

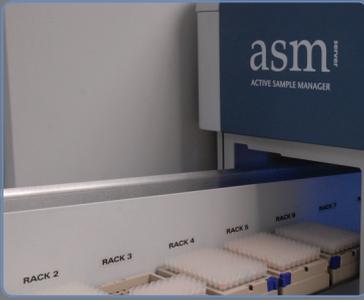
# Automated Sample Management



Product Catalog

**HAMILTON**<sup>®</sup>  
STORAGE TECHNOLOGIES

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# Product Guide

## Our Sample Management Solutions

Since 2007, Hamilton Storage Technologies, a division of Hamilton Company, has offered comprehensive ultra-low temperature automated sample management systems for a broad array of life science processes. Our line of biobanking and compound storage solutions, as well as consumables and small devices, consists of products such as BiOS™, SAM™ and ASM™, specifically designed for sample integrity, flexibility and reliability. Hamilton Storage Technologies continues to develop innovative technologies to fit the market needs and be known as the sample care company for the life science industry.

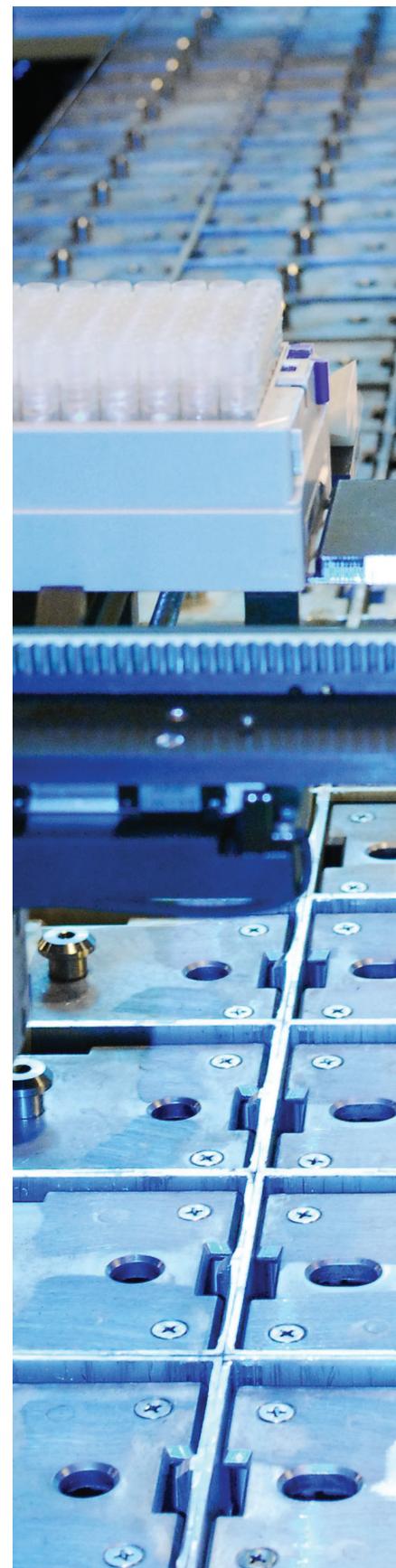
The product guide below is to help you choose the correct size storage system based on your sample capacity and sample temperature needs.

### Benefits of Automation

- ▶ Maintain sample integrity
- ▶ Provide sample security
- ▶ Eliminate human error
- ▶ Labor, maintenance and energy cost savings
- ▶ Ease of mind

## Sample Storage Product Guide:

Sample Capacity (1 mL microtubes)	2M–10M+	BiOS High-Capacity p. 8			
	500K–2M	BiOS Mid-Capacity p. 8			
	100K–750K	ASM p. 4		SAM with Rack Runner p. 6	
	<100,000	-20°C SAM p. 6		-80°C SAM p. 6	
		Ambient	+4°C	-20°C	-80°C
<b>Storage Temperature</b>					



# ASM™ — Active Sample Manager

## High-Throughput Sample Management

The ASM is our automated sample management system for high-throughput storage of tubes, vials and plates with a temperature range down to -20°C. One storage module can store up to 207,360 tubes or 2,160 plates, accomodating all the popular tube sizes, from 0.3 mL to 1 dram vials. Its modular design allows the capacity of the system to be conveniently expanded by combining multiple ASM Store modules.

### Quick Processing Speeds!

*Up to 120 tube racks and plates can be delivered out of storage per hour. The high-speed picking and return rates of 300 to 1,000 tubes per hour are unparalleled thanks to the adaptive process technology (APT).*



ASM Store

ASM Server

## The ASM provides many benefits including:

- ▶ Modular expandability
- ▶ Enhanced alarm notification
- ▶ System monitoring for process safety
- ▶ Standard thaw stations
- ▶ Easy installation
- ▶ Seamless integration with Microlab STAR Line workstations and third-party instruments

## Storage Capacities:

Tube Type*	Capacity**	Throughput***
0.3 mL Screwcap	207,360	300-1,000 per hour
0.5 mL Septa	207,360	300-1,000 per hour
0.5 mL Screwcap / 0.7 mL Septa	138,240	300-1,000 per hour
1.4 mL Septa/Screwcap	99,840	300-1,000 per hour
1 dram vials	24,960	300-1,000 per hour
SBS Microplates	2,160	120 per hour

\* Please contact Hamilton for verification of labware type and system capacities.

\*\*Capacity per Store module. Contact Hamilton for multiple Store capacities.

\*\*\*Throughput figures are based on rack distributions of 1-5%.



## Intelligent Design

Unlike the competition, our ASM system's picking speeds increase when additional Store modules are added to the system. Our design includes multiple pickers with simultaneous picking, instead of one single picker that becomes overburdened. Each additional Store module has its own gantry for rack selection, picker for tube selection and smart cache for look-ahead picking.

Because the Hamilton system is modular, the components can generally fit into elevators and through standard laboratory doorways. Minimal facilities work is typically required to accommodate the ASM system. The system is delivered as a finished product, which means installation and system commissioning is generally completed within a week.

## Applications

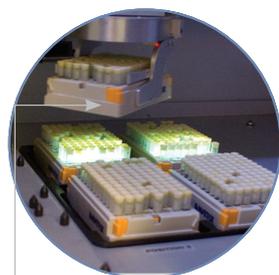
- ▶ Compound management
- ▶ Drug discovery
- ▶ Genomics
- ▶ Proteomics
- ▶ Oligos



Integrated hand-off arm for delivery to a Microlab STAR workstation and/or other third-party equipment.



Integrated thaw of 40 racks simultaneously.



1-D and 2-D barcode reading.

## Technical Specifications:

Module	Specification
ASM Store Dimensions	1041.0 mm (w) x 2559.0 mm (h) x 2146.0 mm (d) 41.0 in (w) x 100.7 in (h) x 84.5 in (d)
ASM Server Dimensions	787.4 mm (w) x 1981.2 mm (h) x 1295.0 mm (d) 31.0 in (w) x 78.0 in (h) x 50.9 in (d)
ASM Store Weight (empty)	1361 kg 3,000 lbs
ASM Server Weight (empty)	431 kg 950 lbs
Voltage	220 VAC ± 10%, 20 A service, 50 Hz/60 Hz
Operating Environment	10-30°C, relative humidity 0-80% with no condensation (Altitude < 2,000 m)
ASM Store Sample Temperature	Ambient to -20°C
ASM Store Sample Atmosphere	Nitrogen or dry air (-40°C dew point or lower)
ASM Server Active Thaw	User selectable thaw temperature from ambient to 37°C
ASM Server Storage Capacities	40 rack positions for active thawing, input and output
Control PC	Windows 7 operating system
Barcode Reader	Integrated 1-D and 2-D barcode reader

# SAM™ — Sample Access Manager

## Automated Low-Capacity Biobanking

SAM is an automated sample management system available in +4°C, -20°C and -80°C platforms that combines reliability, robustness, flexibility, and ease of use in a small-sized store. This compact, localized storage system is used for secure sample management of plates and tubes. Our patented automation not only eliminates freeze-thaw cycles, but also limits any moisture introduction to the system, therefore, maintaining sample integrity. The system continuously monitors the environment, even during picking, ensuring the samples never reach critical sample temperature.



### Integrated Tube Processor

*The SAMple Picker/Puncher allows for a fast and easy way to cherry-pick or punch tubes.*



### Benefits of the SAM System:

- ▶ Flexible storage of up to three labware types per system
- ▶ Retrieves samples in less than 70 seconds
- ▶ Minimum facilities work required as the modular system easily fits into existing laboratories
- ▶ Remote monitoring and job execution
- ▶ Reads both 2-D barcodes on the bottom and 1-D/2-D barcodes on the side of the tube

### Storage Capacities:

Tube Type*	Capacity**
0.3 mL REMP	60,000
0.3 mL Dura/Septa/Screwcap	45,600
0.5 mL Screwcap	34,080
1.4 mL Dura/Septa	34,080
1.0 mL/1.4 mL Screwcap	28,800
1.2 mL Cryovials	14,400
2.0 mL Cryovials/Screwcap	14,400
5.0 mL Screwcap	8,496
10 mL Vacutainers	3,816
SBS Microplates	803

\* Please contact Hamilton for verification of labware type and system capacities.  
\*\*Capacity per SAM.



## Feature-Rich Software

SAM's sample management software supports 21 CFR Part 11 compliance to meet the rigorous demands for sample security. The interface is easy to learn and its features and capabilities have been thoroughly field-proven. Reports available include sample history, sample temperature, sample aging, freeze-thaw cycles, user reports, audit reports and more. Additionally, users can be granted different levels of system operation with access restrictions to specific sample sets. Sample sets can be stored physically as a group, if necessary.

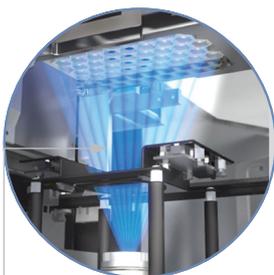
For additional sample security, a standard UPS and LN<sub>2</sub> (or CO<sub>2</sub> for the -20°C SAM) backup is provided to help mitigate typical disaster scenarios and ensure samples are kept cold and safe.

## Applications

- ▶ Biobanking
- ▶ Forensics
- ▶ Drug discovery
- ▶ Life science research
- ▶ Pharmacogenomics
- ▶ Genotyping



Internal carousel provides optimized and flexible storage capacities.



2-D barcode scanning for full sample tracking.



Our patented external magnetic couplers drive the internal robotics.

## Technical Specifications:

Dimensions	1270.0 mm (w) x 2210.0 mm (h) x 1346.0 mm (d) 50.0 in (w) x 87.0 in (h) x 53.0 in (d)
Weight (empty)	704 kg 1,550 lbs
Voltage	208-240 VAC ± 10%, 15 A service, 50 Hz/60 Hz
Operating Environment	10-30°C, relative humidity 0-80% with no condensation (Altitude < 2,000 m)
Sample Temperature	+20°C to -40°C / -55°C to -80°C
Sample Atmosphere	Nitrogen or dry air (-40°C dew point or lower)
Control PC	Windows 7 operating system
Barcode Reader	Integrated 1-D and 2-D barcode reader

## SAMple Picker/Puncher Retrieval Rates Per Hour:

Tubes per Rack	48-Rack Cryovial (1-D)	48-Rack Cryovial (2-D)	96-Rack Cryovial (2-D)	96-Rack REMP (2-D)
1 tube	31	30	32	38
5 tubes	85	105	115	166
10 tubes	103	135	136	267
20 tubes	120	136	148	472

# BiOS™

## Automated Mid- to High-Capacity Biobanking

BiOS is Hamilton's third-generation automated storage system specifically designed for storage of sensitive biological samples at temperatures down to -85°C. This system is capable of ensuring the integrity of 250,000 to more than 10 million sample tubes (based on 1.4 mL tubes in 96-position racks).

Our system provides the utmost in temperature stability, flexibility, reliability, sample tracking, and security required for biobanking, research operations, and forensic applications.



### Ultra-Low Temperature Tube Picker

*Capable of processing multiple types of labware without the need for any mechanical changes or additional processing modules.*



### Benefits of the BiOS System:

- ▶ Sample integrity—ensures samples are always kept at ultra-low temperatures, even during processing
- ▶ Flexibility—capable of storing and picking multiple types of labware and expanding modularly
- ▶ Reliability—redundant backup systems
- ▶ Sample tracking—1-D and 2-D barcode reading during introduction, internal processes and retrieval
- ▶ Feature-rich software—provides access restrictions, sample tracking and audit trails to support 21 CFR Part 11 compliance

### Supported Labware\*:

Tube Type	Volume Range
Matrix	0.3 mL to 12 mL
Micronic	0.5 mL to 2 mL
Greiner	1 mL to 4 mL
Nunc	0.5 mL to 5 mL
FluidX	0.3 mL to 5 mL
Corning	0.5 mL to 5 mL
SBS Microplates	Shallow-well, half-height, deep-well
SBS Container	Up to 110 mm (height)

\* Please contact Hamilton for verification of additional labware.



## The Sample Integrity Store

BiOS provides excellent temperature stability for maximum sample integrity during sample storage by using lid-covered chest freezer compartments. Special measures are taken to minimize warming events during internal processing, in addition to sample introduction and sample removal. One of the key components for this is our ultra-low temperature tube picker (patent pending). As a result, BiOS prevents samples from experiencing warming events throughout their lifetime in the system.

## The Flexibility Store

BiOS can store multiple types of labware in one system. Almost any labware stored in racks that are in conformity to SBS standards, up to a maximum racked height of 10 cm, can be stored and processed. The ultra-low picker is capable of processing a wide range of labware without the need for any mechanical changes or additional picking modules.

Additionally, the capacity of BiOS can be scaled according to the specific storage needs of the customer, and can be expanded in the field without removing the samples from the existing chest freezers operating at temperatures down to -85°C.

## The Reliability Store

BiOS avoids placing drives, sensors\* or joints into the -85°C environment or even close to regions within that temperature. By keeping all automation and sensors in the easily accessible and serviceable -20°C region, high reliability and ease of serviceability are designed into the system. Additionally, the refrigeration system provides several levels of backup systems to maintain sample integrity in the event of any failure.

\*With the exception of temperature sensors.

## Applications

- ▶ Biobanking
- ▶ Forensics
- ▶ Drug discovery
- ▶ Life science research
- ▶ Pharmacogenomics
- ▶ Genotyping

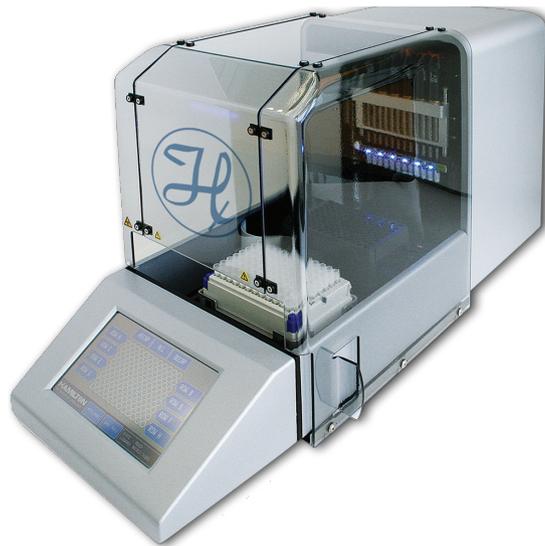
## Technical Specifications:

Dimensions	Base System (e.g. 1M 0.5 mL samples)	4.1 m (w) x 2.9 m (h) x 6 m (d) 13 ft (w) x 10 ft (h) x 20 ft (d)
	Large System (e.g. 14M 1.4 mL samples)	9 m (w) x 4.8 m (h) x 20 m (d) 30 ft (w) x 16 ft (h) x 66 ft (d)
Temperature Range		Down to -85°C
Capacity	1.4 mL tubes	250,000 to > 10 Million
Labware Sizes		0.3 mL to 12 mL
Redundancy (Options)		Two independent refrigeration systems; LN <sub>2</sub> backup
Operating System		Windows 7
Labware Processing		Processes multiple types of labware without hardware modifications
Barcode Reading		1-D and 2-D for plates
		2-D for tubes

# DeCapper™

## Automated Decapping

For laboratories that require frequent removal and replacement of caps, we offer the Hamilton DeCapper. The DeCapper\* optimizes the workflow in a laboratory by decapping 12 rows of tubes simultaneously in 60 seconds. The DeCapper supports 0.3 mL to 1.4 mL microtubes from Matrix, Micronic, Nunc and Corning. The DeCapper can be controlled by Microlab STAR Line VENUS one software or a stand-alone controller. Caps can be placed on a separate cap holder for processing multiple racks. In addition, this system can be operated as an integrated and stand-alone unit simultaneously.

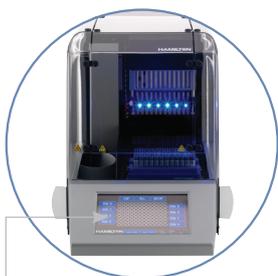


## Features of the DeCapper

- ▶ Selective row-wise opening or closing via 12 wells in parallel or complete rack
- ▶ Torque monitoring and security mode ensures an optimal seal on tubes during capping
- ▶ Permanent sensor control monitors each cap during transportation to ensure no caps are lost
- ▶ Removable cap holder rack allows batch processing of several tube racks simultaneously
- ▶ No cap moves over opened tubes to avoid cross contamination
- ▶ An easy-to-use touchscreen provides easy navigation through the system



Selective row-wise opening and closing.



Touchscreen panel for easy navigation.

## Technical Specifications:

Instrument Dimensions (with attached touchscreen panel)	Width: 306.0 mm (12.0 in) Height: 363.0 mm (14.2 in) Depth: 687.0 mm (27.0 in)
Instrument Dimensions (without attached touchscreen panel)	Width: 306.0 mm (12.0 in) Height: 363.0 mm (14.2 in) Depth: 546.0 mm (21.5 in)
Weight	20 kg (44 lbs)
Throughput Rate	Decaps in 60 sec/Caps in 90 sec per 96-tube rack
Labware	Compatible with Matrix, Micronic, Nunc and Corning*

\* Others available upon request.



# Rack Runner™

## Integration Robot

The Rack Runner is a fast and reliable robot used to integrate our automated storage systems to several devices including Microlab STAR Line workstations, additional storage systems, DeCappers, or third-party equipment such as hotels, incubators, and plate readers.

The two desktop versions—Rack Runner 720 and Rack Runner 1872—are built to position the linear drive robot directly on a workbench.

The Line Rack Runner is a modular and scalable system that is configured to the user's needs. This version can link devices over a distance of up to 8.0 m (26.2 ft), providing easy integration for large laboratories and factories.

The Line Rack Runner can be expanded in the field to easily add more equipment. It includes a protective housing to guarantee safety for users, which can be purged with dry air or inert gas to eliminate frost buildup during cold sample transport. Lastly, the access portal can be electronically locked by the user.



## Features and Benefits of the Rack Runner:

- ▶ Compact footprint easily integrates into a laboratory
- ▶ Built-in force sensors control the gentle, yet firm grip on the racks and plates
- ▶ Absolute encoders eliminate slow and risky initialization movements and collisions with peripheral devices
- ▶ Wireless data transmission eliminates moving cables on the linear track
- ▶ Linear drive technology produces minimal wear
- ▶ Modern direct current motors provide forceful and smooth movements

## Technical Specifications:

	Line Rack Runner	Rack Runner 720/1872
Height	1700 mm (67 in)	700 mm (27.6 in)
Width	380 mm (15 in)	270 mm (10.6 in)
Length	800 to 8500 mm (31 to 335 in)	760 mm (29.9 in)
Track Length	Up to 8000 mm (315 in)	720 mm (28.3 in) / 1872 mm (73.7 in)
Track Height	880 mm (34.6 in)	55 mm (2.2 in)
Horizontal Arm	250 mm (9.8 in)	250 mm (9.8 in)
Rotation	315°	315°
Gripper Range	60 to 136 mm (2 to 5 in)	60 to 136 mm (2 to 5 in)
Gripper Height	950 to 1340 mm (37.4 to 52.8 in)	70 to 460 mm (2.8 to 18.1 in)
Speed	2.5 m/s (8.2 ft/s)	2.5 m/s (8.2 ft/s)
Max. Transport Weight	2 kg (4.4 lbs)	2 kg (4.4 lbs)



# Microlab<sup>®</sup> STAR Line and Storage Integration

## Microlab<sup>®</sup> STAR Line

Hamilton offers a full line-up of the most flexible automated liquid handling workstations on the market. The Microlab STAR Line integrates seamlessly with our ASM or SAM systems to perform decapping, daughter plate production, and a myriad of post- or pre-processing applications. Barcode reading and pipette pressure monitoring supply chain-of-custody data to track and document all steps. Readers, sealers, shakers, as well as many other additional devices, can be integrated for expanded applications.



The STAR Line uses proven air displacement pipetting technology for superior accuracy and precision. The STAR can be configured with one or more arms, with each arm featuring one or more pipetting tools and labware gripping devices. Pipetting channels and labware grippers move independently of each other, providing for parallel processing and higher throughputs. The Autoload option provides barcode tracking of samples, labware, racks and carriers. Hamilton offers both the traditional capacitive liquid level detection as well as pressure-based liquid level detection. All workstation functions and integrated third-party devices are controlled by the Microlab STAR Line VENUS Software.

## The STAR Line delivers performance by combining:

- ▶ Leading pipetting technology
- ▶ Highly scalable platforms
- ▶ A wide range of applications
- ▶ Easy-to-use software
- ▶ Modular accessories

## Deck Capacities\*:

Instrument	Deck Capacity
STARlet	30 tracks
STAR	54 tracks
STARplus	82 tracks

\* For technical specifications, please refer to the Microlab STAR Brochure.

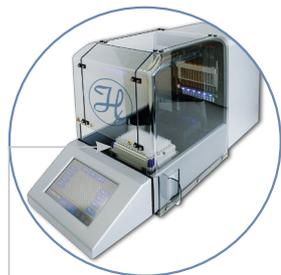


## Comprehensive Sample Processing Systems

In today's dynamic discovery research environment, organizational growth and process change is inevitable. Our liquid handling integration allows rapid, simple, cost-effective implementation of an integrated solution. Hamilton's liquid handling workstations are designed specifically for our storage platforms, creating a comprehensive sample processing center with a broad range of drug discovery applications.



The Rack Runner can transport racks between the ASM or SAM to a DeCapper or STAR.



A DeCapper can be integrated as well for automated decapping and capping.

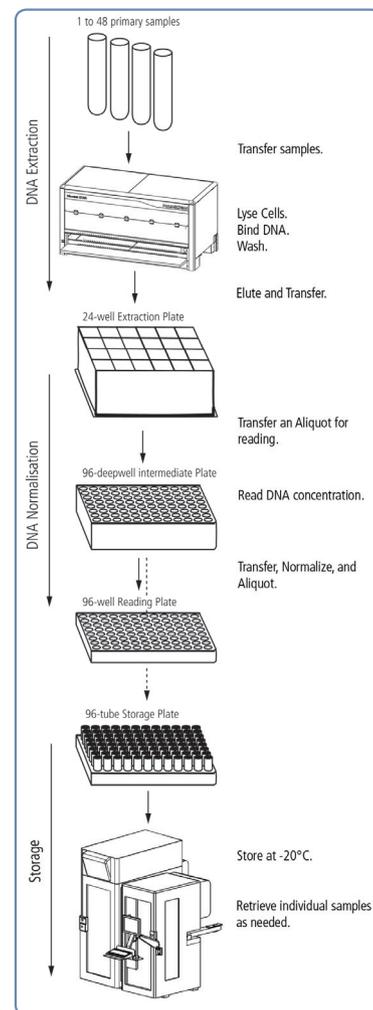


Third-party instruments can also be integrated, such as centrifuges, shakers and sealers.

Our systems allow users to start with a simple, single format technique with the availability to adopt additional formats into our system's design. Users can combine standard modules to configure a system to fit specific automated sample management needs and budgetary guidelines without compromising future growth.

Whatever your current or future sample management requirements, Hamilton can offer a wide range of solutions to provide your lab with a complete, fully integrated automated sample management system.

## Example Workflow



The workflow of a DNA biobank that automates all the steps of DNA extraction, DNA normalization, and storage/retrieval at -20°C.



# HST Cryovial/Microtube Rack

## 48-Position Cryovial/Microtube Rack

Hamilton developed a proprietary 48-position cryovial/microtube rack, custom made in order to provide laboratories with additional choices in storing cryovial/microtube types. The honeycomb design increases the number of tubes that can be placed in the rack, maximizing the use of the storage space. These custom-designed racks can be used in both manual and automated sample storage and are specifically designed for utilization in our -80°C SAM and BIOS systems. The rack can hold labware from Corning, FluidX, Greiner and Nunc.



## Custom-Made Rack



*The custom-made rack provides laboratories with additional choices in storing cryovial or microtube types.*

## Technical Specifications:

Rack Dimensions	127.64 mm x 84.71 mm 5.03 in x 3.34 in
Vial/Tube Diameter	10.0 mm to 12.0 mm 0.39 in to 0.47 in
Vial/Tube Min. Height	43.0 mm 1.69 in
Vial/Tube Max. Height	100.0 mm 3.94 in
Rack Material	RTP 132HI, 30% Talc Filled Polypropylene Copolymer
Temperature Range	-100°C to 120°C
Autoclavable	Yes



# About Hamilton Company

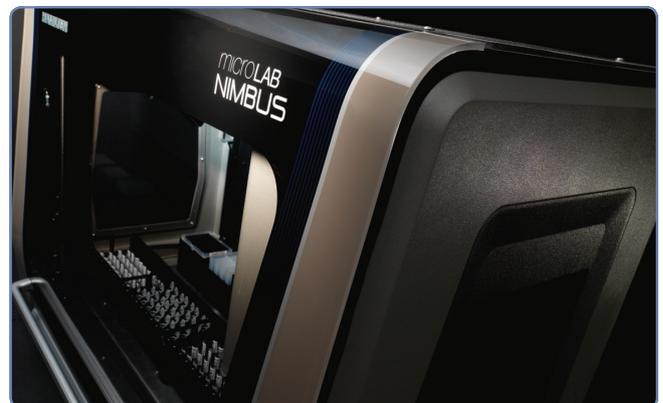
Hamilton Company is a global enterprise with headquarters in Reno, Nevada; Franklin, Massachusetts; and Bonaduz, Switzerland and subsidiary offices throughout the world.

We are an industry leader in the design and manufacture of liquid handling, process analytics, robotics and automated storage solutions. For more than 60 years, Hamilton has been satisfying customer needs by combining quality materials with skilled workmanship to ensure the highest level of performance. Hamilton's lifelong commitment to precision and quality has earned us global ISO 9001 Certification.



Founded on the technology of analytical Microliter™ and Gastight® syringes, Hamilton has a broad offering of laboratory products including manual and semi-automated precision fluid measuring instruments, chromatography products, process sensors, laboratory electrodes, pipettes and more. Top innovations from these lines include Arc™ pH, DO and Conductivity Intelligent Sensors, the BioLevigator™ 3D Cell Culture System, Microlab® 600 Diluters/Dispensers and the Microlab 300 Guided Pipetting System.

A pioneer in liquid handling equipment and laboratory automation technology, Hamilton Robotics is known for advancing life science and biotechnology industries through reliability, performance and flexibility. Hamilton is the industry leader in design and manufacturing with patented technologies such as Compression-induced O-Ring Expansion (CO-RE™), Total Aspiration and Dispensing Monitoring (TADM) and Anti-Droplet Control (ADC). Hamilton's platforms include Hamilton VANTAGE™, its newest vertically-integrated liquid handler, Microlab STAR, Hamilton's highest selling automated pipetting platform, and Microlab NIMBUS®, the first in its class of compact, high-speed, personalized pipetting workstations.



Hamilton Storage Technologies offers comprehensive ultra-low temperature automated sample management systems for microtube and microplate storage. Hamilton's line of biobanking and compound storage solutions, as well as consumables, are designed for a broad array of life science processes. Products include BiOS™, SAM™ and ASM™, designed for sample integrity, flexibility and reliability.

Hamilton Company is focused on blending invention and accuracy to deliver customers unparalleled products.

Your Hamilton Representative

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