

# **SBE 41CP CERTIFICATES**

## **CTD Serial Number 41CP-5717**

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# **SBE 41CP Instrument Configuration**

**Model Number: SBE 41CP**

**Serial Number: 41CP-5717**

**Part Number: 90697.005**

**Description : METOCEAN OCEANUS Configuration**

**Firmware Version: 3.0C**

**Pressure Type: Kistler**

**Pressure Range: 2000 Dbar**

**Pressure Serial Number: 2145983**

SBE 41 ALACE-CP V 3.0c SERIAL NO. 5717  
temperature: 03-dec-13  
TA0 = 4.670482e-05  
TA1 = 2.761371e-04  
TA2 = -2.528021e-06  
TA3 = 1.548761e-07  
conductivity: 03-dec-13  
G = -9.743702e-01  
H = 1.403878e-01  
I = -3.049249e-04  
J = 4.163646e-05  
CPCOR = -9.570001e-08  
CTCOR = 3.250000e-06  
WBOTC = -3.788444e-07  
pressure S/N = 2145983, range = 2900 psia: 21-nov-13  
PA0 = -2.203784e+00  
PA1 = 1.377149e-01  
PA2 = 1.686047e-08  
PTCA0 = 6.994301e+01  
PTCA1 = -1.801791e+00  
PTCA2 = 4.875674e-02  
PTCB0 = 1.059027e+02  
PTCB1 = -7.940880e-03  
PTCB2 = 0.000000e+00  
PTHA0 = -9.758291e+01  
PTHA1 = 3.930161e-02  
PTHA2 = 1.546323e-06  
POFFSET = 0.000000e+00

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SENSOR SERIAL NUMBER: 5717  
CALIBRATION DATE: 03-Dec-13

SBE 41cp TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

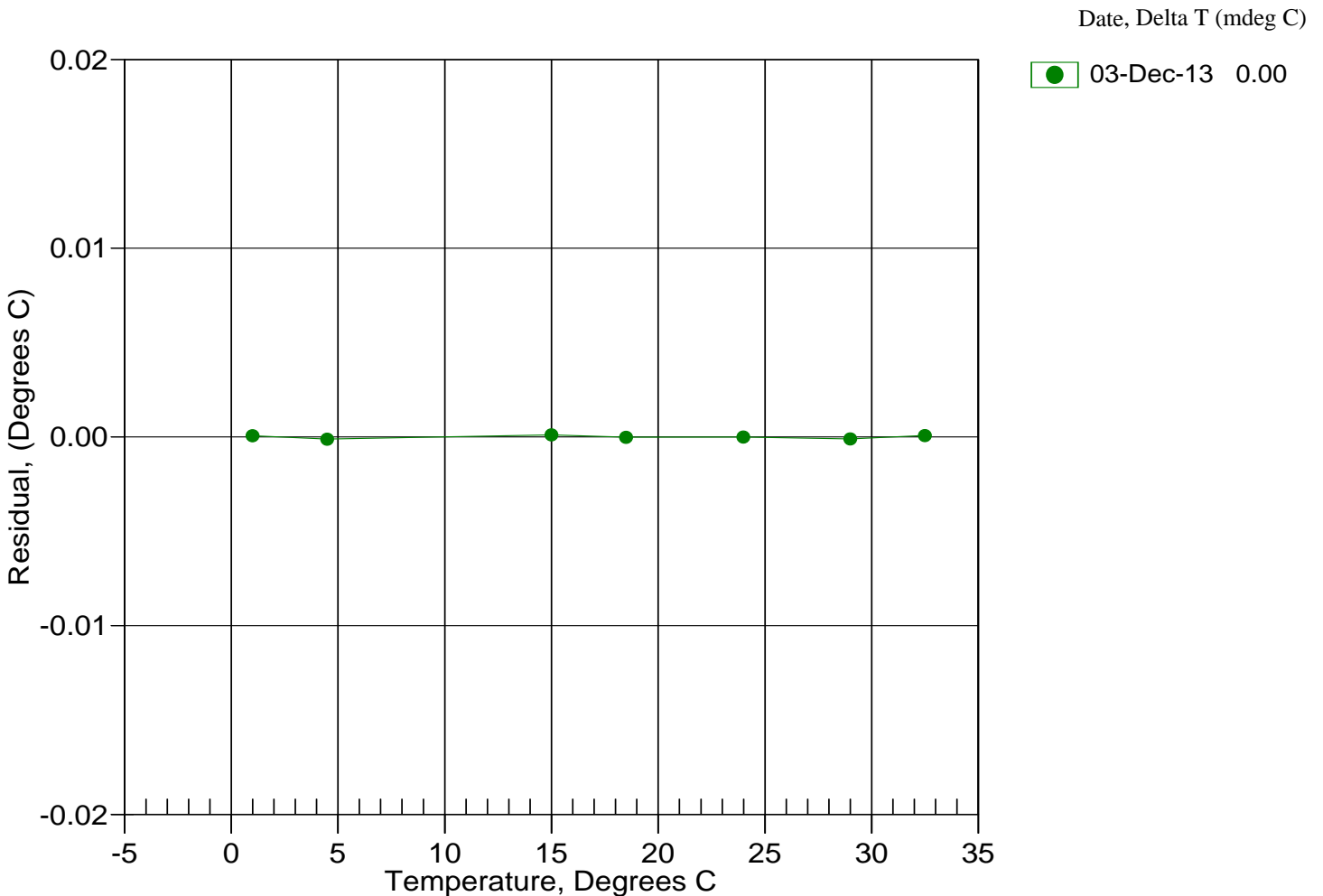
## ITS-90 COEFFICIENTS

a0 = 4.670482e-005  
a1 = 2.761371e-004  
a2 = -2.528021e-006  
a3 = 1.548761e-007

| BATH TEMP<br>(ITS-90) | INSTRUMENT<br>OUTPUT | INST TEMP<br>(ITS-90) | RESIDUAL<br>(ITS-90) |
|-----------------------|----------------------|-----------------------|----------------------|
| 1.0000                | 620446.5             | 1.0001                | 0.0001               |
| 4.5000                | 529703.8             | 4.4999                | -0.0001              |
| 15.0000               | 336152.8             | 15.0001               | 0.0001               |
| 18.5000               | 290681.9             | 18.5000               | -0.0000              |
| 23.9940               | 232769.3             | 23.9940               | -0.0000              |
| 29.0000               | 191275.3             | 28.9999               | -0.0001              |
| 32.5000               | 167296.5             | 32.5001               | 0.0001               |

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

Residual = instrument temperature - bath temperature



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SENSOR SERIAL NUMBER: 5717  
CALIBRATION DATE: 03-Dec-13

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

## COEFFICIENTS:

|                    |                      |
|--------------------|----------------------|
| g = -9.743702e-001 | CPcor = -9.5700e-008 |
| h = 1.403878e-001  | CTcor = 3.2500e-006  |
| i = -3.049249e-004 | WBOTC = -3.7884e-007 |
| j = 4.163646e-005  |                      |

| BATH TEMP<br>(ITS-90) | BATH SAL<br>(PSU) | BATH COND<br>(Siemens/m) | INST FREQ<br>(Hz) | INST COND<br>(Siemens/m) | RESIDUAL<br>(Siemens/m) |
|-----------------------|-------------------|--------------------------|-------------------|--------------------------|-------------------------|
| 22.0000               | 0.0000            | 0.00000                  | 2639.35           | 0.00000                  | 0.00000                 |
| 1.0000                | 34.8508           | 2.97863                  | 5314.82           | 2.97864                  | 0.00000                 |
| 4.5000                | 34.8308           | 3.28596                  | 5516.99           | 3.28596                  | -0.00000                |
| 15.0000               | 34.7877           | 4.26848                  | 6117.92           | 4.26847                  | -0.00001                |
| 18.5000               | 34.7781           | 4.61385                  | 6315.31           | 4.61384                  | -0.00000                |
| 23.9940               | 34.7674           | 5.17154                  | 6621.32           | 5.17154                  | 0.00001                 |
| 29.0000               | 34.7602           | 5.69416                  | 6895.42           | 5.69417                  | 0.00001                 |
| 32.5000               | 34.7522           | 6.06608                  | 7083.81           | 6.06607                  | -0.00001                |

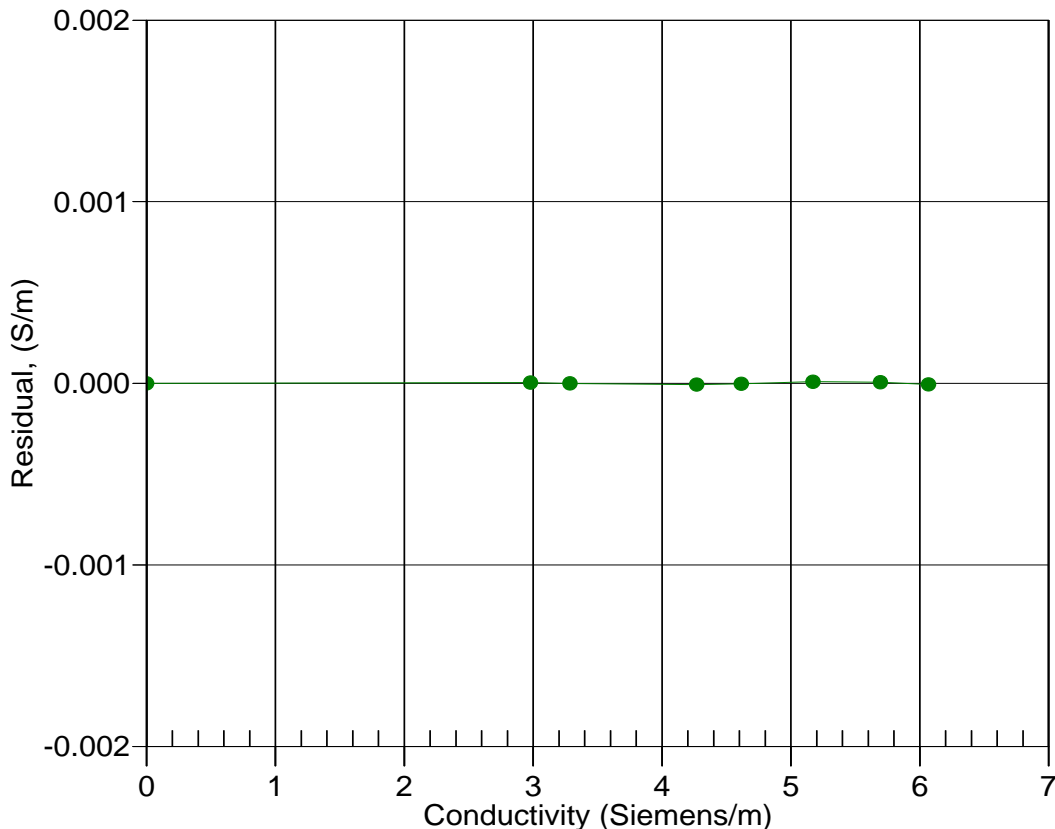
$$f = \text{INST FREQ} * \text{sqrt}(1.0 + \text{WBOTC} * t) / 1000.0$$

$$\text{Conductivity} = (g + hf^2 + if^3 + jf^4) / (1 + \delta t + \epsilon p) \text{ Siemens/meter}$$

t = temperature[°C]; p = pressure[decibars];  $\delta$  = CTcor;  $\epsilon$  = CPcor;

Residual = instrument conductivity - bath conductivity

Date, Slope Correction



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SENSOR SERIAL NUMBER: 5717  
CALIBRATION DATE: 21-Nov-13

SBE 41cp PRESSURE CALIBRATION DATA  
2900 psia S/N 2145983

## COEFFICIENTS:

|                        |                        |
|------------------------|------------------------|
| PA0 = -2.203784e+000   | PTCA0 = 6.994301e+001  |
| PA1 = 1.377149e-001    | PTCA1 = -1.801791e+000 |
| PA2 = 1.686047e-008    | PTCA2 = 4.875674e-002  |
| PTHA0 = -9.758292e+001 | PTCB0 = 1.059027e+002  |
| PTHA1 = 3.930161e-002  | PTCB1 = -7.940880e-003 |
| PTHA2 = 1.546323e-006  | PTCB2 = 0.000000e+000  |

## PRESSURE SPAN CALIBRATION

| PRESSURE PSIA | INST OUTPUT | THERMISTOR OUTPUT | COMPUTED PRESSURE | ERROR %FSR |
|---------------|-------------|-------------------|-------------------|------------|
| 14.92         | 178.4       | 2750.0            | 14.96             | 0.00       |
| 592.38        | 4364.0      | 2745.3            | 592.66            | 0.01       |
| 1169.86       | 8543.6      | 2744.4            | 1170.10           | 0.01       |
| 1747.47       | 12719.8     | 2743.5            | 1747.67           | 0.01       |
| 2325.06       | 16891.6     | 2742.3            | 2325.20           | 0.00       |
| 2902.35       | 21056.6     | 2741.4            | 2902.38           | 0.00       |
| 2324.86       | 16888.1     | 2739.6            | 2324.70           | -0.01      |
| 1747.74       | 12718.5     | 2738.5            | 1747.46           | -0.01      |
| 1169.99       | 8541.2      | 2737.4            | 1169.76           | -0.01      |
| 592.37        | 4360.9      | 2736.1            | 592.23            | -0.00      |
| 14.91         | 177.0       | 2735.0            | 14.80             | -0.00      |

## THERMAL CORRECTION

| TEMP ITS90 | PRESS TEMP | INST OUTPUT |
|------------|------------|-------------|
| 32.50      | 2964.30    | 189.78      |
| 29.00      | 2891.60    | 185.75      |
| 23.99      | 2787.50    | 182.00      |
| 18.50      | 2673.00    | 180.39      |
| 15.00      | 2598.80    | 180.70      |
| 4.50       | 2375.10    | 189.71      |
| 1.00       | 2300.40    | 195.34      |

| TEMP (ITS90) | SPAN (mV) |
|--------------|-----------|
| -4.54        | 105.94    |
| 36.12        | 105.62    |

$$y = \text{thermistor output}; t = \text{PTHA0} + \text{PTHA1} * y + \text{PTHA2} * y^2$$

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

$$n = x * \text{PTCB0} / (\text{PTCB0} + \text{PTCB1} * t + \text{PTCB2} * t^2)$$

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

