



QSR-240 Quantum Scalar Reference Sensor

The QSR-240 Hemispherical Quantum Scalar Reference Sensor is designed for monitoring total incident Photosynthetically Available Radiation (PAR; 400-700 nm) from the sun and sky. The rugged QSR-240 features a patented solid Teflon® spherical collector with hemispherical field-of-view cutoff plate, ensuring uniform directional response over 2π steradians. An aluminum-encased optical light pipe funnels flux from the collector to a silicon photodetector that has a flat quantum response over PAR. The QSR-240 sensor shares the scalar directional response characteristics of the Biospherical Instruments QSP-200 series scalar sensors

QSR-240 applications include monitoring solar radiation in energy studies and aquatic productivity studies, and as a surface irradiance reference sensor for the QSP-200 series profiling sensors or PNF-300 Profiling Natural Fluorometer.

Options for the QSR-240 include QSC-240 weather-resistant cable, DAS-186 automated Data Acquisition System and power supply, or QSP-170BD digital display and power supply.



Key Features

- *Designed to monitor total incident PAR (400-700 nm) from the sun and sky*
- *1.9 cm (3/4") diameter Teflon® spherical irradiance collector with hemispherical field-of-view cutoff plate*
- *Compact, rugged, and low-cost*
- *Can be used as a surface reference for the QSP-Series underwater profiling instruments or PNF-300 Profiling Natural Fluorometer*

Specifications

Optical Features

Scalar Irradiance Collector:

1.9 cm (3/4") diameter solid Teflon® sphere optically connected to the main housing by a 2.5 cm aluminum-encased quartz light pipe.

Photodetector: Blue-enhanced high-stability silicon photovoltaic detector with dielectric and absorbing glass filter assembly.

PAR Spectral Response: Equal (better than $\pm 10\%$) quantum response from 400 nm to 700 nm with response sharply attenuated above 700 nm and below 400 nm. Spectral response-induced errors will cause less than 5% errors in naturally occurring light fields.

Directional Response: Each instrument's directional response is optimized before final calibration. Front-to-side (approximately 85° from head on) response over all angles is equal ($\pm 6\%$) with response attenuated to 0 (at 95°) by the 20-cm diameter cutoff shield. Individual detector response plots are available as an option.

Sensitivity: When purchased alone, the sensor is calibrated in $\text{quanta}/(\text{cm}^2\text{-sec})/\text{volt}$. Nominal sensitivity is $1 \text{ volt} = 1 \times 10^{17} \text{ quanta}/(\text{cm}^2\text{-sec})$ (slightly less than full sunlight). Noise level is typically less than 1 millivolt, temperature coefficient of the dark signal is less than 10 microvolts/ $^\circ\text{C}$, and response temperature coefficient is less than 0.15%/ $^\circ\text{C}$.

Electronic Features

Measured Signals:

PAR Dynamic Range: $1.4 \times 10^{-5} \mu\text{E}/(\text{cm}^2\text{-sec})$ to $0.5 \mu\text{E}/(\text{cm}^2\text{-sec})$

Power Requirements:

Power: 12 VDC at 6 mA

Compatible Power Supplies:

DAS-186 automated Data Acquisition System or QSP-170BD Power Supply and Digital Display (may be purchased separately).

Cable: QSC-240 shielded, weather-resistant cable with appropriate connectors (may be purchased separately).

Mechanical Features

Dimensions:

Diameter: 20.0 cm

Height: 5.8 cm

Weight: 0.9 kg

Housing Materials:

Collector: Hard anodized aluminum mounted with solid PTFE sphere

Housing: Hard anodized aluminum

Environmental

Temperature Range: -2°C to 35°C

Calibration

The QSR-240 sensor is calibrated using a National Institute of Standards and Technology (NIST) traceable 1000-watt type FEL Standard of Spectral Irradiance using procedures recommended by NIST. Annual recalibration is strongly recommended.

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