Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 01/11/17 **Job No.:** R12833
Model Number: QSP200L4S
Serial Number: 4242
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 (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:	**1.38E+13**	**quanta/cm²·sec per volt**	**2.29E-05**	**µEinsteins/cm²·sec per volt**
Wet Calibration Factor:	**2.44E+13**	**quanta/cm²·sec per volt**	**4.04E-05**	**µEinsteins/cm²·sec per volt**

Sensor Test Data and Results[4)]

Sensor Supply Current (Dark):	70.3	mA			
Supply Voltage:	6	Volts			
Lamp Integrated PAR Irradiance:	8.38E+15	quanta/cm²·sec	0.01391	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%	2.785	100.00%		6.09E-08	6.09E-08	2.786	0.001	0.0	8.38E+15
0.3	36.10%	2.345	36.19%		2.20E-08	2.20E-08	2.345	0.000	-0.2	3.03E+15
0.5	27.60%	2.234	27.96%		1.70E-08	1.68E-08	2.229	-0.005	-1.3	2.34E+15
1	9.27%	1.771	9.47%		5.77E-09	5.65E-09	1.763	-0.008	-2.1	7.94E+14
2	1.11%	0.928	1.15%		7.01E-10	6.76E-10	0.916	-0.012	-3.5	9.64E+13
3	0.05%	0.292	0.08%		4.76E-11	3.25E-11	0.257	-0.035	-31.7	6.55E+12

Dark Before: 0.171 Volts
Light - No Filter Hldr.: 2.785 Volts
Dark After - NFH: 0.172 Volts
Average Dark 0.171 Volts

I_{Ref} = 1.00E-10 Amps
I_{Dark} = 1.48E-10 Amps
10^{VDark} = 1.483662

RG780 0.19

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.