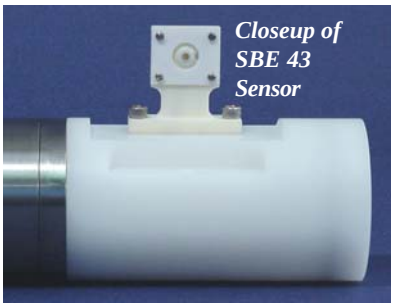
Sea-Bird D.O. Sensor (for Argo Float Applications)

SBE 43I

The SBE 43I (integral) dissolved oxygen sensor is intended for integration with the SBE 41 or 41CP Argo float CTD. The SBE 43I derives from Sea-Bird's modular SBE 43 sensor for conventional CTDs, in production since 2001. The SBE 43I uses the same sensing technology and calibration techniques as the SBE 43, but the 43I implementation is engineered for optimum performance on the SBE 41 Argo platform. The signal output is a frequency (vs. voltage in the SBE 43), and sensor power and signal conditioning circuits are relocated to the CTD electronics board. This allows for a smaller size with greater electrolyte reserve. The tight mechanical configuration within the CTD flow path permits better spatial coordination between the oxygen measurement and the temperature and conductivity measurements. These features result in lower power consumption, smaller mass, and better dynamic accuracy.

SBE 43I mounted on SBE 41 ALACE CTD for ARGO Float

Calibration of 43I sensors is performed in dedicated bath systems, separately from the CTD. A submersible calibration module, incorporating a pump and dual sensor acquisition channels, is a temporary host for the 43I modules during calibration. The automated bath systems produce a high-precision 18-point calibration (3 oxygen levels at 6 temperatures) with a unique set of coefficients for each sensor.



Closeup of SBE 43 Sensor

Closeup of SBE 43I Sensor

SBE 43I Calibration

Specifications for Argo Float Applications:

Measurement range [1] :	0-120% of saturation, minimum
Output signal frequency:	3000 - 20,000 Hz
Initial accuracy [2] :	1% of saturation
Observed stability [3] :	Drift less than 1 micro-molar/year
Resolution [4] :	1 Hz (approximately 0.01% saturation, < 0.05 micro-molar)
Depth rating:	2000 dbars
Power:	50 milliwatts

[1] The sensor output frequency signal is converted to oxygen concentration via the calibration equation. Inspection of the equation reveals that the frequency is proportional to percent saturation, and a span of about 10,000 Hz is 100% saturation. The minimum guaranteed measurement range and associated signal resolution depends strongly on temperature conditions:

T,S	Saturation	120% Saturation
-1.8C, 35 psu	365 micro-molar	440 micro-molar
30C, fresh	237 micro-molar	285 micro-molar

[2] Initial absolute accuracy is influenced by the oxygen standard (Winkler titration standard), the calibration bath environment, and the accuracy with which the calibration equation captures the characteristics and sensitivities of the sensor. We believe the sum of errors is less than 1% saturation. The internal repeatability of calibrations, and agreement between different sensors, is better.

[3] The calibration stability of the Clark sensor technology for measuring oxygen is affected by and related to the amount of oxygen gas converted to hydroxyl ion within the sensor electrolyte. This inherent sensor stability is a function of how the Clark sensor design is specifically implemented. We have assessed the inherent sensor drift rate from drift performance observed in deployed sensors on Argo floats. This drift rate is less than 0.5% saturation in 33 months (Janzen, C., Larson, N., Murphy, D., *Examining the Calibration Stability of Sea-Bird's Oxygen Sensor Technology: Drift < 1 µmol/kg per year*, poster presentation, AGU 2006 Fall Meeting). When these SBE 43I sensors are paired with the SBE 41 and SBE 41CP CTD systems designed for Argo floats, the CTDs provide an unusually clean and well-antifouled environment that reduce the oxygen measurement drift rate to the inherent sensor stability. We believe SBE 43I sensors in this specific float environment will drift less than 1 micro-molar/year.

[4] See footnote 1. The data resolution are reported rounded to 1 Hz. This is less than 0.05 micro-molar, depending on temperature and salinity. The sensor accurately resolves static equilibrium oxygen changes in the calibration bath environment at better than 0.1% of saturation.

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