sisco

Tipping Bucket Rain Gauge

User Manual

1. Product Introduction

This instrument is a primary instrument for measuring precipitation, and its performance meets the requirements of the national standard GB/T21978.2-2014 "Tipping Bucket Rain Gauge".

The tipping bucket, the core component of the instrument, adopts a three-dimensional streamlined design, which makes the tipping bucket turn water more smoothly and is easy to clean.

This instrument is a precision rain gauge that requires regular maintenance and cleaning of the tipping bucket and the water outlet of the water diversion funnel during use.

TWhen the instrument is delivered, the tilt Angle of the tipper has been adjusted and locked in the best tilt Angle position. When installing the instrument, it can be put into use only by installing the tipper and adjusting the base level according to the requirements of this manual, and the tilt adjustment screw of the tipper can not be adjusted on site.

Tipping bucket rain gauge is a hydrological and meteorological instrument used to measure natural rainfall and at the same time convert the rainfall into digital information output in the form of switch value to meet the requirements of information transmission, processing, recording and display.

Features:

(1) The resolution has three options of 0.1mm/0.2mm/0.5mm.

(2) High precision and good stability.

(3) The tipper parts are well manufactured, the friction resistance moment is small, so the parts are sensitive, stable performance and reliable work.

(4) The instrument shell is made of 304 stainless steel, with strong anti-rust ability and good appearance quality.

(5) The rain socket is made of 304 stainless steel shell as a whole, with high finish and small error caused by water stagnation.

(6) The rain socket has a built-in protective screen to prevent deciduous mosquitoes from blocking the rain socket.

(7) The chassis is provided with a horizontal adjustment bubble, which can assist the bottom Angle to adjust the levelness of the equipment.

(8) Has a clock circuit, can query up to 10 register content.

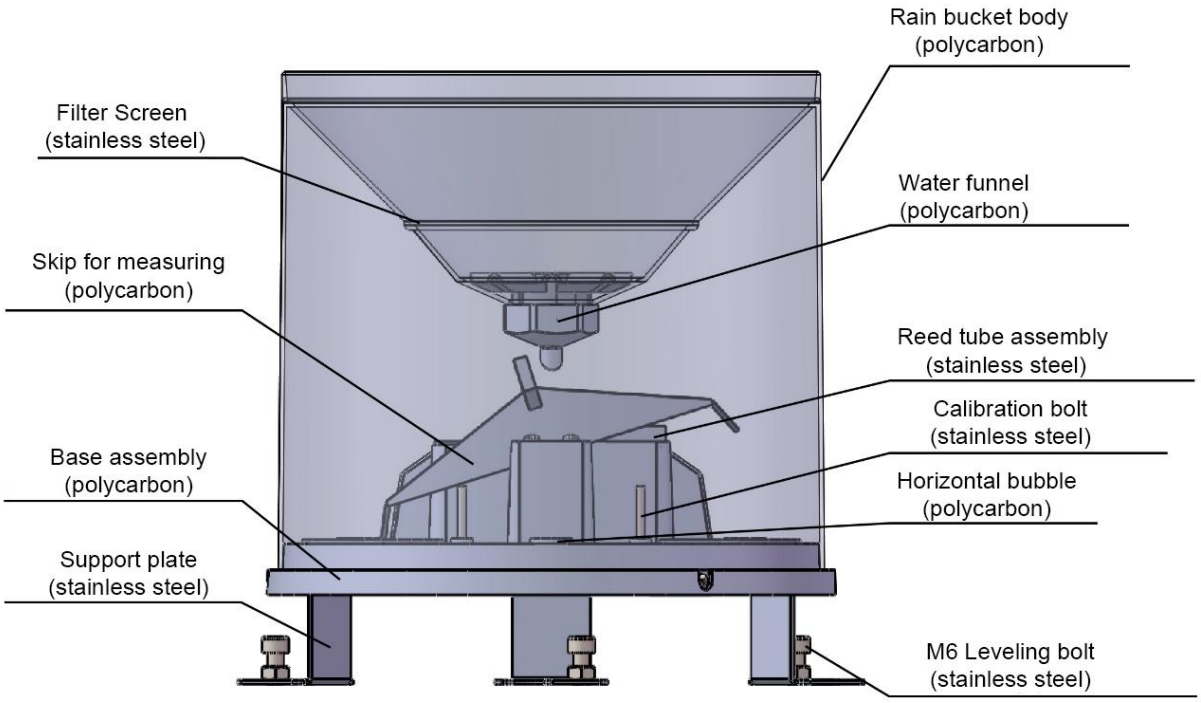
Application:

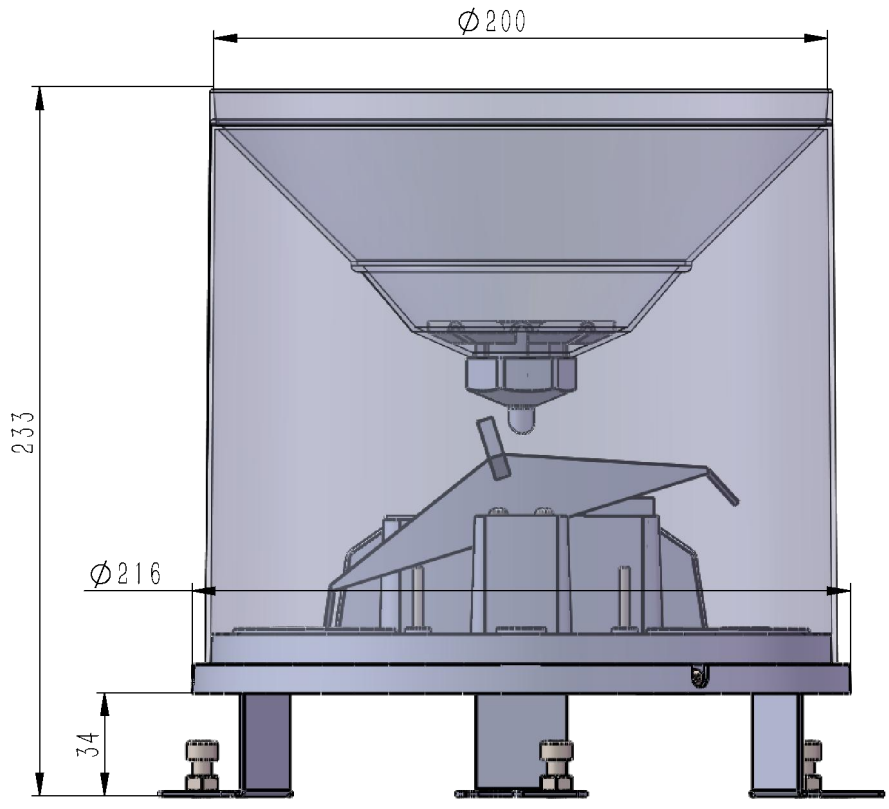
Our company independently developed and produced rainfall recorder to measure rainfall, rainfall intensity, rainfall time, etc., can be used in weather stations (stations), hydrology stations, agriculture and forestry, national defense, field monitoring stations and other relevant departments, can provide original data for flood control, water supply dispatching, power station reservoir water management.

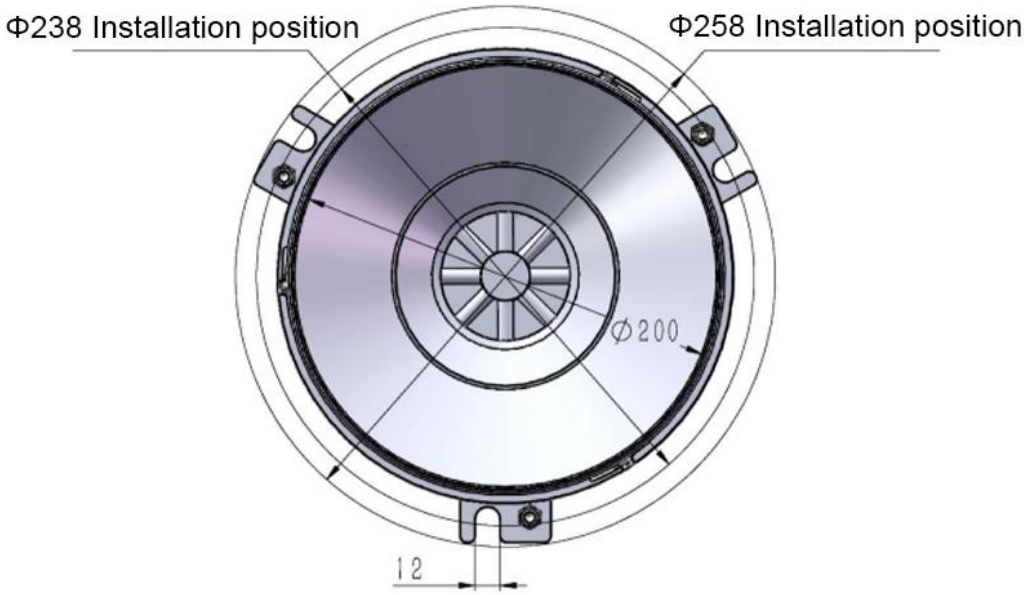
2. Technical Parameters

Rain Inlet Dimension	φ200mm
Acute Angle of Cutting Edge	40°-45°
Range	0 ~ 100mm (range only analog signal, RS485 signal is not limited)
Resolution	0.1mm/0.2mm/0.5mm
Rain Intensity Range	0.01mm-4mm/min (Maximum rain intensity allowed to pass 8mm/min)
Accuracy	≤ ± 3%
Output signal	A: Voltage signal (Choose one of 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 0.1mm/0.2mm/0.5mm rainfall)
Supply voltage	5-24V DC (When the output signal is 0-2V, RS485, SDI-12)
	12-24V DC (When the output signal is 0-5V, 0-10V, 4-20mA)
Working temperature	0℃ ~ 70℃ (optional heating function, can be as low as -40℃)
Working humidity	< 100% (no condensation)

3. Dimension


Rain bucket body
(polycarbon)
Filter Screen
(stainless steel)
Water funnel
(polycarbon)
Skip for measuring
(polycarbon)
Reed tube assembly
(stainless steel)
Calibration bolt
(stainless steel)
Base assembly
(polycarbon)
Horizontal bubble
(polycarbon)
Support plate
(stainless steel)
M6 Leveling bolt
(stainless steel)


Ø200
233
Ø216
34



Resolution 0.1mm(pulse)

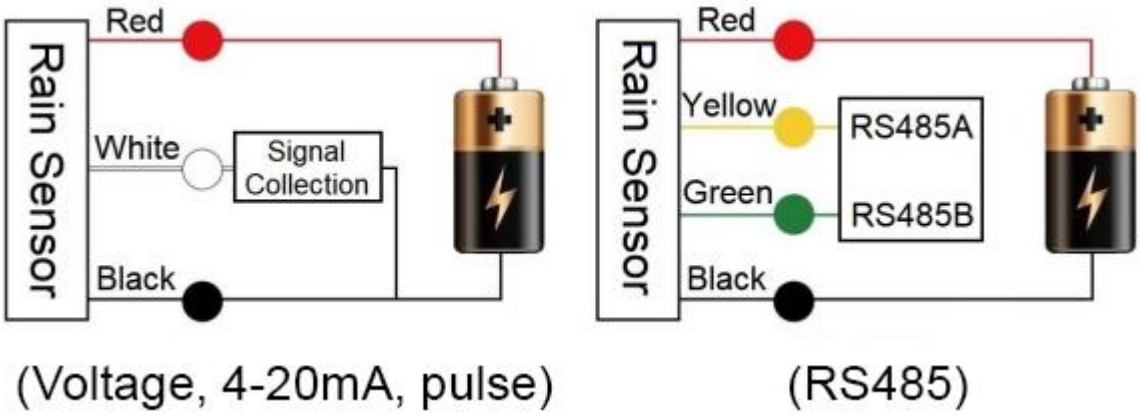
Resolution 0.2mm(pulse)

Resolution 0.5mm(pulse)

RS485/ Analog

4. Wiring method

Tipping bucket rain gauge can be connected to various data collectors with differential input, data acquisition cards, remote data acquisition modules and other equipment. The wiring instructions are as:



(Voltage, 4-20mA, pulse) (RS485)

5. Data Conversion Method

The standard of tipping bucket rain gauge's output analog signal is to start the calculation from the zero o'clock (00:00) of the day. The accumulated rainfall so far, the default range is 0-100mm, and other ranges can also be selected.

H: Rainfall, unit: mm;

V: The voltage value collected by the collector, unit: V;

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

Output Signal	Data Conversion Method for Each 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 0.1mm/0.2mm/0.5mm rainfall		

RS485 signal (default address 01):

Standard Modbus-RTU protocol, baud rate: 9600; check bit: none; data bit: 8; stop bit: 1

5.1 Modification Address

For example: change the address of the sensor with address 1 to 2, host→slave

Original Address	Function Code	Register Address High	Register Address Low	Start Address High	Start Address Low	CRC16 Low	CRC16 High
0X01	0X06	0X00	0X30	0X00	0X02	0X08	0X04

If the sensor receives correctly, the data will be returned in the same way.

Note: 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 to one slave, and the return address is still the original address, which can be used as a method for address query.

5.2 Query/Set the Time

Query time, host→slave

Original Address	Function Code	Register Address High	Register Address Low	Register Length High	Register Length Low	CRC16 Low	CRC16 High
0X01	0X03	0X00	0X34	0X00	0X03	0X44	0X05

If the sensor receives correctly, the following data will be returned, slave→host

Address	Function Code	Data Length	Year	Month	Day	Hour	Minute	Second	CRC16 Low	CRC16 High
0X01	0X03	0X06	0X20	0X03	0X30	0X10	0X25	0X10	0X77	0X8C
			BCD Code means: 10:25:10 of 30th March, 2020							

If the clock is skewed, the clock can be calibrated, host→slave

Address	0X01	
Function Code	0X10	
Start Register Address High	0X00	
Start Register Address Low	0X34	
Register Length High	0X00	
Register Length Low	0X03	
Data Length	0X06	
Year	0X20	BCD Code means: 17:06:28 of 3rd April, 2020
Month	0X04	
Day	0X03	
Hour	0X17	
Minute	0X06	
Second	0X28	

CRC16 Low	0XE2	
CRC16 High	0XF4	

If the sensor receives correctly, the following data will be returned, slave→host

Address	Function Code	Start Register Address High	Start Register Address Low	Register Length High	Register Length Low	CRC16 Low	CRC16 High
0X01	0X10	0X00	0X34	0X00	0X03	0XC1	0XC6

5.3 Rainfall Inquiry

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

Address	Function Code	Start Register Address High	Start Register Address Low	Register Length High	Register Length Low	CRC16 Low	CRC16 High
0X01	0X03	0X00	0X00	0X00	0X0A	0XC5	0XCD

If the sensor receives correctly, the following data will be returned, slave→host

Address	0X01	
Function Code	0X03	
Data Length	0X14	
Register 0 Data High	0X00	Rainfall on the day: 10.0mm Rainfall from 0:00 a.m. to the present
Register 0 Data Low	0X64	
Register 1 Data High	0X00	Instant rainfall: 1.6mm Rainfall between the two queries
Register 1 Data Low	0X10	
Register 2 Data High	0X00	Yesterday rainfall: 8.0mm Rainfall in 24 hours yesterday
Register 2 Data Low	0X50	
Register 3 Data High	0X06	Total rainfall: 166.5mm Total rainfall after sensor power up
Register 3 Data Low	0X81	
Register 4 Data High	0X00	Hourly rainfall: 0.2mm
Register 4 Data Low	0X02	
Register 5 Data High	0X00	Rainfall last hour: 0.2mm
Register 5 Data Low	0X02	
Register 6 Data High	0X00	24-hour maximum rainfall: 10.0mm
Register 6 Data Low	0X64	
Register 7 Data High	0X01	24-hour maximum rainfall period 01:00-02:00
Register 7 Data Low	0X02	
Register 8 Data High	0X00	24-hour minimum rainfall: 0.0mm
Register 8 Data Low	0X00	
Register 9 Data High	0X03	24-hour minimum rainfall period 03:00-04:00
Register 9 Data Low	0X04	
CRC16 Low	0X24	
CRC16 High	0XDC	

Note: Data supports striped queries

5.4 Rainfall Data Reset Setting

Rainfall data reset setting, host→slave

Original Address	Function Code	Register Address High	Register Address Low	Data Content High	Data Content Low	CRC16 Low	CRC16 High
0X01	0X06	0X00	0X37	0X00	0X03	0X78	0X05

If the sensor receives correctly, the data will be returned in the same way.

Note: Before installation and use, it is necessary to set the rainfall to zero.

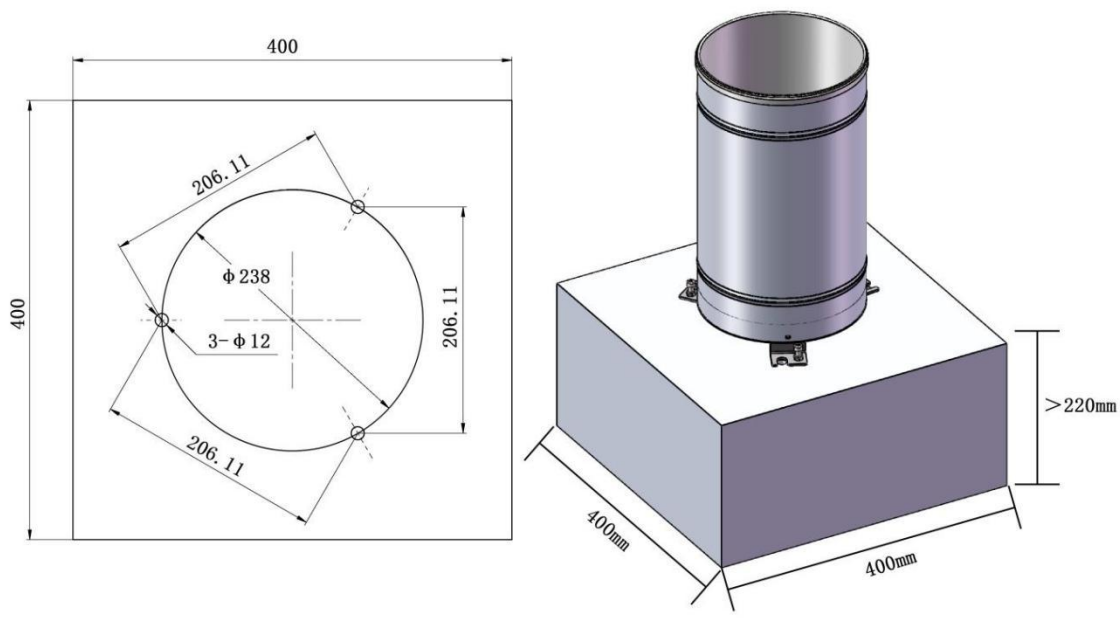
6.Installation and Adjustment

(1) Unpacking Inspection

① Carefully read the product instruction manual, and check whether the equipment accessories are complete against the packing list.

② Check whether the appearance of the instrument is damaged, especially to prevent the tip of the tipping bucket shaft and the two water diversion points of the tipping bucket from being damaged, and do not touch the inner wall of the tipping bucket with your fingers to contaminate the tipping bucket.

(2)Making and installing cement table



When installing on the outdoor ground or roof, the cement table should be made first. The height of the cement table above the ground level is 22cm, and the dimensions are: length 40cm×width 40cm, and the upper plane is a horizontal plane. When installing on the ground, the distance between the height of the rain inlet and the ground plane should be 70cm.

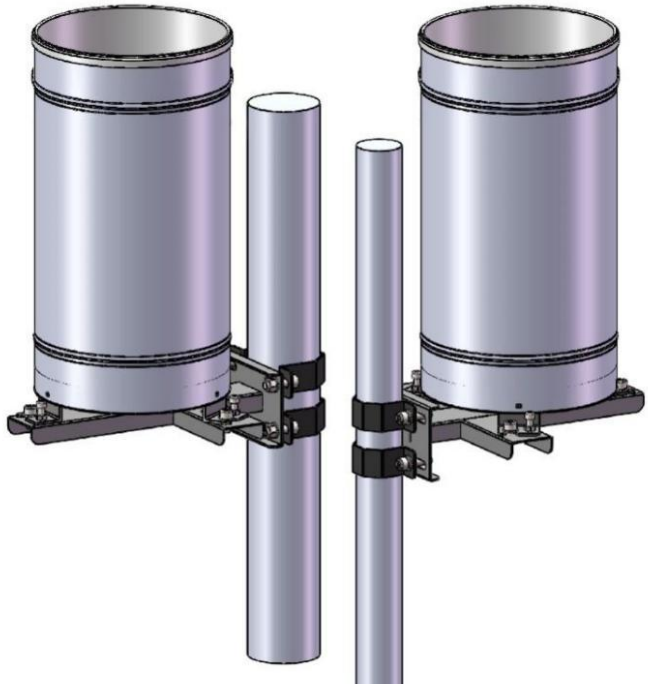
(3)Install and fix the instrument, adjust the bracket level

First, punch three mounting holes with a diameter of Φ12mm and a depth of 8-10cm on the cement table. The mounting holes are located on the circumference of Φ238mm and are equally divided by 120°. Insert the cable into the base of the instrument and prepare to install the stationary instrument. Remove the outer cylinder of the instrument, place the expansion bolts in the installation holes, install the instrument base on the 3 expansion bolts, adjust the level of the instrument base with the leveling bolts, make the level bubble in the center circle, and fix the leveling bolts , and then tighten the nuts to lock the three feet. Finally, install the outer cylinder of the instrument and lock the expansion bolts, and the instrument can be put into use.

(4)Optional mounting bracket, suitable for outdoor hoop installation and use

Applicable for poles with diameter of 48mm

Applicable for poles with diameter of 76mm



The diameter of the pole is 76mm/48mm, and it is fixed with two hoops

9. Troubleshooting

This table lists the general failure phenomena, causes and troubleshooting methods that may occur in the instrument.

Central Station Performance	Rain Sensor Failure	Solution
Can't receive data when it rains	①Reed switch failure ②The distance between the magnetic steel and the reed switch is too far ③The welding wire falls off or the signal wire is broken ④The tipping bucket is stuck ⑤ The instrument is blocked	①Replace the reed switch ②Adjust the reed switch distance ③Repair ④ Exclude ⑤ Clear the blockage
When it rains, the rainfall data received is quite different from that of the compared rain gauge.	①The tilt angle of the tipping bucket of the rain sensor is out of balance, but this error generally does not exceed ±10% ②The position of the magnetic steel and the reed switch is not good, resulting in good times and bad times, so that some signals are missing ③The distance between the rain gauge and the system rain sensor is farther or there is strong wind	①Re-titration to adjust the inclination ②Adjust the distance ③Objective reasons, not instrument failures

Keep receiving the rainfall data, but the actual situation is not raining	Check whether the socket is flooded, this phenomenon often occurs after heavy rain	Dispose of incoming water, reinstall

Note: The faults listed in the table are not necessarily the faults of the rain gauge itself. After checking the faults of the instrument itself, you should also check whether there are faults in the transmission lines, data acquisition devices, telemetry terminals and other equipment of the instrument, And troubleshoot and solve them one by one.

Thank you for purchasing our products!

Due to the continuous improvement of our products, the products you purchase may differ from the illustrations in the manual without notice. Please refer to the actual product.