

Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 06/30/05

Job No.: R12302

Model Number: QSP200L

Serial Number: 4497

Operator: TPC

Standard Lamp: V-031(3/3/15)

Operating Voltage Range: 6 to 15 VDC (+)

Note: The QSP200L uses a log amplifier to measure the detector signal current with $V = \log I \text{ (Amps)} / I_{\text{Ref}}$
To calculate irradiance, use this formula:

$$\text{Irradiance} = \text{Calibration factor} * (10^{\text{Light Signal Voltage}} - 10^{\text{Dark Voltage}})$$

With the appropriate (solar corrected) Irradiance Calibration Factor:

Dry Calibration Factor:	8.73E+12	quanta/cm ² ·sec/"amps"	1.45E-05	μEinsteins/cm ² ·sec/"amps"
Wet Calibration Factor:	1.54E+13	quanta/cm ² ·sec/"amps"	2.56E-05	μEinsteins/cm ² ·sec/"amps"

Sensor Test Data and Results⁴⁾

Sensor Supply Current (Dark):	74.7	mA		
Supply Voltage:	6	Volts		
Lamp Integrated PAR Irradiance:	1.05E+16	quanta/cm ² ·sec	0.01750	μEinsteins/cm ² ·sec
SC3 Immersion Coefficient:	0.5664	Scalar Correction:	1	PAR Solar Correction: 1.0000

Nominal Filter OD	Calibrated Trans.	Sensor Voltage	Measured Trans.	Measured Signal (Amps)	Estimated Signal (Amps)	Calc. Output (Volts)	Error (Volts)	Error (%)	Test Irrad. (quanta/cm ² ·sec)
No Filter	100.00%	3.082	100.00%	1.21E-07	1.21E-07	3.082	0.000	0.0	1.05E+16
0.3	36.10%	2.638	35.88%	4.33E-08	4.36E-08	2.641	0.003	0.6	3.78E+15
0.5	27.60%	2.522	27.48%	3.32E-08	3.33E-08	2.525	0.002	0.4	2.90E+15
1	9.27%	2.053	9.26%	1.12E-08	1.12E-08	2.054	0.001	0.1	9.75E+14
2	1.11%	1.163	1.10%	1.33E-09	1.34E-09	1.166	0.003	0.6	1.16E+14
3	0.05%	0.370	0.09%	1.10E-10	6.45E-11	0.276	-0.094	-41.5	9.61E+12

Dark Before: 0.172 Volts
 Light - No Filter Hldr.: 3.079 Volts
 Dark After - NFH: 0.017 Volts
 Average Dark: 0.095 Volts

$I_{\text{Ref}} = 1.00\text{E-}10$ Amps
 $I_{\text{Dark}} = 1.24\text{E-}10$ Amps
 $10^{V_{\text{Dark}}} = 1.243483$ Amps
 RG780 **0.269**

Notes:

1. Annual calibration is recommended.
2. The collector should be cleaned frequently with alcohol.
- 4) This section is for internal use and for more advanced analysis.