Infrared Radiometers

SI-400 Series
SDI-12 Output

www.apogeeinstruments.com 435.792.4700



- Digital (SDI-12) output enables expanded usage regarding number of sensors as well as compatible dataloggers
- Most accurate infrared radiometer on the market
- Measures surface temperature rapidly
- Uncertainty of 0.2°C (95% confidence)
- 8-14 µm germanium atmospheric window
- Radiation shield included
- Multiple field of view (FOV) options
- Calibrated target temperature range from -30 to 65°C
- Rugged and lightweight
- Four year warranty



Available in four different fields of view.

Apogee Instruments Infrared Radiometers (IRRs) measure surface temperature by converting thermal energy radiated from any surface in its field-of-view (FOV) to an electrical signal with a response time less than 1 second. Each IRR carries an impressive uncertainty of 0.2°C at 95% confidence to ensure accurate measurements. The resilient 8-14 µm germanium window corresponds to the atmospheric window in order to minimize the effects of water bands below 8 µm and above 14 µm. The radiation shield, included free of charge with every IRR, insulates the sensor from rapid temperature changes, thus reducing noisy measurements. Multiple field-of-view (FOV) options range from half angles of 14, 18, and 22 degrees, for circular apertures, to 13 and 32 degrees for the vertical and horizontal half angles, respectively, of the horizontal aperture. The large range of calibrated target temperature, from -30 to 65°C, allows you to make accurate terrestrial measurements when the sensor body temperature is within 20°C of the target temperature. The durable clear anodized aluminum housing makes your sensor strong and lightweight, capable of withstanding extreme weather conditions.

SPECIFICATIONS

Signal Output: SDI-12 version 1.3 (24-bit ADC)

Input Voltage Requirement: 4.5 to 24 V DC

Current Drain: 1.1 mA (quiescent), 6 mA (transmitting)

Calibration Uncertainty (-20 to 65 C): 0.2 C (models SI-411, SI-421, and SI-4H1), 0.3 C (model SI-431), when target and detector temperature are within 20 C

Calibration Uncertainty (-40 to 80 C): 0.5 C (models SI-411, SI-421, and SI-4H1), 0.6 C (model SI-431), when target and detector temperature are different by more than 20 C (see Calibration Traceability below)

Measurement Repeatability: < 0.05 C

Stability (Long-term Drift): less than 2 % change in slope per year when germanium filter is maintained in a clean condition

Response Time: 0.6 s, time for detector signal to reach 95 % following a step change; fastest data transmission rate for SDI-12 circuitry is 1 s

Field of View:
- SI-411 – 22° half angle
- SI-421 – 18° half angle
- SI-431 – 14° half angle
- SI-4H1 – 32° horizontal half angle; 13° vertical half angle

Spectral Range: 8 to 14 µm; atmospheric window (see Spectral Response below)



AM-210 Mounting Bracket

Operating Environment: -45 to 80 C
0 to 100 % relative humidity (non-condensing)

Dimensions: 2.3 cm diameter and 6.0 cm length

Mass: 190 g (with 5 m of lead wire)

Cable: 5 m of four conductor, shielded, twisted-pair wire.
- Additional cable available in multiples of 5 m
- Santoprene rubber jacket (high water resistance, high UV stability, flexibility in cold conditions)
- Pigtail lead wires

Calibration Traceability:

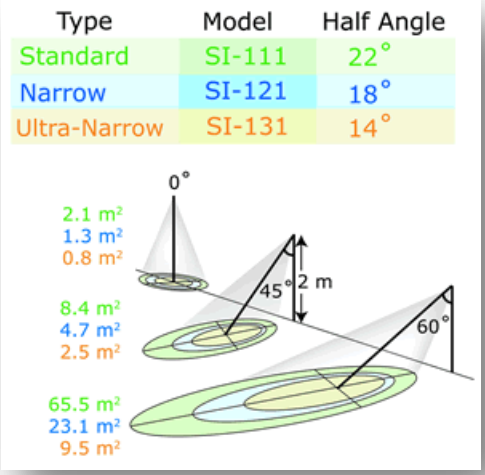
Apogee SI series infrared radiometers are calibrated to the temperature of a custom blackbody cone held at multiple fixed temperatures over a range of radiometer (detector/sensor body) temperatures. The temperature of the blackbody cone is measured with replicate precision thermistors thermally bonded to the cone surface. The precision thermistors are calibrated for absolute temperature measurement against a platinum resistance thermometer (PRT) in a constant temperature bath. The PRT calibration is directly traceable to the NIST.

Field of View:

The field of view (FOV) is reported as the half-angle of the apex of the cone formed by the target surface (cone base) and the detector (cone apex), as shown below, where the target is defined as a circle from which 98 % of the radiation detected by the radiometer is emitted.

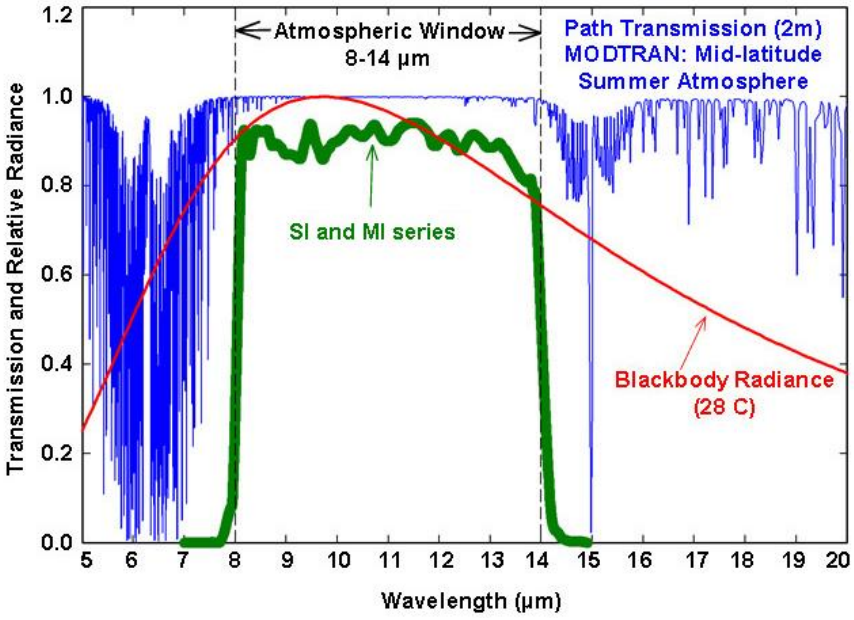


Sensor FOV, distance to target, and sensor mounting angle in relation to the target will determine target area. Different mounting geometries (distance and angle combinations) produce different target shapes and areas, as shown below.



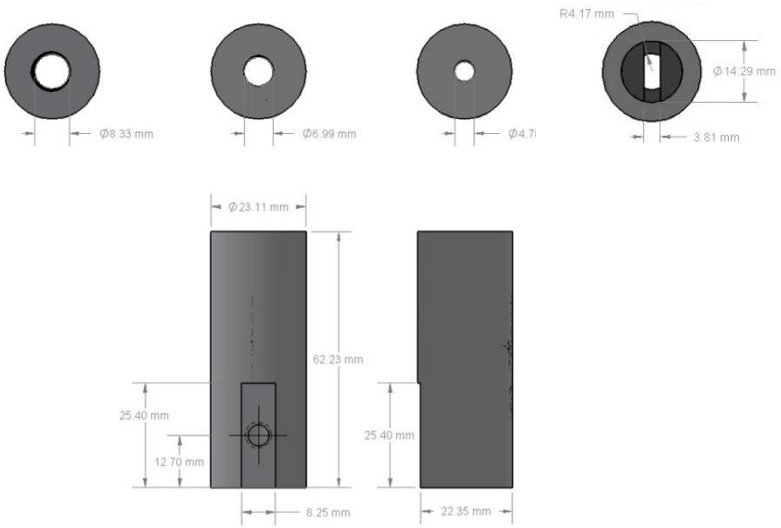
A simple FOV calculator for determining target dimensions based on infrared radiometer model, mounting height, and mounting angle, is available on the Apogee website: http://www.apogeeinstruments.com/using-your-apogee-instruments-infrared-radiometer/.

Spectral Response:



Spectral response of SI series infrared temperature meters. Spectral response (green line) is determined by the germanium filter and corresponds closely to the atmospheric window of 8-14 µm, minimizing interference from atmospheric absorption/emission bands (blue line) below 8 µm and above 14 µm. Typical terrestrial surfaces have temperatures that yield maximum radiation emission within the atmospheric window, as shown by the blackbody curve for a radiator at 28 C (red line).

SI-411 SI-421 SI-431 SI-4H1



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