

SBE 7

Microstructure Conductivity Sensor

The SBE 7 Microstructure Conductivity 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 conductivity features. Where salinity variations are minimal, the conductivity signal offers unexcelled resolution of temperature structure. Used in conjunction with the SBE 8 Microstructure Temperature Sensor, the SBE 7 can provide comparably sensitive resolution of salinity and density fields.

Although the SBE 7 is intended primarily for determination of conductivity gradients, it is configured to respond also to absolute conductivity:

- 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 0.005 S/m over periods of several hours) to provide useful data regarding absolute conductivity.



Shown with Remote Probe Configuration

Features

- Sensing element is a remote-cabled, probe-mounted, 2-terminal, platinized electrode cell of *dual needle* configuration; sensing element's completely open construction provides nearly total freedom from fouling.
- Sensor probe is a small, stainless steel assembly that may be mounted up to 3 m from the sensor electronics housing. This arrangement minimizes effect of the instrument housing and its wake on the data.
- Cell electrodes are fabricated of solid platinum and are platinized to reduce effect of polarization impedance on sensor response.
- 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 cell is driven by a sinusoidal voltage of approximately 0.24 Volts_{rms} at a frequency of 15 kHz. The resulting current is synchronously detected to provide a signal proportional to conductivity (transformer coupling is used to preclude the flow of galvanically induced currents into the electrodes). This signal is subsequently *pre-emphasized* so that the sensor's output increases as a function of frequency. The effect of pre-emphasis is to magnify the sensor output for rapidly changing conductivity, therefore overcoming restrictions on system resolving power that would otherwise be imparted by the use of conventional (e.g., 16-bit) digitizers. The SBE 7's pre-emphasis response magnifies a 100 Hz conductivity signal by a factor of 1000, facilitating acquisition of signals 1000 times smaller than could be characterized by conventional CTD sensors.

The spatial response characteristics of the SBE 7 are such that about 90% of the electrical current associated with the dual needle cell response flows within a volume of water less than 3 cm in diameter and mostly forward of the needle tips. General characteristics of similar sensors are described in a paper by Meagher, et al¹, which also discusses field experiences with instruments of this type.

¹ Meagher, T.B.; Pederson, A.M.; and M.C. Gregg, "A Low-noise conductivity microstructure instrument", *IEEE-MIS Proceedings of Oceans '82*.

Performance

High-Speed Micro-Scale Resolution	-3 db at 100 cycles/m (sensor) -3 db at 1000 Hz (electronics)
Extremely Low Noise	2×10^{-7} (S/m) / (Hz ^{1/2}) Pre-emphasized response to overcome system thresholds
Conductivity Sensing Element	2-terminal, dual-needle, platinized-electrode cell. Cabled (up to 3m) remote stainless steel probe assembly.

Electrical

Input Power	± 15 V \pm 3% at 25 mA
Output Signal (Pre-Emphasized)	Voltage, +6 to -6 V for 0 to 6.5 S/m 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	0.8 kg in air, 0.4 kg in water

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