
YGC-JYZ

Photovoltaic Total Radiation Sensor

User Manual V.02



Please read this manual carefully before use and keep it properly for future reference.

Thank you for purchasing our product!

As our products are continuously improved, the product you purchased may differ slightly from the illustrations in this manual without prior notice. Please refer to the actual product.

Product Introduction

YGC-JYZ Photovoltaic Total Radiation Sensor (Transmitter) can be used to measure the total solar radiation in the spectral range of 0.3-1.1 μm . If the sensing surface is facing downward, it can measure reflected radiation, and with a shading ring, it can measure scattered radiation. The core component of the radiation sensor is a high-precision photosensitive element with excellent stability and high accuracy. Additionally, a quartz glass dome, precision-crafted through optical cold processing, is installed outside the sensing element to effectively prevent environmental factors from affecting its performance. This product is widely applicable in fields such as meteorology, energy, agriculture, and construction.

Technical Parameters

Power Supply		<input type="checkbox"/> DC 5V <input type="checkbox"/> DC 12V <input type="checkbox"/> DC 24V
		<input type="checkbox"/> Others
Output Signal	Current	<input type="checkbox"/> 4~20mA <input type="checkbox"/> 0~20mA
	Voltage	<input type="checkbox"/> 0~2.5V <input type="checkbox"/> 0~5V
	Serial Port	<input type="checkbox"/> RS485 (<input type="checkbox"/> Default Modbus <input type="checkbox"/> ASCII)
		<input type="checkbox"/> RS232 (<input type="checkbox"/> Default Modbus <input type="checkbox"/> ASCII)
Others		
Cable Length		<input type="checkbox"/> Standard: 2.5 meters <input type="checkbox"/> Others:

Spectral Range: 300~1100nm

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Resolution: 1 W/m²

Measurement Range: 0~1500 W/m²

Sensitivity: 7~14 $\mu\text{V}/(\text{W}\cdot\text{m}^{-2})$

Accuracy: $\pm 5\%$

Load Capability: Current Output: Impedance $R_L \leq 250 \Omega$

Voltage Output: Impedance $R_L \geq 1K \Omega$

Response Time: <5 seconds

Cosine Response: < $\pm 10\%$ (at 10° solar altitude angle)

Non-Linearity: < $\pm 5\%$

Annual Drift Rate: < $\pm 5\%$

Operating Environment: Temperature -40°C~60°C; Humidity $\leq 100\%RH$

Product Weight: Sensor 420 g

Product Power Consumption: 0.48 W

Calculation Formulas

Current Output	
4-20mA	$F = (I - 4) / 16 * 1500$

0-20mA	$F = I / 20 * 1500$
Voltage Output	
0-2.5V	$F = V / 2.5 * 1500$
0-5V	$F = V / 5 * 1500$

F: Total radiation value, unit: W/m²

I: Sensor output current, unit: mA

V: Sensor output voltage, unit: V

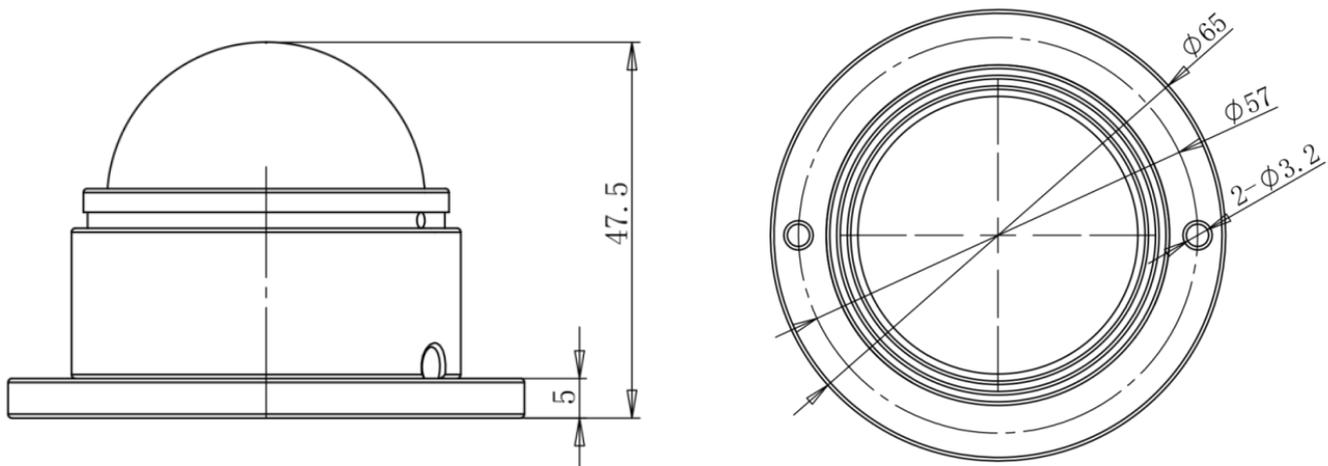
Wiring Method

(1) If the sensor is equipped with our company’s instrument: Simply connect the sensor directly to the corresponding interface on the instrument using the sensor cable.

(2) If the sensor is purchased separately: The wiring sequence is as follows:

Wire Color	Output Signal		
	Voltage/Current	RS485	RS232
Red	Power Positive	Power Positive	Power Positive
Black		A+	Connect to device RX, computer serial port pin 2
Yellow		B-	Connect to device TX, computer serial port pin 3
Green	Power Negative	Power Negative	Power Negative
White	Signal		

Structural Dimensions



Explanation of Sensor Communication Protocol

I. If you are using a single sensor connected directly to a computer to read data: It is recommended to use the company’s proprietary protocol, which allows for intuitive display in ASCII code (hex for transmission,

non-hex for reception).

II. If you are using multiple sensors interconnected with PLCs, SCADA systems, or programmable data loggers: It is recommended to use the standard ModBus-RTU protocol (hex for both transmission and reception).

Standard ModBus-RTU Communication Protocol

I. Serial Port Format

Data bits: 8 bits, Stop bit: 1 bit, Parity: None, Baud rate: 9600 bps, Serial debugging software set to hex transmission and reception, communication interval at least 1000 ms, CRC in the manual refers to the checksum, 2 bytes.

II. Communication Format

【1】 Writing the Device Address (e.g., write address 01)

Send	00	06	00	20	00	01	48	11
Description	Address	Write	Starting Address		New Address		CRC Check	
Return	00	06	00	20	00	01	48	11
Description	Address	Write	Starting Address		New Address		CRC Check	

If the return is 01 86 ***, the configuration has failed.

【2】 Reading the Device Address (e.g., read the address of device 1)

Send	00	03	00	20	00	01	84	11
Description	Address	Read	Starting Address		Number of Points		CRC Check	
Return	00	03	02		00	01	44	44
Description	Address	Read	Data Length		Device Data		CRC Check	

【3】 Reading Register Data (e.g., read data from address 1)

Send	01	03	00	00	00	01	84	0A
Description	Address		Starting Address		Number of Points		CRC Check	
Return	01	03	02		00	26	39	9E
Description	Address		Data Bytes		Device Data		CRC Check	

The sensor returns data as 0x0026, which converts to decimal 38, indicating a total radiation value of 38 W/m².

【4】 Reading the Device Communication Baud Rate (e.g., baud rate = 9600)

Send	01	03	00	10	00	01	85	CF
Description	Address	Read	Starting Address		Number of Points		CRC Check	
Return	01	03	02		00	02	39	85
Description	Address	Read	Data Length		Device Data		CRC Check	

For example, if the returned data is 00 02, the baud rate = 4800 * 2 = 9600.

【5】 Writing the Device Communication Baud Rate (e.g., write baud rate 9600)

Send	01	06	00	10	00	02	09	CE
Description	Address	Write	Starting Address		New Baud Rate		CRC Check	

Return	01	06	00	10	00	02	09	CE
Description	Address	Write	Starting Address		New Baud Rate		CRC Check	

Baud Rate = Data * 4800. For example, if the returned data is 00 02, the baud rate = 4800 * 2 = 9600. Supported baud rates include 4800, 9600, 14400, 19200, 38400, 57600, and 115200. If an unsupported baud rate is written, the device will automatically reset to 9600 after a restart.

If the return is **01 86 *****, the configuration has failed.

【6】 Switching the Communication Protocol (e.g., switch to ASCII protocol)

Send	01	06	00	14	00	03	89	CF
Description	Address	Write	Starting Address		01-MODBUS 03-ASCII		CRC Check	
Return	01	06	00	14	00	03	89	CF
Description	Address	Write	Starting Address		Data		CRC Check	

If the return is **01 86 *****, the configuration has failed.

The protocol is switched from 01-MODBUS to 03-ASCII.

ASCII Proprietary Communication Protocol

I. Serial Port Format

Data bits: 8 bits, Stop bit: 1 bit, Parity: None

Baud rate: 9600 bps, Communication interval: At least 1000 ms between two communications

II. Communication Format

【1】 Writing a New Device Address (e.g., write address 01)

Send	AA	00	10	00	01
Description	Start	Broadcast Address	Write	Write Address	New Address
Return	OK				
Description	Successfully wrote the new address				

【2】 Reading the Device Address

Send	AA	00	03	00	00
Description	Start	Broadcast Address	Read	Read Address	
Return	Address=001				
Description	The read address is 1				

【3】 Reading Real-Time Data

Send	AA	01	03	0F	00
Description	Start	Device Address	Read	Read Data	
Return	FS=0038W/m ²				
Description	Returns the total solar radiation value of 38 W/m ²				

【4】 Switching the Communication Protocol (e.g., switch to MODBUS protocol)

Send	AA	01	10	01	01
Description	Start	Address	Write	Write Protocol	01-MODBUS

					03-ASCII
Return	OK				
Description	Successfully wrote the new protocol				

The protocol is switched from 03-ASCII to 01-MODBUS.

Transitional characters such as spaces are omitted in the above description.

Serial port software (e.g., SSCOM3.3) should enable HEX sending but disable HEX display. When the device is powered on, it will return Start.

Modbus CRC Checksum Steps

1. Initialize a 16-bit register to hexadecimal FFFF; this register is called the CRC register.
2. XOR the first 8-bit data with the low byte of the CRC register, and store the result in the CRC register.
3. Right shift the contents of the CRC register by one bit (towards the low-order bit), and fill the highest bit with 0. Check the lowest bit.
4. If the lowest bit is 0: repeat step 3 (shift again).
If the lowest bit is 1: XOR the CRC register with the polynomial A001 (binary: 1010 0000 0000 0001).
5. Repeat steps 3 and 4 until 8 shifts have been performed, which completes the processing of the 8-bit data.
6. Repeat steps 2 to 5 for the next 8-bit data.
7. The final value in the CRC register is the CRC checksum (note: the resulting CRC code is low byte first, high byte last).

Precautions

1. Check whether the packaging is intact and verify that the product model matches the ordered specifications.
2. Do not perform wiring while the device is powered on. Ensure the wiring is correct and secure before powering on.
3. The length of the sensor cable can affect the product's output signal. Do not modify the product without permission. If modifications are necessary, contact the manufacturer.
4. The sensor is a precision instrument. Users should not disassemble it, nor should they allow sharp objects or corrosive liquids to come into contact with the sensor surface to avoid damaging the product.
5. Keep the calibration certificate and product qualification certificate safe. These must accompany the product when it is returned for repair.

Troubleshooting

1. The display value of the instrument is incorrect when using analog signals or RS232, RS485 output. This may be caused by wiring issues or communication port faults, resulting in the inability to obtain correct data. Please check whether the wiring is correct and secure, whether the port is occupied, and whether the port settings are correct;
2. If the above reasons are not the cause, please contact the manufacturer.

Selection Table

Model	Power Supply	Output	Description
YGC-JYZ			Photovoltaic total radiation sensor
	5V		5V power supply
	KV		7-30V power supply
		W1	RS232 (default Modbus protocol)
		W2	RS485 (default Modbus protocol)
		V	0-5V
		V2	0-2.5V
		A1	4-20mA
		A2	0-20mA

Example: YGC-JYZ-5V-W2: Photovoltaic total radiation sensor, 5V power supply, RS485 signal output (default Modbus protocol).