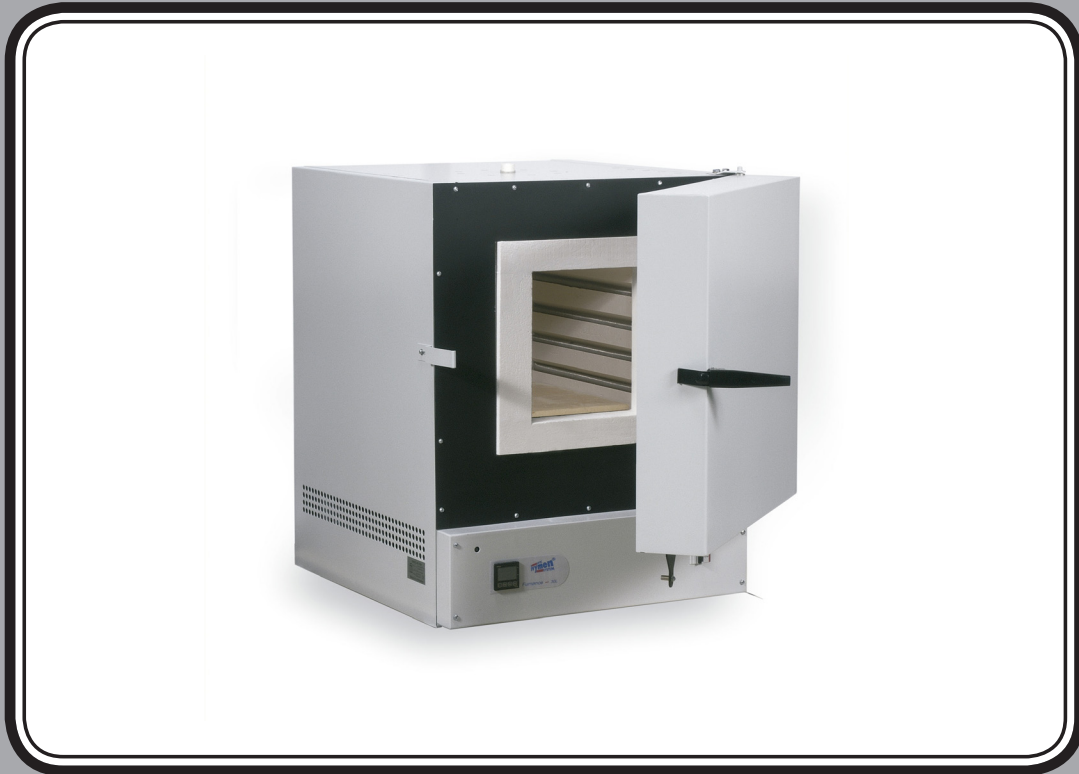




Laboratory Furnace Model N-40L

2200857

Instructions Manual

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1. PURPOSE

The **XX/1200** electrical resistive-element laboratory furnace (herein referred to as "furnace") is intended for analysis of various materials as well as for different kinds of thermal treatment, ceramic firing at the temperatures up to 1200°C.

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 of operators.
	This symbol indicates 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 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.
 Attention !	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.
 Attention !	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. PACKAGE CONTAINS

The user is supplied with:

Name	40/1200	45/1200
Electrical furnace XX/1200, pc.	1	1
Feet, pc.	4	4
Bottom plate, pc.	2	1
Ceramic tube, pc.	1	-
Fuse 1A, pc.	2	2
Instruction manual	1	1
User manual of temperature controller	1	1

5. COMPOSITION AND PRINCIPLE OF OPERATION

The base of the furnace – metal frame. On the top of it there is heating chamber installed, made from heat insulation material with heating elements mounted on ceramic tubing. Control panel is in under part of frame. On the front of frame there is door with heat insulation material fixed.

Working chamber of the furnace consist of heating chamber and door, which are heat-sealed. Working chamber is covered over the preventive sheets. Plate should be in the chamber.

The furnace has a 230 V power supply, 50/60 Hz frequency. A digital temperature controller and a thermocouple temperature sensor mounted in the chamber work together to control and adjust the temperature. The controller shows the set and present temperature.

Air heated by heating elements circulate in the chamber and heats the load.

Electric diagramme is attached.

Additional options by customer request:

1. Over-temperature protection device, which prevents the furnace from overheating. If the maximum temperature of the furnace is exceeded, it prevents the furnace from heating. If this happens, allow the furnace to cold 50-100°C below its maximum temperature, then press the reset button on the front panel. If it does not reset or trips repeatedly contact the manufacture or their agent.
2. Timer; designed for delayed start-up of the furnace.
3. Buzzer; to inform user the temperature controller's program has ended
4. Chimney; designed to extract the fumes from the chamber. The additional switch on the front panel turns on the chimney's fan.
5. Computer Connection for data collection and management of the temperature controller.

6. 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; - ambient temperature from +5 to +35°C; - ambient relative air humidity should not exceed 80% at the temperature of +25°C; - explosion – proof environment free of a considerable amount of conducting dust, water vapour and corrosive gases; - it is recommended that the furnace be placed under an exhaust ventilation hood; - the supply network voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage; - 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 !	Take care, the load does not touch the heating chamber borders or heating elements. If the element went off the exploitation time because of load's touch, damage repairs are performed of user account. In operating time inside the furnace may spring up separate cracks, which do not affect the performance of the furnace and cannot be claimed as damage under warranty. Furnace door should be opening, when the temperature isn't higher than 400°C. If it is opening in a higher temperature, running time of heating elements shorten very quickly because of heat strikes.

7. UNPACKING, CHECKING EQUIPMENT, DELIVERY

Please check the product, or are all interdependent parts for the bill of lading, there are no visible signs of transport damage. Inform the carrier immediately if transportation damage has occurred.

Please remove the transportation screws, remove the adhesive materials and instructions for use of the product, and remove the attached heating chamber protective materials, which is located inside the product.

	 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.).
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If you need return, Use the original packaging for safe transportation and follow instructions. Dispose of the transport packaging (See page 33).

8. ASSEMBLY

Unpack the electric furnace and place it in the location prepared for its operation. Adjust the feet in order to stabilize the furnace. Put in a bottom plate (-s).

If is added a ceramic tube, remove it from the package and place a ceramic tube 27 x17 in the back wall of the furnace chamber, and screw on the protective plate to the rear guard (40/1200).

The voltage quoted on the rating plate (rated voltage) must correspond with the nominal supply network voltage.

Insert the plug into the socket outlet. Check the earthing contact and link the furnace to it.

9. PREPARATION FOR USE

Before the first heating cycle or after a long unused period the moisture must be expelled from the furnace thermal insulation. To 'burn-off' the furnace insulation it must be heated according to the following schedule with the door closed and chamber empty:

- raise the temperature to 100-150 °C dwell for 2-3 hours;
- raise the temperature to 500° C dwell for 2-3 hour;
- heat up to nominal temperature and dwell for 1-2 hour;
- switch-off the furnace and cool down.

The dried furnace can be operated.

	While drying some 'smoke' may appear but it has no effect on further operation of the electric furnace.
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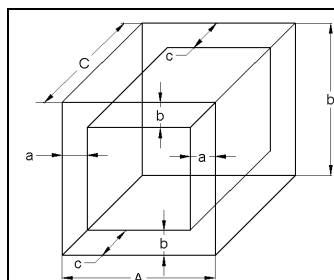
10. OPERATION

Open the door of the electric furnace.

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



The data indicated in technical specifications gives 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 / circuit breaker into the ON (I) position.

Set the desirable operating conditions by following attached controller instruction.

Not leaving the furnace at high temperatures for longer than necessary will prolong its life.

11. MAINTENANCE



The electric furnace should be disconnected from the mains (power supply) and cooled.

Door adjustment	Open the door and loose 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 slightly. In the case if there are gaps 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 a year	Once a year measure the insulation resistance between the frame and heating elements. Dry the electric furnace. Connect the megohmmeter to the leads of the heating element and frame.
Once every six months	Once every six months visually examine the power lead and inside of the chamber for damage..
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 vacuum cleaner.

12. STORAGE



Store the electric furnace in its packing in a location that meets the following requirements:
- heated and naturally ventilated room with an ambient temperature ranging from +5 to +35°C;
- 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.

13. TRANSPORTATION

The furnace can be delivered only by covered means of transportation at an ambient temperature ranging from minus 50°C to plus 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.

14. 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.

15. TECHNICAL SPECIFICATIONS

		Measure	40/1200	45/1200
Nominal power		kW	3,4	4,6
Voltage		V	230	
Frequency		Hz	50/60	
Nominal chamber temperature		°C	1200	
Number of phases			1	
Atmosphere in the chamber			Air	
Heat - up time (without load), not more		min	150	130
Temperature fluctuations in the thermal regime of well-established, without load		°C	±2	
Furnace working chamber dimensions	width	mm	290	290
	length	mm	420	380
	height	mm	290	430
Furnace outside dimensions	width	mm	650	715
	length	mm	875	850
	height	mm	835	1100
Weight		kg	105	120

16. TROUBLESHOOTING AND ASSESSMENT TECHNIQUE OF THE LABORATORY ELECTRIC FURNACE'S PARAMETERS

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 solid-state relay.	Switch on temperature controller; Change heating element; Change solid-state relay
Heating time is longer than expected.	Low voltage of the power supply; Door's does not maintain a proper 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).

METHODOLOGY FOR ELECTRIC FURNACE PARAMETERS CERTIFICATION

Parameters, needed to assess:

1. Review of rated temperature and temperatures stability without load, when the electric furnace is heated to rated temperature.

EXPERIMENTATIONS METHODS

All tests are performed when the low temperature laboratory electric furnace is heated to the nominal temperature and has stabilised, i.e. when the temperature of the furnace corresponds to the nominal temperature and temperature fluctuations reach minimal values (e.g. $1200 \pm 2^\circ\text{C}$).

1. Review of rated temperature and temperatures stability without load, when the electric furnace is heated to rated temperature is performed according to the method described further.

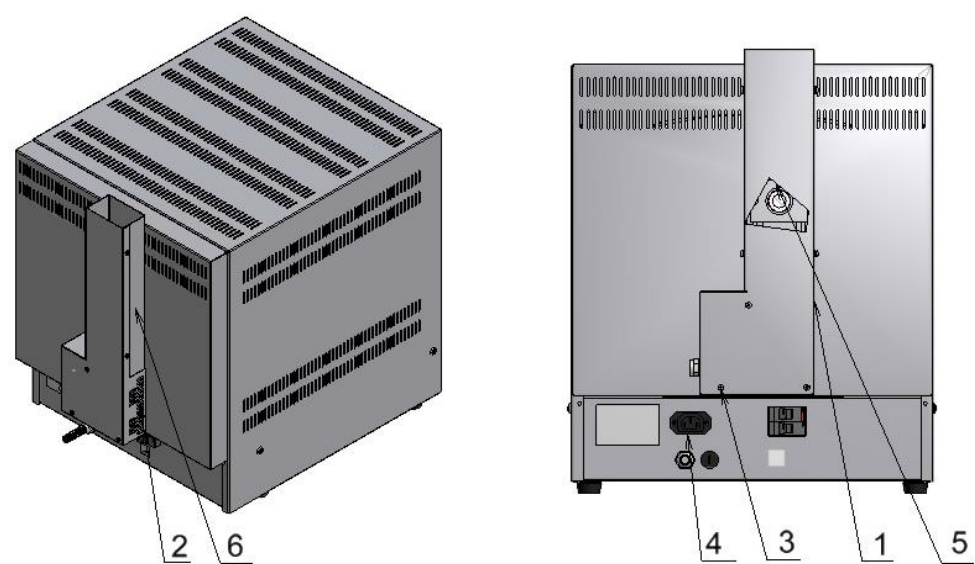
When the furnace is cold telltale thermocouple is installed as closer as possible to the working thermocouple. The review period of rated temperature and stability of temperature is 1 hour. Telltale device showings should be registrated e.g. after 10 minute's period.

How to calculate rated temperature:

The sum of all registered values should be divided into such number, how many records were made. The result should be from 1198°C to 1202°C . At the same way, it is measured stability of the temperature. If the result of checked rated temperature is positive, temperature stability fulfils the requirement $\pm 2^\circ\text{C}$.

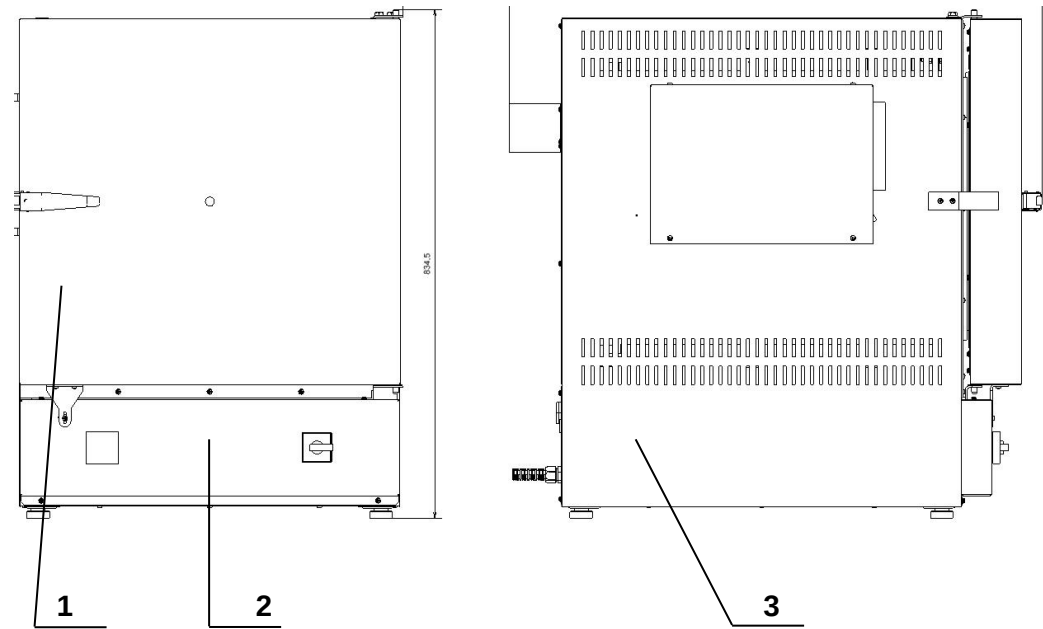
ATTENTION!

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



1.		Chimney
2.		Ventilator
3.		Screw
4.		Plug
5.		Screw for fixing a ceramic tube
6.		Detail of chimney

40/1200



1.		Door
2.		Control panel
3.		Frame