

SBE 8 Microstructure Temperature Sensor

The SBE 8 Microstructure Temperature Sensor is a reliable, lightweight instrument intended for use in marine profiling applications where its high speed and spatial resolving power offer the ability to characterize small-scale ocean temperature features. Used in conjunction with the SBE 7 Microstructure Conductivity sensor, the SBE 8 can provide comparably sensitive resolution of salinity and density fields.

Although the SBE 8 is intended primarily for determination of temperature gradients, it is configured to respond also to absolute temperatures:

- The gradient sensitivity of the sensor is a function of its average zero-frequency response and may be evaluated by integrating that response.
- The functionality of the instrument is verified by its proper *static* response.
- It is accurate enough as an absolute sensor (typically within 0.01 °C for periods of several hours at atmospheric pressure) to provide absolute temperature data.



Shown with Remote Probe Configuration

Features

- Sensing element is a remote-cabled, probe-mounted thermistor (Thermometrics type FP07).
- Sensor probe is a small, stainless steel assembly that may be mounted up to 3 m from sensor electronics housing. This arrangement minimizes effect of instrument housing and its wake on the data.
- Thermistor body is O-ring sealed into the sensor assembly to ensure pressure integrity.
- Aluminum housing; depths to 6800 m.
- Five-year limited warranty.

Options

- Cabled remote probe (up to 3 m length) or probe mounted to sensor housing.
- AG or wet-pluggable MCBH connector.

Measurement Method

The thermistor has a 25 °C resistance of 270 K ohms and is driven by a DC current derived from a low-noise, 6.9 volt reference and 1 megohm resistor. The thermistor voltage is buffered by a low-noise FET op amp. The output is subsequently *pre-emphasized*, so the sensor's output increases as a function of the frequency components in the temperature signal. The effect of pre-emphasis is to magnify the sensor output for rapidly changing temperature, thereby overcoming restrictions on system resolving power that would otherwise be imparted by the use of conventional (e.g., 16-bit) digitizers. The SBE 8's pre-emphasis response magnifies a 20 Hz temperature signal by a factor of 200, thus facilitating acquisition of signals 200 times smaller than could be characterized by conventional CTD sensors.

General characteristics of similar sensors are described in a paper by Gregg, et al¹. A discussion of field experiences with instruments of this type may be found in another paper by Gregg².

¹ Gregg, M.C.; T.B. Meagher; A.M. Pederson; and E. Aagaard, "Low Noise Temperature Microstructure Measurements with Thermistors", *Instruments and Methods, Deep-Sea Research, Vol 25, pp 843-856, 1978.*

² Gregg, M.C., "Variations in the Intensity of Small-Scale Mixing in the Main Thermocline", *Journal of Physical Oceanography, Vol 7, pp 436-454, 1977.*

Performance

High-Speed Micro-Scale Resolution	-3 db at 22 Hz (sensor) -3 db at 1000 Hz (electronics)
Extremely Low Noise	$8 \times 10^{-7} \text{ (}^\circ\text{C) / (Hz}^{1/2}\text{)}$ Pre-emphasized response to overcome system thresholds
Temperature Element	High-speed thermistor, Thermometrics type FP07. Cabled (up to 3 m) remote stainless steel probe assembly.

Electrical

Input Power	$\pm 15 \text{ V} \pm 3\%$ at 15 mA
Output Signal (Pre-Emphasized)	Voltage, +6 to -6 V for -3 to 30 °C nominal at 0 frequency. Output increases in proportion to frequency, beginning at 0.1 Hz and ending at 200 Hz.

Mechanical

Housing & Depth rating	Hard-anodized 7075-T6 aluminum, zinc anode protected, 4.8 cm diameter x 18 cm long, 6800 m depth rating
Connector	6-pin Impulse AG 306 (1/2-20 thread) or MCBH-6MAL
Weight	0.7 kg in air, 0.3 kg in water

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