Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 02/08/19 **Job No.:** R13512
Model Number: QSP200L4S
Serial Number: 4497
Operator: TPC
Standard Lamp: V-042(1/3/19)
Operating Voltage Range: 6 to 15 VDC (+)

Note: The QSP200L4S uses a log amplifier to measure the detector signal current with V = log I (Amps) / IRef
To calculate irradiance, use this formula:

Irradiance = Calibration factor * (10^Light Signal Voltage - 10^Dark Voltage)

With the appropriate (solar corrected) Irradiance Calibration Factor:

Dry Calibration Factor:	**8.97E+12**	**quanta/cm²·sec per volt**	**1.49E-05**	**µEinsteins/cm²·sec per volt**
Wet Calibration Factor:	**1.58E+13**	**quanta/cm²·sec per volt**	**2.63E-05**	**µEinsteins/cm²·sec per volt**

Sensor Test Data and Results[4)]

Sensor Supply Current (Dark):	73.9	mA			
Supply Voltage:	6	Volts			
Lamp Integrated PAR Irradiance:	9.40E+15	quanta/cm²·sec	0.01561	µEinsteins/cm²sec	
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/ cm²·sec)
No Filter	100.00%	3.021	100.00%		1.05E-07	1.05E-07	3.022	0.001	0.0	9.40E+15
0.3	36.10%	2.579	36.05%		3.78E-08	3.79E-08	2.580	0.001	0.1	3.39E+15
0.5	27.60%	2.467	27.82%		2.92E-08	2.90E-08	2.464	-0.003	-0.8	2.62E+15
1	9.27%	1.995	9.29%		9.75E-09	9.73E-09	1.995	0.000	-0.3	8.74E+14
2	1.11%	1.114	1.10%		1.16E-09	1.16E-09	1.117	0.004	0.8	1.04E+14
3	0.05%	0.349	0.07%		7.83E-11	5.60E-11	0.304	-0.045	-28.4	7.01E+12

Dark Before: 0.162 Volts
Light - No Filter Hldr.: 3.021 Volts
Dark After - NFH: 0.162 Volts
Average Dark 0.162 Volts

I_{Ref} = 1.00E-10 Amps
I_{Dark} = 1.45E-10 Amps
10^{VDark} = 1.451777

RG780 **0.263**

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.