NÜVE SANAYİ MALZEMELERİ İMALAT VE TİCARET A.Ş.

DRY AIR STERILIZERS / OVENS

FN 300-FN 400-FN 500
FN 300 (S)-FN 400 (S)-FN 500 (S)
FN 300 (P)-FN 400 (P)-FN 500 (P)

SERVICE MANUAL

CE 0473

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SECTION 1

INTRODUCTION

1.1. PURPOSE OF THE SERVICE MANUAL

This manual includes servicing and maintenance information for FN 300, FN 400, FN 500, P and S types. It is prepared to be used by technicians who were formerly trained by Nuve. This manual informs the technicians about the operating principles, diagnosing and repairing methods and spare part replacing.

If any problem determined which is not identified in this manual, please contact to Nuve Servicing Team.

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1.2. GENERAL PURPOSE

The control units are located on the left side of the unit. The heating function is obtained by the sheet heaters assembled on the bottom and side surfaces of the chamber. In “S” models a circulation fan motor is assembled to the back side of the chamber. In “P” models, the chamber is made of stainless steel, the heater is a circular heater that is placed on the back side of the chamber with a circulation fan motor placed in the middle to provide the internal air circulation. The safety thermostat sensor is mounted to the front side on the panel and the thermocouple is mounted to upper left side of the chamber, for the P models it is mounted to the upper left of the back side of the chamber. FN sterilizers are microprocessor controlled units.

SECTION 2

OPERATING PRINCIPLES

2.1. GENERAL OVERVIEW

The FN dry air sterilizers/ovens may be split into 3 main groups;

- Power supply
- Control unit
- Heating unit

2.2. EXPLANATIONS FOR FUNCTIONS

2.2.1. Power Supply Values

The electrical specifications of FN 300, 400, 500 and P models are as follows;

	Glass Fuse	Power Consumption	Power Supply	Heater Type
FN 300	3 A	500 W	230 V	Plate type-Serial Connection 6 pieces 17 Ω
FN 400	4 A	800 W	230 V	Plate type-Serial Connection 4 pieces 12,5 Ω, 2 pieces 6,5 Ω
FN 500	10 A	1600 W	230 V	Plate type Serial / Parallel Connection 8 pieces 12,5 Ω, 4 pieces 6,5 Ω
FN 300 P	3 A	600 W	230 V	Circular Type 500 Watts
FN 400 P	4 A	850 W	230 V	Circular Tube Type 750 Watts
FN 500 P	8 A	1600 W	230 V	Circular Tube Type 1500 watts

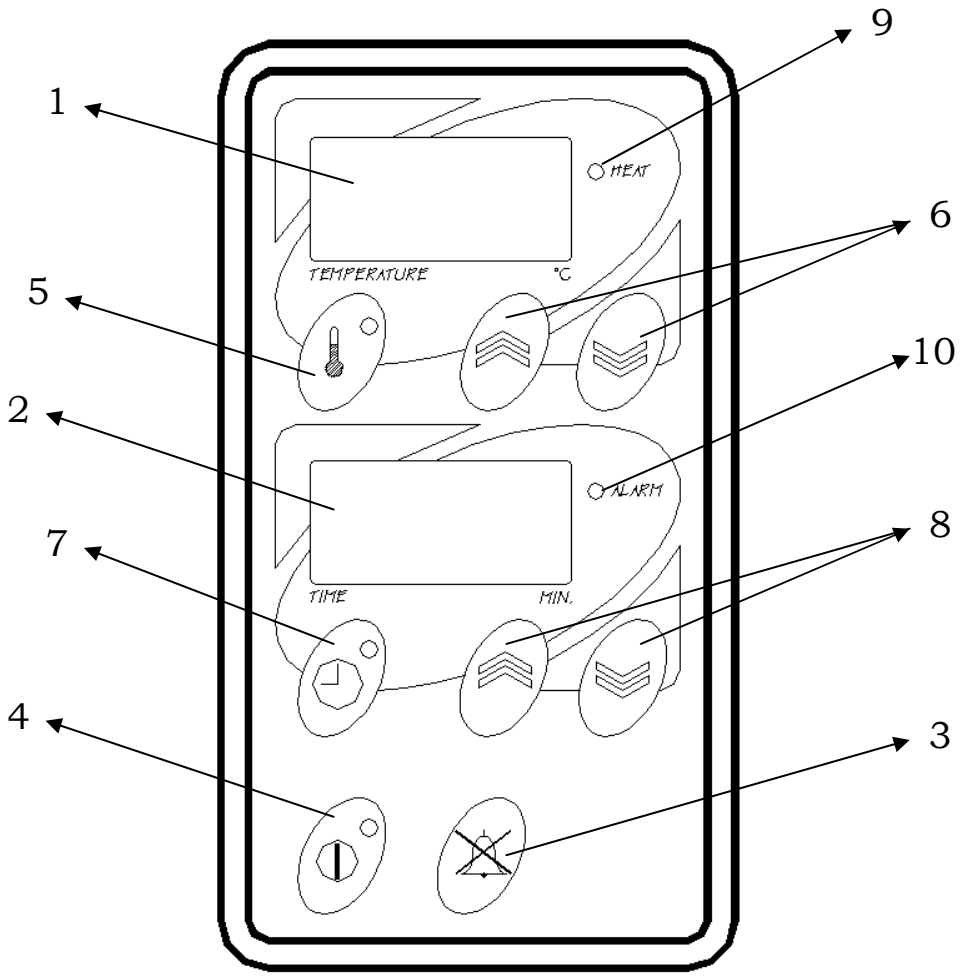
2.2.2. Main PCB

The main PCB operates on PID (Proportional + Integral + Derivative) controlling system. Excluding the safety thermostat and the circulation motor for P and S models, all other command and control elements are connected to the main PCB. These are;

- Thermocouple
- Keyboard and display PCB
- Power supply terminals of heaters

2.2.3. Control Panel

The illustration below shows the control panel functions. For more information, please refer to the user's manual.



1- Temperature Display
2- Time Display
3- Alarm Mute Key
4- Start / Stop Key
5- Temperature Set Key
6- Temperature Value Increase/Decrease Keys
7- Time Set Key
8- Time Value Increase/Decrease Keys
9- Heat Led
10- Alarm Led

SECTION 3

SERVICING

Caution: Before servicing the instrument, please take the necessary precautions both for your health and environmental safety. Please respect the warnings on the unit!!

3.1. GENERAL OVERVIEW

The failures can be diagnosed according to the following tables.

Most of the arising problems can be determined by the help of a multimeter.

The components on the main PCB must not be replaced even the failure is caused by one of the components on the main PCB. In this case, please send the failed PCB to factory service along with a note on which the failure explanations are written.

Before replacing the PCB or any control element, please make sure that the failure is not caused by weak wire and terminal connections.

3.2. GENERAL FAILURES

	FAILURE	PROBABLE CAUSES	SOLUTION
1	The on / off switch is on but it does not lighten and the display is blank.	Power supply inlet failure.	Check that mains voltage is supplied. Check that the terminals and power supply sockets are well connected.
		The glass fuse has blown.	Replace the glass fuse and check the short circuit that causes the blowing of the fuse.
		The on/off switch is defective.	Replace the on/off switch.
2	The on / off switch is on and lightens but the display is blank or some segments are blank.	The main PCB / display PCB connection cable is not connected properly.	Remove this connection cable and re-place it carefully.
		The main PCB / display connection cable is defective.	Replace the connection cable.
		The display PCB is defective.	Replace the display PCB.
		The main PCB is defective.	Replace the main PCB.
3	The on / off switch is off but it lightens.	The on / off switch cable connections are in reverse.	Check the connections and correct them. (Connect the cables coming from the mains filter to the 0 position of the switch and the cables coming from the main board to the 1 position of the switch.)
4	The unit blows fuse frequently.	Short-circuit exists.	Check the heaters by a multimeter. If there is short circuit, replace the heaters. Check the other electrical terminals and cables for short circuit.
		The main PCB is defective.	Replace the main PCB.
5	The circulation motor does not work. (For S and P types)	The motor cable connection terminals are loose.	Check these terminals if they are connected properly.
		Motor winding connections are broken.	Weld the motor windings to the collector.
		The motor is defective.	Replace the motor.

3.3. TEMPERATURE REGULATION OPERATING FAILURES

	FAILURE	PROBABLE CAUSES	SOLUTION
1	Temperature does not Reach to the set value.	The safety thermostat is adjusted to a temperature lower than the set temperature or it is defective.	Set the safety thermostat to a value higher than the set temperature, if it is defective replace the safety thermostat.
		Heaters are defective.	Check the heater resistances with multimeter. Replace them if they are defective.
		The heating terminal on the main PCB does not outlet to the SSR (solid state relay).	Check the outlet with a multimeter. If 12 V DC does not exist, replace the main PCB.
		There is excess heat loss.	Check that the door is closed properly and chamber gasket is tightened by the door.
		SSR (solid state relay) is defective.	Check the heater side connections of SSR by multimeter. If it is continuously open-circuit replace SSR.
2	The chamber temperature exceeds the set temperature.	The heating terminal on main PCB outlets continuously to the SSR.	Check the PCB outlet with a multimeter. Replace the main PCB if continuous outlet (12 VDC) exists.
		Heater connection cables are short circuited.	Check the connection cables. If short circuit exists, reconnect the cables.
		SSR (solid state relay) is defective.	Check the heater side connections of SSR by multimeter. If it is continuously short-circuit replace SSR.
3	Actual temperature in the chamber is different from the value on the display.	The thermocouple measures incorrectly.	Check that the ending of the thermocouple does not touch the chamber surface or the samples.
		The main PCB calibration fails.	Apply the calibration procedure, if the problem continues replace the main PCB.
4	“OFL” appears on the temperature display.	Thermocouple endings are broken or the connection to the main PCB is loose.	Check that endings and clamp connections are not loose. If the endings are broken replace the thermocouple.
		Temperature exceeds 255 °C	Apply the solution method of the 2nd failure.

SECTION 4

CALIBRATION PROCEDURE

4.1 HOW TO MEASURE THE ACTUAL TEMPERATURE

- Insert the **calibrated** external sensor in the chamber through the ventilation hole. Place the external sensor in the middle of the chamber. Close the door properly.
- Start the program.
- Please wait approximately 4 hours (after the set temperature) before measuring the actual temperature by the external temperature sensor.
- Be sure that calibrated external sensor does not touch any metal part in the chamber and it measures only the air temperature.
- If there is difference between the instrument's display and the external sensor apply the calibration procedure as below:

4.2 CALIBRATION

- Press temperature set button continuously until PAS appears on the temperature display.
- Press the time increasing button until 277 appears on the time display. (277 is the password)
- Press the temperature set button once, 0 appears on the temperature display.
- Press temperature increasing button four times, 4 appears on the temperature display, 4th parameter is for calibration.
- Change the value on the time display according to difference between the instrument's display and the external sensor.
  For example, if the set temperature is 150°C and the external sensor measures 152°C, increase the value, which appears on the time display, by adding 2; if the set temperature is 150°C and the external sensor measures 147°C, decrease the value, which appears on the time display, by subtracting 3 by using "time value increase or decrease keys".
- After applying the above calibration procedure please press temperature set button to return to stand-by mode.

NOTE: DO NOT CHANGE ANY OTHER PARAMETERS!!!

SECTION 5

SPARE PART REPLACING

CAUTION : Unplug the unit before replacing any component.
Use protective glove and mask while removing the insulation material!!

5.1. ACCESS TO CONTROL UNIT

- Remove the left side cover sheet.

5.2. REPLACING MAIN PCB

- Disconnect all cable terminals which are connected to the main PCB (15).
- Disconnect the keyboard and display PCB / main PCB connection cable from the main PCB.
- Take the main PCB out from 4 connection clipses.
- Place a new PCB on the connection clipses and make the terminal connections according to the electric diagram provided in Section 6.
- Reconnect the display PCB / main PCB connection cable.

5.3. REPLACING KEYBOARD AND DISPLAY PCB

- Disconnect the display PCB / main PCB connection cable from the display PCB.
- Remove the 4 connection screws and then remove the PCB.
- Place a new PCB and fix it.
- Check that the display keys and the leds meet their places on the plastic panel (11).
- Reconnect the connection cable.

5.4. REPLACING SAFETY THERMOSTAT

- Disconnect the power supply socket (18) terminals from the back cover sheet.
- Remove the back cover assembly screws and then the sheet.
- Remove the insulation material at the back side.
- Loosen the safety thermostat sensor from tightening item and remove it. Take the sensor out by pulling the capillary cable.
- Disconnect the cable terminals on the safety thermostat (14).
- Remove the two connection screws which fix the safety thermostat to the front panel sheet and pull the safety thermostat towards back.
- Loosen the screw of adjustment button on the adjustment shaft and remove it.
- Remove the chassis connection item which is connected to the safety thermostat body.
- Take care of the new safety thermostat's capillary cable, do not bend or break it while fixing.

5.5. REPLACING THERMOCOUPLE

- Disconnect the thermocouple terminals from the main PCB.
- Release the thermocouple sensor, which is inside the chamber, from the tightening item.
- Pull the thermocouple sensor from the back side.
- Connect a new thermocouple sensor inside the chamber with a help of a guidance.

- Make the thermocouple terminal connections carefully according to the electric diagram provided in Section 6.
- Check that the thermocouple sensor does not touch to the chamber surface or to the tightening item.

The thermocouple coded as Z15. I 01 066 is started to be used for the P models after the serial numbers: 05.5278 for FN 400P and 05.4470 for FN 500P and replacing of the thermocouple is applied as follows:

- Remove the back cover sheet.
- Remove the thermocouple connection nut from the inside of the chamber.
- Pull the thermocouple sensor from the back side.
- Disconnect the thermocouple terminals from the main PCB.
- Connect a new thermocouple sensor inside the chamber.
- Make the thermocouple terminal connections carefully according to the electric diagram provided in Section 6.

5.6. REPLACING HEATER

- Take the back cover sheet out.
- Disconnect the safety thermostat sensor.
- Disconnect the thermocouple from the inside of the chamber.
- Remove the insulation material around the chamber by paying attention to the heater connection cables.
- Place a supporting item under the chamber.
- Unscrew the chamber gasket (6) screws and remove the gasket.
- Disconnect the heaters supply cables.
- Take the chamber (19) out by pulling it from the back side.
- Remove the heater plate mounting sheets (20).
  (Be careful while removing these sheets since they are connected to the welded screws.)
- Remove the failed heaters (21) and mount new ones.
- Make the heater connections according to the electric diagrams provided on Section 6.
- Place the chamber and make it come out from the front a little.
- Place the chamber gasket and screw it.
- Place the thermocouple and the safety thermostat sensor.
- Make the heaters supply connections.
- Place the insulation material around the chamber and the back cover sheet.

5.7. REPLACING HEATER FOR “P” MODELS

- Remove the back cover.
- Disconnect the heater cable connection terminals.
- Remove the heater chassis connection nuts.
- Remove the 4 screws on the corners of the heater protection cover inside the chamber.
- Take the heater out.
- Mount new heater and tighten it to the back wall of the chamber by nuts.
- Connect the heater cable connection terminals and place the insulation material.
- Close the back cover. Make sure that the circulation fan motor does not touch the heater.

5.8. REPLACING DOOR LOCKING

- Loosen the claws on the locking body and take the locking body out.
- Mount new locking body.
- Tighten the claws by pressing them.

5.9. REPLACING PLASTIC PANEL

- Remove the display PCB (13) safety thermostat on / off switch (8) and the fuse socket all of which are on the panel sheet.
- Unscrew the panel sheet screws and pull the panel away.
- Remove the plastic panel.
- Clean the surface of the panel by alcohol etc.
- Paste carefully the plastic panel while paying attention to the safety thermostat adjustment button and the display keys.

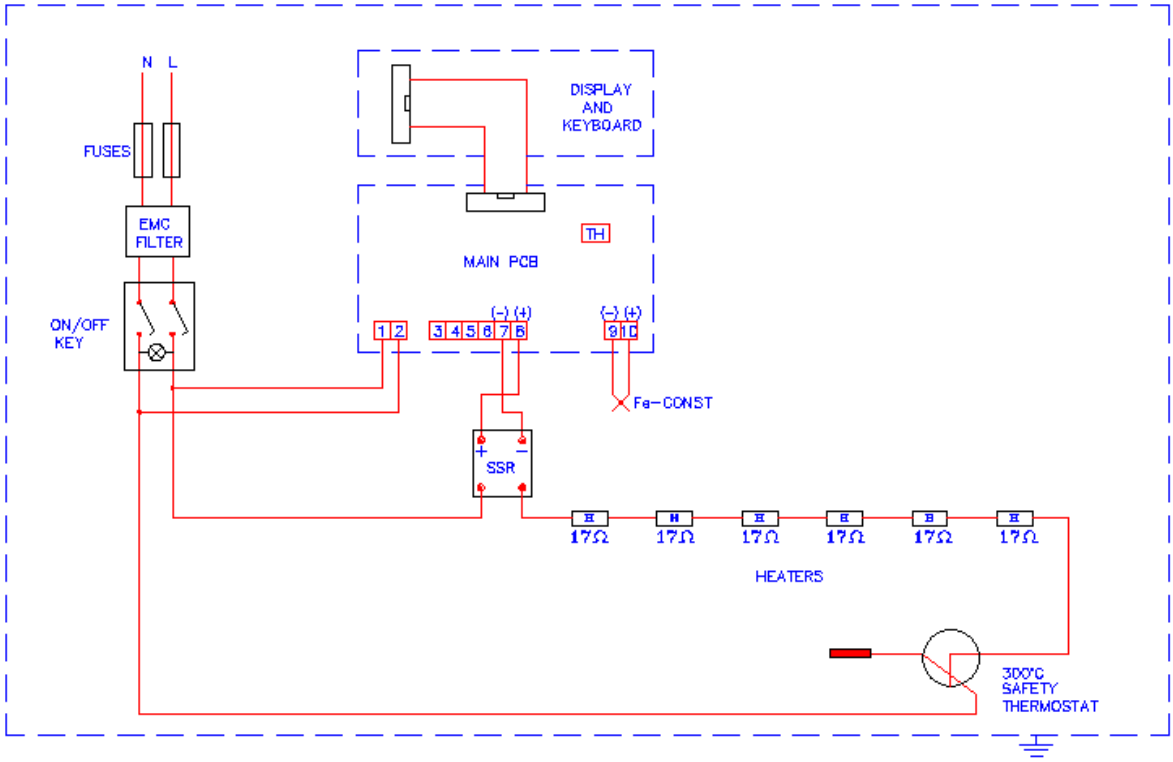
5.10. REPLACING CIRCULATION MOTOR FOR “P” and “S” TYPES

- Remove the back cover.
- Disconnect the circulation fan motor cable connection terminals.
- Remove the circulation motor propeller by turning it on the clockwise direction.
- Pull the circulation motor from the back side.
- Place new circulation motor from the back side and mount it.

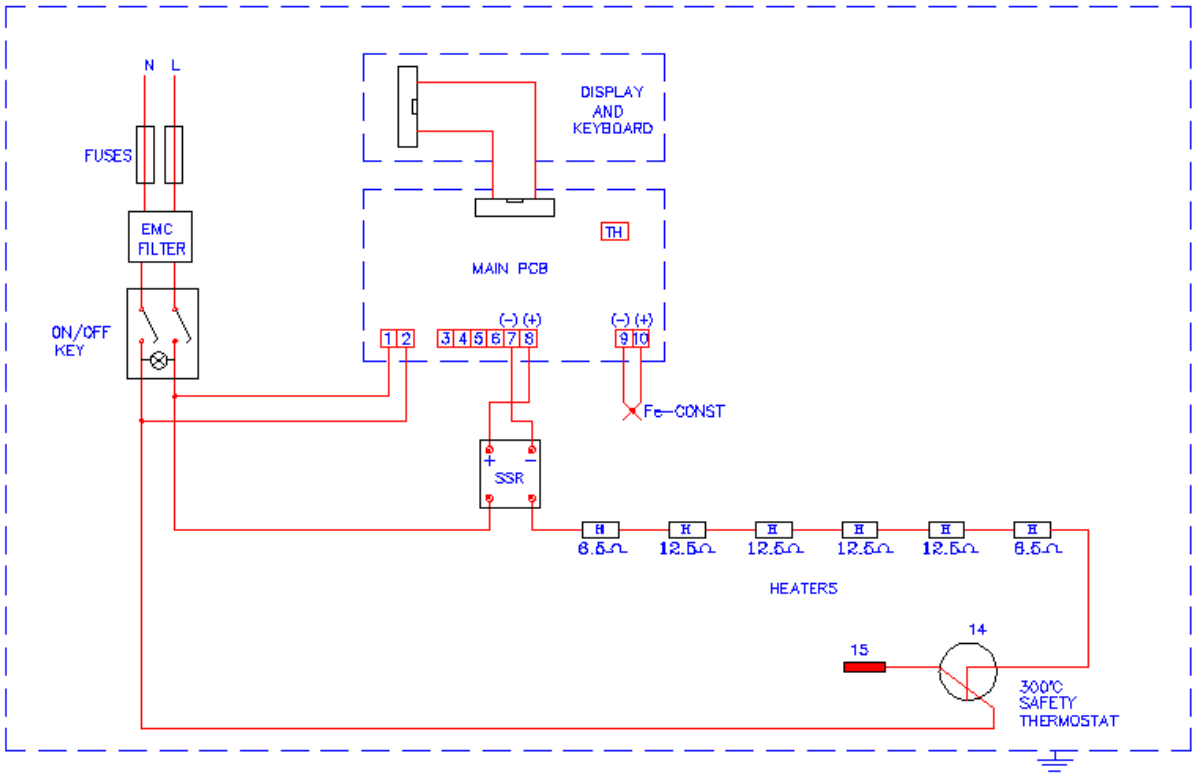
SECTION 6

DRAWINGS AND DIAGRAMS

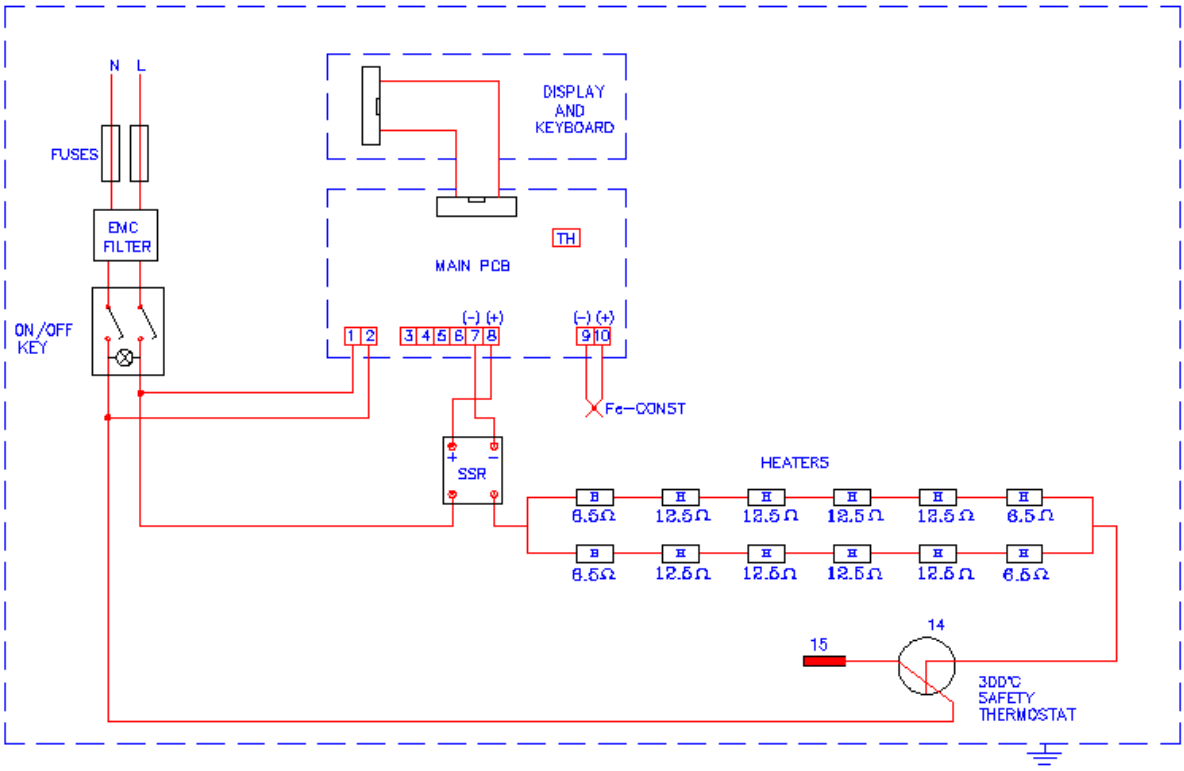
6.1. ELECTRICAL CIRCUIT DIAGRAM (FN 300)



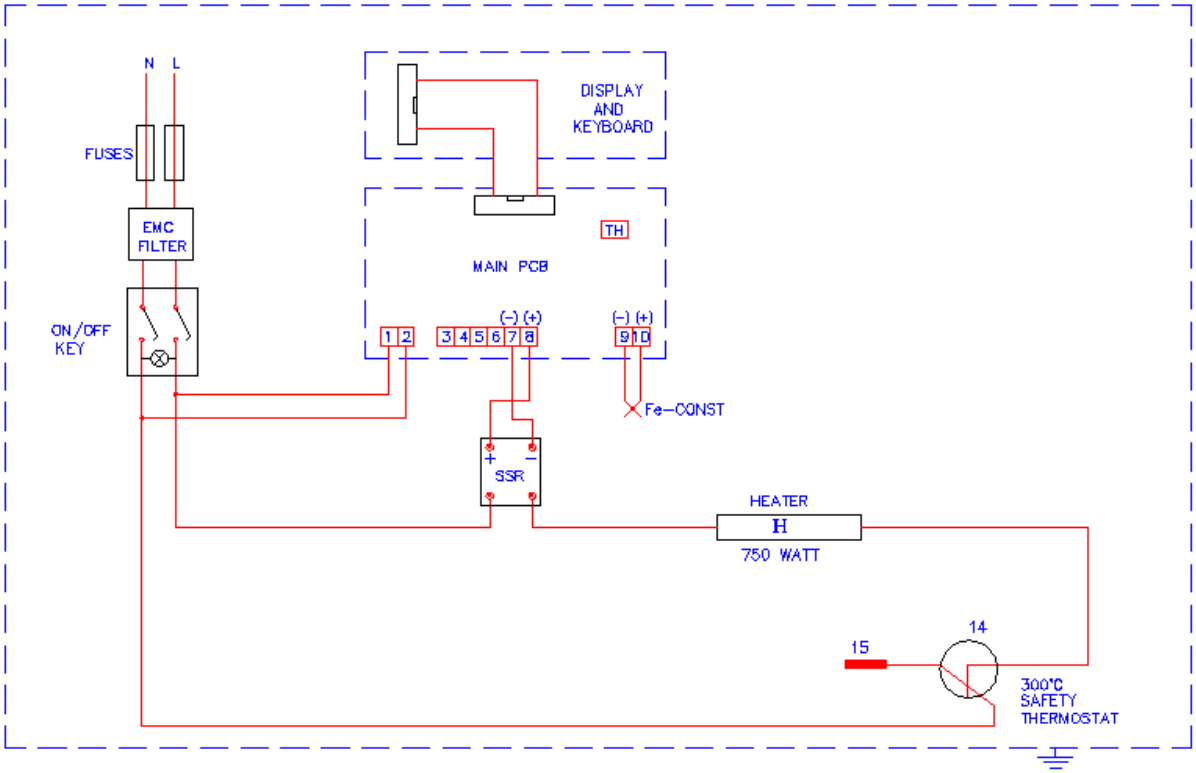
6.2. ELECTRICAL CIRCUIT DIAGRAM (FN 400)



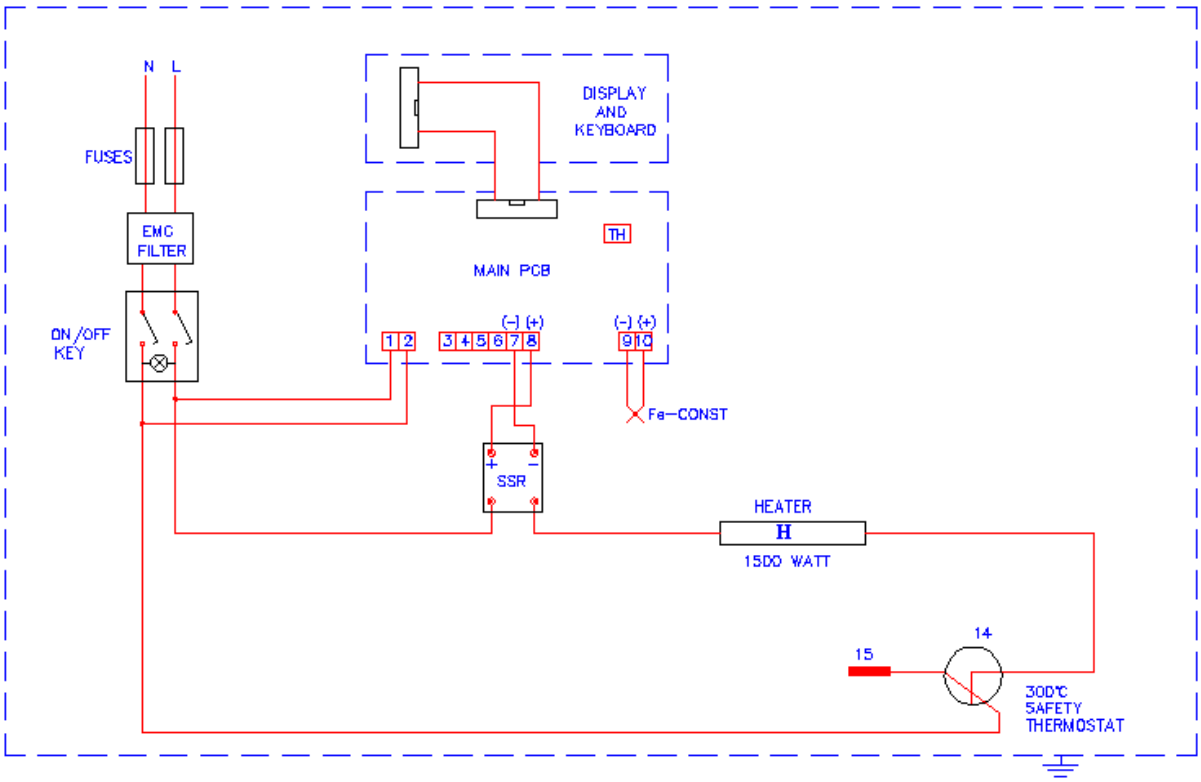
6.3. ELECTRICAL CIRCUIT DIAGRAM (FN 500)



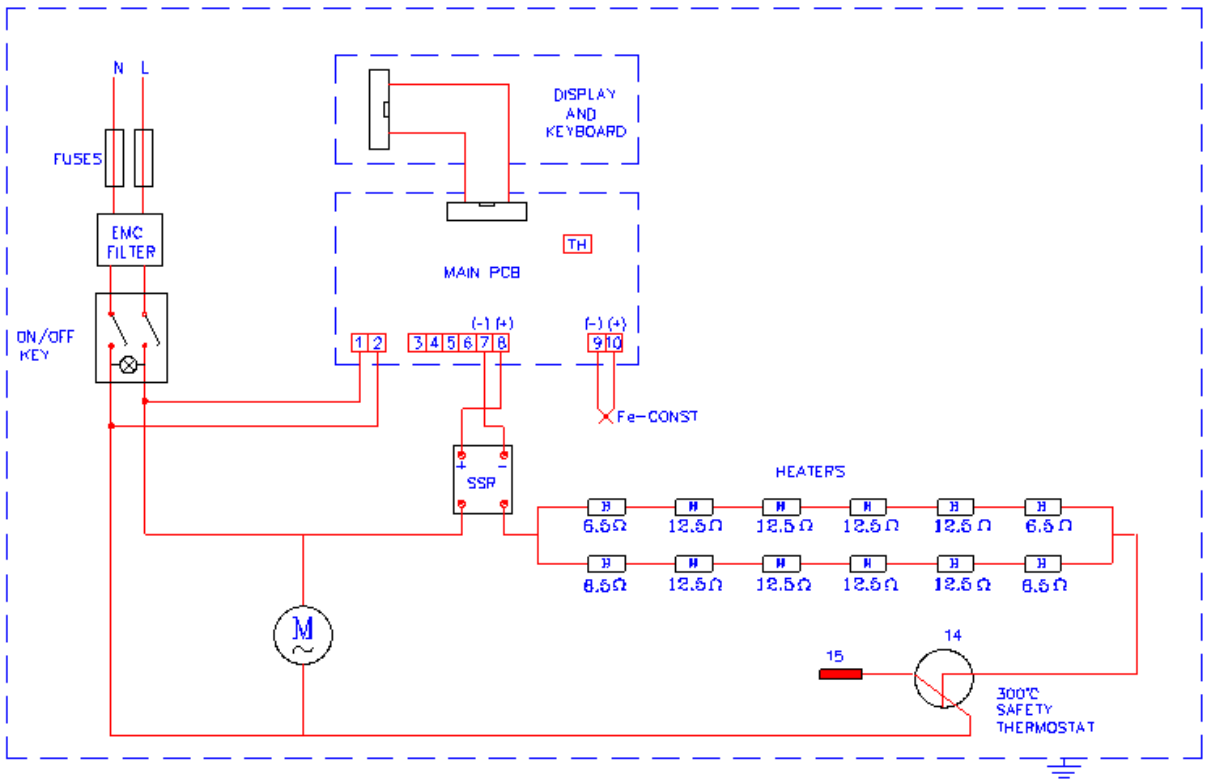
6.4. ELECTRICAL CIRCUIT DIAGRAM (FN 400 P)



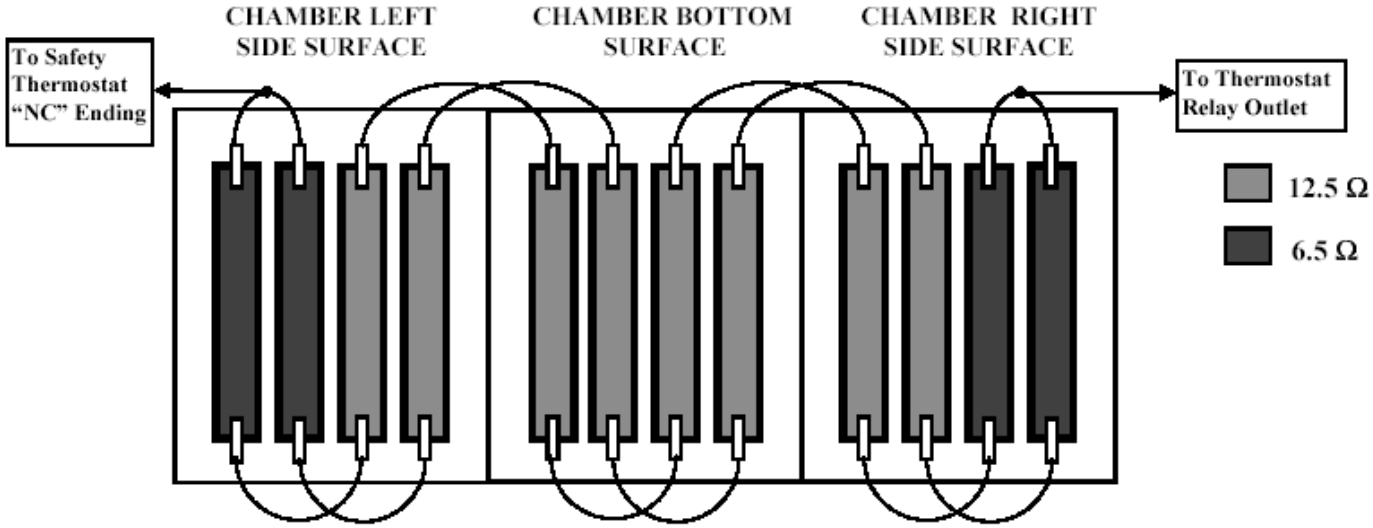
6.5. ELECTRICAL CIRCUIT DIAGRAM (FN 500 P)



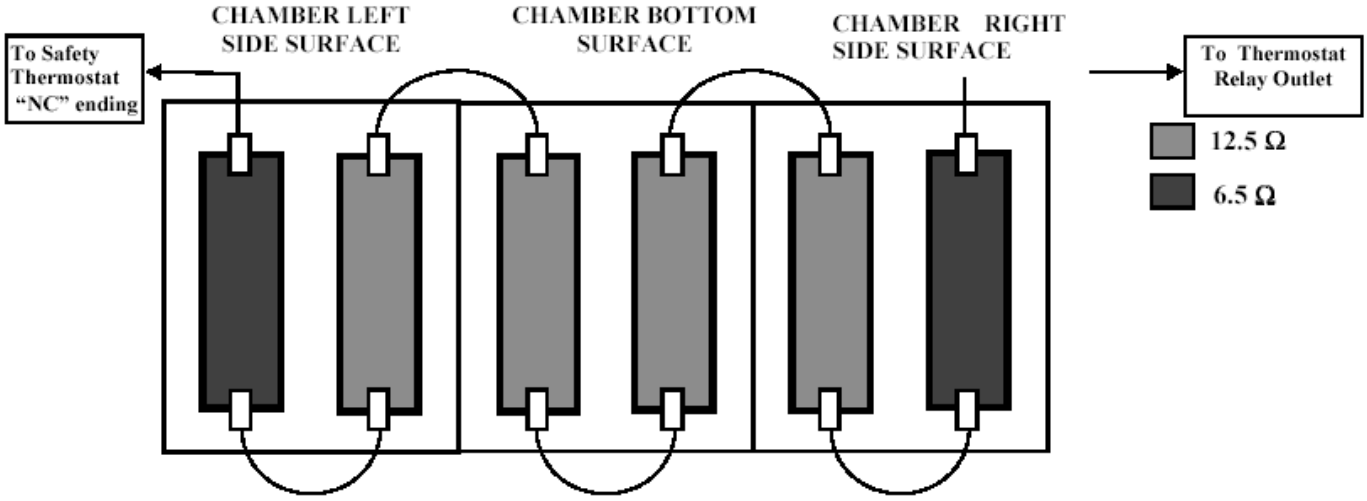
6.6. ELECTRICAL CIRCUIT DIAGRAM (FN 400S – FN 500S)



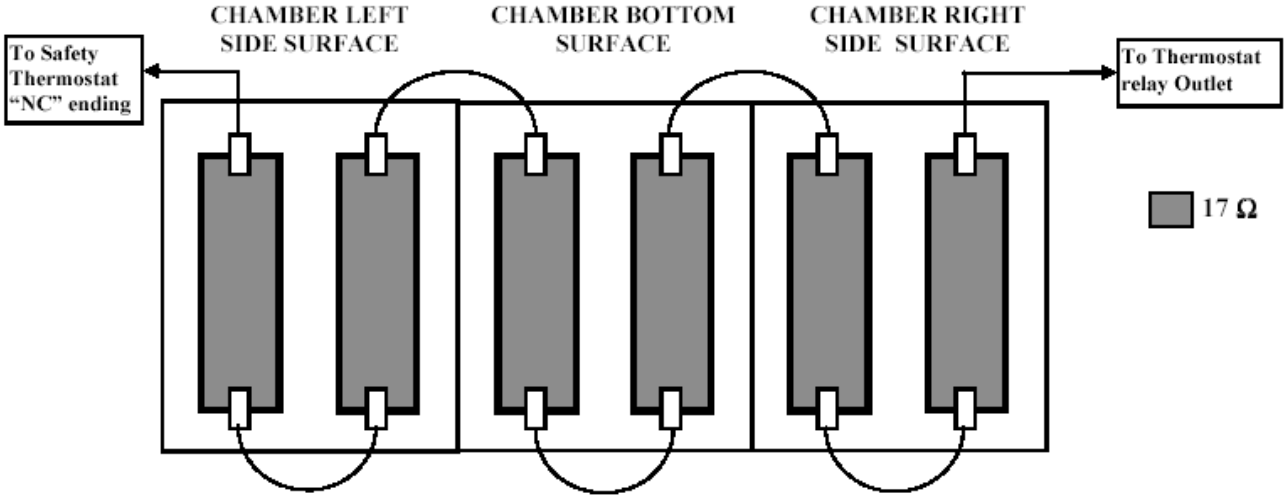
6.6. FN 500 HEATER CONNECTION DIAGRAM



6.7. FN 400 HEATER CONNECTION DIAGRAM

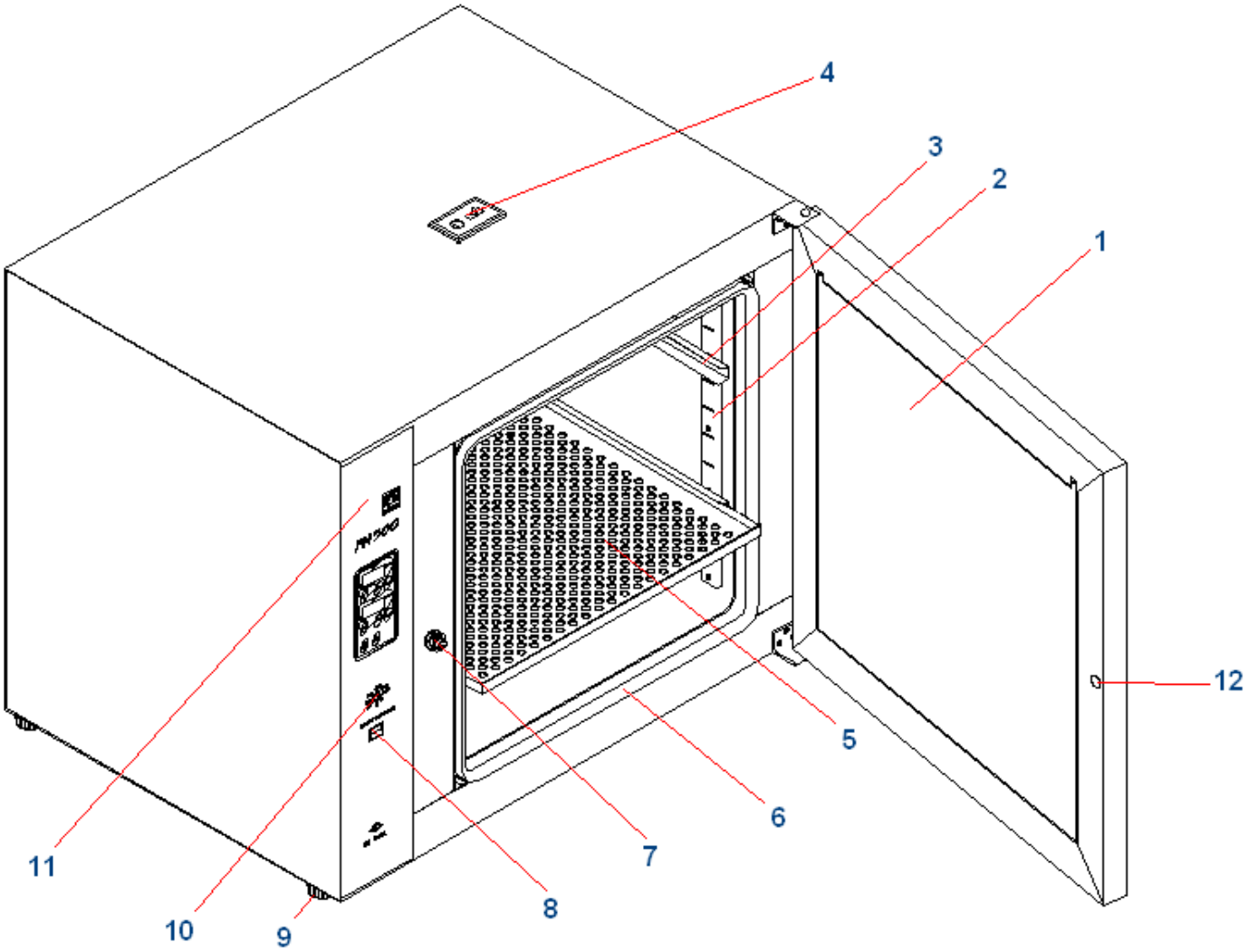


6.8. FN 300 HEATER CONNECTION DIAGRAM



SECTION 7

SPARE PART LIST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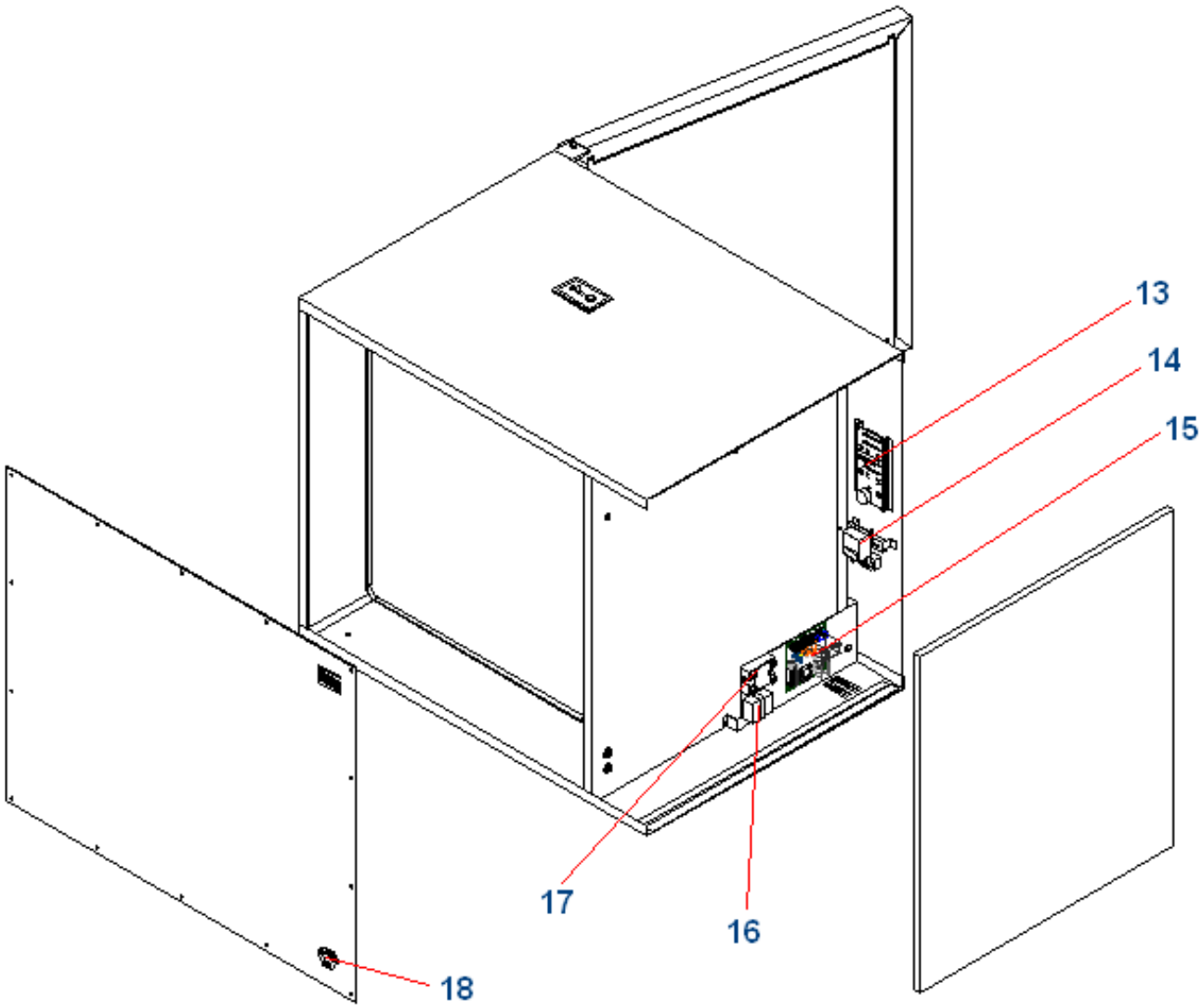
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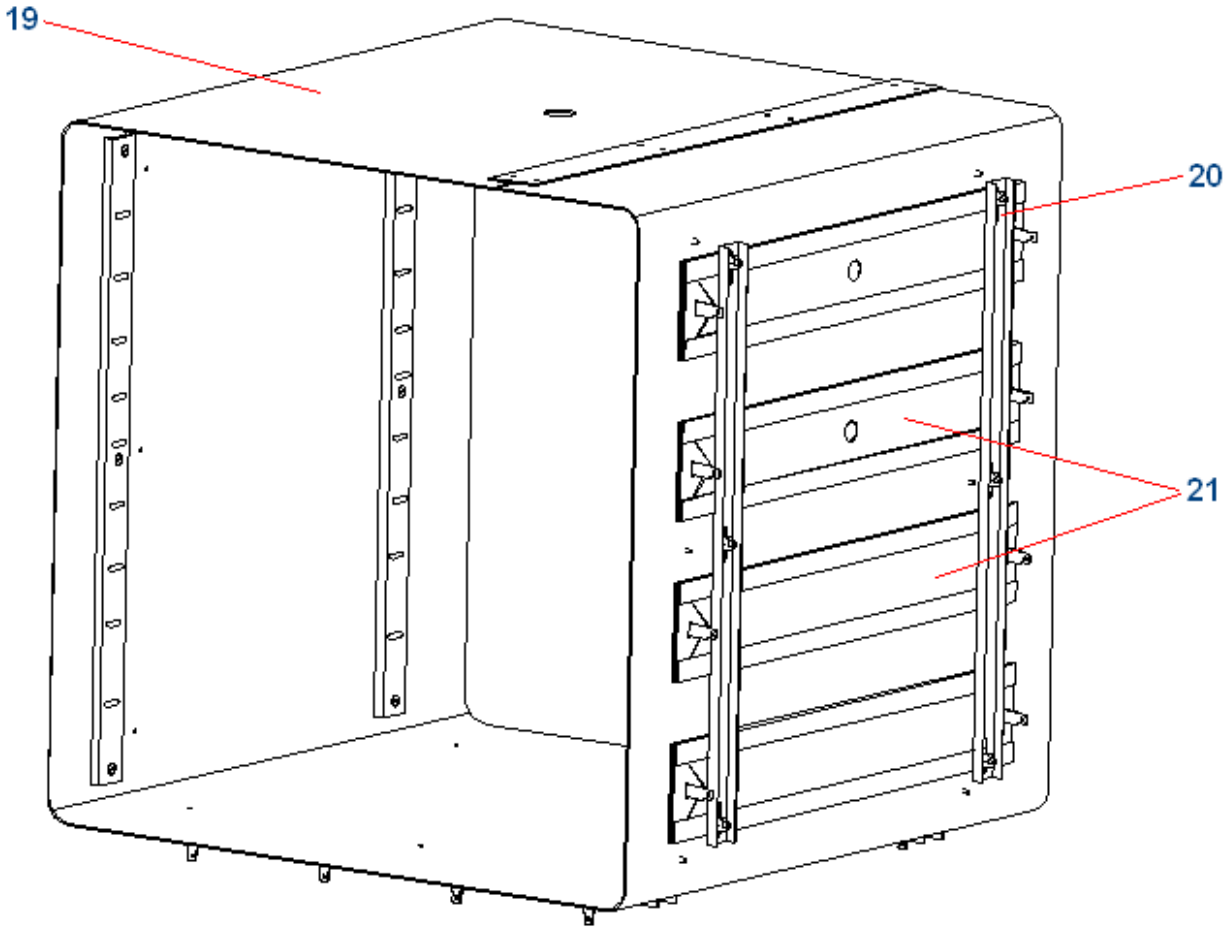
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7.1. Spare Part List

NO	NAME OF MATERIAL	MATERIAL CODE / QUANTITY					
		FN 300	QTY	FN 400	QTY	FN 500	QTY
1	Door Inside Body	Z 11. P 03 482	1	Z 11. P 03 482	1	Z 11. P 03 483	1
2	Shelf Column	Z 11. D 02 049	4	Z 11. D 02 047	4	Z 11. D 02 048	4
3	Shelf Carrier	Z 11. K 23 031	4	Z 11. K 23 029	4	Z 11. K 23 030	4
4	Chamber Ventilation Hole	Z 11. M 07 019	1	Z 11. M 07 019	1	Z 11. M 07 019	1
5	Shelf	Z 11. R 01 014	2	Z 11. R 01 084	2	Z 11. R 01 085	2
6	Chamber Gasket	Z 15. C 03 076	1	Z 15. C 03 071	1	Z 15. C 03 072	1
7	Locking Body	Z 15. K 27 007	1	Z 15. K 27 007	1	Z 15. K 27 007	1
8	On / Off Switch	Z 12. A 03 018	1	Z 12. A 03 018	1	Z 12. A 03 018	1
9	Fitting Support	Z 21. A 07 002	4	Z 21. A 07 002	4	Z 21. A 07 002	4
10	Safety Thermostat	Z 11. T 50 002	1	Z 11. T 50 002	1	Z 11. T 50 002	1
11	Plastic Panel	Z 15. P 15 158	1	Z 15. P 15 159	1	Z 15. P 15 160	1
12	Door Lock	Z 11. K 51 001	1	Z 11. K 51 001	1	Z 11. K 51 001	1
13	Display PCB	Z 15. G 05 021	1	Z 15. G 05 021	1	Z 15. G 05 021	1
14	Safety Thermostat	Z 11. T 50 002	1	Z 11. T 50 002	1	Z 11. T 50 002	1
15	Main PCB	Z 15. T 09 096	1	Z 15. T 09 096	1	Z 15. T 09 096	1
16	Mains Supply Filter	Z 15. F 06 005	1	Z 15. F 06 005	1	Z 15. F 06 005	1
17	SSR (solid state relay)	Z 12. R 07 013	1	Z 12. R 07 013	1	Z 12. R 07 013	1
18	Power Inlet and Fuse Holder	Z 12. S 13 010	1	Z 12. S 13 010	1	Z 12. S 13 010	1
19	Complete Chamber	Z 11. G 04 250	1	Z 11. G 04 248	1	Z 11. G 04 249	1
20	Heater Plate Mounting Sheet	Z 11. P 03 154	6	Z 11. P 03 153	6	Z 11. P 03 150	9
21	Heater (Long)	Z 11. I 02 014	6	Z 11. I 02 001	2	Z 11. I 02 002	4
	Heater (Short)	----------	---	Z 11. I 02 077	4	Z 11. I 02 075	8
	Thermocouple	Z 15. I 01 066	1	Z 15. I 01 066	1	Z 15. I 01 066	1
*	Circulation Motor	Z 12. M 06 080	1	Z 12. M 06 080	1	Z 12. M 06 080	1
*	SS Heater	Z 15. I 02 058	1	Z 15. I 02 051	1	Z 15. I 02 052	1

* For “P” and “S” types