



# RoboLabs

Incredible machines for fastfood & funfood

## Popcorn machine Grand Robopop 220 (VPM-RGM2EU)

400 V 50 Hz

Technical manual



**Read this manual before use and keep for future reference!**

PDF version of this manual is available on [www.robolabs.pro](http://www.robolabs.pro)

## Safety requirements



This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**



- **THIS MANUAL IS FOR QUALIFIED TECHNICIANS ONLY!**
- **DO NOT** open electric panels unless you are qualified for this.
- **Electric shock hazard!** High voltage inside electric panel. **DO NOT** touch bare terminals and/or wires.
- **ALWAYS** unplug the machine before servicing, unless you need it to be energized for performing setup procedures.

### **WARNING**



- **Burn hazard!** Some parts of machine are very hot. Wait until machine is cooled down before working with those parts.

### **WARNING**





- **ALWAYS** wear eye protection while servicing this equipment to avoid possible injury.

# Contents

<b>1</b>	<b>Components setup</b>	<b>3</b>
1.1	Backlight . . . . .	3
1.2	VFD (inverter) . . . . .	4
1.3	Fiber amplifier . . . . .	5
1.4	Corn bin sensor . . . . .	6
1.5	Voltage control relay . . . . .	7
1.6	Temperature regulator TCN4S . . . . .	8
1.7	Temperature limiter TC4SP . . . . .	9
<b>2</b>	<b>Diagnostic procedures</b>	<b>10</b>
2.1	Controls . . . . .	10
2.1.1	EMERGENCY STOP switch (SA1) . . . . .	10
2.1.2	FEEDING switch (SA2) . . . . .	10
2.1.3	TURBINE SPD switch (SA3) . . . . .	10
2.1.4	START push button (SB1) . . . . .	11
2.1.5	PAUSE push button (SB2) . . . . .	11
2.1.6	TURN OFF push button (SB3) . . . . .	11
2.1.7	CLOGGING lamp (HL1) . . . . .	11
2.1.8	LOW CORN lamp (HL2) . . . . .	11
2.1.9	HEATING lamp (HL3) . . . . .	11
2.1.10	POPPING lamp (HL4) . . . . .	11
2.1.11	COOLING lamp (HL5) . . . . .	11
2.2	Heating elements (EK11-EK33) . . . . .	12
2.3	Solid-state relays (VS1-VS3) . . . . .	13
2.4	Contactors (KM1) . . . . .	13
2.5	Contactors (KM2) . . . . .	13
2.6	Temperature limiter (DC4) . . . . .	14
2.7	High temp heaters sensor (BT1) . . . . .	14
2.8	Temperature regulator (DC3) . . . . .	14
2.9	Chamber temperature sensor (BT2) . . . . .	15
2.10	Slim relay (K1) . . . . .	15
2.11	Slim relay (K2) . . . . .	15
2.12	Power supply unit (PSU) . . . . .	15
2.13	Buzzer (BZ) . . . . .	15
2.14	Circuit breaker (QF) . . . . .	16
2.15	Turbine (UZ,M1) . . . . .	16
2.16	Corn feeder (DD,M2) . . . . .	17
2.17	Low corn sensor (BL1) . . . . .	17
2.18	Fiber amplifier (BL2) . . . . .	17
2.19	Voltage control relay (FV) . . . . .	17
<b>3</b>	<b>Parts list</b>	<b>18</b>

# 1 Components setup

## 1.1 Backlight

<b>⚠ DANGER</b>	
	• <b>Electric shock hazard!</b> Unplug the machine before servicing.
<b>⚠ WARNING</b>	
	• <b>Burn hazard!</b> Wait until machine is cooled down.

1. Unplug the machine. Wait until it cools down.
2. Open the chamber. Locate the backlight (Fig.1).
3. Remove two screws that holds protective screen (1); 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.
4. The lightbulb (3) is held by two spring loaded sockets (2). Take the bulb firmly and press towards one of the socket (2), release the opposite end of the bulb from the socket, and finally release the second end of the bulb and take the bulb out.
5. **DO NOT TOUCH THE NEW BULB WITH BARE FINGERS!** Skin grease will significantly reduce the lifetime of the bulb. Use a soft clean cloth or gloves to take and install the new bulb.
6. Insert the bulb in the sockets in the same way.
7. Close the protective screen and fix it with screws.
8. Close the chamber.

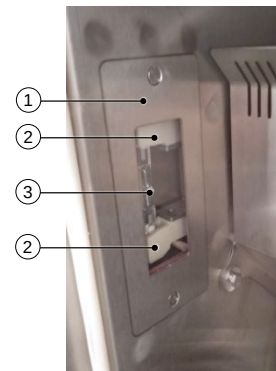


Figure 1: Backlight

## 1.2 VFD (inverter)

### ⚠ DANGER



- **Electric shock hazard!** High voltage inside electric panel. DO NOT touch bare terminals and/or wires.

**NOTE 1:** VFD setup must be performed only when the drive is stopped.

**NOTE 2:** After setting parameter 02.00 to 9, VFD displays **End**, and gets back to the main indication mode. After this, continue setup process from parameter 00.03.



Figure 2: VFD control panel

### Parameters changing procedure

1. Locate the VFD control panel, see Fig 2.
2. To change or view parameter value, press **ENTER**, the display shows **00.---**
3. Press **▲** or **▼** to choose the first two digits of the parameter (for example, 02).
4. Press **ENTER** again, display shows **02.00**.
5. Press **▲** or **▼** to choose the second two digits of the parameter, for example, **02.11**.
6. Press **ENTER** again to see the current value of the parameter. Change value, if needed, with **▲** or **▼**.
7. Press **ENTER** to confirm and save the new value, the display shows **End**.
8. Press **MODE** to return back to the previous level of selection or to the main mode.

Parameter	Value	Description
00.02	9	Settings initialization
00.03	1	Start-up display selection
01.00	60.00	Maximum output frequency
01.09	15.0	Accel time 1
01.10	15.0	Decel time 1
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
02.09	0	Source of second frequency command
02.10	1	1st and 2nd master frequency command combination
02.11	37.5	Keypad frequency command
09.00	1	VFD communication address
09.01	2	Baud rate 19200 bps
09.02	3	Transmission fault treatment:keep operating
09.04	3	Communication protocol: RTU 8, N, 2

### 1.3 Fiber amplifier

#### **⚠ DANGER**



- **Electric shock hazard!** High voltage inside electric panel. DO NOT touch bare terminals and/or wires.

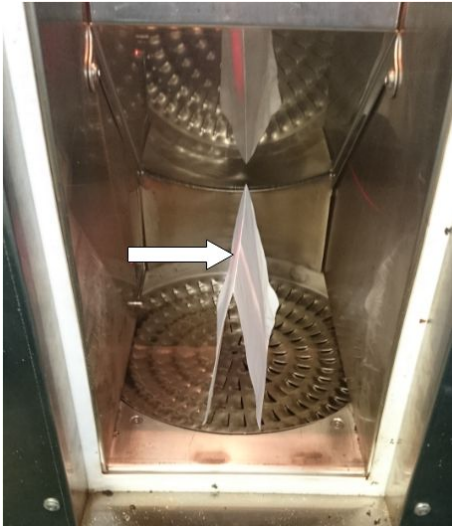


Figure 3: Paper screen

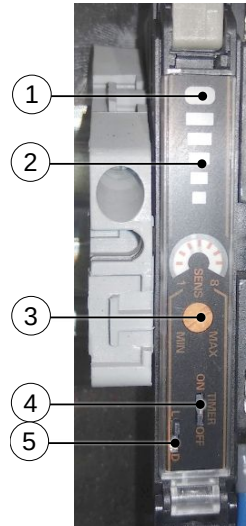


Figure 4: Fiber amplifier

1. Put a folded sheet of white paper in the chamber as shown on Fig.3, so the light ray of the sensor is screened.
2. Locate fiber amplifier in electric panel, see Fig.4.
3. If operation indicator (1) is off, go to the next step. If indicator (1) is on, rotate the screw (3) counter-clockwise, until indicator (1) turns off.
4. Set timer switch (4) to OFF.
5. Set operation mode selector (5) to L.
6. Slowly rotate the screw (3) clockwise until indicator (1) turns on.

## 1.4 Corn bin sensor

### ⚠ CAUTION



- DO NOT cover the sensor. Failed to do so might cause false chamber clogging error.
- Improperly set sensing distance might cause false chamber clogging error.

1. Rotate adjustment screw (4), see Fig.5 clockwise to increase the sensing distance (1), counter-clockwise to decrease the distance. Adjust the sensor so that it trips whenever there is little amount of corn left in the bin.
2. Operation indicator (orange) (3) represents status of the sensor (ON LED means tripped sensor).
3. Stability indicator (green) (4) represents stability of the signal (ON LED means strong signal).
4. Position of the fixing nut (5) also affects the sensing distance.

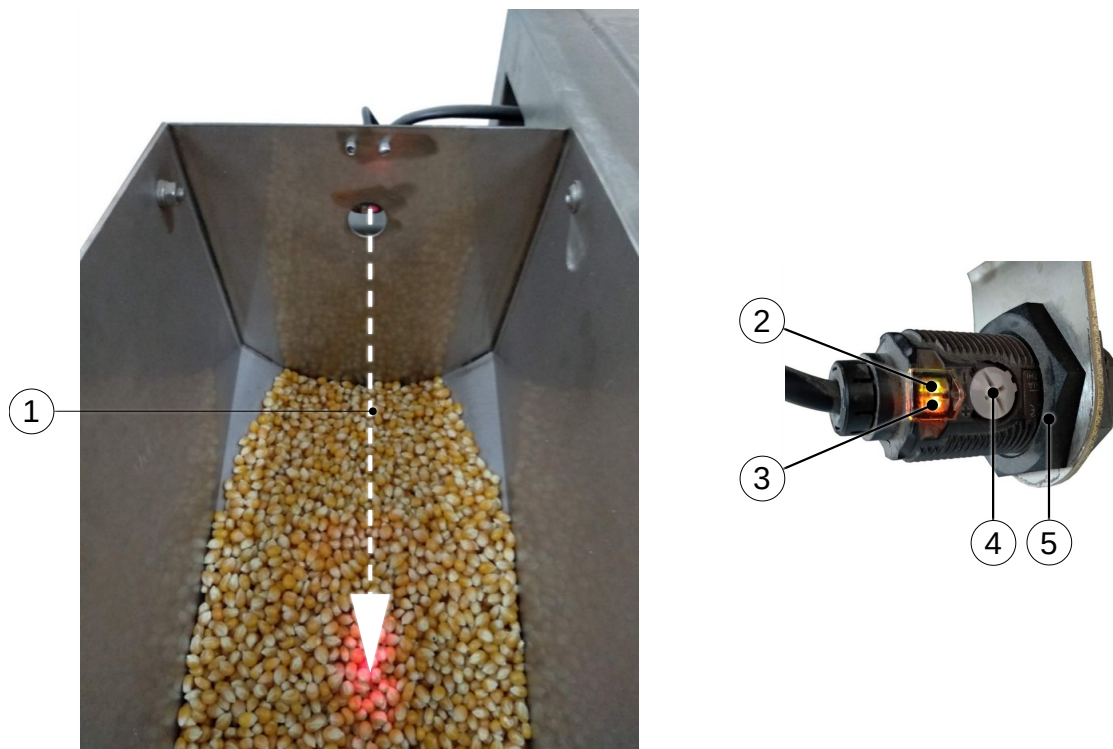


Figure 5: Corn bin sensor

## 1.5 Voltage control relay

### DANGER



- **Electric shock hazard!** High voltage inside electric panel. DO NOT touch bare terminals and/or wires.

Voltage control relay (Fig.6) is intended to protect the machine from improper connection and from voltage deviations in the service grid. The relay has following controls, see Fig.6:

1 – High voltage limit adjustment knob; 2 – Low voltage limit adjustment knob; 3 – Tripping delay adjustment knob; 4 – Power supply status LED (green); 5 – Relay output status LED (yellow).

### Setup procedure

1. Unplug the machine.
2. Set (1) at 260 V.
3. Set (2) at 180 V.
4. Set (3) at 2 s.

### LED status

GREEN	YELLOW	Meaning
GLOWS	GLOWS	Voltage is ok.
GLOWS	BLINKS	Voltage is beyond allowed range. Check the voltage in the mains.
FLASHES	FLASHES	Voltage exceeds both high and low limit because of improper set up.

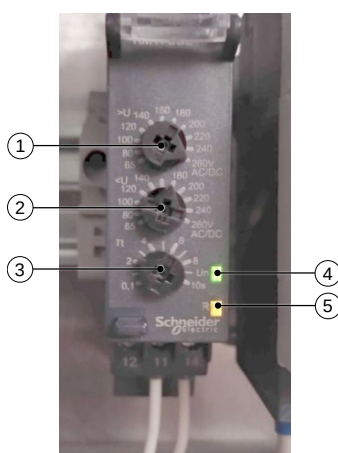


Figure 6: Voltage control relay



## 1.6 Temperature regulator TCN4S

Temperature regulator TCN4S (Fig.7) has three setting groups: 1st setting group, 2nd setting group, and SV setting group (the main indication mode). The settings must be changed in the same order as they appear in the list. Note that after changing **In-t** (temperature sensor type) or **UnI-t** (temperature unit) values, parameters **H-Su**, **L-Su**, **AL1**, **AL2**, **AHYS** must be set again. The regulator has more parameters than listed below; if you see a parameter not from the list, skip it and move to the next one.

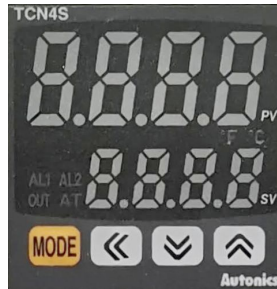


Figure 7: TCN4S panel

### Parameters changing procedure

1. To access the 2nd group of parameters press and hold **MODE** for 4 seconds; once display reads **PAR2**, release **MODE**.
2. To access the 1st group of parameters, press and hold **MODE** for 2 seconds; once display reads **PAR1**, release **MODE**.
3. Press **MODE** to go through the parameters. Current value is represented on the lower line of the display.
4. Press **▲** or **▼** to change the value.
5. Press **MODE** to move to the next parameter.

Group	Param	Value	Meaning
2nd	LoC	oFF	Unlock all settings for changing
2nd	In-t	YCA	Temperature sensor type
2nd	L-Su	190	SV low-limit value
2nd	H-Su	240	SV high-limit value
2nd	C-nd	PId	Control type
2nd	oUt	SSr	Control output
2nd	AL-1	An1._	AL1 alarm operation mode
2nd	AHYS	90	Alarm output hysteresis
1st	AL1	-005	AL1 alarm temperature
1st	P	000.5	Proportional band, °C
1st	I	0010	Integral time
1st	d	0	Derivative time
2nd	LoC	LoC2	Settings group 1,2 locked
SV	SV	220	Default temperature

## 1.7 Temperature limiter TC4SP

### **⚠ DANGER**



- **Electric shock hazard!** High voltage inside electric panel. DO NOT touch bare terminals and/or wires.

TC4SP unit (Fig.8) has three setting groups: 1st setting group, 2nd setting group, and SV setting group (the main indication mode). The settings must be changed in the same order as they appear in the list. Note that after changing **In-t** (temperature sensor type) or **UnI-t** (temperature unit) values, parameters **H-Su**, **L-Su**, **AL1**, **AL2**, **AHYS** must be set again. The regulator has more parameters than listed below; if you see a parameter not from the list, skip it and move to the next one.

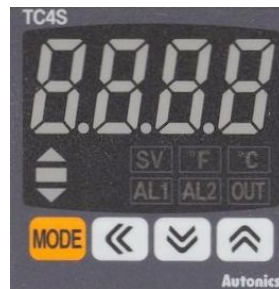


Figure 8: TC4SP panel

### Parameters changing procedure

1. To access the 2nd group of parameters press and hold **MODE** for 4 seconds; once display reads **PAR2**, release **MODE**.
2. To access the 1st group of parameters, press and hold **MODE** for 2 seconds; once display reads **PAR1**, release **MODE**.
3. Press **MODE** to go through the parameters. Press **←** to see current value of the parameter.
4. Press **↑** or **↓** to change the value.
5. Press **MODE** to move to the next parameter.

Group	Param	Value	Meaning
2nd	LoC	oFF	Unlock all settings for changing
2nd	In-t	YCA	Temperature sensor type
2nd	L-Su	250	SV low-limit value
2nd	H-Su	400	SV high-limit value
2nd	C-nd	onoF	Control type
2nd	oUt	rLY	Control output
2nd	AL-1	An1._	AL1 alarm operation mode
2nd	AHYS	10	Alarm output hysteresis
1st	AL1	-20	AL1 alarm temperature
1st	HYS	20	Hysteresis
SV	SV	350	Default temperature
2nd	LoC	LoC3	All settings locked

## 2 Diagnostic procedures

### DANGER



- **Electric shock hazard!** High voltage inside electric panel. DO NOT touch bare terminals and/or wires.
- ALWAYS unplug the machine before resistance measurement, or open circuit check, or circuit continuity check.

**NOTE:** Refer to the wiring diagram and parts list to locate the components. Following designation is used in this section:

- (5)/DC1 – terminal no.5 of the component DC1.
- 1.15 – wire labelled “1.15”.

### 2.1 Controls

#### 2.1.1 EMERGENCY STOP switch (SA1)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 1.8 1.9.
3. Press EMERGENCY STOP switch.
4. Ensure (1)/SA1 and (2)/SA1 are open.
5. Release EMERGENCY STOP switch.
6. Ensure (1)/SA1 and (2)/SA1 are closed.

#### 2.1.2 FEEDING switch (SA2)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 5.30 5.29 5.6 5.5 5.4 5.3 5.2 5.1 5.0.
3. Set FEEDING at 1.
4. Ensure (1)/SA2 and (2)/SA2 are closed, (3)/SA2 and (4)/SA2 are open.
5. Set FEEDING at 2.
6. Ensure (1)/SA2 and (2)/SA2 are open, (3)/SA2 and (4)/SA2 are open.
7. Set FEEDING at 3.
8. Ensure (1)/SA2 and (2)/SA2 are open, (3)/SA2 and (4)/SA2 are closed.

#### 2.1.3 TURBINE SPD switch (SA3)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 5.32 5.31 5.4 5.3 5.2 5.1 5.0.
3. Set TURBINE SPD at 1.
4. Ensure (1)/SA3 and (2)/SA3 are closed, (3)/SA3 and (4)/SA3 are open.
5. Set TURBINE SPD at 2.
6. Ensure (1)/SA3 and (2)/SA3 are open, (3)/SA3 and (4)/SA3 are open.
7. Set TURBINE SPD at 3.
8. Ensure (1)/SA3 and (2)/SA3 are open, (3)/SA3 and (4)/SA3 are closed.

#### 2.1.4 START push button (SB1)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

1.10	1.15	1.14	1.13	1.12							
5.24	5.10	5.9	5.8	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0

.
3. Ensure (1)/SB1 and (2)/SB1 are closed if SB1 IS pressed, and open if SB1 IS NOT pressed.
4. Ensure (3)/SB1 and (4)/SB1 are closed if SB1 IS pressed, and open if SB1 IS NOT pressed.

#### 2.1.5 PAUSE push button (SB2)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.25	5.11	5.10	5.9	5.8	5.7	
5.6	5.5	5.4	5.3	5.2	5.1	5.0

.
3. Ensure (1)/SB2 and (2)/SB2 are closed if SB2 IS pressed, and are open if SB2 IS NOT pressed.

#### 2.1.6 TURN OFF push button (SB3)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.26	5.12	5.11	5.10	5.9				
5.8	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0

.
3. Ensure (1)/SB3 and (2)/SB3 are closed if SB3 IS pressed, and are open if SB3 IS NOT pressed.

#### 2.1.7 CLOGGING lamp (HL1)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.8	5.7	5.6	5.5	5.4	5.3	5.2
5.1	5.0	6.11				

.

#### 2.1.8 LOW CORN lamp (HL2)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.7	5.6	5.5	5.4	5.3	5.2
5.1	5.0	6.10			

.

#### 2.1.9 HEATING lamp (HL3)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.2	5.1	5.0	6.12
-----	-----	-----	------

.

#### 2.1.10 POPPING lamp (HL4)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.1	5.0	6.13
-----	-----	------

.

#### 2.1.11 COOLING lamp (HL5)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: 

5.0	6.14
-----	------

.

## 2.2 Heating elements (EK11-EK33)

1. Cool down the machine and unplug.
2. Ensure the resistance between any two of (L1)/VS1, (L1)/VS2, and (L1)/VS3 is about 14  $\Omega$ . IF any of them reads other value, or OL:
3. Take off the door (1), see Fig.9. Remove panel (2), remove thermal insulation mats that cover busbars and heater terminals.
4. Ensure continuity and terminal tightening for the wires: 1.3 2.3 3.3.
5. Remove busbars (3), (4), (5), (6).
6. Ensure the resistance of each heating element (EK11-EK33) is about 21  $\Omega$ . If open or short circuit, replace fault heating element.
7. Ensure each heating element DOES NOT HAVE ground fault, there should be no contact between each terminal stud and the ground. Replace fault heating element.
8. Mount busbars (3), (4), (5), (6) back in place. Use conductive anti-seize paste on bolted joints between terminal studs of the heaters and the busbars.

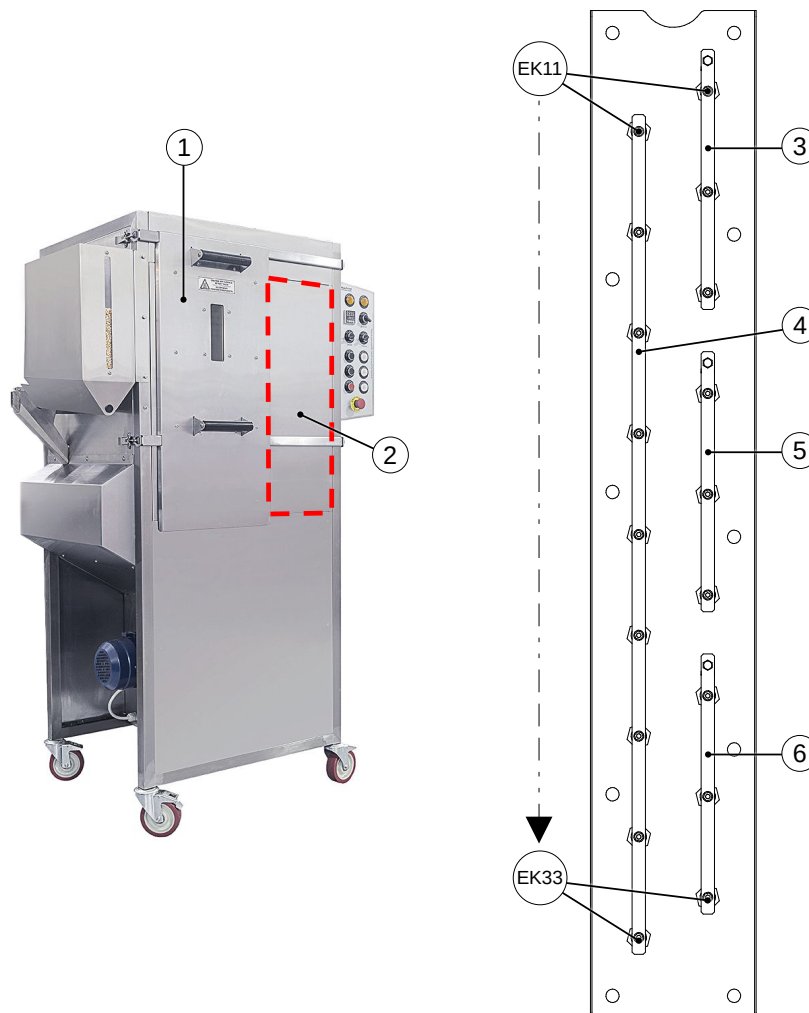


Figure 9: Heating elements panel

### 2.3 Solid-state relays (VS1-VS3)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [5.35](#) [5.34](#) [5.33](#) [6.20](#) [6.19](#) [6.18](#) [1.2](#) [2.2](#) [3.2](#).
3. Ensure (L1)/VS1 and (T1)/VS1 are open.
4. Ensure (L1)/VS2 and (T1)/VS2 are open.
5. Ensure (L1)/VS3 and (T1)/VS3 are open.
6. Plug the machine in. Press START. Wait 15 seconds.
7. Ensure voltage from (T1)/VS1 to ground is 230 VAC.
8. Ensure voltage from (T1)/VS2 to ground is 230 VAC.
9. Ensure voltage from (T1)/VS3 to ground is 230 VAC.
10. Ensure voltage from (L1)/VS1 to ground is 230 VAC whenever pilot light on VS1 is lit.
11. Ensure voltage from (L1)/VS2 to ground is 230 VAC whenever pilot light on VS2 is lit.
12. Ensure voltage from (L1)/VS3 to ground is 230 VAC whenever pilot light on VS3 is lit.

### 2.4 Contactor (KM1)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [4.6](#) [4.5](#) [4.4](#) [4.3](#) [4.2](#) [4.1](#) [1.11](#).
3. Ensure the plunger of the contactor can be smoothly pushed down with a suitable tool (e.g. screwdriver).
4. Ensure (1)/KM1 closes to (2)/KM1, (3)/KM1 closes to (4)/KM1, (5)/KM1 closes to (6)/KM1, whenever the plunger IS pushed down.
5. Ensure (1)/KM1 doesn't close to (2)/KM1, (3)/KM1 doesn't close to (4)/KM1, (5)/KM1 doesn't close to (6)/KM1, whenever the plunger IS NOT pushed down.
6. Ensure resistance between (A1)/KM1 and (A2)/KM1 is about 500  $\Omega$ . IF open or short circuit, replace KM1.
7. Plug the machine in. Press START.
8. Ensure voltage from (2)/KM1 to ground is 230 VAC.
9. Ensure voltage from (4)/KM1 to ground is 230 VAC.
10. Ensure voltage from (14)/KM1 to ground is 230 VAC.

### 2.5 Contactor (KM2)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [1.1](#) [2.1](#) [3.1](#) [1.21](#) [4.1](#).
3. Ensure the plunger of the contactor can be smoothly pushed down with a suitable tool (e.g. screwdriver).
4. Ensure (1)/KM2 closes to (2)/KM2, (3)/KM2 closes to (4)/KM2, (5)/KM2 closes to (6)/KM2, whenever the plunger IS pushed down.
5. Ensure (1)/KM2 doesn't close to (2)/KM2, (3)/KM2 doesn't close to (4)/KM2, (5)/KM2 doesn't close to (6)/KM2, whenever the plunger IS NOT pushed down.
6. Ensure resistance between (A1)/KM2 and (A2)/KM2 is about 500  $\Omega$ . IF open or short circuit, replace KM2.

7. Plug the machine in. Press START. Wait 15 seconds.
8. Ensure voltage from (A1)/KM2 to (A2)/KM2 is 230 VAC.
9. Ensure voltage from (2)/KM2 to ground is 230 VAC.
10. Ensure voltage from (4)/KM2 to ground is 230 VAC.
11. Ensure voltage from (6)/KM2 to ground is 230 VAC.

## 2.6 Temperature limiter (DC4)

1. Cool down the machine and unplug.
2. Take out the DC4 out of the socket. Ensure the pins and socket are clean and free of dust and scrap. Insert DC4 back into socket, ensure it sits tight and fixed.
3. Ensure continuity and terminal tightening for the wires: [4.5](#) [4.4](#) [4.3](#) [4.1](#) [4.0](#) [1.16](#) [1.13](#) [1.12](#) [1.16](#).
4. Plug the machine in. Press START. Wait 15 seconds.
5. Ensure voltage from (10)/DC4 to (11)/DC4 is 230 VAC. IF voltage DOES present, BUT the DC4 display doesn't lit, replace DC4.
6. Ensure DC4 proper setup.
7. Ensure 230 VAC presents at (5)/DC4 whenever machine is on.
8. Ensure 230 VAC presents at (4)/DC4 whenever machine is in heating mode and OUT indicator is lit up. IF voltage DOES NOT present, relay output is fault, replace DC4.

## 2.7 High temp heaters sensor (BT1)

1. Cool down the machine and unplug.
2. Ensure sensor wires are properly connected to (2)/DC4 and (3)/DC4.
3. Ensure resistance from (2)/DC4 and (3)/DC4 is about 10  $\Omega$ . IF open or short circuit, replace BT1.

## 2.8 Temperature regulator (DC3)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [1.17](#) [4.7](#) [4.6](#) [4.5](#) [4.4](#) [4.3](#) [4.1](#) [5.8](#) [5.7](#) [5.6](#) [5.5](#) [5.4](#) [5.3](#) [5.2](#) [5.1](#) [5.0](#).
3. Plug the machine in. Press START. Wait 15 seconds.
4. Ensure 230 VAC presents between (10)/DC3 and (11)/DC3. IF voltage DOES present, BUT the DC3 display doesn't lit, replace DC3.
5. Ensure DC3 proper setup.
6. Ensure 24 VDC presents at (8)/DC3 whenever machine is on.
7. Ensure 24 VDC presents at (1)/DC3 and (2)/DC3 whenever OUT indicator is lit up. IF voltage DOES NOT present, SSR output is fault, replace DC3.
8. Ensure 24 VDC presents at (7)/DC3 whenever AL1 indicator is lit up. IF voltage DOES NOT present, AL1 output is fault, replace DC3.
9. Ensure 24 VDC presents at (9)/DC3 whenever AL2 indicator is lit up. IF voltage DOES NOT present, AL2 output is fault, replace DC3.

## 2.9 Chamber temperature sensor (BT2)

1. Cool down the machine and unplug.
2. Ensure sensor wires are properly connected to (10)/DC3 and (11)/DC3.
3. Ensure resistance from (10)/DC3 and (11)/DC3 is about 10  $\Omega$ . IF open or short circuit, replace BT1.

## 2.10 Slim relay (K1)

1. Cool down the machine and unplug.
2. Take out the relay's central module by pressing latching lever. Ensure the module pins and the socket are clean and free of dust and scrap. Insert the module back.
3. Ensure terminals (12)/K1 and (11)/K1 are closed. IF not, replace the relay.
4. Ensure continuity and terminal tightening for the wires: [1.9](#) [1.8](#) [1.6](#) [1.5](#) [6.17](#) [5.16](#) [5.15](#) [5.14](#) [5.13](#).
5. Plug the machine in. Press START.
6. Ensure voltage from (11)/K1 to ground is 230 VAC.
7. Ensure voltage from (12)/K1 to ground is 230 VAC.

## 2.11 Slim relay (K2)

1. Cool down the machine and unplug.
2. Take out the relay's central module by pressing latching lever. Ensure the module pins and the socket are clean and free of dust and scrap. Insert the module back.
3. Ensure terminals (11)/K2 and (14)/K2 are open. IF not, replace the relay.
4. Ensure continuity and terminal tightening for the wires: [1.21](#) [1.22](#) [5.15](#) [5.14](#) [5.13](#) [6.16](#).
5. Plug the machine in. Press START. Wait 15 seconds.
6. Ensure voltage from (A1+)/K2 to (A2-)/K2 is 24 VDC whenever the machine is in heating or popping mode.
7. Ensure voltage from (11)/K2 to ground is 230 VAC.
8. Ensure voltage from (14)/K2 to ground is 230 VAC.

## 2.12 Power supply unit (PSU)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [1.14](#) [1.13](#) [1.12](#) [1.16](#) [4.4](#) [4.3](#) [4.1](#) [GND3](#).
3. Ensure voltage from (L)/PSU to (N)/PSU is 230 VAC.
4. Ensure voltage from (24V)/PSU to (0V)/PSU is 24 VDC. IF 24 VDC DOES NOT present, replace PSU.

## 2.13 Buzzer (BZ)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [5.17](#) [5.16](#) [5.15](#) [5.14](#) [5.13](#) [6.15](#).



## 2.14 Circuit breaker (QF)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: **1.0** **2.0** **3.0** **4.0**.
3. Cock up the black lever of QF.
4. Ensure (1)/QF closes to (2)/QF, (3)/QF closes to (4)/QF, (5)/QF closes to (6)/QF, (7)/QF closes to (8)/QF.
5. Plug the machine in.
6. Ensure voltage from (2)/QF to (8)/QF is 230 VAC.
7. Ensure voltage from (4)/QF to (8)/QF is 230 VAC.
8. Ensure voltage from (6)/QF to (8)/QF is 230 VAC.

## 2.15 Turbine (UZ,M1)

### DANGER



- Capacitors in the output circuit of the VFD might maintain high voltage at output terminals U, V, W for up to 10 minutes after power cut off.

### VFD unit (UZ)

1. Cool down the machine and unplug. Wait 15 minutes.
2. Ensure continuity and terminal tightening for the wires: **1.19** **4.9** **10.0** **11.0** **GND4**.
3. Plug the machine in. Press START.
4. Ensure voltage from (R)/UZ to (S)/UZ is 230 VAC.
5. Ensure UZ display is lit up. IF not, replace UZ.
6. IF display reads **OL** (Overload), or **OC** (Overcurrent), or **GFF** (Ground fault), check M1.

### AC Motor (M1)

1. Cool down the machine and unplug. Wait 15 minutes.
2. Ensure continuity and terminal tightening for the wires: **U.0** **V.0** **W.0** **GND5**.
3. Ensure resistance between any two of **U.0** **V.0** **W.0** is about 15  $\Omega$ . IF open or short circuit, repeat resistance measurement from the terminal box of the motor. IF confirmed, replace M1.
4. Ensure the motor wired in delta.
5. Ensure open circuit from any of **U.0** **V.0** **W.0** to the ground.
6. Remove the grilled cap from the motor that covers the cooling impeller. Ensure the impeller can rotate as driven by hand. IF impeller cannot rotate, or can rotate only with significant effort, then take off the motor with turbine and inspect for mechanical damage.

## 2.16 Corn feeder (DD,M2)

### Step driver (DD)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [5.13](#) [6.1](#) [6.2](#) [6.8](#) [6.9](#).
3. Ensure resistance from (PUL-)/DD to (Y2)/DC1 is 2000  $\Omega$ .
4. Ensure proper setup of dip-switches:

**SW #1 ON**  
**SW #2 ON**  
**SW #3 OFF**  
**SW #4 OFF**  
**SW #5 OFF**  
**SW #6 ON**  
**SW #7 ON**  
**SW #8 OFF**

### Step motor (M2)

1. Cool down the machine and unplug.
2. Ensure the auger can be rotated by hand.
3. Ensure continuity and terminal tightening for the wires: [6.21](#) [6.22](#) [5.36](#) [5.37](#).
4. Ensure resistance between (A+)/DD and (A-)/DD is 0,7  $\Omega$ . If open or short circuit, replace M2.
5. Ensure resistance between (B+)/DD and (B-)/DD is 0,7  $\Omega$ . If open or short circuit, replace M2.

## 2.17 Low corn sensor (BL1)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [5.21](#) [5.27](#) [6.7](#).
3. Plug the machine in. Press START.
4. Ensure LED indicator for (X5)/DC1 is lit whenever sensor is tripped.

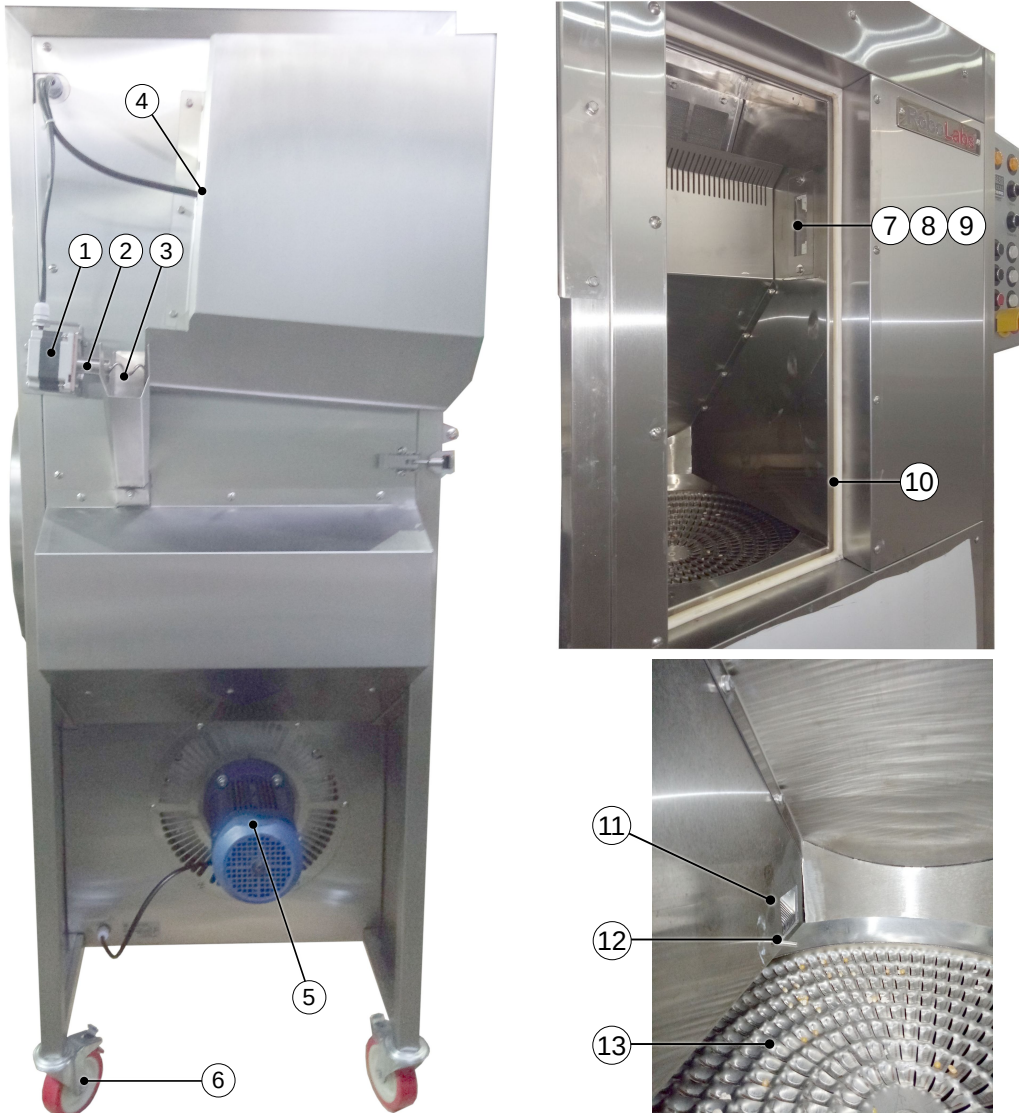
## 2.18 Fiber amplifier (BL2)

1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [5.20](#) [5.28](#) [6.6](#).
3. Ensure BL2 proper setup.
4. Ensure LED indicator for (X6)/DC1 is lit whenever operation indicator (pos.1 Fig.4) is lit and vice versa.

## 2.19 Voltage control relay (FV)

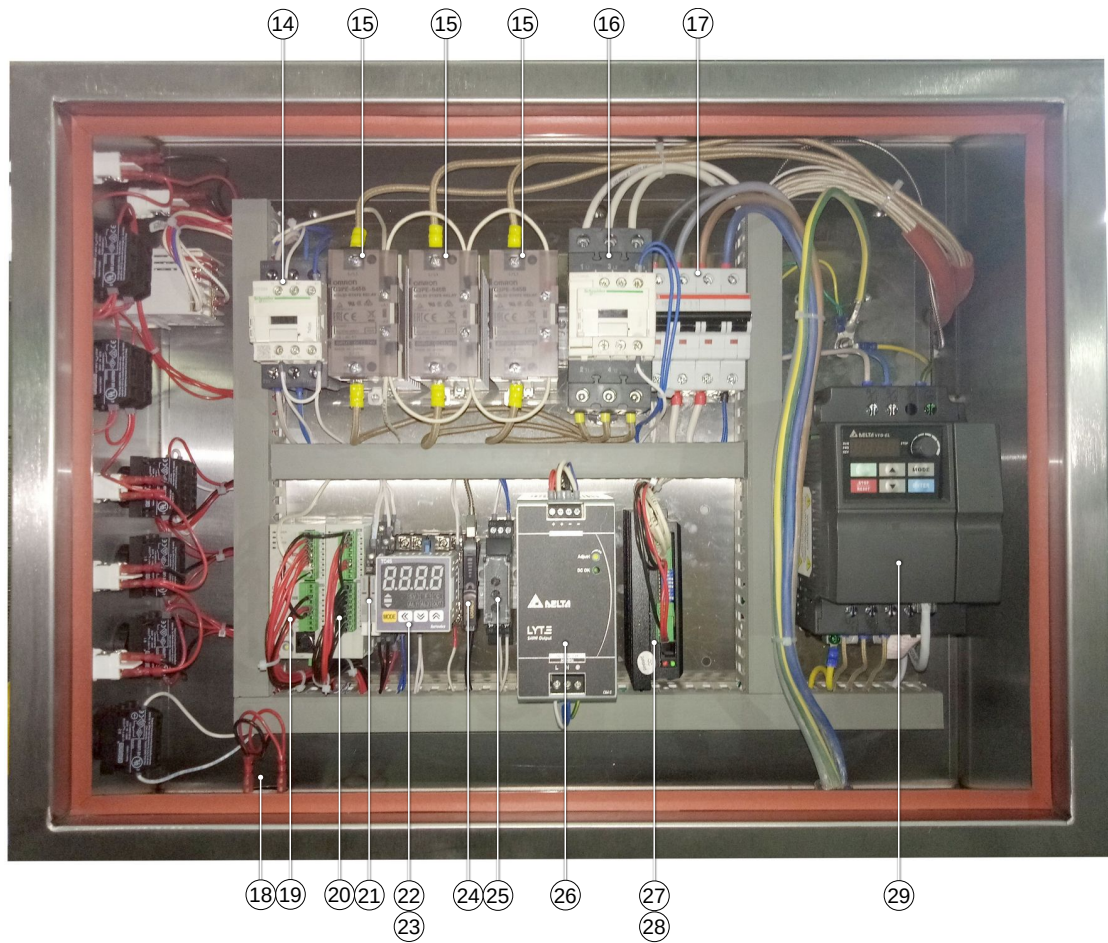
1. Cool down the machine and unplug.
2. Ensure continuity and terminal tightening for the wires: [1.5](#) [1.6](#) [4.3](#) [4.1](#).
3. Ensure (11)/FV and (14)/FV are open.
4. Ensure FV proper setup.
5. Plug the machine in.
6. Wait until both green and yellow indicators on FV start to glow.
7. Ensure voltage (14)/FV to ground is 230 VAC.

### 3 Parts list



Pos.	WD sign	Item	Order no.
1	M2	Step motor	24730
2	-	Step motor w/auger assembled	25268
3	-	Auger	25269
4	BL1	Photoelectric sensor	22080
5	M1	AC motor w/turbine assembled	23110
6	-	Swivel caster	24731
7	-	Lamp casing assembled	23128
8	-	Lamp protective screen	23127
9	HL	Halogen lamp	22615
10	-	Door gasket	25532
11	-	Heat-resistant fiber head	17028
12	BT2	Temperature sensor (chamber)	23226
13	-	Perforated bowl	23123

## Parts list (continued)



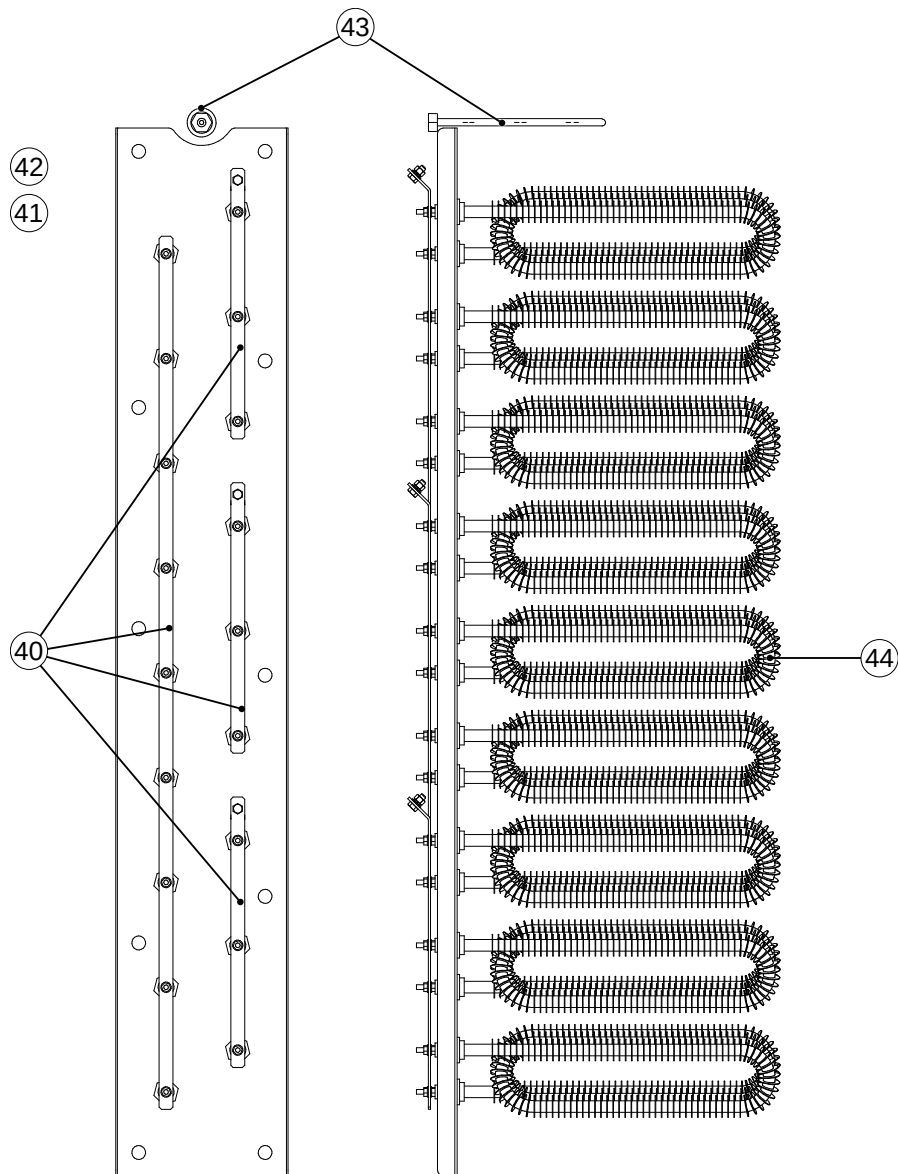
Pos.	WD sign	Item	Order no.
14	KM1	Contactor 25A	25270
15	VS1-VS3	Solid-state relay	21985
16	KM2	Contactor 40A	25118
17	QF	Circuit breaker 50A	21974
18	BZ	Buzzer	22951
19	DC1	PLC	25145
20	DC2	I/O extension module	25716
21	K1,K2	Slim relay	25147
22	DC4	Temperature limiter	16848
23	-	PS-11 socket	22599
24	BL2	Fiber amplifier	17029
25	FV	Voltage control relay	25627
26	TV	Power supply unit	25715
27	DD	Step motor driver	25150
28	R	Step motor driver wire	26090
29	UZ	Inverter (VFD)	25271

## Parts list (continued)



Pos.	WD sign	Item	Order no.
30	SB3	Push button red	25138
31	SB1,SB2	Push button black	25156
32	-	Contact block	22451
33	DC3	Temperature regulator	25111
34	-	Signal light armature (yellow)	26078
35	EL1-EL5	LED lamp	25717
36	SA2,SA3	3-pos switch	12978
37	-	Signal light armature (white)	26077
38	-	Yellow protective collar	25473
39	SA1	Emergency stop switch	25138

## Parts list (continued)



Pos.	WD sign	Item	Order no.
40	-	Busbars set	23119
41	-	Heaters connection wires set (not shown)	23211
42	-	Insulation mat (not shown)	16222
43	BT1	Heaters high temp sensor	23983
44	EK11-EK33	Heating element	10950