

**AUTOMATIC
MINI DAIRY
PLANT**

EKOMILK mini Dairy Plant 120L

TECHNICAL MANUAL



2016

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Read the manual before installing and starting the plant!
Keep this document carefully!

1. GENERAL

1.1 Terms of use of the present technical manual:

This technical manual is included into the complete set of the plant for processing of dairy products and contains important instructions for its operation and maintenance. It is designed for all professionals involved in the installation, commissioning, maintenance and daily operation with the device.

The manual should always be available to servicing personnel of the product.

1.2 Structure of safety instructions:



Attention! - Important.



Attention! - Danger of electrical shock.



Information! – Useful information or recommendation.

1.3 Warranty terms:

The warranty period of the plant for processing of dairy products is 12 months from the date of receipt but not more than 13 months from the date of sale.



The assembly of the plant for processing of dairy products is carried out by the manufacturer or by organization authorized thereof!

The company manufacturer / the authorized organization is obliged to remove all defects arising in the course of operation during the warranty period.

The manufacturer is not liable in the following cases:



- damage caused during transportation of the equipment;
- damage due to incorrect installation by unauthorized for this purpose persons;
- when it was attempted to remove damage by unauthorized for this purpose persons;
- failure to comply with the operation instructions of the equipment which are given in this manual;
- in case of damage by electrical shock, natural disasters and accidents which are not related to the operation of the machine.

After expiration of the warranty period, the user can conclude a contract with the manufacturer or his authorized organization for service support of the device after sales.

1.4 Liability limitation:



Comply with the technical guidance - this is a necessary condition for safe operation of the plant for processing of dairy products and achieving the technical parameters of the product.

Company BULTEH-2000 is not responsible for injuries of personnel, material and pecuniary loss resulting from failure to follow the instructions in this manual.

2. SAFETY DATA AND LABOR PROTECTION

The purpose of the following instructions on operational safety is to prevent injuries to personnel and avoid damage to property.

User is obliged to ensure strict compliance with these guidelines. Ensure that personnel responsible for the condition of the device and its operation, as well as staff who will operate the equipment have completely read and mastered what is written in the technical manual.

2.1 Characteristics of operator and service personnel:

The automatic mini dairy plant can be operated only by an operator who has received training for working with this equipment.

Connection of the plant to drains system and maintenance of drains system should be carried out only by a licensed plumbing technician familiar with this manual.

Electrical connection and electric maintenance of the plant should be carried out only by a qualified electrician who has been trained.

The operator must have everything needed to work in safe mode.

2.2 Preliminary checks:

It must be checked for:

- absence of by-products in and on the machine;
- proper connection of all the hydraulic and electric links must be checked.

2.3 General requirements for safety:

- It is forbidden to use the plant in explosive environments.
- It is forbidden to use the plant in an environment with harmful oils, acids, dust, radiation, etc.
- Starting the machine should be allowed only when safe working conditions are provided.
- It is forbidden to approach the parts found in the movement for a person not working with the machine.
- The operator should always use protection means prescribed by safety standards of the user country.
- It is forbidden to remove or isolate safety devices and emergency indicators.
- In case of detection of unusual noises or symptoms of the machine, the operator shall disconnect it from the power supply and notify the relevant technical persons.
- It is forbidden to perform actions which are not within the operator's competence, and thus may endanger his safety or that of others.

2.4 Appropriate application of the plant:

This plant is designed for processing of liquid dairy products in small quantities.

Inappropriate application of the plant is not allowed.

3. INSTALLATION OF THE PLANT

The dairy product processing plant is supplied in two parts:

- a main frame including a vessel for heat processing of milk products; gearbox and electrical equipment. It is affixed with four studs on a special transport wooden pallet;
- a metal vat; a curd separator / dispenser with a cover; plastic cheese molds (optional).

3.1 Installation site requirements:

The dairy product plant is to be operated in closed premises with normal climatic conditions:

- Air temperature – 5°C to 35°C;
- Relative air humidity – 40% to 85%;
- Temperature of the cold feed water should be at least by 20°C lower than that of the dairy product fermenting.

The place of installation should be leveled - up to 5 mm per 1000 mm and equipped with the energy and water resources, as follows:

- **Power supply** - **380V ±10%** industrial three-phase current with frequency of **50÷60 Hz** or **220V ±10%** monophasic current with frequency of **50÷60 Hz** and a minimum installed power of **21 kW**.



Power supply network, plug and terminal connections must meet obligatory requirements / standards of the user country.

**Attention:
Obligatory!**

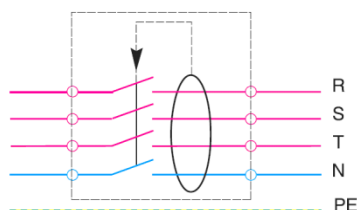
Use five-wire mains power supply;



The power supply can be provided by a separate circuit in the electrical switchboard, secured with four wire leakage protection installed in the electrical panel with:

- **Rated current – minimum 35A per phase;**
- **Rated current of activation 30mA;**
- **Class A;**

Principle diagram of connecting the four-wire residual current device protection:



- After the residual current device protection the zero and protective conductors must not be connected anywhere between themselves;
- If the cable route from the power distribution panel to the plant is long, we recommend to install an extra electrical switchboard in the vicinity in which to embed the residual current device;
- The fitness of the residual current device protection must be periodically checked by an authorized person or organization;
- It is not recommended to use residual current devices, operation of which is influenced by the power supply voltage;



The control unit monitors the value of the rated voltage and turns off the plant automatically, if the supply power exceeds the exposure limits.

- **Water drains system:** W&S drains system for cold drinking water should be at a pressure of 0,3 ÷ 0,6mPa equipped with a valve to stop and drain water
 - hot and cold water equipment / drains system.

It is recommended that before the cold water inlet of the plant should be mounted an additional filter. It is not allowed in the water content of solid particles > 25µn.



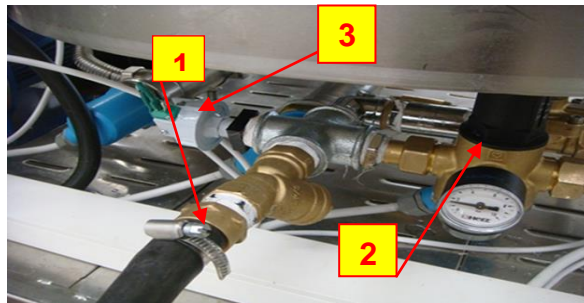
This installation does not require a special foundation

Premises where the Plant will be installed must have equipment for washing, cleaning and aspiration.

3.2 Diagram of assembly for plumbing fixtures: ([pic.1/pos.1](#)), ([pic.2/pos.1÷3](#))

Plumbing fixtures assembly must be performed by an authorized technician who is pre-trained and familiar with the technical characteristics of the plant and its peculiarities.

After the equipment is placed on the work site, a specialized technician will perform a connection to the existing water supply network for supplying clean drinking water ([pic.1/pos.1](#)).



Pic.1

1

- connection of the plant for dairy product processing to the water supply network

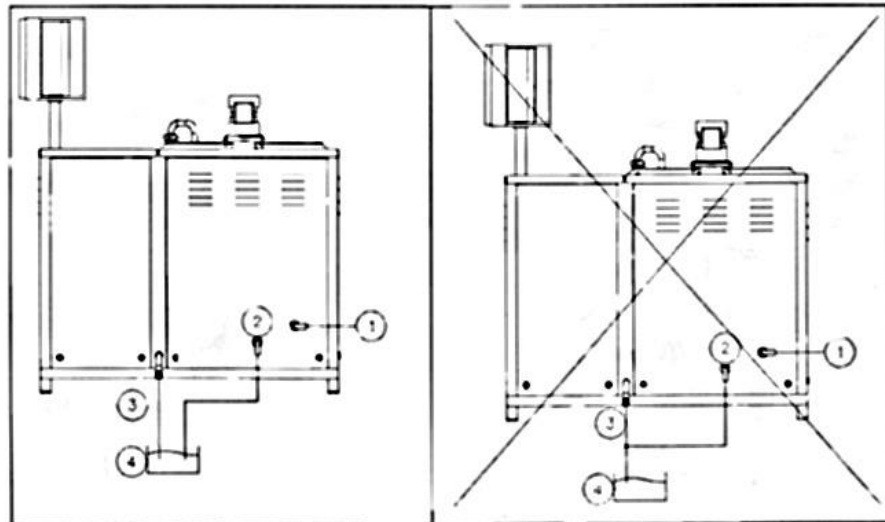


A shut-off valve must be installed between the plant for processing of dairy products and water network!

Hot and waste water draining system should be ensured (**the pipes from the two water leads should have a separate connection**) ([pic.2](#)).

Right

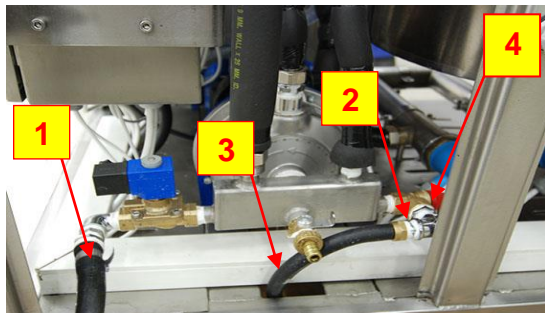
Wrong



pic.2

In case that the user has the possibility to use the processed hot water for other purposes (washing, irrigation, watering of livestock, etc.), water storage tanks have to be connected in the fitting ([pic.3/pos.1](#)).

Processed hot / cold water has the same properties as input drinking water.



Pic.3

1 - connection of the pipe of the processed hot water to the fitting

2 - connection of the short pipe of the emergency safety valve to the fitting



The short hose that is connected to the emergency safety valve (pic.3/pos.2), must be inserted into drains or placed under the plant (pic.3/pos.3) - in case of activation to prevent burning of operating personnel.

The hydraulic block diagram is given in ([attach. 1 on p.28](#)) to this technical Manual.

3.3 Assembly diagram to power source:

The electric assembly must be performed by an authorized technician who is pre-trained and familiar with the technical characteristics of the plant and its peculiarities.



Due to different national standards and user requirements the dairy product Plant is offered without power cable and plug.



For proper and safe operation of the unit, power cord that will be mounted by user must be five-core with cross-section of 5x6mm², flexible, with insulation meeting the conditions in which it will work.

Connection of the power cable to the plant should be done by an approved circuitry included in the set of the product (annex 2).

Power cable must pass through the fitting of the electric cabinet installed in the plant ([pic.4/pos.1](#)), and fitting on the rear center column of the unit - when transported this fitting is removed and attached on the inside of the column ([pic.5/pos.1](#)).



pic.4



pic.5

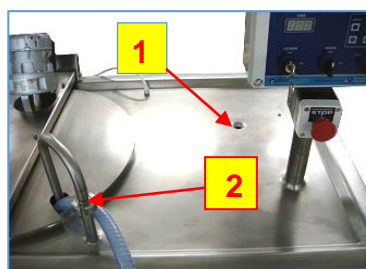
After mounting the power cable the plant grounding must be done, according to the standards of the user country.



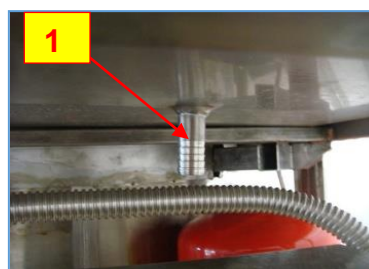
Fitness of the grounding must be periodically checked by an authorized specialist or a specialized organization, according to the standards of the user country.

3.4 Diagram of waste water drainage from upper board: ([pic.6/pos.1](#)), ([pic.7/pos.1](#))

For draining water obtained as a result of condensation in heating milk product or cleaning the upper board it is provided with a fitting hole on the bottom side. A pipe is mounted at the fitting through which this water is drained into the drains system.



Pic.6



Pic.7

4. TECHNICAL DESCRIPTION OF THE PLANT:

4.1 Purpose and area of application:

The Plant is designed for processing of up to 120L of dairy products.

Function of the plant includes :

4.1.1 Automatic or manual processing of dairy products:

Automatic or manual processing of dairy products through thermal cycles of heating and cooling, pasteurization and subsequent coagulation.

4.1.2 Operation in thermostatic mode:

The processing vat can operate as a thermostatic chamber with manually set up of temperature and time by the operator.

4.2 Parts of the installation and their design:

The installation for dairy products' processing consists of the following main parts:

4.2.1 Main processing device, comprising :

4.2.1.1 Metal vat with water jacket for heating & cooling of processed milk:

([pic.8/pos.1](#)), ([pic.9/pos.1÷2](#))

Made of stainless steel with maximum working volume of 135L. The vat design is a typical heat exchanger with indirect heating. Externally it is covered by a belt that serves as a water jacket. To reduce heat losses and protect the operating personnel from burns, the outer surface of the vat and the jacket is covered with insulating wool. The heating of the processed dairy product is done with water heated to a maximum of 110°C. Automatically it is maintained ΔT processed product / water in the jacket at 15÷20°C. Circulation is provided by a centrifugal pump included in the hydraulic system.

Cooling is carried out with water, the temperature of which is lower by at least 20°C than the temperature to which the processed product is cooled by providing a free flow through the water jacket due to the water source pressure. To reduce the cooling time of the processed products ice-cold water may be used.

The temperature of the processed dairy product is measured by the temperature sensor mounted in the hull of the vessel - ([pic.8/pos.1](#)).

The water temperature in the jacket is measured by the temperature sensor mounted in the heat exchanger - ([pic.9/pos.2](#)).

To avoid emergency from overheating in case of refusal of the control device a two-stage protection is provided for consisting of - a temperature sensor of automatically unrecoverable type - ([pic.9/pos.1](#)) and safety hydraulic-overflow valve - ([pic.3/pos.4](#)).



Restarting of the emergency temperature sensor is performed only after removal of the accident by authorized specialist!

Operation of the safety hydraulic-overflow valve should be checked periodically by **an authorized specialist**, not rarer than twice a year, by forcibly increasing the pressure in the hydraulic system between 3 and 5 bars when the hydraulic system is filled with cold water by pressure controller - ([pic.1/pos.2](#)) before water runs out from the valve.

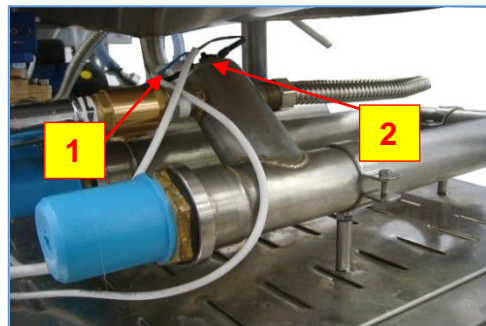
At a smooth increase in pressure the safety overflow valve should be enabled at 3 ÷ 4 bar.



After checking the safety hydraulic-overflow valve the system pressure must be restored to its normal working value of 1.5 bar.



Pic.8



Pic.9

4.2.1.2 Metal vat cover with mixer: ([pic.10/pos.1÷3](#)), ([pic.11](#))

The vat is closed with stainless steel cover ([pic.10/pos.1](#)). There is a U-shaped profile with a handle ([pic.10/pos.2](#)) mounted on the cover plate, and a hinge limiter on the opposite side. A gearbox ([pic.10/pos.3](#)) is placed on the plate. A stirrer of blade type with bayonet connection ([pic.11](#)) for convenient and quick assembly and disassembly is mounted on gearbox's axis.



Pic.10



Pic.11

The gearbox rotates at speed varying from 0 ÷ 30 rev / min.

Changing the rotation speed is set by the control panel as a percentage fulfillment.

The blade shaped stirrer provides intensive mixing of dairy products and improves heat transfer.

4.2.1.3 Horizontal centrifugal pump:

It is designed for the transportation of clean water which temperature shouldn't exceed 110°C. It is made of stainless steel.

4.2.1.4 Dosing system:

It includes the following:

- Dosing pump,
- dosing pistol,
- dosing pistol trigger.

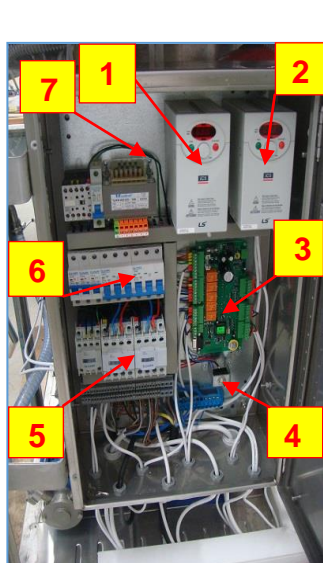
The dosing pump's rotation speed can be set up between 33% and 100%. In practice this speed determines its flow.

- "Hold" - the dosing pump is running while the button is pressed;
- "Trigger" - pressed and released button (start) and trigger pressed and button released (end of execution);
- "Automatic" - button pressed for a dose (at set speed / flow of the dosing pump and time set for duty cycle)

When automatic dosing quantity (a dose) is proportional to the pump rotation speed and time of dosing.

Dosing is autonomous and it is possible in all operation modes (of the plant) if the product temperature is 55°C.

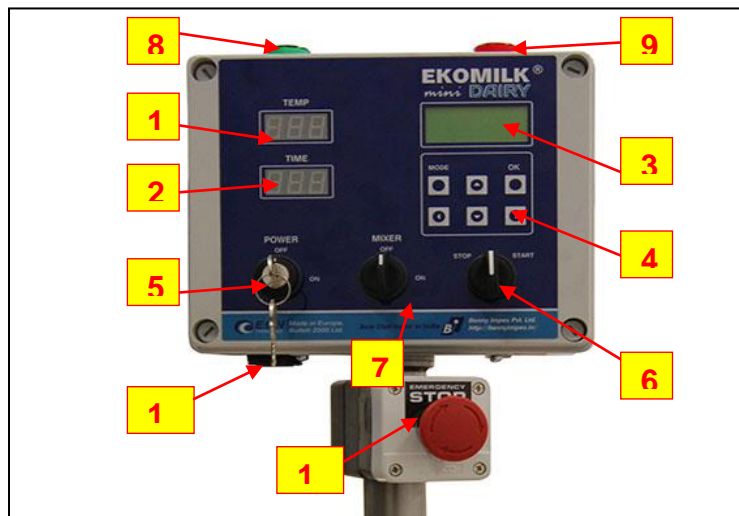
The operating time of the dosing pump is programmable within the range of 3 ÷ 60sec.

4.2.1.5 Electric box: (pic.12/pos.1÷7)

pic.12

- Frequency inverter for dosing pump control
- Frequency inverter for mixer control
- Controller board MDAIRY2
- CK switch for turning on one or both power circuits (10kW/20kW)
- Contactors
- Electrical fuses
- Transformer

4.2.1.6 Control Panel: (pic.13/pos.1÷11)



pic.1

DIGITAL DISPLAY (on the control panel):

- 1** - LED indication : for product temperature
- 2** - LED indication : for elapsed time
- 3** - LCD: symbolic indicator of specific functions : for parameters' setting up, values and messages

CONTROLS:

- 4** - **Keyboard** : 6 keys with auto repeat upon arrest (hold). Used to set modes, parameters and values for operation of the installation
- 5** - **Key Power:** for the installation
- 6** - **Key "Start - Stop" for control of the installation** : for Start/Stop of the process (recipe/step)
- 7** - **Key "MIXER":** start/stop stirrer in the container: only by the operator

LIGHT AND SOUND INDICATORS:

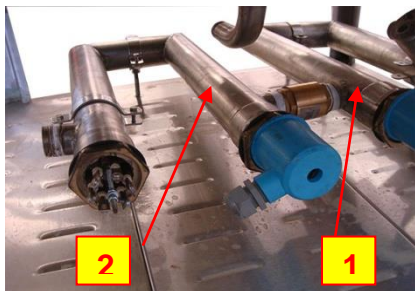
- 8** - **Green light** : the installation process has started
- 9** - **Red light** : fault in the installation
- 10** - **Emergency stop**
- 11** - **Sound signaling:** siren

- **Continuous Sound signaling:** failure of the installation
- **Beep (1 second) might indicate :** the end of the step (if preset by the operator) signal for an interruption which requires operator's intervention.

The system works in automatic and manual mode, which is set up and monitored by the operator via the control panel.

4.2.1.6 Electric heaters 4 pcs. x 5kW:

Electric heaters ([pic.15](#)) are included in two heating circuits / collectors of 10Kw each ([pic.14/pos.1 and 2](#)).



Pic.14



pic.15

Electric heaters are fitted in two U-shaped collectors ([pic.14/pos.1 and 2](#)), made of stainless steel. Each collector has a drainage outlet closed by a cap. Each collector has two heaters with installed power of 5kW. If necessary (when a consumer of 21 kW cannot be included in the network) two of the heaters are switched off, and the installed power of the plant becomes 11kW. The configuration of electric heaters that will work two or four in a circuit is done using switch ([pic.12/pos.4](#)), mounted in the electric box of the plant.

4.2.1.7 Expansion vessel with 8L volume:

For compensation of the increased water volume during the heating an 8L hydraulic accumulator is installed in the hydraulic system. The vessel has rubber membrane that divides the vessel into two parts - the part where the working fluid of the hydraulic system (water) is and the part that is filled with inert gas. The pressure of the inert gas should be 2.4 to 3 bar and is set by the manufacturer.

Protection

The hydraulic system of the plant is automatically filled with water under pressure between 1.3 and 1.5 bar. To create and maintain this pressure a reducing valve is used ([pic.1/pos.2](#)). When the water pressure in the hydraulic system is lower than the rated pressure, the pressure sensor ([pic.1/pos.3](#)) provides a signal to the control panel. Control panel terminates the program. To prevent the plant of heating of working fluid up to inadmissible temperature (higher than 110°C), if the control panel fails to work, an emergency temperature sensor of automatically unrecoverable type is provided - ([pic.9/pos.1](#)).

To protect the hydraulic system of the plant from pressure higher than permissible a safety overflow valve ([pic.3/pos.4](#)) is included in the hydraulic system.

4.2.2 Tools & accessories for dairy product processing.

Tools and accessories include the following parts:



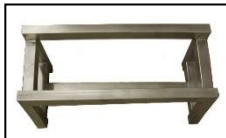
1. Curd separator



2. Receptacle for making curd



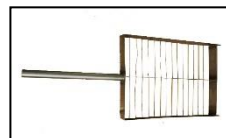
3. Legs for preparing cheese



4. Stand for washing of curd separator



5. Lira-knife for cutting the curd vertical



6. Lira-knife for cutting the curd horizontal



7. Circle stand for thermostatic mode



8. Metal plate for breaking the curd



9. Cover with handle for cheese making



10. Plastic cheese mold cylindrical shape 800 gr. – Ø 120/H 135 mm (optional)



11. Plastic cheese mold conic shape 300 gr. – Ø 120/Ø83/H 63 (optional)

mm

5. TECHNICAL DATA:

PARAMETERS:	Measuring Units	VALUE
1. Rated working volume	L	120
2. Minimum working volume	L	45
3. Maximum working volume	L	135
4. Installed power (optional)	kW	10 / 20
5. Cold water flow / consumption	L/min	15÷40
6. Temperature of cold water - recommended	°C	12 ÷ 18°C
7. Stirrer speed – controllable from control panel	rev/min	up to 30
8. Dimensions:		
- Length	mm	1180
- Width	mm	800
- Height with control panel	mm	1500
- Height without control panel	mm	1000
9. Net Weight	kg	275

6. OPERATION PRINCIPLE OF THE DAIRY PRODUCTS PROCESSING PLANT

The plant is designed for industrial processing of dairy products in small quantities.

The main part of the plant is the vessel / vat in which liquid milk product is processed. It is filled manually, in accordance with the limits of volumes given in the „Technical Data“ on [p. 15](#).



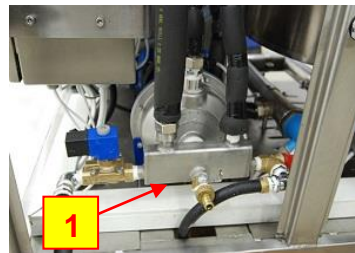
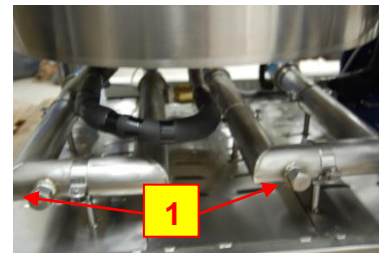
Before each filling of the vat with liquid dairy product it must be cleaned (see „Technical Manual“ item 7).

6.1 Initial start-up of the plant and start-up after a prolonged stay:

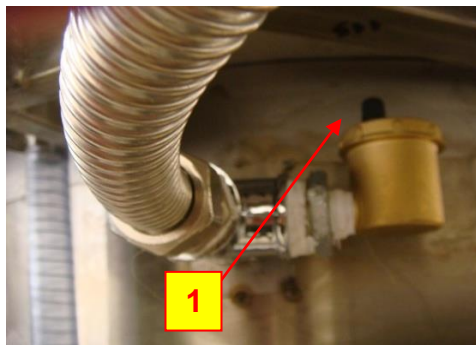
Remove from the plant anything that is not necessary for work.

- 6.1.1 Wash the internal and external surfaces;
- 6.1.2 Connect the input ([pic.1/pos.1](#)) to the water source at the required pressure, flow and water quality;
- 6.1.3 Connect the output ([pic.3/pos.1](#)) to the drains system or vessels for storing hot water;
- 6.1.4 Connect the outlets of flexible pipeline ([pic.3/pos.3](#)) to the drains system or under the unit;

- 6.1.5 Connect the flexible pipeline that discharges the waste water from the upper board to the sewerage;
- 6.1.6 Supply water to the Plant for processing dairy products from the water source;
- 6.1.7 Check the reading on the pressure gauge outflow of the pressure reducing valve ([pic.1/pos.2](#)). Normal pressure should be 0.15mPa. Carefully adjust the rated pressure using the rotary knob; turning the knob in increases the pressure, turning the knob out decreases the pressure.
- 6.1.8 Open the valve for free outflow ([pic.16/pos.1](#)), until it starts to pour out only water without being mixed with air;
- 6.1.9 Unscrew the two end caps ([pic.17/pos.1](#)) on the electrical heat exchangers by $\frac{1}{2}$ ÷ 1 turns successively, until air stops to come out of them.

**Pic.16****Pic.17**

- Screw the end caps in until they stop leaking;
- 6.1.10 Unscrew the lid of the automatic air vent ([pic.18/pos.1](#));

**Pic.18**

- 6.1.11 If during the performing of the above operations leakage from some of the hydraulic connections are noticed, tighten carefully the respective connection to remove the leak. If the leak still persists, dismount the connection and re-do the assembly, using the best practices for the implementation of plumbing systems;
- 6.1.12 Fill up the vessel with water for pasteurization, as the water level should be about 10 cm above the temperature sensor;
- 6.1.13 Connect the power supply cable of the plant, according to the Attached schematic diagram – Attachment 2;
- 6.1.14 Check electric phases on the metal surface of the plant;
- 6.1.15 Turn off the emergency stop (if it is ON) ([pic.13/pos.10](#));
- 6.1.16 Check if the emergency stop button works – Press it;
- 6.1.17 Switch the power supply on, using Power Button ([pic.13/pos.5](#));
- 6.1.18 Digital panel ([pic.13/pos.1](#)) indicates the temperature of the processed product (in this case the temperature of the water which is filled up in the vessel for pasteurization). Press the UP arrow on the keyboard ([pic.13/pos.4](#)). It indicates

the temperature of the water in the heat exchanger - in this case the temperature of the cooling water.

6.1.19 Select any program from freely programmable ones – 5 to 9 inclusive;

6.1.20 Edit the program, as follows:

6.1.20.1 The heating t° should be 20°C higher than the water temperature in the vessel for pasteurization;

6.1.20.2 Pasteurization time should be set in the range of 5 to 15 minutes;

6.1.20.3 Cooling – the cooling t° should be 10°C lower than the water temperature in the heat exchanger;

6.1.21 Select step „Cooling” from the program created in item 6.1.20.

6.1.22 Start the program using key **pos.6/pic.13** – turn the key clockwise and release it;

6.1.23 Pull out the end of the flexible pipe (**pic.3/pos.3**) which is placed in the drains system. It shall drain from 15 to 40 liters of water per minute. If the water runs out with the air, wait until it starts to drain only water;

6.1.24 Stop running the program using key **pos.6/pic.13** – turn the key counterclockwise and release it;

6.1.25 The outflow of cooling water from the end of the flexible pipe (**pic.3/pos.3**) should be stopped;

6.1.26 To control, start and stop running the program. Starting the program shall start discharging the cooling water, and stopping the program shall stop discharging the cooling water;

6.1.27 Stop running the program.

6.1.28 Place the end of the flexible pipe again into the drains system;

6.1.29 Add up to 100 – 120 litres of water in the vessel for pasteurization.

6.1.30 Put the blade on the stirrer;

6.1.31 Close the cover on the vessel for pasteurization. When the stirrer turns on, the pasteurization vessel must be closed. It is inadmissible for the Operator or other specialists working with the plant to be in the area of the moving parts of the stirrer.

6.1.32 Using the key (**pos.7/pic.13**) turn on the Stirrer. Check if the Stirrer moves uniformly.

6.1.33 Turn off the Stirrer;

6.1.34 Go to the edit mode of the control device and edit the percentage execution of the Stirrer speed;

6.1.35 Check the work of the stirrer at a different speed of percentage execution;

6.1.36 Turn off the Stirrer;

6.1.37 Mount the flexible pipe with the dosing pistol using the holender connection. Be careful as not to damage the O-ring. Place the end of the dosing pistol through the gap in the cover for thermal processing of dairy products, so that dosing product flows back into the vessel.

6.1.38 Mount the plug connector on the dosing Trigger.

6.1.39 Unscrew the holender connection (**pos.2/pic.6**). Take the nut aside and pour a 5% solution of liquid soap in the suction pipeline of the dosing pump to fill the suction and discharge piping. Wait a minute, if necessary fill up the suction pipeline. This procedure is performed only when the dosing pump is not filled with process product or water that it does not run dry.

6.1.40 **!!! It is forbidden to run the dosing pump dry. This leads to unrecoverable damage.**

6.1.41 When pumping products processed, stop working with the dosing pump before it starts to suck air with the processed product – the surface of the treated product

is about 15-20 mm above the top end of the suction pipe in the vessel for thermal processing of dairy products.

6.1.42 Reassemble the holender connection.

6.1.43 Using the dosing Trigger check the work of the Dosing system in all modes – see the Manual.

6.1.44 If there is a leak from the holender connections, tighten them carefully.

6.1.45 Monitor the dosed product flow in the flexible pipe. If after one or two minutes of the dosing pump work it is still seen movement of air inclusions in the dosed product, it is necessary to check tightness of all the hydraulic connections in the dosing system.

6.1.46 **!!! The dosing system works only if the processed product has temperature lower than 55°C.**

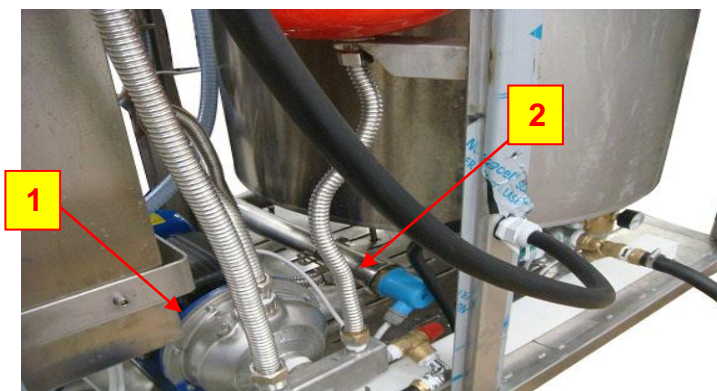
6.1.47 From the control panel, Select Recipe 2 - Cow / Goat white brine cheese.

6.1.48 Using the switch (**pic.12/pos.4**), select power of 10kW of the Plant operation;

6.1.49 Turn ON the mixer to run at 100% speed;

6.1.50 Change to the automatic operation mode of the program;

6.1.51 Start the operation of the program - Recipe 2. When the program starts the centrifugal pump (**pic.19/pos.1**) and heaters in the heat exchanger (**pic.19/pos.2**) get started automatically. The centrifugal pump drives the water through the electric heat exchanger in which it is heated. The heated working fluid flows around the temperature sensor (**pic.9/pos.2**) and emergency temperature sensor (**pic.9/pos.1**), and then it enters the heat exchanger jacket in the pasteurization vat - in the bottom of the heat exchange jacket. From the outlet of the latter the working fluid returns to the intake manifold of the centrifugal pump;



Pic.19

6.1.52 Follow the change of the product temperature (the water in the pasteurization vessel) and the working fluid (press the UP arrow (**pic.13/pos.4**), by reading the display for temperature (**pic.13/pos.1**);

6.1.53 After heating the product at 10°C above the original temperature, the heaters can be switched to power of 20kW using a switch (**pic.12/pos.4**), if the electrical system allows to work with such power;

6.1.54 Follow the work of the plant. Upon execution of each step of the program you will hear a beep. It will automatically start the next step.

6.1.55 If during the execution of the program when the processed product temperature increases a ringing sound is heard, it is due to the cavitation process in the centrifugal pump. Quickly switch to cooling mode and wait until the drains pour

about 15 to 20 liters of cooling water. Go back to heating mode. If the ringing sound does not disappear, repeat the procedure.

6.1.56 Wait for the program to terminate.

6.1.57 The Plant is ready to implement the manufacturing process.

7. CLEANING OF THE DAIRY PRODUCT PROCESSING PLANT

To clean the Plant remove everything that interferes with the procedure.

Fill the multifunction vessel for dairy products processing with washing solution (water and soap) at $40 \div 45^{\circ}\text{C}$. If there is no source of hot water, use the plant facilities to heat the washing solution. Dosing pump and piping input and output are washed in the "Dosage" mode lasting at least for five minutes, as the effluent washing solution is poured into a multipurpose vessel.



For washing use only soft plastic brushes. Metallic brushes scratch the surfaces and damage them beyond repair.

Rinse with clean water after washing with washing solution. To protect surfaces from deposits of salts wipe dry the wet surfaces. To avoid bacterial contamination at the end of the working day wash the Plant and dosing system with a sodium hydroxide solution with a concentration of $2 \div 3\%$ and a temperature of $45 \div 50^{\circ}\text{C}$ for $10 \div 15$ minutes.

If necessary, wash the plant with sodium hydroxide as well when changing the processed products.

At the end of the working day wash the Plant inside and outside. To prevent buildup of "Milk stone" once a week wash the Plant and with a solution of Citric or Acetic acid at a concentration of $2 \div 3\%$ and a temperature of $45 \div 50^{\circ}\text{C}$ for $10 \div 15$ minutes.

When working with alkalis and acids, personal protective equipment must be used "working spectacles", "rubber gloves", "rubber apron" etc. These procedures are performed only by an operator or person from personnel who attended courses and training for working with aggressive detergents. In an eventual contact with such substances, comply with all the procedures described by the manufacturer and seek medical attention.

When washing be careful not to get water jet directly on the electrical, boilers and engines.



During the set operation cycles the dosing pistol must be placed so as to pour into the vat.

Then rinse the vat with hot water ($70-75^{\circ}\text{C}$) and finally with cold mains water.

8. TRANSPORTING THE PLANT FOR PROCESSING OF DAIRY PRODUCTS

Transporting the Plant for processing of dairy products is carried out vertically in a transport case with a special wooden pallet.

The Plant shall be rigidly secured to the wooden pallet with four studs that pass through the pallet and turned in the screw holes instead of leveling heels.

The Plant can be transported with any kind of transport.

If the temperature during the transport and storage will be below 5°C, measures should be taken to drain the hydraulic and dosing systems by complying with the following procedures:

- **Hydraulic system:**

1. Remove the flexible pipe which supply water ([pic.1/pos.1](#));
2. Open the valve for free effusion ([pic.16/pos.1](#));
3. Supply air instead of water at min. 0,02Mpa through fitting ([pic.1/pos.1](#)), until the free effusion valve stops water drainage;
4. Close the valve for free effusion;
5. Open and close the end caps one by one on the two heat exchangers ([pic.17/pos.1](#)), until they stop water drainage;
6. Repeat the procedure from item 2 to item 5.

- **Dosing system:**

1. Disconnect the Dosing pump holender connections;
2. Blow the pump with air;
3. Fill up the pump with ethyl alcohol concentration min.60%;
4. Blow the pump with air;
5. In subsequent start-up of the Plant connect the holender connections to the dosing pump.

9. **FAULTS**

The controller monitors the fault no matter what condition the plant is.

Upon detection of a malfunction the corresponding message is sent.

Faults are conditionally divided into 3 groups:

- faults in control panel (HID) and controller (PLC) ;
- faults in exchanges between control panel (HID) and controller (PLC);
- faults in other equipment of the plant;

Faults in exchanges are errors either in communication or no communication.

List of faults

Message	Fault	Cause
"No communication" "Няма връзка" "Нет связи"	No communication between HID and PLC	Impossible to control PLC. PLC does not change its state.
"RTC not present !"	No connection to the real-time clock. Fault of HID hardware.	For now: It can start a process, but does not account the time!

"No Water Press "Няма вода "Нет воды	" " "	No pressure of the input (cooling) water.	Cannot start a process. Signal for the operator !
"Mixer "Миксер "Миксер	" " "	Fault in the mixer drive (enabled by the inverter)	Cannot start a process. Signal for the operator !
"Dosing Pump "Дозираща помпа "Насос – дозатор	" " "	Fault in the dosing pump drive (enabled by the inverter)	Dosing is not possible Signal for the operator !
"Tank t° sensor "Датчик t° в съда "Датчик t° бака	" " "	Fault of t° sensor in the tank	Cannot start a process. Signal for the operator !
"Heater t° sensor "Датчик t° награв. "Датчик t° награв.	" " "	Fault of t° sensor in the heaters.	Cannot start a process. Signal for the operator !
"Uac Overvoltage ! "Високо Uac ! "Повышенное Uac!"	" " "	Overvoltage of power supply	Cannot start a process. Signal for the operator !
"Uac Undervoltage ! "Ниско Uac ! "Пониженное Uac!"	" " "	Undervoltage of power supply	Cannot start a process. Signal for the operator !
"Uac Undefined! "	" "	Invalid state of the pattern to control supply voltage. Fault of PLC hardware.	Cannot start a process. Signal for the operator !
"T° out of range "T° извън диапазон "T° вне диапазона	" " "	The temperature that should be kept in the vessel is beyond permissible limits	Signal for the operator !
"Without Heating "Няма подгряване! "Нет нагрева	" " "	At the interval of two minutes no temperature increase in the vat!	Signal for the operator !
"No Faults "Няма "Нет	" " "	No faults detected.	

It might be more than one fault. Then this indicates damage that was discovered first from the top down - according to the table above.

Sound signaling for operator has 3 elements :

- Message on the display determining the error.
- Light indicator: RED light. The lamp goes off in case of error failure.
- Sound signal : Continuous! The sound signal stops when you press a button on the keyboard.

No special protection action on the plant or process (product in the vessel)!

Variation in temperature during pasteurization "Past" or fermentation "Ferm" also is indicated as an error if the signaling is turned on from the menu "Settings".

When registering an error light and sound signal is switched on. The error is indicated on the display. The sound signal is switched off by pressing the button on the keyboard, i.e. the operator saw the accident.

10. CONTROLS:

(English)

" 1.Select Recipe "	: Selection of process recipe
" 2.Edit Recipe "	: View / edit / make recipe
" 3.Working Mode "	: Selection of operation mode : Operator / Automatic
" 4.Mixer Speed "	: Setting of rotation speed of the stirrer
" 5.Pump Speed "	: Setting of dosing pump flow
" 6.Dosing "	: Selection of control method of dosing
" 7.Dosing Time "	: Setting of operation time of the pump for a dose
" 8.Settings "	: Other settings: signaling ; dt allowance
" 9.Display Fault "	: List of recent faults after the power is on
" A.Set Time "	: Setting of time
" B.Set Date "	: Setting of date
" C.Language Sel "	: Selection of language for operator
" #.FW Revision "	: Software version
" "	

(Bulgarian)

" 1.Избор Рецепта",	: Избиране на рецепта за изпълнение
" 2.Редактиране "	: Преглед / редактиране / съставяне на рецепта
" 3.Режим работа "	: Режим на изпълнение : Оператор /Автомат
" 4.СкоростМиксер",	: Задаване скорост на въртене на бъркалката
" 5.Скорост помпа "	: Задаване дебита на дозиращата помпа
" 6.Дозирание "	: Избиране начина на управление на дозирането
" 7.Време за доза "	: Задаване времето на работа на помпата за доза
" 8.Настройки "	: Други настройки: сигнализация ; толеранс dt
" 9.Неизправности "	: Списък с последните неизправности след вкл. хранване
" A.Час "	: Сверяване на час
" B.Дата "	: Задаване на дата
" C.Избор на език "	: Избиране на език за оператора
" #.FW Версия "	: Версия на софтуера
" "	

(Russian)

"1.Выбор рецепта",	: Выбор рецепта для выполнения
"2.Редактировать",	: Просмотр / редактирование / составление рецепта
"3.Режим работы",	: Режим для выполнения: Оператор / Автомат
"4.Скор. мешалки",	: Задание скорости вращения мешалки
"5.Расх. насоса "	: Задание расхода дозирующего насоса
"6.Дозировка "	: Выбор управления дозировкой
"7.Время дозы "	: Задание времени работы насоса для дозы
"8.Настройки "	: Другие настройки: сигнализация ; допуск dt
"9.Неисправности",	: Перечень последних неисправностей после вкл. питания
" A.Время "	: Проверка времени
" B.Дата "	: Задание даты
" C.Выбор языка "	: Выбор языка для оператора
" #.FW Версия "	: Версия ПО
" "	

11. Recipes

Fixed recipes:

These 4 recipes cannot be edited!

Recipe1 : Yogurt ("BKMilk[]") : Bulgarian yogurt

Recipe2 : Cow Cheese ("CowGoatBSS[]") : Cow / goat white brine cheese

Recipe3 : Sheep Cheese ("SheepBSS[]") : Sheep white brine cheese

Recipe4 : SoftCheese ("SoftCheese[]") : Soft cheese

Recipes to be made / edited by user:

Recipe5 : UserRecipe1

Recipe6 : UserRecipe2

Recipe7 : UserRecipe3

Recipe8 : UserRecipe4

Recipe9 : UserRecipe5

Built-in 9 recipes totally.

Maximum number of steps in one recipe: 10

Description of recipes – format and values:

"Yogurt ",
"Кисело мляко",
"Кисело мляко",
1, // N: рецепта
EDITDISABLE, //
"Heat", 94°, , //1
"Past", 94°, 0:20, //2
"Cool", 45°, , //3
"Intr", 0°, , //4
"Ferm", 45°, 0:20, //5 enable fermenting
"Intr", 0°, , //6 call of the operator for overflow of the product
"End ", 0°, , //7
"----", 0°, , //8
"----", 0°, , //9
"End ", 0°, , //10

"Cow Cheese ",
"Краве сирене",
"Коровья брынза",
2, // N: recipe
EDITDISABLE, //
"Heat", 72°, , //1
"Past", 72°, 0:20, //2
"Cool", 33°, , //3
"Intr", 0°, , //4
"Ferm", 33°, 1:00, //5
"Intr", 0°, , //6
"End ", 0°, , //7
"----", 0°, , //8
"----", 0°, , //9
"End ", 0°, , //10

"Sheep Cheese",
"Овче сирене",
"Овечья брынза",
3, // N: recipe
EDITDISABLE, //
"Heat", 68°, , //1
"Past", 68°, 0:25, //2
"Cool", 33°, , //3
"Intr", 0°, , //4
"Ferm", 33°, 1:00, //5
"Intr", 0°, , //6
"End ", 0°, , //7
"----", 0°, , //8
"----", 0°, , //9
"End ", 0°, , //10

"Soft Cheese",
"Мекo сирене",
"Мягкая брынза",
4, // N: recipe
EDITDISABLE, //
"Heat", 63°, , //1
"Past", 63°, 0:30, //2
"Cool", 40°, , //3
"Intr", 0°, , //4
"Ferm", 40°, 0:15, //5
"Heat", 44°, , //6 secondary heating for ? time
"Intr", 0°, , //7
"End ", 0°, , //8
"----", 0°, , //9
"End ", 0°, , //10

12. QUALITY CERTIFICATE

Nº

Unit :

PLANT FOR PROCESSING OF DAIRY PRODUCTS

Factory number :

Manufactured on :

The product is suitable for manufacturing process.

The product is made according to technical documentation.

Prescribed technological control was carried out throughout the manufacturing process.

The product was tested according to the technical requirements of the manufacturer.

The shown functionality, quality and technical parameters comply with the technical specification.

The plant's tools and accessories comply with the given packing list and this manual.

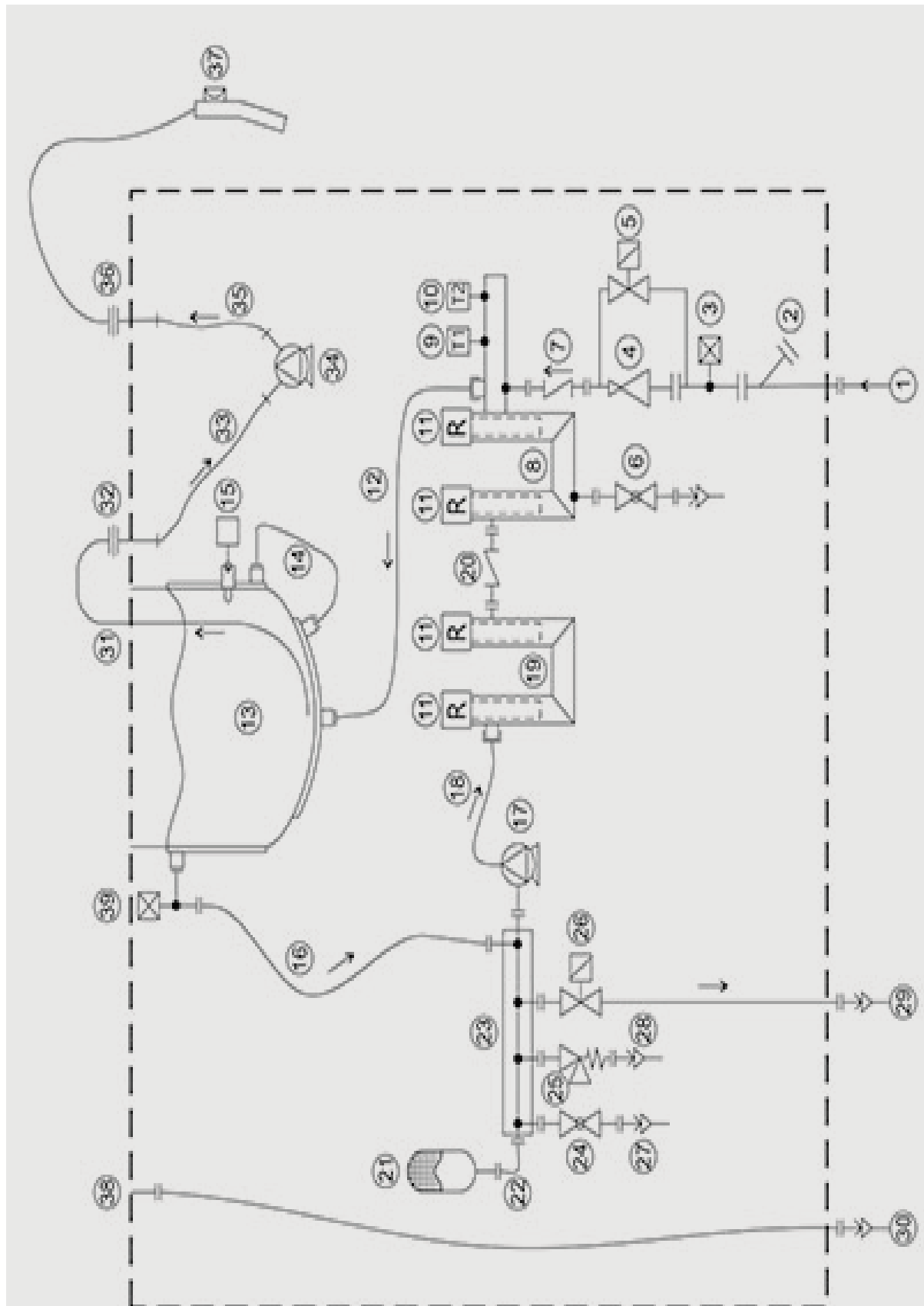
Signature:

13. SALES SERVICE**Product:** Plant for processing of liquid dairy products**Factory № :**

Date	Refusal and service	Service technician	Signature

Hydraulic Block Diagram

EKOMILK mini DAIRY

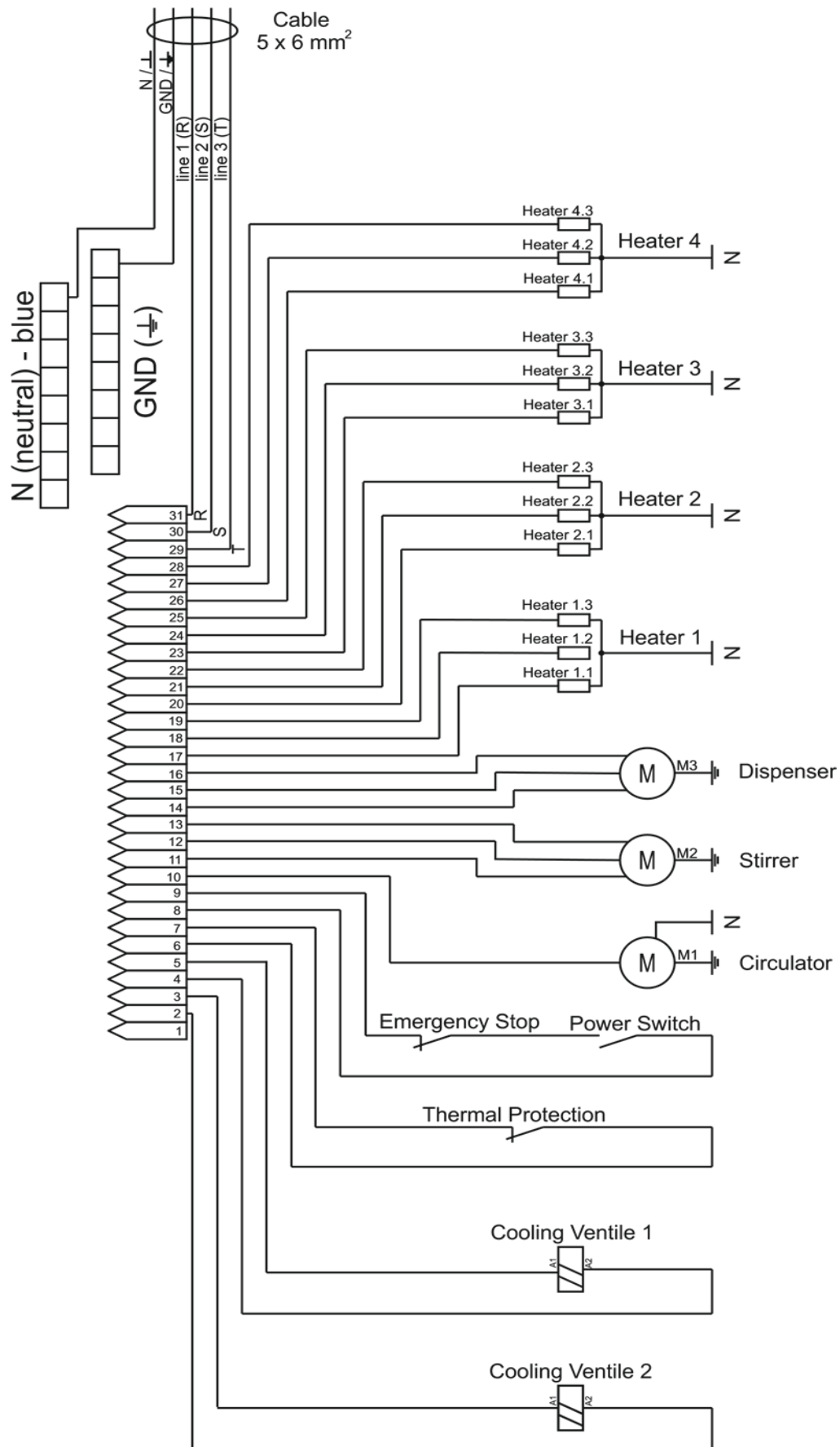


LEGEND :

1. Fitting $\frac{3}{4}$ " – $\varnothing 20$ – drinking water inlet
2. "Y" filter
3. Pressure sensor
4. Pressure reducing valve
5. Electromagnetic valve
6. drainage outlet „cap“
7. Return valve
8. Heat exchanger
9. t° sensor – measuring of water temperature in the heat exchanger
10. Emergency t° sensor unrecoverable
11. Electric heater
12. Flexible metal pipeline
13. Product inside the vat
14. Internal connection between bottom water jacket & side water jacket of the vat
15. t° sensor – measuring of processed product temperature inside the vat
16. Flexible metal pipeline
17. Centrifugal pump
18. Flexible metal pipeline
19. Heat exchanger
20. Return valve
21. Hydraulic accumulator
22. Flexible metal pipeline
23. Collector
24. Emergency drain valve
25. Safety valve
26. Electromagnetic valve
27. Connection to drains system
28. Connection to drains system

- 29. Connection to drains system
- 30. Connection to drains system
- 31. Portable metal tube for product pouring out
- 32. Holender connection
- 33. Flexible pipe with inbuilt metal coil
- 34. Dosing pump
- 35. Flex pipe with inbuilt metal coil
- 36. Holender connection
- 37. Pistol terminal for pouring out
- 38. Upper board outlet for liquids drainage
- 39. Automatic air vent

Attachment №2



Electrical Block Diagram

EKOMILK mini DAIRY