

# Optical Oxygen Systems

## With ISM<sup>®</sup> ... a powerful combination

### Open the way for enhanced process control in Biotech applications

To enable optimal growth conditions for high yield and quality in biotech processes, control of the oxygen level is essential. Maintenance or replacement of a failing sensor system during the batch includes a high risk of contamination with microorganisms and is therefore not practicable in most cases. In order to reach optimum batch to batch consistency, the accuracy, repeatability and safety of the oxygen measuring system are key requirements. INGOLD's optical DO sensors with built-in ISM (Intelligent Sensor Management) technology set new standards for ease-of-use, process safety, documentation and maintenance efficiency.

Since 60 years INGOLD is successfully developing process analytical instruments for biotech applications and serves the industry with the most innovative and reliable measurement solutions.

The optical measurement principle offers significant advantages compared to conventional systems. The InPro 6880 i and InPro 6870 i are the first INGOLD oxygen sensors using this principle. Enhanced process control resulting from a combination of safety, reliability and ease of use were the key prerequisites for the development of these sensors. The unique combination of optical technology with INGOLD's Intelligent Sensor Management results in a highly efficient and reliable oxygen measurement system.



### **Always ready for action ... Plug and Measure significantly reduces installation and start up**

The InPro 6880 i / 6870 i sensors are tailored for the biopharmaceutical industry, where safety of the process control is the main focus of interest. During preparation and maintenance operations of an oxygen sensor for the next batch, all procedures must be carefully executed and well documented in order to avoid possible handling errors with potentially disastrous consequences once the sensor is installed and the fermentation is started.

Because these handling errors that can never be completely excluded, INGOLD has equipped the optical sensors InPro 6880 i and InPro 6870 i with the most advanced technology available for advanced process control.

With the ISM technology, all sensor data, including calibration, are stored in the sensor itself. Maintenance and calibration can be performed in the lab under controlled and clean conditions; installation in the process can be done in minutes. In the case that your SOP requires calibration with the sensor installed, the M400 transmitter offers easy and fast routines for air or process calibration. After connecting the sensor to the transmitter, all relevant data are automatically transferred to the transmitter and an oxygen reading is available in less than a minute. System status and the quality of the sensing element, the OptoCap, is monitored in real-time and if action is required, the user will be prompted to do so via the transmitter. Before starting the batch, the user has the latest information available about remaining lifetime.

When using a conventional oxygen measurement system, special care must be given to the quality of the analog communication between sensor and transmitter. A damaged cable or connector

can lead to measurement errors. With digital, RS485 based communication between sensor and transmitter such installation issues can be largely avoided. Precalibrated sensors can be held on stock and swiftly exchanged at the measurement point.

### **Reduced maintenance and higher reliability**

Especially in biopharmaceutical applications, all maintenance and handling steps of production instruments are defined in standard operating procedures (SOP's) and have to be documented according to validation requirements. Optical oxygen measurement is characterized by its easy maintenance and, together with the ISM® features, facilitates handling, maintenance planning and documentation.

Instead of membrane body, inner body and electrolyte found in amperometric sensors, only one component, the OptoCap has to be replaced from time to time as consumable. The longer lifetime of the OptoCap, together with the fast and easy replacement operation reduces maintenance cost.

### **Hygienic Design for higher process safety**

Next to complying with the stringent industry requirements for quality and reliability, measurement systems for the biotech and pharmaceutical Industry must be designed to the highest hygienic standards.

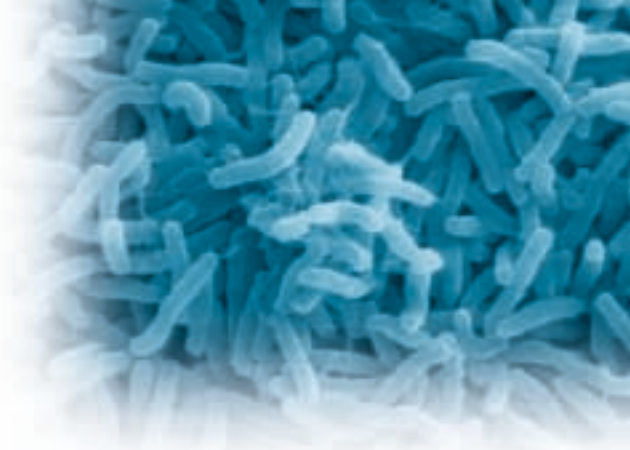
The exchangeable OptoCap fulfills the high requirements for FDA compliance. Material and position of the O-Ring (USP Class VI) are optimized for minimized risk of cross-contamination.



**Enhanced diagnostics for predictive maintenance**



During batch processes, high reliability of the instrumentation is required because only very limited corrective actions are possible, as this would jeopardize the necessary sterile conditions for optimal growth. Because of the potentially disastrous consequences of a failed batch in term of loss of manufacturing time and higher costs, biotech companies have tried to minimize the possibility of instant failure by introducing highly developed manual quality and performance checks. With the use of optical DO measurement systems in combination with the highly innovative ISM technology for predictive maintenance, significant improvements in reliability can be attained without excessive maintenance operations. With ISM, additional reactive sensor information is generated in the sensor itself and condensed into a value called DLI (Dynamic Lifetime Indicator) in the transmitter. The DLI uses information about the quality of the OptoCap after each calibration and together with the current process conditions (temperature and oxygen level), translates this information into an estimated remaining lifetime of the system. The highest stress for an optical oxygen sensor is during cleaning (CIP), sterilization (SIP) and autoclaving of the fermenter. Normally the user has to record all actions manually in the logbook for each sensor. Thanks to the ISM® technology, the InPro 6880i/6870i detects CIP and SIP automatically and the cycles are stored in the sensor memory. The user has the option to predefine a maximum number of CIP, SIP and autoclaving cycles for this measurement point.



**Features overview**

- Plug and Measure with precalibrated systems without polarization
- Easy maintenance
- Higher performance
- Enhanced diagnosis
- Predictive maintenance

- Hygienic design
- Class VI USP O-Rings
- Surface roughness and FDA compliant materials

The sensor automatically recognizes if this maximum is reached, and generates an alarm to replace the OptoCap. As a result, an unwanted use of a potentially failing sensor is avoided. The data is always available when the sensor is connected to a transmitter. There is no need for manual documentation of the SIP / CIP and autoclavings.

**Reliable accuracy for efficient process control**



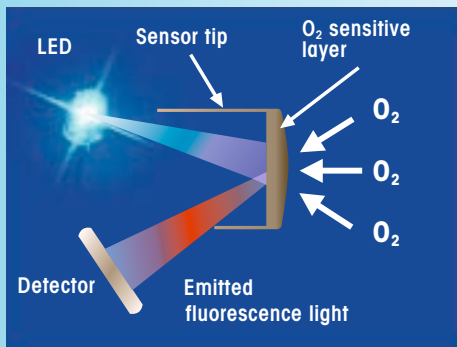
The increasing requirements on the process control are met by INGOLD's optical sensors, with their outstanding measuring performance. Excellent signal stability, low drift and low signal noise reduce the need of recalibration. Especially fermentation over several months can be performed with a very high and predictable accuracy. During the process, the user has access to reliable up to date information about the quality of the measurement at any time.

### At a Glance

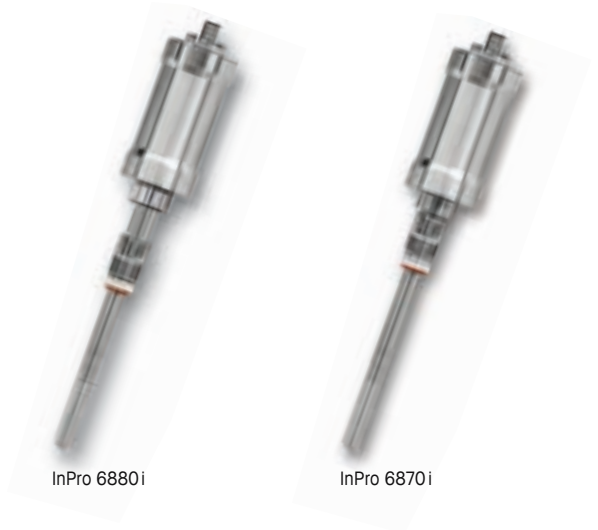
#### The optical measurement principle

The heart of the optical sensor is an oxygen sensitive layer containing immobilized marker molecules. They absorb light from a light emitting diode and are able to release this energy as light at a different wavelength (fluorescence).

The fluorescence depends on the amount of oxygen that is present in the environment of the marker molecules. This effect allows determination of the oxygen concentration in the sample media.



An oxygen-sensitive layer containing immobilized marker molecules is the "heart" of the optical sensor.



M400 for high versatility and advanced process control

For more information:

- ▶ [www.mt.com/InPro6870 i](http://www.mt.com/InPro6870i)
- ▶ [www.mt.com/InPro6880 i](http://www.mt.com/InPro6880i)
- ▶ [www.mt.com/M400](http://www.mt.com/M400)