At Hamilton Process Analytics we pioneer open sensing solutions to enhance the understanding and control of critical process parameters. Customer collaboration drives our vision for excellence in measurement technology that works seamlessly with the infrastructure of today and the possibilities of tomorrow.
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**ArcAir App**
See more on page 4

**Single Use Sensors**
See more on page 5

**Cell Density**
See more on page 65

**Housings**
See more on page 109
The Hamilton OneFerm pH sensor is a single use glass electrode for pH measurement. It retains the high accuracy performance of a glass electrode after gamma irradiation and dry storage. It is delivered as an integrated part of a single use container to provide ease of use. The OneFerm pH sensor is available to integrators such as bag-, bioreactor- or downstream skid manufacturers.

For the OneFerm pH sensors, there is also the full range of auxiliary products available. Those products ease the integration into the system. On the one hand for the mechanical integration in the single use containers like a bag with the bag port. On the other hand also the electrical integration into the control system is covered. The OneFerm products can connect to any type of transmitter or controller. It is also possible to integrate with the Arc Module SU pH with a digital signal. This connection is most reliable especially for the needed flexibility in single use applications.

With the OneFerm product range, special demands to the product can be covered. Resistance of the whole product including the electrolyte against high energy radiation is given. Even after this sterilization, the material are proven non-cytotoxic in the application. As the pH probe is built in into the container, the probe must withstand long dry storage time up to 18 Month without loss of accuracy or long wet-in time. Covering all those demands including the low drift in application, the OneFerm is the perfect match for application with high demands.

The Hamilton VisiFerm DO SU sensor systems are now also available for single use applications. It is available in a wide application range for bag and rigid containers. The Arc system makes it easily integrate able in existing or new system with the full range of connectivity to the controller. Various mechanical connections in the vessel are available with a single use sensor element and reusable electronic for a cost effective application. The new single use optical dissolved oxygen sensor offers a reliable and comparable measurement to existing re-useable probes. With the Arc communication, the system has all possible options as know from the Hamilton re-useable sensors. It can be combined within the ArcAir™ App with all other sensors available with the Arc system. With the wireless connection and a mobile device, the calibration data shown on the label of the probe can easily written into the electronic. With this feature, the probes are ready to use within seconds.
**Cell Density**

**Viable and Total Cell Density Monitoring**

Biological processes are increasingly important in biotechnical and pharmaceutical industries. The variability of living organisms is often very high, making the culture process difficult to standardize. Extensive process optimization and control are required for stable cell cultures, fermentations and improved yield. Today bioprocess development relies on labor intensive sampling and offline measurements that also lack the necessary granularity to fully optimize the yield. The available online measurements of pH and dissolved oxygen are linked indirectly to the cell status and characteristics. Online monitoring of cell density provides the continuous information necessary to optimize control and yield beyond what is possible offline. Hamilton now offers sensors for continuous cell density measurement. The Incyte permittivity sensor delivers information on viable cell density whereas the Dencytee sensor measures total cell density via turbidity. In combination with our advanced Arc pH and dissolved oxygen probes, permittivity and turbidity sensors provide all relevant information on the progress of mammalian, yeast and high density bacteria cultures. This enables better understanding and control of bioprocesses.

**VisiFerm DO and VisiPro DO Family**

*Family structure now also for VisiPro DO available*

With the VisiFerm DO and VisiPro DO families all sensors can be configured with H0 and H2 caps. The benefit for VisiPro DO is that the ODO cap does no longer have to be ordered separately. Additionally non-Ex versions of the VisiPro DO are available. This allows customers to configure the best suitable optical dissolved oxygen sensor, and cap in a more convenient way.

**Conducell I**

*Inductive sensor technology to complete conductivity portfolio*

Toroidal or inductive conductivity measurement technology is widely used in applications where aggressive acids might corrode metal electrodes made of stainless steel or even titanium. There are no metal parts in contact with the media, even the temperature sensor is covered by PEEK. Sensors of this type show no polarization effects and are resistant to coating and fouling. Due to their design these sensors need more space than conductive ones and are not suitable for very low conductivities. On the other side their measuring range is designed for medium to very high conductivities. So inductive sensors can be found in CIP applications as well as in filling lines in breweries. Conducell I can be connected to H100 Cond I or H220X Cond I transmitters.

**Transmitter H220X**

*Transmitter series for Memosens and analog sensors*

The H220X transmitters have an ATEX certification and use 2-wire technology. So they’re designed for hazardous environments like in the chemical industry, food & beverage, and pharmaceutical industry. They’re available for pH (analog & Memosens), ORP (analog & Memosens), conductivity (conductiv & inductive), and dissolved oxygen (polarographic sensor technology Memosens).

**Conducell 4UxF**

*New product family*

The variety of electrodes available has been expanded when the Conducell 4UxF family was created. In order to resist corrosive media even better Platinum electrodes were integrated into the family. The family structure helps to configure the desired sensor. All family members are available as analog sensors with VP 6 electrical connector or as Arc sensors (VP 8).
Beyond Process Analytics

Hamilton’s electrochemical and optical sensors are the solution for process analytical measurement systems, characterized by proven quality and outstanding performance. Offering measurement parameter solutions in pH, ORP, dissolved oxygen and conductivity, our sensors and accessories are backed by over 50 years of engineering and manufacturing expertise in innovative design.

Foodlyte

Biocompatible Reference Electrolyte

The Foodlyte electrolyte was specifically developed for the needs of the biotechnology, pharmaceutical and food industries. It’s based on food ingredients and the perfect electrolyte for applications where non-toxicity is mandatory. Foodlyte is taste-, odor- and harmless for microorganisms.

The biocompatibility is approved by MDT1 according to EN ISO 10993-52 and USP 31, 2008 Chapter 873 and according to international GLP4 guidelines.

pH Glasses

Measurement Accuracy in Various Applications

Measurement stability and sensor lifetime in various environments requires different pH glasses.

Our high performance glasses, the PHI and the HB glass, were developed to withstand frequent steam sterilization, autoclaving and CIP cleaning using hot caustics. PHI and HB glass provide the lowest drift and show almost no shift after sterilization and cleaning procedures.

The H glass has excellent aging characteristics and offers stable readings even in samples with low water content such as anhydrous or only partially aqueous solutions. The low alkali error of H glass means accurate measurements even at high pH or high operating temperatures. HF glass ensures the longest possible lifetime in low temperature processes and processes containing hydrofluoric acid.

Single Pore Concept

The never-clog Liquid Junction

A Single Pore is an open liquid junction and an alternative to diaphragms. Instead of many tiny pores in a ceramic diaphragm, a single pore, about 2000 times larger in diameter, is used. This concept provides a direct contact between reference electrode and sample. In combination with the bigger diameter this liquid junction can hardly be clogged. The Single Pore results in a faster response time, more accurate readings and prevents reference poisoning.

Polisolve Plus

Most innovative Polymer Reference Electrolyte

Hamilton has designed innovative Polisolve Plus polymer electrolyte sensors that cover the full pH range, a wide temperature range and withstand reference poisoning for an extended lifetime. It’s also stable against most organic solvents and free of toxic acrylamide.

When Polisolve Plus and Single Pore concepts are combined the result is a Polilyte Plus sensor for a wide range of applications as well as a problem solver for difficult applications.

- Industrial waste water
- Hot sugar juice
- Samples containing color pigments
- Oily samples

The combination leads to more stable reference signals and minimized diffusion potentials. Polisolve Plus represents a significant contribution to long lasting pH sensors.

NOTE: The PTB (Physikalisch-Technische Bundesanstalt = Physical Technical Federal Institute) in Braunschweig, Germany, determined the Single Pore pH electrode to be the most accurate laboratory electrode. Further information can be found in “Traceability of pH measurement” by Petra Spitzer, ISBN 3-89429-877-4 or ISSN 0947-7063

1 Medical Device Testing GmbH Ochsenhausen
2 Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity
3 Biological Activity Tests, In Vitro
4 Good Laboratory Practice
Conductivity Standards

Certified and Traceable

Hamilton was the first to offer conductivity standards at 1.3 and 5 μS/cm with a certified accuracy of ±1% and a durability of 1.5 or 3 years. All conductivity standards exhibit a previously unknown level of stability which has been confirmed by measurements done by the PTB. Governmental metrological institutes that deal with measurement of electrolytic conductivity have become aware of these standards, and the composition of these standards is patented. The measurement procedure for determining conductivity has been developed in collaboration with the DFM. Each batch is certified by the DFM. In an inter-laboratory test among prestigious European metrological institutes (PTB, DFM, DAkkS), Hamilton standards were used as a measurement solution.

DuraCal pH Buffers

Easy Calibration with 5-Year Shelf Life

DuraCal pH buffers consist of a complete range of patented stable pH buffer solutions from pH 1.09 to pH 12.00. Hamilton guarantees that they will last for five years from the date of manufacture. The pH 9.21 and pH 10.01 buffers are even stable in air. High buffer capacities enable quick and stable calibrations.

Closed-loop traceability: In contrast with other manufacturers Hamilton has developed a “closed-loop” traceability. For users of DuraCal pH buffer solutions this means a unique level of reliability.

Top-down traceability: With Hamilton the pH value of the DuraCal buffer is determined by a comparison with two secondary reference solutions.

Bottom-up traceability: From each lot manufactured, a representative quantity is measured at DAkkS (Deutsche Akkreditierungsstelle, Wolfen, Germany). This ensures an external independent verification by an accredited institute. The DAkkS issues an official calibration certificate for every DuraCal batch manufactured.

VisiFerm DO

The most reliable Optical Dissolved Oxygen sensor in the Industry

The VisiFerm DO is the first optical dissolved oxygen (DO) process sensor for demanding applications in the pharmaceutical, biotechnology and beverage industries. The measuring principle is based on oxygen dependent quenching of the emitting light of a luminophore. Easy and fast to maintain, the multiple time-constraints caused by the use of electrochemical type DO sensors is eliminated. Decreased cost of ownership is further improved with an integrated sensor lifetime check that indicates when the sensor is in need of maintenance. A simple, replaceable cap rebuilds the sensor in seconds.

The optical measurement is independent from the flow and insensitive to CO2. A special window behind the luminophore enables the sensor to withstand pressure hammers and spikes. Due to this design, the VisiFerm DO is suitable for inline measurement of dissolved oxygen in various processes.

Beverly

Portable Dissolved Oxygen Measurement

Beverly is designed for at-line and laboratory use in small and midsize breweries as well as in the beverage industry to provide excellent reliability in a rugged design, and purpose built to handle the environmental extremes encountered in everyday brewing operations. Superior performance at an affordable price is achieved using Hamilton’s best in class optical sensor VisiFerm DO with built-in intelligence, making Beverly the brewer’s best friend.
The True Power

Hamilton Arc revolutionizes the integration of sensors by rethinking communication between sensors, end users and process control systems (PCS). The functionality of a traditional transmitter has been replaced by a microprocessor within the sensors head. Arc sensors communicate directly with the PCS through 4-20mA standard and digital signals.

Intelligence Integrated

With the micro-transmitter integrated, Arc sensors offer a fully compensated, converted digital and 4-20mA signal directly to the process control system.

**Fully compensated signal**
- Temperature compensated
- E.g. Pressure, Salinity

**Conversion to**
- Digital Modbus
- 4-20mA analog
- Different parameter units (e.g. mV, ppb, %sat...)

The integrated micro-transmitter stores
- Last calibration data
- Diagnostic information
- Sensor configuration

Wireless Communication & Calibration

Arc sensors provide full online wireless option for monitoring, configuration and calibration.

**Laboratory Calibration**

**Complete Arc Sensor Portfolio**
- pH Arc
- DO Arc
- ORP Arc
- COND Arc
Analog Systems

Standard Measuring Loop

Measuring Loop in Hazardous Area

Measuring Loop in Pipe

Arc Systems

Skid System

Arc in R&D
pH measurements are important in many processes. There is almost none where the pH value does not play a dominant role. All biological processes depend on the activity of enzymes because they show a pH optimum and lose their functionality if the pH is too low or too high.

The pH value is measured in most processes using a glass electrode. This pH glass forms a thin gel layer in aqueous solutions that is highly selective to H⁺ ions. The pH dependent potential of the gel layer is measured against a built-in reference electrode with a constant potential. This reference electrode may be a silver wire in contact with solid silver chloride or a calomel electrode.

In general, the pH value is a measure of the acidity or the basicity of an aqueous solution. In technical terms, pH is the negative logarithm of the activity of the solvated protons H⁺. It’s mostly explained as the measure of the proton concentration which is correct for dilute aqueous solutions.
The outstanding success of the Polilyte Plus in chemical and wastewater applications gave the inspiration for transferring the good features to a whole family of sensors. The expanded portfolio widens the range of applications that can be covered.

All members have the same reference electrolyte Polisolve Plus, use the Single Pore technology but will have different pH glasses. A new member with the HB glass will be established.

**Benefits**
- More applications with HB pH glass
- Better overview of the portfolio
- There’s always at least one family member that suits the different applications
- Resistant against solvents, strong acids and bases

**Typical applications**
- Sugar industry
- Microelectronics
- Industrial waste water
- Downstream processes
- Fermentation

**Specifications**
- Measuring range: 0 – 14 pH
- Process temperature: See table on page 138/139
- Pressure range: See table on page 138/139
- Hygienic aspects: Autoclavable: H, HB, PHI
  - SIP: H, HB, PHI
- pH glass: See table on page 18
- Electrolyte: Polisolve Plus
- Reference system: Everef-L
- Diaphragm: Single Pore
- O-ring: EPDM*: HB, PHI
  - FKM: H, HF

**Ordering Information**

**Polilyte Plus Family Structure**

<table>
<thead>
<tr>
<th>Code</th>
<th>pH glass</th>
<th>Electrical Connector</th>
<th>a-length (mm)</th>
<th>Temperature sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>H</td>
<td>VP</td>
<td>120</td>
<td>P1000 (VP)</td>
</tr>
<tr>
<td>1</td>
<td>HB (not for MS)</td>
<td>S8</td>
<td>225</td>
<td>none (S8) or given (Memosens, Arc)</td>
</tr>
<tr>
<td>2</td>
<td>HF</td>
<td>Arc</td>
<td>325</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PHI</td>
<td>Memosens</td>
<td>360 (not for Arc, MS only with H glass)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>425</td>
<td></td>
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<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>238811</td>
<td>Polilyte Plus XP S8 120</td>
<td></td>
</tr>
<tr>
<td>242415</td>
<td>Polilyte Plus XP VP 120</td>
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</tr>
</tbody>
</table>

**Accessories**
- pH buffers see page 91
- Cables see page 96
- housings see page 109
The EasyFerm Plus family of pH sensors is designed to withstand demanding applications in the Pharmaceutical and Chemical industries. All family members have the same reference electrolyte Phermlyte, the same type of diaphragm HP Coatramic but different pH glasses. The standard EasyFerm Plus, with its PHI glass, is directed at the BioPharm and Pharmaceutical industries because the glass has an excellent chemical robustness and provides best results in applications where sterilization either in an autoclave or an SIP is performed frequently. The new versions with the HB glass show a very fast recovery after CIP and SIP cycles leading to a shortened set-up time.

The LEVP (LE = Liquid Earth) versions have a stabilized sensor signal and an extended sensor diagnosis.

“Did you know... that with a pre-pressurized reference system the life time of a sensor is extended?”

**Benefits**
- Pre-pressurized reference electrolyte ensures a clog-free diaphragm
- Almost drift-free measurement
- Stable measurement signals after steam sterilization, autoclavage and CIP cleanings

**Typical applications**
- Bioreactors
- Industrial processes
- Downstream processes

How to choose the sensor

<table>
<thead>
<tr>
<th>CIP, SIP, autoclavations, chemical robustness</th>
<th>CIP, SIP, autoclavations, fast response time</th>
</tr>
</thead>
<tbody>
<tr>
<td>New sensor</td>
<td>pH glass</td>
</tr>
<tr>
<td>EasyFerm Plus PHI</td>
<td>PHI</td>
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<tr>
<td>EasyFerm Plus HB</td>
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**Ordering Information**

<table>
<thead>
<tr>
<th>EasyFerm Plus Family Structure 238633</th>
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<tr>
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<td>PHI (recommended pH glass type)</td>
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</tr>
<tr>
<td>2</td>
<td>HB</td>
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</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Electrical Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VP</td>
</tr>
<tr>
<td>2</td>
<td>S8</td>
</tr>
<tr>
<td>3</td>
<td>Arc</td>
</tr>
<tr>
<td>4</td>
<td>Memosens</td>
</tr>
<tr>
<td>5</td>
<td>K8</td>
</tr>
<tr>
<td>6</td>
<td>LEVP (only for 120 and 225 mm length)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>a-length (mm)</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>160</td>
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<tr>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>225</td>
</tr>
<tr>
<td>5</td>
<td>325</td>
</tr>
<tr>
<td>6</td>
<td>360 (not for Arc and only PHI glass)</td>
</tr>
<tr>
<td>7</td>
<td>425</td>
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<table>
<thead>
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<th>Temperature sensor</th>
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<tr>
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<tr>
<td>2</td>
<td>P11000 (VP, LEVP)</td>
</tr>
<tr>
<td>3</td>
<td>none (S8, K8) or given (Memosens, Arc)</td>
</tr>
</tbody>
</table>

**Accessories**

- **pH buffers** see page 91
- **Cables** see page 96
- **Housings** see page 109

**Specifications**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
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<tbody>
<tr>
<td>Measuring range</td>
<td>0 – 14 pH</td>
</tr>
<tr>
<td>Process temperature</td>
<td>0 – 140 °C (Arc: analog 0 – 110 °C, digital 0 – 140 °C)</td>
</tr>
<tr>
<td>Pressure range (relative to ambient)</td>
<td>0 – 6 bar</td>
</tr>
<tr>
<td>Hygienic aspects</td>
<td>Autoclavable, SIP, CIP</td>
</tr>
<tr>
<td>pH glass</td>
<td>PHI, PHI</td>
</tr>
<tr>
<td>Electrolyte</td>
<td>Phermlyte</td>
</tr>
<tr>
<td>Reference system</td>
<td>Everef-F</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>HP Coatramic</td>
</tr>
<tr>
<td>O-ring</td>
<td>EPDM*</td>
</tr>
</tbody>
</table>

**Order Code**

238633 –
The EasyFerm Bio family of pH sensors is designed for applications in the Pharmaceutical, Biotechnology and Food & Beverage industries. All family members have the same reference electrolyte Foodlyte, with its certified bio-compatibility. Additionally the EasyFerm Bio sensors are certified to EHEDG criteria. The standard EasyFerm Bio, with its HB glass, is directed at the Food & Beverage industry where CIP and SIP cycles occur frequently because the glass shows a very fast recovery leading to a shortened set-up time. The new versions with the PHI glass show an excellent chemical robustness at high pH values. The LEVP (LE = Liquid Earth) versions have a stabilized sensor signal and an extended sensor diagnosis.

**Benefits**

- Specifically designed for sterile applications in Pharma and Biotechnology (EHEDG, Biocompatibility)
- Highly reliable measurements after steam sterilization, autoclavage and CIP cleanings
- Drift free measurements
- Ceramic diaphragm is an improved barrier of the electrode

**Typical applications**

- Bioreactors
- Brewhouse
- Downstream processes
- Gelatine manufacturing

**Specifications**

- Measuring range: 0 – 14 pH
- Process temperature: 0 – 140 °C (Arc: analog 0 – 110 °C, digital 0 – 140 °C)
- Pressure range: 0 – 6 bar (relative to ambient)
- Hygienic aspects: Autoclavable, SIP, CIP
- pH glass: HB, PHI
- Electrolyte: Foodlyte
- Reference system: Everef-F
- Diaphragm: HP Coatramic
- O-ring: Silicone*

**Did you know... that you may even eat the Foodlyte?**

**Ordering Information**

- Code pH glass
  1. PHI
  2. HB (recommended pH glass type)
- Code Electrical Connector
  1. VP
  2. SR
  3. Arc
  4. Memosens
  5. K8
  6. LEVP (only for 120 and 225 mm length)
- Code a-length (mm)
  1. 120
  2. 160
  3. 200
  4. 225
  5. 325
  6. 425
- Code Temperature sensor
  1. Pt100 (VP, LEVP)
  2. Pt1000 (VP, LEVP)
  3. none (SR, K8) or given (Memosens, Arc)

**Accessories**

- pH buffers: see page 91
- Cables: see page 96
- Housings: see page 109
ChemoTrode / P
ChemoTrode Bridge

The ChemoTrode is the most robust sensor to measure pH in demanding applications in pharmaceutical and chemical industries. The ChemoTrode has a refill hole which allows refilling of the electrolyte and pressurization of the reference system. Its Everef-F reference cartridge ensures that the reference electrolyte remains free of silver and precipitation of proteins.

Benefits
- Liquid electrolyte ensures fast response time and high precision
- Longer lifetime thanks to refillable electrolyte
- Everef-F reference cartridge extends electrode life in aggressive media

Did you know... that the ChemoTrode Bridge has an extended life time due to its special reference system?

Typical applications
- Industrial processes
- Mining Industry
- Pulp and Paper industry
- Fermentations

Specifications

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>0 – 14 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process temperature</td>
<td>0 – 130 °C</td>
</tr>
<tr>
<td>Pressure range (relative to ambient)</td>
<td>0 – 6 bar</td>
</tr>
<tr>
<td>Hygienic aspects</td>
<td>SIP, CIP</td>
</tr>
<tr>
<td>pH glass</td>
<td>PHI</td>
</tr>
</tbody>
</table>
| Electrolyte | ChemoTrode: Viscous 3 M KCl-LR
ChemoTrode Bridge: Skylyte
ChemoTrode P: Protelyt |
| Reference system | ChemoTrode Bridge: Everef-I
ChemoTrode Bridge: Everef-B
ChemoTrode P: Everef-F |
| Diaphragm | ChemoTrode: HP ceramic
ChemoTrode Bridge: Platinum
ChemoTrode P: HP ceramic |
| Temperature sensor | Pt1000 in VP version |

Ordering Information

<table>
<thead>
<tr>
<th>a-length</th>
<th>S7</th>
<th>VP 6</th>
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<tbody>
<tr>
<td>ChemoTrode</td>
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<td>250</td>
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</tr>
<tr>
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<td>150</td>
<td>238763</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>238765</td>
</tr>
<tr>
<td>ChemoTrode Bridge (Non Ex)</td>
<td>120</td>
<td>238770</td>
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<td></td>
<td>150</td>
<td>238772</td>
</tr>
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<td></td>
<td>250</td>
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</table>

Accessories

| pH buffers | see page 91 |
| Cables | see page 96 |
| Housings | see page 109 |
FermoTrode

The maintenance free FermoTrode sensors are designed for measuring pH in pharmaceutical and biotechnological industries and fit in the MasterFit and RetractoMaster housings. The Everef-F reference cartridge ensures that the reference electrolyte Skylyte remains free of silver and precipitation, and withstands steam sterilization.

It is not suited for contact with caustic soda like in CIP-cleanings or for use in media containing citric acid.

**Benefits**
- No air pressure required, no risk of empty reference electrolyte compartment
- 3 Coatramic diaphragms prevent clogging due to proteins
- Very long lifetime, stable calibration after sterilization and practically drift-free signals

**Typical applications**
- Biotechnology
- Pharmaceutical Industry

**Specifications**
- Measuring range: 0 – 14 pH
- Process temperature: 0 – 130 °C
- Pressure range: 0 – 4 bar (relative to ambient)
- Hygienic aspects: SIP
- pH glass: PHI
- Electrolyte: Skylyte
- Reference system: Everef-F
- Diaphragm: Coatramic

**Ordering Information**

<table>
<thead>
<tr>
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**Accessories**
- pH buffers: see page 91
- Cables: see page 96
- Housings: see page 109
The IonoTrode sensor is designed for applications in ion weak media. The F glass membrane has a very low resistance, therefore the sensor can be used in samples with low conductivity, where it offers highest accuracy over a long period of time.

If there is a storage container with 3 M KCl attached via a tube to the side-arm of the IonoTrode, the flow-out of the electrolyte can be controlled with the sleeve diaphragm.

**Benefits**
- Offers highest accuracy over a long period of time
- Stable measurements in samples with low conductivity of at least 0.2 μS/cm
- Removable PTFE sleeve diaphragm to check electrolyte outflow
- Side-arm attachment via tube to storage vessel containing 3 M KCl, and control of electrolyte flow with PTFE diaphragm ring

**Typical applications**
- Drinking Water Plants
- Boiler Feed Water

---

**Did you know...**

that the IonoTrode is designed for ion weak media with a low conductivity of only 0.2 μS/cm?

---

**Specifications**

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**Accessories**

- pH buffers: see page 91
- Cables: see page 96
- Housings: see page 109
InchTrode

The InchTrode sensors are designed to measure pH in demanding applications in the paper making as well as in the chemical industries. The Single Pore liquid junction guarantees the best and fast measuring results because of direct contact between the sample and the Polisolve electrolyte. The InchTrode sensors are easy to install without additional housing and have a robust PEEK shaft.

Benefits
- Single Pore for direct sample contact with Polisolve electrolyte – no clogging
- Very long-lasting reference system
- Robust PEEK shaft
- Simple installation without additional housing

Typical applications
- Pulp and Paper industry
- Water and Wastewater

Did you know... that the InchTrode is available in two different sizes and with different membrane shapes?

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*P = Flat membrane
*C = Cylindrical membrane
*C = Fix cable

Accessories
- pH buffers see page 91
- Cables see page 96
- Housings see page 109
Specifications

<table>
<thead>
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<th>Measuring range</th>
<th>0 – 14 pH</th>
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MecoTrode

The maintenance free MecoTrode sensor is designed for processes in the chemical industry with extreme pH values. The H glass type membrane glass provides a low alkaline error and stable measurement even at high temperatures.

Three high-performance ceramic diaphragms reduce the effect of flow potential in pipe mounting.

Benefits

- 3 high performance ceramic diaphragms for reduced flow potentials when mounted in pipes
- "H" glass for most accurate readings at high pH values or high temperatures
- Very good precision at low pH values (pH < 2)

Typical applications

- Water and Wastewater
- Industrial processes

Did you know...

that the MecoTrode is already 20 years in the market?

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Accessories

- pH buffers see page 91
- Cables see page 96
- housings see page 109
The maintenance free Polilyte Pro and Polyplast Pro sensors are designed for pH measurement in water applications, especially in low conductivity samples, e.g. wastewater, fish farming, ground water, etc.

The Single Pore liquid junction guarantees best measurement results because of direct contact between the sample and the Polisolve electrolyte – clogging is nearly impossible. The Polyplast Pro sensor comes with a robust plastic shaft and glass bulb protection.

**Benefits**
- Single Pore for direct sample contact with Polisolve electrolyte
- No clogging
- Fast response even in low conductivity media
- Easy maintenance due to non-refillable electrolyte

**Typical applications**
- Wastewater applications
- Fish farming
- Ground water

*“Did you know... that the Polilyte Pro has the HF resistant pH glass?”*

---

**Specifications**

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**Accessories**

- pH buffers see page 91
- Cables see page 96
- Housings see page 109
Liq-Glass PG EasyControl

The maintenance free Liq-Glass PG and the EasyControl sensors are entry level sensors for chemical or waste water applications and low process temperatures. They show good behavior in samples containing few ions, respectively low conductivity.

Benefits

- Suitable for low conductivity media
- Easy maintenance due to non-refillable electrolyte
- Liq-Glass PG has 3 ceramic diaphragms for reduced flow potentials

Typical applications

- Wastewater applications
- Fish farming
- Ground water
- Swimming Pools

“Did you know... that the EasyControl is also available as ORP sensor?”

Did you know... that the EasyControl is also available as ORP sensor?

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Specifications

- **Measuring range**
  - Liq-Glass PG: 1 – 12 pH
  - EasyControl: 0 – 14 pH
- **Process temperature**
  - Liq-Glass PG: -5 – 60 °C
  - EasyControl: 0 – 60 °C
- **Pressure range**
  - Liq-Glass PG: 0 – 2 bar
  - EasyControl: 0 – 2 bar
- **pH glass**
  - Liq-Glass PG: F
  - EasyControl: HF
- **Electrolyte**
  - Liq-Glass PG: Viscous 3 M KCl-LR
  - EasyControl: Viscous 3 M KCl-Pharma
- **Reference system**
  - Liq-Glass PG: Everef
  - EasyControl: Ag/AgCl
- **Diaphragm**
  - Ceramic
- **O-ring**
  - Liq-Glass: EPDM*
  - EasyControl: EPDM*

Accessories

- pH buffers see page 91
- Cables see page 96
- Housings see page 109
ORP (Oxidation Reduction Potential) is a common measurement in biochemistry, environmental chemistry and water quality. In the biochemical perspective, an oxidizing chemical pulls electrons away from the cell membrane which means it can be destabilized and leaky. The rapid death of a cell is the consequence of a destroyed membrane. The ORPs of natural systems like aerated surface water, rivers, lakes, rainwater and acid mine water usually have oxidizing conditions leading to positive potentials. Submerged soils, swamps and marine sediments, where air supply has its limitations, reducing conditions are the norm leading to negative potentials. For water system monitoring, the ORP value provides the operator with a rapid and single-value assessment of the disinfection potential of water in the postharvest system. This enables the operator to assess the activity of the applied disinfectant rather than the applied dose.

ORPs in aqueous solutions are determined by measuring the potential difference between an inert sensing electrode in contact with the solution and a stable reference electrode. The reference electrode is connected to the solution by a salt bridge. It has a known potential and is made of silver chloride or saturate calomel. Platinum is frequently used for the sensing electrode.

The Oxygen-Reduction Potential, also known as Redox Potential, describes the tendency of a chemical species or a solution to acquire electrons and therefore to be reduced. Each species has its own reduction potential. It is measured in Volts (V) or mV.
The maintenance free Polilyte Plus ORP sensors are designed to withstand demanding applications in chemical and petrochemical industries. Monitoring the ORP value is becoming increasingly important in many applications, especially harsh chemical environments or high alkaline wastewater. Because of its Single Pore diaphragms you will never have liquid junction problems and total breakdowns. The Polilyte Plus ORP sensors demonstrate reliable reproducible measurement accuracy in highly alkaline solutions as well as in samples with low conductivity. Additionally, the Everef-L reference cartridge ensures a long lifetime.

Benefits
- 2 Single Pores prevent clogging and ensure reliable measurements
- Minimal diffusion potential
- Highly reproducible measurements and very stable over a long period of time
- Resistant against solvents, strong acids and bases

Typical applications
- Sugar industry
- Dye industry
- Industrial wastewater
- Paper industry

Specifications
- Measuring range: ± 2000 mV (Arc: ± 1500 mV)
- Process temperature: 0 – 130 °C (Arc: analog 0 – 110 °C, digital 0 – 130 °C)
- Pressure range: 0 – 3 bar (140 °C)
  0 – 10 bar (130 °C)
  0 – 16 bar (100 °C)
- Hygienic aspects: Autoclavable, CIP, SIP
- ORP element: Pt wire
- Electrolyte: Polisolve Plus
- Reference system: Everef-L
- Diaphragm: Single Pore
- O-ring: FKM

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Accessories
- ORP buffers see page 91
- Cables see page 96
- Arc Accessories see page 100
- Housings see page 109
The EasyFerm Plus ORP sensors are designed to withstand demanding applications in pharmaceutical and chemical industries. It is supplied with a pre-pressurized electrolyte which prevents the diffusion of sample into the sensors. The Everef-F reference cartridge ensures that the Phermlyte reference electrolyte remains free of silver and precipitation. Measuring the ORP value is getting more and more important in the branches mentioned above.

**Benefits**
- Pre-pressurized reference electrolyte ensures a clog-free diaphragm
- Almost drift-free measurement
- Stable measurement signals after steam sterilization, autoclavage and CIP cleanings
- Large platinum ring

**Typical applications**
- Bioreactors
- Industrial processes
- Downstream processes

**Specifications**

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**Accessories**
- ORP buffers see page 91
- Cables see page 96
- Arc Accessories see page 100
- Housings see page 109
The ChemoTrobe ORP is the most robust sensor to measure the oxidation-reduction potential in demanding applications in pharmaceutical and chemical industries. The ChemoTrobe has a refill hole which allows refilling the electrolyte and pressurization of the reference electrolyte. Its Everef-F reference cartridge ensures that the reference electrolyte remains free of silver and precipitation of proteins.

**Benefits**

- Liquid electrolyte ensures fast response time and high precision
- Longer lifetime thanks to refillable electrolyte
- Everef-F reference cartridge extends electrode life in aggressive media

**Typical applications**

- Industrial processes
- Mining Industry
- Pulp and Paper Industry
- Fermentations

**Specifications**

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**Accessories**

- ORP buffers see page 91
- Cables see page 96
- Housings see page 109
The maintenance free OxyTrode Pt is an ORP sensor designed for processes in the chemical industry and for applications in wastewater treatment. Three high-performance ceramic diaphragms reduce the effect of flow potential in pipe mounting.

**Did you know... that the OxyTrode Pt is the ORP version of the MecoTrode?**

**Benefits**
- 3 high performance ceramic diaphragms for reduced flow potentials when mounted in pipes
- Platinum wire coil welded onto the glass

**Typical applications**
- Water and Wastewater
- Industrial processes

### Specifications

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### Accessories

- ORP buffers [see page 91](#)
- Cables [see page 96](#)
- Housings [see page 109](#)
Polilyte RX
Polyplast Pro RX

The maintenance free Polilyte RX and Polyplast Pro RX sensors are designed for ORP measurement in water applications and low conductivity samples, e.g. wastewater, fish farming, ground water, etc.

The Single Pore liquid junction guarantees best measurement results because of direct contact between the sample and the Polisolve electrolyte – clogging is nearly impossible. The Polyplast Pro sensor comes with a robust plastic shaft and glass bulb protection, making it one of our most economical and longest lasting sensors.

Benefits
► Single Pore for direct sample contact with Polisolve electrolyte
► No clogging
► Fast response even in low conductivity media
► Easy maintenance due to non refillable electrolyte

Typical applications
► Wastewater applications
► Fish farming
► Ground water

Specifications

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Accessories

- ORP buffers see page 91
- Cables see page 96
- Housings see page 109
EasyControl ORP

The maintenance free EasyControl ORP is an entry level ORP sensor for chemical or wastewater applications and low process temperatures.

It is also often used in swimming pools to control the disinfection with chlorine. They show also good behavior in samples containing few ions, with respectively low conductivity.

Benefits
- Suitable for low conductivity media
- Easy maintenance due to non refillable electrolyte

Typical applications
- Wastewater applications
- Fish farming
- Ground water
- Swimming Pools

Specifications
- Measuring range ± 2000 mV
- Process temperature 0 – 60 °C
- Pressure range (relative to ambient) 0 – 2 bar
- ORP element Pt-wire
- Electrolyte Viscous 3 M KCl-Pharma
- Reference system Ag/AgCl
- Diaphragm Ceramic
- O-ring EPDM
- ORP buffers see page 91
- Cables see page 96
- Housings see page 109

Ordering Information

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The electrical conductivity is important for the characterization of liquids in different kinds of processes. In aqueous solutions the conductivity is caused by the decomposition of dissolved acids, bases or salts into positive cations and negative anions. In ultra-pure water, where no ions, except very few $\text{H}_3\text{O}^+$ and $\text{OH}^-$, are present, the conductivity is extremely low. This intrinsic conductivity of water represents the lower border of the conductivity scale.

The electrical conductivity is determined by a resistivity measurement when an alternating voltage is applied to a measurement cell that consists of two or four electrodes. To compensate for the geometry of the conductivity cell a cell constant is used. This constant is either known or determined by means of conductivity standards.

Electrical conductivity is the reciprocal of electrical resistivity, and measures a material’s ability to conduct an electric current. Its SI unit is Siemens per meter (S/m). For the measurement of the conductivity of a solution it’s common to use µS/cm or mS/cm.

<table>
<thead>
<tr>
<th>Segment / Application</th>
<th>Sensor</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP station</td>
<td>Conducell I</td>
<td>Inductive</td>
</tr>
<tr>
<td>Bio Pharma</td>
<td>Conducell 4UxF</td>
<td>VariVent®</td>
</tr>
<tr>
<td>Chem Pharma</td>
<td>Conducell 4US</td>
<td>4 pole / wide measuring range</td>
</tr>
<tr>
<td>Brewery / Beverage</td>
<td>Conducell UPW</td>
<td>Various O-ring positions</td>
</tr>
<tr>
<td>UPW</td>
<td>Conducell 2DC</td>
<td>Triclamp</td>
</tr>
<tr>
<td>Waste Water</td>
<td></td>
<td>2 pole</td>
</tr>
</tbody>
</table>
The Conducell 4UxF sensors are suited for measurements in hygienic applications. All wetted parts are FDA approved, can be cleaned easily and withstand CIP cleanings and autoclavings. The sensors show a very good linearity over a broad measuring range. They are available with different process connections such as BioConnect® (BC) or Varivent®.

The Conducell 4USF with stainless steel electrodes is most common and suitable for many applications. All plastic materials are compliant with the order EU 10/2011.

Benefits
- Very good linearity, especially for applications with sharp variations in conductivity
- All wetted parts are FDA-compliant
- Sensor is very easy to clean due to the forward facing, flush arrangement of electrodes
- Specifically designed for sterile applications in Pharma and Biotechnology (EHEDG)

Typical applications
- CIP station
- Water preparation

Specifications
- Measuring range: 1 µS/cm – 300 mS/cm
- Measurement Principle: 4 pole contacting
- Process temperature: -20 – 150 °C (Arc: analog 0 – 110 °C, digital 0 – 140 °C)
- Pressure range: -1 – 20 bar (135 °C) (relative to ambient) -1 – 10 bar (140 °C)
- Hygienic aspects: Autoclavable, CIP, SIP
- Cell constant: 0.36/cm
- Material of electrodes: S = Stainless steel 1.4435, H = Hastelloy C 2.4602, T = Titanium, Pt = Platinum
- O-ring: EPDM*

Conducell 4UxF Family Structure

<table>
<thead>
<tr>
<th>Code</th>
<th>Electrode Material</th>
<th>Electrical Connector</th>
<th>a-length (mm)</th>
<th>O-ring Material</th>
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<tbody>
<tr>
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<td>Arc</td>
<td>120</td>
<td>EPDM</td>
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<tr>
<td>2</td>
<td>Platinum</td>
<td>VP</td>
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<td>4</td>
<td>Titanium</td>
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</tr>
<tr>
<td></td>
<td>O-ring Material</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accessories
- Conductivity Standards see page 92
- Cables see page 96
- Housings see page 109
The Conducell 4US 4-pole conductivity sensors are designed for different process connections such as Triclamp or G 1¼" with various O-ring positions. The sensors show a very good linearity over a broad range of conductivities. The Conducell 4US 4-pole sensor can easily be cleaned and is suitable for steam sterilization, autoclavation and CIP cleanings. All plastic materials are compliant with the order EU 10/2011.

**Conducell 4US**

**Benefits**

- Very good linearity, especially for applications with wide variations in conductivity
- All wetted parts are FDA-compliant
- Sanitary: Sensor is easy to clean
- O-ring position can be chosen individually

**Typical applications**

- Fermentation
- Chemical industry

**Ordering Information**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>a-length</th>
<th>5 m Fix cable</th>
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<tr>
<td>Conducell 4US-G125</td>
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<tr>
<td>Conducell 4US-T150-50</td>
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<td>237750</td>
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<tr>
<td>Conducell 4US-T150-100</td>
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<td>237760</td>
</tr>
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</table>

**Accessories**

- Flow-through cell PEEK TC 1.5” Ref 237931
  This flow through cell made of FDA approved PEEK facilitates insertion of Conducell 4US-T150-50 in pipework.

**Conductivity Standards** see page 92
**Safety Socket** see page 136
Conducell UPW

The Conducell UPW 2-pole conductivity sensors are designed for the use in liquids with very low conductivity, i.e. Ultra Pure Water, Pure Water and Water for Injection, particularly in the pharmaceutical and chemical industry.

Conducell UPW sensors are available with different process connections such as TriClamp 1.5", PG 13.5.

All plastic materials are compliant with the order EU 10/2011.

Did you know... that with Arc all the important information is stored in the sensor head?

Benefits

- Sanitary design: all wetted parts are FDA approved
- Easy cleanable
- Intelligence in the sensor: fully compensated measurement signals
- Easy handling due to user-friendly interface

Typical applications

- Ultra Pure Water
- Pure Water
- Water for Injection

Specifications

- Measuring range: 0.01 – 1500 µS/cm
- Measurement Principle: 2 pole contacting
- Process temperature: Arc: analog 0 – 110 °C, digital 0 – 130 °C
- Pressure range (relative to ambient): 0 – 10 bar (130 °C)
- Hygienic aspects: Autoclavable, CIP, SIP
- Cell constant: < 0.1/cm
- Material of electrodes: Stainless Steel DIN 1.4435
- Surface quality: Ra < 0.4 μm (N5)
- O-ring: EPDM*

Ordering Information

Conducell UPW PG 13.5

- a-length: 120
- VP6: 243640
- Arc: 243579

Conducell UPW TC 1.5"

- a-length: 87
- VP6: –
- Arc: 243578

Accessories

- UPW Simulator
  - Ref 243580
  - Traceable resistor to verify the Arc module acc. to USP <645>
- Conductivity Standards
  - see page 92
- Cables
  - see page 96
- Arc Accessories
  - see page 100
- Housings
  - see page 109
Conducell 2DC-PG

The Conducell 2DC sensor is constructed in a simple way and is best suited for measurements in clean solutions and non-critical applications. Contaminants, such as lime, will affect the measurement.

**Specifications**
- **Measuring range**: 10 µS/cm – 20 mS/cm
- **Measurement Principle**: 2 pole contacting
- **Process temperature**: -5 – 80 °C
- **Pressure range**: 0 – 6 bar (relative to ambient)
- **Cell constant**: 1/cm
- **Material of electrodes**: Graphite
- **O-ring**: EPDM*

**Benefits**
- 2 large graphite electrodes for stable measurements
- Mechanically-stable plastic shaft
- Easily cleanable

**Typical applications**
- Water and Wastewater

**Ordering Information**
- **Conducell 2DC-PG 120**
  - **a-length**: 120
  - **5 m Fix cable**: 237610

**Accessories**
- **Conductivity Standards**: see page 92
- **Housings**: see page 109

---

*EPDM*
Conducell I family

The inductive conductivity cell Conducell I is specifically designed for use in demanding applications in beverage and pharmaceutical industries and in biotechnology. Thanks to its food-grade PEEK body and its hygienic design it meets the demands of these industries.

**Benefits**
- Unique hygienic design, therefore no risk of contamination
- Made from non-corrosive materials which is good for acids and bases
- Fast temperature response time t90 under 26 s enable safe and efficient phase separations
- Insensitive to electrode soiling and polarization thanks to electrodeless, inductive measuring principle.

**Typical applications**
- Phase separation
- Control of CIP (cleaning in place)
- Leakage monitoring

**Specifications**
- **Measuring range**: 100 µS/cm – 2000 mS/cm (uncompensated)
- **Measurement Principle**: Inductive
- **Process temperature**: -10 – 125 °C
- **Pressure range**: 0 – 8 bar (125 °C)
- **0 – 12 bar (90 °C)
- **Hygienic aspects**: CIP, SIP
- **Cell constant**: 6.3/cm
- **Wetted Parts**: PEEK (FDA approved USP class VI, EU 10/2011)

**Ordering Information**

**Conducell I Family Structure**

<table>
<thead>
<tr>
<th>Code</th>
<th>Process Connection</th>
<th>Additional Certificate</th>
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<tr>
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<td>Triclamp 2&quot;</td>
<td>Biocompatibility USP class VI</td>
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</tr>
<tr>
<td>3</td>
<td>Tuchenhagen Varivent® DN50/40</td>
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<td></td>
</tr>
</tbody>
</table>

**Accessories**

- **Conductivity Standards** see page 92
- **Housings** see page 109

[Image of the Conducell I sensor]
Biological processes are increasingly important in biotechnical and pharmaceutical industries. The variability of living organisms is often very high, making the culture process difficult to standardize. Extensive process optimization and control are required for stable cell cultures, fermentations and improved yield. Today bioprocess development relies on labor intensive sampling and offline measurements that also lack the necessary granularity to fully optimize the yield. The available online measurements of pH and dissolved oxygen are linked indirectly to the cell status and characteristics.

Online monitoring of cell density provides the continuous information necessary to optimize control and yield beyond what is possible offline. Hamilton now offers sensors for continuous cell density measurement. The Incyte permittivity sensor delivers information on viable cell density whereas the Dencytee sensor measures total cell density via turbidity. In combination with our advanced Arc pH and dissolved oxygen probes, permittivity and turbidity sensors provide all relevant information on the progress of mammalian, yeast and high density bacteria cultures. This enables better understanding and control of bioprocesses.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Application</th>
<th>Sensor</th>
<th>Feature</th>
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</thead>
<tbody>
<tr>
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<td>VCD (Viable Cell Density)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Insensitivity to micro-carrier / cell debris</td>
</tr>
<tr>
<td>Brewery</td>
<td>Yeast</td>
<td>Dencytee</td>
<td>TCD (Total Cell Density)</td>
</tr>
<tr>
<td></td>
<td>Bacteria</td>
<td></td>
<td>Low density fermentation</td>
</tr>
</tbody>
</table>

In combination with our advanced Arc pH and dissolved oxygen probes, permittivity and turbidity sensors provide all relevant information on the progress of mammalian, yeast and high density bacteria cultures. This enables better understanding and control of bioprocesses.
Accurately analyzing the characteristics of viable cells during bioprocess is crucial. Only viable and healthy cells are producing the product of interest. Today these characteristics are monitored by labor intensive offline samplings.

Analyzing cell characteristics online provides deep insight into the bioprocess. It allows stable process control, fast optimization and reduces the risk of sampling errors. The Incyte sensor is especially designed for measuring viable cells during mammalian cell culture, yeast and high density bacterial fermentation.

The measurement principle of Incyte sensors is based on permittivity. Viable cells behave like little capacitors and their polarization and depolarization in an alternating electrical field is measured. This signal can be correlated to the viable cell density. This method is insensitive to cell debris and microcarriers because only viable cells can be polarized.

A measuring Unit consists of an Incyte sensor and a pre-amplifier, which converts the analog measurement to a stable digital signal. This unit has to be connected to the Arc View Controller, equipped with a required Incyte and optional Incyte scan license.

Did you know... that Hamilton is the only provider of all relevant parameters for cell cultures & fermentations: viable cell density, pH and DO?"

**Typical applications**
- Eucaryotic cells
- Yeast
- High density bacteria fermentation

**Benefits**
- Specific for viable cells
- Suitable for cell culture and fermentation
- Insensitive to microcarriers and cell debris
- No more hidden events
- Optimization of feeding strategy and yield

**Specifications**
- **Measuring Range**
  - 5 x 10^5 – 8 x 10^9 cells/mL (Mammalian)
  - 5 – 200 g/L dry weight (fermentation)
- **Conductivity range**
  - Incyte LC: 0.5 – 10 mS/cm
  - Standard: 2 - 60 mS/cm
- **Measuring principle**
  - Permittivity
- **Process temperature**
  - 0 - 60 °C
- **Pressure range**
  - 0 – 12 bar (DN12)
  - 0 – 3 bar (DN25)
- **Hygienic aspects**
  - Autoclavable, CIP, SIP
  - O-ring EPDM*

**Ordering Information**
- **a-length**
  - Incyte DN25 - SG 70 243710 – 243730 –
  - Incyte DN25 - DG 46 243711 – 243731 –
  - Incyte DN25 - DG BE 54 243712 – 243736 –
  - Incyte DN12 120 243700 243704 243732 243716
  - Incyte DN12 220 243701 243705 243733 243717
  - Incyte DN12 320 243702 243706 243734 243718
  - Incyte DN12 420 243703 243707 243735 243719

**Accessories**
- Val/Cal Kit Incyte Ref 243740
- Val/Cal Kit Incyte LC Ref 243713
- Permittivity Simulator Ref 243743
- Solution A Ref 239988
- Solution B Ref 243742
- Solution B LC Ref 243709
- Incyte Pre-Amp Ref 243720
- 5 m cable M12/M12 Ref 243670
- 10 m cable M12/M12 Ref 243871
- 20 m cable M12/M12 Ref 243872
- 40 m cable M12/M12 Ref 243873
Accurate cell growth analysis during bioprocesses is essential. The Dencytee sensor is especially designed for monitoring total cell density during low density bacterial fermentation, as well as yeast and mammal cell cultivation.

As soon as the required amount of cells is reached, bio-production and analysis can begin. Monitoring total cell density requires offline sampling and analysis, which leads to delayed result information. By measuring this parameter online the cell growth rate can be determined quickly and accurately without the loss of any information. Dencytee sensors are based on optical density respectively the turbidity of a suspension at NIR (near-infra red) wavelengths. All particles and molecules that scatter the NIR light will be detected and can be correlated to the total cell density. The sensor keeps the light intensity at the detector constant, which leads to a broader measuring range.

A measuring Unit consists of a Dencytee sensor, available in different lengths, and a pre-amplifier. This unit has to be connected to the Arc View Controller, equipped with a required Dencytee license.

Did you know... that Dencytee is the only optical density sensor that works with a constant light intensity at the detector?
In order to understand a biological process, all relevant parameters must be plotted on a graph to be interpreted. This is done manually after ending a process run or continuously with a process control system.

It is now possible to display all relevant parameters of a bioprocess simultaneously on a screen and directly at the fermenter. The Arc View Controller, ComBox, and Cell Density Integration Kit (CDIK) are specifically designed for viable and total cell density measurements and support Hamilton's wireless Arc-technology to graph and record pH and DO measurements. This allows process analysis directly on site.

The Controller stores the calibration and recorded data of the Incyte and Dencytee units. When the recorded data of the connected units is displayed, errors or failures will be detected, reported, and an alarm initiated. A software license is required for the use of the specific Controller for Incyte and Dencytee; an additional license will also be needed if options such as the Incyte Scan or OPC are selected.

The ComBox is a compact alternative to the Arc View Controller 265 and is designed to easily fit minimal space requirements. It is operated by a simple connection to an existing computer. The Cell Density Integration Kit is designed to allow easy integration into skid fermenter controllers or production cabinets.

Benefits
- All relevant parameters for cell culture and fermentation can be shown at once
- Various different outputs ensure compatibility to process control systems
- Immediate automatic re-start after power failure ensures minimum loss of data
- Data of several runs can be stored and copied on a USB stick
- Different licenses for different customers’ needs

Ordering Information

<table>
<thead>
<tr>
<th>Choose Controller</th>
<th>Choose License</th>
</tr>
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<table>
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</table>

Accessories
- Incyte License Ref 243822
- Incyte Scan License Ref 243823
- Dencytee License Ref 243824
- OPC License Ref 243820
- 4-20 mA Output Box Ref 243850
- 5 m cable M12/Open end Ref 243851
- 10 m cable M12/Open end Ref 243852
- Arc View Controller Profibus Ref 243899

Specifications
- Measured variable: Conductivity, permittivity, optical density
- Calculated variable: Viable cell density, total cell density
- Analog output: AUX to Analog Output Box 4-20 mA
- Digital outputs: Modbus RTU (RS485), Ethernet RJ45 (OPC XML-DA)
- Digital inputs: USB for downloading data and firmware upgrade
- Dimensions (W x D x H): Arc View 265: 280 x 240 x 115 mm, Arc View 465: 296 x 240 x 115 mm, Arc View 465 XL: 443 x 364 x 114 mm, ComBox: 190 x 85 x 56 mm
- Display: Arc View 265/465: 5.7" color display, Arc View 465 XL: 12" color display, Virtual keyboard: ComBox: none
- Housing material: Stainless Steel 1.4435
- Measuring Channels: Arc View 265: 2, Arc View 465/465 XL: 4, ComBox: 2
- Operating humidity: 0 – 80%
- Operating temperature: 0 – 45 °C
- Power supply: 24 VDC, power adapter 110 – 240 VAC to 24 VDC
The partial pressure of dissolved oxygen (DO) plays an important role in many biological, chemical and physical processes. Respiration in a lung or a leaf depends on the differences of the partial pressure as well as fermentation of substrates by yeast or bacteria. The amount of dissolved oxygen is also important for the safety and the quality of many other industrial processes.

The most common technologies to measure DO are the classical amperometric and the modern optical method. Classical amperometric Clark cells, where cathode and anode are separated from the sample by a gas permeable membrane, generate an electrical current proportional to the oxygen partial pressure of dissolved oxygen. The oxygen is reduced in the sensor, catalyzed by an electrolyte at a platinum cathode. At the anode silver is oxidized. In contrast to the Clark cells the optical measurement is based on the luminescence of a luminophore that absorbs photons and releases a part of the absorbed energy by emission of photons with a higher wavelength. Oxygen quenches this process by transferring the energy partially by collision. The more oxygen present the more quenching is observed. Hamilton measures the phase shift between excitation and emission across a population of light pulses in order to achieve the highest accuracy and widest operating range. The difference in the intensity of both waves is used for online sensor diagnostics.

<table>
<thead>
<tr>
<th>Segment / Application</th>
<th>Sensor</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Water</td>
<td>Oxysens</td>
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<tr>
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<td>VisiFerm DO</td>
<td>Optical / Atex / IECEx</td>
</tr>
<tr>
<td>Chem Pharma</td>
<td>VisiTrace DO</td>
<td>Cl₂ resp. ClO₂ resistant</td>
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<tr>
<td>Boiler Feed Water</td>
<td>VisiPro DO Ex</td>
<td>2-wire HART 4-20 mA</td>
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<td>OxyFerm FDA</td>
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<td>OxyGold G</td>
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<td></td>
<td>OxyGold B</td>
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</tr>
</tbody>
</table>
**VisiPro DO**

The VisiPro DO is the optical dissolved oxygen (DO) sensor for use in explosive environments. VisiPro DO optical technology improves the measuring performance and simplifies maintenance. Improvements compared to conventional electrochemical (amperometric) sensors include flow independence, rapid start-up with no polarization time, and simplified maintenance.

With their integrated transmitter, VisiPro DO sensors enable direct communication to the process control system via 2 wire 4-20 mA standard signal or digital HART. All relevant sensor data including calibration and diagnostic information are stored in the sensor head, simplifying calibration and maintenance. Additional wireless communication directly from the sensor to your computer simplify laboratory calibration, configuration, and maintenance.

---

**Did you know...**

*that Hamilton invented the first optical DO sensor with ATEX / IECEx approval?*

---

**Benefits**

- Reliable and robust optical measurement in hazardous environments
- Easy installation with 2-wire connection
- Laboratory calibration possible with HDM
- Direct analog or digital HART communication to the process control system via 4-20 mA signal

---

**Typical applications**

- ATEX environment
- Fermentation

---

**Ordering Information**

**VisiPro DO Family Structure**

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<tr>
<td>2</td>
<td>H2</td>
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</tbody>
</table>

---

**Specifications**

- **Measuring range**: 4 ppb – 25 ppm (DO)
- **Measurement Principle**: Oxygen dependent luminescence quenching
- **Process temperature**: -20 – 140 °C, the sensor provides no DO reading above 85 °C
- **Analog interface**: Two wire sink needs to be powered by external power supply
- **Operating voltage**: 18 – 30 VDC
- **Pressure range**: -1 – 12 bar (relative to ambient)
- **Hygienic aspects**: CIP, SIP
- **Surface Quality**: Ra < 0.4 μm (N5)
- **Material**: Stainless steel 1.4435
- **O-ring**: EPDM*

---

**Accessories**

- **ODO Cap H0 Kit**: Ref 243515
- **ODO Cap H2 Kit**: Ref 243505

**Typical applications**

- ATEX environment
- Fermentation

---

*Did you know...*
**VisiTrace DO**

The VisiTrace DO is designed to measure dissolved oxygen in the low ppb ranges in brewing applications, notably during filtration, and filling. In addition, the special designed ODO Cap L0 for breweries is stabilized against standard disinfectant solution with active chlorine and chlorine dioxide. This is powerful during measurements in breweries, which may not allow for calibration after every CIP.

With the transmitter integrated, the intelligent VisiTrace DO sensor provides more reliable measurements directly to your process control system via the 4-20 mA output. The also integrated Bluetooth 4.0 wireless interface may be used for monitoring, configuration and calibration, and saves time without compromising quality.

**Benefits**
- For measurements from 0 - 2000 ppb
- Stable against chlorine and chlorine dioxide
- Rapid start-up with no polarization
- Flow and CO2 independent readings
- Robust design for high flow rates

**Typical applications**
- Breweries
- Power Plants

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Measurement Principle</td>
<td>Oxygen dependent luminescence quenching</td>
</tr>
<tr>
<td>Response time t&lt;sub&gt;98%&lt;/sub&gt;</td>
<td>&lt; 20 s in gas; &lt; 90 s in water</td>
</tr>
<tr>
<td>Process temperature</td>
<td>-10 - 140 °C, the sensor provides no DO reading above 85 °C</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>18 - 30 VDC</td>
</tr>
<tr>
<td>Pressure range</td>
<td>-1 - 12 bar (relative to ambient)</td>
</tr>
<tr>
<td>Hygienic aspects</td>
<td>CIP, SIP</td>
</tr>
<tr>
<td>Surface Quality</td>
<td>Ra &lt; 0.4 μm (N5)</td>
</tr>
<tr>
<td>Material</td>
<td>Stainless steel 1.4435</td>
</tr>
<tr>
<td>O-ring</td>
<td>EPDM*</td>
</tr>
</tbody>
</table>

**Did you know...** that the VisiTrace DO is the only optical DO sensor that withstands chlorine and chlorine dioxide for a long time?

**Ordering Information**

<table>
<thead>
<tr>
<th>VisiTrace DO</th>
<th>M12</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>243560</td>
</tr>
<tr>
<td>225</td>
<td>243561</td>
</tr>
</tbody>
</table>

**ODO Cap L0:** The LO cap is designed for trace level measurements of dissolved oxygen in breweries, water de-aeration and power plants.

**Accessories**
- ODO Cap L0 Kit: Ref 243530
- Calibration station: Ref 243575
- Cables: see page 96
- Housings: see page 109
VisiFerm DO family

The VisiFerm DO is the first optical oxygen sensor with integrated opto-electronics, having the full functionality of a measuring device with self-diagnostics. It is steam sterilizable, autoclavable and CIP compatible. The VisiFerm requires less maintenance than a classical oxygen sensor as it does not have a mechanically sensitive membrane or a corrosive electrolyte.

Did you know... that Hamilton invented the first optical DO sensor in 12 mm format?

Benefits
- No fragile membrane – with a solid sensor cap
- No polarization time required
- Instantly stable values, low drift, quick response
- Electrolyte-free, no leakage
- Convenient precalibration in the laboratory, because data is stored in the sensor head

Typical applications
- Ethanologenic fermentation
- Biotechnical fermentation
- Brewery fermentation, filtration, filling
- Proactive corrosion control in HVAC systems

Specifications
- Measuring range: 4 ppb – 25 ppm (DO)
- Measurement Principle: Oxygen dependent luminescence quenching
- Response time: < 30 s at 25 °C, from air to nitrogen
- Process temperature: -10 – 140 °C, the sensor provides no DO reading above 85 °C
- Operating voltage: 7 – 30 VDC max. 1 W
- Pressure range: -1 – 12 bar
- Hygienic aspects: Autoclavable, CIP, SIP
- Surface Quality: Ra < 0.4 μm (N5)
- Material: Stainless steel 1.4435
- O-ring: EPDM*

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Interface</th>
<th>a-length (mm)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>120</td>
</tr>
<tr>
<td>2</td>
<td>ECS</td>
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<tr>
<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>325</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>425</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>ODO Cap</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>H0</td>
</tr>
<tr>
<td>2</td>
<td>H2</td>
</tr>
</tbody>
</table>

- ODO Cap H0: For general application in biotechnology, water treatment and monitoring as well as in breweries, wineries and soft drink processing.
- ODO Cap H2: The ODO Cap H2 is designed for fermentation processes where sterilization in place (SIP) is performed in media containing higher amounts of lipophilic compounds. It comes with a hygienic design.

Accessories
- ODO Cap H0 Kit Ref 243515
- ODO Cap H2 Kit Ref 243505
- Cables: see page 96
- Arc Accessories: see page 100
- Housings: see page 109
OxyFerm FDA

The OxyFerm FDA is an electrochemical oxygen sensor suited for applications with high demands for hygiene, e.g. in pharmaceutical industry, in biotechnology and in food & beverage production. It is available with 12 mm or 25 mm (XL) shaft diameter.

The sensor is equipped with a FDA approved membrane for use in hygienic processes. It withstands steam sterilization, autoclavation and CIP cleanings.

Specifications

- Measuring range: 10 ppb – 40 ppm (DO)
- Response time t98% < 60 s at 25 °C, from air to nitrogen
- Process temperature: 0 – 130 °C (Arc: analog 0 – 110 °C, digital 0 – 130 °C)
- Pressure range: 0 – 4 bar (relative to ambient)
- Hygienic aspects: Autoclavable, CIP, SIP
- Electrolyte: Oxylyte
- Surface Quality: Ra < 0.4 μm (N5)
- Current in air at 25°C: 40 – 80 nA
- Material: Stainless steel 1.4435
- Polarization voltage: -670 mV
- O-ring: EPDM*

Benefits

- Sanitary Feature: The silicone membrane seals without a gap to steel membrane body (no additional o-ring)
- Little drift, fast response, short polarization time
- Replacing the cathode is possible and very simple to perform.

Typical applications

- ATEX environment
- Fermentation

With the XL option, the o-ring position can be optimally matched to the weld-in socket from 22 to 55mm. Please state the OP you need when ordering.

Ordering Information

<table>
<thead>
<tr>
<th>a-length</th>
<th>T82</th>
<th>VP 6</th>
<th>Arc</th>
<th>MS</th>
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<tbody>
<tr>
<td>OxyFerm FDA 120</td>
<td>237450</td>
<td>237540</td>
<td>243100</td>
<td>237713</td>
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<tr>
<td>160</td>
<td>237455</td>
<td>237541</td>
<td>243101</td>
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<td>225</td>
<td>237452</td>
<td>237542</td>
<td>243102</td>
<td>–</td>
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<tr>
<td>325</td>
<td>237453</td>
<td>237543</td>
<td>243103</td>
<td>237715</td>
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<tr>
<td>425</td>
<td>237454</td>
<td>237544</td>
<td>–</td>
<td>243104</td>
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<tr>
<td>OxyFerm FDA XL 56</td>
<td>237175-OP</td>
<td>–</td>
<td>243140-OP</td>
<td>–</td>
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<tr>
<td>150</td>
<td>237170</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>300</td>
<td>237174</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>OxyFerm CIP 120</td>
<td>243289</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Accessories

- Membrane Kit FDA Ref 237140
- Membrane Kit CIP Ref 237126
- Membrane Kit Ref 237123
- Oxylyte 30 mL Ref 237118
- Replacement Cathode OxyFerm Ref 237306
- Autoclavation Cap OxyFerm Ref 242000
- Polarization Module G Ref 237350
- Polarization Module T Ref 237370

With the XL option, the o-ring position can be optimally matched to the weld-in socket from 22 to 55mm. Please state the OP you need when ordering.

Cables see page 96
Arc Accessories see page 100
Housings see page 109
The OxyGold B is an electrochemical oxygen sensor especially designed for applications which contain carbon dioxide like the production of beer, sparkling wine or soft drinks. The sensor is not affected by acidic gases. Apart from the production of sparkling beverages, the OxyGold B can be used in all production processes where CO₂ might be an issue for electrochemical sensors.

"Did you know... that the OxyGold B is the only sensor in the market with a polarization voltage of 0 mV?"

**Benefits**
- No cross-sensitivity with CO₂
- Only very little flow required
- Pressure and CIP resistant
- Replacing the cathode is possible and very simple to perform.

**Typical applications**
- CO₂ recovery
- Water de-aeration

**Ordering Information**

<table>
<thead>
<tr>
<th>OxyGold B</th>
<th>VP 6</th>
<th>Arc</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>237180</td>
<td>243115</td>
</tr>
<tr>
<td>225</td>
<td>237185</td>
<td>243116</td>
</tr>
</tbody>
</table>

**Accessories**
- OxyGold Membrane Kit Ref 237135
- Oxylyte B 30 mL Ref 237138
- Polarization Module B Ref 237080
- Replacement Cathode OxyGold B Ref 237437

Cables see page 96
Arc Accessories see page 100
Housings see page 109
The OxyGold G is an electrochemical oxygen sensor designed for processes in which very small amounts of oxygen have to be traced, like in the pharmaceutical or microelectronics industry. It is also suitable for processes where high pressures are applied.

**Benefits**
- Trace level measurement
- Suitable for use at high temperatures and high pressures during sterilization and CIP
- Little flow sensitivity
- Replacing the cathode is possible and very simple to perform.

**Typical applications**
- Boiler Feed Water
- Microelectronics

### Specifications

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>1 ppb – 40 ppm (DO)</td>
</tr>
<tr>
<td>Response time t 98%</td>
<td>&lt; 60 s at 25 °C, from air to nitrogen</td>
</tr>
<tr>
<td>Process temperature</td>
<td>0 – 130 °C (Arc: analog 0 – 110 °C, digital 0 – 130 °C)</td>
</tr>
<tr>
<td>Pressure range (relative to ambient)</td>
<td>0 – 12 bar</td>
</tr>
<tr>
<td>Hygienic aspects</td>
<td>Autoclavable, CIP, SIP</td>
</tr>
<tr>
<td>Electrolyte</td>
<td>Oxylyte G</td>
</tr>
<tr>
<td>Surface Quality</td>
<td>Ra &lt; 0.4 μm (N5)</td>
</tr>
<tr>
<td>Current in air at 25°C</td>
<td>180 – 500 nA</td>
</tr>
<tr>
<td>Material</td>
<td>Stainless steel 1.4435</td>
</tr>
<tr>
<td>Polarization voltage</td>
<td>-670 mV</td>
</tr>
<tr>
<td>O-ring</td>
<td>EPDM*</td>
</tr>
</tbody>
</table>

### Accessories
- **OxyGold Membrane Kit** Ref 237135
- **Oxylyte G 30 mL** Ref 237139
- **Polarization Module G** Ref 237350
- **Replacement Cathode OxyGold G** Ref 237427

### Ordering Information

<table>
<thead>
<tr>
<th>a-length</th>
<th>VP 6</th>
<th>Arc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OxyGold G</td>
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</tr>
<tr>
<td></td>
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</table>

Cables see page 96
Arc Accessories see page 100
Housings see page 109
Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>40 ppb – 40 ppm (DO)</td>
</tr>
<tr>
<td>Response time t&lt;sub&gt;98%&lt;/sub&gt;</td>
<td>&lt; 60 s at 25 °C, from air to nitrogen</td>
</tr>
<tr>
<td>Process temperature</td>
<td>0 – 60 °C</td>
</tr>
<tr>
<td>Pressure range (relative to ambient)</td>
<td>0 – 4 bar</td>
</tr>
<tr>
<td>Electrolyte</td>
<td>Oxylyte</td>
</tr>
<tr>
<td>Surface Quality</td>
<td>R&lt;sub&gt;a&lt;/sub&gt; &lt; 0.8 μm (N6)</td>
</tr>
<tr>
<td>Current in air at 25°C</td>
<td>40 – 80 nA</td>
</tr>
<tr>
<td>Material</td>
<td>Stainless steel 1.4435</td>
</tr>
<tr>
<td>Polarization voltage</td>
<td>-670 mV</td>
</tr>
<tr>
<td>O-ring</td>
<td>EPDM*</td>
</tr>
</tbody>
</table>

The Oxysens is an electrochemical oxygen sensor designed for applications in water, e.g. wastewater treatment, swimming pools or fish farms. It is easy to maintain, because the membrane and the electrolyte do not need to be replaced.

The response time of the Oxysens is fast, it is almost independent to flow and insensitive to soiling.

Benefits

- Maintenance-free DO sensor, no change of membrane or electrolyte
- Robust design
- Insensitive to soiling
- Short polarization and response times

Typical applications

- Water and Wastewater
- Fish farming

Ordering Information

<table>
<thead>
<tr>
<th>a-length</th>
<th>5 m fix cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxysens</td>
<td>120</td>
</tr>
</tbody>
</table>

Accessories

- Immersing Set Ref 237158
  The Immersing Set sheaths and protects 120mm sensors such as Oxysens while immersed in streams or channels.

Housings see page 109
Born with a Purpose

Beverly is designed for at-line and laboratory use in small and midsize breweries as well as in the beverage industry to provide excellent reliability in a rugged design, and purpose built to handle the environmental extremes encountered in everyday brewing operations.

Superior performance at an affordable price is achieved using Hamilton’s best in class optical sensor VisiFerm DO with built-in intelligence, making Beverly the brewer’s best friend.

Portable DO Measurement

Measure DO in the bottle or can

Beverly can be used as shown in the pictures and even beyond. An additional application is to check the oxygen content of the exhaust gas of vessels while flushing with CO2 after cleaning and prior to filling. Measuring the oxygen at this point can help to save time and CO2. Even if Beverly stays connected to a pipe or a vessel while CIP is running it’s robust stainless steel flow cell prevents damage.

Measure DO during or after filtration

Check DO of bright beer tank prior to bottling

Ordering Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly</td>
<td>817100</td>
</tr>
</tbody>
</table>

Benefits

- Efficiency and serviceability bred from VisiFerm DO optical sensors
- Built to endure IP 67 watertight standards
- Stamina for 50 hours of continuous operation
- Fast response time down to ppb level
- Calibration without removing the sensor

Specifications

- Operating temperature range: 0 – 80 °C (media) / 0 – 40 °C (environment)
- Operating pressure range: 0 – 10 bar
- Dimensions (B x W x H): 222 x 142 x 322 mm
- Ø O.D. Barbed hose fittings: 8 mm
- Weight: 4.7 kg
- Protection rate: IP67
- Battery: 50 h (continuous operation)
- Measuring range: 4 ppb – 25 ppm (DO)
- Accuracy at 25 °C: ± 1 ± 0.05%-vol: 21± 0.2%-vol
- Measurement principle: Oxygen dependent luminescence quenching
- Response time (t98%): < 30 s at 25 °C, from air to nitrogen

Accessories

- VisiFerm DO Ref 243666-211
- ODO Cap Kit H0 Ref 243515
- Hoses Ref 817134
- Power supply Ref 817804
- Torx screwdriver Ref 817145
Buffer Solutions you can Trust

All calibration procedures assume that the labeled values of the calibration buffers are correct. But buffer values can change over time and so can your results. A complete range of patented buffer solutions provides pH stability up to 5 years, something never achieved before. The pH buffers 9.21 and 10.01 are even stable when exposed to air. High buffering capacity provides rapid, stable calibration. The growth of fungus and microorganisms is prevented.

Traceability
An important issue for the production of Certified Reference Materials is to ensure traceability through an unbroken chain of comparisons to reference material of the highest metrological quality (Primary Reference Material) from NIST and PTB. Unlike other manufacturers, where only top-down traceability is applied, Hamilton works with circular or closed-loop traceability, providing unique reliability of Hamilton DuraCal buffers.

Top-down traceability: At Hamilton, the pH value of DuraCal buffers is determined by comparison against two secondary reference buffer solutions from accredited suppliers of secondary reference materials. The solutions themselves are compared against primary reference solutions from PTB or NIST. The measurement uncertainties of every measurement comparison are known and documented.

Bottom-up traceability: To ensure the highest possible accuracy and full reliability of the pH value, a representative number of samples from every single production lot is verified by an external, independent and impartial DAkkS laboratory. The DuraCal samples are compared against secondary reference solutions from DAkkS and these are referenced themselves to primary reference solutions from PTB or NIST. At this stage, the traceability loop is closed. DAkkS provides Hamilton with a calibration certificate for every DuraCal production batch.

Certified reference material: Due to the complete traceability of the measurement procedure and the assignment of uncertainties to the particular testing steps, the buffers pH 4.01, 7.00, 9.21 and 10.01 are classified as “Certified Reference Material” (CRM).

Features
- Convenient 250 mL or 500 mL bottle with built-in calibration compartment
- Economical, only about 15 mL of buffer is used per calibration
- Certified pH value from a DAkkS laboratory accredited for pH measurement
- First class certificate with traceability to international standards
- Certificates available at www.hamiltoncompany.com
- Expiration date on the bottle
- Immune to microbial growth

Value Accuracy Stability Certified By Packaging Unit Ref
271 mV ±5 mV 24 None 500 mL 238226
475 mV ±5 mV 24 None 500 mL 238322
475 mV ±5 mV 24 None 500 mL 238227

1) NIST: National Institute of Standards and Technology, Gaithersburg, MD, USA
2) PTB: Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
3) DAkkS: Deutsche Akkreditierungsstelle GmbH (D-K-15186-01-00), Zentrum für Messen und Kalibrieren GmbH, Wolfen, Germany

*p in months after date of manufacturing

Simple handling for professional results
Hamilton Conductivity Standards

Long-term stability and accuracy

For measurements in the low conductivity range stable and reliable calibration standards have been completely lacking up to now. Since a conductivity standard is not a buffer solution, the lower the value of the conductivity standard, the greater the effect of entry of CO₂ or contamination. Hamilton is the first manufacturer to offer patented conductivity standards of 1.3 and 5 µS/cm with a certified accuracy of ±1% and a lifetime of 1 and 3 years, respectively. The procedure for determining conductivity was developed in collaboration with DFM. Many metrological institutes choose Hamilton standards because of their unprecedented stability and independent verification by PTB. During an interlaboratory test among prestigious European metrological institutes (PTB, DFM, DAkkS) Hamilton standards were used as measurement solutions.

Hamilton offers conductivity standards whose stability of ±1% is guaranteed over a lifetime of up to 3 years. They can be used repeatedly under the condition that the bottle is not left open for more than 1 hour in total.

A representative number of bottles from every batch are measured by DFM. Their value is recorded on the calibration certificate and on every bottle. DFM enjoys the highest prestige in Europe in the area of electrolytic conductivity and is equipped with an absolute measurement cell that was developed in collaboration with NIST, and is accredited by the Danish accreditation agency DANAK to a conductivity of 0.9 µS/cm. DFM and NIST have made comparisons of their measurement uncertainty and have confirmed in a series of scientific publications that the measurement accuracy is in each case the same. Because no primary standards exist in the low conductivity range, measurements depend on absolute measurement cells which trace electrical conductivity back to the SI units: meter and volt. Testing of Hamilton standards is thus carried out on the most precise measurement apparatus in the world, and certified accordingly.

Unique advantages:
- Remains stable for a minimum of 1 year for 1.3 µS/cm, and up to 3 years for all other values
- Certificate with calibration document from DFM (available at www.hamiltoncompany.com)
- Expiration date shown on every bottle
- Bottles are permitted to stay open for a total of 60 minutes

Stability of the Hamilton 5µS/cm Conductivity Standard over 36 months

Check measurement by PTB

<table>
<thead>
<tr>
<th>Conductivity (µS/cm)</th>
<th>Time in storage (months)</th>
<th>Tolerance: 5µS/cm ± 1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 µS/cm</td>
<td>±1%</td>
<td>12 DFM Glass bottle 300 mL 238973</td>
</tr>
<tr>
<td>5 µS/cm</td>
<td>±1%</td>
<td>36 DFM Glass bottle 300 mL 238926</td>
</tr>
<tr>
<td>15 µS/cm</td>
<td>±1%</td>
<td>36 DFM Glass bottle 300 mL 238927</td>
</tr>
<tr>
<td>84 µS/cm</td>
<td>±1%</td>
<td>18 DFM Cappack bottle 500 mL 238964</td>
</tr>
<tr>
<td>100 µS/cm</td>
<td>±1%</td>
<td>36 DFM Glass bottle 300 mL 238934</td>
</tr>
<tr>
<td>147 µS/cm</td>
<td>±1%</td>
<td>18 DFM Cappack bottle 500 mL 238985</td>
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<td>706 µS/cm</td>
<td>±2%</td>
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<td>1413 µS/cm</td>
<td>±1%</td>
<td>36 DFM Glass bottle 300 mL 238928</td>
</tr>
<tr>
<td>1413 µS/cm</td>
<td>±1%</td>
<td>18 DFM Cappack bottle 500 mL 238986</td>
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<tr>
<td>12880 µS/cm</td>
<td>±1%</td>
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<tr>
<td>100 mS/cm</td>
<td>±1%</td>
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</tr>
</tbody>
</table>

1) DFM: Danish Institute of Fundamental Metrology, Dänemark
2) PTB: Physikalisch-Technische Bundesanstalt, Braunschweig
3) DAkkS: Deutsche Akkreditierungsstelle
4) NIST: National Institute of Standards and Technology, Gaithersburg MD, USA

1) in months after date of manufacturing
Oxygen Accessories

**OxyFerm Membrane Kit**
The OxyFerm Membrane Kit contains 3 membrane bodies, Oxylyte electrolyte, pipette, spare o-ring and a polishing strip.

**Membrane Kit FDA**
The Membrane Kit FDA is the kit for the OxyFerm FDA sensors and contains 3 FDA membrane bodies, Oxylyte electrolyte, pipette, spare o-ring and a polishing strip. The membrane body of the FDA membrane has a special rounded design to prevent accumulation of gas bubbles.

**Membrane Kit CIP**
The Membrane Kit CIP contains 3 membrane bodies that are especially designed to withstand CIP cleanings. Oxylyte electrolyte, pipette, spare o-ring and a polishing strip.

**OxyGold Membrane Kit**
The OxyGold Membrane Kit contains 3 membrane bodies with the rounded design, pipette and a spare o-ring. Electrolyte must be ordered separately to match the sensor (see page 95).

**Polarization Module**
The Polarization Module is to prepare replacement sensors so that they can be used immediately for measurements without connection to a transmitter. It polarizes the oxygen sensors and saves polarization time at the transmitter.

**Autoclavation Cap**
The Autoclavation Cap is used to protect the OxyFerm T82 connector from moisture during autoclavation. It is important to keep connections dry and clean to ensure reliable measurements.

Electrolytes and Solutions

**Electrolytes for pH Sensors**
- 3 M KCl 100 mL Ref 238036
- 3 M KCl 500 mL Ref 238936
- Skylyte-CL 100 mL Ref 242080
- Protelyte 100 mL Ref 238038
- 3 M KCl LR 500 mL Ref 238939
- Skylyte 500 mL Ref 238937

**Electrolytes for Oxygen Sensors**
- OxyGold Oxylyte G 30 mL Ref 237139
- OxyGold Oxylyte B 30 mL Ref 237138
- OxyFerm Oxylyte 30 mL Ref 237118

**Storage Solution**
In order to achieve long sensor life and faster electrode response times, it is recommended to store electrodes in our storage solution. It is an acid-buffered solution that ensures the regeneration of the electrode in addition to provide an optimized storage.

**Cleaning Solution Set**
Depending on the type of application, the pH glass or diaphragm can get contaminated through various ingredients of the measuring solution. This is indicated by a slow response of the electrode, or even incorrect readings. To overcome these problems, Hamilton has developed a cleaning solution set. The intention is to have an overall cleaning of the pH glass as well as the diaphragm. The set is comprised of Cleaning Solution A, Cleaning Solution B and a storage solution. To clean the electrode put it into each solution for 15 – 30 minutes, and your electrode will be ready for new measurements again.

**Ref**
- 237123
- 237140
- 237126
- 237370
- 237350
- 237360
- 237306
- 237427
- 237437
- 242000
- 238036
- 238936
- 242080
- 238038
- 238939
- 238937
- 237139
- 237138
- 237118
- 238931
- 238290
- 237306
- 237427
- 237437
- 242000
- 238036
- 238936
- 242080
- 238038
- 238939
- 238937
- 237139
- 237138
- 237118
- 238931
- 238290
Cables for traditional and Memosens Sensors

For sensors with standard (S7) connector. Device side no connector (open end).

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>5 mm</td>
<td>355072</td>
</tr>
<tr>
<td>5 m</td>
<td>5 mm</td>
<td>355066</td>
</tr>
<tr>
<td>10 m</td>
<td>5 mm</td>
<td>355080</td>
</tr>
</tbody>
</table>

For sensors with standard (S7) connector. Device side BNC connector.

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3 mm</td>
<td>355043</td>
</tr>
<tr>
<td>3 m</td>
<td>3 mm</td>
<td>355057</td>
</tr>
<tr>
<td>5 m</td>
<td>3 mm</td>
<td>355056</td>
</tr>
</tbody>
</table>

For sensors with standard (S7) connector. Device side DIN connector.

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>3 mm</td>
<td>355045</td>
</tr>
<tr>
<td>3 m</td>
<td>3 mm</td>
<td>355059</td>
</tr>
</tbody>
</table>

For sensors with K8 connector. Device side no connector (open end).

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>5 mm</td>
<td>355153</td>
</tr>
<tr>
<td>3 m</td>
<td>5 mm</td>
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<tr>
<td>5 m</td>
<td>5 mm</td>
<td>355155</td>
</tr>
<tr>
<td>10 m</td>
<td>5 mm</td>
<td>355156</td>
</tr>
</tbody>
</table>

For sensors with VP 6 connector. VP 6 single coaxial cable. Device side no connector (open end).

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>5 mm</td>
<td>355157</td>
</tr>
<tr>
<td>2 m</td>
<td>5 mm</td>
<td>355158</td>
</tr>
<tr>
<td>3 m</td>
<td>5 mm</td>
<td>355159</td>
</tr>
</tbody>
</table>

For sensors with T82/D4 connector, e.g. OxyFerm. Device side no connector (open end).

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>7,5 mm</td>
<td>355108</td>
</tr>
<tr>
<td>3 m</td>
<td>7,5 mm</td>
<td>355109</td>
</tr>
<tr>
<td>5 m</td>
<td>7,5 mm</td>
<td>355110</td>
</tr>
<tr>
<td>10 m</td>
<td>7,5 mm</td>
<td>355111</td>
</tr>
<tr>
<td>20 m</td>
<td>7,5 mm</td>
<td>355112</td>
</tr>
</tbody>
</table>

For sensors with Memosens connector. Device side no connector (open end).

<table>
<thead>
<tr>
<th>Length</th>
<th>Diameter</th>
<th>Ref</th>
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</thead>
<tbody>
<tr>
<td>1 m</td>
<td>6,3 mm</td>
<td>355360</td>
</tr>
<tr>
<td>2 m</td>
<td>6,3 mm</td>
<td>355361</td>
</tr>
<tr>
<td>3 m</td>
<td>6,3 mm</td>
<td>355362</td>
</tr>
<tr>
<td>5 m</td>
<td>6,3 mm</td>
<td>355352</td>
</tr>
</tbody>
</table>
Cables for Intelligent Sensors

Connection for Industrial Processes e.g. Production (see page 13)

**VP8**

Compatible with:
- VisiFerm DO family
- pH Arc family
- ORP Arc Sensors
- UPW Arc Sensors
- Conducell UPW Arc Sensors
- eDO Arc Sensor (e.g. OxyFerm FDA Arc)

Compatible with:
- > VisiFerm DO ECS family
- > pH Arc family
- > ORP Arc family
- > Arc Sensors (Note: does not support VisiPro DO and VisiTrace DO family)

**M12-4 Pole**

Compatible with:
- VisiPro DO family
- VisiTrace DO family

**Arc Wi 2G Adapter BT**

**M12-8 Pole**

**Power Cables for Bio Controllers**

Connection for old Bio Controllers or Transmitters in R&D (see page 15)

**VP8**

Compatible with:
- VisiFerm DO ECS family

**Arc ECS Adapter pH/ORP**

Compatible with:
- pH Arc family
- ORP Arc family

**Arc USB Power Cable**

Compatible with:
- Arc Sensors (Note: does not support VisiPro DO and VisiTrace DO family)

**M12-4 Pole**

Compatible with: VisiPro DO family / VisiTrace DO family

**VP8**

Compatible with: VisiFerm DO family

**T82/D4**

Compatible with: VisiFerm T82/D4 Power Adapter

The code XX in the product number defines the type of electrical power connector:
- 01 – Power cord EU / 02 – Power cord CH / 03 – Power cord US / 04 – Power cord UK / 05 – Power cord AU/NZ

Cables for Intelligent Sensors

Connection for Industrial Processes e.g. Production (see page 13)

**VP8**

Compatible with:
- VisiFerm DO family
- pH Arc family
- Conducell 4UxF family
- ORP Arc Sensors
- UPW Arc Sensors
- Conducell UPW Arc Sensors
- eDO Arc Sensor (e.g. OxyFerm FDA Arc)

Compatible with:
- > VisiFerm DO family only
- > pH Arc family
- > ORP Arc family

**M12-4 Pole**

Compatible with:
- VisiPro DO family
- VisiTrace DO family

**Arc Wi 2G Adapter BT**

**M12-8 Pole**

**Power Cables for Bio Controllers**

Connection for old Bio Controllers or Transmitters in R&D (see page 15)

**VP8**

Compatible with:
- VisiFerm DO ECS family

**Arc ECS Adapter pH/ORP**

Compatible with:
- pH Arc family
- ORP Arc family

**Arc USB Power Cable**

Compatible with:
- Arc Sensors (Note: does not support VisiPro DO and VisiTrace DO family)

**M12-4 Pole**

Compatible with: VisiPro DO family / VisiTrace DO family

**VP8**

Compatible with: VisiFerm DO family

**T82/D4**

Compatible with: VisiFerm T82/D4 Power Adapter

The code XX in the product number defines the type of electrical power connector:
- 01 – Power cord EU / 02 – Power cord CH / 03 – Power cord US / 04 – Power cord UK / 05 – Power cord AU/NZ
Arc Accessories

Arc View Mobile
This mobile device empowers the operator to monitor measurement values, calibrate Arc sensors and configure various parameters with a unified user interface for pH, DO, Conductivity and ORP. The Arc View Mobile device is based on the Samsung Galaxy Tab Active tablet and comes pre-configured with the ArcAir application, app blocker application, power supply cable, instruction manual and Hamilton quick guide.

Modbus Profibus Converter
The Deutschmann Urignat® CL Module converts the Modbus protocol of the Arc and VisiFerm DO sensors into the Profibus DP protocol. All Arc parameters DO, pH, ORP and conductivity are supported. The conversion script is pre-installed.

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus Profibus Converter</td>
<td>243555</td>
</tr>
<tr>
<td>Modbus Profibus Programmer’s Manual</td>
<td>624719</td>
</tr>
</tbody>
</table>

Arc Wireless Converter BT

Designed for wireless communication between HDM (Hamilton Device Manager) and VisiPro DO Ex.

| Ref | 243499 |

Arc Wi 1G Adapter BT

The Arc Wi 1G Adapter BT is expanding the functionality of Arc sensors by providing wireless communication wire Bluetooth® 4.0 for local monitoring all analog and digital signals are bypassed through the Arc Wi 1G Adapter BT.

| Ref | 243460 |

Arc Wi 2G Adapter BT

The Arc Wi 2G adapter is expanding the functionality of Arc sensors by providing wireless communication for local monitoring in parallel to robust 4-20 mA signal, and simple sensor connection to the PCS with additional internal galvanic isolator for an enhanced signal quality.

| Ref | 243470 |

Hamilton Customized Products

Customized products for our customers’ special needs
The adaptation of standard products to customer’s special needs is the main focus of our application engineering team. Customizing can include modifications to length, insertion depth, process adaptation of the sensor or changing the housing to a different material. Many more adaptions are possible.

Customized products for our customers’ special needs
The adaptation of standard products to customer’s special needs is the main focus of our application engineering team. Customizing can include modifications to length, insertion depth, process adaptation of the sensor or changing the housing to a different material. Many more adaptions are possible.

Need a custom housing or sensor? The Hamilton Customized Product Team is happy to help design products for your specific application. Give us a call to learn more.
Transmitter H100

The H100 is a transmitter for universal use in the chemical industry, power stations, biotechnology, food processing and pharmaceutical industries as well as in water/wastewater treatment. Icons guide the operator and show the sensor status.

Sensor failures are detected, shown on the display and an alarm is set. Calibration can be done manually or by selecting standard calibration media. After each calibration the sensor data will be shown and evaluated. The H100 is easy to handle and can be mounted on the wall as well as on a panel.

User friendly, robust and reliable

Easy to install, operate and calibrate
- Large terminal compartment and pre-assembled rear unit for easy installation.
- The large display and intuitive menu structure ensure straightforward navigation.
- Icons supply operating messages and signal unusual states.
- Simple calibration with automatic buffer recognition.

Robust design
- Optional protective hood for additional protection against weather exposure and mechanical damage.
- Wall, post/pipe, or panel mounting possible with optional panel- or pipe-mount kit.

Reliable instrument for process applications
- The sensor status and potential defects are continuously monitored for real time display of error or alarm.
- Asymmetry potential, slope and response time are evaluated during calibration through the sensor lifetime for preventive maintenance indication.
- The integrated calibration timer automatically indicates when calibration is required.

Transmitter H100 pH

Specifications
- Measured variable: pH, mV and temperature
- Measuring range (pH / OPR): -1500 – +1500 mV
- Display range pH: -2.00 – 16.00
- Measuring error: <0.02 pH, <1 mV
- Temperature input: Pt 100, Pt 1000, NTC 30 kOhm
- Temperature measuring range: -20.0 – +150 °C
- Temperature resolution: 0.1 °C
- Calibration: 1 point, 2 point and product calibration
- Power supply: 24 – 230 V AC/DC
- Display: LC display, 7-segment with icons
- Ambient temperature: -20 – 55 °C
- Relative humidity: 80 % at temperatures up to 55 °C
- Ingress protection: IP 65, NEMA 4X
- Alarm contact: Yes
- Hold mode: Yes
- FM: Ni Class I, Div 2 Group A, B, C, D, T4 Ta = 55 °C; Type 2
  Ni Class I, Zone 2 Group II, T4 Ta = 55 °C; Type 2

Ordering Information
- Type: H100 pH
- Ref: 243080-01

Accessories
- Pipe-mount kit Ref 243082
- Panel-mount kit Ref 243083
- Protective hood Ref 243084
Transmitter H100 Cond

**Specifications**
- **Measured variable**: Conductivity, resistivity, concentration, salinity, temperature
- **Measuring range conductivity**: 0 – 999.9 mS/cm
- **Effective range conductivity**: 0.2 µS/cm – 1020 mS/cm
- **Measuring range resistivity**: 0.00 – 99.99 MΩ x cm
- **Effective range resistivity**: 0.2 µS/cm – 1000 MΩ x cm
- **Measuring range concentration**: 0.00 – 20.00 g/l / 0.00 – 20.00 ppm
- **Effective range concentration**: 0.00 – 20.00 g/l / 0.00 – 20.00 ppm
- **Temperature input**: Pt 100, Pt 1000, NTC 30 kOhm
- **Temperature measuring range**: -20.0 – +150 °C
- **Temperature resolution**: 0.1 °C
- **Power supply**: 24 – 230 V AC/DC
- **Display**: LC display, 7-segment with icons
- **Ambient temperature**: -20 – 55 °C
- **Relative humidity**: 80 % at temperatures up to 55 °C
- **Ingress protection**: IP 65, NEMA 4X
- **Alarming**: Yes
- **Hold mode**: Yes
- **FM**: Ni Class I, Div 2 Group A, B, C, D, T4 Ta = 55 °C; Type 2
  - Ni Class I, Zone 2 Group IIIC, T4 Ta = 55 °C; Type 2

**Accessories**
- Pipe-mount kit Ref 243082
- Panel-mount kit Ref 243083
- Protective hood Ref 243084

**Mounting plan**
- All dimensions in mm

---

Transmitter H100 DO

**Specifications**
- **Measured variable**: DO saturation, DO concentration
- **Measuring current**: -2 – 1800 nA
- **O2 resolution**: 0.05 nA
- **O2 saturation**: 0 – 200 %
- **O2 concentration**: 0.00 – 20.00 mg/l / 0.00 – 20.00 ppm
- **Polarization voltage**: 0 – 1000 mV (User-defined)
- **Salinity correction**: 00.00 – 45.00 g/kg (User-defined)
- **Measuring error**: < 0.5 % meas. val. + 0.5 %
- **Temperature input**: NTC 22 kOhm, NTC 30 kOhm
- **Temperature measuring range**: -20.0 – +150 °C
- **Temperature resolution**: 0.1 °C
- **Power supply**: 24 – 230 V AC/DC
- **Display**: LC display, 7-segment with icons
- **Ambient temperature**: -20 – 55 °C
- **Relative humidity**: 80 % at temperatures up to 55 °C
- **Ingress protection**: IP 65, NEMA 4X
- **Alarm contact**: Yes
- **Hold mode**: Yes
- **FM**: Ni Class I, Div 2 Group A, B, C, D, T4 Ta = 55 °C; Type 2
  - Ni Class I, Zone 2 Group IIIC, T4 Ta = 55 °C; Type 2

**Accessories**
- Pipe-mount kit Ref 243082
- Panel-mount kit Ref 243083
- Protective hood Ref 243084

**Mounting plan**
- All dimensions in mm
Transmitter H220X family

Hamilton H220X Transmitters combine ease of use and reliability. They are available in different configurations: Analog pH / ORP, Conductivity and inductive Conductivity as well as Memosens® pH and Oxygen.

It has been designed for universal process application including use in pharmaceutical, chemical, food & beverage industries as well as water / waste water treatment. The self-explaining user interface ensures comfortable and intuitive handling. Hamilton H220X transmitters provide continuous sensor monitoring and preventive maintenance indication for maximal reliability. The Memosens® Technology allows plug & play with pre-calibrated Memosens® sensors. Predictive maintenance system detects when a sensor has to be cleaned, calibrated or replaced.

Perfectly designed for hazardous areas and the Memosens® technology

Easy to install, operate and calibrate
- The large display and intuitive menu structure ensure straightforward navigation
- Simple calibration with automatic buffer recognition
- Memosens® sensors can be connected for even more simple handling

Robust design
- Suitable for Explosions protected areas (Ex II 1) 2G Ex ib [ia Ga] IX T6/T4 Gb
- Wall, post/pipe, or panel mounting possible
- Transmitter suitable for pollution degree 3

Reliable instrument for process applications
- Sensor status and potential defects are continuously monitored; errors and alarms are displayed in real time
- Asymmetry potential, slope and response time are evaluated during calibration through the sensor lifetime for preventive maintenance indication
- User-guided commissioning, graphic display and plain text guidance for maximum operating safety

The Transmitter H220X is available for the following parameters
- pH / ORP analog
- pH / ORP Memosens
- Conductive Conductivity analog
- Conductivity Inductive analog
- eDO Memosens

More info about measuring ranges, temperature ranges, input and output signals can be found on the Hamilton website.

Transmitter H220X Family Structure

<table>
<thead>
<tr>
<th>Code</th>
<th>Sensor Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conductivity, Conductive Sensor</td>
</tr>
<tr>
<td>2</td>
<td>Conductivity, Inductive Sensor</td>
</tr>
<tr>
<td>3</td>
<td>Digital, Memosens pH, ORP</td>
</tr>
<tr>
<td>4</td>
<td>Digital, Memosens eDO</td>
</tr>
<tr>
<td>5</td>
<td>pH or ORP (analog)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Standard Version</td>
</tr>
<tr>
<td>2</td>
<td>Advanced Version</td>
</tr>
</tbody>
</table>

243081 – Order Code

Mounting plan

All dimensions in mm
Different processes have different requirements for sensors to provide an accurate and reliable measurement. Being in contact with the media is the most important one. In order to meet the different requirements, Hamilton has developed various kinds of housings and armatures: static, retractable, pressurizable, pneumatic, manual, weld-in and hygienic sockets.

No matter what type of housing is needed for a pipe or a vessel, on the following pages the right one for each application can be found.
FlexiFit

The FlexiFit housings are designed for 120 mm sensors in different kinds of industries. A variety of process connections ensure the usability in the chemical industry as well as in hygienic processes. All FlexiFit have EPDM o-rings and the electropolished surface quality (Ra < 0.4 µm) quality is shown on a certificate. They are suitable for autoclavation, CIP and SIP procedures.

Benefits
- Easy installation and handling
- Various o-ring positions available
- ATEX approved
- Hygienic design

Ordering Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Process Connection</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlexiFit Bio</td>
<td>G 1½</td>
<td>237331-OP</td>
</tr>
<tr>
<td>FlexiFit U Bio</td>
<td>G 1½</td>
<td>237380-OP</td>
</tr>
<tr>
<td>FlexiFit TC 150-33</td>
<td>TC 1.5”</td>
<td>237341</td>
</tr>
<tr>
<td>FlexiFit VV-0</td>
<td>Varvent®</td>
<td>237344</td>
</tr>
<tr>
<td>FlexiFit VV-15</td>
<td>Varvent®</td>
<td>237345</td>
</tr>
</tbody>
</table>

Specifications

- Wetted parts: Stainless Steel 1.4435
- O-ring material: EPDM (FDA approved)
- O-ring position: 22 mm – 55 mm (G 1¼)
- Pressure range (relative to ambient): 0 – 6 bar
- Temperature range: -10 – 140 °C
- Sensor thread: PG 13.5
- Sensor a-length: 120 mm
- Surface finish: Ra < 0.4 µm (N5 electropolished)
- ATEX approval: CE 0035 II 1/2 G Ex ia llC T4/T5/T6

Other designs and materials available on request.

Dimensional drawing / FlexiFit

FlexiFit VV-0

FlexiFit Bio

Accessories

- Service Kit FlexiFit Bio Ref 237366
- Service Kit FFKM Ref 237319
- Service Kit FKM Ref 237219

Safety Socket see page 136
The RetractoFit is a retractable armature designed for 225 mm sensors in industrial applications. It allows the operator to mount and dismount sensors while the process is running. Safe sensor handling during process is guaranteed because insertion into the vessel without a sensor is impossible so is removal while in the measuring position. It is easy to use and maintain: only one press on the red button is needed to move the sensor into or out of the process. All o-rings can easily be replaced by the operator without special tools. The RetractoFit is available in different versions.

When the housing with an Arc sensor, VisiPro DO (Ex), VisiTrace DO and protective sleeve the aperture (hole) in the protective sleeve must be enlarged or the housing has to be used without the protective sleeve. Wireless adapters on top of Arc sensors can only be used without the protective sleeve.

Benefits
- Integral safety mechanism
- Sensor can be withdrawn from the process for cleaning, calibration or replacement
- Easy maintenance
- 3.1 material certificate included

Ordering Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Process Connection</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>RetractoFit</td>
<td>G 1½</td>
<td>237240</td>
</tr>
<tr>
<td>RetractoFit PEEK 25</td>
<td>G 1½</td>
<td>237490</td>
</tr>
</tbody>
</table>

Specifications

| Wetted parts           | RetractoFit: Stainless Steel 1.4571  
RetractoFit PEEK: PEEK (FDA approved) |
| O-ring material        | FKM |
| O-ring position        | RetractoFit: 22.5 mm  
RetractoFit PEEK: 25 mm |
| Pressure range (relative to ambient) | 0 – 6 bar |
| Temperature range      | -10 – 130 °C |
| Sensor thread          | PG 13.5 |
| Sensor a-length        | 225 mm |
| Surface finish         | RetractoFit: Ra < 0.4 µm (N5 electropolished)  
RetractoFit PEEK: CE 0035 ll 1/2 G Ex ia IIC T4/T5/T6 |
| ATEX approval          | RetractoFit: CE 0035 ll 1/2 G Ex ia IIC T4/T5/T6 |

Dimensional drawings / RetractoFit

<table>
<thead>
<tr>
<th>Dimensional drawings / RetractoFit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance position</td>
</tr>
<tr>
<td>Measuring position</td>
</tr>
</tbody>
</table>

Accessories

- Service Kit RetractoFit Ref 237239
- FFKM Kit RetractoFit Ref 237339
- Insertion tube short Ref 237255

Safety Socket see page 136
RetractoFit Bio

The RetractoFit Bio is a retractable housing designed for 225 mm sensors in hygienic applications in the biotechnology, food & beverage and the pharmaceutical industry. It allows the operator to mount and dismount sensors while the process is running. Safe sensor handling during the process is guaranteed because insertion into a vessel without sensor is impossible so is removal while in the measuring position. It is easy to use and maintain: only one press on the red button is needed to move the sensor into or out of the process. All o-rings can be easily be replaced by the operator without special tools.

“Did you know… that the RetractoFit Bio has a special rinsing chamber with angled connections for cleaning solutions and special inlet construction guarantees an entire cleaning of the chamber through a swirl effect.”

Benefits
- Integral safety mechanism
- Sensor can be withdrawn from the process for cleaning, calibration or replacement
- Special hygienic design of cleaning chamber
- Easy maintenance

Specifications
- Wetted parts: Stainless Steel 1.4435
- O-ring material: EPDM (FDA approved)
- O-ring position: 22 mm and 55 mm
- Pressure range (relative to ambient): 0 – 6 bar
- Temperature range: -10 – 140 °C
- Sensor thread: PG 13.5
- Sensor a-length: 225 mm
- Surface finish: Rₐ < 0.4 µm (N5 electropolished)
- ATEX approval: CE 0035 ll 1/2 G Ex ia IIC T4/T5/T6

Ordering Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Process Connection</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>RetractoFit Bio 25</td>
<td>G 1¼</td>
<td>237480</td>
</tr>
<tr>
<td>RetractoFit Bio 55</td>
<td>G 1¼</td>
<td>237440</td>
</tr>
</tbody>
</table>

Accessories
- FDA Service Kit Ref 237338
- Safety Socket see page 136
Retractex B

The retractable pneumatic or manual housing Retractex B was designed for sanitary applications in biotechnology, food & beverage and pharmaceutical industry. The compact design with a stroke of only 36 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place, including the space between the socket and rinsing chamber. The Retractex B with its patented HyCIP cleaning principle offers the best available cleaning efficiency for Ingold sockets (G 1¼”). It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. It is available with various process connections that can be used with all vessels used in these branches.

How does the HyCIP process connection work?

In cleaning position, the sensor can be cleaned and sterilized together with all wetted seals. In the HyCIP connection the cleaning solution is directed between armature and socket up to the process seal so the most remote parts of the chamber are rinsed. Thus HyCIP housings are unmatched for their cleaning performance of the sensor and of all relevant seals.

Benefits

► Extremely compact design
► Integrated safety concept: no sensor – no insertion
► Very low maintenance
► Sterile safety and unique cleaning efficiency with HyCIP

Specifications

<table>
<thead>
<tr>
<th>Code</th>
<th>Material (wetted parts)</th>
<th>Sealing Material (wetted sealings)</th>
<th>Sensor</th>
<th>Process Connection</th>
<th>Cleaning Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stainless Steel 1.4404</td>
<td>EPDM/FDA USP class VI (elastomer certificate included)</td>
<td>225 mm PG 13.5 Gel-filled</td>
<td>Ingold (G 1¼”) o-Ring Position 28 mm</td>
<td>G ¼” thread female</td>
</tr>
<tr>
<td>2</td>
<td>FKM</td>
<td></td>
<td></td>
<td>Varivert N DN 40-125</td>
<td>G 1¼” thread female</td>
</tr>
<tr>
<td>0</td>
<td>special</td>
<td></td>
<td></td>
<td>TriClamp 1.5” (OD Ø 40,5 mm)</td>
<td>¼” NPT female</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TriClamp 2” (OD Ø 64 mm)</td>
<td>TriClamp ¼”</td>
</tr>
<tr>
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Ordering Information

Ref

<

Order Code

How does the HyCIP process connection work?

In cleaning position, the sensor can be cleaned and sterilized together with all wetted seals. In the HyCIP connection the cleaning solution is directed between armature and socket up to the process seal so the most remote parts of the chamber are rinsed. Thus HyCIP housings are unmatched for their cleaning performance of the sensor and of all relevant seals.

Benefits

► Extremely compact design
► Integrated safety concept: no sensor – no insertion
► Very low maintenance
► Sterile safety and unique cleaning efficiency with HyCIP
Retractex BC Steel

The retractable pneumatic or manual housing Retractex BC is designed for applications in the chemical industry. The compact design with a stroke of only 36 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. The Retractex BC comes with a G 1¼" process connection and is available with two different o-ring positions.

Cleaning of the Retractex BC?
In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits
- Extremely compact design
- Integrated safety concept: no sensor – no insertion
- Very low maintenance
- Sterile safety and unique cleaning efficiency with HyCIP

Ordering Information

### Specifications

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<thead>
<tr>
<th>Wetted parts</th>
<th>Stainless Steel 1.4404 or 2.4602</th>
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<tr>
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<td>EPDM (FDA approved) or FKM or FFKM</td>
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<td>0 – 16 bar (120 °C), 10 bar (140 °C)</td>
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<td>Temperature range</td>
<td>-10 – 140 °C</td>
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<td>Sensor a-length</td>
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<td>Surface finish</td>
<td>R₆ &lt; 0.8 µm (N6)</td>
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<td>ATEX approval</td>
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### Ordering Information

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<td>3</td>
<td>¼&quot; NPT female</td>
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</table>
Retractex BC Plastic

The retractable pneumatic or manual housing Retractex BC was designed for applications in the chemical industry. The compact design with a stroke of only 36 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. The Retractex BC comes with a G 1¼" process connection and is available with two different o-ring positions.

Cleaning of the Retractex BC?
In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits
► Extremely compact design
► Integrated safety concept: no sensor – no insertion
► Very low maintenance
► Easy installation of the pneumatic armature with color coded connectors
► Choice of 3 different plastics

Specifications
- Wetted parts: PVDF or PEEK or PP
- O-ring material: EPDM (FDA approved), FKM or FFKM
- Pressure range (relative to ambient): 0 – 16 bar (120 °C), 10 bar (140 °C)
- Temperature range: -10 – 140 °C
- Sensor a-length: 225 mm
- Surface finish: Rₐ < 0.8 µm (N6)
- ATEX approval: Conform to DIN EN 13463-1

Ordering Information

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PTFE Scraper

USP Class VI
FMD
CE
Retractex C Steel

The retractable pneumatic or manual housing Retractex C was designed for applications in the chemical industry. The compact design with a stroke of only 36 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g., no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. It is available with various process connections that can be used with all vessels used in this branch.

Cleaning of the Retractex C?

In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits

► Extremely compact design
► Integrated safety concept: no sensor – no insertion
► Very low maintenance
► Easy installation of the pneumatic armature with color coded connectors

Specifications

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<td>Temperature range</td>
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<td>Sensor a-length</td>
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<tr>
<td>Surface finish</td>
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Ordering Information

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<td>Flange DN50 PN16</td>
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<tr>
<td>4</td>
<td>Flange ANSI 1½&quot; 150lbs</td>
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<tr>
<td>5</td>
<td>Flange ANSI 1½&quot; 150lbs</td>
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<td>6</td>
<td>Flange ANSI 2&quot; 150lbs</td>
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<td>3</td>
<td>½&quot; NPT female</td>
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<table>
<thead>
<tr>
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</tr>
<tr>
<td>0</td>
<td>special</td>
</tr>
</tbody>
</table>

USP Class VI

Did you know... that the pneumatic Retractex can be connected to the RetractoControl for even more comfortable handling?"
Retractex C Plastic

The retractable pneumatic or manual housing Retractex C was designed for applications in the chemical industry. The compact design with a stroke of only 36 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. It is available with various process connections that can be used with all vessels used in this branch.

Cleaning of the Retractex C?

In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits
  ▶ Extremely compact design
  ▶ Integrated safety concept: no sensor – no insertion
  ▶ Very low maintenance
  ▶ Easy installation of the pneumatic armature with color coded connectors
  ▶ Choice of 3 different plastics

Specifications

- Wetted parts: PVDF or PEEK or PP
- O-ring material: EPDM (FDA approved), FKM or FFKM
- Pressure range (relative to ambient): 0 – 16 bar (120 °C), 10 bar (140 °C)
- Temperature range: -10 – 140 °C
- Sensor a-length: 225 mm
- Surface finish: Ra < 0.8 µm (N6)
- ATEX approval: Conform to DIN EN 13463-1

Ordering Information

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<td>2</td>
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<td>FKM</td>
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<td>Flange ANSI 2”</td>
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Ref. Order Code
Retractex C Steel LT

The retractable pneumatic or manual housing Retractex C was designed for applications in the chemical industry. The compact design with a stroke of only 36 mm with an insertion depth up to 207 mm keeps wear on seals to a minimum and creates excellent reliability – day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. It is available with various process connections that can be used with all vessels used in this branch.

Cleaning of the Retractex C?

In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits
- Extremely compact design (only 36 mm stroke of insertion tube with an insertion depth of 207 mm)
- Integrated safety concept: no sensor – no insertion
- Very low maintenance
- Easy installation of the pneumatic armature with color coded connectors

Specifications

- Wetted parts: Stainless steel 1.4404 or 2.4602
- O-ring material: EPDM (FDA approved) or FKM or FFKM
- Temperature range (relative to ambient): 0 – 16 bar (120 °C), 10 bar (140 °C)
- Pressure range (relative to ambient): -10 – 140 °C
- Sensor a-length: 325 mm
- Surface finish: Rₐ < 0.8 µm (N6)
- ATEX approval: Conform to DIN EN 13463-1

Ordering Information

Retractable Housing: Retractex C Steel LT

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<th>Sealing Material (wetted sealings)</th>
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<th>Process Connection</th>
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Code Position switch
- 1 pneumatic / without for manual
- 0 special

Code Cleaning Connection
- 1 G ½" thread female
- 2 G ½" thread female
- 3 ½" NPT female
- 0 special

Code Order Code
- Ref
Retractex C Plastic LT

The retractable pneumatic or manual housing Retractex C was designed for applications in the chemical industry. The compact design with a stroke of only 36 mm with an insertion depth up to 207 mm keeps wear on seals to a minimum and creates excellent reliability - day and night, all year long. It can be cleaned easily and thoroughly in place. It is designed for 12 mm sensors and is equipped with several safety features (e.g. no sensor – no insertion, window to check seals for leakage etc.) to provide operator safety. It is available with various process connections that can be used with all vessels used in this branch.

Cleaning of the Retractex C?

In cleaning position, the sensor can be cleaned while the process is running. The advantage of the insertion tube is the short way for insertion. A PTFE scraper with o-ring guarantees that dirt stays outside of the armature and does not harm the o-ring.

Benefits

- Extremely compact design (only 36 mm travel of insertion tube with an insertion depth of 207 mm)
- Integrated safety concept - no sensor – no insertion
- Very low maintenance
- Easy installation of the pneumatic armature with color coded connectors

Specifications

- Wetted parts: PVDF or PEEK
- O-ring material: EPDM (FDA approved) or FKM or FFKM
- Pressure range (relative to ambient): 0 – 16 bar (120 °C), 10 bar (140 °C)
- Temperature range: -40 – 140 °C
- Sensor a-length: 325 mm
- Surface finish: Rₐ < 0.8 µm (N6)
- ATEX approval: Conform to DIN EN 13463-1

Ordering Information

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Cleaning Connection

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Position switch

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<tr>
<th>Code</th>
<th>Cleaning Connection</th>
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<tbody>
<tr>
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<td>pneumatic / without for manual</td>
</tr>
<tr>
<td>0</td>
<td>special</td>
</tr>
</tbody>
</table>

Order Code: Ref
The MasterFit is a housing for pressurizable pH sensors like the ChemoTrode types. The pressurization ensures a constant outflow of electrolyte. This helps to prevent clogging of the diaphragm and poisoning of the electrolyte. The MasterFit can be used in a huge variety of applications mainly in the chemical industry. The pressure inside the MasterFit can be controlled via a built-in manometer. Furthermore the liquid level of the electrode can be controlled through the coated glass body of the armature at any time.

**Benefits**
- Sealing feature prevents loss of pressure caused by soiling
- Pressure reduction on disassembly
- Various o-ring positions available
- Easy maintenance

**Specifications**
- Wetted parts: Stainless Steel 1.4435
- O-ring material: EPDM (FDA approved)
- O-ring position: 22 mm – 55 mm
- Pressure range (relative to ambient): 0 – 6 bar
- Temperature range: -10 – 130 °C
- Sensor a-length: 120, 150, 200 mm
- Surface finish: R<sub>a</sub> ≤ 0.8 µm (N6)
- ATEX approval: CE 0035 II 1/2 G Ex ia IIC T4/T5/T6

**Dimensional drawings / MasterFit 120**

**Ordering Information**

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<td>MasterFit 250</td>
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**Accessories**
- Pressure Adapter Ref 237252
- Service Kit for MasterFit Ref 237229
- FFKM Kit for MasterFit Ref 237319
- Flange Adapter for MasterFit* Ref 237810

* The Flange Adapter is used with a MasterFit 120 and a sensor with a shaft length of 150 mm

**Ordering Information**

- Flange Adapter for MasterFit* Ref 237810
- Service Kit for MasterFit Ref 237229
- FFKM Kit for MasterFit Ref 237319

* The Flange Adapter is used with a MasterFit 120 and a sensor with a shaft length of 150 mm
The RetractoMaster is a retractable housing for pressurizable sensors like the ChemoTrode. The pressurization ensures a constant outflow of electrolyte. This helps to prevent clogging of the diaphragm and poisoning of the electrolyte. It allows the operator to mount and dismount the sensors while the process is running. The pressure inside the RetractoMaster can be controlled via a built-in manometer. Only one press on the red button is needed to move the sensor into or out of the process. Safe sensor handling during process is guaranteed because insertion into a vessel without the sensor is impossible so is removal while in measuring position. O-rings can easily be replaced without special tools. Furthermore the liquid level of the electrode can be controlled through the coated glass body of the armature at any time. The RetractoMaster can be used in a huge variety of applications mainly in the chemical industry.

**Benefits**

- Sensor can be withdrawn from the process for cleaning, calibration or replacement
- Easy maintenance
- Long lifetime of the sensor due to pressurization of the sensor and the possibility to remove it while the process is running.
- 3.1 certificate included

**Ordering Information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Process Connection</th>
<th>Ref</th>
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</thead>
<tbody>
<tr>
<td>RetractoMaster</td>
<td>G 1¼</td>
<td>237250</td>
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</table>

**Specifications**

- Wetted parts: Stainless Steel 1.4571
- O-ring material: FKM
- O-ring position: 22.5 mm
- Pressure range (relative to ambient): 0 – 6 bar
- Temperature range: -10 – 130 °C
- Sensor a-length: 250 mm
- Surface finish: R_a < 0.4 µm (N5)
- ATEX approval: Conform to DIN EN 13463-1

**Accessories**

- **Pressure Adapter** Ref 237252
- **Safety Socket** see page 136
RetractoControl Plus

The RetractoControl is a control unit for a pneumatic Retractex used to clean a sensor automatically. The full power of the automatic cleaning system can be achieved with an Arc sensor because it can be built-in pre-calibrated. Analog sensors in combination with a transmitter can be used as well. The measurement and cleaning cycles can be programmed very easily according to the needs of the process. Thanks to automatically controlled cleanings the life time of the sensor can be extended and manpower can be saved.

Benefits
- Scheduled and unattended maintenance
- Easy interaction with process control system
- Menu based user interaction
- Manpower can be saved

Connection Plan with Arc Sensor

Connection Plan with Analog Sensor

Ordering Information

Automatic Control Unit for Retractables

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</tr>
<tr>
<td>2</td>
<td>for two cleaning solutions with drain port</td>
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<tr>
<td>3</td>
<td>special</td>
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<table>
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<tr>
<td>2</td>
<td>3 m length</td>
</tr>
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<td>3</td>
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<tr>
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<td>10 m length</td>
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<tr>
<td>2</td>
<td>Fastening angle Retractex</td>
</tr>
<tr>
<td>3</td>
<td>special</td>
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Specifications
- Ingress protection rating: IP 54
- Power: 24V DC 30 VA
- Air pressure: 4 – 6 bar

Accessories
- Wall Mounting Set (for plastic housing) Ref 242214
- Wall Mounting Set (for stainless steel housing) Ref 242212
- Post Mounting Set (for plastic and stainless steel housing) Ref 242213
- Cleaning valve set PVDF/FKM with 2 membrane-valves for one cleaning solution and one drain; connectors, PTFE-tubing and mounting brackets included Ref 242210
- Cleaning valve set PVDF/FKM with 3 membrane-valves for two cleaning solution and one drain; connectors, PTFE-tubing and mounting brackets included Ref 242211
Safety Socket

The Safety Sockets are hygienic weld-in sockets suitable for hygienic armatures like the FlexiFit Bio. They are available for 3 different o-ring positions to cover different standards. Furthermore you can choose between two kinds of stainless steel and two different angles. The Safety Socket narrows at the o-ring positions and it seals only if the o-ring of the armature is exactly at the right place. If the process is under pressure, a dripping process medium can be a strong hint that the armature should not be loosened entirely. Therefore the Safety Socket is suited for a wide variety of applications and installations.

Benefits

- Safety design, leakage before total release of the armature
- Hygienic surface finish
- 3 different o-ring positions and two different stainless steels available

Specifications

<p>| | | | |</p>
<table>
<thead>
<tr>
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<th></th>
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<td></td>
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<tr>
<td>O-ring material for blind plug</td>
<td>EPDM (FDA approved)</td>
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<td>0 – 50 bar</td>
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<td>Temperature range</td>
<td>-30 – 160 °C</td>
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<tr>
<td>Process connection</td>
<td>G 1½</td>
<td></td>
<td></td>
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<tr>
<td>Surface finish</td>
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<td>ATEX approval</td>
<td>Conform to DIN EN 13463-1</td>
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Ordering Information

- Blind plug 1.4404-25 Ref 242560
- Blind plug 1.4404-50 Ref 242562
- Blind plug 1.4404-55 Ref 242564

- Blind plug 1.4435-25 Ref 242565
- Blind plug 1.4435-50 Ref 242567
- Blind plug 1.4435-55 Ref 242569
- Blind Plug 1.4571-25 Ref 237230

Dimensional drawings

Type | Steel | Angle | OP | Ref
--- | --- | --- | --- | ---
Safety Socket | 1.4404 | 15 | 25 | 242570
Safety Socket | 1.4404 | 15 | 50 | 242571
Safety Socket | 1.4404 | 15 | 55 | 242572
Safety Socket | 1.4404 | 0  | 25 | 242573
Safety Socket | 1.4404 | 0  | 50 | 242574
Safety Socket | 1.4404 | 0  | 55 | 242575
Safety Socket | 1.4435 | 15 | 25 | 242576
Safety Socket | 1.4435 | 15 | 50 | 242577
Safety Socket | 1.4435 | 15 | 55 | 242578
Safety Socket | 1.4435 | 0  | 25 | 242579
Safety Socket | 1.4435 | 0  | 50 | 242580
Safety Socket | 1.4435 | 0  | 55 | 242581
Weld in socket | 1.4571 | 15 | 25 | 237202

Accessories

- Blind plug 1.4404-25 Ref 242560
- Blind plug 1.4404-50 Ref 242562
- Blind plug 1.4404-55 Ref 242564
- Blind plug 1.4435-25 Ref 242565
- Blind plug 1.4435-50 Ref 242567
- Blind plug 1.4435-55 Ref 242569
- Blind Plug 1.4571-25 Ref 237230
Hygienic Socket

The Hygienic Socket with its space saving design and simple sterilization is ideal to weld in fermenters or small pipes. The advantages are numerous for many other applications in tanks or pipes for water treatment and in the pharmaceutical and chemical industries. It is designed for 120 mm sensors and developed for easy installation and maintenance, improve the cleaning process and increase safety. Two “Live Guard” openings provide an indication of sealing failures. The sensor insertion depth can be varied for DO sensors by using the Hamilton DO Adapter.

Benefits
- Hygienic design because complete sensor installation with only one wetted o-ring
- Space saving
- Cost saving: Socket and Housing all in one
- Low maintenance and easy replacement of o-ring

Example for Installation

Insertion depth 0 to 55 mm

Specifications

<table>
<thead>
<tr>
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<th>Value</th>
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<tr>
<td>O-ring material</td>
<td>EPDM (FDA approved)</td>
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<tr>
<td>Pressure range (relative to ambient)</td>
<td>0 – 16 bar</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-10 – 140 °C</td>
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<tr>
<td>Sensor thread</td>
<td>PG 13.5</td>
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<tr>
<td>Sensor a-length</td>
<td>120 mm</td>
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<tr>
<td>Surface finish</td>
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<td>ATEX approval</td>
<td>Conform to DIN EN 13463-1</td>
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Example for Installation

Dimensional drawings

Ordering Information

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<th>Ref</th>
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</tr>
<tr>
<td>Hygienic Socket 1.4435</td>
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<td>242548</td>
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<td>Hygienic Socket 2.4602</td>
<td>242550</td>
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Accessories

- Hygienic Socket DO Adapter Ref 242538
- Replacement Kit Seal Pusher Ref 242532
- O-ring set EPDM Ref 242595
- Sensor Dummy Ref
- O-ring set FKM Ref 242596
- O-ring set Silicone Ref 242597
- O-ring set FFKM Ref 242598
Hamilton Flow-Through Cells are designed for measuring one or two parameters at a time. Possible combinations are pH/DO and pH/Conductivity. The measurement is done in bypasses when inline measurement is not possible due to small pipe dimensions. Application fields are biotechnology, water treatment and power plants, where reliable measurements have to be carried out in ion-weak media. There are two different sizes of the flow cells available.

**Benefits**
- Flexible design for one or two measuring points
- PEEK insert of high chemical resistance
- Low dead volume
- Self draining
- Internal aseptic clamp pipe connection

**Specifications**
- Wetted parts: Stainless Steel 1.4435, PEEK
- O-ring material for blind plug: EPDM (FDA approved)
- Pressure range: 0 – 16 bar
- Temperature range: -10 – 140 °C
- Sensor thread: PG 13.5
- Sensor a-length: 120 mm
- Process connection: TC 25, TC 50, Swagelok
- ATEX approval: Conform to DIN EN 13463-1

**Ordering Information**

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<th>Measuring position</th>
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<tr>
<td>2</td>
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<tr>
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<td>Conductivity and Oxygen</td>
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<td>Swagelok 6 mm</td>
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<td>6</td>
<td>Swagelok 1/2&quot;</td>
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<td>7</td>
<td>Swagelok 5/16&quot; *)</td>
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<td>8</td>
<td>Swagelok 11/16&quot;) *)</td>
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**Code** | **Pipe Connection** | **Order Code**  |
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<th>Measuring position</th>
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<tbody>
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<td>1</td>
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<td>only Conductivity or Oxygen</td>
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<td>3</td>
<td>pH and Conductivity or Oxygen</td>
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<td>4</td>
<td>Conductivity and Oxygen</td>
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<table>
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<th>Pipe Connection</th>
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<td>TC50 1&quot;</td>
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<td>3</td>
<td>TC50 1-1/2&quot;)</td>
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<tr>
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<td>FFKM (two measuring positions)</td>
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<td>3</td>
<td>FFKM (one measuring position)</td>
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<td>special</td>
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**Code** | **O-ring material** | **Order Code**  |
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**Accessories**
- O-ring kit Flow Cell TC25 Ref 237387
- O-ring kit Flow Cell TC50 Ref 237390
- Sensor Dummy 96 mm Ref 242540
  117 mm Ref 242563
The FlexiFlow is a flow-through cell. It can be used in all cases where pH or oxygen must be reliably measured in ion-weak media including coolant piping in power generating stations. The sample is fed into the cell from the bottom at a low flow speed, and out of the cell again at the side. A groove cut into the FlexiFlow allows it to easily be attached anywhere with commercially available screws.

Benefits

- Compact design
- Easy to attach to a plate
- For use in small pipes where sensors cannot be inserted directly
- Self draining

Specifications

- Wetted parts: Stainless Steel 1.4435
- O-ring material: EPDM (FDA approved)
- Pressure range: 0 – 16 bar (relative to ambient)
- Temperature range: -10 – 130 °C
- Sensor thread: PG 13.5
- Sensor a-length: 120 mm
- Process connection: Swagelok 10 mm
- ATEX approval: Conform to DIN EN 13463-1

Dimensional drawings

Ordering Information

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# Sensor Comparison

## pH or ORP sensor

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<th>Nominal measurement range</th>
<th>Recomm. measurement range</th>
<th>Reference system</th>
<th>Reference electrolyte</th>
<th>Diaphragm type</th>
<th>Recomm. min. conductivity (pF/cm)</th>
<th>Nominal temperature range (°C)</th>
<th>Recomm. temperature range (°C)</th>
<th>Nominal pressure max. (bar)</th>
<th>Upside down installation</th>
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<tr>
<td>ChemoTrode</td>
<td>PHI</td>
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<td>0 - 13</td>
<td>Everef-F</td>
<td>3M KCl-LR</td>
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<td>0 - 130</td>
<td>5 - 130</td>
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<td>ChemoTrode Bridge</td>
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<td>0 - 13</td>
<td>Everef-F</td>
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<td>0 - 130</td>
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<td>0 - 13</td>
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<td>0 - 14</td>
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<td>50</td>
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<td>0 - 14</td>
<td>2 - 12</td>
<td>Everef-L</td>
<td>Polisolve Plus Single Pore</td>
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<td>0 - 130</td>
<td>0 - 130</td>
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<td>only VP</td>
<td>Predecessor: Polilyte Plus, Polilyte HT</td>
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<tr>
<td>Polilyte Plus HB</td>
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<td>2 - 12</td>
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<td>Polisolve Plus Single Pore</td>
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<td>0 - 130</td>
<td>10</td>
<td>only VP</td>
<td>Predecessor: Polilyte HB</td>
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<td>EasyFerm Plus PHI</td>
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<td>HP Costramic</td>
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<td>EasyFerm Bio PHI</td>
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<td>2 - 13</td>
<td>Everef-F</td>
<td>Foodlyte</td>
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<tr>
<td>EasyFerm Bio HB</td>
<td>HB</td>
<td>0 - 14</td>
<td>2 - 13</td>
<td>Everef-F</td>
<td>Foodlyte</td>
<td>HP Costramic</td>
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## ORP Sensors

<table>
<thead>
<tr>
<th>ORP Sensors</th>
<th>pH glass type</th>
<th>Nominal measurement range</th>
<th>Recomm. measurement range</th>
<th>Reference system</th>
<th>Reference electrolyte</th>
<th>Diaphragm type</th>
<th>Recomm. min. conductivity (mV)</th>
<th>Nominal temperature range (°C)</th>
<th>Recomm. temperature range (°C)</th>
<th>Nominal pressure max. (bar)</th>
<th>Upside down installation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChemoTrode ORP</td>
<td>Platinum ring</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Everef-F</td>
<td>3M KCl-LR</td>
<td>HP ceramic</td>
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<td>0 - 130</td>
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<tr>
<td>EasyControl ORP</td>
<td>Platinum wire</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Ag/AgCl</td>
<td>Gel Ceramic</td>
<td>Ceramic</td>
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<td>0 - 60</td>
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<tr>
<td>OxyTrode PT</td>
<td>Platinum wire</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Everef</td>
<td>Viscous 3M KCl Ceramic</td>
<td>50</td>
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<td>Polyplast Rx</td>
<td>Platinum wire</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Everef-B</td>
<td>Polisolve Single Pore</td>
<td>50</td>
<td>-10 - 60</td>
<td>-10 - 60</td>
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<tr>
<td>EasyFerm Plus ORP</td>
<td>Platinum wire</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Everef-F</td>
<td>Pharmlyte</td>
<td>HP Costramic</td>
<td>100</td>
<td>0 - 140</td>
<td>5 - 140</td>
<td>6</td>
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<tr>
<td>Polilyte Plus ORP</td>
<td>Platinum ring</td>
<td>± 2000 mV</td>
<td>± 2000 mV</td>
<td>Everef-L</td>
<td>Polisolve Plus Single Pore</td>
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<td>0 - 130</td>
<td>0 - 130</td>
<td>10</td>
<td>only VP</td>
<td>Arc: ± 1500 mV/ Arc: ± 1500 mV, 0 to 16 bar at 100 °C, 0 to 3 bar at 140 °C</td>
<td></td>
</tr>
</tbody>
</table>
Marking sensors or housings for ATEX / IECEx is as follows:

Example OxyFerm FDA

Gas:
CE 0035 II 1/2 G ia IIC T4/T5/T6 Ga/Gb

Dust:
CE 0035 II 1/2 D ia IIIC T x °C Da/Db

The temperature value x in dust atmospheres needs to be calculated.

Many industrial processes are in hazardous environments and require suitable equipment with the European ATEX or the global IECEx approval. Hamilton provides safe sensors and housings since many years for these applications. In case a gas atmosphere and a dust atmosphere are or could be present at the same time, the risk of explosion must be examined carefully and special precautions may be necessary. Typical gas atmospheres can be found in oil refineries, printing industries and biogas plants. Dust atmospheres can be found in underground coalmines, woodworking areas and in all kind of mills. In the chemical industry both atmospheres can be found.

ATEX is the widely used synonym for the ATEX directives of the European Union. ATEX stands for the French abbreviation «ATmosphère EXplosible». The objective of ATEX is to ensure the free movement of goods throughout the European Union, by offering one harmonized compliance procedure accepted by all EU countries. This means that different national standards within the EU are obsolete. ATEX covers equipment only. Equipment for hazardous areas requires an ATEX approval when sold within the European Union.

The IECEx system is a conformity assessment system of the International Electrical Commission (IEC). It is the objective of the IECEx system to facilitate international trade in equipment and services. Currently Australia, New Zealand, and Singapore accept the IECEx certificate of conformity as meeting all of the national requirements for Ex Certification. No further national certification is required. The IECEx is also accepted in many other countries.

Safety First

Hamilton Offers More Certificates Then Ever

The table gives an overview of the approvals available for the different product lines. Detailed information about a specific product can be found on the Hamilton website their spec sheets. For general overview please refer to: www.hamiltoncompany.com/support/process-analytics/certificates/products-for-explosive-atmospheres

<table>
<thead>
<tr>
<th>Sensor / Housing</th>
<th>ATEX</th>
<th>IECEx</th>
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<tr>
<td>Analog Sensors</td>
<td>☑</td>
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<td>Arc</td>
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<td>VisPro DO</td>
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