CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Electronic board: **3623**
Electronic board serial: **1143**
Reference reading: **889**

Product: **RCM 9**
Serial No: **904**
Calibration Date: **January 5, 2011**

For details; see the individual Calibration Sheets.

The calibration coefficients listed below are valid for sensors with the following serial numbers:

Sensor	Type	Serial No.	Range	
Doppler Current Sensor	3920	502		
Temperature Sensor	3621	1161		
			Arctic:	-3.04 to 5.89
			High:	9.78 to 36.63
			Low:	-2.72 to 21.75
			Wide:	-0.64 to 32.83
Conductivity Sensor	3619	907	0 - 74 mS/cm	
Pressure Sensor	3815B	596	0 - 3500 kPa	
Turbidity Sensor	3612	774	0 - 20 NTU	
Oxygen Sensor	3835	460	0 - 500 uM	

Calibration Coefficients:

Ch. No.	Parameter	A	B	C	D	Unit
1	Reference	0.000E+00	1.00E+00	0.000E+00	0.000E+00	-
2	Current Speed	0.000E+00	2.93E-01	0.000E+00	0.000E+00	cm/s
3	Current Direction	0.000E+00	3.52E-01	0.000E+00	0.000E+00	Deg. M
4	Temperature Range					
	Arctic	-3.044E+00	8.974E-03	-3.476E-07	1.134E-10	Deg. C
	High	9.780E+00	2.390E-02	-5.941E-07	2.820E-09	Deg. C
	Low	-2.722E+00	2.406E-02	-2.238E-06	2.056E-09	Deg. C
	Wide	-6.428E-01	3.414E-02	-6.292E-06	4.800E-09	Deg. C
	Other					
5	Conductivity	8.996E-01	6.920E-02	0.000E+00	0.000E+00	mS/cm
6	Pressure	-2.030E+01	3.435E+00	7.608E-05	0.000E+00	kPa
7	Turbidity	-1.018E+00	2.857E-02	-1.729E-05	1.363E-08	NTU
8	Oxygen	0.000E+00	4.883E-01	0.000E+00	0.000E+00	uM

Date:
January 5, 2011

Sign: Shawn A. Sneddon

Service and Calibration Engineer

Aanderaa Data Instruments, Inc.
182 East Street Attleboro, MA 02703 Tel. +1 (508) 226-9300 email: infoUSA@aadi.no
an ITT Analytics Company

1. Visual and Mechanical Checks:

1.1 Sensors fixed in correct position
1.2 Wire harness, screws and sensor plugs
1.3 Epoxy coating intact
1.4 Zinc anode installed
1.5 Clean and inspect O-ring groove

2. Performance Tests of complete instrument:

2.1 Current consumption at continuous operation, maximum 120 mA
2.2 Current consumption between measurements at 120 min. interval, maximum 1.0 mA average
2.3 Check operation with Test Unit 3751,-5C to +35C, (all channels tested, 16 hour run, data stored in DSU 2990)
2.4 Check remote start, PDC-4 output and external powering
2.5 Electrical isolation between system ground and Top end-plate

3. Final Check prior to Shipment:

3.1 Doppler Current Sensor is tested with Test Unit 3731
3.2 Temperature readings correspond to room temperature
3.3 Conductivity Sensor reads correct with seawater loop
3.4 Check that the pressure sensor is oil filled
3.5 Pressure Sensor gives correct reading at air pressure
3.6 Turbidity reading increases when a reflector is placed 20cm in front of it
3.7 The oxygen sensor reads maximum in air
3.8 Erased DSU installed
3.9 Set temperature range switch to default setting and conductivity range to 0-74 mS/cm
3.10 Set interval switch to 10 min, channel selector to 8 channel and OFF/ON switch to OFF position
3.11 Inspect O-ring groove and clean
3.12 Replace Top-End Plate and Receptacle O-ring

CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

		Product:	Conductivity Sensor 3619
Layout No:		**Serial No:**	907
Program Version:		**Calibration Date:**	December 21, 2010

Calibration

The calibration of each sensor is carried out at the factory and the calibration is valid for all following data handling. The form below is filled in only where necessary, depending upon which type of sensor it concerns.

Range		Loop-Reading			Reading in seawater		
0 -74 mS/cm		N(open)=	**0**		Reference conductivity:	**36.19**	mS/cm
		N(2000)=	**6**		Instrument reading:	**510**	Raw data
		N(50)=	**790**				
		N(o)=	-13				
A=	8.996E-01	**COND**	0.90	36.19	Cell form factor K=		2.782
B=	6.920E-02	**N**	0	510	Not in use.		

Date:
December 21, 2010

Sign: Shawn Sneddon

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CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Product: Pressure Sensor 3815B
Layout No:
Serial No: 596
Range: 0 - 3500 kPa
Calibration Date: January 5, 2011

Calibration

The calibration of each sensor is carried out at the factory and the calibration is valid for all following data handling. The form below is filled in only where necessary, depending upon which type of sensor it concerns.

Pressure		Coefficients (kPa)	
Bar	Reading N		
Air	36	A	-2.030E+01
7	238	B	3.435E+00
16	496	C	7.608E-05
24	723	D	0.000E+00
33	975		

Date:
January 5, 2011

Sign: Shawn Sneddon

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CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Sensing Foil Batch No:	5005	**Product:**	3835
Certificate No:	3835 460 1059	**Serial No:**	460
		Calibration Date:	December 3, 2010

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

Parameter: Internal Temperature:

Calibration points and readings:

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

*Temperature calibratoin not performed

Giving these coefficients

Index	0	1	2	3
TempCoef	2.24532E+01	-3.02092E-02	2.74852E-06	-4.09758E-09

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 (°)	3.07214E+01	6.27950E+01
Temperature reading (°C)	1.05188E+01	2.11355E+01
Air Pressure (hPa)	1.01723E+03	

Giving these coefficients

Index	0	1	2	3
PhaseCoef	-5.24460E-01	1.15236E+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:
December 3, 2010

Sign: Shawn A. Sneddon

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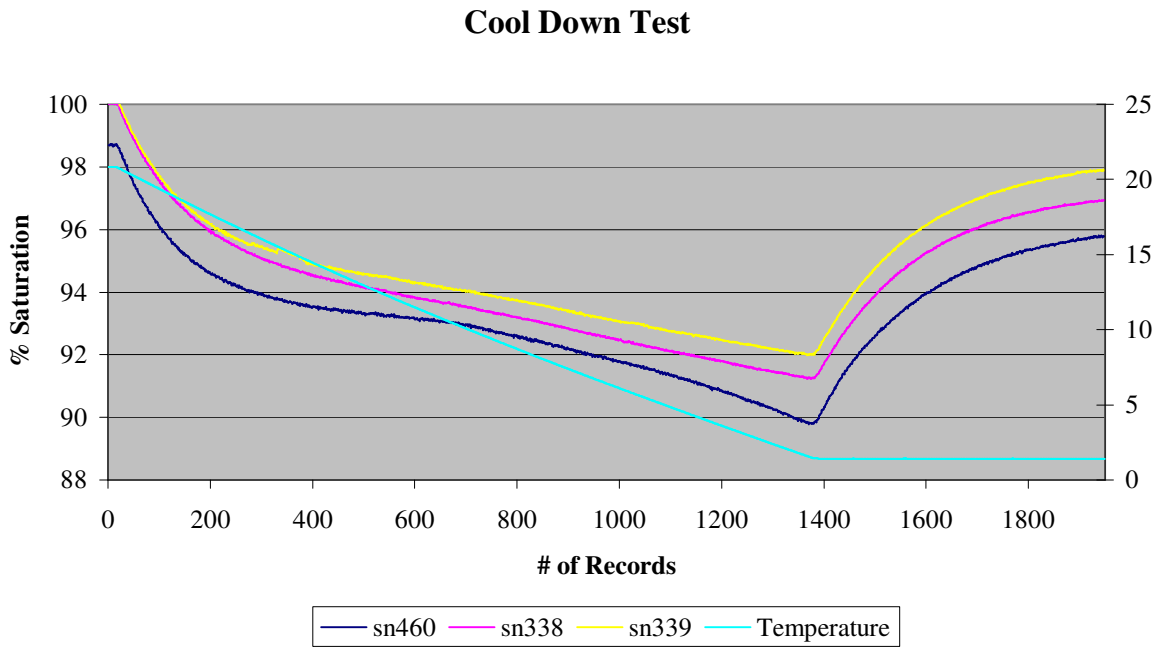
CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Sensing Foil Batch No:	5005	**Product:**	3835
Certificate No:	3835 460 1059	**Serial No:**	460
		Calibration Date:	December 3, 2010

Data from Cool Down Test:



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:
December 3, 2010

Sign: Shawn A. Sneddon

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CALIBRATION CERTIFICATE

AANDERAA DATA INSTRUMENTS

Form No. 710, Dec 2005

Sensing Foil Batch No: 5005
Certificate No: 3853 5005 38757

Product: O2 Sensing Foil PSt3 3853
Calibration Date: 9 February 2006

Calibration points and phase readings (degrees)

Temperature (°C)		3.67	11.42	20.42	29.47	37.68
Pressure (hPa)		972.63	972.63	972.63	972.63	972.63
O2 in % of O2+N2	0.00	72.88	72.35	71.57	70.85	70.08
	1.00	68.80	67.84	66.53	65.25	63.84
	2.00	65.23	63.95	62.27	60.63	58.91
	5.00	56.78	54.98	52.76	50.67	48.59
	10.00	47.48	34.55	43.10	40.93	38.91
	20.90	36.43	34.55	32.41	30.56	28.84
	30.00	31.26	29.55	27.64	26.02	24.53

Giving these coefficients [1)]

Index	0	1	2	3
C0 Coefficient	4.94529E+03	-1.67764E+02	3.41751E+00	-3.07691E-02
C1 Coefficient	-2.69898E+02	8.31507E+00	-1.74439E-01	1.62807E-03
C2 Coefficient	5.97638E+00	-1.67971E-01	3.75245E-03	-3.67960E-05
C3 Coefficient	-6.18186E-02	1.60203E-03	-3.91116E-05	4.02796E-07
C4 Coefficient	2.45035E-04	-5.90218E-06	1.59999E-07	-1.71557E-09

[1)] *Ask for Form No 621S when this O2 Sensing Foil is used in Oxygen Sensor 3830 with Serial Numbers lower than 184.*

Date:
August 3, 2010

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TEST & SPECIFICATIONS

AANDERAA DATA INSTRUMENTS

Layout No: **Product:** 3835
Circuit Diagram No: **Serial No:** 460
Program Version:

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1. Visual and Mechanical Checks:

1.1.	O-ring surface	OK
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: 38mA)	31.3mA	mA
2.2.	Current drain in sleep (Max: 300uA)	189uA	uA

3. Performance Test in Air, 20°C Temperature:

3.1.	Amplitude measurement (Blue: 290 – 470mV)	403.99	mV
3.2.	Phase measurement (Blue: 25 ±5°)	27.81	°
3.3	Temperature Measurement (100 ± 300mV)	-6.71	mV

4. Firmware:

4.1.	Firmware upgrade	3.22

Date:
December 3, 2010

Sign: Shawn A. Sneddon

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