



**SEA-BIRD**  
SCIENTIFIC

**SBE** Sea-Bird  
Electronics

Sea-Bird Electronics  
13431 NE 20<sup>th</sup> Street  
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98005 USA

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## SBE41-CP ALACE

### Instrument Configuration

Instrument Serial Number: 41-8716  
Instrument Firmware Version: V 7.2.5  
Zero Conductivity Frequency: 2654.95  
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           | Druck              | 10387032             | 2000m(2000 dBar) |
| RS232              | Oxygen             | SBE 63             | 63-1394              | 7000m            |

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SENSOR SERIAL NUMBER: 8716  
CALIBRATION DATE: 16-Aug-16

SBE 41 TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

## COEFFICIENTS:

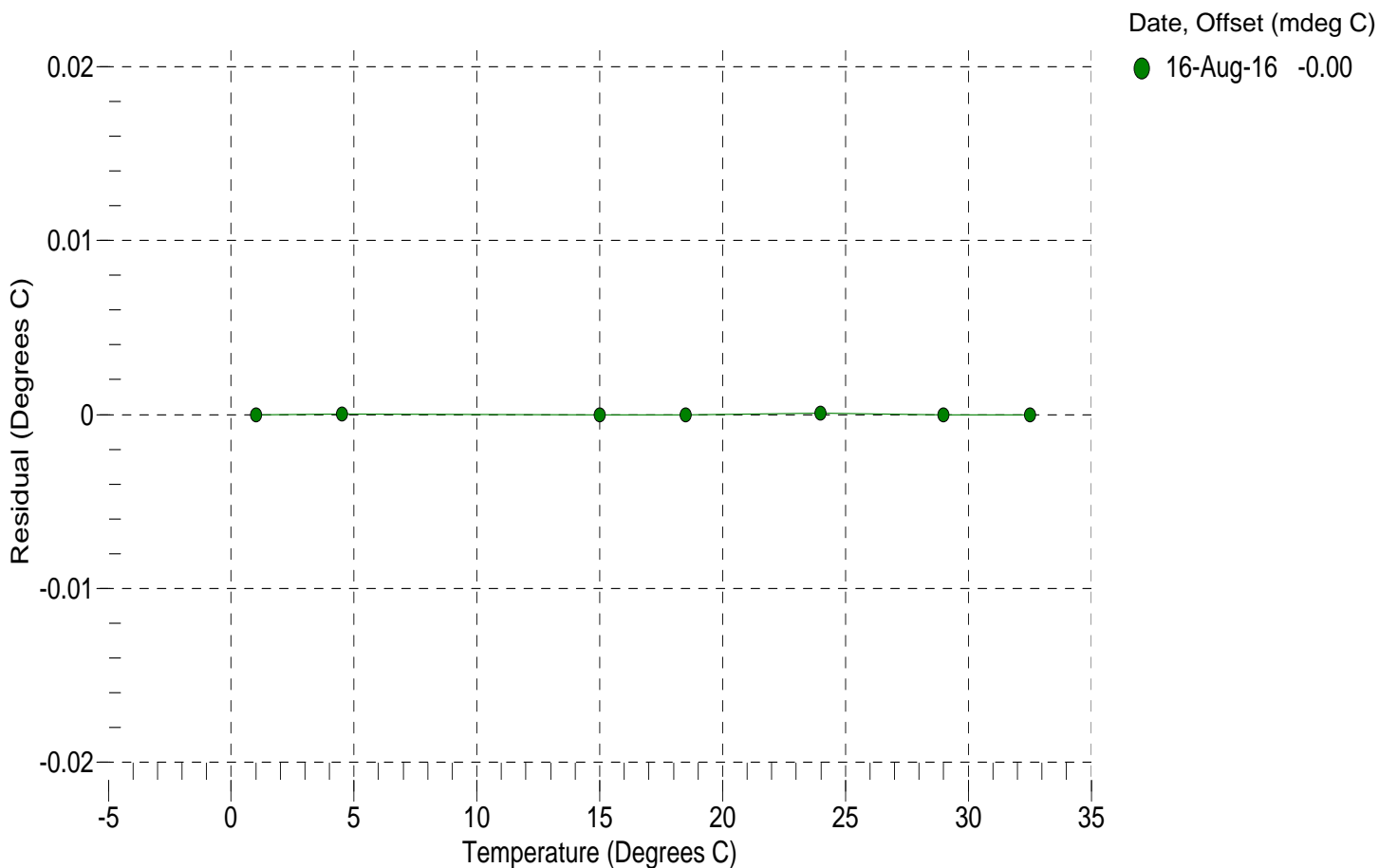
a0 = -8.438109e-004  
a1 = 2.955510e-004  
a2 = -3.979276e-006  
a3 = 1.536093e-007

| BATH TEMP<br>(° C) | INSTRUMENT<br>OUTPUT (counts) | INST TEMP<br>(° C) | RESIDUAL<br>(° C) |
|--------------------|-------------------------------|--------------------|-------------------|
| 1.0001             | 15070241.8                    | 1.0001             | -0.0000           |
| 4.5000             | 12855837.2                    | 4.5000             | 0.0000            |
| 15.0000            | 8139793.0                     | 15.0000            | -0.0000           |
| 18.5000            | 7033533.5                     | 18.5000            | -0.0000           |
| 23.9940            | 5625897.1                     | 23.9941            | 0.0001            |
| 29.0001            | 4618407.6                     | 29.0001            | -0.0000           |
| 32.5001            | 4036717.7                     | 32.5001            | -0.0000           |

n = Instrument Output (counts)

Temperature ITS-90 (°C) =  $1 / \{a_0 + a_1[\ln(n)] + a_2[\ln^2(n)] + a_3[\ln^3(n)]\} - 273.15$

Residual (°C) = instrument temperature - bath temperature



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SENSOR SERIAL NUMBER: 8716  
 CALIBRATION DATE: 16-Aug-16

SBE 41 CONDUCTIVITY CALIBRATION DATA  
 PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

**COEFFICIENTS:**

g = -1.020128e+000  
 h = 1.455118e-001  
 i = -4.327653e-004  
 j = 5.169634e-005

CPcor = -9.5700e-008  
 CTcor = 3.2500e-006  
 WBOTC = -8.7874e-007

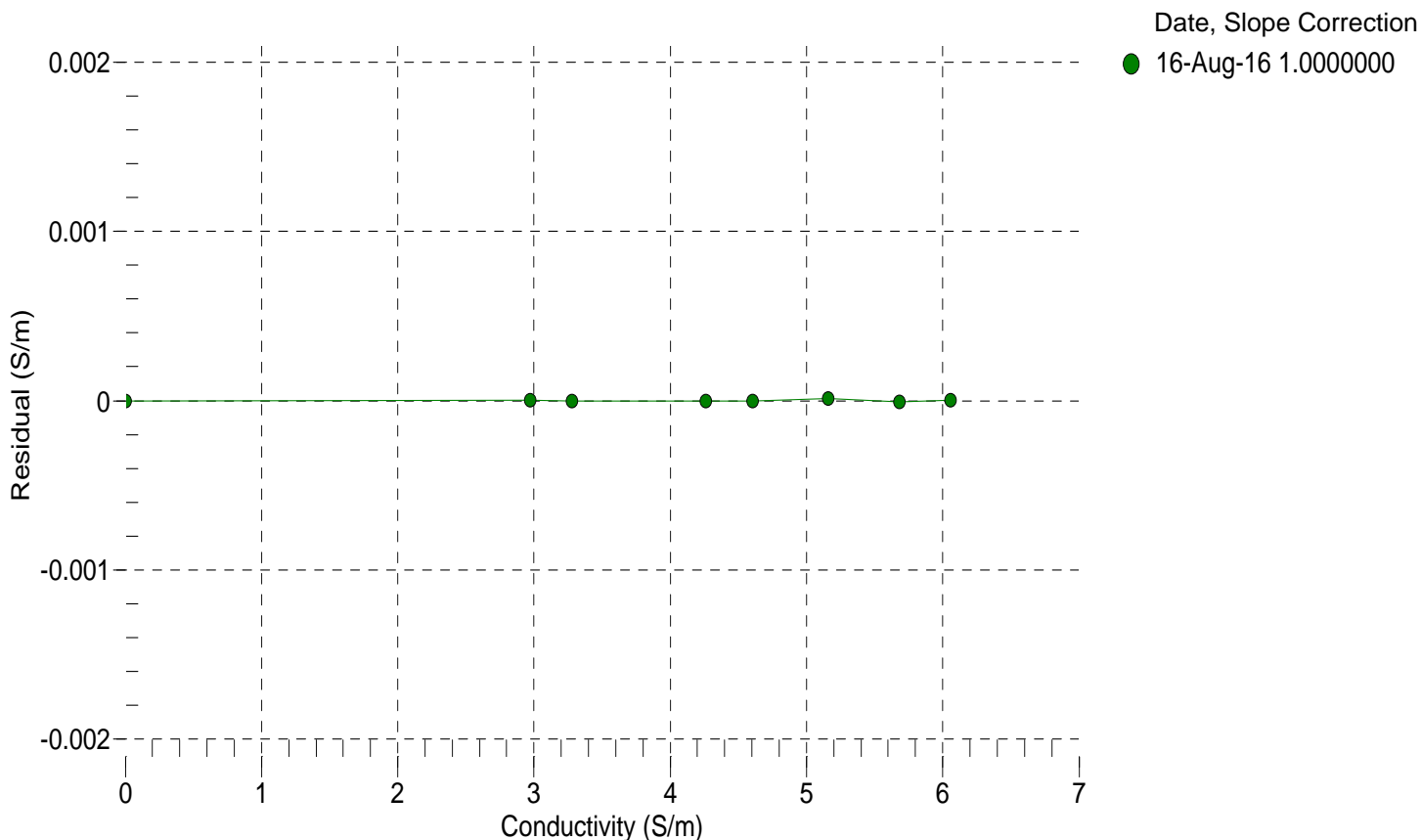
| BATH TEMP<br>(° C) | BATH SAL<br>(PSU) | BATH COND<br>(S/m) | INSTRUMENT<br>OUTPUT (Hz) | INSTRUMENT<br>COND (S/m) | RESIDUAL<br>(S/m) |
|--------------------|-------------------|--------------------|---------------------------|--------------------------|-------------------|
| 22.0000            | 0.0000            | 0.00000            | 2654.95                   | 0.00000                  | 0.00000           |
| 1.0001             | 34.7674           | 2.97219            | 5253.30                   | 2.97220                  | 0.00000           |
| 4.5000             | 34.7477           | 3.27889            | 5450.93                   | 3.27889                  | -0.00000          |
| 15.0000            | 34.7054           | 4.25945            | 6038.81                   | 4.25944                  | -0.00000          |
| 18.5000            | 34.6965           | 4.60419            | 6232.05                   | 4.60419                  | -0.00000          |
| 23.9940            | 34.6870           | 5.16090            | 6531.74                   | 5.16091                  | 0.00001           |
| 29.0001            | 34.6820           | 5.68280            | 6800.36                   | 5.68280                  | -0.00001          |
| 32.5001            | 34.6789           | 6.05475            | 6985.29                   | 6.05475                  | 0.00000           |

$f = \text{Instrument Output(Hz)} * \text{sqrt}(1.0 + \text{WBOTC} * t) / 1000.0$

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

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

$\text{Residual (Siemens/meter)} = \text{instrument conductivity} - \text{bath conductivity}$



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SENSOR SERIAL NUMBER: 8716  
CALIBRATION DATE: 11-Aug-16

SBE 41 PRESSURE CALIBRATION DATA  
2900 psia S/N 10387032

**COEFFICIENTS:**

|         |                |         |                |
|---------|----------------|---------|----------------|
| PA0 =   | 3.340166e-001  | PTCA0 = | 5.645829e+003  |
| PA1 =   | 3.923983e-004  | PTCA1 = | 7.816775e+001  |
| PA2 =   | -2.941592e-013 | PTCA2 = | -1.791583e+000 |
| PTHA0 = | 3.105403e+002  | PTCB0 = | 2.514088e+001  |
| PTHA1 = | -6.235071e-005 | PTCB1 = | 5.750000e-004  |
| PTHA2 = | -1.103764e-012 | PTCB2 = | 0.000000e+000  |

**PRESSURE SPAN CALIBRATION**

**THERMAL CORRECTION**

| PRESSURE (PSIA) | INSTRUMENT OUTPUT (counts) | THERMISTOR OUTPUT (counts) | COMPUTED PRESSURE (PSIA) | RESIDUAL (%FSR) | TEMP (°C) | THERMISTOR OUTPUT (counts) | INSTRUMENT OUTPUT (counts) |
|-----------------|----------------------------|----------------------------|--------------------------|-----------------|-----------|----------------------------|----------------------------|
| 14.67           | 43164.9                    | 4292855.8                  | 14.71                    | 0.00            | 32.50     | 4153849.80                 | 44601.40                   |
| 591.16          | 1514556.7                  | 4291100.4                  | 591.12                   | -0.00           | 29.00     | 4202739.40                 | 44775.32                   |
| 1167.43         | 2989031.0                  | 4289826.6                  | 1167.45                  | 0.00            | 23.99     | 4272568.60                 | 44840.63                   |
| 1743.71         | 4466742.3                  | 4288707.0                  | 1743.77                  | 0.00            | 18.50     | 4349007.00                 | 44798.71                   |
| 2320.06         | 5947877.6                  | 4287488.4                  | 2320.13                  | 0.00            | 15.00     | 4397624.00                 | 44720.25                   |
| 2896.22         | 7431470.1                  | 4286523.6                  | 2896.15                  | -0.00           | 4.50      | 4542991.00                 | 44336.64                   |
| 2319.97         | 5947536.7                  | 4286612.2                  | 2319.99                  | 0.00            | 1.00      | 4591338.40                 | 44034.25                   |
| 1743.70         | 4466601.6                  | 4286649.8                  | 1743.71                  | 0.00            |           |                            |                            |
| 1167.43         | 2988869.1                  | 4286703.4                  | 1167.38                  | -0.00           |           |                            |                            |
| 591.10          | 1514232.7                  | 4286834.4                  | 590.99                   | -0.00           |           |                            |                            |
| 14.67           | 43158.2                    | 4284688.2                  | 14.71                    | 0.00            |           |                            |                            |

| TEMPERATURE (°C) | SPAN (mV) |
|------------------|-----------|
| -5.00            | 25.14     |
| 35.00            | 25.16     |

y = thermistor output (counts)

$$t = PTHA0 + PTHA1 * y + PTHA2 * y^2$$

$$x = \text{instrument output} - PTCA0 - PTCA1 * t - PTCA2 * t^2$$

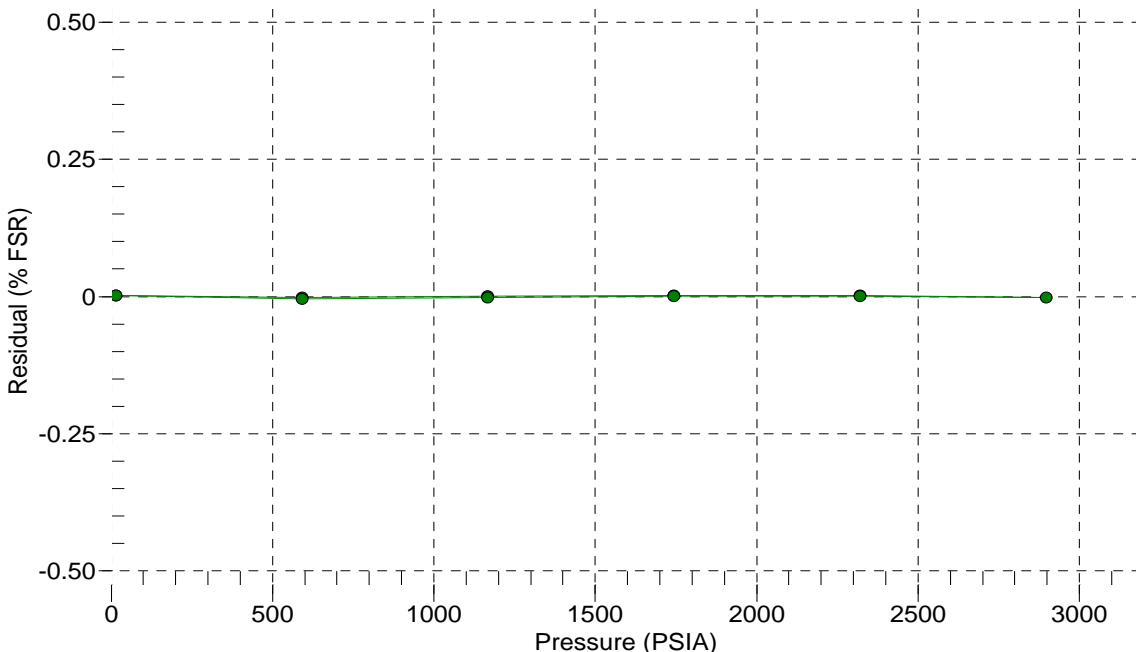
$$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$$

$$\text{pressure (PSIA)} = PA0 + PA1 * n + PA2 * n^2$$

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

Date, Offset (%FSR)

● 11-Aug-16 0.00



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SENSOR SERIAL NUMBER: 1394  
CALIBRATION DATE: 15-Jul-16

SBE 63 OXYGEN TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

## COEFFICIENTS:

TA0 = 7.156890e-004    TA2 = 1.103430e-006

TA1 = 2.468098e-004    TA3 = 8.751443e-008

| BATH TEMP<br>(° C) | INSTRUMENT<br>OUTPUT(V) | INST TEMP<br>(° C) | RESIDUAL<br>(° C) |
|--------------------|-------------------------|--------------------|-------------------|
| 1.9999             | 1.12013                 | 2.0000             | 0.00010           |
| 2.0000             | 1.12013                 | 2.0000             | 0.00000           |
| 2.0000             | 1.12013                 | 2.0000             | 0.00000           |
| 2.0000             | 1.12013                 | 2.0000             | 0.00000           |
| 5.9999             | 0.99586                 | 5.9999             | -0.00001          |
| 5.9999             | 0.99586                 | 5.9999             | -0.00001          |
| 6.0000             | 0.99586                 | 5.9999             | -0.00011          |
| 6.0000             | 0.99586                 | 5.9999             | -0.00011          |
| 11.9999            | 0.82990                 | 12.0001            | 0.00018           |
| 11.9999            | 0.82991                 | 11.9997            | -0.00021          |
| 12.0000            | 0.82990                 | 12.0001            | 0.00008           |
| 12.0000            | 0.82990                 | 12.0001            | 0.00008           |
| 20.0000            | 0.64610                 | 20.0000            | 0.00004           |
| 20.0000            | 0.64610                 | 20.0000            | 0.00004           |
| 20.0000            | 0.64610                 | 20.0000            | 0.00004           |
| 20.0000            | 0.64610                 | 20.0000            | 0.00004           |
| 25.9999            | 0.53401                 | 25.9999            | -0.00001          |
| 26.0000            | 0.53401                 | 25.9999            | -0.00011          |
| 26.0000            | 0.53401                 | 25.9999            | -0.00011          |
| 26.0000            | 0.53401                 | 25.9999            | -0.00011          |
| 30.0000            | 0.47013                 | 30.0001            | 0.00009           |
| 30.0000            | 0.47013                 | 30.0001            | 0.00009           |
| 30.0001            | 0.47013                 | 30.0001            | -0.00001          |
| 30.0001            | 0.47013                 | 30.0001            | -0.00001          |

V = Instrument Output (Volts)

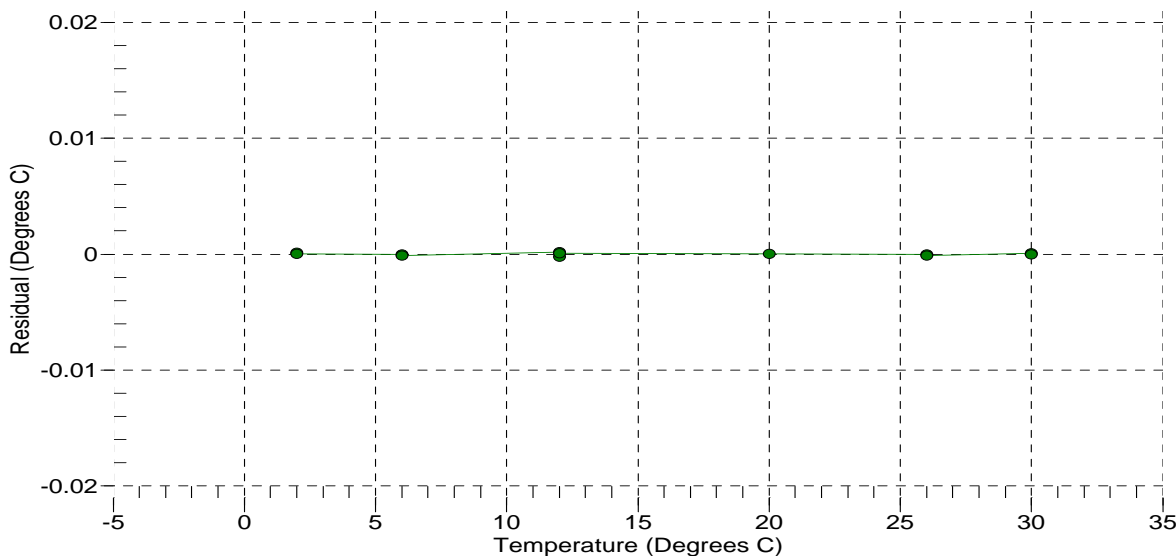
$L = \ln(100000 * V / (3.3 - V))$

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)

● 15-Jul-16 0.00



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CALIBRATION DATE: 15-Jul-16

SBE 63 OXYGEN CALIBRATION DATA

**COEFFICIENTS:**

A0 = 1.0513e+000    B0 = -2.3167e-001    C0 = 9.6811e-002    E = 1.1000e-002  
 A1 = -1.5000e-003    B1 = 1.6515e+000    C1 = 4.1199e-003  
 A2 = 4.3091e-001    C2 = 5.6313e-005

| BATH OXYGEN (ml/l) | BATH TEMPERATURE (° C) | BATH SALINITY (PSU) | INSTRUMENT OUTPUT (µsec) | INSTRUMENT OXYGEN (ml/l) | RESIDUAL (ml/l) |
|--------------------|------------------------|---------------------|--------------------------|--------------------------|-----------------|
| 0.717              | 30.00                  | 0.00                | 30.93                    | 0.722                    | 0.004           |
| 0.750              | 26.00                  | 0.00                | 31.55                    | 0.754                    | 0.004           |
| 0.807              | 20.00                  | 0.00                | 32.53                    | 0.809                    | 0.002           |
| 0.895              | 12.00                  | 0.00                | 33.90                    | 0.896                    | 0.001           |
| 0.992              | 6.00                   | 0.00                | 34.90                    | 0.991                    | -0.001          |
| 1.095              | 2.00                   | 0.00                | 35.44                    | 1.095                    | 0.000           |
| 2.205              | 30.00                  | 0.00                | 22.71                    | 2.207                    | 0.002           |
| 2.317              | 26.00                  | 0.00                | 23.32                    | 2.322                    | 0.005           |
| 2.487              | 20.00                  | 0.00                | 24.40                    | 2.488                    | 0.001           |
| 2.994              | 12.00                  | 0.00                | 25.32                    | 2.992                    | -0.002          |
| 3.416              | 6.00                   | 0.00                | 26.26                    | 3.413                    | -0.003          |
| 3.653              | 30.00                  | 0.00                | 18.79                    | 3.651                    | -0.003          |
| 3.759              | 2.00                   | 0.00                | 26.92                    | 3.753                    | -0.006          |
| 3.907              | 26.00                  | 0.00                | 19.21                    | 3.912                    | 0.005           |
| 4.318              | 20.00                  | 0.00                | 19.99                    | 4.317                    | -0.001          |
| 5.074              | 12.00                  | 0.00                | 21.02                    | 5.075                    | 0.000           |
| 5.168              | 30.00                  | 0.00                | 16.29                    | 5.156                    | -0.012          |
| 5.667              | 26.00                  | 0.00                | 16.48                    | 5.677                    | 0.011           |
| 5.844              | 6.00                   | 0.00                | 21.82                    | 5.845                    | 0.001           |
| 6.300              | 20.00                  | 0.00                | 17.14                    | 6.299                    | -0.001          |
| 6.440              | 2.00                   | 0.00                | 22.45                    | 6.440                    | -0.000          |
| 7.260              | 12.00                  | 0.00                | 18.21                    | 7.256                    | -0.005          |
| 8.395              | 6.00                   | 0.00                | 18.92                    | 8.398                    | 0.003           |
| 8.825              | 2.00                   | 0.00                | 19.87                    | 8.827                    | 0.003           |

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

S<sub>corr</sub> (salinity correction function) = 1.0 for calibration in DI water

See the user manual for more information on S<sub>corr</sub> calculation

$$V = U / 39.457071$$

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

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

Date, Slope Correction

● 15-Jul-16 1.0000

