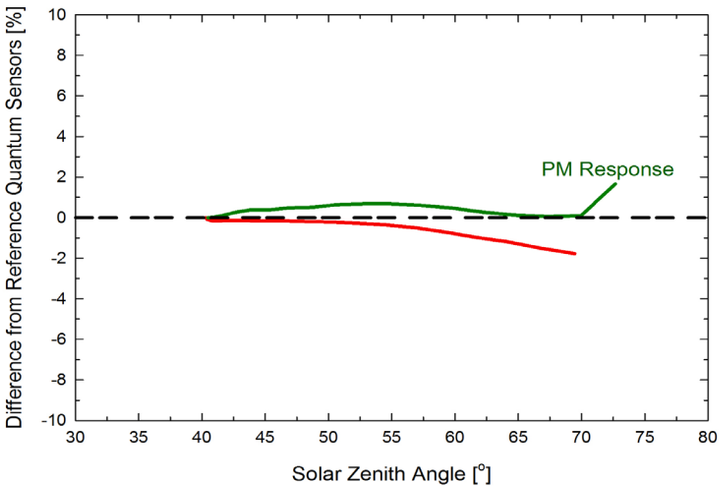
apogee INSTRUMENTS

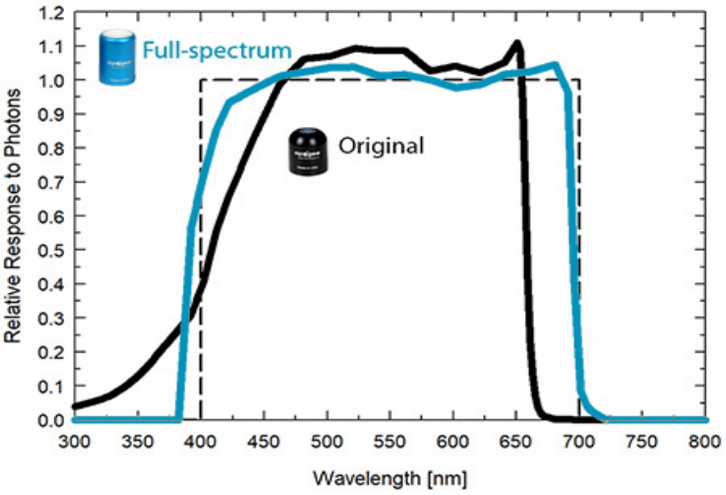
FULL-SPECTRUM QUANTUM METER

MQ-500

Response Graphs



Mean **cosine response** of seven Apogee SQ-500 quantum sensors. The red data are AM measurements; the green data are PM measurements.



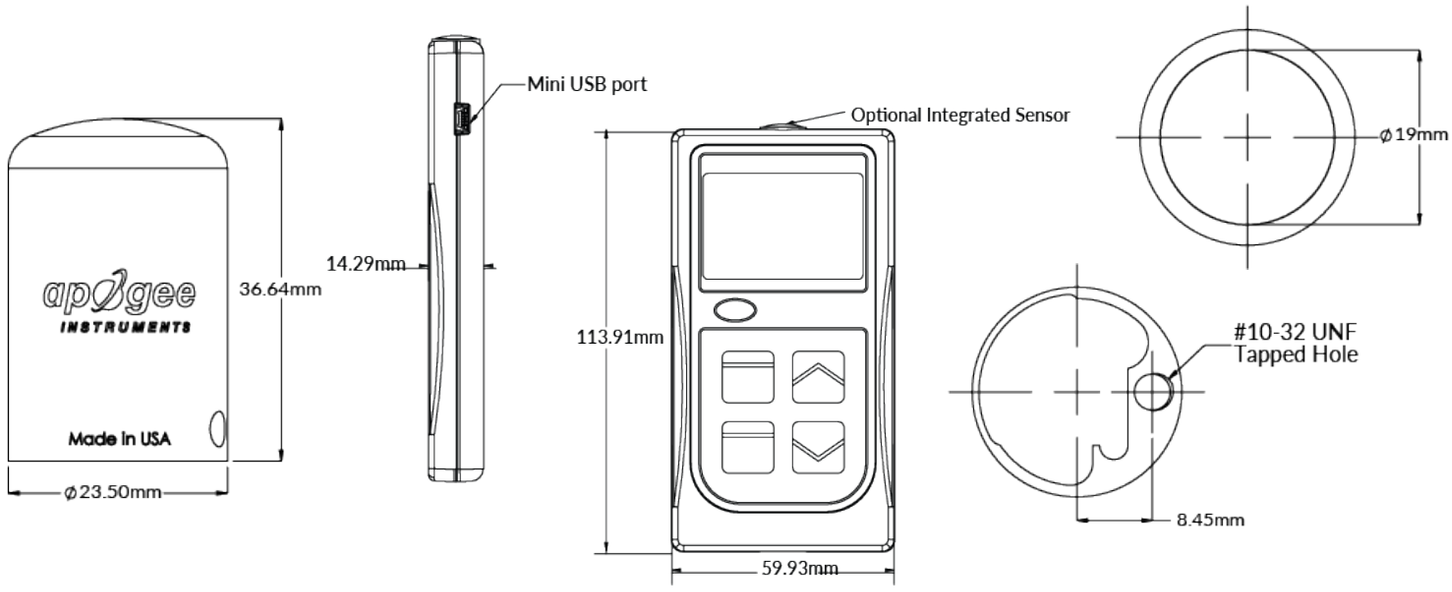
Mean **spectral response** measurements of six replicate Apogee SQ-100 and SQ-500 series quantum sensors.

Product Specifications

	MQ-500
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	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 30 m
Cable	2 m of shielded, twisted-pair wire; additional cable available; TPR jacket
Warranty	4 years against defects in materials and workmanship

DORGEAN
Beijing Dorgean Electronic Technology Co.,Ltd
Instrument Expert
Original factory packaging
www.dorgean.com

Dimensions



Features

TYPICAL 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

UNIQUE DESIGN

Measure photosynthetically active radiation with a research grade, full-spectral response sensor. Offers a self-cleaning, cosine-corrected head to minimize errors and is fully-potted for a waterproof design.

ACCURATE, STABLE MEASUREMENTS

Long-term non-stability determined from multiple replicate quantum sensors in accelerated aging tests and field conditions is less than 2 % per year.

CALIBRATION TRACEABILITY

Apogee SQ-500 sensors are calibrated through side-by-side comparison to the mean of four transfer standard sensors under T5 cool white fluorescent lamps. The transfer standard sensors are calibrated through side-by-side comparison to the mean of at least four quantum sensors under T5 cool white fluorescent lamps traceable to the National Institute of Standards and Technology (NIST).

Spectral Errors

	Apogee SQ-500	Apogee SQ-110 SQ-120	LI-COR LI-190	Kipp & Zonen PQS 1
Sun (Clear Sky)	**0.0**	0.0	-0.4	-1.0
Sun (Cloudy Sky)	**0.1**	0.2	-0.2	-1.3
Sun (Reflected from Grass Canopy)	**-0.3**	3.8	-0.8	1.1
Sun (Transmitted below Wheat Canopy)	**0.1**	4.5	-0.1	-0.3
Cool White Fluorescent (T5)	**0.0**	0.0	0.0	0.0
Metal Halide	**0.9**	-2.8	0.2	-1.7
Ceramic Metal Halide	**0.3**	-16.1	0.4	-0.7
High Pressure Sodium	**0.1**	0.2	1.3	1.4
Red LED (667 nm peak, 20 nm full-width half-maximum)	**2.8**	-62.1	3.5	-1.8
Red, Blue, White LED Mixture (60 % Red, 25 % White, 15 % Blue)	**-2.0**	-35.5	2.6	-1.7

SPECTRAL ERRORS OF COMMERCIAL QUANTUM SENSORS

Spectral errors are theoretical errors calculated from sensor spectral responses and spectral output of radiation sources. Only spectral errors are listed in the table. Calibration, cosine, and temperature error can also contribute to measurement error.

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