

Use of Oxygen Sensors & Monitors in Hyperbaric Chambers

Hyperbaric chambers are devices, which are used to simulate depth.
i.e the chamber acts like a submarine where the internal pressure has to be raised sufficiently to prevent the water pressure outside collapsing the submarine wall.
The chambers are specifically designed to withstand these pressures so humans can be encased in them and subjected to high pressures.
They are not only used to simulate diving and to re-compress divers with bends but are now a well used in medical treatments for certain diseases.

In general oxygen sensors are designed to function in an atmospheric pressure of 1Bar but can be used under high pressures as long as the rear membrane is at the same pressure as the front membrane.

Sensor output is dependent on the partial pressure of the Oxygen present.

21% at 1 Bar become 42% at 2Bar and 63% at 3Bar.

The corresponding outputs would be 10.5mV; 21mV; and 31.5mV

At 100% Oxygen the outputs become; 50mV ; 100mV ; and 150mV

Sensor Linearity can be limited by the sensor output. As a temperature compensated voltage output increases beyond a certain point the sensors begin to become non linear E.g. the R-17 has a maximum output of 175 mV before it becomes non linear. As the output is 10.0 mV in air and in 100% O₂ is 50mV it will become non linear at an Oxygen partial pressure of 3.5.Bar

The T-1 can be used up to 10 Bar

Some of the newer sensors such as the R-33D have higher outputs in air up to 25mV
These sensors therefore become non-linear much earlier.

Teledyne are recommending that the normal limit on sensors be 2Bar.

Over 2Bar special sensors specifically designed for hyperbaric work must be chosen