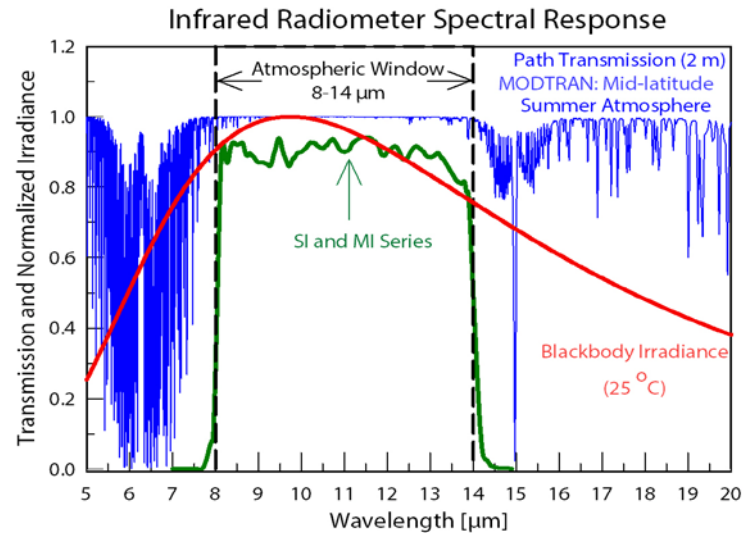
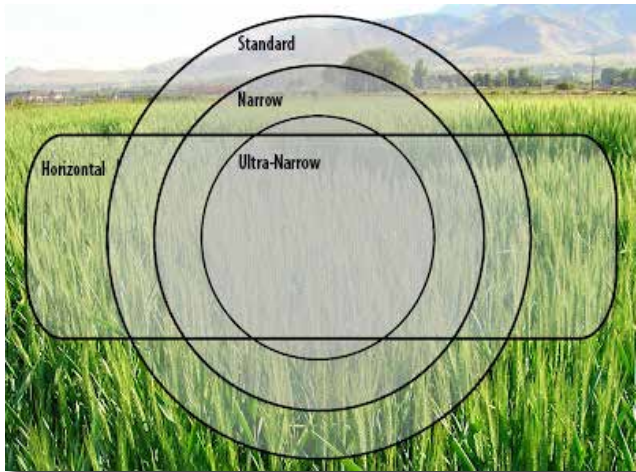




## Spectral Response



Above: Spectral response of SI series infrared radiometers. Spectral response (green line) is determined by the germanium filter and corresponds closely to the atmospheric window of 8 to 14  $\mu\text{m}$ , minimizing interference from atmospheric absorption/emission bands (blue line) below 8  $\mu\text{m}$  and above 14  $\mu\text{m}$ . Typical terrestrial surfaces have temperatures that yield maximum radiation emission within the atmospheric window, as shown by the blackbody curve for a radiator at 25 C (red line).



Ultra Narrow 14° half-angle    Narrow 18° half-angle    Standard 22° half-angle    Horizontal 13° x 32° half-angles

## Calibration Traceability

An Infrared Radiometer (IRR) combines a thermopile detector and a National Institute of Standards and Technology (NIST) traceable thermistor to measure a mV response proportional to the thermal radiation balance between the target temperature and the thermopile temperature. IRRs are placed in a temperature controlled housing, which is thermally insulated from a blackbody cone. The housing, pointed at a blackbody cone, is temperature cycled through various sensor body set-points. The blackbody cone temperature is likewise cycled through multiple temperature set-points relative to each sensor body temperature set-point. A linear fit is used to model each sensor body set-point with the respective blackbody cone set-points versus the thermopile signal at those set-points. The slopes and y-intercepts of all linear fits corresponding to each sensor body temperature are then fit to a second order polynomial to adequately interpolate between the calibrated set-points. These two sets of second order polynomial coefficients render the custom calibration coefficients for each sensor.

## Features

### TYPICAL APPLICATIONS

- Plant water status estimation
- Road surface temperature measurement for determination of icing conditions
- Terrestrial surface (soil, vegetation, water, snow) temperature measurement in energy balance studies

### HIGH ACCURACY

Calibrated to a custom black-body cone with a measurement uncertainty of  $\pm 0.2$  C from -30 to 65 C when the sensor temperature is within 20 C of the target. Radiometers are only sensitive to wavelengths from 8 to 14  $\mu\text{m}$  to minimize the influence of water vapor and CO<sub>2</sub> on the measurement.

### RUGGED HOUSING

Anodized aluminum body with fully-potted electronics. The outer radiation shield reduces thermal fluctuations.



MI-210

## Output Options

- Analog Response
- Fast response (SIF) with 0.2 second response time
- or hand-held meter

## Product Specifications

	SI-111-SS	SI-121-SS	SI-131-SS	SI-1H1-SS	SIF-111-SS	SIF-121-SS	SIF-1H1-SS
Analog Model Output (Difference between Target and Detector)	≈ 60 μV per C	≈ 40 μV per C	≈ 20 μV per C	≈ 40 μV per C	≈ 15 μV per C	≈ 10 μV per C	
Input Voltage Requirement	2500 mV thermistor excitation (typical, other voltages can be used)						
Analog Output from Thermistor	0 to 2500 mV (typical, depends on input voltage)						
Calibration Uncertainty (-30 to 65 C), when target and detector ΔT are < 20 C	0.2 C		0.3 C		0.2 C		
Calibration Uncertainty (-40 to 80 C), when target and detector ΔT are > 20 C	0.5 C		0.6 C		0.5 C		
Measurement Repeatability	Less than 0.05 C						
Long-term Drift	Less than 2 % change in slope per year when germanium filter is maintained in clean condition						
Response Time	0.6 s, time for detector signal to reach 95 % following a step change				0.2 s, time for detector signal to reach 95 % following a step change		
Field of View (half-angle)	22°	18°	14°	32° horizontal; 13° vertical	22°	18°	32° horizontal; 13° vertical
Spectral Range	8 to 14 μm; atmospheric window						
Operating Environment	-50 to 80 C; 0 to 100 % relative humidity (non-condensing)						
Dimensions	23 mm diameter, 60 mm length						
Cable	5 m of four conductor, shielded, twisted-pair wire; TPR jacket (high water resistance, high UV stability, flexibility in cold conditions); pigtail lead wires; stainless steel (316), M8 connector located 25 cm from sensor head						
Mass (5 m of cable)	190 g						
Warranty	4 years against defects in materials and workmanship						

### Road Weather Networks

The SI-4HR-SS (SDI-12) and SI-5HR-SS (Modbus) infrared radiometers are developed for road weather networks specifically, with a 10° vertical field of view, allowing for remote detection of a narrow and distant target roadway. The rectangular-shaped aperture maximizes the horizontal field of view allowing for a larger integrated measurement without including undesired target areas such as sky or surrounding terrain. The elongated external shield is designed to better protect from snow and ice building up on the sensor.



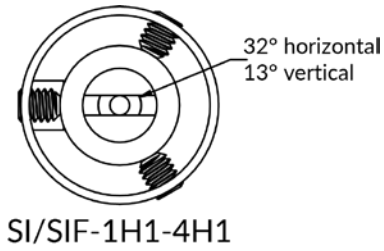
### Output Options

- SDI-12
- Modbus

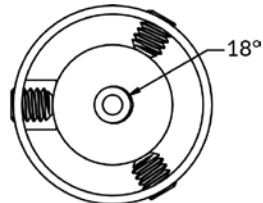
### Product Specifications

All Models -SS	SI-411	SI-421	SI-431	SI-4H1	SI-4HR	SI-511	SI-521	SI-531	SI-5H1	SI-5HR
Input Voltage Requirement	5.5 to 24 V DC									
Current Draw	1.5 mA (quiescent), 2.0 mA (active)				RS-232 quiescent 37 mA, active 37 mA; RS-485 quiescent 37, active 42 mA			RS-232 29 mA; RS-485 30 mA		
Calibration Uncertainty (-30 to 65 C), when target and detector ΔT are < 20 C	0.2 C	0.3 C	0.2 C	0.3 C	0.2 C	0.3 C	0.2 C	0.3 C	0.2 C	0.5 C
Calibration Uncertainty (-40 to 80 C), when target and detector ΔT are > 20 C	0.5 C	0.6 C	0.5 C			0.6 C	0.5 C	1 C		
Measurement Repeatability	Less than 0.05 C									
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					—				
Field of View (half-angle)	22°	18°	14°	32° horizontal; 13° vertical	16° horizontal; 5° vertical	22°	18°	14°	32° horizontal; 13° vertical	16° horizontal; 5° vertical
Spectral Range	8 to 14 μm; atmospheric window									
Operating Environment	-50 to 80 C; 0 to 100 % relative humidity (non-condensing)									
Dimensions	23 mm diameter, 60 mm length				23 mm diameter, 76 mm length	23 mm diameter, 60 mm length				23 mm diameter, 76 mm length
Cable	5 m of two conductor, shielded, twisted-pair wire; TPR jacket (high water resistance, high UV stability, flexibility in cold conditions); pigtail lead wires; stainless steel (316), M8 connector located 25 cm from sensor head									
Mass (5 m of cable)	190 g				219 g	190 g				219 g
Warranty	4 years against defects in materials and workmanship									

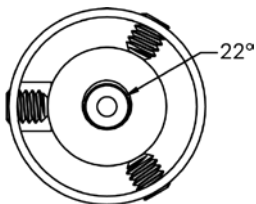




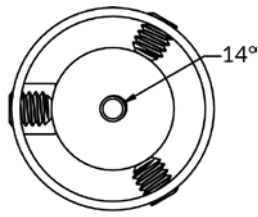
SI/SIF-1H1-4H1



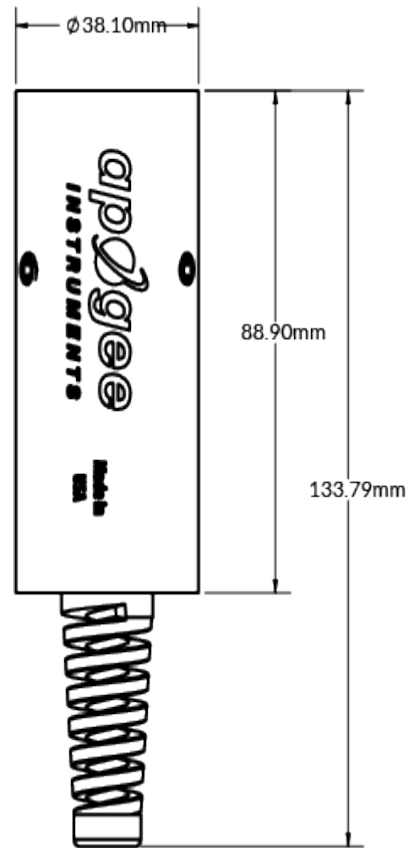
SI/SIF-121-421



SI/SIF-111-411



SI/SIF-131-431



SI-4HR & SI-5HR Dimensions

