Net Radiometer | SN-500

Four-component measurement of net radiation with black-body pyranometers and pyrgeometers

Four-component Net Radiometer
Separate measurements of net radiation components provide best accuracy.

Digital Output
An on-board 24-bit A to D converter makes measurements and provides a digital SDI-12 output. This eliminates the need for multiple analog datalogger channels to measure each of the four components of net radiation.

Heated Sensors
Each of the four sensors includes a 0.2 W heater that keeps water (liquid and frozen) off the sensors and minimizes errors caused when dew, frost, rain, or snow block the radiation path.

Compact and Light Weight
The small lightweight design facilitates easy mounting to a cross arm using the AM-500 mounting bracket. The bracket facilitates precision leveling.

Accurate and Affordable
Comparable in accuracy to other four-component net radiometers, but lower cost.

Typical Applications
Net radiation is a key variable in the surface energy balance and influences turbulent fluxes, including evapotranspiration. Applications include measurements on flux towers and weather stations.

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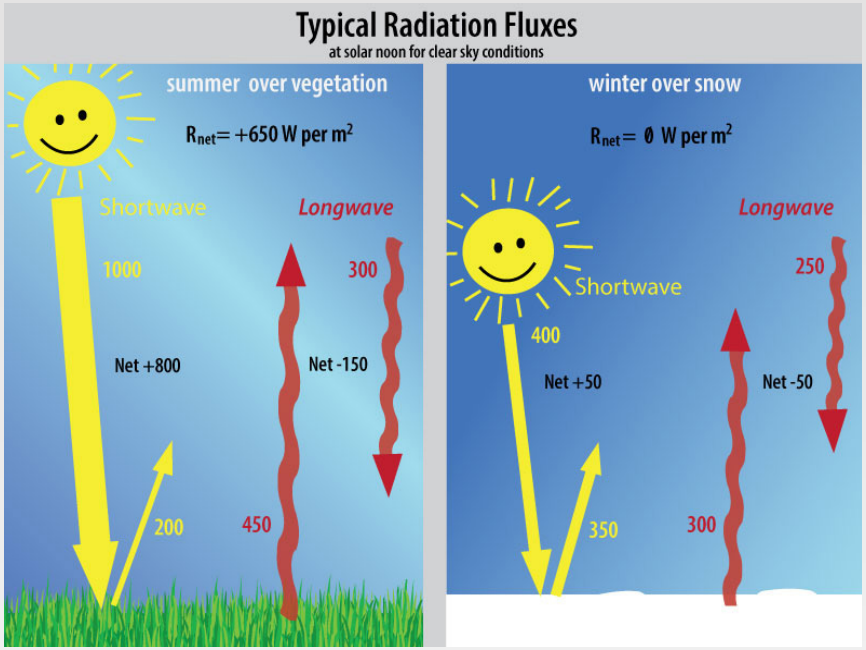
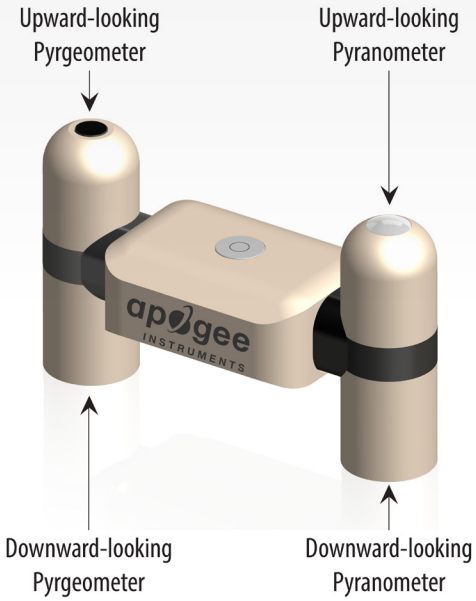
apogee® INSTRUMENTS
Logan, UT

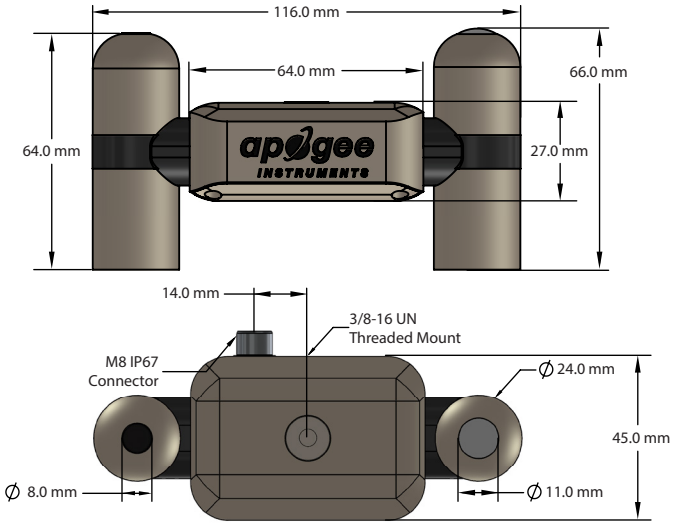


Net radiation is the sum of the four components shown above (incoming shortwave, outgoing shortwave, incoming longwave, outgoing longwave). Incoming shortwave incident on the surface is either reflected or absorbed by the surface material, and longwave radiation is emitted from the surface and emitted from the molecules of air in the atmosphere. Typical clear sky summer fluxes over grass and clear sky winter fluxes over snow are shown. A typical summer flux at solar noon would be +650 W m^{-2}; in winter it would be 0 W m^{-2}.



Apogee Instrument's four-component net radiometer consists of an upward-looking and downward-looking pyranometer (to measure shortwave radiation), and an upward-looking and downward-looking pyrgeometer (to measure longwave radiation). Each provide separate measurements of the four components of net radiation.

Dimensions



SN-500

Input Voltage Range	5 to 16 V DC (heaters are optimized to run at 12 V DC)
Current Draw (12 V DC Supply Voltage)	Heaters on, communication enabled: 62 mA; Heaters off, communication enabled: 1.5 mA
Response Time (using SDI-12 Protocol)	1 s (SDI-12 data transfer rate; detector response times are 0.5 sec)
Heaters (sensors individually heated)	62 mA current drain and 740 mW power requirement at 12 V DC
Operating Environment	-50 to 80 C; 0 to 100% relative humidity
Dimensions	116 mm length x 45 mm width x 66 mm height
Mass	320 g (with mounting rod and 5 m of lead wire)
Cable	M8 connector (IP67 rating) to interface to sensor housing; 5 m of four conductor, shielded, twisted-pair wire in a santoprene rubber jacket with pigtail leads wires

SL-500 Series

Sensitivity	0.12 mV per W m^{-2} (variable from sensor to sensor, typical value listed)
Calibration Factor (Reciprocal of Sensitivity)	8.5 W m^{-2} per mV
Calibration Uncertainty	± 5 %
Output Range	-24 to 24 mV
Measurement Range	-200 to 200 W m^{-2} (net longwave irradiance)
Measurement Repeatability	Less than 1 %
Long-term Drift	Less than 2 % change in sensitivity per year
Non-linearity	Less than 1 %
Detector Response Time	0.5 s
Field of View	150°
Spectral Range	5 to 30 µm (50 % points)
Temperature Response	Less than 0.1 % C^{-1}
Window Heating Offset	Less than 10 W m^{-2}
Zero Offset B	Less than 5 W m^{-2}
Tilt Error	Less than 0.5 %
Uncertainty in Daily Total	± 5 %
Temperature Sensor	30 kΩ thermistor, ± 1 C tolerance at 25 C
Output from Thermistor	0 to 2500 mV (typical, other voltages can be used)
Input Voltage Requirement for Thermistor	2500 mV excitation (typical, other voltages can be used)

SP-500 Series

Sensitivity	0.057 mV per W m^{-2} (upward-looking); 0.15 mV per W m^{-2} (downward-looking); (variable from sensor to sensor, typical values listed)
Calibration Factor (Reciprocal of Sensitivity)	17.5 W m^{-2} per mV (upward-looking); 6.7 W m^{-2} per mV (downward-looking)
Calibration Uncertainty	± 5 %
Output Range	0 to 114 mV (upward-looking); 0 to 300 mV (downward-looking)
Measurement Range	0 to 2000 W m^{-2} (net shortwave irradiance)
Measurement Repeatability	Less than 1 %
Long-term Drift	Less than 2 % per year
Non-linearity	Less than 1 %
Detector Response Time	0.5 s
Field of View	180° (upward-looking); 150° (downward-looking)
Spectral Range	385 nm to 2105 nm (upward-looking); 295 to 2685 nm (downward-looking); (50 % points)
Directional (Cosine) Response	Less than 20 W m^{-2} at 80° solar zenith
Temperature Response	Less than 0.1 % C^{-1}
Zero Offset A	Less than 5 W m^{-2}; less than 10 W m^{-2} (heated)
Zero Offset B	Less than 5 W m^{-2}
Uncertainty in Daily Total	Less than 5 %