SECURITY THROUGH MVE SYSTEMS

Cryo Preservation Equipment

Storage and Transport Systems for Biological Materials

MVE Biological Systems

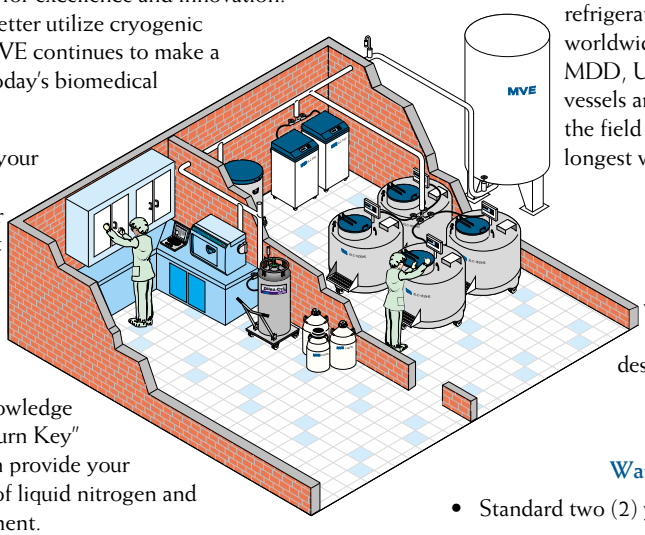
Chart-MVE is the world's leading manufacturer of vacuum insulated products and cryogenic systems. More than thirty years ago, we set the standard for storage of biological materials at low temperatures. Today, we continue to exceed these standards. Industries, from around the world, look to Chart-MVE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

Chart-MVE has the solution for all of your cryogenic storage needs. We offer the broadest range of storage capacities for your biological products with the most advanced vacuum technology.

Chart-MVE is the market leader in the manufacturing of Bulk Storage, Liquid Cylinder and Vacuum Insulated Pipe products. Chart-MVE applied this knowledge to the development and creation of "Turn Key" liquid nitrogen supply systems that can provide your freezer with the most economical use of liquid nitrogen and the best return on your storage investment.

Every Chart-MVE freezer is designed for optimum vacuum performance for the duration of its use. Chart-MVE freezers are engineered to hold and maintain specific temperatures whether samples are in liquid or vapor. Chart-MVE has the widest range of storage capacities and storage options (from -125° to -196°C) for your biological product needs.

By choosing Chart-MVE, you are installing a secure and viable environment, free of the noise and heat created by mechanical refrigeration systems. Chart-MVE products meet worldwide standards of excellence such as CE, MDD, UL, IATA, and ISO 9001. Chart-MVE vessels are factory tested to ensure reliability in the field and are backed by the strongest and longest warranty in the industry.



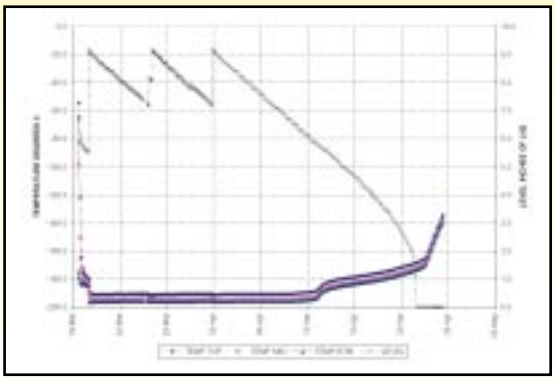
Service to Match Your Expectations.

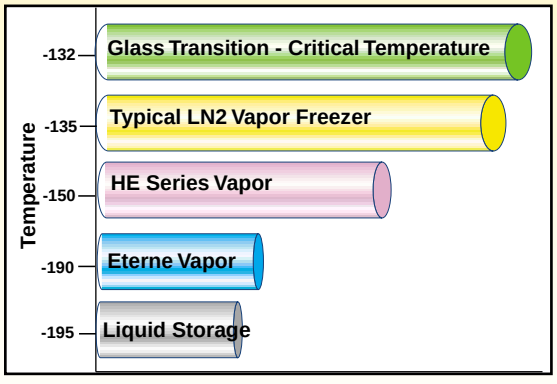
- Worldwide network of distributors who are second to none. Each distributor is factory trained in sales and service designed to provide to you the expertise and assistance you need and deserve.

Warranties that Surpass Industry Standards.

- Standard two (2) year warranty on all equipment (parts and labor).
- Three (3) year vacuum warranty on CryoSystem Series and Vapor Shippers.
- Five (5) year vacuum warranty on Stainless Steel Freezers and XC/SC Aluminum Units.

	MVE 810 Eterne/HE	MVE 810 Plus Series	MVE1520 Eterne/HE	MVE 1520 Plus Series	MVE1830 Eterne/HE	MVE 1830 Plus Series
UNIT DIMENSIONS						
LN2 Capacity (Liters)	370	377	756	797	1672	1829
LN2 Capacity Under Platform (L)	52	52	133	133	296	296
Neck Opening (In/mm)	12.5 / 317	12.5 / 317.5	17.5 / 444.5	17.5 / 444.5	25 / 635	25 / 1735
Useable Internal Height (In/ mm)	27.5 / 698	31.75 / 806.5	28.6 / 726.4	30.8 / 781.8	28.6 / 726.4	34.5 / 876
Inner Diameter (In/mm)	28.7 / 729	28.78 / 731	38.5 / 997.9	38.5 / 977.9	56 / 1422.4	56 / 1422
Overall Height (In/mm)	47.3 / 1202	53.3 / 1353.3	53.2 / 1351	62.8 / 1595.7	63.3 / 1608	68.3 / 1735
Outer Diameter (In/mm)	32 / 812.8	32 / 812.8	42 / 1066.8	42 / 1066.8	60 / 1524	60 / 1524
Weight Empty (Lbs/Kg)	475 / 216	378 / 171	750 / 341	1388 / 629	1500 / 681	1545 / 701
UNIT CAPACITIES - VIALS						
1.2 & 2 ml Vials (Internally Threaded)						
Number of Racks (100 cell boxes)	12	12	24	24	54	54
Number of Racks (25 cell boxes)	4	4	12	8	30	30
Number of Stages per Rack	12	14	13	14	13	15
Total Vial Capacity	*15,600*	*18,200*	*33,800*	*36,400*	*79,950*	*92,250*





MVE Eterne/HE & HE Plus Series

-190°C Vapor Storage / High Efficiency Storage In Liquid Vapor

NEW Ergonomic Double Step - Folds Away When Not Required

There is a critical temperature for most biological samples that are cryopreserved. Known as the Glass Transition Temperature (Tg), this is widely accepted as being in the order of -130 to -135°C. The long term viability of frozen samples can be seriously compromised if stored above this temperature. Further, if they experience several transitions through the temperature, in either thermal direction additional deterioration may occur. It is important that the LN_2 freezer maintain a lower temperature, even during filling and sample retrieval cycles. This is much more likely to be achieved if the freezer maintains -190°C than if the system is at or near the critical temperature at normal equilibrium. Chart-MVE's approach to this problem was to improve the fundamental design of freezers used in vapor phase and to design and build a nitrogen vapor freezer which addresses the previous issues associated with storage in vapor.

Blood Bag Capacities

Unit Capacities	Bags/Frame	No Frames	Total Bags
MVE 810 Eterne/HE			
4R9951	6	111	666
4R9953	4	95	380
4R9955	4	68	272
MedSep 810	6	138	828
MVE1520 Eterne/HE			
4R9951	6	224	1,344
4R9953	4	190	760
4R9955	4	180	720
MedSep 1520	6	428	2568
MVE 1830 Eterne/HE			
4R9951	6	480	2,880
4R9953	4	390	1,560
4R9955	4	276	1,104
MedSep 1830	7	828	5796

Unit Capacities	Bags/Frame	No Frames	Total Bags
MVE 810 Plus Series			
4R9951	7	111	777
4R9953	4	95	380
4R9955	4	68	272
MedSep 810	8	140	1120
MVE1520 Plus Series			
4R9951	7	248	1,736
4R9953	4	190	760
4R9955	4	180	720
MedSep 1520	8	428	3,424
MVE 1830 Plus Series			
4R9951	8	828	6,624
4R9953	5	390	1,950
4R9955	5	276	1,380
MedSep 1830	8	828	6,624

TWO Year Standard Warranty
FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE 600 / 1400 Series

The MVE 600 and 1400 Cryo-Preservation Systems are designed to provide reliable storage of biological products in liquid or vapor. New design with improved ergonomics and easier sample access, all aluminum cabinet and lid with stainless steel top deck. With vial storage capacities ranging from 16,900 to 26,650, combined with our low maintenance design, industry leading warranty, and the TEC 2000 electronics the MVE 600 and 1400 Series are world class wide neck freezers.

** The MVE 600/1400 Series Freezers are designed primarily for liquid phase storage. If vapor phase storage is required, ask your distributor about the available vapor phase storage accessory package.

MODEL	MVE 600	MVE1400
MAXIMUM STORAGE CAPACITY		
Number of 1.2 & 2.0 ml vials in racks (13/2)	16,900	26,650
Number of racks (100 vials)	12	18
Number of racks (25 vials)	4	10
Total number of racks	16	28
No of Blood Bags Stored (Fenwal 4R-9953)	352	512
PERFORMANCE		
Liquid nitrogen capacity (liters)	236	375
Power supply	24 VDC	24 VDC
UNIT DIMENSIONS		
Neck opening (in/mm)	25.13 / 638	31.75 / 806
Usable height (in/mm)	29.06 / 738	28.9 / 735
Overall height (in/mm)	40.38 / 1026	40.38 / 1026
Outside dimensions (in/mm)	28x35.13 / 711x892	34.75x41.13 / 882x1044
Internal diameter (in/mm)	25.13 / 638	31.75 / 806
Weight empty (lbs/kg)	330 / 150	530 / 240
Weight full (lbs/kg) w/LN2	751 / 341	1198 / 543

TWO Year Standard Warranty
FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE Series

MVE Cryo-Preservation Systems are designed for the user requiring either vapor or liquid storage. A wide neck opening and stainless steel construction provides the most durable environment for your biological samples. With advanced features and storage from 3,200 to 39,000 vials, the MVE series is the choice of laboratories worldwide.

** The MVE 611/1411 Series Freezers are designed primarily for liquid phase storage. If vapor phase storage is required, ask your distributor about the available vapor phase storage accessory package.

MODEL	*MVE 230**	*MVE 230II*	*MVE 511*	*MVE 611*	*MVE 1411*	*MVE 1841*
MAXIMUM STORAGE CAPACITY						
Number of 1.2 & 2.0 ml vials in racks	3200	5200	10,400	16,900	26,650	39,000
Number of racks (100 vials)	4(13/2 rack)	4 (13/2 rack)	7 (13/2 rack)	12(13/2 rack)	18 (13/2 rack)	28 (13/2 rack)
Number of racks (25 vials)	-	-	4 (13/2 rack)	4 (13/2 rack)	10 (13/2 rack)	8 (13/2 rack)
Total number of racks	4	4	11	16	28	36
Number of blood bags stored (Fenwal 4R–9953)	-	132	224	352	512	980
PERFORMANCE						
Liquid nitrogen capacity (liters)	63	89	158	236	375	669
Power supply	-	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
UNIT DIMENSIONS						
Neck opening (in/mm)	16.1 / 408	16.0 / 408	21 / 533	25.13 / 638	31.75 / 806	39.5 / 1003
Usable height (in/mm)	19.38 / 492	28.9 / 735	29.8 / 756	29.81 / 757	28.7 / 726	33.3 / 846
Overall height (in/mm)	30.25 / 768	45.25 / 1150	44 / 1118	40.69 / 1 033	40.69 / 1034	48 / 1219
Outside diameter (in/mm)	18 / 457	18.0 / 457	22.75 / 579	27.38 / 695	33.75 / 857	42 / 1067
Internal diameter (in/mm)	16.1 / 408	16.0 / 408	21 / 533	25.13 / 638	31.75 / 806	39.5 / 1003
Weight empty (lbs/kg)	79 / 36	125 / 57	228 / 103.6	283 / 128	530 / 240	675 / 306
Weight full (lbs/kg)	191 / 87	283 / 129	511 / 232.3	704 / 319	1198 / 543	1867 / 847

*Number of SUC-1 Canisters is 22

TWO Year Standard Warranty
FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

SECURITY THROUGH MVE SYSTEMS

MVE Stock Series

MVE Stock Series tanks are primarily designed for storage of either vials/straws on canes in liquid nitrogen. In addition to a build intended for long life and durability in service, the ergonomics of sample retrieval is of vital importance in this type of storage environment. Dual lids on the MVE 1370 aid in sample removal while retaining critical temperatures inside the storage area. The rotating sample tray in the 1830 allows for maximized storage space and easy access. All MVE Stock units are built with the emphasis on sample security and the ability to provide safe long-term storage for your most valuable samples.

MODEL	MVE 140	MVE 810	MVE 1370	MVE 1830	MVE 18302T
MAXIMUM STORAGE CAPACITY					
Number of 1.2 & 2.0 ml vials in racks	-	11,700	20,800	-	-
Number of racks (100 vials)	-	12 (9/2 rack)	24 (8/2 rack)	-	-
Number of racks (25 vials	-	4 (9/2 rack)	8 (8/2 rack)	-	-
Total number of racks	-	16	32	-	-
Number of blood bags stored (Fenwal 4R-5461)	-	N/A	N/A	N/A	N/A
Number of SUC-1 canisters (2.5" x 2.5" x 11")	22	61	129	300	561
Number of 1.2 & 2.0 ml vials on canes	3696	11,346	23,994	55,800	104,346
Number of 1/2 cc straws (10/cane)	6820	18,910	39,990	93,000	173,910
PERFORMANCE					
Liquid nitrogen capacity (liters)	39	230	482	860	1400
Power supply	-	24 VDC	24 VDC	24 VDC	24 VDC
UNIT DIMENSIONS					
Neck Opening (in/mm)	16.0 / 406	25 / 635	35.5 / 902	25 / 635	25 / 635
Usable height (in/mm)	12.0 / 305	21.4 / 544	19.4 / 492	13 / 330	2x13 / 2x330
Overall height (in/mm)	16.3 / 414	41.5 / 1054	44 / 1118	40.9 / 1039	53.9 / 1368
Outside diameter (in/mm)	18.0 / 457	31 / 787	42 / 1067	60 / 1524	60 / 1528
Internal diameter (in/mm)	16.0 / 406	28.2 / 716	39.5 / 1003	56 / 1422	56 / 1422
Weight empty (lbs/kg)	48 / 22	250 / 114	410 / 186	984 / 447	1184 / 538
Weight full (lbs./kg)	117 / 53	660 / 300	1269 / 577	2517 / 1144	3700 / 1682

FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

Recommended maximum temperatures for storage of biological samples.

MATERIAL TO BE STORED	VOLUME	CONTAINER	INVENTORY CONFIGURATION	CRITICAL TEMPERATURE
Algae	0.5 - 1.0 m	Cryovial	Boxes or canes	-150°C
Bacteria	0.5 - 1.0 ml	Cryovial	Boxes or canes	-80°C
Bacteriophage	0.5 - 1.0 ml	Cryovial/Eppendorf Tube	Boxes or canes	-80°
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
Spores	0.5 - 1.0 ml	Cryovial	Boxes or canes	-80°C
Hybridomas	0.5 - 1.0 ml	Cryovial	Boxes or canes	-150°C
Nucleic Acids:				
DNA	milli/micro grams	Cryovial/Eppendorf Tube	Boxes	>-20°C
RNA	milli/micro grams	Cryovial/Eppendorf Tube	Boxes	>-20°C
Phage:				
Libraries	0.5 - 1.0 ml	Cryovial	Boxes or canes	-150°C
Plasmids	milli/micro grams	Cryovial/Eppendorf Tube	Boxes	-80°C
Proteins			Boxes	>-20°C
Protozoa	0.5 - 1.0 ml	Cryovial	Boxes or canes	-150°C
Viruses: Animal				
Cell-Free	0.5 - 1.0 ml	Cryovial	Boxes	-80°C
In Cells	0.5 - 1.0 ml	Cryovial	Boxes or canes	-150°C
Plant	0.5 - 1.0 ml	Cryovial	Boxes	-80°C

Source: F. Simeone, American Type Culture Collection, Manassas, VA

MVE CryoSystem Series

The MVE CryoSystem 2000, 4000 and 6000 combine the benefits of low nitrogen consumption with mid-range vial capacity to meet the diverse needs of today's professionals worldwide. The light weight and low space demands of these containers make them the most economical units in their class. Chart-MVE cryogenic vessels are performance leaders through innovation, super insulation and vacuum technology.

MODEL	CryoSystem 750	CryoSystem 2000	CryoSystem 4000	CryoSystem 6000
MAXIMUM STORAGE CAPACITY				
Number Of Racks	6	4	4	6
Number of 1.2 & 2.0 ml vials (100/Box)	750	2000	4000	6000
Boxes Per Rack	6 (25 Cell)	5	10	10
PERFORMANCE				
Liquid nitrogen capacity (liters)	47.4	61	121	175
Static Evaporation Rate (liters/day)	0.39	.85	.99	.99
Working Volume (liters)	47	51	111	165
Normal Working Duration (Days)	76	38	70	104
UNIT DIMENSIONS				
Neck opening (in/mm)	5 / 127	8.5 / 216	8.5 / 216	8.5 / 216
Overall height (in/mm)	26.5 / 673	27.5 / 680	37.5 / 950	37.5 / 950
Outside diameter (in/mm)	20 / 508	22 / 559	22 / 559	26 / 665
Weight empty (lbs/kg)	42 / 19	53 / 24	96 / 43	107 / 48
Weight full (lbs/kg)		161 / 73.3	312 / 141.5	419 / 190

* Static evaporation rate and static holding times are nominal. Actual rate and holding time will be affected by the nature of container use, atmospheric conditions, and manufacturing tolerances.

** Normal Working Duration is an arbitrary reference, to estimate container performance under normal operating conditions. Actual working time may vary due to current atmospheric conditions, container history, manufacturing tolerances and any individual patterns of use.

THREE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE Lab Series

The Lab Series cryogenic liquid dewars are named for their acceptance in laboratories and medical facilities worldwide. These high-efficiency, super insulated dewars are the most convenient, economical way to store and dispense liquid nitrogen. Many lab units can be fitted with pouring spouts, pressurized dispensing devices or dippers to aid in the transfer of liquid nitrogen.

MODEL	LAB 4	LAB 5	LAB 10	LAB 20	LAB 30	LAB 50	SS Transfer Unit
Net Capacity (liters)	4	5	10	21	32	50	5
PERFORMANCE							
Static Evaporation Rate (liters/day)	0.19	0.15	0.18	0.18	0.22	0.49	N/A
UNIT DIMENSIONS							
Neck opening (in/mm)	1.4 / 35.5	2.2 / 56	2.2 / 56	2 / 51	2.5 / 64	2.5 / 64	6 / 152
Usable height (in/mm)	7.8 / 198	10.5 / 266	13.5 / 343	13.7 / 348	14.9 / 378	22 / 559	14 / 356
Overall height (in/mm)	16.8 / 426	18.2 / 462	21.5 / 546	24.7 / 627	24.1 / 611	30.7 / 779	16.5 / 419
Outside diameter (in/mm)	7.3 / 185	8.8 / 222	10.3 / 260	14.5 / 368	17 / 432	17 / 432	8 / 203
Internal diameter (in/mm)	5.5 / 139	6.5 / 165	8.3 / 210	11.4 / 289	14 / 356	14 / 356	6 / 152
Weight empty (lbs/kg)	6 / 2.7	8 / 4	13 / 6	19 / 9	27 / 12	34 / 15	11 / 5
Weight full (lbs/kg)	13 / 6	17 / 8	31 / 14	56 / 26	84 / 38	123 / 56	20 / 9

FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE SC Series

MVE offers the widest range of compact aluminum storage tanks available on the market today. Whatever the application, you will find the perfect solution within the XC and SC product lines. Over the past 40 years, our product designs have benefited from end-user input and have evolved into a unique selection of units. Each unit is perfectly designed for various applications.

MODEL	SC 3/3	SC 8/5	SC 11/7	SC 16/11	SC Millennium 20	SC 20/20	SC 36/32	SC 33/26
MAX. STORAGE CAPACITY								
Number of canisters	6	6	6	9	6	6	6	6
No. of 1/2 cc straws (10/cane)	-	-	540	-	540	540	540	540
No. of 1/2 cc straws (1 Level Bulk)	732	732	732	1098	780	780	780	780
No. of 1.2 & 2.0 ml vials (5/cane)	-	-	150	-	150	150	150	150
No. of Racks (25 Vials)	-	-	-	-	-	-	-	-
PERFORMANCE								
Liquid nitrogen capacity (liters)	3.6	8.4	11.0	16.4	20.5	20.5	36.5	33
Static evaporation rate (lit/day)*	0.12	0.15	0.15	0.14	.095	0.09	0.10	0.13
Normal Working Duration (days)**	19	35	46	74	135	142	224	182
UNIT DIMENSIONS								
Neck opening (in/mm)	2 / 51	2 / 51	2 / 51	2 / 51	2.18 / 55.4	2 / 51	2 / 51	2 / 51
Overall height (in/mm)	16 / 406	18.5 / 470	21.6 / 549	17.5 / 444	25.7 / 652	25.7 / 652	27.2 / 690	25.9 / 657
Outside diameter (in/mm)	8.7 / 222	10.2 / 260	10.2 / 260	17.2 / 438	14.5 / 368	14.5 / 368	18.2 / 464	18.2 / 464
Canister height (in/mm)	5 / 127	5 / 127	11 / 279	5 / 127	11 / 279	11 / 279	11 / 279	11 / 279
Canister diameter (in/mm)	1.5 / 38	1.5 / 38	1.5 / 38	1.5 / 38	1.5 / 38	1.5 / 38	1.5 / 38	1.5 / 38
Weight empty (lbs/kg)	8 / 3.6	12 / 5.3	17 / 7.7	14 / 6.4	23 / 10.5	26 / 11.8	34 / 15.4	34 / 15.4
Weight full (lbs/kg)	14.4 / 65	27 / 12.1	36.6 / 16.6	43 / 19.6	59.5 / 27	62.5 / 28.3	100 / 44.8	93.4 / 42.4

* Static evaporation rate and static holding time are nominal. Actual rate and holding time will be affected by the nature of container use, atmospheric conditions, and manufacturing tolerances.

** Normal Working Duration is an arbitrary reference, to estimate container performance under normal operating conditions. Actual working time may vary due to current atmospheric conditions, container history, manufacturing tolerances and any individual patterns of use.

MVE XC Series

MVE XC Series tanks have capacities ranging from 700 - 5000 straws and 150 to over 1000 vials. Manufactured to a world class level of excellence and backed by an industry leading 5 year vacuum warranty, these durable, lightweight units can be relied on to perform in the most demanding of environments.

The XC Series is designed for the user who requires large capacity storage and low liquid nitrogen consumption in a convenient lightweight package.

XC Millennium 20	XC 21/6	XC 22/5	XC 32/8	XC 33/22	XC 34/18	XC 43/28	XC47/11-6SQ	XC 47/11-6	XC 47/11-10
6	9	6	9	6	6	6	6 sq.	6	10
720	N/A	2,400	2,520	1,260	2,100	1,260	-	4,500	3,500
1122	3,870	3,666	3,960	1,764	3,000	1,764	-	6,216	5,000
210	N/A	810	855	360	630	360	-	1,320	1,050
-	-	-	-	-	-	-	750	-	-
20.5	21	22.4	32	33.4	34.8	42.2	47.4	47.4	47.4
.095	.25	0.35	0.35	0.14	0.18	0.14	0.39	0.39	0.39
140	53	40	57	154	123	193	76	76	76
2.18 / 55.4	3.5 / 89	3.81 / 97	3.81 / 97	2.75 / 70	3.5 / 89	2.75 / 70	5 / 127	5 / 127	5 / 127
25.7 / 652	17.2 / 438	22 / 559	21.5 / 546	26 / 660	26.6 / 675	26.4 / 670	26.5 / 673	26.5 / 673	26.5 / 673
14.5 / 368	18.2 / 464	14.5 / 368	18.2 / 464	18.2 / 464	18.2 / 464	20 / 508	20 / 508	20 / 508	20 / 508
11 / 279	5 / 127	11 / 279	11 / 279	11 / 279	11 / 279	11 / 279	-	11 / 279	11 / 279
1.65 / 41.9	2.75 / 70	3.09 / 79	2.62 / 67	2.22 / 56	2.81 / 71	2.22 / 56	-	4 / 102	2.81 / 71
23 / 10.5	30 / 13.6	26 / 11.8	30 / 13.6	34 / 15.4	34 / 15.4	36 / 16.4	42 / 19	42 / 19	42 / 19
59.5 / 27	62.5 / 28.3	66 / 30	87 / 39.5	94 / 42.5	96 / 43.5	111 / 50.5	120.4 / 54.6	120.4 / 54.6	120.4 / 54.6

FIVE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE Doble Series

The traditional method of export shipment and distribution for biological products such as semen and vaccines has been based around wet shipment under liquid nitrogen. Over the past few years, many of the traditional shipping companies have either prohibited the shipment of liquid nitrogen, or placed hazardous material surcharges on shipments to the point where this method is uneconomical.

In many cases, vapor shippers have become the method of choice for cryogenic shipment. These shippers hold product at cryogenic temperature and allow most shipping methods to be employed, even for export shipments. From a transport point of view, this is a perfect solution. From a distribution standpoint, it leaves much to be desired. Once at a destination, the samples have to be transferred into a liquid storage tank and the shipping container has to be recovered by the shipping company. Therefore, there is an additional "return shipment".

Since the early 1960's Chart/MVE has been at the forefront of innovation and excellence in the field of storage and transportation of frozen biological samples. Once again, Chart/MVE has taken a step in front of all other cryogenic manufacturers.

The Doble series tanks are the first units to be designed for both vapor shipment and liquid storage. A unique absorbent layer in the base of the storage tanks enable them to be charged with nitrogen and employed as dry shippers with hold times of up to 30 days. Once at the final destination, the tanks can be filled with liquid and used for long term storage.

MODEL **PART NUMBER**	***Doble-11*** ***110507886***	***Doble-20*** ***11492151***	***Doble-28*** ***11527730***	***Doble-34*** ***11497948***	***Doble-47*** ***11498684***	***Doble47-10*** ***115543508***
Number of Canisters	6	6	6	6	6	10
No. of 1/2 cc Straws (10/cane)	480	660	2400	2100	4500	3500
PERFORMANCE						
Liquid Nitrogen Capacity (liters)	10	18.5	28	32	46	46
Vapor Capacity (liters)	3.4	3.4	8.4	6.7	8.4	9.6
Static Evaporation Rate (liters/day)	0.17	0.1	0.3	0.2	0.4	0.4
Normal Working Duration (days for liquid)	42	125	50	100	74	72
Normal Working Duration (days for vapor)	21	21	24	30	21	21
UNIT DIMENSIONS						
Neck Opening (in/mm)	2 / 51	2.18 / 55	3.81 / 97	3.5 / 89	5 / 127	5 / 127
Overall Height (in/mm)	21.6 / 549	25.7 / 652	22 / 559	26.6 / 676	26.5 / 673	26.5 / 673
Outside Diameter (in/mm)	10.2 / 260	14.5 / 368	18.2 / 462	18.2 / 462	20 / 508	20 / 508
Canister Height (in/mm)	11 / 279	11 / 279	11 / 279	11 / 279	11 / 279	11 / 279
Canister Diameter (in/mm)	1.5 / 38	1.65 / 42	3.09 / 78	2.81 / 72	4 / 101.6	2.81 / 72
Weight Empty (lbs/kg)	19 / 8.7	25.2 / 12	34 / 16	39.2 / 18	47 / 21.3	48 / 21.8
Weight Charged (vapor lbs/kg)	24 / 11	30.2 / 14	49 / 22	51 / 23	63 / 28.6	64 / 29
Weight Full (liquid lbs/kg)	36 / 16	60 / 27	84 / 38	95 / 43	125 / 57	120 / 54.5
Lbs/Kg of Cabosil	1 / .45	1 / .45	2.5 / 1.2	2 / .9	2.5 / 1.2	3.4 / 1.6

THREE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

MVE Vapor Shippers

MVE Vapor Shipper containers are designed for the safe transportation of biological samples at cryogenic (-150°C or colder) temperatures. Fabricated from durable, lightweight aluminum, they employ a hydro-phobic absorbent that contains the liquid nitrogen for "spill free" shipping. The absorbent also repels moisture and humidity, assuring the maximum holding time. This eliminates the necessity to dry units between uses.

A protective shipping carton is available for all models (except the SC 20/12V) which protects the container from being placed on its side and helps in withstanding the rigors of transportation. These containers may be used to ship your samples with a "non-hazardous" classification throughout the world, thus reducing costs and helping to assure sample viability.

MODEL	SC 2/1V	SC 4/2 V	SC 4/3V	SC 20/12V	XC 20/3V*	Mini Moover	Cryo Moover	Cryo Shipper	Cryo Shipper XC
MAX. STORAGE CAPACITY									
Number of canisters	1	1	1	6	4 + 1 Center	1	7	1 Rack	-
No. of 1/2 cc straws (10/cane)	-	280	120	540	2,500/2,000*	60	3080	-	
No. of 1/2 cc straws (1 Level Bulk)	88	440	210	780	3,750/3,000*	88	4354	-	
No. of 1/4 cc straw (1 Level Bulk)	182	938	452	6,750/6,000*	7,410/6,000	8904	-		
No. of 1.2 & 2.0 ml vials (5/cane)	-	95	40	150	675/560*	20	945	-	
No. of 1.2& 2.0 ml vials (6/cane)	9	106	48	180	840/672*	24	1134	500	966 (Bulk)
No. of blood bags stored (4R9953)	-	-	-			-	-	10	10
PERFORMANCE									
Liquid nitrogen capacity (liters)	1.5	3.6	4.3	12.3	6.8	2.9	4.2	8.5	10
Static evaporation rate (liters/day)	0.19	0.26	0.20	0.09	0.3	0.20	0.35	0.85	.7
Static holding time (days)	8	14	21	85	23	14	12	10	14
UNIT DIMENSIONS									
Neck opening (in/mm)	1.4 / 35	2.75 / 70	2 / 51	2 / 51	3.81 / 96.7	1.4 / 35	3.8 / 97	8.5 / 216	8.5 / 216
Overall height (in/(mm)	13.5 / 343	18.4 / 468	19.4 / 492	25.7 / 652	25 / 635	19.5 / 495	22 / 558	21.5 / 546	23 / 584
Outside diameter (in/mm)	7.25 / 184	8.7 / 222	8.7 / 222	14.5 / 368	14.50 / 368	7.2 / 184	18.3 / 464	14.5 / 369	15 / 381
Canister height (in/mm)	5 / 127	11 / 278	11 / 278	11 / 279	11 / 278	11 / 278	11 / 278	-	12.5 / 317.5**
Canister diameter in (mm)	1.2 / 31	2.62 / 67	1.81 / 46	1.5 / 38	3.2 / 80	1.2 / 31	3.1 / 79	-	-
Weight empty (lbs/kg)	6 / 2.7	11 / 5	13 / 5.9	30 / 13.6	23 / 10.5	8 / 3.6	30.5 / 13.8	24 / 10.9	30 / 13.6
Weight charged (lbs/kg)	8.8 / 4	18 / 8.1	20 / 9.3	52 / 23.6	35 / 16	11.6 / 5	38 / 17.2	37.5 / 17	47 / 21.4

Static evaporation rate and static holding times are nominal. Actual rate and holding time will be affected by the nature of container use, atmospheric conditions, and manufacturing tolerances. Without center absorbent canister two week holding time, greater storage capacity

* With center absorbent canister (3 week holding time)

** Useable Height

THREE Year Vacuum Warranty

Conforms to MDD 93/42/EEC, the Medical Device Directive for the EU.

SECURITY THROUGH MVE SYSTEMS

MVE BIOLOGICAL OVERVIEW

Biological materials change and deteriorate over time, this is a simple fact of life. Some means of halting these processes must be used that will not change the biological material in order for it to be properly preserved for later study. The most effective means of preserving biological materials is storage at low-temperatures, known as Cryo-preservation, is used throughout the biological and bio-medical research community.

Cooling and freezing of biological materials is a complex process. This is due to the chemical and physiological process that takes place when material is cooled. Proper maintenance and handling of biological materials is critical to ensure their continued stability at low temperatures. Since biological materials vary, an important aspect of setting up and operating an effective bio-repository is an understanding of the materials to be maintained. While biological materials can be preserved by several means, low-temperature storage is the only preservation method that minimizes changes in the material. Cryo-preservation has been used for decades to ensure the maintenance of living cells and organisms.

Once biological materials are properly cryo-preserved, there is virtually no risk of change if they are properly maintained. Proper maintenance requires assuring a constant critical temperature.

From a good practice point of view, safety margins and modes of failure are also important and very worthy of consideration. Safety margins and critical temperatures are vital considerations. Initially it is important to realize that once a substance is in the solid phase (i.e., frozen); there is no such thing, in terms of cryobiology, as too cold. There is no state below solid; further cooling simply reduces the energy for every degree it is cooled, otherwise it may cause structural changes. Secondly, it is vital to appreciate that the critical temperature for long term viability of the sample will be, in many cases, a temperature far below the nominal fusion temperature. In other words, keeping the sample frozen simply is not sufficient.

Therefore, from a cryobiological point of view; the sample must be stored at a temperature sufficiently below the critical temperature so that normal operation of the storage system will ensure that the samples will not inadvertently rise above that temperature. In addition, the failure mode of the system employed should allow for sufficient time to take remedial action in the event such a failure should occur within normal working conditions. Finally, all of these factors combined with the expected storage period determine the optimum mode of storage.

The most important element of a low-temperature storage system is ensuring a constant range of temperatures below a minimum critical threshold. The upper limit of the range should be well below the critical temperature for the material to allow for any effects or compromise during stocking and retrieval activities.

For example, the critical temperature for living cells is below-130°C; therefore maintaining cells in a liquid nitrogen freezer at -150°C to -196°C is ideal. So in making a decision as to what method and type of storage will be employed, it is necessary to consider the following.

- **Safety** - racks full of liquid nitrogen are heavy to lift and must be drained before sample removal. This can cause splashing and potential cryogenic burn injury.
- **Sample integrity** - storing under liquid can lead to LN_2 leaking into improperly sealed sample containers. These containers may explode on removal, causing loss of sample and potential contamination in the laboratory.
- **Cross contamination** - cases of sample to sample pathogen transfer have been recorded between samples stored under liquid nitrogen.

It is vital to consider the quality of the tank itself and the control options available even if the issues associated with full liquid storage are considered unimportant.

- Chart-MVE has been manufacturing high quality vacuum systems for more than 40 years. This experience and high technology allows us to offer an industry leading 5-year warranty on all stainless steel vacuum vessels. Some manufacturers have less than 5 years experience of producing their own vacuum units.

- The Chart-MVE TEC 2000 system is a state-of-the-art controller unit. The system offers password protection; twin platinum RTD temperature probes with 2-point altitude adjusted calibration, seamless level measurement and LN_2 usage statistics. In addition, the system offers self-diagnosis on start up and a serial interface, which allows access to all stored parameters (the system memory retains time and date stamped information on controller events).

- Chart-MVE freezers offer full function alarm systems with alarms for low and high liquid level, high and low temperature for each of the 2 RTD probes, LN2 supply, valve, and power failure. Additional controller options allow for battery back-up systems for protection from electrical supply problems and a hot gas bypass system which will vent incoming filling gas until liquid reaches the valve, minimizing the normal filling losses associated with filling from liquid cylinders.

The above features are common to all Chart-MVE freezers. If vapor storage is the method of choice, additional considerations must be made:

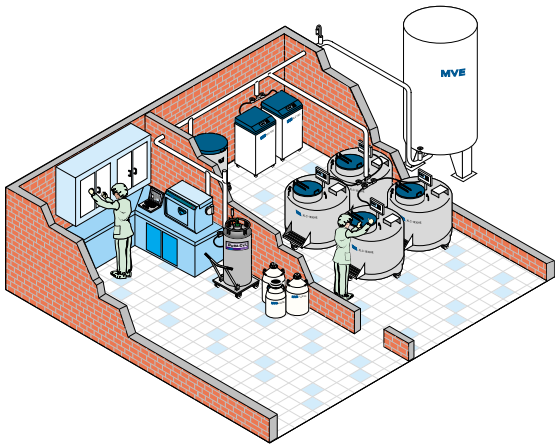
- What temperature will be maintained at the warmest point in the freezer?
- What mechanism is used within the freezer to generate this temperature -- are any artificial measures used which increase nitrogen consumption and costs?
- History of the manufacturer and warranties.
- Control systems.
- Failure modes.
- Liquid Reserve, "Operational Hold Time".

The Chart-MVE Eterne series freezers have been specifically designed for vapor storage. The units feature a smaller, offset lid. This allows for more of the top of the unit to be protected by a vacuum insulated surface. This ensures that samples are always maintained in a -190°C (-150°C option is available) environment. The vacuum protection allows the unit to maintain this temperature in excess of 20 days without additional filling.

For lower capacity storage requirements Chart-MVE also manufactures the largest range of aluminum storage Dewars. Canister configurations are available for straw or vial storage. Shipping of cryogenically preserved samples is made simple and safe with our vapor shippers.

For applications that require shipping and subsequent long term storage, the dual use Doble series is a unique container.

Chart-MVE is committed to meeting your cryogenic requirements from the bulk storage tank, through the vacuum delivery pipe, to the freezer.



NOTE: Temperature specifications in this guide are made according to measurement with the most accurate systems available. Environment, measurement system accuracy and operational considerations may lead to different experimental measurements.

SECURITY THROUGH MVE SYSTEMS

Ph/ 888-683-2796
www.chartbiomed.com

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