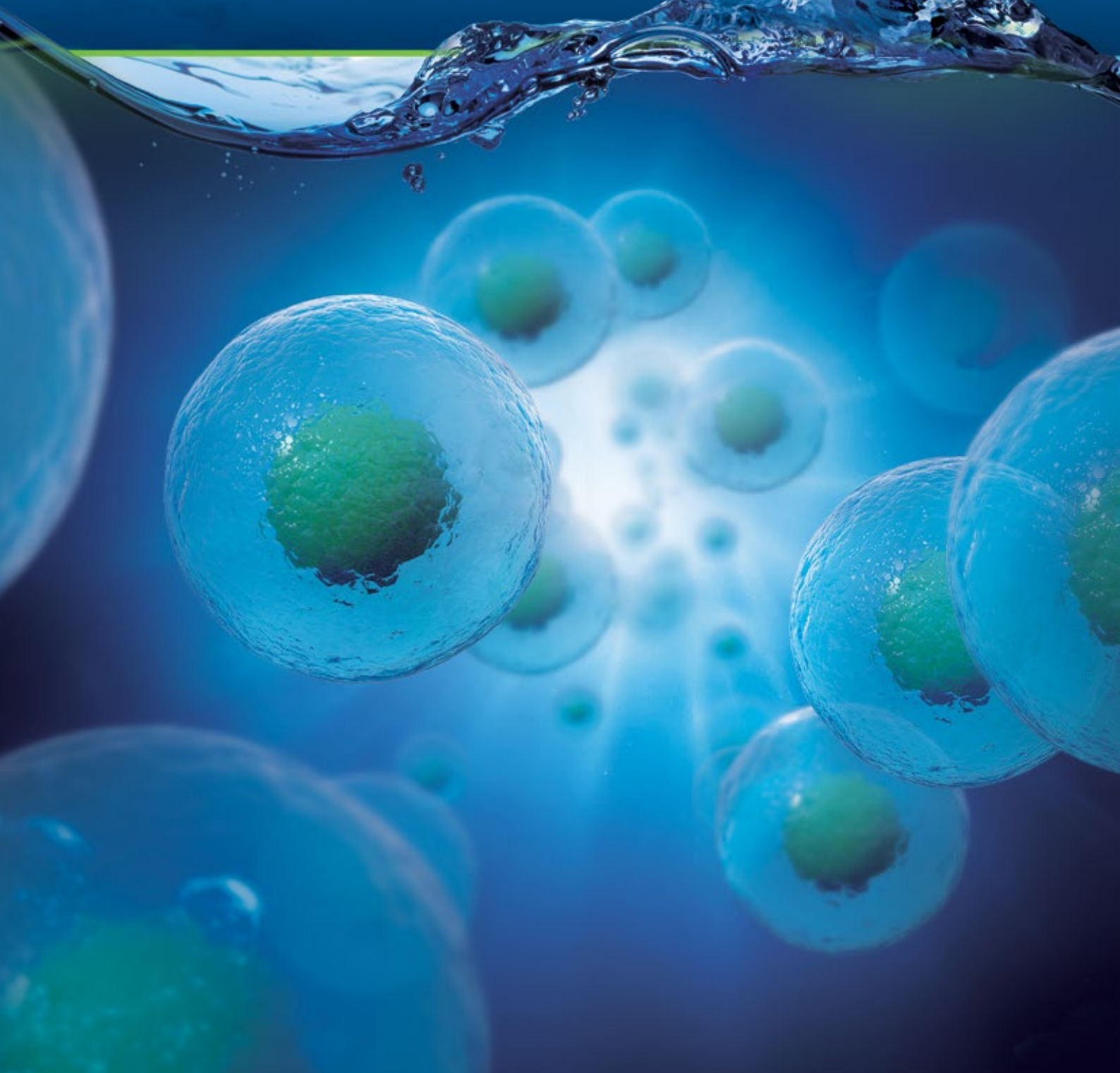


# On-Line Data Real-Time Decisions

Viable Cell Density Sensors



# On-Line Cell Density Monitoring

Measure viable  
cell density in  
real-time for  
immediately  
actionable data  
and automated  
process control

On-line, or in-situ, measurement is the pinnacle of process monitoring and necessary for true process control as evidenced with control of pH and dissolved oxygen, common for most biological processes. In fact, many parameters can be monitored but those directly related to cell physiology are typically time consuming off-line measurements that provide only a reactionary window into the past.

Incyte Arc sensors provide a means for directly measuring viable cell density in real-time, meeting the increasing need for PAT in the biopharmaceutical industry. Achieve advanced process control with unprecedented data availability. Clear, instantly available information ensures critical events that could have been missed between off-line samples are now immediately recognizable. Learn more about each process in R&D, strategize process development, and automate production with one sensor that can be used at all stages.



## 1. VIABLE CELL DENSITY

Permittivity measurements are the most reliable method of monitoring viable cell density. This measurement is immediately affected by changes in viable cell density and can be used to time process-specific actions for maximum yield. Permittivity can also be used to detect changes in cell physiology and is the most immediate method for determining the beginning of the cell death phase.

## 2. pH

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

## 3. 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. On-line monitoring and control of dissolved oxygen (DO) ensures the optimal amount of oxygen to maintain high quality products.

## 4. TOTAL CELL DENSITY

Total cell density is a reliable parameter for measuring cell growth. The most relevant information is obtained during the lag and growth phase before significant cell death occurs. With on-line, or in-situ, measurements it is possible to detect process deviations and make the required adjustments.

# Measure to Control

Increased data from real-time measurement provides enhanced control opportunities resulting in desirable quality metrics like increased yield, lower operating costs, and improved reproducibility.



# Incyte Arc

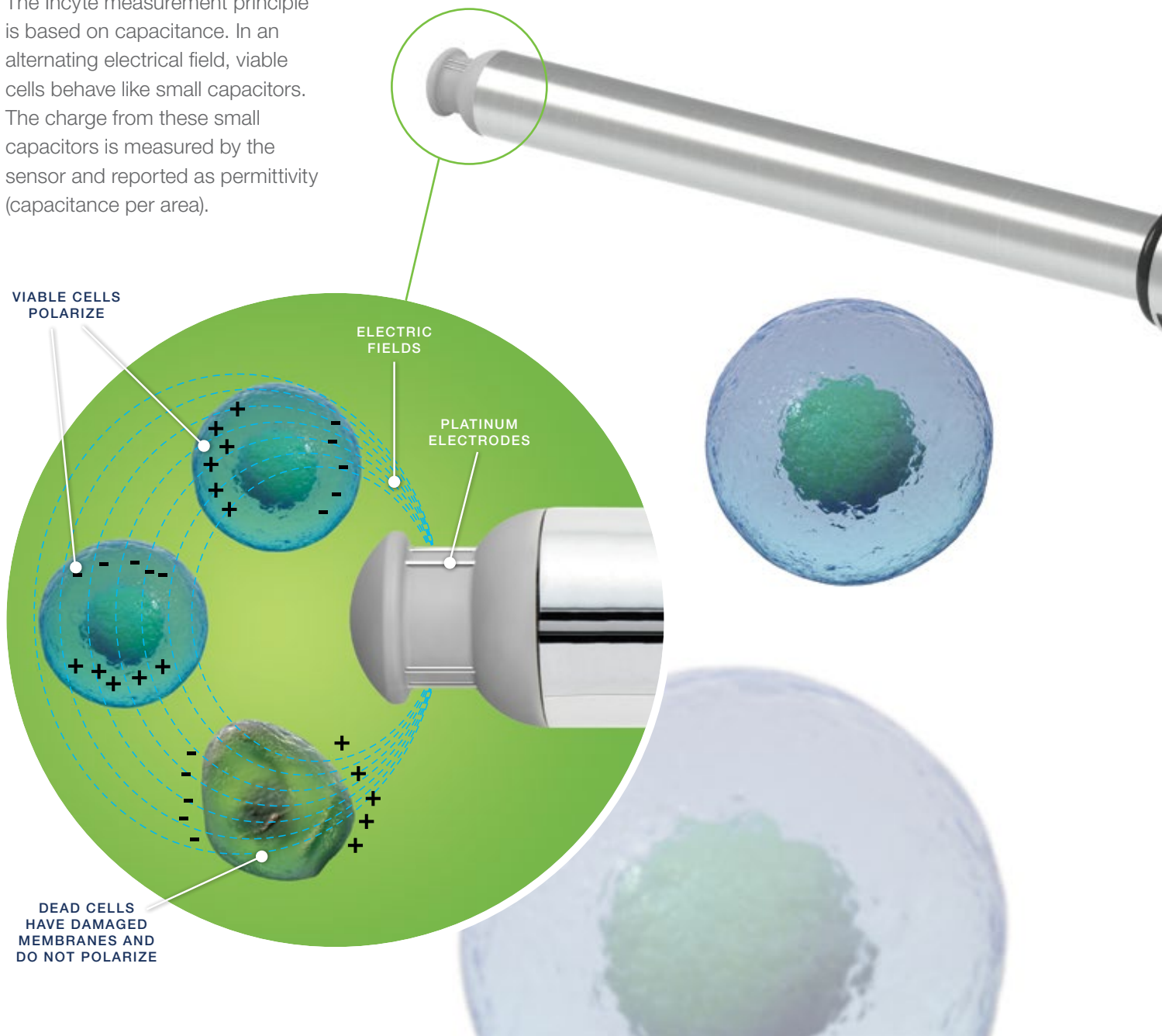
## ON-LINE MEASUREMENT OF VIABLE CELL DENSITY

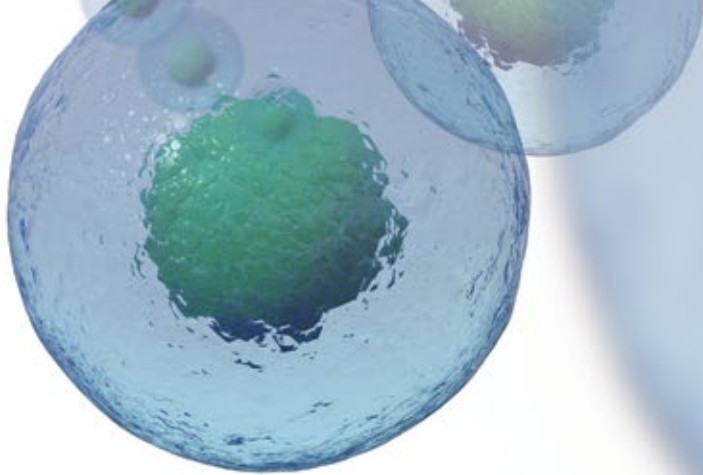
The Incyte Arc sensor enables real-time, on-line measurement of viable cells. The measurement is not influenced by changes in the media, microcarriers, dead cells, or debris. On-line measurement of viable cell density makes it possible to detect events and respond in real time without sampling. Combined with Hamilton's Arc technology, use of this powerful tool can lead to increased yield and lower production cost by enabling:

- ▶ Precise control of process actions
- ▶ Process optimization
- ▶ Early detection of process events
- ▶ Detection of changes in cell physiology

### 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).





## ARCAIR

ArcAir is intuitive software designed to work the way you do. Record and graph Incyte Arc data while monitoring all sensors in your lab from an easy-to-use dashboard. The software also features one-click access to sensor configuration and measurement parameters, automatic recording of maintenance actions, and report generation from a centralized database.



## ELECTRONICS: ARC MICROTRANSMITTERS

Incyte Arc's integrated microtransmitter amplifies the sensor signal for direct connection to the control system. Sensor configuration occurs via USB or wireless Bluetooth®. Arc sensors save space and cost with their integrated microtransmitters. Factory calibration and diagnostic data are saved within the sensor, so you can always check a sensor's performance, even mid-run.

## PROCESS DATA

Arc sensors provide a robust connection directly to the Process Control System. Analog (with an Arc Wi 2G BT adapter) and digital communication protocols allow effortless integration into existing systems:

- ▶ Modbus
- ▶ 4-20 mA

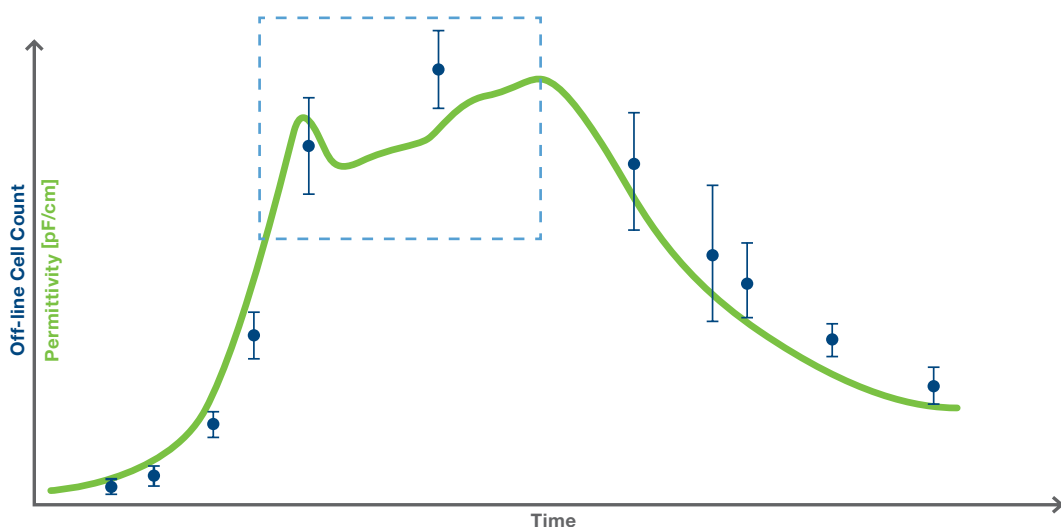
# The Power of Permitt

## INCYTE FOR VIABLE CELL DENSITY

Continuous on-line, or in-situ, data allows for real-time process control. With off-line data, decisions can only be made at the time of sample analysis, resulting in imprecise timing or missing events entirely. Permittivity measurement is quickly becoming the industry standard because of the robust real-time data. It correlates well to off-line cell counting in the crucial exponential phase without the risk of counting errors. Incyte Arc sensors can be used to increase process quality across many cell lines, process types, and scales. Learn what Incyte can do for you with integration facilitated by the Hamilton Applications team.

### CONTINUOUS DATA

Incyte Arc sensors provide a real-time measurement of viable cell density with continuous permittivity data. Off-line samples only provide limited, error-prone data points, so process events may be missed. Real-time permittivity reveals changes in cell physiology, so advanced process control can be automatically triggered for process optimization.



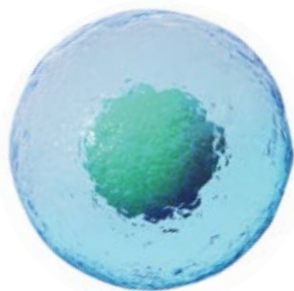
### PROVEN PERFORMANCE

Incyte technology has proven success in a wide range of suspension and adherent cell types including mammalian and insect cells, as well as yeast and bacteria. It is also compatible with many process strategies including fed-batch and perfusion.



To learn about Incyte with your cell line download our Applications ebook at [HamiltonCompany.com/CellDensity](https://HamiltonCompany.com/CellDensity) or contact us.

# ivity



## INCYTE IN ACTION

From increasing yield to shortening process time, the real power of permittivity is in your hands. As shown in the examples below, ask yourself what you could do with continuous process data.



### Process understanding:

Expand your PAT capabilities with permittivity and gain process insights such as cell physiology through use of multi-frequency scan.



### Process optimization:

Real-time data means never missing a key process event. Use this data to develop enhanced process decisions for increased efficiency and prolonged productivity. Alternatively, use ArcAir Data Modeling software for real-time understanding of legacy off-line counts.



### Automated control:

Precisely time key process events such as feeding, induction, and harvest for lower production cost, increased yield, and enhanced product quality.



### Consistent quality:

Compare permittivity data to ensure batch-to-batch and scale-up reproducibility.



### Continuous process improvement:

Gather on-line viable cell density data every run to enable continuous optimization.

# Leverage Hamilton Expertise

Utilize Hamilton's Application Team and proven evaluation process for rapid implementation and robust product evaluation.

## SETUP

Hamilton evaluates your application to recommend quick-start measurement settings.

## COLLECTION

Follow Hamilton's standard protocol to ensure robust and reliable data sets.

## ANALYSIS

Hamilton's Application Team can support your analysis and generate a comprehensive report with useful insights.

# INCYTE ARC FOR VIABLE CELL DENSITY

## Specifications

a-length	120, 220, 320, 420 mm
Diameter	12 mm
Process Connection	PG13.5
Wetted Parts	Platinum, Stainless Steel 1.4435, PEEK (Polyetheretherketone), EPDM (Ethylene propylene elastomer)
Surface Quality of Steel	Ra < 0.4 µm (N5)
Operating Temperature Range	0 to 60°C
Steam Sterilizable	Yes
Autoclavable	Yes
CIP	Yes
Pressure Range	0 to 12 bar g
Conductivity Range	1–80 mS/cm

## Ordering Information

	a-length	REF
Incyte Arc Expert	120 mm	243950-0211
	220 mm	243950-0212
	320 mm	243950-0213
	420 mm	243950-0214

## Accessories

### Cables – M12:

Arc USB Power Cable M12 – 8 pole,  
REF 243490-02

Open end – 3m, REF 355320

Open end – 5m, REF 355321

Open end – 10m, REF 355322

### Cables – VP8:

Arc USB Power Cable VP8 pole,  
REF 243490-01

Open end – 5m, REF 355265

Open end – 10m, REF 355266

Open end – 20m, REF 355268

### Wireless Accessories:

Arc Wi 2G BT, REF 243470

Arc View Mobile Advanced (Tablet), REF 10071113

Arc Wireless Converter BT, Advanced REF 242333

### Verification Buffer:

12880 µS/cm, REF 238988



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Web: [www.hamiltoncompany.com](http://www.hamiltoncompany.com)

USA: 800-648-5950

Europe: +41-58-610-10-10

## Hamilton Americas & Pacific Rim

Hamilton Company Inc.  
4970 Energy Way  
Reno, Nevada 89502 USA  
Tel: +1-775-858-3000  
Fax: +1-775-856-7259  
[sales@hamiltoncompany.com](mailto:sales@hamiltoncompany.com)

## Hamilton Europe, Asia & Africa

Hamilton Bonaduz A.G.  
Via Crusch 8  
CH-7402 Bonaduz, Switzerland  
Tel: +41-58-610-10-10  
Fax: +41-58-610-00-10  
[contact.pa.ch@hamilton.ch](mailto:contact.pa.ch@hamilton.ch)

To find a representative in your area, please visit [hamiltoncompany.com/contacts](http://hamiltoncompany.com/contacts).