



## Product Introduction

### 1. Product overview:

The measurement of the radiation perpendicular to the surface of the sun (viewing angle about  $0.5^\circ$ ) and the scattered radiation of the very narrow annular sky around the sun is called solar direct radiation, which is measured with a pyrheliometer.

### 2. Principle and structural features:

This table structure is as accompanying drawing 1, mainly is made up of light cylinder and automatic tracking device.

The interior of the light tube is composed of seven light barriers, an inner tube, a thermopile and a desiccant tube.

Seven apertures are used to reduce internal reflections, constitute the opening angle of the instrument and limit turbulence of the air inside the instrument.

Outside the light barrier is the inner cylinder, which seals the dry air inside the light barrier and the outer cylinder to reduce the influence of ambient temperature on the thermopile.

A JGS3 quartz glass sheet is installed at the mouth of the outer cylinder, which can pass through the radiant light of  $0.27\text{-}3.2\mu\text{m}$  wavelength, which is convenient for direct solar radiation measurement.

The cylinder is filled with desiccant to prevent the formation of moisture condensation.

The sensing part of the pyrheliometer is the core part of the light tube, which is composed of a fast-response wire-wound electroplating thermopile.

The side of the sensing part facing the sun is painted with matte black paint, and the bottom is the hot junction of the thermopile. When the sun shines on the hot junction, the temperature rises, and it forms a temperature difference with the cold junction on the other side, thereby generating an electromotive force. It is directly proportional to the intensity of direct solar radiation.

## Technical Parameters

Measuring range:  $0\sim 2000\text{ W/m}^2$

Signal output:  $0\sim 20\text{mV}$

Measurement accuracy: working table  $<5\%$ ;  
standard table  $<2\%$

Sensitivity:  $7\sim 14\mu\text{V/W}\cdot\text{m}^2$

Time constant:  $\leq 15\text{S}(99\%)$

Internal resistance: about  $80\Omega$

Tracking accuracy:  $<168\text{h}\pm 1^\circ$

Power supply:  DC 12V

Other

Output:  Voltage:  $0\text{-}5\text{V}$

Other

Annual stability:  $\pm 1\%$  (sensitivity change rate)

Working environment:  $-45^\circ\text{C}\sim +45^\circ\text{C}$

Instrument cable length:  Standard  
configuration: 2.5 meters

Other

Opening angle:  $4^\circ$

Product weight: 5Kg

Product power consumption: 50 mW

## Calculation formula

Voltage type ( $0\sim 2.5\text{V}$ ):

$$F = V / 2.5 \times 2000$$

(F: radiation value, unit  $\text{W/m}^2$ , V: output)

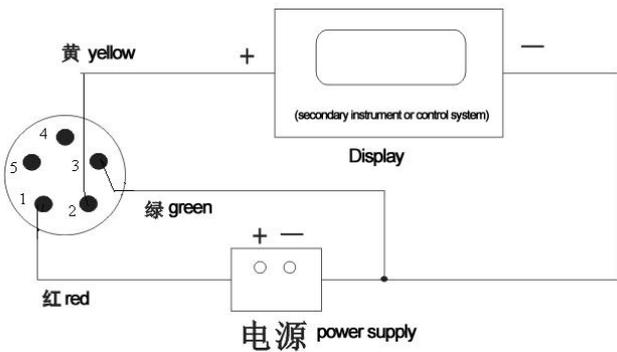
voltage, unit V, radiation test range  
0~2000W/m<sup>2</sup>)

### Connection method

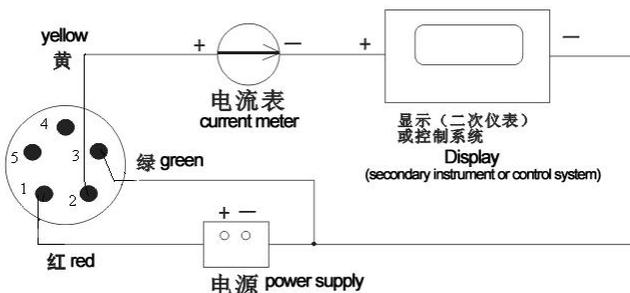
- (1) If equipped with a weather station produced by our company, directly use the sensor line to connect the sensor to the corresponding interface on the weather station.
- (2) If the transmitter is purchased separately, the wiring sequences of the transmitter supporting lines are as follows:

| Line color       | Output Signal  |  |  |
|------------------|----------------|--|--|
|                  | Voltage        |  |  |
| Red              | +              |  |  |
| Black<br>(Green) | -              |  |  |
| Yellow           | Voltage signal |  |  |
| Blue             |                |  |  |

- (3) Pulse voltage and current two output wiring methods:



(voltage, pulse mode wiring)



(Current output mode wiring)

### MODBUS-RTU Communication Protocol

1. Serial port format  
Data bit 8 bits  
1 or 2 stop bits  
Check digit None  
Baud rate 9600 The interval between two communications is at least 1000ms
2. Communication format

#### 【1】 Write device address

Send: 00 10 Address CRC (5 bytes)  
Return: 00 10 CRC (4 bytes)  
Note: 1. The address bit of the read/write address command must be 00.  
2. Address is 1 byte, ranging from 0-255.  
Example: send 00 10 01 BD C0  
return 00 10 00 7C

#### 【2】 Read device address

Send: 00 20 CRC (4 bytes)  
Return: 00 20 Address CRC (5 bytes)  
Description: Address is 1 byte, the range is 0-255  
Example: Send 00 20 00 68  
return 00 20 01 A9 C0

#### 【3】 Read real-time data

Send: Address 03 00 00 00 01 XX XX  
Description: As shown in the figure below:

| Code    | Functional definition                         | Remark |
|---------|---|--------|
| Address | Station number (address)                      |        |
| 03      | Function code                                 |        |
| 00 00   | Start address                                 |        |
| 00 01   | Read Points                                   |        |
| XX XX   | CRC Check code, low in front and high in back |        |

Return: Address 03 02 AA BB XX XX

Description:

| Code    | Functional definition    | Remark |
|---------|--------------------------|--------|
| Address | Station number (address) |        |

|       |                                |     |
|-------|--------------------------------|-----|
| 03    | Function code                  |     |
| 02    | Read Unit Bytes                |     |
| AA BB | Date (High front and low back) | Hex |
| XX XX | CRC Check Code                 |     |

## Installation Method

1. The installation site of the straight meter should ensure that the direct sunlight is not affected by any obstacles in all seasons and times (from sunrise to sunset). If there are obstacles, the elevation angle of the obstacles in the direction of sunrise and sunset shall not exceed 5°. At the same time, try to avoid places with serious air pollution such as smoke and fog. Usually located within the observatory with other pyranometers, but can also be located on a roof deck. The bench should be installed firmly, even if it is subjected to severe impact and vibration (such as strong wind, etc.), the horizontal state of the instrument should not be changed. The tracking accuracy of the straight watch is related to whether the installation is accurate. Although it is very simple, it must be careful.
2. The automatic tracking device is set symmetrically

on both sides, and the side marked with  is the

installation side of the smart tracker.  is also marked on the bottom connector of the smart tracker, so that the directions of the two marked arrows are in the same direction, just tighten the four corresponding bolts. as the picture shows:



3. The other side marked with  is the installation side of the direct radiation meter (light tube), and the connection method is the same as that of the smart tracker. (Note: Do not tighten the bolts when connecting, so as to adjust the light spot of the light tube later) as shown in the figure:



4. Install the connected automatic tracking device on the four leveling bolts of the circular base on the radiation joint bracket. (Note: The direction of the north mark on the square base of the automatic tracking device is aligned with the north) as shown in the figure:



5. Adjust the light spot on the light tube so that the light spot just passes through the small hole on the upper edge of the light tube and projects to the location of the "+" light spot on the lower edge, as shown in the figure:



Then tighten the bolts of the light tube connector and the horn bolts on the light tube.

## Notice

1. Please check whether the packaging is in good condition, and check whether the product model is consistent with the selected model;
2. Do not connect live wires, and power on after the wiring is completed and checked;
3. The length of the sensor wire will affect the output signal of the product. When using it, do not change the components or wires that have been welded when the product leaves the factory. If you need to change it, please contact the manufacturer;
4. The sensor is a precision device. When using it, please do not disassemble it by yourself, or touch the surface of the sensor with sharp objects or corrosive liquids, so as not to damage the product;
5. Please keep the verification certificate and qualification certificate, and return it with the product when repairing.

## Use and Maintenance

1. Compared with other pyranometers, not only the sensing parts must be sensitive, but also the tracking must be accurate in order to obtain accurate direct radiation. It is not easy to keep tracking the sun consistently, accurately and reliably all year round in all weather conditions, so strict operating procedures are required.
2. At the beginning of work every day, check whether the quartz glass window of the light tube is clean. If there is dust and water vapor condensation, it should be blown with an ear suction ball or wiped with a soft cloth or optical lens paper in time.
3. The tracking situation should be checked once a month, and adjusted in time (point to light).
4. This instrument is a precision instrument, and it must be debugged in strict accordance with the operating procedures. Never use too much force, handle it with care, and reduce vibration to avoid

damage.

5. If the pyranometer has been used for more than two years, its sensitivity must be re-calibrated by the manufacturer or the measurement department

## Contact Us

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