Product Manual

Optical Rainfall Sensor

Model · RFS08

Product version · V1.0



1. Product Overview

This product is a high-precision rainfall sensor based on optical principles. It adopts the industrial standard RS485 MODBUS-RTU protocol, allowing convenient integration into systems such as PLC and DCS for monitoring optical rainfall and other state variables. It features high reliability and excellent long-term stability.

2. Functional Features

- Uses a high-precision sensing core and related components to ensure data accuracy.
- Features high reliability and excellent long-term stability.
- Standard RS485 bus interface, supporting the MODBUS-RTU protocol.
- Customizable output methods including RS232, CAN, 4-20mA, DC0~5V/10V, ZIGBEE, Lora, WIFI, GPRS, and NB-IOT (customization required).

3. Application Scenarios

- Industrial and Scientific Research: Rainfall detection in industrial park monitoring and scientific research.
- Agricultural Applications: Meteorological monitoring in agricultural environments such as farmland and greenhouses.
- Landscape and Ecology: Greening maintenance and environmental monitoring in parks and gardens.
- Field Monitoring: Collection of rainfall and meteorological data in outdoor environments such as fields and forest areas.

4. Structural Interface

- Appearance Material: Stainless steel metal housing.
- Sensing Area: Top transparent spherical structure (sensing diameter Φ60mm).
- Interface Method: Side lead cable (supports RS485 or analog/voltage output).

Technical Parameters

Parameter	Parameter Value

Product Name	Optical Rainfall Sensor
Model	RFS08
Brand	SMRTE
Power Supply Method	DC 12~24V
Input Voltage/Current	DC 12-24
Interface Type/Quantity	RS485 (customizable to others)
Performance Indicator	0.1mm
Dimensions	62 × 62 × 39 mm
Weight	500 g
Packing List	Optical Rainfall Sensor x 1
Industrial and Scientific Research	Rainfall detection in industrial park monitoring and scientific research.
Agricultural Applications	Meteorological monitoring in agricultural environments such as farmland and greenhouses.
Landscape and Ecology	Greening maintenance and environmental monitoring in parks and gardens.
Field Monitoring	Rainfall and meteorological data collection in outdoor environments such as fields and forest areas.
Appearance Material	Stainless steel metal housing.
Sensing Area	Top transparent spherical structure (sensing diameter Φ60mm).

Interface Method	Side lead cable (supports RS485 or analog/voltage output).
Typical Accuracy	±5% (@25℃)
Maximum Instantaneous Rainfall	24mm/Min
Operating Pressure	Standard atmospheric pressure ±10%
Default Baud Rate	9600, 8, n, 1
Operating Ambient Temperature	-30℃ ~ 85℃
Operating Ambient Humidity	5%RH ~ 90%RH
> Note	Please wire according to the illustrated method with the power off. If the product itself has no leads, the wire core colors are for reference.
Power Positive	Connect to DC12~24V power positive.
Power Negative	Connect to power negative.
RS485 Signal	Connect A+ to converter A+, and B- to converter B-.
Data Transmission	Connect to the computer or data acquisition device via an RS485 to USB converter or similar.
Factory Settings	The default device address is 1 and the default baud rate is 9600, 8, n, 1 when the device leaves the factory.
Communication Preparation	After correctly wiring the sensor, power it on. Use test software or a PLC host that supports the Modbus RTU protocol to send inquiry frames according to the factory default address and baud rate to read data.

Data Conversion	The read data is in hexadecimal. After converting to decimal, the true value must be calculated based on the multiplier (e.g., 100). Example: Data 0079 converts to 121 in decimal. Assuming a multiplier of 100, the true value is 121/100 = 1.21.
(Address	01, Function Code: 03, Start Address: 0000, Data Length: 0001, Checksum: 840A)*
Register Address (Hex)	Register Description; Data Type; Value Range
:---	:---; :---; :---
0000	1# Optical Rainfall Register; Read-only; 0~65535
0064	Model Code; Read/Write; 0~65535
0065	Total Number of Measurement Points; Read/Write; 1~20
0066	Device Address; Read/Write; 1~249
0067	Baud Rate; Read/Write; 0~6
0068	Communication Mode; Read/Write; 1~4
0069	Protocol Type; Read/Write; 1~10
Send	FA 03 00 66 00 01 71 9E (FA, i.e., 250, is the universal address; 0066 is the device address register).
Response	01 03 02 00 01 79 84 (The first byte 01 indicates the actual device address is 1).
Success Response	02 06 00 66 00 02 E8 27 (The address change takes effect immediately; the host query address must be updated synchronously).
Baud Rate Encoding	1=2400, 2=4800, 3=9600, 4=19200, 5=38400, 6=115200.
Read Baud Rate	Send 01 03 00 67 00 01 35 D5.
Range	-1000 to +1000 (Negative values are represented in two's complement).
Modification Example	If the displayed value is too small, add 100 (hexadecimal 0x64) for calibration.

Environmental Limits	Please use within an operating temperature range of -30℃~85℃ and humidity of 5%RH~90%RH.
Pressure Limits	The operating environment pressure should be standard atmospheric pressure ±10%.
Calibration Limits	When adjusting errors via the "Calibration Value", the modification range limit can be set to ±1000.
Safety Warning	Wiring operations must be performed with the power off. Do not operate while energized to avoid equipment damage or personal safety accidents.
Maintenance Recommendation	Regularly clean the top optical spherical surface to keep the lens clean, avoiding obstruction by dust, debris, or snow, which may affect measurement accuracy.
Product Version	V1.0

6. Installation and Wiring

> Note: Please wire according to the method shown in the diagram with the power off. If the product itself has no leads, the wire core colors are for reference.

RS485 Wiring Method

- Power positive: Connect to DC6~24V power positive.
- Power negative: Connect to power negative.
- RS485 signal: A+ connects to converter A+, B- connects to converter B-.
- Data transmission: Connect to a computer or data acquisition device via converters such as RS485 to USB.

7. Configuration and Usage

- Factory settings: The default device address is 1, and the default baud rate is 9600, 8, n, 1.
- Communication preparation: After correctly wiring the sensor, power it on. Use test software or a PLC host that supports the Modbus RTU protocol to send query frames according to the factory default address and baud rate to read data.
- Data conversion: The read data is in hexadecimal. After converting to decimal, the true value must be calculated based on the multiplier (e.g., 100). For example: data 0079 converts to 121 in decimal. Assuming a multiplier of 100, the true value is 121/100 = 1.21.

8. Communication Protocol

This product uses the standard Modbus-RTU protocol format. All operation or response commands are 16-hexadecimal data.

(1) Read Data (Function Code 0x03)

- Example of sending a query frame (querying 1 data point from device 1#):

01 03 00 00 00 01 84 0A

(Address: 01, Function Code: 03, Start Address: 0000, Data Length: 0001, Checksum: 840A)

- Example of response data:

01 03 02 00 79 79 A6

(Address: 01, Function Code: 03, Byte Count: 02, Data: 0079, Checksum: 79A6)

(2) Common Data Address Table

Configuration Address	Register Address	Description	Data Type	Operation	Value Range
40001	00 00	Accumulated Value Register	UINT16	Read-only	0~65535
40002	00 01	1-minute Instantaneous Value	UINT16	Read-only	0~145
40003	00 02	Difference	UINT16	Read-only	0~100 Sensitivity
40004	00 03	Reference Value	UINT16	Read-only	0~10000
40005	00 04	Raindrop Dynamics	UINT16	Read-only	0~1000
40006	00 05	Water Immersion Dynamics	UINT16	Read-only	0~1000
40101	00 64	Model Code	UINT16	Read-only	0~59999
40102	00 65	Total Number of Measurement Points	UINT16	Read-only	1~20
40103	00 66	Device Address	UINT16	Read/Write	1~249

40104	00 67	Baud Rate	UINT16	Read/Write	0~6
40105	00 68	Communication Mode	UINT16	Read/Write	1 Query 2 Upload
40106	00 69	Protocol Type	UINT16	Read/Write	1 MODBUS-RTU
40107	00 6A	Time Interval	UINT16	Read/Write	1~36000
40108	00 6B	Sensitivity	UINT16	Read/Write	0~100
40109	00 6C	Water immersion threshold	UINT16	Read/Write	Water immersion threshold setting
40110	00 6D	1-hour instantaneous value	UINT16	Read/Write	Cleared when 0 is written
40111	00 6E	12-hour instantaneous value	UINT16	Read/Write	Cleared when 0 is written
40112	00 6F	Cumulative value	UINT16	Read/Write	Cleared when 0 is written

(3) Reading and Modifying Device Address

- Query address (when only one device is known on the bus):

Send: FA 03 00 66 00 01 71 9E (FA, i.e., 250, is the universal address; 0066 is the device address register).

Response: 01 03 02 00 01 79 84 (The first byte 01 indicates the actual device address is 1).

- Modify address (e.g., change address 1 to 2):

Send: 01 06 00 66 00 02 E8 14

Success response: 02 06 00 66 00 02 E8 27 (The address change takes effect immediately; the host computer's query address must be modified synchronously).

(4) Read and Modify Baud Rate

- Baud rate encoding: 1=2400, 2=4800, 3=9600, 4=19200, 5=38400, 6=115200.
- Read baud rate: Send 01 03 00 67 00 01 35 D5.
- Modify baud rate (e.g., change from 9600 to 38400, i.e., code 3 to 5):

Send: 01 06 00 67 00 05 F8 16 (Takes effect immediately after modification; the device will lose response, so the host computer's baud rate must be modified to reconnect).

(5) Read and Modify Calibration Value

- Range: -1000 to +1000 (negative values are represented in two's complement).
- Modification example: If the displayed value is too small, add 100 (hexadecimal 0x64) for calibration.

Send: 01 06 00 6B 00 64 F9 FD. After successful operation, the parameter takes effect immediately.

9. Applicable Conditions and Limitations

- Environmental limitations: Please use within an operating temperature range of -30℃~85℃ and humidity of 5%RH~90%RH.
- Pressure limitation: The working environment pressure should be standard atmospheric pressure ±10%.
- Calibration limitation: When adjusting errors via the "calibration value", the modifiable range is limited to plus or minus 1000.

10. Safety and Maintenance

- Safety warning: Wiring operations must be performed with the power off. Do not operate while energized to avoid equipment damage or personal safety accidents.
- Maintenance suggestion: Regularly clean the top optical spherical surface to keep the lens clean, avoiding obstruction by dust, debris, or snow, which may affect measurement accuracy.

11. Packing List

1. Optical Rainfall Sensor x 1