



SQ-515

DESCRIPTION

The SQ-515 is an amplified full-spectrum quantum sensor with a 0 to 5 V output. The sensor incorporates a blue-enhanced silicon photodiode and custom optical filters with a rugged, self-cleaning sensor housing design, anodized aluminum body with acrylic diffuser. Typical applications include PPFD measurement over plant canopies in outdoor environments, greenhouses, and growth chambers, and reflected or under-canopy (transmitted) PPFD measurements in the same environments. Quantum sensors are also used to measure PAR/PPFD in aquatic environments, including salt water aquariums where corals are grown. Sensor includes IP68 marine-grade stainless-steel cable connector 30 cm from head to simplify sensor removal and replacement for maintenance and recalibration.

How is the SQ-500 different from previous Apogee quantum sensors?

The SQ-500 is a full spectrum quantum sensor with a spectral range of 389 to 692 nm \pm 5 nm, which can be seen in the graph below. This improved spectral response increases the accuracy of LED measurements.

Where is the SQ-500 used?

The SQ-500 is used to measure incoming PPFD measurements in outdoor environments, greenhouses, growth chambers, and aquariums.



Features:

Apogee Instruments Quantum Sensors

are the tool of choice for researchers and agricultural professionals measuring photosynthetically active radiation (PAR) all over the world. Apogee offers two types of quantum sensors: a **Full-spectrum Quantum (previously gold)** and **Original Quantum Sensor**. Consult our spectral response graph to decide which model is right for your application.

Accurate, Stable Measurements

Cost-effective, original quantum sensors work well for broadband radiation sources (sun, high-pressure sodium, metal halide, cool white fluorescent lamps), while full-spectrum sensors are good for all light sources, including LEDs. Offers a self-cleaning, cosine-corrected head that is fully-potted for a waterproof design.

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.

Calibration Traceability

Apogee SQ series quantum 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).

Spectral Errors

	Apogee SQ-500	Apogee SQ-110 SQ-120	LI-COR LI-190	Kipp & Zonen PQS1
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

Output Options

- 0 to 40 mV
- 0 to 2.5 V
- 0 to 5 V
- 4 to 20 mA
- USB
- SDI-12
- Modbus
- or hand-held meter

SQ-500

	SQ-500-SS	SQ-512-SS	SQ-514-SS	SQ-515-SS	SQ-520	SQ-521-SS	SQ-522-SS
Power Supply	Self-powered	3.3 to 24 V DC	12 to 24 V DC	5.5 to 24 V DC	Uses a 5 V USB power source and has a 2.1 mA current draw when logging	5.5 to 24 V DC	5.5 to 24 V DC
Current Draw	—	At 12 V is 57 μ A	maximum of 20 mA	At 12 V is 57 μ A	—	1.4 mA (quiescent), 1.8 mA (active)	20 mA maximum
Output (sensitivity)	0.01 mV per μ mol $m^{-2} s^{-1}$	0.625 mV per μ mol $m^{-2} s^{-1}$	0.004 μ mol $m^{-2} s^{-1}$ per mA	1.25 mV per μ mol $m^{-2} s^{-1}$	—	—	—
Resolution	—	—	—	—	0.1 μ mol $m^{-2} s^{-1}$	—	—
Calibration Factor (reciprocal of output)	100 μ mol $m^{-2} s^{-1}$ per mV	1.6 μ mol $m^{-2} s^{-1}$ per mV	250 μ mol $m^{-2} s^{-1}$ per mA	0.8 μ mol $m^{-2} s^{-1}$ per mV	Custom for each sensor and stored in the firmware		
Calibration Uncertainty	$\pm 5\%$						
Output Range	0 to 40 mV	0 to 2.5 V	4 to 20 mA	0 to 5 V	USB	SDI-12	Modbus
Measurement Repeatability	Less than 0.5 %	Less than 1 %	Less than 0.5 %	Less than 1 %	Less than 0.5 %	Less than 1 %	
Long-term Drift	Less than 2 % per year						
Non-linearity	Less than 1 % (up to 4000 μ mol $m^{-2} s^{-1}$)						
Response Time	Less than 1 ms				Software updates every second	Less than 0.6 s	320 ms
Field of View	180°						
Spectral Range	389 to 692 nm ± 5 nm (wavelengths where response is greater than 50 %)						
Spectral Selectivity	Less than 10 % from 412 to 682 nm ± 5 nm						
Directional (Cosine) Response	$\pm 2\%$ at 45°, $\pm 5\%$ at 75° zenith angle						
Temperature Response	-0.11 \pm 0.04 % per C						
Operating Environment	40 to 70 C; 0 to 100 % relative humidity; can be submerged in water up to depths of 30 m						
Dimensions	24 mm diameter, 37 mm height	30.5 mm diameter, 36.6 mm height			24 mm diameter, 37 mm height	30.5 mm diameter, 36.6 mm height	
Mass	100 g (5 m of lead wire)	51 g			100 g (5 m of lead wire)	51 g	

Contact info



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