Since oxygen is involved in most of the biological and chemical processes in aquatic environments, it is a crucial parameter to measure. Oxygen can also be used as a tracer in oceanographic studies. Aanderaa revolutionized oceanographic oxygen monitoring/research with the introduction of oxygen optodes in 2002. Applications range from shallow creeks to the deepest trenches, from tropical to in-ice/in-sediment measurements. More than 150 scientific papers have so far been published using these optodes.

These sensors are based on the ability of selected substances to act as dynamic fluorescence quenchers. The fluorescent indicator is a special platinumporphyrin complex embedded in a gas permeable foil that is exposed to the surrounding water. This sensing foil is attached to a sapphire window providing optical access to the measuring system from inside a watertight housing. The sensing foil is excited by modulated blue light; the sensor measures the phase of the returned red light. For improved stability the optode also performs a reference phase reading by use of a red LED that do not produce fluorescence in the foil. The sensor has an incorporated temperature thermistor which enables linearization and temperature compensation of the phase measurements to provide the absolute O$_2$-concentration The lifetime-based luminescence quenching principle offers the following advantages over electrochemical sensors:

- Less affected by fouling
- Measures absolute oxygen concentration without repeated calibrations
- Excellent long-term stability
- Less affected by pressure
- Pressure behaviour is predictable
- Faster response time

The oxygen optode outputs data in RS-232 and analog 0-5V. The sensor can present the O$_2$ concentration in µM, Air Saturation in % and Temperature in °C.

**Oxygen Optode 4831/4831F**

The Oxygen Optode 4831/4831F is a compact fully integrated sensor for measuring the O$_2$ concentration and temperature. Fast Response Foil (4831F, refer overleaf)

**Advantages:**
- Optical lifetime-based luminescence quenching measurement principle
- Multipoint calibrated in 40 points
- Long time stability with pre-burned foil and red reference LED
- Low maintenance needs
- Not stirring sensitive (it consumes no oxygen
- User friendly
- Small size and weight
- Stand-alone sensor
- Output format: RS232, 0-5V
- Four depth ranges maximum 12000 meter
Specifications

**Oxygen:**
- **Measurement Range:** O₂-Concentration: 0 - 1000 µM
  Air Saturation: 0 - 300%
- **Calibration method:**
  - 40-point automatic calibration,
  - 20-point verification,
  - 3 fully Winkler calibrated optodes for referencing
- **Fois:**
  - **Calibration Range:** 0 - 500 µM
    0 - 150%
  - **Resolution:** < 0.1 µM
    0.05 %
  - **Accuracy:** < 2 µM or 1.5% < 1.5 %
  - **Response Time (63%):** 4831F (with fast response foil) <8 sec
    4831 (with standard foil) <25 sec
  - **Typical field drift:** <0.5 % per year

**Temperature:**
- **Range:** -5 to +40°C (23 - 104˚F)
- **Resolution:** 0.01°C (0.018°F)
- **Accuracy:** ±0.03°C (0.18°F)
  - **Response Time (63%):** <2 sec

**Output format:**
- RS-232, 0-5V

**Output Parameters:**
- **RS-232:** O₂ Concentration in µM, Air Saturation in %, Temperature in °C, Oxygen raw data and Temperature raw data
- **Analog channel 1:** O₂ Concentration in µM, or Air Saturation in %
- **Analog channel 2:** Temperature in °C

**Supply voltage:**
- **Average:** 0.16 +48mA/S where S is sampling interval in seconds
- **Maximum:** 100mA
- **Quiescent:** 0.16mA

**Operating depth:**
- **SW:** 0 - 300m (0 - 984ft)
- **IW:** 0 - 3000m (0 - 9,845ft)
- **D1:** 0 - 12000m (0-39,380ft)
- **DW:** 0 - 6000m (0 - 19,690ft)
- **Hadal:** 0-12000m (0-39,380ft)
- **8 pin Subconn MCBH8M**

**Elec. connection:**
- **Dimensions (WxDxH):** Ø36 x 111.5mm (Ø1.4”x 4.4”)
- **Weight:** 217g (7.65oz)

**Materials:**
- Epoxy coated Titanium, PA

**Accessories:**
- Foil Service Kit 4733/4733O (standard)/ 4794 (fast)

Sensing Foil Considerations

- The standard sensing foil is protected by an optical isolation layer which makes the foil extra rugged and insensitive to direct sunlight. The fast response sensing foil is not equipped with this layer; ambient light intensity higher than 15000 lux may cause erroneous readings. To avoid potential bleaching the fast response foil should be protected from ambient light when storing the sensor. We recommend the standard foil in applications where fast response time is not needed.

**Misleading specifications**

When Aanderaa states an absolute accuracy of e.g. ±1.5% or ±2 µM, we mean the accuracy of the sensor in the field over the entire range of oxygen concentrations and temperatures, others might refer to accuracy in the laboratory just after the sensor was calibrated. When Aanderaa give response time in water others refer to response time in air which is much faster. For more information read our Best Practice document on Oxygen Optodes.