

RoboLabs

Incredible machines for funfood & fastfood

Mini Robopop® VPM-MRS2F

OPERATION MANUAL

2016

1. OVERVIEW AND PRINCIPLE OF OPERATION

1.1. THE PURPOSE OF THE POPCORN MACHINE

Vortex Popcorn™ machine Mini Robopop® VPM-MRS2F is designed for corn popping by the means of hot air. The corn spreads evenly on parabolic bowl bottom in the chamber. The corn stirs permanently around the bowl axis, being mixed and warmed up evenly. Due to the air vortex inside the chamber, popped corn is immediately blown out from the hot area; this is good for popcorn quality and taste. Popped corn goes to the sifter, where husk and unpopped corn are being separated. This kind of popcorn is suitable for producing caramel popcorn or popcorn with desired taste (e.g. cheese).

1.2. TECHNICAL SPECIFICATIONS

Productivity*	up to 12 kg/hour
Hopper Capacity	8 kg
Max. consumption current (on all phases)	not more than 25 A
Rated Voltage	230V AC (207...253V)
Rated Power	not more than 5,95 kW
Frequency	50/60 Hz (47...63 Hz)
Dimensions (LxWxH)	1070x580x1600 mm
Package Dimensions (LxWxH)	1700x1200x800 mm
Weight of the machine, not more than	150 kg
Weight of the machine packed, not more than	280 kg

*- machine productivity depends on corn quality and humidity (see section 2.3)

The popcorn machine must be operated at the environment temperature from +5° to +40°C and relative humidity not more than 50% (at 40°C). Temperature decreasing correlates with possible increasing of humidity (e.g. the temperature 20°C is possible with maximum relative humidity up to 90%). Altitude above sea level should not exceed 1000 m.

Ingress protection IP22 (IEC 60529). In accordance to the standard IEC 60204-1 the machine must be connected to the mains equipped with ground contact.



The machine is made in accordance to the following standards:

2006/42/EC Machinery Directive

2014/35/EU Low Voltage Directive

2014/30/EU EMC Directive

CE conformity certificate no.161299118, issue date 20.06.2016

1.3 DELIVERY SET

The following are included in the delivery set:

Mini Robopop® VPM-MRS2F completed with sifter, feeder, and husk tray.	1 piece
Electric Cord 5 m*	1 piece
Controls module Key	2 pieces
Halogen Lamp 48 W 64684 ECO	1 piece
Documentation Set	1 copy

* - the machine is supplied without a cable plug It is recommended to use cable plug 2P+E, 32 A to connect the machine to the mains.



The machine is delivered assembled and does not need additional assembling. Once unpacked, the machine is ready to operate.

1.4. STRUCTURE AND PRINCIPLE OF OPERATION



Each machine is tested before shipping to customer, so small amount of corn can be found in the machine.

The principle of operation is as following. Corn is fed from Hopper (2) to preheated (210-230°C) Chamber (1). Continuous air heating and airflow circulating are taking place in the chamber. Once appeared in hot air of the chamber, corn is heated and popped. Once popped, corn immediately fly out from the chamber by the means of airflow, and reach the Sifter (3).

The Observation Port (5) is provided to control popping process and to clean the chamber. The observation port is located on the left side of the chamber.

Un-popped corn and husk reach the sifter along with fresh-made popcorn and are immediately being separated into the Waste Tray (4). Popcorn gets into container for fresh-made popcorn.

The appearance of the machine is presented on the following photo.



General view of the machine (Front View):

- 1 - Chamber; 2 - Hopper; 3 - Sifter (perforated drum); 4 - Waste Tray; 5 - Observation Port (not shown);
6 - Controls.

The machine is non-dismountable and has swivel casters, which allow the machine to move.

2. INTENDED USE

2.1. SAFETY REQUIREMENTS

CAREFULLY READ THE OPERATION MANUAL BEFORE START!

ONLY INSTRUCTED PERSONNEL ARE ALLOWED TO OPERATE THE MACHINE!

Never turn off the machine by the EMERGENCY STOP button while the machine is running. It could lead to fire and machine failure!

The EMERGENCY STOP button is intended to use only if there is a real danger to human life.



ATTENTION! Many parts of the machine are very hot; danger of burn injury.

STRICTLY PROHIBITED!

- TOUCH MOVING PARTS OF THE MACHINE IN OPERATION!
- WASH ELECTRICAL PARTS OF THE MACHINE AND THE CONTROLS WITH WATER, IT IS ONLY ALLOWED TO USE DAMP CLOTH!
- DISASSEMBLE THE MACHINE OR REMOVE ITS COMPONENTS WHILE THE MACHINE IS PLUGGED IN.
- CHANGE THE CONSTRUCTION OF THE MACHINE.
- USE THE MACHINE TO POP ANY GRAIN OTHER THAN CORN.
- LEAVE RUNNING MACHINE UNATTENDED.
- TURN ON THE MACHINE IF THERE IS BURNED CORN IN THE CHAMBER.

SYSTEM PROTECTORS AND LOCKUPS

On the front panel the EMERGENCY STOP button is located. The button completely turns off the machine at any time.



ATTENTION! In case of emergency shutoff during the operation, the chamber can get clogged with popped corn. To resume the operation, you first need to take off the hatch with observation port and clean out the chamber of popped and un-popped corn.

There is a voltage relay included in the beginning of the circuit, which won't let to turn on the machine in case if voltage in the mains is too low or too high (the range set on the relay), excluding any risk of machine failure due to improper hookup or surges.

There is a contactor included in the electrical circuit before solid-state relays, which run heating elements. Emergency thermostat runs the contractor. The thermostat sensor is located inside the chamber, next to the heating elements. In case of solid-state relays failure or main automation system failure and uncontrolled heating, the emergency thermostat will be triggered and will shut off the heating elements, avoiding overheating.

There is an automatically operated 32A electrical switch (circuit breaker) installed at the mains input inside the machine.

The sifter drum isn't rigidly connected to the drive rollers. Thus, if a slight effort to block the sifter is applied, the sifter won't rotate and will stay in its position.

The machine is installed on a stand equipped with locking casters with mechanical locks, which avoid spontaneous movements of the machine.

2.2. PREMISES REQUIREMENTS

The premises where the machine is located, should meet the requirements of SNiP II-L.81-71, which intends to have purge ventilation on the location. It is calculated that Mini Robopop® VPM-MRS2F requires ventilation 300 cu.m. per hour (see appendix D).

Maximum humidity at the location should not exceed 45% at 24°C. If humidity is greater than 45%, then popcorn starts to absorb moisture quickly.

2.3. RAW CORN REQUIREMENTS

Popcorn is a hygroscopic product. If the production and storage terms aren't met, then fresh-made popcorn will consume excess moisture from the environment and turn to tough and not crispy product.

The humidity of the raw corn must be 13-15%. To use corn with greater humidity, it is necessary to increase the temperature in the chamber and decrease productivity of the machine (see section 2.8.)

Popcorn is crispy only if its humidity does not exceed 2%.

2.4 GETTING STARTED

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

2.5. CONNECTING TO THE MAINS



ATTENTION! Mains connecting must be done only by qualified electricians.

Mini Robopop® VPM-MRS2F connects to single phase mains **230V AC (207...253V), 50/60 Hz.**

Mains connection diagram is shown on the picture.



ATTENTION! It is prohibited to connect the machine to the mains without ground connection.

The machine is delivered without a cable plug. It is recommended to use 2P+E, 32A cable plug to connect the machine.

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

2.6. FIRST START OF THE MACHINE.

1. Turn on the machine by pressing the **START/PAUSE** button.
2. Wait for the temperature controller is ready. Set the testing temperature 210°C using   buttons. It will take no more than 15 minutes to achieve this temperature.

3. Once the set temperature is reached, the sifter will start. Check to see if the sifter rotates.

If the sifter rotates unevenly and strange sound can be heard, it is necessary to adjust sifter position on the drive rollers. To do this, lift the sifter a bit, and move it firmly towards to the chamber.

4. Load 3 kg of corn into the hopper and prepare a container for fresh-made popcorn (3 kg of corn is enough to produce no more than 120 liters of popcorn).

5. Corn feed starts automatically. Corn is fed in the chamber by batch, in automatic mode.

During the first few batches it is necessary to control the processes which are taking place in the chamber.

Algorithm of the machine is as following. Loading time for a batch of corn is 20 seconds, during this time the feeder's auger is in operation, supplying about 350 grams of corn, total.

The corn will stir in the bowl in evenly manner, close to the periphery of the bowl.

The popping time is 110 seconds by default. During this time all corn should be popped and thrown out from the chamber. During this time the feeder doesn't work.

It is intended that popcorn has to fly out from the chamber in rhythmic manner, avoiding popcorn stopping in the observation port area and any preconditions to chamber clogging and sifter blocking.



If it's not enough time for the corn to pop and fly out of the chamber, then it is necessary to reduce the machine productivity (see section 2.8) and start the process again.

Chamber purging time is 10 seconds. During purging, impeller rate is increasing to the maximum, chamber airflow rate is increasing as well, thus un-popped and burned corn are being thrown out from the chamber. Then the cycle resumes.

6. Wait for the feeder to be empty. It will take no more than 15 minutes.

7. Turn off the machine by pressing the **COOLING/TURN OFF** button. The machine will automatically switch into cooling mode, and then will be shut off completely. The cooling stage takes about 10 minutes.



ATTENTION! THE FIRST BATCH OF CORN IS INTENDED TO CLEAN THE CHAMBER AND IS NOT INTENDED TO EAT!

2.7. OPERATION MODE

To make popcorn, the following must be done.

1. Clean the tray from husk, debris, and un-popped corn.
2. Load corn into the hopper. The hopper can hold up to 8 kg of corn.
3. Prepare a container or a cart for fresh-made popcorn. Roll it under the sifter.
4. Press the **START/PAUSE** button. The impeller starts to rotate and the chamber starts to warm-up. It takes 15 minutes to warm up the machine.

5. Use the arrow keys   to set required popping temperature.

At the temperature controller screen, PV stands for actual temperature inside the chamber; SV stands for the set temperature.

Optimal temperature of popping is between 200 and 230°C

6. It takes 12-15 minutes to warm up the machine. Once the set temperature is reached, the sifter will start to rotate and corn will be fed in the chamber automatically.

7. Batch loading of the chamber is a feature of Mini Robopop® VPM-MRS2F. Corn is fed into the chamber by batch, in automatic mode.

Algorithm of the machine is as following. Corn loading time is 20 seconds, popping time is 110 seconds (parameter by default), and chamber purging time is 10 seconds.

During purging, impeller rate is increasing to the maximum, chamber airflow rate is increasing as well, thus un-popped and burned corn are being thrown out from the chamber. Then the cycle resumes.

8. To suspend the popping, press the **START/PAUSE** button. The corn feeding will be suspended. The set temperature will be maintained in the chamber. Sifter will be stopped in a few minutes. To resume the process, press the **START/PAUSE** button again.

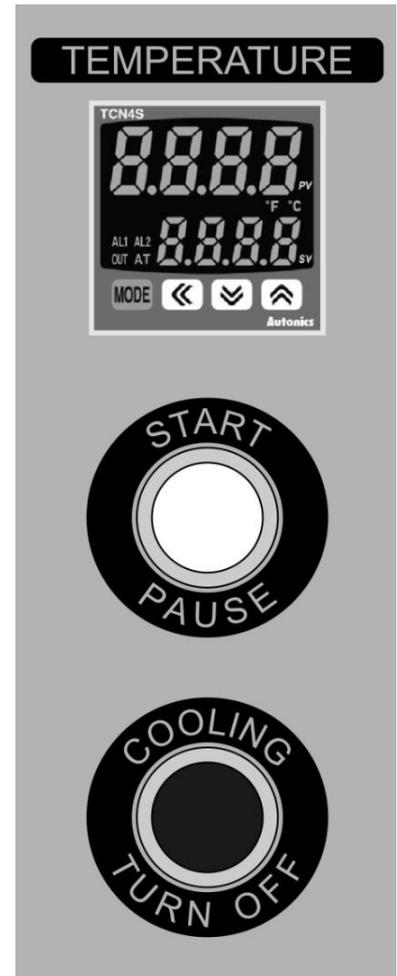
9. To turn off the machine, press the **COOLING/TURN OFF** button. The machine will automatically switch into cooling mode, and then will be shut off completely. The cooling stage takes about 10 minutes.



ATTENTION! Use the **EMERGENCY STOP** button only in cases of life-threatening emergency. Turning off the machine by the **EMERGENCY STOP** button could result to the chamber clogging with popcorn, and therefore, smoke formation and equipment failure.

The **START/PAUSE** button is equipped with an indicator, which works as the following:

- slow flashing is for warming-up mode;
- fast flashing is for pause mode;
- permanent glowing is for popping mode;
- during cooling mode the indicator doesn't glow.



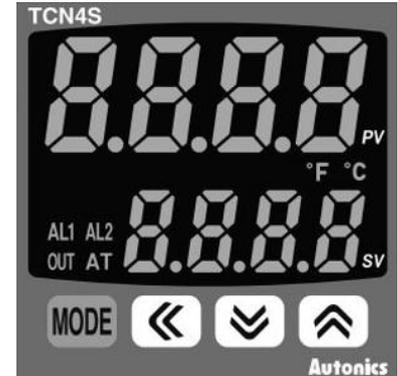
2.8. POPPING PARAMETERS ADJUSTMENT

Chamber temperature adjustment

To change temperature in the chamber do the following:

- Turn on the machine by pressing the **START/PAUSE** button.
- Use keys   to set required temperature on the temperature controller.

At the temperature controller screen, PV stands for actual temperature inside the chamber; SV stands for the set temperature.



You can change the temperature from 190°C to 240°C. Service parameters adjustment is locked.

It is recommended to empirically find the most suitable temperature for each kind of corn. For the most of “Butterfly” corn popping temperature is 200-210°C. For the most of “Mushroom” corn popping temperature is 215-230°C.

Average poppability of “Butterfly” corn is 30-40 liters of popcorn, and of “Mushroom” corn is 25-30 liters of popcorn per 1 kg of raw corn.

Some amount of any “Mushroom” corn always will be popped as “Butterfly”. The percent of corn popped as “Mushroom” depends on quality of the corn as it stated in the certificate for that particular shipment. Some amount of “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.

To obtain maximum popcorn quality, we recommend to experiment in each certain case. Start with 200°C temperature, wait for the machine is warmed up, process 2-3 kg of corn, then increase the temperature stepwise, by 5°C, and process same amount of corn at each temperature step. Comparing popcorn which popped in different temperatures will let you to choose an optimal temperature.



IMPORTANT! The lower temperature in the chamber, the more crispy popcorn you get.

Before you start to use new kind of corn, it is necessary to try this corn and find optimal parameters of the machine.



ATTENTION! Chamber clogging with popcorn caused by wrong selected parameters of the equipment is not the warranty case.

Popping time adjustment

To adjust the popping time, it is necessary to proceed to setup mode of the machine. To do this, press and hold the **COOLING/TURN OFF** button, and, at the same time, turn on the machine by pressing the **START/PAUSE** button.

The **START/PAUSE** indicator starts to flash slowly, which corresponds to 110 seconds of popping time. Press the **START/PAUSE** button, the indicator starts to flash faster, which corresponds to 90 seconds of popping time. Press the **START/PAUSE** button again, the indicator will flash very fast, which corresponds to 75 seconds of popping time.

In the setup mode, the **START/PAUSE** indicator has three modes of indication that corresponds to the popping parameters as following:

- slow flashing (110 seconds popping time) - it is 3/4 of maximum productivity of the machine (it is the setting by default);
- fast flashing (90 seconds popping time) - it is 7/8 of maximum productivity of the machine;
- very fast flashing (75 seconds popping time) - it is the maximum productivity of the machine.



ATTENTION! Inadequate popping time setting could result to the bowl overfilling with corn, further chamber clogging with popcorn, smoke formation, and machine failure.

If corn is being popped at the temperature below 200°C, then popping time must be set on its maximum.

If corn is being popped at the temperature higher than 220°C, and it is good corn, then it is possible to reduce popping time to the minimum.

The main criterion of optimal popping time is that more than 95% of corn should be popped and thrown out from the chamber before chamber purging.

If popping time is set on the maximum and most of the corn batch can't pop and fly out in time, then we recommend using corn with less humidity or increasing the temperature not less than 10°C.

If you press the **COOLING/TURN OFF** button within setup mode, then the corn feeder will start. The feeder will stop after 20 seconds (the time required to supply a batch of corn into the chamber).



ATTENTION! By starting the feeder in testing mode, corn will be supplied in the chamber. It is necessary to remove all the corn from the chamber before starting the machine. Otherwise, excess corn in the bowl will lead to chamber clogging with popcorn, smoke formation and equipment failure.

To exit the setup mode, press the **EMERGENCY STOP** button.

Chamber airflow rate adjustment

The chamber airflow rate is directly related to the impeller rotational rate. The greater impeller rate, the greater chamber airflow rate, and vice versa. To adjust impeller rate, the following must be done.

1. Take off the side panel of the controls module. To do this, you have to open four locks using the special key (included in the delivery set).



ATTENTION! This manipulation must be done **ONLY** by qualified and trained personnel.
Unskilled operation can lead to electric injury.

2. Turn on the machine by pressing the **START/PAUSE** button.



3. Wait for the impeller is reached the operation mode. The frequency of voltage, currently provided to the impeller drive, will be shown on the VFD display.

4. Use arrow keys ('up' and 'down') to adjust the frequency of voltage provided to the impeller drive. New voltage frequency value will be shown on the VFD display in real time.



ATTENTION! It is only allowed to change the voltage frequency between **F30.0** and **F40.0**. Other voltage frequency value can lead to chamber clogging with popcorn, smoke formation, and equipment failure.

4. Once the frequency is adjusted, close the side panel.

In case of bad popping (resulting in small wads) you should increase chamber airflow rate. To throw such popcorn out from the hot chamber, faster airflow is needed. If airflow rate isn't enough to get out the popcorn out of the chamber, the popcorn will remain and accumulate in the chamber. Eventually, it will lead to chamber clogging with popcorn, and combustion.

It may be necessary to reduce airflow rate if good un-popped corn are being thrown out of the chamber along with popcorn. If percentage of debris is more than 5%, then impeller rate must be reduced.

To adjust the impeller rate, actions described above are required.

3. TECHNICAL MAINTENANCE

3.1. GENERAL GUIDANCE

The purpose of technical maintenance is to maintain the popcorn machine in working order during all the lifetime, and to ensure fire safety rules.

Technical maintenance of the popcorn machine must be done as needed.

Recommended schedule of maintenance (specified) is shown in the following table:

Work type	Period
Surface cleaning, dust and waste removal	Once a day
Sifter cleaning (husk, popcorn removal)	Once a day
The chamber cleaning (husk, corn dust, un-popped corn removal)	Once a week
Chamber grid cleaning (husk, corn dust removal)	Once a month

3.2. SAFETY MEASURES

It is necessary to unplug the machine from the mains before technical maintenance.

It is forbidden to wash electrical parts of the machine with water. It is only allowed to wipe with soap solution damped cloth.

If there a combustion happened in the chamber, then it is necessary to immediately turn off the machine by pressing the **EMERGENCY STOP** button, then unplug the machine from the mains, and only then you may proceed to fire extinguishing.

3.3. TECHNICAL MAINTENANCE ORDER

In the end of day it is necessary to remove dust and grit from all outer surfaces of the machine by the means of dry and clean cloth.



ATTENTION! Do not leave corn in the hopper at the end of day. It will impair its quality, and then overall volume of popcorn will be vastly reduced. Store corn in a hermetically sealed container for the night.

It is necessary to clean the chamber of husk and dust once a week. 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.

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



ATTENTION! IT IS NOT ALLOWED TO WASH THE CHAMBER WITH WATER JET!

It is necessary to visually inspect chamber grid once a week. Clean the grid of corn dust if necessary. Open the chamber and clean the grid with a brush. After cleaning, place the hatch back and fasten up the latches.

In case of intensive contamination and impossibility to clean it by brush, unscrew the bolts

and take the grid apart. Prior to that, it is necessary to remove internal partition inside the chamber. Assembly is performing in the reverse order.

3.4. CHAMBER CLOGGING WITH POPCORN

Mini Robopop® VPM-MRS2F doesn't have automatic chamber overflow protection. Operator has to choose optimal settings (chamber temperature, popping time, airflow rate) and supervise for trouble-free operation, considering that quality of corn may vary from bag to bag.

In case of chamber clogging with popcorn and smoke formation, it is necessary to immediately press the EMERGENCY STOP button to turn off the machine, and then unplug it from the mains.



ATTENTION! DO NOT open the hatch, DO NOT use fire extinguishers. The machine is hermetically sealed and made of steel; even if the popcorn begins to smolder, it won't combust without extra air.

Wait for the machine is cooled down, and popcorn is ceased smolder. It will take not less than 2 hours. Only then you may take off the hatch and proceed to clean the chamber.



ATTENTION! Chamber clogging with popcorn caused by unskilled actions of operating personnel is not the warranty case.

If you cannot to clean the chamber of popcorn by yourself, contact the service center.

3.5. TROUBLESHOOTING



ATTENTION! Before any repair works it is necessary to unplug the machine from the mains and discharge the EMI filter by bridging all the pins in the plug.

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, cracking, breaking.	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 do not heat or heat rate is vastly reduced.	Heating elements failure.	Use a tester to check if the 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 20A, 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 terminals/wires connection point.	Use a tester to check the contactor's coil for breakage; check if contact groups are closing while armature is pressed 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.

Fault	Possible cause	Remedy
The sifter doesn't spin or it spins with slower rate.	<p>Driver failure.</p> <p>Improper positioning of SW1-SW8 microswitches on the driver.</p> <p>Loose mounting between the auger clutch and the motor shaft. Clutch mount screw break.</p> <p>Loose gripping of mounting nuts of the sifter's drive shaft rollers.</p>	<p>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.</p> <p>Check the microswitches position to see if it matches with the circuit diagram. Set the right position.</p> <p>Check the auger clutch mounting to the motor shaft, consistency and gripping of mounting screws. Tighten loose joint, replace broken screw.</p> <p>Check nuts gripping. Tighten loose joint.</p>
No backlight.	<p>Sifter's drive and support shafts bearings jamming.</p> <p>Loose mounting between sifter's drive shaft clutch and the motor shaft. Clutch mount screw break.</p> <p>Sifter's motor drive failure.</p> <p>The lamp failure.</p> <p>Lamp socket breakage.</p>	<p>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.</p> <p>Check the auger clutch mounting to the motor shaft, consistency and gripping of mounting screws. Tighten loose joint, replace broken screw.</p> <p>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.</p> <p>Inspect the lamp; use a tester to check for breakage. Replace the lamp.</p> <p>Inspect lamp socket and check for damages and terminals oxidation. Check spring contacts of the socket. Replace faulty socket.</p>
The chamber is clogged with popcorn.	<p>Lamp circuit failure.</p> <p>Chamber grid and bowl are clogged with husk and debris.</p>	<p>Use a tester to check the lamp circuit for breakage. Fix the circuit.</p> <p>Clean up the chamber, diagnose the machine, and check condition of chamber grid and bowl. Draw customer's attention to the necessity of periodic cleaning of grid and bowl.</p>
Too much "Butterfly" popped popcorn while "Mushroom" corn is being popped.	<p>The temperature in the chamber is too low, popping time is too short; impeller's rate is too low as well.</p> <p>Sifter stoppage.</p> <p>Technical fault of the machine.</p> <p>Low quality of corn.</p> <p>Incorrect popping temperature.</p> <p>Technical fault of the machine, caused by inaccurate chamber temperature maintenance.</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>Do the full diagnosis of the 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.</p> <p>Check the popping temperature. For most kinds of corn, popping temperature for "Mushroom" is 220...230°C. Set the correct temperature.</p> <p>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.</p>

3.5. PRESERVATION

If the machine is not in use for a long time, it is necessary to perform all the technical maintenance works, including complex cleaning of the sifter.

4. TRANSPORTATION AND STORAGE

Popcorn machine 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.

5. TEST CERTIFICATE

Mini Robopop® VPM-MRS2F is met the requirements of TU5151-023-74387948-2015 and approved for use.

Test certificate

Popcorn machine Mini Robopop® VPM-
MRS2F
Product Name

No. _____
Serial Number

The machine is made with accordance to mandatory requirements of the state standards, actual technical documentation, and approved for use.

Quality Control Engineer

Stamp Here

Signature

Full Name

Date

6. WARRANTY OBLIGATIONS

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



ATTENTION! Chamber clogging with popcorn caused by unskilled actions of operating personnel is not the warranty case!

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 machine 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 machine 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

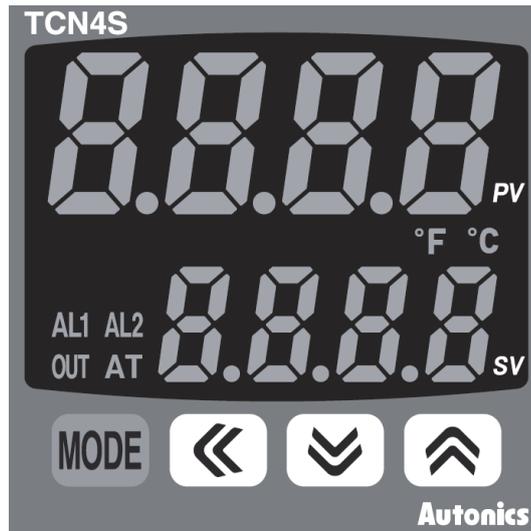
NPO Tvertorgmash, LLC, 11 Industrial Street, Tver, 170000 Russia.

More information can be found at www.robopocorn.com

APPENDIX A. MINI ROBOPOP® VPM-MRS2F ELECTRIC CIRCUIT SPECIFICATION LIST

Designation	Description	Specification
AT	Emergency thermostat	230AC, 16A
BT	Temperature sensor	Pt100
C	Capacitor	1,5uF 450AC
DC1	Controller	24DC
DC2	Temperature controller	230AC
DD	Digital Stepping Driver	24DC
EK1, EK2	Heating Element	230AC, 2500W
EL	Halogen Lamp	230AC, 48W
EMI	Electromagnetic Interference Filter	230AC, 30A
FV	Voltage control Relay	230AC, 16A
HL	Contact Block with a light indicator	230AC
K1, K2, K3, K4	Electromechanical Relays	24DC, 4A
KM1	Contactora	400AC, 9A
KM2	Contactora	400AC, 25A
M1	Asynchronous Motor	230AC, 3000rpm
M2	Electric Motor with reduction gear	230AC
M3	Stepper Motor	-
QF	Circuit Breaker	32A
R	Resistor	2kΩ, 2W
SA	Emergency Stop Button	4A
SB1	Push Button Switch without fixation, white	4A
SB2	Push Button Switch without fixation, black	4A
TV	Power Supply	24DC, 2A
UZ	Frequency Converter	230AC
VS	Solid-state Relay	24DC, 45A

APPENDIX B. TEMPERATURE CONTROLLER TCN4S-24R SETTINGS



Group	Parameter	Value	Description
PAR-2	IN-T	dPtH	Temperature Sensor (Heat-variable Resistor) Pt100
PAR-2	L-SV	190	SV low-limit value
PAR-2	H-SV	240	SV high-limit value
PAR-2	OUT	SSr	Controls output (to Solid-State Relay)
PAR-2	AL-1	$\overline{A} \overline{1} \square$ $\overline{A} \square . A$	Alarm Operation Mode
PAR-2	ALYS	20	Alarm Output Hysteresis
PAR-1	AL1	-5	Alarm Temperature
PAR-1	P	5.0	Proportional Band
PAR-1	I	10	Integral time setting
PAR-1	D	0	Derivative time setting
PAR-2	LoC	LoC2	Lock settings (all settings, except Operating temperature)

Operating temperature is set on 210°C by default.

Other parameters are set by default.

Temperature Controller Settings must be set out in the same order as they appear in the table.

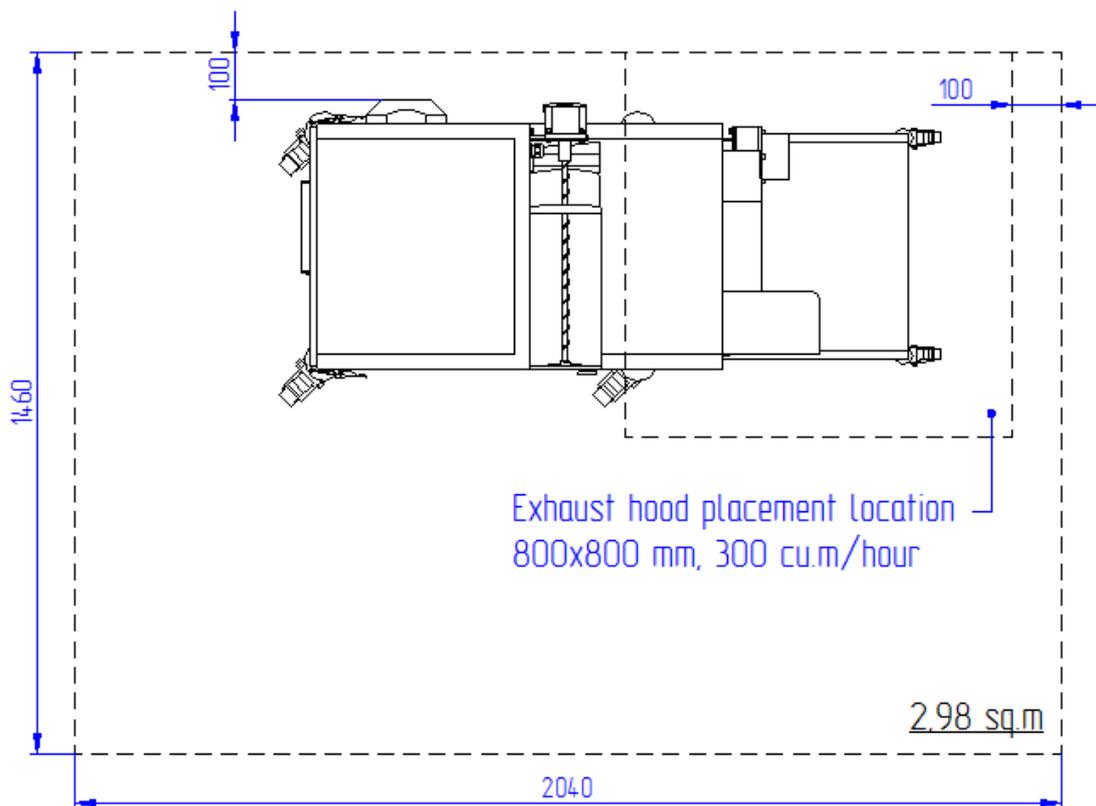
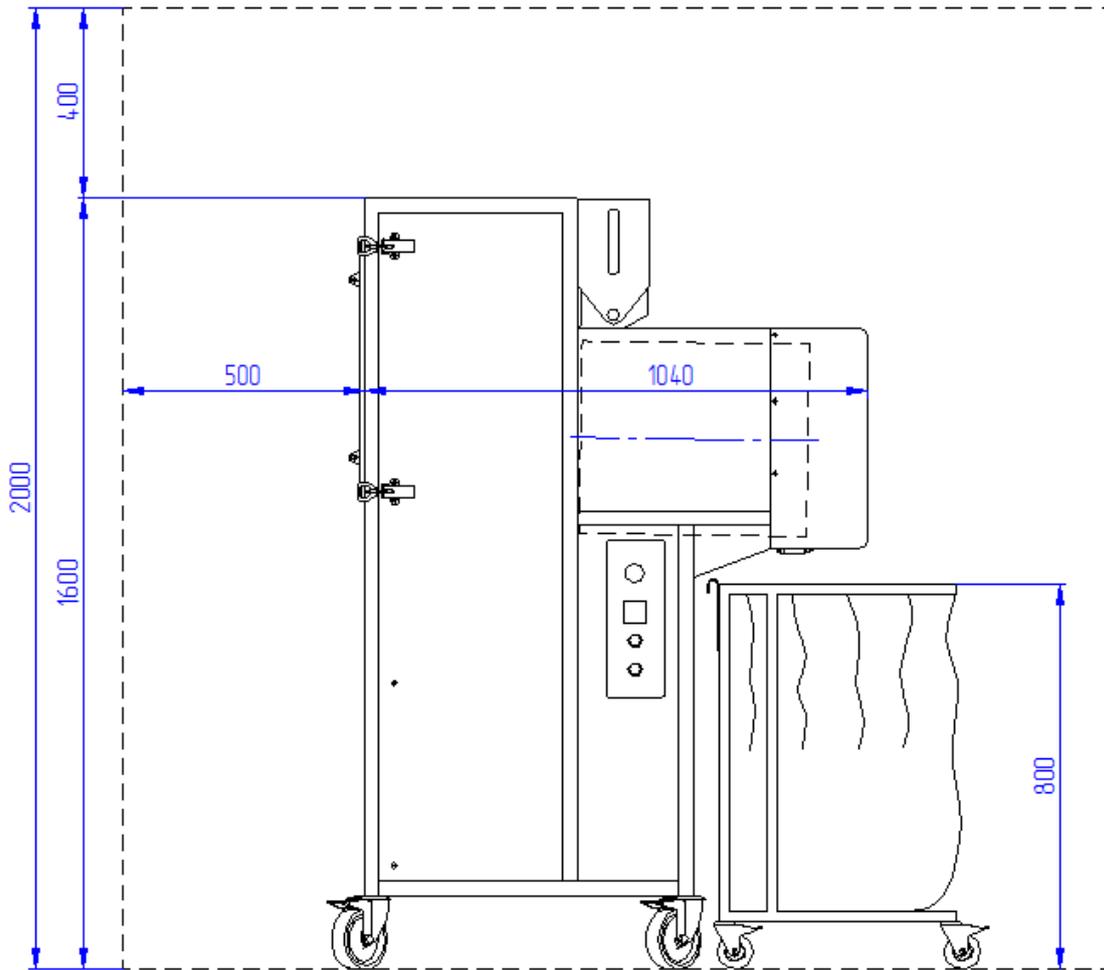
APPENDIX C. VFD007EL21A VARIABLE FREQUENCY DRIVE SETTINGS



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 (First Master Frequency Command+ Second Master Frequency Command)
02.11	40.00	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))

The rest of parameters are set by default (Parameter Reset 00.02, value 9).

APPENDIX D. DIMENSIONS AND PREMISES REQUIREMENTS



APPENDIX E. REDUCING CORN SUPPLY

Chamber clogging is possible in case of low quality corn, even with maximum popping time setting. To avoid this, it is recommended to reduce amount of corn that is supplied into the chamber per a batch. It can be done by adjusting a stepping driver. Popping time must be set on maximum, 110 sec (see 2.8 section).



WARNING! High voltage! Electric injury hazard!



WARNING! The driver's parameters can be adjusted during the machine operation. Unskilled and wrong actions could lead to chamber clogging and equipment failure. The following procedure must be done by a qualified technician only!

Use a special key (included to the delivery set) to open the compartment of the machine. Locate the stepping driver. The driver is a black unit with a pair of green terminal blocks and a blue panel between them, with 8 DIP-switches on it.

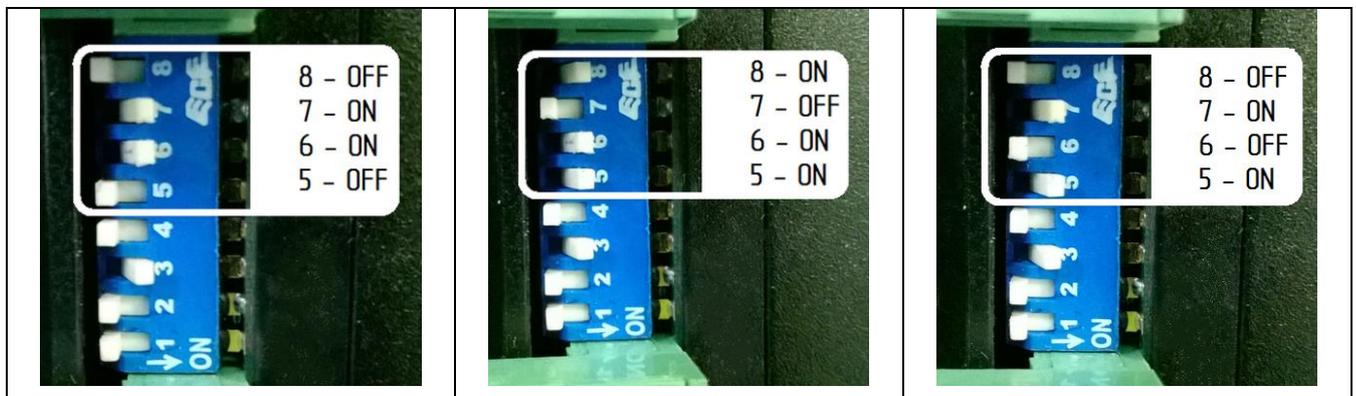
Stepper drive rate (hence corn auger rate) is set by DIP-switches ##5-8 on the panel.

Below are the recommended settings options (DIP-switches positions) and appropriate single batch volume and production rate:

Option 1 (by default)

Option 2

Option 3



Single batch volume 340...360 g.,
Production rate ~9 kg/h

Single batch volume 260...280 g.,
Production rate ~7 kg/h

Single batch volume 210...230 g.,
Production rate ~5,6 kg/h