



HY-RS2E

Radar Precipitation Sensor



User Manual

1、 Foreword

Thank you for purchasing HY-RS2E precipitation sensor manufactured by Hongyuv. This device without moving parts, free of maintenance and calibration on site. We suggest you to read this user manual carefully before operating it.

As our products are developed continuously, Hongyuv reserve the right to make any alterations on performance or appearance without prior notice.

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2、 Introduction

HY-RS2E Radar Rain sensor has advantage of light weight robust and no moving parts, free of maintenance and calibration.

The radar precipitation sensor HY-RS2E precipitation sensor allows fast measurement of precipitation intensity and distinguishes between Rain, snow, sleet, freezing rain, hail, drizzle and No precipitation.

The operation is maintenance-free, thanks to radar measurement technology.

HY-RS2E can be connected to computer or any other data acquisition module which has compatible communication protocol with it. HY-RS2E has three communication interfaces for option: RS232, RS485 or SDI-12.

3、 Working Principle

The Radar Rain Sensor (HY-RS2E) is a precipitation sensor which can be used to determine both the type of precipitation and its quantity and intensity.

The HY-RS2E operates with a 24GHz Doppler radar, which records raindrop fall speed. The precipitation quantity is then calculated by means of the correlation of raindrop size and speed.

HY-RS2E is more sensitive and has faster response time than tipping bucket rain gauge, It's configurable as a replacement for tipping bucket systems and the leaves fallen on its surface won't matter at all, no necessary to add extra heating device to protect it from freezing.

4、 Heating Function

To prevent instrument from freezing, and to avoid consequential error measurements, we provide heating function for customers to choose.

Heating function is divided into two modes, one is automatic mode, the device automatically controls the heating function ON/OFF, and the other is manual mode, the user can turn on and off the heater through commands. By default, the heating is set in automatic mode and full capacity. This is the recommended heating mode of the sensor.

At the same time, the initial temperature of the heater can be set, and the factory default setting is -5 °C.

5、 Technical Specification

| | |
|------------------------------|---|
| Model | HY-RS2E |
| Distinguishable type | Rain, snow, sleet, freezing rain, hail, drizzle and No precipitation |
| Measure Range | 0-500mm/hour (precipitation) |
| Accuracy | ±10% |
| Droplet size | 0.3...5.0 mm |
| Solid precipitation | 5.1...~30 mm |
| Particle velocity | 0.9...15.5 m/s |
| Survival wind speed | 75 m/s |
| Resolution of rain | 0.1mm |
| Sample frequency | 1 second |
| Communication interface | RS485、RS232、SDI-12(choose one of them) |
| Communication | ModBus、NMEA-0183、ASCII |
| Power supply | 7-30VDC |
| Power consumption or standby | ≤ 1 VA working(≤ 0.4 VA in Stand by mode) |
| Operating temperature | -40°C - +70°C |
| Operating humidity | 0-100% |
| Dimension | Ø105 * 178mm |
| Material | ASA |
| Weight | 0.45kg |
| Protection grade | IP66 |

Specifications may be subject to change without prior notice.

6、 Packing List

| | |
|---|---|
| HY-RS2E radar rain sensor | 1 |
| 10 meters communication cable with water-proof connector and cables with differentiated conductors. | 1 |
| User manual | 1 |

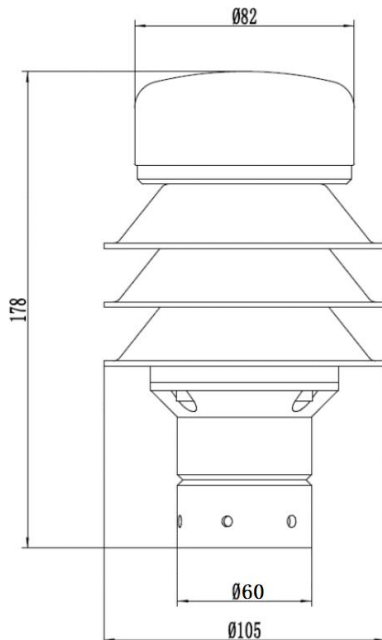
7、 Installation

Follow the instructions below to guarantee correct long-term operation:

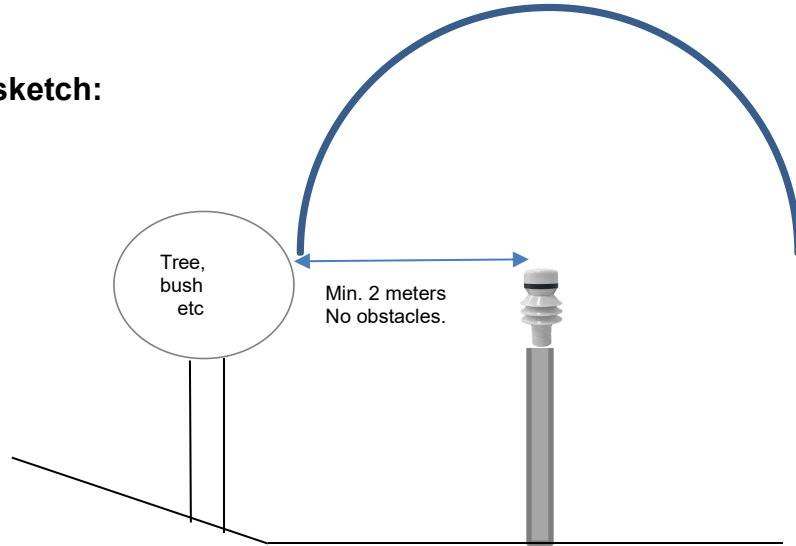
- Installation height above the ground 2 meters
- Distance to trees or bushes at the height of the sensor at least 2 meters
- When selecting the installation location please take care to position the device at a suitable distance from other systems incorporating a 24GHz radar sensor, such as traffic counting devices on overhead gantry signs. Otherwise cross effects and system malfunctions may occur.

In the final analysis, the distance to other measuring systems also depends on their range of coverage and signal strength.

8、 Dimension (unit in mm)



Installation sketch:



9、 Connections

There is an 4-pole screw-in connector on the underside of the device. This serves to connect the power supply and the interfaces using the associated connection cable.

For RS485 output, communication cable is four cores, connected as below:

| POWER | | RS485 | |
|----------|-------|-----------|-----------|
| Red | Black | Yellow | Green |
| DC7~30V+ | GND | RS485 DA+ | RS485 DB- |

For RS232 output, communication cable is five cores, connected as below:

| POWER | | RS232 | |
|----------|-------|----------|----------|
| Red | Black | Green | Yellow |
| DC7~30V+ | GND | RS232 TX | RS232 RX |

For SDI-12 output, communication cable is 4 cores, connected as below:

| POWER | | SDI-12 | |
|----------|-------|---------------|--------|
| Red | Black | Green | Yellow |
| DC7~30V+ | GND | SDI-12 Signal | Shield |

Note:

- 1.Default output is RS485.
- 2.Final definition of cable wiring should be referred to sticker on cable.
- 3.For SDI-12, the cable heating definition is: Red (Heating) PWR + and Black (Heating) PWR GND.

SDI-12 Communication Protocol

SDI-12 V1.08M

SDI-12 Interface Definition

| | |
|------------|------------|
| Start Bit | 1 bit |
| Data Bits | 7 bits |
| Parity Bit | 1 bit-EVEN |
| Stop Bits | 1 bit |
| Baud Rate | 1200 bps |

SDI-12 Commands

?! Returns Unit Address (default is 0).

a Current unit address letter (factory default is 0, range is 0 to 9, a to z, A to Z).

b New address letter, range is 0 to 9, a to z, A to Z.

a! To read out device identification information.

You can use command '>NameSet:HIYIELD WDC6SE1.200001' to rename identification.

aAb! Change unit address from a to b see above.

aM4! Address, Precipitation Type, Rain Intensity, Accumulated Rain, Status.

aD0! Request a line of the above data

Note:

1. Maximum length of response message of measurement command (aM! ~ aM9!) is 35 bytes, therefore, there will need more than one read command(aD0! ~ aD9!) to read out complete measurement data for aM5,aM6,aM8,aM9.
2. aR0! ~ aR9! is use to read continuous measurement data, the maximum length of response message is 75 bytes, so that all data can be returned at one time.
3. 10 minutes averaged result will be available after 10 minutes since the moment receiving measure command aM6! or aM9!(every time instrument receive aM6! or aM9!, it will clear all raw data that is already stored), any data access command sent before 10 min will only read out averaged value calculated based on current existing raw data.
4. If user is using command continuous measurement command(aR0! ~ aR9!), then the rolling stored raw data won't be cleared.
5. By no means will any command clear the stored raw data used for 3s Gust calculation.
6. Even if the quantity of raw data doesn't fulfill preset period, the instrument will start output gust based on current available raw data once

| Command | Description | Response | Example |
|-------------|---|-----------------------------|---|
| aHauto_x! | Change heater Automatic mode x = ON, auto mode x = OFF, manual mode | auto or manual | aHauto_ON! auto |
| aHmanual_x! | Change heater Manual mode x = ON, On heater. x = OFF, Off heater. | on or off | aHmanual_ON! on |
| aHset_t! | Change heater Set mode t = 0, the default temperature -5. t=?, specific temperature | t | aHset_-10! -10 |
| aM4! | Request to start measurement | 00014 | Data will be ready within 1 second |
| aD0! | Request for measurement result | 0+001+063.9+ 00002.3+111 | 0:Address 001:Rain 063.9: 63.9 mm/hr 00002.3: 2.3 mm 111: three data are all valid |

● **Appendix III. Precipitation Type**

| BIT 15 | BIT 14 | BIT 13 | BIT 12 | BIT 11 | BIT 10 | BIT 9 | BIT 8 |
|--------|--------|----------------|-------------|-------------------------|--------------|-------------|-------------|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
| 0 | 0 | Drizzle 0/1 | Hail 0/1 | Freezing rain 0/1 | Sleet 0/1 | Snow 0/1 | rain 0/1 |

Corresponding bit is valid when value is '1'.

All "0" means no precipitation.

For instance:

Precipitation type: Decimal: 002 => Binary: 10 => stand for snow

Precipitation type: Decimal: 017 => Binary: 10001 => stand for Hail + rain

Manually turn on/off power of radar rain module commands:

1. Turn off radar module needs two commands:

1.1 >RadarPwrCtr:0\r\n

1.2 >SaveConfig\r\n

2. Turn on radar module needs two commands:

2.1 >RadarPwrCtr:1\r\n

2.2 >SaveConfig\r\n

Set auto-sleep interval needs two commands:

1. >SysModeCfg:1,255\r\n

2. >SaveConfig\r\n

255 standand for interval in second, you can use any value within 0~255 to replace it.

Specially, when value is 0, auto-sleep function is deactivated.

Our weather station will automatically turn off radar module for certain period(example 255 seconds), and then wake up for 4 seconds to detect existence of rain. It will keep working if rain is detected, otherwise it dormant again. It repeats this cycle all the time.

Power consumption under different state:

| Device State | Radar off | Radar on | Radar on & heating on |
|-------------------|------------|-------------|-----------------------|
| Power Consumption | 65mA@12VDC | 144mA@12VDC | 385mA@12VDC |