

# FREEZER

## Super-quick freezing system

- BOX FREEZER



### FREEZING SPEED AND QUALITY

When freezing foods, a zone from approx. 0°C to -5°C is called a maximum ice crystal generation zone. Whether this temperature zone is to be quickly or slowly passed through affects the size and type of ice crystals and determines the texture of frozen foods. Slow freeze generates fewer and larger ice crystals; those generated between the cells destroy the texture, increasing a drip amount at defreezing. On the contrary, quick freeze generates many fine crystals and does not destroy the cells. (See Frozen Foods Handbook published by Korin Shoin)

### SUPERQUICK FREEZE WITH LIQUID NITROGEN(LIQUEFIED CARBON DIOXIDE)

- Liquid nitrogen(liquefied carbon dioxide) is a low-temperature gas at -196 °C(-78°C).
- Foods can be instantaneously frozen by directly spraying liquid nitrogen(liquefied carbon dioxide) to them.
- Superquick freeze does not destroy the food cells.
- Superquick freeze does not deteriorate the taste of foods or discolor them, maintaining their quality.
- The flavor is maintained for a long period.
- Drip outflow and drying loss can be prevented, allowing little product loss.

Furthermore;

- Lower facility cost, compared with conventional mechanical air blast.
- Simple mechanism and easy maintenance.

### OVERVIEW OF FREEZER

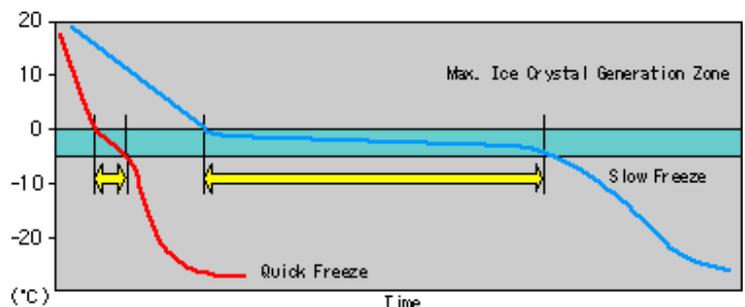
The principle of the superquick freezing method with liquid nitrogen(liquefied carbon dioxide) is to instantaneously freeze foods by directly spraying liquid nitrogen(liquefied carbon dioxide) to them, which is vaporized at -196 °C(-78.9°C) in a heat insulated freeze room.

Conventional mechanical freezers have been improved with various devices, but they use far-higher-temperature refrigerants(chlorofluorocarbon: approx. -40°C, ammonia: -33°C) than liquid nitrogen(liquefied carbon dioxide). Furthermore, as they have employed an indirect cooling method by means of air or brine, there is a considerable difference in cooling speed.

### NATURE OF LIQUID NITROGEN/LIQUEFIED CARBON DIOXIDE

	L-N2	L-CO2
Boiling point (°C)	-195.8	
Melting point (°C)	-210	Sublimation point (°C) -78.5 (1atm)
Latent heat (kcal/kg)	47.5 (Boiling point)	67.79 (-20°C)
		Sublimation heat 137.0 (Sublimation point)
Specific heat (kcal/kg °C)	0.248	0.199
Critical temperature (°C)	-147.1	31
Critical pressure (atm)	33.5	72.9
Specific gravity (air=1)	0.967	1.52
Available cold and heat (discharge temperature: -15°C)(kcal/kg)	93	77

### FREEZE CURVE



# BOX FREEZER



BOX FREEZER

## OVERVIEW OF BOX FREEZER

A box freezer is compactly designed. Compared with conventional mechanical freezers, it costs less and is more easily moved. It is optimum for treatment of seasonal goods at peak time, improvement of the capabilities of the existing factories and development of new products.

## FEATURES OF BOX FREEZER

- The box freezer is a batch type freezer to quickly cool/freeze foods.
- Using liquefied carbon dioxide or liquid nitrogen as a refrigerant, the box freezer quickly freezes within a range of freezer internal temperature of  $-60^{\circ}\text{C}$  to  $-100^{\circ}\text{C}$ .
- Both interior and exterior of the box freezer are made of stainless steel, ensuring corrosion-proof and cold resistance.
- A forced convection fan swiftly cools inside the freezer to ensure uniform temperature distribution.
- Capable of mounting/dismounting the shelf supports together with a frame.(Option)

## FOODS SUITABLE FOR FREEZING WITH LIQUID NITROGEN/LIQUEFIED CARBON DIOXIDE

- Foods with high moisture content, which produce many drips and have no restoring force after defreezing.  
Example: Strawberries, tangerines, crab meat, cod fish meat.
- Foods which cannot be frozen after steaming because the taste is damaged by heat treatment.  
Example: Mushrooms, matsudake mushrooms, shiitake mushrooms.
- Starchy foods  
Example: Boiled fish pastes, sushi, breads, cakes(Japanese and Western), noodles.
- Foods making much of flavor.  
Example: Spaghetti and meat sauce, pizzas, curry rice.
- Any food to be frozen in bulk.  
Example: Prawns, minced saurel meat, sliced carp meat, sweetfish, catfish, rainbow trout, scallops, shellfish, raw fish, steaks, chickens, meat patties, croquettes, hamburgers, Chinese ravioli, shao-mai, spring rolls, green asparaguses, green soybeans, ice cream.

## SPECIFICATION OF BOX FREEZER

Major Specification	BF-350	BF-600	BF-1000
Outer size(cm)	147 x 98 x 136	120 x 146 x 166	169 x 129 x 195
Inner size(cm)	78 x 70 x 95	88 x 80 x 105	105 x 100 x 146
Tray size(cm)	60x60	70x70	80x80
No. of tray shelves	7.5	8.5	9.5
Tray pitch(cm)	80	90	100
Internal setting temp.	L-CO2 spec.(const. temp. to $-70^{\circ}\text{C}$ ) L-N2 spec.(const. temp. to $-100^{\circ}\text{C}$ )		
Weight(kg)	250	280	350
Power source	3 $\phi$ x 0.75kw	3 $\phi$ x 1.5kw	3 $\phi$ x 2.25kw