

Instruction Manual

FURNACE N-3L 1100°C	2200850
FURNACE N-8L 1100°C	2200851
FURNACE N-13L 1100°C	2200852
FURNACE N-30L 1300°C	2200853
FURNACE N-22L 1100°C	2200854
FURNACE N-39L 1100°C	2200856
FURNACE N-40L 1200°C	2200857

CONTENT

1. PURPOSE	3
2. SYMBOLS AND MARKINGS	3
3. SAFETY REGULATIONS	3
4. REQUIREMENTS FOR SAFE USAGE	4
5. COMPOSITION AND PRINCIPLE OF OPERATION	4
6. UNPACKING, CHECKING EQUIPMENT, DELIVERY	6
7. ASSEMBLY	6
8. PREPARATION FOR USE	7
9. OPERATION	8
10. MAINTENANCE	8
11. STORAGE	9
12. TRANSPORTATION	9
13. WARRANTY	9
14. TROUBLESHOOTING	9
15. ASSESSMENT TECHNIQUE OF THE PARAMETERS	10
16. TECHNICAL SPECIFICATIONS	11
17. ELECTRICAL PRINCIPLE SCHEME	12
18. FURNACE WITH MUFFLE CHAMBERS	15
19. PACKAGE CONTAINS	18

1. PURPOSE

The electrical resistive laboratory Furnace (further called "Furnace") is designed for heating or drying materials and stocks in the ambient air temperatures from $T + 10$ to $1100 \div 1300$ °C in static conditions (T – temperature of the room where Furnace is being operated).

2. SYMBOLS AND MARKINGS

Markings

	alternating current
	earth/grounding contact
	danger of electrical shock
	caution, hot surface

Warning symbols

	This symbol precedes any important safety instructions. Personal and property safety could be put at risk if these instructions are not followed. Before switching on the low temperature Furnace, it is very important to read and follow all the instructions of this manual.
	This symbol precedes manual requirements which must be followed with great care in order to ensure the Furnace's correct operation, to prevent damage and to protect the safety operators. 
	This symbol precedes important information.

3. SAFETY REGULATIONS

The Furnace must be used in accordance with the requirements of the user's technical safety operation rules for electric equipment and local legislation.

The operator working with the electric Furnace must be informed about the operational guidelines for electric equipment up to 1000V, acquainted with safety regulations for the operation of an electric Furnace, and knowledgeable about the product's operating principles and proper use.

The Furnace must be earthed and should only be connected to a mains electrical supply that has an earth/grounding contact. The Furnace must be connected to a mains electrical supply of the correct rating, check the label on the rear of the Furnace for voltage, frequency and power usage.

	It is prohibited to operate the electric Furnace if the earth/grounding is insecure.
	It is prohibited to operate the electric Furnace if any of external protective shields are removed.
	If the electric Furnace is operated for a longer period of time, the external surfaces and the door may get hot. Wear heat-resistant gloves when opening the door of the hot electric Furnace, loading or unloading it, or touching the hot external surfaces.
	Combustible or explosive materials or materials that can become combustible or cause explosion during thermal treatment must not be loaded into the low temperature Furnace.
	Do not load unknown materials into the Furnace.
	The gas emitted during thermal treatment has to be directed outside through a ventiduct (required by existing regulations).

	The room where the Furnace is operated must have appropriate ventilation.
	It is forbidden to operate the Furnace in a closed, unventilated room.
	A room in which several Furnaces are in operation must have a dedicated means of ventilation.
	In the event of obvious malfunctions, the Furnace must be immediately turned off. Maintenance can be performed by service operators, an authorized specialist or a user who strictly follows written maintenance instructions.
	In the event the Furnace ceases normal operations, disconnect it from the power supply (the mains) and take measures to resolve the problem. The manufacturer is not responsible for damages arising from the use of the Furnace for purposes for which it was not intended; the user bears all responsibility. Any operations that put at risk the Furnace's safety are forbidden. General safety and accident prevention rules should be applied. Only Furnaces that are technically sound should be used.
	Failure to comply with instructions could result in negative consequences for the user.

The manufacturer's advice cannot cover all issues. Therefore, the user assumes responsibility for the reaction and the impact that heat has on materials and the risks related to conducting tests. Our advice will help to reduce the dangers faced by users as well as protect the Furnace and the tested materials from damages.

4. REQUIREMENTS FOR SAFE USAGE

The electric Furnace should be placed in a closed, ventilated room that meets the following requirements:

	- the electric Furnace should be placed on a base that is horizontal (an allowed unevenness for a 1m base is $\pm 1\text{mm}$.), hard, made of incombustible material; - height above sea level – up to 2000 m; - ambient temperature from $+5$ to $+40^\circ\text{C}$; - ambient relative air humidity should not exceed 80% at the temperature of $+31^\circ\text{C}$, and should not exceed 50% at the temperature of $+40^\circ\text{C}$; - the voltage fluctuation in the mains (power supply) should not exceed $\pm 10\%$ of the nominal value; - the environment should not pose an explosion risk; it also should not contain a large amount of electrically conductive dust, water vapor, aggressive gas; - it is recommended that the Furnace be placed under an exhaust ventilation hood; - the electric Furnace should not be subjected to vibration and shocks; - it is prohibited to exceed the maximum rated temperature, otherwise the service life of heating elements will be shortened and the thermocouple could be damaged.
 Attention !	Working chamber is not resistant to mechanical damages. So, using the Furnace you must avoid mechanical contact with walls of the electric Furnace. During exploitation individual cracks may appear on inner chamber, which do not affect the technical characteristics of the Furnace and cannot be the cause of a claim.

5. COMPOSITION AND PRINCIPLE OF OPERATION

The Furnace consists of frame, chamber, door and control panel.

Frame is welded of sheet steel. Chamber is installed in the frame. There are two types of chambers: chamber of fiber material, with enclosed or open heating elements

(Pic. 1) and chamber made of cordierite boards with open or enclosed heating elements (Pic. 2). A thermo-insulating material is installed around the working chamber and in the door.

Control panel is mounted on the bottom part of the Furnace. When the furnace door opens, a switch switches off the power supply of the heaters.

For insertion of additional control thermocouple or air supply to the chamber, there is a point provided in the door (Pic. 3), which is covered with foil. If necessary, user should use a sharp tool to make a hole. From outside the hole can be covered by protective cover (Pic.3).

The charge is put on the bottom plate of the chamber. Parameters of the electric Furnace connection to the net: voltage, power, frequency, in each case, are indicated on the label of the product (see p. 5). Temperature control and adjustment is affected by a temperature controller operating in combination with a thermocouple mounted in chamber. The microprocessor controller shows the set and actual temperature, process time.

The air flows through the heating elements and circulates in the chamber.

Electrical principle scheme is attached (see p. 35-62).



Picture 1



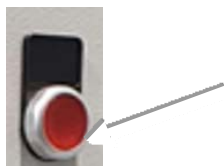
Picture 2



Picture 3

ADDITIONAL ACCESSORIES MAY BE INSTALLED IN THE FURNACE:

1. Process observation window;
2. Protection from overheating, which prevents the Furnace from exceeding the maximum temperature. If the maximum temperature is exceeded, the safety device turns the heating off automatically. If this happens, allow the Furnace to cool down by 50-100°C below overheating safety device activation temperature. Turn the Furnace on. To reset safety device to the inactive mode, find the red button at the front of the Furnace (Pic.4) and press it (In each case, the mounting position of the button may vary). If the safety device is going to run again contact the manufacturer or to the company which sold the product (company addresses at the end of the passport);



Picture 4

3. Timer is designed to delay execution of the program. If timer is mounted in the Furnace the main switch is on, turn on the fixed control of the timer. For that reason, press the second counting from left to right, button (A) of the timer. The symbol of closed contacts („ON A“) on the display will appear and the Furnace will start working normally.

If you want to use the timer to turn the Furnace on / off at the certain time, by following the User Manual of the timer, set up the Furnace on/off program. After putting in the charge turn the Furnace on, so that it starts to heat up, and set the timer from fixed to programming control. For this reason, press second button on the timer (A). The note („OFF A“) should fade from timer's display;

4. Buzzer is to alarm about the end of the program;
5. RS-485 / USB interface and software for data recording, viewing and configuring the temperature controller running your thermal treatment process. The software is designed for Windows operating system. Computer software allows simply run, review and display charts on thermal process temperatures and other settings;
6. Data recorder Eurotherm 6100 is for basic visualization and recording requirements. The 6100 has full color display and utilises touch screen technology for clear and intuitive configuration and operation. It further supports a USB port as standard to enable the use of a mouse, keyboard or bar code scanner. Data can be moved manually or automatically archived to multiple locations: removable media, network servers or the Eurotherm Review database on a PC. The recorder can easily be integrated into a larger system and data files can be transferred across the network;

6. UNPACKING, CHECKING EQUIPMENT, DELIVERY

Please check the product in its original packaging, if there are any damages of transportation. Inform the carrier immediately if transportation damage has occurred.

If necessary, carefully flip the packaging with the Furnace in it. Unscrew wood screws that hold pallet to the cover. Take off the cover.

Remove transportation screws from the bottom of the pallet (Pic. 5).

If the Furnace is attached to the pallet with metal plates (Pic.6), firstly, unscrew wood screws that hold the metal plates to the pallet then carefully flip Furnace and remove metal plates attached to the frame.

Remove protective film, take off User Manual, feet and bottom plate (-es), from top of the product. Take the protective materials out of the chamber (Pic. 7).



Picture 5



Picture 6



Picture 7

	 Attention ! Sliding or tilting of the unit. Damage to the unit. Risk of injury by lifting heavy loads. Do not lift or transport the unit using the door handle, the door or the lower housing. Forbidden to raise or to carry one person, if the stove weighs more than 30 kg. Products, which weight from 30 to 60 kg, have lift and transport two people. Products, which weight in excess of 60 kg, lifting and transporting to be used auxiliaries (lifts, etc.).
--	--

If you need to return, Use the original packaging for safe transportation. Dispose of the transport packaging (See page 72).

7. ASSEMBLY

Unpack the electric Furnace and place it in the location prepared for its operation. Gently flip the Furnace and at the bottom part (Pic.8) screw in the feet (Pic.9). Put in the bottom plate (-es) (Pic. 10) to the chamber. Voltage specified in technical specification chart (see. p. 33) must correspond to the rated voltage of the supply network.

Before connecting to the mains, check the serviceability of the cord, plugs and sockets with a grounding contact. Check the serviceability of the electrical socket with the grounding contact. Insert a plug into the socket outlet.

 Attention !	Do not position the furnace in a manner that would make it difficult to operate your main power disconnect switch.
------------------------	--



Picture 8



Picture 9

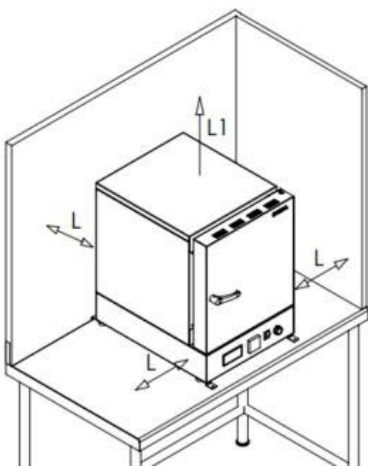


Picture 10



Make sure that all persons who use the Furnace and its associated work equipment have read and understood the Operating Manual.

Prepare the place where the Furnace will be used.



-The supporting surface, where the Furnace will be placed on, must be smooth and non-combustible.

-To prevent damage to the floor covering or the risk of fire if a hot object falls during removal from the chamber, the floor covering in the working area of the Furnace must be non-combustible.

-The Furnace must be installed at a safe distance from the surrounding surfaces:

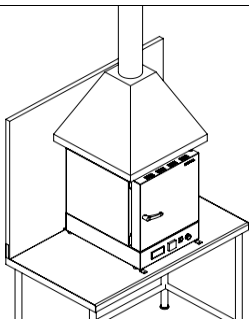
-The minimum distance from the rear and side surfaces of the Furnace to flammable surrounding surfaces is $L = 0.5 \text{ m}$;

-The minimum distance from the top surface of the Furnace to flammable surrounding surfaces is $L1 = 1 \text{ m}$;

-The minimum distance from the rear and side surfaces of the Furnace to non-combustible surrounding surfaces can be reduced to $L = 0.2 \text{ m}$;

-The minimum distance from the rear surface of the Furnace with a ventilation hole or chimney in the rear wall to the surrounding surfaces $L = 1 \text{ m}$;

In individual cases, safety distances must be adapted to the environment and larger distances must be selected.



The room where the Furnace is installed must have a good ventilation system. Working with the processes that emit vapors, fumes, etc. in addition, we recommend installing hoods or connecting the furnace chimneys to the ventilation system as shown in the figure.

8. PREPARATION FOR USE

The Furnace should be dried before using it for the first time or if it has been out of operation for a long period of time and stored in humid conditions. It should be dried as follows:

without load, heat the Furnace until it reaches a temperature ranging from $100\text{-}150^{\circ}\text{C}$ and maintain this temperature range for 2-3 hours;

heat up to the nominal temperature. Maintain for 1-2 hours.

The dried Furnace can now be operated.



While drying, some 'smoke' may appear but it has no effect on further operation of the electric Furnace.

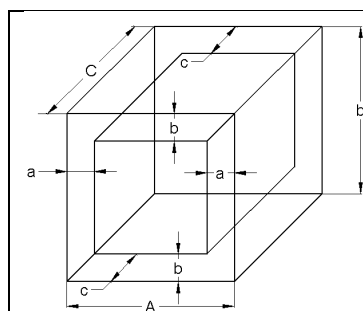
9. OPERATION

Open the door of the electric Furnace.

Put the load on the bottom plate (-s) at least 1/10 of the space away from the side walls to ensure a better circulation of air.

 Attention !	When putting or taking off the charge do not damage thermocouple, mounted in the chamber.
--	--

	The data indicated in technical specifications refer to the working space.
---	---



A, B, C – dimensions of the chamber;
a, b, c – spaces between the walls and the load;
 $a = A \times 0,1$
 $b = B \times 0,1$
 $c = C \times 0,1$
Working volume (space)
 $V = (A - 2a) \times (B - 2b) \times (C - 2c)$

Close the electric Furnace's door.

Turn the switch (Pic.11, Pic.12) on. The light indicates that the Furnace is switched on (just in Pic. 11).

Set the necessary program by following the instruction of the temperature controller.



Picture 11



Picture 12

If the Furnace is equipped with a switch, as shown in Fig. 12, by pressing the red button, you can close the switch in the off position (Fig. 13).



Picture 13

After end of the work turn off the Furnace.

10. MAINTENANCE

 Attention !	The electric Furnace should be disconnected from the mains (power supply) and cooled.
--	--

Door adjustment	Open the door and loosen the door hinge fastening screws. Move the door to chamber and clamp the screw. Close the door and check the door position. There must be no gaps between the chamber gasket and the door and should close tightly. If gaps remain – repeat the procedure.
Change of fuse	Press the holder of the fuse, turn anticlockwise and take out from the socket. Change a burnt-out fuse. Screw in the holder of the fuse in the reverse order. Ensure the fuse holder is firmly tightened.

Once every six months	Once every six months examine visually the wires and electrical connections. If necessary, tighten the contact screws.
Cleaning	When an operation is completed, clean the external surfaces of the electric Furnace, except for the markings, with a water-dampened piece of cloth. Clean out the scale from the heating chamber with a water-dampened piece of cloth. If there is necessity clean the vents with a vacuum cleaner.

You are responsible for the correct boot sterilization.

Before cleaning or sterilization (in addition to what is recommended by the manufacturer), the user must make sure that his chosen method of sterilization and cleaning products will not damage the equipment.

11. STORAGE

	Store the electric Furnace in its packaging in a location that meets the following requirements: - heated and naturally ventilated room with an ambient temperature ranging from +5 to +35°C; - atmosphere with sulphurous gas concentration not exceeding 0,13 mg/m³ and chlorine salts concentration not exceeding 0,3 mg/m² per 24 hours; - the ambient relative air humidity should not exceed 80% at the temperature of 25°C.
---	---

	During loading and unloading of the Furnace, protect it from any shocks.
---	--

12. TRANSPORTATION

The electric Furnace should be transported only in closed means of transport in which the temperature ranges from - 50 to + 50°C; at the temperature of +25°C, the ambient relative air humidity must not exceed 80%.

You can transport the electric Furnace by any means of closed transport, but protect it from any rough, jarring movements. The packaging does not protect the electric Furnace from the effects of improper handling.

	The chamber must be empty when the furnace is transported. Remove shelves, bottom plates or container, etc. These accessories can cause severe damage to the furnace
---	--

13. WARRANTY

The manufacturer guarantees that the electric Furnace meets company standards.

The Furnace is guaranteed for 12 months from the date of purchase provided that the user follows the instructions regarding the Furnace's storage, transportation and usage. However, the guarantee does not extend more than 24 months beyond the Furnace's manufacture date.

Manufacture defects that appear during the warranty period shall be repaired at the manufacturer's expense.

14. TROUBLESHOOTING

Problem	Possible Cause	Solution
The Furnace doesn't turn on.	There is no rated power supply voltage; The fuse is burnt out.	Check the power supply; Change the fuse.
The Furnace doesn't heat up.	The temperature controller is not switched on; Damaged heating element; Damaged thyristor relay.	Switch on temperature controller; Change heating element; Change thyristor relay
Heating time is longer than expected.	Low voltage of the power supply; Door does not maintain a hermetic seal.	Check the power supply's voltage; Tighten the door's closure.
Temperature fluctuation or large over-shoot of the set temperature.	Temperature Controller requires control terms tuning.	Perform an Auto-tune (AT) on the temperature controller (look at temperature controller instructions).



*If after switching on the protective device it triggers again, the Furnace must not be operated. In that case the manufacturer or the manufacturer 's representative should be addressed for the repairs of the Furnace.



In order to continually improve our products and their usage, supplements to this publication may be introduced without notice.

15. ASSESSMENT TECHNIQUE OF THE PARAMETERS

TESTED PARAMETERS:

1. Verification of nominal temperature and temperature stability without charge,
2. Measurement of temperature distribution

TEST METHODS

All tests are performed when the electric Furnace is heated to the nominal temperature set point and operates in the established temperature mode.

Before measuring the temperature stability, it is necessary to select the PID parameters of the temperature controller (see User Manual of temperature controller).

1. Verification of nominal temperature and temperature stability is performed without charge.

In the cold Furnace, the control thermocouple is fastened as close to the working thermocouple as possible. The nominal temperature is set at the temperature controller. When the Furnace is heated and the thermodynamic equilibrium is settled, the control points of the thermocouple are recorded in the interval of not less than 1 hour, every 60 seconds (but not at longer intervals). The arithmetic mean of these values is the measured value of the nominal temperature.

The maximum (positive and negative) temperature deviations from the average temperature are temperature stability.

2. The temperature distribution is measured by thermocouples with the recorder. The thermocouples are positioned at the corners of the chamber, from surfaces at a distance of 0.1 edge lengths, and in the center. At least five thermocouples are used. The nominal thermal temperature is set. When the Furnace is heated and the thermodynamic equilibrium stabilizes, the temperature is captured. The result is calculated according to the formula:

$$T = \pm \frac{T_{\max} - T_{\min}}{2}$$

Where:

T - temperature distribution, °C;

T_{max} - is the maximum temperature obtained during measurement at one of the points, °C;

T_{min} - is the minimum temperature obtained during measurement at one of the points, °C;

16. TECHNICAL SPECIFICATIONS

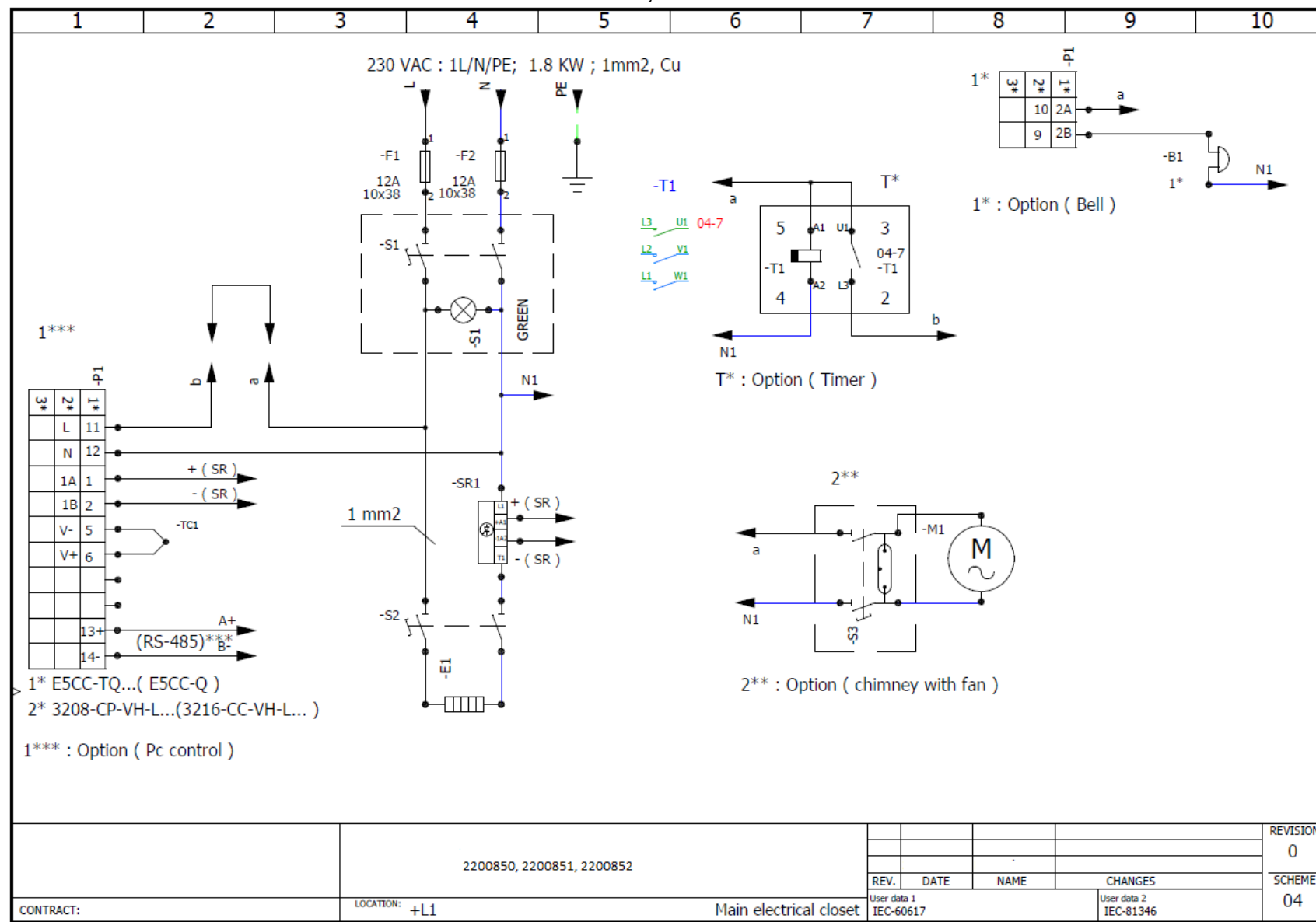


In the tables are provided the technical parameters of basic models

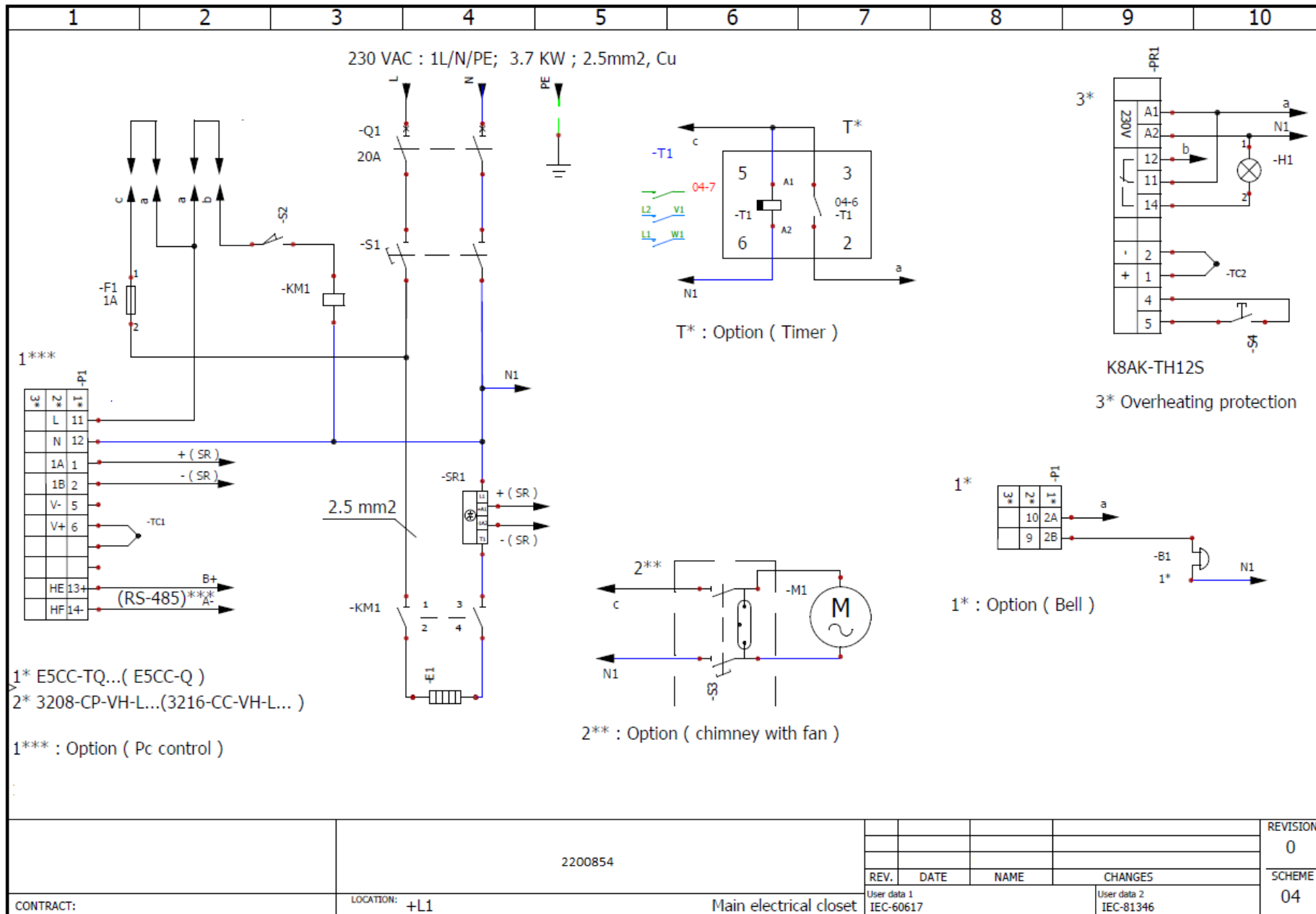
Model	Volume	T max.C	Power, kW	Weight ,kg	Phase	Dimensions of the chamber,mm/			Dimenions of the Furnace,mm /			Environment in the chamber/ Air	Warm – up time to rated temperature , without charge , not more than	Temperature distribution in the thermal regime of well – established, without charge, °C/	Temperature fluctuations in steady- state, without charge, °C/	Closed heating elements	Open heating elements
						W	D	H	W	D	H						
	Furnaces with muffle chambers																
	1100 °C																
IVYMEN FURNACE N-3L 1100° C	3	1100	1,8	17	1	120	200	105	345	470	430	+	35	±10	±2	+	-
IVYMEN FURNACE N-8L 1100° C	8,2		1,8	28	1	195	310	135	440	580	495	+	50			+	-
IVYMEN FURNACE N-13L 1100° C	13		1,8	36	1	220	335	170	505	685	555	+	50			+	-
IVYMEN FURNACE N-22L 1100° C	22		3	58	1	280	500	160	605	860	620	+	50			+	-
IVYMEN FURNACE N-39L 1100° C	39		6	75	3	320	495	230	655	890	740	+	50			+	-
	1300 °C																
IVYMEN FURNACE N-30L 1300° C	30	1300	4,6	120	1	200	440	290	640	870	840	+	150	±10	±2	-	+
	1200 ° C																
IVYMEN FURNACE N-40L 1200°C	40	1200	3,4	110	1	295	420	295	645	870	835	+	150	±10	±2	-	+

17 ELECTRICAL PRINCIPLE SCHEME

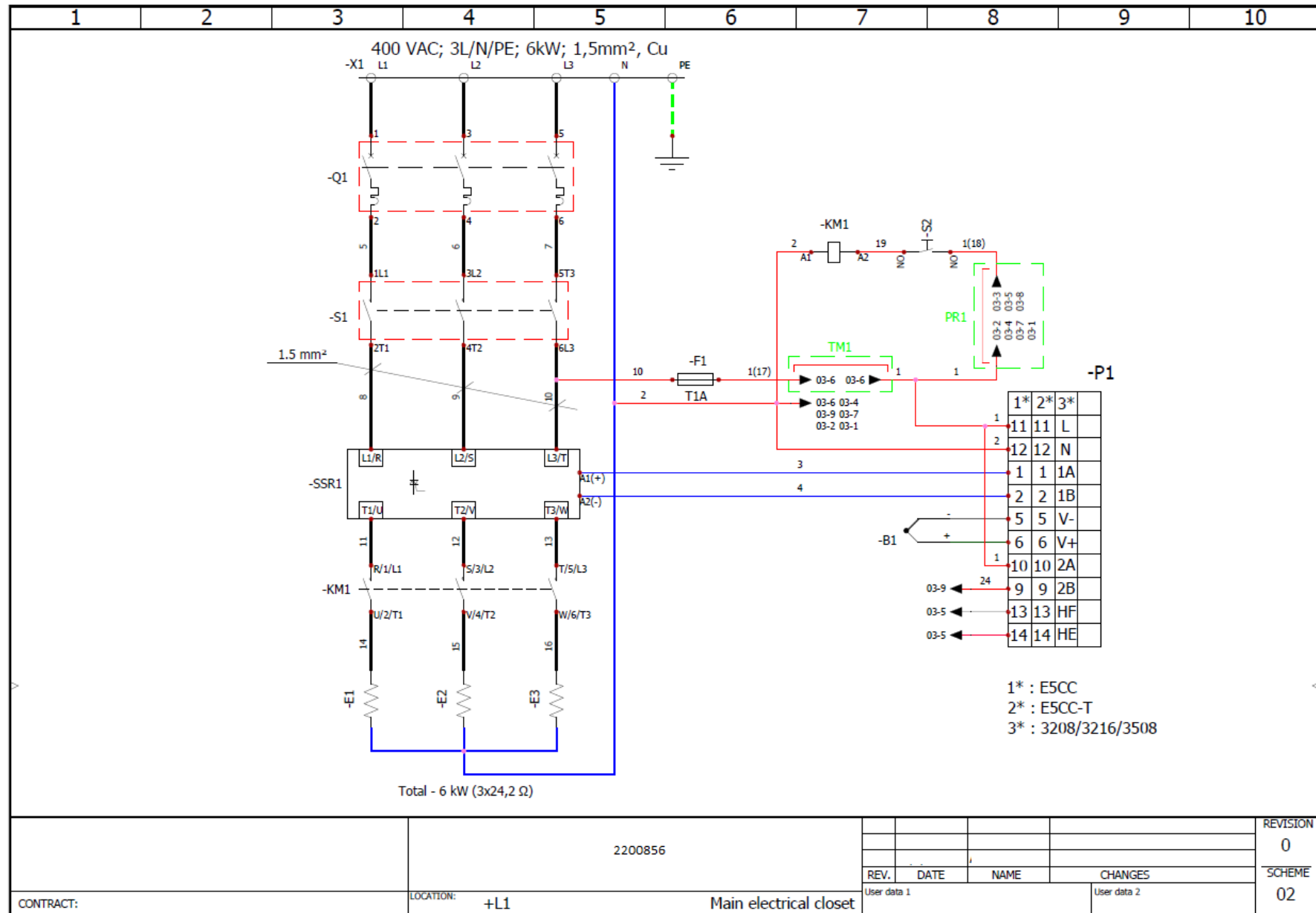
MODELS: 3, 8 & 13 L – 1100°



MODEL 22 L – 1100°



MODEL 39 L - 1100°



18. FURNACE WITH MUFFLE CHAMBERS

Example of base model



2200852 IVYMEN FURNACE N-13L 1100°

BASIC MODEL	
Chamber made of thermal insulation fiber	
Heating elements are embedded in vacuum formed fiber (in models up to 1100 ° C)	
Heating elements exposed on ceramic tubes(on models up to 1300 ° C)	
Microprocessor – controlled thermoregulator	
Ceramic hearth plate (-es)	
High- quality thermal insulation material	

CLOSED HEATING ELEMENTS

IVYMEN FURNACE N-3L 1100° C IVYMEN FURNACE N-13L 1100° C	 A white, box-shaped laboratory furnace with a square opening on the front. The top lid is open, revealing a dark interior. The unit has a control panel on the bottom right with a green indicator light.
IVYMEN FURNACE N-8L 1100° C	 A smaller, white, box-shaped laboratory furnace with a square opening on the front. The top lid is open, revealing a dark interior. A white, rectangular sample tray is placed inside the furnace.

OPEN HEATING ELEMENTS

IVYMEN FURNACE N-22L 1100° C IVYMEN FURNACE N-39L 1100° C	 A white, box-shaped laboratory furnace with a square opening on the front. The top lid is open, revealing a dark interior. The unit has a control panel on the bottom right with a red indicator light.
--	--

OPEN HEATING ELEMENTS

IVYMEN FURNACE N-30L 1300° C
IVYMEN FURNACE N-40L 1200°C



19. PACKAGE CONTAINS

PRODUCT	Furnace;	Bottom plate	Feet	Instruction manual	Instruction manual of temperature controller
IVYMEN FURNACE N-3L 1100° C	1	1	4	1	1
IVYMEN FURNACE N-8L 1100° C	1	1	4	1	1
IVYMEN FURNACE N-13L 1100° C	1	1	4	1	1
IVYMEN FURNACE N-22L 1100° C	1	1	4	1	1
IVYMEN FURNACE N-39L 1100° C	1	1	4	1	1
IVYMEN FURNACE N-30L 1300° C	1	1	4	1	1
IVYMEN FURNACE N-40L 1200°C	1	1	4	1	1