## Biospherical Instruments Inc.

# QSP-2000, Quantum Scalar Sensors
**Measuring Downwelling Irradiance over PAR(400-700nm)**

Scalar PAR sensors in our new QSP-2000 series, feature Biospherical's patented spherical collector. This unique design ensures uniform directional response over 3.7 pi steradians. A stainless-steel encased, optical light-pipe funnels flux from the collector to a silicon photodetector that has a flat quantum response over PAR (Photosynthetically Active Radiation; 400 – 700 nm).

The most noteworthy improvement in this new series is the capability of direct connection to a PC or laptop computer. Our **QSP-2100** sensors contain imbedded calibration information and data are transmitted directly into the computer. This new low-power circuitry requires no batteries, relying instead upon power from the host computer's serial comport.

**QSP-2200** linear output models, feature high-quality, low-drift, electrometer-grade amplifiers and are are compatible with most commercially available dataloggers. When equipped with an optional depth transducer, **(QSP-2200D)** and a matching surface reference sensor **(QSR-2200)** the QSP series offers researchers a truly low-cost, scalar irradiance profiling system.

**QSP-2300**, a logarithmic output version is also available. This sensor was designed specifically for integration with CTD systems and dataloggers requiring a limited-range of signal input.

**The new QSP-2000 is rugged and compact.**

# Key Features

- *Designed to measure downwelling PAR (400-700 nm) irradiance to depths of 2000 meters*

- *1.9 cm (3/4") diameter solid Teflon® spherical irradiance collector*

- *Compact, rugged, and low-cost*

- *QSP-2100 includes operating software allowing direct connection to a PC workstation or laptop computer*

# Specifications

## Optical Features
**Scalar Irradiance Collector:** 1.9 cm (3/4") diameter solid Teflon® sphere optically connected to the main housing by a 4.0 cm stainless-encased quartz light pipe.

**Photodetector:** Blue-enhanced, high-stability silicon detector with dichroic blocking filters.

**PAR Spectral Response:** Equal (better than ±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 (± 6%). Individual detector response plots are available as an option.

## Optical Features (Cont.)

**Sensitivity:** When purchased alone, the sensor is calibrated in quanta/(cm$^2$·sec))/volt. Nominal sensitivity is 1 volt = $1 \times 10^{17}$ quanta/(cm$^2$·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/°C, and response temperature coefficient is less than 0.15%/°C.

## Electronic Features
**Measured Signals:**
PAR Dynamic Range: $1.4 \times 10^{-5}$ µE/(cm$^2$·sec) to 0.5 µE/(cm$^2$·sec)

## Environmental
**Temperature Range:** -2°C to 35°C

## Calibration
Each QSR-2000 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.

## Mechanical Features
***Collector:*** Solid PTFE sphere, epoxy mounted to a machined aluminum base

***Housing:***
Hard-anodized aluminum, rated to 2000 meters

**Dimensions:**
*Diameter:* 5.0 cm
*Height:* 15.0cm
*Weight:* 1.1 kg

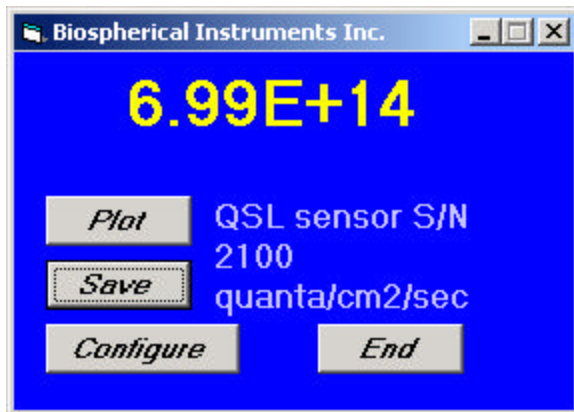**Fully calibrated with lamps traceable to NIST, each digital sensor contains imbedded calibration factors.**





**BSI's new operating software, LOGGER-2100 logs and displays calibrated data in either Quanta or µEinsteins .**

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*\*Specifications subject to change without notice*