Linde Gas

Instruction manual

cryogenic freezing tunnel

CRYOLINE MT

3. Construction and operation

3.1 Description of operation

1 product import
2 exhaust gas fan
3 fans
4 injection
5 product export

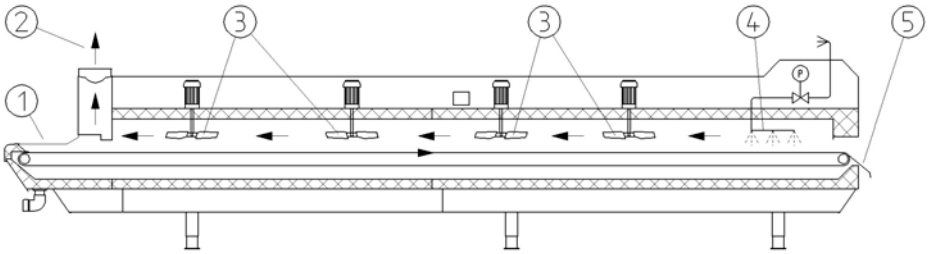

Fig. 3-1 CRYOLINE MT

The CRYOLINE MT is a continuous cryogenic tunnel freezer designed for hygiene and optimum cooling performance. The CRYOLINE MT is suitable for cooling and freezing food. For this purpose, the products are placed on the conveyor belt via a supply belt or manually, which transports them continuously through the freezer (fig. 3-1, 1).

In the freezer, the product to be cooled is treated with cold gas and finally with liquid nitrogen from - 196°C. An optimum heat transfer is achieved due to the counter-current principle. The very cold gas is created under the injection (4), under which the nitrogen on the product surface evaporates, expands and circulates around the product with the aid of fans (3). As a result, the cold gas is continuously moved towards the inlet, while extracting heat from the product. As soon as the gas reaches the inlet (1), it has lost its cooling effect and is discharged through the air outlet (2).
At the end of the freezer is the outlet (5) where the product is removed from the conveyor.

3.2 Description of the modules

3.2.1 Construction and insulation

Fig. 3-2, lifting device

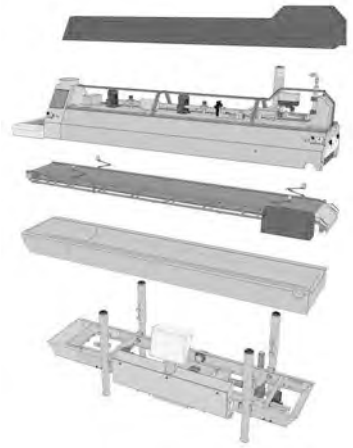

fig. 3-3, exploded view

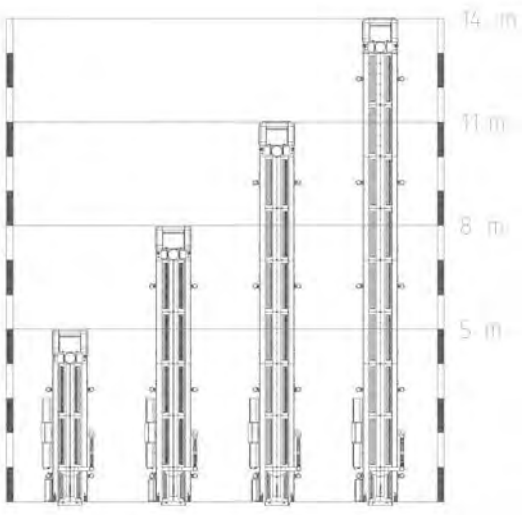

Fig. 3-4, modular construction

The freezing tunnel consists of two independent, isolated cell parts. This special construction makes it possible to fully open the tunnel for defrosting and cleaning after working hours. The upper part is raised electrically so that it can be cleaned.

The stainless steel base supports the entire construction, but mainly the legs and the lower part of the cell.
The movement elements for "opening" and "closing" the tunnel are located in the four legs (plus two extra per module) on which the freezing tunnel stands. The insulation consists of PS foam of at least 100 mm thickness, all metal sheets are made of stainless steel. The stainless steel plates are fully welded on the inside, allowing optimal hygienic conditions.

The connection between the top part and the bottom part has no seals and is designed as a smooth metal surface. This also enables optimal cleaning.

In the fully welded bottom part of the cell (also completely welded lengthwise), the bottom slopes towards the middle; in the middle there is a channel in which the water and any dirt residues collect during cleaning. This channel ends at a central water discharge point at the entrance.
The freezing tunnel has a modular construction, ie the freezing tunnel can be made longer by adding additional modules of 3 m in length between the basic module and the inlet.
This extension can be carried out on site. The module connections are completely welded on the inside for hygienic reasons.
Plastic liners have been fitted along the entire length of the freezing tunnel, which considerably simplify cleaning of the freezing tunnel.

3.2.2 Transport system with drive

Fig. 3-5, tire frame

The product is transported through the freezing tunnel on a stainless steel wire plate belt.
The conveyor system is driven by a worm gear motor with frequency-controlled speed control (vector control).
This drive ensures reliable, energy-saving and stepless speed control with minimum speed tolerance.
The easily removable guides (patent pending) for the stainless wire plate belt are made of low-temperature resistant and food-compatible plastic, with special attention to hygiene.

When the tunnel is opened, the conveyor belt rises from the bottom, so that it can be easily cleaned.

3.2.3 Coolant Supply and Injection

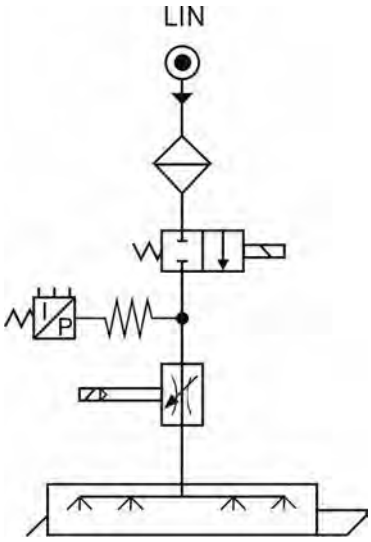

Fig. 3-6, LIN Fluid Chart

The machine is supplied with coolant via a central coolant connection through which the coolant is routed to the control valve.
For safety reasons, a solenoid valve and a filter are fitted in front of the control valve. The pressure is recorded electronically and can be evaluated.

The control valve is electro-pneumatically controlled.
The liquid nitrogen injection system, which can be adjusted in the direction of injection, serves to distribute the coolant in the freezing zone and, above all, to ensure a particularly efficient heat transfer.
Thanks to the adjustable injection direction, the LIN dosage can be adapted to any desired application.

3.2.4 Cold gas circulation

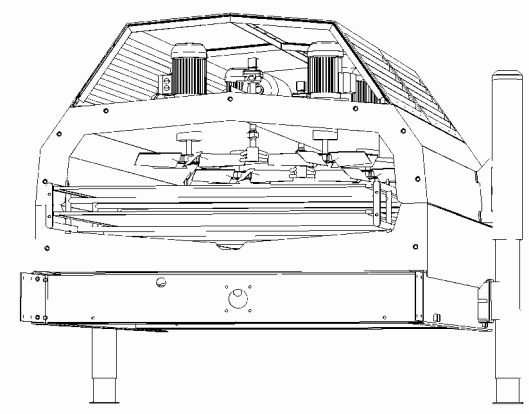

Fig. 3-7, placement of the fans

Special hygienic fans (patent pending) guarantee an optimal heat transfer to the product. These fans, specially developed for cryogenic freezing tunnels, cause minimal ice formation during the entire period of use thanks to the Linde patented defrost system (defrost system) and thus ensure continuous optimal operation.

The fan motors are located outside the cell in a housing that is protected against splash water and dirt.
The fans are installed in series (with the CRYOLINE MT 600) or in 2 series (with the CRYOLINE MT 1000 / 1250).
The fan power (speed) and therefore the heat transfer can be adjusted as desired with the aid of the frequency converter.
The drive of the frequency converter also allows use with limited power.
The fans of each module can be set individually.

3.2.5 Cold gas discharge

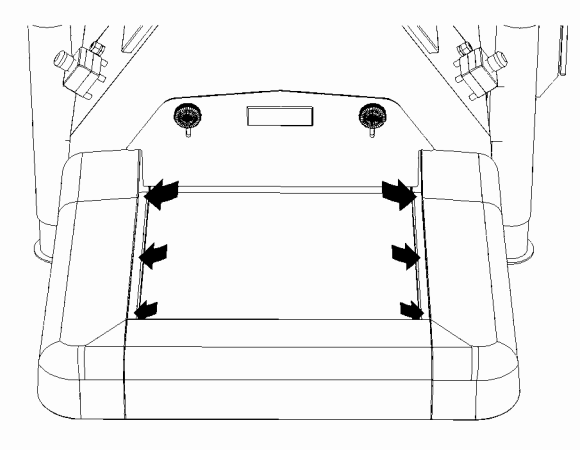

Fig. 3-8, exhaust air system

The cold gas outlet removes the gas expanded within the installation.
For this purpose, the expanding nitrogen is extracted through slots next to the belt at the product inlet.
The outlet shaft is constructed in such a way that no contamination by any backflowing condensation water can take place.
The extraction is easy to clean when the freezing tunnel is open.

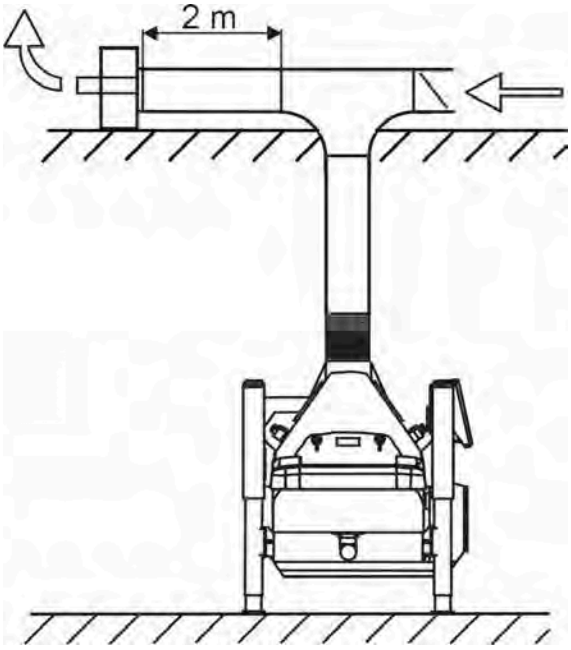

Fig. 3-9, exhaust gas fan

and leadership

A . installed on the freezing tunnel or in the pipeline (fig. 3-9) and guarded exhaust gas fan discharges the gas mixture through an additional pipeline to be installed. The end of the pipe is always outside the building.

The exhaust fan can be heated to prevent freezing.

The exhaust air power (engine speed) is fixed or regulated with a temperature controller.

When the exhaust gas fan
+ installed at the end of the pipe, additional warm air can be drawn in from an intermediate floor (fig. 3-9).

3.2.6 Control and regulation facilities

Fig. 3-10, touchscreen service

The operating states are controlled, regulated and monitored via a touchscreen PC.

The control cabinet contains modern control and regulation technology with PLC, frequency converter, digital connections and EMERGENCY OFF relay.

The PLC communicates with the other modules via Profibus DP.

All operating data such as temperature, freezing time and operating hours are displayed on the touchscreen (fig. 2-1, 4) and are saved.

The operator can request all data via the touchscreen (PC).

The touchscreen PC can transfer current and historical data online via LAN or modem.

The 5 digital connections (3 digital inputs, 2 digital outputs) are used, among other things, for connection of transfer facilities such as product supply.

All safety measures have been observed.

The control box and its components are insensitive to electromagnetic disturbances.

When all claddings are mounted and intact, the CRYOLINE MT has a complete protection class of IP 67.

If desired, the control unit (touch screen) can be set up at a distance from the freezing tunnel.

3.2.7 Safety features

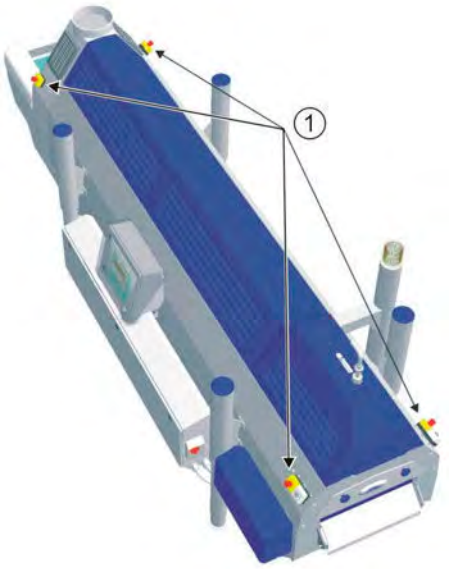

fig. 3-11, position of the EMERGENCY STOP SWITCHES

The safety features consist of:

- EMERGENCY STOP SWITCHES (4x) (fig. 3-11, 1), at the product entry and exit area (left and right). All EMERGENCY STOP SWITCHES are linked to an EMERGENCY STOP relay

- Electronic monitoring devices protect the installation from

  + overload

and

  + undershoot of the permissible operating temperature

REMARK

When one of the safety devices is activated, the installation is immediately switched off.

4. Technical data / machine identification

4.1 Machine drawing

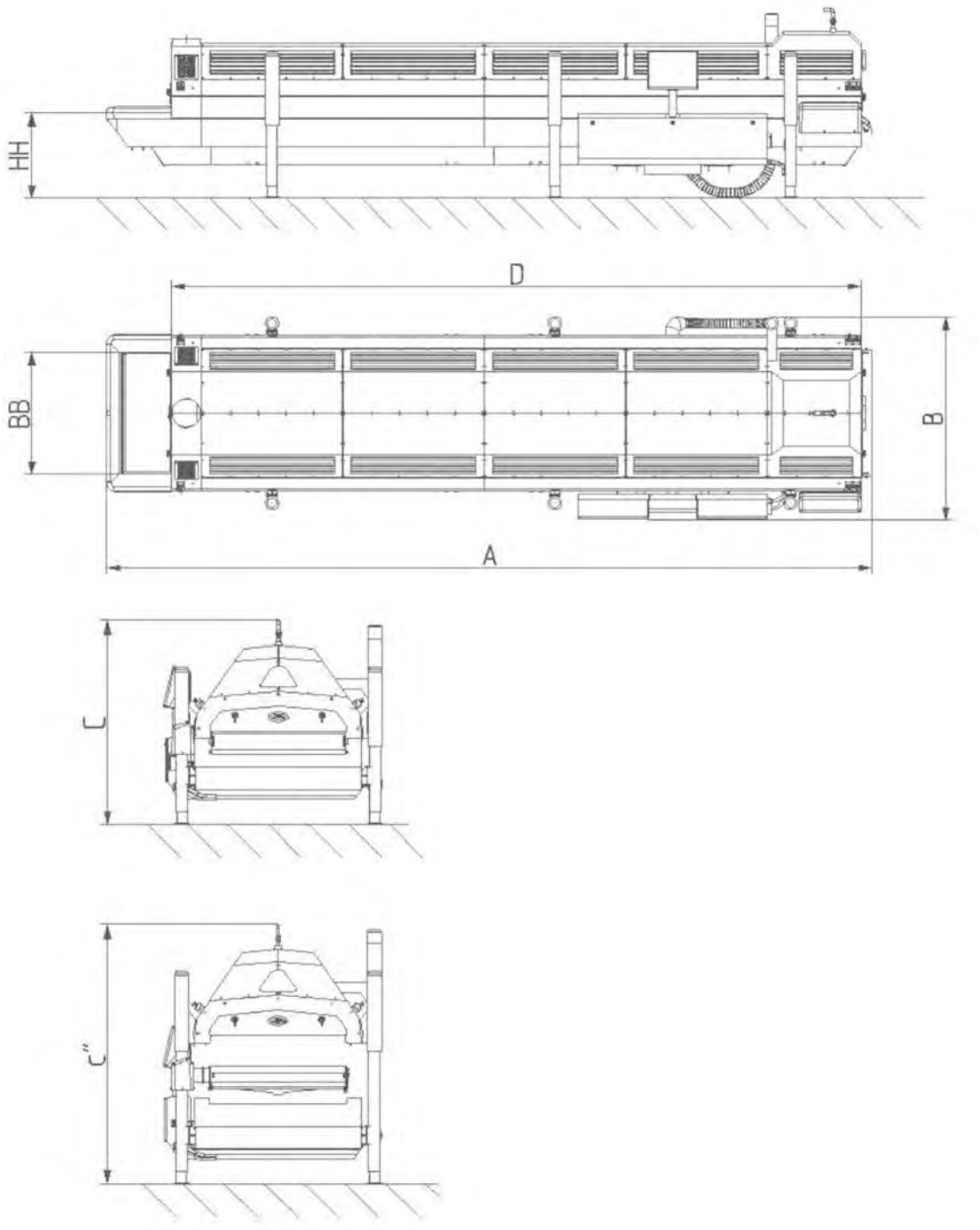

Fig. 4-1, machine drawing

Dimensions see table below

4.4 Technical data (1250 series)

Description	A-heid				
type		MT1250-5	MT1250-8	MT1250-11	MT1250-14
construction method		freezing tunnel with wire conveyor belt			
input, output		front side and opposite side			
number of modules		0	1	2	3
length (size A)	m	5.13	8.13	11.13	14.13
height closed (size C)	m	2.1			
height open (size C")	m	2.65			
width (size B)	m	2.17			
opening height	mm	550			
useful band length (D)	m	4.3	7.3	10.3	13.3
useful bandwidth (size BB)	mm	1250			
useful freezing surface	m^2	5.38	9.13	12.88	16.63
tire height at product import and -output (size HH)	mm	900 ± 100			
max. product height	mm	100			
electric power	kW	6	9	12	15
connected load	kVA				
electric connection		380 - 500V /32A			380 - 500V /63A
weight	t	2.0	3.0	4.0	5.0
exhaust pipe	mm	300			
residence time	min	1 - 20	1 - 35	1.5 - 50	2 - 60
belt speed	m/min	0.2 - 7			
compressed air consumption	nm^3/h	1	2	3	4
number of fans	pieces	4	8	12	16
size fan, angle 45°	mm	500			
number of legs	pieces	4	6	8	10
refrigerant connection		LINK 1"			
freezing capacity		product dependent			
noise level			≤ 78db (A)		
performance		complete VA with plastic covers			