TrackSo

Solar PV Monitoring & Analytics

Datasheet & Installation Guide
Solar Irradiation Sensor [PYRA300V]

Internet of Things

Solar Energy

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MODEL

PYRA 300 V

DATASHEET

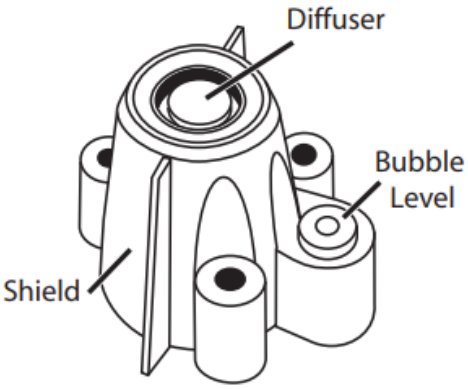
Introduction

The solar irradiation sensor or solar pyranometer measures global radiation, the sum at the point of measurement of both the direct and diffuse components of solar irradiance. The sensor's transducer, which converts incident radiation to electrical current, is a silicon photodiode with wide spectral response. From the sensor's output voltage, the console calculates and displays solar irradiance. It also integrates the irradiance values and displays total incident energy over a set period of time.

The outer shell shields the sensor body from thermal radiation and provides an airflow path for convection cooling of the body, minimizing heating of the sensor interior. It includes a cutoff ring for cosine response, a level indicator, and fins to aid in aligning the sensor with the sun's rays. The space between the shield and the body also provides a runoff path for water, greatly reducing the possibility of rain or irrigation-water entrapment. The diffuser is welded to the body for a weather-tight seal; it provides an excellent cosine response. The transducer is a hermetically-sealed silicon photodiode with integrated amplifier. Spring-loaded mounting screws, in conjunction with the level indicator, enable rapid and accurate leveling of the sensor. Each sensor is calibrated against a secondary standard pyranometer in natural daylight.

Specifications

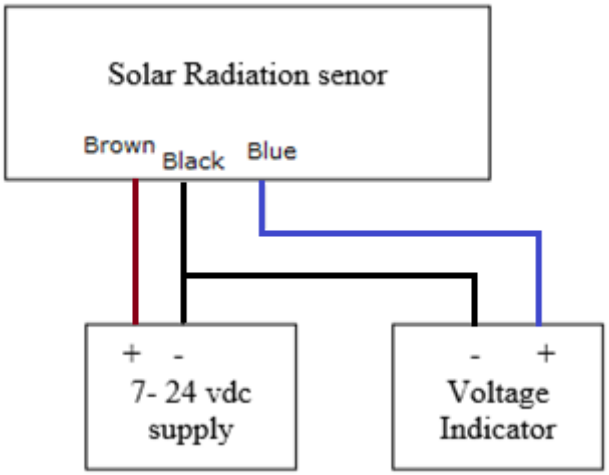
Operating Temperature	-40° to +65° C
Storage Temperature	-45° to +70°C
Transducer	Silicon photodiode
Spectral Response	400 to 1100 nanometers
Cosine Response	
Percent of Reading	±3% (0° to ±70°), ±10% (±70° to ±85°)
Percent of Full Scale	±2% (0° to ±90°)
Temperature Coefficient	+ 0.12% per °C
Reference temperature	25°C
Housing Material	UV-resistant PVC plastic
Weight	250 g
Range	0 to 1800 W/m2
Accuracy	± 5% of full scale
Drift	up to ±3% per year
Sensor Cable Length	2m
Output A, B, C are 3 different models	A. 0-5 V_{DC} (Voltage Type) B. 4-20 mA (Current Type) C. MODBUS RTU-RS485
Operating Voltage	7-24 V_{DC}, 2 to 5 mA
Recommended calibration interval	1 Year



Solar Radiation Sensor

I/O Specifications for 0-5V Sensor Output

- Brown- Input 12VDC
- Black- Ground
- Blue- Output (0 to 5 VDC);



0-5 Vdc Sensor Output Wiring Diagram

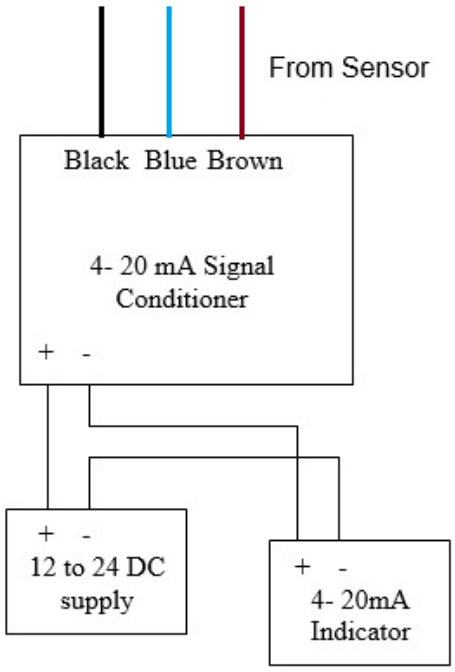
I/O Specifications for 4-20ma Sensor Output

Input
Raw Sensor Input

- Brown-, Black & Blue

Output

- + & - ports with 4-20ma Output



4-20ma Sensor Output Wiring Diagram

INSTALLATION

Guidelines

The following guidelines are recommended while installation of a pyranometer:

- Pyranometer is to be mounted in an easy-to-reach location in order to clean the dome regularly and carry out maintenance. At the same time, make sure that no buildings, constructions, trees or obstructions exceed the horizontal plane where the pyranometer lies. If this is not possible, select a site where obstructions in the path of the sun from sunrise to sunset do not exceed 5 degrees of elevation. N.B The presence of obstructions on the horizon line affects significantly the measurement of direct irradiance
- Pyranometer is to be located far from any kind of obstruction, which might reflect sunlight (or sun shadow) onto the pyranometer itself.
- The sunlight sensor must be installed at the same azimuth and tilt angle than the PV array.

Tools and Materials Needed

Please make sure you have all the necessary material as mentioned below:

- Wrench or pliers
- Wire cutters and stripper
- Multi meter
- Drill with 3/16 in drill bit (4.7 mm) to drill pilot holes
- Adjustable wrench or 11/32 in. wrench and 7/16 in
- Electrical Tapes to cover the wire

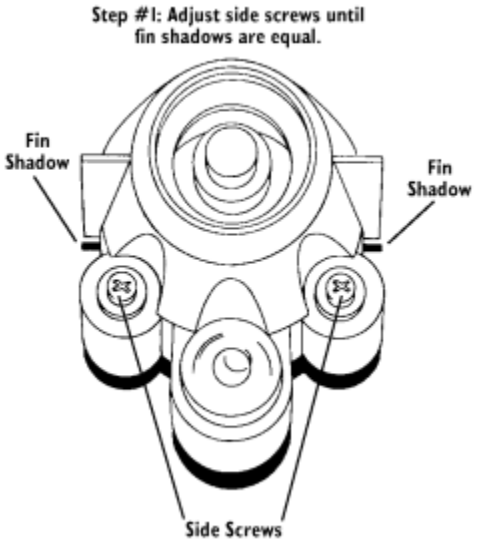
Location Recommendation

Use the following guidelines to determine the best location for mounting the Solar Radiation Sensor:

- The sunlight sensor must be installed at the same azimuth and tilt angle than the PV array (Drill it on the top of the panel).
- Pyranometer is to be located far from any kind of obstruction, which might reflect sunlight (or sun shadow) onto the pyranometer itself.

Mounting

- Using the bubble level on the sensor as a guide, adjust the sensor until it is level by tightening or loosening the screws.
- Small errors in alignment can produce significant errors. Be certain that the sensor is mounted level.
- Mount the sensor where it will not be in a shadow. Any obstruction should be below the plane of the sensor head. If that is not possible, try to limit obstructions to below 5 degrees, where the effect will be minimal.
- If possible, avoid locating the sensors in dusty locations. Dust, pollen, and salt residue that collect on the top of the sensor can significantly degrade accuracy.
- Ensure that the cables are free of crimps. Secure them to the support tubes with the provided cable ties so that they will not fray in the wind.
- Shade the sensor and make sure the reading changes
- If necessary, adjust the position of the sensor by tightening or loosening the leveling screws. When pointed directly at the sun, the shadows from the alignment fins should appear as shown in the illustration below:



Example Installations

Calibration

- If using Modbus sensor then the Pyranometer is factory calibrated.
  Output- 0-1800 W/m^2
- If using analog output senor then use the following info to calibrate.

  Output: 0 - 5 V_{DC} (0- 1800 W/m^2)
  Irradiance in W/m^2 = 360*Sensor Output voltage (in Volt)

  Output: 4-20mA (0-1800 W/m^2)
  Irradiance in W/m^2 = 112.5 (Output in mA - 4)

It is highly recommended that the calibration be checked annually

Logger Connections

- For ANALOG output connections (Voltage or Current) , please search for '*Installation Guide – Analog Sensors*' on: https://trackso.in/trackso-installation-manuals/

- For MODBUS output connections, please search for '*Installation Guide – MODBUS Sensors*' on: https://trackso.in/trackso-installation-manuals/

Sensor Maintenance

- Monthly maintenance
  - The frequency of cleaning is highly dependent upon the local weather and environmental conditions, such as dust, airborne pollutants or salt spray in marine environments. Ideally, the sensor should be cleaned every month.

    Note: Wipe the surfaces of the shield with a damp cloth to remove dirt and dust. You can wash it using water and standard papers for lens, and if necessary, using pure ETHYL alcohol. After using alcohol, clean again the dome with water only. The effectiveness of the radiation shield will be reduced if the surfaces of the shield are dirty.
- Yearly maintenance
  - Check all the electrical connections. Check cables for damage caused by accident or by rodents.
  - Inspect cable quality, inspect cable glands, inspect mounting position, inspect cable, clean instrument, clean cable, inspect levelling, change instrument tilt in case this is out of specification, inspect mounting connection, inspect interior of dome for condensation and take necessary corrective actions.
  - Due to the sensitivity of ultraviolet and solar radiation sensors, it is common practice for manufacturers to recommend recalibration after a period of time. You can get approximately 3% drift per year on the readings from these sensors. For applications demanding higher accuracy, the sensors should be calibrated once every year. Read more about common calibration practices here- https://trackso.in/knowledge-base/common-practices-for-pyranometer-recalibration/

- When operating multiple instruments in a network TrackSo recommends keeping procedures simple and having a few spare instruments to act as replacements during service and recalibrations.

Troubleshooting

Situation	Comments
The sensor signal / output is unrealistically high or low.	• Note that night-time signals may be negative (down to -5 W/m2 on clear windless nights), due to zero offset a. • Check if the pyranometer has clean domes. • Check the location of the pyranometer; are there any obstructions that could explain the measurement result. • Check the orientation / levelling of the pyranometer. • Check if the right calibration factor is entered into the algorithm. • Check the condition of the wiring at the logger. • Check the cable condition looking for cable breaks.
The sensor signal shows unexpected variations	• Check the presence of strong sources of electromagnetic radiation (radar, radio etc.) • Check the condition of the shielding. • Check the condition of the sensor cable. • Check if the cable is not moving during the measurement

Disclaimer

This sensor is a low-cost alternative to the Class 1/Class 2 sensors of the same type. Since this sensor fall under no class, there will be some variation in the real vs. expected values. If you wish to minimise the error/deviation in output values, we recommend that you purchase Class 1/Class 2 sensor.

Please note this product is not manufactured by TrackSo, but sold by TrackSo, warranties are only to the limits extended by the original manufacturer.

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Warranty

Applicable Warranty Term & Conditions is available on - https://trackso.in/warranty/

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