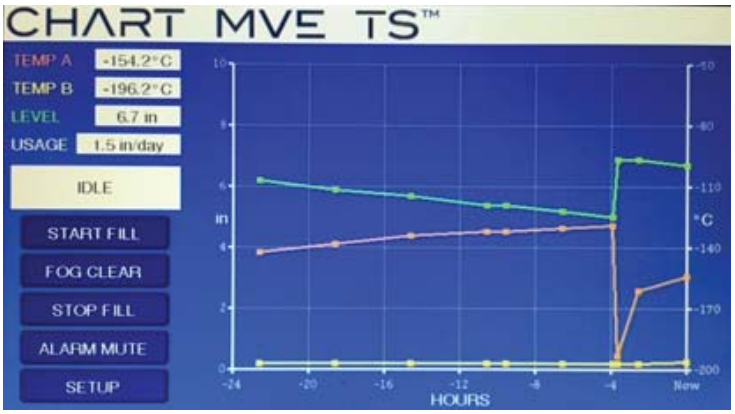
SECURITY THROUGH MVE SYSTEMS®
A Chart Industries Company

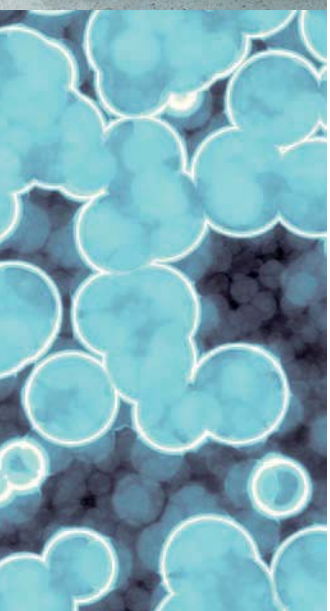
CHART®

MVE Cryopreservation for Life Science

New Chart MVE Touch Screen Control Systems



Stainless Storage Systems for MVE Cryopreservation



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Visit www.chartbiomed.com for more information.

Temperature Chart

Chart MVE is the leading global manufacturer of vacuum insulated products and cryogenic systems. More than fifty years ago, we set the standard for storage of biological materials at low temperatures. Today, we continue to exceed these standards. Industries from around the world look to Chart MVE for excellence and innovation. Our solutions empower industries to better utilize cryogenic technology. In this manner, Chart MVE continues to make a vital contribution in today's biomedical Life Sciences industry.

Recommended maximum temperature for storage of biological samples.

MATERIAL TO BE STORED	VOLUME	CONTAINER	INVENTORY CONFIGURATION	CRITICAL TEMPERATURE
Algae	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Blood	0.5 - 500 mL	Cryovial/Blood Bag	Boxes or canes/bag rack	-150°C
Cells:				
Animals / Human	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Plant	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Embryos		Straw	Canes	-150°C
Fungi:				
Mycelium	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Hybridomas	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Phage:				
Libraries	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Protozoa	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C
Viruses: Animal				
In Cells	0.5 - 1.0 mL	Cryovial	Boxes or canes	-150°C

Product Selector Guide

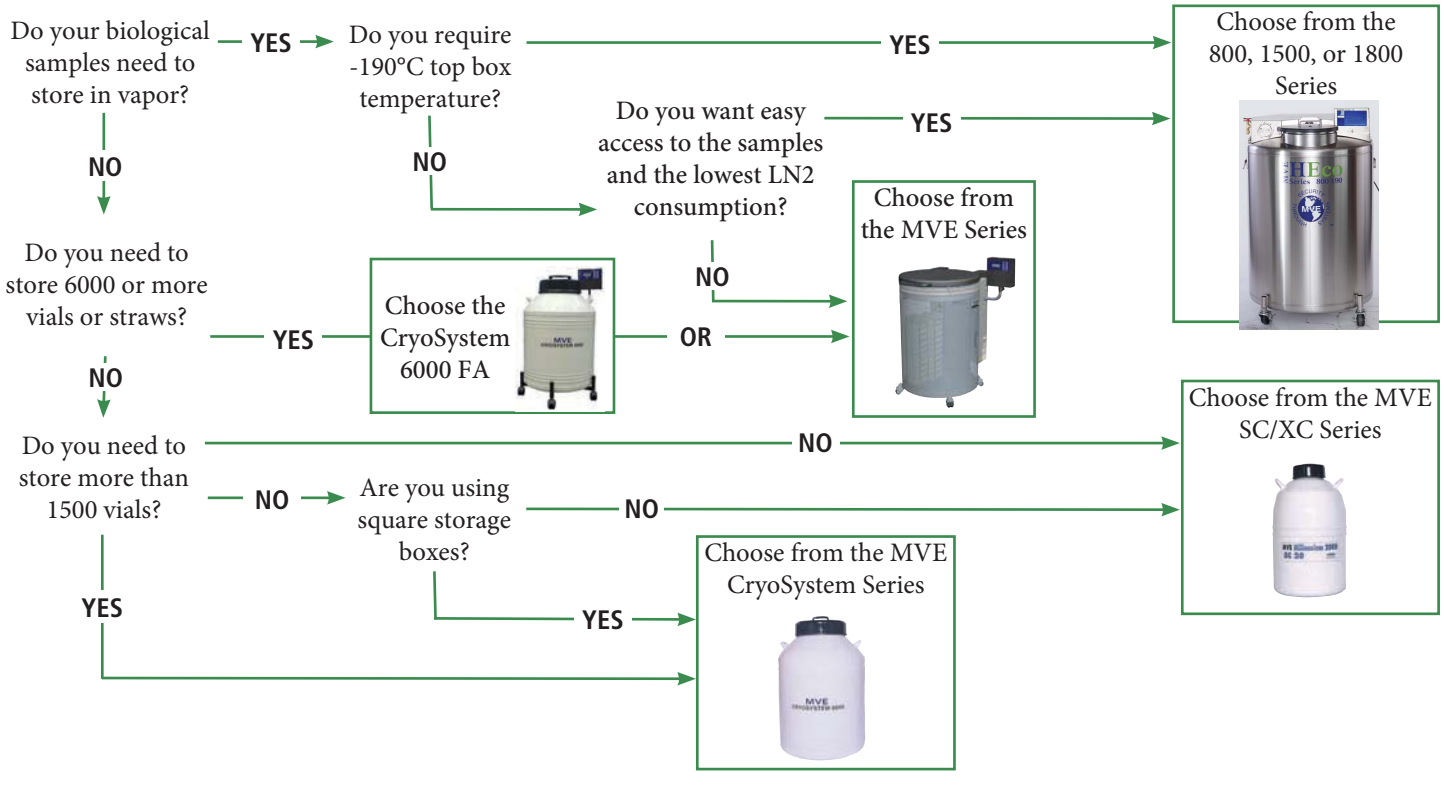
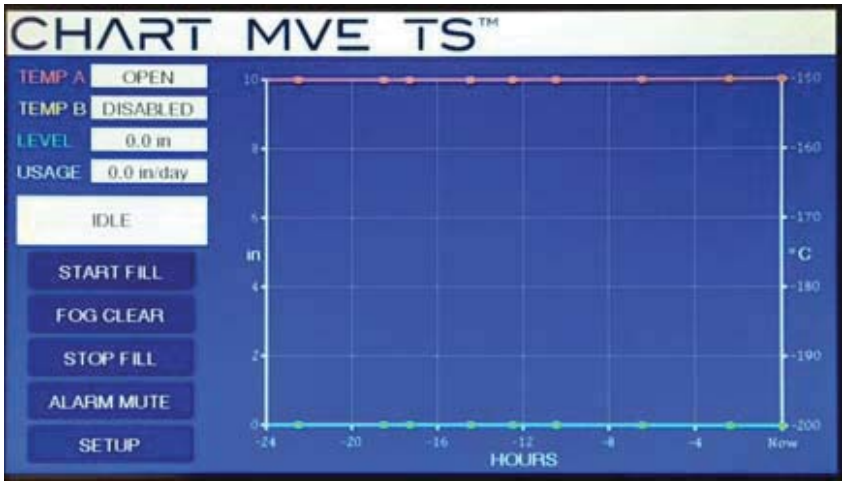


Chart MVE TS (Touch Screen)



New Screen will feature X,Y Graph for quick view of Temperature and Liquid Nitrogen Level!

Chart MVE TS employs a variety of advanced features that enable the controller to monitor and control the environment inside a freezer with a high level of precision.

Liquid Nitrogen Level Measurement

Chart MVE TS uses a differential pressure system to determine the LN2 level to an accuracy of ± 0.5 in. (15 mm) and a resolution of 0.1 in. (5.0 mm). Unlike alternative level sensing systems, differential pressure allows the exact level to be measured and displayed. Using the simple single point calibration in a range of 3.0 in. to 48.0 in. (75 mm to 1220 mm), the patented, self-maintaining, closed-loop system displays in inches, millimeters, or a percentage full.

Automatic Liquid Nitrogen Level Control

The fully automated LN2 level control system is based on user-defined parameters that can be electronically adjusted over the entire level range. The parameters include Low Level Alarm, Low Level Fill Point, High Level Fill Point and High Level Alarm. The redundant Dual Solenoid Valves for overfill protection run on 24 VDC, 1.0 amp (max).

Liquid Usage

This exclusive feature provides an estimation of liquid usage to track LN2 consumption and can provide an early failure warning to allow sufficient time to implement corrective action and save irreplaceable samples.

User-Defined Alarms

A total of 18 audio/visual alarms are used to alert the user to any potential or developing problems. The alarms include: High Temperatures, Low Temperatures, High Level, Low Level, Liquid Usage, Maximum Fill Time, Gas Bypass, Stuck Open/Closed, Temperature Calibrations, Low Battery, Power Failure, Lid Open and Communication Loss.

Remote Alarm Monitoring

Alarm monitoring includes Global/Discrete Remote Alarm Relay.

Temperature Measurement

Two independent temperature measurement channels are employed to accurately measure the temperature across the entire storage space. The two platinum RTD sensors have an accuracy of ± 1.0°C and a resolution of 0.1°C. The temperature can be displayed in °C, °F or K. The single or two point calibration also has altitude compensation for the highest accuracy.

Temperature Inlet Settings (Hot Gas Bypass)

This unique feature is able to vent warm nitrogen gas from the supply line before initiating a fill. This prevents warm gas from entering the freezer space, which helps maintain a stable temperature gradient and increases the efficiency by reducing excess LN2 evaporation.

Event Log / Data Storage

Store vital, unalterable, time-stamped data in nonvolatile memory. This is a great tool for assessing freezer performance and troubleshooting any problems. The memory can store 30,000 events, an estimated 10 years of storage capacity. The data includes time-stamped temperatures, LN2 level, liquid usage, and any alarms or events.

Password Security

The multilevel security system comprised of up to ten user-specific programmable passwords and four security levels can be customized to grant or restrict personnel access to certain menus and settings.

Communication Capabilities

One independent port can be used to communicate with other TEC 3000 controllers, a remote PC, serial printer, or other RS-485 networks and devices. Options include ASCII, MODBUS, Printer and One Fill All Fill (OFAF).

Ethernet Capabilities

One independent RJ45 port can be used for network connection.

Chart MVE TS Main Screen Details

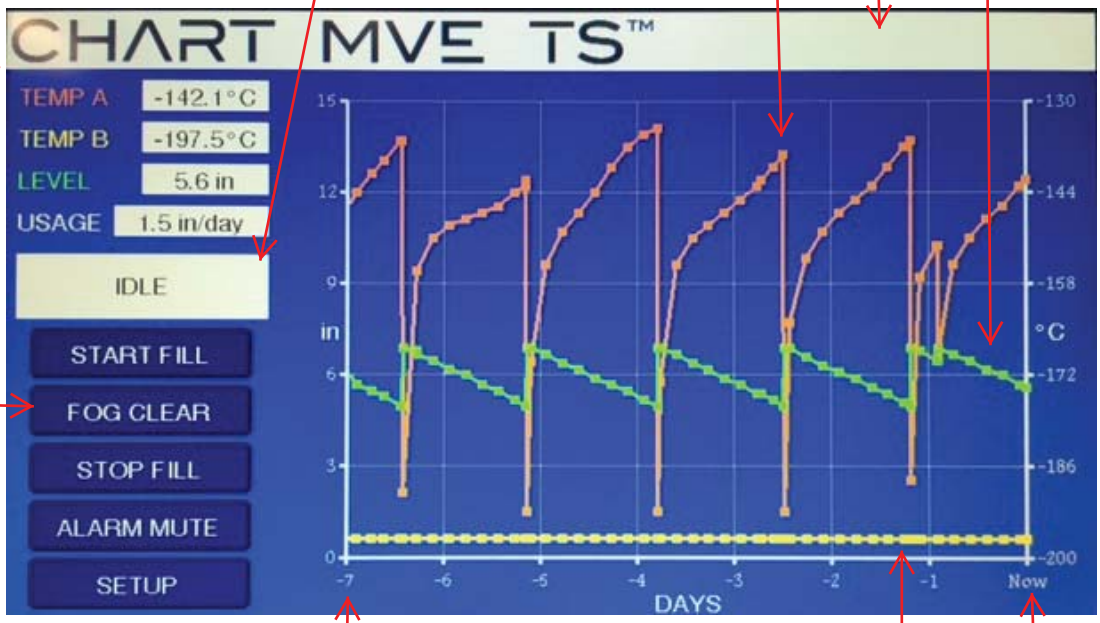
Temp A, B, and Level is displayed when navigating the Menus!

Idle Status indicates freezer on standby. Changes to Bypassing or Filling

Alarm Status Indicator (Changes to Red)

Temp A

Level



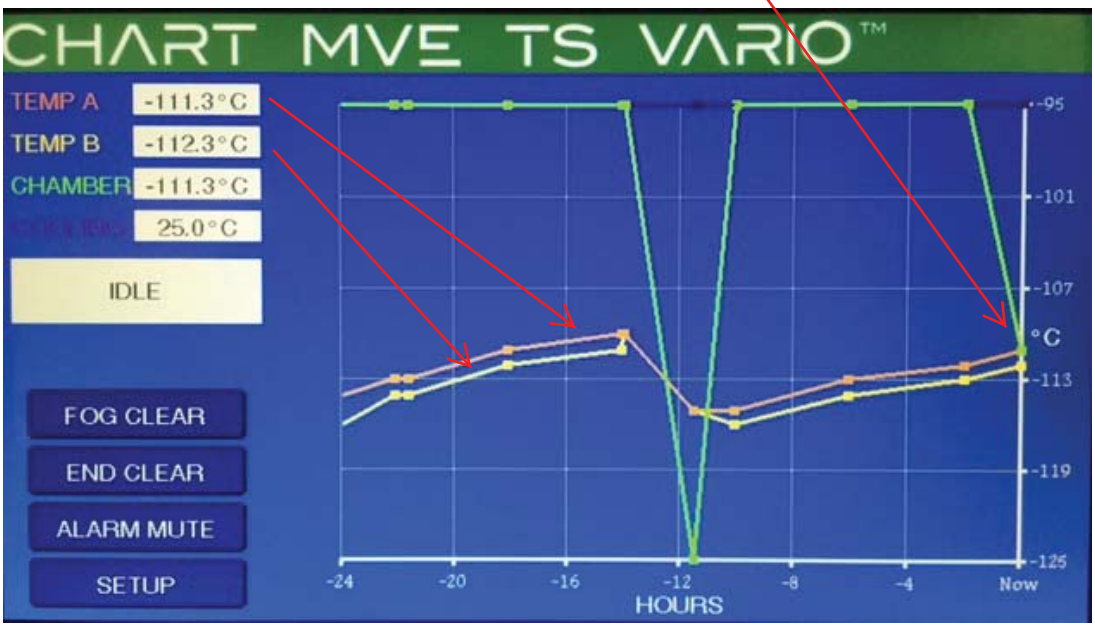
Fog Clear Icon! replaced Manual Fill Button)

Trend Data adjustable from one day, 7 days, or 30 days

Temp B

Now Data (Present data)

Temperature A & B and Chamber Temp Display on Graph



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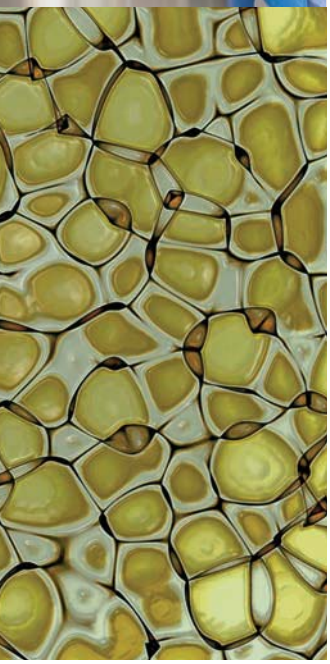
MVE HEco™ 800 Series Freezers

Featuring the New Chart MVE Touch Screen!



The MVE HEco Series is the next generation High Efficiency freezer from Chart BioMedical. With their unique shroud design, streamlined LN2 plumbing, and vacuum jacketed transfer hose, the MVE HEco 800 Series freezers provides efficient use of LN2, making them the most efficient vapor freezers available. These next generation high efficiency freezers incorporate hinged work surfaces that fully enclose all electronics and plumbing to enhance overall safety and usability.

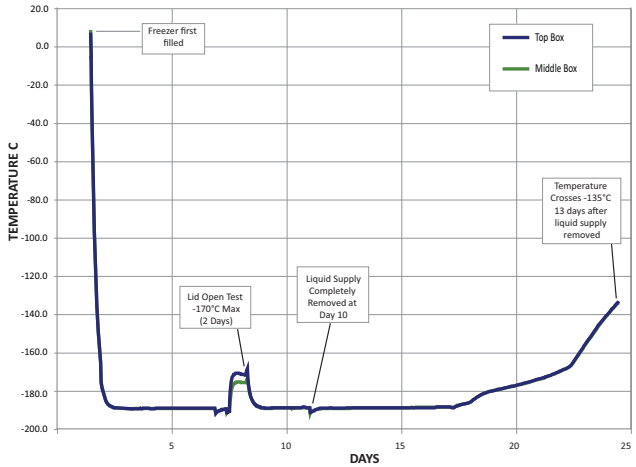
The technical and visual improvements combination create a more aesthetically pleasing freezer that offers greater functionality. As with all of MVE's cryogenic freezers, the MVE HEco 800 Series freezers are available in three unique sizes and provide maximum storage density as well as the longest hold time and highest sample security in the industry.

Features include:

- LN2 efficiency
- Fully enclosed wiring and plumbing
- Vacuum jacketed transfer hose
- Dry sample storage
- -190°C top box temperature
- Lowest liftover height
- Single step standard
- Optional double-tier step
- Optional battery backup—ask about one part number to order HEco with battery backup installed!

- Standard One-Tier Step
- Optional Two-Tier Steps

MVE HEco 800 Temperature Test*



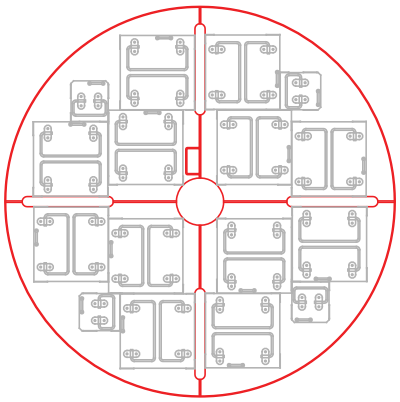
Temperature Test Graph

* Temperature test indicates typical performance of HEco Series freezer with full inventory system and factory recommended level settings. Actual performance may vary with atmospheric conditions and usage.

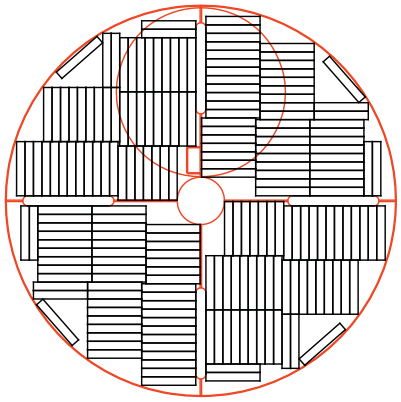
Visit www.chartbiomed.com for more information.

Rack Layouts

Square Rack Layout (P)



791 OS/U Layout



	MVE HEco 815P-190			MVE HEco 818P-190			MVE HEco 819P-190		
Maximum Storage Capacity									
1.2 & 2 ml Vials (Internally Threaded)	15,600			18,200			19,500		
Quantity of Large Racks 100 cell boxes	12			12			12		
Quantity of Mini *Racks* 25 cell boxes	4			4			4		
Number of Shelves per Rack	12			14			15		
Performance									
LN2 Capacity w/o Inventory L est.	370			420			463		
LN2 Capacity at Vapor Platform L est.	52			55			55		
Static Hold Time—Vapor days	10			11			11		
Static Hold Time—Liquid Full days est.	74			84			92		
Unit Dimensions									
Neck Opening in. (mm)	12.5 (317)			12.5 (317)			12.5 (317)		
Usable Internal Height in. (mm)	26.5 (673)			30.7 (781)			34.5 (877)		
Inner Diameter in. (mm)	28.8 (731)			28.8 (731)			28.8 (731)		
Overall Height in. (mm)	49.5 (1257)			53.9 (1370)			57.70 (1465)		
Liftover Height in. (mm)	40 (1016)			43.8 (1115)			47.63 (1209)		
Door Width Requirement** in. (mm)	32.0 (813)			32.0 (813)			32.0 (813)		
Door Width Requirement, with handles** in. (mm)	33.2 (843)			33.2 (843)			33.2 (843)		
Weight Empty* lb. (kg)	475 (215)			495 (225)			515 (234)		
Weight Liquid Full* lb. (kg) est.	1134 (514)			1168 (530)			1340 (608)		
Blood Bag Capacities	**Total Bags**	**Bags/ Frame**	**No. Frames**	**Total Bags**	**Bags/ Frame**	**No. Frames**	**Total Bags**	**Bags/Frame**	**No. Frames**
791 OS/U Medsep (25 ml)	1,224	6	204	1428	7	204	1,836	9	204
4R9951 (50 ml)	768	6	128	896	7	128	1024	8	128
4R9953 (250 ml)	416	4	104	416	4	104	520	5	104
4R9955 (500 ml)	304	4	76	304	4	76	380	5	76
DF200 (200 ml)	236	4	59	236	4	59	295	5	59
DF700 (700 ml)	132	3	44	176	4	44	220	5	44

TWO Year Parts Warranty • FIVE Year Vacuum Warranty

* Without inventory

**Minimum width required for vessel to pass through opening. Footprint may vary. Contact Tech Service for detailed drawings.

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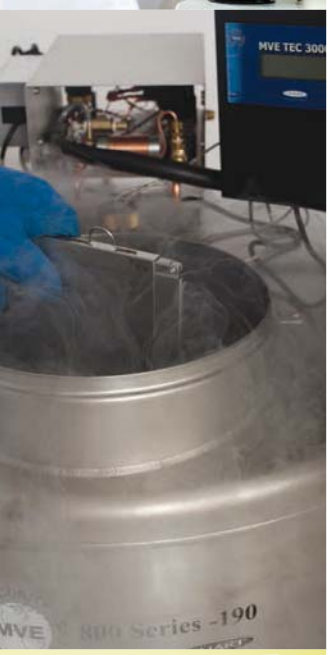
MVE HEco™ 1500 Series Freezers

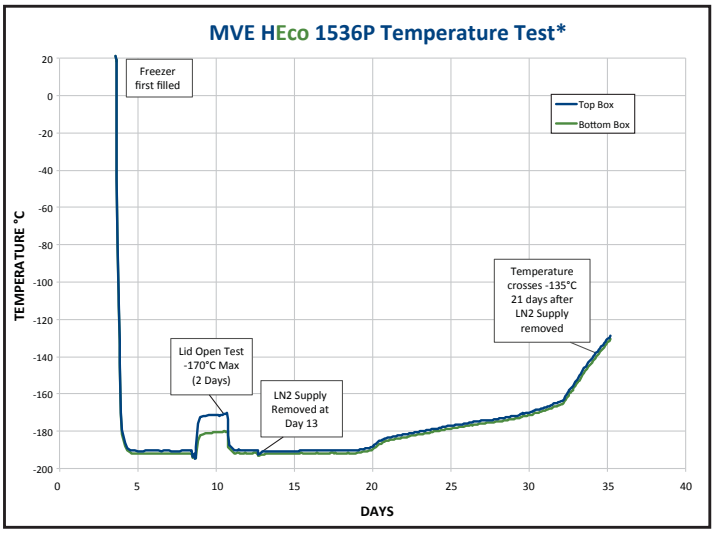
New Chart MVE Touch Screen!

The MVE HEco 1500 Series freezers provide efficient use of LN2, making them the most efficient vapor freezers available. These next generation high efficiency freezers incorporate a hinged work surfaces that fully enclose all electronics and plumbing to enhance overall safety and usability. The technical and visual improvements combine to create a more aesthetically pleasing freezer that offers greater functionality. As with all of MVE's cryogenic freezers, the MVE HEco 1500 Series freezers are available in three unique sizes and provide maximum storage density as well as the longest hold time and highest sample security in the industry.



Features include:

- LN2 efficiency
- Fully enclosed wiring and plumbing
- Vacuum jacketed transfer hose
- Dry sample storage
- -190°C top box temperature
- Lowest liftover height
- Two tier folding step
- Optional battery backup—ask about one part number to order HEco with battery backup installed!



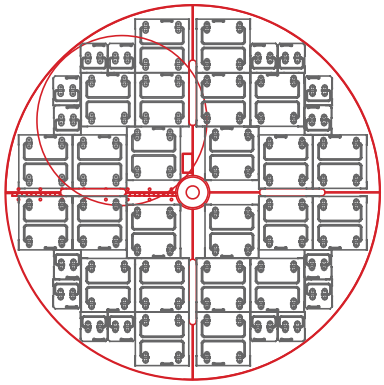
Temperature Test Graph

* Temperature test indicates typical performance of HEco Series freezer with full inventory system and factory recommended level settings. Actual performance may vary with atmospheric conditions and usage.

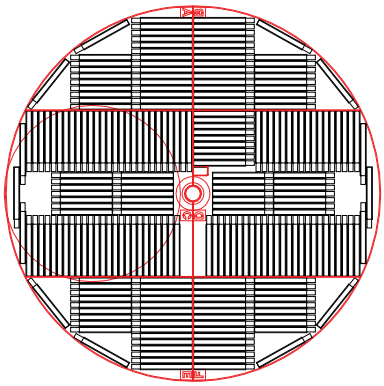
Visit www.chartbiomed.com for more information.

Rack Layouts

Square Rack Layout (P)



4R9951 Layout (R)



	MVE HEco 1536P-190			MVE HEco 1539P-190			MVE HEco 1542R-190		
Maximum Storage Capacity									
1.2 & 2 ml Vials (Internally Threaded)	36,400			39,200			42,000		
Quantity of Large *Racks* 100 cell boxes	24			24			26		
Quantity of Mini *Racks* 25 cell boxes	16			16			16		
Number of Shelves per Rack	13			14			14		
Performance									
LN2 Capacity w/o Inventory L est.	730			768			768		
LN2 Capacity at Vapor Platform L est.	115			115			115		
Static Hold Time—Vapor days	17			17			17		
Static Hold Time—Liquid Full days est.	100			104			104		
Unit Dimensions									
Neck Opening in. (mm)	17.4 (442)			17.4 (442)			17.4 (442)		
Usable Internal Height in. (mm)	28.8 (732)			30.2 (767)			30.8 (782)		
Inner Diameter in. (mm)	38.5 (978)			38.5 (978)			38.5 (978)		
Overall Height in. (mm)	54.7 (1389)			56.8 (1442)			56.8 (1442)		
Liftover Height in. (mm)	37.3 (947)			39.4 (999)			39.4 (999)		
Door Width Requirement** in. (mm)	42.0 (1067)			42.0 (1067)			42.0 (1067)		
Door Width Requirement, with handles** in. (mm)	43.3 (1099)			43.3 (1099)			43.3 (1099)		
Weight Empty* lb. (kg)	700 (318)			700 (318)			700 (318)		
Weight Liquid Full* lb. (kg) est.	2000 (907)			2100 (953)			2100 (953)		
Blood Bag Capacities	**Total Bags**	**Bags/ Frame**	**No. Frames**	**Total Bags**	**Bags/ Frame**	**No. Frames**	**Total Bags**	**Bags/ Frame**	**No. Frames**
791 OS/U Medsep (25 ml)	2,905	7	415	3,320	8†	415	3,184	8†	398
4R9951 (50 ml)	1,488	6	248	1,736	7	248	1,687	7	241
4R9953 (250 ml)	812	4	203	812	4	203	768	4	192
4R9955 (500 ml)	608	4	152	608	4	152	576	4	144
DF200 (200 ml)	496	4	124	496	4	124	488	4	122
DF700 (700 ml)	256	4	64	256	4	64	264	4	66

TWO Year Parts Warranty • FIVE Year Vacuum Warranty

* Without inventory

**Minimum width required for vessel to pass through opening. Footprint may vary. Contact Tech Service for detailed drawings. † Between usable height and clearance. Please refer to specifications.

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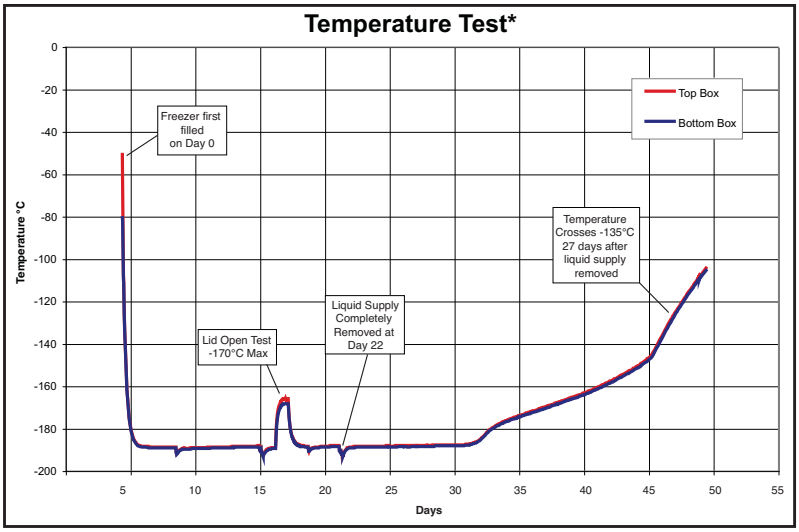
MVE HEco™ 1800 Series Freezers

New Chart MVE Touch Screen!

The MVE HEco 1800 Series freezers provide efficient use of LN2, making them the most efficient vapor freezers available. When an LN2 fill is initiated, the redesigned plumbing system optimizes the LN2 flow and reduces transfer loss, increasing efficiency and LN2 cost savings. The 1800 series provides option for greater storage in one freezer. These next generation high efficiency freezers incorporate a hinged work surfaces that fully enclose all electronics and plumbing to enhance overall safety and usability. The technical and visual improvements provide an aesthetically more pleasing freezer while offering greater functionality. As with all of MVE's cryogenic freezers, the MVE HEco 1800 Series freezers provide maximum storage density as well as the longest hold time and highest sample security in the industry.

Features include:

- LN2 efficiency
- Fully enclosed wiring and plumbing
- Vacuum jacketed transfer hose
- Dry sample storage
- -190°C top box temperature
- Lowest liftover height
- Two tier folding step
- Optional battery backup—ask about one part number to order HEco with battery backup installed!



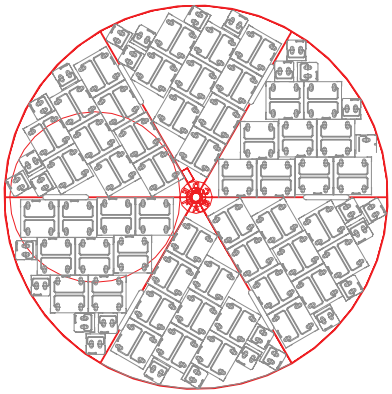
Temperature Test Graph

* Temperature test indicates typical performance of HEco Series freezer with full inventory system and factory recommended level settings. Actual performance may vary with atmospheric conditions and usage.

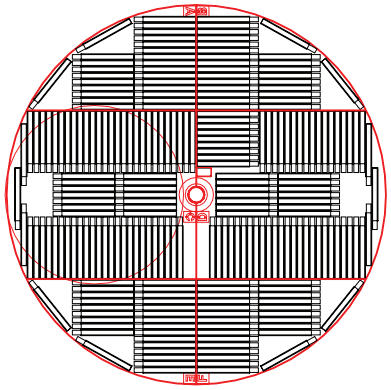
Visit www.chartbiomed.com for more information.

Rack Layouts

Square Rack Layout (P)



4R9951 Layout (R)



	MVE HEco 1879P-190	MVE HEco 1881R-190	MVE HEco 1892P-190	MVE HEco 1894R-190
Maximum Storage Capacity				
1.2 & 2 ml Vials **(Internally Threaded)**	79,950	81,900	92,250	94,500
Number of Racks *100 cell boxes*	54	60	54	60
Number of Racks *25 cell boxes*	30	12	30	12
Number of Stages per Rack	13	13	15	15
Performance				
LN2 Capacity ***L***	1745	1745	1770	1770
LN2 Capacity Under Tray ***L***	318	318	295	295
Static Hold Time—Vapor ***days***	25	25	23	23
Static Hold Time—Liquid Full ***days***	139	139	142	142
Unit Dimensions				
Neck Opening ***in. (mm)***	24.7 (627)	25 (635)	24.7 (627)	24.7 (627)
Usable Internal Height ***in. (mm)***	29.5 (749)	29.2 (741)	34.5 (876)	34.2 (868)
Inner Diameter ***in. (mm)***	56.0 (1422)	54.8 (1391)	56.0 (1422)	54.7 (1389)
Overall Height ***in. (mm)***	63.7 (1618)	61.3 (1556)	68.6 (1742)	68.6 (1742)
Liftover Height ***in. (mm)***	38.8 (985)	38.8 (985)	44.0 (1118)	44.0 (1118)
Door Width Requirement** ***in. (mm)***	60.0 (1524)	60.0 (1524)	60.0 (1524)	60.0 (1524
Weight Empty ***lb. (kg)***	1712 (781)	1721 (781)	1721 (781)	1721 (781)
Weight Liquid Full* ***lb. (kg)***	4830 (2191)	4830 (2191)	4875 (2211)	4875 (2211)

Blood Bag Capacities	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames
791 OS/U ***(25 ml)***	5,866	7	838	5,628	7	804	6,704	8	838	6,432	8	804
4R9951 ***(50 ml)***	2,952	6	492	2,940	6	490	3,936	8	492	3,920	8	490
4R9953 ***(250 ml)***	1,584	4	396	1,608	4	402	1,980	5	396	2,010	5	402
4R9955 ***(500 ml)***	1,104	4	276	1,240	4	310	1,380	5	276	1,550	5	310
DF200 ***(200 ml)***	960	4	240	984	4	246	1,200	5	240	1,230	5	246
DF700 ***(700 ml)***	504	4	126	544	4	136	630	5	126	680	5	136

TWO Year Standard Warranty • FIVE Year Vacuum Warranty

* Without inventory

**Minimum width required for vessel to pass through opening. Footprint may vary. Contact Tech Service for detailed drawings.

SECURITY THROUGH MVE SYSTEMS®
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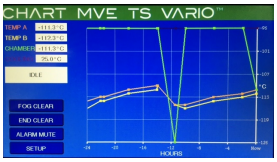
MVE Variō™ Series

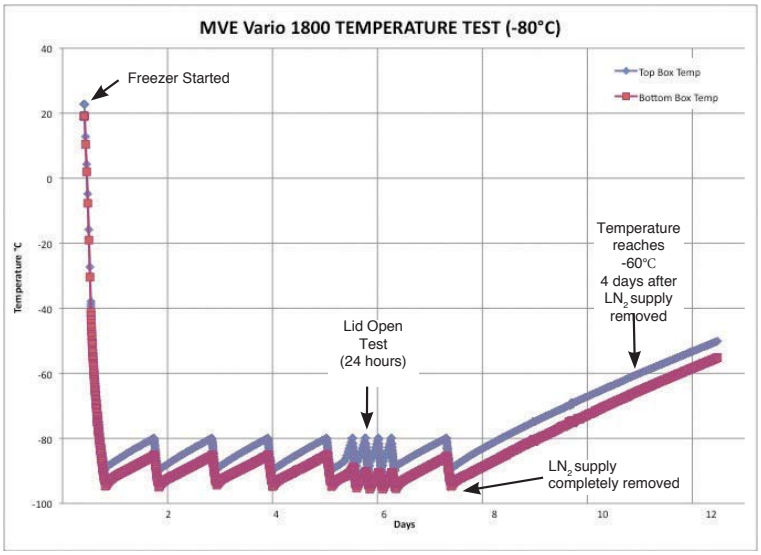


*Featuring the New Chart MVE Touch Screen!

The MVE Variō™ Series is the innovative and energy efficient alternative for ultra low temperature to cryogenic storage. The completely dry sample storage area will maintain a user-defined temperature anywhere between -20°C and -150°C. The MVE Variō Series significantly reduces the possibility of sample contamination via contact with LN2 while providing the safety margin and consistent temperature profile, even with the lid open, that is associated with LN2 based cryogenic storage. The MVE Variō Series is able to provide all of this with less than 1% of the power consumption and approximately 70% overall operating cost savings when compared to the leading mechanical freezers.

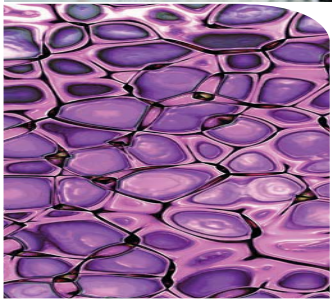
Features include:

- Approximately 70% operating cost savings compared to leading mechanical freezers (-80 °C)
- Less than 1% of the electricity consumption compared to leading mechanical freezers (-80 °C)
- Completely dry storage area
- Consistent temperature profile, even with lid open
- Improved processing time, minimal increase in temperature when warm samples introduced
- No thermal load; no heat introduced into room and no additional HVAC required
- No more expensive compressors to replace
- Convertible asset: can be retrofitted to expand temperature range to -190
- New Touch Screen



Temperature Test Graph

* Temp Test indicates typical performance of MVE Variō Series freezer with full inventory system and factory recommended level settings. Actual performance may vary with atmospheric conditions and usage.

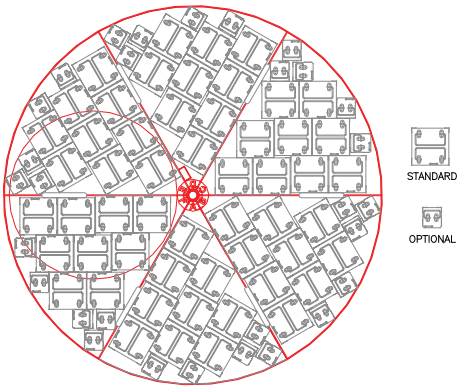


ML-O000044

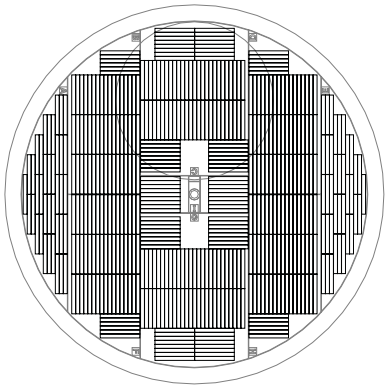
Visit www.chartbiomed.com for more information.

Rack Layouts

Square Rack Layout (P)



4R9951 Layout (R)



	MVE Varió 1536P	MVE Varió 1539R	MVE Varió 1879P	MVE Varió 1881R	MVE Varió 1894R
Maximum Storage Capacity					
1.2 & 2 ml Vials (Internally Threaded)	36,400	39,000	79,950	81,900	94,500
Quantity of Large Racks 100 cell boxes	24	26	54	60	60
Quantity of Mini Racks 25 cell boxes	16	16	30	12	12
Number of Shelves per Rack	13	13	13	13	15
Performance					
Temperature Range	-20°C, -150°C	-20°C, -150°C	-20°C, -150°C	-20°C, -150°C	-20°C, -150°C
LN2 Usage at -80°C L/day	9	9	12	12	15
Power consumption (cont.) W	8	8	8	8	8
Unit Dimensions					
Neck Opening in. (mm)	17.5 (445)	17.5 (445)	25.0 (635)	25.0 (635)	25.0 (635)
Usable Internal Height in. (mm)	28.8 (732)	28.8 (732)	29.5 (749)	29.2 (741)	34.2 (868)
Inner Diameter in. (mm)	38.5 (978)	38.5 (978)	56.0 (1,422)	54.8 (1,391)	54.8 (1,391)
Overall Height in. (mm)	61.3 (1,556)	61.3 (1,556)	62.1 (1,577)	61.3 (1,556)	66.3 (1,683)
Door Width Requirement** in. (mm)	42.0 (1,067)	42.0 (1,067)	60.0 (1,524)	60.0 (1,524)	60.0 (1,524)
Weight Empty* lb. (kg)	690 (313)	690 (313)	1,606 (728)	1,721 (781)	1,721 (781)

Blood Bag Capacities	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames	Total Bags	Bags/ Frame	No. Frames
791 OS/U Medsep (25 ml)	3,080	7	440	2,786	7	398	5,866	7	838	5,628	7	804	6,432	8	804
Compact (25 ml)	4,338	9	482	3,924	9	436	8,622	9	958	9,414	9	1,046	11,506	11	1,046
4R9951 (50 ml)	1,488	6	248	1,446	6	241	2,952	6	492	2,940	6	490	3,920	8	490
4R9953 (250 ml)	812	4	203	768	4	192	1,584	4	396	1,608	4	402	2,010	5	402
4R9955 (500 ml)	608	4	152	576	4	144	1,104	4	276	1,240	4	310	1,550	5	310
DF200 (200 ml)	496	4	154	488	4	122	960	4	240	984	4	246	1,230	5	246
DF700 (700 ml)	256	4	64	204	4	66	504	4	126	544	4	136	680	5	136

TWO Year Parts Warranty • FIVE Year Vacuum Warranty

* Without inventory

**Minimum width required for vessel to pass through opening. Footprint may vary. Contact Tech Service for detailed drawings.

Chart: Total Cryogenic Solutions

Air Separation

Distribution & Storage

Bulk Storage Tanks

Liquid Cylinders

Dewars

Security Through Systems

Freezers

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