

FYLGZ-N01-1

Optical tipping-type integrated rainfall and solar radiation sensor user's manual

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SIBO.X INDUSTRIAL CO.,LTD.

Add: No. Building 1, No. 1, Jingshi Road, Cicheng Town Industrial Park, Jiangbei District,
Ningbo City, Zhejiang, China

<https://www.sbxsun.com>

Email: info@sbxsun.com

Tel: +86-15958288207

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1. Product Introduction

1.1 Product Overview

This product is a transmitter for measuring rainfall and illuminance; it utilizes optical and pulse-based principles to measure rainfall, ensuring reliable rainfall detection. Unlike traditional mechanical rain gauges, this optical and pulse-based rain gauge sensor features a smaller size, higher sensitivity and reliability, greater intelligence, and easier maintenance. The device incorporates a high-precision photodetector for accurate illuminance measurement, with the output value expressed in Lux.

This device can be widely applied in industries and fields requiring rainfall and illuminance measurements, such as smart irrigation, ship navigation, mobile weather stations, automatic door and window systems, and geological hazard monitoring.

1.2 Functional Features

1. Compact size, lightweight, and easy to install.
2. Low-power design, energy-efficient
3. High reliability; capable of operating normally in high-temperature and high-humidity environments.
4. Easy-to-maintain design that prevents leaves from falling and obstructing visibility.
5. The rain gauge employs optical and pulse-based rainfall measurement technology, ensuring more precise measurements.
6. High-precision illuminance detection: measurement range 0–200,000 Lux
7. RS485 signal output, offering long communication distance and stable communication performance.

1.3 Key Technical Specifications

Rainfall diameter	6cm	
service voltage	9~30V DC	
power dissipation	Less than 0.24 W	
resolution ratio	rainfall	Standard: 0.1 mm
	beam	1Lux
Typical accuracy	rainfall	±4%1
	beam	±7%(25℃)
Maximum instantaneous rainfall	24mm/min	
Light intensity measurement range	0–200,000 Lux	

Output method	RS485 output	
Transmitter component temperature and humidity resistance:	-40–80 °C; 0–95% (relative humidity); no condensation	
working pressure range	Standard atmospheric pressure: $\pm 10\%$	
long term stability	beam	$\leq 5\%/y$

1: Based on laboratory indoor simulated rainfall tests, optical rain gauge components must be selected and installed.

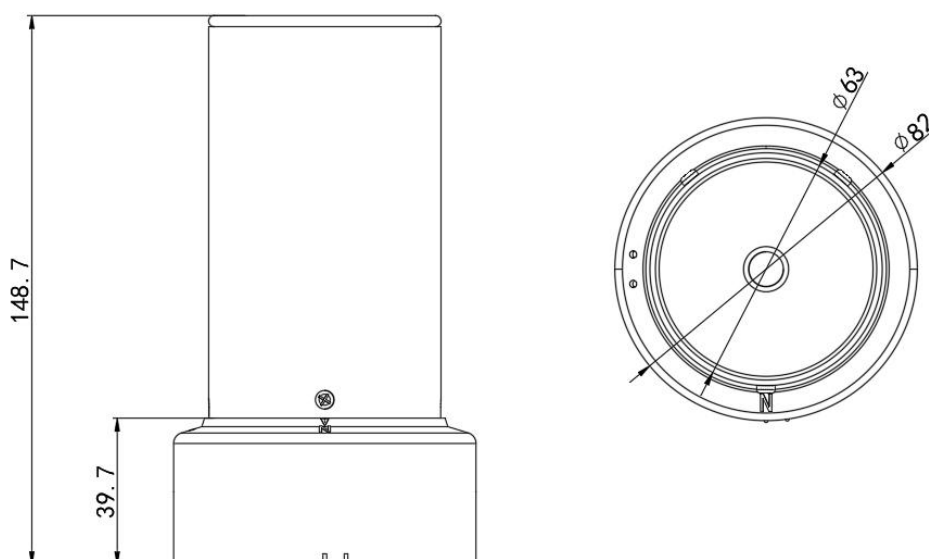
The performance data described above were obtained under test conditions using our company's testing system and software. To continuously improve our products, our company reserves the right to modify design functions and specifications without prior notice. Although this product offers high reliability, we recommend verifying that the equipment functions correctly and that all parameters meet the specified requirements before use, to ensure no adverse impact on field deployment.

1.4 Product Selection

FYL-		Optical tipping-type rain gauge
FYLGZ		Optical tipping-type rain gauge + 200,000-hour light endurance
	N01-	RS485 output
	1	-1 Housing

2. Equipment Installation Instructions

2.1 Equipment Dimensions



2.2 Pre-installation Equipment Inspection

equipment list

- Main equipment: 1 unit
- Support plate: 1 piece
- M4×35 screws (4 pieces)
- 3 M4×10 screws and 3 nuts
- Warranty card and certificate of conformity: 1 copy

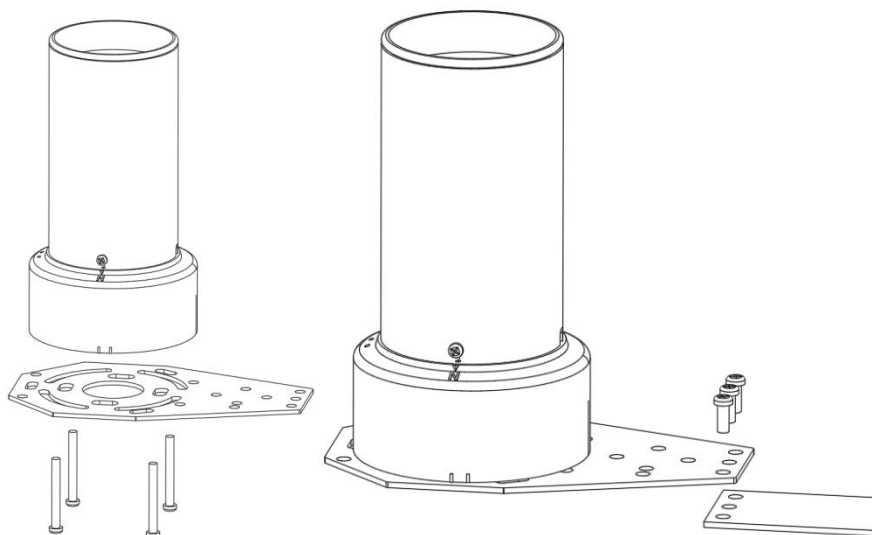
The housing has been tightened; the PG7 below is securely locked, with no signs of looseness.

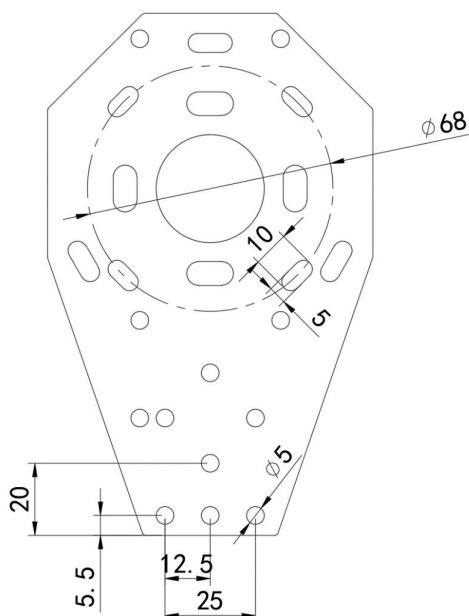
2.3 Outdoor Installation and Commissioning

The rainfall sensor should be installed in an open area; there must be no obstructions surrounding or above it.

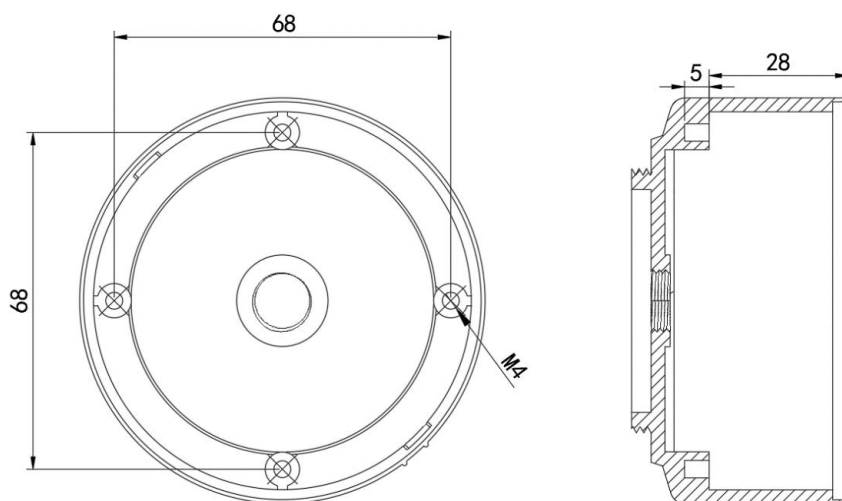
First, install the equipment onto the bracket plate within the accessory assembly; then, secure the equipment to the bracket plate using four M4×35 304 stainless steel screws and their corresponding nuts.

Next, install the support plate at the target installation location (the target location must have a $\phi 5$ circular hole); the support plate should be installed horizontally. Finally, secure the support plate and the equipment using three M4×10 304 stainless steel screws and their corresponding nuts.





If a mounting bracket is not used, the customer may install the component according to their own installation method based on the position and dimensions of the copper stud shown in the figure below.



2.4 Wiring Instructions

Line Color	explain
brown	Positive power supply (9–30 V DC)
black	Power Negative
yellow	485A
blue	485B

3. Configuration of Software Installation and Usage

3.1 Software Selection

Open the data package, select "Debugging Software" → "485 Parameter Configuration Software", and click "Open".



3.2 Parameter Settings

① Select the correct COM port (you can check the COM ports by navigating to "My Computer → Properties → Device Manager → Ports"); the figure below lists the driver names for several different RS-485 converters.



② Connect only one device and power it on; click the "Test Baud Rate" button in the software, which will test the baud rate and address of the current device; the default baud rate is 4800 bit/s, and the default address is 0x01.

③. Modify the address and baud rate according to usage requirements; additionally, you can query the device's current functional status.

④. If the test fails, please re-check the device wiring and the installation of the RS-485 driver.



4. Communication Protocol

4.1 Basic Communication Parameters

encoding	8-bit binary
data bit	8-bit
parity check bit	not have
stop bit	1st place
error check	CRC (Redundant Cyclic Code)
Baud rate	Supported baud rates: 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, and 115200 bps; the default 出厂 setting is 4800 bps.

4.2 Data Frame Format Definition

The Modbus-RTU communication protocol uses the following format:

Initial structure ≥ 4 -byte time

Address code = 1 byte

Function code = 1 byte

Data Area = N bytes

Error Check = 16-bit CRC Code

Time required for completion of the structure (≥ 4 bytes)

Address code: The address of the transmitter; it is unique within the communication network (factory default: 0x01).

Function Code: Indicates the function of commands issued by the host; this transmitter supports the following function codes: 0x03 (read register data) and 0x06 (write register data).

Data Area: The data area contains specific communication data; note that the 16-bit data's high byte comes first!

CRC code: a two-byte checksum.

Host Inquiry Frame Structure:

address code	FC	Register starting address	register length	Low-order bit of the check code	High-order bit of the check code
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave device response frame structure:

address code	FC	Number of valid bytes	Data Zone 1	Second Data Area	Data Area N	check code
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1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes
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4.3 Register Addresses

Register Address	PLC or configuration address	Operation (Hexadecimal)	Scope, Content, and Definitions
0000H	40001	03/06	Rainfall value: 10 times the actual value
0002H	40003	03	Illuminance (32-bit unsigned integer, high-byte first) Actual Value: Unit – Lux
0003H	40004		
0006H	40007	03	illuminance Actual Value: Unit: 100 Lux
0050H	40081	03/06	Illuminance deviation value
07D0H	42001	03/06	device address 1–254 (Factory default: 1)
07D1H	42002	03/06	Equipment baud rate 0 represents 2400; 1 represents 4800. 2 represents 9600; 3 represents 19200 4 represents 38,400; 5 represents 57,600. 6 represents 115200; 7 represents 1200.

4.4 Communication Protocol Examples and Explanation

4.4.1 Query current rainfall values

Query Frame:

address code	FC	Initial register	DL	Low-order bit of the check code	High-order bit of the check code
0x01	0x03	0x00 0x00	0x00 0x01	0x84	0x0A

acknowledgement frame :

address code	FC	Returns the number of valid bytes	Precipitation values	Low-order bit of the check code	High-order bit of the check code
0x01	0x03	0x02	0x00 0x0A	0x38	0x43

Current rainfall value: (The uploaded value has been multiplied by 10)

000A (hexadecimal) = 10 (decimal) → Precipitation value: 1.0 mm

Note: Upon each power-on, the system will automatically reset the values and recalculate the rainfall; alternatively, you can manually clear the rainfall data by following the steps below.

4.4.2 Cleaning of Precipitation Data

Query Frame:

address code	FC	Initial register	clear command	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

acknowledgement frame :

address code	FC	Initial register	clear command	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

4.4.3 Query current illuminance

Query Frame:

address code	FC	Initial register	DL	Low-order bit of the check code	High-order bit of the check code
0x01	0x03	0x00 0x02	0x00 0x02	0x65	0xCB

acknowledgement frame :

address code	FC	Returns the number of valid bytes	High illuminance level	Low illuminance level	Low-order bit of the check code	High-order bit of the check code
0x01	0x03	0x04	0x00 0x03	0x0D 0x40	0x0F	0x53

Instructions for illuminance calculation:

This protocol is applicable only to transmitters with a measurement range of 0–200,000 lux, where the unit is 1 lux.

30D40 H (hexadecimal) = 200000 => Illuminance = 200000 Lux

4.4.4 Change current address

Query frame: (If the current address is 01, the address must be changed to 02)

address code	FC	start address	Modify values	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

acknowledgement frame :

address code	FC	start address	Modify values	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

4.4.5 Change the current baud rate

Query frame: (If the current baud rate is 4800, change it to 9600)

address code	FC	start address	Modify values	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

acknowledgement frame :

address code	FC	start address	Modify values	Low-order bit of the check code	High-order bit of the check code
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

4.4.6 Query Address

If a user forgets their address, they can use the following function code to look up their address.

Query Frame:

address code	FC	start address	DL	Low-order bit of the check code	High-order bit of the check code
0xFF	0x03	0x07 0xD0	0x00 0x01	0x91	0x59

acknowledgement frame

address code	FC	Returns the number of valid bytes	address	Low-order bit of the check code	High-order bit of the check code
0xFF	0x03	0x02	0x00 0x01	0x50	0x50

The address code read is the device's actual address: 01

5. Precautions

5.1 Daily Maintenance

This instrument is used outdoors over an extended period in highly demanding operating

conditions; therefore, its surface should be kept clean by wiping it regularly with a soft cloth. For long-term operation, the instrument should be cleaned once every month and at least once every three months;

5.2 Usage Warnings

1) Warning: Risk of personal injury. This equipment is strictly prohibited from being used as a safety device or emergency stop device, nor may it be used for any other purpose where equipment failure could result in personal injury. Usage Restrictions: For use only in accordance with the authorized intended purposes. The technical manual must be consulted prior to installation, operation, or maintenance. Failure to comply with the above instructions may result in death or severe injury.

2) Do not install rainfall sensors in any location where an erroneous sensor indication could lead to serious consequences. Ensuring fault tolerance—so that a failure in any component (including the rainfall sensor) does not result in catastrophic consequences—is the responsibility of the system designer or system integrator. Our company assumes no liability for any consequences arising from erroneous sensor indications.

5.3 Frequently Asked Questions and Solutions

The device cannot connect to the PLC or computer.

probable cause :

- 1) The computer has multiple COM ports; the selected port is incorrect.
- 2) The device address is incorrect, or there are devices with duplicate addresses (all 出厂 default addresses are set to 1).
- 3) Baud rate, parity check method, data bits, stop bits – errors
- 4) The 485 bus is disconnected, or lines A and B are connected in reverse.
- 5) If there are too many devices or if the wiring is excessively long, power should be supplied from the nearest source, a RS-485 repeater should be added, and a 120 Ω termination resistor should also be installed.
- 6) The USB-to-RS-485 driver is not installed or is damaged.
- 7) Equipment damage.

6. Warranty Information

The warranty period shall be 24 months from the date of purchase (subject to the validity of the purchase receipt); during the warranty period, if the equipment experiences malfunctions due to issues with its internal components, materials, or manufacturing process under normal use and maintenance conditions, and such malfunction has been

verified as genuine upon inspection, our company will provide free repair services and replacement parts.

If the warranty period has expired, we provide lifelong repair services.

The product is not covered by the warranty if any of the following conditions applies:

1. The product may cause equipment damage due to incorrect installation, use, or operation.
2. Any components within the equipment have been disassembled, repaired, modified, or reconfigured by personnel other than our technical staff, or have been replaced by the user themselves.
3. Damage caused by negligent use or by water or other substances being introduced into the equipment.
4. Accidental incidents: faults or damage resulting from natural disasters.
5. Faults or damage resulting from operating outside the range of operating parameters specified in the product specifications.