Brooks
LIFE SCIENCE SYSTEMS

Cryogenic Cold-Chain Solutions

Ensure the integrity of your samples to -190° C.

BioStore III Cryo Sample Storage System

Protect and manage your samples at -190° C.

BioStore™ III Cryo is the only cryogenic storage solution that combines the sample protection, safety, and accessibility of a manual high-efficiency LN_2 freezer with advanced automation features such as inventory control, cold-chain management, and an ergonomic, superior user experience.

Sample integrity: the BioStore III Cryo combines Chart MVE's proven, high-efficiency LN_2 stainless steel freezer plus Brooks' automation technology and software to ensure the highest sample integrity. Biosamples are stored in LN_2 vapor at -190° C, and are protected by an industry-leading 20-plus-day hold time with anytime manual access. Sample safety is further enhanced by protecting innocent samples during storage and retrieval transient exposures. The automated system quickly pulls a rack into an insulated sleeve, significantly slowing the rate of transient warming and allowing complete tracking and control of all innocent sample exposures.

Highly flexible: the system stores and manages up to 252 cryoboxes (49,392 1 mL FluidX vials). It accepts any consumable type that can fit inside a standard cryobox, and retrieves a box in less than 60 seconds. The BioStore III Cryo system comes with integrated sample inventory, tracking, audit trail, and LIMS connectivity. The software includes a sample integrity calculator that protects samples from excessive warming by predicting their temperatures based on experimental evidence. Sample security can be assured by administrator assignment of specific user-level controls and permissions. The entire system fits within the footprint of a standard 42-inch (107 cm) LN_2 freezer, and can be installed in nearly any lab space.

User safety: a highly ergonomic design provides designed-in user safety and easy sample access that minimizes the risk of repetitive or strain injuries. Gone are the days of climbing up steps to reach into an LN_2 freezer.

Cost-effective: the BioStore III Cryo has very low operating costs since it uses the same amount of liquid nitrogen as a manual high-efficiency LN_2 freezer.

CryoPod Carrier and Automatic Filling Station

The truly portable CryoPod™ carrier enables -150° C or colder sample transportation for over 4 hours. Safe and reliable, the CryoPod easily extends the cryogenic cold chain throughout the lab and campus by ensuring samples are safely kept below -150° C in vapor phase LN_2. There is no user or sample contact with the liquid nitrogen.

The CryoPod carrier has integrated visual temperature monitoring plus audible and visual alarms that warn if conditions exceed user-defined limits. It monitors and logs temperature, date, time, alarms, and all events as it efficiently protects samples during transport. Compact and lightweight at less than 20 pounds (9 Kg), the CryoPod carrier enables quick and easy transport of samples between the shipping dock, LN_2 freezer, lab bench, or wherever samples are needed across a campus.

No longer do researchers and clinicians have to rely on cumbersome, improvised, or potentially unsafe transport methods, such as heavy LN_2 shippers or homemade carriers, to handle and transport their cryogenic biospecimens.

Automatic Filling Station Offers Safe and Easy LN_2 Charging

The fully automatic filling station safely recharges the CryoPod's LN_2 supply in 10 minutes or less. The single push-button filling process eliminates any user interaction with LN_2 or dangerously cold surfaces. The user simply loads the CryoPod in the filling station, presses "start," and in minutes the carrier is precisely filled and ready to transport samples. It also can hold the CryoPod charged for immediate use. The CryoPod filling station can be installed on a lab bench and connected to virtually any LN_2 supply.

Cryo Storage Consumables

FluidX™ cryo storage consumables are ideal for use with the BioStore III Cryo sample management system. These products feature increased storage densities and enhanced sample ID to achieve maximum productivity and sample tracking.

FluidX cryo consumables include:

- **14 x 14 Cryobox**
  Fits 196 1 mL cryotubes with 2D barcodes in the same footprint as a traditional 9 X 9 cryobox, more than doubling the capacity of the BioStore III Cryo system or an LN_2 freezer.
- **10 x 10 Cryobox**
  Fits 100 2 mL external thread cryotubes (using 2 ml Jacket Tube) in the same footprint as a traditional 9 x 9 box — a 20% increase in storage density. Unique 2D rack ID provides enhanced sample tracking.
- **SBS Shuttle**
  Allows the immediate use of standard SBS plates/racks in a BioStore III Cryo system or manual LN_2 freezer that normally accepts cryoboxes.
- **2 ml Jacket™ Cryo Tube**
  Offers tri-labelled technology, a unique automation-friendly cap design, and a double thread for maximizing sample security.

  FluidX cryo consumables offer highly secure tracking, plus automation-friendly, temperature-resistant sample storage.

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Protect Sample Viability by Never Exceeding Tg (-135° C)

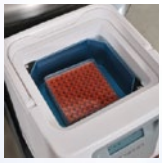
Brooks provides cryogenic (-190° C vapor phase) sample management solutions that offer proven automation, cold-chain management, and improved sample safety to customers requiring cryogenic biological storage and short-range transport.

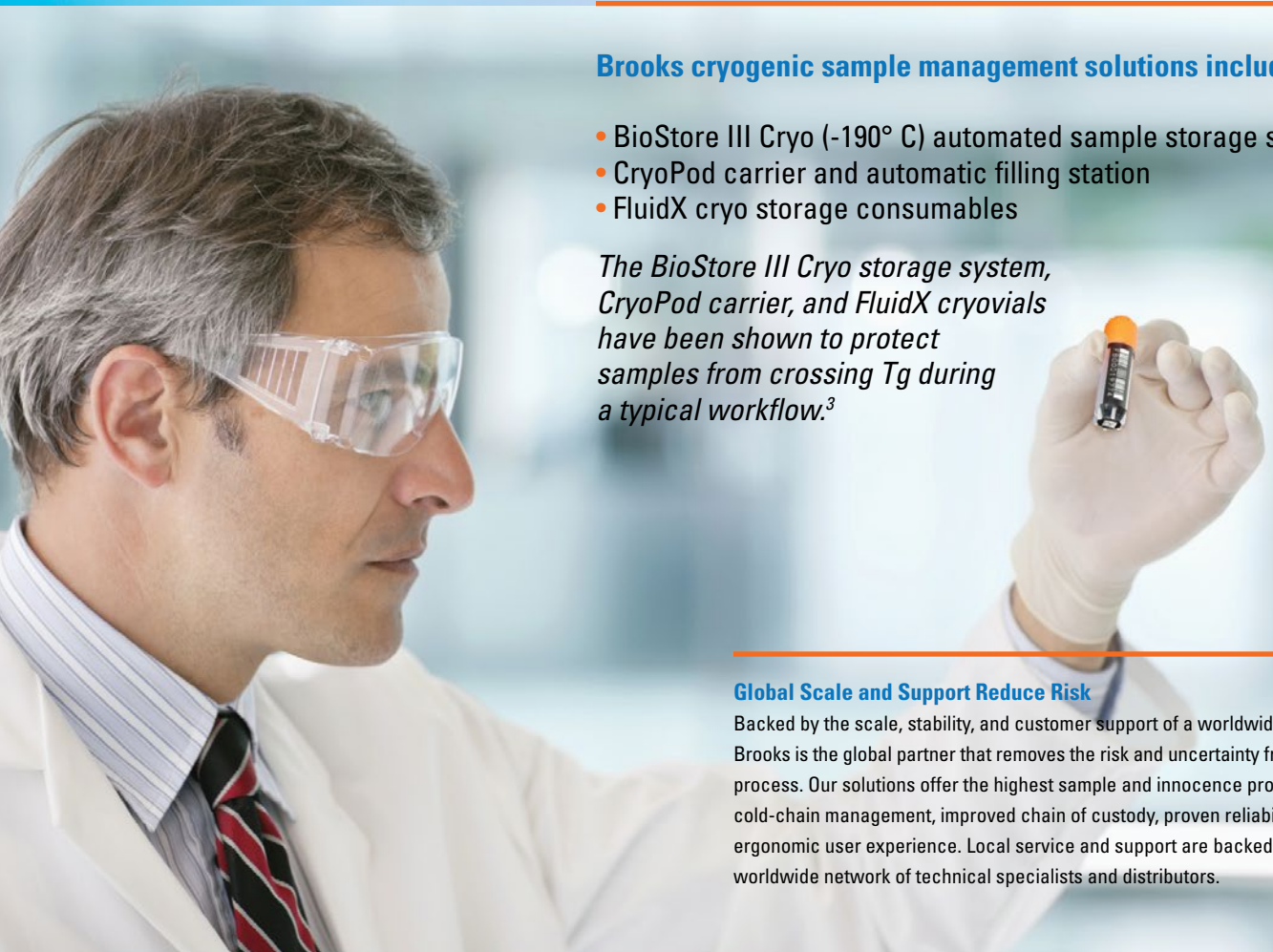
Best practices recommend biosample storage and transport at temperatures always below Tg (the glass transition temperature of H_2O, -135° C). They also suggest no freeze-thaw cycles and protection of innocent samples from warming above Tg during transient events to preserve sample viability.

Experimental research shows that individual samples can warm as quickly as 101° C per minute when moved from a liquid nitrogen (LN_2) freezer into ambient air. Furthermore, a cryogenic sample placed in dry ice warms even faster and can exceed Tg from -175° C in less than 12 seconds![1]

Additional research demonstrated that innocent samples still continue to significantly warm for minutes after returned to the -190° C LN_2 freezer and therefore, risk crossing Tg unexpectedly. Even after the samples stop warming, it takes hours to equilibrate to the LN_2 freezer's temperature.[2]

The research recommends that to ensure viability, innocent samples should never be warmed above Tg. To achieve this, samples should be stored at the coldest possible temperature, transient exposures need to be controlled and protected, and all sample movement must be monitored and recorded. With this information and knowledge of the workflow, permissions and access controls should be put in place to minimize the risk of any sample crossing Tg during subsequent operations.





Brooks cryogenic sample management solutions include:

- BioStore III Cryo (-190° C) automated sample storage system
- CryoPod carrier and automatic filling station
- FluidX cryo storage consumables

The BioStore III Cryo storage system, CryoPod carrier, and FluidX cryovials have been shown to protect samples from crossing Tg during a typical workflow.[3]

Global Scale and Support Reduce Risk

Backed by the scale, stability, and customer support of a worldwide automation company, Brooks is the global partner that removes the risk and uncertainty from your sample storage process. Our solutions offer the highest sample and innocence protection via superior cold-chain management, improved chain of custody, proven reliability, and a safe, ergonomic user experience. Local service and support are backed by Brooks' worldwide network of technical specialists and distributors.

About Brooks Automation

Brooks is a leading worldwide provider of automation and cryogenic solutions for multiple markets including semiconductor manufacturing and life sciences. Since 1978, the company has been a leading partner to the global semiconductor manufacturing market and, through product development initiatives and strategic business acquisitions, has expanded offerings to meet the needs of customers in the life sciences industry, analytical and research markets, and clean energy solutions. Brooks Life Science Systems is the global leader in automated sample management solutions that ensure cold-chain integrity from room temperature to -190° C. The company's highly reliable systems and consumables manage sample chain of custody across a broad range of drug discovery and biostorage applications. Brooks is headquartered in Chelmsford, MA, with direct operations in North America, Europe and Asia. For more information, visit www.brooks.com.

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[1] Salvetti, M., Fink, J. Barlett, A. et al. (2015, May). Thermal excursions of cryogenically frozen vials (below -150°C) and the risk of rising above Tg, H_2O: analyzing warm-up rates from cryogenic storage to both dry ice and ambient temperature environments. Poster presented at annual International Society of Cellular Therapy conference, Las Vegas, Nevada.

[2] Warhurst, J., Fink, J., Holmes, T. et al. (2015, May). Protection of innocents: continued sample warm up after return to a cryogenic environment (below -150° C) following a transient ambient picking operation. Oral presentation presented at annual International Society of Cellular Therapy conference, Las Vegas, Nevada.

[3] Fink, J., Albert, M., Salvetti, M. (2015, September). Cryogenic Cold Chain Management - Protecting Bio-Sample Temperatures Using Automation and Best Practices. Poster presented at annual European, Middle Eastern & African Society for Biopreservation & Biobanking conference, London, UK.

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