SEA-BIRD SCIENTIFIC

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SBE 38
Digital Oceanographic Thermometer

Sophisticated A/D acquisition electronics, ultra-stable thermistor, and state-of-the-art calibration provide the standards-level performance of an expensive AC bridge and platinum thermometer at a small fraction of the cost. The SBE 38 is unaffected by shock and vibration, has high accuracy and stability, and is easy to use. It has a rugged, 10,500 m titanium housing. Real-time temperature is transmitted via the RS-232 or RS-485 serial interface in ASCII characters (°C or raw counts). The SBE 38 must be externally powered, and its data logged or telemetered by a computer, data logger, or instrument.

Applications include calibration baths, oceanographic/aquatic research, and environmental monitoring. The SBE 38 is frequently integrated as a remote temperature sensor with an SBE 21 Thermosalinograph or SBE 45 MicroTSG, to provide accurate sea surface temperature. It can also be integrated as a secondary temperature sensor with an SBE 16plus, 16plus-IM, 16plus V2, 16plus-IM V2, 19plus V2, or 25plus CTD.

Features

- Programmable sampling:
  - Continuous (begins when power applied or on command);
    interval between samples (sec) = (0.133 * NAvg) + 0.339 *where* NAvg is number of acquisition cycles/sample.
  - Polled.
- Serial output:
  RS-232 (full duplex) with one SBE 38 connected to the interface;
  RS-485 (half duplex) with one SBE 38 connected to the interface; or
  RS-485 (half duplex) with several RS-485 sensors sharing one pair of wires (cannot sample continuously).
- No batteries or memory.
- Compatible with Sea-Bird thermosalinographs and some Sea-Bird CTDs.
- Titanium housing; depths to 10,500 m.
- Seasoft© V2 Windows software package (instrument setup and data display).
- Five-year limited warranty.

Options

- RS-232 or RS-485 output.
- XSG or wet-pluggable MCBH connector.

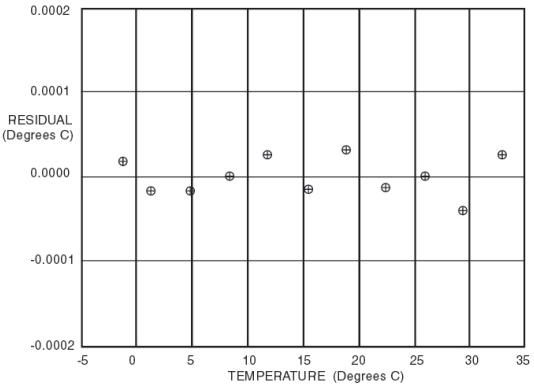
Calibration

The SBE 38 is calibrated in Sea-Bird's state-of-the-art calibration laboratory, which maintains primary temperature standards (water triple point [TPW] and gallium melting point [GaMP] cells), ITS-90 certified and standards-grade platinum resistance thermometers, and a low-gradient temperature bath. Temperature is computed using the Steinhart-Hart polynomial (Steinhart and Hart, 1968; Bennett, 1972). The equation characterizes the non-linear temperature versus resistance response of the sensor. Thermistors require individualized coefficients to the Steinhart-Hart equation, because the material is an individualized mix of dopants:

$t_{90L} = \{[1.0 / (a0 + a1 * \ln(n) + a2 * \ln^2(n) + a3 * \ln^3(n))] - 273.15\} * \text{Slope} + \text{Offset}$ [°C] *where* n is SBE 38 output.

Example Calibration Data (sensor serial number 80, 02 Sept 1997):
a0 = -2.809379e-05 a2 = -2.619655e-06 a1 = 2.783483e-04 a3 = 1.598734e-07

Bath Temperature [°C]	Instrument Output [n]	Instrument Temperature [°C]	Residual (Instrument - Bath) [°C]
-1.52985	824162.7	-1.52983	0.00002
1.03108	733633.1	1.03106	-0.00002
4.60520	625547.1	4.60518	-0.00002
8.11169	536776.4	8.11169	-0.00000
11.61533	462132.6	11.61536	0.00003
15.17575	398167.3	15.17574	-0.00001
18.63931	345476.6	18.63934	0.00003
22.14032	300170.8	22.14031	-0.00001
25.66793	261276.6	25.66793	0.00000
29.13948	228549.1	29.13944	-0.00004
32.61481	200420.3	32.61484	0.00003



Performance

Measurement Range	-5 to +35 °C
Initial Accuracy [1]	± 0.001 °C (1 mK)
Typical Stability	0.001 °C (1 mK) in six months, certified
Resolution	0.00025 °C (0.25 mK)
Response Time [2]	500 msec
Self-heating Error	< 200 µK

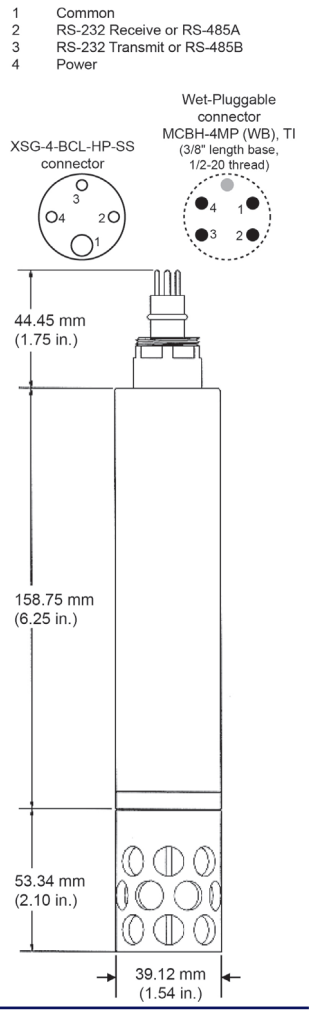
[1] *NIST-traceable calibration applying over the entire range.*
[2] *Time to reach 63% of final value following a step change in temperature*

Electrical

Output Signal	RS-232 or RS-485 (half-duplex)
Input Power	8-15 VDC at 15 mA average for RS-232 output; 8-15 VDC at 10 mA average for RS-485 output

Mechanical

Housing & Depth rating	Titanium, 10,500 m
Weight	0.9 kg in air, 0.5 kg in water



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