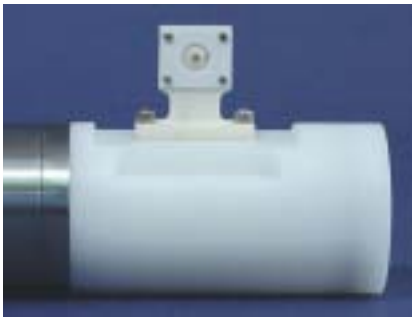
Sea-Bird Dissolved Oxygen Sensor

SBE 43

Developed during five years of intensive research and development — and following almost four years of field trials — the SBE 43 sets a new oxygen measurement standard for oceanographic research.



The new 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 new sensor holds calibration in shipment and requires less frequent calibration.

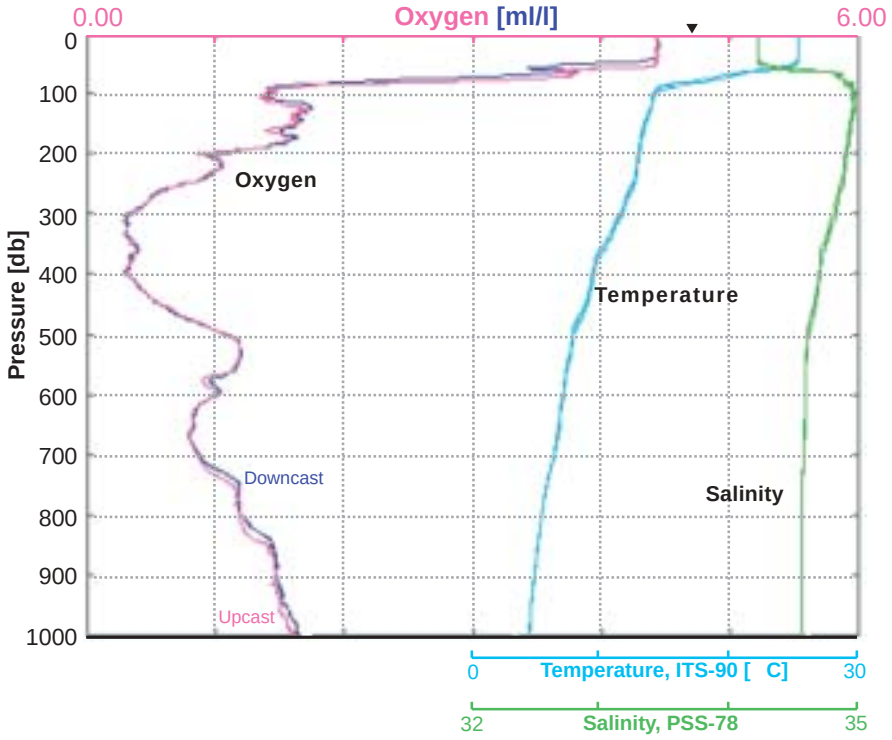
Calibration drift is caused primarily by chemical processes inside the sensor and by membrane fouling from ocean contaminants. If the membrane is kept clean, the steps taken to improve the new sensor's chemical stability yield demonstrated calibration drift rates of less than 2% over 1000 hours.

Temperature response and corrections are dramatically improved. The largest source of error in profiling applications is nearly eliminated, and the 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 new design. Not only does the new 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 new design. Hysteresis from pressure cycling remains a factor below 1000 meters.



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

Previous 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 the power-up delay.

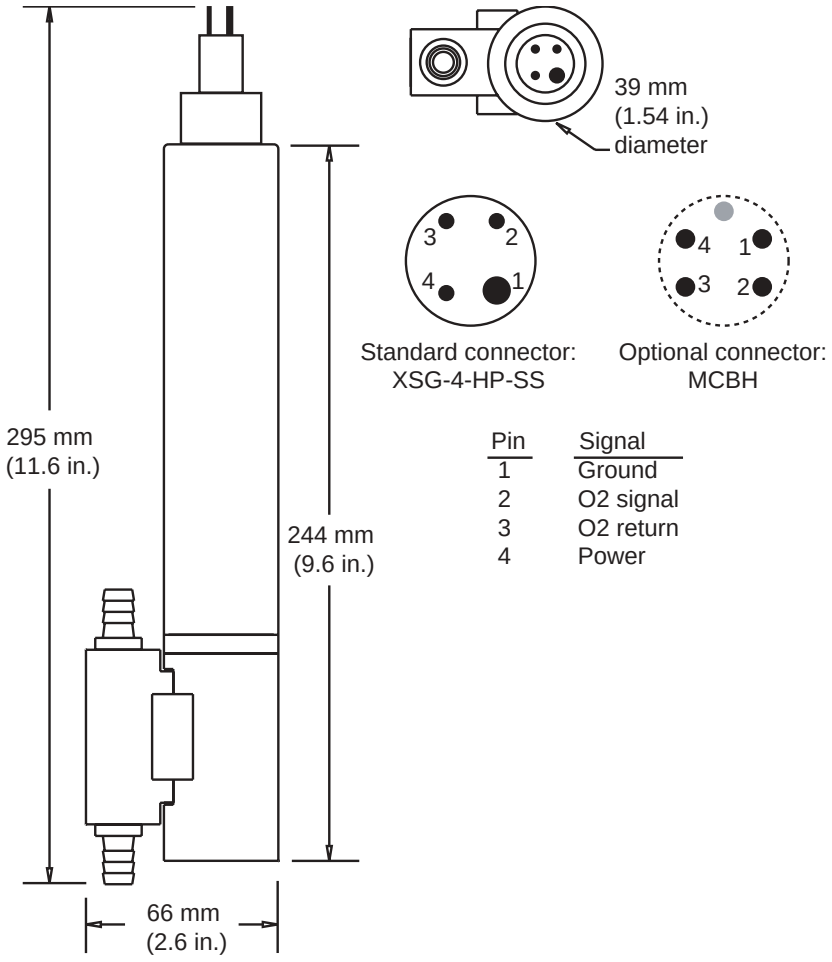
Signal resolution is increased by on-board temperature compensation. And because there is no 'temperature' output signal, a CTD channel is made available for other purposes.

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 new 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 our facility free of charge.

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 voltage:	6.5 - 24 VDC
Input power:	60 milliwatts
Output signal:	0 - 5 VDC
Depth rating:	7000 meters
Materials:	titanium and plastic
Weight:	0.7 kg (1.5 lbs)



Pin	Signal
1	Ground
2	O2 signal
3	O2 return
4	Power

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