MicroCAT C-T Recorder (**S**erial interface, **M**emory, & integral **P**ump) SBE 37-SMP

The SBE 37-SMP MicroCAT is a high-accuracy conductivity and temperature (pressure optional) recorder with **S**erial interface, internal battery, non-volatile FLASH **M**emory, and integral **P**ump. The MicroCAT is designed for moorings or other long duration, fixed-site deployments. Constructed of titanium and other non-corroding materials to ensure long life with minimum maintenance, the MicroCAT's depth capability is 7000 meters; it is also available with an optional 250-meter plastic *ShallowCAT* housing.

Calibration coefficients are stored in EEPROM, and uploaded data is presented in ASCII engineering units. The data always includes Conductivity, Temperature, and Pressure (if optional pressure sensor is installed). If desired, time can be added to each scan, and the MicroCAT can calculate and output salinity and sound velocity (Chen-Millero). The MicroCAT retains the temperature and conductivity sensors used in our time-proven SEACAT products; however, new acquisition techniques provide increased accuracy and resolution while reducing power consumption. Electrical isolation of the conductivity electronics eliminates any possibility of ground-loop noise.

The MicroCAT's unique internal-field conductivity cell permits the use of expendable anti-foulant devices. The aged and pressure-protected thermistor has a long history of exceptional accuracy and stability.

The optional pressure sensor, developed by Druck, Inc., has a superior new design that is entirely different from conventional 'silicon' types in which the deflection of a metallic diaphragm is detected by epoxy-bonded silicon strain gauges. The Druck sensor employs a micro-machined *silicon diaphragm* into which the strain elements are implanted using semiconductor fabrication techniques. Unlike metal diaphragms, silicon's crystal structure is perfectly elastic, so the sensor is essentially free of pressure hysteresis. Compensation of the temperature influence on pressure offset and scale is performed by the MicroCAT's CPU.

Intended for deployment in orientation shown (connector at top) for proper pump operation (U-shaped intake/exhaust prevents air from being trapped in impeller housing).

Standard titanium housing; optional plastic (ShallowCAT) housing also available

SENSOR INTERFACE ELECTRONICS

Temperature is acquired by applying an AC excitation to a hermetically sealed VISHAY reference resistor and an ultra-stable aged thermistor (drift rate typically less than 0.002 °C per year). The ratio of thermistor resistance to reference resistance is determined by a 24-bit A/D converter; this A/D also processes the pressure sensor signal. Conductivity is acquired using an ultra-precision Wien-Bridge oscillator. A high-stability reference crystal with a drift rate of less than 2 ppm/year is used to count the frequency from the oscillator.

COMMUNICATIONS AND INTERFACING

The MicroCAT communicates directly with a computer via standard RS-232 interface. Data can be uploaded at up to 38.4K baud. Real-time data can be transmitted at distances of up to 1600 meters (5200 feet) at 600 baud, simultaneous with recording. An optional RS-485 interface allows multiple MicroCATs to share a common 2-wire cable, minimizing cable complexity for C-T chains.

User-selectable operating modes include:
- **Autonomous Sampling** – At pre-programmed intervals of 5 seconds to 9.1 hours, the MicroCAT wakes up, runs the pump, samples, stores the data in its FLASH memory, and goes to sleep.
- **Polled Sampling** – On command from a computer or satellite, radio, or wire telemetry equipment, the MicroCAT runs the pump, takes a sample, and transmits the data.
- **Serial Line Sync** – In response to a pulse on the serial line, the MicroCAT wakes up, runs the pump, samples, stores the data in its FLASH memory, transmits real-time data, and goes to sleep.

PUMP

The integral pump runs for 0.5 seconds each time the MicroCAT samples, providing the following advantages:
- **Improved conductivity response** – The pump flushes the previously sampled water from the conductivity cell and brings a new water sample quickly into the cell.
- **Improved anti-foul protection** – Water does not freely flow through the conductivity cell between samples, allowing the anti-foul concentration inside the cell to build up.

SOFTWARE

The MicroCAT is supplied with a powerful Windows 95/98/NT/2000/XP software package, SEASOFT©-Win32, which includes:
- SEATERM© – terminal program for easy communication and data retrieval.
- SBE Data Processing© – programs for calculation, display, and plotting of conductivity, temperature, pressure (optional), and derived variables such as salinity and sound velocity.

DATA STORAGE AND BATTERY ENDURANCE

Temperature and conductivity are stored 5 bytes/sample, time 4 bytes/sample, and optional pressure 2 bytes/sample; memory capacity is in excess of 185,000 samples. The MicroCAT is powered by a 7.2 Ampere-Hour (nominal) battery pack consisting of six 9-volt lithium batteries which, when removed from the MicroCAT, can be shipped via commercial aircraft. The pack provides sufficient internal battery capacity for more than 90,000 samples. *

SPECIFICATIONS

Measurement Range

Conductivity:	0 - 7 S/m (0 - 70 mS/cm)
Temperature:	-5 to 35 °C
Optional Pressure:	20/100/350/600/1000/2000/3500/7000
	(meters of deployment depth capability)

Initial Accuracy

Conductivity:	0.0003 S/m (0.003 mS/cm)
Temperature:	0.002 °C
Optional Pressure:	0.1% of full scale range

Typical Stability *(per month)*

Conductivity:	0.0003 S/m (0.003 mS/cm)
Temperature:	0.0002 °C
Optional Pressure:	0.004% of full scale range

Resolution

Conductivity:	0.00001 S/m (0.0001 mS/cm)
Temperature:	0.0001 °C
Optional Pressure:	0.002% of full scale range

Time Resolution 1 second

Clock Accuracy 13 seconds/month

Quiescent Current * 10 microamps

Sampling and Communication Current *
Without external power option

Communication	38 milliamps
Sampling (excluding pump)	20 milliamps for autonomous or serial line sync sampling; 39 milliamps for polled sampling

With external power option

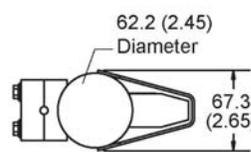|	
Communication	35 milliamps
Sampling (excluding pump)	35 milliamps

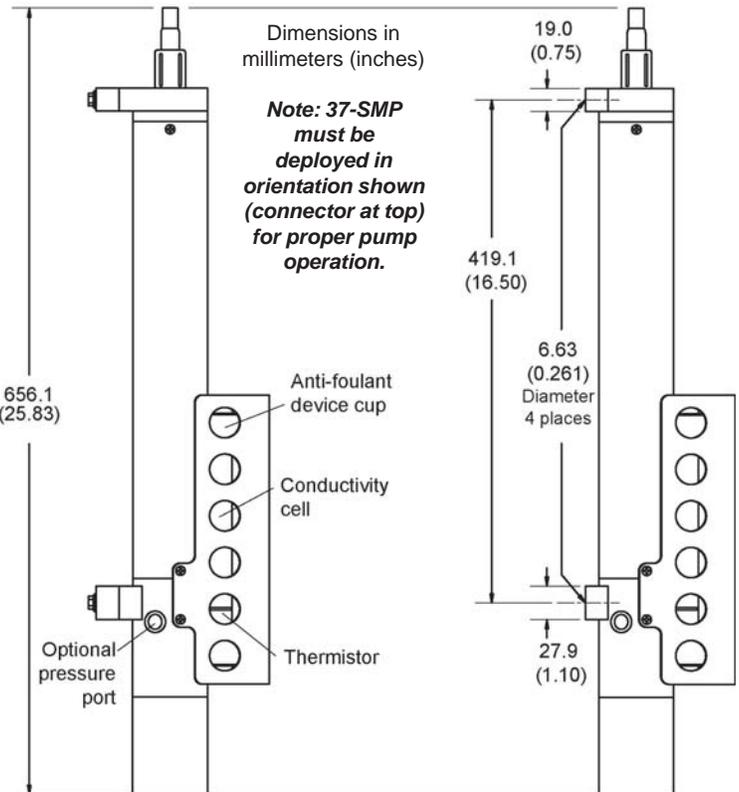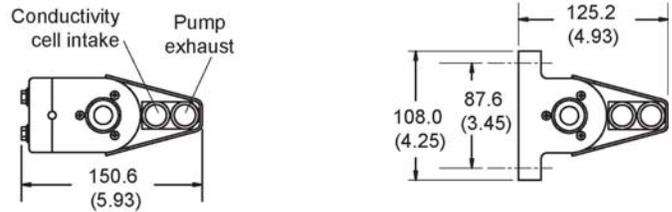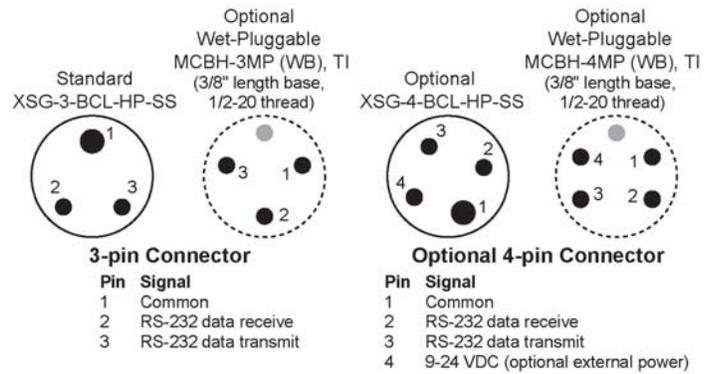**Pump Current** 0.13 amp-seconds/sample

Sampling Time 2 - 4 seconds/sample for 1 measurement/sample (dependent on sampling mode and inclusion of pressure sensor)
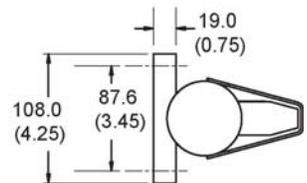
Optional External Power 0.5 Amps at 9-24 VDC

Housing, Depth Rating, and Weight (without pressure sensor)

Standard	Titanium, 7000 m (23,000 ft) Weight in air: 5 kg (11 lbs) Weight in water: 3 kg (7 lbs)
Optional ShallowCAT	Plastic, 250 m (820 ft) Weight in air: 3.5 kg (7.7 lbs) Weight in water: 1.5 kg (3.3 lbs)

* Power consumption / battery endurance values are for standard RS-232 interface; for optional RS-485 interface, see RS-485 manual.

3-pin Connector

Pin	Signal
1	Common
2	RS-232 data receive
3	RS-232 data transmit

Optional 4-pin Connector

Pin	Signal
1	Common
2	RS-232 data receive
3	RS-232 data transmit
4	9-24 VDC (optional external power)

Dimensions in millimeters (inches)

Note: 37-SMP must be deployed in orientation shown (connector at top) for proper pump operation.

Standard Wire Mounting Clamp and Guide

Alternate Flat Surface Mounting Brackets

11/06