

# Online Data Real-Time Decisions

Viable and Total Cell Density Sensors

**HAMILTON** 

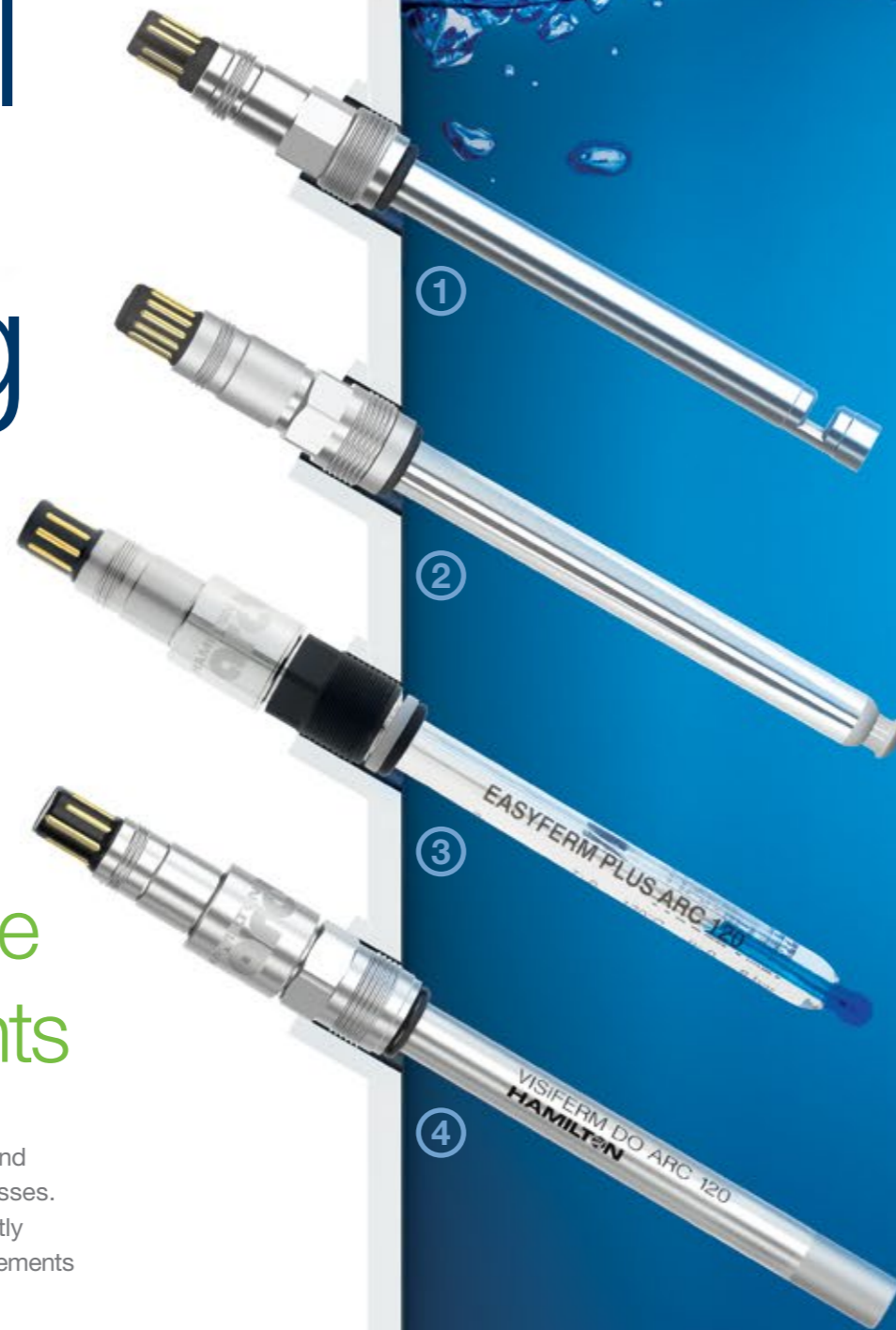


# Online Cell Density Monitoring

For the first time, you can monitor cells in real-time, obtain actionable data, and automate process adjustments

Online measurement with methods such as control of pH and dissolved oxygen are common for most biological processes. In fact, many parameters can be monitored but those directly related to cell physiology are time consuming offline measurements that only provide a reactionary window into the past.

Incyte and Dencytee sensors provide a means for directly measuring viable and total cell density in real-time. Obtain advanced control with never-before instantly available data. With clear, up-to-date information, critical events that could have been missed between offline samples are now immediately recognizable. Automate production processes and strategize product development with new awareness in R&D.



## 1. TOTAL CELL DENSITY

Monitoring the total cell density is a reliable method for measuring cell growth. The most relevant information is obtained during the lag and growth phase before significant cell death occurs. With online measurements it is possible to detect process deviations and make the required adjustments.

## 2. VIABLE CELL DENSITY

Detecting when cells begin to die can be difficult when looking at the total cell density. Monitoring the viable cell density will show an immediate change and depending on the culture and timing will indicate next steps to take to maximize yield. In addition to cell death this measurement also provides information on changes in cell physiology.

## 3. pH

Precise control over pH is critical to generate the right product and maximize yield. Online pH control enables more frequent, small adjustments to pH that minimize stress and maintain a constant environment.

## 4. DISSOLVED OXYGEN

Oxygen is the most important gas for bioprocesses. Too little oxygen will result in apoptosis or anaerobic digestion, reducing the viability and yield significantly. Online monitoring and control of dissolved oxygen (DO) ensures the optimal amount of oxygen to maintain high quality products.

## OFFLINE SAMPLING

Sampling is time consuming with many manual steps

- ▶ Provides a limited window into critical process events
- ▶ Time-consuming



## ONLINE MONITORING

Obtain more data without manual intervention

- ▶ Early detection of process deviations
- ▶ Reduced labor and risk of contamination from grab sampling
- ▶ Increased product yield





# Incyte



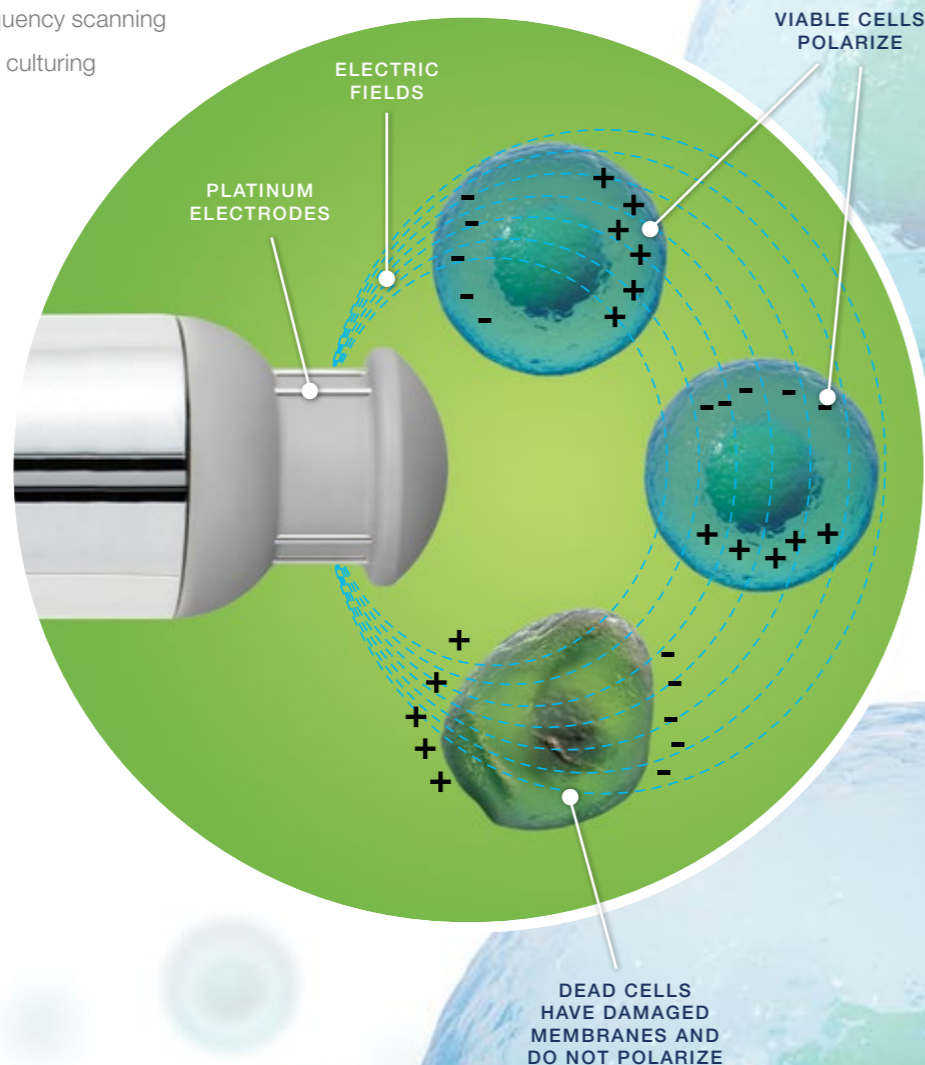
## ONLINE MEASUREMENT OF VIABLE CELL DENSITY

The Incyte sensor enables real-time, online measurement of viable cells in solution. The measurement is not influenced by changes in the media, microcarriers, dead cells or debris, and is designed for mammalian cell culture, yeast and high-density bacterial fermentation. Online measurement of viable cells makes it possible to detect events and respond in real time without sampling.

- ▶ Increase yield and lower production costs
- ▶ Detect changes in cell physiology with frequency scanning
- ▶ Precisely control harvesting for continuous culturing
- ▶ Early detection of process deviations

### HOW IT WORKS

The Incyte measurement principle is based on capacitance. In an alternating electrical field, viable cells behave like small capacitors. The charge from these small capacitors is measured by the sensor and reported as permittivity (capacitance per area).



# Dencytee



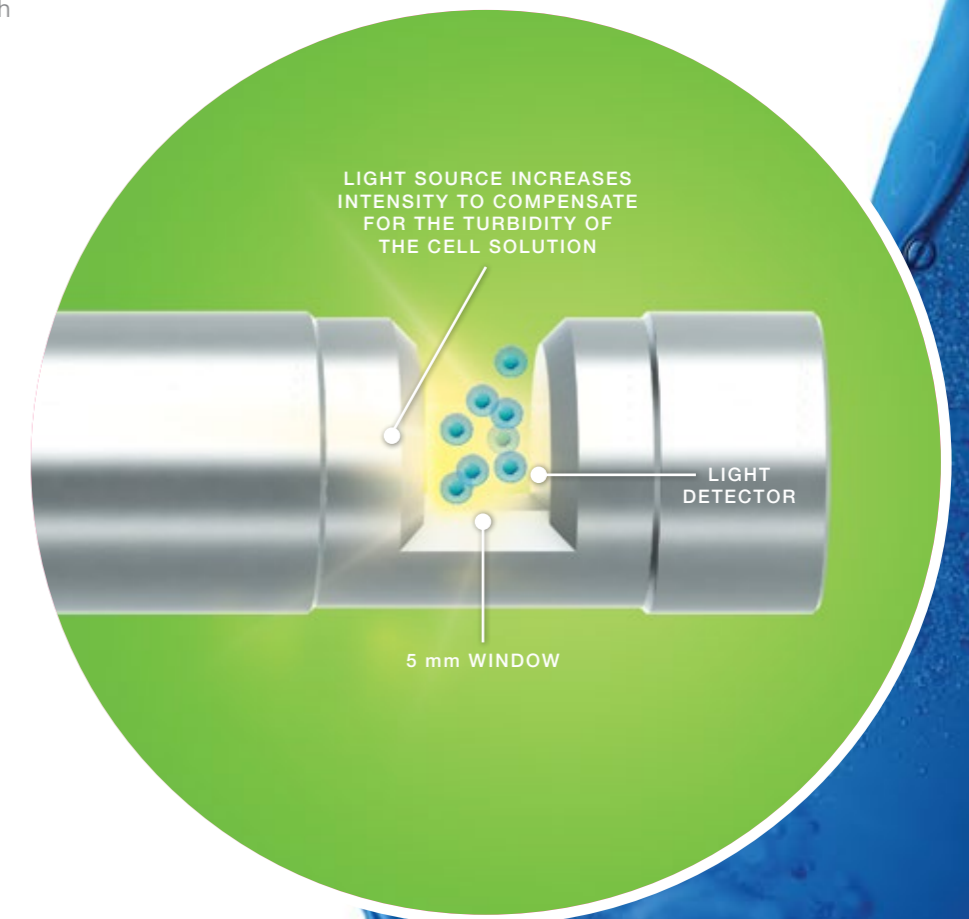
## ONLINE MEASUREMENT OF TOTAL CELL DENSITY

The Dencytee sensor performs online measurement of total cell density in solution. The sensor is based on optical density, which measures the turbidity of the cell suspension. The measurement is made at NIR (near-infra red) wavelengths so it is insensitive to changes in media color. All particles and molecules that scatter light at 880 nm will be detected, including living and dead cells as well as cell debris. This measurement is effective after inoculation when cells are expanding quickly but concentrations are low, making capacitance-based readings less reliable.

- ▶ Simple online measurement of cell growth
- ▶ Reliable values during the growth phase
- ▶ Early detection of process deviations

### HOW IT WORKS

The Dencytee sensor emits light through a 5 mm window onto a light detector. Cells in suspension absorb and scatter light so less light is read by the detector. To compensate, the sensor increases the amount of light emitted by the light source to maintain a constant reading at the detector. By reading the amount of light that is increased at the light source, the Dencytee sensor can measure solutions with high cell densities.



# Cell Density Measuring Loops

## INCYTE FOR VIABLE CELL DENSITY

A measuring unit consists of an Incyte sensor and a pre-amplifier, which converts the analog measurement to a stable digital signal. The digital signal is read by an Arc View Controller equipped with the Incyte License and optional Incyte Scan License.

### Ordering Information



	a-length	Unit*	Replacement Sensor
Incyte DN25 – SG	70	243710	243730
Incyte DN25 – DG	52	243711	243731
Incyte DN25 – DG BE	54	243712	243736
Incyte DN12	120	243700	243732
Incyte DN12	220	243701	243733
Incyte DN12	320	243702	243734
Incyte DN12	420	243703	243735

SG = Single Gasket (Ingold) DG = Double Gasket (Sartorius / B.Braun) DG BE = Double Gasket Bioengineering

\*When purchased as a unit, the sensor and preamp are factory calibrated.

### ACCESSORIES

Val/Cal Kit Capacitance Ref. 243740    Capacitance Simulator Ref. 243743    10 m Cable M12 Ref. 243871  
 Solution A Ref. 238988    Incyte Pre-Amp Ref. 243720    20 m Cable M12 Ref. 243872  
 Solution B Ref. 243742    5 m Cable M12 Ref. 243870    40 m Cable M12 Ref. 243873

## DENCYTEE FOR TOTAL CELL DENSITY

A measuring unit consists of the Dencytee sensor and a pre-amplifier. The unit is connected to an Arc View Controller, equipped with a required Dencytee License.

### Ordering Information



	a-length	Unit*	Replacement Sensor
Dencytee	120	243755	243750
Dencytee	220	243756	243751
Dencytee	320	243757	243752
Dencytee	420	243758	243753

\*When purchased as a unit, the sensor and preamp are factory calibrated.

### ACCESSORIES

Val/Cal Solution OD Ref. 243886    10 m Cable M12 Ref. 243871  
 Dencytee Pre-Amp Ref. 243760    20 m Cable M12 Ref. 243872  
 5 m Cable M12 Ref. 243870    40 m Cable M12 Ref. 243873

## ARC VIEW CONTROLLER

Review all of your data at a glance. The Arc View Controller is used to collect and record data generated by the Incyte and Dencytee sensors. The controller can connect to either two (265) or four (465) sensors at the same time. The 465 Controller is available with a larger (XL) screen for simplified viewing of multiple sensors. The Arc View can wirelessly record Arc sensors, such as pH and dissolved oxygen, so all parameters can easily be viewed from a single screen.

- ▶ Record, display and export measurement data
- ▶ Output measurement data as 4-20 mA\*, OPC\*\* or Modbus
- ▶ Store calibration data for multiple sensors
- ▶ Wizards for calibration and troubleshooting

### Ordering Information



	265	465	465 XL
Arc View Controller	234800	243801	243802

## REQUIRED LICENSES

To properly run an Incyte or Dencytee sensor the Arc View must be equipped with the proper licenses. They must be purchased for each controller and are not transferable. Each controller requires a license to use an Incyte or Dencytee sensor with optional ad-ons available to support Incyte Scan or OPC-communication. Incyte License is required to use Incyte sensors. Incyte Scan License is optional for measurement at 17 additional frequencies to analyze the bioprocess more detailed. Dencytee License is required to use Dencytee sensors. OPC XML-DA License is optional for connection to OPC network.

Ref	Description	Incyte	Dencytee
243822	Incyte License	Required	N/A
243823	Incyte Scan License	Optional	N/A
243824	Dencytee License	N/A	Required
243820	OPC XML-DA License	Optional	Optional

### ACCESSORIES

4-20 mA Output Box Ref. 243850  
 5 m Cable Output Box Ref. 243851  
 10 m Cable Output Box Ref. 243852

\*Requires Ref. 243850, 4-20 mA Output Box with Cell Density & Conductivity outputs and four alarms  
 \*\*Requires Ref. 243820, OPC XML-DA License



# SPECIFICATION SHEETS

## Incyte

<b>Dimensions</b>	<b>DN25</b>	a-length	70 mm (SG), 46 mm (DG) or 54 mm (DG BE)
		O-ring position (Gaskets)	28 mm (SG), 28 mm and 52 mm (DG) or 28 mm and 44 mm (DG BE)
		Process Connection	G 1¼ (Ingold, Sartorius or Bioengineering)
	<b>DN12</b>	a-length	120, 220, 320, 420 mm
		Diameter	12 mm
		Process Connection	PG13.5
<b>Wetted Parts</b>		Stainless steel 1.4435, PEEK (FDA approved, USP class VI), Platinum, EPDM (FDA approved, USP class VI)	
<b>O-ring Material</b>		EPDM (FDA approved, USP class VI)	
<b>Operating Temperature Range</b>		0 to 60°C	
<b>Steam Sterilizable</b>		Yes, max. temperature 135°C	
<b>Autoclavable</b>		Yes	
<b>CIP</b>		Yes	
<b>Pressure Range</b>		0 to 3 bar (25°C)	
<b>Measuring Range</b>		0 – 700 pF/cm, equivalent to viable cell density of: Mammalian cells in suspension 5·10 <sup>5</sup> cells/ml to 8·10 <sup>9</sup> cells/ml Fermentation 5 to 200 g/l dry weight	
<b>Conductivity Range</b>		2 – 50 mS/cm	

## Dencytee

<b>a-length</b>	120, 225, 325, 425 mm
<b>Diameter</b>	12 mm
<b>Optical Path Length</b>	5 mm
<b>Wetted Parts</b>	Stainless steel 1.4435, Sapphire glass, EPDM (FDA approved, USP class VI)
<b>O-ring Material</b>	EPDM (FDA approved, USP class VI)
<b>Process Connection</b>	PG13.5
<b>Operating Temperature Range</b>	0 to 80°C
<b>Steam Sterilizable</b>	Yes, max. temperature 135°C
<b>Autoclavable</b>	Yes
<b>CIP</b>	Yes
<b>Pressure Range</b>	0 to 10 bar (25°C)
<b>Optical Density 880</b>	0 – 2500, equivalent to total cell density of: Mammalian cells in suspension 10 <sup>5</sup> cells/ml to 7·10 <sup>8</sup> cells/ml Fermentation 0.5 to 100 g/l dry weight
<b>Measuring Principal</b>	Absorbance
<b>Wavelength</b>	880 nm (NIR)