RoboLabs

Incredible machines for funfood & fastfood

GRAND ROBOPOP 220 (VPM-RGM2)

OPERATION MANUAL

CAUTION: READ THE INSTRUCTIONS BEFORE USING THE MACHINE!

PDF version is available for download at www.robolabs.pro

2019

SAFETY REQUIREMENTS

DO NOT WASH 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!

SOME PARTS ARE HOT WHILE IN OPERATION!
BURN HAZARD!

DO NOT TOUCH MOVING PARTS!

1. OVERVIEW

1.1. PURPOSE

Vortex Popcorn™ machine Grand Robopop® 220 VPM-RGM2 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 kept as much as possible.

1.2. TECHNICAL SPECIFICATIONS

Throughput[1]	75 to 100 kg/hour
Hopper capacity	25 kg
Rated voltage[2]	3P 400 Vac 50/60 Hz
Rated power	24 kW
Overall dimensions[3] (LxWxH)	1220x810x1930 mm
Package dimensions (LxWxH)	2100x1400x1000 mm
Net/gross weight	300/500 kg
IP rating	IP22

[1] Amount of raw corn processed. Production rate of the machine depends on corn quality. Due to humidity loss during popping and some amount of unpopped kernels and husk, weight difference may be up to 20%.

[2] 3P 208/240 Vac option is available upon request.

[3] 1220x1690x1930 mm completed with sifter (see Annex F).

1.3 DELIVERY SET[4]

Popper	1 pc
Controls compartment key	2 pcs
Halogen lamp 64684ECO	1 pc
Documentation	1 set

1.4 POWER REQUIREMENTS

ELECTRIC SOCKET MUST HAVE GROUNDING CONTACT!

CONNECTIONS MUST BE DONE ONLY BY QUALIFIED ELECTRICIAN!

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 on, and call for qualified electrician!

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

IEC 5021

Machine comes with ROJ power cord (5x10 mm^2). It is recommended to use 3P+N+PE 63A plug for 400 Vac option or 3P+PE 63 A plug for 208/240 Vac option. Follow power cord sticker wiring information.

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.

[4] Sifter with a scrap tray to be ordered separately.

1.5 GETTING STARTED

Unpack the machine carefully. Check the contents of the package. Remove protective film from all surfaces.

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 section 2.6 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!

50 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.

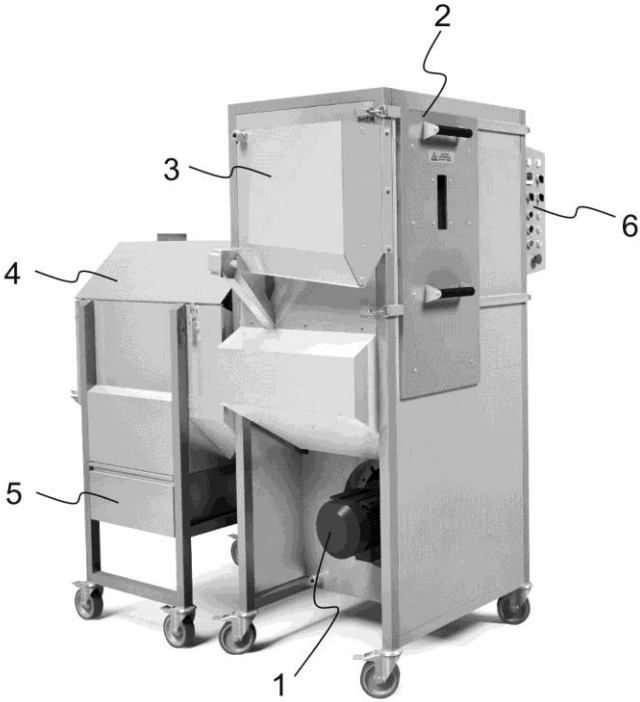
The main PLC controls actual turbine rotation speed. If the speed is

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 of the machine are shown below.



Popper general appearnace: 1 – Turbine (Blower); 2 - Chamber; 3 – Corn Hopper; 4 – Sifter; 5 – Scrap tray; 6 – Controls)

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 is equipped with corn sensor that trips in case of low corn.

CONTROLS

Temperature regulator – popping temperature settings.

Light indicators

CLOGGING – chamber optical sensor tripped.

LOW CORN – low corn.

HEATING – machine is in heating mode.

POPPING – machine is in operation mode (constant glow); machine is in pause mode (flashing).

COOLING – machine is in cooling mode.

Switches

FEEDING – single batch amount.

SIFTER SPD – sifter speed.

TURBINE SPD – turbine speed.

Pushbuttons

START – turns machine on.

PAUSE – turns on pause mode and resume popping mode.

TURN OFF – turns machine in cooling mode.

EMERGENCY STOP – immediately turns machine off.

2. INTENDED USE

2.1 OPERATION MODES

Popper has following operation modes:

- Heating mode. Once START button is pressed, popper automatically starts to heat up. Upon reaching certain temperature popper switches automatically to popping mode.
- Popping mode. This is the main operation 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. See section 2.5 for more details.

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.

DO NOT EAT FIRST BATCH!

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. Press the START push button to turn the popper on. Popper will start to heat up.

4. Once heating up is completed, popper will be switched in popping mode automatically.

5. 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.

6. To finish operation, press TURN OFF push button. Popper will be switched in cooling mode[5]; 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

[5] 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.

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 SETTINGS

POPPING TEMPERATURE

Popping temperature shall be chosen by a customer. During operation, machine keeps temperature in chamber at the set value. Popping temperature affects the way how popcorn pops; first of all, its shape and size. Too high temperature leads to smaller popcorn and possible chamber clogging. 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.

Common value for Butterfly lies between 200 and 215°C; for Mushroom between 210 and 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 using temperature regulator located on the front panel. To change the temperature, press up or down arrow keys. SV value is the set point; PV value is the current temperature in chamber.

FEEDING TIME

Feeding time is the time auger operated pushing kernels to chamber.

FEEDING switch has three positions:

‘1’ - 35 seconds; ‘2’ - 40 seconds; ‘3’ - 45 seconds

This parameter depends on corn quality. If the corn is good and kernels are big enough, then it is allowed to set this switch to the maximum. If corn quality is low, or kernels are too small, then it is better to keep this parameter on the minimum value.

IMPROPERLY CHOSEN PARAMETERS MAY LEAD TO CHAMBER CLOGGING!

SIFTER SPEED

SIFTER SPD switch sets sifter’s rotational speed; three values are available:

‘1’ - 50 rpm; ‘2’ - 75 rpm; ‘3’ - 100 rpm

Sifter speed should be adjusted depending on batch size. With big batch, sifter must spin faster, to withdraw popped popcorn from the area of chamber output in order to avoid chamber clogging with popped popcorn.

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 turbine (blower) that is being controlled automatically via VFD unit.

While popper is in heating/pause/cooling mode, the turbine rotates with basic speed F that is set on the VFD unit.

F setting can be adjusted using controls on VFD unit.

HIGH VOLTAGE! ONLY INSTRUCTED AND QUALIFIED PERSONNEL ARE ALLOWED TO DO THE FOLLOWING OPERATIONS!

1. Open electric compartment.

2. Press START button to turn the machine on.

3. Wait until turbine is started.

4. Use ‘up’ and ‘down’ arrow keys on VFD control panel to set the desired value. New figure will be shown on the display in real time.

F VALUE MUST BE WITHIN F20.0 TO F40.0.

OTHER VALUES MAY LEAD TO CHAMBER CLOGGING, SMOKE FORMATION AND/OR EQUIPMENT FAILURE!

5. Once new value is set, close the compartment.

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 5-7% (comparing to the weight of raw corn processed), then the F value should be decreased.

Popper's algorithm changes turbine speed depending on current cycle stage using value set by TURBINE SPD switch. Available values are 6, 8, or 10 Hz; which are corresponded to switch positions #1, 2, and 3, accordingly.

It is recommended to choose higher increment to avoid chamber clogging.

2.5 TESTING MODE

It is possible to check certain components of the machine in testing mode. Press and hold PAUSE button and press START button to enter into the testing mode.

SIFTER TESTING

Press and hold PAUSE button more than for 3 seconds. Sifter is rotating as long as PAUSE button is pressed.

FEEDER TESTING

Press and release PAUSE button. Feeder will execute a single cycle of feeding.

CORN WILL BE FED INTO THE CHAMBER DURING FEEDER TESTING. ALL CORN MUST BE REMOVED FROM THE CHAMBER BEFORE START!

Press TURN OFF button to exit the testing mode.

2.6 POPCORN QUALITY AND PRODUCTION CAPACITY

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 moisture content and product 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:

<u>Single batch weight</u>, which is defined by Feeding time setting. There is a

simple way to measure batch weight. Fill the hopper full, and then do three consecutive feeding cycles by activating feeder testing procedure as described in section 2.5.

Then take out all corn from the chamber, weigh 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. Depending on quality of corn used, duration of popping stage may vary, while duration of feeding and purging stages are constant.

So, knowing cycle duration for certain corn and settings, and batch weight, it is possible to find out the real throughput rate.

3. TECHNICAL MAINTENANCE

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

3.1 CLEANING GUIDE

Recommended cleaning schedule is listed below[6]:

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	twice 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.

[6] Any cleaning procedure has to be performed as often as required.

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 door, and pull it out. After that, remove husk and debris from the chamber. It is handy to use a vacuum cleaner for this operation.

After cleaning, place the door 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.

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.

3.2 CHAMBER CLOGGING

Refer to Annex E for list of actions should be taken in case of chamber clogging. It is recommended to print it out and keep next to machine.

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 right 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.

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.

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

3.4 PRESERVATION

In case of prolonged period of no use all the technical maintenance routine must be executed.

4. 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).

5. ACCEPTANCE CERTIFICATE

Equipment is met mandatory requirements of the state standards, actual technical documentation, and approved for use.

TEST 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

6. 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!

7. MANUFACTURER DETAILS

NPO Tvertorgmash LLC

11 Industrial Street, Tver, 170000 Russia

Technical support:

Email: support@robolabs.pro

Phone: +7 495 956 4000

ANNEX A.

ELECTRIC COMPONENTS LIST

DESIGNATION	*NAME*	*MODEL, MANUFACTURER*	*SPECS*
BL1	Optical sensor	E3F1-DP12 2M, Omron	24 Vdc
BL2	Digital fiber amplifier	E3X-NA41, Omron	24 Vdc
	Optical head, heat-resistant	E32-D61 2M, Omron	24 Vdc
BT1	Temperature sensor	ДТС124-PT100-A3.10/2, or ДТПК124-00.10/2	Pt100 (RTD) or type K
BT2	Temperature sensor	ДТПК-054-00.120/2, Owen	Type K
BZ	Buzzer	SC235B, Sonitron	24 Vdc
DC1	PLC	DVP14SS211T, Delta	24 Vdc
DC2	I/O extension module	DVP16SP11T, Delta	24 Vdc
DC3	Thermoregulator	TCN4S-24R, Autonics	230 Vac
DC4	Thermoregulator	TC4SP-14R, Autonics	230 Vac
	Thermoregulator socket	PG-11, Autonics	—
DD1, DD2	Stepper driver	DM556, Leadshine	24 Vdc
EK1 — EK3	Heating elements (9 pcs)	1GIK8BL33001, IRCA	230 Vac, 2.5kW
EL1, EL2	Signal lamp	NA201, Emas	24 Vdc
	Lighting, yellow	S224S7, Emas	—
EL3 — EL5	Signal lamp	NA201, Emas	24 Vdc
	Lighting, white or green	S224B7 or S224Y7, Emas	—
FV	Voltage control relay	УЗМ-16 УХЛ4, Meandr	16 A
HL	Halogen lamp	64684 ECO	250 Vac
K1, K2	Electromechanical relay	G2RV-SL700 DC24, Omron	24 Vdc
KM1	Contactor	LC1D09M7, Schneider Electric	9 A
KM2	Contactor	LC1D40M7, Schneider Electric	40 A
M1	Asynchronous motor	АИР90L2 IM2081	3 kW
M2	Stepper motor	FL86STH65-2808A	2.8 A
M3	Stepper motor with gear	FL86STH65-2808AG5	2.8 A
QF	Circuit breaker	S204-C50, ABB	50 A
R1, R2	Resistor	C2-23-2	2 kΩ, 2 W
SA1	Emergency stop button	B200E40, Emas	4 A
SA2 — SA4	3 position switch	B101S30, Emas	4 A
SB1, SB2	Push-button, black	B100DH, Emas	4 A
SB3	Push-button, red	B100DK, Emas	4 A
TV	Power DC supply	S8VK-C24024, Omron	24 Vdc, 10 A
VS1 — VS3	Solid-state relay	G3PE-545B DC12-24, Omron	45 A
UZ	Voltage frequency driver	VFD037EL43A, Delta	3.7 kW

ANNEX B.

MAIN TEMPERATURE REGULATOR SETTINGS

PARAMETER	*VALUE*	*DESCRIPTION*
In-t	dPt.H or tCA.H	Temperature Sensor Pt100 type or K type
L-Su	190	SV low-limit value
H-Su	240	SV high-limit value
oUt	SSr	Controls output (to SSR)
AL-1	An 1.□ An□.A	Alarm Operation Mode
AHYS	15	Alarm Output Hysteresis
AL 1	-5	Alarm Temperature
P	5,0	Proportional Band
I	10	Integral time setting
d	0	Derivative time setting
LoC	LoC2	Lock settings (all settings, except Operating temperature)

Temperature set by default at 220°C (428°F).

ANNEX C.

SAFETY TEMPERATURE REGULATOR SETTINGS

PARAMETER	*VALUE*	*DESCRIPTION*
In-t	tCA.H	Temperature Sensor (Thermocouple, type K)
AL1	-20	Alarm temperature
HYS	20	Alarm Output Hysteresis
L-Su	250	SV low-limit value
H-Su	400	SV high-limit value
oUt	rLY	Controls output
C-md	onoF	Control type ON/OFF
AL-1	Am1	Alarm Operation Mode
AHYS	10	Alarm Output Hysteresis
LoC	LoC3	Lock settings (all settings are locked)

Temperature set by default at 320°C (608°F).

ANNEX D.

VFD SETTINGS

PARAMETER	*VALUE*	*DESCRIPTION*
00.03	1	Start-up Display selection Display the actual output frequency (Hxxx)
01.00	60.00	Maximum Output Frequency
01.09	15.0	Acceleration Time
01.10	15.0	Deceleration Time
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 (Based of Acceleration/Deceleration time specified)
02.09	0	Source of Second Frequency Command (Digital keypad UP/DOWN keys or Multifunction Inputs UP/DOWN)
02.10	1	Combination of the First and Second Master Frequency Command
02.11	25.00	Keypad Frequency Command (by default)
09.00	1	Communication Address of the VFD
09.01	2	Transmission Speed (19200bps Baud rate)
09.02	3	Transmission Fault Treatment (No warning and keep operating)
09.04	3	Communication Protocol (8,N,2 (Modbus, RTU)

ANNEX E.

CHAMBER CLOGGING/SMOKE FORMATION

DO THE FOLLOWING:

1. Press EMERGENCY STOP button.
2. Disconnect the plug from the mains.
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!

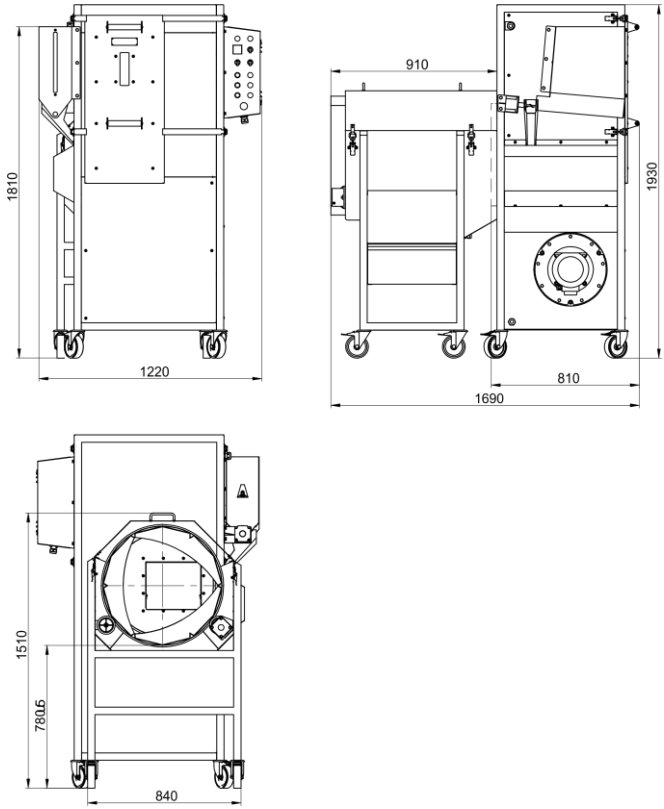
4. Cooling down will take not less than 2 hours.
5. Carefully open the chamber and proceed to cleaning.
6. If corn supply tube is clogged with popcorn, use some flexible item, like a piece of thick rubber hose, to remove clogging.

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

ANNEX F.

DIMENSIONS

All dimensions are given in mm.



ANNEX G.

TROUBLESHOOTING GUIDE

ATTENTION! UNPLUG THE MACHINE FROM THE MAINS AND DISCHARGE THE EMI FILTER BEFORE SERVICING!

FAULT	*POSSIBLE CAUSE*	*REMEDY*
The machine doesn't turn on when the START button is pressed.	There is no power supply in the mains.	Use a tester to check to see if voltage presents on all phases. Provide the power supply to the mains outlet.
	Power cord is broken.	Use a tester to check the cord for breakage, replace faulty cord.
	The EMERGENCY STOP button is pressed.	Reveal the cause of pressing the EMERGENCY STOP button by the personnel. If it's because of the machine fault, fix it.
Strange sounds during impeller operation.	Loose bolt mounting of the impeller.	Remove the motor from the machine, check gripping of the impeller bolt mounting, and tighten up the bolt.
	Impeller deformation or	Remove the motor from the machine; inspect the impeller if there any defects on it. Replace faulty impeller.
	Wear and tear of the bearing assembly of the motor's rotor.	Remove the motor from the machine; rotate the rotor with a hand, check if there are strange sounds, troubles to turn, and bearing backlash. Replace faulty motor.
Heating elements	Heating elements failure.	Use a tester to check if the

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FAULT	*POSSIBLE CAUSE*	*REMEDY*
do not heat or heat rate is vastly reduced.		heating elements are continuous. Replace faulty heating element.
	Heating elements power circuit failure, oxidation or burning of clips/wires.	Use a tester to check if the circuit part from Solid-state relay to heating elements clamps is continuous. Inspect heating elements' terminals, wire tips, and check if the terminals are tightening properly. Eliminate circuit breakage, dress or replace oxidized wires and tips.
	Solid-state relay failure. Relay doesn't open while control voltage is applied.	Use a current clamp to measure the current intensity between the relay and heating elements. Measure voltage drop at power terminals of the relay, both when control voltage 24V is on and off. When control voltage is applied, the current intensity should be about 34A, and the voltage drop should be a few volts. When control voltage isn't applied, the current intensity should be about 0A, and the voltage drop should be about 220V. If control voltage is applied, and the current intensity is about 0A and the voltage drop is 220V, then the relay is out of order, it must be replaced.
	Contactor's coil breakage, spring set aren't closing while the contactor is in operation, circuit breakage at the	Use a tester to check the contactor's coil for breakage; check if contact groups are closing while armature is pressed

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FAULT	*POSSIBLE CAUSE*	*REMEDY*
	terminals/wires connection point.	manually; inspect inlets, wires and terminals. Replace the faulty contactor. Dress or replace oxidized or burned wires.
The corn aren't supplied into the chamber.	Supply tube clogging with corn, popped corn.	Inspect receiving cone of corn supply tube to see if it's clogged. If there is no clog in receiving cone, pour a small amount of corn into the cone to see if the corn will get the chamber. Eliminate the tube and cone clogging.
	Extraneous objects in the supply tube.	Use a wire with a clot, which fit the tube tightly, to check if there are extraneous objects in the tube. Pull the wire through the tube and push out all the foreign objects with the clot.
	Auger's motor failure.	Check the auger motor operation in setup mode. Use a tester to check coil winding for breakage. Replace faulty motor.
	Driver failure.	Check the auger motor operation in setup mode. Use a tester to check coil winding for breakage. If coil windings are ok, then replace faulty driver.
	Improper positioning of SW1-SW8 DIP-switches on the driver.	Check the DIP-switches position to see if it matches with the circuit diagram. Set the right position.
	Loose mounting between the auger clutch and the motor shaft. Clutch mount screw	Check the auger clutch mounting to the motor shaft, consistency and gripping of mounting screws.

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FAULT	*POSSIBLE CAUSE*	*REMEDY*
	break.	Tighten loose joint, replace broken screw.
The sifter doesn't spin or it spins with slower rate.	Loose gripping of mounting nuts of the sifter's drive shaft rollers.	Check nuts gripping. Tighten loose joint.
	Sifter's drive and support shafts bearings jamming.	Detach the drive shaft with rollers from the motor using the clutch. Check free rotation of drive and support shafts in the bearings. Replace the faulty bearing.
	Loose mounting between sifter's drive shaft clutch and the motor shaft. Clutch mount screw break.	Check the auger clutch mounting to the motor shaft, consistency and gripping of mounting screws. Tighten loose joint, replace broken screw.
	Sifter's motor drive failure.	Check the sifter drive motor operation by performing the service test. Use a tester to check the motor's coil for breakage. Replace the motor.
No backlight.	The lamp failure.	Inspect the lamp; use a tester to check for breakage. Replace the lamp.
	Lamp socket breakage.	Inspect lamp socket and check for damages and terminals oxidation. Check spring contacts of the socket. Replace faulty socket.
	Lamp circuit failure.	Use a tester to check the lamp circuit for breakage. Fix the circuit.
The chamber is	Chamber grid and bowl are	Clean up the chamber, diagnose

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FAULT	*POSSIBLE CAUSE*	*REMEDY*
clogged with popcorn.	clogged with husk and debris.	the machine, and check condition of chamber grid and bowl. Draw customer's attention to the necessity of periodic cleaning of grid and bowl.
	The temperature in the chamber is too low, popping time is too short; impeller's rate is too low as well.	Do the full cleaning and diagnosis of the machine. If the machine is operable, check the operation with corn in continuous mode. If it's not enough time for corn to completely fly out of the chamber during testing of the machine, then it is needed to increase popping time. If it didn't help, increase chamber temperature.
	Sifter stoppage.	Do the full cleaning and diagnosis of the machine. Check gripping of sifter rollers nuts, sifter shaft bearings, shaft drive clutch, and the motor. Tighten loose joints, replace faulty component.
	Technical fault of the machine.	Clean the chamber, the grid, the supply tube, chamber bottom of the popcorn and dust. In order to do this, unscrew 4 bolts and take off chamber bottom. Do the full diagnosis of the machine, pay special attention to the components that are responsible for productivity (the main motor, heating elements, solid-state relays, sifter drive). Replace faulty component.
Too much "Butterfly"	Low quality of corn.	Do the full diagnosis of the

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FAULT	*POSSIBLE CAUSE*	*REMEDY*
popped popcorn while “Mushroom” corn is being popped.		machine. If the machine is operable, change the popping temperature with 5 degrees increment and decrement, checking the quality of fresh-made popcorn at the same time. Set the temperature that provides the best quality for this particular corn.
	Incorrect popping temperature.	Check the popping temperature. For most kinds of corn, popping temperature for “Mushroom” is 220...230°C (428…446°F). Set the correct temperature.
	Technical fault of the machine, caused by inaccurate chamber temperature maintenance.	Do the full diagnosis of the machine, pay special attention to the components that are responsible for heating (heating elements, solid-state relays, wires and tips of heating elements). Replace faulty component.