



Tetra Pak® Linear Moulder 1500 A2

For high capacity production of moulded stick products



Highlights

- Highest singel index capacity on the market with multilane wrapping
- Flexible, modular mould cleaning system with minimum water consumption
- Robust and hygienic design with smart utility connections
- Servo-driven extractor and mould index
- Automatic stick inserter with double magazine and reversing in-feed belt

Application

The Tetra Pak® Linear Moulder A2 enables flexible and efficient automatic continuous linear production of moulded products such as ice cream, sherbet, water ice or fruit-juice lollies. It is optimized for high capacities and complex products.

Operating principle

The production of moulded stick products is carried out in six main stages:

1. Filling ice cream mix or water ice into moulds
2. Inserting wooden sticks into ice cream
3. Freezing product in cold brine bath
4. Defrosting thin outer layer of product with warm water spray for release from mould
5. Extracting frozen product from mould
6. Coating with chocolate and subsequently dry ingredients, if applicable
7. Lay-down into wrapping machine

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Basic unit

Mould slats

Mould slats in total	468
Mould slats in brine section	170
Mould and mould slat material	AISI 316 L

Available number of lanes and respective pitch:

- 18 lanes => Pitch 70.5 mm => possible product width = 63.5 mm
- 20 lanes => Pitch 63.5 mm => possible product width = 56.5 mm
- 24 lanes => Pitch 53 mm => possible product width = 46 mm

The mould slats of a Tetra Pak® Linear Moulder 1500 A2 handle ice cream stick products up to 180 mm long (excluding stick) for a maximum thickness of up to 30 mm. Shorter products can also be thicker. Sticks must protrude 30 mm above the mould slats, depending on mould shape.

Brine tank

The 11.4-meter long double-walled rectangular tank is insulated with polyurethane foam. The cold brine distribution system is placed inside the tank. The inlet brine flow combined with nozzle plates creates a well-distributed turbulent flow around the moulds, which secures even freezing both lengthwise and crosswise in the freezing section. The tank is made of stainless steel, and uses AISI 316 quality for all parts exposed to brine. Two rails are placed on the top of the brine tank for mounting the stick dispenser, filling equipment and back suction, etc.

Brine flow system

The return flow from the brine tank flows by gravity into a filter tank. Two low-pressure centrifugal pumps, positioned next to the filter tank, divide the brine into two streams:

- Approximately 2/3 of the brine flow is re-circulated into the brine tank
- Approximately 1/3 of the brine is pumped through the optional external plate heat exchanger and back into the brine tank in the extraction end

The total circulation volume is up to 500-600 m³/hour, depending on product size and type, at a temperature of -40°C at the brine inlet. An optional extension of the brine system with buffer tank and an additional pump is available.

Defrosting system

In the defrost zone, a manifold sprays warm water up under the mould slats. This heats up the moulds from below and loosens the products for extraction. The defrost water circulates back to a tank and is heated with steam. The water level in the defrost tank is automatically regulated with a valve, controlled by a level switch. The precision steam valve ensures the precisely accurate temperature for optimal slip film thickness. This keeps the amount of product residue left after extraction to a minimum.

Product removal system

In the product removal system, warm water flushes the back of the moulds, ensuring that any non-extracted product does not re-freeze but is instead removed from the mould by a spray bar with nozzles. The warm water is heated by steam and tubular nozzles ensure even distribution of the warm water. Temperature control of the warm water is integrated in the automation system. A frequency-controlled pump handles the recirculation of the defrost water, product removal water and cleaning water. A conveyor collects products ejected from the product removal system and transports these outside the mould area.

Flush and cleaning system

The basic machine is equipped with a tank system used for flushing and cleaning. The moulds are flushed during production three times with water spray and once with tap water final rinse. The tanks are connected with a backward overflow system securing optimal reuse of water and minimizing water consumption. A second cleaning tank is used for adding lye and/or sanitizer after production or during planned cleaning. This tank is equipped with a steam valve for heating up the cleaning media. All tanks are equipped with level controlled water supply.

Main drive

The mould slats are mounted to the indexing chain without any loose parts. The chain is a robust design which is running stable even with only few mould slats mounted e.g. during maintenance. The chain is driven by a servo-controlled motor through a reduction gear. A torque overload feature prevents mechanical damage in case of a jam due to a foreign object. The speed of the Tetra Pak Linear Moulder 1500 A2 varies between 8 to 30 strokes per minute.

Electric equipment

The equipment is housed in a built-on, stainless steel power cabinet and consists of a main circuit breaker, circuit breakers, motor starters, including protection, servo motor controllers, frequency inverters, control relays for heating elements and transformers for control voltage.

Control panel

All in-line functions, including servo drives, the filling equipment, automatic stick inserter and extractor with chocolate dipping and lay-off are controlled via the PLC from one central control panel hanging beside the machine, normally next to the extraction position. This panel consists of a touch screen panel that provide the security and reliability of the operation. Through the touch screen panel, operator can acknowledge the running condition of the machine, the prompt information and set recipe data for the individual products.

Extractor, dipping and lay-off device

Situated on top of the brine tank, the extractor and lay-off device pulls the moulded stick products out and dips them in the chocolate/coating compound. The device consists of an in-line chain conveyor with 50 extractor arms carrying individual extractor tongs for standard flat sticks. The tongs are made of stainless steel with a hard metal gripping knife. The indexing of the extractor arms is servo-driven for smooth motions and optimized dipping time.

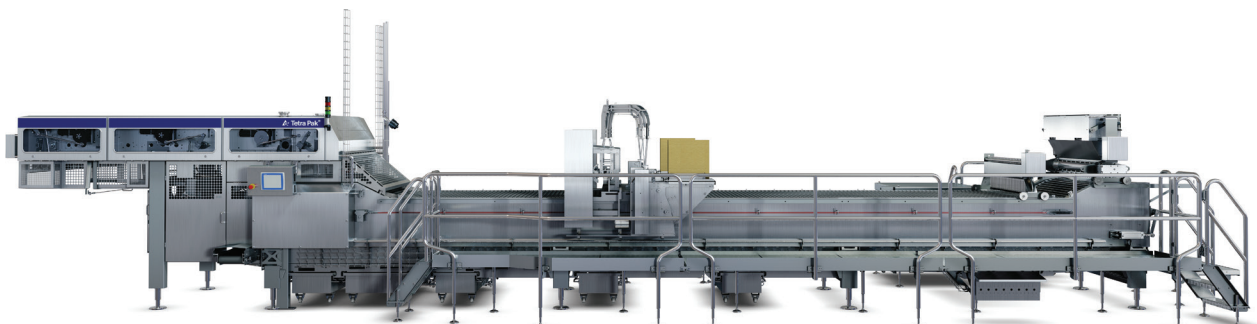
The down and up motion that extracts the stick products from the defrosted mould strip is also servo-driven. This enables optimized pull force and pull speed for each individual product. The down and up motion for dipping products into the chocolate/coating compound, as well as in the optional dry coating, is also servo-driven. The down position of the arm and tongs is adjusted in the panel and saved in the recipe for the actual product. When chocolate and/or dry coating is not desired, the down and up motion of the arms stops.

There are 10 strokes between the chocolate dip and lay-off to wrapping, for a drying time of 21 seconds at a speed of 28 strokes. If wrapping is not yet desired, products are pre-released just prior to individual lay-off corresponding to each wrap lane.

The positive two-position lay-off system is also servo-driven and the products are transferred to the wrapping machine lanes in the right position between cuts, with position and release timing. The lay-off arm with a gripper handles the stick product from the extractor tong and into the wrapping lane without touching the product surface. This type of positive two-position lay-off system matches the Tetra Pak® Multilane Wrapper 1500 A2.

Chocolate coating equipment

The chocolate coating equipment with a circulation pump is situated at the rear end of brine tank. It includes a dipping hopper for coating matter and/or chocolate. The outer tank is equipped with a water jacket for electric heating. The water temperature is controlled from the touch screen and the recipe set-up. The dipping level/coating height is controlled by the downward servo-control of the extracting arm. The chocolate/dipping matter circulation is performed by a separate chocolate tank with a circulation pump. We recommend the Tetra Pak® Pump Station Centrifugal M2, but other systems with the right capacity and pump selection for the right viscosity may also be used.



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Product specific equipment

General

All equipment is all placed on rails mounted on top of the brine tank. There are two sets of rails:

- 1) A short set at the beginning of the tank before moulds enter the brine zone – moulds are warm and equipment can be moved out over end for cleaning
- 2) The rest of the equipment including the stick inserter is placed after the moulds have entered the lower position in the brine tank

Water ice filler

The water ice filler is a device for filling liquid with good fluidity (like water) into pockets. It consists of a tank across the machine (e.g. lane 1 to lane 24) and individual filling heads – one per lane. The surface of the liquid in the container is auto-controlled by a fluid level controller to ensure the same quantity with each filling. The water ice products shall not have any ice crystals in the hopper. The typical basic equipment set-up consists of one filler for one-coloured water ice. Options with two, three or more colours are available.

Back suction unit

The back suction unit sucks liquid back from the moulds. It is used when running shell and core products or multi coloured water ice products. It consists of a frame where the suction pipes are located and a vacuum pump unit including a collection tank and a feeding pump. Moulds are not indexed when pipes are in the moulds. The typical basic equipment set-up consists of one back suction unit.

Volumetric ice cream filler

The ice cream filler is a device that fills ice cream into pockets. It consists of vertical dosing cylinders, a tank and filling heads – one per lane. The typical basic equipment set-up consists of one volumetric ice cream filler. Options with two colours are available, in either a side-by-side, concentric or a zebra pattern. Also available is option with movable inlet.

Other filling equipment

See the detailed specifications for information on other filling equipment, such as the pencil filler, combi-filler, volumetric bottom filler in separate materials.

Automatic stick inserter

The automatic stick inserter consists of an automatic sorting and dispensing section that takes the sticks directly from the box placed upside-down on the stick sorter and loads them onto the feeding belt. The feeding belt transports the sticks into position for each inserter unit, corresponding to the number of pockets on the mould slat. The insertion activation is pneumatic. Sticks in bulk pack boxes are loaded manually onto the stick sorter inlet when the unit indicates an empty box. The stick inserter is equipped with a back-up magazine that feeds sticks onto the opposite end of the feeding belt. This set-up enables the feeding belt to reverse when using the back-up magazine. This can be used to clear out a jam.

Options

- Additional down motion(s) for N2-dip and/or dry coating
- Additional extension of extractor for more coating matter drying time or space for additional dipping stations
- Level control for buffer tank
- Circulation system for dipping matter with inclusions, including agitator
- Dry stuff feeder for pump station
- One position lay-down, enabling no-product-no-wrap on the wrapping machine

Recommended basic set-up

- Independent filling unit for one-coloured water ice (required for water ice)
- Water ice suction unit (back suction unit for split ice)
- Volumetric top filling equipment for one-coloured ice cream
- Tetra Pak® Automatic Stick multi for inline A2 dispenser for bulk sticks in boxes
- Chocolate dipping hopper and tank with heated water jacket and circulation pump
- Positive, two-position product lay-off system to multi-lane wrapper

Capacity

The capacity for typical products (see tables) is normally in the range of 18,000 to 40,000 ice cream stick novelties per hour. The actual capacity depends upon a number of factors, including:

- Number of lanes (18, 20 or 24) depending on product width and colour combination
- Product thickness and product volume
- Mould shape
- Recipe (e.g. sugar types, content and total solids content) and overrun
- Viscosity of ice cream mix
- Ice cream/product filling temperature
- Brine temperature
- Number and types of filling operations
- Capacity of the wrapping and packing line

The capacity is based on an ice cream mix recipe using good quality ingredients as follows:

Fat	10.00%
Skimmed milk powder, fat free	11.15%
Sugar (sucrose)	12.00%
Glucose syrup	5.35%
Auxiliary ingredients	0.50%
Water	61.00%
Total	100%

Example based on:

- Water ice filling temperature + 5°C, 0% overrun
- Ice cream filling temperature -3°C, with 20% pre-frozen water, 40-60% overrun,
- Cooling conditions: -40°C brine temperature



	Basic/simple products	Thick products	Complex products	Product-in-product
Type	1 C - Ice cream or Water ice	Ice cream	5 C - Water ice	Ice cream and Water ice
Thickness	21,7 mm	35 mm	30 mm	(25,2) 33,2 mm
Volume	62 ml	110 ml	100 ml	(62,5) 84 ml
Bottleneck	Mechanical speed	Cooling	Time	Time
Speed	30 stroke/min	18,5 stroke/min	13,5 stroke/min	26,9 stroke/min
Capacity	43 200 products/h	26 640 products/h	19 467 products/h	19 366 products/h

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Optional equipment

Filling

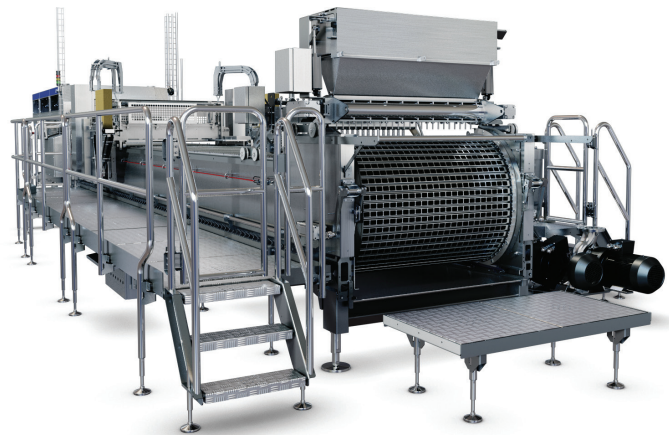
- Additional water ice filler(s)
- Additional water ice suction unit (back suction unit for split ice)
- Additional volumetric top filling equipment for one-coloured ice cream
- Additional parts for other stick sizes
- Additional mould cleaning tank with circulation pump and level control
- Additional mould cleaning tank with circulation pump and level control, and heated by steam
- Chocolate circulation system for dipping matter with inclusions such as chopped nuts
- Volumetric filling equipment for two-coloured ice cream in one strip
- Equipment for top filling two-coloured ice cream in the mould at one time, vertically divided
- Equipment for top filling two-coloured ice cream in the mould at one time, horizontally divided
- Equipment for top filling two-coloured ice cream in the mould at one time, concentrically divided
- Equipment for top filling two-coloured ice cream in the mould at one time, zebra pattern
- Equipment for top filling three-coloured ice cream in the mould at one time, rainbow pattern
- Tetra Pak® Combi Top Filler Adjustable, equipment for filling two-coloured ice cream in the mould at one time, e.g. slush ice or products with large inclusions
- Tetra Pak® Volumetric Bottom Filler for viscous product with large inclusions
- Pencil equipment for filling jam into the core of the ice cream
- Pencil equipment for filling two jam columns in different colours

Supply and coating

- Ripple and jam pump for pencil filler, including hopper and positive pump with adjustable speed
- Additional coating matter dipping station
- Dry coating equipment for coating the stick novelties with granulated ingredients such as nuts, candy, etc.

Brine/Cooling system

- Additional brine pump
- Heat exchanger for brine cooling/chilling
- Cold brine buffer tank
- Automatic controllable valves



Technical data

Electric motors

Mould strip indexing	2.9 kW (3.8 HP)
Extractor index servo	2.9 kW (3.8 HP)
Extraction of products	1.9 kW (2.5 HP)
Servo chocolate dip	1.9 kW (2.5 HP)
Lay-down servo	1.9 kW (2.5 HP)
Total electrical consumption	20 KW
Brine internal circulation	7.5 KW
Brine external circulation	11.0 KW
Optional: brine circulation pump	22.0 KW
Power voltage standard	3 x 400 V
Change of voltage	≤ 10 %
Typical operation load	180 Amps
Main circuit breaker	250 Amps
Recommended supply breaker	300 Amps

Heating elements

Warm water	Heated by steam
Optional	Electrical heating

Installed max effect

Steam	600 kg (792 lbs)/h
Steam pressure	6 ≥ P ≥ 0.5 bars
Optional – electrical heating	48 kW

Pipe connections

Inlet for brine	203.2 mm (8.0")
Outlet for brine	140 x 740 mm (5.5 x 29")
Inlet for steam	25.4 mm (1")
Inlet for water	25.4 mm (1")
Main inlet for air	25.4 mm (1")

Piping dimensions for ice cream are not less than the outlet of the continuous freezer.

Air consumption

Standard machine	1.0 m ³ /min
Working pressure	6.0 bars

Water consumption

Defrost and mould wash	2.0 m ³ /h*
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Brine quantity

Specific gravity	1.286/1
pH	8-9
Baume gravity	32

Brine flow required

	300-520 m ³ /h
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Max. refrigeration load at a cold brine temperature of -40°C/-40°F	365 500 kcal/425 kW
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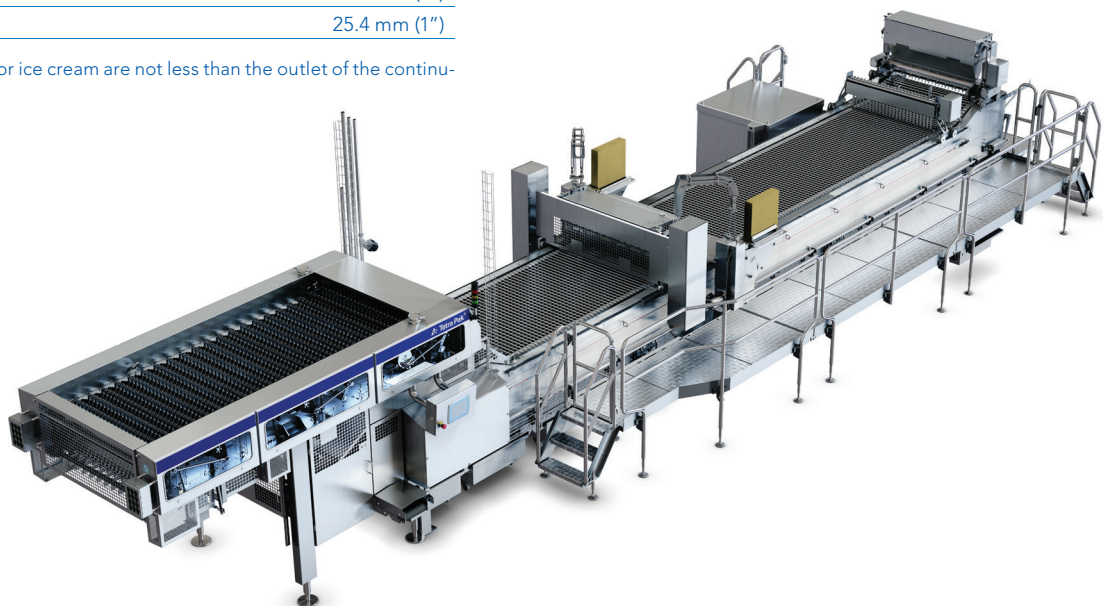
Shipping data

Net weight	14 000 kg/30 864 lbs
Gross weight	19 000 kg/41 887 lbs
In ready-to-work condition approx.	18 000 kg/39 682 lbs

Volume

	51 m ³ (11.4 m x 2.2 m x 2 m)
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* depending on capacity, mould size and shape, cleaning/flush process etc



Main dimensions

