

RK210-03 Dust Monitoring System



Revision Time	Reviser	Current Version	Remarks
20250808	SUN	V5.1	Update calibration steps

User Notice

Please read this manual carefully before use to ensure safe and optimal operation. Retain this manual for future reference.

Pre-Use Instructions

- Carefully review this manual and follow all operational and safety guidelines to prevent malfunctions and hazards.

Unpacking Inspection

- Upon receipt, carefully inspect the sensor device and accessories for any shipping damage.
- If damage is detected:
- Immediately notify the manufacturer and distributor.
- Retain all packaging materials for return or replacement processing.

Parts List

Item	Quantity	Remarks
Dust monitoring system	1	
Install the accessories	4	Set
Cable	1	The length depends on the order

1. Product Introduction

The soiling on the glass of solar modules is the main factor affecting the power generation efficiency of PV power plants. The soiling monitoring device using blue light pollutant measurement technology can be easily installed in the PV array and integrated into the power plant management system. The device is installed on the frame of the PV panel and calculates the reduction in sunlight reaching the solar modules by measuring the proportion of pollutants (SR).

This allows operation and maintenance personnel to know when pollutants reach the critical point and decide whether it is necessary to start the cleaning process. The product does not require maintenance, only cleaning surrounding components in the same way. Due to the varying pollution rates of large photovoltaic power plants throughout the entire park, the IEC 61724-1 standard requires multi-point measurement. Compared to traditional products, it has much lower procurement, installation, and maintenance costs, making it more economical.

2. Product Features

- Continuous optical measurement
- Multi filter technology
- Closed loop optical structure
- Clean at the same time as photovoltaic panels
- 24-hour monitoring
- High monitoring sensitivity
- Temperature compensation
- On-site calibration

3. Specifications

Item	Specification	Remark
Technical Principles	Continuous multi frequency blue diffuse scattering closed-loop technology	
Execution Standard	IEC61724-1:2017	
Soiling Ratio (SR) Range	100% - 50%	SR=100-TL (Transmission Loss)
Accuracy	± 1%	90-100%
	± 3%	80-90%
	± 5%	50~80%
PV Module Temperature	Principle:PT100 Measurement range : - 50~150°C Accuracy: ± 0.5°C Resolution: 0.1°C	Optional
GPS	Positioning accuracy: 10m	Optional
Output	RS485	
	Relay	
Communication	Modbus-RTU	
Supply	12~24VDC	
Maximum Power Consumption	<2.5W @DC12V	Low-power design
Alarm Threshold	Can set upper and lower threshold values	
Stability	±1%/year	
Operating Environment	-40℃~+60℃@0-90%RH	
Weight	3.5kg	Net weight
Size	900 * 170 * 42mm	
Cable Length	20m	
Ingress Protection	IP65	
Storage Condition	10℃-60℃@20%-90%RH	

4. Electrical Connections

Connector(Cable)	RS485
Red	V+
Blue	V-
Yellow	RS485A
Green	RS485B

5. Product Dimensions

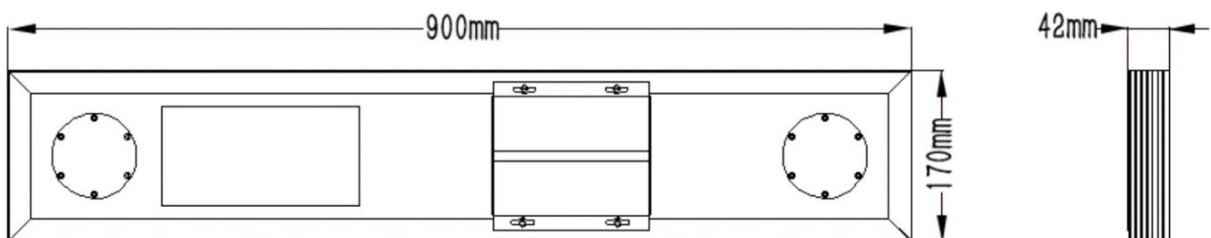


Figure 5.1
Dimensional Details(Unit: mm)

6. Communication Protocol (MODBUS-RTU)

Parameter	Value
Data Bits	8 bits
Check Bit	None
Stop Bit	1 bit
Baud Rate	9600 bps
Slave Address	0x01 (Factory Default)

6.1 Read Real-time Data

Client sends:

01 03 00 00 00 02 C40B

Return:

01 03 04 03 E8 03 E8 7AFD

6.1.1 Description of Return Data Format

No.	Conception	Byte Number	Description	Remarks
1	Address block	1	Address(0x01)	0x01
2	Function code	1	Only read(0x03)	0x03
3	Number of bytes	1	0X04	4bytes
4	Data block	2	Cleanliness rate1	0x03E8(100%)
5	Data block	2	Cleanliness rate2	0x03E8(100%)
6	Check block	2		0x7A 0xFD

6.2 Modify Slave Address

Client sends:(Change slave address from 01H to 02H.)

Slave id	Function code	Address_H	Address_L	New id_H	New id_L	CRC_L	CRC_H
0x01	0x06	0x00	0x0F	0x00	0x02	0x38	0x08

Response:

Slave id	Function code	Address_H	Address_L	New id_H	New id_L	CRC_L	CRC_H
0x01	0x06	0x00	0x0F	0x00	0x02	0x38	0x08

7. Installation Guidelines

- The Dust Monitoring System needs to be installed in conjunction with photovoltaic panels.
- During installation, there should be no obstruction above the sensor to ensure that there are no other interfering objects within the field of view of the detection probe, so as not to affect the detection results.

7.1 Installation Method

Place the dust detection device at the same angle as the solar panel, with its glass surface facing upward. Place the installation accessory between the dust detection system and the solar panel. Use a matching screw to pass through the screw hole in the center of the accessory and tighten it with a nut. Repeat the above steps for fixed installation at multiple points, as shown in Figures 7.1.1 - 7.1.4. Adjusting the installation direction of Accessory B can adapt to different frame thicknesses of solar panels, as shown in Figure 7.1.5. If necessary, use Accessory C for auxiliary installation.

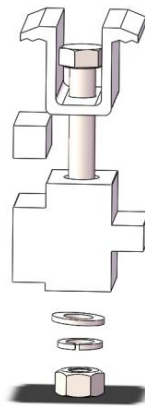


Figure 7.1.1 Overall Accessory Assembly Diagram

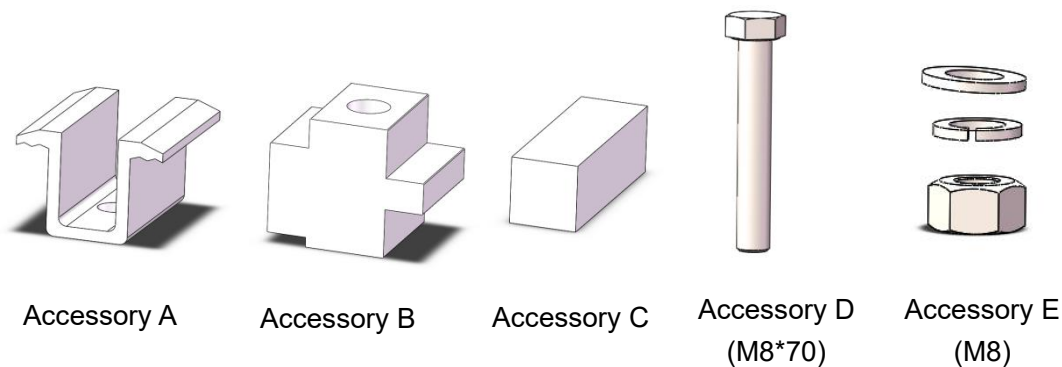
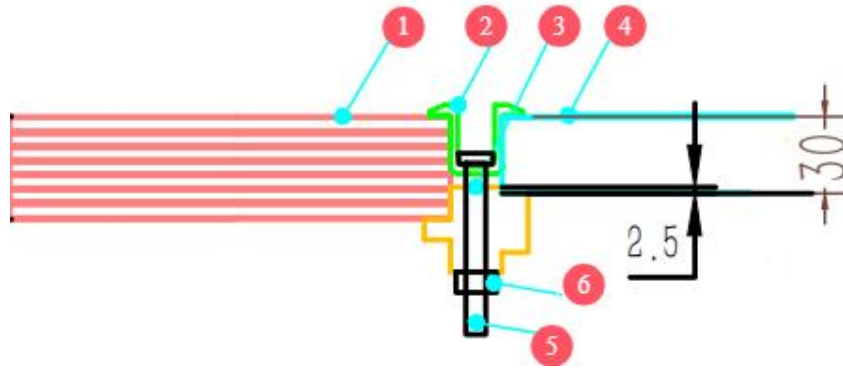


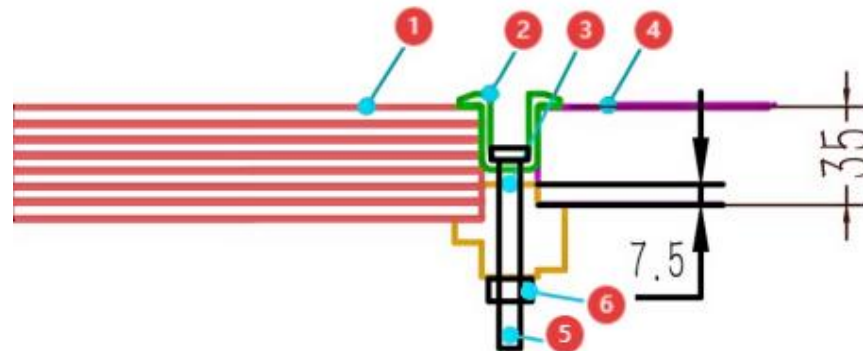
Figure 7.1.2 Accessory Exploded View Diagram



- ① Dust Monitoring System ② Accessory A ③ Accessory B
④ Solar Panel ⑤ Accessory D ⑥ Accessory E

Figure 7.1.3

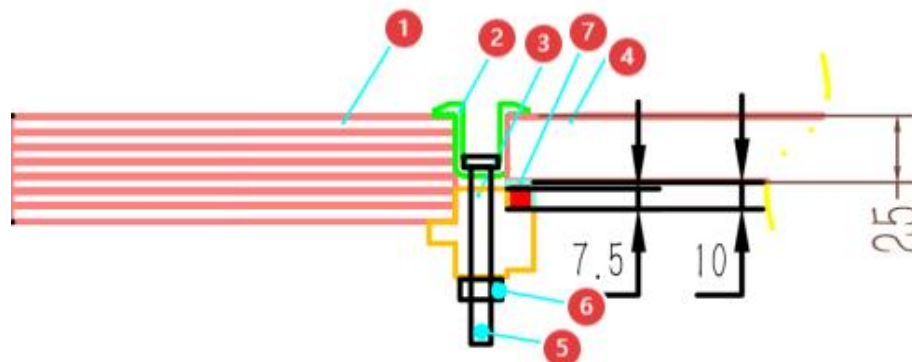
Installation method suitable for the frame thickness of the solar panel being 30mm



- ① Dust Monitoring System ② Accessory A ③ Accessory B
④ Solar Panel ⑤ Accessory D ⑥ Accessory E

Figure 7.1.4

Installation method suitable for the frame thickness of the solar panel being 35mm



- ① Dust Monitoring System ② Accessory A ③ Accessory B
④ Solar Panel ⑤ Accessory D ⑥ Accessory E ⑦ Accessory C

Figure 7.1.5

Installation method suitable for the frame thickness of the solar panel being 25mm

8. Dust Monitoring System Calibration Procedure

When the dust monitoring system shows data discrepancies, follow the steps below for on-site calibration.

8.1 Calibration Steps

Dust calibration process: (First calibrate for no dust, then calibrate for full dust)

- ① Wipe the front panel glass of the sensor clean;
- ② Press and hold the button for 10 seconds. When you hear the buzzer beep for a long time, release the button to start calibration;
- ③ After the sensor buzzer sounds twice, the dust-free calibration begins;
- ④ During the dust-free calibration process, sudden changes in ambient light should be avoided;
- ⑤ After the sensor buzzer sounds 3 times, the calibration is completed without dust;
- ⑥ Use covering materials (such as soil or printing paper) to completely cover the two sensor windows, simulating a situation where the glass panel is covered in dust;
- ⑦ Wait for 9 to 10 seconds;
- ⑧ After the sensor buzzer sounds twice, the full-dust calibration begins;
- ⑨ During the full-dust calibration process, sudden changes in ambient light should be avoided;
- ⑩ After the sensor light flashes 3 times or the buzzer sounds 3 times, the full dust calibration is completed;
- ⑪ Wait for 10 seconds, power off the sensor, and remove the blocking material.

Note: Contact the manufacturer if the above steps fail to resolve the problem.

9. Precautions

Powered Wiring Prohibition

- Do not connect wires while powered. Only energize the sensor after confirming correct wiring.

Component Modification Restriction

- Do not alter factory-soldered components or pre-connected wires.

Precision Handling Requirement

The sensor is a precision device. Avoid:

- Unauthorized disassembly.
- Do not touch internal components to prevent product damage.

10. Troubleshooting

Incorrect Output Signals (Analog/RS232/RS485):

- Verify wiring correctness and secure connections.
- Check if the serial port is occupied or malfunctioning.
- Confirm serial port settings (baud rate, data/stop bits) match device requirements.

Persistent Issues:

- Contact the manufacturer if the above steps fail to resolve the problem.

11. Product Maintenance

Maintenance and Safety

- Regularly clean and inspect the sensor to maintain performance.
- Do not expose the sensor to extreme temperatures, moisture, or corrosive substances unless explicitly specified.
- Unauthorized disassembly, modification, or repairs may void the warranty and lead to malfunctions.

Troubleshooting Protocol

- In case of malfunction, refer to the troubleshooting section of this manual.
- Do not attempt unauthorized disassembly or repairs.
- Contact the manufacturer's after-sales department directly for technical support.

12. Warranty Terms

This product comes with a one-year warranty, starting from the date of delivery. Within twelve months, the Company shall be responsible for free repair or replacement of any failure caused by sensor quality issues (non-human damage). Fees will be charged for repairs or replacements after the warranty period expires.

 Complies with applicable CE directives.

Manual subject to change without notice.

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