Measure photosynthetically active radiation (PAR) in µmol m^{-2} s^{-1}

APOGEE QUANTUM METERS | MQ-100, MQ-200, & MQ-300 Series

Features

MQ-200

Multiple Output Options
- Attached hand-held meter
- Separate sensor
- Line quantum meter- 3 sensors
- Line quantum meter- 6 sensors
- Line quantum meter- 10 sensors

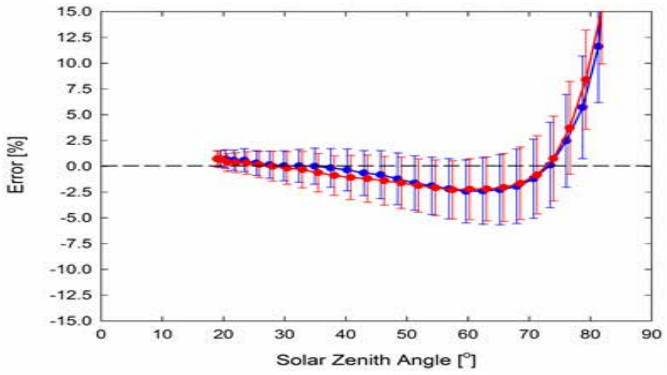
Accurate, Stable Measurements
Cosine-corrected with directional errors less than ± 5 % at a solar zenith angle of 75°. Long-term non-stability less than 2 % per year.

Unique Design
Cost-effective, original quantum sensors work well for broadband radiation sources. The patented, dome-shaped aluminum head is cosine-corrected, self-cleaning, and fully-potted for a waterproof design.

Line Quantum Sensor Options
Sensors are available with multiple detectors mounted along the length of a rugged anodized aluminum bar, which provide spatially averaged PPFD measurements along the length of the bar.

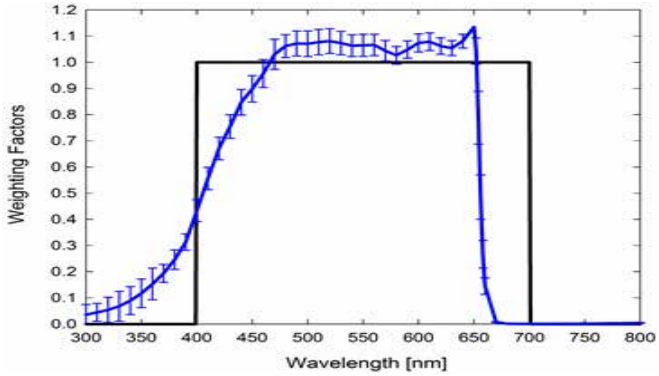
Typical PPFD Measurement Applications
- Incoming and reflected PPFD over and under plant canopies in greenhouses, in fields, and in growth chambers
- Aquatic environments including salt water aquariums and freshwater lakes and streams

Cosine Response



Mean **cosine response** of twenty-three SQ series quantum sensors. Cosine response measurements were made by direct side-by-side comparison to the mean of four reference thermopile pyranometers, with solar zenith angle-dependent factors applied to convert total shortwave radiation to PPFD. Blue points represent the AM response and red points represent the PM response.

Spectral Response

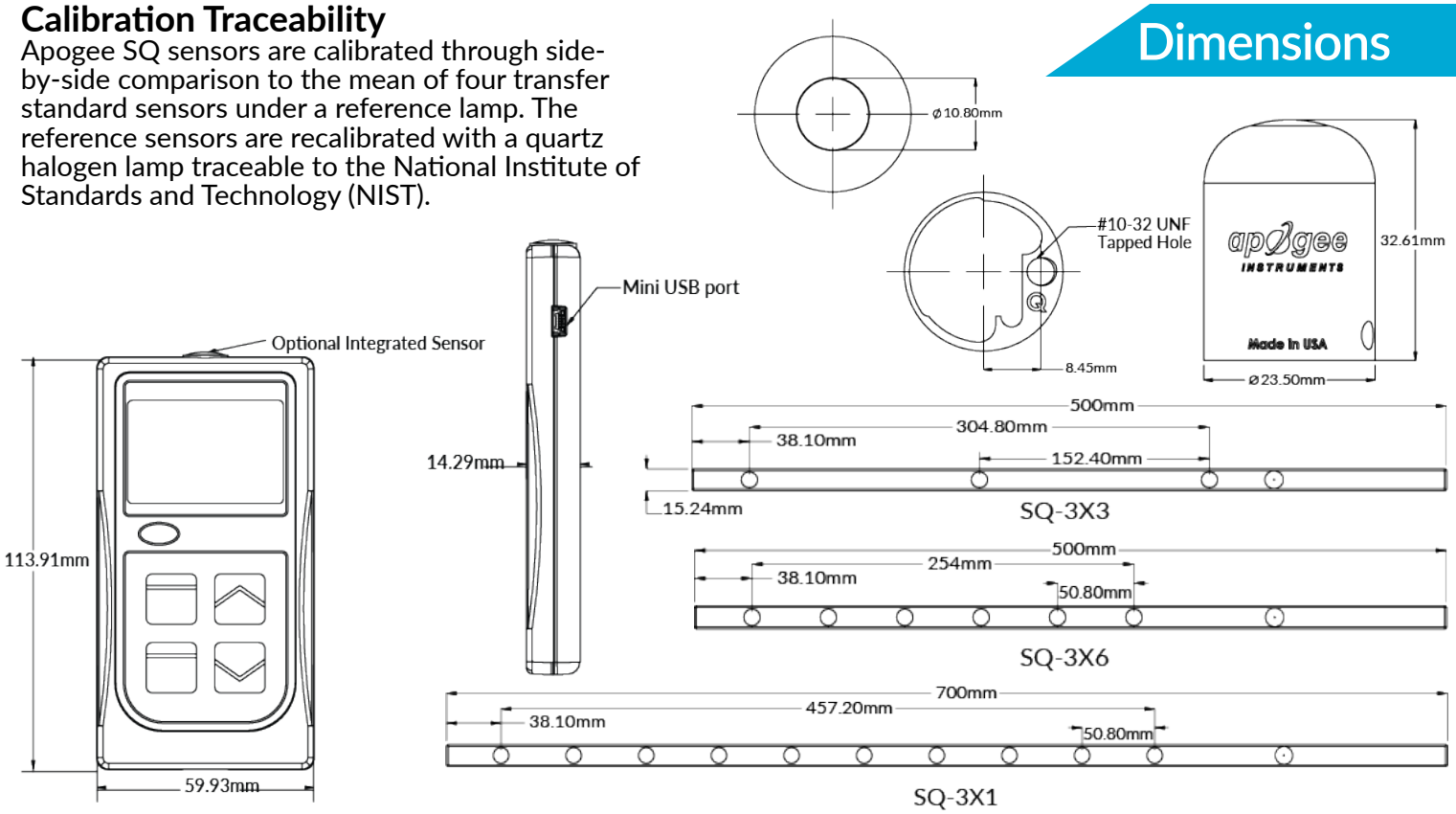


Mean **spectral response** of six SQ series quantum sensors (error bars represent two standard deviations above and below mean) compared to PPFD weighting function. Spectral response measurements were made at 10 nm increments across a wavelength of 300 to 800 nm in a monochromator with an attached electric light source. Measured spectral data from each quantum sensor were normalized by the measured spectral response of the monochromator/electric light combination, which was measured with a spectroradiometer.

Calibration Traceability

Apogee SQ sensors are calibrated through side-by-side comparison to the mean of four transfer standard sensors under a reference lamp. The reference sensors are recalibrated with a quartz halogen lamp traceable to the National Institute of Standards and Technology (NIST).

Dimensions



Product Specifications

	MQ-100	MQ-200	MQ-301	MQ-303/306
Calibration Uncertainty	± 5 %			
Measurement Repeatability	Less than 1 %			
Long-term Drift	Less than 2 % per year			
Non-linearity	Less than 1 % (up to 3000 µmol m^{-2} s^{-1})			
Response Time	Less than 1 ms			
Field of View	180°			
Spectral Range	410 to 655 nm (wavelengths where response is greater than 50 % of maximum)			
Directional (Cosine) Response	± 5 % at 75° angle			
Temperature Response	0.06 ± 0.06 % per C			
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; separate sensors can be submerged in water up to depths of 30 m			
Meter Dimensions	113.9 mm height, 59.9 mm width			
Sensor Dimensions	Integrated with Meter	24 mm width, 33 mm height	700 mm length, 15 mm width, 15 mm height	500 mm length, 15 mm width, 15 mm height
Mass	150 g	180 g	380 g	300 g
Cable	2 m of shielded, twisted-pair wire; additional cable available; TPR jacket (high water resistance, high UV stability, flexibility in cold conditions)			
Warranty	4 years against defects in materials and workmanship			