Single-Use Sensors

Cond, Cell Density, pH, DO
Designed Specifically to Meet Your Single-Use Requirements

Our single-use sensors combine the reliability and measurement stability of our long-term proven conventional sensors with the ease of use as an integral part of the bioreactor. The sensors retain the high accuracy performance even after gamma irradiation and a sufficient shelf life making it the ideal single-use solution.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Gamma Sterilization</td>
<td>45 kGy (pH), 50 kGy (all other sensors)</td>
</tr>
<tr>
<td>Dry Storage Time</td>
<td>Before irradiation: 12 months for all sensors After irradiation: 18 months pH, 24 months all other sensors</td>
</tr>
<tr>
<td>Pressure Range</td>
<td>0 to 2 bar (pH and ODO Cap S0) 0 to 1 bar (all other sensors)</td>
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<tr>
<td>Wet-in Time</td>
<td>&lt; 30 minutes prior to measurement</td>
</tr>
<tr>
<td>Cytotoxicity</td>
<td>ISO 10933-5 and USP &lt;87&gt;</td>
</tr>
</tbody>
</table>
True Integration Through Arc Technology

A NEW WAY TO THINK ABOUT SENSOR MANAGEMENT
All Hamilton single-use products include options for Arc Intelligent sensor technology. Arc converts the measurement into a robust, noise-free connection without the bulk of traditional transmitters. Choose open source digital protocol or 4–20mA signals directly into the process control system. Simplify the start of each run through wireless sensor configuration, calibration, and diagnostics using ArcAir software.

DETACHABLE SENSORS
Your measurement comes pre-installed and pre-sterilized in the single-use bioreactor or bag.

ARC MODULE SU
The detachable Arc Electronics stores all sensor data, amplifies the measurement, and outputs the signal to the process control system.

OPTIONAL ARC WI WIRELESS ADAPTER
Arc Wi Adapters enable wireless communication from sensors to ArcAir while passing through the hard-wired signal to the process control system. The LED provides a visual indicator of sensor status.

HARDWIRED MEASUREMENT DATA
Your process data is communicated via Modbus digital protocol or 4–20mA directly to the control system.

WIRELESS CALIBRATION
Using the optional Arc Wi wireless adapter reduces data entry errors by scanning sensor calibration information directly into Hamilton ArcAir software.
Solutions for Single-Use Bags
One Vendor, All the Measurements

Hamilton has worked closely with single-use bag manufacturers to understand the market needs.

WIDE VARIETY OF MEASUREMENTS
Whether media prep, mixing, or cell culture, each application has different sensing requirements. Hamilton’s reusable measurement technologies have been adapted for single-use bag installations.

Cond Cell pH DO

DESIGNED FOR YOUR NEEDS
There are no accordion-style insertion devices or probe assemblies that must be autoclaved. Single-use sensors come with either weld-in style measurement elements or work with industry standard port fittings. All products can be gamma sterilized with the bag prior to use.
Technology You Can Trust

Reliable glass membrane pH technology offers a proven measurement with broad range and very low drift after wet-in. The OneFerm is available in lengths from 70 to 425 mm so that your entire bioreactor product family can be outfitted with single-use specific pH sensors.

The unique S2 optical DO cap mounts on an insertion tube from the bioreactor headplate. It uses the same technology as the industry leading VisiFerm Optical DO sensor.

GENERAL REQUIREMENTS FOR ALL SENSORS

- 3rd party test data available for review
- Packaging suitable for clean room environments
- All sensor elements are pre-calibrated for manual input; No shift due to gamma irradiation
## pH - OneFerm pH

### Criteria |
**Description** 
- **Shaft length options**: 70 mm, 120 mm, 225 mm, 325 mm, 425 mm 
- **Electrical Connector**: K8, VP6 (traditional) / VP8 (Arc) 
- **Temperature Sensor**: PT100, PT1000 (traditional) / NTC 22 kOhm (Arc) 
- **pH measuring range**: 3–10 
- **Drift**: < 0.1 pH /week 
- **Wetted Parts**: Glass / VMQ (Silicone elastomer) 

## DO - VisiFerm DO SU

### Criteria |
**Description** 
- **Measurement principle**: Oxygen dependent luminescence quenching 
- **ODO Insert Options**: ODO Cap S0 (Bag), ODO Cap S2 (Bioreactor) 
- **Response time t98%**: < 30s at 25°C 
- **Drift at room temperature**: < 1% per week 
- **Wetted parts**: PA (Cycloaliphatic polyamide) / VMQ (Silicone elastomer) / EPDM
## Single-Use Sensor Patch Solutions

### Incyte SU VCD

<table>
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<tbody>
<tr>
<td>Measurement principle</td>
<td>Permittivity and Conductivity</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0–700 pF/cm, equivalent to $5 \times 10^5$ to $8 \times 10^9$ cells/mL (mammalian)</td>
</tr>
<tr>
<td>Installation</td>
<td>Weld-in flush sensing element</td>
</tr>
<tr>
<td>Arc Module Options</td>
<td>Straight for stirred tank bags</td>
</tr>
<tr>
<td>Wetted Parts</td>
<td>HDPE / Ceramic / Glass / Platinum</td>
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### Conducell SU

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<tr>
<td>Measurement principle</td>
<td>4-Pole contacting conductivity</td>
</tr>
<tr>
<td>Measurement range</td>
<td>100 $\mu$S/cm to 100 mS/cm</td>
</tr>
<tr>
<td>Installation</td>
<td>Weld-in flush sensing element</td>
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Getting Started with Hamilton

Product Discussion Guide

Demos? Samples? Hamilton OEM support realizes that selecting single-use measurement technology requires pre-qualification before launching to the public. Let us help by getting some basic information about your process to see if Hamilton Single-Use products can be a good fit.

MECHANICAL INTEGRATION
- Definition of SU container (bag, benchtop, size, etc.)
- Needed Measurements
- Sensor Geometry for Your Application
- Documentation (Verification reports, Biocompatibility, L&E data, etc.)

CONTROLLER INTEGRATION
- Digital—Modbus
- Digital—Profibus
- Digital—Foundation Fieldbus
- Analog Sensor Signals—mV
- Analog—4–20mA
- Other?