

We hope that the information contained in this manual will be helpful. It is based on data and is correct to the best of our knowledge.

Read the contents of the manual carefully, including the recommendations and suggestions. Also read the sales conditions, including those that limit the warranty. No part of this manual may be reproduced or passed on to third parties without advance permission in writing from Tetra Pak Hoyer S.p.A.

Plant HOYER PROMIX 600 - 1200- 2000 HTST

Serial no.



Tetra Pak Hoyer A/S
Soeren Nymarks Vej, 13
DK 8270 Hoejbjerg
Denmark
Telephone + 45 89 393939
Telefax + 45 86 292200
Telex 68770 Alhoy DK

Tetra Pak Hoyer Inc.
7711 95th Street
P.O. Box 0902
Pleasant Prairie, WI 53158-092
U.S.A.
Telephone + 414 9479100
Telefax + 414 9479190

Tetra Pak Hoyer S.p.A.
Via Monferrato, 52
20098 San Giuliano Milanese (Milano)
Italy
Telephone +39 2 98292.1
Telefax +39 2 9880171

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2 General

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HOYER PROMIX HTST

1 - MACHINE IDENTIFICATION DATA

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1.1 Introduction

Thank you for choosing a machine manufactured by Tetra Pak Hoyer S.p.A. We recommend you to read this manual carefully as it is indispensable for the installation, checking and maintenance operations required to keep your machine in perfect working order.


We will be pleased to receive your suggestions should you find that any explanation has been omitted or is not exhaustive. We will take them into the greatest consideration in an effort to improve the manual.


1.2 Identification plate

For maintenance and overhaul operations not covered by this manual and for all technical problems, our Service Department is at your complete disposal to provide information and to coordinate the necessary action.

When calling our Service Department, please quote the data shown on the identification plate affixed to the machine and shown in Fig. 1.1.

MODEL	<input type="text"/>
SERIAL N.:	<input type="text"/>
YEAR OF CONSTRUCTION:	<input type="text"/>
ELECTRICAL SUPPLY:	<input type="text"/> V
	<input type="text"/> kW
	<input type="text"/> ph <input type="text"/> Hz
PNEUMATIC SUPPLY:	<input type="text"/> bar <input type="text"/> Nlt./min.
REFRIGERANT:	<input type="text"/> Type <input type="text"/> Kg.
HEATING GAS:	<input type="text"/>
THERMAL CAPACITY:	<input type="text"/> Kcal/h


Tetra Pak
Hoyer
 Via Monferrato, 52 - 20098 San Giuliano Milanese
 (MI) Italia - Tel. 02-982921 - Fax 02-9880171



Made in Italy

Fig. 1.1 - Identification plate

1.3 Services Centres

For any need or problem requiring our help, please contact one of the following centres authorised to carry out technical assistance under warranty or maintenance to machines manufactured by Tetra Pak Hoyer S.p.A.

EUROPE and MIDDLE EAST

Tetra Pak Hoyer A/S
Soeren Nymarks Vej 13
DK-8270 Hoejbjerg
Denmark
Phone: +45 89 39 39 39
Fax: +45 86 29 22 00
Tlx: 6 87 70 alhoy dk

Tetra Pak Hoyer S.p.A.
Via Monferrato, 52
I- 20098 San Giuliano Milanese
(Milan)
Italy
Phone: + 39 2 98 29 21
Fax: + 39 2 98 80 171

Tetra Pak Hoyer France
c/o Tetra Laval Service SARL
R.C.S. Versailles B403 276 223
P.O. Box 56
F-78340 Les Clayes-Sous-Bois
France
Phone: +33 1 30818184
Fax: +33 1 30818120

NORTH AMERICA:

Tetra Pak Hoyer Inc.
7711 95th Street
P.O. Box 0902
Pleasant Prairie, WI 53158-0902
USA
Phone: +1 414 947 9100
Fax: +1 414 947 9190

SOUTH AMERICA:

**Tetra Pak Hoyer Industria e
Comércio Ltda.**
Rua Napoleao de Barros, 1038
Cep04024-003 Sao Paulo-SP
Brazil
Phone: +55 11 573 9422
Fax: +55 11 549 5420

ASIA/PACIFIC:

Tetra Pak Hoyer Shanghai
Shanghai Overseas Chinese
Mansion
Room 2105-2107
No. 129, Yan'an Xi Lu
200040 Shanghai
P.R. China
Phone: +86 21 6249 0860
Fax: +86 21 6249 9064

Tetra Pak Hoyer Service
3rd Floor, Molace Building
2231 Pasong Tamo Street
Makati, Metro Manila
Philippines
Phone: +63 2 8132848
Fax: +63 2 8132866

SOUTH KOREA:

Hoyer Ltd.
4fl. Dookyong Bldg.
66-1/9 Hannam-Dong
Yong San-Ku
140-210 Seoul
South Korea
Phone: +82 2 796 0362
Fax: +82 2 796 0365

THAILAND:

Tetra Pak Hoyer (Thai) Ltd.
1042 Soi Poosin, Sukhumvit Soi
66/1
Bangchak, Prakanong
Thailand
Phone: +66 2 3611680
Fax: +66 2 3612310

C.I.S.:

Tetra Pak Hoyer A/O
4th Rostovsky peureulok
Dom 1, stroenie 1
R-11921 Moscow
C.I.S.
Phone: +7 502 2242160
Fax: +7 502 2242162

HOYER PROMIX HTST

2 - GENERAL

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2.1 Declaration of conformity

The machine has been manufactured in accordance with international standards and hygiene and sanitary legislation applicable to food machinery. In particular Tetra Pak Hoyer certifies, through the Declaration of Conformity supplied with the machine,

that the **PROMIX HTST** is designed and manufactured in accordance with the provisions of Directive 89/392/EC (Machinery Directive) and with the abovementioned standards.

2.2 Preliminary observations



- The illustrations and drawings of the machine are intended purely for general reference and are not necessarily accurate in every detail;
- The machine dimensions and specifications given in this manual are not binding and may be changed without advance warning;
- The drawings and all other documents provided with this machine remain the property of Tetra Pak Hoyer S.p.A. and may not be passed on to third parties without written authorisation from Tetra Pak Hoyer S.p.A..
- The manual includes instructions covering all accessories mounted on the standard machine.
- **The machine is covered by warranty as specified in the purchase contract. During the warranty period, any repair work not authorised by Tetra Pak Hoyer S.p.A. will automatically invalidate the warranty.**

2.3 General Safety precautions



- These safety precautions have been drawn up in your interests. Follow the guidelines strictly in order to reduce the risk of accident both to you and to others.
- Do not attempt to move, install or operate the machine without having read and understood this manual.
If in doubt, ask your superior;
- Ensure that all guards and safety covers are in position BEFORE starting the machine.
- NEVER leave tools, mechanical parts or other extraneous material on or inside the machine;
- Press the emergency button in the event of a product blockage.
- NEVER PUT YOUR HANDS INSIDE THE MACHINE WHILE IT IS RUNNING;
- Take great care even when the main switch is in the “OFF” position, since the power supply cables are still live;
- Turn off the air supply before disconnecting any pneumatic part of the machine;
- Make sure that all guards and protective covers are correctly installed BEFORE restarting the production cycle after maintenance or repair operations;
- always work with the greatest care and remember that you are responsible for your own safety and for that of your colleagues;
- when moving or lifting the machine, ensure that relevant standard for these operations are followed.

2.4 Special warnings



- All personnel operating the machine must be familiar with the general safety rules and must observe them strictly. Failure to follow these rules may result in personal injury or damage to machine components.
- Maintenance work must be performed with the machine turned off. The main switch must be in the OFF position, the air valve closed and a “work in progress” sign affixed to the machine.
- The user must make sure that all the instructions given in this manual are strictly observed.
- Users will be solely responsible for risks caused by tampering with the safety system.
- The safety of other plant used together with this machine, unless supplied directly by Tetra Pak Hoyer, is the responsibility of the customer.
- The pressure, speed, temperature and voltage limits and all instructions given are indispensable for the correct operation of the machine and must always be complied with by the customer.
- Ambient conditions must be taken into consideration during installation.
- National legislation governing this type of machine must also be observed.

2.5 Ambient operating limits

The machine is able to operate within the following ambient limits:

- Temperature: from 4°C to 40°C
- Humidity : from 20% to 95%.

 **NOTE:**

Our company will accept no responsibility for damage or injury caused by failure to comply with the above warnings.

HOYER PROMIX HTST

3 - DESCRIPTION OF THE MACHINE AND TECHNICAL SPECIFICATIONS

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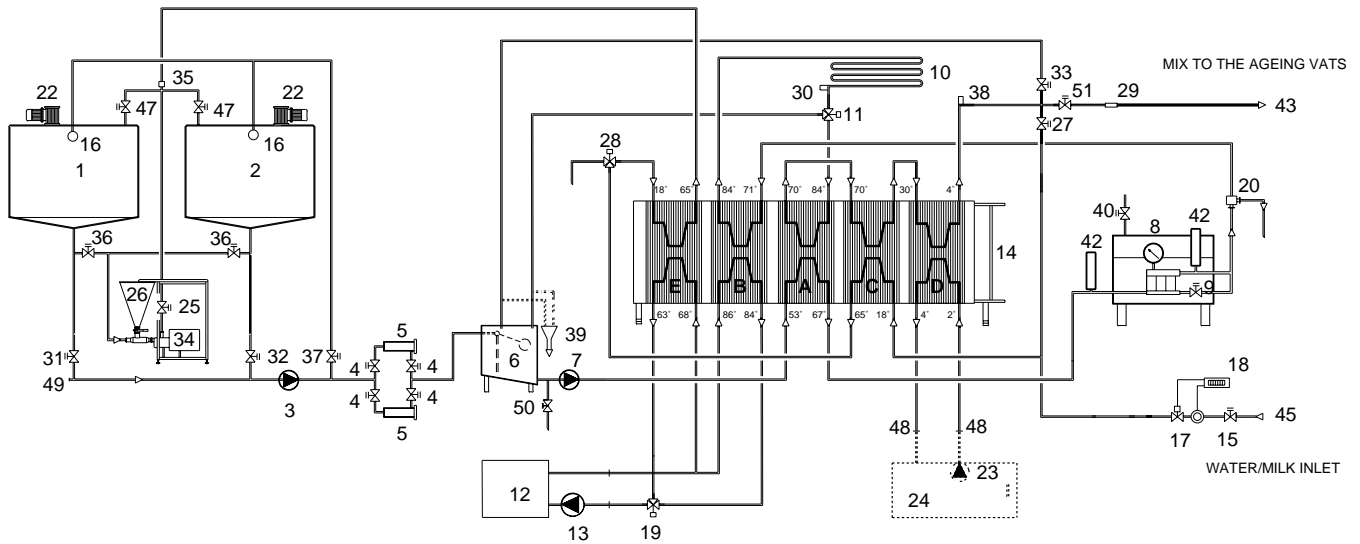


Fig. 3.1

- | | | | |
|-----------|---|-----------|--------------------------------------|
| 1 | Mixing tank no. 1 | 23 | Chilled water pump |
| 2 | Mixing tank no. 2 | 24 | Chilled water tank |
| 3 | Mix pump | 25 | Adjusting valve of the powder feeder |
| 4 | By-pass of the mix filter; manual valve | 26 | Powder feeder |
| 5 | Mix filter | 27 | By-pass for CIP, manual valve |
| 6 | Balance tank | 28 | Overflow pneumatic valve |
| 7 | Mix pump | 29 | Sight glass |
| 8 | Homogenizer | 30 | Pasteurizing temperature sensor |
| 9 | By-pass of the homogenizer; pneumatic valve | 31 | Mix outlet manual valve; tank no. 1 |
| 10 | Holding pipe | 32 | Mix outlet manual valve; tank no. 2 |
| 11 | By-pass of the hot mix; pneumatic valve | 33 | Recirculation manual valve for CIP |
| 12 | Steam heater or boiler | 34 | Powder feeder pump |
| 13 | Hot water pump | 35 | No return valve |
| 14 | <u>Plate heat exchanger</u> | 36 | Mixing valve; manual |
| | A: Mix heating to homogenize | 37 | Tank washing valve; manual |
| | B: Pasteurizing | 38 | Mix outlet temperature sensor |
| | C: First cooling | 39 | Manual discharge for CIP |
| | D: Final cooling | 40 | Compressed air tap |
| | E: First heating of water/milk from cold condition | 42 | Pressure damper |
| 15 | Water/milk inlet manual valve | 43 | Mix outlet |
| 16 | Washing spray balls | 45 | Water/milk inlet |
| 17 | Litre counter automatic valve | 47 | Water/milk inlet into the tanks |
| 18 | Litre counter | 48 | Connections for chilled water |
| 19 | Hot water solenoid valve | 49 | Plug |
| 20 | Pressure relief valve | 50 | Balance tank discharge tap |
| 22 | Stirrer | 51 | Mix outlet valve |

3.1 Description of the plant

HOYER PROMIX HTST is a plant for the continuous production of ice-cream mix. The plant is supplied factory tested with all the equipment fully assembled and the electrical and water systems connected. The plant is therefore ready for immediate use and needs only to be connected to the electricity, steam (gas), water, chilled water and compressed air supplies.

The components are mounted on two independent frames, one of which houses the boiler, enabling it to be located in a different room to the rest of the plant.

The main support frame houses the following equipment:

- two heat insulated mixing tanks with stirrers, each having a capacity equal to the hourly capacity of the plant. The liquid components are poured directly into the tanks, while the solid ingredients are added by a powder feeder. The alternate use of the two tanks ensures a continuous production process.
- an intermediate balance tank of capacity 100 litres, with mix inlet controlled by a float valve. This tanks allows the mix to be recirculated locally without interfering with the mix in the two main tanks, thus proving useful during washing.
- centrifugal pump for transferring the mix to the above mentioned balance tank. There are two filters mounted on the delivery line between the pump and the tank. The filters are equipped with a bypass to enable them to be washed without interrupting production.
- centrifugal pump for transferring the mix from the balancing tank to the first section of the heat exchanger and to the homogenizer. The function of the pump is to correctly feed the homogenizer.
- plate heat exchanger with five distinct sections:
 - preheating of the mix from the vat up to the ideal homogenizing temperature. The heating fluid is the already pasteurized mix which needs to be cooled. This section therefore acts as a heat recovery unit.
 - homogenized mix pasteurizing section. The heating fluid is water from the boiler (see later).
 - mix cooling using water or milk which prepares the mix for the next section.
- This section also acts as a heat recovery unit, in that the mix being cooled supplies the heat necessary for heating the water or milk from ambient or storage temperature to the correct temperature required to completely dissolving the solids and to liquefy the fats.
- final cooling to bring the temperature of the mix down to its ageing temperature of 4°C. The cooling fluid is chilled water (max. 2°C) which must be supplied from a suitable tank not included in the supply.
- heating of water or milk when the plant is cold. Under this condition, the above heat recovery section is not active. Therefore, the water or milk is heated by the hot water from the boiler to the temperature at which the ingredients dissolve.
- holding pipe, sized to retain the mix for a period of 25 seconds. In this way, the start of mix cooling is delayed in order that the pasteurizing can be completed.
- pasteurizing temperature control unit, with flow deviation valve, an audible alarm and continuous recording of the temperature on paper.
- homogenizer with a continuous operating pressure of up to 250 bar. In the larger plants, it is anchored to the frame and mounted directly on the floor.
- water or milk litre counter which may be set at an instantaneous rate of flow or a total quantity required for a recipe or for washing.
- centralised electric control cabinet for controlling all equipment and displaying temperatures.

The separate smaller frame housing the steam heated hot water boiler includes:

- brazed plate water/steam heat exchanger with condensate drain.
- automatic water temperature controller which acts directly on the steam feed.
- shut-off valve and steam bypass
- hot water circulation pump
- hot water expansion tank with breather, feed reducer and safety valve.

In order to operate, HOYER PROMIX HTST must be connected to the following supplies:

- a. ELECTRICAL POWER SUPPLY
- b. MAINS WATER, needed for:
 - making up the percentage of liquid in the mix when milk is not used;
 - filling the boiler circuit;
 - washing the plant;
 - cooling the homogenizer pistons.
- c. STEAM or combustible gas to heat the water required in the second or fifth section of the plate heat exchanger.
- d. CHILLED WATER, required to complete the cooling of the mix in the fourth section of the plate heat exchanger.
- e. COMPRESSED AIR for the homogenizer and pneumatic valves.

3.2 Functional description

The operating cycle of the HOYER PROMIX HTST pasteurizing plant is described below and refers to figure 3.1.

The liquid component (water or milk) is fed automatically into the mixing tanks, while the solid ingredients are added separately by means of a powder feeder. The two tanks guarantee continuous production of the mix, in that while the mix in one tank is being pasteurized, the other mix is being prepared in the empty tank. As soon as the first tank is empty, its outlet valve closes automatically (*Pos. 31 or 32*) and the valve on the other tank (*Pos. 32 or 31*), in which the new mix has been prepared, opens and the new pasteurizing cycle is started.

When the plant is first started-up from cold, the process water or milk is heated to the mixing temperature (65°C) by passing it through one of the heat exchanger sections (*Section E*), through which hot water produced by the boiler flows in the opposite direction. In subsequent cycles, Section E is inactive, in that the heat is recovered from the mix being cooled (see later).

The hot water or milk enters one of the two tanks where it is mixed with the solid ingredients which have been added by the powder feeder (*Pos. 26*). The dissolving of the solids causes a reduction in the initial temperature in the tank to produce a mix of around 53°C.

A centrifugal pump (*Pos. 3*) transfers the mix from the mixing tank to the balance tank (*Pos. 6*), from where it is pumped by another centrifugal pump (*Pos. 7*) to the preheating section (*Section A*). Here, the mix is heated to the homogenizing temperature (67°C) and then homogenized in the homogeniser (*Pos. 8*) at a pressure of 150 - 250 bar. The pressure can be varied by means of a pressure regulator.

A good homogenizing process is important for the consistency and quality of the finished ice-cream. During homogenization, the fats contained in the mix are broken down into minute particles and are uniformly distributed throughout the product.

After homogenizing, the mix enters the pasteurizing section (*Section B*) where it is heated to a temperature of 84°C. The mix will remain at this temperature for the time it takes to pass through a "holding pipe" (*Pos. 10*). This time, which is required to complete the pasteurizing process, is 25 seconds. The pasteurizing temperature is read by a sensor (*Pos. 30*) located at the outlet of the holding pipe and recorded by an electronic printer mounted on the control panel.

If the temperature of the mix is lower than 84°C, the mix is returned to the balance tank (*Pos. 6*) through a 3-way pneumatic valve (*Pos. 11*) in order to repeat the pasteurizing process; the operator is warned of this process by a luminous signal above the control panel. If the temperature is correct, the mix is sent to the cooling sections of the heat exchanger.

Cooling takes place in three stages:

In the first stage (*Section A*), the mix is cooled from 84°C to 70°C, transferring heat to the mix entering the preheating stage prior to homogenizing (see above).

In the second cooling stage (*Section B*), the temperature falls to around 30°C (or less in the case of milk). The cooling agent in this stage is water or milk, on its way to the mixing tank for the preparation of the mix for the next cycle, which must be heated to 65°C in order to dissolve the ingredients.

Therefore, both of these sections recover heat from the high temperature mix which needs to be cooled to heat the tepid mixture prior to homogenizing and to heat the cold water or milk to place in the tank. This system reduces energy consumption during heating and final cooling of the mix to a minimum.

In the final cooling, the mix, which has already been cooled as much as possible by the water or milk available, is cooled even further to 4°C in the last part of the heat exchanger (*Section D*). The cooling agent in this phase is chilled water from a chilling unit (*Pos. 24*) which is supplied separately on request.

Finally, the mix arrives at the outlet fitting to the ageing vats (*Pos. 43*), where a sensor (*Pos. 38*) measures and records the temperature.

The plant is equipped with a water boiler (*Pos. 12*) and pump (*Pos. 13*) to satisfy demands for heat in sections “B” and “E” described above.

 **NOTE:**

The temperature values indicated at the various heat exchanger sections (Fig. 3.1) are the temperatures relative to a mix of 40% solid ingredients with fats placed in the mixing vats in a liquid state and process water at 18°C.

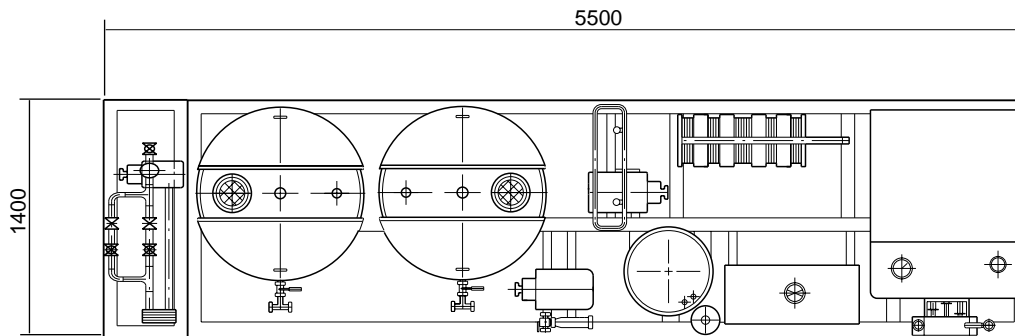
The heat exchanger has also been designed to operate correctly with:

- fats added in their solid state (introduced in small pieces in order not to deform the blades of the mixer):
- process water with temperatures up to 30°C;
- milk at 4°C.

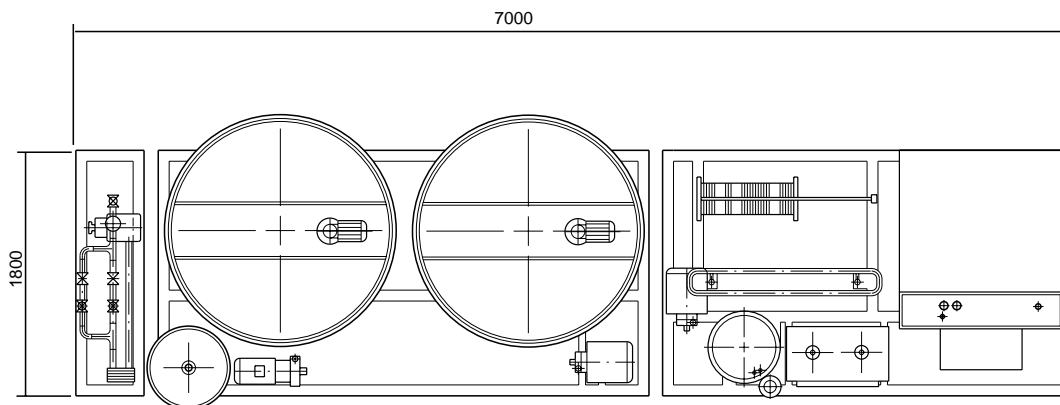
In these cases, the intermediate temperatures will have different balancing values to those described above, while still maintaining values of +84°C for pasteurizing and +4°C for sending to the ageing vats.

3.3 Technical data

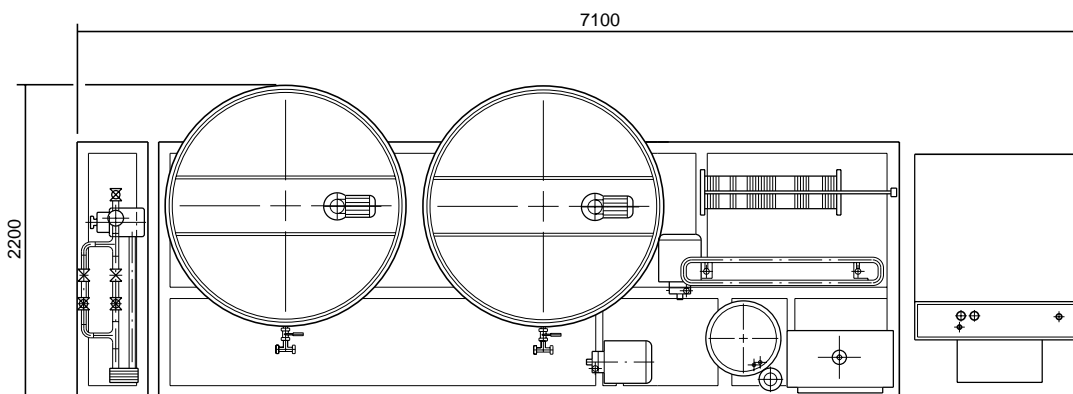
HOYER PROMIX HTST	600	1200	2000	
Net weight (model with steam unit)	1700	2300	2700	Kg.



Hoyer Promix 600 HTST - Fig. 3.2



Hoyer Promix 1200 HTST - Fig. 3.3



Hoyer Promix 2000 HTST - Fig. 3.4

3.3.1 Reference mix

Water	60-68%
Total solids	32-40%
Sugars	15-21%
Fats	8-12%
Non-fat milk solids	8-12%
Other solids	1-5%

NOTE:

The maximum working pressure of the heat exchanger is 6 bar. Consequently, do not use stabilisers such as potato flour which create excessive viscosity at low temperatures.

3.3.2 Services

Hoyer PROMIX HTST	Unit	600	1200	2000	NOTES
Mix: - Outlet fitting to the ageing vats:	clamp	1"	1"	1½"	
Mix preparation (60% liquid): - Water/milk inlet connection: - Water flow (*): - Milk flow: - Minimum inlet pressure:	clamp lt/hr lt/hr bar	¾" 425 392 1.5	¾" 855 785 1.5	¾" 1425 1308 1.5	(*) Drain or recover the excess hot water at 65°C.
Heating capacities: Pasteurization - Heating capacity during the cycle: - Hot water inlet temperature (**): First heating from cold condition. - Heating capacity at start-up while using (*): - H ₂ O 18°C: - H ₂ O 30°C: - Milk 4°C: - Hot water inlet temperature (**):	kW °C kW kW kW °C	11 86 22 16 26 68	22 86 44 32 53 68	37 86 73 53 88 68	(*) The heating time is 55 minutes if water is being used in the mix recipe; in case of use of milk the heating time is 60 minutes. (**) These temperatures are set automatically by the control system.
Heating by steam (standard version): - Inlet connection (flange DIN 2673): - Maximum steam consumption (*): - Minimum inlet pressure (gauge): - Maximum inlet pressure (gauge): - Condensate drain connection: - Water connection:	DN Kg/hr bar bar ½" ½"	15 50 1 5 ½" ½"	15 90 1 5 ½" ½"	15 150 2 5 ½" ½"	(*) Saturated steam at 1 bar gauge for the first heating from cold condition of milk at 4°C (worst case).
Heating by natural gas CH₄ (*) (on request): - Inlet gas connection: - Maximum consumption (**): - Minimum inlet pressure: - Exhaust diameter to the chimney: - Water connection:	 m3/hr mbar mm ½"	 3 20 180 ½"	 6 20 200 ½"	 9 20 250 ½"	(*) The boiler can run with other gases. Refer to the boiler manual. (**) First heating from cold condition of milk at 4°C (worst case).
Cooling by chilled water : - Inlet and outlet connections: - Maximum inlet temperature : - Requested water flow: - Pressure drop: - Maximum cooling capacity : - Approx outlet temperature (*): - Recommended TPHoyer chilled water tank:	 °C lt/hr bar kW °C kW	 2 7300 0.4 26 5 11	 2 12700 0.5 44 5 22	 2 20300 0.6 71 5 30	(*) Depending on the temperature of the inlet water or milk which is being used in the recipe of the mix.
Electrical data (400/3/50) (*): - Total installed power : - Homogenizer main motor cooling fan oil pump - Mix pump nr 3 - Mix pump nr 7 - Stirrer (each) - Hot water pump - Powder feeder - Controls	kW kW kW kW kW kW kW kW kW	15.9 7.5 0.10 --- 2.2 2.2 0.37 0.37 2.2 0.6	19.4 11 0.10 --- 2.2 2.2 0.37 0.37 2.2 0.6	27.6 18.5 0.10 0.37 2.2 2.2 0.55 0.37 2.2 0.6	(*) Other mains voltages are available on request.
Compressed air - Inlet connection: - Air consumption: - Minimum inlet pressure: - Maximum inlet pressure:	 Nl/min bar bar	 80 5 8	 100 5 8	 150 5 8	
Tap water to the homogenizer - Inlet connection: - Water consumption:	 lt/h	 100	 100	 100	

3.4 Control panel

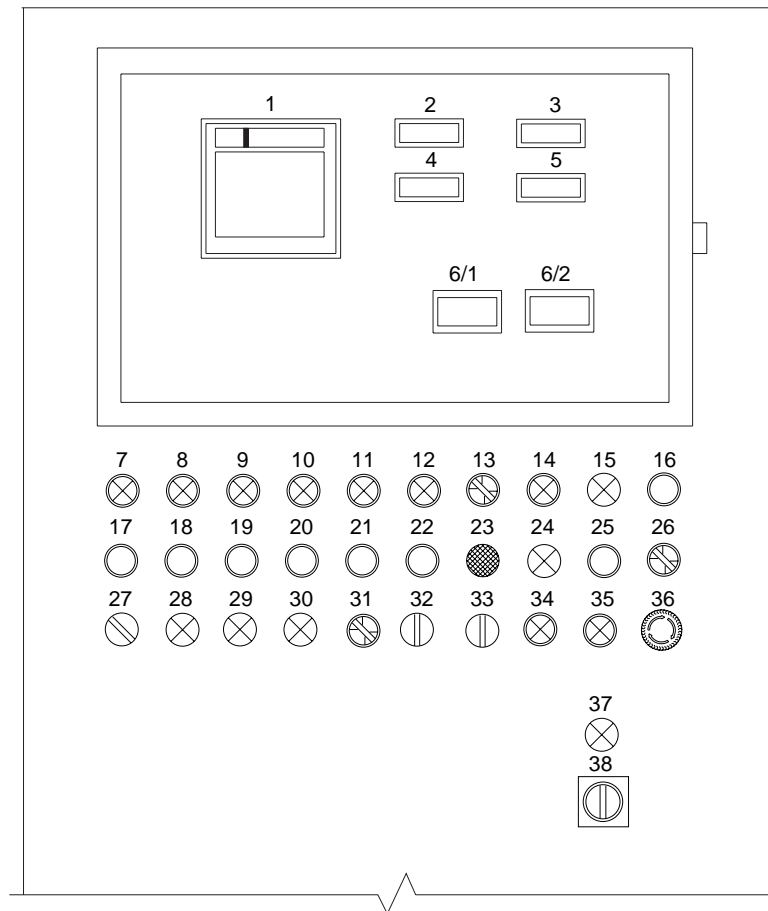


Fig. 3.5

- | | | | |
|------------|---------------------------------|-----------|---|
| 1 | Temperature recorder | 20 | Feeding pump - stop |
| 2 | Tank no. 1 temperature | 21 | Circulation pump - stop |
| 3 | Hot water temperature | 22 | Homogenizer - stop |
| 4 | Tank no. 2 temperature | 23 | Not used |
| 5 | Pasteurizing temperature | 24 | Homogenizer - no oil
(Promix 2000 HTST only) |
| 6/1 | Rate of flow measurement device | 25 | Powder feeder - stop |
| 6/2 | Litre counter | 26 | Alarm - setting |
| 7 | Hot water pump - start | 27 | Heating OFF / ON |
| 8 | Stirrer 1 - start | 28 | Tank no. 1 - open cover |
| 9 | Stirrer 2 - start | 29 | Tank no. 2 - open cover |
| 10 | Feeding pump - start | 30 | Overload |
| 11 | Circulation pump - start | 31 | First heating OFF / ON |
| 12 | Homogenizer - start | 32 | Flow deviation
MAN / AUTO / BYPASS |
| 13 | Homogenizer - 1st stage air | 33 | Production – end of production – CIP |
| 14 | Homogenizer - no water | 34 | Low air pressure |
| 15 | Powder feeder - start | 35 | Reset |
| 16 | Litre counter - start/stop | 36 | Emergency stop |
| 17 | Hot water pump - stop | 37 | Power supply ON |
| 18 | Stirrer 1 - stop | 38 | Main switch |
| 19 | Stirrer 2 - stop | | |

HOYER PROMIX HTST

4 - INSTALLATION

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4.6	Connection to plants with gas-fired boilers	3
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4.1 Unpacking and delivery checks

The simplest way to handle the **HOYER MIXTURA HTST** crate is to use a pallet truck or a lift truck. The crate must be unloaded as close as possible to the place of installation.

When the crate has been positioned correctly, unpack as follows:

- a. Unnail the upper lid and remove it. Do the same with the side panels. Pay particular attention to the wooden spacer blocks located between the sides of the crate.
- b. Remove the spare parts box and the other components.
- c. Unnail the wooden blocks that hold the machine in place during transport and remove the cellophane sheet.
- d. Check that the contents of the crate correspond to the description given in the shipping documents.
- e. Check that all the covers and panels have been correctly fitted and that there are no loose parts.
- f. Inspect visually all the electrical components to check that they are not damaged.
- g. If any part/component is missing, stop unpacking and immediately notify Tetra Pak Hoyer.
- h. If the machine has been damaged during transport, notify the Insurance Company immediately.

Do not proceed beyond unpacking until you are authorised to do so by the Insurance Company.

4.2 Transport and installation

When the unpacking and delivery checks have been completed, place the plant in its working position. Level the frame by adjusting the feet.

4.3 Electrical connection

Check that the local electricity supply corresponds to the data on the machine's identification plate.

Connect the electricity supply to the electric panel.

Check that the motors rotate in the direction indicated by the arrows, especially on the homogenizer.

4.4 Pneumatic connection

Connect the compressed air supply (minimum pressure 5 bar) to the compressed air inlet connection on the plant.

4.5 Water connection

The mains water must be connected to the homogenizer and the water boiler.

Homogenizer connection:

- connect the mains water to the appropriately marked connection on the homogenizer.
The cooling water drain outlet must be connected to a pipe which in turn is connected to the drainage system. The water is not re-used.

Hot water boiler connection:

- The connection to the mains is necessary for plant operation, regardless of the type of water heater installed.
The connection is made to the appropriate connection point on the boiler mounting frame. A manual shut-off valve is fitted downstream of the connection.

If the mix recipe requires the use of water, connect the process water system:

- a process liquid connection is provided behind the heat exchanger for liquid which passes through the recovery section before being sent to the pasteurizing vat.

A manual shut-off valve is mounted immediately after the connection. The diameter of the pipes vary according to the size of the plant and are reported in the table in **CHAPTER 3 - DESCRIPTION OF THE MACHINE AND TECHNICAL DATA**.

4.6 Connection to plants with gas-fired boilers

Connect the gas pipe to the gas inlet fitting (see boiler instructions). The dimensions of the pipe are indicated in **CHAPTER 3 - DESCRIPTION OF THE MACHINE AND TECHNICAL DATA**.

In the case of long pipe runs, the diameter of the pipe must be increased accordingly. For LPG supplies, it is advisable to provide the plant with a bank of gas bottles connected to a single header,

which in turn is connected to the boiler by a single pipe.

If such a system is installed in the correct manner, the plant will have a good supply of gas with a few spare bottles connected and ready for switching-in. The installation of the gas supply must be entrusted to suitably qualified personnel and in line with current safety standards.

4.7 Connection to chilled water tank

Connect the heat exchanger connections to the water inlet/outlet using the appropriate fittings.

4.8 Homogenizer checks

Before start-up:

1. check the oil level in the sump: normally supplied full.
2. check the direction of rotation: start-up the homogenizer for a couple of seconds and check that the direction of rotation is the same as that indicated by the arrow.



WARNING:

If the homogenizer motor is turning in the wrong direction, the lubrication system will not function and the machine may be damaged.

3. check that the cooling water for the pumping pistons is flowing correctly from the nozzles to ensure that the pistons are cooled in the proper manner.

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5 - SET-UP AND PRODUCT CHANGEOVER PROCEDURES

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5.1 Set-up

The set-up procedure is as follows:

1. Close all the guards.
2. Release the emergency button.
3. Turn the main switch.
4. Open the air supply.
5. Check that the stirrers and powder mixer pump rotate in the direction shown by the arrows.
6. Set on the litre counter the parameters relevant to the quantitative of water or milk
7. Check the calibration of the litre counter by measuring a certain volume and reading the value on the instrument.
8. Check the plant functionality with only a reduced volume of water (150÷500 depending on plant size).
9. Start-up the boiler pump.
10. Heat up water in the fifth section for plant test.
11. Check that the solenoid valve exchanges between the second section and fifth section of the excahgnr.
12. Open vat cock.
13. Start-up mix transfer pump from the vat to the mix balance tank.
14. Start-up the pump of mix supply to the homogenizer.
15. Start-up the homogenizer.
16. Check that the homogenizer reaches the working pressure.
17. Check that water test recycles up to the pasteurization temperature (84° C) and that exchanges the pneumatic valve supplying water to the last two sections of the heat exchanger.
18. Supply chilled water to the fourth setion (after having previously started-up the water tank).
19. Check the third section is heating water for the second vat.
20. Check the outlet from the fourth section.

5.2 Product changeover

The product changeover procedures are as follows:

1. Carry out the end of production and pipe emptying procedure described in paragraph **6.3 - Start up - Production cycle.**
2. Wash the plant as described in paragraph **7.1 - Cleaning the plant.**
3. Start production with the new product as described in paragraphs **6.1 - Preliminary checks** and **6.2 - Dry run with hot water.**

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6 - OPERATING PROCEDURES

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6.1 Preliminary checks

Before starting the plant, carry out the following checks:

1. Make sure that all the connections have been done and that the valves are in their working positions.
2. Check that the plant is clean (before starting it is advisable to wash the machinery carefully, see **CHAPTER 7 - CLEANING AND MAINTENANCE**).

 **NOTE:**

Start-up the chilled water tank sufficient time beforehand in order to have water available at the correct temperature (max. 2°C) when required for plant operation.

3. Check that the air pressure is between 5 and 8 bar.
4. Check that the emergency button works.



WARNING:

If the emergency button does not work correctly, contact technical service immediately.



WARNING:

Never start up the machine production cycle without first checking again that the machine is safe.

6.2 Dry run with hot water

This procedure is recommended both as a dry run test for new plants and as a daily operation to carry out prior to starting production. The procedure will remove any traces of washing solution left in the plant.

Before beginning the test, set the quantity of water or milk to be used on the litre counter (*Fig. 3.5, Pos. 6/2*).

To access the litre counter programming function, turn the switch (*Fig. 3.5, Pos. 26*) to **SETTING**. You may now access the instrument's programming function (refer to the instruction manual provided with the instrument).

When you have finished programming, set the switch (*Fig. 3.5, Pos. 26*) on **ALARM**.

The alarm will be triggered only when the litre counter is turned on and does not detect any flow of water or milk.

In addition to the litre counter, the feeding system is provided with an instant rate of flow measurement device and a modulating valve. (For information on programming, refer to the instruction manuals provided with the instruments.)

- Switch-on the heater selector (*Fig. 3.5, Pos.*

27) and hot water pump button (*Fig. 3.5, Pos. 7*).

- Ensure that the chilled circuit is closed. Open valve (*Fig. 3.1, Pos. 33*) and close valve (*Fig. 3.1, Pos. 51*).

Place the pipe to the ageing vats in the drain position.

- Rotate selector (*Fig. 3.5, Pos. 32*) to the "AUTO" position and rotate both pipes entering the cover of the constant level tank over the drain funnel located on the side.

- Open valve (*Fig. 3.1, Pos. 47*) of tank (1), start-up the litre counter and wait for tank (1) to fill with approximately 150÷300 litres of water (depending on the size of the tank).

- Start-up pump (*Fig. 3.1, Pos. 3*). The water will start to flow into the constant level tank. Wait until the tank is almost full and start-up pump (*Fig. 3.1, Pos. 7*) which will transfer the water into the homogeniser through the heat exchanger. Open the homogenizer bypass valve (*Fig. 3.1, Pos. 9*).

- Allow the water which starts to flow from one of the pipes over the constant level tank to flow into the drain funnel for a few seconds. Then reposition the pipe over the tank so that the water recirculates.
- When the temperature reaches 84°C, the water will automatically start to flow towards the other sections of the heat exchanger, returning to the constant level tank through the second bypass pipe.
- After a few seconds of bypass flow through the second pipe, the pipe itself can be repositioned on the constant level tank.
- After a few minutes, rotate selector (*Fig. 3.5, Pos. 32*) to “MANUAL”, open valve (*Fig. 3.1, Pos. 51*) and discharge the water into the ageing vats.

6.3 Starting - Production cycle

Most of the production cycle of the HTST pasteurizing plant is automatic.

Start the production cycle as follows (*Fig. 3.1*):

1. Start-up the chilled water tank.
2. Start-up the hot water pump (*11*), start the boiler (refer to the boiler operating manual) and rotate selector “First heating” (*Fig. 3.5, Pos. 31*) to “ON”.

 **NOTE:**

In this way, valve (*19*) sends the boiler water into section “E” of the heat exchanger in order to heat the cold water or milk from the tank.

3. Open valve (*47*) of tank (*1*) and ensure that mix outlet valves (*31 and 32*) are closed, also close valves (*36*).
4. Set the quantity of milk or water required for the mix on the litre counter.
5. Press the litre counter start button (*Fig. 3.5, Pos. 16*). The hot milk or water will flow into tank (*1*).
6. When the liquid in tank (*1*) completely covers the blades of the stirrer, start the stirrer motor using push-button (*Fig. 3.5, Pos. 8*).
7. Open valve (*36*) of tank (*1*), start-up powder feeder pump (*34*) by pressing button (*Fig. 3.5, Pos. 15*) and add the ingredients necessary for the preparation of the mix in hopper (*26*). If necessary, adjust the flow of the mixer at valve (*25*).
When all the solid ingredients have dissolved, switch off the mixer and close valve (*36*) of tank (*1*).
8. When the litre counter reaches the set value and

stops the flow of water or milk into the tank, close valve (*47*) of tank (*1*) and place the “First heating” selector (*Fig. 3.5, Pos. 31*) on “OFF”.

 **NOTE:**

In this way, valve (*19*) sends hot water to section “B” of the heat exchanger and the plant is ready to start pasteurizing.

9. Check that the flow bypass selector (*Fig. 3.5, Pos. 32*) is on “AUTO” and that the switch (*Fig. 3.5, pos. 33*) is on “PRODUCTION”.
10. Check that valves (*4*) of the mix filter group (*5*) are in the correct position so that only one of the filters is used. When the first filter is blocked, the flow can be diverted to the second filter while the first is cleaned. In this way production is not interrupted.
11. Open valve (*31*) and start-up mix feed pump (*3*) by pressing button (*Fig. 3.5, Pos. 10*). The mix drawn from tank (*1*) is pumped to the constant level tank (*6*).

 **NOTE:**

The mix of the first pasteurizing cycle pushes any rinse water left in the system to the constant level tank (*6*). Move the bypass pipes from the constant level tank to the funnel on the side. Wait until the mix starts coming out of the pipes and then reposition them on the constant level tank.

12. Start-up pump (*7*) and homogenizer (*8*) by pressing the relative buttons. Check that bypass valve (*9*) of the homogeniser is closed. The mix

circulates in the preheating and pasteurizing circuit (Sections “A” and “B”) and arrives at valve (11). This valve will return the mix to the constant level tank to repeat the cycle if the pre-set pasteurising temperature has not been reached. When the correct temperature has been reached (84°C), valve (11) automatically sends the mix for cooling in sections “A”, “C” and “D”.

13. On reaching the heat exchanger, the mix is cooled progressively until it arrives at valve (51), from where it leaves the plant through delivery pipe (43) to the ageing vats.

The pasteurizing temperature and the temperature of the mix leaving the plant (4°C) are recorded and displayed on the temperature recorder.

 **NOTE:**

While the pasteurizing of the mix in tank (1) is starting, the new mix for tank (2) starts being prepared. In this way, production is continuous and section “C” of the heat exchanger can function in the correct manner to recover heat from the mixture already prepared in tank (1) (which has to be cooled) in order to heat the water or milk for the new mix in tank (2).

14. Open valve (47) on tank (2) and ensure that mix outlet valve (32) is closed.

15. Adjust the rate of flow of water or milk using the rate of flow measurement device (Fig. 3.5, Pos. 6/1) so that precisely the quantity required in tank (2) is fed in the amount of time required to empty tank (1).

16. Add the other ingredients necessary for the preparation of the mix, as already done for tank (1) (see points 5-6-7).

17. When tank (1) is empty, shut-down the mixer and close the mix outlet valve (31).

18. The mix prepared in tank (2) is now ready for pasteurizing. To start the new cycle, open mix outlet valve (32) and proceed as described in points 11-12-13.

 **NOTE:**

Every two pasteurizing cycles, divert the flow of mix from one filter (5) to the other using valve (4). This enables the used filter to be washed.

The mixer must be kept in rotation throughout the entire cycle. The mixer, in fact, can only be stopped when there is very little mix left in the tank and the blades are almost completely exposed.

6.4 Turning off - end of production and emptying pipes

To interrupt or end the production cycle, proceed as follows (Fig. 3.1):

1. When performing the last pasteurising cycle at the end of the shift, turn the switch (*Fig. 3.5, Pos. 3.3*) to “END OF PRODUCTION” to automatically set the litre counter to the amount of water required for the first washing cycle (about 200 lt).
2. Open the water inlet valve (*47*) for the empty tank and press push button (*Fig. 3.5, Pos. 16*) to let water for washing in while the mix in the other tank is being pasteurised.
3. When the latter tank is empty, close the mix outlet valve and open the valve on the other tank containing the 200 l of hot water.
4. Place the flow deviation selector (*Fig. 3.5, Pos. 32*) on “MANUAL”.
5. Start the homogenising cycle without pressure and with bypass valve (*9*) open.
6. When the mix has been emptied from constant level tank (*6*), wait approximately 2 minutes and divert the vat outlet fitting to the drain.
7. When water also starts to come out of this pipe, the plant is completely empty of mix and it is therefore possible to proceed with the end of production cleaning operations.

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7 - CLEANING AND MAINTENANCE

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7.1 Plant washing procedures

The plant is equipped with a semi-automatic washing program for cleaning the heating, pasteurizing and cooling units and all pipes as far as those connecting the plant to the ageing vats. The washing operations are carried out as follows (see Fig. 7.1 - 7.5):

1. Pre-wash the mixing tanks by hand and open valves (31) and (32) located on the tank bottoms. Wash and dry the powder mixer components that the CIP solution will not reach by hand and then pre-wash the components through which the washing solution will pass.
2. Dismantle, pre-wash and replace the filters.
3. Start-up the boiler. From the control panel, activate the washing cycle by rotating selector (Fig. 3.5, Pos. 33) to "CIP" and selector (Fig. 3.5, Pos. 32) to "AUTO". Place "First heating" selector (Fig. 3.5, Pos. 31) on "OFF".
4. Close valves (27) and (51) and open valve (33) so that the solution can be sent through the bypass pipe and not to the ageing vats.
5. Divert the outlet fitting to the ageing vats to the drain; the wash cycle will also wash this fitting in the direction of the ageing vats.

6. Open valve (47) of tank (1) and start the litre counter. The water will run into tank (1). Shut-off the water when the level in the tank has reach $\frac{1}{4}$ of the total capacity. Prepare the washing solution in tank (1), then open the appropriate valve (31) to circulate the water in the plant.
7. Ensure that there is no cold water circulating in the pre-cooling and cooling sections of the heat exchanger. Start pumps (3) and (7), and start the homogenizer without pressure and with bypass valve (9) open. When transferring the washing solution from the ageing vat to the balance tank, open valves (4) to wash the mix filters.
8. The solution is recirculated between balance tank (6), the preheating and pasteurizing sections (A and B) of the PHE, the homogenizer (8) and the holding pipe (10) until the diversion temperature of valve (11) is reached (see circuit in bold of Fig. 7.1). For the first few seconds, rotate the bypass pipe onto the funnel (39), in order to drain the last of

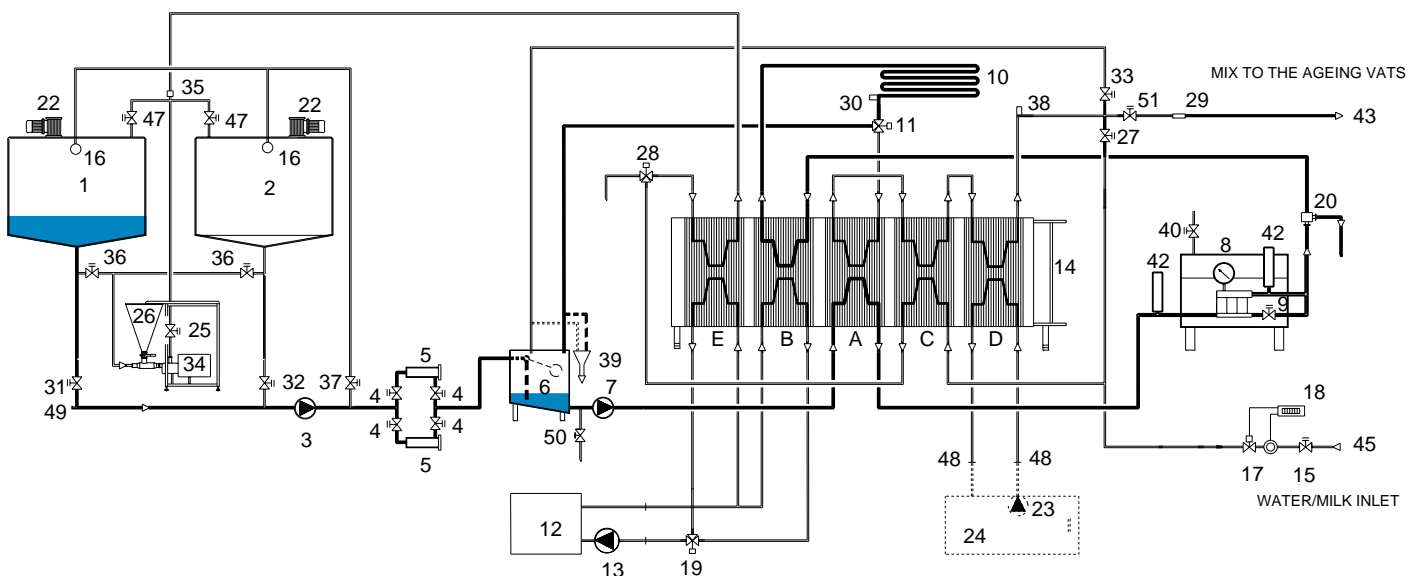


Fig. 7.1

the mix left in the plant or the washing solution of the previous cycle. Then replace the bypass pipe on the constant level tank.

Also open discharge tap (50) for a short while in order to wash the drain pipe under the balance tank.

9. When the solution, which has been heated by the boiler water (Section B), reaches the set temperature, the red light will go out, the green light will light-up and valve (11) will switch over. The solution continues to the remaining sections of the heat exchanger, to then return to the constant level tank (6) through valve (33) and the second bypass pipe (see Fig. 7.2).

For the first few seconds, rotate the bypass pipe to the drain (39) in order to remove the remains of the mix, or the washing solution from the previous cycle, from the plant. Then return the bypass pipe onto the constant level tank.

Allow the solution to circulate for a further 10 to 15 minutes to ensure that all the PHE plates through which the mix passes are thoroughly washed

10. Close valve (33) and open valve (51) for a short

time to allow a small amount of solution to leave the plant to wash the outlet fitting to ageing vats (43).

11. Keep valves (33) and (51) closed and open valve (27). The washing solution is recirculated from the balance tank to the sections of the PHE, the homogenizer and tank (1) (see Fig. 7.3).

In this way the milk inlet pipe, sections C and E of the PHE (first heating) and the pipe filling the mixing tanks with milk are all washed.

12. Close valves (4) at the mix filter inlets to transfer the washing solution from the balance tank to the start tank. When the balance tank (6) is empty, switch off the homogeniser and pump (7). Do not allow the pump or the homogenizer to run dry. The solution left in the heat exchanger-homogenizer circuit can be drained-off partly through valve (50) under the balance tank.

13. Now wash tanks (1) and (2). Open valve (37) and valves (31 and 32). Pump (3) will then pump the washing solution through the tanks in a closed circuit through the washing spray balls

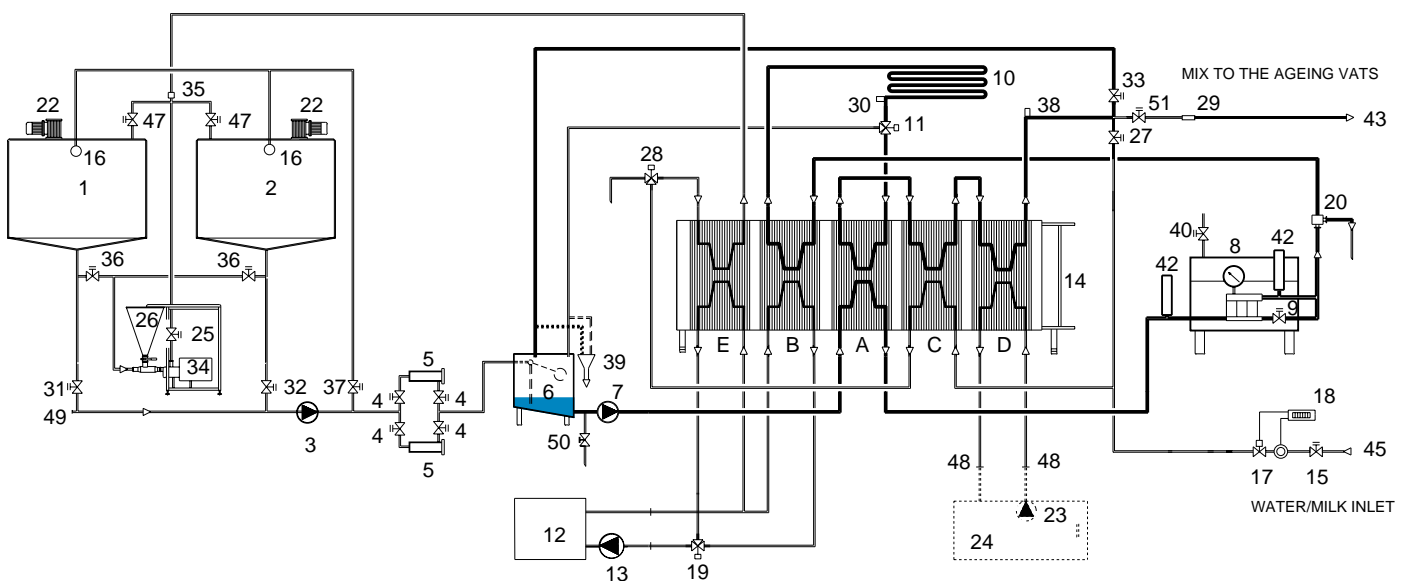


Fig. 7.2

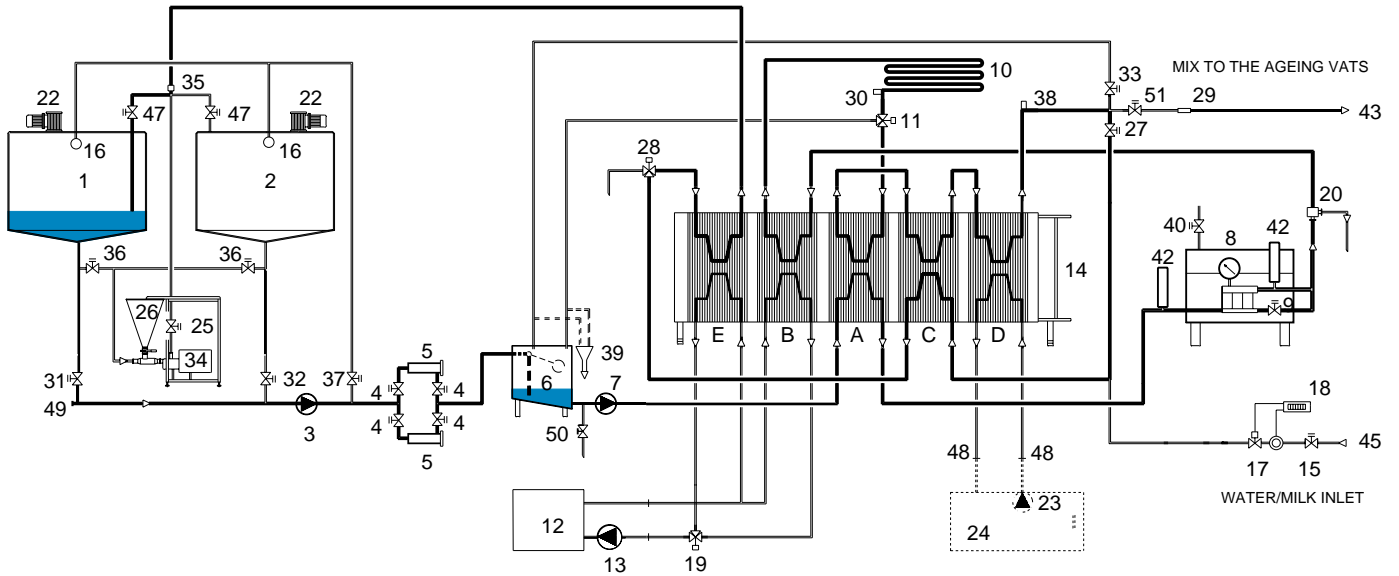


Fig. 7.3

(see Fig. 7.4).

14. Wash the mixer pipes by sending the washing solution to either tank (1) or tank (2), opening the relative valve (36) and keeping the drain valves on tanks (31, 32 and 36 of the unused tank) closed. This will allow the solution to flow through the powder feeder (see Fig. 7.5). Start pump (34) for the minimum washing time, around 5 minutes, and then close previously opened valve (36). Wait until no more liquid

- comes out of the feed pipe. Switch off pump (34).
 15. Switch off pump (3) and drain the washing solution from the circuit by removing plug (49).
 16. Repeat the cycle using fresh water to rinse out the system.
 17. Carry out a descaler wash followed by a rinse, repeat the cycle.
 18. Carry out a disinfectant cycle followed by a rinse, repeat the cycle.

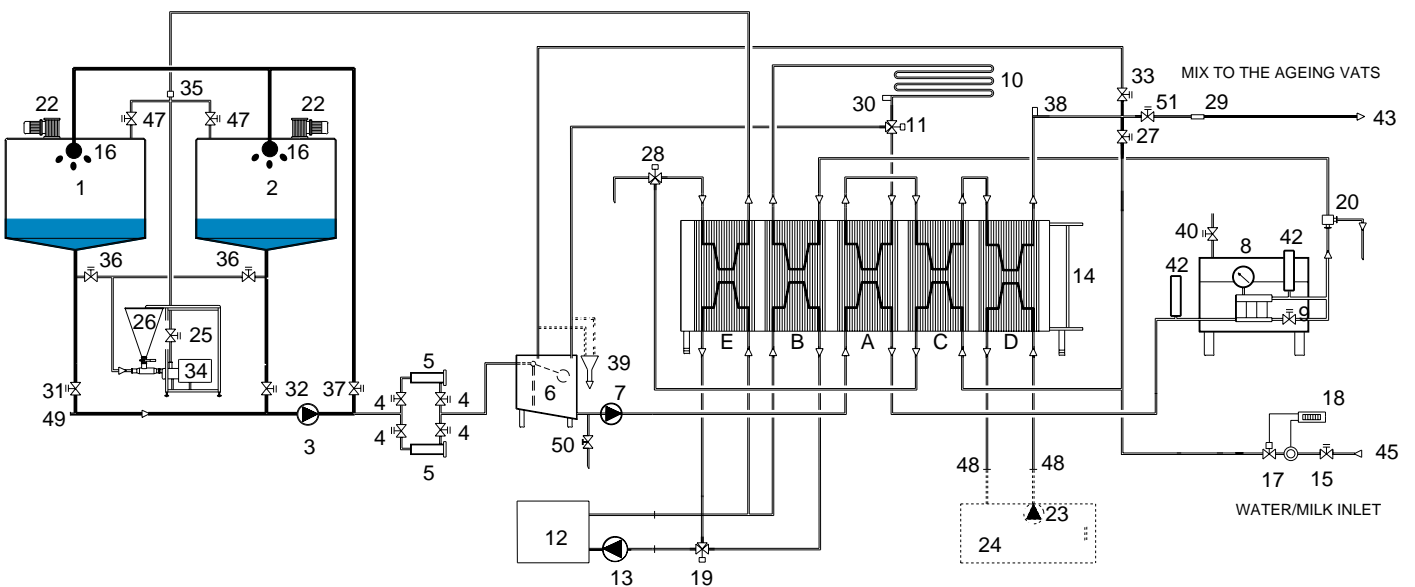


Fig. 7.4

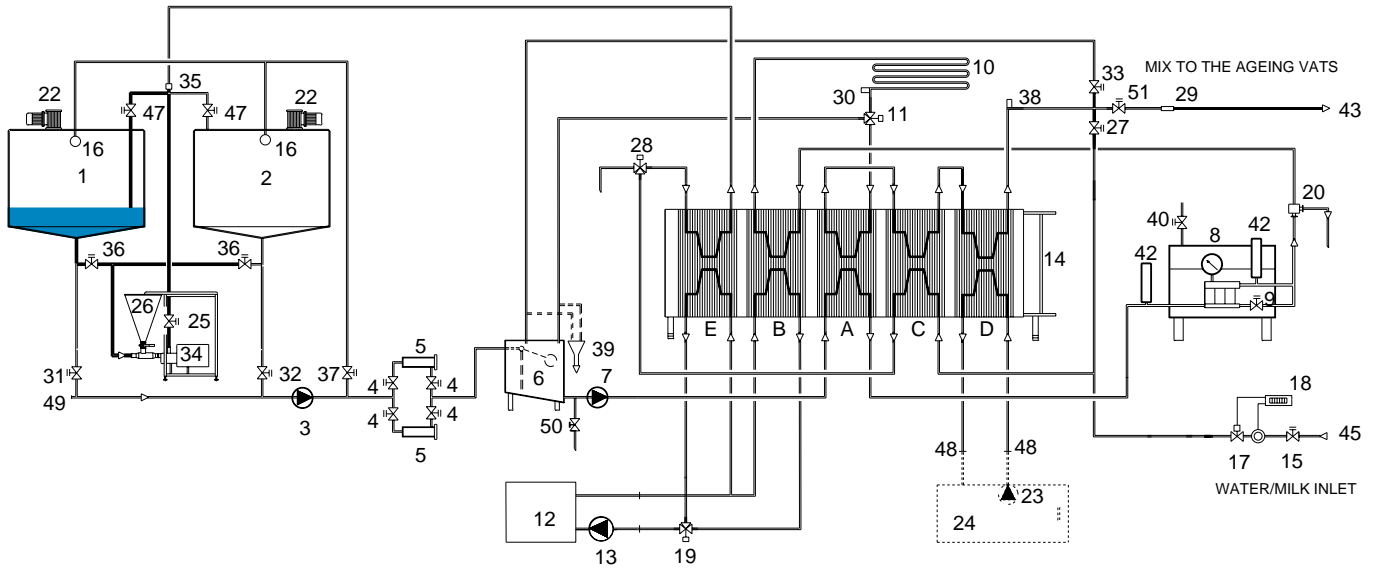


Fig. 7.5

7.1.1 Detergent wash

To make a detergent wash, select and use a detergent (concentration abt. 1%, temperature 60°C) strongly alkaline, caustic and not foaming, containing a mix of sequestering, descaler and suspensive agents.

7.1.2 Descaler wash

To make a descaler wash, use a buffered phosphoric acid (concentration 0.5-1%, temperature 60°C).

7.1.3 Disinfectant wash

To make a disinfectant wash, use a disinfectant without chlorine.

7.2 Washing program

7.2.1 Internal washing program

- a. Prewash with hot water (50°).
- b. Detergent wash. Use a caustic alkaline detergent (not foaming) containing a mixture of antifouling sequestering substances and dirt suspending. The concentration required varies from 1.2% to 1.6% depending on the existing dirt and on the water hardness utilized.
- c. Rinse with water. Wait 5 minutes before rinsing thoroughly to remove all trace of dirt.
- d. Descaler wash. Use an acid-base, low viscosity descaler containing a mixture of wetting and emulsifying agents. The concentration required varies from 0,5% to 1%. The recommended minimum contact time is between 10-15 minutes.
- e. Rinse with water.
- f. Disinfectant wash. Use a suitable disinfectant

diluted in water.

The concentration required varies from 0,5% - 0.3% to 1%. The recommended minimum contact time is between 10-15 minutes.

- g. Rinse with water.

- h. At the end of the daily or weekly wash, fill the homogenizer and the heat exchanger plates with a disinfectant type ALDEHYDE (Gluteraldehyde). The next morning, make a wash with water.



WARNING:

Do not use products containing chlorine which could nick the homogenizer components.

Wash phases	Advised products	% in water	°C	Minutes	Notes
Pre-wash	Water	100	50	5	throwaway
Detergent wash (Use a caustic alkaline detergent (not foaming) containing a mixture of antifouling sequestering substances and dirt suspending).	SU559 (Diversey Lever) P3-N 421 (Henkel Ecolab)	1.2-1.6	65-70	15	at recycle
Rinse	Water	100	20	5	throwaway
Descaler wash (Use buffered phosphoric acid)	SU475 (Diversey Lever) P3-PE4 Spezial A (Henkel Ecolab)	0.5-1	60-70	10	at recycle
Rinse	Water	100	20	5	throwaway
Disinfectant wash (Use chlorine-free disinfectant)	DIVOSAN GA (Diversey Lever) P3-OXONIA AKTIV (Henkel Ecolab)	1 0.3	20	10-15	at recycle
Rinse	Water	100	20	10	throwaway

At the end of the daily or weekly wash, fill the homogenizer and the heat exchanger plates with a disinfectant type Aldehyde (Gluteraldehyde).
The next morning, make a wash with water.

7.2.2 External washing program, ageing tanks manual pre-washing and mixer hopper

- a. Prewash with hot water (50°).
- b. Detergent wash. Use a foaming alkaline detergent or in gel with an high fat emulsionant power. The concentration required varies from 2% to 10% depending on the existing dirt and on the water hardness utilized.
- c. Rinse with water. Wait 10 minutes before rinsing thoroughly to remove all trace of dirt.
- d. Descaler wash. Use an acid-base, low viscosity descaler containing a mixture of wetting and emulsifying agents. The concentration required varies from 2% to 3%. The recommended minimum contact time is between 15-20 minutes.
- e. Rinse with water.
- f. Disinfectant wash. Use a suitable disinfectant diluted in water.
The concentration required varies from 1% to 1.2%. The recommended minimum contact time is between 15-20 minutes.
- g. Rinse with water.



WARNING:

- Do not use high pressure water jets.
- Do not use products containing chlorine which could nick the homogenizer components.

Wash phases	Advised products	% in water	°C	Minutes	Notes
Pre-wash	Water	100	50	5	throwaway
Detergent wash (Use a foaming alkaline detergent or in gel with an high fat emulsionant power).	SU928 (Diversey Lever) SU616 (Diversey Lever) P3-topax 17 (Henkel Ecolab)	2-10	60	15	at recycle
Rinse	Water	100	20	5	throwaway
Descaler wash (Use an acid-base, low viscosity descaler containing a mixture of wetting and emulsifying agents.)	P3-topax 52 (Henkel Ecolab)	2-3	50-60	15-20	at recycle
Rinse	Water	100	20	5	throwaway
Disinfectant wash	P3-topax 99 (Henkel Ecolab)	1-1.2	60	10-15	at recycle
Rinse	Water	100	20	10	throwaway

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8 - TROUBLESHOOTING

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8.1 Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
Light (Pos. 37, Fig. 3.5) OFF.	<ul style="list-style-type: none"> - Main switch faulty. - Main switch in position "0". - Bulb HL1 blown. - Switches QF02 open. - Transformer (TC) faulty. - Short circuit. 	<ul style="list-style-type: none"> - Replace. - Rotate to position "1". - Replace. - Reset switches. - Check and replace if necessary. - Identify the fault and repair the circuit.
Overload light (Pos. 30, Fig. 3.5) on.	<ul style="list-style-type: none"> - One or more switches open. - One or more switches faulty. 	<ul style="list-style-type: none"> - Reset the switches. - Check and replace if necessary.
Light SB6 on.	<ul style="list-style-type: none"> - Reducer-filter unit badly adjusted. - Air supply disconnected. - Pressure switch PS1 badly adjusted or faulty. - Relay KA3 faulty. 	<ul style="list-style-type: none"> - Regulate the pressure to approx. 6-7 bar. - Connect. - Check and replace if necessary (regulate pressure to 4 bar). - If the above checks are OK and light HL2 is still lit, check the electrical connections and replace relay KM3 if necessary.
The mix temperature does not rise or rises too slowly.	<p>a) With bottled gas plant:</p> <ul style="list-style-type: none"> - bottle half-empty, insufficient number or too small. - poor combustion due to insufficient chimney drawing. - thermostat or probe defective. <p>b) With steam plant:</p> <ul style="list-style-type: none"> - steam pressure lower than pre-set value. - steam filter blocked. - condensate drain dirty. <p>c) With electric boiler:</p> <ul style="list-style-type: none"> - Heater elements burnt out 	<ul style="list-style-type: none"> - Refill, increase the number of bottles or use larger bottles. - Refer to boiler manual. - Replace. - Check steam plant. - Clean. - Clean. - Replace

PROBLEM	PROBABLE CAUSE	REMEDY
Low mix flow to constant level tank and/or mix level in constant level tank decreases.	Filter(s) dirty in the mix transfer circuit from the pasteurisers to the constant level tank.	- Dismantle and clean.
Homogenizer flow lower than normal.	- Homogenizer.	- Refer to homogenizer manual.
Mix leaking from mix pump.	- Rotary seal worn. - Gasket dry or worn.	- Replace. - Lubricate or replace.
Mix leaking from plate heat exchanger.	- Passage through the plates obstructed by solidified milk. - Heat exchanger gaskets worn.	- Dismantle and clean (refer to attached heat exchanger manual). - Replace (refer to attached heat exchanger manual).
The temperature of the mix leaving the heat exchanger is too high (indicator light HL8 is on).	- Chilled water tank. - Pre-chilled water valve closed. - Insufficient flow of pre-chilled water.	- Check that the thermostat is set at 1-2°C. - Open the tap. - The flow must be approx. 7300 l for Hoyer Mixtura 600 HTST, 12600 l for the 1200 HTST and 20200 l for the HTST 2000.
Mix temperature does not rise.	- Air in the hot water system. - Heat exchanger plates in the pasteurising section dirty. - Thermo-regulators TRL1, TRL5 badly adjusted.	- Slacken fitting and release air. - Wash (refer to heat exchanger manual). - Adjust.
The boiler will not start-up.	- Safety thermo-regulator on boiler has tripped.	- Reset.