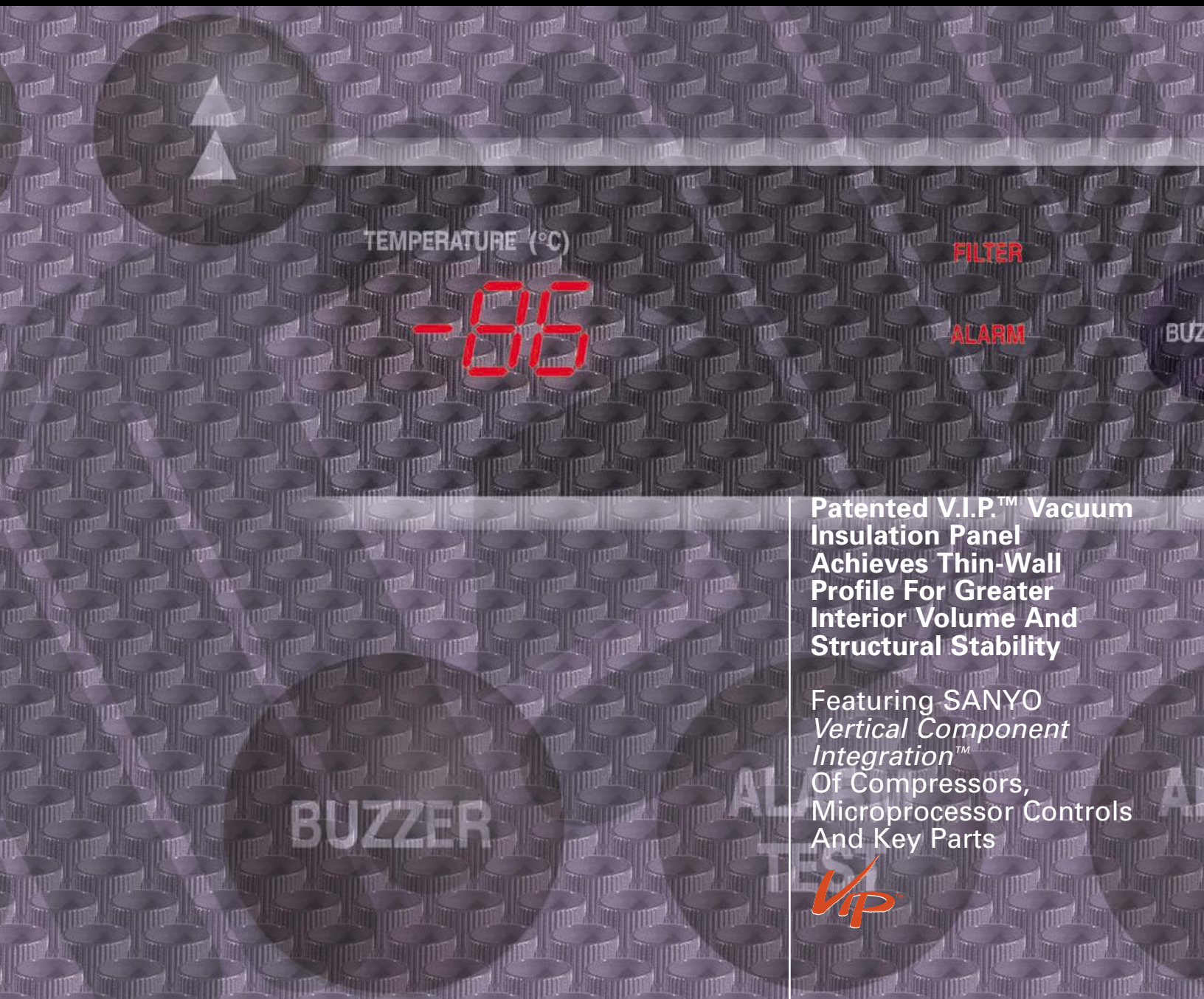
HIGH DENSITY™
ULTRA-LOW STORAGE

VERTICAL COMPONENT™
INTEGRATION

SANYO

V.I.P.™ Series -86°C Ultra-Low Temperature Freezers

High-Density Biological Storage Solutions For The Laboratory



Patented V.I.P.™ Vacuum Insulation Panel Achieves Thin-Wall Profile For Greater Interior Volume And Structural Stability

Featuring SANYO *Vertical Component Integration™* Of Compressors, Microprocessor Controls And Key Parts

VIP

V.I.P.™ Series -86°C Ultra-Low Temperature Freezers

High-Density Storage For The Laboratory

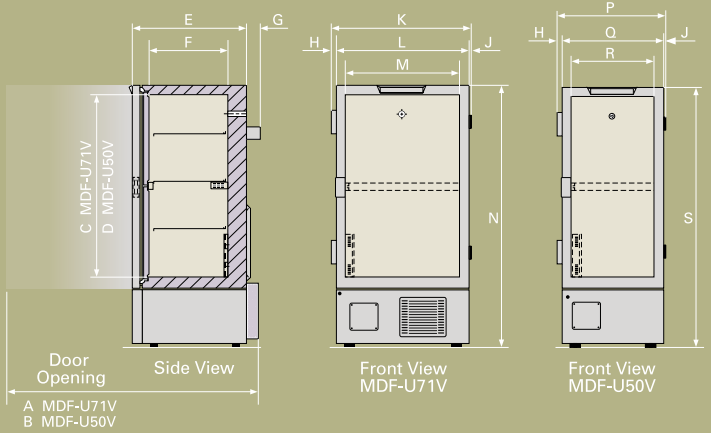
SANYO V.I.P.™ Series -86°C ultra-low temperature freezers with patented vacuum insulation cabinet construction, microprocessor controls and high-performance refrigeration achieve the most efficient high-density storage capability in the industry.

Model MDF-U71V, above, offers high-density storage of up to 57,600 standard 2" (5.4cm) 2 ml vials in boxes. Dual, insulated inner doors retain cabinet temperature and improve energy efficiency. Optional temperature recorder, not shown, installs in cabinet base; see Accessories.

Model MDF-U50V

Drawing Key	inches (nominal)	mm
A	72.3"	1835
B	62.8"	1595
C	55.1"	1400
D	54.3"	1380
E	34.4"	875
F	23.6"	600
G	4.1"	105
H	1.5"	37
J	0.7"	18
K	41.7"	1065
L	39.7"	1010
M	34.25"	870
N	79.1"	2010
P	32.4"	824
Q	30.3"	770
R	24.8"	630
S	78.3"	1990

Designed for New and Replacement Installation



SANYO freezers can be installed in existing laboratories to replace conventional ultra-low freezers, or in new laboratories where high-density storage is a planned performance requirement. See back cover for site preparation.

Inventory Management

Increased storage efficiencies are achieved through the thin-wall V.I.P.™ cabinet design and enhanced with the use of commonly available inventory boxes that hold biological samples in vials, tubes or other labware.

- The cabinet interior is protected by two insulated inner doors designed to minimize exposure during outer door openings. Inner doors remove easily without tools for occasional wipe-down of gasket surfaces.
- Three adjustable shelves are included; shelves create four independent inventory compartments for convenient use of accessory inventory racks.

High-Density Storage

Mechanically refrigerated ultra-low freezers have evolved from early chest to newer upright designs to improve the coefficient between floor space and storage volume. Now, as the cost of laboratory space continues to increase, every square measure of floor area demands a productive return on investment. The need for safe, efficient and convenient ultra-low storage solutions remains at the forefront of lab planning and management.

Differences between safe ultra-low storage temperatures at -86°C and a working lab ambient (which often approaches seasonal highs of +35°C) are extreme. Thus, insulation integrity in the ultra-low freezer cabinets is critical to maintaining differentials of up to 120°C (or 217°F).

- SANYO Electric Biomedical Co., Ltd. has integrated time-tested vacuum insulation panel V.I.P.™ technology with structurally strong closed-cell foam to achieve a thin-wall composite. This protects temperature differentials while increasing interior chamber volume without the need for added floor space.
- As a result, the new SANYO V.I.P.™ Series upright freezers offer improved high-density storage capacity that effectively reduces the volumetric unit costs of low-temperature freezers, whether measured in stored vials, boxes or ft^3 and $meter^3$.

Model MDF-U71V

Model MDF-U50V

SANYO pioneering developments in consumer products such as advanced vacuum insulation panels, refrigeration compressors, microprocessor electronics and robotic manufacturing techniques are applied to all SANYO Electric Biomedical products through an exclusive *Vertical Component Integration*™ program. This powerful corporate technology transfer capability assures that only the very best components are used in each SANYO product.

VERTICAL COMPONENT™ INTEGRATION

Condenser air filter is removable, washable, no tools needed.

Dual insulated inner doors add protection.

SANYO built compressors feature time-tested refrigerants and lubricating oils.

V.I.P.™ cabinet design with high-surface condensers minimize operating costs.

Integrated alarm warns of temperature deviation or power interruption.

SANYO built NiCad battery assures memory back-up.

Refrigeration System

The SANYO cascade refrigeration system is designed for high-performance operation in laboratories where frequent door openings, introduction of room temperature samples, changing ambient temperatures and voltage variations are common.

- V.I.P.™ Series refrigeration compressors are designed and built by SANYO specifically for ultra-low temperature freezer applications and operate within a ***total energy management system*** to minimize power consumption and operating costs. The SANYO system employs two high-performance, industrial-grade compressors in cascade.
- Unlike commercial compressors adapted for use in laboratory products, SANYO ultra-low compressors employ proprietary design features that reduce energy, increase cooling capacity, minimize stress on key components and enhance reliability through extended compressor life.
- The sealed refrigeration system is individually leak-tested at every stage of production with an ultra-sensitive helium leak detection process to assure overall integrity.
- Downflow evaporator tubing sealed within the V.I.P.™ wall is strategically positioned to achieve maximum top-to-bottom temperature uniformity within the cabinet.
- The SANYO condenser has an expanded tube-to-fin ratio to allow efficient heat transfer from the refrigerants to the ambient air, adding cooling power to the system while reducing compressor load and energy consumption.

Patented SANYO refrigerants are non-ozone depleting, non-flammable and environmentally safe in compliance with the Montreal Protocol.

- A quiet, high-flow condenser fan moves air through a removable, washable filter. Regular filter cleaning (no tools required) maintains cooling capacity, reduces energy consumption and extends system life.
- High-purity lubricating oils are formulated to operate at high temperatures without vaporization to maintain maximum bearing protection at all times.
- Sound reduction is achieved through a combination of compressor motor location, condenser fan blade design, noise abatement insulation and mounting shocks to isolate components from load-bearing frames.

SANYO Vertical Component Integration™

All V.I.P.™ freezers reflect the latest proven technologies, advanced robotic manufacturing and worldwide resources, assuring our customers of dependable performance, product safety, energy efficiency and ergonomic sensitivity. The SANYO development model of *vertical component integration*™ assures our customers that only the very best, accurately matched components are used in each SANYO product.

VERTICAL COMPONENT™ INTEGRATION

- As a global leader in consumer electronics, refrigeration, energy and environmental products, the SANYO corporate platform offers a robust source of proven technologies that can be deployed throughout a range of biomedical and medical research products.

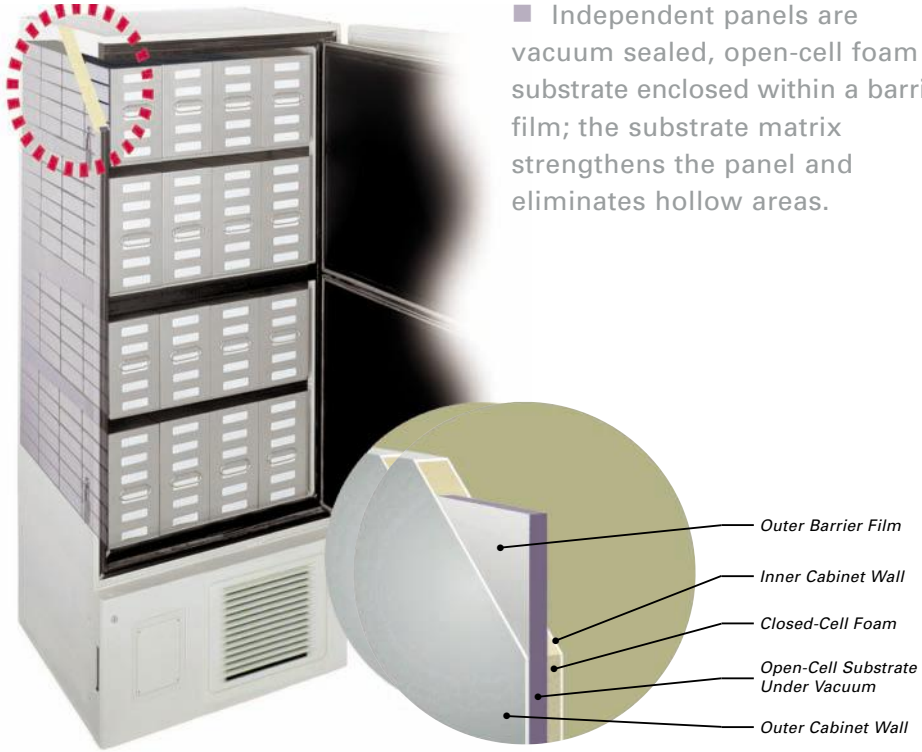
V.I.P.™ Freezer Selection

	MDF-U50V	MDF-U71V
Interior Volume	18.3 cu.ft. (519 liters)	25.7 cu.ft. (728 liters)
Maximum 2" (5cm) vials, 1.8ml capacity	35,200	57,600
Temperature, guaranteed in a +30°C ambient	-86°C	-86°C
60Hz, Single Phase	208V - 230V	208V - 230V
50Hz, Single Phase	220V 230/240V	220V 230/240V

SANYO V.I.P.™ ultra-low temperature freezers are available in two upright sizes. Sizes and inventory configurations are different, while space-saving V.I.P.™ construction, microprocessor controls, alarm, monitoring and accessories are the same.

SANYO components such as refrigeration compressors, microprocessor electronics and patented V.I.P.™ vacuum insulation panels are engineered to exact specifications for critical applications in the life science, pharmaceutical and biotechnology industries.

Patented SANYO Vacuum Insulation Panel Technology



Individual vacuum panels are formed into a unitized composite of panel sections, sealed with reflective barrier film, arranged within the steel inner and outer walls, then pressure laminated with high-density, closed-cell injected foam to form the high-tech wall.

- Patented* vacuum insulation panel technology used in SANYO V.I.P.™ freezers is developed and manufactured by SANYO for exclusive use in refrigerated cabinets.
- Cellular freezer construction of vacuum panels and polyurethane foam provides structural stability and the highest insulation values required for extreme temperature differential between the ambient and interior chamber.
- Independent panels are vacuum sealed, open-cell foam substrate enclosed within a barrier film; the substrate matrix strengthens the panel and eliminates hollow areas.
- Lamination of multiple insulation components creates an effective R-value-to-volume coefficient that reduces wall thickness by nearly 50% over conventional ultra-low techniques.
- Downflow evaporator coils are helium leak-tested and encased against the interior surfaces for efficient heat exchange.
- All components are CFC-free for environmental protection.

*U.S. Patent No. US6,260,377 B1 July 17, 2001.

Control And Alarm/Monitoring System

The SANYO microprocessor control system is crafted from SANYO built electronic components specifically selected for low-temperature applications. The self-contained controller is mounted at the top of the outer door with an angled front for easy viewing.

- The large LED display reads the actual chamber temperature and functions as an alarm indicator, data entry display, and system diagnostics.
- The alarm/monitor system includes SANYO exclusive Ni-Cd battery technology for memory backup.
- A constant charging battery powered alarm activates audible and visual warnings in the event of line power failure, power interruption or other alarm event.
- Alarm system contacts allow connection to remote alarm for off-site or remote notification of alarm event.
- Temperature alarm setpoint parameters may be set within a range of 5°C to 20°C above or below setpoint. Deviation activates audible and visual alarm.

Alarm And Monitoring Reference

Alarm Function	Event	Visual Indicator	Error Code	Audible Indicator	Remote Alarm
High temperature	Interior chamber warms beyond high-temperature setpoint	ALARM lamp flashes; digital display flashes actual chamber temperature	none	Intermittent tone; time delay of 15 minutes after reaching alarm setpoint to avoid false alarms	yes
Low temperature	Interior chamber cools below low-temperature setpoint	ALARM lamp flashes; digital display flashes actual chamber temperature	none	Intermittent tone; time delay of 15 minutes after reaching alarm setpoint to avoid false alarms	yes
Power failure	Loss of power	ALARM lamp flashes; digital display flashes actual chamber temperature	none	Intermittent tone	yes
Chamber sensor failure	Sensor probe disconnected, short-circuited or fails	ALARM lamp flashes	Display flashes chamber temperature and error code E1; refrigeration system defaults to continuous ON	Solid tone	n/a
Filter sensor failure	Filter sensor is disconnected, short-circuited or fails	ALARM lamp flashes	Display flashes chamber temperature and error code E2; refrigeration system defaults to continuous ON	Solid tone	n/a
Refrigeration sensor failure	Interstage heat exchange sensor is disconnected, short-circuited or fails	ALARM lamp flashes	Display flashes chamber temperature and error code E3	Solid tone	n/a

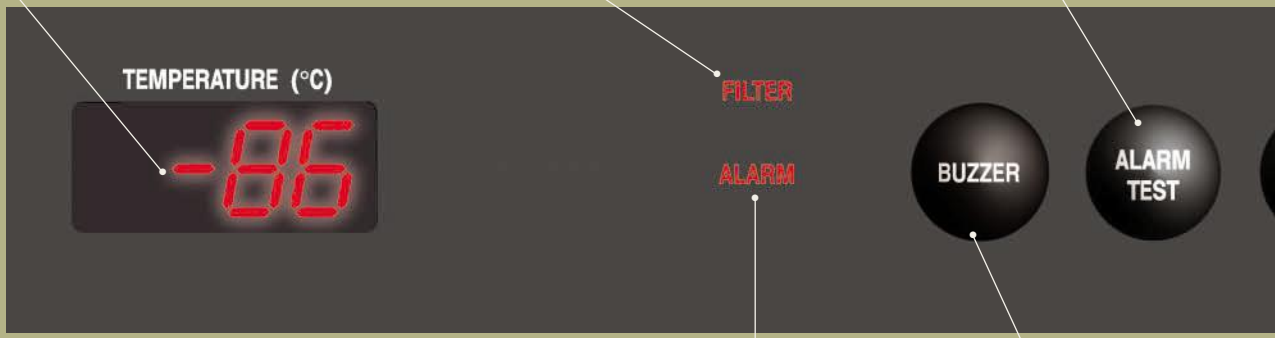
Safety Function	Event	Visual Indicator	Error Code	Audible Indicator	Remote Alarm
Filter check	Clogged or dusty condenser filter	FILTER lamp flashes	none	none	n/a
Auto-return	Key is not pressed for at least 90 seconds	Reverts to chamber temperature display	none	none	n/a
Key lock	Key lock in "on"	none	none	none	n/a

Digital display defaults to actual chamber temperature. Display mode changes when setpoint, alarm parameters programming and diagnostic functions are performed.

Filter indicator lamp glows when condenser filter requires removal for cleaning. Proper filter maintenance assures maximum temperature performance, lowest operating costs and minimum refrigeration system work.

Simulates high-temperature condition to verify alarm system operation.

SANYO exclusive Ni-Cd battery technology powers the microprocessor control memory and alarm system during power failure.



Shown Actual Size

Remote alarm located at the rear of the freezer cabinet allows connection to remote or off-site alarm or monitoring system.

Electronic components are made by SANYO and matched for use in biomedical applications.

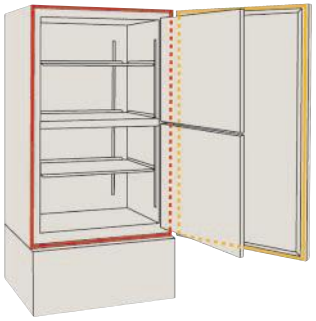
Alarm indicator lamp glows when freezer is in alarm condition.

The buzzer silence temporarily mutes the audible alarm.

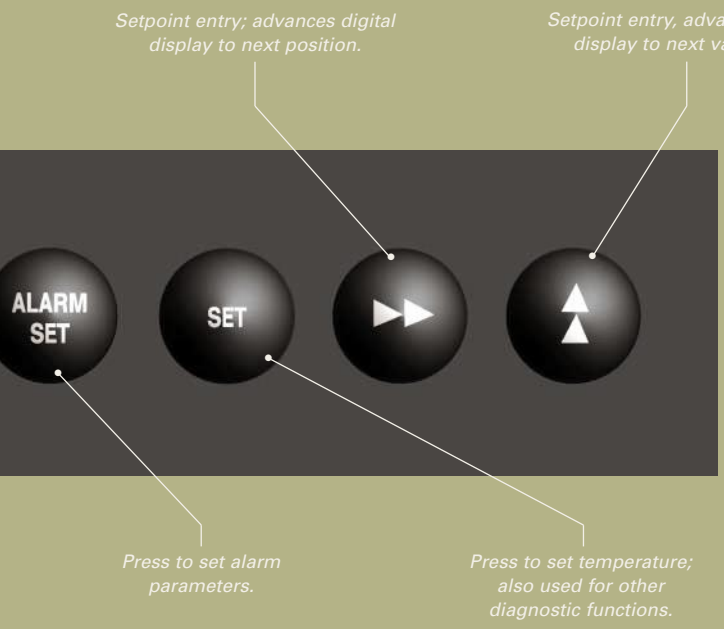
Cabinet Construction

The upright cabinet design offers maximum storage volume in the least amount of floor space, making the SANYO V.I.P.™ ultra-low freezer a cost-effective replacement for conventional freezer cabinets.

- Insulated inner doors offer additional protection during door openings and improve overall energy efficiency in response to ambient temperature changes.
- A combination of variable durometer door gaskets with magnetic and pressure seals protect interior temperatures and minimize frost buildup around the door. Door gaskets retain pliability for a tight seal under ultra-low conditions.
- The insulated outer door protects the interior with positive mechanical latches.
- Reinforced interior shelves are fully adjustable on vertical brackets. Three shelves are included; additional shelves are available.
- Interior and exterior surfaces are protected by a scratch resistant, easy-to-clean baked-on acrylic finish.
- Three access ports are preformed into the cabinet wall for use with probes, instrumentation or optional backup systems.
- Recessed casters permit easy movement during installation or relocation. Adjustable leveling legs stabilize the cabinet when installation is complete.
- Seismic restraints are mounted on the cabinet exterior, rear wall, for use according to local codes.
- An optional temperature recorder can be installed in the cabinet base by an authorized service representative. See Accessories.
- A liquid CO_2 or liquid nitrogen (LN_2) backup system is optional.



A peripheral strip heater and hot-gas refrigerant loop around the cabinet facing minimizes frost build-up.



Microprocessor control inputs are managed with convenient push-pad buttons on a unitized, sealed control overlay.

Accessories

Inventory Racks

Choose from box, microplate or other storage rack options. Inventory racks, boxes and grid dividers are ordered separately. Contact SANYO for a detailed selection.

Temperature Recorder

Designed for quick installation.

- Standard 6" (153mm) circular chart.
- Three-speed selection; 1 day, 7 days, 32 days.

Order Number MTR-G85

Replacement Chart Paper

Range -100°C to +40°C, box of 55.
Order Number RP-G85

Replacement Recording Pen

Order Number PG-R

Backup System

Protects cabinet load during an extended power outage.

- Liquid CO_2 Backup System, Order Number CVK-UB2
- Liquid Nitrogen (LN_2) Backup System, Order Number CVK-UBN 2

Box Dividers

For Fiberboard Boxes
100-cell, Order Number CD-100
81-cell, Order Number CD-81

General Specifications

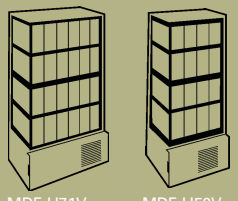
SANYO V.I.P.™ Series -86°C Upright Freezers

Model Number	MDF-U50V	MDF-U71V
Operating Temperature	-86°C	-86°C
Temperature Range (rated in +30°C ambient)	-50°C to -86°C	-50°C to -86°C
Interior Volume	18.3 cu.ft. (519 liters)	25.7 cu.ft. (728 liters)
Interior Dimensions	24.8"W x 23.6"D x 54.3"H 630 x 600 x 1380mm	34.25"W x 23.6"D x 55.1"H 870 x 600 x 1400mm
Exterior Dimensions	30.3"W x 34.4"D x 78.3"H 770 x 875 x 1990mm	39.8"W x 34.4"D x 79.1"H 1010 x 875 x 2010mm
Area Footprint	7.31 ft² (<0.68m²)	9.51 ft² (<0.89m²)
Net Weight, Empty	660 lbs/299kg	750 lbs/340kg

V.I.P.™ Series Cabinet Construction

Patented SANYO Brand V.I.P.™ Insulation	Multiple, independent V.I.P.™ vacuum insulation panels of sealed open-cell composite in combination with CFC-free closed-cell polyurethane foam for maximum insulation value and thin-wall profile allowing increased interior volume
Interior and Exterior	Baked-on acrylic finish over corrosion-resistant zinc galvanized steel
Insulated Inner Door	Two (2) independent steel-framed, high-impact ABS door panels with foam injected insulation, positive latches; doors are mounted on lift-off hinges for easy removal to simplify gasket wipe-down if desired
Outer Door	Baked-on acrylic finish over corrosion-resistant zinc galvanized steel with dual independent door latches
Triple Independent Door Gaskets	Two (2) independent compression gaskets for inner doors and outer door, plus one magnetic outer door gasket
Shelf	Three (3) independent solid shelves, adjustable
Sound Abatement	Refrigeration compartment insulation, condenser fan blade design and all cooling component mounts are engineered for minimum emissions
Remote Alarm	Maximum 30V, DC, 2 amps

Rack Positions



MDF-U71V MDF-U50V

Inventory Capacity, Nominal*	MDF-U50V	MDF-U71V
Rack Positions, Standard Configuration	4 racks across x 4 elevations	6 racks across x 4 elevations
Microplates in Racks, Standard SBS Footprint		
Plates with foil tape cover	2112	3456
Plates with cover lid	1632	2592
Fiberboard Boxes in Racks		
Boxes, 2" (5cm) high	352	576
Vials, 2" (5cm), 1.8-2.0ml, in 100 cell grid	35,200	57,600
Boxes 3" (7.6cm) high	224	384
Vials, 2" (5cm), 1.8-2.0ml, in 100 cell grid	22,400	38,400

*Maximum storage volume varies according to storage vessel, vial configuration, preservation protocol, laboratory technique and user preference. Contact SANYO for detailed information on inventory racks, boxes and storage options.

SANYO Electric Biomedical Co., Ltd., as a member of the SANYO Electric Group, has received ISO14001 Certification for its environmental management system.

Refrigeration System	MDF-U50V	MDF-U71V
SANYO High-Capacity Hermetically Sealed Compressors	Cascade circuit with two (2) independent compressors, interstage heat exchanger, high efficiency air-cooled high-stage condenser, washable condenser filter and sound abatement	
HFC Refrigerants	High Stage R-407D; Low Stage R-508	
High Stage Compressor	1 HP	1.5 HP
Low Stage Compressor	1.5 HP	1.5 HP
Heat Removal Capacity, Maximum	5444BTU 1595 watts	6075BTU 1780 watts
Heat Removal Capacity, Nominal	3271BTU 1090 watts	4249BTU 1245 watts

Electrical	MDF-U50V/U50VC[1]			MDF-U71V/U71VC[1]		
Voltage	Watts	Amps	Breaker[3]	Watts	Amps	Breaker[3]
208V - 230V, 60Hz, Single Phase[1, 2, 4]	1505	8.8	15	1560	8.0	15
220V, 50Hz, Single Phase	1025	6.6	15	1220	6.8	15
230V, 50Hz, Single Phase	1045	5.4	15	1220	6.5	15
240V, 50Hz, Single Phase	1090	5.9	15	1220	6.2	15

[1] 60Hz Models MDF-U50VC and MDF-U71VC include built-in voltage boost systems.

[2] Line cord with NEMA 6-15P plug provided. Installation requires NEMA 6-15R receptacle.

[3] Independent circuit breaker recommended for all installations.

[4] Measured under 240V 60Hz at 40°C determined by CSA standard.

SANYO