

# SYSTEM CONFIGURATION

Model SBE 16plusV2	<b>S/N 16-50484</b>
Instrument Type	<b>SBE 16plusV2 Seacat</b>
Firmware Version	<b>3.2.0</b>
Communications	<b>9600 baud, 8 data bits, no parity, one stop bit</b>
Memory	<b>64MB</b>

Housing	<b>600 meter (Acetron plastic)</b>
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Pressure Sensor	<b>Strain Gauge: 20 dBar, S/N 11999143</b>
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Zero Conductivity Raw Frequency	<b>2565.40 Hz</b>
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Number of Voltages Sampled:	<b>1</b>
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Serial RS-232C Sensor	<b>SBE63</b>
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<b>Pump (SBE 5)</b>	<b>05-11175</b>
<b>Oxygen (SBE 63)</b>	<b>63-3227</b>
<b>CHL (ECO)</b>	<b>FLS-7581</b>

## Common SBE Factory Default Values for Sensor Delays:

Seacat without external sensors..... 0 Seconds

Minimum delay for external sensors (voltage or serial)..... 4 Seconds

*Common sensors with a 4 second delay include:*

*Wet Labs ECO sensors, Seapoint STM and SCF, PAR sensors, SBE38, SBE50, Cylcops-7, & OBS3+*

Wet Labs C-Star..... 10 Seconds

SBE43 (0.5 mil membrane) ..... 30 Seconds

SBE43 (1.0 mil membrane) ..... 40 Seconds

SBE63..... 40 Seconds

SBE18 or SBE27..... 60 Seconds

<b>Configured Overall Delay Setting for this CTD:</b>	<b>40 Seconds</b>
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Note: Overall Voltage Delay Setting is based on the longest time delay as needed. A list is provided above of common sensor delay values programmed into CTD when integrated and shipped from Sea-Bird Electronics. To recalculate this value when adding or removing sensors, please refer to CTD manual.

## SEASOFT CONFIGURATION:

The settings for the configuration of your instrument as delivered are documented below:

Configuration for the SBE 16plus V2 Seacat CTD

Configuration file opened: 16-50484.xmlcon

Pressure sensor type: Strain Gauge Data...

External voltage channels: 1

Serial RS-232C sensor: SBE 63 Oxygen

Sample interval seconds: 60

☐ NMEA position data added

Channel	Sensor
1. Count	Temperature
2. Frequency	Conductivity
3. Count	Pressure, Strain Gauge
4. A/D voltage 0	Fluorometer, WET Labs ECO-AFL/FL
5. Serial RS-232	Oxygen, SBE 63

New Open... Save Save As... Select... Modify...

Report... Help... Exit Cancel



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# Product Documentation

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## SBE16plusV2 SeaCAT Moored

### Instrument Configuration

Instrument Serial Number: 16-50484  
Instrument Firmware Version: 3.2.0  
Zero Conductivity Frequency: 2565.40  
Communications Format: RS232  
Communications Settings: 9600 baud, 8 Data Bits, No Parity

### Installed Devices/Sensors

<i>Data Format</i>	<i>Measurement</i>	<i>Sensor Type</i>	<i>Serial Number</i>	<i>Rating</i>
Count	Temperature	Internal	N/A	N/A
Frequency	Conductivity	Internal	N/A	N/A
Count	Pressure Sensor	Druck	11999143	20m(30 dBar)
NONE	N/A	SBE 5	11175	600m
RS232	Oxygen	SBE 63	63-3227	600m

**Maximum Depth: 20m**

**CAUTION** - The maximum deployment depth will be limited by the measurement range of the pressure sensor, if installed, an attached sensor, if installed, or the housing.



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SENSOR SERIAL NUMBER: 50484  
CALIBRATION DATE: 01-Jul-22

SBE 16plus V2 TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

a0 = 1.279264e-003  
a1 = 2.597615e-004  
a2 = 1.108489e-006  
a3 = 8.680217e-008

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	555720.800	1.0000	0.0000
4.5000	490922.200	4.4999	-0.0001
15.0000	332592.300	15.0002	0.0002
18.4999	290664.545	18.4997	-0.0002
24.0000	234101.600	23.9999	-0.0001
28.9999	191315.400	29.0001	0.0002
32.5000	165580.600	32.4999	-0.0001

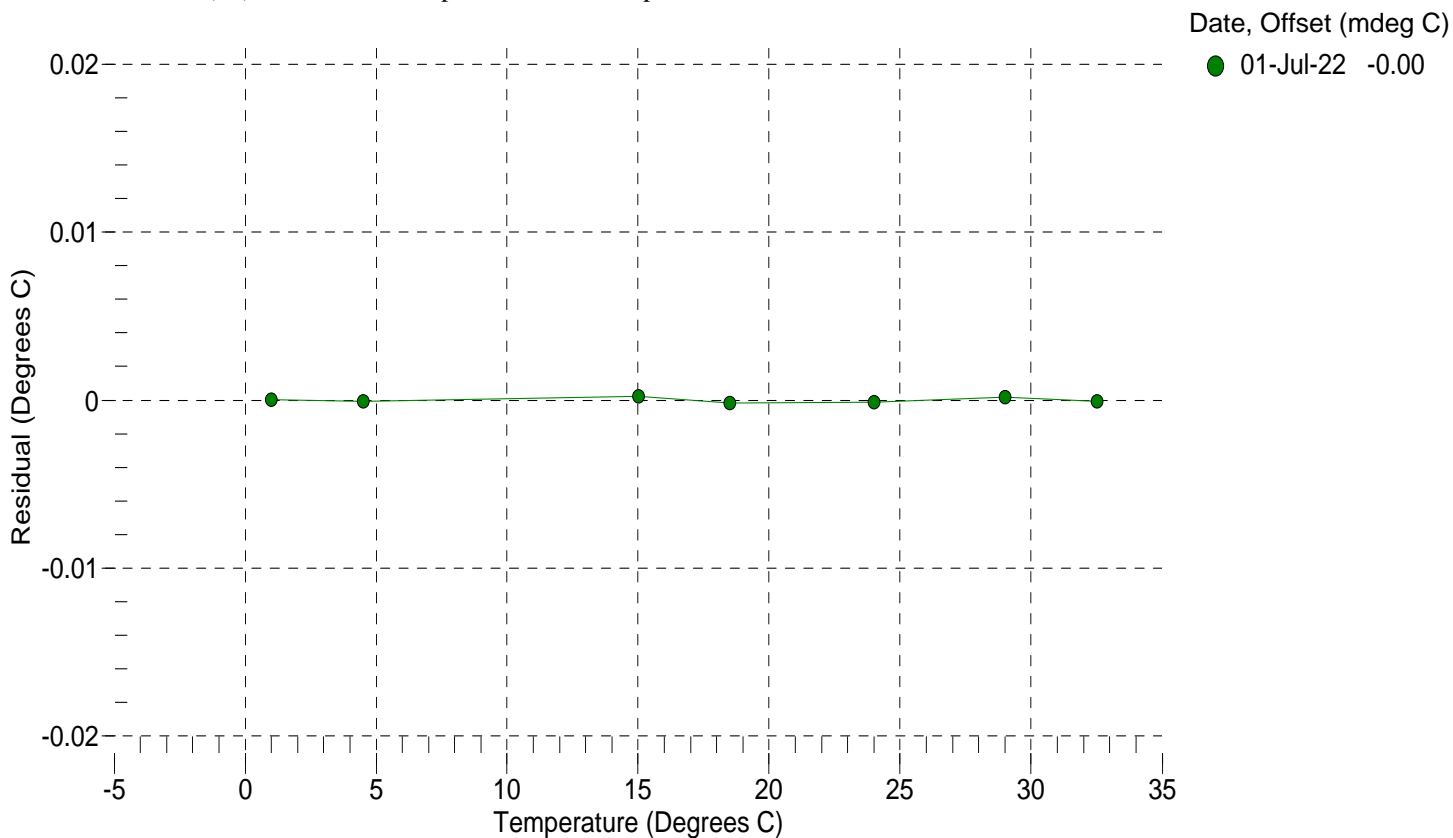
n = Instrument Output (counts)

MV = (n - 524288) / 1.6e+007

R = (MV \* 2.900e+009 + 1.024e+008) / (2.048e+004 - MV \* 2.0e+005)

Temperature ITS-90 (°C) = 1 / {a0 + a1[ln(R)] + a2[ln<sup>2</sup>(R)] + a3[ln<sup>3</sup>(R)]} - 273.15

Residual (°C) = instrument temperature - bath temperature





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SENSOR SERIAL NUMBER: 50484  
CALIBRATION DATE: 01-Jul-22

SBE 16plus V2 CONDUCTIVITY CALIBRATION DATA  
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

#### COEFFICIENTS:

g = -1.007161e+000  
h = 1.537379e-001  
i = -4.136631e-004  
j = 5.430523e-005

CPcor = -9.5700e-008  
CTcor = 3.2500e-006

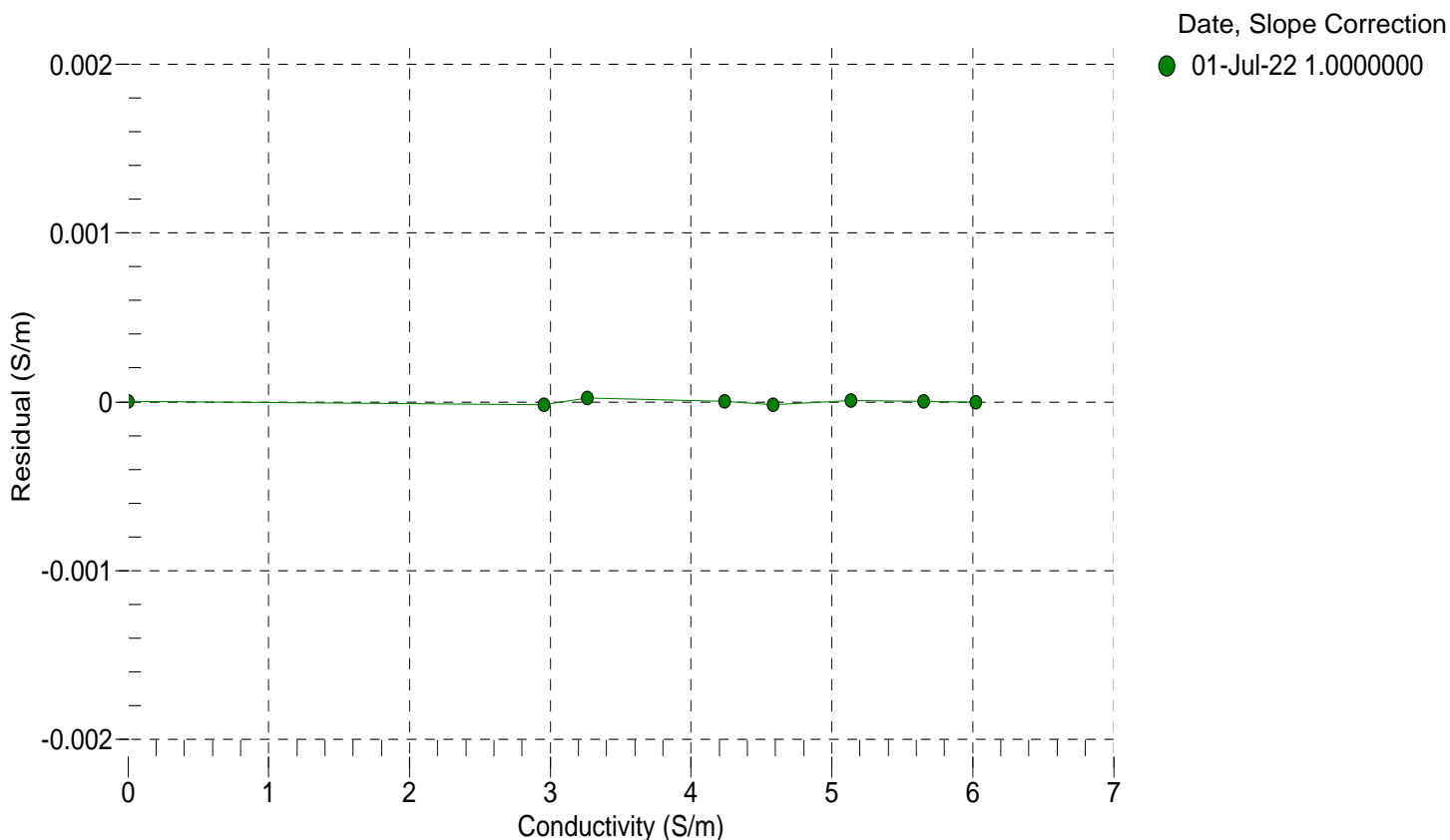
BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
22.0000	0.0000	0.00000	2565.40	0.0000	0.00000
1.0000	34.5617	2.95627	5089.02	2.9563	-0.00002
4.5000	34.5445	3.26160	5280.95	3.2616	0.00002
15.0000	34.5061	4.23757	5851.59	4.2376	0.00000
18.4999	34.4974	4.58060	6039.08	4.5806	-0.00002
24.0000	34.4876	5.13511	6330.15	5.1351	0.00001
28.9999	34.4820	5.65368	6590.39	5.6537	0.00000
32.5000	34.4778	6.02360	6769.72	6.0236	-0.00000

f = Instrument Output (Hz) / 1000.0

t = temperature (°C); p = pressure (decibars);  $\delta$  = CTcor;  $\epsilon$  = CPcor;

Conductivity (S/m) =  $(g + h * f^2 + i * f^3 + j * f^4) / (1 + \delta * t + \epsilon * p)$

Residual (Siemens/meter) = instrument conductivity - bath conductivity





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SENSOR SERIAL NUMBER: 50484  
CALIBRATION DATE: 23-Jun-22

SBE 16plus V2 PRESSURE CALIBRATION DATA  
44 psia S/N 11999143

#### COEFFICIENTS:

PA0 =	-2.000544e-002	PTCA0 =	5.264731e+005
PA1 =	1.329566e-004	PTCA1 =	-2.275874e+000
PA2 =	-1.483117e-012	PTCA2 =	-1.740508e-001
PTEMPA0 =	-6.164916e+001	PTCB0 =	2.518750e+001
PTEMPA1 =	4.999894e+001	PTCB1 =	-2.992519e-004
PTEMPA2 =	3.175169e-004	PTCB2 =	0.000000e+000

#### PRESSURE SPAN CALIBRATION

#### THERMAL CORRECTION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)	TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
14.58	636313.0	1.7	14.59	0.01	32.50	1.88	638459.60
24.61	711913.0	1.7	24.61	-0.01	29.00	1.81	638535.36
29.62	749758.0	1.7	29.62	-0.01	24.00	1.71	638570.30
34.64	787626.0	1.7	34.63	-0.01	18.50	1.60	638610.76
39.65	825598.0	1.7	39.65	-0.00	15.00	1.53	638656.57
44.66	863562.0	1.7	44.66	0.00	4.50	1.32	638732.10
39.65	825646.0	1.7	39.66	0.00	1.00	1.25	638713.29
34.64	787734.0	1.7	34.65	0.01	TEMPERATURE (°C)		SPAN
29.63	749827.0	1.7	29.63	0.01			
24.61	711929.0	1.7	24.61	0.01			
14.58	636186.0	1.7	14.57	-0.01			
					-5.00		25.19
					35.10		25.18

y = thermistor output (counts)

t = PTEMPA0 + PTEMPA1 \* y + PTEMPA2 \* y<sup>2</sup>

x = instrument output - PTCA0 - PTCA1 \* t - PTCA2 \* t<sup>2</sup>

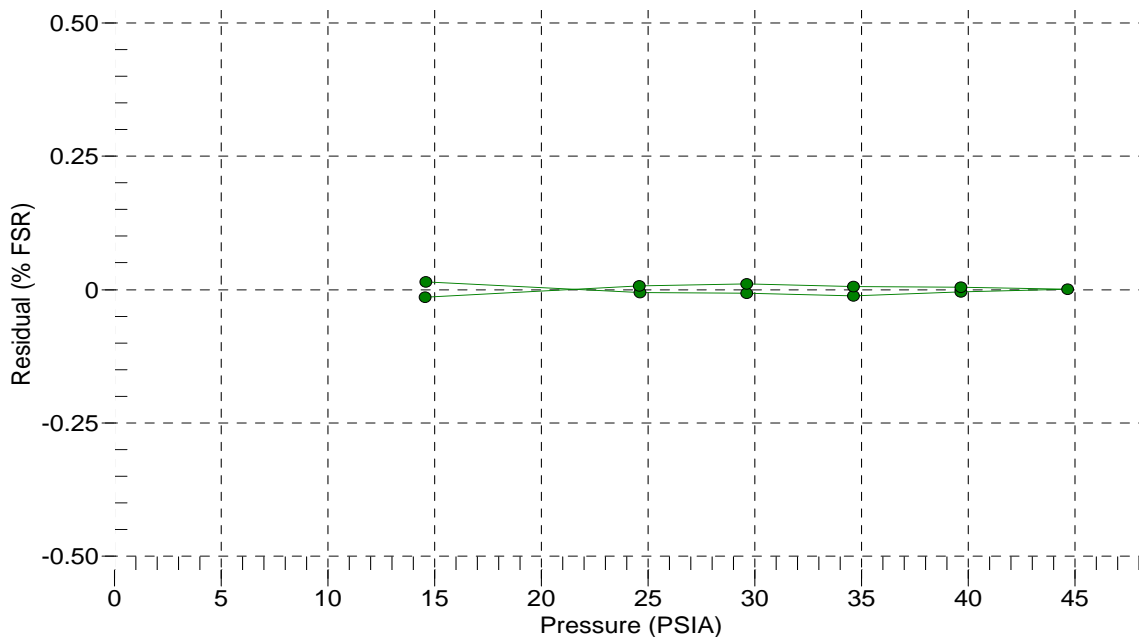
n = x \* PTCB0 / (PTCB0 + PTCB1 \* t + PTCB2 \* t<sup>2</sup>)

pressure (PSIA) = PA0 + PA1 \* n + PA2 \* n<sup>2</sup>

Residual (%FSR) = (computed pressure - true pressure) \* 100 / Full Scale Range

Date, Offset (%FSR)

● 23-Jun-22 0.00







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## Pressure Test Certificate

Test Date: **2022-06-21**

Description: **SBE-16P SeaCat**

### Sensor Information:

Model Number: **SBE-16P**

Serial Number: **50484**

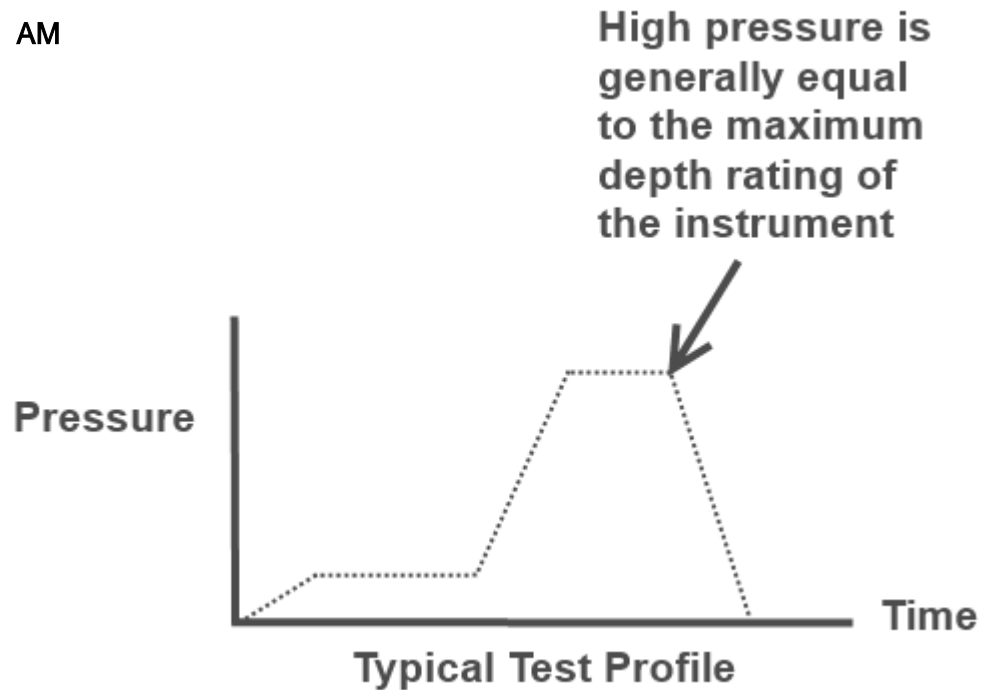
### Pressure Test Protocol:

Low Pressure Test: **40**      PSI      Held For: **15**      Minutes

High Pressure Test: **40**      PSI      Held For: **15**      Minutes

Passed Test: **True**

Tested By: **AM**





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## Pressure Test Certificate

Test Date: **2022-05-02**

Description: **SBE-5P Submersible Pump**

### Sensor Information:

Model Number: **SBE-5P**

Serial Number: **11175**

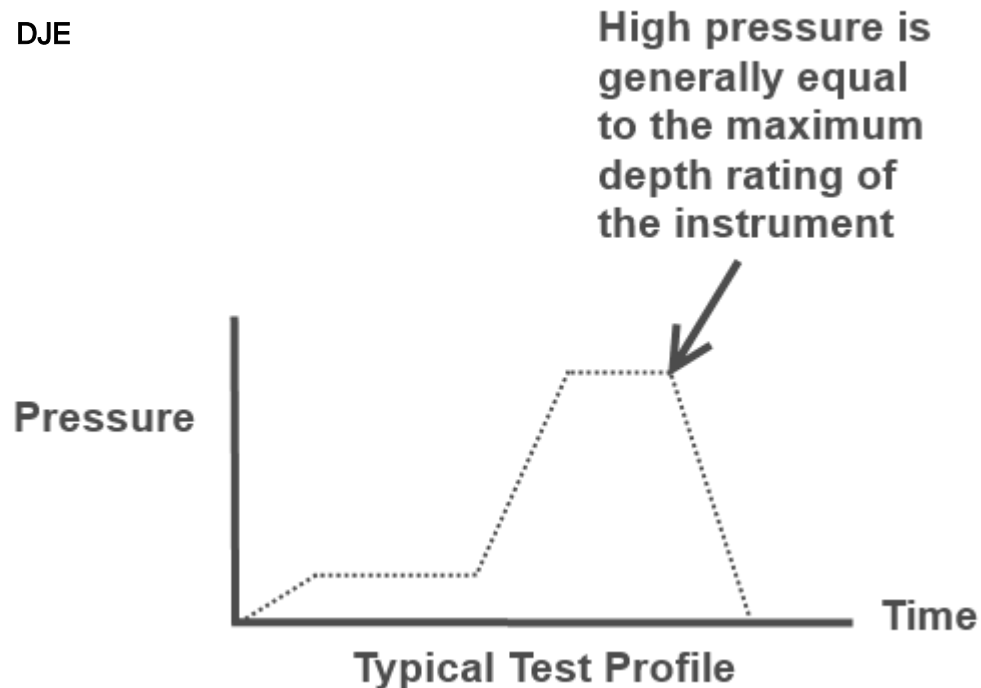
### Pressure Test Protocol:

Low Pressure Test: **40**      PSI      Held For: **15**      Minutes

High Pressure Test: **870**      PSI      Held For: **15**      Minutes

Passed Test: **True**

Tested By: **DJE**





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SENSOR SERIAL NUMBER: 3227  
CALIBRATION DATE: 21-May-22

SBE 63 OXYGEN TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

TA0 = 7.050944e-004 TA2 = 7.282127e-007

TA1 = 2.508857e-004 TA3 = 9.671481e-008

BATH TEMP (° C)	INSTRUMENT OUTPUT(V)	INST TEMP (° C)	RESIDUAL (° C)
1.9999	1.11716	1.9997	-0.00016
1.9999	1.11715	2.0001	0.00015
2.0000	1.11715	2.0001	0.00005
2.0001	1.11715	2.0001	-0.00005
5.9999	0.99273	5.9998	-0.00012
6.0000	0.99272	6.0001	0.00012
6.0000	0.99273	5.9998	-0.00022
6.0000	0.99272	6.0001	0.00012
12.0000	0.82668	12.0001	0.00010
12.0000	0.82668	12.0001	0.00010
12.0000	0.82668	12.0001	0.00010
12.0001	0.82668	12.0001	0.00000
19.9999	0.64299	19.9996	-0.00033
19.9999	0.64299	19.9996	-0.00033
20.0000	0.64298	20.0001	0.00006
20.0001	0.64298	20.0001	-0.00004
25.9998	0.53107	26.0001	0.00030
25.9999	0.53107	26.0001	0.00020
26.0000	0.53107	26.0001	0.00010
26.0000	0.53107	26.0001	0.00010
29.9998	0.46735	29.9999	0.00008
30.0000	0.46735	29.9999	-0.00012
30.0000	0.46735	29.9999	-0.00012
30.0000	0.46735	29.9999	-0.00012

V = Instrument Output (Volts)

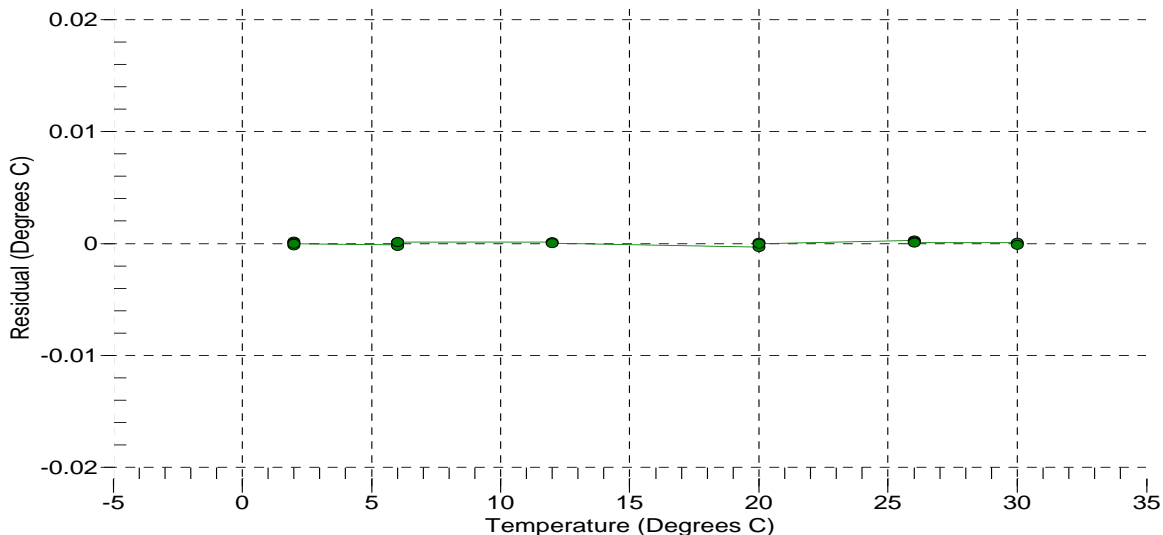
$L = \ln(100000 * V / (3.3 - V))$

Temperature ITS-90 (°C) =  $1 / (TA0 + (TA1 * L) + (TA2 * L^2) + (TA3 * L^3)) - 273.15$

Residual (°C) = instrument temperature - bath temperature

Date, Offset (mdeg C)

● 21-May-22 -0.00





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SENSOR SERIAL NUMBER: 3227  
CALIBRATION DATE: 21-May-22

# SBE 63 OXYGEN CALIBRATION DATA

## COEFFICIENTS:

A0 = 1.0513e+000    B0 = -2.5087e-001    C0 = 1.0926e-001    E = 1.1000e-002  
A1 = -1.5000e-003    B1 = 1.6229e+000    C1 = 4.6373e-003  
A2 = 3.9019e-001    C2 = 6.5598e-005

BATH OXYGEN (ml/l)	BATH TEMPERATURE (° C)	BATH SALINITY (PSU)	INSTRUMENT OUTPUT (µsec)	INSTRUMENT OXYGEN (ml/l)	RESIDUAL (ml/l)
0.750	30.00	0.00	30.63	0.749	-0.000
0.780	26.00	0.00	31.29	0.780	0.000
0.837	20.00	0.00	32.27	0.837	0.001
0.923	12.00	0.00	33.70	0.924	0.000
1.031	6.00	0.00	34.65	1.031	-0.000
1.126	2.00	0.00	35.26	1.126	-0.000
2.304	30.00	0.00	22.18	2.302	-0.002
2.428	26.00	0.00	22.77	2.428	-0.000
2.581	20.00	0.00	23.92	2.580	-0.001
3.086	12.00	0.00	24.89	3.087	0.001
3.493	6.00	0.00	25.89	3.492	-0.000
3.812	30.00	0.00	18.31	3.809	-0.002
3.839	2.00	0.00	26.56	3.838	-0.001
4.080	26.00	0.00	18.72	4.082	0.001
4.488	20.00	0.00	19.51	4.489	0.001
5.238	12.00	0.00	20.57	5.242	0.004
5.487	30.00	0.00	15.77	5.489	0.003
5.837	26.00	0.00	16.18	5.836	-0.001
5.960	6.00	0.00	21.48	5.958	-0.002
6.468	20.00	0.00	16.82	6.467	-0.001
6.567	2.00	0.00	22.08	6.569	0.002
7.519	12.00	0.00	17.81	7.519	-0.000
8.532	6.00	0.00	18.64	8.531	-0.001
9.019	2.00	0.00	19.52	9.020	0.000

T = temperature (°C) , P = pressure (dbar), U = Instrument output (µsec)

$S_{corr}$  (salinity correction function) = 1.0 for calibration in DI water

See the user manual for more information on  $S_{corr}$  calculation

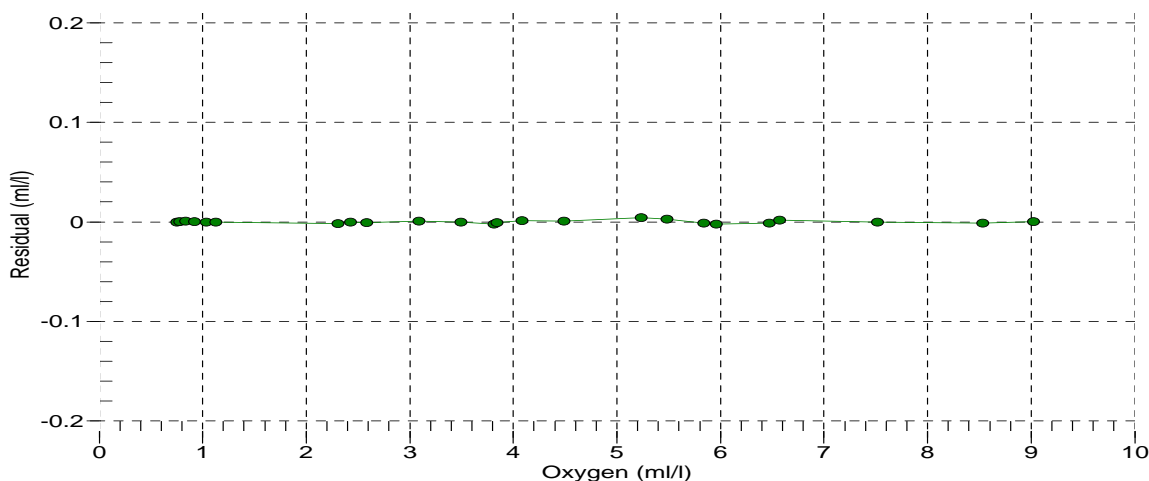
$V = U / 39.457071$

Oxygen (ml/l) =  $\{((A0 + A1 \cdot T + A2 \cdot V^2) / (B0 + B1 \cdot V) - 1.0) / (C0 + C1 \cdot T + C2 \cdot T^2)\} \cdot S_{corr} \cdot \exp(E \cdot P / (T + 273.15))$

Residual (ml/l) = instrument oxygen - bath oxygen

Date, Slope Correction

● 21-May-22 1.0000





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## Pressure Test Certificate

Test Date: **2022-07-26**

Description: **SBE-63 Optical Oxygen Sensor**

### Sensor Information:

Model Number: **SBE-63**

Serial Number: **3227**

### Pressure Test Protocol:

Low Pressure Test: **40**      PSI      Held For: **15**      Minutes

High Pressure Test: **870**      PSI      Held For: **15**      Minutes

Passed Test: **True**

Tested By: **MA**

