

# Infrared Radiometer Meters | MI-200 Series

High accuracy, non-contact surface temperature measurement



## Accurate Measurements

Calibrated to a custom black-body cone with a measurement uncertainty of  $\pm 0.2$  C from -30 to 65 C when the sensor (detector) temperature is within 20 C of the surface (target) being measured. Radiometers are only sensitive from 8-14  $\mu\text{m}$  (atmospheric window) to minimize the influence of water vapor and  $\text{CO}_2$  on the measurement.

## Field of View Options

Four field of view (FOV) options, including: three circular and one horizontal aperture. Custom FOVs available upon request.

## Rugged Housing

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

## High Speed Options

Standard models (SI) have a response time of 0.6 seconds. New fast response models (SIF) have a 0.2 second response time.

## Output Options

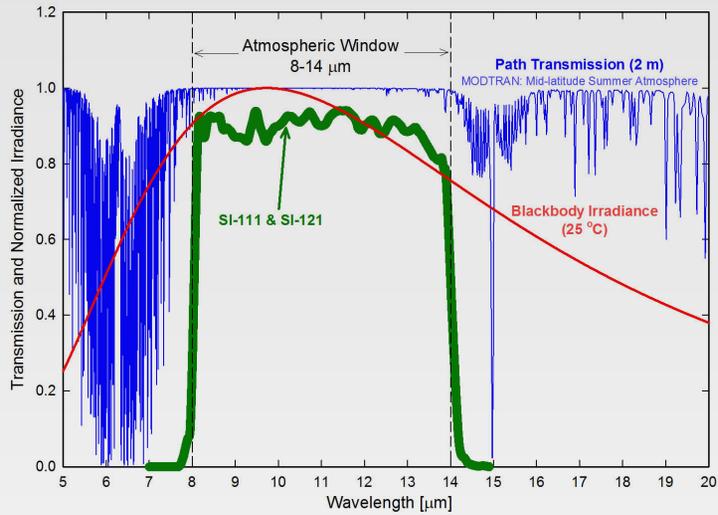
Analog and digital output options are available. Analog versions include un-amplified and amplified voltage outputs. Digital versions include SDI-12 and ModBus communication protocols. Sensors are also available attached to a hand-held meter with digital readout.

## Typical Applications

Plant canopy temperature measurement for use in plant water status estimation, road surface temperature measurement for determination of icing conditions, and terrestrial surface (soil, vegetation, water, snow) temperature measurement in energy balance studies.

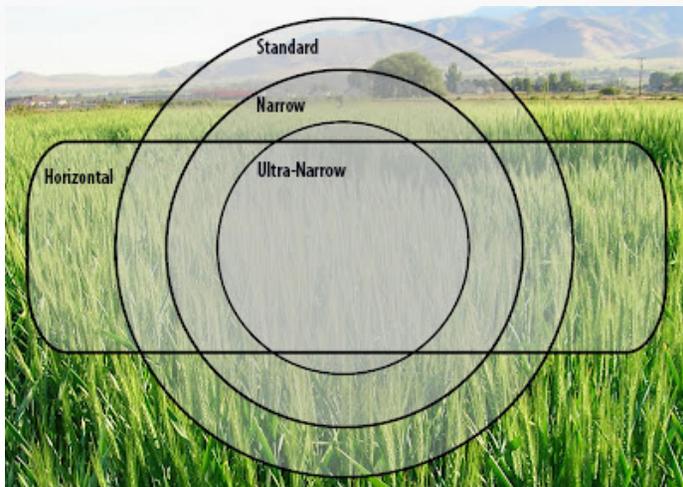


## Spectral Response



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 - 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).

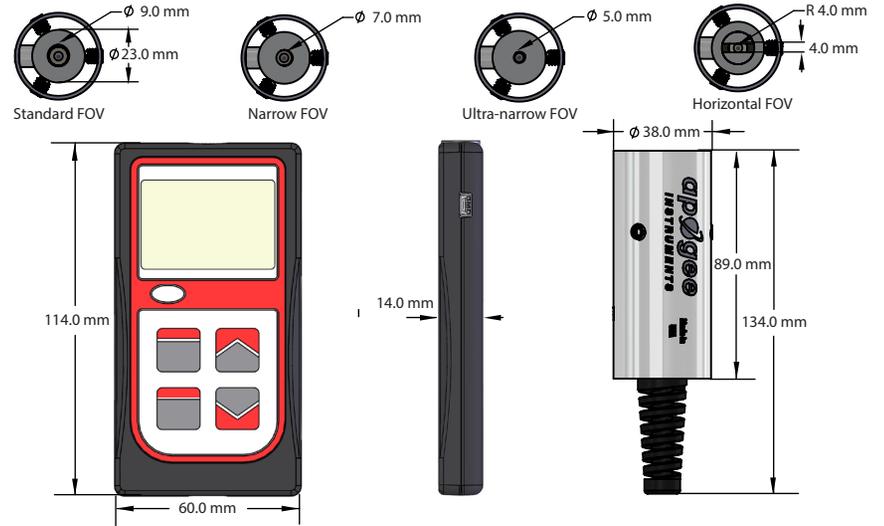
## Field of View Simulation



## Calibration Traceability

Apogee Instruments MI series infrared temperature meters 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.

## Dimensions



	MI-210	MI-220	MI-230	MI-2H0
Calibration Uncertainty (-20 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; meter firmware averaging results in a 3 s response for digital output on meter screen			
Field of View	22° half angle	18° half angle	14° half angle	32° horizontal half angle; 13° vertical half angle
Spectral Range	8 to 14 μm; atmospheric window			
Operating Environment	-0 to 50 C; less than 90 % non-condensing relative humidity up to 30 C; less than 70 % non-condensing relative humidity from 30 to 50 C			
Meter Dimensions	126 mm length, 70 mm width, 24 mm height			
Sensor Dimensions	23 mm diameter, 60 mm length			
Cable	2 m of four conductor, shielded, twisted-pair wire; additional cable available; santoprene rubber jacket (high water resistance, high UV stability, flexibility in cold conditions)			
Mass	270 g (with radiation shield)			
Warranty	4 years against defects in materials and workmanship			