

# Sea-Bird Dissolved Oxygen Sensor

## SBE 43



The SBE 43 sets the oxygen measurement standard for oceanographic research. The SBE 43 sensor is a Clark polarographic membrane type in which careful choices of materials, geometry, and sensor chemistry are combined with superior electronics interfacing and calibration methodology to yield major gains in performance.

**Calibration stability** is improved by an order of magnitude; the sensor holds calibration in shipment and requires less frequent calibration.

*Calibration drift is caused primarily by chemical processes inside the sensor and by membrane fouling from ocean contaminants. If the membrane is kept clean, the steps taken to improve the sensor's chemical stability yield demonstrated calibration drift rates of less than 2% over 1000 hours.*

**Temperature response** and corrections are dramatically improved. The largest source of error in profiling applications is nearly eliminated, and equilibration 'wait time' at the beginning of a profile is reduced to seconds. Profiling accuracy in gradients is dramatically improved.

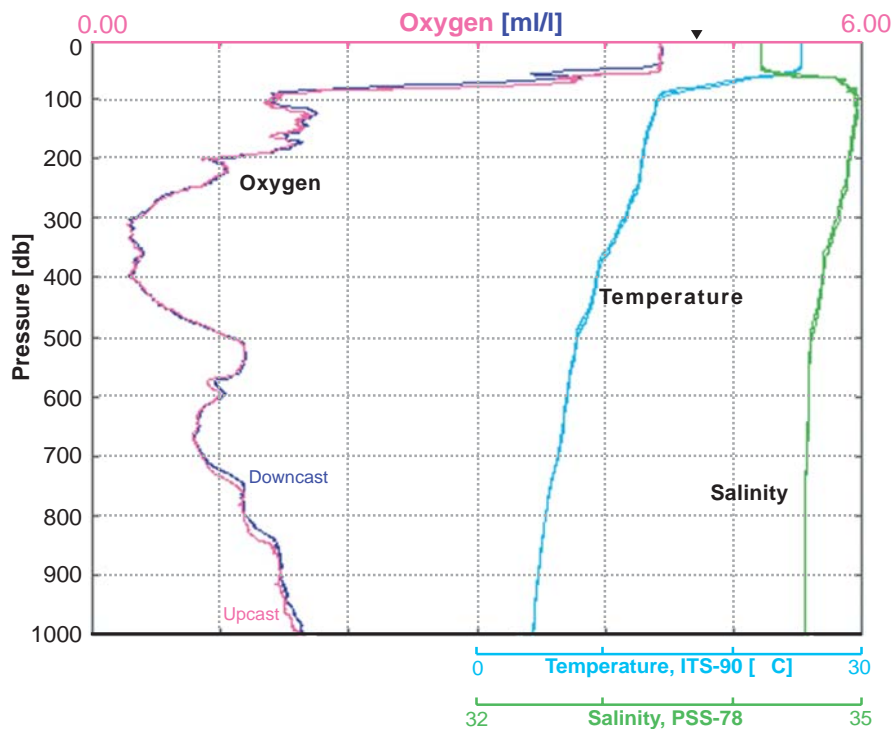
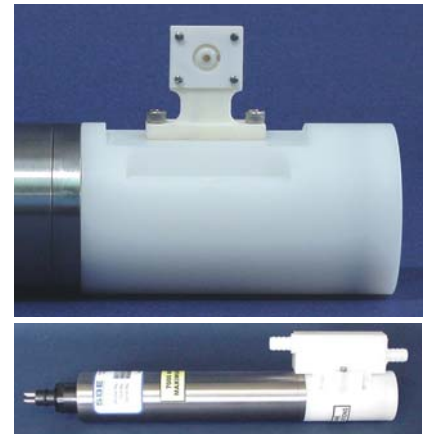
*The chemical and physical processes that underlay the oxygen measurement are very sensitive to temperature. Accurate characterization of the internal sensor temperatures that control these processes, especially when water temperature is changing rapidly, is a key accomplishment of this design. Not only does the SBE 43 sensor measure temperature in the right place: the temperature equilibration time of the entire sensor head has been reduced to a few seconds so that it tracks the changing water temperature much more faithfully.*

**Pressure hysteresis** is largely eliminated in the upper ocean (1000 meters). Oxygen features are more precisely resolved, and the agreement in down-and-up profiles reduces the ambiguity about which should be locked to bottle Winklers.

*Hysteresis in oxygen measurements is caused by delays in a sensor's response to changing temperature, pressure — and oxygen. Slow temperature response and time-mismatch of temperature corrections are responsible for most of the hysteresis in the upper 1000 meters. These faults have been largely overcome in the SBE 43 design. Hysteresis from pressure cycling remains a factor below 1000 meters.*

**Continuous polarization** eliminates stabilization wait-time after power-up. The sensor is always ready for immediate use.

*Earlier sensors required several minutes to 'polarize' following power-up. During that time, sensor readings were inaccurate. In the SBE 43, micropower electronics and an internal, five-year, board-mounted battery eliminate power-up delay.*



Equatorial Pacific  
2° 0.9' N, 110° 2.2' W  
25 Oct 2000

24 Hz SBE 911 *plus* data; oxygen measurements were time shifted 6 seconds relative to pressure to account for water transit time through TC Duct and plumbing. No other processing was performed.

▼ surface oxsat = 4.7 ml/l



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**Signal resolution** is increased by on-board temperature compensation. And because there is no 'temperature' output signal, a CTD channel is made available for other purposes.

*Even when oxygen concentration is constant, the normal range of ocean temperatures causes the output of earlier sensors to vary by a factor of two. The SBE 43's internal temperature compensation eliminates this variation, allowing the sensor to pre-amplify the signal proportionately; resolution with existing CTD systems is correspondingly doubled.*

**A 5-year warranty** backs the sensor's integrity. During the warranty period, one sensor re-charge (electrolyte refill, membrane replacement, and recalibration — as mandated by chemical depletion of electrolyte) will be performed at Sea-Bird free of charge.

## Configuration Options

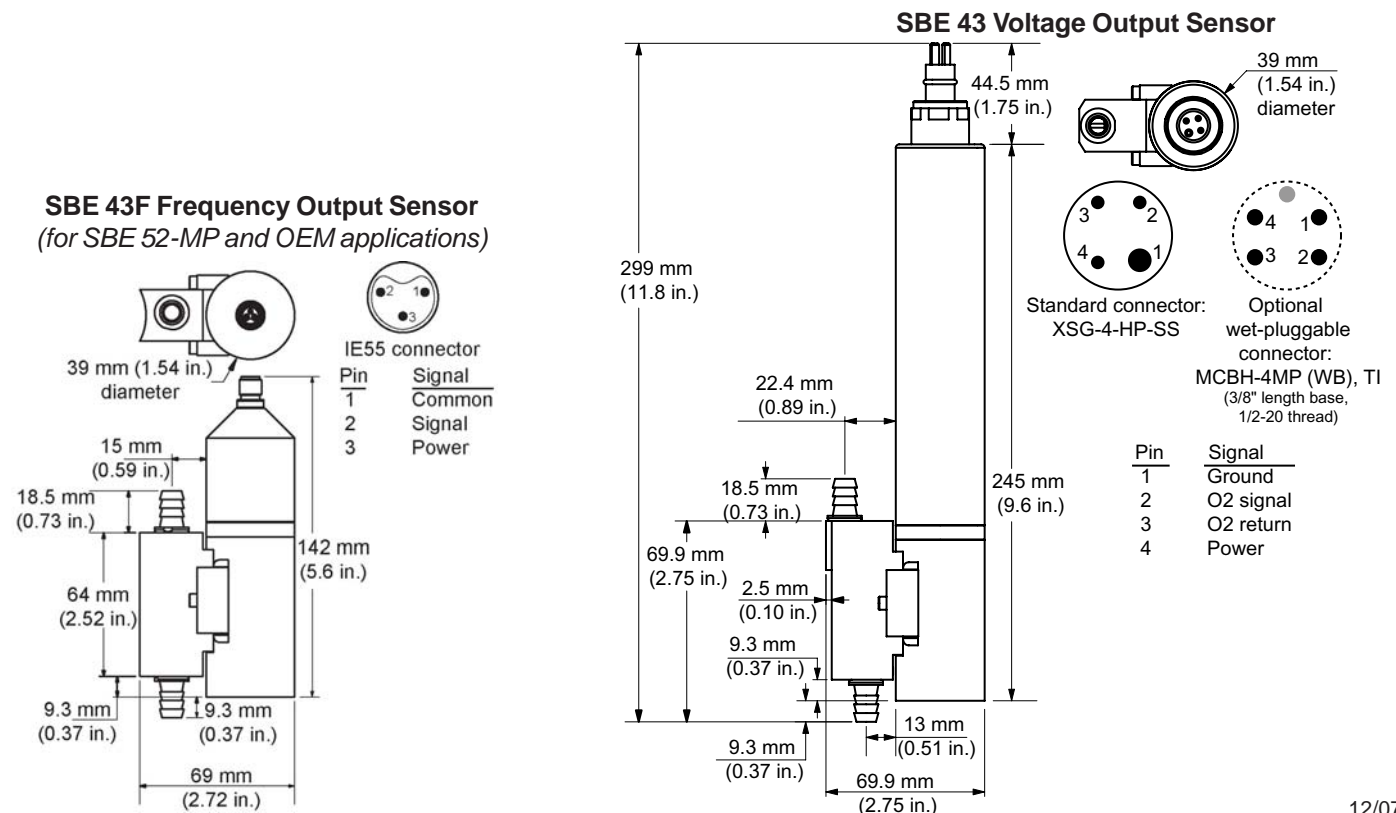
The SBE 43 **voltage output** sensor can be integrated with any Sea-Bird CTD that accepts input from a 0 - 5 volt auxiliary sensor (for example, SBE 9*plus*, 16, 16*plus*, 16*plus*-IM, 19, 19*plus*, or 25). SBE 43 configuration choices include:

- Housing: 7000-meter titanium or 600-meter plastic housing
- Connector: XSG or wet-pluggable MCBH connector
- Membrane: 0.5-mil (fast response, typically for profiling applications) or 1-mil (slower response but more rugged for enhanced long-term stability, typically for moored applications)

The SBE 43**F frequency output** sensor can be integrated with an SBE 52-MP or used for OEM applications (requires OEM circuit board). The SBE 43F is available with a 600-meter plastic or 7000-meter titanium housing.

## Specifications

- Measurement range: 120% of surface saturation in all natural waters, fresh and salt  
 Initial accuracy: 2% of saturation  
 Typical stability: 2% per 1000 hours (clean membrane)  
 Input power: 6.5 - 24 VDC, 60 milliwatts  
 Output signal: 0 - 5 VDC (SBE 43), frequency (SBE 43F)  
 Housing/depth rating: 600-meter plastic housing or 7000-meter titanium housing  
 (10,500-meter titanium housing available on request — contact Sea-Bird)  
 Weight (in air): SBE 43 — 0.7 kg (1.5 lbs) with titanium housing, 0.5 kg (1.0 lb) with plastic housing  
 SBE 43F — 0.4 kg (0.9 lbs) with titanium housing



12/07



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