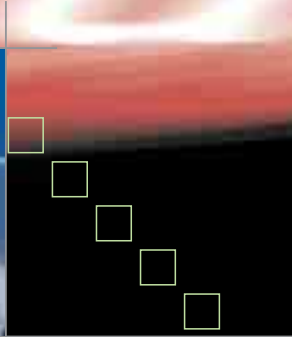


Advance your time to market



with *advanced* freeze drying systems



from *Hull*

**PRODUCT
SPECIFICATION
GUIDE**



With more than 750 installations worldwide in the pharmaceutical, biotech, chemical, and veterinary industries, Hull is the leading global designer and manufacturer of high-performance freeze dryer solutions.

The company has grown from a modest design and sales company that opened its doors in 1954, to a world-class engineering and manufacturing company. Now in its second generation as part of SP Industries, Hull continues its uncompromising dedication to the pharma-

ceutical and biotech community.

Every aspect of a Hull freeze dryer works toward a single goal – to get more of your products to market faster. That's why Hull lyophilizers are highly customized to your exact application and designed for easier validation, shorter cycle times, better throughput and an overall higher return on investment.

Hull systems are designed and built to stand the test of time. According to our customers, we continually pass the test with flying

colors. There is no guessing with a Hull system. You can be certain it will perform beyond your expectations.

Hull offers the most generous warranties in the industry because only Hull has 50 years of experience, 15+ patents, one of the most experienced sales and engineering staffs in the industry, and a vertically integrated manufacturing facility. When you invest in a Hull freeze drying system, you're getting the most advanced, cost-efficient, and dependable freeze dryer in the world.

Hull freeze drying systems help you get more product to market faster. Period.

Solution-oriented designs

A Variety of Configurations

With over a half century of experience, Hull has a complete understanding of the needs of the pharmaceutical and biotech industries. Our broad spectrum of standard system configurations – from pilot plant units to large-scale production systems – are designed to fit a wide variety of application requirements.

The standard and custom features incorporated into each freeze drying system are designed for reliability, outstanding performance, and operator convenience.

Complete Engineering for System Customization

Every pharmaceutical and biotech company has its own unique requirements. Hull makes it easy and cost-effective to customize a freeze dryer to your exact specifications.

Hull offers custom-engineered equipment configurations with up to 1000+ sq. ft. of usable shelf area.

Hull engineers will work closely with you to help you choose from available options and, when appropriate, to design features expressly for your application.

Hull's exclusive Windows®-based Lyo-Link Control System allows the operator to control the freeze dryer in real time. Each configuration provides precise control for reproducible product quality and efficient processing cycles.

Vertically Integrated Manufacturing For Ultimate Quality Control

All critical manufacturing processes are performed in our own facility by our own personnel. This vertical integration process – which gives us ultimate control over quality, scheduling and costs – results in the most dependable freeze drying systems on the market. What's more, Hull has the best validation record in the

lyophilization industry.



Standard features

Hull continues to set the standards for the lyophilization industry. Many of our standard features represent significant innovations and each and every component has been designed to improve efficiency, performance, convenience and safety.

Standard features on Hull freeze drying systems include:

- 8 ft² through 450 ft² and larger systems
- 316L Stainless Steel – wetted surfaces
- 32 Ra internal finish
- Passivated internal wetted surfaces
- ASME Code Section VIII, Division I
- 25 PSIG internal pressure (MAWP)

- cGMP-compliant
- Full opening, manual locking chamber door
- Robust shelf design – years of trouble-free service with no washboarding effect
- Shelf flatness – 0.5 mm/meter
- External and internal condenser designs
- Platecoil condensing design – effective condensing surface and cleaning surface vs. tubing
- Two-stage reciprocating compressor refrigeration system
- Non-CFC refrigerants
- Smart Cool system – electronic expansion valves
- Brazed plate heat exchangers
- Canned circulating pump
- Automated steam-in-place (SIP)
- Lyo-Link Control System

- 21 CFR Part 11 configurable
- Allen Bradley SLC 5/05 Plc
- PC interface
- Modem - remote diagnostics
- CD-RW drive
- Alarm printer (black & white)
- Graphic Printer (color)
- Industrial grade motor starters
- NEMA 12 electrical enclosures – mechanical area
- NEMA 4X electrical enclosures – aseptic area
- Operations manual
- Maintenance manual
- Factory Acceptance Test (FAT)
- Material certificates
- ASME code documentation



Custom features

Hull holds more patents than any other company in the industry. So if there's a way to improve a process or to positively affect overall performance, chances are, Hull created it. Just review the list of custom features available from Hull. It's like a list of the most important innovations in the lyophilization industry.

- 10 Ra, 20 Ra and 25 Ra internal finishes to improve cleanability
- Electropolished internal finish to improve cleanability
- Cooling channels for chamber and chamber door – for rapid turnaround after sterilization and improved cycle time
- Vessel internal working pressures from 0 PSIG through 30 PSIG (MAWP)
- Double door pass-through design
- Patented sub-door for automatic loading or fixed position manual shelf loading
- Vial extraction mechanism – to facilitate product analysis without interrupting drying cycle
- Patented ram bellows
- Positive mechanical locking

stopping cylinder – designed to clamp the ram in the fully extracted position

- Variable shelf spacing
- Automated shelf indexing – for Automatic Loading and Sub-Door systems
- Single or double sterilizable filters
- Patented cyclonic external condenser design
- Hull patented rotary disk valve – replaces standard butterfly valve, designed to operate with minimal friction to eliminate product contamination
- Rotary compound screw compressors – pioneered by Hull
- Cascade Refrigeration System – for applications that demand ultra low temperatures
- Liquid Nitrogen (LN2) – provides a distinct process advantage by attaining temperatures well below the limits of mechanical refrigeration technologies
- Redundancy back-up compressors, circulating pumps and vacuum pumps

- Hot back-up PLC
- Parallel PCs
- Allen Bradley Panelview Human-Machine Interface (HMI)
- Custom report generation from LyoLink
- Documentation packages
 - Control System Qualification Package (CSQP) – documents the functional and structural testing of the control system and workstation
 - Installation Qualification (IQ) – documents the system's design and hardware components
 - Operation Qualification (OQ) – documents the operating capabilities and performance of the site-installed system
 - Performance Qualification (PQ)
 - Site Acceptance Test (SAT) – test similar to the FAT testing of the installed system



Hull redefines service

Every company promises "service after the sale," but Hull's partnership with its customers takes service and support to new heights.

Our renowned customer service begins before the sale, when we review your process requirements, discuss your needs and answer all your questions. It continues throughout the entire design, manufacturing, installation and testing process. And Hull is there to help during start-up and at every critical juncture.

Hull offers flexible service/ maintenance contracts to fit your specific requirements. This includes access to Hull design engineers to answer technical equipment questions.

Training, technical assistance, and even re-manufacturing are available for as long as you own your Hull system. Hull spearheads customer education in the lyophilization industry by offering seminars on the fundamentals of freeze drying and maintenance throughout the United States. The more you know about lyophilization, the easier it is to choose Hull.



*The only logical choice is **Hull***

Your choice of a freeze drying system is not something to be taken lightly. It can impact your company in a multitude of ways. Millions of dollars can be made or lost depending on the timely performance of your lyophilization system.

Why take chances? Hull systems

have been proven time and again. your needs.

We meet or exceed every industry standard; and we set the standards that other companies are still trying to achieve.

Find out how easy, cost-effective and reassuring it is to work with Hull. Contact a Hull applications engineer to discuss



technical data

STANDARD EXTERNAL CONDENSER LYOPHILIZERS

CAPACITIES & DESIGN FEATURES	UNIT	24FXS50-SS25C	48FXS75-SS25C	72FXS100-SS25C	120FXS200-SS25C	220FXS450-SS25C	360FXS700-SS25C	450FXS800-SS25C
Usable Shelf Area	m ² ft ²	2.2 24	4.5 48	6.7 72	11.1 120	20.4 220	33.4 360	41.8 450
Number of Shelves		4 + 1	8 + 1	6 + 1	10 + 1	11 + 1	12 + 1	15 + 1
Shelf Dimensions	mm (w x d) in (w x d)	61 x 91 24 x 36	61 x 91 24 x 36	91 x 122 36 x 48	91 x 122 36 x 48	152 x 122 60 x 48	152 x 183 60 x 72	152 x 183 60 x 72
Shelf Interdistance	mm in	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2
Shelf Fluid Temperature Range	deg. C deg. F	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167
Condenser Capacity	liters	50	75	100	200	450	700	800
Condenser Surface Area	m ² ft ²	3.1 33	5 54	6.3 68	9.5 102	21.5 231	38 406	43.1 464
Condenser Plate Temp @ Blankoff	deg. C deg. F	-70 -94	-70 -94	-70 -94	-70 -94	-70 -94	-70 -94	-70 -94
CONSUMPTION DATA								
Standard Voltage	volts/ ph/hz	230/3/60	230/3/60	460/3/60	460/3/60	460/3/60	460/3/60	460/3/60
Power Installed (60 Hz)	KW Amps	35* 75	52* 110	75* 80	103* 110	187* 200	337* 360	337* 360
Cooling Water	LPM GPM	120 32	156 41	228 60	319 84	595 157	1,246 329	1,246 329
DIMENSIONS & WEIGHTS								
Shipping Weight	kg lbs	2,722 6,000	5,897 13,000	8,165 18,000	11,793 26,000	16,783 37,000	25,855 57,000	29,484 65,000
Footprint	mm (w x d) in (w x d)	1,397 x 2,438 55 x 96	2,845 x 3,505 112 x 138	3,378 x 4,064 133 x 160	3,683 x 4,572 145 x 180	4,572 x 5,207 180 x 205	5,080 x 6,604 200 x 260	5,080 x 6,604 200 x 260
Max. Height	mm in	2,337 92	2,362 93	1,905 75	2,261 89	3,175 125	4,521 178	4,826 190



STANDARD INTERNAL CONDENSER LYOPHILIZERS

CAPACITIES & DESIGN FEATURES	UNIT	24FS40-SS25C	48FS75-SS25C	72FS100-SS25C	120FS175-SS25C
Usable Shelf Area	m ² ft ²	2.2 24	4.5 48	6.7 72	11.1 120
Number of Shelves		4 + 1	8 + 1	6 + 1	10 + 1
Shelf Dimensions	mm (w x d) in (w x d)	61 x 91 24 x 36	61 x 91 24 x 36	91 x 122 36 x 48	91 x 122 36 x 48
Shelf Interdistance	mm in	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2	114.3 4-1/2
Shelf Fluid Temperature Range	deg. C deg. F	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167	-55 to +75 -67 to 167
Condenser Capacity	liters	40	75	100	175
Condenser Surface Area	m ² ft ²	2.6 28	5.3 57	4.9 53	7.9 85
Condenser Plate Temp @ Blankoff	deg. C deg. F	-70 -94	-70 -94	-70 -94	-70 -94
CONSUMPTION DATA					
Standard Voltage	volts/ph/hz	230/3/60	230/3/60	460/3/60	460/3/60
Power Installed (60 Hz)	KW Amps	35* 75	52* 110	75* 80	103* 110
Cooling Water	lpm gpm	120 32	156 41	246 65	319 84
DIMENSIONS & WEIGHTS					
Shipping Weight	kg lbs	2,041 4,500	5,443 12,000	8,165 16,000	9,525 21,000
Footprint	mm (w x d) in (w x d)	1,575 x 2,032 62 x 80	1,448 x 3,810 57 x 150	1,880 x 4,115 74 x 162	1,880 x 4,115 74 x 162
Max. Height	mm in	2,337 92	2,311 91	1,803 71	2,413 95

* Based on 85% power factor



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