

Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 11/21/16

Job No.: R12782

Model Number: QSP200L4S

Serial Number: 4553

Operator: TPC

Standard Lamp: 91453(7/20/16)

Operating Voltage Range: 6 to 15 VDC (+)

Note: The QSP200L4S 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:	9.91E+12	quanta/cm ² ·sec per volt	1.64E-05	μEinsteins/cm ² ·sec per volt
Wet Calibration Factor:	1.75E+13	quanta/cm ² ·sec per volt	2.90E-05	μEinsteins/cm ² ·sec per volt

Sensor Test Data and Results⁴⁾

Sensor Supply Current (Dark):	68.4	mA								
Supply Voltage:	6	Volts								
Lamp Integrated PAR Irradiance:	8.38E+15	quanta/cm ² ·sec		0.01391		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%	2.928	100.00%	8.47E-08	8.47E-08	2.929	0.001	0.0	8.38E+15	
0.3	36.10%	2.487	36.10%	3.06E-08	3.06E-08	2.487	0.001	0.0	3.02E+15	
0.5	27.60%	2.375	27.86%	2.36E-08	2.34E-08	2.371	-0.003	-0.9	2.33E+15	
1	9.27%	1.911	9.47%	8.02E-09	7.85E-09	1.902	-0.008	-2.1	7.93E+14	
2	1.11%	1.045	1.16%	9.79E-10	9.40E-10	1.030	-0.015	-3.9	9.68E+13	
3	0.05%	0.297	0.08%	6.64E-11	4.52E-11	0.248	-0.049	-31.9	6.57E+12	

Dark Before: 0.120 Volts
 Light - No Filter Hldr.: 2.928 Volts
 Dark After - NFH: 0.120 Volts
 Average Dark: 0.120 Volts

$I_{\text{Ref}} = 1.00E-10$ Amps
 $I_{\text{Dark}} = 1.32E-10$ Amps
 $10^{V_{\text{Dark}}} = 1.318257$

RG780 0.247

Notes:

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