CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Sensing Foil Batch No:	2808F	**Product:**	4330I
Certificate No:	4330IE 199 2034	**Serial No:**	199
		Calibration Date:	April 15, 2011

This is to certify that this product has been calibrated using the following instruments:

Fluke CHUB E-4	Serial No. A7C677
Fluke 5615 PRT	Serial No. 802054
Fluke 5615 PRT	Serial No. 849155
Honeywell PPT	Serial No. 44074
Calibration Bath model FNT 321-1-40	

Parameter: Internal Temperature:

Calibration points and readings:

Temperature (°C)	-	-	-	-
Reading (mV)	-	-	-	-

Giving these coefficients

Index	0	1	2	3
TempCoef	2.30117E+01	-3.03997E-02	2.81608E-06	-4.12565E-09

*Note: Temperature calibration not performed.

Parameter: Oxygen:

	O2 Concentration	Air Saturation
Range:	0-500 µM [1)]	0 - 120%
Accuracy[1)]:	< ±8µM or ±5%(whichever is greater)	±5%
Resolution:	< 1 µM	< 0.4%
Settling Time (63%):	< 25 seconds	

Calibration points and readings[2)]:

	Air Saturated Water	Zero Solution (Na_2SO_3)
Phase reading (°)	3.06683E+01	6.21500E+01
Temperature reading (°C)	1.01521E+01	2.17141E+01
Air Pressure (hPa)	1.00647E+03	

Giving these coefficients

Index	0	1	2	3
PhaseCoef	-1.59956E+00	1.01688E+00	0.00000E+00	0.00000E+00

[1)] *Valid for 0 to 2000m (6562ft) depth, salinity 33 - 37ppt*

[2)] *The calibration is performed in fresh water and the salinity setting is set to: 0*

Date:
April 15, 2011

Sign: Shawn A. Sneddon

Service and Calibration Engineer

Aanderaa Data Instruments, Inc.
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an ITT Analytics Company

CALIBRATION CERTIFICATE

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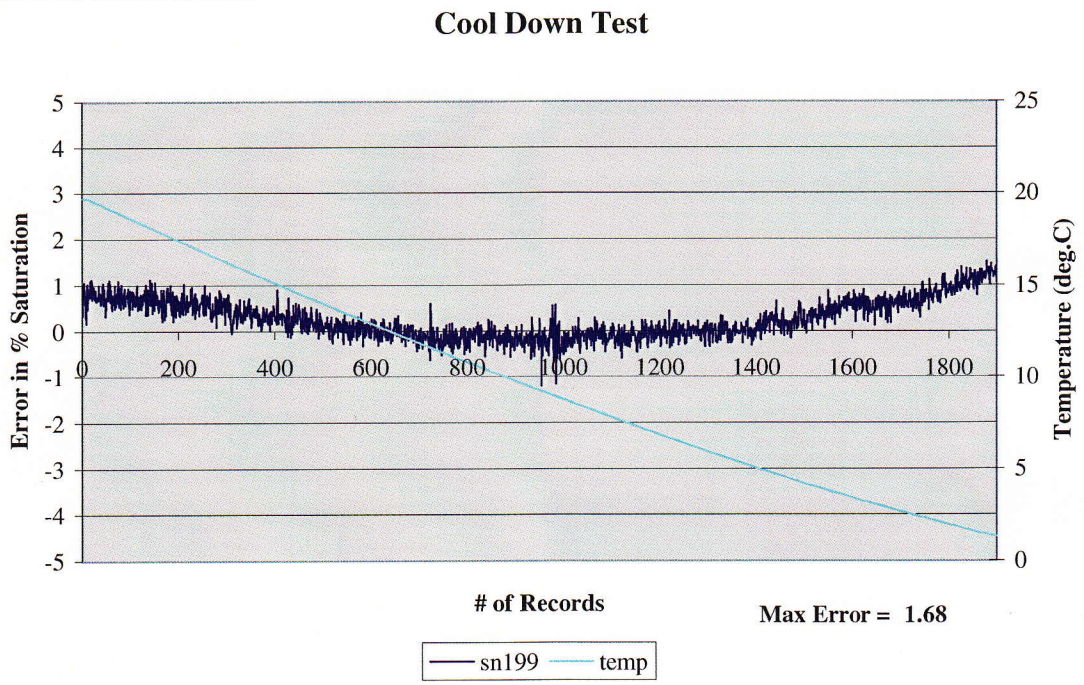
Sensing Foil Batch No:	2808F	**Product:**	4330I
Certificate No:	4330IE 199 2034	**Serial No:**	199
		Calibration Date:	April 15, 2011

Data from Cool Down Test:



Max Error = 1.68

SR10 Scaling Coefficients:

At the SR10 output the Oxygen Optode 3830 can give either absolute oxygen concentration in µM or air saturation in %. The setting of the internal property "Output" [3], controls the selection of the unit. The coefficients for converting SR10 raw data to engineering units are fixed.

Output = -1	Output = -2
A = 0	A = 0
B = 4.883E-01	B = 1.465E-01
C = 0	C= 0
D = 0	D = 0
Oxygen (uM) = A + BN + CN2 + DN3	Oxygen (%) = A + BN + CN2 + DN3

[3] *The default output setting is set to -1*

Date:
April 15, 2011

Sign: Shawn A. Sneddon

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AADI TEST & SPECIFICATIONS

AANDERAA DATA INSTRUMENTS

Layout No:
Circuit Diagram No:
Program Version:

Product: 4330I
Serial No: 199

1.	**Visual and Mechanical Checks:**			
1.1.	O-ring surface		N/A	
1.2.	Soldering quality		N/A	
1.3.	Visual surface		OK	
1.4.	Pressure test (60MPa)		N/A	
1.5.	Galvanic isolation between housing and electronics		OK	
2.	**Current Drain and Voltages:**			
2.1.	Average current drain at 0.5Hz sampling (Max: 100mA)		39.1	mA
2.2.	Current drain in sleep (Max: 160uA)		117	uA
3.	**Performance Test in Air, 20°C Temperature w/fluorescence foil:**	Blue	Red	
3.1.	Amplitude measurement (Blue and Red: 700 – 1200mV)	812.6	939.8	mV
3.2.	Phase measurement (TC: 27 ±5°)	31.73		°
3.3	Temperature Measurement (100 ± 300mV)		50.8	mV
3.4	AiCap Mode Tested (output(200))		OK	
4.	**Firmware:**			
4.1.	Firmware upgrade		1.22.1	

Date:
April 15, 2011

Sign: Shawn A. Sneddon

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CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Form No 770. , Jun 2008

Certificate No: 3853_2808F_39784
Batch No: 2808F

Product: O2 Sensing Foil PSt3
Calibration Date: 2 December 2008

Serial No: 2808

Calibration points and phase readings

Index	Temperature (°C)	Phase Reading (°)	Oxygen reference (µM)	Index	Temperature (°C)	Phase Reading (°)	Oxygen reference (µM)
0	3.315	63.024	0.00	32	39.680	33.609	85.05
1	3.318	59.314	18.88	33	39.686	25.499	177.73
2	3.315	56.083	37.76	34	39.680	22.036	255.14
3	3.315	48.522	94.41	35	6.782	62.775	0.00
4	3.315	40.556	188.82	36	6.783	58.912	17.34
5	3.312	31.479	394.67	37	6.781	55.556	34.68
6	3.312	27.327	566.51	38	6.780	47.820	86.70
7	10.248	62.526	0.00	39	6.780	39.796	173.41
8	10.247	58.510	15.80	40	6.778	30.786	362.45
9	10.247	55.030	31.60	41	6.776	26.703	520.28
10	10.246	47.117	79.00	42	15.172	62.139	0.00
11	10.244	39.036	158.00	43	15.171	57.895	14.21
12	10.243	30.093	330.23	44	15.171	54.257	28.42
13	10.240	26.079	474.04	45	15.171	46.135	71.06
14	20.096	61.751	0.00	46	15.170	38.029	142.11
15	20.096	57.281	12.62	47	15.170	29.206	297.02
16	20.095	53.484	25.25	48	15.168	25.291	426.36
17	20.096	45.153	63.12	49	25.017	61.341	0.00
18	20.096	37.023	126.23	50	25.016	56.662	11.47
19	20.096	28.319	263.82	51	25.016	52.720	22.94
20	20.096	24.503	378.68	52	25.016	44.230	57.34
21	29.938	60.931	0.00	53	25.017	36.105	114.67
22	29.937	56.042	10.31	54	25.018	27.553	239.66
23	29.937	51.956	20.62	55	25.018	23.827	344.01
24	29.936	43.306	51.56	56	34.811	60.495	0.00
25	29.938	35.188	103.12	57	34.810	55.443	9.41
26	29.940	26.788	215.51	58	34.811	51.237	18.82
27	29.940	23.150	309.34	59	34.809	42.477	47.04
28	39.684	60.059	0.00	60	34.809	34.398	94.08
29	39.684	54.843	8.50	61	34.813	26.143	196.62
30	39.686	50.518	17.01	62	34.810	22.593	282.24
31	39.682	41.649	42.52	63			

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AANDERAA DATA INSTRUMENTS

CALIBRATION CERTIFICATE

Giving these coefficients

Index	FoilCoefA	FoilCoefB
0	-3.738569E-06	5.316652E-07
1	-8.656474E-06	3.832035E+03
2	2.206881E-03	-3.871124E+01
3	-2.269625E-01	1.475505E-01
4	7.958563E-04	-3.303319E-04
5	-6.780085E-07	2.289283E-05
6	1.189709E+01	-5.008295E-07
7	-6.533028E-02	0.000000E+00
8	1.284304E-04	0.000000E+00
9	-2.894669E-07	0.000000E+00
10	-3.249648E+02	0.000000E+00
11	2.497815E+00	0.000000E+00
12	-7.050041E-03	0.000000E+00
13	-1.363821E-05	0.000000E+00

Using the following monomial degrees

Index	FoilPolyDegT	FoilPolyDegO
0	1	4
1	0	5
2	0	4
3	0	3
4	1	3
5	2	3
6	0	2
7	1	2
8	2	2
9	3	2
10	0	1
11	1	1
12	2	1
13	3	1
14	4	1
15	0	0
16	1	0
17	2	0
18	3	0
19	4	0
20	5	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0

Date: 2 December 2008

Sign:

John Arne Lillestøl,
Automation Engineer

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AANDERAA DATA INSTRUMENTS

SERVICE REPORT

Service report no
255188

Customer Info

Customer no	**2120052**	*Delivery to*	
Customer	**University of Hawaii**	**University of Hawaii**	
Contact	**Jennie Mowatt**	*Date of receipt*	**11.04.2011**
Your ref	**Credit Card**	*Delivery date*	**20.04.2011**

Serviced Items

Next service: **15.04.2013**

Type	*Serial no*	
4330	**199**	**Oxygen Optode**

Reason for service **Service and calibration. Fast foil version.**

Service comments

1) Performed visual inspection: OK.
2) Checked for isolation between housing and electronics: OK.
3) Checked current consumption: operating = 39.1mA, quiescent = 117uA; OK.
4) Performed test in air checkin C1Amp, C2Amp, TCPhase, and RawTemp: C1Amp and C2Amp Low; Gain needs to be adjusted.
5) Checked temperature in 10 deg.C bath with reference: sn199 = 10.130, reference = 10.141; OK.
6) Checked saturation in 100% saturated bath with reference optode: sn199 = 79.228%, sn338 = 97.551%; needs to be recalibrated.
7) Checked foil: Found several black marks on foil; checked for stability to ensure foil is OK;
8) Checked firmware version: 1.22.1; boot enable not wired out; firmware cannot be upgraded.
9) Changed foil to batch 2808F.
10) Burned in foil overnight.
11) Checked C1Amp and C2Amp: OK.
12) Performed saturation calibration at 100% and 0% saturation: PASSED.
13) Checked in 100% saturated bath versus reference optode: sn199 = 98.351%, sn338 = 98.377%; OK.
14) Checked in 20 deg.C bath versus reference optode: sn199 = 96.238%, sn338 = 96.014%; OK.
15) Performed cool down test from 20 to 1 deg.C: PASSED.
16) Returned to customer settings.

Test comments **PASSED**

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SWIFT code: DNBANOKK

AANDERAA DATA INSTRUMENTS

SERVICE REPORT

Service report no
255188

Customer Info

Customer no	**2120052**	*Delivery to*	
Customer	**University of Hawaii**	**University of Hawaii**	
Contact	**Jennie Mowatt**	*Date of receipt*	**11.04.2011**
Your ref	**Credit Card**	*Delivery date*	**20.04.2011**

Serviced Items

Summary

Serviced	*Repaired*	*Total*
0	**0**	**0**

Bergen, 15.04.2011

Service engineer

All prices are in **NOK**

Shawn Sneddon

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