LYOMAX SERIES

INDUSTRIAL FREEZE DRYERS

The LYOMAX freeze drying range of equipment epitomizes the legendary reliability and performance of IMA LIFE. Lyomax offers the most comprehensive range of custom-built freeze dryers for customers requiring more than a standard solution. Lyomax can provide the solution from 1 m^2 to 100 m^2 applying state-of-the-art engineering in vacuum, refrigeration, stoppering and heat transfer technology. Created for configure-to-order applications using Modular Design Technology, Lyomax can be designed, manufactured and qualified to meet any requirement. With Lyomax, virtually any configuration is possible, whether single floor, multi-level or pass-through.

Model	Nominal Shelf area manual loading (m^2)	Nominal Shelf area manual loading (m^2)	Shelf spacing range (mm)	Shelf size (wxd) manual loaded (mm)	Shelf size (wxd) autoloaded (mm)	Condenser capacity (kg @ 12.7 mm ice)	Typical Refrigeration configuration	Vacuum pumping capacity (m^3/h)
Lyomax 1	1.4	NA	80 to 140	455 x 615	NA	27	2 x 5 hp	1 x 28
Lyomax 3	2.8	NA	80 to 140	615 x 915	NA	67	2 x 8 hp	1 x 40
Lyomax 5	5	4.6	80 to 140	615 x 915	914 x 837	107	2 x 12 hp	2 x 80
Lyomax 7	7.8	7.3	80 to 140	915 x 1220	914 x 1141	148	2 x 16 hp	2 x 80
Lyomax 10	10	9.4	80 to 140	915 x 1220	914 x 1141	218	2 x 20 hp	2 x 175
Lyomax 15	14.5	13.9	80 to 140	1220 x 1220	1220 x 1142	294	2 x 30 hp*	2 x 275
Lyomax 20	20.5	19.4	80 to 140	1220 x 1524	1220 x 1445	398	3 x 30 hp*	2 x 275
Lyomax 25	26	24.7	80 to 140	1220 x 1524	1220 x 1445	532	3 x 30 hp*	2 x 275
Lyomax 30	30.2	28.6	80 to 140	1524 x 1524	1524 x 1445	644	3 x 50 hp*	2 x 275
Lyomax 35	36.3	34.7	80 to 140	1524 x 1830	1524 x 1751	756	3 x 50 hp*	2 x 275
Lyomax 40	41.8	40.0	80 to 140	1524 x 1830	1524 x 1752	756	4 x 50 hp*	2 x 275

Note: freeze dryer shelf surface from 40 to 100 sqm is available on request.
* Screw type compressors

STANDARD EQUIPMENT SPECIFICATIONS

Configuration	Cylindrical and rectangular chambers with separate ice condenser, all models mounted on an open frame, monoblock up to and including Lyomax 20 and two skids above this size, containing all components. Control equipment located in a separate cabinet. Multi-story configuration and possibility to customise layout design.
Chamber	Mirror-finished AISI 304L and other inert materials used for product contact parts. Equipped with safety valve, validation flange, drain, illuminated sightglass, instrumentation nozzles. Insulated with vapour barrier and clad with brushed finish metal cover.
Chamber door	Hinged with silicon seal. Sightglass, insulated with vapour barrier and clad with brushed finish, AISI 304L, stainless steel cover.
Shelves	Fusion™ shelves manufactured from AISI 316L with brushed satin finish, mirror-finished edges. 0.5 mm/m flatness.
Ice Condenser	Vertical and horizontal configurations. Coiled pipe refrigerated by direct expansion of refrigerant/diathermic fluid recirculation/Liquid nitrogen rated for approximately 20 kg/m^2 load. Equipped with safety valve, thermoprobes, drains, illuminated sightglass, instrumentation nozzles, defrost manifold. Insulated with vapour barrier and clad with brushed finish metal.
Main valve	Mirror-finished mushroom type with silicon seal, hydraulically actuated.
Refrigeration system	2-stage reciprocating semi-hermetic/screw compressors/Liquid nitrogen. Separate circuits with control and safety instrumentation. Sufficient capacity to provide shelf cooling to -55/70° C and condenser cooling to -75/120° C. HFC/LN2 refrigerants.
Vacuum system	Pumpdown to 0.1 mbar within 40 minutes provided by oil sealed rotary pumps fitted with isolation valves and mist filters.
Vacuum measurement	Capacitance manometers MKS type gauge.
Vacuum control	Automatic control using proportional needle valve.
Control system	Manual, semi-automatic and automatic operation. PLC controlled with PC based Graphical User Interface with printer and recorder. Slave Lyomax range control system based on customer request PLC/HMI, DCS.
Heat Exchange	Silicon oil circulating medium with hermetic/magnetic drive pump/s and expansion tank; plate exchangers cooled by direct refrigerant expansion; multi- element electrical heating. Shelf temperature control ±1° C.
Process valves	AISI 316L stainless steel product contact surfaces. Diaphragm, butterfly and ball type valves with pneumatic actuation.
Condenser water regulator valves	Thermostatically controlled valves fitted to the cooling water inlets of the refrigerant condensers to optimise operating efficiency of the refrigeration system and minimise the consumption of cooling water.
Temperature sensors	PT100 product temperature measurement; heat exchange medium; individual condenser circuits.
Pressure vessel codes	ASME, PED, GB150 alternates.
Electrical standards	NNEC, EN60204-I, JIS alternates.
Safety standards	OOSHA, CE.

IMA LIFE
Aseptic Processing & Freeze Drying Solutions

OPTIONAL ACCESSORIES

SIP	Vessels are built from AISI 316L stainless steel, thus conforming to design codes and enabling chamber and condenser sterilisation with steam up to 126° C. Includes all controls and instrumentation required for the process. Water ring pump for post-sterilisation drying included. Sterilisation at up to 130° C is available, on request.
Vent filter	A-Hydrophobic sterile filter housing, piping and valves to filter gas vented into chamber for vacuum break and control; B- as A configured for manual in-situ integrity test; C- as A with two housings in series; D- as C configured for manual in-situ integrity test.
Auto FIT - WIThin™ *	The optional vent filter configurations B and D may be further enhanced with an embedded test protocol providing results of the filter element integrity test within Lyomax's SCADA and batch report.
Auto FIT - External	The optional vent filter configurations B and D may be further enhanced with connections enabling an external filter element integrity test device to be connected to the system.
Sanitary valves	Butterfly and ball valves exposed directly to the product are substituted by sanitary diaphragm valves (except for drain and vacuum valves). This option is included if SIP is selected.
Cooling Jacket	For accelerating the cooldown of a chamber after SIP by flowing cooling water/diathermic fluids through an external jacket.
CIP	Fixed and rotary nozzles mounted on manifolds to enable water to be sprayed at pressure onto internal surfaces of the chamber and condenser. AISI316L material.
CIP recirculation	System comprising a clean pump with instrumentation and controls to increase efficiency by recirculating water used during the CIP process.
Slot door	A sliding slot door enables loading onto the shelves whilst minimising exposure of the chamber to the environment. Useful when loading onto chilled shelves or interfacing with an assisted loading system. Slot doors can be supplied fitted to a main chamber door or within a chamber wall. A fixed bridge plate is included with the slot door to assist with loading and unloading of trays. Sliding door with tilting mechanism for extensive sanitisation.
316L Stainless steel	AISI 316L stainless steel replaces AISI 304L grade material used in the base machine to provide enhanced corrosion resistance. (SIP & CIP machines do not require this option).
Loading trays	AISI 316L stainless steel trays and/or fences for products in bulk and containers. Various sizes available.
Hydraulic shelf movement	Hydraulically actuated system employing a stainless steel piston for moving the shelves, to utilise the 'easy loading' of larger machines with vials or bulk trays.
Hydraulic stoppering	Hydraulically actuated system employing a stainless steel piston for moving the shelves to enable vials to be sealed within the chamber.
Stoppering bellows	AISI 316L bellows shroud for the hydraulic shelf movement piston to further reduce the possibility of extraneous contamination. Includes controls and instrumentation for testing the bellows' integrity.
Main valve bellows	AISI 316L bellows shroud for the actuating rod of the main valve to further reduce the possibility of extraneous contamination. Includes controls and instrumentation for testing the bellows' integrity.
Variable shelf interdistance	Shelves can be latched to provide double shelf interdistance or variable shelf interdistance to accommodate larger product containers.
Variable frequency driver	VFD system allows better control of refrigeration screw compressors optimising shelf set point temperature control and shelves uniformity. Smoother compressors start up minimising mechanical wear. Considerable energy saving during freeze drying cycle.
Refrigeration syst. backup	Cooling system backup is available with liquid nitrogen (LN2) or additional refrigeration compressors.
Screw compressors	Substitution of 2-stage, semi-hermetic, screw compressors for the standard reciprocating models. Compared with reciprocating types, screw compressors provide greater efficiency and reliability whilst requiring less maintenance and generating lower noise.
Electronic expansion valves	Greater precision in the control of the refrigeration system is provided by electronic expansion valves compared with mechanical equivalents.
Back-up vacuum pump	For systems supplied with a single primary vacuum pump, dual pumps are supplied to provide back-up should the duty pump fail.
Booster vacuum pump	A booster may be added to reduce pumpdown time to less than 30 minutes to 0.1 mbar.
Dry vacuum system	To eliminate the possibility of oil backstreaming from rotary pumps and reduce maintenance, dry vacuum pumps may be substituted for the standard oil sealed type.
Absolute pressure measurement	A heated (125°C) capacitance manometer provides greater vacuum measurement accuracy.
Modulated vacuum control	A proportionally controlled needle valve provides the smoothest control of process vacuum (available only with Absolute Pressure Measurement option).
PLC	Siemens/AB (Control Logix)/Mitsubishi.Siemens/AB (Control Logix)/Mitsubishi.
Chart recorders	A recorder of either 12 or 24 channels is supplied as standard according to the model and options selected. The standard recorder may be upgraded to either a 24 or 30 channel recorder.
UPS	An uninterruptible power supply to provide electrical power to the control system for at least 10 minutes should the main power supply fail.
IQ/OQ	A package of blank IQ/OQ protocols that integrates with Lyomax's Vendor Internal Test Package provides a seamless structure for equipment validation. IMA LIFE is able to assist with undertaking IQ/OQ activities at site.
Configurable batch report	This option provides the flexibility for a user to easily configure batch reports to their specific needs at any time during the system's lifecycle. With over 100 user selectable parameters, this option provides the ultimate solution to satisfy changing needs.
eSignature	Software compliant with 21 CFR part 11.
GAMP4	Documentation regarding the control system compliant with GAMP4 standard.
Alternate layout	The refrigeration group may be mounted on a discrete frame and located separately from the chamber and condenser, including separate floors. Configurations may also be adapted to accommodate loading and unloading requirements.
Solvent handling	Lyomax may be configured to handle non-aqueous solvents. Your sales contact will be pleased to arrange a response to your specific requirements.
Potent product	Lyomax may be configured to handle toxic materials. Your sales contact will be pleased to arrange a review to elaborate a response for specific product requirements.

Note: *WIThin is a trademark of Sartorius Stedim

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