Rainfall sensor Introduce

1 Overview

Rainfall sensor is a kind of hydrological and meteorological instrument, which is used to measure the rainfall in nature and convert the rainfall into digital information output in the form of switch value, so as to meet the needs of information transmission, processing, recording and display.

This instrument is a primary instrument for precipitation measurement, and its performance meets the requirements of national standard GB/T11832-2002 "Tipping bucket rain gauge".

The core part of this instrument, the tipping bucket, adopts three-dimensional streamlined design, which makes the tipping bucket more smooth and easy to clean.

This instrument is a precision rain gauge, which should be maintained regularly during use, and the outlet of tipping bucket and diversion funnel should be cleaned.

When the instrument leaves the factory, the tilt angle of the tipping bucket has been adjusted and locked at the best tilt angle position. When installing the instrument, it can be put into use only by installing the tipping bucket and adjusting the level of the base according to the requirements of this manual, and the tilt angle adjusting screw of the tipping bucket cannot be adjusted on site.

2 Characteristic

1. High precision and good stability.
2. Good linearity, long transmission distance and strong anti-interference ability.
3. Small size and convenient installation.
4. Mesh is designed at the funnel to prevent sundries such as leaves from blocking the downflow of rainfall.
5. The shell of the instrument is made of ABS engineering plastic/polycarbon, which has no rust and good appearance quality.
6. The rain bearing mouth is made of ABS engineering plastics/polycarbon injection molding, which has high smoothness and small error caused by stagnant water.
7. There is a horizontal adjustment bubble inside the chassis, which can assist the bottom angle to adjust the levelness of the equipment.

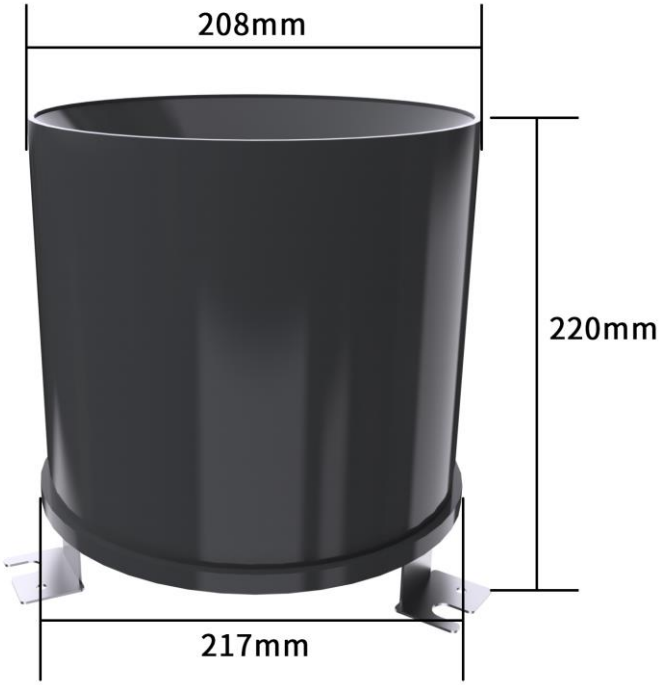
3 Scope of application

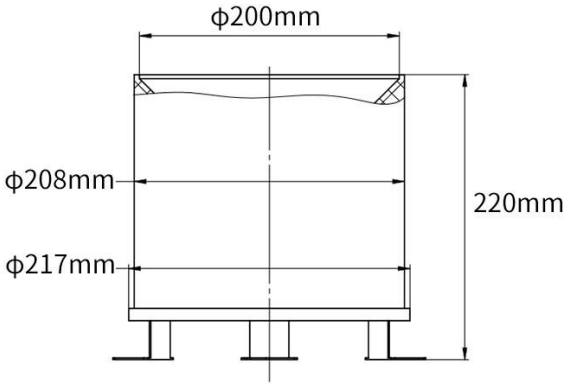
The rainfall recorder independently developed and produced by our company can measure precipitation, precipitation intensity, precipitation time, etc. It can be used in meteorological stations, hydrological stations, agriculture and forestry, national defense, field forecasting stations and other relevant departments, and can provide original data for flood control, water supply dispatching and water regime management of power stations and reservoirs.

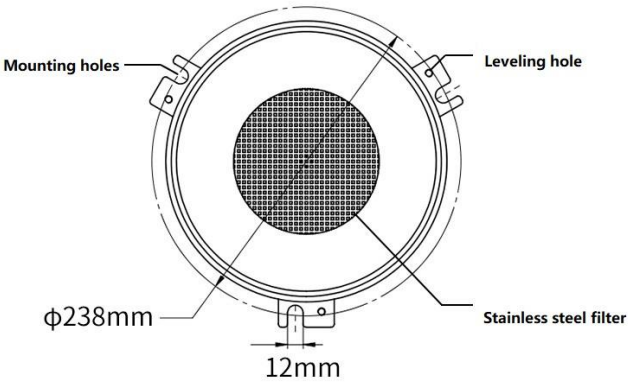
4 Technical parameters

1. Dimension of rain bearing port: φ 200 mm;; Acute angle of cutting edge: 40 ~ 45
2. Range: 0 ~ 100mm (range is limited to analog signals, RS485 signals are not measured)
3. Resolution: 0.2/0.5 mm
4. Rain intensity range: 0mm ~ 4mm/min (the maximum allowable rain intensity is 8mm/min)
5. Accuracy: ≤ ± 3%
6. Output signal:
   A: Voltage signal (0 ~ 2V, 0 ~ 5V, 0 ~ 10V)
   B: 4 ~ 20mA (current loop)
   C: RS485 (standard Modbus-RTU protocol, device default address: 01)
   D: Pulse signal (one pulse represents 0.2/0.5 mm rainfall)
7. Power supply voltage:
   5 ~ 24V DC (when output signal is 0 ~ 2V, RS485)
   12 ~ 24V DC (when the output signal is 0 ~ 5V, 0 ~ 10V, 4 ~ 20mA)
8. Working temperature: 0 ℃ ~ 70 ℃ (optional heating function, which can be as low as-40 ℃)
9. Working humidity: < 100% (no condensation)

5 Shape specification

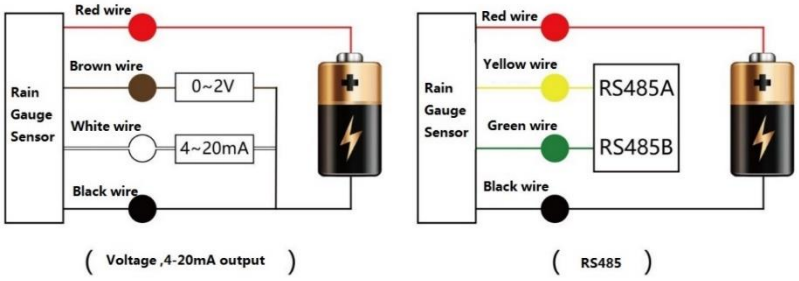






6 Usage

The rainfall sensor can be connected with various data collectors, data acquisition cards, remote data acquisition modules and other equipment with differential input. The wiring description is as follows:



7 Data conversion method

1. Analog output

The standard of analog signal output by rainfall sensor is calculated from zero point (00:00) of the same day. The default range of accumulated rainfall so far is 0 ~ 100mm, and other ranges can also be selected.

H: Rainfall in mm;

V: Voltage value collected by collector, unit: V;

A: The current value collected by the collector, unit: mA;

Output signal	Data conversion method of each measuring range		
	0 ~ 50mm	0 ~ 100mm	0 ~ 200mm
0 ~ 2V DC	H=25*V	H=50*V	H=100*V
0 ~ 5V DC	H=10*V	H=20*V	H=40*V
0 ~ 10V DC	H=5*V	H=10*V	H=20*V
4 ~ 20mA	H=3.125*A-12. 5	H=6.25*A-25	H=12.5*A-50
Pulse	One pulse represents 0.2/0.5 mm rainfall		

2. RS485 output

Standard Modbus-RTU protocol, baud rate: 9600; Check bit: None; Data bits: 8; Stop bit: 1

1. Address Modification

For example, the sensor with address 1 is changed to address 2, and the host → slave

Original address	Function code	Register address high	Register address low	High starting address	Low starting address	Low CRC16	CRC16 High

0X01	0X06	0X00	0X30	0X00	0X02	0X08	0X04

If the sensor receives correctly, the data returns according to the original route.

Remarks: If you forget the original address of the sensor, you can use the broadcast address 0XFE instead. When using 0XFE, the host can only connect with one slave, and the return address is still the original address, which can be used as an address query method.

2. Query/Set Time

Query time, master → slave

Original address	Function code	Register address high	Register address low	High register length	Low register length	Low CRC16	CRC16 High
0X01	0X03	0X00	0X34	0X00	0X03	0X44	0X05

If the sensor receives correctly, return the following data, slave → host

Address	Function code	Data length	Year	Month	Day	Hour	Points	Seconds	Low CRC16	CRC16 High
0X01	0X03	0X06	0X20	0X03	0X30	0X10	0X25	0X10	77	8C
			BCD code, which means: 10: 25: 10 on March 30, 20							

If the clock has deviation, you can calibrate the clock, master → slave

Address	0X01	
Function code	0X10	
Start register address high	0X00	
Start register address low	0X34	
High register length	0X00	
Low register length	0X03	
Data length	0X06	
Year	0X20	BCD code Indicated: April 3, 20, 17:06:28
Month	0X04	
Day	0X03	
Hour	0X17	
Points	0X06	
Seconds	0X28	
Low CRC16	0XE2	
CRC16 High	0XF4	

If the sensor receives correctly, return the following data, slave → host

Address	Function code	Start register address high	Start register address low	High register length	Low register length	Low CRC16	CRC16 High
0X01	0X10	0X00	0X34	0X00	0X03	0XC1	0XC6

3. Rainfall enquiries

Inquire the data (rainfall) of sensor (address 1), host → slave

Address	Function code	Start register address high	Start register address low	High register length	Low register length	Low CRC16	CRC16 High
0X01	0X03	0X00	0X00	0X00	0X0A	0XC5	0XCD

If the sensor receives correctly, return the following data, slave → host

Address	0X01	
Function code	0X03	
Data length	0X14	
Register 0 data high	0X00	Rainfall for the day: 10.0 mm Rainfall from 0:00 am to now
Register 0 data low	0X64	
Register 1 data high	0X00	Instantaneous rainfall: 1.6 mm Rainfall between queries
Register 1 data low	0X10	
Register 2 Data High	0X00	Yesterday's rainfall: 8.0 mm Rainfall in 24 hours yesterday
Register 2 data low	0X50	
Register 3 Data High	0X06	Total rainfall: 166.5 mm Total rainfall after the sensor is powered on
Register 3 Low Data	0X81	
Register 4 Data High	0X00	Hourly rainfall: 0.2 mm
Register 4 Low Data	0X02	
Register 5 Data High	0X00	Precipitation last hour: 0.2 mm
Register 5 Low Data	0X02	
Register 6 Data High	0X00	Maximum rainfall in 24 hours: 10.0 mm
Register 6 Low Data	0X64	
Register 7 Data High	0X01	24-hour maximum rainfall period 01:00 ~ 02:00
Register 7 Low Data	0X02	
Register 8 Data High	0X00	24-hour minimum rainfall: 0.0mm
Register 8 Low Data	0X00	
Register 9 Data High	0X03	24-hour minimum rainfall period 03:00 ~ 04:00
Register 9 Low Data	0X04	
Low CRC16	0X24	
CRC16 High	0XDC	

4.Rainfall data clearing setting

Rainfall data clearing setting, host → slave

Original address	Function code	Register address high	Register address low	High data content	Low data content	Low CRC16	CRC16 High
0X01	0X06	0X00	0X37	0X00	0X03	0X78	0X05

If the sensor receives correctly, the data returns according to the original route.

Remarks: Before installation and use, it is necessary to set the rainfall to be cleared.

8 Troubleshooting and Troubleshooting

This table lists the possible general fault phenomena, causes and troubleshooting methods of the instrument.

Manifestation form of central station	Rainfall sensor failure	Solution
You can't get a few when it rains	It shows that the rainfall sensor has no signal output or the transmission line is faulty ① Reed tube failure ② The distance between magnetic steel and reed tube is too far ③ The welding wire falls off or the signal wire is broken ④ The tipping bucket is stuck ⑤ Instrument blockage	Lower station inspection ① Replace the reed tube ② Adjust the distance of reed tube ③ Repair ④ Exclusion ⑤ Clear the blockage
There is a big difference between the received rainfall data and the comparative rain gauge during rainfall	The tilt angle of the rainfall sensor is out of balance, but the error is generally less than ± 10% The position of magnetic steel and reed tube is not good, which causes good and bad, so that some signals are omitted ③ Failure of anti-jitter function of data collector ④ The rain gauge is far away from the system rainfall sensor or there is strong wind	① Re-titrate and adjust the inclination angle ② Adjust the distance ③ Adjust the parameters of anti-jitter circuit ④ Objective reasons, non-instrument failure
The amount of rain keeps coming, but the actual situation is not raining	Check whether the socket is flooded, which often happens after heavy rain	Treat inlet water and reinstall

Note: The fault phenomena listed in the table are not necessarily the fault of the rain gauge itself. After checking the instrument itself to eliminate the fault, we should also check whether there are faults in the transmission outlet, data acquisition device, telemetry terminal and other equipment of the instrument, and eliminate and solve them one by one.