



Sea-Bird Scientific
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SENSOR SERIAL NUMBER: 1093
CALIBRATION DATE: 06-Apr-21

SBE 9plus PRESSURE CALIBRATION DATA
10000 psia S/N 121342

DIGIQUARTZ COEFFICIENTS:

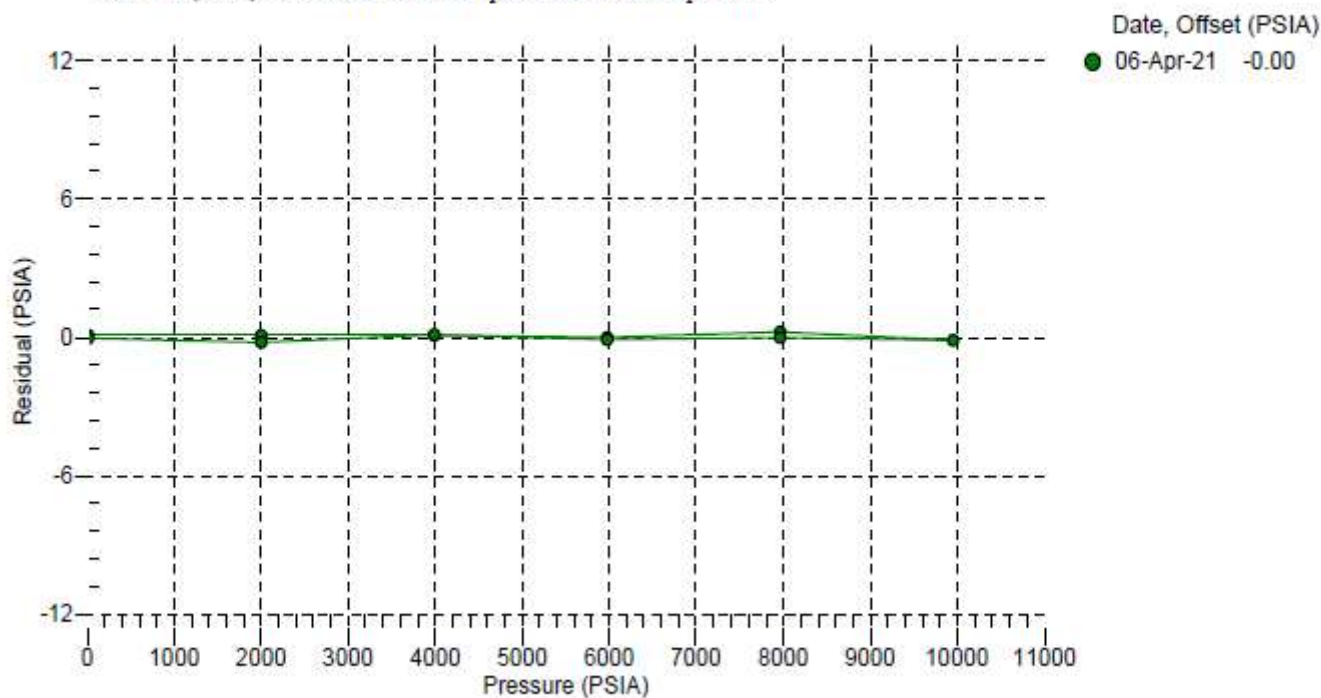
C1 = -4.962086e+004
C2 = -5.338120e-002
C3 = 1.472130e-002
D1 = 3.831600e-002
D2 = 0.000000e+000
T1 = 3.004597e+001
T2 = -2.951930e-004
T3 = 3.717090e-006
T4 = 3.520660e-009
T5 = 0.000000e+000

AD590M, AD590B, SLOPE AND OFFSET:

AD590M = 1.28090e-002
AD590B = -9.27151e+000
Slope = 0.99994
Offset = -0.3245 (dbars)

PRESSURE (PSIA)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT TEMPERATURE (°C)	INSTRUMENT PRESSURE (PSIA)	CORRECTED PRESSURE (PSIA)	RESIDUAL (PSIA)
14.585	33292.50	21.5	15.138	14.668	0.083
2000.507	33951.10	21.6	2001.170	2000.584	0.077
3988.001	34595.70	21.7	3988.768	3988.066	0.065
5975.569	35226.60	21.6	5976.362	5975.545	-0.024
7963.219	35844.70	21.7	7964.387	7963.455	0.236
9951.136	36450.40	21.7	9952.054	9951.007	-0.129
7963.134	35844.60	21.7	7964.048	7963.115	-0.019
5975.901	35226.70	21.8	5976.613	5975.796	-0.105
3987.927	34595.70	21.8	3988.721	3988.019	0.092
2000.419	33951.00	21.8	2000.805	2000.219	-0.230
14.580	33292.50	21.8	15.004	14.533	-0.047

Residual (PSIA) = corrected instrument pressure - reference pressure





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SENSOR SERIAL NUMBER: 1136
CALIBRATION DATE: 13-Apr-21

SBE 9plus PRESSURE CALIBRATION DATA
10000 psia S/N 127421

DIGIQUARTZ COEFFICIENTS:

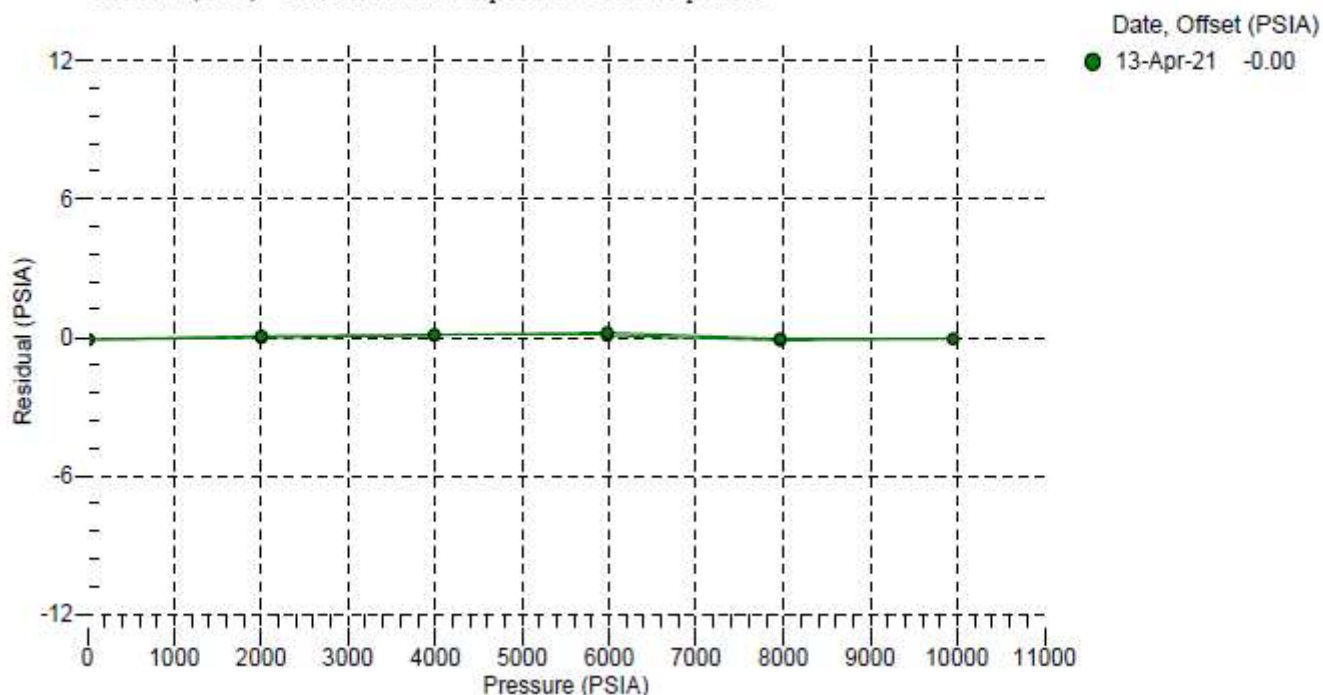
C1 = -4.373304e+004
C2 = 2.440268e-001
C3 = 1.442500e-002
D1 = 3.686900e-002
D2 = 0.000000e+000
T1 = 3.002769e+001
T2 = -1.951630e-004
T3 = 4.244630e-006
T4 = 2.954280e-009
T5 = 0.000000e+000

AD590M, AD590B, SLOPE AND OFFSET:

AD590M = 1.28120e-002
AD590B = -8.82994e+000
Slope = 1.00000
Offset = -2.5573 (dbars)

PRESSURE (PSIA)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT TEMPERATURE (°C)	INSTRUMENT PRESSURE (PSIA)	CORRECTED PRESSURE (PSIA)	RESIDUAL (PSIA)
14.668	33312.00	21.3	18.282	14.573	-0.095
2001.344	34058.90	21.3	2005.048	2001.338	-0.006
3988.667	34787.60	21.3	3992.459	3988.748	0.081
5976.059	35499.00	21.4	5979.833	5976.120	0.061
7963.478	36194.10	21.4	7967.044	7963.330	-0.148
9951.196	36874.10	21.4	9954.851	9951.136	-0.060
7963.394	36194.10	21.4	7967.035	7963.321	-0.073
5975.913	35499.00	21.5	5979.818	5976.105	0.192
3988.611	34787.60	21.5	3992.441	3988.730	0.119
2001.286	34058.90	21.5	2005.033	2001.323	0.037
14.670	33312.00	21.6	18.273	14.564	-0.106

Residual (PSIA) = corrected instrument pressure - reference pressure





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SENSOR SERIAL NUMBER: 6552
CALIBRATION DATE: 18-Jun-21

SBE 3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

$g = 4.35762863e-003$
 $h = 6.41465377e-004$
 $i = 2.24786147e-005$
 $j = 2.13731145e-006$
 $f0 = 1000.0$

BATH TEMP (° C)	INSTRUMENT OUTPUT (Hz)	INST TEMP (° C)	RESIDUAL (° C)
-1.5000	2980.045	-1.5000	0.00002
1.0000	3151.772	1.0000	-0.00002
4.5000	3404.050	4.5000	-0.00001
8.0000	3670.511	8.0000	-0.00001
11.5000	3951.537	11.5000	0.00001
15.0000	4247.493	15.0000	0.00002
18.5000	4558.735	18.5000	-0.00000
22.0000	4885.614	22.0000	0.00001
25.5000	5228.454	25.5000	-0.00002
29.0000	5587.580	29.0000	-0.00003
32.5000	5963.304	32.5000	0.00003

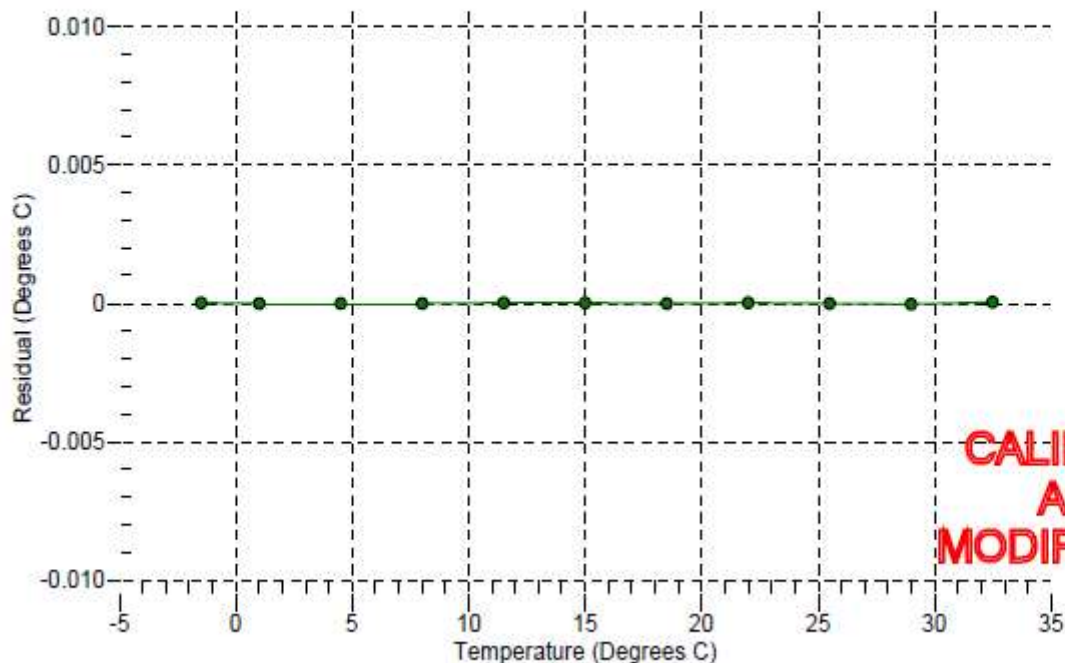
f = Instrument Output (Hz)

Temperature ITS-90 (°C) = $1 / \{g + h[\ln(f0 / f)] + i[\ln^2(f0 / f)] + j[\ln^3(f0 / f)]\} - 273.15$

Residual (°C) = instrument temperature - bath temperature

Date, Offset (mdeg C)

● 18-Jun-21 0.00



**CALIBRATION
AFTER
MODIFICATIONS**



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SENSOR SERIAL NUMBER: 5003
CALIBRATION DATE: 27-Oct-20

SBE 4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.01103687e+001
h = 1.39399190e+000
i = -8.40975670e-004
j = 1.34772804e-004

CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (kHz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
0.0000	0.0000	0.00000	2.69435	0.00000	0.00000
-1.0001	34.7337	2.79853	5.22898	2.79852	-0.00002
0.9999	34.7340	2.96959	5.34500	2.96961	0.00002
14.9999	34.7351	4.26270	6.15105	4.26270	0.00000
18.4999	34.7354	4.60878	6.34931	4.60877	-0.00002
28.9999	34.7323	5.69010	6.93205	5.69012	0.00003
32.4999	34.7234	6.06161	7.12112	6.06159	-0.00002

f = Instrument Output (kHz)

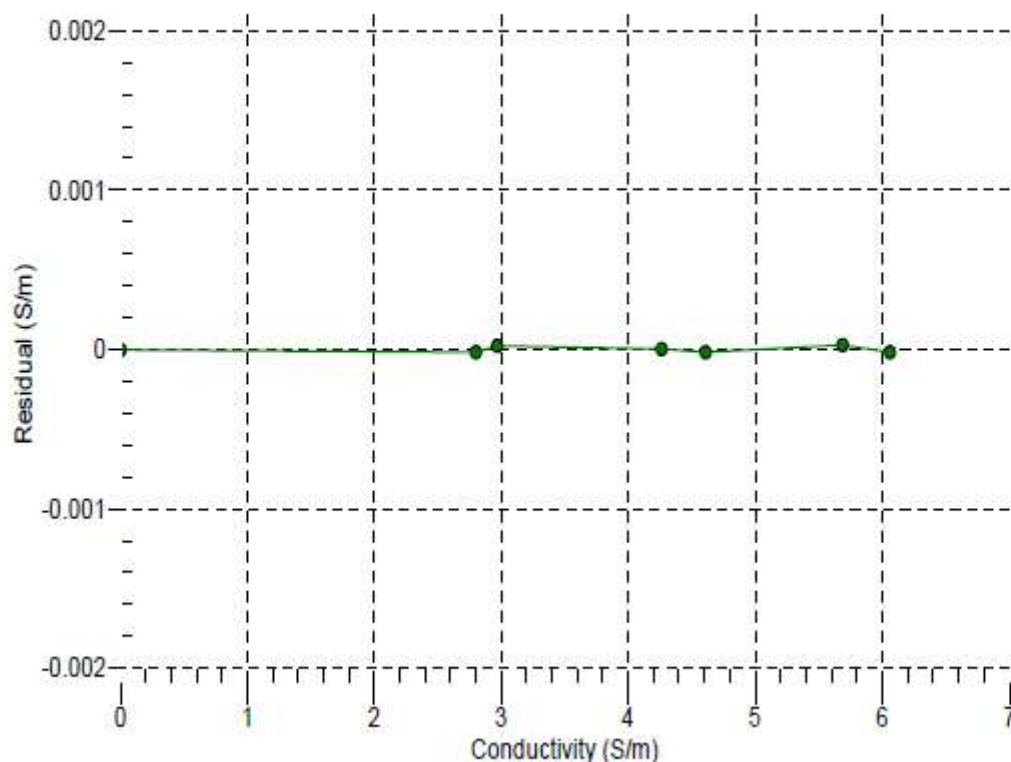
t = temperature (°C); p = pressure (decibars); δ = CTcor; ϵ = CPcor;

Conductivity (S/m) = $(g + h * f^2 + i * f^3 + j * f^4) / 10 (1 + \delta * t + \epsilon * p)$

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

Date, Slope Correction

● 27-Oct-20 1.0000000





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SENSOR SERIAL NUMBER: 0460
CALIBRATION DATE: 06-Oct-22

SBE 43 OXYGEN CALIBRATION DATA

COEFFICIENTS:

Soc = 0.5808

Voffset = -0.4931

Tau20 = 1.65

A = -4.5316e-003

B = 1.9992e-004

C = -2.8759e-006

E nominal = 0.036

NOMINAL DYNAMIC COEFFICIENTS

D1 = 1.92634e-4

D2 = -4.64803e-2

H1 = -3.300000e-2

H2 = 5.00000e+3

H3 = 1.45000e+3

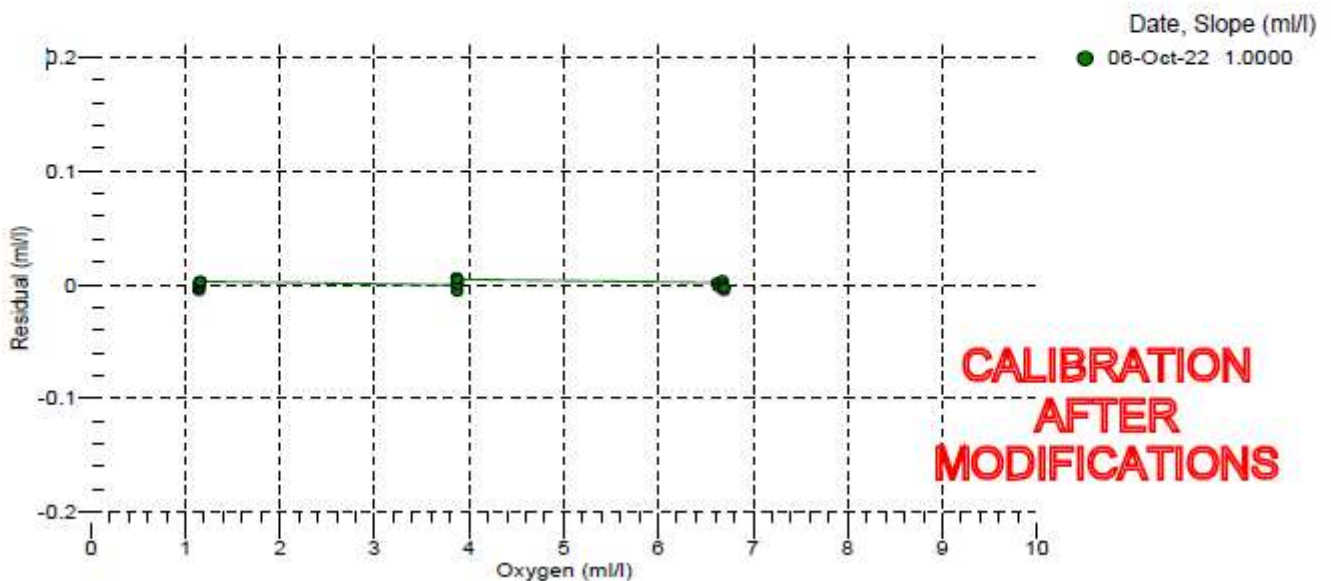
BATH OXYGEN (ml/l)	BATH TEMPERATURE (°C)	BATH SALINITY (PSU)	INSTRUMENT OUTPUT (volts)	INSTRUMENT OXYGEN (ml/l)	RESIDUAL (ml/l)
1.14	2.00	0.00	0.697	1.14	-0.01
1.15	6.00	0.00	0.724	1.14	-0.00
1.15	12.00	0.00	0.763	1.15	0.00
1.15	20.00	0.00	0.815	1.15	0.00
1.15	26.00	0.00	0.855	1.15	0.00
1.15	30.00	0.00	0.882	1.15	0.00
3.87	2.00	0.00	1.187	3.87	-0.00
3.87	20.00	0.00	1.579	3.88	0.01
3.87	30.00	0.00	1.796	3.87	-0.01
3.87	12.00	0.00	1.406	3.88	0.00
3.88	6.00	0.00	1.276	3.88	0.00
3.88	26.00	0.00	1.711	3.88	0.00
6.62	2.00	0.00	1.681	6.62	0.00
6.63	6.00	0.00	1.832	6.63	-0.00
6.68	30.00	0.00	2.743	6.68	0.00
6.68	12.00	0.00	2.066	6.68	-0.00
6.69	26.00	0.00	2.591	6.69	-0.01
6.70	20.00	0.00	2.369	6.70	-0.00

V = instrument output (volts); T = temperature (°C); S = salinity (PSU); K = temperature (°K)

Oxsol(T,S) = oxygen saturation (ml/l); P = pressure (dbar)

Oxygen (ml/l) = Soc * (V + Voffset) * (1.0 + A * T + B * T² + C * T³) * Oxsol(T,S) * exp(E * P / K)

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



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C-Star Calibration

Date **September 23, 2021** S/N# **CST-2151** Pathlength **25 cm**

	Analog output	Digital output	
V _{dark}	0.000 V	0 counts	
V _{air}	4.802 V	15784 counts	
V _{ref}	4.702 V	15455 counts	
Temperature of calibration water			23.4 °C
Ambient temperature during calibration			23.2 °C

Relationship of transmittance (Tr) to beam attenuation coefficient (c), and pathlength (x, in meters): $Tr = e^{-cx}$

To determine beam transmittance: $Tr = (V_{sig} - V_{dark}) / (V_{ref} - V_{dark})$

To determine beam attenuation coefficient: $c = -1/x * \ln(Tr)$

V_{dark} Meter output with the beam blocked. This is the offset.

V_{air} Meter output in air with a clear beam path.

V_{ref} Meter output with clean water in the path.

Temperature of calibration water: temperature of clean water used to obtain V_{ref}.

Ambient temperature: meter temperature in air during the calibration.

V_{sig} Measured signal output of meter.