



**apogee**<sup>®</sup>  
INSTRUMENTS



# APOGEE INFRARED RADIOMETER METERS | MI-200 Series

High accuracy non-contact surface temperature measurement

## Product Specifications

### Features

#### Output Options

- Regular response
- Fast response (SIF, 0.2 second response time)
- SDI-12
- Attached hand-held meter with digital readout

#### 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 from 8 to 14  $\mu\text{m}$  to minimize the influence of water vapor and  $\text{CO}_2$  on the measurement.

#### Rugged Housing

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

#### High Speed Options

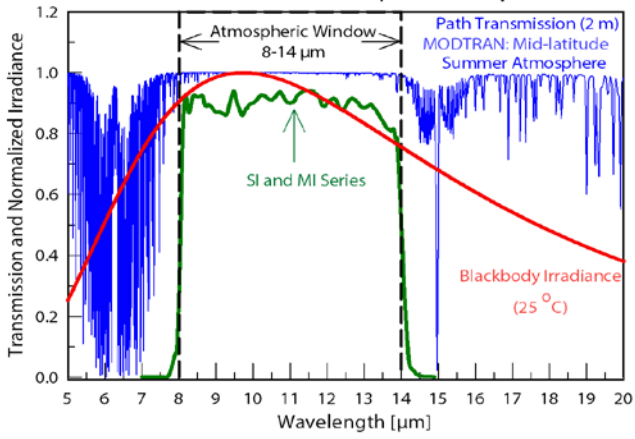
New fast response models (SIF) have a 0.2 second response time.

#### Typical Measurement 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

	MI-210	MI-220	MI-230	MI-2H0
Measurement Range	-60 to 110 C *Uncertainty has been determined for ranges below			
Calibration Uncertainty (-20 to 65 C), when target and detector $\Delta T$ are <20 C	0.2 C		0.3 C	0.2 C
Calibration Uncertainty (-40 to 80 C), when target and detector $\Delta T$ 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			
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 (half-angle)	22°	18°	14°	32° horizontal; 13° vertical
Spectral Range	8 to 14 $\mu\text{m}$ ; 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; TPR 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			

### Infrared Radiometer Spectral Response

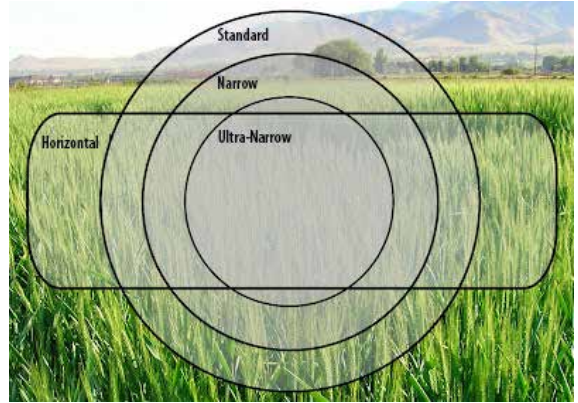


Left: Spectral response of SI series infrared radiometers. Spectral response (green line) is determined by the germanium filter and corresponds closely to the atmospheric window of 8 to 14 μm, minimizing interference from atmospheric absorption/emission bands (blue line) below 8 μm and above 14 μm. Typical 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).

### 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 National Institute of Standards and Technology (NIST).

### Field of View Simulation



### Dimensions

