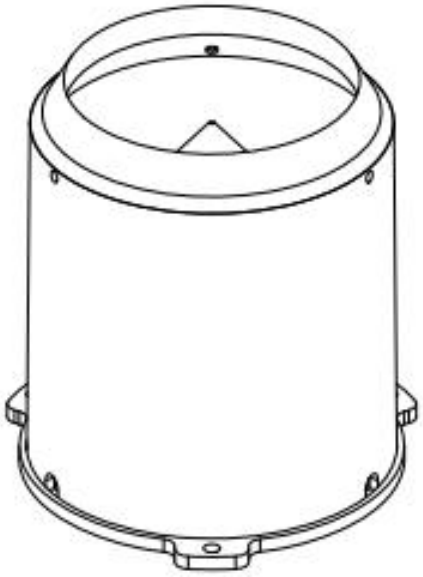
YGC-RS1

Droplet-sensitive Rainfall Sensor

User Manual V.03



（Note: The product must be installed on a horizontal surface!）

Please read this manual carefully before use and keep it properly for future reference.

SMS-62

Thank you for choosing our product!
As our products are continuously improved, the product you purchased may differ slightly from the illustrations in this manual. Changes will not be notified separately. Please refer to the actual product.

Product Overview

This instrument is a drip-sensing rainfall sensor that adopts an innovative drip-sensing design concept. It uses a specially designed internal structure to precisely control raindrop size and employs optical sensing technology to count raindrops, thereby measuring rainfall accurately.

Unlike traditional tipping bucket, pressure-sensitive, or optical rainfall sensors, this sensor combines the advantages of these three principles while overcoming their shortcomings. It achieves a compact size and high measurement accuracy.

The sensor can be widely applied in various fields, including smart agriculture, meteorology and environmental protection, smart irrigation, maritime navigation, automatic weather stations, automatic doors and windows, and geological disaster monitoring.

Features

- Compact size and lightweight design for easy installation.
- Diameter: 7.5 cm; Height: less than 9 cm, making it highly integrable with other sensors.
- High reliability, capable of operating in high-temperature and high-humidity environments.
- No moving parts, reducing wear and tear, making it easy to maintain.
- Innovative drip-sensing principle for accurate measurements in compliance with national standards.
- Durable metal construction, robust and visually appealing.

Technical Specifications

Power Supply Voltage	□5V DC □9~30V DC
Output Options	□Standard RS485 □RS232 □4-20mA □0-5V □Pulse Signal □Other Output Signals：
Cable Length	□Standard 2.5m □Other：
Rain Collector Diameter	60mm
Material Type	□Metal Type □Plastic Type
Measurement Range	0-4mm/min (Measurements may be inaccurate above this range)
Resolution	0.03mm

Accuracy	±4%±4% (Under static indoor testing at 2 mm/min rainfall intensity)
Protection Level	IP65
Power Consumption	≤0.24W (12V DC, current less than 20mA)
Product Weight	300g (net weight), 560g (with packaging and cable)
Operating Temperature	0~65℃
Operating Humidity	0~99% RH (non-condensing)

Wiring Method

(1) When used with a weather station produced by our company: Simply connect the sensor to the corresponding interface on the weather station using the provided sensor cable.

(2) For sensors with other signal outputs: The standard sensor cable wiring and corresponding functions are as follows:

Wire Color	Output Signal		
	Voltage Current Pulse	RS485	RS232
Red	Power Positive	Power Positive	Power Positive
Black		A+	Connect to computer RX serial port pin 2.
Yellow		B-	Connect to computer TX serial port pin 3.
Green	Power Negative	Power Negative	Power Negative
White	Signal		
Brown	Shielded wire grounded.		

Calculation Formulas

Pulse Output:	
F=0.1*M	
Current Output:	
4-20mA	F=（I-4）/16*A+B
0-20mA	F=I/20*A+B
Voltage Output	
0-2.5V	F=V/2.5*A+B
0-5V	F=V/5*A+B
1-5V	F=（V-1）/4*A+B

F: Represents rainfall intensity

M: Number of pulses;

I: Sensor output current value, mA;

- V: Sensor output voltage value, V;

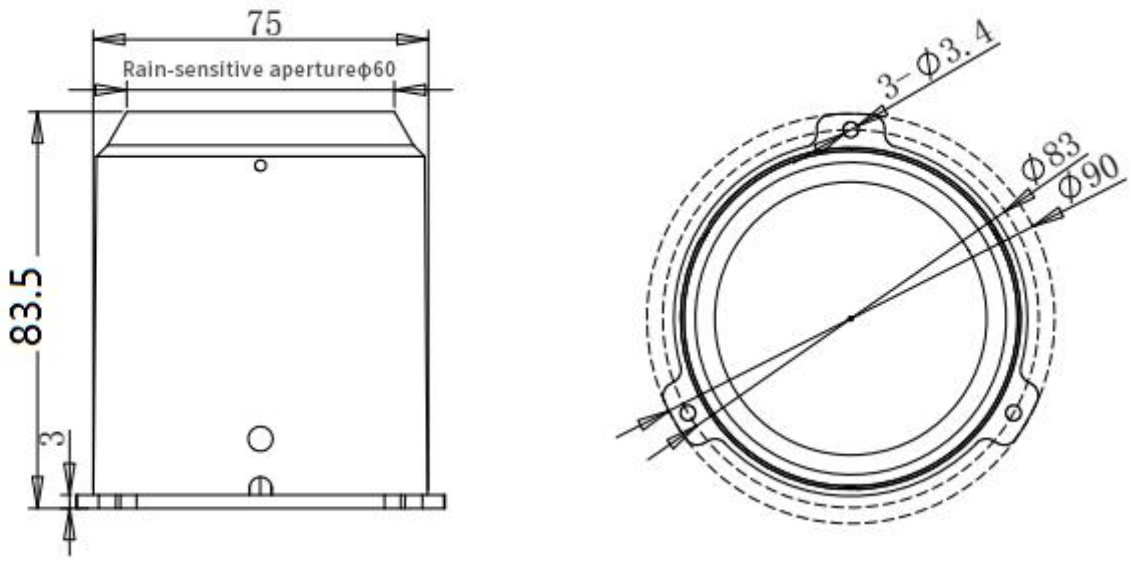
A: Sensor range width (upper limit minus lower limit);

B: Sensor minimum value (lower limit);

For example: If the sensor range is 0-4mm, then: A=4, B=0

Structural Dimensions

Structural Dimensions
Mounting Hole Diameter: 3.2 mm
Distribution Diameter: 83 mm
Aviation Plug Diameter: 15 mm (It is recommended to reserve 25 mm for wiring convenience. Connect the wires first, then install and fix the sensor.)



MODBUS-RTU Communication Protocol

I. Serial Port Format

Data bits: 8 bits, Stop bit: 1 bit, Parity: None, Default baud rate: 9600bps. The serial debugging software should be set to hex for sending and receiving. The interval between two communications should be at least 500ms. The CRC mentioned in the manual is the checksum, consisting of 2 bytes. The default device address is 1.

II. Communication Format Examples

【1】Write Device Address (e.g., set address to 01)

Send	00	06	00	20	00	01	48	11
Description	Address	Write	Start Address		New Address		CRC Checksum	
Return	00	06	00		20		E1	FD
Description	Address	Write	Start Address				CRC Checksum	

If the response is 01 86 ****, the configuration failed.

【2】Read Device Address (e.g., read address of device set to 01)

Send	00	03	00	20	00	01	84	11
Description	Address	Read	Start Address		Number of Points		CRC Checksum	
Return	00	03	02		00	01	44	44
Description	Address	Read	Data Length		Device Data		CRC Checksum	

【3】Read Rainfall Intensity per Minute

Send	01	03	00	00	00	01	84	0A
Description	Address	Read	Start Address		Number of Points		CRC Checksum	
Return	01	03	02		00	26	39	9E
Description	Address	Read	Data Length		Rainfall Data		CRC Checksum	

The returned rainfall data is 0x0026. Convert to decimal: 38, representing a rainfall intensity of 0.38mm/min (two decimal places).

【4】Simultaneously Read Rainfall Intensity and Cumulative Rainfall

Send	01	03	00	00	00	02	C4	0B
Description	Address	Read	Start Address		Number of Points		CRC Checksum	
Return	01	03	04	00 03	00 0A		8A	34
Description	Address	Read	Length	Rainfall Intensity	Cumulative Rainfall		CRC Checksum	

The sensor returns data 0x0003 and 0x000A, which are converted to decimal as 03 and 10, indicating a rainfall intensity of 0.03mm (with two decimal places) and a cumulative rainfall of 1.0mm (with one decimal place).

【5】Set Rainfall Cumulative Mode

Send	01	06	00	F1	00	01	19	F9
Description	Address	Write	Start Address		cumulative modes 01: Manual Mode 02: Automatic Mode		CRC Checksum	
Return	01	06	00		F1		20	5D
Description	Address	Write	Start Address				CRC Checksum	

After receiving the cumulative mode setting command, the sensor will clear the cumulative rainfall value.

There are two cumulative rainfall modes: Manual Mode and Automatic Mode.

1. Manual Mode: Cumulative rainfall is recorded from the time the sensor is powered on and continues until the "clear cumulative rainfall" command is received, at which point the value resets.

2. Automatic Mode: Cumulative rainfall is recorded from the time the sensor is powered on and resets automatically after 24 hours (sensor clock error: ±2%)

【6】Clear Cumulative Rainfall

Send	01	06	00	F2	00	00	28	39
Description	Address	Write	Start Address		Clear Value		CRC Checksum	
Return	01	06	00		F2		60	5C
Description	Address	Write	Start Address				CRC Checksum	

After receiving the command, the cumulative rainfall value is cleared.

【7】Read Device Baud Rate (e.g., read baud rate = 9600)

Send	01	03	00	10	00	01	85	CF
Description	Address	Read	Start Address		Number of Points		CRC Checksum	
Return	01	03	02		00	02	39	85
Description	Address	Read	Data Length		Device Data		CRC Checksum	

Baud rate = Data × 4800. If the returned data is 00 02, then: Baud rate = 4800 × 2 = 9600.

【8】Write Device Baud Rate (e.g., set baud rate to 9600)

Send	01	06	00	10	00	02	09	CE
Description	Address	Write	Start Address		Write Value		CRC Checksum	
Return	01	06	00		10		E0	15
Description	Address	Write	Start Address				CRC Checksum	

Baud Rate = Data × 4800. if the written data is 00 02, then: Baud Rate = 4800 × 2 = 9600.

Modbus CRC Checksum Steps

1. A 16-bit CRC register is preset to hexadecimal FFFF. This register is referred to as the CRC register.
2. XOR the first 8-bit data with the lower 8 bits of the CRC register. Place the result back into the CRC register.
3. Shift the contents of the CRC register 1 bit to the right (towards the lower bit), and fill the highest bit with 0. Examine the lowest bit.
4. If the lowest bit is 0: Repeat Step 3 (shift again).
If the lowest bit is 1: XOR the CRC register with the polynomial A001 (binary 1010 0000 0000 0001).
5. Repeat Steps 3 and 4 until the register has been shifted 8 times, meaning the entire 8-bit data has been processed.
6. Repeat Steps 2 to 5 for the next 8-bit data until all data bytes are processed.
The final content in the CRC register is the CRC code. The resulting CRC code is low byte first, high byte last.

Experimental Testing Method

If customers want to verify the accuracy of the sensor using a simple method, the following steps can be performed: Wet the water inlet of the product, then power it on. Within 1 minute, evenly pour no more than 11.3ml of water into the inlet. The water must be in droplet form because when the maximum rainfall intensity exceeds 4mm/min, the measurement data becomes inaccurate. (4mm/min range is based on national standards).

Calculation Method: For example, if 2ml of water is slowly poured into the device within 1 minute, the calculation for the current rainfall intensity is:

RS = 2000 / (30 × 30 × 3.14) mm

Note: 2ml water = 2000 cubic millimeters of water
Rain inlet radius = 30mm

Precautions

1. Check whether the packaging is intact and verify that the product model matches the selection requirements. Do not connect wires while the device is powered on. After wiring is completed, verify that the connection is correct before powering on.
2. The length of the sensor cable may affect the product's output signal. Do not modify the components or wires soldered at the factory. If modifications are necessary, please contact the manufacturer.
3. The sensor should be inspected regularly to remove dust, mud, leaves, or insects that may block the water flow channel in the funnel. For normal operation, clean the sensor at least once a month. For long-term use, clean it every three months.
4. If the inner surface of the tipping bucket is dirty, rinse it with water or a solution of water and detergent. Do not wipe it with fingers or other objects to avoid leaving oil stains or scratching the surface.
5. During winter, when ice forms, the instrument should not be used. It can be brought indoors for storage.
6. Keep the warranty card. When repairs are needed, return it together with the product.

Usage Warning

Do not use the rain sensor in any situation where incorrect readings could lead to severe consequences. Ensuring fault tolerance, so that a single component failure (including the rain sensor) does not result in catastrophic outcomes, is the responsibility of the system designer or integrator. The company assumes no liability for any consequences caused by incorrect sensor readings.

Troubleshooting

1. The instrument displays incorrect values for analog signals or RS232/RS485 output: This may be caused by wiring issues or serial port communication failures, resulting in the inability to retrieve correct data. Check whether the wiring is correct and secure. Check whether the serial port is occupied. Verify that the serial port settings are correct.
2. The displayed values on the instrument differ significantly from actual conditions: Clean the sensor’s water bucket and funnel. Then test the sensor using the Experimental Testing Method.
3. If the above solutions do not resolve the issue, please contact the manufacturer.

Selection Table

Model Number	Power Supply	Output	Description
YGC-RS1			Rainfall sensor (transmitter)
	5V		5V power supply
	KV		9-30V power supply
		M	Pulse (default NPNR output, PNP optional)
		A1	4-20mA
		V	0-5V
		W1	RS232 (default Modbus)
		W2	RS485 (default Modbus)
Example: YGC-RS1-5V-W2, metal-type droplet-sensitive rainfall sensor, 5V power supply, RS485 standard Modbus output.			