



RoboLabs

Incredible machines for fastfood & funfood

OPERATING MANUAL ROBOPOP® 75 (VPM-RM4LT) 3/N/PE AC 400 V



**CAUTION: READ THE INSTRUCTIONS
BEFORE USING THE MACHINE!**

PDF version of this manual is available on www.robolabs.pro

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Safety requirements



DO NOT WASH MACHINE WITH WATER!



ONLY INSTRUCTED PERSONNEL ARE ALLOWED TO OPERATE THE MACHINE!



IT IS PROHIBITED TO USE MACHINE FOR PROCESSING OTHER KERNELS THAN CORN!



DO NOT LEAVE RUNNING MACHINE UNATTENDED!



ALL SWIVEL CASTERS MUST BE LOCKED WHILE IN OPERATION!



SOME PARTS ARE HOT WHILE IN OPERATION!
BURN HAZARD!



DO NOT TOUCH MOVING PARTS!

	WARNING RISK OF FIRE OR ELECTRIC SHOCK DO NOT OPEN	
WARNING, TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK) NO USER-SERVICEABLE PARTS INSIDE REPAIR SHOULD BE DONE BY AUTHORIZED SERVICE PERSONNEL ONLY		

1. Overview

1.1 Purpose

Vortex Popcorn™ machine VPM-RM4LT (Robopop® 75) is a hot-air popcorn making machine (hereinafter “popper” or “machine”). It can process both Butterfly and Mushroom popcorn varieties. Popper is built on patented Vortex technology that has following benefits:

- No oil is used at all. As a result, popcorn has no carcinogens and trans-fats; moreover, production cost is lower.
- Once popped, popcorn is immediately removed from the hot area, thus its nutritional value and taste are kept as much as possible.

1.2 Technical specifications

Throughput ¹	up to 34 kg/h
Ampacity	25 A
Rated voltage	3/N/PE AC 230/400 V 50/60 Hz
Rated power	11,3 kW
Machine dimensions (LxWxH)	1370x600x1690 mm
Net weight	200 kg
Ingress protection	IP22

1.3 Delivery set

Popper	1 pc
Popcorn cart	1 pc
Pipe cleaning brush	1 pc
Plastic bags (LDPE)	50 pcs
Electric cord 5m	1 pc
Controls module key	2 pcs
Halogen lamp 48 W 64684 ECO	1 pc
Documentation	1 pc

¹ Weight of raw corn processed. Actual production capacity of ready-to-eat product depends on corn quality and settings. Weight loss caused by natural reasons during the process may be up to 20%.

1.4 Power requirements



CONNECTIONS MUST BE DONE ONLY BY QUALIFIED ELECTRICIAN!



ELECTRIC SOCKET MUST HAVE GROUNDING TERMINAL!



IF SUPPLY CORD DAMAGED, IT MUST BE REPLACED BY MANUFACTURER, SERVICE AGENT, OR QUALIFIED PERSONS IN ORDER TO AVOID HAZARD!

It is necessary to periodically check electric connections, including grounding connection. Whenever any fault conditions are found, do not turn the equipment and call for qualified electrician!

Equipotential bonding wire (up to 10 sq.mm) shall be connected to screw terminal marked with IEC 5021 sign.



Cable plug is not included in the delivery set. Use a 32 A plug. Refer to the wiring diagram on the power cord label.

It is necessary to check electric wires and ground connection of the machine periodically. In case of faults found, an electrician must be called. It is allowed to turn the machine on only after all the issues are resolved.

1.5 Getting started

Unpack the machine carefully. Check the delivery set. Remove protective film from all surfaces. Connect popper to the mains. Once machine is installed, lock all swivel casters.



THERE MAY BE SOME CORN KERNELS FOUND IN THE MACHINE DUE TO QUALITY CONTROL CHECKS CONDUCTED AT THE FACTORY

1.6 Ambient conditions

The equipment must be operated at the ambient temperature from +5° to +40°C (+41°F to +104°F), relative humidity not more than 45% at 40°C/104°F). Altitude above sea level should not exceed 1000 m.

While in operation, a lot of moisture and heat is coming out of the popper. It is essential to provide exhausting hood (800x800 mm, 750 cu.m/h or more) installed above popper's output port.

Ambient conditions have strong effect on the end product quality! See chapter 2.5. for more details.

1.7 Safety components

EMERGENCY STOP button located on the front panel should be used in case of emergency. Press the button to turn popper off immediately.



USING EMERGENCY STOP BUTTON MAY LEAD TO CHAMBER CLOGGING!

A circuit breaker protects the machine from short circuit.

Voltage control relay analyzes voltage at the machine's input. Tolerance gap is preset on the unit. If the voltage value is beyond the gap, popper won't be energized.

Safety temperature sensor is located close to heating elements. In case of overheating, safety temperature regulator will turn off the contactor that runs heating elements, so they will be de-energized and temperature won't rise further.

The main PLC controls actual turbine rotation speed. If the speed is below 20 Hz, then PLC will shut the machine off in 12 seconds.

Popper has four swivel casters with locking mechanisms, which avoid

spontaneous movements of the machine.

1.8 Main components

Main components are: 1 – Turbine (not shown) 2 – Chamber; 3 – Hopper with Feeder; 4 – Sifter (perforated drum); 5 – Popcorn cart; 6 – Scrap tray; 7 – Controls, see Fig.1:



Fig. 1 Main components

Turbine (Blower)

The turbine provides constantly circulating airflow inside the popper. This is a direct type drive; the blower sits on motor's shaft. Rotational speed is controlled by the main PLC.

Chamber

This is where popping happens. Airflow circulates through the chamber; air is being heated by heating elements. In the chamber's lower part there is a bowl with special shaped holes that causes air vortex.

During machine operation corn kernels are being fed into the chamber; kernels are being heated up, and finally, immediately blown away from the chamber once popped.

Chamber can be easily accessed through the door provided. Halogen lamp

illuminates chamber inside, helping operator to control the operation.

Chamber is equipped with temperature sensor and optical sensor (see below).

Chamber Optical Sensor

The chamber optical sensor monitors processes happening in the chamber. Popper uses signal from this sensor in order to maintain smooth and effective operation process.

Chamber Temperature Sensor

Chamber temperature sensor helps to maintain the temperature in the chamber.

Sifter and Scrap Tray

Sifter is a rotating drum that screens un-popped kernels (“old maids”), partly popped popcorn, and other small fractions into scrap tray located under the sifter. Scrap tray is easily removable.

Corn Hopper

Corn hopper can hold one bag of corn (22.68 kg / 50 Lbs). Hopper equipped with feeder. Hopper can be easily removed for cleaning.

Controls

There are following controls located on the front panel:

- 4-digit LED indicator. Displays parameter values, alerts and notifications.
- TEMPERATURE adjusting buttons, marked with up and down arrows.
- START/PAUSE push button with light indicator. This button is used for starting machine, pause mode activation, and other operating purposes.
- COOLING/TURN OFF push button. This button is used to turn machine into cooling mode, and other operating purposes.
- EMERGENCY STOP push button. See 1.7 Safety components.

Popcorn Cart

Popper delivery set includes wheeled cart and 200-liter bags set. Cart is equipped with swivel casters.

2. Intended use

2.1 Operation modes

The popper has following operation modes:

- Heating mode. Once popper is turned on, it automatically starts to heat up. Upon reaching certain temperature popper switches automatically to popping mode.
- Popping mode. This is the main operation mode. See 2.2 Popping mode.
- Pause mode. Popper doesn't process corn in this mode, but maintains temperature in the chamber; thus, popping process can be resumed in no time.
- Cooling mode. Before turning off, popper must be cooled down. In cooling mode heating elements are completely de-energized; turbine keeps running, cooling down the machine. Once temperature drops low enough, popper is turned off automatically.
- Testing mode. This mode is used for testing popper components and adjusting popper parameters. See 2.6 Testing mode.

2.2 Popping mode

Popping mode is the main operation mode. Popper operates in cyclic way, processing corn kernels batch by batch. Each cycle consists of three stages:

- 1) Feeding. Hopper auger rotates, pushing corn kernels into the chamber.
- 2) Popping. Corn kernels are being heated up in the chamber, eventually being blown out from the chamber once popped.
- 3) Purging. Turbine is accelerated to higher speed in order to blow everything that are left in the chamber, i.e. unpopped kernels, dust and other scrap.

Normal Operation Workflow

Below is a quick, step-by-step guide how to operate the machine.

1. Make sure that scrap tray is empty and chamber is clean and not clogged.
2. Put one bag (22.68kg / 50Lbs) of corn into the hopper.

3. Put empty plastic bag into popcorn cart and put the cart under the sifter.
4. Press the START/PAUSE push button to turn the popper on. Popper will start to heat up.
5. Once heating up is completed, popper will be switched in popping mode automatically.
6. To make a pause in the process, press the START/PAUSE push button. Popper will stop producing popcorn, but will maintain temperature in the chamber at the set value. To resume production, press the START/PAUSE push button again.
7. To finish, press the COOLING/TURN OFF push button. Popper will be switched in cooling mode²; upon cooling completion, popper will be shut off automatically.

Chamber Purge Feature

It may happen that chamber is nearly to be clogged, despite regular purging happening in the end of each cycle. This can happen because of low quality corn used, or improperly chosen operation parameters. In this case, chamber purge feature may help to clean the chamber.

No matter which stage of operation the popper currently at. To clean the chamber, press and hold COOLING push button for 3 seconds, and then the turbine will be accelerated and chamber will be blown through.

This is easy and handy way to keep chamber clean without opening it.

Chamber purge procedure is also initialized automatically every time while popper in heating mode, once the sifter starts to rotate. This way the chamber is being emptied of scrap left there before.

2.3 Parameters

Properly chosen parameters are essential for good quality product and stable operation process. Make sure that you have understood all parameters and how they interact to each other.

Most parameters can be only adjusted in testing mode. Popping temperature

² Feeding auger will be stopped immediately once COOLING button is pressed; however, corn kernels that are already in the chamber will be processed and current cycle will be completed.

and basic turbine speed can be adjusted in any operation mode.

See Annex for the reference list of parameters and its values.



ANY MISOPERATION OR FAULT CONDITION CAUSED BY IMPROPERLY SET PARAMETERS IS NOT COVERED BY THE WARRANTY!

Popping Temperature

Popping temperature shall be chosen by a customer. During operation, the machine maintains the chamber temperature at the set value. Popping temperature affects the way how popcorn pops; first of all, its shape and size. The main principle is the following: the higher the temperature, the smaller the popcorn. Too low temperature leads to reduced productivity, improperly popped kernels, and finally, chamber clogging. So it is required to find a “sweet spot” while choosing the temperature. After little practice, anyone will be able to do it.

Common popping temperature for Butterfly is between 200-215°C; for Mushroom it is between 210-225°C.

Certain amount of Mushroom corn always will be popped as Butterfly. The percent of corn popped as Butterfly depends on quality of the corn as it stated in the certificate for that particular corn. Butterfly corn can be popped as Mushroom by means of increasing popping temperature. But this could result in decreasing of overall volume of popcorn (per 1 kilogram of raw corn), due to negative effect of excessive temperature to the volume of popcorn.

Temperature set point can be adjusted during heating or popping modes. To change the temperature, press up or down arrow marked push buttons on the front panel. The display will show the temperature set point. As long as you hold the button, the set point will start to be changed, degree by degree. Once the value is changed for 5 degrees, it will start to be changed by 5 degree steps. Once desired value is reached, release the button.

Turbine Speed

Turbine speed affects airflow intensity. As a rule, turbine speed for Mushroom should be higher than for Butterfly. Unlike Mushroom, which has proper spherical shape, Butterfly has irregular shape with “winglets”; hence less intense airflow is required to blow out Butterfly popcorn; and more intensive airflow is required for Mushroom.

Alike the popping temperature, excessive values of turbine speed may cause a

bunch of issues. Too slow turbine will cause popcorn accumulation in the chamber, smoldering, smoke formation, and finally, chamber clogging. Too fast turbine increases scrap rate, because many kernels are blown out of the chamber before they pop.

Airflow intensity can be reduced because of clogged metallic mesh inside the chamber. See chapter 3 for more details.

The Vortex patented technology is based on air convection inside the machine. Airflow intensity is being changed during operation accordingly to the operational algorithm. Airflow is being generated by the main turbine that is being controlled by VFD unit (voltage frequency driver).

While popper is in heating/pause/cooling mode, the turbine rotates with basic speed F that is set on the VFD unit. There are also two parameters that affect actual turbine speed during popping mode:

FP – popping frequency boost that is activated during popping stage of the cycle.

Fb – purging frequency boost that is activated during purge stage of the cycle.

If the airflow isn't strong enough, then the mass of popcorn would not be moved in the chamber; that will probably cause chamber clogging with further popcorn smoldering. In that case F value should be increased.

Too high F value may lead to excessive waste percentage; if scrap rate is more than 7% (comparing to the weight of raw corn processed), then the F value should be decreased.

To change basic speed F the following should be done.



HIGH VOLTAGE INSIDE! ONLY QUALIFIED AND TRAINED PERSONNEL ARE ALLOWED TO DO THIS!

1. Use a special key provided to open the electric controls compartment.
2. Press START button to turn the machine on.
3. Wait until turbine is started. A value of the frequency currently supplied to the turbine will be shown on the VFD display.
4. Use 'up' and 'down' arrow keys to set the desired frequency value for the basic rate. New value will be shown on the display in real time.



F VALUE MUST BE WITHIN F30.0 TO F40.0.
OTHER VALUES MAY LEAD TO CHAMBER CLOGGING, SMOKE FORMATION AND/OR EQUIPMENT FAILURE!

5. Close the compartment.

*Popping Time (**tP**)*

This parameter sets duration of popping stage. The main criterion of optimal popping time is that more than 95% of corn be are popped and thrown out from the chamber during this period.

*Feeding Speed (**Fr**) and Feeding Time (**tF**)*

Those two parameters define rotation speed of the auger (in rpm) and duration of feeding stage (in seconds), accordingly. The faster and longer auger rotates the more corn to be supplied.

*Purge Time (**tb**)*

This parameter sets duration of purging stage (in seconds).

*Forced Heating Time (**tH**)*

Popper uses PID algorithm for maintaining temperature in the chamber. However, when cycle begins, temperature tends to drop due to natural reasons. To avoid this, in the beginning of each cycle heaters are forcedly operated on full power for period of time defined by this parameter (in seconds).

*Sifter Speed (**Sr**)*

This parameter defines rotational speed of the sifter (in rpm). Too low sifter speed may cause chamber clogging.

2.4 Display notifications

Popper has 4-digit 7-segment LED indicator located on the front panel. Depending on popper condition and/or certain situation, operator can see 4-symbol codes, which are listed below.

Message meaning

HHHH	Heating mode in progress
CCCC	Cooling mode in progress
PPPP	Popping mode in progress (constant glow) Pause mode activated (flashing)
[Corn]	"Corn is over" alert (flashing)
Err 1	Turbine speed is below 20 Hz
Err 2	Chamber clogging
Err 3	Temperature sensor fault
Err 4	Connection fault between PLC and temperature module

2.5 Popcorn quality

Popcorn is a product that requires ultimate attention towards many aspects. Understanding popcorn processing technology is essential to get high quality product.

Raw Corn

It is impossible to get good stable result using low quality supplies, first of all, raw corn kernels. Choose reliable corn suppliers. Make sure that raw corn is stored and handled properly at your production site or warehouse. Ask your supplier for corn storage recommendations.

Popcorn Crunchiness

Popcorn is crunchy when its moisture content doesn't exceed 1-1.5%. Popcorn that just came out of the machine has higher moisture rate, it is still losing moisture as cooling down. It is recommended to establish proper environment and workflow in such a way that will let you to achieve proper quality.

Production Capacity

Due to the nature of popping process, there is always a difference between

weight of raw corn processed and weight of ready-to-eat product in popcorn cart. This difference may vary. Low quality corn or improperly chosen popper parameters may increase the weight difference. For example, if too dry corn used, or there are a lot of damaged kernels, then there will be a lot of “old maids” screened in sifter and dumped to scrap. Another example, if turbine speed is set too high, a lot of unpopped kernels will be blown out before they would have been popped.

The real production capacity depends on many aspects, including corn quality and popper parameters and settings, including:

Amount of corn per batch, which is defined by Feeding Speed and Feeding Time parameters, see section 2.3 for more details. There is a simple way to measure batch amount. Fill the hopper generously, and then do three consecutive feeding cycles by activating feeder testing procedure as described in section 2.6

Then take out all corn from the chamber, measure it and divide by 3. This is the average weight of a single batch.

Popping stage duration. Popper uses chamber sensor data to manage the popping process. The real duration of popping stage may be different than ‘Popping time’ (*t_P*) parameter.

Therefore, cycle duration is the sum of feeding time, purging time and popping time; the last one can be measured in each particular case. Knowing cycle duration and amount of corn supplied per batch, one can calculate the real throughput rate.

2.6 Testing mode

The purpose of this mode is testing certain components and adjusting most parameters. To enter the testing mode, press and hold COOLING button and press START button once; release COOLING button as you see “0” on the display. Once you entered in the testing mode you see “St” on the display. It means that the machine is ready.

Sifter And Feeder Testing

To test sifter, *press and hold* COOLING push button. The display will show “St-S” message and sifter starts to rotate as long as the button is kept pressed. To test feeder, *press and release* COOLING push button. The display will show “St-F” message and feeder will execute one feeding cycle in accordance with

set Feeding Time and Feeding Speed parameters.

Parameter Adjustment

All parameters, except popping temperature and basic turbine speed can be adjusted from this mode. Press START button to list parameters. Once desired parameter is displayed, its value can be adjusted by pressing COOLING button. The value will be increased by step each time COOLING button is pressed. After reaching maximum value, it will shift to the minimal value.

Reset To Default Values

Once you see **dEF** on the display, press and hold COOLING button and press START button once. All parameters, except basic turbine speed will be reset to its default values, and the popper will be shut off.

Save And Exit

There are two ways to exit the testing mode and save all changes have been made: press EMERGENCY STOP button at any time; or press START button one more time once you see 'dEF' on display.

3. Technical maintenance

The purpose of technical maintenance is to keep equipment in good condition during all the lifetime and to meet safety regulations.

3.1 Cleaning guidance

Recommended cleaning schedule is the following³:

ACTION	PERIOD
Outer surface cleaning	once a day
Chamber cleaning, including mesh screen	once a day
Sifter cleaning	once a week
Sifter drive shaft rollers cleaning	once a month
Hopper/feeder cleaning	once a month



DISCONNECT ELECTRIC PLUG BEFORE CLEANING!



DO NOT WASH WITH WATER!



DO NOT USE SHARP TOOLS OR ABRASIVES FOR CLEANING!



WAIT UNTIL MACHINE IS COOLED DOWN BEFORE CLEANING!

Outer Surface Cleaning

Clean outer surfaces of the machine by the means of dry and clean cloth; it is allowed to use a cloth slightly damped with soap water.

Chamber Cleaning

It is necessary to clean the chamber of husk and dust once a day. To clean the chamber, unfasten the latches which hold the hatch, and pull it out. After that, remove husk and debris from the chamber. It is handy to use a vacuum cleaner for this operation. Make sure that chamber sensor head (little red dot next to temperature sensor) overtops the chamber wall, and its surface is free of dust. Clean it gently with soft dry cloth if required.

³ Any cleaning procedure has to be performed as often as required.

After cleaning, place the hatch back and fasten up the latches.

During long time operation, certain amount of corn dust is accumulated in the chamber. It is important to clean mesh screen.

Open the chamber. There is a baffler in the center. The mesh screen is behind the baffler. Normally there is enough room to get access to the screen in order to clean it. However, if required, baffler can be removed. To do so, remove two bolts that fix the baffler to sidewalls. And then pull the baffler out. Once cleaning is done, put the baffler back and fix it with the bolts.



IT IS NOT ALLOWED TO OPERATE POPPER WITHOUT BAFFLER OR MESH SCREEN!

Sifter Cleaning

Sifter is not rigidly connected to the machine and can be taken out of the machine. Sifter lies freely on two shafts each with couple of rubber rollers. In the course of time, the rollers' surface may become greasy and slippery, because of natural corn oil and dust. This may cause sifter stop and chamber clogging. To avoid this, rollers must be cleaned as necessary. It is suitable to do with a hard steel brush or other tool that provides strong impact on grease layer on rollers' surface.

Hopper Cleaning

As the chamber, the hopper can be easily cleaned with a vacuum cleaner. However, it can be easily removed. To do this, unscrew three wing bolts fastening left upper brim of the hopper, and then pull the hopper out.

3.2 Chamber clogging

See Annex E. It is recommended to print out this annex and keep it next to machine visible to operators all the time.

3.3 Light bulb replacement

To replace lightbulb do the following.

1. Turn off the machine and disconnect it from the mains. Wait until the machine cools down.
2. Take chamber door off to open the chamber.

3. Backlight is located on the left sidewall of the chamber.
4. Remove four screws that holds lamp screen and take the screen off. If it is stuck, carefully insert flat screwdriver under the metal frame of the screen and turn it gently to detach the screen.
5. The lightbulb is being hold by spring loaded socket. Shift the bulb upwards or downwards to release its opposite end, and then take the bulb out.



THE BULB MAY BE EXTREMELY HOT! BURN HAZARD!

6. One must not touch the new lightbulb with bare fingers; skin fat can cause bulb destruction during further operation. If the bulb is greasy, it is required to wipe it thoroughly with soft, clean and dry cloth before putting it in.
7. Once bulb replacing is done, put the protective screen back and fix it with four screws. Close the chamber.

3.4 Preservation

If the machine is not operated for a long time, it is necessary to perform all cleaning procedures listed above.

4. Troubleshooting

Problem	Possible cause	Possible remedy
Chamber clogged with popcorn (Error 2 message)	<ul style="list-style-type: none"> - low quality corn - corn storage conditions are not met - wrong chosen settings of the machine - chamber clogging sensor is detuned. 	<ul style="list-style-type: none"> - use high quality corn - provide proper storage conditions for raw corn - adjust popping temperature - adjust turbine speed - adjust corn auger speed - set up chamber clogging sensor operation distance properly, see Annex related.
Too much scrap	<ul style="list-style-type: none"> - low quality corn - too high turbine speed 	<ul style="list-style-type: none"> - use high quality corn - decrease turbine speed
Popcorn is not crispy	<ul style="list-style-type: none"> - low quality corn - extreme ambient conditions - no exhausting hood provided - popcorn is still hot 	<ul style="list-style-type: none"> - use high quality corn - provide proper ambient conditions - provide exhausting hood - arrange the workflow such a way to let popcorn to cool down - use a special tool to check moisture content of the product - note that generally Mushroom is less crispy than Butterfly
Too small popcorn	<ul style="list-style-type: none"> - too high popping temperature 	<ul style="list-style-type: none"> - reduce popping temperature
Too much butterfly shaped popcorn while making Mushroom	<ul style="list-style-type: none"> - too low popping temperature 	<ul style="list-style-type: none"> - increase popping temperature
Corn is not being pushed into the chamber while machine is in popping mode	<ul style="list-style-type: none"> - connection fault between corn auger motor, stepper driver, and the main PLC - mechanical jam in auger 	<ul style="list-style-type: none"> - check connections between corn auger motor M3, stepper driver DD2, and the main PLC unit DC1 - manually check the rotation of auger (the machine must be turned off)
Error 1 message	<ul style="list-style-type: none"> - turbine speed is below 20 Hz 	<ul style="list-style-type: none"> - check to see if turbine is rotating - check the power supplied to the VFD unit UZ - check connection between AC motor and VFD unit UZ - check the VFD unit settings, see the Annex below
Error 3 message	<ul style="list-style-type: none"> - temperature sensor fault 	<ul style="list-style-type: none"> - check the connection between temperature sensor BT1 and temperature controller DC2
Error 4 message	<ul style="list-style-type: none"> - PLC to temperature module connection fault 	<ul style="list-style-type: none"> - check connection between temperature controller DC2 and the main PLC unit DC1

5. Transportation and storage

The equipment may be transported by any kind of covered vehicle, in accordance with transportation rules for this kind of vehicle.

Ambient temperature during the transportation and storage must be between minus 25°C to +55°C (-13°F to 131°F).

6. Acceptance certificate

ACCEPTANCE CERTIFICATE	
_____ Product Name	_____ Serial No.
The equipment is made with accordance to mandatory requirements of the state standards, actual technical documentation, and approved for use.	
QC Engineer	
STAMP HERE	
_____ Signature	_____ Full Name
_____ DD.MM.YYYY	

7. Warranty obligations

The manufacturer guarantees trouble-free operation of the equipment during 12 months from the date of receiving the equipment by dealer (in accordance with transport documentation); or, in case of purchase directly through Trapeza LLC, from the purchase date, given that terms of using, transportation, and storage are met.

The warranty repair is performed upon presentation of this manual and filled warranty card with the seller's seal and the date of sale.

Technical specifications of the equipment can be changed by manufacturer at any time due to improvements and/or other reasons. Technical specifications stated in this document are intended to act as a reference point, which is necessary to evaluate suitability of the equipment for the customer's needs, and are not the subject of warranty policy.

The information stated in this document has been thoroughly checked and considered as accurate one; nevertheless, the manufacturer is not responsible for any typographical errors or misprints.

Due to constant improvement of the equipment, technical specifications are subject to change without prior notice!

8. Manufacturer details

NPO Tvertorgmash LLC

11 Industrial Street, Tver, 170100 Russia

Technical support:

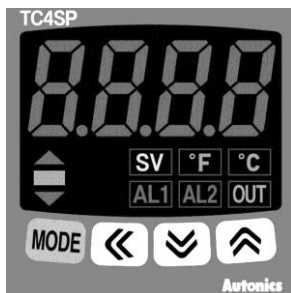
Email: support@roboabs.pro

Phone: +7 495 956 4000

Annex A. Electric component list

SIGN	COMPONENT	MODEL	SPECIFICATION
BL	Digital amplifier with heat-resistant sensor	E3X-NA41 2M E32-D61	24 Vdc
BT1	Temperature sensor	ДТПК124-00.32/2,5	K type
BT2	Temperature sensor	ДТПК 054-00.120/2	K type
DC1	PLC	DVP12SA211T	230 Vac
DC2	Temperature module	DTC1000V	24 Vdc
DC3	LED MODBUS indicator	СМИ2	24 Vdc
DC4	Limiting temperature regulator	TC4SP-14R	230 Vac
	11-pin socket	PS-11	—
DD1, DD2	Stepper driver	DM556	24 Vdc
EK1 — EK4	Heating element	I1GIK8BL33001 IRCA	230 Vac, 2500 W
EL	Halogen lamp	64684 ECO	230 Vac, 48 W
EMI	EMI filter	DL-25EB3	400 Vac, 25 A
FV	Voltage control relay	RM17UBE15	230 Vac, 5 A
HL	Contact block with LED	B5	24 Vdc
K1, K2	Electromechanical relay	G2RV-SR700 AC/DC24 BY OMB	24 Vdc, 4 A
KM1	Contact	LC1D09M7	400 Vac, 9 A
KM2	Contact	LC1D32M7	400 Vac, 32 A
M1	AC motor	TN80A/2 B5	400 Vac, 3000 rpm
M2	Stepper motor with gear 1:5	FL86STH65-2808AG5	2.8 A
M3	Stepper motor	FL86STH65-2808A	2.8 A
QF	Circuit breaker	S203-C32	32 A
R1, R2	Resistor	C2-23-2	2 k Ω , 2 W
SA1	Emergency stop button	B200E40	4 A
SA2	Double push button black	M22-DDL-S	4 A
SB1	Push button, white	B100DB	4 A
SB2	Push button, black	B100DH	4 A
TV	Power supply unit	S8VK-C24024	24 Vdc, 10 A
UZ	Voltage frequency driver	VFD007EL21A	230 Vac
VS1, VS2	Solid-state relay	SAL963460	24 Vdc, 32 A

Annex B. Temperature regulator settings



PARAMETER	VALUE	DESCRIPTION
In-t	TCR	Temperature sensor: thermocouple K type
L-Sv	250	SV low-limit value
H-Sv	400	SV high-limit value
oUt	rLY	Control output type: relay
C-nd	onof	Control mode type: ON/OFF
AL-1	AN 1. <input type="checkbox"/> AN <input type="checkbox"/> A	Alarm Operation Mode
ALYS	50	Alarm Output Hysteresis
AL 1	0	Alarm Temperature
HYS	50	
LoC	LoC2	Lock settings: all locked, except SV

Set point (SV) is set at 300°C by default.

Annex C. VFD settings



PARAMETER	VALUE	DESCRIPTION
00.03	0	Start-up Display Selection: display the frequency command value (Fxxx)
01.00	70.00	Maximum Output Frequency
01.16	4	Auto Acceleration/Deceleration
02.00	3	Source of First Master Frequency Command: RS-485
02.01	4	Source of First Operation Command (RS-485)
02.04	0	Motor Direction Control
02.07	1	Up/Down Mode
02.10	1	Combination of the First and Second Master Frequency Command
02.11	40.00	Keypad Frequency Command
09.00	5	Communication Address of the VFD
09.01	1	Transmission Speed (9600 bps)
09.02	3	Transmission Fault Treatment (keep operating)
09.04	1	Communication Protocol (ASCII 7, E, 1)

Annex D. Parameters list

All parameters, except popping temperature and basic turbine speed are to be changed from testing mode.

PARAMETER	DISPLAY	DEFAULT VALUE		RANGE (STEP)
Popping temperature	<value>	210	°C	190...240 (1)
Turbine speed	F	40	Hz	30...40 (0.1)
Popping time	tP	180	s	150...300 (30)
Feeding speed	F_r	200	rpm	100...350 (10)
Feeding time	tF	10	s	10...30 (5)
Purge time	t_b	10	s	10...30 (5)
Heating boost time	tH	40	s	10...60 (5)
Sifter speed	S_r	50	rpm	10...95 (5)
Popping freq boost	FP	10	Hz	10...15 (1)
Purging freq boost	F_b	20	Hz	15...30 (1)
Reset to default	dEF			

Annex E. Chamber clogging

If chamber is clogged, and/or smoke is coming out from the machine, DO THE FOLLOWING:

1. Press EMERGENCY STOP button.
2. Take out the plug from the mains socket.
3. Wait until machine is cooled down.



DO NOT OPEN THE CHAMBER DOOR! DO NOT USE FIRE EXTINGUISHER!

POPPER IS MADE OF STEEL AND CHAMBER IS SEALED; EVEN IF POPCORN BEGINS TO SMOLDER, IT WON'T GET A FIRE WITHOUT EXTRA AIR!

4. Cooling down will take not less than 2 hours.
5. Carefully open the chamber and proceed to cleaning.
6. If corn supply tube is clogged with popcorn, use some flexible item, like a piece of thick rubber hose, to remove clogging.



CHAMBER CLOGGING CAUSED BY UNSKILLED ACTIONS OF OPERATING PERSONNEL IS NOT THE WARRANTY CASE!

Annex F. Chamber optical sensor setup

Enter the testing mode of the machine.



ATTENTION! SOME COMPONENTS IN THE COMPARTMENT ARE UNDER HIGH VOLTAGE! BE CAREFUL WHILE OPERATING INSIDE!

Open electric compartment, find the optical amplifier, see Fig.1



Fig. 1 Optical amplifier: 1 – Operation distance adjusting screw; 2 – Operation indicator

Open the chamber and make sure that the sensor head is clean, use a dry soft cloth if necessary.

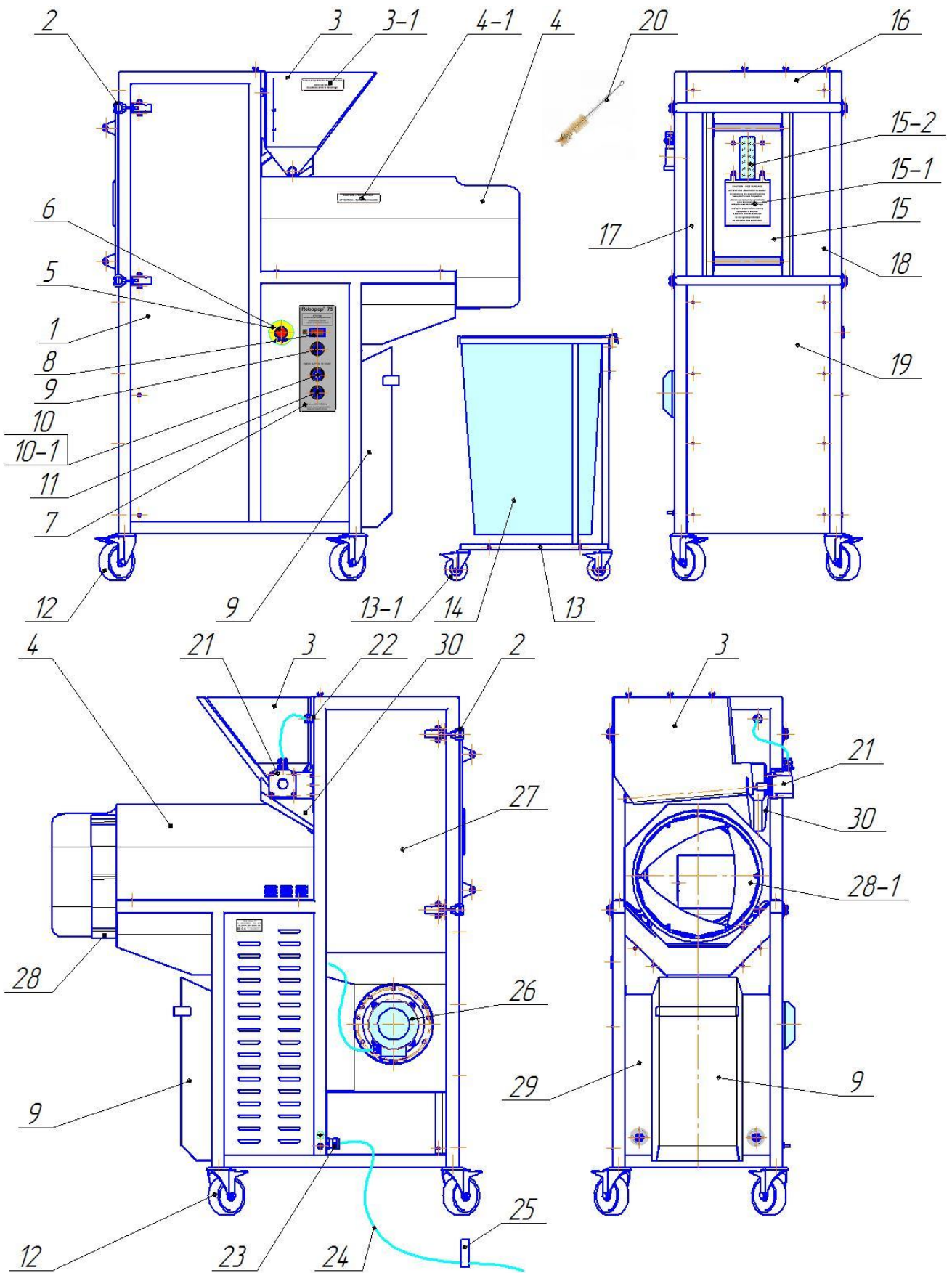
Put a piece of paper or any suitable item inside the chamber, in order to block sensor's sightline in the middle of the chamber, see Fig.2.

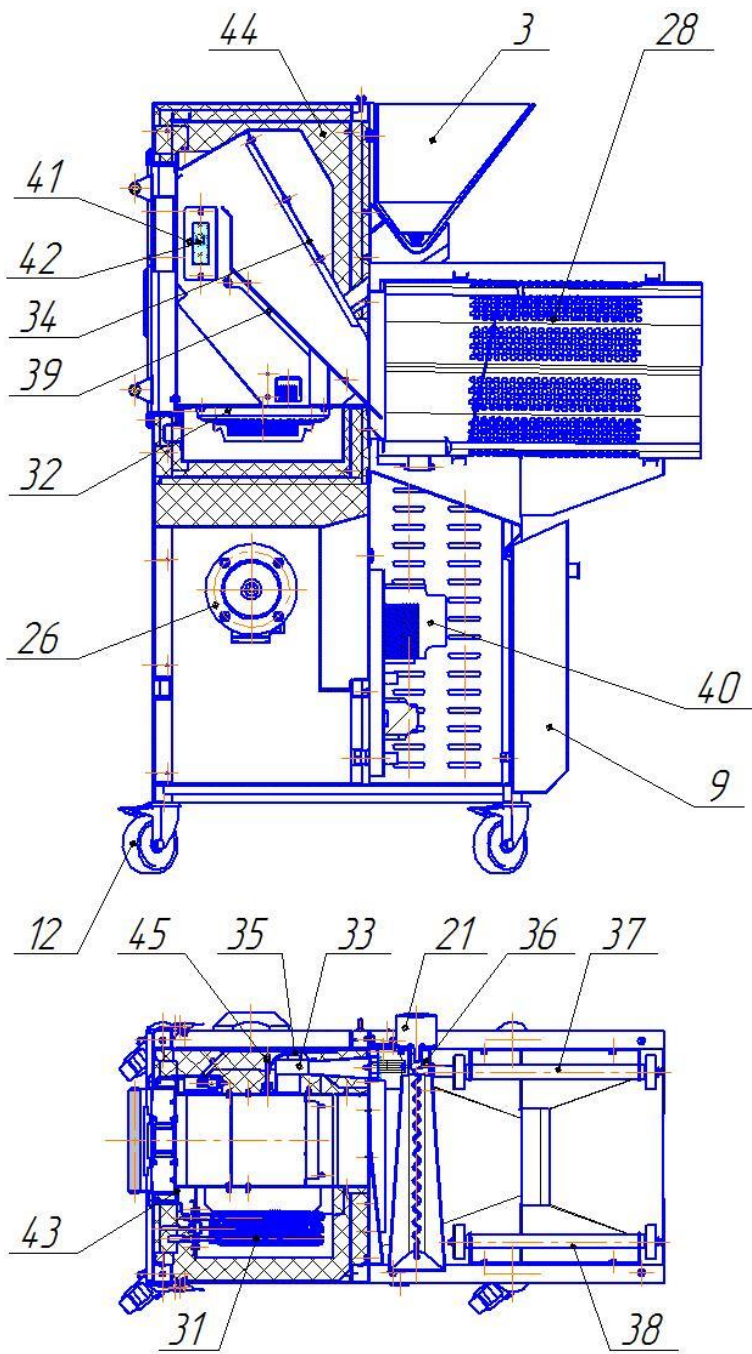
Use the adjustment screw on the amplifier to set the operating distance accordingly. Use the operation indicator on the amplifier to see the moment of tripping, see Fig.1.

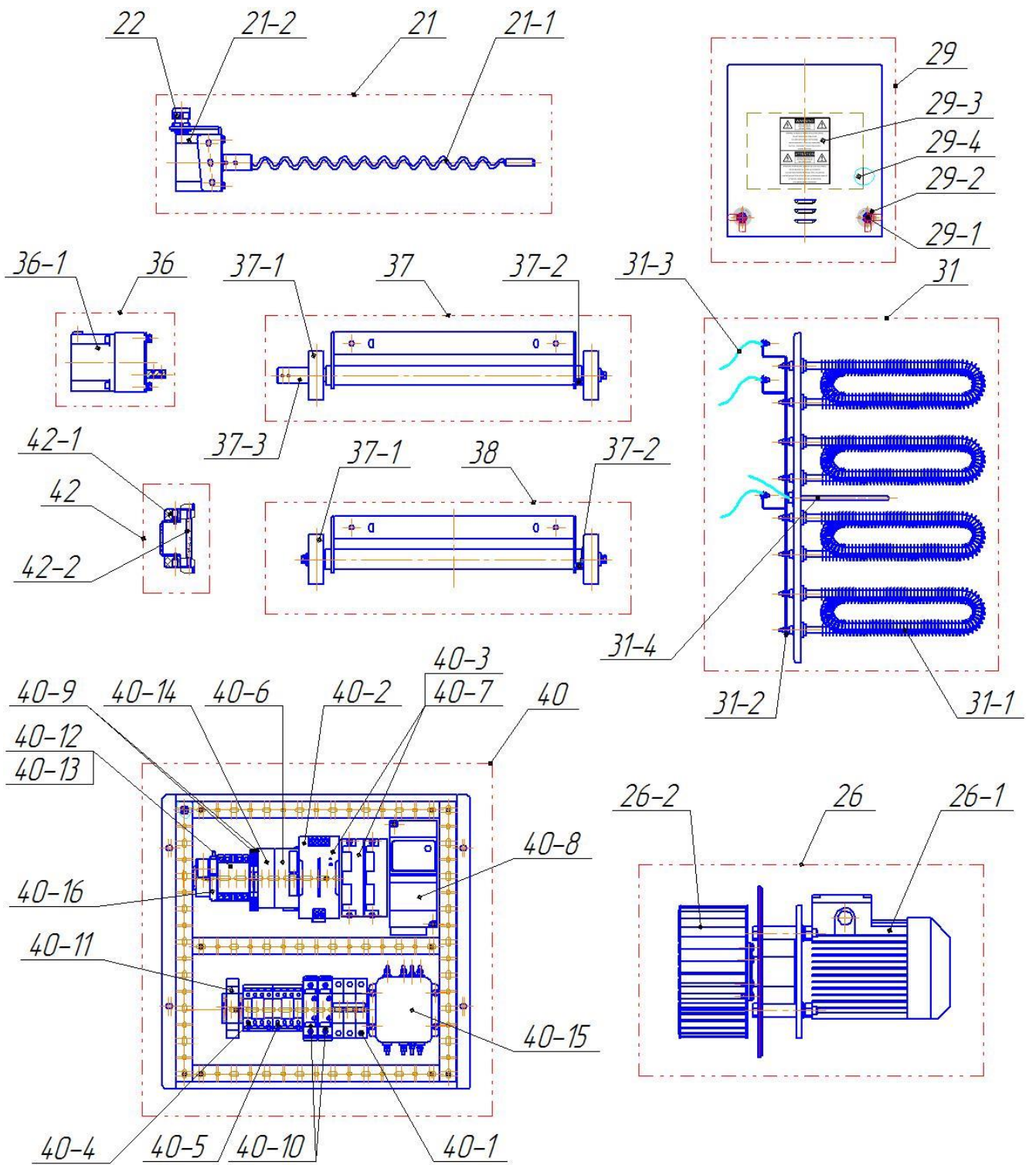


Fig. 2 Paper screen

Annex G. Parts list







ITEM#	ARTICLE#	PART	MODEL
1	21476	Front panel	
2	21477	Lock	
3	21478	Corn hopper	
3-1	-	Corn hopper sticker	
4	21479	Sifter shroud	
4-1	-	Sifter shroud sticker	
5	4068	"STOP" sticker	BET60A
6	496	EMERGENCY STOP button	B200E40
7	20731	Control panel sticker	
8	16140	4-digit LED indicator	CMI2
	21454		
9	21455	Double push button black	M22-DDL-S
	21456		
10	2467	Push button white	B100DB
10-1	188	Contact block with LED	B5 12-30B
11	2393	Push button black	B100DH
12	1215	Swivel caster with lock 125 mm	3300-PUR-125-F18
13	77963	Popcorn cart	TR1
13-1	1203	Swivel caster with lock 75 mm	
14	1838	LDPE bags (50 pcs)	
15	21480	Chamber door assembled	
15-1	-	Chamber door sticker	
15-2	21481	Glass unit	
16	21482	Upper panel	
17	21483	Left side panel	
18	21484	Right side panel	
19	21485	Down side panel	
20	20744	Pipe cleaning brush	
21	21486	Corn hopper drive	
21-1	21487	Corn auger	
21-2	13832	Stepper motor	FL86STH65-2808A
22	13446	Cable gland	PG13,5
23	776	Cable gland	PG21
24	20673	Power cord	КГН 4x4
25	13592	Power cord sticker	
26	21488	Motor with turbine assembled	
26-1	17431	AC motor	TN80A2 B5
26-2	21489	Turbine with flange	
27	21490	Rear panel	
28	21491	Sifter drum	
28-1	21492	Sifter spade	
29	21493	Control cabinet cover	
29-1	806	Lock	KY05.1.2
30	21494	Corn supply funnel	
31	21495	Heaters unit assembled	
31-1	3744	Finned heater 2500 W 230 Vac	1GIK8BL33001
31-2	21496	Copper bus set (2 pcs)	
31-3	21497	Hot-resistant wire set	
31-4	21469	Temperature sensor (type K)	ДТПК 054-00.120/2
32	21498	Bowl	
33	21499	Corn supply tube	

ITEM#	ARTICLE#	PART	MODEL
34	21500	Mesh screen	
35	12888	Hot-resistant optical head	E32-D61
36	21501	Sifter drum drive	
36-1	4023	Stepper motor w/gearbox 1:5	FL86STH65-2808AG5
37	21502	Drive roller assembled	
37-1	1224	Wheel	MTB 75x22
37-2	2480	Bearing	6101
37-3	21503	Clutch	
38	21504	Idle roller assembled	
39	21505	Chute	
40	21506	Control panel	
40-1	77	Circuit breaker 32 A	S203 C32
40-2	13451	Power supply unit 240 W 24 Vdc	S8VK-C24024
40-3	13715	Stepper driver	DM556
40-4	13450	Contactora 9 A	LC1D09M7
40-5	13449	Contactora 32 A	LC1D32M7
40-6	13765	Programmable logic controller	DVP12SA211T
40-7	2786	Resistor 2 W 2.0 kOhm	C2-23
40-8	12648	VFD unit 0.75 kW 230 Vac	VFD007EL21A
40-9	12647	Electromechanical relay	G2RV-SR700 AC/DC24 BY OMB
40-10	14641	Solid-state relay 32 A, 3,5-32 Vdc	SAL963460
40-11	14429	Voltage relay 220 Vac, 50 Hz	RM17UBE15
40-12	16118	Temperature regulator	TC4SP-14R
40-13	11445	Temperature regulator 11-pin socket	PS-11
40-14	20328	Temperature controller	DTC1000V
40-15	3895	EMI filter	DL-25EB3
40-16	12798	Digital amplifier	E3X-NA41
41	21507	Lamp protective glass	
42	21508	Chamber backlight assembled	
42-1	2281	Lamp socket	R7s 206
42-2	13454	Halogen lamp 64684 ECO	48 W 78 mm 230 V
42-3	21509	Hot-resistant wire set	
43	2666	Silicone profiled gasket, 2 m	№14-12
44	13860	Mineral wool 38 thick	1260 (1300) - 128
45	22407	Temperature sensor (type K)	ДТПК-124-00.32/2.5
	15075	Hot-resistant sealant, gray	250°C
	13538	Anti-seize paste, food grade	Molykote P-1900 FM