

F25M PHARMACEUTICAL FREEZE DRYER

Technical Configuration - Approx. 25 m² Effective Shelf Area

Key Configuration

Item	Specification
Application	Pharmaceutical / API production freeze drying
Chamber type	Rectangular chamber; split-type equipment arrangement
Shelf arrangement	2 shelf stacks installed side by side
Shelf configuration	17 product shelves + 1 top compensation shelf per stack
Individual shelf size	600 × 1,200 mm
Effective freeze-drying shelf area	Approx. 24.48 m² (nominally approx. 25 m²)
Condenser ice capacity	Up to 200 kg per batch, subject to product characteristics and fill thickness
Control mode	Automatic and manual operation with selectable mode

Shelf-area basis: 0.60 m × 1.20 m × 17 product shelves × 2 stacks = 24.48 m². The top compensation shelves are not included in the effective product shelf area.

A. Drying Chamber and Shelf Assembly

No.	Item	Specification / Material	Qty.
1	Drying chamber	AISI 304L stainless steel	1 set
2	Shelf assembly	AISI 304L stainless steel	1 set
3	Shelves	600 × 1,200 mm; 17 product shelves + 1 compensation shelf per stack; 2 stacks	36 plates total
4	Chamber door	AISI 304 stainless steel	1 set
5	Safety door-locking system	Safety-handle door lock	1 set
6	Product temperature sensors	Imported Class A Pt100 RTDs	4 pcs
7	Heat-transfer-fluid temperature sensors	Imported Class A Pt100 RTDs	2 pcs
8	Chamber body material	AISI 304 stainless steel	1 set

A1. Drying Chamber - Performance

No.	Parameter	Value
1	Design pressure	0.15 MPa
2	Design temperature	128 °C
3	Internal surface finish	Ra ≤ 0.4 µm
4	Shelf flatness	0.5 mm/m
5	Minimum shelf temperature (at heat-transfer-fluid inlet)	-55 °C
6	Maximum shelf temperature (at heat-transfer-fluid inlet)	+70 °C
7	Shelf temperature uniformity	±1 °C after stabilization under no-load conditions
8	Shelf spacing	70 mm; adjustable to a maximum of 100 mm upon request
9	Chamber shape	Rectangular
10	Thermal insulation	B1-grade, fire-retardant insulation
11	Door opening direction	Right-hand opening
12	Door gasket	Silicone-rubber sealing gasket

A2. Drying Chamber - Design Features

No.	Feature
1	High-quality stainless-steel plate provides a smooth, cleanable chamber surface suitable for aseptic applications.
2	High-strength shelf construction is designed for reliable long-term service.
3	Precision-machined shelves provide the specified flatness.
4	Shelf temperature control accuracy: ±1 °C with PID control.

B. Ice Condenser (Including Coil)

No.	Item	Specification / Material	Qty.
1	Ice condenser	AISI 304L stainless steel	1 set
2	Condenser coil	AISI 304L stainless steel	1 set
3	Condenser temperature sensors	Class A Pt100 RTDs	2 pcs
4	Defrost valve	Vacuum ball valve	1 pc

B1. Ice Condenser - Performance and Features

No.	Parameter	Value
1	Design pressure	0.15 MPa
2	Design temperature	128 °C
3	Internal surface finish	Ra ≤ 0.4 µm
4	Minimum coil temperature	≤ -70 °C
5	Ice-condensing capacity	Up to 200 kg/batch; actual cycle time depends on product characteristics and fill thickness
6	Condenser shape	Rectangular
7	Cooling arrangement	Internal coil
8	Defrost method	Water-flood defrost
9	Sight glass	Provided
10	Connection piping to chamber	AISI 304 stainless steel
11	Construction feature	High-quality stainless-steel plate provides a smooth, cleanable surface suitable for aseptic applications

D. Refrigeration System

No.	Item	Specification / Brand	Qty.
1	Two-stage compressor	Frascold, Italy; 30 HP	2 units

No.	Item	Specification / Brand	Qty.
2	Refrigerant	R507A	As required
3	Oil separator	Emerson	1 pc
4	Suction-line filter	Emerson, USA	1 pc
5	Automatic pressure-protection device	High/low-pressure protection	4 pcs
6	Acid-removal filter drier	Castel	1 set
7	Pressure gauge	REFCO	3 pcs
8	Expansion valve	Danfoss	4 pcs
9	Piping insulation	B1-grade fire-retardant insulation	1 set
10	Water-cooled condenser	Shanghai Beifeng	20 HP × 2

D1. Refrigeration System - Performance and Features

No.	Parameter / Feature	Value
1	Shelf cooling performance, no load	+20 °C to -30 °C in ≤ 60 min
2	Condenser cooling performance, no load	+20 °C to -30 °C in ≤ 30 min
3	Refrigeration design	Imported-brand compressors and cascade refrigeration provide rapid cooling, low temperatures, and stable operation
4	Environmental consideration	Refrigerant selected in accordance with the Montreal Protocol
5	Motor protection	Multiple compressor-motor protection functions

E. Vacuum System

No.	Item	Specification / Brand	Qty.
1	Vacuum pump	DRV90	2 units
2	Roots booster pump	BOSS; 100 L/s	1 unit (optional)
3	Pump isolation valve	Pneumatic butterfly valve	1 pc
4	Vacuum sensor	POSIFA, USA	2 pcs

E1. Vacuum System - Performance and Features

No.	Parameter / Feature	Value
1	Ultimate vacuum	≤ 1 Pa
2	Evacuation time	Atmospheric pressure to 20 Pa in ≤ 30 min
3	Leak rate	≤ 5 × 10 ⁻³ Pa·m³/s
4	Valve position feedback	Vacuum-system valves provide open/closed status feedback
5	Anti-backstreaming protection	The high-efficiency pump-head valve operates together with the vacuum pump to minimize reverse diffusion of pump oil

G. Heat-Transfer-Fluid Circulation System

No.	Item	Specification / Brand	Qty.
1	Circulation pump	Wilo / Grundfos / low-temperature magnetic-drive pump	1 unit
2	Heat-transfer fluid	Dow Corning low-viscosity methyl silicone oil, USA	As required
3	Electric heater	5,000 W	2 pcs
4	Plate heat exchanger	Stainless-steel plate heat exchanger	2 pcs
5	Heat-transfer-fluid temperature sensors	Class A Pt100 RTDs	2 pcs
6	Piping insulation	B1-grade insulation	1 set

G1. Circulation System - Performance and Feature

No.	Parameter / Feature	Value
1	Heating rate	1 °C/min
2	Heating control	PID power regulation for efficient use of heating energy

K. Electrical Control System

No.	Item	Specification / Brand	Qty.
1	Electrical standard	Applicable national safety standard	N/A
2	PLC	Siemens	1 set
3	Touchscreen HMI	MCGS	1 pc
4	Circuit breakers	Schneider Electric, France	As required
5	AC contactors	Schneider Electric, France	As required
6	Intermediate relays	IDEC, Japan	As required
7	Switching power supply	Mean Well, Taiwan; 24 VDC, 3 A, or equivalent	As required
8	Control mode	Manual and automatic control	1 system

K1. Control Software Functions

No.	Function
1	Freeze-drying operation with freely selectable manual or automatic mode
2	Water-flood defrost
3	Process setup and recipe management
4	Manual/automatic mode can be changed at any process step
5	With the optional computer, operation is available from the cleanroom, equipment room, and freeze-dryer control room; interlocks prevent incorrect operation
6	For stoppering configurations, a hydraulic emergency-stop button in the cleanroom can stop shelf movement in an emergency
7	User-friendly HMI displays component and valve status, temperature values, and vacuum readings
8	With the optional computer, recipe management supports storage of multiple freeze-drying cycles
9	The automatic freeze-drying sequence displays the current process stage
10	With the optional computer, data and trend records can be retrieved or printed by batch number
11	Data and trend records can be stored

No.	Function
12	With the optional computer, recipes, trends, historical data, operation logs, and alarm logs can be printed and retained as detailed batch records
13	Additional software functions can be configured to suit the user's operating requirements

L. Utility Requirements

No.	Utility	Requirement
1	Total connected electrical load	55 kW; 380-440 V AC, 50 Hz, 3-phase, 5-wire

M. Main Equipment Data

No.	Parameter	Value
1	Equipment arrangement	Split type
2	Approximate overall dimensions (L × W × H)	6,500 × 2,300 × 2,500 mm
3	Approximate net weight	8,000 kg
4	Vial loading capacity	To be confirmed according to vial size and loading pattern
5	Recommended raw-material loading	Up to 200 kg/batch
6	Cooling method	Water cooled
7	Power supply	380-440 V AC, 3-phase

O. Documentation Package

No.	Document	Qty.
1	Site Acceptance Test (SAT) report	1 set
2	Operation manual	1 set
3	Maintenance manual	1 set
4	Electrical wiring diagrams	1 set
5	Main-component manuals	1 set
6	Calibration / verification reports	1 set

Note: Values marked as approximate are subject to final engineering confirmation. Brand selections may be replaced by equivalent components subject to mutual agreement.