MicroCAT C-T-DO Recorder (**I**nductive **M**odem, integral **P**ump)   **SBE 37-IMP-IDO**

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

Intended for deployment in orientation shown (sensor end up) for proper operation

SUMMARY

- Conductivity, Temperature, Pressure (optional), and 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 250 meters (*ShallowCAT* plastic housing) or 7000 meters (titanium housing).
- Adds to Sea-Bird's field-proven MicroCAT family, with more than 8000 instruments deployed since 1997.

DESCRIPTION

The SBE 37-IMP-IDO MicroCAT is a high-accuracy conductivity and temperature (pressure optional) recorder with internal batteries, memory, built-in **I**nductive **M**odem, integral **P**ump, and **I**ntegrated **D**issolved **O**xygen 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 (decimal or XML; raw output available).

The inductive modem 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 **I**nductive **M**odem **M**odule (IMM) or **S**urface **I**nductive **M**odem (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

Temperature and Conductivity 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 IDO is a frequency-output version of our field-proven SBE 43 Dissolved Oxygen sensor, with the same performance specifications.

The optional Druck pressure sensor has a micro-machined silicon diaphragm, and is essentially free of pressure hysteresis. 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 and oxygen sensor plenum between samples, allowing the anti-foul concentration inside the system to maintain saturation.

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 2000/XP 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.
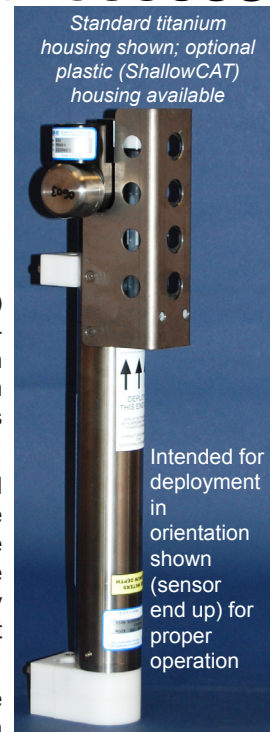
DATA STORAGE AND BATTERY ENDURANCE

Temperature and conductivity are stored 6 bytes/sample, time 4 bytes/sample, oxygen 3 bytes/sample, and optional pressure 5 bytes/sample; memory capacity is in excess of 444,000 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
Oxygen:	120% of surface saturation, (all natural waters, fresh and salt)
Optional Pressure:	20/100/350/600/1000/2000/3500/7000 m (meters of deployment depth capability)

Initial Accuracy

Conductivity:	0.0003 S/m (0.003 mS/cm)
Temperature:	0.002 °C
Oxygen:	2% of saturation
Optional Pressure:	0.1% of full scale range

Typical Stability

Conductivity:	0.0003 S/m (0.003 mS/cm) per month
Temperature:	0.0002 °C per month
Oxygen:	0.5% per 1000 hours
Optional Pressure:	0.05% of full scale range per year

Resolution

Conductivity:	0.00001 S/m (0.0001 mS/cm)
Temperature:	0.0001 °C
Oxygen:	0.035% of saturation
Optional Pressure:	0.002% of full scale range

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

Housing, Depth Rating, & Weight

Standard	Titanium housing, 7000 m (23,000 ft) Weight in air: 4.5 kg (10.0 lbs)*
Optional ShallowCAT	Plastic housing; 250 m (820 ft) Weight in air: 3.8 kg (8.5 lbs)*

* Weight with standard mooring guide & clamp

564.4 mm
(22.22 in.)

428.2 mm
(16.86 in.)

62.2 mm
(2.45 in.)
diameter

114.0 mm
(4.49 in.)

138.9 mm
(5.47 in.)

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