

Full-Spectrum Quantum Meter | JMQ-501

Easy-to-use handheld quantum meter designed for spot-check measurements.

Compact Handheld Design

The JMQ-501 is designed to be an easy-to-use handheld meter for spot-check measurements. The meter includes the AM-001 meter mounting bracket to mount the sensor on a horizontal plane to the meter and shortened cable to accommodate the bracket length.



Refined Spectral Response

Improved spectral response increases the accuracy of LED measurements making it ideal for use with both natural and electric light sources.

Accurate, Stable Measurements

Calibration in controlled laboratory conditions is traceable to an NIST lamp. Quantum sensors are cosine-corrected, with directional errors less than $\pm 5\%$ at a solar zenith angle of 75° . Long-term non-stability determined from multiple replicate quantum sensors in accelerated aging tests and field conditions is less than 2 % per year.

Rugged, Self-cleaning Housing

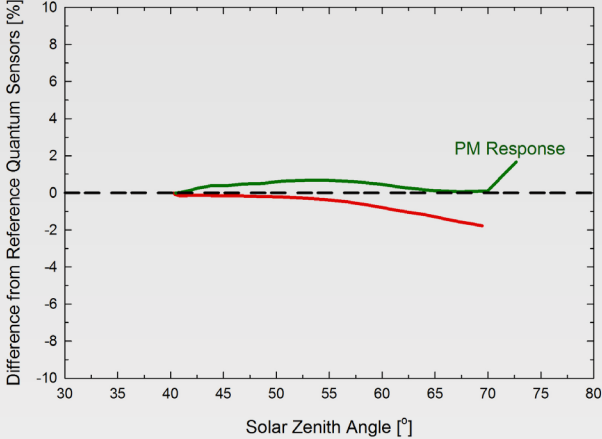
Patented domed shaped sensor head (diffuser and body) facilitate runoff of dew and rain to keep the sensor clean and minimize errors caused by dust blocking the radiation path. Sensors are housed in rugged anodized aluminum body and electronics are fully potted.

Typical Applications

PPFD measurement over plant canopies in outdoor environments, greenhouses, and growth chambers, and reflected or under-canopy (transmitted) PPFD measurements in the same environments.

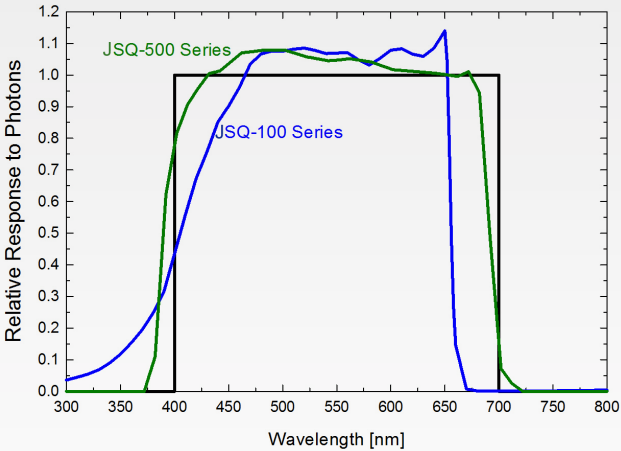


Cosine Response



Mean cosine response of seven JSQ-500 quantum sensors. Cosine response measurements were made on the rooftop of the our building in Logan, UT. Cosine response was calculated as the relative difference of JSQ-500 quantum sensors from the mean of replicate reference quantum sensors (models LI-190 and LI-190R, PQS 1). The red data are AM measurements; the green data are PM measurements.

Spectral Response



Mean spectral response measurements of six replicate JSQ-100 and JSQ-500 series quantum sensors. Spectral response measurements were made at 10 nm increments across a wavelength range 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.

Spectral Errors of Commercial Quantum Sensors

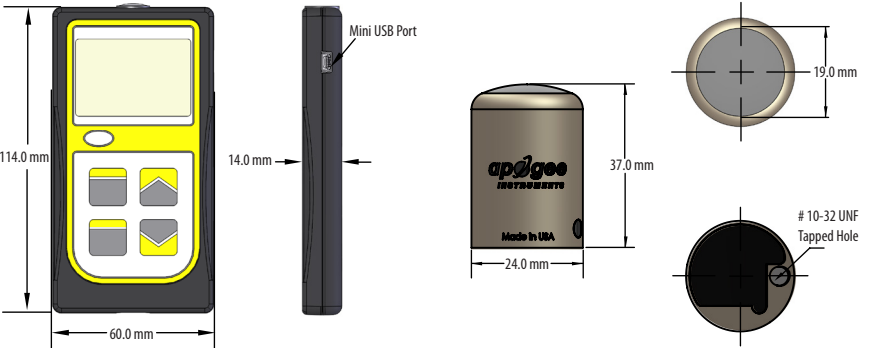
Radiation Source	JSQ-500	JSQ-110 JSQ-120	LI-190	PQS 1
Sun (Clear Sky)	-2.2	0.0	-0.4	-1.0
Sun (Cloudy Sky)	-1.7	1.4	-0.2	-1.3
Sun (Reflected from Deciduous Leaves)	-2.0	4.9	-0.8	1.1
Sun (Transmitted below Wheat Canopy)	-1.1	6.4	-0.1	-0.3
Cool White Fluorescent (T5)	0.0	0.0	0.0	0.0
Metal Halide	0.9	-3.7	0.2	-1.7
Ceramic Metal Halide	-0.3	-6.0	0.4	-0.7
High Pressure Sodium	0.0	0.8	1.3	1.4
Red/Blue LED (16 % 444 nm, 84 % 667 nm peaks)	-3.4	-65.3	3.5	-1.8
Red/White LED (6.5 % 436 nm, 4.5 % 531 nm, 89 % 668 nm peaks)	-3.0	-60.3	2.6	-1.7

Spectral errors are theoretical errors calculated from sensor spectral responses (JSQ-100 and JSQ-500 series shown in graph above) and spectral output of radiation sources (measured with a spectroradiometer). Only spectral errors are listed in the table. Calibration, cosine, and temperature error can also contribute to measurement error.

Calibration Traceability

JSQ-500 series quantum sensors are calibrated through side-by-side comparison to the mean of four model JSQ-500 transfer standard quantum sensors under high output T5 cool white fluorescent lamps. The transfer standard quantum sensors are calibrated through side-by-side comparison to the mean of at least three model LI-190R reference quantum sensors under high output T5 cool white fluorescent lamps. The reference quantum sensors are recalibrated on a biannual schedule with a model 1800-02 and quartz halogen lamp that are traceable to the National Institute of Standards and Technology (NIST).

Dimensions



JMQ-501	
Calibration Uncertainty	± 5 %
Measurement Range	0 to 4000 μmol m ⁻² s ⁻¹
Measurement Repeatability	Less than 0.5 %
Long-term Drift (Non-stability)	Less than 2 % per year
Non-linearity	Less than 1 % (up to 4000 μmol m ⁻² s ⁻¹)
Response Time	Less than 1 ms
Field of View	180°
Spectral Range	389 to 692 nm ± 5 nm (wavelengths where response is greater than 50% of maximum)
Spectral Selectivity	Less than 10% from 412 to 682 nm ± 5 nm
Directional (Cosine) Response	± 5 % at 75° zenith angle
Azimuth Error	Less than 0.5 %
Tilt Error	Less than 0.5 %
Temperature Response	-0.11 ± 0.03 % per C
Uncertainty in Daily Total	Less than 5 %
Detector	Blue-enhanced silicon photodiode
Housing	Anodized aluminum body with acrylic diffuser
IP Rating	IP68
Operating Environment	0 to 50 C; less than 90 % non-condensing relative humidity up to 30 C; less than 70 % non-condensing relativity humidity from 30 to 50 C; separate sensors can be submerged in water up to depth of 30 m
Meter Dimensions	126 mm length, 70 mm width, 24 mm height
Sensor Dimensions	24 mm diameter, 37 mm height
Mass	180 g
Cable	Approximately 0.17 m of shielded, twisted-pair wire; additional cable available; santoprene rubber jacket
Warranty	4 years against defects in materials and workmanship