

Temperature (& Pressure) Recorder

SBE 39


The SBE 39 is a high-accuracy temperature (pressure optional) recorder with internal battery and non-volatile memory for deployment at depths up to 10500 m (34,400 ft). The 39 is intended for moorings or other long-term, fixed-site applications, as well as shorter-term deployments on nets, towed vehicles, or ROVs. Calibration coefficients are stored in EEPROM, and uploaded data is in ASCII engineering units (°C and decibars).

The 39's thermistor, the same sensor used in the SBE 16*plus* SEACAT and 37 MicroCAT, has a long history of exceptional accuracy and stability; drift is typically less than 0.002 °C per year. Two configurations are offered:

- Thermistor embedded in titanium endcap (25-second time constant), for rugged conditions.
- External thermistor in pressure-protected sheath (0.5-second time constant), for fast sampling.

The 39's optional Druck pressure sensor employs a micro-machined *silicon diaphragm* in which the strain elements are implanted with semiconductor fabrication techniques. Unlike metal diaphragms, silicon's crystal structure is perfectly elastic, so the sensor is essentially free of pressure hysteresis. Compensation of temperature influence on pressure offset and scale is performed by the 39's CPU.

COMMUNICATIONS AND INTERFACING

The SBE 39 communicates with a computer via a standard RS-232 interface, at a user-selectable 1200 to 38,400 baud rate. Connection is dependent on the housing:

- Standard — open housing; plug data cable into connector on electronics assembly.
- Optional — plug data cable into external, waterproof connector.

User-selectable operating modes include:

- **Polled Sampling** — sampling and data transmission is triggered by a command from a computer or satellite, radio, or wire telemetry equipment.
- **Autonomous Sampling** — sampling occurs at pre-programmed intervals, and can be set up to start at a future time and date. There are two types of Autonomous Sampling —
 - *Interval*: At pre-programmed 3-second (4-second if transmitting in real time) to 9-hour intervals, 39 wakes up, samples, records, and powers off.
 - *Continuous*: 39 continuously samples, and does not power off between samples. Time between samples varies from 0.8 to 1.5 seconds, depending on data format.
- **Serial Line Sync** — sampling and data transmission is triggered by a pulse on the serial line, which causes a sleeping 39 to wake up, sample, transmit in real time (programmable option), record, and power-off automatically.

DATA STORAGE AND UPLOAD, AND BATTERY ENDURANCE

The SBE 39 has a 4 Mbyte non-volatile FLASH memory. Temperature (3 bytes/sample) and time (4 bytes/sample) are always stored. Optional pressure adds 2 bytes/sample. Binary upload capability provides **fast upload** of large data sets. A 39 uploads its full memory (466,000 samples of T, P, and time) in only 55 minutes — including error checking each block of data.

With its 9-volt, non-hazardous, lithium battery (alkaline battery may be substituted), the 39 can acquire more than 150,000 samples of T, P, and time. Because of the low power consumption when not sampling, deployments of 3 years or more are possible.

CONFIGURATION

A standard SBE 39 is supplied with embedded thermistor, internal connector, and plastic housing for depths to 600 meters. Options include:

- External thermistor in pressure-protected sheath
- Titanium housing for depths to 10,500 meters
- Strain gauge pressure sensor — available in eight pressure ranges, to a maximum depth of 7000 meters
- Mooring clamp(s)
- Net fender / fairing — conical ends are shaped to shed fishing lines and nets

CALIBRATION

The SBE 39's inherent accuracy, resolution, and stability, combined with a rigorous 11-point temperature calibration, yields a true research-quality tool. Primary temperature standards (water triple point and gallium melting point cells) and state-of-the-art equipment are maintained in our NIST-traceable calibration facility. Pressure calibrations are referenced to specially maintained (at Sea-Bird) Paroscientific Digiquartz sensors that trace to Paroscientific's pressure standard.

SOFTWARE

The SBE 39 is supplied with a powerful Win 95/98/NT/2000/XP software package, SEASOFT-Win32[®], for communication, data upload, data conversion, plotting, and export to other programs.



Sea-Bird Electronics, Inc.

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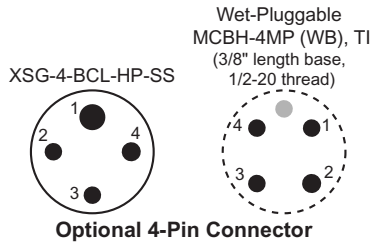
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Temperature (& Pressure) Recorder



Optional 4-Pin Connector

| Pin | Signal |
|-----|----------------------|
| 1 | Common |
| 2 | RS-232 data receive |
| 3 | RS-232 data transmit |
| 4 | 9-30 VDC |

SPECIFICATIONS

Measurement Range

Temperature: -5 to +35°C

P (optional)*: 20/100/350/600/1000/2000/3500/7000 m

*Expressed in meters of deployment depth capability.

Initial Accuracy

Temperature: ± 0.002°C

P (optional): 0.1% of full scale range

Typical Stability (per month)

Temperature: 0.0002°C

P (optional): 0.004% of full scale range

Resolution

Temperature: 0.0001°C

P (optional): 0.002% of full scale range

Clock

5 seconds/month accuracy

Power Supply/Endurance

9V non-hazardous Lithium Battery: > 150,000 samples

9V Alkaline Battery: > 41,000 samples

Quiescent Current

10 microamps

Current Consumption (per sample)

T & time 0.018 amp-second

T, P, & time 0.023 amp-second

Current Consumption (continuous sampling)

15 milliamps

External Power (with optional external I/O connector)

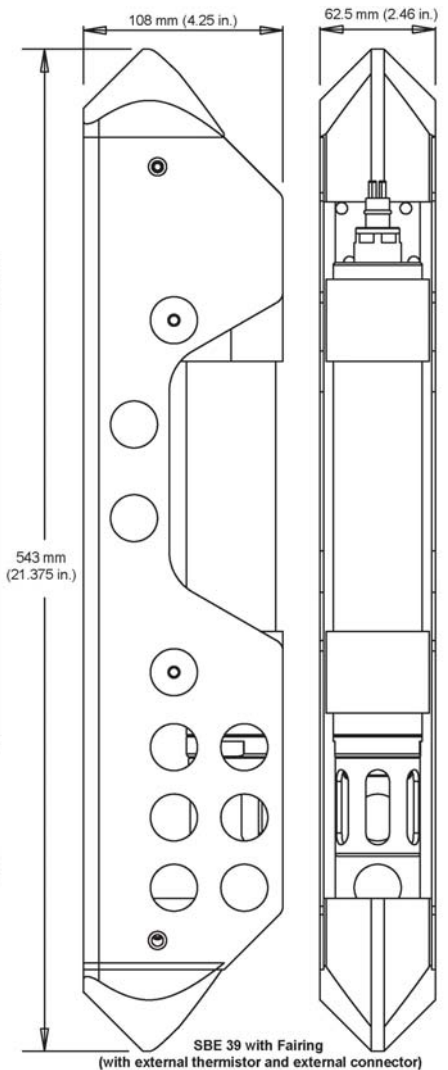
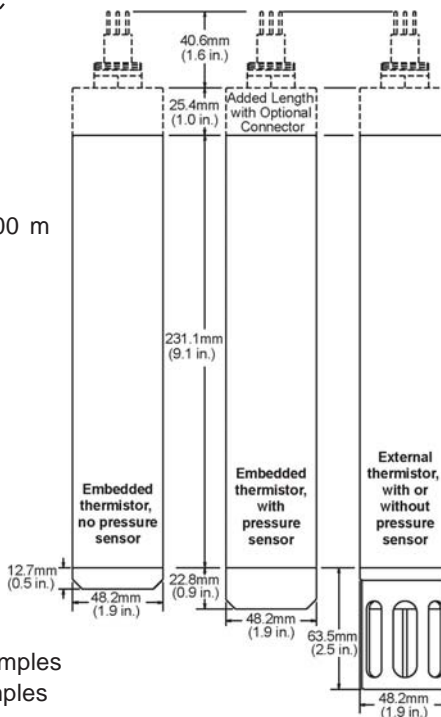
9 - 30 VDC

Memory 4 Mbyte non-volatile FLASH

Memory capacity* (T & time): 599,000 samples

Memory capacity* (T, P, & time): 466,000 samples

*T=3 bytes/sample; time=4 bytes/sample; P=2 bytes/sample



Housing (depth rating)

PET plastic: 600 m (1960 ft)

Titanium: 10,500 m (34,400 ft)

Weight (without external connector)

Plastic housing, embedded thermistor:

in air 0.6 kg (1.2 lbs), in water 0.25 kg (0.6 lbs)

Titanium housing, thermistor in sheath:

in air 1.2 kg (2.6 lbs), in water 0.7 kg (1.6 lbs)

(Other configurations vary slightly).

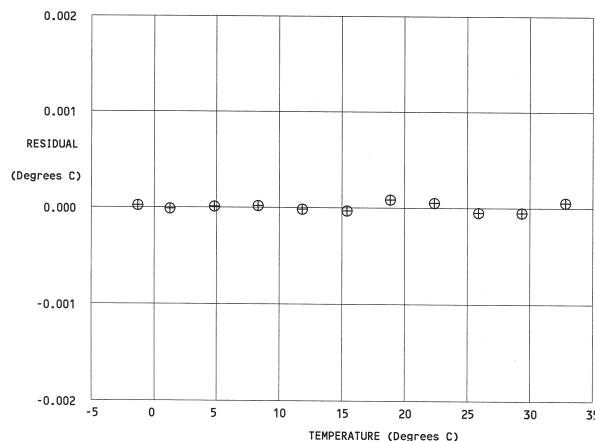
Actual Calibration Data for sensor # 204

Calibration Date: 19 May 2000

a0= -1.661595e-04 a2= -4.625199e-06

a1= 3.079553e-04 a3= 2.075766e-07

| Bath Temp (deg C) | Inst Output (n) | Inst Temp (deg C) | Residual (deg C) |
|-------------------|-----------------|-------------------|------------------|
| -1.5115 | 786460.1 | -1.5115 | 0.0000 |
| 1.0482 | 700444.0 | 1.0482 | -0.0000 |
| 4.6236 | 597614.7 | 4.6236 | 0.0000 |
| 8.1305 | 513142.6 | 8.1305 | 0.0000 |
| 11.6344 | 442083.3 | 11.6344 | -0.0000 |
| 15.1949 | 381161.9 | 15.1949 | -0.0000 |
| 18.6590 | 330948.6 | 18.6590 | 0.0001 |
| 22.1592 | 287767.8 | 22.1592 | 0.0000 |
| 25.6867 | 250672.7 | 25.6866 | -0.0001 |
| 29.1579 | 219443.9 | 29.1579 | -0.0001 |
| 32.6336 | 192584.6 | 32.6337 | 0.0000 |



02/07



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