

FREEZE DRYING SYSTEMS



Delvac offers complete range of Lyodel Freeze Dryers and accessories for quick and efficient sample preparation. They meet the stringent requirements of freeze drying applications in biotechnology, Pilot Plant production as well as R & D studies.

Mini-Lyodel

This small bench top freeze dryer occupies very little space with an ice capacity of 1.5Kg. It is ideal for small volume drying and is cost effective. Mini-Lyodel is ideal for all freeze drying applications using 8-port column flask manifold as well as other accessories for vials and ampoules. Supplied with 100 LPM direct driven high vacuum pump.

Lyodel

The Lyodel model having an ice capacity of 5 Kg is a multi purpose freeze dryer. It can be used with a wide range of accessories used for flaks, vials, ampoules and bulk samples. With vertically positioned ice condenser, this bench top Lyodel model is easy to use with a front positioned bottom drain. Control Panel has digital indication for both Condenser Temperature and Vacuum Pressure. Vacuum pump of 200LPM is supplied with this model. Both mini-Lyodel and Lyodel are also available with trolley.

Maxi-Lyodel

Maxi-Lyodel is for high product volumes and long running time with an ice capacity of 18 Kg. It is suitable for multi-user operation in the laboratory or small-scale production. It has horizontal designed condenser and hot gas defrost system. With integral vacuum pumping, visible ice buildup and trouble free operation from interlocked controls, this unit is upgradeable to pilot plant.

Technical Specifications of 3 Basic models

Technical data		Mini -Lyodel		Lyodel		Maxi-Lyodel	
Refrigerant Condenser							
Area	Sq.m	0.07		0.15		0.40	
Volume	litres	2.3		7.2		44.5	
Ice capacity 24hrs	Kg	1.2		2.3		10.5	
	Max	1.5		5.0		18.0	
Ultimate low temp. $\pm 5^{\circ}\text{C}$ @ 20°C ambient	$^{\circ}\text{C}$	-50	-80	-55	-85	-55	-85
Condenser	Matl of Construction	SS 304		SS 304		SS 304	
	Position	Vertical		Vertical		Horizontal	
Compressor	HP	1/4	2 x 1/4	1/3	2x1/3	3/4	2 x3/4
Refrigerant		CFC Free					
Vacuum indication		Digital pirani vacuum gauge with a range of 999 to 1×10^{-3} mbar					
Vacuum pump	Lit/min	100		200		250	
Foot Space	mm x mm	550 x 550	650x850	550 x 750	820 x 950	820 x 950	1000 x 1000
Weight	Kg	50	95	85	140	225	275
Input power supply		220V, 50Hz, 1 Phase					



Lyodel with Spin Freezer



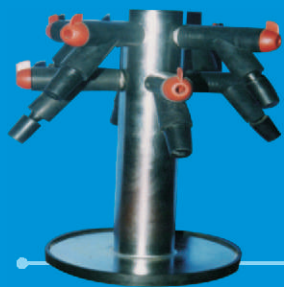
Lyodel (-85°C)

Product Code	Description	Temperature Range
LYO1550	Mini-Lyodel	-50°C
LYO1580	Mini-Lyodel	-80°C
LYO0555	Lyodel	-55°C
LYO0585	Lyodel	-85°C
LYO1855	Maxi-Lyodel	-55°C
LYO1885	Maxi-Lyodel	-85°C

ACCESSORIES

SS Column (T) Manifold (8-Port or 24-Port)

8-Port or 24-Port Column Manifold is useful for drying of small volume of liquids in flasks. It is provided with quick seal valves for holding flasks up to 1 litre capacity. Manifold sealing gaskets and cone connectors are also supplied with this accessory.



Product Code	Description	No of Valves
FM0080	8-Port SS Column Manifold	8
FM0024	24-Port SS Column Manifold	24

SS Drum Manifold (12-Port or 16-Port)

Stainless Steel Drum Manifold is available in 12 as well 16-Port versions. Each port is supplied with quick seal valve for holding flasks. Top and bottom manifold sealing gaskets are also provided. Drum manifolds are also useful for bulk drying in trays and beakers inside the drum.



8-Port Acrylic Drum Manifold

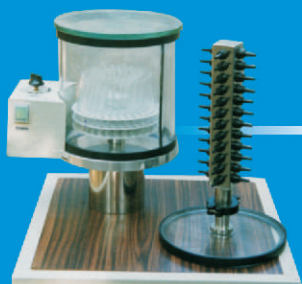
8-Port Acrylic Drum Manifold can be used with all three models of Lyodel. Manifold sealing gaskets are also supplied with this accessory.



Product Code	Description	No of Valves
FM0012	12-Port SS Drum Manifold	12
FM0016	16-Port SS Drum Manifold	16
FM0081	8-Port Acrylic Drum Manifold	8

Spin Freezer

Spin Freezer is useful for freezing & primary drying of samples in glass ampoules. By spinning ampoules, samples are frozen on the base unit without the need for pre-freezing. The centrifugal force holds the liquid sample in position and prevents frothing and bubbling during evaporation as the sample solidifies and sublimes. The spin freezer has an independent power supply and includes a timer to prevent spinner overrun after freezing. Removable rotor plates provided with system accept 5 different sized ampoules.

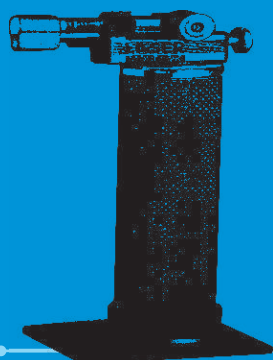


Secondary Drying Manifold (24-Port or 48-Port or 96-Port)

To complete the cycle and seal ampoules in the best possible condition, secondary drying manifold is used. 48-Port Manifold can be doubled to hold 96 ampoules by using the additional manifold supplied with a 'T' piece for connection.

Ampoule Sealing Torch

Simple hand held Ampoule Sealing Torch is useful for flame sealing freeze dried ampoules under vacuum in combination with secondary drying manifold. This Torch does not require conventional gas cylinders or long hoses.



Product Code	Description
ADSP096	Spin Freezer with 5 interchangeable carriers
ADSM024	24-Port secondary drying manifold
ADSM048	48-Port secondary drying manifold
ADSM096	96-Port secondary drying manifold
ADST100	Spark tester, for leak check of ampoules (Imported)
ADST101	Hand held ampoule sealing torch
ADAT102	Adaptor for 12 ampoules (samples to be pre-frozen)

Vial Stopping Shelf

Using Vial Stopping Shelf, samples in vials can be processed and stoppered under vacuum. The unit has movable aluminium shelves inside acrylic vacuum chamber. Each shelf accommodates two semicircular SS trays, removable for dual-purpose (vials as well as bulk) freeze drying. The vials can be moved together for stoppering under vacuum via a capstan.



Product Code	Description
VS0012	Vial Stopping Shelf with 1 shelf & 2 trays
VS0024	Vial Stopping Shelf with 2 shelves & 4 trays
VS0036	Vial Stopping Shelf with 3 shelves & 6 trays
VS0048	Vial Stopping Shelf with 4 shelves & 8 trays

Isolation Valve

The basic function of this manually operated isolation valve is to isolate the drying accessory and sample from the ice condenser and pump. This is also useful in injecting inert gas before sealing the vials and for determining the dryness of the sample by measuring the vapour pressure in the drying accessory

Product Code	Description
VSIV01	Isolation Valve

Bulk drying accessory (Chamber, Racks & Trays)

The system has acrylic vacuum chamber with lid and upto five shelf rack assembly and trays. The acrylic vacuum chamber gives a clear view of the product and transmits radiant heat energy for drying. It is easily sealed by drop on acrylic lid with lead through for heater accessories. A conveniently designed rack supports up to 5 one litre stainless steel trays, and is ready wired to accept low voltage, heater pads under each tray. The design allows selection of any tray & heater combination for maximum utilization. It can be easily lifted in and out of freezer units. This system can also be used with temperature control unit for careful control of drying rate.

Product Code	Description
BA02200	Bulk rack assembly with acrylic cylinder to accommodate rack & 2 trays of 200 x 20 mm (dia x h)-For Mini Lyodel only
BA02230	Bulk rack assembly with acrylic cylinder to accommodate rack & 2 trays of 230 x 20 mm (dia x h)
BA03230	Bulk rack assembly with acrylic cylinder to accommodate rack & 3 trays of 230 x 20 mm (dia x h)
BA05230	Bulk rack assembly with acrylic cylinder to accommodate rack & 5 trays of 230 x 20 mm (dia x h)

Heater Control Unit

The heater control unit is a freestanding power supply unit designed to deliver a thermostatically controlled low voltage power supply to the heaters. The heat energy produced by the heater mat under each shelf enhances the drying rate.

Product Code	Description
VSHC01	Heater control unit

LYODEL SHELF FREEZE DRYER

Delvacs' Lyodel Shelf Freeze Dryers are specially designed for flexible and reproducible production cycles.

Highlights

Easy to use Separate stainless steel chamber/condenser

Hermetic type refrigerating compressor DD8, double stage oil sealed rotary pump
Digital vacuum and temperature indicators

Wide range of accessories that include also microprocessor for automatic control system Compact size, supplied with trolley

Using Lyodel-Shelf, materials can be processed in a wide range of product containers with provision for sealing under vacuum or inert gas.

Design

Lyodel-Shelf freeze dryer consists of stainless steel (AISI304) drying chamber with easy accessibility and visibility using insulated transparent Perspex (poly-acrylic) door. The drying chamber has one or two shelves that are cooled through direct expansion of refrigeration circuit and heated by an electrical resistance at low voltage of 50V sunk in the plate thereby ensuring excellent heat exchange.

Vapour condenser

Cylindrical, constructed in stainless steel (AISI304) with an external copper coil, cooled by direct expansion with a maximum condensing capacity of 5 kg of ice. Defrosting takes place by reversing the refrigerating cycle of the service compressor to the condenser.

Refrigeration compressor

The refrigerating system of the shelf freeze dryers consists of a single refrigerating unit using hermetic compressor and non-CFC refrigerant, operating both on the shelf and on the condenser, thereby guaranteeing system performance flexibility and safety.

Thermo-regulators

For precise control of freezing, primary drying and a secondary drying the unit has a microprocessor based programmable temperature controller with 2 relay outputs for shelf heating and cooling. Shelf temperature and product tray temperature are displayed. Keys are provided for changing the set programme as per the user need.

Lyodel Shelf Freeze Dryer

Technical Details	Lyodel-1S	Lyodel-2S
Ice Condenser		
Capacity (max. kg)		5
Performance (max. kg/24h)		2.5
Temperature in °C ($\pm 5^{\circ}\text{C}$ @ 20°C ambient)		55
Shelf temperature control in °C ($\pm 2^{\circ}\text{C}$)		-45 (pre-freezing) to +60
No. of shelves	1	2
Shelf size (w x d mm)		275 x 350
Shelf area (m ²)	0.10	0.20
Distance between shelves (mm)	135	73
Max. bulk capacity (with 1cm depth)	1 litre	2 litre bulk only
Max. capacity of vials	2ml-400, 5ml-164, 10ml-34	2 litre bulk only
Flask drying (Optional)		4-port manifold with quick seal valve
Refrigeration compressor		1 x 0.75kW
Manual stoppering system (top down)	Standard	NA
Dimensions (w x d x h) in mm		850 x 650 x 1100
Vacuum pump LPM		100
Vacuum display / Vacuum control		Digital pirani / Standard

Product Code	Description	No of shelves & type
LSFD1S	Lyodel shelf Freeze Drier	One fixed shelf with stoppering device
LSFD2S	Lyodel shelf Freeze Drier	Two fixed shelves for bulk drying only



LYODEL - PILOT PLANT

For controlled freezing and drying of sensitive materials in vials or in bulk, Lyodel–Pilot Plant is the ideal choice. The unit is easy to use and has an integral refrigeration system allowing precise temperature control as well as reliable mechanical Stoppering.

Maxi-Lyodel is upgradeable into Lyodel-Pilot Plant by addition of a 3-Shelf Refrigerated chamber with Stoppering mechanism. The 3-Shelf refrigerated unit is designed to fit on top of the Maxi-Lyodel base unit, with no additional requirement of valuable floor space.

Vial loading trays

Single shelf loads can be stored, handled and ultimately slid on to this fence and tray accessory that is designed to maximize heat transfer by keeping the vial in direct contact with the shelf.

Bulk trays

Each stainless steel tray is capable of holding 2.5L of liquid. They are easy to clean, store and makes loading liquids very convenient.

Specifications

Model	Lyodel-Pilot Plant
No of Shelves	3
Shelf dimension and area	300 x 450 (mm); 0.40 sq. m/4 sq. ft
Stoppering Method	Mechanical screw jack
Maximum Clearance	80 mm
Vial capacity (Nos O.D)	430 - 30mm; 750 23 mm; 1600 16 mm
Bulk material	8 Litres @ 20mm depth
Cooling System	Indirect Fluid
Minimum Shelf temperature	-45°C
Compressor / Refrigerant	3/4 HP / R 404 A
Heating System	Indirect Fluid
Maximum Shelf Temperature	60°C
Heater type / Load	Cartridge Type / 400 W
Fluid Circulation	Centrifugal Fluid Pump
Controls	Digital
No of Probes	Four (One for liquid and three for products)
Voltage	220 240V, 50 Hz
Power KW	2.0
Condenser 12 Hour	6.0
Ice Capacity 24 Hour	10.5
Ice Capacity Total	18
Condenser ultimate low temperature @ 20°C	-55°C ± 5°C
Condenser Area (in m ²)	0.40
Volume (L)	44.5
Foot Space (mm)	820 x 950

Special features

- Product uniformity from top to bottom
- Product safety assured with accurate temperature control to ± 1°C
- Non-carcinogenic inert cooling fluid for operator safety
- Single phase operation without water cooling
- Includes vial stoppering under vacuum or inert gas
- Large shelf area (0.40m²/4 ft²) from a small footprint
- Complete with full instrumentation for process optimization and pressure rise testing

Optional Accessories:

Isolation Valve; Bulk Trays; Spares Kit

Product Code	Description	No of Shelves & type
LYO1855RC3S	Pilot Plant Standard	Three fixed type with stoppering device
LYO1855RC3SB	Pilot Plant (Bulk only)	Four fixed type with bulk trays



DELVAC DIRECT DRIVEN HIGH VACUUM PUMPS

Delvac Direct Driven High Vacuum Pumps are designed to meet the requirement of high vacuum applications of Freeze Drying. The Pump comprises of two stage offset rotary vane arrangement with a special inbuilt oil pump to take care of oil circulation and to assure continuous silent operation under high vacuum. Operation of the pump with the inbuilt gas ballast valve in open condition warms up the pump thereby preventing vapour condensation inside the pump. This increases the water handling capacity and thereby makes them ideal for use in Freeze drying operations.

Special Features:

- | | |
|-----------------------------------|---------------------|
| Built-in anti-suck-back mechanism | Low oil consumption |
| Built-in gas ballast valve | Silent operation |
| High vapour handling capacity | Compact and sturdy |

Easy Maintenance:

The advanced lubrication system with special in-built oil pump enables the vacuum pumps to work with wide oil level tolerance, reducing the need for frequent topping-up. These pumps are modular in construction. Dismantling and assembling these pumps is very easy.

Delvac offers three different models of high vacuum pumps to suit individual applications.

	Units	DD8	DD12	DD18
Displacement	Litres / min	100	200	300
	m ³ / Hr	8	12	18
Max. Vacuum	mbar	0.03	0.03	0.05
Max Water Vapour inlet pressure	mbar	15	15	20
Max Water Vapour Pumping rate	Kg / Hr	0.06	0.15	0.30
Oil Capacity	Litre	0.42 - 0.55	0.56 - 0.75	0.75 - 1.05
Recommended oil	(Min-Max)	Molecular distilled oil	Molecular distilled oil	Molecular distilled oil
Oil Mist Filter	-	MF 10	MF 10	MF 20

Product Code	Description
VP001	Vacuum Pump 100 LPM
VP002	Vacuum Pump 200 LPM
VP003	Vacuum Pump 250 LPM
EMF10	Oil Mist Filter

Pre freezing Glycol bath

Pre freezing Glycol bath is meant to freeze materials in round bottom flaks before loading on the freeze dryer. The pre-freezer bath can achieve a temperature range of -40°C and has rotation mechanism for a pair of flasks.

Product Code	Description
FMFB040	Pre-freezing Glycol Bath



Pre-freezing bath