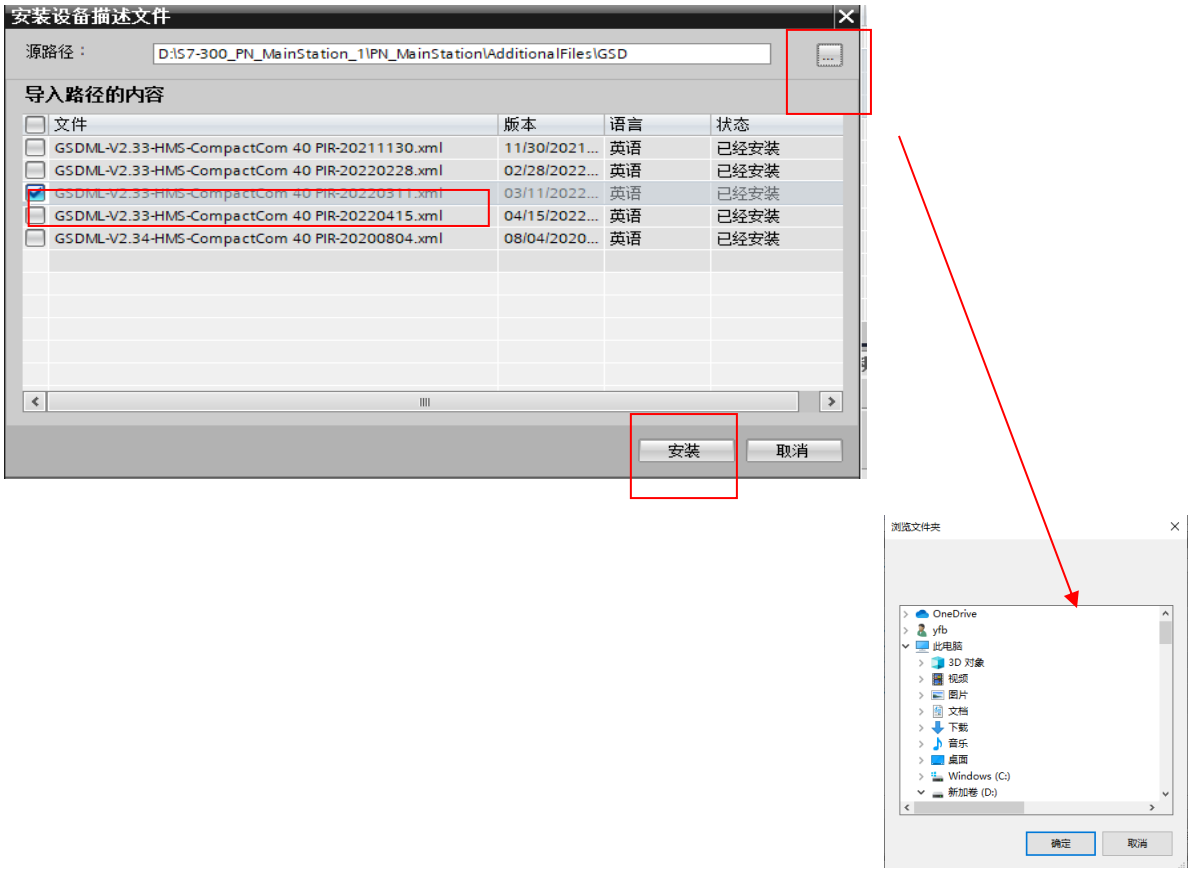
Use STEP7 V13 to create a new project, and configure S7-300 station PLC _ 1. through "Add new equipment" . Select CPU 315-2 PN/DP; Set the following items in the "Ethernet address" attribute setting: "subnet" is PN/IE_ 1;” IP address "is set to the address of the same network segment as the laser range sensor (such as 192.168.0.2); Confirm to check "Automatically generate PROFINET device name". In this example, the device name is plc_ 1, as shown below.

12.2 Installing GSD Files

Enter "Options" - "Installation Device Description File (GSD)", as shown below.

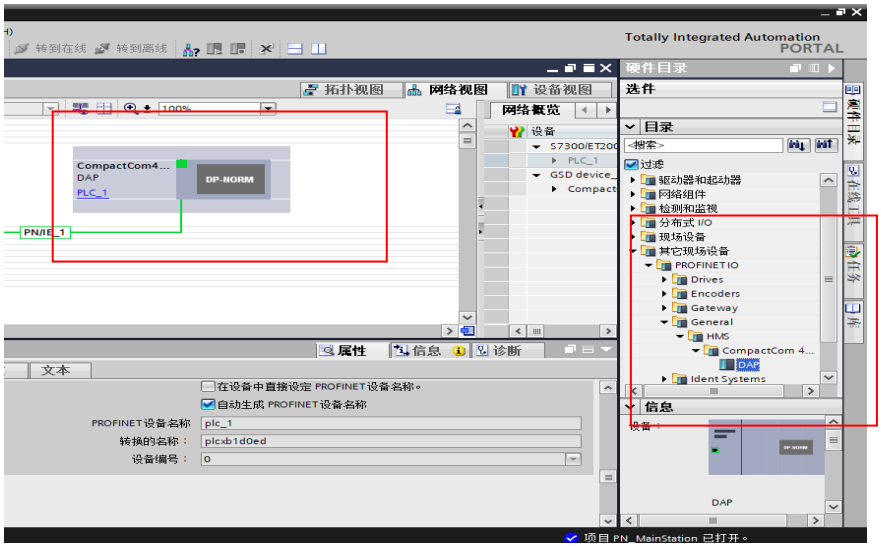


In the installation file interface, find the GSD file prepared in advance, click "Install", and wait until the installation is completed, as shown in the following figure.

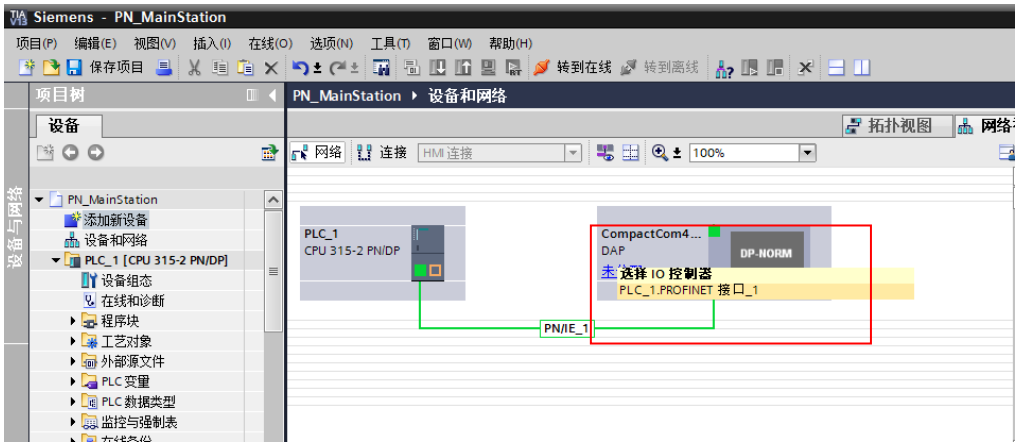


12.3 Adding and Configuring Slave Modules

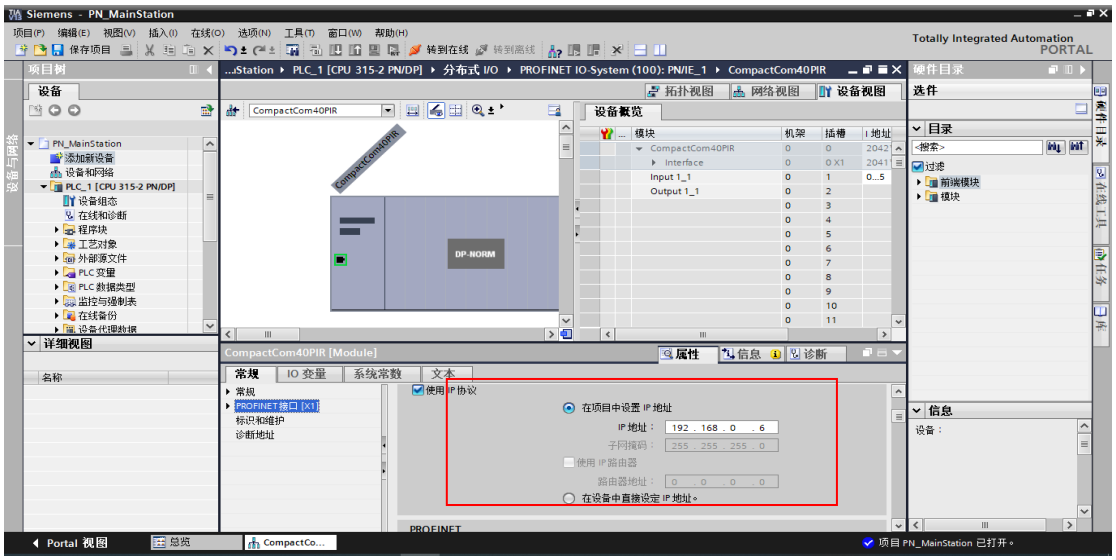
Add a PROFINET slave from the hardware directory to the network view. The directory is "Other Field Devices" - "PROFINET IO" - "General" - "HMS" - "CompactCom 40 PIR" - "DAP", as shown below.



Assign the master controller to the slave module by clicking "Unassigned" and selecting "PLC_1.PROFINET port_1", as shown in the following figure。



Double click the slave module in the network view to enter the device view. Double click the device module in the device view to enter the attribute setting. Set the IP address in the PROFINET interface attribute setting. The address set here should be consistent with the IP address set previously through the IPconfig software, as shown in the following figure.



12.4 Set communication data address range

Select "Module" - "Input" - "Input1" in the directory. After double clicking, "Input1_1" will appear in the "Device Overview" list, and the "I Address" in the list is set to 0... 5.

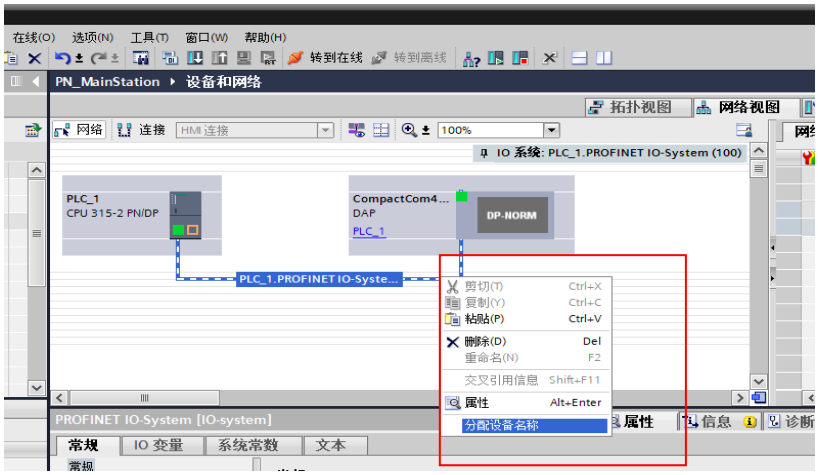
Select "Module" - "Output" - "Output1" in the directory. After double clicking, "Output1_1" will appear in the "Device Overview" list. Set it to 0... 1 in the "Q Address" of the list

Note: If there are multiple laser rangefinders, the setting of address range can be postponed. For example, the setting of the first rangefinders "I address" is 0... 5, the setting of the second rangefinders "I address" is 6... 11, and the setting of the third rangefinders "I address" is 12... 17; Similarly, the "Q address" of the first rangefinder is set as 0... 1, the "Q address" of the second rangefinder is set as 2... 3, and the "Q address" of the third rangefinder is set as 4... 5, and so on

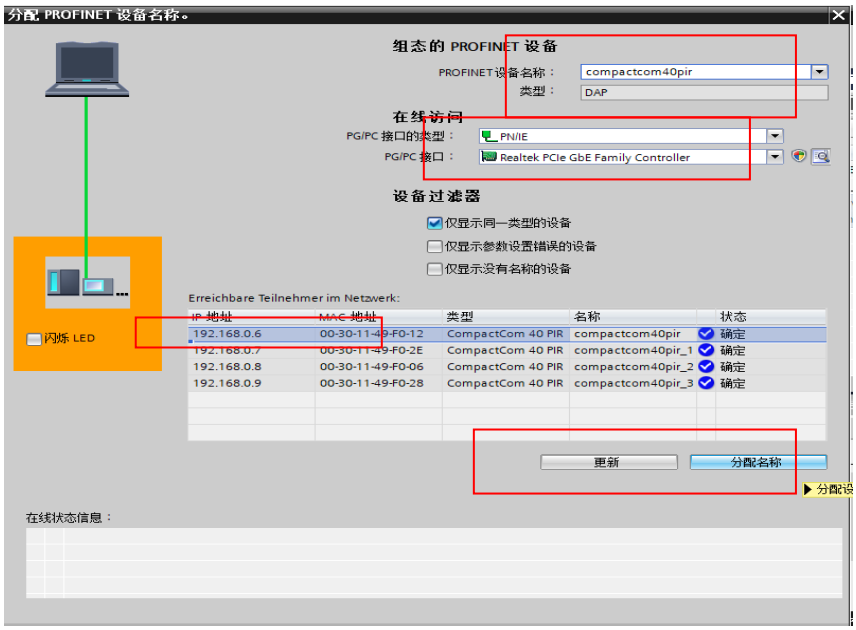
The setting process is shown as follows.

12.5 Assign Device Name

In the network view, right-click the connecting line between PLC and slave module, and select Assign Device Name, as shown in the following figure.

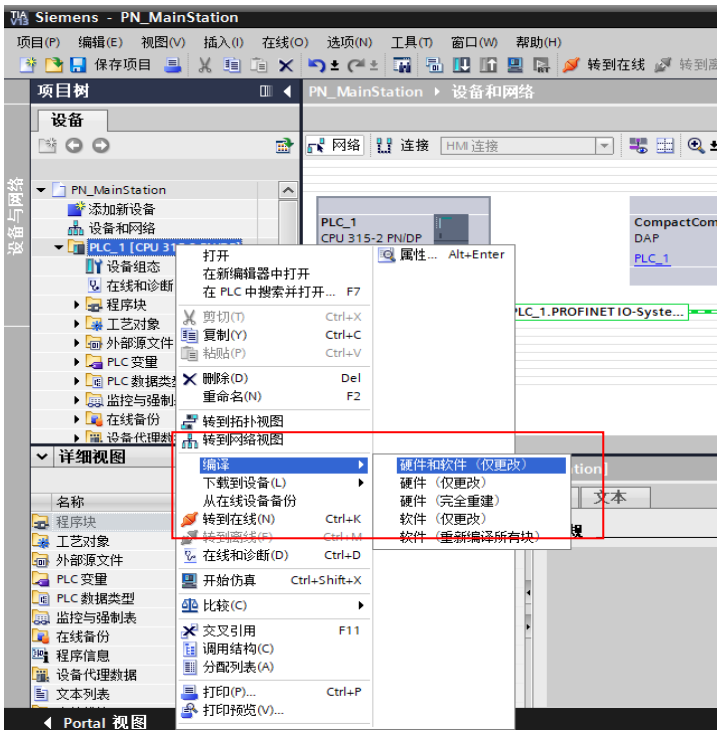


Select compactcom40pir in "PROFINET Device Name" (Note: this name is the default name. If the name is modified when configuring the slave module, select the modified name here), select "PN/IE" in "PG/PC Interface Type", select the network card used in "PG/PC Interface", click "Update" to find the slave device with the name to be assigned in the list, and select the slave device in the list, Click Assign Name to assign a device name, as shown in the following figure.

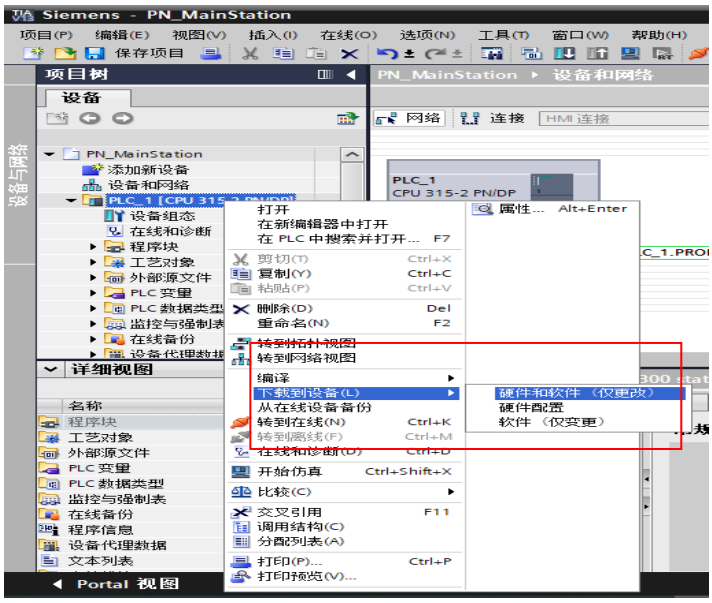


12.6 Compile, download

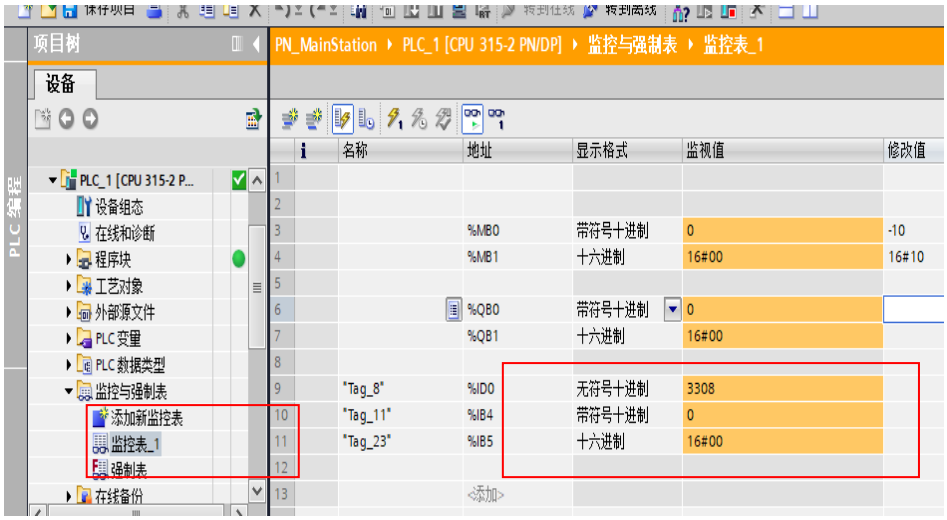
Right click PLC_ 1. Select "Compile" - "Hardware and software (change only)" to complete the program compilation, as shown in the following figure



Right click the PLC and select "Download to Device" - "Hardware and Software (Change Only)" to complete the program download, as shown below.



After downloading the program, you can check whether the data can be received normally in the monitoring interface. For the meaning of specific data, please refer to the description in the "十一 Data Format" as shown below.



十三 Notes

- The sensor should be installed far away from the environment with moisture, dirt and danger of damage to the sensor.
- Do not spray the lens surface.
- Keep the lens surface clean. If dirty, wipe the lens with a damp cloth (do not use any cleaner or solvent);
- Avoid interference from similar light sources. When multiple sensors need to be

installed, avoid overlapping the emission spot of the sensor to the emission spot of another sensor.

- Do not disassemble, modify or repair the sensor by yourself, otherwise it will cause electric shock;
- If you want to change the settings, please contact your sales engineer.

十四 Trouble shooting

14.1 Display

Phenomenon	Possible causes	Solution
All indicators and screens do not light up	Abnormal product power supply	Adjust to the specified voltage range
	Cable damage or wrong wiring	Check whether the wiring and M12 nut are locked
	Product internal failure	Return to factory for maintenance
PWR The yellow and green lights flash alternately screen display 000000mm	The light spot did not hit the reflective film	Readjust the light path
	Obstacle between sensor and reflective film	Remove obstacles
	Dirty lens	Wipe the lens with a damp cloth
PWR Green indicator flashing	Internal fault	Return to factory for maintenance
ERR Red indicator lighting on	Abnormal network connection	Check whether the connection with IO controller (such as PLC) is normal
	Internal fault	Return to factory for maintenance
MS indicator lighting off or the red lighting on	Internal fault	Return to factory for maintenance
NS green indicator flashing	IO controller works in "STOP" state (PLC works abnormally)	Reset PLC
NS red indicator single flashing	Slave name error	Assign equipment name (see 12.5)
NS red indicator double	IP address error	Set IP address (see IP address setting)

flashing		
NS red indicator triple flashing	PLC Program error	Reinstall GSD files
LINK1/LINK2 indicator lighting off	Wiring fault	Check the network cable wiring
Confused distant data	The light spot did not hit the reflective film	Readjust the light path
Deviation between distance data and benchmark	Whether the zero point position or optical path position is appropriate	Confirm that the zero point of the laser range sensor is the measurement zero point Confirm whether the light path is biased, and readjust the light path Use the offset function to correct data

14.2 Data interaction error message

Phenomenon	Possible causes	Solution
Real time distance information remains zero	The light spot did not hit the reflective film	Readjust the light path
	Obstacle between sensor and reflective film	Remove obstacles
	Dirty lens	Wipe the lens with a damp cloth
Bit0=1 of slave data Byte5	Internal fault	Return to factory for maintenance

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