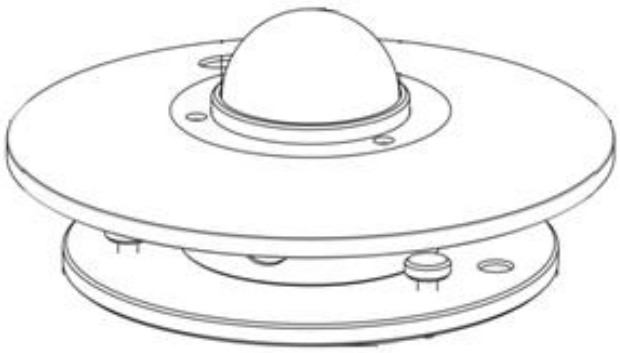
TRUSTED RELIABLE
INSTRUMENTATION

Total Solar Radiation Sensor

BGT-TBQ



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1. Products Introduction

BGT-TBQ total radiation sensor uses pyroelectric sensor principle, used in conjunction with various radiation the total solar radiation, the reflected radiation, scattered radiation, infrared radiation, visible light, ultraviolet radiation, long wave radiation.

Core inductive element of the sensor, using winding plating multi-contact thermopile, its surface is coated with the black coating of the high absorption rate. The hot junction is located in the body, hot and cold contacts to generate thermoelectric power. Within the linear range, in proportion to the output signal and solar irradiance.

The double glass is in order to reduce the impact of the air convection radiation table, the inner cover is set in order to cut off the infrared radiation of the nacelle itself.

2. Application

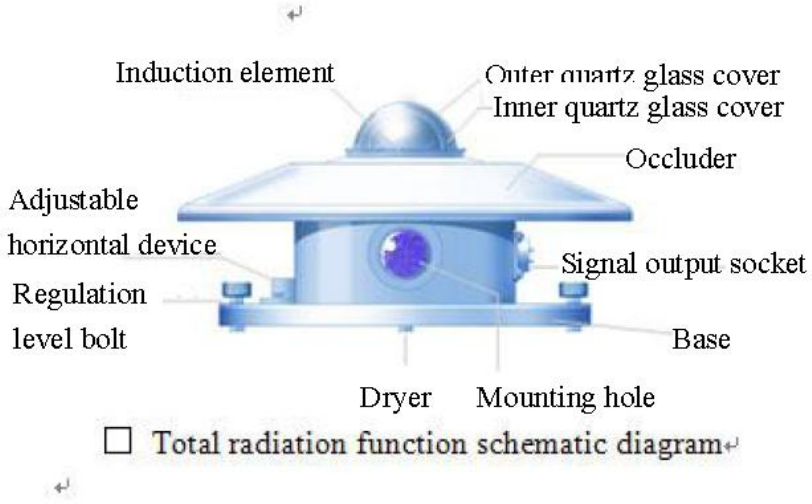
This sensor is used to measure the spectral range of 0.3-3μm,solar radiation, can also be used to measure the incident solar radiation to the slant of the reflected radiation can be measured,such as the induction downwardly facing, light shielding ring measurable scattered radiation. Therefore, it can be widely applied to the use of solar energy, meteorology, agriculture, building materials, aging and atmospheric pollution and other departments to do the measurement of solar radiation energy.

3. Technical Parameter

Sensitivity	7~14μV▪m^2/W
Spectral Range	0.3~3μm
Measuring Range	0~2000W/m^2
Resolution	1W/m^2
Accuracy	±3%
Response Time	≤35S(99%)
Internal resistance	Approximately 250Ω
Spectral selectivity	≤±10%
Non-stability	≤±3%
Tilt response	≤±3%
Azimuth response error	≤±30W/m^2
Temperature characteristics	±8% (-40℃ to +40℃)
Non-linear	≤3%
Working Temp. and Humi.	-40~+50℃, 0-100% RH
Cable Length	2.5m or customized
Power Supply	DC5V or DC9~30V
Output	RS485 Modbus/ASCII, RS232 Modbus/ASCII, 4~20mA, 0~20mA, 0~5V, 0~2.5V or others

4. Overall Structure

4-1 sensor dimension



4-2 Schematic diagram of total radiation function

5. Calculation Formula

Original 0-20mV:	
F=H/N*1000	
Current (0~2000W/m^2)	
4-20mA	F= (I-4) /16*2000
0-20mA	F=I/20*2000
Voltage (0~2000W/m^2)	
0-2.5V	F=V/2.5*2000
0-5V	F=V/5*2000

6. Installation and Connection

The sensor should be installed in the space, around the place above the sensing surface without any obstacles. Then the radiation table cable plug is on the north, adjust level position, firmly fixed, then the total radiation sensor output cable acquisition equipment connected to observation. The best cable is securely fixed to the mounting bracket to reduce the fracture or interruptions occur intermittently windy days.

(1) If the sensor is equipped with our d, directly use the sensor cable to connect the sensor with the corresponding interface on the instrument.

(2) If just order sensor, check the wire definition as following:

Cable Color	Output Signal			
	Original 0-20mV	Voltage/Current	RS485	RS232
Red	Signal+	VDD	VDD	VDD
Black	Signal-	GND	A+	Connect device TX, computer serial port 2
Yellow	Signal-	Signal output	B-	Connect device RX, computer serial port 3
Green			GND	GND, computer serial port 5

7. Communication Protocol

1.If you are using a single sensor connected to the computer to read data directly, it is recommended to use the ASCII private protocol (see page 4), you can visual display in ASCII (hex send, non-hex receive);
2.If you are multi-sensor connected to the PLC,configuration or access programmable collector, it is recommended to use the Standard ModBus-RTU protocol (see below, hex send and receive).

7.1 Standard ModBus-RTU Protocol

7.1.1 The serial format

8 data bits, 1 stop bit, no parity bit. Baud rate 9600 bps, serial debugging software set to send and receive hex, the two communication intervals of at least 1000ms above, the instructions in the CRC for the parity bit, two bytes.

7.1.2 Communication format (eg: default add is 00)

[1] Write device address (eg: write address 01)

Send	00	06	00	20	00	01	48	11
Description	add	Write	Start address		New address		CRC check	
Return	00	06	00	20	00	01	48	11
Description	add	write	Start address		New address		CRC check	

[2] Read register data (eg: read address 01)

Send	00	03	00	20	00	01	D4	1B
Description	Add	read	Start address		New add		CRC Check	
Return	00	03	02	00	01		44	44
Description	Address	read	Data length		Device Address		CRC Check	

[3] Read register (eg: read address 01)

Send	01	03	00	00	00	01	84	0A
Description	Address		Start Address		Read points		CRC Check	
Return	01	03	02		00	26	39	9E
Description	Address		Data byte		Device data		CRC Check	

The sensor returns data 0x0026 converted to decimal 38, indicating the radiation value of 38W/m^2)

[4] Read device baud rate

Send	01	03	00	10	00	01	85	CF
Description	Add						CRC Check	
Return	01	03	02		00	02	39	85
Description	Add		Data byte		Baud rate		CRC CHECK	

Baud rate = data *2 Return data is 00 02, so baud rate =48

[5] Write device baud rate(eg. Write baud rate 4800)

Send	01	06	00	10	00	02	09	CE
Description	Add	write	Start add		New baud rate		CRC check	
Return	01	06	00	10	00	02	09	CE
Description	Add	write	Start add		New baud rate		CRC check	

Baud rate = data *4800.Return data 00 02, then baud rate =4800*2=9600.The supported baud rates are 4800, 9600, 14400, 19200, 38400, 57,600, and 115,200.If any other unsupported baud rate is written, it is automatically restored to 9600 on restart.

Returning 01 86 *** is an unsuccessful configuration

[6] Change communication protocol (Eg; change to ASCII protocol)

Send	01	06	00	14	00	03	89	CF
Description	Add	Write	Start add		01-MODBUS 03-ASCII		CRC	
Return	01	06	00	14	00	03	89	CF
Description	Add	write	Start add		Data		CRC	

Returning 01 86 *** is an unsuccessful configuration

Change the protocol from 01-MODBUS to 03-ASCII

7.2 ASCII Private protocol

7.2.1 The serial format

Data bit 8, stop bit 1, parity bit none.

Baud rate 9600bps,two communication intervals at least 1000ms above

7.2.2 Communication format

[1] Write device address (eg: write address 01)

Send	AA	00	10	00	01
Description	Start address	Broadcast add	write	Write add	New address(1-255)
Return			OK		
Description			Write new address successfully		

[2] Read device address

Send	AA	00	10	00	01
Description	START	Broadcast add	Write	Write add	New Add
Return			Address=001		
Description			Read address is 1		

[3] Read real-time data

Send	AA	01	03	0F	00
Description	Start	Device add	read	Read data	
Return	FS=1001W/m2				
Description	Return value 1001W/m2				

[4] Change communication protocol (Eg; change to Modbus protocol)

Send	AA	01	10	01	01
Description	start	add	write	Write protocol	01-MODBUS 03-ASCII
Return	OK				
Description	Write protocol in success				

CChange the protocol from 03-ASCII protocol to 01-MODbus protocol.

Transition characters such as Spaces are omitted in the above instructions.

Serial port software (such as SSCOM3.3) will return Start when HEX is checked and HEX display is not checked.

In the above description, the transition characters such as spaces are ignored.

7.3 Modbus CRC check steps

1. Preset 16-bit register hexadecimal FFFF, said the register for the CRC register;
2. The first 8-bit data and CRC register low or XOR, the result placed in the CRC register;
3. The contents of the register to the right one (toward the low), with 0 to fill the most significant bit, check the lowest bit;
4. If the least significant bit is 0: Repeat step 3 (shift again) If the least significant bit is 1: The CRC register is XOR'ed with the polynomial A001 (1010 0000 0000 0001)
5. Repeat steps 3 and 4 until 8 shifts to the right so that the entire 8-bit data is completely processed;
6. Repeat step 2 to step 5 for the next 8-bit data processing;
7. The resulting CRC register is the CRC code (the resulting CRC code is low after high)

8. Precautions

1. Please check the packaging is intact, and check the product model is consistent with the selection;
2. Do not live wiring, check the wiring is completed after the correct power;
3. Sensor length will affect the product output signal, do not use when changing products. If there is a need to change,please contact with the manufacturer;
4. Sensor is a precision device, the user when in use, please do not disassemble, with sharp objects or corrosive liquid contact with the sensor surface, so as not to damage the product;
5. Please save the test certificate and certificate, and return the product for maintenance.

9. Trouble Shooting

1. If the indicator value is 0, check whether the protective cover is removed and whether there is sunlight. Please do not discard the protective cover.
2. Analog signal or RS232, RS485 output instrument display value is not correct. May not be able to get the correct data due to wiring problems or communication serial port failure. Please check the wiring is correct, solid, serial port is occupied, the serial port settings are correct;
3. If not for the above reasons, please contact the manufacturer.

10. Maintenance

1. Open or close the protective cover with special care as the quartz glass cover is valuable and fragile.To keep the mask bright and clean, always rub it with a soft cloth.
2. The quartz glass cover can not water, the cover should not condense water vapor.Always check whether the desiccant in the dryer becomes damp (from orange to dark), otherwise, replace the desiccant in time or take it to the oven to dry so that it becomes orange again for use;
3. Fall heavy rain (snow, ice, etc.) or a long time of rainfall, in order to protect the radiation table, the

observer will be based on the specific situation of the best cover, the cover is open after the rain stopped;