ACCELERATE YOUR TIME TO MARKET

PROCESS DEVELOPMENT TIME, CYCLE TIME, TURNAROUND TIME

‘Time is money’ and a single delay from broken vials or other inefficiencies in your freeze drying production can cost millions of dollars. Choosing a freeze drying partner who understands your unique application, facility requirements and project goals is the first step to maximizing your return on investment.

At SP Scientific we like to say “There are companies that can build freeze dryers, but only SP Scientific has the science, technology and engineering expertise to design and build systems that precisely match each client’s needs.”

Whether your expertise is in pharmaceutical, biotechnology, chemical, veterinary or food processing, you can rely on SP Scientific’s proven track record of 800 + installations and counting.

SP SCIENTIFIC FREEZE DRYERS:

- Improve cycle times, increase yield, control temperature and product parameters and optimize efficiency with proprietary technologies:
  - ControLo™ controlled nucleation
  - TDLAS Lyoflux pinpoints completion of secondary drying
  - Hy-Pro cyclonic vapor flow condenser directs even ice build-up for efficient vapor removal
- Support faster validation through data rich processes and documentation
- Offer best-in-class after install service, engineering support and educational training opportunities
- Provide scalable technology for development and manufacturing environments, making your transition more cost effective and seamless. Our LyoStar 3 is the market leader for development of scalable freeze drying cycles.
FROM OUR INITIAL MEETING, THROUGH THE LIFE OF YOUR FREEZE DRYER – OFTEN 40 YEARS OR MORE –
YOU HAVE A PARTNER IN SP SCIENTIFIC.
SP Scientific’s strength in pilot-scale freeze drying and methods development, as well as our collaboration with highly regarded lyophilization experts put SP in a unique position to offer state-of-the-art process technologies scalable to new or retrofit production freeze dryer projects.

**WHAT CONTROLYO™ NUCLEATION TECHNOLOGY CAN DO FOR YOU:**

- Shorter primary drying times; ControlYo™ controls the degree of supercooling to optimize cycle times
- Less aggregation and better stability of protein formulations
- Technology conforms to the regulatory framework by controlling process inputs
- Reduce waste from vial breakage
- Improved cake appearance, cake morphology and product homogeneity
- Improved end user reconstitution

**FREEZING ALL VIALS AT THE SAME TIME, AT A HIGHER TEMPERATURE = LARGER, MORE CONSISTENT CRYSTAL SIZES THAT WILL DRY MORE UNIFORMLY**

ControLyo™ technology, developed with Praxair pressurizes the freeze dryer chamber with filtered inert gas and then quickly depressurizes the chamber. The quick depressurization causes product that is slightly subcooled to nucleate at virtually the warmest possible temperature, thus yielding the largest possible ice crystals and the shortest potential drying time while providing increased product heterogeneity. And, it does so without significant addition of utilities or risk of introducing foreign matter into the vials as may occur with other technologies. ControLyo™ is an option on SP Scientific clinical, pilot and production freeze dryers and may be retrofitted onto qualified existing units regardless of manufacturer.
GET MORE PRODUCT TO MARKET FASTER!

SP SCIENTIFIC HULL®, VIRTIS® AND FTS LYOSTAR® LYOPHILIZERS DELIVER INCREASED OPERATING EFFICIENCIES, CONSISTENT PRODUCT YIELDS AND EASIER VALIDATION FOR A HIGHER RETURN ON INVESTMENT.

DETERMINE DRYING PHASE END POINT UTILIZING TDLAS LYOFUX

- Non-invasive tunable diode laser absorption spectroscopy (TDLAS) measures the molecular flow of water molecules from chamber to condenser which enables continuous determination of water vapor mass flow rate
- Accurately pinpoints the completion of primary, and most importantly, secondary drying phases
- Software provides key process parameters effecting end product quality such as vial heat transfer coefficient (kv), batch average product temperature, product dry layer thickness, and product drying resistance

FINE TUNE PRIMARY DRYING WITH SMART TECHNOLOGY – AVAILABLE EXCLUSIVELY ON OUR LYOSTAR 3 RESEARCH / SMALL PRODUCTION FREEZE DRYER

- Patented system puts the experience of the world’s top lyophilization scientists into an easy-to-use tool that quickly determines ideal, consistent shelf temperature for your product
- Devote more time to formulation optimization; SMART optimizes primary drying cycle for most products in one run
- Instant, important data on product resistance, heat flow, product dry layer thickness and more utilizing MTM technology and standard heat and mass transfer equations
- Data rich process with documentation to support validation process

ACCUARATELY MEASURE PRODUCT TEMPERATURE AT THE SUBLIMATION INTERFACE WITH MANOMETRIC TEMPERATURE MEASUREMENT (MTM) PRESSURE RISE TECHNOLOGY

- Facilitates Quality by Design Approach (QbD) in product development
- Non-invasive to product
- Enables scale up and technology transfer

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MAXIMIZE PRODUCT YIELD WITH BUILT-IN EFFICIENCY

MINIMIZE DOWNTIME WITH HY-PRO VAPOR FLOW CONDENSER

- Cyclonic vapor flow condenser directs vapor and deposits it evenly on the entire condensing plate surface area
- Results in even ice build-up for more efficient vapor removal
- Full condenser access door allows complete inspection of Clean-In-Place process for full confidence and quick turnaround time

MAXIMIZE VAPOR FLOW WITH ROTARY DISC VALVES

- Patented rotating disc allows higher vapor flow
- Reduces maintenance time; disk and shaft seal are easily serviced
- No mechanical ingress into system

SIMPLE DESIGN LN2 REFRIGERATION SYSTEM SAVES OPERATING AND MAINTENANCE COSTS

- High-efficiency heat exchangers
- Easy to maintain with fewer moving parts
- Eliminates the need for major electrical power inputs

PRECISION CONTROL SMART-COOL REFRIGERATION TECHNOLOGY

- Smart-Cool technology allows the PLC to precisely control the refrigeration system utilizing temperature and pressure inputs to maintain optimal superheat within the refrigeration system
- Precise +/- 0.3°C electronic control
- Substantial energy savings when paired with SP’s optional Variable Frequency Drive (VFD) which further conserves power consumption through the cycling of compressor speeds

WATCH THE VIDEO: bit.ly/ Rotary-Valve
CUSTOM BUILT TO YOUR REQUIREMENTS

LISTEN, LOOK, SOLVE, IMPLEMENT - FROM UNDERSTANDING NEEDS TO FULLY OPERATIONAL SYSTEMS

At SP Scientific we do something very unique and unusual: we listen. We make certain we understand all the intricacies of your operation and everything that may impact your freeze drying process. After we listen, we look for ourselves. We conduct a thorough analysis of your facility often uncovering and solving potential problems before they turn into costly delays.

Attention to detail at the outset of your project, coupled with our proprietary technologies allows our engineering and project management teams to deliver robust systems rapidly and assist you in timely validation.

All critical processes are performed in our own facilities with strict adherence to GAMP guidelines. SP Scientific’s Standard Operating Procedures (SOP) cover all aspects of production from inspection of raw materials, to maintaining our facilities and equipment, and training of our staff. Comprehensive documentation assures easier project management, testing and validation.

productionlyo@spscientific.com

www.spscientific.com
1. CHAMBER SIZE AND SHELF AREA

Shelf areas up to 100 m² are tailored to suit a wide range of applications and processes. Chamber size and shelf area are the first critical calculation in assuring proper dryer size. The Shelf Area/Vial Capacity chart gives an initial overview of dryer size. Shelf configuration depends upon product configuration as well as integration of the unit into your facility.

<table>
<thead>
<tr>
<th>VIAL CAPACITY PER SQ. M/FT OF SHELF AREA</th>
<th>PER SQ. METER</th>
<th>PER SQ. FOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>18mm dia. vial</td>
<td>2,454</td>
<td>228</td>
</tr>
<tr>
<td>23mm dia. vial</td>
<td>1,916</td>
<td>178</td>
</tr>
<tr>
<td>25mm dia. vial</td>
<td>1,485</td>
<td>138</td>
</tr>
<tr>
<td>52mm dia. vial</td>
<td>344</td>
<td>32</td>
</tr>
</tbody>
</table>

3. CLEANING & STERILIZATION

Thorough cleaning performed quickly and safely optimizes productivity. SP freeze dryers can be fitted with a variety of options including:

- Clean-in-Place (CIP) or Steam-in-Place (SIP) for after use
- SP exclusive CIP design features:
  - Unique ‘Halo’ design guarantees 100% chamber cleaning
  - Simple single manifold design for external condensers
  - Recirculation option uses less water than other CIP solutions
  - Riboflavin removal coverage verification
- Chemical sterilization or SIP for before use
- Accessories available to accommodate your project may include:
  - Chamber cooling to permit quicker system turnaround (SIP)
  - Shelf buffer heat exchanges (SIP)
  - Skid provision (CIP and SIP)

2. SHELF LOADING & ACCESS SYSTEMS

Shelf loading systems may range from simple manual loading to fully automatic. Selection of the most appropriate designs and technologies for your application will assure maximum productivity.

- Robust, welded, super-flat shelves that do not bend or ‘washboard’
- Push-Pull load/unload systems, pumped product, guided automatic vehicle loaders, racks; SP can deliver or integrate with your preferred partners
- Access via door or door within a door; Hull® doors are designed to provide secure, yet easy access, with inherent mechanical interlock under pressure and no ingress into clean rooms

USA: toll free: 800-431-8232 or 845-255-5000   EUROPE: +44 (0)1473 240000
4. TECHNOLOGY OPTIONS

Many factors including energy use and ease of maintenance impact operational economy. Within the dryer, accurate, efficient control of the freeze drying process and thorough design of a robust cycle will assure highest product quality while positively impacting operational economy.

SP’s leadership in process development freeze dryers have advanced the introduction of many technologies and best practices which can be incorporated into your production unit. Those using SP’s LyoStar 3 for cycle development can count on matchless accuracy and unique ease-of-use features and technologies that can create robust, scalable processes with confidence.

- ControLyo™ can significantly reduce drying times and has been shown to improve viral titer, reduce protein aggregation, improve cake appearance and reduce reconstitution times
- TDLAS monitors the primary and secondary drying phase to ensure complete drying and reduce cycle time
- SMART-Cool precise +/- 0.3 C refrigeration
- Variable Frequency Drive (VFD) cycles compressor speeds delivering more power when needed and reducing power at times of low load such as during steady state operation during the drying phases
- Hy-Pro cyclonic vapor flow condenser offers greater vapor trapping
- LN2 condensers eliminate the need for major electrical power inputs
- Rotary Disc Valves between chamber and condenser open fully so flow is not restricted and functions without abrasion of seal materials minimizing particulates generation when compared to other types of valves

5. CONTROL SYSTEMS

Intuitive, reliable control systems allow easy freeze dryer operation and include a comprehensive set of process controls and alarms for complete protection of valuable product. Your control platform is designed to fit your process and requirements, right up to full parenteral production standards.

- Utilizes flexible control architecture: Allen-Bradley or Siemens
- 21CFR Part 11 compliant
- SCADA configuration options
- Feedback and troubleshooting synoptic screens
- Easy interface with existing data collection systems
- Option for Ethernet connectivity with multiple Thin Client HMI’s
COUNT ON IT

Over six decades of experience, innovation and development of best practices go into every freeze dryer that carries our name and is deemed a trustworthy environment for your product.

ENGINEERING CONSIDERATIONS

High quality engineering, materials and workmanship enable long life and easy maintenance.

- Product chambers, shelves, condenser assemblies and control systems are manufactured on-site in our U.S. facilities
- Flexible system design to fit confined or awkward spaces. SP engineers are experienced in multi-level units, flexible access options and utility placement of condensers.
- Pull-open condenser door for easy visual inspection and access
- Optional N + 1 redundancy of hot swappable parts in cooling/heating circuits to assure maximum up-time

CERTIFICATIONS AND COMPLIANCE

SP SOP result in superior validation documentation that has been used by all major pharmaceutical companies and helps ensure your fastest route to validation. When needed, our teams have and will work successfully with your preferred and validated international suppliers to utilize system components that are pre-approved for use on your site.

- GAMP5
- cGMP
- 21CFR Part 11
- NEMA 12
- NEMA 4X
- Use of materials traceable and certified at the source
- Certifications:
  - CE
  - ISO 9001:2008
  - ASME/PED
INTEGRATION AND INSTALLATION PREPARATION

Effective project management and pre-planning mean your standard unit is generally ready for factory acceptance testing pending current plant loading. Typical installation takes two to six weeks depending upon size of the unit and readiness of the facility. Contact productionlyo@spscientific.com for details.

Our team has in-depth experience, routinely working with your partners or ours, to ensure seamless operation of the entire line including:

- Sterile filtration and filling
- Capping and crimping
- Manual or auto loading systems
- Isolators and Restricted Access Barrier (RAB) systems
- Cleaning and sterilization e.g. VHP systems
- Additional PAT technologies including Tempris™ wireless thermocouples, along with SP’s SMART-COOL can be implemented to meet your unique process requirements

EACH SP FREEZE DRYER IS BUILT AND TESTED TO RIGOROUS SPECIFICATIONS.

BEFORE LEAVING OUR PLANT, IT MUST PASS A BATTERY OF TOUGH TESTS. WE WORK OUT THE ‘BUGS’ SO YOU DON’T HAVE TO.
Our customer service begins when we review your process requirements, discuss your needs and answer all your questions. It continues throughout the entire design, manufacturing and testing process. But, building your freeze dryer is simply where our partnership begins. SP customers have a 100% success record on installation and validation of SP Lyophilizers. Being able to support your investment is what sets us apart.

**SERVICES & SUPPORT**

**INSTALLATION SERVICES**
- Set-up and configuration
- Rigging, air caster moving, precision laser leveling, floor protection, safety monitoring
- Utility verification
- Start-up
  - Mechanical and electrical connections
  - Motor rotation checks
  - Shelf-leveling

**VALIDATION AND DOCUMENTATION**

Bringing your unit from a ‘delivered and installed’ piece of machinery to a fully validated cGMP Production dryer requires significant steps. Each SP freeze dryer is delivered with a complete documentation package to meet current industry standards. SP experts are available to provide validation assistance.

- Factory Acceptance Test
- System Integration Test
- Site Acceptance Test
- Installation Qualification
- Operational Qualification
- Performance Qualification Test
- Supporting documentation for lifecycle management including operations manual, FAT documentation, material certifications, ASME code documentation

THE FASTER YOUR FREEZE DRYER IS INSTALLED, COMMISSIONED AND VALIDATED, THE FASTER YOU CAN MEET YOUR PRODUCTION AND FINANCIAL GOALS.

**SP SERVICE CAN PROVIDE ANY LEVEL OF SUPPORT, FROM SIMPLE INSTALLATION ASSISTANCE TO A FULL TURNKEY SOLUTION.**
EQUIPMENT LIFECYCLE MANAGEMENT

Whether performing routine and preventative maintenance or assisting with crisis management, SP’s global direct service team and factory trained distributor personnel are regularly hailed for their responsive and experienced support.

- Service programs to fit your facility/production
- Use of parts sourced from your preferred suppliers
- Training for operators, technicians and maintenance personnel
- SP quality in our chambers and systems assure these key components can be retrofitted and retooled several times giving them a lifespan of 30-50 years of operational use
- Service all manufacturer’s systems

TRAINING AND PROFESSIONAL DEVELOPMENT

SP Scientific spearheads user education in the lyophilization industry by collaborating with leading lyophilization scientists and experts to offer live programs and webinars on process cycle development, scientific advances and freeze dryer maintenance and diagnostics. Where merited, we collaborate with complementary providers and leading lyophilization scientists and experts.

Freeze Dryer Training Programs and Workshops

- Fundamentals I: Basic Freeze Dryer Operation and Maintenance
- Fundamentals II: Advanced Freeze Dryer Operation and Maintenance
- Freeze Dryer Diagnostics
- Lyophilization Cycle Development and Optimization: A Hands-on Laboratory Based Approach

www.spscientific.com
productionlyo@spscientific.com
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SP FREEZE DRYER OPTIONS

CLINICAL TO PRODUCTION

HULL

- Broad choice of standard and highly customized freeze dryer models complemented by ancillary equipment and technologies
- Reliability and longevity; Hull units commissioned over 40 years ago are still in active service
- Standard features include:
  - 25 PSIG pressure vessel rating
  - Automatic perimeter locking door; double-latching
  - Smart Cool 4.0 precise electronic refrigeration control
  - Heavy duty shelves for flatness over the life of the unit
  - Sterilizable stainless steel, accordion design stoppering ram bellows
  - 21CFR Part 11 configurable PC/PLC based controls

See pages 18 and 19 for Hull and VirTis Freeze Dryer Models at a Glance.
PILOT TO PRODUCTION

VirTis Benchmark

- Built and configured to meet your facility/project specs
- Shelf area up to 29.73m² stoppering or 38.65m² bulk
- Bulk, top down stoppering or bottom up stoppering available
- Internal or External Condenser choices with plate or coil technology; flexible orientation to chamber
- Bio-seal flange for clean room installation
- Uniform shelf temperature +/- 1°C
- Critical systems redundancy
- Control systems with superior historical trend functionality

See pages 18 and 19 for Hull and VirTis Freeze Dryer Models at a Glance.
RESEARCH, DESIGN, OPTIMIZE

FTS LyoStar 3

Whether you need a solution for pilot/small scale production or require a new investment to optimize future scale-up and cycle development, it’s easy to see why LyoStar 3 is the choice of freeze drying thought leaders.

- Matchless process accuracy for optimized cycle development
- 30L condenser capacity
- Space-saving, self-contained dryer designed to facilitate scale-up
- Process a wide variety of products including aqueous and solvent containing formulations*; Shelf temperature control range -70°C to +60°C
- Available with ControLyo™, SMART, and TDLAS Lyoflux to reduce development time and improve cycles
- Offer important Process Analytical Technology (PAT) tools

*with maximum condenser low temperature of -85°C

LYORENEWAL™ - RETROFIT, RENEW, REPURPOSE

Give life to your older freeze dryer by incorporating current performance capabilities

- Upgraded control features such as 21CFR PART 11
- Refrigeration system upgrades
- Cleaning system upgrades
- Retrofit your dryer for ControLyo™ or other technologies
- Replace poppet or butterfly valves with Rotary Disc Valves
- Complete FAT/SAT and IQ/OQ of renewed dryer; warranty on new parts
CONTROLLED NUCLEATION


PROCESS ANALYTICAL TECHNOLOGY (PAT)


MORE PAT TOOLS – TUNABLE DIODE LASER ABSORPTION SPECTROSCOPY (TDLAS)


CYCLE DESIGN & OPTIMIZATION


### AT A GLANCE

Standard Virtis or Hull freeze dryer models that can be custom configured to meet your application, capacity and space requirements.

<table>
<thead>
<tr>
<th>Brand Model</th>
<th>Virtis BM1000</th>
<th>Virtis BM2000</th>
<th>Virtis BM3000/ BM3500</th>
<th>Virtis BM4000/ BM4500</th>
<th>Virtis BM5000/ BM5500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Shelf Surface Area</strong></td>
<td>0.5m² - 1.5m² (5.3ft² - 16ft²)</td>
<td>1.1m² - 2.7m² (12ft² - 29ft²)</td>
<td>2.2m² - 5.9m² (24ft² - 64ft²)</td>
<td>3.9m² - 9.6m² (42ft² - 104ft²)</td>
<td>8.9m² - 20m² (96ft² - 224ft²)</td>
</tr>
<tr>
<td><strong>Number of Shelves (Plus 1 radiant)</strong></td>
<td>2 - 6</td>
<td>3 - 7</td>
<td>4 - 8</td>
<td>7 - 13</td>
<td>8 - 14</td>
</tr>
<tr>
<td><strong>Shelf Dimensions</strong></td>
<td>410 x 610mm (16” x 24”)</td>
<td>510 x 760mm (20” x 30”)</td>
<td>610 x 915mm (24” x 36”)</td>
<td>610 x 1220mm (24” x 48”)</td>
<td>915 x 1220mm (36” x 48”)</td>
</tr>
<tr>
<td><strong>Shelf Spacing</strong></td>
<td>2 Shelves: 169mm</td>
<td>3 Shelves: 139mm</td>
<td>4 Shelves: 122mm</td>
<td>5 Shelves: 95mm</td>
<td>7 Shelves: 120mm</td>
</tr>
<tr>
<td></td>
<td>3 Shelves: 101mm</td>
<td>4 Shelves: 77mm</td>
<td>5 Shelves: 64mm</td>
<td>6 Shelves: 54mm</td>
<td>8 Shelves: 54mm</td>
</tr>
<tr>
<td></td>
<td>4 Shelves: 63mm</td>
<td>5 Shelves: 45mm</td>
<td>6 Shelves: 36mm</td>
<td>7 Shelves: 27mm</td>
<td>8 Shelves: 22mm</td>
</tr>
<tr>
<td></td>
<td>5 Shelves: 52mm</td>
<td>6 Shelves: 42mm</td>
<td>7 Shelves: 33mm</td>
<td>8 Shelves: 26mm</td>
<td>9 Shelves: 20mm</td>
</tr>
<tr>
<td></td>
<td>6 Shelves: 48mm</td>
<td>7 Shelves: 43mm</td>
<td>8 Shelves: 38mm</td>
<td>9 Shelves: 33mm</td>
<td>10 Shelves: 28mm</td>
</tr>
<tr>
<td></td>
<td>7 Shelves: 48mm</td>
<td>8 Shelves: 43mm</td>
<td>9 Shelves: 38mm</td>
<td>10 Shelves: 33mm</td>
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<tr>
<td></td>
<td>8 Shelves: 48mm</td>
<td>9 Shelves: 43mm</td>
<td>10 Shelves: 38mm</td>
<td>11 Shelves: 33mm</td>
<td>12 Shelves: 28mm</td>
</tr>
<tr>
<td></td>
<td>9 Shelves: 48mm</td>
<td>10 Shelves: 43mm</td>
<td>11 Shelves: 38mm</td>
<td>12 Shelves: 33mm</td>
<td>13 Shelves: 28mm</td>
</tr>
<tr>
<td><strong>Condenser Capacity Options (24hrs) (Sized to Unit)</strong></td>
<td>20L</td>
<td>20L - 42L</td>
<td>34L - 100L</td>
<td>50L - 150L</td>
<td>100L - 450L</td>
</tr>
<tr>
<td><strong>Shelf Stack Construction</strong></td>
<td>316 SS, serpentine fluid loop</td>
<td>316 SS, serpentine fluid loop</td>
<td>316 SS, serpentine fluid loop</td>
<td>316 SS, serpentine fluid loop</td>
<td>316 SS, serpentine fluid loop</td>
</tr>
<tr>
<td><strong>Coldest Shelf Temperature, Standard</strong></td>
<td>-60ºC</td>
<td>-60ºC</td>
<td>-60ºC</td>
<td>-60ºC</td>
<td>-60ºC</td>
</tr>
<tr>
<td><strong>Coldest Shelf Temperature with Cascade or LN2 Refrigeration</strong></td>
<td>-70ºC (Cascade)</td>
<td>-70ºC (Cascade)</td>
<td>-70ºC (Cascade)</td>
<td>-70ºC (Cascade)</td>
<td>-70ºC (Cascade)</td>
</tr>
<tr>
<td><strong>Shelf Temp Control Range, Standard</strong></td>
<td>-40ºC to +65ºC</td>
<td>-40ºC to +65ºC</td>
<td>-40ºC to +65ºC</td>
<td>-40ºC to +65ºC</td>
<td>-40ºC to +65ºC</td>
</tr>
<tr>
<td><strong>Shelf Temperature Control with Cascade or LN2 refrigeration</strong></td>
<td>-55ºC (Cascade)</td>
<td>-55ºC (Cascade)</td>
<td>-55ºC (Cascade)</td>
<td>-55ºC (Cascade)</td>
<td>-55ºC (Cascade)</td>
</tr>
<tr>
<td><strong>Shelf Temperature Uniformity</strong></td>
<td>+/- 1ºC</td>
<td>+/- 1ºC</td>
<td>+/- 1ºC</td>
<td>+/- 1ºC</td>
<td>+/- 1ºC</td>
</tr>
<tr>
<td><strong>Condenser Temperature, Standard</strong></td>
<td>-75ºC (DX), -65ºC (Fluid)</td>
<td>-75ºC (DX), -65ºC (Fluid)</td>
<td>-75ºC (DX), -65ºC (Fluid)</td>
<td>-75ºC (DX), -65ºC (Fluid)</td>
<td>-75ºC (DX), -65ºC (Fluid)</td>
</tr>
<tr>
<td><strong>Condenser Temperature with Cascade or LN2 Refrigeration</strong></td>
<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
</tr>
<tr>
<td><strong>ControlLyo™ Controlled Nucleation</strong></td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td><strong>SIP &amp; CIP Auto-Loading for Vials</strong></td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>1 Year</td>
<td>1 Year</td>
<td>1 Year</td>
<td>1 Year</td>
<td>1 Year</td>
</tr>
<tr>
<td><strong>Vial Capacity, (approx)</strong></td>
<td>18mm diameter (3ml vial)</td>
<td>1525</td>
<td>3990</td>
<td>176</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>25mm diameter (10ml vial)</td>
<td>2974</td>
<td>7500</td>
<td>413</td>
<td>126</td>
</tr>
<tr>
<td></td>
<td>52mm diameter (100ml vial)</td>
<td>6864</td>
<td>16,800</td>
<td>1056</td>
<td>336</td>
</tr>
<tr>
<td></td>
<td>1220 x 1220mm (48” x 48”)</td>
<td>20,590</td>
<td>48,000</td>
<td>1848</td>
<td>608</td>
</tr>
<tr>
<td></td>
<td>1220 x 1220mm (48” x 48”)</td>
<td>20,590</td>
<td>48,000</td>
<td>1848</td>
<td>608</td>
</tr>
<tr>
<td>Virtis BM6000/ BM6500</td>
<td>Hull 120 Class</td>
<td>Hull 240 Class</td>
<td>Hull 300 Class</td>
<td>Hull 450 Class</td>
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<tr>
<td>13m² - 29m²</td>
<td>10m² - 13m²</td>
<td>20m² - 25m²</td>
<td>27m² - 33m²</td>
<td>40m² - 50m²</td>
<td></td>
</tr>
<tr>
<td>(144ft² - 320ft²)</td>
<td>(120ft² - 144ft²)</td>
<td>(240ft² - 280ft²)</td>
<td>(300ft² - 360ft²)</td>
<td>(450ft² - 540ft²)</td>
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</tr>
<tr>
<td>12 - 20</td>
<td>10 - 12</td>
<td>11 - 13</td>
<td>14 - 16</td>
<td>15 - 18</td>
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</tr>
<tr>
<td>915 x 1220mm</td>
<td>965 x 1270mm</td>
<td>1270 x 1575mm</td>
<td>1270 x 1575mm</td>
<td>1575 x 1880mm</td>
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<tr>
<td>(36” x 48”)</td>
<td>(38” x 50”)</td>
<td>(50” x 62”)</td>
<td>(50” x 62”)</td>
<td>(62” x 74”)</td>
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</tr>
<tr>
<td>12 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>13 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<tr>
<td>14 shelves: 115mm/96mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>14 shelves: 115mm/96mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>15 shelves: 114mm/65mm</td>
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<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>15 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>114mm (4.5”) standard or sized to application</td>
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<td>16 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>16 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>18 shelves: 114mm/65mm</td>
<td>114mm (4.5”) standard or sized to application</td>
<td>114mm (4.5”) standard or sized to application</td>
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<td>18 shelves: 114mm/65mm</td>
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<td>114mm (4.5”) standard or sized to application</td>
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<td>19 shelves: 114mm/65mm</td>
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<td>19 shelves: 114mm/65mm</td>
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<td>20 shelves: 114mm/65mm</td>
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<td>20 shelves: 114mm/65mm</td>
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<tr>
<td>200L-600L</td>
<td>200L</td>
<td>450L</td>
<td>550L</td>
<td>800L</td>
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<tr>
<td>316 SS, serpentine fluid loop</td>
<td>316 SS heavy gauge accommodating largest stoppering load force</td>
<td>316 SS heavy gauge accommodating largest stoppering load force</td>
<td>316 SS heavy gauge accommodating largest stoppering load force</td>
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<td>-60ºC</td>
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<tr>
<td>-70ºC (Cascade)</td>
<td>-70ºC (LN2)</td>
<td>-70ºC (LN2)</td>
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<tr>
<td>-40ºC to +65ºC</td>
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<td>-55ºC (Cascade)</td>
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<td>+/- 1ºC</td>
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<tr>
<td>-75ºC (DX), -65ºC (Fluid)</td>
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<td>-85ºC (DX), -75ºC (Fluid) (Cascade)</td>
<td>-80ºC (LN2)</td>
<td>-80ºC (LN2)</td>
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<td>Available</td>
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<td>1 Year</td>
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<td>81,600</td>
<td>27,360</td>
<td>54,720</td>
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<td>32,032</td>
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<td>42,900</td>
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<td>7680</td>
<td>9900</td>
<td>14,850</td>
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</table>

productionlyo@spscientific.com  www.spscientific.com
Your Time • Your Investment • Your Results

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