Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 06/01/16 **Job No.:** R12593
Model Number: QSP200L4S
Serial Number: 4603
Operator: TPC
Standard Lamp: V-035(3/4/15)
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:	**1.30E+13**	**quanta/cm²·sec per volt**	**2.16E-05**	**µEinsteins/cm²·sec per volt**
Wet Calibration Factor:	**2.29E+13**	**quanta/cm²·sec per volt**	**3.81E-05**	**µEinsteins/cm²·sec per volt**

Sensor Test Data and Results[4)]

Sensor Supply Current (Dark):	67.8	mA			
Supply Voltage:	6	Volts			
Lamp Integrated PAR Irradiance:	1.03E+16	quanta/cm²·sec	0.01713	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%	2.901	100.00%		7.96E-08	7.96E-08	2.902	0.001	0.0	1.03E+16
0.3	36.10%	2.461	36.19%		2.88E-08	2.87E-08	2.461	0.000	-0.3	3.73E+15
0.5	27.60%	2.346	27.73%		2.21E-08	2.20E-08	2.345	-0.001	-0.5	2.86E+15
1	9.27%	1.875	9.25%		7.37E-09	7.38E-09	1.877	0.002	0.2	9.55E+14
2	1.11%	1.003	1.08%		8.62E-10	8.84E-10	1.013	0.010	2.5	1.12E+14
3	0.05%	0.306	0.07%		5.61E-11	4.25E-11	0.276	-0.030	-24.3	7.27E+12

Dark Before: 0.165 Volts
Light - No Filter Hldr.: 2.901 Volts
Dark After - NFH: 0.165 Volts
Average Dark 0.165 Volts

I_{Ref} = 1.00E-10 Amps
I_{Dark} = 1.46E-10 Amps
10^{VDark} = 1.462766

RG780 **0.234**

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.