Ultraviolet Sensor

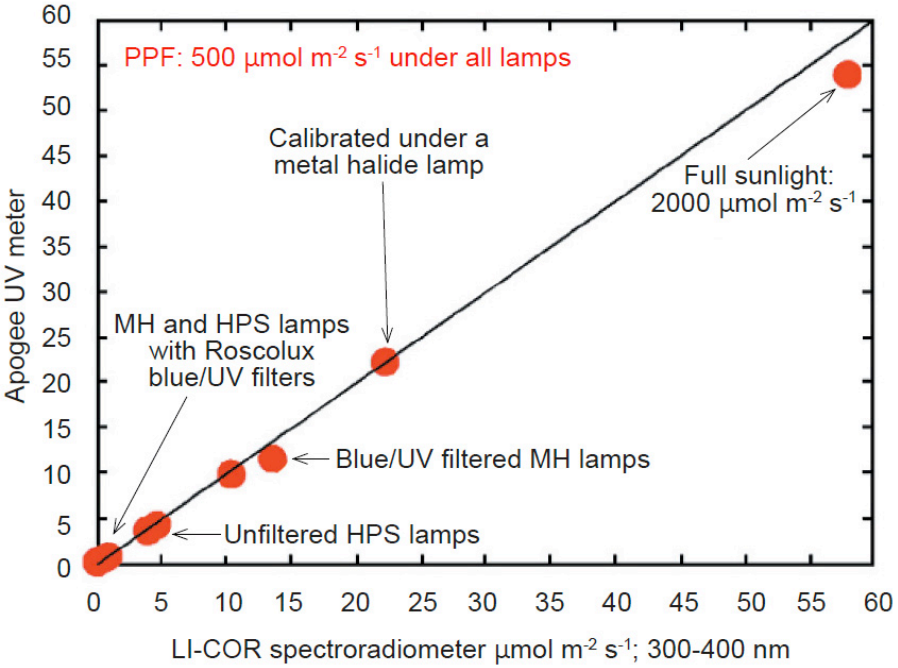
SU-100

Ultraviolet Sensor

This sensor measures the ultraviolet radiation between 250 and 400 nm in µmol m^{-2} s^{-1} (micromoles of photons per meters squared second).

Although the relative wavelengths of UV radiation differ among sunlight and electric lights, our measurements, shown in the graph below, indicate that this sensor provides a close estimate of the UV radiation coming from electric lamps. This sensor is particularly useful for determining the UV filtering capacity of the transparent plastic and glass barriers that are commonly used below electric lamps.

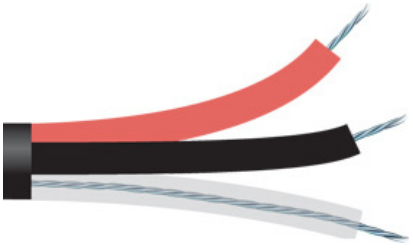
Apogee UV meter vs. LI-COR spectroradiometer under metal halide and high-pressure sodium lamps



Connection Instructions

Attach the sensor to a meter or datalogger capable of displaying or recording an mV output.

DO NOT attach the sensor to a power source.
The sensor is self-powered.
Applying voltage to the sensor will damage it.



Red	Positive (signal from sensor)
Black	Negative (signal from sensor)
Clear	Shield/Ground

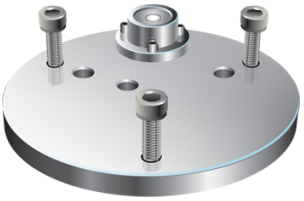
The model, serial number, production date, and calibration factor are located on the sensor cable.

Application

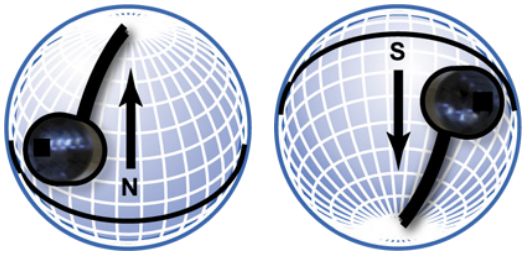
Measures UV radiation between 250 and 400 nanometers in µmol m^{-2} s^{-1} (micromoles of photons per square meter per second). The self-cleaning dome-shaped head prevents water accumulation. The sensor head is potted solid to prevent internal condensation in humid environments.

Mounting the Sensor

Mount the sensor to a solid surface with the nylon mounting bolt. The sensor should be mounted level for the most accurate measurements. We recommend using our leveling plate (AL-100). The sensor should be mounted with the cable pointing toward true north in the northern hemisphere or true south in the southern hemisphere to minimize azimuth error. The azimuth error is typically less than 1%.

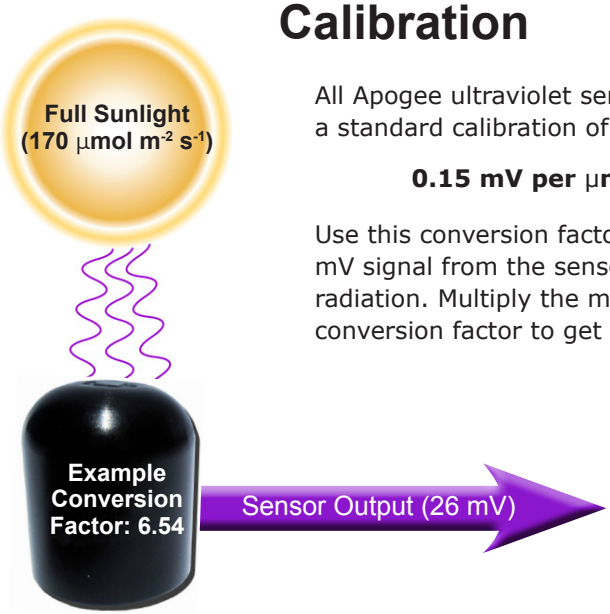


Model AL-100



Orientation

Calibration



All Apogee ultraviolet sensor models have a standard calibration of exactly:

0.15 mV per µmol m^{-2} s^{-1}

Use this conversion factor to convert the mV signal from the sensor to ultraviolet radiation. Multiply the mV output by the conversion factor to get µmol m^{-2} s^{-1}.

UV Radiation = sensor output * conversion factor
= 26 mV * 6.54 = 170 µmol m^{-2} s^{-1}

Cleaning

Debris on the sensor head is a common cause of low readings. The sensor has a domed head for improved self-cleaning from rainfall, but salt deposits can accumulate from evaporation of sprinkler irrigation water and dust can accumulate during periods of low rainfall. Salt deposits should be dissolved and removed with vinegar and a soft cloth or q-tip. Dust and other organic deposits are best removed with water, rubbing alcohol or window cleaner. *Never use an abrasive cleaner on the lens.*

Effects on Output

Cosine Response

Some of the radiation coming into a sensor at low angles is reflected, causing the reading to be less than it should be. The cosine-corrected head helps to capture radiation. The cosine error for typical applications is less than 10%.

Temperature Response

The temperature response is about 0.1% per degree Celsius. This temperature error is insignificant for most applications.

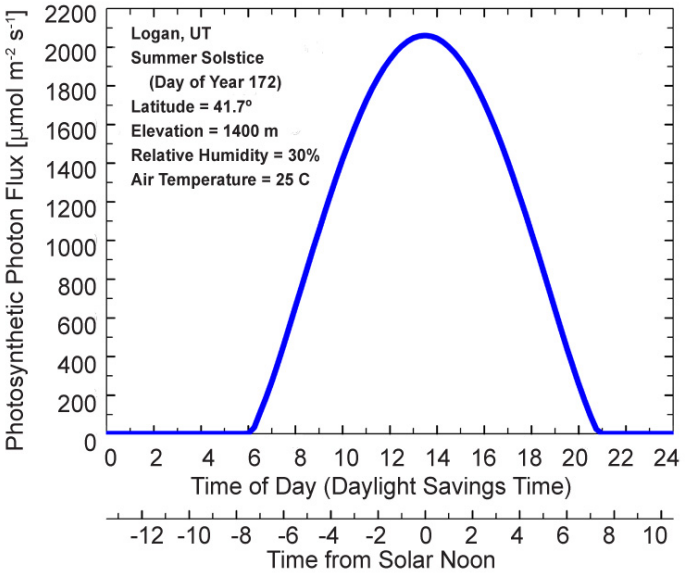
Long-Term Stability

The output of all radiation sensors tends to decrease over time as the detector ages. Our measurements indicate that the average decrease of the sensor is about 1% per year. We recommend returning the sensor for recalibration every 3 years.

The Clear Sky Calculator is designed to determine the need for radiation sensor recalibration. It determines the intensity of radiation falling on a horizontal surface at any time of the day in any location in the world. It is most accurate when used near solar noon in the summer months.

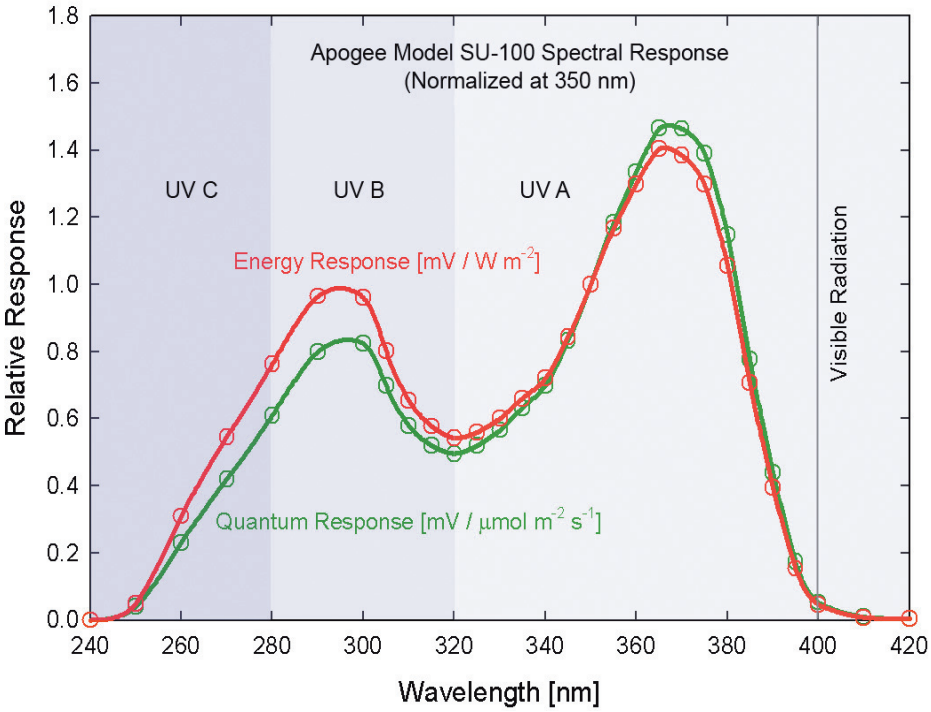
The calculator is found at www.clearskycalculator.com and is used by typing conditions into the Clear Sky model and comparing measured values with the calculated value for a clear sky. If the output of the sensor over multiple days at solar noon is consistently less than the model value (by more than 8%), the sensor should be cleaned and re-leveled. If the output is still low after a second test, email calibration@apogeeinstruments.com to discuss test results and the possible return of sensors. When used near solar noon over multiple clear, unpolluted days during the spring and summer months, it is estimated that the accuracy of the model can be ± 4% in all climates and locations around the world.

Example of Model Output



Measuring UV-B Radiation

Our measurements confirm those of others and indicate that less than 0.4% of the photon flux from sunlight falls below 320 nm; 2.3% falls between 320 and 350 nm, and 6% falls between 350 and 400 nm. Although the UV radiation between 250 and 320 nm is critically important in photochemical and photobiological reactions, only about 5% of the UV photons are in this range. Because only a small fraction of the photons are in the UV-B range, this meter cannot be used to selectively measure UV-B radiation. The sensor is sensitive to UV-B radiation, but it is included with the UV-A radiation to provide a total measurement of UV radiation.



Specifications

Absolute Accuracy

- ± 10%

Uniformity

- ± 5%

Repeatability

- ± 1%

Responsivity

- Approximately 0.15 mV per μmol m^{-2} s^{-1}

Output in Full Sunlight

- Approximately 26 mV (170 μmol m^{-2} s^{-1})

Linear Range

- 0 to 60 mV

Sensitivity

- Calibrated to approximately 6.5 μmol m^{-2} s^{-1} per mV

Input Power

- None, self-powered

Operating Environment

- Can be submerged in water (with or without mounting screw)

Materials

- Aluminum head, potted solid

Cable

- 5 meters of twisted-pair wire
- Foil shielded
- Santoprene jacket
- Ending in pigtail leads
- Additional cable is available in multiples of 5 meters

Dimensions

- 2.4 cm diameter by 2.75 cm height

Mass

- 75g

Warranty

- 1 year against defects in materials and workmanship

www.apogeeinstruments.com
techsupport@apogeeinstruments.com
435.792.4700
Fax: 435.787.8268