



## VACUUM FREEZE DRYER (INDUSTRIAL SCALE)



Kemolo Co., Limited

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## Company Profile

Located in Yangzhong, China, Kemolo Co., Limited is one of the few companies that can independently design, research and manufacture large scaled freeze dryers. Continually try and improve, Kemolo is committed to producing a more reliable freeze dryer with characteristics of more energy efficient, more environmentally friendly, more convenient to operate.

Freeze dryer is an integral system composed of dozens of components and chamber. All components, no matter how small it is, are required to be perfect, just because small issue on component would cause a big problem on the whole system. Therefore, only those enterprises who have ever gained good reputation from their users shall be qualified to supply us spares. The chambers, shelves and vapor condenser made by ourselves, will be given a long time high pressure test to make sure it can work every day in 10 years without problem.



Energy saving compressors and pumps get the priority to be supplied to our system. Aluminum alloy cooling and heating shelves with radiant design, the heat transfer efficiency will be 10 times higher than stainless steel. The size of chamber gets reduced by good use of space, thus the cost of shipping and installation area would be reduced accordingly and the input power of vacuum would be reduced too. The heat from compressor could be reclaimed for defrost as an option. It will save approx. 30% energy cost. All new technology would be tested for over 5 years, till it is 100% mature. We would never take our customer as a sample for laboratory.



30 %



The system uses less power, thus will reduce the quantity of gas emissions. Freon R22 would destroy the Ozone Sphere. It is completely replaced by environment friendly refrigerant R404A/R507 in our system. Kemolo manufactures good quality equipment only, refusing fake and poor quality components, no used components, no jerry-build, aiming at producing the highest quality freeze dried products efficiently with our reliable equipment. Temperature, pressure, amp automatically monitored, controlled and recorded. When you freeze dry different products, you just need to select the item you have set in the system. There is Chinese, English and Spanish language for option on the touch screen. The system will start to run automatically according to your pointed curve. So, the quality of finished products of each batch of production would

be the same. For new hands, it is easy to understand and easy to operate. The users just simply need to get the raw material cleaned, peeled, sliced and loaded into product trays, then place the raw material into the machine. Start the machine on touch screen (HMI) after the door closed, the machine will keep running till the product is dried. Vent air into chamber; open the door to get the dried product out for packing. And finally get the vapor condenser defrosted for next batch of production.



Kemolo freeze dryers are adapted to local power supply 110-240V, single phase, 220-480V, 3 phases, 50/60Hz for your option. The middle and small freeze dryer is designed to fit the container loading size to reduce the cost of shipping. All components and chamber is mounted on the same frame for small freeze dryer. The installation time is only 2-3 days. And the middle freeze dryer is module designed; it will be assembled in user's site in a week. We have rich oversea installation experience and provide quality certificates, pressure vessel certificates, certificate of origin, certificate of fumigation where required. With our equipment, you will get a two-year quality warranty and life time technical support.



### Technical parameters

Model	FD-50	FD-100	FD-200	FD-300	FD-300	FD-500	FD-750	FD-1000	FD-1200	FD-1500	FD-2000	FD-2500
Type	Conductive type				Radiant type							
Ice capacity (kg/batch)	50kg	100kg	200kg	300kg	300kg	500kg	750kg	1000kg	1200kg	1500kg	2000kg	2500kg
Condenser temperature (°C)	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C	-45°C
Shelf temperature (°C)	-35 to 60	-35 to 60	-35 to 60	-35 to 60	<100	<100	<100	<100	<100	<100	<100	<100
Product cooling place	in place	in place	in place	in place	in IQF	in IQF	in IQF	in IQF	in IQF	in IQF	in IQF	in IQF
Product cooling temperature	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C	-35°C
Number of shelves	6	8	10	11	9	10	15	19	19	19	19	19
Shelf dimension (m)	1.2*0.7	1.6*0.8	2.01*1	2.3*1.2	2.8*1.2	4.2*1.2	4.2*1.2	4.2*1.2	5.6*1.2	7.0*1.2	8.4*1.2	9.8*1.2
Shelf spacing (mm)	50	50	50	50	95	95	95	95	95	95	95	95
Heating/cooling medium	oil	oil	oil	oil	water	water	water	water	water	water	water	water
Number of product trays	12 pcs	16 pcs	60 pcs	66 pcs	64 pcs	108 pcs	168 pcs	216 pcs	288pcs	360pcs	432pcs	504pcs
Tray dimension (mm)	600*700	800*800	500*670	766*600	605*690	605*690	605*690	605*690	605*690	605*690	605*690	605*690
Trolley (1460*1390mm)	/	/	/	/	2	3	3	3	4	5	6	7
Rail system for fast loading	/	/	/	/	included	included	included	included	included	included	included	included
Individual quick freezer (IQF)	/	/	/	/	included	included	included	included	included	included	included	included
Refrigerant	R404a	R404a	R404a	R404a	R404a	R404a	R404a	R404a	R404a	R404a	R404a	R404a
The way of cooling	by air	by air	by water	by water	by water	by water	by water	by water	by water	by water	by water	by water
Ultimate vacuum level (Pa)	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa	10 Pa
The way of defrost	by water	by water	by water	by water	by water	by water	by water	by water	by water	by water	by water	by water
Power requirement (kw)	11kw	19kw	30kw	42kw	42kw	80kw	112kw	164kw	204kw	243kw	305kw	363kw
Installation area (m2)	9	10	15	20	100	130	180	200	250	350	450	500
Chamber dimension (m)	2.6*1.2*2	3*1.4*2.1	3.7*2*2.2	4.4*2*2.5	5.5*2*2.5	6*2.3*2.8	6*2.6*3	8.6*2.6*3	10*2.6*3	12*2.6*3	15*2.6*3	17*2.6*3
Weight (kg)	2000	2500	3500	5500	7000	11000	140000	17000	19000	22000	25000	28000

## **A brief introduction to freeze dryer**

Freeze dryer known as lyophilizer, is the machine to dry different types of material to prolong its preservation time. There are many kinds of dryers; freeze dryer is the best dryer to make high quality dried products. It is quite different from dehydrator, drying oven, microwave heating, and vacuum heating drying. Drying needs heat, with those kinds of drying method, heating is in room temperature, so it has harmful to material, and there is huge nutrition and biological activity loss in the drying procedure.

On the contrary, by freeze drying, heating is occurred after the material is completely frozen to -40 C, and material is in frozen status in the whole drying procedure till completely dried. Therefore, the freeze dried products preserve its original shape, color and it has no biological activity loss, no nutrition loss. Freeze dryer is suitable for food industry, pharmaceutical industry, chemical industry and laboratory test.

Full range of freeze dryers provided: the small unit is for laboratory and home use; the medium-sized is for food and pharmaceutical drying application; the large-sized freeze dryer is for food and chemical industry which requires mass production by economic equipment with lower energy consumption. We focus on manufacturing freeze dryer for 15 years with rich installation experience in home and abroad.

## **Category of freeze dryer**

Kemolo provides two types of freeze dryers for different applications.

### **Type 1: All in one (integrated)**

This type of freeze dryer is called conductive freeze dryer, small and medium-sized. Its production capacity is always less than 300kg. The tray area is always no more than 30 square meters. If you don't have a freeze room, you may choose this type of freeze dryer. The material frozen is on the plates, and heating also on the plates. The machine can work after get pipes, water and power supplied. Stainless steel SUS304 is for food, and sanitation grade option for pharmaceutical constructed by stainless steel SUS316.





### Type 2: Assemble (disconnect-type)

This type is large scale radiant freeze dryer, production capacity from 500-2500kg per batch. It needs to be shipped by 40'Flat Rack container with 40'HQ containers. One set of radiant freeze dryer includes vessel unit (shelf and vapor condenser inside), refrigeration unit, vacuum unit, heating unit, trolley, rail unit and control unit. Our engineer will guide the workers of our user to get each module collected together and form a complete system. This type of freeze dryer comes with a freeze room to save drying time energy. The vessel, doors and vapor condensers are made by SUS304 stainless steel. The trays are made of aluminum with track-loading system equipped with trolley and IQF (individual quick freezer).



### Remarkable advantage of freeze-dried food

#### 1, Retain biological activity

To retain biological activity as much as possible, the material must be in low temperature environment, but on the contrary, drying needs heat involved. Heating will destroy biological activity and nutrition. Our solution is to get the liquid water in the material completely frozen to solid status. The water in the material is solid ice status during the whole heating processing till the material is completely dried. So, the biological activity is retained greatly.



## 2, No damage to the nutrition

Heating is no doubt the main reason of nutrition damage. By using our freeze dryer, heating processing occurs after material gets completely frozen to ice status. Thus, it typically retains 97% of the nutritional value.



## 3, Taste, color and appearance

Lyophilized by our freeze dryer, the material still tastes fresh, delicious as a snack, but a different try. The freeze dried material remains the same color, flavor and appearance as it was firstly harvested. And the volume of freeze dried material has no change, that is to say the appearance has no shrink or toughen. It is the real high quality preserved food.



## 4, Longer shelf-life




Freeze dried food material has a longer preservation time than frozen food, canned food and oven drying food. Having freeze dried food storage, you do not need to rack your brains what to eat and far away from pigmentum, additive, GMO and anti-season food material. Freeze-drying help us design a healthy lifestyle.





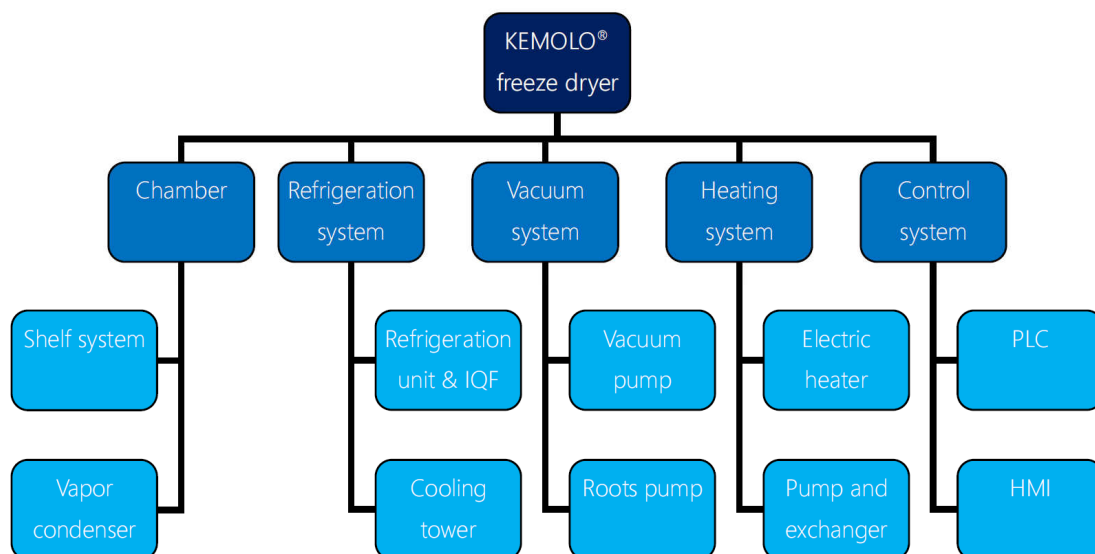
## Application

Vacuum freeze-drying technology is applied to process food material to make freeze dried food. The freeze dryer is used in all conceivable kinds of agricultural products with top drying quality.

		
<b>Fruits</b> durian, strawberry, mango, apricot, kiwifruit, pineapple, lemon, raspberry, avocado, banana	<b>Vegetables</b> broccoli, parsley, mushroom, bean, scallion, asparagus, onion, celery, carrot, tomato, pepper etc.	<b>Other food</b> beef, coffee, colostrums, herbal, flower, tea, honey, sea food and all kinds of pets food.

## Composition of KEMOLO freeze dryer

In a sealed vacuum chamber, the ice in frozen material will be sublimated and removed out of the frozen product, and captured by frozen coils, forming ice on vapor condenser. The freeze dryer composed of chamber, shelf, vapor condenser, trays, refrigeration system, vacuum system, heating system, control system.





## Construction and main components of the whole system

### 1, Drying chamber

The chamber, where freeze drying process occurred, is cylinder shaped with multiple reinforcing ribs to strength. The chamber, doors are constructed in SUS304 stainless steel. The chamber contains both the product shelves and the vapor condenser in side. The chamber is fitted with valves of vacuum line connection, drain, water defrost and vacuum release. The chamber has two doors - one at each end. The one is for products loading / unloading; the other is at the condenser end. The doors and chambers are sealed by silicon rubber to avoid any vacuum leaks. The doors have an opening angle of 110. The hinges will be either left or right hand side, to be specified by the customer. Closing is by means of four quick acting latches. Each door has viewing port. The frame of viewing ports is made of 304 stainless steel and toughened glass window, to allow visual monitoring of both the vapor condenser and product. Track is suspended on the ceiling of inside the chamber to allow trolleys hang and move.



### 2, Shelf and trolley

A particular number of 'modules' are consisting of a number of shelves on where are available for product loading, with the top plate providing radiant heat only. The product is placed in trays, which are loaded onto the heat-plates (shelves) in the freeze dryer. The heat-plates can be chilled and heated, so the machine is capable of freezing product in place or pre-frozen in IQF. The heat-plates are fabricated by SUS304 stainless steel or aluminum, and have a flat upper side and heating fluid channels on the underside. The trolleys of large scaled lyophilizers are fitted with wheels that run in a track located above the chamber, allowing each trolley to be wheeled outside of the chamber.



### 3, Product trays

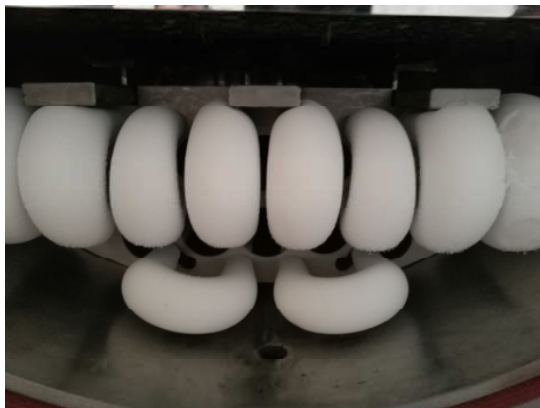
A: The SUS304 stainless steel product trays are designed for freeze dryer to process liquid material mainly. Two sets of trays are included with the freeze dryer.

B: The aluminum product trays are designed for freeze dryer to process solid material mainly, and have rounded corners for ease of cleaning.



### 4, Vapor condenser

The vapor condenser is located in the rear half of the chamber or lower half, and is constructed from SUS304, 25mm round tube. Refrigeration of the vapor condenser is by direct expansion. Defrosting the accumulated ice from the vapor condenser is by water, and hot water is recommended to speed up the defrosting cycle.



### 5, Vacuum system

The vacuum system is composed of drying chamber, condenser, vacuum pipes, valves and back pump and holding pump. It requires no leaks; Vacuum system is an essential for the rapid sublimation. Backing pumps and holding pumps are required for large scaled system to give efficient capacity for evacuation. Brand: Leybold, Yoivac etc.





## 6, Heating system

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. An electric boiler directly heats the fluid, and chilling is through an intermediate heat exchanger. A centrifugal pump provides the forced circulation of the heat transfer fluid. Optional fluid: silicone oil, water etc.



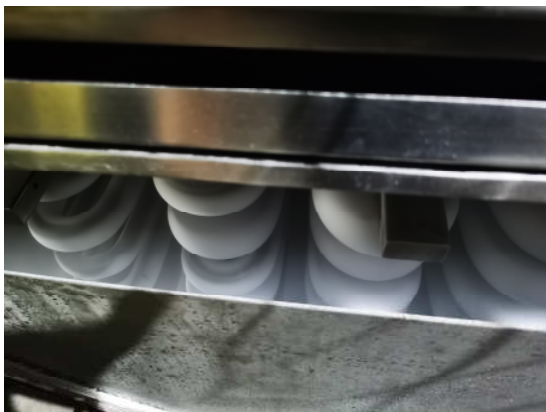
## 7, Refrigeration system

The refrigeration system freezes the heat plates during in-place freezing, evacuation and the early stages of drying. It also cools the vapor condenser during the drying cycle. The screw compressor is adopted on the large scaled equipment and piston for small ones, and the refrigerant used is R404A, R507. Brand option: Refcomp, Bitzer.



## 8, Defrost system

Water is used for defrosting the vapor condenser. As an optional extra, heat can be reclaimed from the refrigeration compressor to enable 60°C hot water defrost, greatly reducing defrosting times over conventional cold water.



## 9, Control system

CE or UL approved Siemens or Advantech PLC is adopted for control system. All electrical components are compatible with local supplies including voltage, frequency, wire, motor circuit breakers and overload protection. A variety of sensors support the data acquisition and control of freeze dryer: Pressure transducers are fitted, which monitor and control the refrigeration system. Vacuum pressure is monitored at the product chamber. Temperature sensors measure and control the heating fluid.



## Packing and delivery

Small freeze dryer is packed by fumigation free wooden box and shipped by standard container. Large freeze dryer is shipped by 40'FR container.





## Installation and training

We have engineers with 15 years installation experience available for our freeze dryer installation guidance and service; and train customer's workers operate the machine.



## FAQs

- 1, Large scaled production capacity: from 10-2500kg per batch (24 hours).
- 2, Equipments with certificates of ISO, CE, UL, RU, CSA, ASME etc is an optional choice. You can also choose Chinese brand equipment as an option to save your cost.
- 3, Power: 110-240V single phase, 220-480V, 3 phase, 50/60Hz optional.
- 4, We provide auto tracking loading system as a standard configuration from FD-500 to FD-2500 radiant type of freeze dryer.
- 5, We provide manual loading for conductive freeze dryer from FD-10 to FD-300.
- 6, We provide IQF (Individual Quick Freezing) as a standard configuration from FD-500 to FD-2500 for radiant type of freeze dryer.
- 7, Heating is by electricity, steam heating is optional for large models from FD-1000.
- 8, We provide recyclable hot-water defrost system to improve the working efficiency and save energy cost as option.
- 9, We provide all-in-one freeze dryer to shorten installation time to 2-3 days for small-scaled freeze dryer; and meanwhile provide modularized units to shorten installation time for large-scaled freeze dryer. The freeze dryer will be designed according to customer's detail requirement.
- 10, We have engineers available for the over sea's installation of freeze dryer.

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