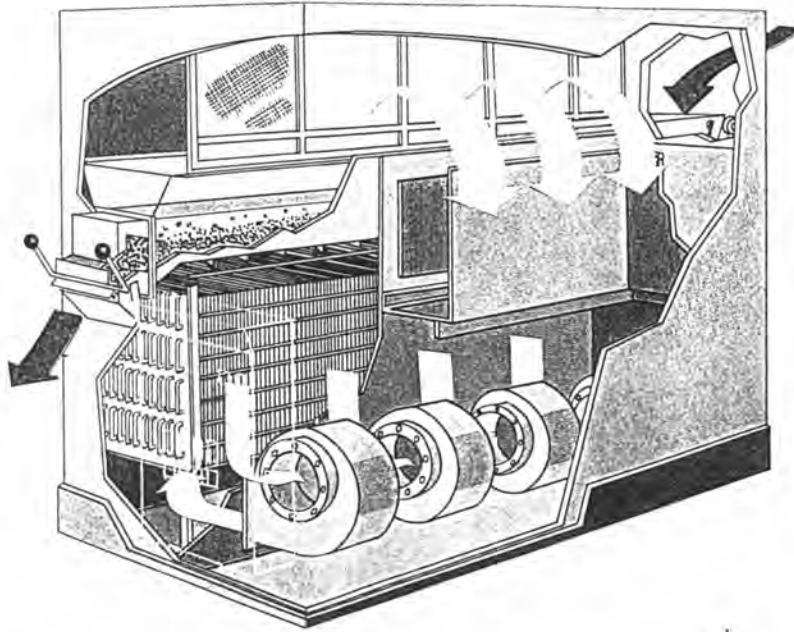


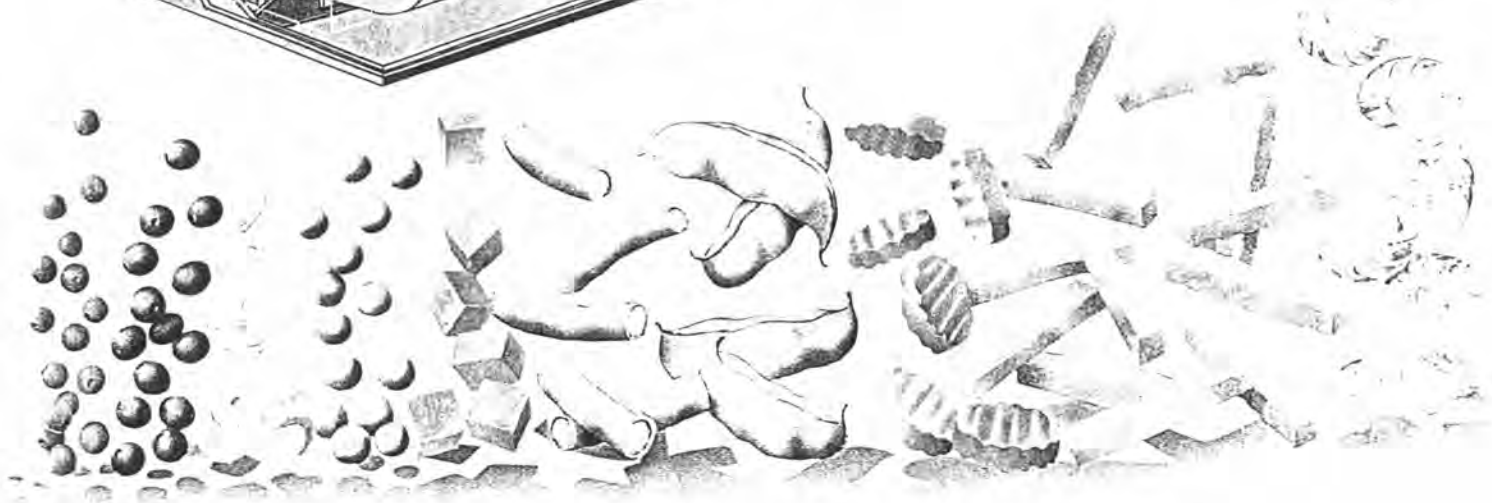
# FLoFREEZE MA for the bulk of IQF products



## A compact IQF package

In the FLoFREEZE MA series, Frigoscandia has packed the full-fluidization IQF principle into a compact, economical, broad-spectrum freezer.

Being a complete, pretested and factory assembled unit, the FLoFREEZE MA can be delivered quickly. Installation and commissioning at the site take five days or less. Its package design also means that it is easy to move if circumstances so require.



## Trouble-free operation

The FLoFREEZE MA is engineered for high capacity and high availability within modest overall dimensions. Accessibility is good too, whether for inspection during operation or defrosting and cleaning between runs. Effective running time between defrosting breaks can be significantly increased with the optional Air Defroster.

## Versatility

With controllable throughput and airflow, the FLoFREEZE MA does an excellent job of fully fluidized freezing on the bulk of IQF products: from rice on up through berries, fruits, vegetables, shrimps, diced meat and French fries to meat balls.

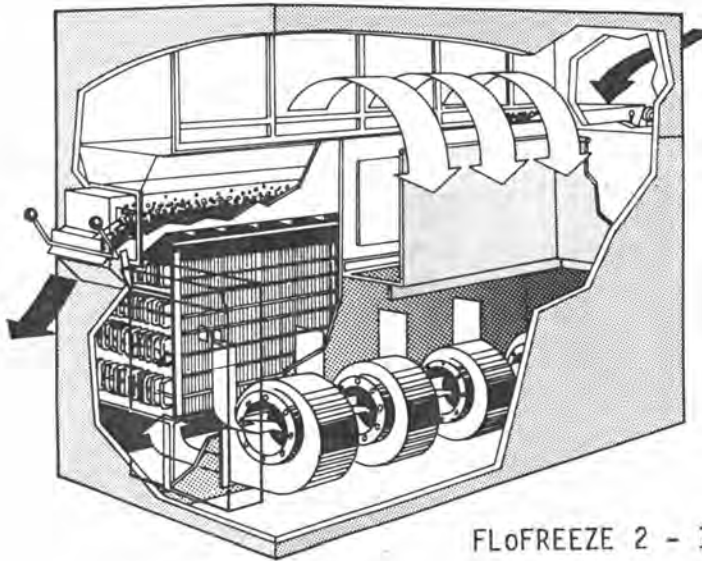
## Available sizes and capacities

Model	Enclosure length			Nominal capacity	
	mm	ft	in	kg/h	lb/h
2MA	2210	7	3	850	1870
4MA	3830	12	7	2100	4620
6MA	5450	17	11	3150	6930
8MA	7070	23	2	4200	9240
10MA	8690	28	6	5250	11550
12MAX	10310	33	10	7000	15400

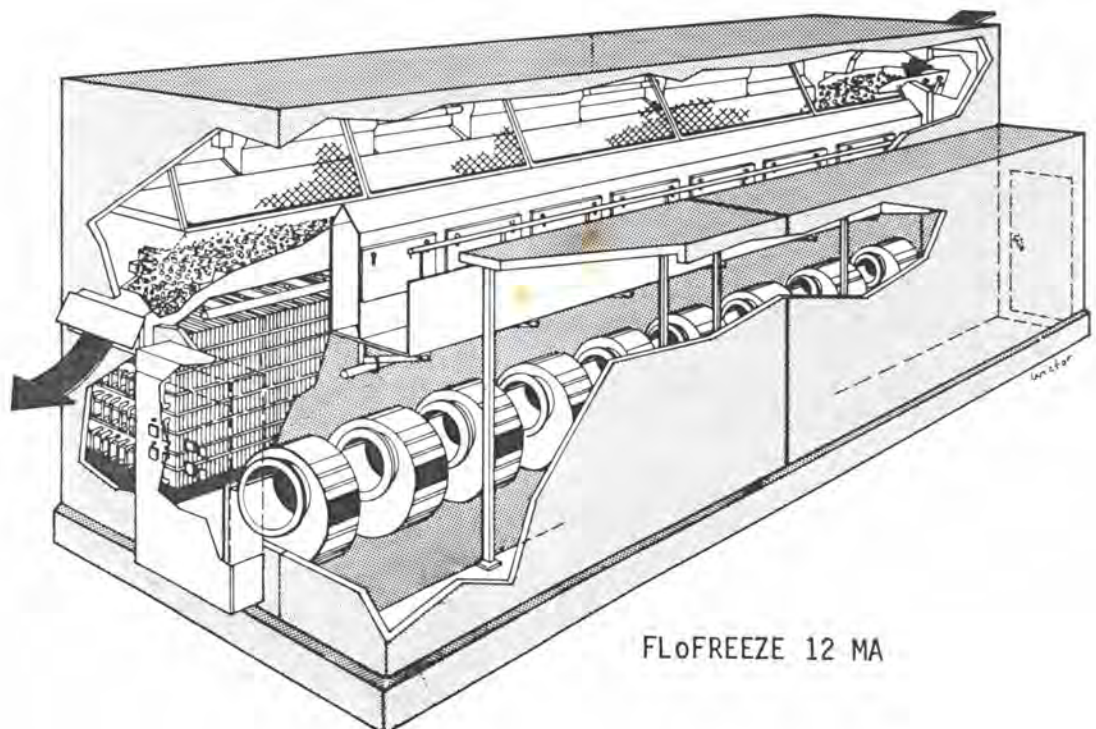
Height (all models): 3600 mm (11'10").  
 Width (2MA-10MA): 2360 mm (7'9").  
 Width (12MAX): 3360 mm (11'0").

**FLoFREEZE MA**General Description

FLoFREEZE is based on a unique Frigoscandia patent of the fluidization principle which means fast, gentle, hygienic and individual (IQF) freezing of a wide range of products. FLoFREEZE is fully continuous and integrated with the production line.



FLoFREEZE 2 - 10 MA



FLoFREEZE 12 MA

<b>Manual</b>	
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FLoFREEZE MA

Typical products are vegetables including peas, cut and sliced beans, diced and sliced carrots, whole and sliced mushrooms, brussels' sprouts and cut corn, strawberries, blueberries, red currants, sliced apples and sliced pineapple and many other products like French fries, cooked peeled shrimps and diced meat.

The fluidization principle means that the product is exposed to an upward directed air stream that supports and conveys the product through the freezer without any need for a conveyor belt.

True fluidization, which can only be achieved through the Frigoscandia design, ensures superior separation of product particles. On its way through the FLoFREEZE each individual product particle is completely surrounded by air of sufficiently low temperature. Suspended separately on a cushion of air, not only do the particles freeze quickly and uniformly throughout the product tray, but they freeze with a minimum of damage and clustering. This ensures complete Individual Quick Freezing (IQF) and highest possible product quality.

The de-watered product is continuously fed into the FLoFREEZE unit. As the product enters the freezer, it is met by an upward "polar air" stream that fluidizes the product immediately. The level of the product bed rises until it reaches the top of the weir at the outfeed end. The mass of product particles behaves like a liquid during fluidization and freezing flows over and out of the freezer at the same rate as they are fed in.

The level of the product bed can easily be controlled by adjusting the weir. By simply opening the weir, the tray can be emptied of products.

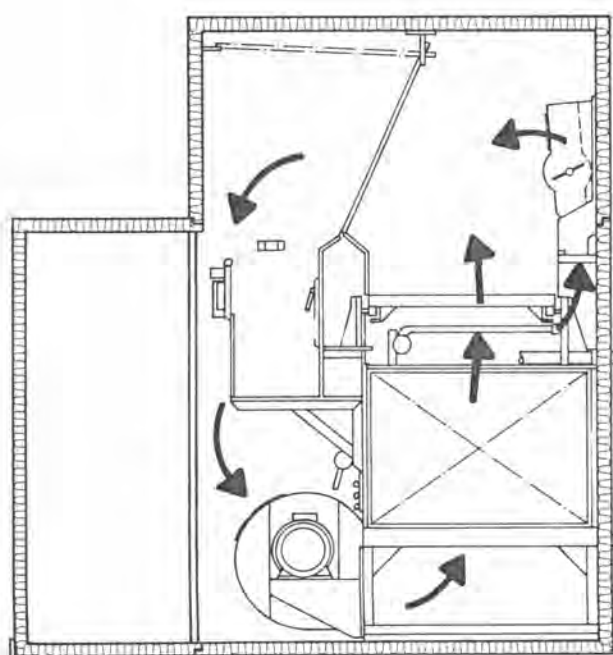
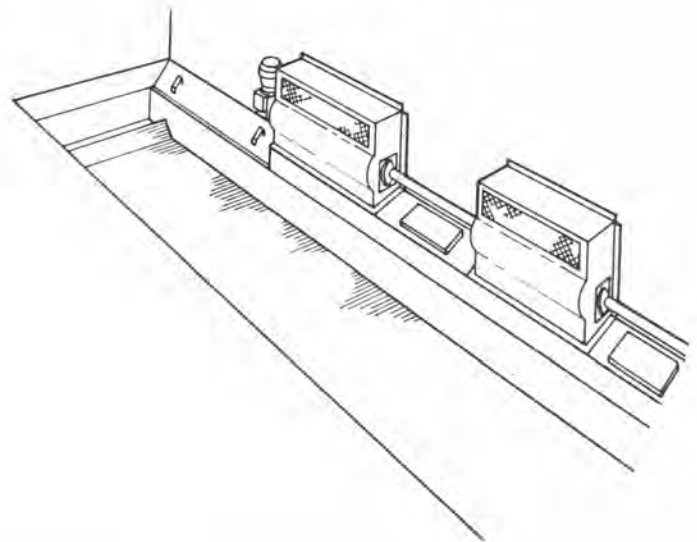
The product infeed shaker is located at a high level to receive de-watered product from the process line, and the product outfeed chute is located high enough for discharge, e.g. into standard palletainers.

As can be seen in the picture, the centrifugal fans are mounted at floor level and connected directly to the plenum chamber. Forced air from the fans is circulated via the plenum chamber through the evaporator, the perforated bottom of the product tray, the product and the screens. The air finally returns to the fan inlet via the opening in the internal platform.

## FLoFREEZE MA

Unique design features for optimum freezing

A special feature is the Air By-Pass Pulsator, now available in a new patented design. The basic idea is to pulsate the air up through the fluidized bed. The purpose of the pulsation is to improve freezing of irregular shaped, soft and delicate products. The new by-pass pulsator allows full and unobstructed airflow from the fans going through the cooling coil, but part of the airflow by-passes the product tray. The by-pass is controlled by a rotating damper mounted in special stainless steel ducts at one side of the product tray.

Air By-pass  
pulsator

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## FLoFREEZE MA

The by-pass pulsator increases the airflow through the cooling coil, thus improving its efficiency and utilization. This is possible as 10-15% larger air volume passes through the evaporator. The larger air volume increases the heat transfer coefficient at the evaporator and causes the temperature differential over the coil to drop considerably. The lower temperature of the air speeds up the freezing process which increases the capacity of the freezer.

The advantages of the by-pass pulsator may be summarized as follows:

- Allows fans to work at full capacity giving improved coil utilization and thus increased heat transfer coefficient, more efficient freezing and capacity.
- Improves agitation to the product bed, which improves the performance when freezing soft delicate, sticky, irregular products, extending product versatility.
- Simplifies changes between different products during production runs.
- Allows adjustment of appropriate fluidization during operation for optimum IQF freezing.
- Decrease frost formation on the evaporator surface, due to lower air temperature onto coil. This leads to increased intervals between defrosting.
- Reduces weight loss due to the lower air temperature, by quicker crust freezing of the product.
- Placed on a high level for easy access for service.

FLoFREEZE MA is equipped with a reciprocating tray bottom giving a gentle motion which assists the upward air stream through the product bed in order to fully separate and improve IQF freezing of products of very irregular shapes.

MA-Models - premanufactured

FLoFREEZE MA-Model units are complete factory assembled and fully tested for minimum site preparation time before commissioning. They are ready for operation after an installation time of a few days. When erected on site they form a complete inline unit with terminals for the necessary refrigeration, water and electrical services. The FLoFREEZE MA can be equipped with a trolley section for tunnel freezing.

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FLoFREEZE MA

### Defrosting

Defrosting is done at intervals of about 4 to 6 hours (depending on the product to be frozen, infeed temperatures and how well it has been de-watered), usually during normal production breaks. The defrosting operation can be carried out in approximately 30 minutes.

Defrosting is carried out manually by a water spray system located above the evaporator. After rinsing the coil, the defrost water is collected and drained away through the defrost hatch at the infeed end. The water defrost headers, laterals and nozzles can easily be checked from the internal platform through the inspection hatches.

Before defrosting, the product tray must be emptied of all products.

### Enclosure

The skid-mounted, insulated enclosure has a core of foamed polyurethane covered on each side by facings of glass fibre re-inforced plastics. Access to the freezer is provided by an insulated "cold room" door (two doors on 12 MA). The defrost hatches gives admission to the plenum chamber for cleaning, draining and inspection. Both are equipped with electrically heated gaskets.

### Internal structure

The internal framework which supports internal platform, product tray, evaporator fans etc. is made from hot dip galvanized steel. The internal platform, made of aluminium checker plate, enables inspection of the freezing process and simplifies cleaning and defrosting.

### Foundation

FLoFREEZE MA- and RMA-model units require a prepared concrete foundation with adjacent drains.

FLoFREEZE MA-model units need no floor heater mat because of their compact design and regular defrosting.

FLoFREEZE RMA-model units on the contrary, which are wide in size and are operated with longer intervals between defrosting during rack freezing, will be delivered with a separate floor heating mat to be installed in the concrete foundation.

FLoFREEZE MA

### Product parts

The following items in contact with the product are all made of stainless steel:

1. Product Infeed Shaker

The product infeed shaker is equipped with a "nose" that projects into the freezer. This "nose" is electrically heated to avoid ice build-up.

2. Product Fluidizing Tray

The specially designed perforated tray bottom is suspended so that it can be reciprocated by rods connected to an agitator mechanism.

3. Product Outfeed Chute

The product outfeed chute is provided with a flange for extension. The hinged gate makes it possible to shut off the product stream for short intervals e.g. to change packaging containers. The outfeed chute is located high enough for discharge into standard palletainers.

### Evaporator

The evaporator coil is made of finned steel tube, hot dip galvanized after manufacture. The fin spacing, which varies with the depth of the coil, is wide at the bottom and narrow at the top. This ensures an even frost build-up on the evaporator without detriment to air flow and hence performance of the FLoFREEZE. The evaporator is arranged for both gravity feed and pump circulation of either ammonia or halocarbon refrigerants.

### Centrifugal Fans

Centrifugal fans with direct coupled squirrel cage electric motors are blowing directly into the plenum chamber under the evaporator. They are suspended from the chamber wall so that the floor of the fans chamber is entirely clear of any equipment. This ensures easy cleaning. Fan housing, inlet cone and motor are made of aluminium. Wheels and motor stand are made of hot dip galvanized steel.

### Electrical Installation

The electrical control panel, mounted on the outside of the insulated enclosure, incorporates the main isolating switch, all necessary switches, fuses, starters and pilot lamps for all motors, door heater and lighting.

A thermometer indicating internal air temperature is supplied separately. All electrical items are factory wired and tested.

### Emergency Stop

For safety reasons and emergency stop operated by wire is situated inside the freezer.

Subject to change without notice