

MicroCAT C-T-(P)-ODO Recorder (Inductive Modem, integral Pump)



SUMMARY

- Moored Conductivity, Temperature, Pressure (optional), and Optical Dissolved Oxygen measurements, at user-programmable intervals (10 seconds to 6 hours).
- Inductive Modem (IM) interface, internal memory, and internal batteries.
- *Adaptive Pump Control* for high-accuracy oxygen data.
- Expendable anti-foulant devices, unique flow path, and pumping regimen for maximum bio-fouling protection.
- Depths to 350 meters (*ShallowCAT* plastic housing) or 7000 meters (titanium housing).
- Adds to field-proven MicroCAT family, with 10,000 instruments deployed since 1997.

DESCRIPTION

The SBE 37-IMP-ODO MicroCAT is a high-accuracy conductivity and temperature (pressure optional) recorder with internal batteries, memory, built-in Inductive Modem, integral Pump, and Optical Dissolved Oxygen sensor. Constructed of titanium and other non-corroding materials for long life with minimal maintenance, the MicroCAT is designed for long duration deployments on moorings. Calibration coefficients are stored in EEPROM, allowing output of C, T, P, DO, and time in ASCII engineering units (raw output available).

The Inductive Modem (IM) system provides reliable, low-cost, real-time data transmission for up to 100 IM-enabled instruments using plastic-coated wire rope (typically 3 x 19 galvanized steel) as both the transmission line and mooring tension member. IM instruments clamp anywhere along the rugged mooring wire. Expensive and potentially unreliable multi-conductor electrical cables with fixed position underwater connectors are not required. IM moorings are easily reconfigured (positions changed or instruments added or removed), by sliding and re-clamping sensors on the cable. IM systems are much less expensive and more power-efficient than acoustic modems, and offer reliable communication over greater distances.

In a typical mooring, an Inductive Modem Module (IMM) or Surface Inductive Modem (SIM) housed in the buoy communicates with underwater IM instruments and is interfaced to a computer or data logger via an RS-232 serial port. The computer or data logger (not supplied by Sea-Bird) is programmed to poll each IM instrument on the mooring for its data, and send the data to a telemetry transmitter (satellite link, cell phone, RF modem, etc.). The MicroCAT saves data in memory for upload after recovery, providing a data backup if real-time telemetry is interrupted.

SENSORS

Conductivity and Temperature sensors are based on our field-proven SeaCAT and SeaCAT*plus* products. Electrical isolation of conductivity electronics eliminates any possibility of ground-loop noise. Our unique internal-field conductivity cell permits the use of expendable anti-foulant devices, for long-term bio-fouling protection. The aged and pressure-protected thermistor has a long history of exceptional accuracy and stability.

The oxygen sensor is our field-proven SBE 63 Optical Dissolved Oxygen sensor.

The optional strain-gauge pressure sensor is available in eight ranges, from 0 - 20 meters to 0 - 7000 meters. Compensation of the temperature influence on pressure is performed by the MicroCAT's CPU.

PUMP

The integral pump runs each time the MicroCAT samples, providing the following advantages:

- **Improved conductivity and oxygen response** – The pump flushes the previously sampled water from the conductivity cell and oxygen sensor plenum, and brings a new water sample quickly into the system.
- **Improved anti-foul protection** – Water does not freely flow through the conductivity cell between samples, allowing the anti-foul concentration inside the system to maintain saturation.
- **Improved measurement correlation** – The individually calibrated SBE 63 Optical Dissolved Oxygen sensor is integrated within the CTD flow path, providing optimum correlation with CTD measurements.

With *Adaptive Pump Control*, the MicroCAT calculates the pumping time for best oxygen accuracy, as a function of the previous sample's temperature and pressure (maximizing data quality while minimizing power consumption).

OPERATING MODES

User-selectable operating modes include:

- Polled Sampling — On command, the MicroCAT runs the pump, takes a sample, and transmits the data.
- Autonomous Sampling — At pre-programmed intervals of 10 seconds to 6 hours, the MicroCAT wakes up, runs the pump, samples, stores data in memory, and goes to sleep.
- Combo or Averaging Sampling — The MicroCAT samples autonomously, and the IMM/SIM can request the last stored data or the average of the samples acquired since its last request.

SOFTWARE

The MicroCAT is supplied with a powerful Windows software package, Seasoft® V2, which includes:

- SeatermV2® – terminal program for easy communication and data retrieval.
- SBE Data Processing® – programs for calculation, display, and plotting of conductivity, temperature, pressure (optional), oxygen, and derived variables such as salinity, sound velocity, and density.



DATA STORAGE AND BATTERY ENDURANCE

Temperature and conductivity are stored 6 bytes/sample, time 4 bytes/sample, oxygen 6 bytes/sample, and optional pressure 5 bytes/sample; memory capacity is in excess of 380,000 samples (with pressure). The MicroCAT is powered by a 7.8 Amp-hour (nominal) battery pack consisting of twelve AA lithium batteries (Saft LS14500) which, when removed from the MicroCAT, can be shipped via commercial aircraft. Battery endurance varies widely, depending on the sampling scheme and deployment pressure and temperature. Sampling every 10 minutes in water temperatures of approximately 10 °C, the MicroCAT can be deployed for almost 6 months (24,000 samples); see the manual for example calculations.

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)
 Dissolved Oxygen: 120% of surface saturation in all natural waters
 (fresh and salt)

Initial Accuracy

Conductivity: ± 0.0003 S/m (0.003 mS/cm)
 Temperature: ± 0.002 °C
 Optional Pressure: ± 0.1% of full scale range
 Dissolved Oxygen: larger of ± 3 µmol/kg (0.07 ml/L, 0.1 mg/L) or ± 2%

Typical Stability

Conductivity: 0.0003 S/m (0.003 mS/cm) per month
 Temperature: 0.0002 °C per month
 Optional Pressure: 0.05% of full scale range per year
 Dissolved Oxygen: sample-based drift < 1 µmol/kg/100,000 samples (20 °C)

Resolution

Conductivity: 0.00001 S/m (0.0001 mS/cm)
 Temperature: 0.0001 °C
 Optional Pressure: 0.002% of full scale range
 Dissolved Oxygen: 0.2 µmol/kg

Clock Accuracy 5 seconds/month

Power Consumption

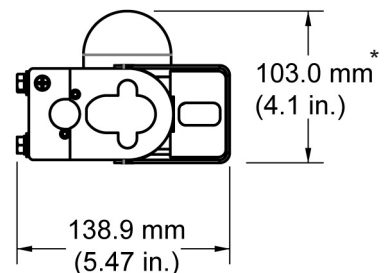
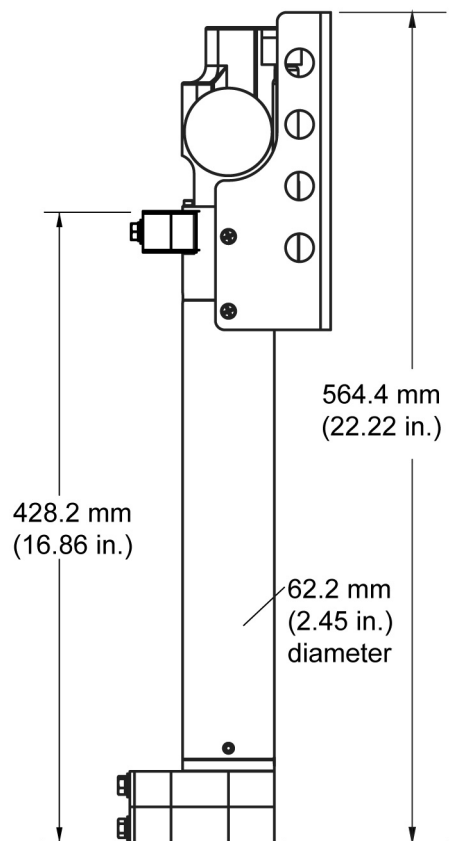
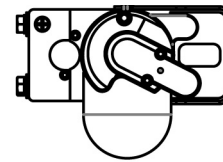
Quiescent: 0.0007 Watts
 CTD-DO Sample Acquisition (excluding pump):
 Without pressure 0.10 Watts
 With pressure 0.17 Watts
 CTD-DO Sample Waiting (not sampling, pump running, excluding pump):
 With pressure 0.016 Watts
 Pump: 0.12 Watts
 Communications:
 IM 0.009 Watts listening, 0.13 Watts transmitting
 RS-232 0.06 Watts

Power Supply 7.8 Amp-hour (nominal) battery pack,
 257 KJoules (derated for calculations)

Housing, Depth Rating, & Weight

Standard Titanium housing, 7000 m (23,000 ft)
 Weight: in air 4.4 kg (9.8 lbs), in water 2.5 kg (5.5 lbs) **
Optional ShallowCAT Plastic housing; 350 m (1150 ft)
 Weight: in air 3.7 kg (8.3 lbs), in water 1.8 kg (4.0 lbs) **

** Weight with standard mooring guide & clamp



* 103 mm is for plastic housing; titanium housing dome is 9 mm smaller