

Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 03/11/08 **Incoming Evaluation**

Job No.: **R-9874**

Model Number: **QSP-200L**

Serial Number: **4553**

Operator: **TPC**

Standard Lamp: **91537(10/25/06)**

Operating Voltage Range: **6** to **15** VDC (+)

Note: The QSP-200 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: **2.10E+13** quanta/cm²·sec/"amps" **3.49E-05** μEinsteins/cm²·sec/"amps"

Wet Calibration Factor: **3.54E+13** quanta/cm²·sec/"amps" **5.88E-05** μEinsteins/cm²·sec/"amps"

Sensor Test Data and Results⁴⁾

Sensor Supply Current (Dark):		71.4	mA							
Supply Voltage:		6	Volts							
Lamp Integrated PAR Irradiance:		8.83E+15	quanta/cm ² ·sec		0.01467	μEinsteins/cm ² sec				
SC3 Immersion Coefficient:		0.594	Scalar Correction:		1	PAR Solar Correction:				1.0000
Nominal	Calibrated	Sensor	Measured		Measured	Estimated	Calc.			Test Irrad.
Filter OD	Trans.	Voltage	Trans.		Signal	Signal	Output	Error		(quanta/
					(Amps)	(Amps)	(Volts)	(Volts)	Error (%)	cm ² ·sec)
No Filter	100.00%	2.625	100.00%		4.22E-08	4.22E-08	2.626	0.001	0.0	8.83E+15
0.3	36.10%	2.187	36.31%		1.53E-08	1.52E-08	2.186	-0.001	-0.6	3.21E+15
0.5	27.60%	2.079	28.22%		1.19E-08	1.16E-08	2.071	-0.008	-2.2	2.49E+15
1	9.27%	1.628	9.79%		4.13E-09	3.91E-09	1.606	-0.021	-5.3	8.65E+14
2	1.11%	0.815	1.24%		5.22E-10	4.68E-10	0.778	-0.036	-10.4	1.09E+14
3	0.05%	0.229	0.09%		3.72E-11	2.25E-11	0.190	-0.039	-39.4	7.79E+12

Dark Before: **0.122** Volts

Light - No Filter Hldr.: **2.625** Volts

Dark After - NFH: **0.122** Volts

Average Dark **0.122** Volts

$I_{\text{Ref}} = \mathbf{1.00E-10}$ Amps

$I_{\text{Dark}} = \mathbf{1.32E-10}$ Amps

$10^{V_{\text{Dark}}} = \mathbf{1.323884}$ Amps

RG780

0.411

Notes:

1. Annual calibration is recommended.
2. There is increasing error associated with readings below zero.
3. The collector should be cleaned frequently with alcohol.
- 4) This section is for internal use and for more advanced analysis.