

Specifically designed for application in:

- fermentation
- cell cultures

The AppliSens DO sensors:

- autoclavable
- in-situ sterilizable (S.I.P.)
- high grade finish to facilitate cleaning (C.I.P.)
- easy to maintain
- low cost
- fully electropolished
- 100% factory tested and certified
- long-life serial code print on sensor head:
essential for GMP/GLP
- applicable with all currently available polarographic amplifiers
- shaft diameter 12mm

The AppliSens DO sensors:

- long term stability after sterilization
- fast response time after repeated sterilization cycles:
< 30 seconds (98%)
- electropolished surface

The AppliSens DO_{NTC} sensors:

- built-in thermoresistor (NTC) for application with amplifiers using automatic temperature compensation

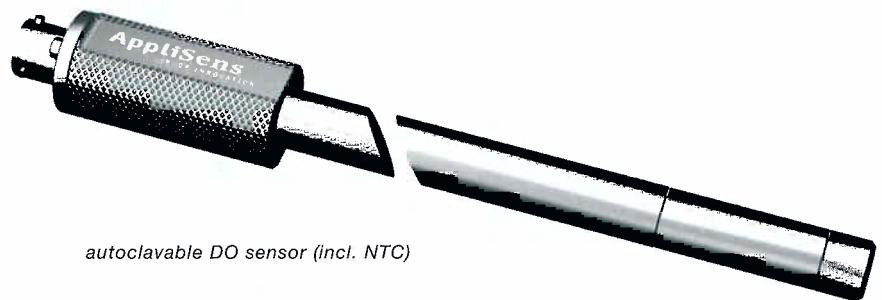
The majority of all biotechnological processes is of the aerobic kind.

A microorganism or cell responds to the liquid phase oxygen concentration in regulating its overall metabolism.

Therefore the knowledge of the DO concentration and the proper control during the process is of great importance.

When the oxygen supply in a culture is limiting for growth or production, oxygen shortage can result in irreversible damage to the culture.

For this and other reasons it is essential to make the choice to use a reliable, high quality sensor when applying it for one of the most important measurements in any fermentation or cell culture experiment.



autoclavable DO sensor (incl. NTC)



S.I.P. DO sensor for DN25 port (incl. NTC)

AppliSens DO_{LowDrift} sensors:

- easy to maintain / simple in design
- free spinning PG13.5 connector (easy mounting)
- Long-life serial code print on sensor head: essential for GMP/GLP
- same cable connector as for pH



Important

The innovative design of the sterilizable **Low Drift DO** sensor offers a guaranteed low drift.



LowDrift DO sensor

Features:

- cable connector, identical to the one as used with the AppliSens pH sensor. This offers the possibility to use identical cables for both electrodes, a simplification of the system configuration.

In some applications the sensor specifications are of significant influence i.e. in dynamic k_{p} measurements. When the temperature changes during the run, when the the system is operated with over- or underpressure or when high concentrations of CO_2 are present all of these have to be accounted for.

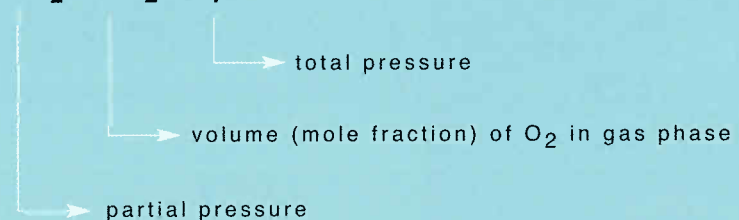
When using a dissolved oxygen sensor there are three physical parameters affecting the reading of the signal:

- | | |
|--------------------|--|
| stirring | <i>the medium must be agitated even during the initial calibration</i> |
| temperature | <i>this parameter has influence on the rate of the oxygen diffusion. Variations in temperature can cause significant changes in probe signal. The calibration of the sensor before running the process, must be performed at the same temperature as applied in the process. Temperature compensation today is easy to perform (software as present in currently available controllers).</i> |
| pressure | <i>changes will affect the reading though this reflects the real change in DO. The probe response is essentially determined by the partial pressure of the oxygen equilibrium with the solution around it.</i> |

The applied expression is in percentage saturation with air at atmospheric pressure.
100% = DOT (160 mm Hg): Dissolved Oxygen Tension

The probe signal

$$P(\text{O}_2) = C(\text{O}_2) \times P_T$$

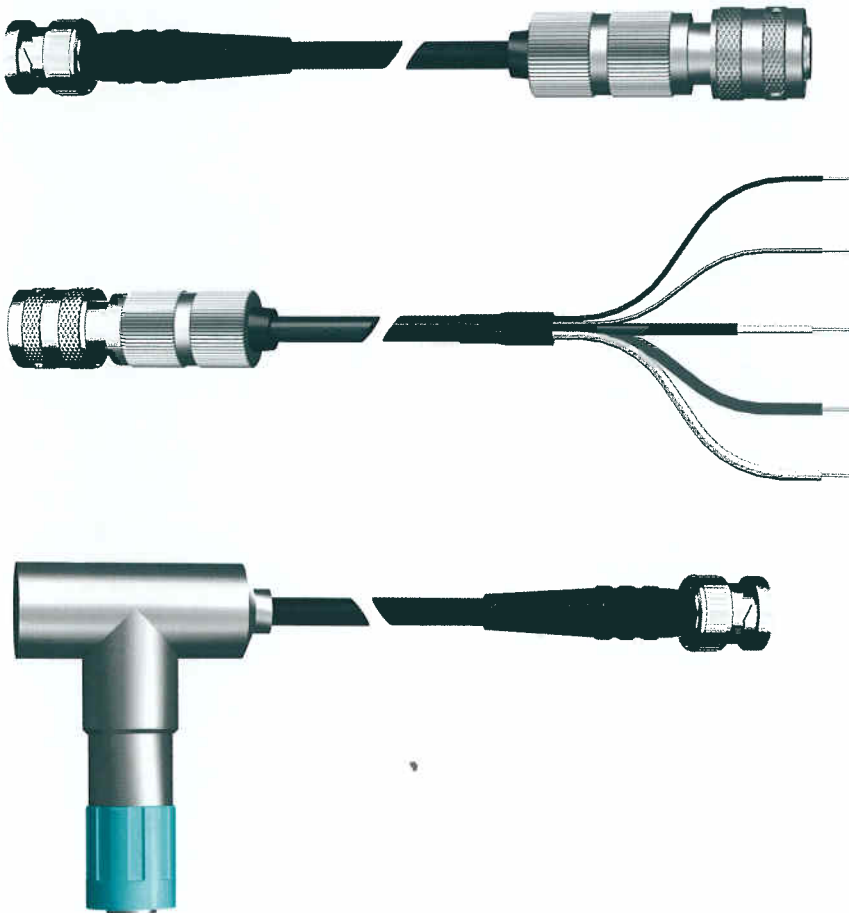


The slope of the O₂ sensor is temperature, pressure and medium dependent. Therefore calibration must be performed under operating conditions (same temperature, pressure and medium!).

When the system is operated for the first time or when the sensor has been disconnected from the controller for longer than 5 minutes, the sensor must be polarized (connected to the dO₂ amplifier) for at least 6 hours prior to calibration. If the sensor is only disconnected for a couple of minutes, less than 6 hours will be sufficient. Insufficient polarization will cause an increased residual signal and therefore lead to measurement errors!



Polarization of the DO-sensor with NTC (4-pins), can be realized with the AppliSens Polarization Module, even during the autoclaving procedure.



Important

Autoclavable Polarization Module

DO electrolyte

Membrane module

4-pin connector with BNC

4-pin connector with leads

**T-pull connector
(for DO_{LowDrift} only)**

Other connectors upon request

