Sistemi per monitoraggi
ambientali e telecontrolli

Global Solar Radiation Sensor

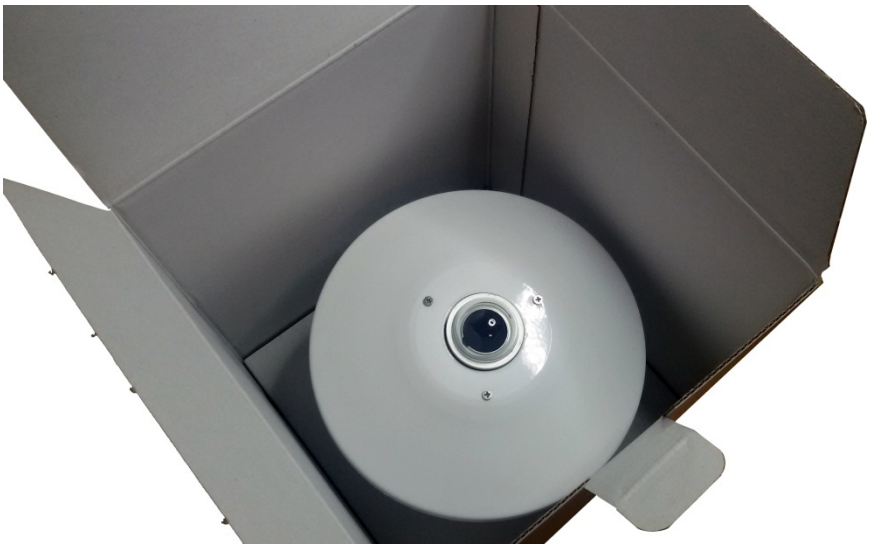
Mod. RSG e RSG1

Manual

Summary

1.1 Packaging and mounting

The sensor is placed in its original packaging already mounted.



1.2 Functioning and features

The sensor is made of a **thermopile transducer** and it can be classified as First Class or Second Class, according to ISO9060 and to standard classification for pyranometers, which defines specific performance and construction features, ensuring high accuracy and sensibility. The transducer is protected by a quartz glass dome (K5), which ensures high **sensibility in 0.3µm ÷3µm spectrum**. The sensor is made according to WMO standards (World Meteorological Organization).
The sensor has the following outputs: natural from thermopile, 0÷2Vdc or 4÷20mA or digital RS485/Modbus rtu. The global solar radiation sensor or Pyranometer is made with materials of high reliability and duration, which allow to maintain in time initial characteristics of sensibility and accuracy.
The thermopile sensing element, after sun irradiation, produces a voltage signal, which is proportional to the heating of the hot junctions. That signal is, typically:

$$10 \times (mV) / (KW \times m^2)$$

The mechanical robustness and the use of materials such as **anodized aluminum** and **stainless steel**, guarantees an excellent resistance to corrosion due to atmospheric agents, assuring long duration in time. The sensor is equipped with **electrical discharger**.

Sensor type	***Wind speed***
Type	RSG (for different models see their own datasheets)
Compliance	WMO
Measuring range	0÷2000 W/m^2
Spectral range	0.3µm ÷ 3µm
Typical sensibility	10 µV/(W/m^2) on 2π sr
Typical output constant	10 mV / (kW/m^2)
Resolution	< 8 W/m^2
Response time	< 25sec
Offset at zero	< 20 W/m^2 (at 200 W/m^2) < ±6 W/m^2 (ΔT = 5K/h)
Long term stability (1 year)	< ±2%
Response to the Cosine law	< ±22 W/m^2
Temperature response (ΔT 50K)	< 8%
Non linearity	< ±2%
Tilt response in 0 ÷ 90°	< ±4%
Expected daily uncertainty	< 10%
transducer type	Thermopile
Output signal	10µV/W/m^2 from termopile 0÷2Vdc, 4÷20mA or RS485 ModBus
Operation intervals	-40 ÷ +80°C
Output impedance	< 40 ohm
Protections	for short circuit and lightning
Made of	anodized aluminum and stainless steel screws
Power supply and consumption	(self-powered for N type, 10÷30Vdc <0,1W for other types
Weight	< 600g

Features written in the table can be modified. For updating always see the latest version of the datasheet.

1.3 Available electrical outputs and interfacing

The sensor is usually available with 4 different outputs (pre-configured in factory), that correspond to 4 order codes, respectively (named XXX the sensor code):

XXX – **N** : Sensor with natural output from thermopile [**µV**]
XXX – **A** : Sensor with voltage output 0-2Vdc = 0…2000W/m^2 [**W/m^2 = (V •1000)**]
XXX – **B** : Sensor with current output 4-20mA = 0…2000W/m^2 non loop [**W/m^2 ={2000•(mA - 4)]/16}**]
XXX – **C** : Sensor with digital output RS485 or ModBus- see below.

The supply includes the solder connector or a cable with ends for terminal block

In case of sensors with digital output, there are two cases:

- ***RS845 Interface (Half duplex)***
  - Standard communication settings are:
    baudrate: **9600**
    parity: **N**
    data bit: **8**
    stop bit: **1**
  - Data request command is: **003, CR** (xxx represents the sensor ID always expressed in 3 digits by putting 0 for numbers less than 100, or 10, example 013; CR = Carriage Return; if set at 000 answer all sensors on the same line 485, example 000CR). *See § 1.8*
  - The response to any sensor request is the measure value in the programmed engineering unit (eg. °C or %Rh), so isn't necessary calculate the value again.

- ***RS845-MODBUS Interface (Half duplex)***
  - Standard communication settings are:
    baudrate: **9600**
    parity: **N**
    data bit: **8**
    stop bit: **1**
  - The sensor answers to MODBUS RTU command only with **FUNCTION CODE 0x03** (Read Holding Register), on the same ID of the RS485; the protocol allows the reading of the measure value, which is stored in two MODBUS registers with the **IEE754 representation.** The floating point value is represented with 32 bit, occupying two MODBUS registers of 16 bit.
  - Modbus addresses to be used are:

40002 - 40003 (2 registers required with a single command)

1.4 Calibration

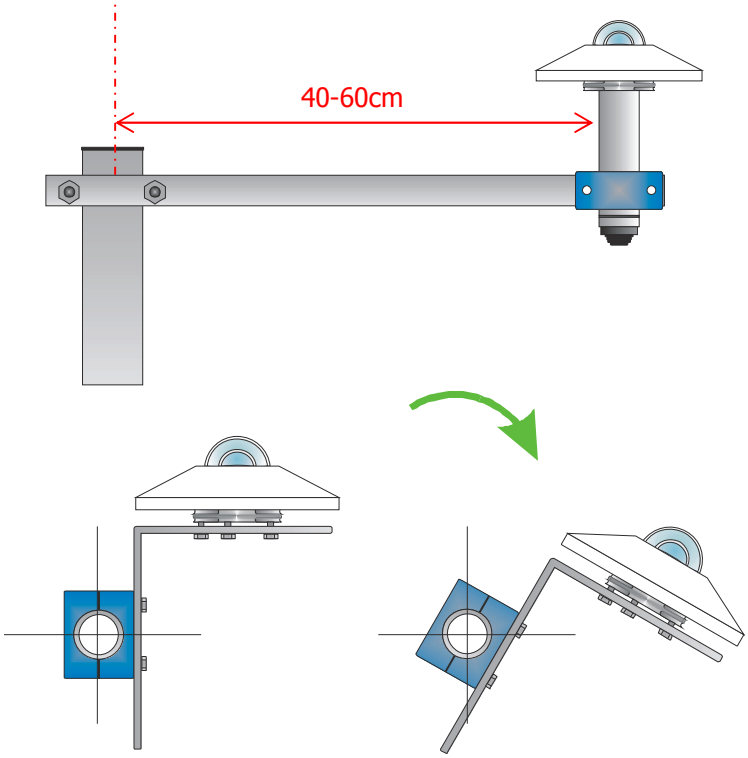
After having assembled the sensor, it is functionally tested, connecting It to the proper measurer, where there is also connected a solar radiation sensor, used as the primary reference tool. The testing is made comparing measures acquired by the two sensors, that mustn't differ of a value higher than the tested sensor accuracy. The reference sensor is a device of a superior class, while the testing table follows the ISO9847 norm IIc Method.

1.5 Cleaning and maintenance

To ensure high measurement accuracy, it's necessary to always keep clean the outer dome of the pyranometer, therefore the greater is the frequency of the cleaning of the dome, the better will be the measurement accuracy. You can wash the dome with towel used to clean photographic lenses and with water, if it were not enough, use pure ethyl alcohol. After the cleaning with alcohol, it's necessary to clean the dome again only with water.

1.6 Installation

The pyranometer should be installed in a place easily accessible, for the periodic maintenance and cleaning of the dome. Buildings, trees or any other obstacle shouldn't go over the horizontal plane where the pyranometer is installed. If this is not possible, it's recommended to find a place where obstacles in the sun path from sunrise to sunset are less than 5°, avoiding that they may project the reflection of the sun (or its shadow) onto the pyranometer.
The pyranometer must always be directed toward the sun (toward SOUTH if you are in the Earth's NORTH hemisphere).



Depending on the type of the pyranometer and on the installation needs, it can be equipped with standard support for the installation on the horizontal plane on metal support, or with special support, which allows the rotation around the vertical axis and then the installation on an oblique plane.

1.7 Validity of certificates

Unless otherwise indicated, the sensor warranty is 24 months from the manufacturing date, while the validity of the certification is 12 months from first use if stored in a depot suitably to the characteristics written on the datasheet.

1.8 ID's sensor for serial communication

ID for RS485*	Measure
1	Temperature
2	Humidity
3	Global Solar adiation
4	Wind Direction
5	Evaporation
6	Hydrometic Level
7	Phreatic Level
8	Battery Voltage
9	Wind Speed
10	Rain Fall
11	Net Solar Radiation
12	Snow Level
13	Pressure
14	Voltage
15	Evapotranspiration
16	Leaf wetness
17	pH
18	Conductivity
19	Counter (digital)
20	Cracks measure
21	Inclinometer
22	Load Cell
23	Redox
24	Oxygen Solution
25	Torbidity
26	Extensimeter
27	Linear Moving
28	Frequency
29	CH4
30	THC
31	NMHC
32	Current
33	Flow
34	CO
35	NO
36	NO_X
37	NO_2
38	O_3
39	SO_2
40	Energy

* Check if it is the latest table