

FD 1200

**STAINLESS STEEL.
(1200kgs)**

**GENERAL PURPOSE FREEZE
DRYER.**

SPECIFICATIONS.

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1. GENERAL

The FD-1200 Freeze Dryer has been designed after careful consideration of all the factors necessary for food freeze drying techniques. The FD-1200 General Purpose Freeze Dryer is capable of drying a variety of biologicals such as fruit and vegetables and diverse products such as blood/plasma, mushrooms to mussels.

2. CONSTRUCTION

2.1. CHAMBER AND DOORS

The cylindrical shaped chamber has separate product chamber and ice condenser with product loading/ unloading doors. The doors are double hinged to assure correct alignment and sealing against the chamber. Each door has one viewing ports, 250mm diameter, AISI 304 stainless steel frame and Acrylic window, to allow visual monitoring of both vapour condenser and product. The chamber contains the product module and the vapour condensing in separate. The chamber is fitted with AISI 304 stainless steel vacuum solenoid and butterfly operated valves that isolate the vacuum line connection, drain, water defrost and vacuum release. The chamber, doors and hinges are constructed in AISI 304 stainless steel. The door sealing material is rubber. The doors have an opening angle of 90° . The hinges will be either left- or right-hand side, to be specified by the customer. Closing is by means of eight quick acting latches.

2.2. PRODUCT MODULE AND HEATING PLATES

The product is placed in trays and loaded onto the heating plate module. The machine is capable of freezing product in place on the heat-plates, which can be chilled as well as heated. Alternatively the product can be frozen in a separate chiller. The module consists of 18 heat-plates (17 available for product loading, top plate provides radiant heat for the top product plate only). There are 3 modules in total. The heat-plates are fabricated from AISI 304 stainless steel, clean of the heat-plates flat for critical hygiene applications. The heating fluid is piped into headers that connect to sockets in the chamber wall. Quick release connectors and flexible hoses are fitted for ease of removal for cleaning or maintenance of the complete modules. The modules are fitted with wheels that run in an AISI 304 stainless steel rail.

No. of modules / machine	3
No. of heat-plates / module	18
Heat-plate material	AISI 304
Heat-plate surface roughness	0.5 – 1.0 mm
Heat-plate intermediate distance	35 mm
Heat-plate thickness	18 mm
Heat-plate width (useful)	1200 mm
Heat-plate depth	1500 mm
Shelf-flatness	<1.5 mm
Optional clean-sheet	Standard.

2.3. PRODUCT TRAYS

The product trays are made of AISI 304 stainless steel 1.2 mm thick, and have rounded corners for ease of cleaning. Sizes are: length 595 x 745 width x 20mm deep. Radius of corners: 3.0mm.

Two sets of trays are included with the freeze dryer. A tray trolley for ease of storing/ cleaning and loading is optional.

Tray size	595 x 745 x 20 mm
No. of trays / heat-plate	4
No. of trays total	216 x 2
Tray material	AISI 304, 1.2mm

2.4. VAPOUR CONDENSER

The vapour condenser is located in the separate chamber, and is constructed from round coil AISI 304. Refrigeration is by direct expansion. Defrosting the accumulated ice is by water, hot water is recommended for a quick defrosting cycle. Heat recovery from the refrigeration system is an option that will provide an efficient and cost-effective way of achieving this.

2.5. MACHINERY FRAME

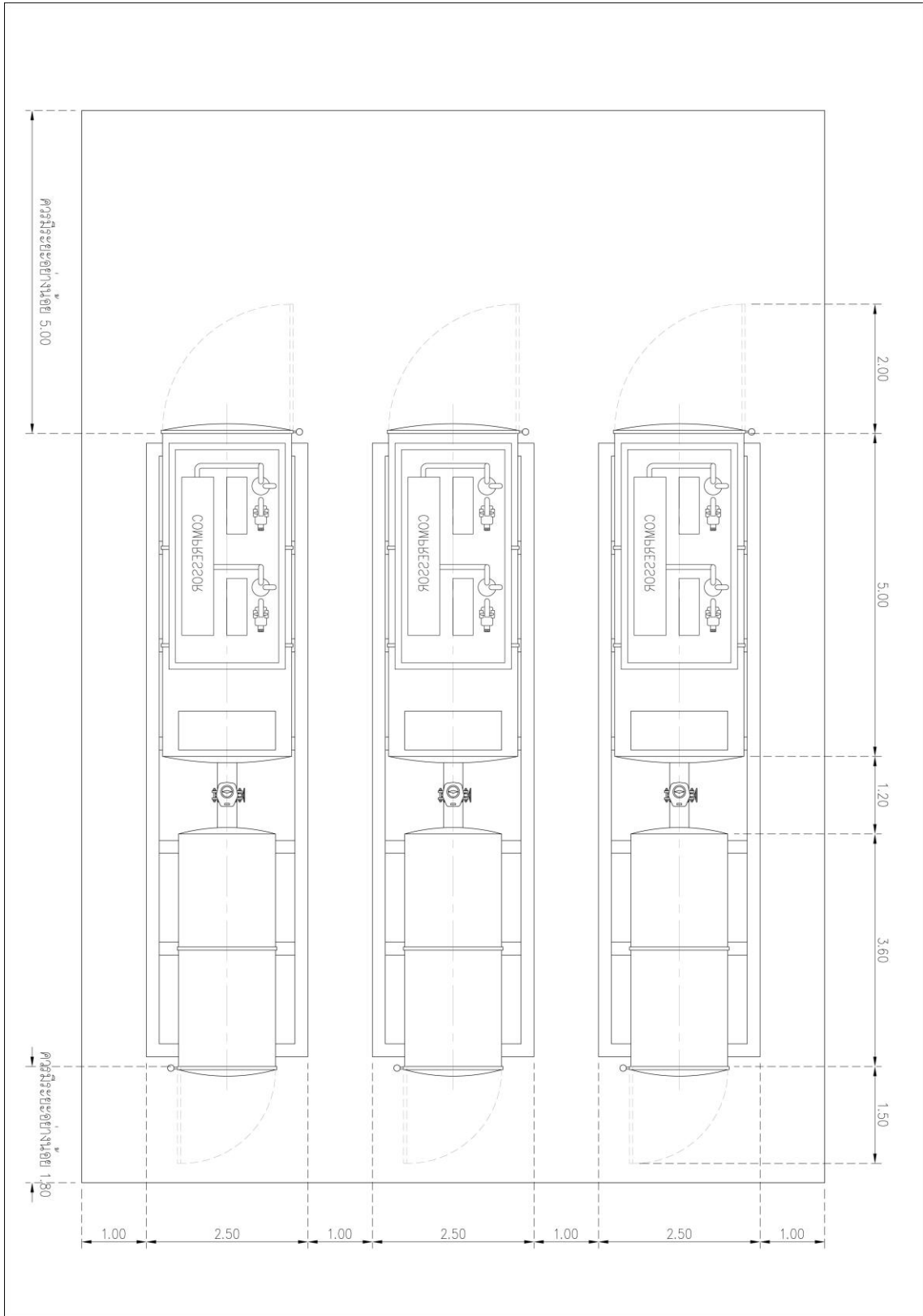
All the machinery involved with the operating of the freeze dryer is mounted in a separate frame. The frame is made from carbon steel sections with powder coating finish. It can be placed up to 15 meters away from the product chamber. Connections are through fixed piping and fixed electrical wiring.

2.6. DIMENSIONS

The following table lists the dimensions of the complete plant.

Product Chamber	length: 5500 mm width: 2500 mm height :3500 mm
Ice Condenser Chamber	length : 4000 mm width : 2500 mm height : 2500 mm
Machinery Frame	length: 3500mm width:2000 mm height :2000mm
Motor Control Cabinet	width: 1200mm height :1500mm depth: 300mm
Water Cooled condenser – Tower (option)	height: 2002m diameter :2175mm
Air cooled refrigeration condenser (optional)	length: 3000mm width: 3000mm height :1500mm
Heat recovery water tank (optional)	height: 2100 mm diameter:1970 mm

DIMENSIONAL SKETCH



3. SYSTEM SPECIFICATION

3.1. VACUUM SYSTEM

The vacuum pumps are a combination set of booster pump and backing pump (Provide 2 stages rotary vane vacuum pump) to give efficient capacity for evacuation and non-condensable vapour management. Pump control is via the integrated control system, with features such as warm-up, condition monitoring, booster pump starting and load control on multi-backing pumps.

Technical data:

No. of Rotary vane pumps	1
Brand	Edwards
Model	
Flow rate	275 m ³ /hr
Power requirements	8 kW
Rotation speed	1400 r.p.m.

3.2. ROOTS BLOWER

No of Booster pump	1
Brand	Edwards
Model	
Flow rate	1250 m ³ /hr
Power requirements	3.5 kW
Rotation speed	2800 r.p.m.

Total vacuum system:

Pumping speed @ 2mbar	1300 m ³ /h @ 2mbar
Estimated evacuation time to 1.0 mbar	20 minutes

3.3. HEATING YSTEM

The heat-plates are cooled and heated with a heat transfer fluid. This fluid can be chilled or heated to provide in-place-freezing or heating of the product during the drying cycle. The fluid used to –40°C is silicone oil M50.

A centrifugal pump provides the forced circulation of the heat transfer fluid.

Heat transfer fluid	Silicone oil M50
Total circuit capacity	1.5 m ³ ≥ Nom.
Circulating pump	Iwaki
Pump flow rate	15.0 m ³ ≥/hr
Pump power requirements	5.0 kW
Rotation speed	2800 r.p.m.
Chilling heat exchanger capacity	100 kW
Heater power	48 kW
No of elements	3
Temperature range	-40 to +60°C
Cooling time 30°C to -20°C	2 Hour
Heating rate	10 K/hr
Temperature variance	+/- 2°C
Temperature variance / shelf	+/- 2°C

3.4. REFRIGERATION SYSTEM

The refrigeration system cools the heat plates during in-place-freezing, evacuation and the early stages of drying. It also cools the vapour condenser during the drying cycle.

The compressor/s are Bitzer 2 stages semi-hermetic; the refrigerant used is chlorine free.

Refrigerant	R404A
Refrigerant capacity	90 kg
Compressor	Tandem 100 Hp.
Compressor Power Requirements	70 kW
Refrigeration Capacity @ -40 SST	40 kW

3.5. DEFROST SYSTEM

Defrosting is by means of water. Option available for 50°C hot water defrost by heat reclaim by refrigeration heat rejection system heat exchanger, 8 m³ insulated storage tank, and circulation pump. This option greatly reduces defrosting times over conventional cold water.

4. ELECTRICAL SPECIFICATION

The Freeze Dryer is delivered with full electrical hardware that, where possible, is chosen to be totally compatible with local supplies. Wiring is complete with mains isolation, motor circuit breakers and overload protection. Electrical enclosures are purpose built and are supplied with key locks. Control circuitry is interfaced with relays to maintain PLC isolation from electrical load. Electrical cabinets are configured to suit customer layouts. Mains supply cable and connection is to the customers account.

Main Switch supplied	Yes
Motor control Cabinet supplied	Yes
Control Cabinet Supplied	Yes
Pneumatics Cabinet supplied	N/A

5. STANDARD EQUIPMENT SUPPLIED

5.1. ELECTRICAL

EQUIPMENT	TYPE
48 K/w Elements	THA
Freeze Thermostat	THA
Cabinet	THA
Contactors	Telemecanique
Overloads	Telemecanique
Circuit Breakers	Telemecanique
Relays	Telemecanique
PLC	Omron
Main Switch	Telemecanique
Touch Screen	Proface

5.2. CHAMBER FITTINGS

Perspex Windows	Clear Acrylic
Ball Valves	NZF
RJT Fittings	NZF
S/S Fitting	THA
Door Seal	silicone Rubber
Braded S/S Hose	THA

5.3. VACUUM VALVES

Solenoid Valves	Burkurt or equivalent
Butterfly Valve	Burkurt or equivalent

5.4. PUMPS AND FLUIDS

Silicone Pump	Iwaki
Heat Recovery Pump (Option)	N/A
Defrost Pump (Option)	N/A
Heat Recovery Tank (Option)	N/A
Flow Switch	N/A
Heat Transfer Fluid	Silicone oil M50

5.4.1. SENSORS

A variety of sensors support the data acquisition and control of the Freeze Dryer. Pressure transducers are fitted and both monitor and control the refrigeration system. Vacuum pressure is monitored at the product chamber. Temperature sensors measure and control the heating fluid. RTD type (PT100) sensors are provided by means of a vacuum plug to allow measurement and logging of the product temperatures inside the vacuum vessel.

Pressure Transducers	N/A
Vacuum Sensor	Edwards
Heat fluid control sensors	PT100
Product temperature sensors	PT100

5.5. CONTROL

Control of the Freeze Dryer is by an Omron PLC interfaced with an Proface Programmable Terminal (Touch Screen). The screen shows a graphical display of temperatures and pressures in a schematic representing the actual freeze dryer installation. The system is designed to control and monitor the dryer and will automatically ramp energy as required to govern sublimation pressure to pre-set parameters.

All analogue data can be logged and kept in historical logs. The data can be stored in compact flash cards for display on a PC, if required.

6. CLIENT SUPPLIED SERVICES

The client is required to supply all buildings for the Drying chamber and plant room equipment including foundations, structural frames and pads for tanks and cooling towers.

Access for Chamber installation.

Power to the main switch of the Motor Control Centre, lighting and plant room ventilation.

Water and air for ancillary services adjacent to necessary plant.

Drainage.

Building detail drawings (CAD preferred).

7. AVAILABLE OPTIONS

Every effort is made to deliver a custom machine most suitable to the clients needs. Several options are available. Some options will need engineering to suit the local conditions. Please discuss your exact requirements with Epsilon Company Limited.