

SBE 54 Tsunami Pressure Sensor

The SBE 54 continuously measures, records, and outputs pressure at user-programmable periods. Resolution is better than 1 mm at full ocean depth (6800 m) at the default 15-second sample period. The SBE 54's sole purpose is to function as the heart of a deep-ocean tsunami detection system. Setup and operation require no user interaction. A power supply supervisor and watchdog timer ensure automatic recovery if power or normal operation is interrupted.

The SBE 54 combines a Paroscientific Digiquartz[®] pressure transducer, microcontroller, real-time clock with temperature-compensated crystal oscillator, precision temperature-compensated reference frequency, two high-resolution frequency acquisition circuits, EEPROM, and FLASH memory. Low power consumption makes multi-year, battery-powered deployments practical. The FLASH memory provides four years continuous backup of the raw pressure record, at a 15-second sample period. Preserving the entire time series in memory allows post-deployment review of the performance, as well as scientific analysis of the entire record. The EEPROM stores calibration coefficients and diagnostic information. The Digiquartz pressure sensor and frequency reference are tested and re-characterized at Sea-Bird to meet the demanding millimeter-scale sensitivity requirements.



Features

- Full ocean depth pressure (6800 m), with extremely high resolution (> 1 mm resolution at 15-sec sample period).
- RS-232 interface.
- Internal memory and simple, XML, real-time data.
- Powered externally (short version) or internal batteries (long version).
- Large memory and low power consumption for multi-year deployments.
- Seasoft[®] for Waves Windows software package (setup, data upload, data conversion).
- Five-year limited warranty.

Components

- Paroscientific Digiquartz[®] temperature-compensated pressure sensor, in four ranges from 1300 - 6800 m (2000 - 10,000 psia).
- Microcontroller, real-time clock with temperature-compensated crystal oscillator, precision temperature-compensated reference frequency, two high-resolution frequency acquisition circuits.
 - Reference frequency that acquires pressure and pressure temperature outputs from pressure sensor accurate to 1 ppm and temperature calibrated to 50 ppb.
 - Pressure sensor, reference frequency, and acquisition circuits powered continuously to eliminate start-up transient errors.
 - Pressure and pressure temperature acquired simultaneously to eliminate phasing errors and increase measurement resolution.

Options

- Short housing (externally powered), or Long housing with battery compartment for 12 D cells (LR-20 – Alkaline) or 6 DD Lithium cells (internal battery diode or'ed with external supply for backup to external power).
- XSG/AG or wet-pluggable MCBH connector.
- Lithium batteries (not supplied by Sea-Bird).

Performance

Measurement Range	0 to 1300, 2000, 4000, or 6800 m (2000, 3000, 6000, or 10,000 psia)
Resolution *	1.1×10^{-7} of Digiquartz pressure range at default 15-sec sample period (0.0011 psia [0.8 mm] with 10,000 psia sensor)
Reference Frequency	<i>Initial accuracy:</i> 1 ppm <i>Temperature characterization:</i> $\pm 0.1 \times 10^{-6}$ (-10 to 30 °C), $\pm 0.05 \times 10^{-6}$ (0 to 10 °C) <i>Aging:</i> 3×10^{-6} first year, 1×10^{-6} after first year
Real-Time Clock	Quartz TCXO watch-crystal, accuracy ± 2 ppm (5 sec/month)
Data Output	XML real-time pressure in ASCII engineering units (dbar, psia) at user-input sample period (1 – 240 sec; default 15 sec)
Memory	128 MB FLASH RAM; 8.9 million samples (51 months at default 15-sec sample period)

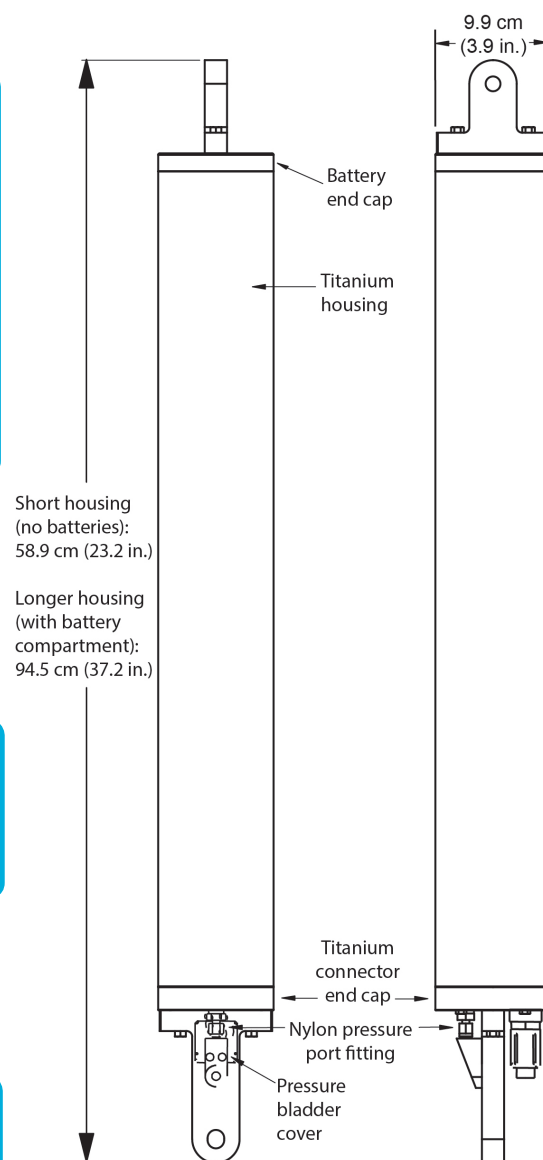
* Sum of all uncertainties in measurement of pressure change < 1 mm over a duration of a few minutes and < 5 mm over a duration of minutes to hours, including ocean/instrument temperature changes of 0.25° C.

Electrical

External Power	12 – 28 VDC
Power Consumption	0.015 Watt at 15V, 0.016 Watt at 20V, 0.018 Watt at 24V, 0.022 Watt at 28V (running continuously)
Battery Endurance	12 Alkaline D cells: 14 months (80% capacity); 6 Lithium DD cells: 37 months (80% capacity)

Mechanical

Housing & Depth Rating	Titanium, 7000 m
Weight	With long housing & alkaline batteries: in air 14.5 kg, in water 8.6 kg



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