SBE 35
Deep Ocean Standards Thermometer

The SBE 35 is a laboratory standards thermometer with the unique ability to be used in fixed point cells and at depths to 6800 meters. It is unaffected by shock and vibration encountered in shipboard and industrial environments, making it ideal for use in calibration labs (-5 to +35 °C), and in the thermodynamic method of measuring hydro turbine efficiency. The SBE 35 can also be used with a CTD / Water Sampler system, eliminating reversing thermometers and providing higher accuracy temperature readings at lower cost.

The SBE 35 is externally powered, and communicates via a standard RS-232 interface. Measurements are output as raw data or in engineering units (°C).

Features

- **Industrial or Lab Applications** - Output can be displayed in real-time and logged to a computer. The SBE 35 is standardized in water triple point (TPW) and gallium melting point (GaMP) cells, following the methodology applied to a standards-grade platinum resistance thermometer (SPRT). Unlike an SPRT, it does not require an expensive resistance bridge, making it a dramatically cost-effective alternative. For fixed point cell measurements, the guard is removed; a brass and plastic tip bushing is attached to provide the length, diameter, and thermal averaging characteristic of an SPRT (resolves temperature to approximately 0.000025 °C (25 µK); accuracy better than 1 mK).
- **Deep Ocean Applications** - The SBE 35 can be used with the SBE 32 Carousel Water Sampler and one of the following systems:
  - Real-time (bottles closed by command from ship) - SBE 9plus CTD with SBE 11plus Deck Unit; or SBE 19, 19plus, 19plus V2, 25, or 25plus CTD with SBE 33 Deck Unit.
  - Autonomous (bottles closed based on programmed pressures or times) - SBE 9plus CTD with SBE 17plus V2 Searam; or SBE 19, 19plus, 19plus V2, 25, or 25plus CTD with Auto Fire Module (AFM).

  The SBE 35 makes a measurement each time a bottle fire confirmation is received, and stores the time, bottle position, and temperature, allowing comparison with CTD and water bottle data.

  Real-Time Operation:

  11*plus* ── 9*plus* CTD ─┬─ Carousel
                                 │
                              35

  33 ─ Carousel ─ 19/19*plus*/19*plus* V2/25/25*plus* CTD
             │
            35

  Autonomous Operation:

  9*plus* CTD ── 17*plus* ─┬─ Carousel
                           │
                        35

  19/19*plus*/19*plus* V2/25/25*plus* CTD ─ AFM ─┬─ Carousel
                                          35

- RS-232 output at 300 baud, 8 data bits, no parity.
- Interface Box connects SBE 35 to a computer for setup and lab use (100-240 VAC powered, provides 15 VDC to SBE 35, and buffers communication lines to minimize interference from external noise).
- Aluminum housing; depths to 6800 m.
- Seasoft© V2 Windows software package (instrument setup, data display, and data upload).
- Five-year limited warranty.

Remove temperature guard for laboratory applications

Options

- XSG or wet-pluggable MCBH connector.

Measurement Method

Temperature is determined by applying an AC excitation to reference resistances and an ultrastable aged thermistor with a drift rate < 0.001 °C/year. Each of the resulting outputs is digitized by a 20-bit A/D converter. The reference resistor is a hermetically sealed, temperature-controlled VISHAY. The switches are mercury wetted reed relays with a stable contact resistance. AC excitation and ratiometric comparison using a common processing channel removes measurement errors due to parasitic thermocouples, offset voltages, leakage currents, and gain errors. Maximum power dissipated in the thermistor is 0.5 µWatts, and contributes < 200 µK of overheat error.

Sensor Output (raw counts) = 1048576 * (NT - NZ) / (NR - NZ)
where NR is reference resistor output, NZ is zero ohms output, NT is thermistor output.

Each measurement acquisition cycle takes 1.1 sec. The number of cycles per measurement is programmable. Increasing the cycles increases acquisition time while reducing RMS temperature noise. In a thermally quiet environment, the temperature noise standard deviation is 82 * sqrt (1/n cycles) [µK].

Performance

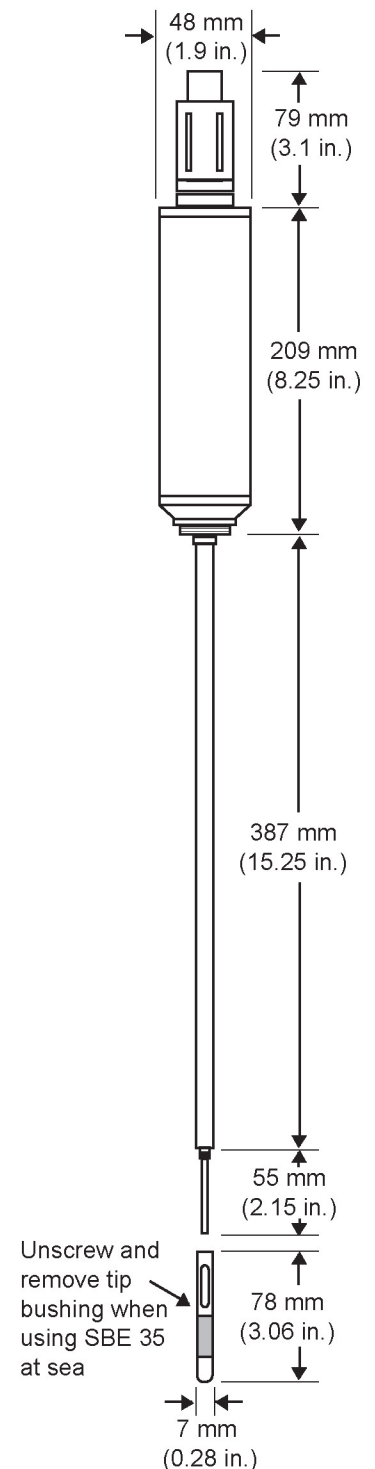| Measurement Range	-5 to +35 °C
Initial Accuracy	± 0.001 °C
Typical Stability	0.001 °C per year
Resolution	0.000025 °C
Calibration	-1.5 to + 32.5 °C
Memory	179 samples
Real-Time Clock	Watch-crystal type

Electrical

Input Power	9 - 16 VDC. On power application ($\approx$ 1 minute) 140 to 160 mA; Operating 60 to 70 mA.
Output Signal	RS-232 (300 baud, 8 data bits, no parity)

Mechanical

Housing & Depth rating	Aluminum, 6800 m
Weight	0.9 kg in air, 0.5 kg in water

48 mm (1.9 in.)

79 mm (3.1 in.)

209 mm (8.25 in.)

387 mm (15.25 in.)

55 mm (2.15 in.)

Unscrew and remove tip bushing when using SBE 35 at sea

78 mm (3.06 in.)

7 mm (0.28 in.)

Note: Temperature sensor guard not shown.

SEA·BIRD SCIENTIFIC

Sea-Bird Electronics
+1 425-643-9866
sales@seabird.com
www.seabird.com