



# RoboLabs

Incredible machines for fastfood & funfood

## Caramel coating machine CP-100SR

### User manual



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

## 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**



- Not grounded equipment can cause electric shock. Power outlet **MUST HAVE PROPER GROUNDING** to avoid electric shock.
- Using excessive water during cleaning can cause short circuit and electric shock. **DO NOT USE** excessive water or water jet for cleaning. **DO NOT SPILL** water on electric panels or parts.
- **ALWAYS** unplug equipment before cleaning or servicing.
- No user serviceable parts inside. **DO NOT OPEN** electric panel unless you are qualified for this.

### **WARNING**



- Swivel casters **MUST BE ALWAYS** locked unless the machine needs to be moved.
- **DO NOT NOT LEAVE** running machine **UNATTENDED**.
- Using heavy or abrasive products might get machine fault. **DO NOT PUT** any heavy or abrasive products inside the machine.

### **WARNING**



- Kettle and caramel slurry are very hot during operation. Direct contact to hot surface, or caramel slurry can cause serious burns. **DO NOT TOUCH** hot kettle or caramel slurry.

### **WARNING**



- Rotating mixer can crush. **DO NOT REACH** into the kettle while in operation.

### **WARNING**



- **WEAR** appropriate slip-resistant footwear.
- **CLEAN UP** spills immediately after discovery.

### **WARNING**



- **IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE PROPERTY DAMAGE, INJURY, OR DEATH.** Read and understand this manual before use.
- **ONLY INSTRUCTED PERSONNEL** is allowed to operate the equipment.

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# 1 General information

Caramel coating machine CP-100SR is used for making caramel coated popcorn (hereinafter “the machine”, or “the equipment”). The machine can work as a stand-alone unit, or as a part of popcorn processing line.

Commercial use only.

## 1.1 Technical specifications

Kettle volume	300 L
Rated voltage	400 V 50 Hz
Rated current	37 A
Dimensions (LxWxH)	1080x1465x2130 mm
Weight	285 kg
Material	stainless steel

## 1.2 Manufacturer details

RoboLabs Ltd.  
11 Industrialnaya Street, Tver, 170100 Russia  
Technical support:  
Email: support@robolabs.pro  
Phone: +7 495 956 4000

## 1.3 Quality check

CP-100SR	
_____	_____
model	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	

## 1.4 Warranty obligations

The manufacturer guarantees trouble-free operation of the equipment during 12 months from the date of receiving the equipment by a dealer (in accordance with transport documentation); or, in case of purchase directly through Trapeza LLC or RoboLabs Ltd., from the date of purchase, 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!***

## 1.5 Ambient conditions

This equipment is designed to be operated at the ambient temperature from +5°C to +40°C (+41°F to +104°F) and relative humidity not more than 45% at 40°C (104°F) while using at altitudes not exceeding 1000 m over the sea level. The temperature decreasing is related to RH increasing, for example, 90% of RH at 20°C (68°F). This equipment **MUST NOT** be exposed to precipitations of any kind (rain, snow and so on).

## 1.6 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 and plus 55°C.

## 2 Installation

### 2.1 Delivery set

- 1x Machine assembled
- 1x Documentation set

### 2.2 Assembling

1. Unpack the machine carefully.
2. Remove protective film from all surfaces.
3. Wipe all surfaces with a clean soft cloth dampen with mild soap. Remove soap residues with a clean cloth dampen in clear water. Let it dry.
4. Install the machine at even surface.
5. Lock all four swivel casters.

### 2.3 Power requirements

 **DANGER**



- Power outlet **MUST HAVE PROPER GROUNDING** to avoid electric shock.
- If supply or interconnection cords damaged, it must be replaced by manufacturer, service agent, or skilled person in order to avoid hazard.
- Connections must be done **BY SKILLED ELECTRICIAN ONLY**.

Equipotential bonding wire (up to 10 sq.mm) shall be connected

- to screw terminal on the base frame marked with IEC 60417-5021 sign:



Machine requires 5-wire 3 phase 400 VAC 50 Hz power supply. Use the 63 A 400 V 50 Hz 3P+N+PE connector in accordance with IEC 60309 standard. Short-circuit current rating for the machine is 6 kA.

### 2.4 Ventilation requirements

A ventilation hood measuring at least 1200x1200mm must be provided above the machine, with capacity of 3000 cu.m/h or more. **NOTE: Ambient conditions have strong impact on the end product quality!**

### 3 Design and principle of operation

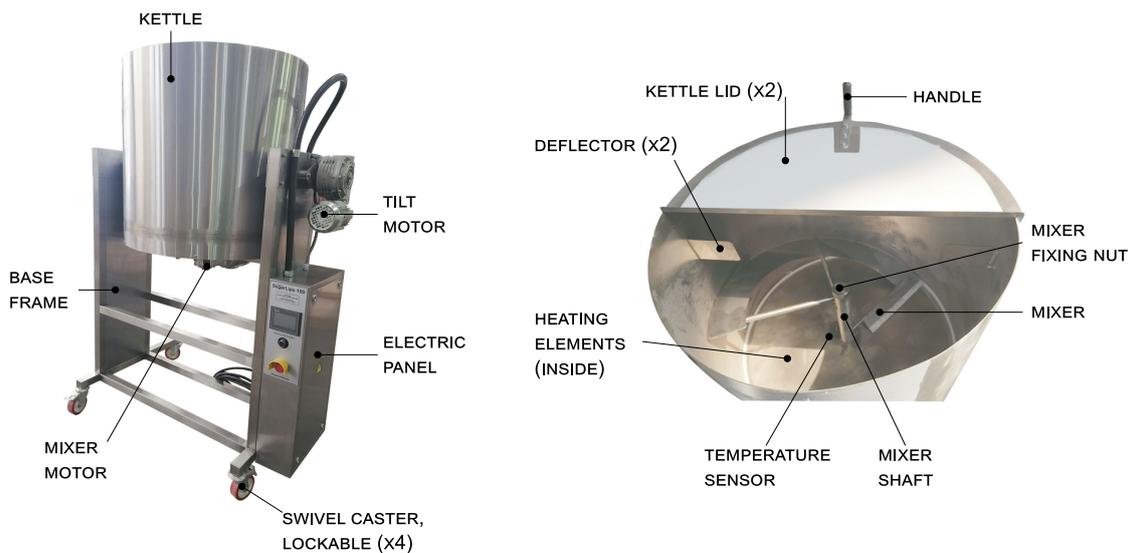


Figure 1: Structural components of the machine

Structural components of the machine are shown on Fig.1.

**Base frame** installed on four **lockable swivel casters** bears all the elements of the machine.

**Kettle** is mounted on the base frame, in such a way that it can be tilted with the means of **tilt motor**.

Inside the kettle's bottom **heating elements** located, which heat caramel slurry in the kettle. **Temperature sensor** controls the temperature of the slurry.

**Mixer** stirs caramel slurry while it is being cooked, and also mixes popcorn with caramel, thus providing coating process. Mixer is driven by the **mixer motor**, via **mixer shaft**.

Kettle is closed with two **lids**, which are used during caramel cooking, and also during cleaning.

**Electric panel** accommodates electric components of the machine, and also control panel, see Fig.2.

**HMI panel** is used to control the machine, change the parameters of operation, and so on.

**ON push button** turns the machine on.

**OFF push button** turns the machine off.

**Emergency stop switch** shut down the machine immediately at any moment.

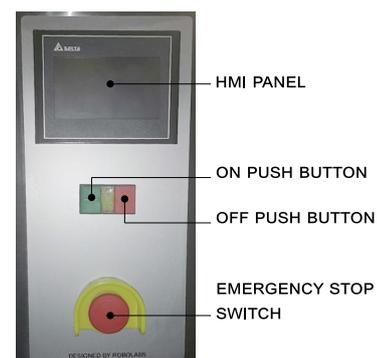


Figure 2: Controls

## 4 Intended use

### **DANGER**



- **DO NOT USE MACHINE** if power cord, or plug, or wall outlet are damaged.

### **WARNING**



- **MAKE SURE ALL FOUR SWIVEL CASTERS IS LOCKED.** Unlocked swivel casters might lead to accidental move of the machine.
- **DO NOT NOT LEAVE** running machine **UNATTENDED.**

### **WARNING**



- Kettle and caramel slurry are very hot during operation. Direct contact to hot surface, or caramel slurry can cause serious burns.  
**DO NOT TOUCH** hot kettle or caramel slurry.

### **WARNING**



- **WEAR** appropriate slip-resistant footwear.
- **CLEAN UP** spills immediately after discovery.

### **WARNING**



- Rotating mixer can crush. **DO NOT REACH** into the kettle while in operation.

### **WARNING**



- Mixer starts and stops automatically. **DO NOT REACH** into the kettle while in operation.

### 4.1 Stages of operation

The whole cycle of machine operation consists of the following stages:

**Heating** – caramel slurry is being heated and cooked. Mixer operates intermittently. Heating elements heat up the kettle or maintain set temperature.

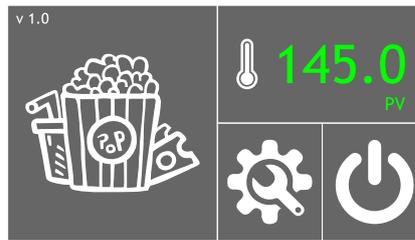
**Mixing** – popcorn is mixed with caramel, to be coated. Mixer operates continuously. Heating is not active.

**Kettle dump** – tilt motor brings the kettle down to discharge caramel coated popcorn to receiving device (cooling table, conveyor etc.). During tilting down, mixer doesn't spin. When kettle is in lowest point, mixer spins for certain time. Heating is not active.

**Kettle raise** – tilt motor brings the kettle back to initial position. Mixer does not spin. Heating is not active.

## 4.2 Operating order

1. Press ON push button on the control panel. Wait until HMI display shows the start screen:



2. Press  to enter the operating screen:



3. Add caramel ingredients in the kettle. Close the lid.
4. Press  to start the process.
5. Wait until steam starts to come out from the kettle. Remove the kettle lid and add oil or butter in the kettle.
6. Wait for the sound alarm.
7. Press  and add popped popcorn in the kettle. If required, spray lecithin over popcorn during mixing.
8. Wait for the sound alarm.
9. Press  to discharge coated popcorn from the kettle. **DO NOT REACH into kettle to help popcorn to come out!**
10. Wait until kettle is empty.
11. Press  to bring popcorn back to vertical position.
12. The machine is ready for the next batch.
13. To turn the machine off, press OFF push button.

Refer to Section 5 for detailed description of the machine settings.

## 5 HMI interface

### 5.1 Start screen

Upon turning machine on, the HMI panel represents the start screen, see Fig.3.

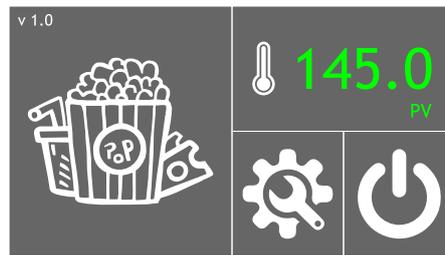
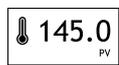


Figure 3: Start screen

 – version of software.

 – press to see the operating screen.

 – current temperature in the kettle.

 – press to see the settings screen.

 – press and hold to turn the machine off.

## 5.2 Operating screen

Operating screen is the main screen operator interacts with during working with the machine, see Fig.4:

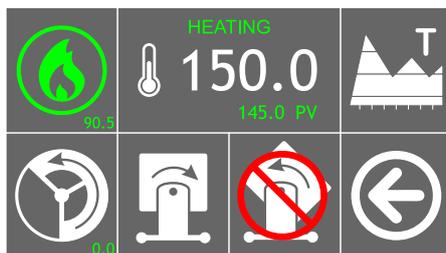


Figure 4: Operating screen

 – activates and de-activates **heating**. White if inactive. Green if active. Red circle backslash if cannot be activated. Timer in the low right corner of the button starts when the temperature in the kettle (PV) reaches SV-10 ° C. Once timer expires, sound alarm is given. For more details see 'add.heating time' setting description.

**HEATING** – current stage of operation of the machine. Other values might be: MIXING, DUMP, RAISE.

 **150.0** – press to change the goal temperature value. Type new value in the keypad appeared on the screen and confirm with ENTER.

**145.0 PV** – current temperature in the kettle.

 – press to see temperature graph screen.

 – activates and de-activates **mixing stage**. White if inactive. Green if active. Blinking green is a prompt for operator to start mixing. Red circle backslash if cannot be activated. Timer in the low right corner of the button displays the time from activating the stage.

 – activates and de-activates **kettle dump stage**. White if inactive. Green if active. Blinking green is a prompt for operator to start dumping the kettle. Red circle backslash if cannot be activated.

 – activates and de-activates **kettle raise stage**. White if inactive. Green if active. Red circle backslash if cannot be activated.

 – back to previous screen.

### 5.3 Settings screen

Settings screen allows operator to change parameters of the machine, see Fig.5:

mixer on timer	5.0	operation time	12345
mixer off timer	30.0	PLC address RoboFactory	1
mixing time	240.0	DEFAULT	
dump mixer timer	10.0	EN	
add. heating time	120.0		
mixer frequency	40.00		

Figure 5: Settings screen

– defines the time (in seconds) of "ON" phase for mixing during heating stage.

– defines the time (in seconds) of "OFF" phase for mixing during heating stage.

– defines the time (in seconds) for mixing stage.

– defines the time (in seconds) for mixer operation in the end of kettle dump stage.

– defines the time (in seconds) for the machine to keep slurry at goal temperature value, after temperature in the kettle (PV) reached SV-10 ° C.

– defines the rotation speed (in Hz) of the mixer.

– total time of machine operation, in hours.

– network address of the machine while working as a part of Robo-Labs production line.

– reset all settings to default values.

– interface language change (RU/EN).

– back to previous screen.

## 5.4 Temperature graph screen

Temperature graph screen allows operator to monitor the process of heating, see Fig.6:

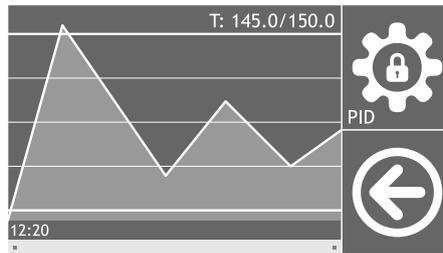


Figure 6: Temperature graph screen

T: 145.0/150.0 – current temperature (145.0) in the kettle, and goal temperature (150.0).



– access to parameters of PID regulator, password required.



– back to previous screen.

Scrolling bar in the low part of the screen allows to see the temperature graph changing in time.

## 5.5 PID regulator screen

PID regulator screen allows service engineer to change parameters of PID regulator, see Fig.7:

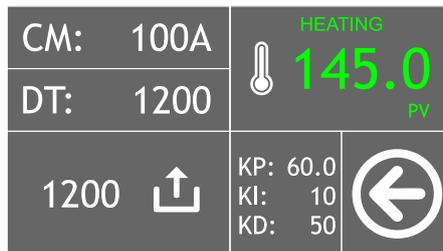


Figure 7: PID regulator screen

CM:100A, DT:1200, 1200  – system parameters.

KP:60.0 – proportional band (PID regulator parameter).

KI:10 – integral time (PID regulator parameter).

KD:50 – derivative time (PID regulator parameter).



– back to previous screen.

## 6 Cleaning

### **DANGER**



- **DO NOT USE EXCESSIVE WATER OR WATERJET** for cleaning the equipment.
- **DO NOT SPILL WATER** on electric panel(s).
- **ALWAYS KEEP** power cord plug **OFF THE FLOOR AND WATER.**

### **WARNING**



- Hot steam coming out from under covering lid is very hot and might cause severe scald burns. **DO NOT EXPOSE** yourself to hot steam.
- Kettle is very hot during water boil, touching it might cause burns. **ALWAYS WAIT** until machine **COOLS DOWN** before further cleaning.

### **CAUTION**



- **DO NOT USE HIGH ALCALINE** cleaners.
- **DO NOT USE SHARP ITEMS** or **ABRASIVES** for cleaning.

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

### 6.1 Daily cleaning

1. Pour water in the kettle (to fill it for about few cm) and close with the lid. Turn the machine on and then start heating stage. Wait until water begins to boil. Let it boil for 5-7 minutes, then turn the machine off. In case of severe carbon build-ups on the kettle's bottom, use special cleaning product (Heet-N-Kleen or similar); follow instructions written on this product.
2. Hot steam accumulated inside the kettle effectively cleans the sidewalls. **WAIT until kettle is cooled down.**
3. Once kettle is cold enough, remove both **kettle lids** using **handles** (see Fig.1). Wash the lids thoroughly. Let it dry.
4. Put a container, suitable to collect waste water, next to the machine. Turn the machine on and dump the kettle to discharge water and debris.
5. Remove the **mixer fixing nut** (see Fig.1), and take off the **mixer** from the **mixer shaft**. **NOTE:** mixer fixing nut is **LEFT HAND THREAD!** Wash the mixer thoroughly. Let it dry, and then put it back to the shaft, fix with the nut.
6. Remove both **deflectors** (see Fig.1), wash them thoroughly. Let it dry, and then put them back.
7. Bring the kettle back to upright position, then turn off and unplug the machine.
8. Clean outer surfaces of the machine with a clean soft cloth dampened with mild soap. Then wipe with a clean soft cloth dampened with water to remove soap residues. Let it dry.

### 6.2 Conservation

If machine is not used for long time, perform all cleaning procedures.

## A Components setup

### **DANGER**



- **THIS SECTION IS FOR SKILLED TECHNICIANS ONLY.**
- **ALWAYS** unplug the machine before servicing, unless you need it to be energized for performing setup procedures.

### **WARNING**



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

## A.1 VFD (inverters)

### DANGER



- Capacitors in the output circuit of the VFD maintain high voltage at output terminals U, V, W for up to 10 minutes after power cut off. **WAIT AT LEAST 10 MINUTES** before replacing connections.

**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 8: VFD control panel

### Parameters changing procedure

1. Locate the VFD control panel, see Fig 8.
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	Mixer	Kettle tilt	Description
00.03	1	1	Start-up display selection
01.00	50.00	50.00	Maximum output frequency
01.09	2.0	1.6 <sup>1</sup>	Accel time 1
01.10	2.0	3.3 <sup>1</sup>	Decel time 1
01.16	4	4	Auto acceleration/deceleration
02.00	3	0	Source of first master frequency command
02.01	4	2	Source of first operation command
02.04	0	0	Motor direction control
02.07	1	1	Up/Down Mode
02.11	30.00	30.00	Keypad frequency command
07.02	5.0	5.0	Torque Compensation
09.00	5	n/a	Communication address
09.01	1	n/a	Transmission speed
09.02	1	n/a	Transmission fault treatment
09.04	1	n/a	Communication protocol

<sup>1</sup>This parameter is set for each machine individually.

## A.2 Temperature regulator

**⚠ DANGER**



- High voltage inside electric panel. **DO NOT TOUCH** bare terminals and/or wires.

There are three modes of operation of DT3 unit (Fig.9): Operation, Regulation, and Initial setting.

When power is applied, controller gets into the operation mode. Press the **SET** key to switch to regulation mode. If the **SET** key is pressed for more than 3 seconds, controller will switch to the initial setting mode. Pressing the **SET** key while in the regulation mode or initial setting mode, forces the controller to return to the operation mode.

**PV/SV:** Sets the temperature set point and displays the temperature process value. Use **▼ ▲** keys to set the temperature set point.

**Setting method:** While in any function mode, press the **◀** key to select the desired function and use **▼ ▲** keys to change settings. Press the **SET** key to save the changes.

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 9: DT3 panel

Mode of operation	Param	Value	Designation
Operation	R-S	STOP	RUN/STOP: Control setting RUN or STOP
Initial setting	CNpt	K	Input type
Initial setting	CtRL	PID	Control mode
Initial setting	CoSH	ON	Communication write-in
Initial setting	C-SL	ASCII	Communication format
Initial setting	C-No	1	Communication address
Initial setting	bPS	9600	Baudrate
Initial setting	LEN	7	Data length
Initial setting	StoP	1	Stop bit
Initial setting	PRtY	E	Parity bit
Regulation	SV0	155.0	Set value for auto mode
Regulation	P0	20.0	Proportional setting
Regulation	i0	0	Integral time setting
Regulation	d0	0	Deviation time setting

Temperature regulator (DC2) controls solid-state relays (VS1),(VS2) that drive the heaters (EK1...EK6), thus controlling normal heating process in the kettle. The regulator reads the temperature from the temp sensor (BT2) located in the kettle, measuring temperature of caramel.

### A.3 Temperature limiter

**⚠ DANGER**



- High voltage inside electric panel. **DO NOT TOUCH** bare terminals and/or wires.

There are three setting groups in TC4SP unit (Fig.10): 1st setting group, 2nd setting group, and SV setting group (the main indication mode). When power is applied, the unit gets into SV setting group (Run mode). To access the 2nd group of parameters press and hold the **MODE** key for 4 seconds; once display reads **PAR2**, release the **MODE** key.

To access the 1st group of parameters, press and hold the **MODE** key for 2 seconds; once display reads **PAR1**, release the **MODE** key.

Press the **MODE** key to go through the parameters. Press the **←** key to see current value of the parameter. Press the **↑** **↓** keys to change the value. Press the **MODE** key to move to the next parameter.

The unit gets back to SV setting group when no key touched for 30 seconds. To change the set value, use **↑** **↓** keys while in initial screen (SV group).

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 **UnIt** (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.

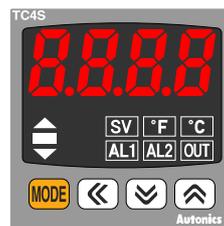


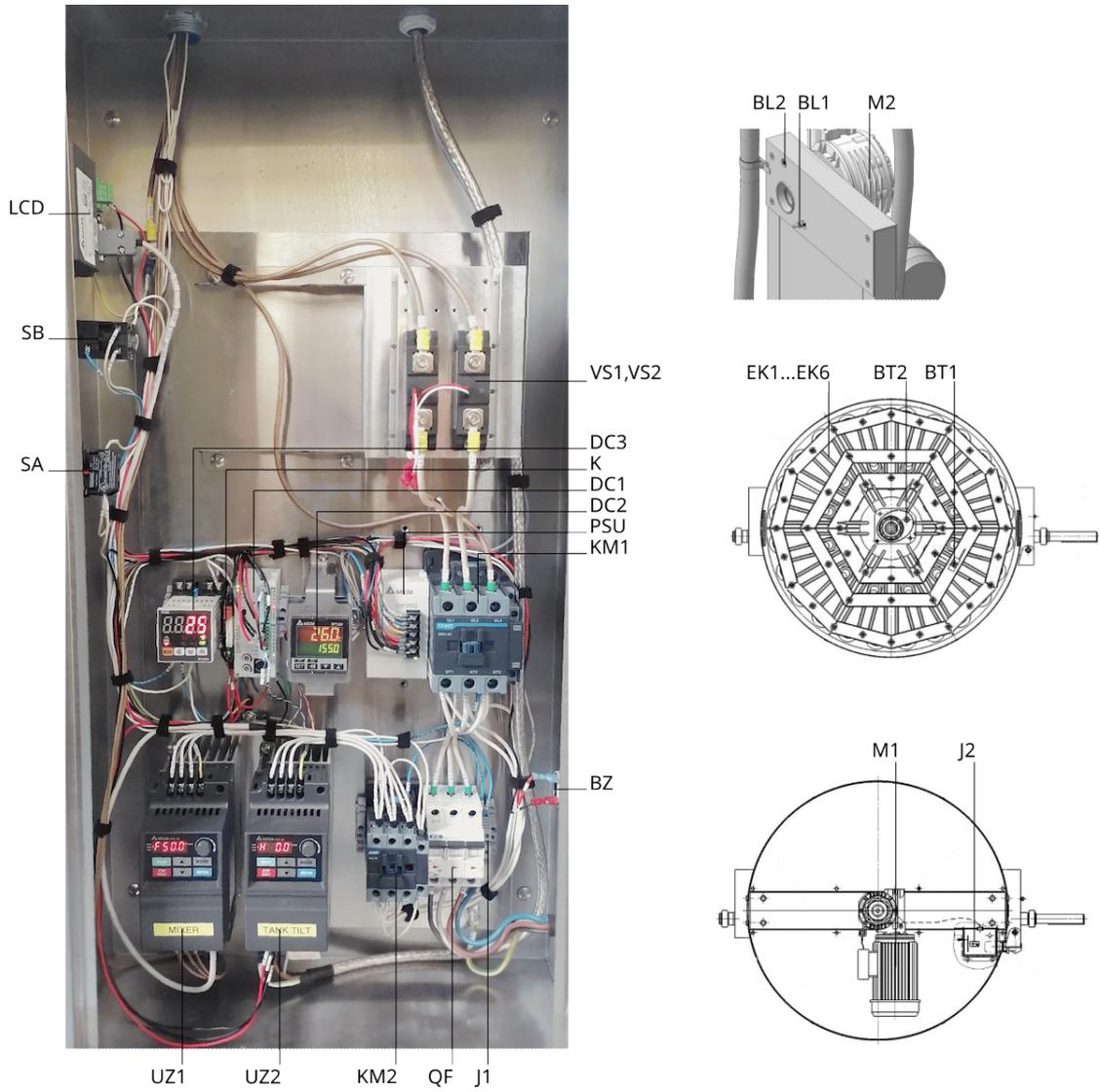
Figure 10: TC4S panel

Group	Param	Value	Designation
PAR2	LoC	oFF	Unlock all settings for changing
PAR2	In-t	YCA	Temperature sensor type
PAR2	L-Su	0250	SV low-limit value
PAR2	H-Su	0400	SV high-limit value
PAR2	C-nd	onoF	Control type
PAR2	oUt	rLY	Control output
PAR1	HYS	0010	Hysteresis
SV	SV	0350	Default temperature
PAR2	LoC	LoC3	All settings locked

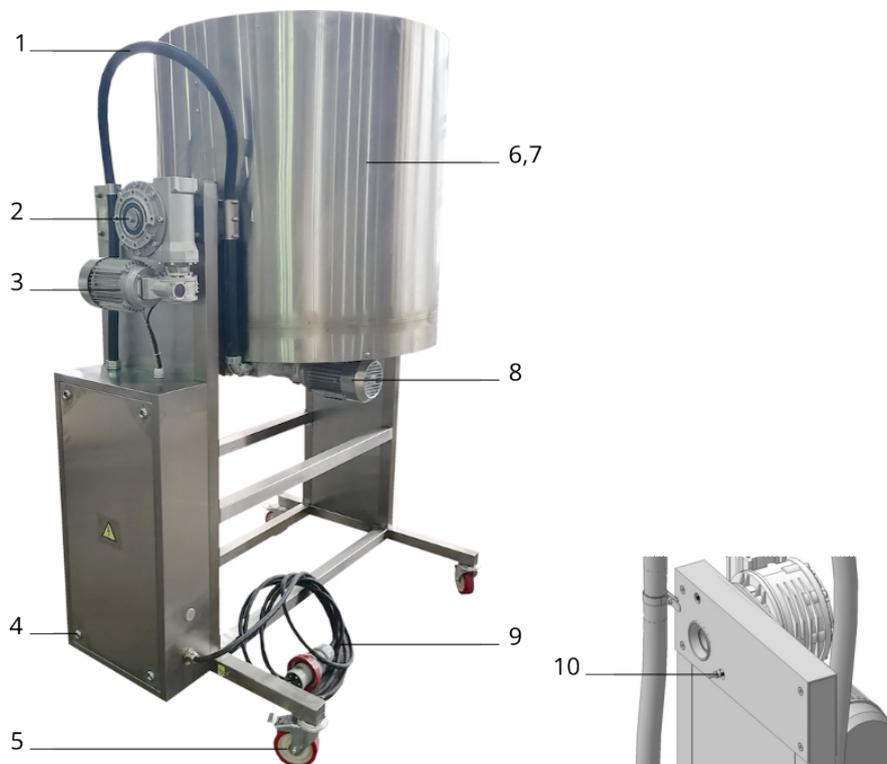
Temperature limiter (DC3) controls contactor (KM2) that feeds solid-state relays (VS1),(VS2) and the heaters (EK1...EK6). The limiter reads the temperature from the temp sensor (BT1), located in the heating elements area, under the kettle's bottom. If the temperature at the sensor exceeds 350°C, the limiter opens the contactor (KM2), thus cutting the power supplied to heating elements (EK1...EK6).

## B Electric components designations

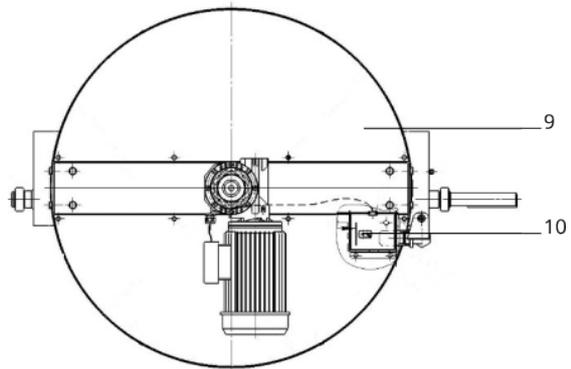
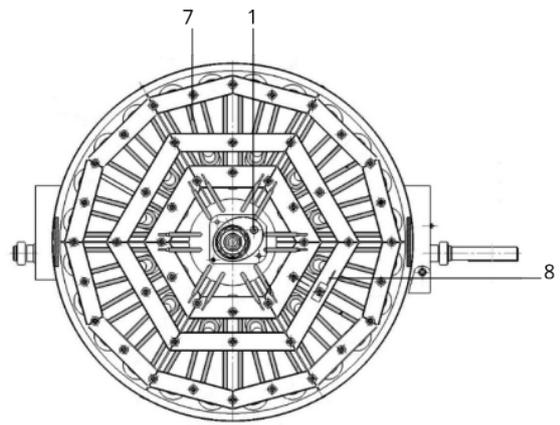
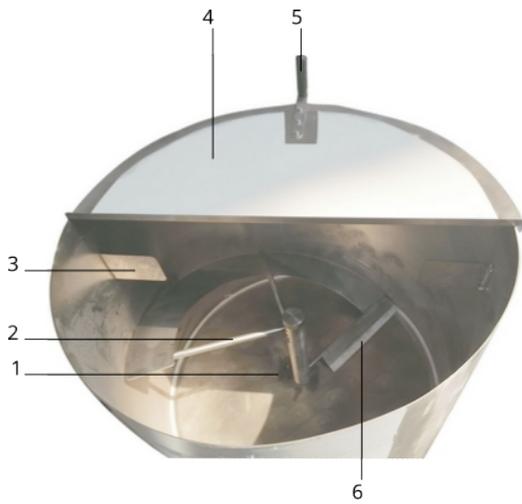
Below is the designations for electric components as they appear in the wiring diagram.



## C Parts list

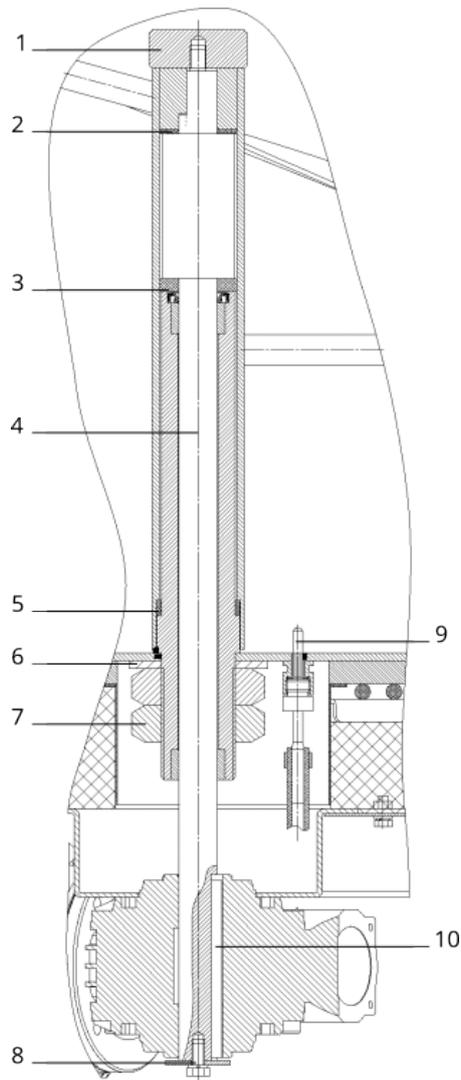


Pos.	Item	QTY	Part no.
1	Conduit w/wires asm	1	31249
2	Key 8x7x130 DIN 6885-1	1	30705
3	Motor w/gearbox MT71M KW 0,25/4 B14/IRWD040-20-71B14/IRWD090-40-90B5	1	31246
4	Lock KY05.1.2	4	25786
5	Swivel caster w/brk 3300 PUR 125 F18	4	24731
6	Kettle asm TM 3618.02.00.000	1	25844
7	Kettle housing TM 3618.02.04.000	1	32878
8	Motor w/gearbox MT80M KW 0,55/4 B14/B063FB08COMB30	1	25629
9	Supply cord w/o plug H07RN-F 5G6	2,5	31248
10	Proximity sensor LA08-45.4P1.U1.K	2	30674

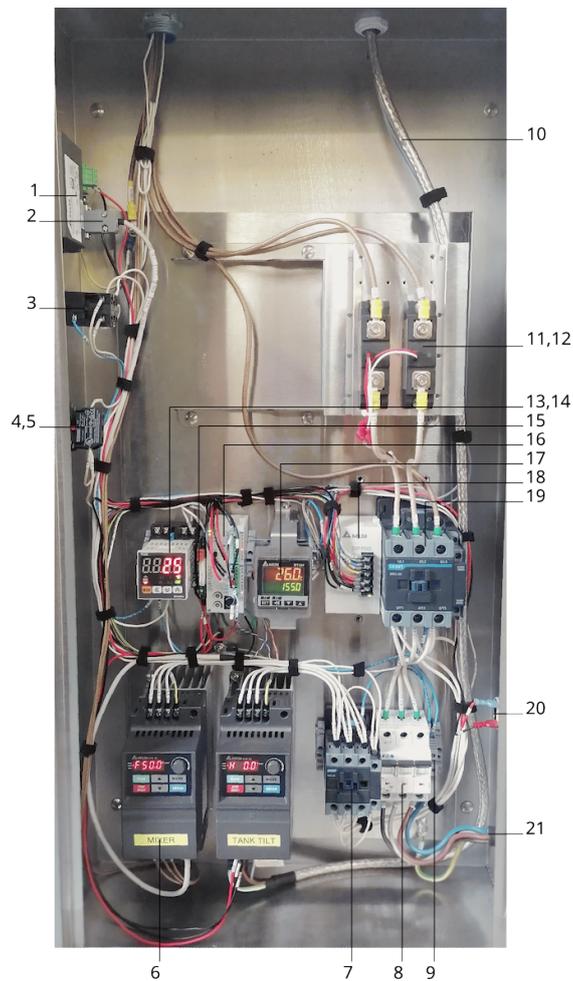


Pos.	Item	QTY	Part no.
1	Temp sensor ДТПК 124-00.32/4	1	25105
2	Mixer asm TM 3618.02.05.000	1	25070
3	Deflector w/fasteners TM 2653.02.00.001	2	23365
4	Kettle lid TM 2653.05.00.000	2	21692
5	Handle TM 2625.06.00.005	2	22870
6	PTFE pad TM 2653.02.05.004	1	23360
7	Heating element 252 E 10/3,2 LH 230	6	31013
8	Temp sensor ДТПК 011-0.5/4	1	24922
9	Insulation mat 38x610x1000	2,5	25965
10	Terminal block 112-12221300-00	1	23310
-	Heaters wiring kit <sup>2</sup>	1	31250

<sup>2</sup>Not shown.



Pos.	Item	QTY	Part no.
1	Nut TM 3618.02.00.024	1	33846
2	Liner TM 2653.02.00.018	1	23380
3	Shaft sealing set	1	26299
4	Shaft asm	1	26305
5	Collar TM 3618.02.00.025	1	33118
6	Washer TM 3618.02.00.026	1	26303
7	Nut M48	2	26302
8	Shaft fasteners set	1	26300
9	Temp sensor ДТПК 124-00.32/4	1	25105
10	Key 8x7x116 DIN 6885-1	1	26301



Pos.	Item	QTY	Part no.
1	Touchscreen DOP-103BQ	1	25154
2	Connector DS1033-09M	1	31481
3	Push button NP2-BW8465	1	25888
4	Switch B200E	1	25138
5	Protective collar M22-XGPV	1	25473
6	Inverter VFD015EL43A	2	25631
7	Contactor NXC-25	1	31025
8	Circuit breaker PL6-C50/3	1	33612
9	Terminal block AVK 10	1	30676
10	Shielded cable 9YSLCY-JB 4G1,5	1,5	17728
11	SS relay SBDH-6044.ZD3	2	26252
12	Heat sink PTP038	1	31247
13	Temp regulator TC4SP-14R	1	16848
14	Mounting socket PS-11	1	22599
15	EM relay RM1.51.0.024.00	1	25979
16	PLC w/o software DVP12SA211T	1	25145
17	Temp regulator DT320VA-0200	1	25933
18	Power supply DVP-PS02	1	15355
19	Contactor NXC-50	1	30672
20	Buzzer SC235B	1	22951
-	Cable plug <sup>3</sup> OL1710/P4	1	30765
-	Receptacle <sup>3</sup> OL1712/S4	1	30733

<sup>3</sup>Not shown.