

Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 05/14/14

Job No.: R-11939

Model Number: QSP200L

Serial Number: 4550

Operator: TPC

Standard Lamp: V-033(3/7/12)

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:

Irradiance = Calibration factor * (10^{Light Signal Voltage} - 10^{Dark Voltage})
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With the appropriate (solar corrected) Irradiance Calibration Factor:

Dry Calibration Factor:	1.36E+13	quanta/cm²·sec/"amps"	2.26E-05	μEinsteins/cm²·sec/"amps"
Wet Calibration Factor:	2.41E+13	quanta/cm²·sec/"amps"	4.00E-05	μEinsteins/cm²·sec/"amps"

Sensor Test Data and Results⁴⁾

Sensor Supply Current (Dark):		67.9	mA							
Supply Voltage:		6	Volts							
Lamp Integrated PAR Irradiance:		9.34E+15	quanta/cm ² ·sec	0.01551	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%	2.837	100.00%	6.87E-08	6.87E-08	2.838	0.001	0.0	9.34E+15	
0.3	36.10%	2.397	36.18%	2.48E-08	2.48E-08	2.397	0.000	-0.2	3.38E+15	
0.5	27.60%	2.282	27.69%	1.90E-08	1.90E-08	2.281	0.000	-0.3	2.59E+15	
1	9.27%	1.818	9.38%	6.44E-09	6.37E-09	1.814	-0.004	-1.1	8.76E+14	
2	1.11%	0.963	1.12%	7.69E-10	7.62E-10	0.960	-0.003	-0.9	1.05E+14	
3	0.05%	0.305	0.07%	5.13E-11	3.67E-11	0.273	-0.032	-28.5	6.98E+12	

Dark Before: <u>0.178</u> Volts	$I_{\text{Ref}} = 1.00\text{E-}10 \text{ Amps}$ $I_{\text{Dark}} = 1.51\text{E-}10 \text{ Amps}$ $10^{V_{\text{Dark}}} = 1.50626 \text{ Amps}$	RG780	0.187
Light - No Filter Hldr.: <u>2.837</u> Volts			
Dark After - NFH: <u>0.178</u> Volts			
Average Dark <u>0.178</u> Volts			

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.