## Veinasa XS-TBQ02A

# Veinasa XS-TBQ02A Total Solar Radiation Sensor

Instruction Manual

## 1. Introduction

The Veinasa XS-TBQ02A is a total solar radiation sensor designed for precise measurement of solar radiation. This device measures the solar radiation received by a horizontal plane from a 2π steradian solid angle (hemisphere), with measurements expressed in Watts per square meter (W/m²). It operates on a passive principle, converting absorbed solar energy into an electrical signal proportional to the incident radiation.

## 2. Product Features

- **Measurement Principle:** Utilizes a passive mode of operation where a black coating on the sensor surface absorbs incident solar radiation, converts it into thermal energy, and generates a temperature difference. This temperature difference produces an output voltage directly proportional to the incident radiation.
- **Standard Compliance:** Rated as Class A according to ISO 9060/WMO standards, ensuring high accuracy and reliability.
- **Measurement Range:** Capable of measuring solar radiation from 0 to 2000 W/m².
- **Spectral Range:** Effective spectral response from 280 to 3000 nm (at 50% transmission point).
- **High-Precision Glass Cover:** Features a double-layer high-precision glass cover for enhanced protection and measurement accuracy.
- **Low Reflectivity:** Incorporates imported light-absorbing paint to significantly reduce reflectivity, leading to more accurate radiation measurements.




*Figure 2.1: Comparison of light absorption rates, highlighting the effectiveness of imported varnish in reducing reflectivity for improved measurement accuracy.*

## 3. Components Overview

The XS-TBQ02A sensor is designed for robust performance and ease of integration. Key components include:

- **Sensor Body:** The main housing containing the thermopile detector.
- **Double-Layer Glass Cover:** Protects the sensor element from environmental factors while allowing solar radiation to pass through.
- **RS485 Output Module:** An integrated module for digital communication, providing reliable data transmission.
- **Mounting Screws:** For secure installation.




*Figure 3.1: General view of the Veinasa XS-TBQ02A Total Solar Radiation Sensor.*




*Figure 3.2: Detailed view of the double-layer high-precision glass cover, designed for optimal protection and light transmission.*




*Figure 3.3: Illustration of the built-in RS485 output module, facilitating digital data communication.*

## 4. Setup and Installation

Proper installation is crucial for accurate measurements. Follow these general guidelines:

1. **Location Selection:** Choose a location that provides an unobstructed view of the sky, free from shadows cast by buildings, trees, or other structures, especially during peak sunlight hours.
2. **Mounting:** Securely mount the sensor on a stable, horizontal surface using the provided mounting hardware. Ensure the sensor is level to accurately measure radiation on a horizontal plane.
3. **Wiring:** Connect the sensor to your data acquisition system or controller according to the wiring diagram provided in the product documentation. Ensure correct polarity and secure connections for the 0-20mV or RS485 output.
4. **Power Supply:** Provide a stable 12-24VDC power supply to the sensor.
5. **Environmental Considerations:** While the sensor is designed for outdoor use, protect wiring and connections from extreme weather conditions.

## 5. Operating Principles

The XS-TBQ02A sensor operates on the principle of a thermopile. When solar radiation strikes the black coating of the sensor, it is absorbed and converted into heat. This heat creates a temperature difference between the hot junctions (exposed to radiation) and cold junctions (shielded from radiation) of the thermopile. This temperature difference generates a small voltage (0-20mV) that is directly proportional to the intensity of the incident solar radiation. For models with RS485 output, this analog voltage is converted into a digital signal for transmission.

## 6. Maintenance

Regular maintenance ensures optimal performance and longevity of your sensor:

- **Cleaning the Glass Cover:** Periodically clean the double-layer glass cover with a soft, damp cloth and mild detergent to remove dust, dirt, or debris that may accumulate and affect measurement accuracy. Avoid abrasive materials.
- **Inspect Wiring:** Regularly check all electrical connections and cables for signs of wear, corrosion, or damage. Ensure connections remain secure.
- **Check Mounting:** Verify that the sensor remains securely mounted and level. Re-tighten any loose screws if necessary.
- **Environmental Checks:** Ensure that no new obstructions (e.g., growing vegetation, new structures) are casting shadows on the sensor.

## 7. Troubleshooting

If you encounter issues with your XS-TBQ02A sensor, consider the following:

| Problem | Possible Cause | Solution |
|---|---|---|
| No output or incorrect readings | • Incorrect wiring<br>• Insufficient power supply<br>• Sensor obstruction<br>• Damaged cable | • Verify wiring against the diagram.<br>• Check power supply voltage (12-24VDC).<br>• Ensure no shadows or debris are on the sensor.<br>• Inspect cables for damage and replace if necessary. |
| Inconsistent readings | • Sensor not level<br>• Partial obstruction<br>• Interference | • Re-level the sensor.<br>• Clear any partial obstructions.<br>• Check for potential electromagnetic interference if applicable. |
| Output stuck at zero | • No solar radiation<br>• Sensor malfunction | • Verify during daylight hours with clear sky.<br>• If problem persists, contact support. |

## 8. Technical Specifications

| Specification | Value |
|---|---|
| Model Number | XS-TBQ02A |
| Measurement Range | 0 - 2000 W/m² |

| Specification | Value |
|---|---|
| Spectral Range | 280 - 3000 nm (50% transmission point) |
| Standard Rating | ISO 9060/WMO Class A |
| Output Signal | 0-20mV (analog) or RS485 (digital) |
| Power Supply | 12-24VDC |
| Product Dimensions | 8.27 x 1.5 x 8.27 inches (210 x 38 x 210 mm) |
| Item Weight | 4.41 pounds (2000 grams) |
| Manufacturer | China |

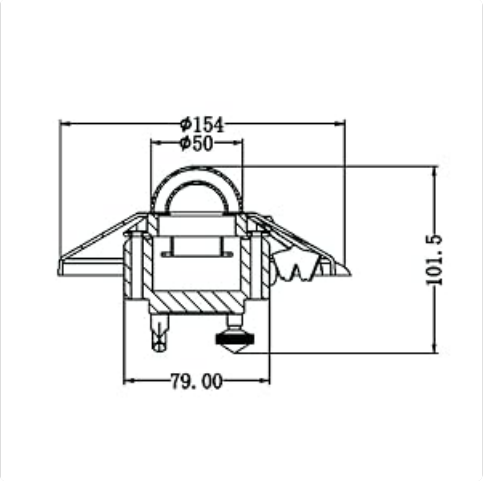



*Figure 8.1: Technical drawing illustrating the dimensions of the XS-TBQ02A sensor.*

## 9. What's in the Box

The product package typically includes:

- 1 x Veinasa XS-TBQ02A Total Solar Radiation Sensor

## 10. Warranty and Support

For warranty information and technical support, please refer to the documentation provided with your purchase or contact your vendor directly. Keep your purchase receipt for warranty claims.


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