

Modulyo® Freeze Dryers



**Delivering maximum flexibility
for life science applications**

Analyze • Detect • Measure • Control™

Thermo
ELECTRON CORPORATION

Modulyo Freeze Drying Systems

Thermo Electron offers a complete range of freeze dryers and accessories for quick and efficient sample preparation. From our space-saving 1-liter MicroModulyo system to our high-volume, 20-liter SuperModulyo system, we have a freeze dryer to suit a wide variety of life science applications.

Thermo Electron's Modulyo freeze dryers are easily configured to meet your needs, with your choice of condenser, vacuum pump, and drying accessories. Thermo also carries a wide range of flasks and manifolds to accommodate all of your sample format requirements.

We've provided a list of key questions on page one that will help you successfully design your Modulyo freeze drying system. Coupled with the diagrams and technical specifications in this brochure, you will be prepared to select an efficient, high-quality freeze drying system from the world leader in sample preparation solutions.



Freeze Drying

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Modulyo

Designing Your Freeze Drying System

Answer these key questions to successfully design your Modulyo freeze drying system.

Will this freeze dryer be used for a single application or multiple applications?

Consider not only the primary application, but also other, less frequently performed applications, for your freeze drying system. For example, flask drying may be successfully performed using a column manifold, but if loose material will also be dried, a drum manifold, with its large internal cavity that accommodates shallow trays, might be a better choice.

What type of sample containers will you use with your freeze drying system?

Will your sample be dried in flasks, vials or ampules, or will it be loose material that requires shallow trays? The type and number of sample containers will dictate not only the type of drying accessory, but

also the size of the ice condenser module. Loose material in large shallow trays requires both a larger ice condenser and a larger drying accessory than samples dried in 2 ml glass ampules or 10 ml vials.

What is the total volume of ice to be extracted at one time?

Ice condensers are rated by the maximum volume of ice they can hold before they need to be shut down and emptied. Routinely drying 300 ml of frozen sample in two 1 liter flasks would easily be accommodated by the 1.5 liter MicroModulyo. Drying sample material in twenty, 1 liter flasks that are each half full would require the ice capacity of the SuperModulyo.

What is the minimum pump displacement capacity required to operate the freeze drying system?

In order to keep the sample frozen during the entire freeze drying process it must be kept under constant vacuum. Column manifolds used on a MicroModulyo have a small

internal volume and therefore do not require a large capacity pump. Some freeze drying systems however, such as those that are used to dry bulk material in trays, have larger internal volumes and require a larger capacity pump to evacuate the total internal volume before the sample begins to thaw.

What is the maximum temperature at which all of the solvent can be successfully trapped before it reaches the vacuum pump?

Modulyo ice condensers operate at a nominal temperature of -50 °C. This is more than cold enough for the vast majority of freeze drying applications. Some applications, however, will require lower temperatures to protect the pump. For these applications, Thermo Electron offers a temperature trap to supplement the Modulyo ice condensers.



MicroModulyo

MicroModulyo Freeze Dryer– 1.5 Liter

The MicroModulyo is a space saving, cost effective, 1.5 liter ice condenser designed specifically for the small volume user. It features an all stainless steel, “coil-in-chamber” ice condenser with an easy-to-use front mounted bottom drain. The MicroModulyo is ideal for use with the 8-port column flask manifold as well as drying accessories for vials and ampules.

Product Features

- Compact, space-saving design
- -50 °C “coil-in-chamber”
all stainless steel ice condenser
- Front mounted bottom drain
- CFC free refrigeration system



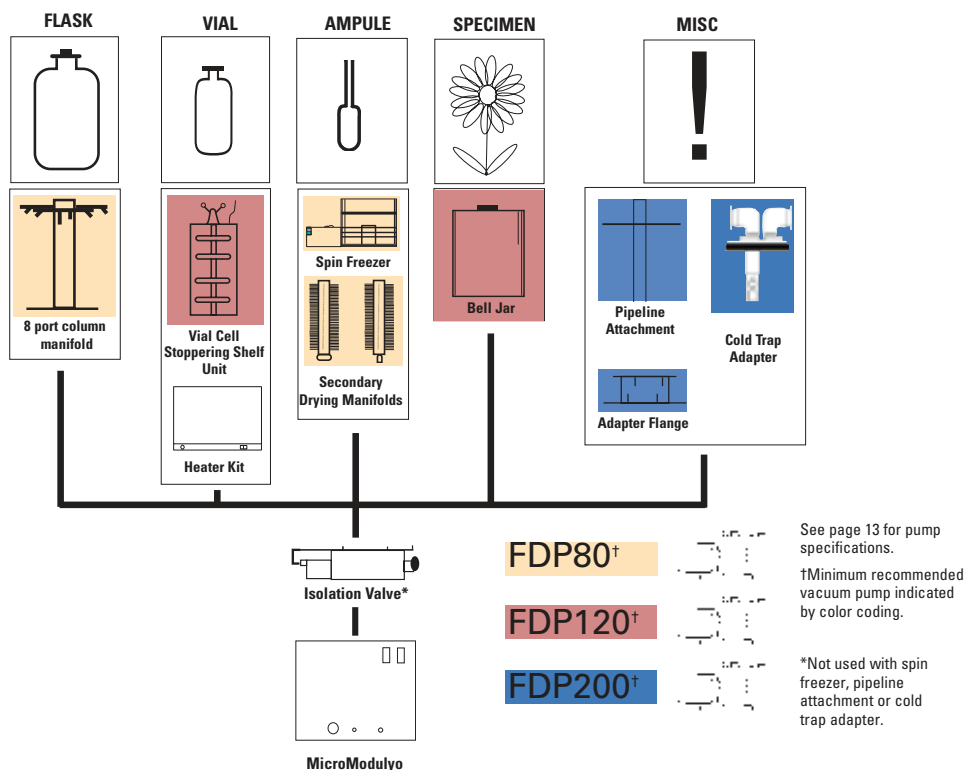
Technical Specifications

| Model | MicroModulyo |
|------------------------------------|----------------------------------------------------------------------------|
| Maximum Condenser Chamber Capacity | 1.5 liters |
| Ice Removal Capacity (in 12 hours) | 2.2 lbs, (1.0 kg) |
| Maximum Ice Capacity | 3.0 lbs, (1.35 kg) |
| Operating Temperature | ~-50 °C |
| Refrigeration Compressor Type | 1/4 hp hermetic unit |
| Dimensions (H x W x D) | 12 x 13 x 17 (in), 305 x 330 x 432 (mm) |
| Weight | 59 lbs (27 kg) |
| Power Requirements | MicroModulyo115, 115 VAC/60 Hz, 8 A MicroModulyo230, 230 VAC/50 Hz, 3 A |

Ordering Information

| Cat No | Description | Voltage |
|-----------------|---------------------------------------|-------------|
| MicroModulyo115 | MicroModulyo, 1.5 liter ice condenser | 115 V/60 Hz |
| MicroModulyo230 | MicroModulyo, 1.5 liter ice condenser | 230 V/50 Hz |

Design Your MicroModulyo System



ModulyoD

ModulyoD Freeze Dryer – 5 Liter

The ModulyoD is a multipurpose ice condenser with a five liter capacity. It is designed to work with a wide variety of drying accessories, including those used for flasks, vials, ampules and bulk materials. The robust design includes a high quality, smooth wall stainless steel ice condenser with an easy-to-use, front mounted, bottom drain.

The membrane panel user interface of the ModulyoD is designed for maximum convenience. It features bright, easy-to-read digital

displays for both condenser temperature and vacuum pressure. The ModulyoD also features color coded, status-at-a-glance indicator bars that allow the user to confirm the system operating status, even from a distance. An RS232 port provides easy access to real time temperature and vacuum pressure data.

Product Features

- Compact benchtop footprint
- Digital display of vacuum & temperature



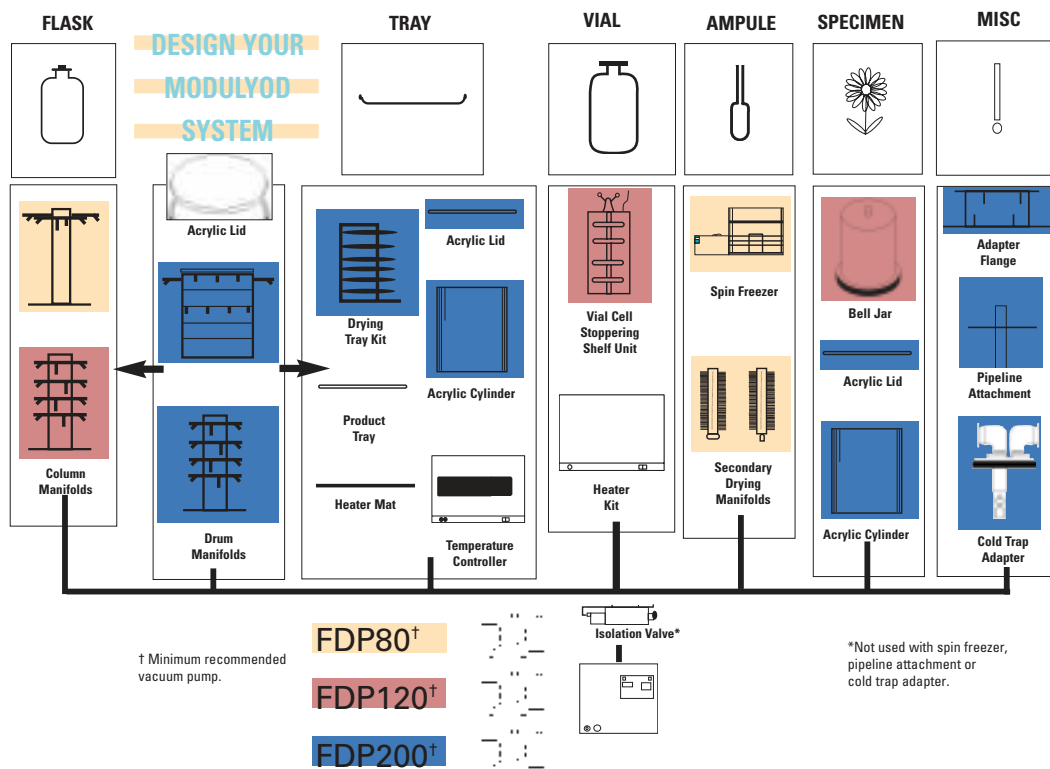
- -50 °C smooth wall stainless steel ice condenser
- RS232 port for collecting critical data
- CFC free refrigeration system

Technical Specifications

| Model | ModulyoD |
|------------------------------------|---------------------------------------------------------------------------|
| Maximum Condenser Chamber Capacity | 5 Liters |
| Ice Removal Capacity (in 12 hours) | 2.6 lbs, (1.2 kg) |
| Ice Removal Capacity (in 24 hours) | 5.1 lbs, (2.3 kg) |
| Maximum Ice Capacity | 9.9 lbs, (4.5 kg) |
| Operating Temperature | ~-50 °C |
| Temperature Display Range | Ambient to -60 °C |
| Pressure Display Range | 30 µbar to 50.0 mbar |
| Refrigeration Compressor Type | 1/3 hp hermetic unit |
| Dimensions (H x W x D) | 13.38 x 18.5 x 26.75 (in), 340 x 470 x 680 (mm) |
| Weight | 99 lbs (45 kg) |
| Power Requirements | ModulyoD-115, 115 VAC/60 Hz, 15.0 A ModulyoD-230, 230 VAC/50 Hz, 8.0 A |

Ordering Information

| Cat No | Description | Voltage |
|--------------|----------------------------------------------|-------------|
| ModulyoD-115 | ModulyoD, 5 liter ice condenser 115 VAC 60Hz | 115 V/60 Hz |
| ModulyoD-230 | ModulyoD, 5 liter ice condenser 230 VAC 50Hz | 230 V/60 Hz |



SuperModulyo

SuperModulyo Freeze Dryer –20 Liter

The SuperModulyo is a high capacity, twenty liter ice condenser designed specifically for the large volume user. It features a horizontally mounted all stainless steel, smooth wall ice condenser. The horizontal design and hot gas defrost system allow the user to empty the ice condenser in a matter of minutes. The SuperModulyo includes a 285* l/min, rotary vane vacuum pump and is ideal for use with the wide variety of drying accessories.

* 285 l/min is the rating for the 220 VAC 60 Hz version of the pump.



Product Features

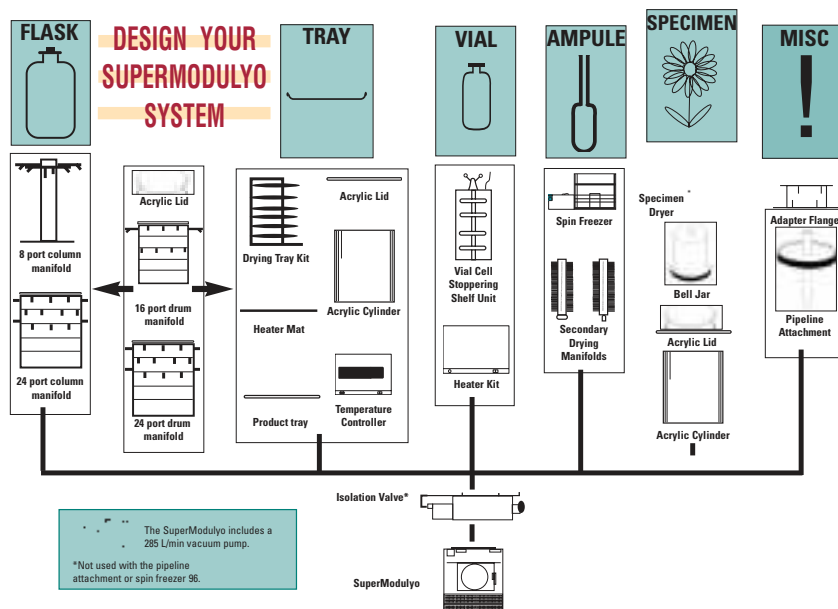
- Space-saving console design
- -50 °C horizontal smooth wall all stainless steel ice condenser
- Rapid, hot gas defrost system
- Vacuum & temperature gauges
- CFC free refrigeration system
- Comes complete with a 285 l/min vacuum pump

Technical Specifications

| Model | SuperModulyo |
|------------------------------------|----------------------------------------------------------------------------------|
| Maximum Condenser Chamber Capacity | 20 Liters |
| Ice Removal Capacity (in 12 hours) | 13.2 lbs, (6 kg) |
| Ice Removal Capacity (in 24 hours) | 23.1 lbs, (10.5 kg) |
| Maximum Ice Capacity | 39.6 lbs, (18 kg) |
| Operating Temperature | ~-50 °C |
| Temperature Display Range | +100 °C to -100 °C |
| Pressure Display Range | 10 µbar to 5.0 mbar |
| Refrigeration Compressor Type | 3/4 hp hermetic unit |
| Pump Capacity | 285 l/min @ 60 Hz |
| Pump Maximum Vacuum | 1.5 mtorr (1.95 x 10 ⁻³ mbar) |
| Pump Oil Capacity | 1 Liter |
| Dimensions (H X W X D) | 35.5 x 25.6 x 27.6 (in), 900 x 650 x 700 (mm) |
| Weight | 396 lbs (180 kg) |
| Power Requirements | SuperModulyo220, 220 VAC/60 Hz, 10.0 A SuperModulyo230, 230 VAC/50 Hz, 10.0 A |

Ordering Information

| Cat No | Description | Voltage |
|-----------------|-------------------------------------|-------------|
| SuperModulyo220 | SuperModulyo 20 liter ice condenser | 220 V/60 Hz |
| SuperModulyo230 | SuperModulyo 20 liter ice condenser | 230 V/50 Hz |



Column and Drum Manifolds

Column Manifolds – 8 Port

The 8-port Column Manifold is ideal for the external drying of small volumes of liquids or slurries in flasks. It is made of high-grade



stainless steel and contains eight ports that are weld mounted radially at the top of the column. Eight removable neoprene valves are supplied with the accessory, each of which

can be fitted with a flask of up to 1 liter capacity. A neoprene manifold sealing gasket is provided with the column, to seal the base.

Connection to other freeze drying accessories or devices requiring a condensable vapor trapping vacuum source may be accommodated by removing one or more of the neoprene valves.

The 1.5 Liter MicroModulyo is ideal for use with the 8-port Column Manifold.



Column Manifolds – 24 Port

The 24-port Column Manifold is ideal for external drying of larger volumes of liquids or slurries in flasks. It is made of high-grade stainless steel

and contains 24 ports that are weld mounted radially around the column. Twenty-four removable neoprene valves are supplied with the accessory, each of which can be fitted with a flask of up to 1 liter capacity. A neoprene manifold sealing gasket is provided with the column, to seal the base.

Connection to other freeze drying accessories or devices requiring a condensable vapor trapping vacuum source may be accommodated by removing one or more of the neoprene valves.

The 20 Liter SuperModulyo is ideal for use with the 24 port column manifold. The 5 liter ModulyoD or 1.5 liter MicroModulyo may also be used, up to the ice capacity of the condenser.



Drum Manifolds – 16 & 24 Port

The high quality, stainless steel drum manifold accessory is

available in both 16- and 24-port versions. Each port of the manifold is supplied with a removable neoprene valve for attaching flasks of up to 1 liter capacity. Drum manifolds are more versatile than the column manifolds as they may also be used for bulk drying in trays (see page 8 for Tray Drying Accessories) or beakers inside the drum. Neoprene manifold sealing gaskets are provided for both the top and bottom of the drum manifold.

The Acrylic Lid (F05632000) used to seal the top of the drum manifold must be ordered separately.

Both versions of the Drum Manifold are suitable for use with either the 20 Liter SuperModulyo or the 5 Liter ModulyoD, up to the ice capacity of the condenser.

Ordering Information

| Cat No | Description | Diameter | Height | Base Flange Diameter | Flask Port Diameter | Number of Valves |
|-------------|-------------------------|-----------------|-----------------|----------------------|---------------------|------------------|
| F056 56 000 | 8-port column manifold | 70 mm (2.76") | 336 mm (13.23") | 215 mm (8.46") | 19 mm (.75") | 8 |
| F056 22 000 | 24-port column manifold | 128 mm (5.04") | 665 mm (26.18") | 215 mm (8.46") | 19 mm (.75") | 24 |
| F056 28 000 | 16-port drum manifold | 350 mm (13.78") | 430 mm (16.93") | 350 mm (13.78") | 19 mm (.75") | 16 |
| F056 21 000 | 24-port drum manifold | 350 mm (13.78") | 430 mm (16.93") | 350 mm (13.78") | 19 mm (.75") | 24 |

Please Note: when ordering a drum manifold you will also need an acrylic lid F05632000 (see page 6.)

Accessories

| Cat No | Description |
|-------------|--------------------------------------------------|
| F056 48 000 | Manifold valve |
| F023 01 018 | Sealing gasket for 8- & 24-port column manifolds |
| F056 21 001 | Sealing gasket for 16- & 24-port drum manifolds |
| F056 32 000 | 350 mm x 25 mm clear acrylic plastic lid |
| H014 30 122 | 20 mm stopper for acrylic lid |



Flasks, Lids, Adapters



Flasks

Three convenient sizes of high quality borosilicate glass flasks are available from Thermo Electron. They range in size

from 300 ml to 1 liter. These flasks have been specifically designed for freeze drying and feature wide-mouth openings for easy access to the dried material. All three flasks feature the same 75 mm diameter opening. This facilitates the use of a single, universal, flask lid that is interchangeable between different size flasks. In addition, rubber cone connectors are available to facilitate the use of standard laboratory flasks. Adapters are also available for use with Labconco® and VirTis® flask lids.

Thermo Electron offers specially designed freeze drying flasks in three convenient sizes: 300 ml, 500 ml and 1000 ml.

Acrylic Lid

The Acrylic Lid is a 25 mm thick disc of clear acrylic plastic with two 20 mm openings sealed with special removable rubber plugs. These openings allow for remote sensing of temperature inside the drying accessory while under vacuum.

The lid may be used with both Drum Manifold accessories (page 6) and the Acrylic Cylinder accessory (page 12).

Flask Lid with Adapter

Thermo Electron provides a snap-on universal flask lid that fits all three wide-mouth flasks. The neoprene rubber lid houses a replaceable filter secured with a rubber O-ring. The filter prevents system and sample contamination when applying vacuum or venting the flask. The lid is also supplied with a metal adapter that connects to the valves on the column and drum manifolds.



Ordering Information and Specifications

| Cat No | Description | Working volume | Flask Diameter | Flask height | Flask Mouth |
|-------------|---------------|----------------|----------------|----------------|-------------|
| F056 58 000 | 300 ml flask | 75 ml | 75 mm, 3" | 125 mm (5.0") | 75 mm |
| F056 50 000 | 500 ml flask | 125 ml | 75 mm, 3" | 173 mm (6.92") | 75 mm |
| F056 57 000 | 1 liter flask | 250 ml | 100 mm, 4" | 195 mm (7.8") | 75 mm |

Lids, Filters & Adapters

| | |
|-------------|-----------------------------------------------------------------------------------------------------|
| F056 3 2000 | Acrylic Lid 350 mm x 25 mm (13.78 x 1") |
| F056 59 000 | Flask lid with adapter |
| F056 59 222 | Flask lid filter, 100/pk |
| F056 51 000 | Cone connector kit for 19/26, 24/29 & 29/32 flasks |
| F056 51 001 | Adapter for VirTis 40 & 75 ml flask lids |
| F056 51 021 | Adapter for Labconco 120-2000 ml flask lids |
| F056 51 020 | Adapter for Labconco 40 & 80 ml flask lids |
| F056 59 003 | Adapter for VirTis 150-2000 ml flask lids; also used as replacement adapter for flask lid F05659000 |
| H02125020-B | Replacement O-ring for F05659000 flask lid, 25/pk |

Tray Cells and Drying Tray Kits



Tray Cell

Tray drying accessories are designed for applications where bulk material is dried in open trays. The TC60 Tray Cell is a complete tray drying system that includes a clear acrylic vacuum chamber with a six-shelf rack assembly and six removable stainless steel product trays. An Acrylic Lid is included with the TC60 to seal the top of the acrylic vacuum chamber. For faster drying, optional Heater Mats and a Temperature Controller may be ordered separately.

Both the 20 liter SuperModulyo and 5 liter ModulyoD are ideal for use with the TC60 Tray Cell.



Drying Tray Kit

The KDT60 Drying Tray Kit is composed of the Tray Cell rack assembly and six product trays. It is intended for those who already have the acrylic cylinder (page 12) and lid (page 7), or a drum manifold (page 6) and lid, and wish to upgrade their system with tray drying capability. The kit fits inside your 350 mm diameter accessory to add multi-tasking capability to your existing Modulyo freeze drying system. The KDT60 may also be used with the Temperature Controller and up to six heater mats (available separately).

Ordering Information and Specifications

| Cat No | Description | Dimensions |
|-------------|--------------------------------------------------------|-------------------------------------------------------------------------------|
| TC60 | Tray cell, acrylic chamber drying tray kit and lid | Diameter: 350 mm (13.78") Height: 435 mm (17.13") |
| KDT60 | Drying tray kit including: tray rack & 6 product trays | Diameter: 300 mm (11.81") Height: 425 mm (16.73") |
| F056 30 000 | Stainless steel product tray | Diameter: 284 mm (11.18") Depth: 25 mm (1") Volume @ 1 cm depth: 594 ml |

Temperature Controller and Isolation Valve



TC60 Tray Cell with Heater Mats and Temperature Controller, on Isolation Valve

Temperature Controller

The Temperature Controller is a free-standing power supply that delivers a controlled low voltage output to up to six optional heater mats used in the drying tray kit. Adding heat energy enhances the drying rate of material in the product trays. The controller regulates heat input by monitoring the temperature of the mat. Mat temperatures may be adjusted from 0 °C to 45 °C, to a point that will add heat energy to, but not melt the samples.

The Temperature Controller is used with both the TC60 Tray Cell and KDT60 Drying Tray Kit. Heater mats must be purchased separately.

Isolation Valve

The Isolation Valve is a high quality, multi-purpose device that is used in conjunction with a variety of freeze drying accessories. The basic function of the manually operated valve is to isolate the drying accessory, and sample, from the ice condenser and pump. With the Isolation Valve closed, the condenser chamber can be evacuated while samples are loaded on the drying accessory. When opened, system vacuum levels fall more quickly. Isolating the drying accessory in this manner will allow the user to apply an external vacuum gauge and measure the vapor pressure in the drying accessory. This information is useful in determining the dryness of the sample. The same accessory port (pressure rise test) may also be used to back-fill the sample containers with an inert gas such as dry nitrogen prior to sealing.

The Isolation Valve will not work with the cold trap adapter, pipeline attachment or Spin Freezer 96.



Isolation Valve shown with valve partially open.

| Ordering Information and Specifications | | |
|-----------------------------------------|------------------------------|-------------------------------------------------------------------------------------|
| Cat No | Description | Dimensions mm |
| F056 33 000 | Temperature controller | 240 VAC 50/60 Hz 250 W x 165 H x 133 D (mm) 10" W x 6.5" H x 5.23" D |
| F056 33 115 | Temperature controller | 115 VAC 50/60 Hz 250 W x 165 H x 133 D (mm) 10" W x 6.5" H x 5.23" D |
| F056 31 000 | Heater mat for product trays | Diameter: 254 mm (10") Thickness: 8 mm (0.31") Power Consumption: 50 W @ 50 V |
| F05643000 | Isolation valve | Base diameter 215 |

The Isolation Valve may be used with the MicroModulyoD or SuperModulyo base units.

Vial Cell Stoppering Shelf

With the Vial Cell Stoppering Shelf, vials can be processed and stoppered while under vacuum. The Vial Cell comprises four movable shelves inside a gasketed acrylic vacuum chamber, with a stoppering handle on top. Each shelf accommodates two trays with up to 62 vials per tray. Eight stainless steel bottle retaining trays are included, which may also be used for bulk product drying. For faster drying, each shelf comes equipped with a built-in heater mat, for use with the optional Heater Kit. An integral electrical lead-through is also supplied with the Vial Cell to connect the Heater Kit. When coupled with the Isolation Valve accessory, the chamber may be back-filled with an inert gas such as nitrogen prior to stoppering the vials.

The Vial Cell may be used with the MicroModulyo, ModulyoD or SuperModulyo base units.

Heater Kit for Stoppering Shelf

The Heater Kit is a free-standing power pack that delivers a constant low voltage output to the built-in heater mats used in the stoppering shelf. This added heat energy enhances the drying rate of material in vials. The included power supply lead attaches to the electrical lead-through in the Vial Cell stoppering shelf.

The Heater Kit is used exclusively with the Vial Cell Stoppering Shelf.

Vials, Stoppers, Caps & Crimpers

Thermo offers a selection of vials specifically designed for freeze drying. The vials are suitable for use with the Vial Cell Stoppering Shelf. Rubber lyophilization stoppers, aluminum sealing caps, and hand crimpers are also available.



| Vial Capacity | Number of Vials |
|---------------|-----------------|
| 2 ml | 480 |
| 5 ml | 156 |
| 10 ml | 156 |

Ordering Information and Specifications

| Cat No | Description | Dimensions |
|-----------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| F05623000 | Vial cell stoppering shelf including: stoppering shelf assembly, clear acrylic vacuum chamber & 8 bottle retaining trays | Diameter: 215 mm (8.46") Height: 550 mm (21.65") Shelf Spacing (fully open): 58 mm (2.28") |
| F02301124 | Bottle retaining tray | Diameter: 175 mm (6.89") Radius (to tray central wall): 71 mm (2.79") Height: 26 mm (1.02") Tray Volume: 300 ml (to top) |
| F02301018 | Vial cell sealing gasket | Diameter: 215 mm (8.46") |
| F05655000 | Heater kit for vial cell stoppering shelf, 220/240 V AC 50/60 Hz | 250 mm (W) x 194 mm (H) x 190 mm (D) 10" x 7.64" x 7.48" Output: 50 V AC at 7A |
| F05655115 | Heater kit for vial cell stoppering shelf, 115 V AC 50/60 Hz | 250 mm (W) x 194 mm (H) x 190 mm (D) 10" x 7.64" x 7.48" Output: 50 V AC at 7A |

Vials, low-extractable borosilicate glass (KG-33), aluminum seal finish, without closure. Glass meets ASTM Type 1, Class A standard. Autoclavable.

| Cat No | Description | Dimensions | Approximate Height w / stopper | Uses aluminum seal finish (vial mouth O.D.) | Quantity |
|-----------|-------------|-------------------------|--------------------------------|---------------------------------------------|----------|
| H01430008 | 2 ml vial | 15 mm O.D. x 40 mm long | 48 mm | 13 mm | 288 |
| H01430048 | 5 ml vial | 23 mm O.D. x 47 mm long | 55 mm | 20 mm | 288 |
| H01430042 | 10 ml vial | 23 mm O.D. x 46 mm long | 54 mm | 20 mm | 100 |

Stopper for aluminum seal finishes, gray butyl rubber, lyophilization style.

| Cat No | Description | Fits GPI aluminum seal finish | Quantity |
|-------------|-------------------|-------------------------------|----------|
| H01430121 | Stopper for 13 mm | 13 mm | 1000 |
| H01430122-B | Stopper for 20 mm | 20 mm | 1000 |

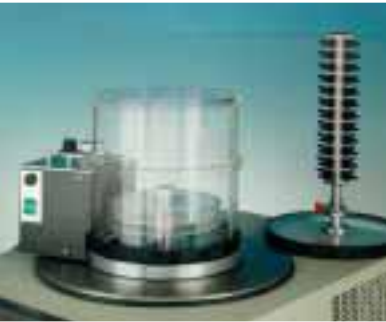
Aluminum seal, one piece unlined, tear-out style. Center portion tears out to allow easy access to setpa.

| Cat No | Description | Fits GPI aluminum seal finish | Quantity |
|-----------|--------------------|-------------------------------|----------|
| H01430161 | Cap for 13 mm O.D. | 13 mm | 1000 |
| H01430162 | Cap for 20 mm O.D. | 20 or 20A mm | 1000 |

Crimper, hand operated. Used to crimp aluminum seals on vials.

| Cat No | Description | Seal Size |
|-----------|----------------------------|--------------|
| H01430203 | Crimper for 13 mm O.D. Cap | 13 mm |
| H01430204 | Crimper for 20 mm O.D. Cap | 20 or 20A mm |

Spin Freezers and Secondary Manifolds



Spin Freezer 96

The Spin Freezer 96 is a self-contained vacuum chamber which facilitates both the freezing and primary drying of samples in glass ampules. Designed to operate as a low speed centrifuge, the Spin Freezer 96 utilizes evaporative cooling and centrifugation to freeze sample in a thin layer on one side of each ampule for faster drying. A simple timer can be set to automatically stop rotation once samples are fully frozen; primary drying (sublimation of ice) then proceeds under vacuum. For maximum flexibility, the Spin Freezer 96 comes complete with an assortment of optional rotors, each capable of handling different sized ampules.

The Spin Freezer 96 may be used with the MicroModulyo, ModulyoD or SuperModulyo.

Secondary Drying Manifolds

Secondary Drying Manifolds are specifically designed to accommodate desorption or secondary drying of samples contained in glass ampules. Ampules are arranged radially around a stainless steel column, and may be flame sealed from this position while under vacuum. A conical shaped rubber nipple is provided with each sample port. This rubber nipple accepts a wide variety of ampule sizes.



Secondary Drying Manifolds are available in two different capacities, 48 and 96 port. The Basic Single Column Manifold holds up to 48 samples. Its capacity may be extended with the optional Additional Single Column Manifold. The combination of basic single column manifold with additional single column allows users to process up to 96 samples at one time. The Double Column Manifold includes both the single and additional single columns and will process up to 96 samples at one time.

The Secondary Drying Manifolds may be used with the MicroModulyo, ModulyoD or SuperModulyo.

| Quantity | Capacity | Max. O. D. |
|----------|----------------|------------|
| 96 | 0.5 ml ampules | 7.93 mm |
| 80 | 1.0 ml ampules | 9 mm |
| 36 | 2.0 ml ampules | 13 mm |
| 24 | 5.0 ml ampules | 15.87 mm |
| 12 | 10 ml ampules | 20.5 mm |

| Ordering Information and Specifications | | | |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------|
| Cat No | Description | Dimensions | |
| F05637000 | Spin freezer 96, with 5 interchangeable carriers 240V 50/60 Hz, single phase | Base Diameter: 215 mm (8.46") | Speed: 760 RPM (approx.) |
| F05637115 | Spin freezer 96, with 5 interchangeable | Base Diameter: 215 mm (8.46") | Speed: 760 RPM (approx.) |
| F02964000 | Secondary drying manifold, basic, single column includes: rubber L-gasket for base, 48 adapter nipples | Diameter: 215 mm (8.46") | Capacity: 48 ampules |
| F02956000 | Secondary drying manifold, additional, single column includes: 48 adapter nipples | Diameter: 215 mm (8.46") | Capacity: 48 ampules |
| F02965000 | Secondary drying manifold, double column, includes: basic single column & additional single column manifolds, rubber L-gasket for base and 96 adapter nipples | Diameter: 215 mm (8.46") | Capacity: 96 ampules |
| F00203008 | Replacement adapter nipples | Cone Diameter: 5 to 7.5 mm | Fits ampule I.D. 4–7 mm |
| F02301018 | Sealing gasket suitable for use with Spin freezer 96 and secondary drying manifolds | Base Diameter: 215 mm (8.46") | |

Accessories

Specimen Drying



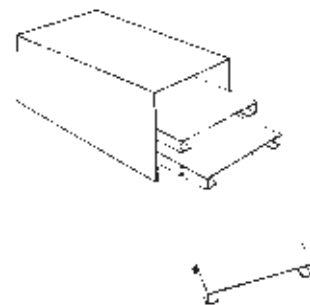
Bell Jar

The Bell Jar is a clear acrylic cylinder (closed on the top). It is used for drying smaller containers or specimens.



Acrylic Cylinder

The clear Acrylic Cylinder is designed to be used in conjunction with the Acrylic Lid. It is used for drying larger containers or specimens.



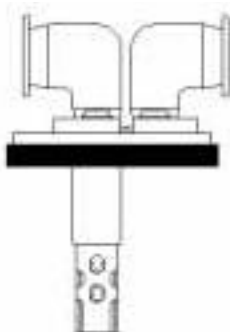
Pre-Freezer Shelf & Specimen Dryer (SuperModulyo Only)

The Pre-Freezer Shelf is a stainless steel shelf, which is used in conjunction with the SuperModulyo base unit. It is designed to fit horizontally inside the condenser chamber to freeze bulk product, when other deep freezing facilities are not available.

Ordering Information and Specifications

| Cat No | Description | Dimensions |
|-----------|----------------------------------------------------------|----------------------------------------------------------------------------------------------|
| F02960000 | Bell jar, includes: sealing gasket | Base Diameter: 215 mm (8.46") Height: 218 mm (8.58") |
| F05652000 | Acrylic cylinder, includes: sealing gaskets on both ends | Base Diameter: 350 mm (13.78") Height: 435 mm (17.13") |
| F05624000 | Pre-freeze shelf (SuperModulyo only) | Length: 400 mm (15.75") Width: 235 mm (9.25") |
| F05627000 | Specimen dryer (SuperModulyo only) | Length: 400 mm (15.75") Width: 235 mm (9.25") Height: 170 mm (6.69") |
| F02301018 | Replacement sealing gasket for bell jar | Diameter: 215 mm (8.46") |
| F05652001 | Replacement sealing gasket for acrylic cylinder | Diameter: 350 mm (13.78") |
| F02305065 | Work table 7" diameter. | Diameter: 178 mm (7") Overall Height: ~30 mm (1.2") Clearance Above Opening: ~51 mm, (~0.6") |

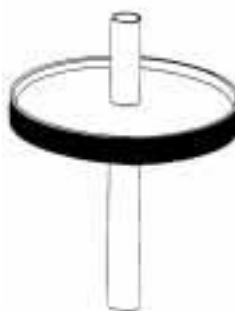
Adapters and Connectors



Cold Trap Adapter

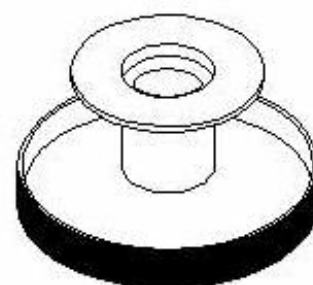
The Cold Trap Adapter is used to convert any MicroModulyo or ModulyoD ice condenser into a high quality stainless steel cold trap with a front bottom mounted drain.

Requires the installation of a BV130 bleeder valve for proper operation.



Pipeline Attachment

The Pipeline Attachment is used to convert the freeze drying system into a cold trap and pump for applications other than freeze drying.



Adapter Flange

The Adapter Flange is a stainless steel bushing with a neoprene insert. It is designed to allow the connection of drying accessories with a three inch throat, such as those supplied by other manufacturers.

Ordering Information and Specifications

| Cat No | Description | Dimensions |
|-----------|---------------------|-------------------------------------------------------------|
| F05660000 | Cold Trap Adapter | Base Diameter: 215 mm (8.50") Port Diameter: NW40 |
| F02305082 | Pipeline Attachment | Base Diameter: 215 mm (8.50") Port Diameter: 28 mm O.D. |
| F05626000 | Adapter Flange | Base Diameter: 215 mm (8.50") Throat Diameter: 7.62 mm (3") |
| FDSV5000 | SpeedVac Adapter | |

Pumps and Pump Accessories

Thermo Electron offers three different two-stage, oil-sealed, rotary vane vacuum pumps specifically designed for standard freeze drying applications. Each pump comes complete with a GBORK (Gas Ballast Oil Return Kit) and an Oil Mist Filter (EMF10). The GBORK allows the user to apply full gas ballast to keep the oil clean, without losing oil. The EMF10 filters the exhaust to keep the air clean.

For applications involving aggressive solvents that might damage ordinary pumps, Thermo Electron recommends the LyoPump, VLP195FD. In addition to the GBORK and oil mist filter, the two-stage, oil-sealed, rotary vane LyoPump™ includes an active oil filtration system (VPOF110) that dramatically extends the life of the pump.

Product Features

- Three models to choose from
- Low noise level, 48 dBA
- High quality cast iron shafts & rotors
- Thermal overload switches with auto-matic reset
- Complete with gas ballast oil return & mist filter



Technical Specifications

| Model | FDP80 | FDP120 | FDP200 or VLP195FD* |
|----------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------|
| Displacement | 76 l/min @ 60Hz | 116 l/min@ 60Hz | 195 l/min@ 60Hz |
| Maximum Vacuum | 1.5 mtorr/1.95 x 10 ⁻³ mbar | 1.5 mtorr/1.95 x 10 ⁻³ mbar | 1.5 mtorr/1.95 x 10 ⁻³ mbar |
| Oil Capacity | 0.7 Liters | 0.7 Liters | 0.75 Liters; 1.75 Liters for VLP195FD |
| Dimensions, W x D x H | 160 x 420 x 230 (mm) 6 x 17 x 9 (in) | 160 x 420 x 230 (mm) 6 x 17 x 9 (in) | 160 x 470 x 260 (mm) 6 x 19 x 11 (in) |
| Weight lbs. (kg) | 48 (22) | 48 (22) | 57 (26); 77 (35) for VLP195FD |
| Power Requirements | 120 VAC/60Hz, 5A 230 VAC/50Hz, 3A | 120 VAC/60Hz, 5A 230 VAC/50Hz, 3A | 120 VAC/60Hz, 8A; 12A for VLP195FD-115 230 VAC/50Hz, 4A; 6A for VLP195FD-230 |
| Vacuum Inlet Fitting, (mm) | 12.7 O.D. | 12.7 O.D. | 12.7 O.D. |

* Includes VPOF110 oil filtration system.

Ordering Information and Specifications

| Cat No | Description | MicroModulyo™ | ModulyoD™ | SuperModulyo™ | Voltage |
|--------------|----------------------------------------------------|---------------|-----------|---------------|---------|
| FDP80-115 | Vacuum pump with GBORK & EMF10 filter | • | • | | 120 |
| FDP80-230 | | | | | 230 |
| FDP120-115 | Vacuum pump with GBORK & EMF10 filter | • | • | | 120 |
| FDP120-230 | | | | | 230 |
| FDP200-115 | Vacuum pump with GBORK & EMF10 filter | • | • | | 120 |
| FDP200-230 | | | | | 230 |
| VLP195FD-115 | Vacuum pump with GBORK, EMF10 filter & VPOF filter | • | • | | 120 |
| VLP195FD-230 | | | | | 230 |

Accessories

| Cat No | Description |
|-------------|---------------------------------------------------------------------------------------|
| DDA110DK | Vacuum pump oil drain kit, Stainless Steel |
| SP01 | Case of 12 one liter bottles of vacuum pump oil |
| SP01-B | One liter of vacuum pump oil |
| SFF1 | Case of 12 one liter bottles of vacuum pump flushing fluid |
| SFF1-B | One liter of vacuum pump flushing fluid |
| MF10 | Mist filter element for EMF10 |
| OF10 | Odor filter replacement element for EMF10, 5 pk |
| MF20 | Mist filter replacement element for EMF20 (SuperModulyo) |
| OF20 | Odor filter replacement element for EMF20, pk of 5, (SuperModulyo) |
| AO310 | Replacement oil filter cartridge for VPOF110 |
| M30-0007-02 | 4 foot length of 1/2" I.D. vacuum tubing |
| M30-0007-03 | 8 foot length of 1/2" I.D. vacuum tubing |
| M60-0044-11 | 1/2" O.D. polypropylene 90° elbow fitting |
| M60-0044-14 | 1/2" O.D. polypropylene straight fitting |
| M60-0044-29 | Reducer Fitting, 5/8" to 1/2" hose I.D. (connects manifold valve to SpeedVac® tubing) |
| BV130 | 1/2" O.D. bleeder valve |
| CC120/DX | Deluxe convenience cart - 61 x 91.4 x 96.5 mm (24"W x 36"L x 38"H) |
| CC160/DX | Deluxe Convenience Cart - 61 x 121.9 x 96.5 mm (24"W x 48"L x 38"H) |
| 203-1009-00 | Additional vacuum connection kit for non-Thermo Electron pumps |

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Thermo Electron freeze drying products (except glassware) are warranted against defects in material and workmanship for one year after the date of delivery to the original purchaser. Thermo Electron's warranty is limited to defective materials and workmanship, and does not cover incidental or consequential damages. Warranty work is the responsibility of the distributor. The warranty obliges you to follow the precautions in this manual. It is the responsibility of the user to dispose of ALL materials in a manner in accordance with all federal, state and local regulations. ALL RETURNED UNITS MUST BE DECONTAMINATED AND FREE OF RADIOACTIVITY. Under no circumstances shall Thermo Electron be liable for damages due to the improper handling or use of its products. Thermo Electron assumes no liability, express or implied, for your use of this equipment.

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