

Lyophilization Product Line Overview



VirTis x FTS Systems



SP SCIENTIFIC
Making Time for Science

Introduction

SP Scientific, through their brands VirTis and FTS, offer the finest lyophilization range available. You will notice that in designing each model, we recognize that all freeze dryer users have their own unique needs and requirements. "One freeze dryer fits all" does not work well in today's competitive research, development and production environments, which is why we offer a wide selection of options including: refrigeration packages, condenser capacity, shelf configuration, control software, endpoint detection, clean room configurations and many others. Our technical sales team is always ready to help you configure a system that will best meet your technical and budgetary needs.

Our client relationship starts before the sale and lasts a lifetime. The LyoLearn Webinar and Technical Briefs on our website are designed to provide continuing education on topics of interest for the lyophilization scientist, engineer and user. When you choose a VirTis or FTS freeze dryer, you are entering a long-term relationship with our technical support team. We are here to answer your equipment and application questions as well as provide troubleshooting support.

For further information about any of the products shown here, please visit www.spscientific.com, or contact your nearest SP Scientific office.

Configure a system that is just right for your laboratory and production needs.

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BenchTop Manifold Freeze Dryers

Performance and versatility in a compact unit

- Configured to meet your application/solvent needs
- Condenser capacity of 3, 8 and 9 liters
- Drum or tree manifolds with optional see-through acrylic or rugged stainless steel
- Easy view digital front panel for continuous parameter monitoring
- Condenser temperatures of -55°C, -75°C, -85°C and -105°C
- User selectable pressure control maximizes energy transfer into samples
- Power saving control features
- Optional stand alone shell bath decreases freeze drying time
- Superior trapping with -105°C condenser temperature option
- Optional heated shelves for tray drying
- Full range of glassware and other accessories
- Vacuum display in user selectable mT, uB or Pa
- Convenient quick turn around with hot gas defrost

Control: Sentry



12½" **W** 31.7cm
19" **D** 48.3cm
15½" **H** 39.4cm
(BASED ON BT2K)



TYPICAL APPLICATIONS

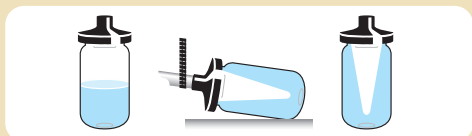
- Laboratory research
- Protein purification
- Products for analysis – plant material, organic tissue, waste products

Freezemobile Large Capacity Manifold Freeze Dryers

Got a big freeze drying problem? The answer just rolled up

- Match condenser configuration to solvent types and loads
- Floor standing and fully mobile
- Available in 25L or 35L configuration
- Condenser temperatures to -85°C
- Wide choice of drum, tee, or tree manifolds – see-through acrylic or rugged stainless steel models
- Easy view digital front panel for continuous parameter monitoring
- User selectable pressure control maximizes energy transfer into samples
- Power saving control features
- Optional stand alone shell bath decreases freeze drying time
- Fast turn-around time defrosts from smooth wall condenser
- Full range of glassware and other accessories
- Easy access vacuum pump drain and fill for simplified and convenient maintenance
- Vacuum readout user selectable in mT, uB or Pa
- Shell bath available as stand-alone or system integrated

Control: Sentry



The Freezemobile built-in shell bath helps to decrease manifold freeze drying time.

35" W 89.0cm
29" D 74.0cm
37" H 94.0cm
(BASED ON FM25)



TYPICAL APPLICATIONS

- Laboratory research
- Protein purification
- Products for analysis – plant material, organic tissue, waste products

AdVantage Plus and AdVantage Bench Top Tray Freeze Dryers

Tray and manifold freeze drying in one exceptional package

AdVantage Plus Features

- Capabilities similar to larger pilot R&D freeze dryers in a small bench top system
- Process flexibility provided by on-board control package
- Ability to anneal/thermally treat product to enhance freeze drying results
- Up to 12 programmable segments in the freezing stage
- Flexibility to customize cycles with up to 16 programmable freeze drying segments
- Easy access to frequently utilized programs with storage of up to 16 cycles
- Adjustable pressure control throughout cycle available in user selectable mT, uB and Pa
- Monitor freeze drying progress more effectively with four product thermocouples
- Condenser capacity of 6L; Condenser temperatures to -85°C
- Accommodates up to three stainless steel shelves
- Flooded shelf design with temperatures as low as -65°C; +/- 1°C shelf temperature uniformity
- Temperature control from -55°C to +60°C
- Available in bulk or stoppering
- **Shelf capacity quick comparison:** Up to 1197--2ml vials (14.75mm OD x 40 mm high with partially inserted stopper) using all 3 shelves

Control: Wizard

AdVantage Features

- A great step up from a manifold freeze dryer when more product is being processed at one time, or when shelf temperature control is needed
- Teflon coated solid shelves
- Single shelf system
- Controller capability similar to the AdVantage Plus
- Condenser capacity of 3.5L with maximum low temperature of -85°C
- Shelf temperature as low as -70°C with control from -55°C to +60°C
- **Shelf capacity quick comparison:** Up to 399--2ml vials (14.75mm OD x 40 mm high with partially inserted stopper)

Control: Wizard



25 ³ / ₄ "	W	65.4cm
28"	D	71.1cm
28 ³ / ₄ "	H	73.0cm

TYPICAL APPLICATIONS

- Laboratory research and development freeze drying
- 96 well plates
- Serum bottles or vials
- Bulk products for analysis – plant material, organic tissue, waste products

AdVantage Plus (In addition to Advantage)

- Small R&D freeze drying

Genesis Pilot Lyophilizers for Product Development and Small Batch Production

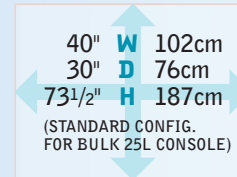
Expertly designed with your needs in mind

- Space saving, self-contained mobile tray freeze dryer
- Available as a stand-alone or clean room configuration
- One to six shelf (bulk) or 5 shelf (stoppering) capacity offering 1.5 ft²/.14m² to 9.18 ft²/.85m²
- Bulk or stoppering
- Large capacity pilot scale with condenser choice of 25L or 35L
- Choice of condenser temperatures
- Hollow flooded shelves provide uniform temperature on shelf surfaces
- Process a wide variety of products (Shelf temperatures as low as -70°C)
- Shelf temperature control range of -55°C to +65°C
- Fast turn-around time defrost from smooth wall condenser
- Add options and accessories to get just the unit you require
- **Shelf capacity quick comparison:** Up to 3135 --2ml vials (14.75mm OD x 40 mm high with partially inserted stopper) using a 5 shelf stoppering unit
- Available with Pirani, capacitance manometer and/or barometric end point determination

Control: Wizard, Encore or Maestro

TYPICAL APPLICATIONS

- Laboratory research and development
- Small production freeze drying
- Diagnostic kits
- 96 well plates
- Serum bottles and vials
- Bulk products for analysis – plant material, organic tissue, waste products



LyoStar for Cycle Development and Optimization

Matchless process accuracy and reliability for R&D professionals

- Space saving, self-contained freeze dryer
- Design facilitates scale-up with characteristics similar to larger systems
- Available with one to five shelves (bulk) or four (stoppering) (1.5 ft²/.14m² to 7.6 ft²/.71m²)
- Bulk or stoppering
- Hollow flooded shelves provide uniform temperature on shelf surfaces
- Process a wide variety of products (shelf temperature control range between -70°C and +60°C)
- Large capacity pilot scale with 30L condenser capacity
- Process non aqueous solvents with maximum low temperature of -85°C
- Add options and accessories to build units specific to your needs
- Shelf capacity quick comparison: Up to 2816 --2ml vials (14.75mm OD x 40 mm high with partially inserted stopper) using a 4 shelf stoppering unit

LyoStar with patented SMART™ MTM technology

- Optimizes most product primary drying cycles in one run
- Can significantly reduce freeze drying cycle development time
- Allows researchers to concentrate on formulation development
- Offers an important Process Analytical Technology (PAT) tool

TYPICAL APPLICATIONS

- Formulation development and stability studies
- Cycle optimization and scale-up
- Lyophilization of products with organic solvents in addition to water
- Laboratory research and development and/or small production freeze drying
- Diagnostic kits
- 96 well plates
- Serum bottles and vials



Now available with Praxair's ControlLyo™
Nucleation On-Demand Technology

33" W 84.0cm
43" D 109.0cm
78" H 190.0cm
(Computer cart not included)

SMART™ Freeze-Dryer Technology

Putting the experience of top lyophilization scientists at your fingertips

SMART™ freeze-dryer technology eliminates the trial-and-error approach normally associated with developing new lyophilization cycles. It enables experts and novices alike to develop new cycles quickly, while also ensuring that those cycles are elegant and efficient.

The SMART™ tools provide instant feedback on important product data – such as product resistance, heat flow, and product thickness – that was previously unavailable. SMART™ determines and verifies your optimized primary drying cycle in three runs or less. This decrease in cycle development time allows researchers to spend more time on value added activities such as formulation optimization and helps return on investment for busy companies.

This patented technology has resulted from extensive partnering with freeze drying industry experts, having been developed exclusively with leading academics at The University of Connecticut and Purdue University. It has been recognized as one of the most important control breakthroughs in freeze drying control and processing in recent years.

SMART™ is available on the LyoStar freeze-dryer, including a retrofit option for existing LyoStar systems.

Case #1 Detail

	Traditional Approach	SMART Approach	Savings
Number of Experimental Runs Performed	10	2	8
Estimated Development Time (Days)	95	9	76
Analytical (DSC) Costs	\$1,000	\$1,000	\$0
Labor Costs	\$36,060	\$2,412	\$33,648
Material Costs	\$93,750	\$75,000	\$18,750
Total Costs per Development Program	\$130,810	\$78,412	\$52,398
Development Programs per Year	8	8	--
Total Annual Cycle Development Costs	\$1,046,480	\$627,296	\$419,184

Case #2 Detail

	Traditional Approach	SMART Approach	Savings
Number of Experimental Runs Performed	8	2	6
Estimated Development Time (Days)	63	16	47
Analytical (DSC) Costs	\$1,000	\$1,000	\$0
Labor Costs	\$30,480	\$2,820	\$27,660
Material Costs	\$25,000	\$25,000	\$0
Total Costs per Development Program	\$56,480	\$28,820	\$27,660
Development Programs per Year	8	8	--
Total Annual Cycle Development Costs	\$451,840	\$230,560	\$221,280

Ultra & VirTual Small Production Capacity Freeze Dryers

Ideal for high mass/surface area product with smaller solvent load

- Space saving, self-contained freeze dryer
- Available as a stand-alone or clean room configuration
- Bulk or stoppering
- Hollow flooded shelves provide uniform temperature on shelf surfaces
- Process a variety of products with shelf temperatures as low as -70°C
- Maximum control range of -55°C to $+65^{\circ}\text{C}$
- Choice of condenser temperatures
- Vacuum readout user selectable in mT, uB and Pa
- Sophisticated process development controls
- Add options and accessories to build units specific to your needs

Ultra:

- Four to 15 shelf capacity offering 6.12 ft²/0.57m² to 22.96 ft²/2.13m²
- External condenser
- Capacity up to 9270 - 2 ml vials with partially inserted stoppers
- Condenser capacity of 25L, 35L, or 50L

VirTual

- Four to 10 shelf capacity offering 6.12 ft²/0.57m² to 15.30 ft²/1.42m²
- Internal condenser
- 50L condenser only
- **Shelf capacity quick comparison:** Up to 6270-- 2ml vials (14.75mm OD x 40 mm high with partially inserted stopper) using a 10 shelf stoppering unit

Control: Wizard, Encore or Maestro



VirTual

Ultra

50" W 127.0cm
38³/₄" D 98.0cm
75³/₄" H 193.0cm
(25L & 35L
ULTRA & VIRTUAL)

TYPICAL APPLICATIONS

- Tissue banking
- Laboratory research and development and/or small production freeze drying
- Diagnostic kits
- 96 well plates
- Serum bottles and vials
- Bulk products for analysis – plant material, organic tissue, waste products

Benchmark Lyophilizers for Pilot to Production Freeze Drying

Custom built for today – with an eye to the future

- *Meets the most demanding requirements from pilot to production*
- *Entirely configurable to meet the needs of the facility or available space*
- *Shelf area up to 320 ft²/29.73m² stoppering and 416 ft²/38.65m² bulk*
- *Bulk or stoppering (top down or bottom up stoppering available)*
- *Hollow flooded shelves provide uniform temperature (+/- 1°C) on shelf surfaces*
- *Bio-seal flange for clean room installation*
- *Optional Clean-in-Place and Steam-in-Place*
- *Critical systems redundancy available to safeguard valuable products*
- *Extensive validation and support as required*
- *Add options and accessories to build units specific to your needs*

Control: *Encore or Maestro*

TYPICAL APPLICATIONS

- *Pharmaceuticals/Biotech Parenterals*
- *Diagnostic Kits*
- *Tissues*
- *Nutraceuticals*
- *Medical devices*



General Purpose Specimen Freeze Dryers

Perfect for whole specimen, artifact and plant drying

- Ideally suited for:

- Plant matter including leaf disks, seeds, grain or cereals
- Taxidermy
- Water damaged document restoration
- Whole biological specimens
- Irregular shaped objects
- Flowers

34" W 86.0cm
55" D 140.0cm
79" H 200.0cm
(BASED ON G PFD
24DX48)

- 25L or 35L condenser configuration with temperatures to -85°C
- Tray configuration with or without programmable heat
- Lyotroll control with manual & automatic programming capabilities
- Shelf areas from 12.3ft²/1.14m² to 370ft²/34.37m²

Control: Lyotroll

TYPICAL APPLICATIONS

- Specimens for taxidermy
- Floral bouquets and arrangements
- Restoration/drying of artifacts & documents



Control Systems At-a-Glance

Capabilities:	Wizard 2.0	Wizard Workstation	Encore	Maestro
Up to 16 Primary and 1 Secondary Drying Segments	■	■	■	■
Thermal Treatment (Annealing) Segments	■	■	■	■
4-8 Product Probes	■	■	■	■
9-16 Product Probes			■	■
17+ Product Probes				■
Integrated Performance and Vacuum Integrity Testing			■	■
Historical Data Trending		■	■	■
Eutectic Point Monitoring with Data Trending			■	■
Batch Reporting				■
Manual Pressure Rise (Barometric Endpoint) Testing	■		■	■
Automatic Pressure Rise (Barometric Endpoint) Testing			■	■
Automated Pirani/CM Differential Feedback			■	■
Clean-in-Place (CIP) Cycle				■
CIP Skid Integration				■
Steam Sterilization (SIP) Cycle				■
Multi-Level Security Capability			■	■
Security Integration with Microsoft Windows XP				■
21 CFR Part 11 Compliance Capability with SQL Database				■
RS-232 Communications	■	■	■	■
Ethernet Communications				■
Cycle Customization				■

Additional Services

Additional value-add services from SP Scientific

The following products and services are available for SP Scientific equipment.

Validation Support Services

- Factory Acceptance Testing (Includes document and testing)
- Control System Testing
- System Integration Testing

Freeze Dryer Validation Guide and Workbook (IQ/OQ)

Site Acceptance Testing

- Equipment Qualification (IQ/OQ)
- Control System Software Qualification (IQ/OQ)

Service, Equipment Management, Maintenance and Repair

Together we can do it better.

- On-site & Return-to-Service-Center capabilities
- Extensively trained staff
- Local service relationships with global presence
- Wide range of post-sales services that can be tailored to your specific needs

Did you know that SP Scientific has a Certified Pre-Owned Lyophilizer program?



LyoTech Center

SP Scientific offers in-depth resources for lyophilization scientists

We are committed to helping our customers achieve the best possible results from their investment and so we offer the following resources online.

LyoLearn Webinar*: this free online monthly seminar series has topics of interest to lyophilization scientists and is presented by industry experts.

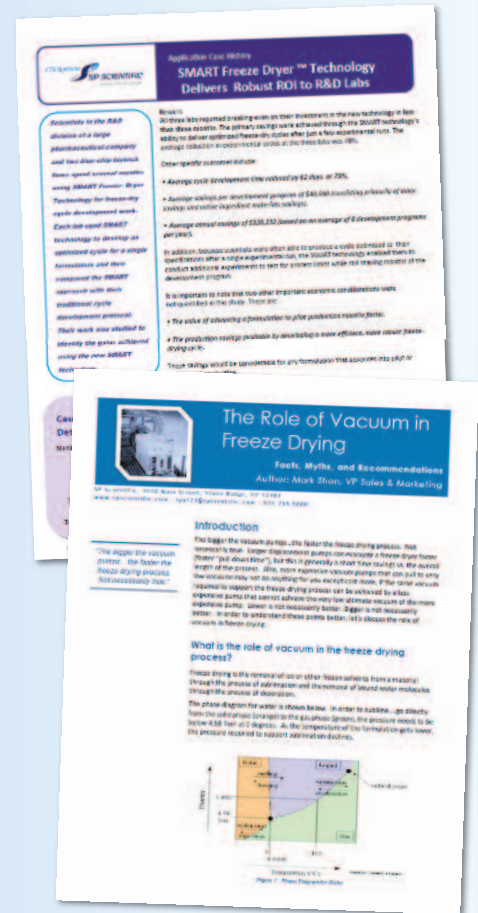
LyoLearn Webinar Archive*: each online LyoLearn Webinar is archived for future reference, as both the actual webinar, including PowerPoint and audio, or just the PowerPoint presentation.

LyoLearn Tech-Brief*: LyoLearn Tech Briefs are articles, case studies and technical notes provided by our associates or consultants to present fundamental freeze drying information.

LyoTools: LyoTools contains a variety of tools and programs that may be helpful in either day-to-day lyophilization research, or in helping customers to decide their lyophilization requirements.



* Available in multiple languages.



Educational Seminars: these one-day lyophilization seminars are led by industry leaders and held in locations around the world.

Hands-On Training: multi-day training sessions held in an SP Scientific laboratory that offers participants a chance to use freeze drying equipment as they learn techniques from industry experts.

Lyo Consultants: a listing of consultants not commercially affiliated with SP Scientific.

Allied Technology: includes links to companies that offer products commonly utilized in freeze drying, but not offered by SP Scientific.

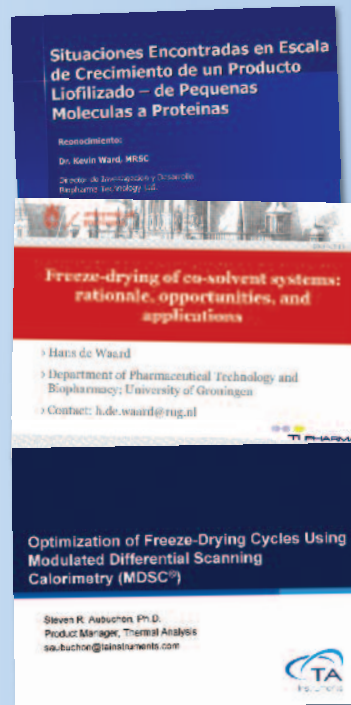
Courses and meetings: a listing of educational opportunities for lyophilization scientists offered by organizations other than our own.

Publications: links to publications and journals of interest to lyophilization scientists and users of lyophilization equipment.

Organizations: details of organizations and groups of interest to the lyophilization community.

Educational facilities: a listing of universities and colleges that provide educational opportunities in freeze drying.

Shows and conferences: a directory of trade shows and venues of relevance to lyophilization scientists.



VirTis x FTS Systems



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