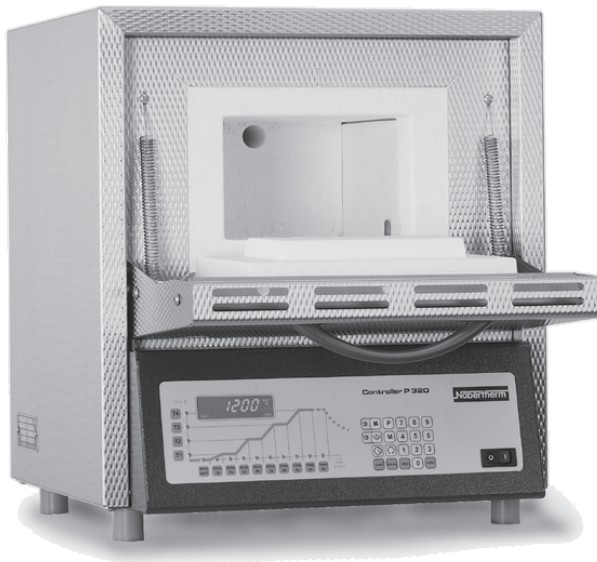


Operating manual

Laboratory furnaces **L 2/10 + L 4/10**
L 3/11/.. - L 40/12/..
L 9/11/SKM
L 9/11/SW
LA 11/..

Read the operating manual before commissioning the furnace.



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General information

This furnace has been designed for commercial use in laboratories.

The multi-layer heat insulation is of exceptionally high quality and energy-saving.

| Model | Width* mm | Depth* mm | Height* mm | Weight kg |
|------------|--------------|--------------|---------------|--------------|
| L 2/10 | 380 | 370 | 420 | 20 |
| L 4/10 | 440 | 470 | 520 | 35 |
| L 3/.. | 380 | 370 | 420 | 20 |
| L 5/.. | 440 | 470 | 520 | 35 |
| L 9/.. | 480 | 550 | 570 | 45 |
| L 15/.. | | 650 | | 55 |
| L 24/.. | 560 | 660 | 650 | 75 |
| L 40/.. | 600 | 790 | | 95 |
| L 9/11/SKM | 480 | 550 | 570 | 50 |
| L 9/11/SW | 480 | 550 | 800 | 55 |
| LA 11/.. | 520 | 450 | 610 | 27 |

* Outer dimensions

The furnace is equipped with a Controller that provides extensive protection against incorrect operation. A long-life NiCr-Ni (Tmax 900/1100 °C) or PtRh-Pt (Tmax 1200 °C) thermocouple is used for measuring and controlling the furnace chamber temperature.

Technical specifications:

Furnace ratings: see the ratings sign on the left side of the furnace

Dimensions and weights: see table

Protection class: 1

Enclosure rating of the furnace: IP 20

Thermal safety according to EN 60519-2, 1993:

without safety controller: Class 0

with safety controller: Class 2

Ambient conditions:

Temperature: 5 - 40 °C

Humidity: max. 95%, non-condensing

Warranty

Nabertherm provides a two-year warranty on all furnaces in this line. Not included are parts subject to wear such as heating elements, contactors and damages from improper handling or use.

Safety



ATTENTION! Hot surface
- Risk of burns -

- There is a risk of burns at some parts of the furnace surface.
- The door handle/handle may get hot during operation. Please wear protective gloves.
- When the door is opened the heating of the furnace is interrupted.
- There is a risk of burns when the furnace is opened at high temperatures.
- The heat outlet of the housing surface must not be obstructed.
- Do not bring any flammable materials close to the furnace.
- Operating the furnace with explosive gasses or mixtures, or with explosive gasses or mixtures created in the process is not permitted.
- Only use materials of which the properties are known.

Ventilation:

Depending on the type of material used, there is the possibility of hazardous gasses or fumes being released. These gasses and fumes must be led outdoors appropriately by the furnace's exhaust.

For more information see „Assembling a chimney“ and “Assembling a ventilation pipe”.

Open the ventilation apertures (L 2/.. - L 40/...: operating lever at the inside of the right door) to support aeration of the furnace chamber.

Mounting the furnace

Transport:

- Always wear protective gloves.
- To carry/transport the furnace at least 2 persons are required dependent on the furnace size.
- Carry the furnace by taking it at the furnace sides from below.
- If carrying straps are used, put the straps only at the sides (crosswise).

Please inform us immediately of any transport damages or incomplete deliveries!

- Remove all packaging from the furnace chamber.
- Insert the ceramic plate included in the delivery scope (only L 2/..and LA 11/..).
- **When mounting, maintain a safety distance of 0.5m to all sides and 1m to the ceiling.**
- The installation site may not be made of wood or similar flammable materials. The heat outlet of the housing surface must not be obstructed. Furthermore provide sufficient room ventilation.
- Mount chimney, if necessary (see „**Assembling a chimney**“).
- Install balancing device (only L9/11/SW)
 - Insert the tube from below into the hole of the furnace floor.
 - Place the balance in the frame below the furnace. Lift the tube and set it on the bearing area of the balance. To secure the tube, push the supporting stamp in between the tube and the bearing area of the balance while lifting the tube.Attention: Please observe the operating manual of the balance!
 - Slip the ceramic plate with the guide in the furnace chamber on to the tube and align precisely to ensure an exact measurement result. The tube must be placed freely on the balance and must not touch the furnace insulation.
 - Connect the balance with the mains plug.
- Connect the furnace's mains plug into the corresponding power socket (do not use an extension cable).

Assembling a chimney

Depending on the application/customer requirements three different ventilation chimneys are available as optional extras:

Type 1: Angled chimney

A ventilation chimney that diverts the gasses and fumes escaping from the waste air nozzle (rear wall) and lets them exit at the top. Cross section: 40 x 30 mm

Mounting:

- Place on the waste air nozzle (rear wall)
- Secure with the two screws provided

Type 2:

Ventilation chimney with fan

Supports ventilation of the gasses and fumes from the furnace chamber. Cross section: 85 x 60 mm

Assembly:

- Place on the waste air nozzle (rear wall)
- Secure with the two screws provided
- Plug connector into a socket (back side of switchgear or externally)

Type 3:

Ventilation chimney with fan and catalyst

Heats up the gasses and fumes of the furnace chamber to about 600 °C and feeds them through the catalyst honeycomb. During this process the organic constituents are burnt catalytically, i.e. are decomposed in carbon dioxide and water vapour. This eliminates most unpleasant smells (e.g. during waste-wax casting).

Caution!

Inorganic substances such as heavy metals, halogen, silicone and fine particulates (even small quantities) can destroy the catalyst!

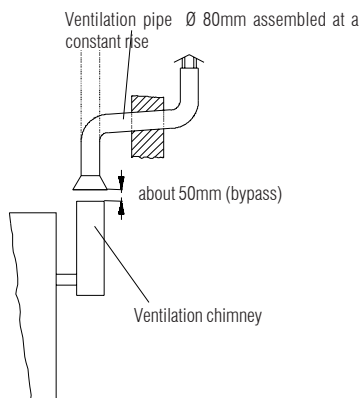
It must be ensured that the catalyser is in operation from the program start up to about 600 °C. No statement can be made about the residual components that are emitted into the environment. They depend to a high degree on the individually employed materials/embedded masses and their composition. Waste air cross section: 120 x 120mm

Assembly:

- Attach the u-shaped holder to the rear wall using the screws included in the delivery scope.
- Put the tube supplied on the waste air nozzle of the furnace
- Screw down the ventilation chimney (with catalyst) to the holder
- Plug connector into a socket (back of switchgear or externally)

If the gasses from the ventilation chimney are to be led outdoors, an additional ventilation pipe must be mounted.

Assembling a ventilation pipe



The ventilation pipe is to be assembled at a constant rise and with a 50mm distance (bypass effect) to the ventilation chimney. Common steel pipe (zinc-coated) or stainless steel pipe Ø 80mm can be used for this purpose.

The temperature at the ventilation chimney and the ventilation pipe can reach 200 °C.

Commissioning the furnace

To achieve an oxide protection layer on the resistance wire coil and to dry the insulation, heat up the furnace once. This may cause an unpleasant smell.

- Open the fresh air apertures in the door, close the door.
- Heat up the empty furnace to 1050 °C, maintain the temperature for one hour.
- Do not damage the insulation of the furnace when charging the furnace. Handle tools and charged products with care. Do not slam the door.
- Be careful when charging the furnace when the furnace is hot: risk of burns!
- To switch the furnace on or off use the switch at the bottom part of the furnace. When the furnace is switched on the display is illuminated.
- To enter the temperatures and times, please read the instructions for the Controller.
- The fresh air apertures must be opened when the catalyst or the fan is started.

Reducing atmosphere

Reducing atmosphere (withdrawal/starving of oxygen) attacks the oxide protection layer of the resistance wire coil. Therefore the next operation is to be carried out in normal atmosphere.

Maintenance/errors

Regularly clean the ventilation holes/pipes so the ventilation cross-section remains unobstructed and the suction functions well.

**In the case of commercial use:
Have the furnace checked by a qualified electrician at the prescribed intervals.
Please observe the safety regulations applicable to your country.**

Use the error search list (Troubleshooting), the repair instructions and the circuit diagram (see the following pages) to identify and eliminate errors.

Only a qualified electrician may carry out work on the electrical system.

Cracks in the insulation:

The insulation of the furnace consists of very high-quality fire-resistant material. As a result of heat expansion, cracks appear in the insulation after a few heating cycles. However, these cracks have no influence on the function or quality of the furnace.

Troubleshooting

| Error | Cause | Error elimination |
|---|--|--|
| Controller does not switch on | No voltage or Controller is defective | <ul style="list-style-type: none"> • Check/replace the fuse(s) of the connection • Check plug connection |
| Controller indicates error | See Controller instructions | |
| No heating of the furnace chamber after the program has started | Error while entering the program | Check heating program (see Controller instructions) |
| | Door switch interrupts | Check if door is closed. If yes: inform Nabertherm service. |
| | Heating element or semiconductor relay defective | inform Nabertherm service. |
| Socket on rear wall of furnace (not all models) without voltage | Error while entering the program or fuse defective | <ul style="list-style-type: none"> • Check heating program (see Controller instructions) • Check/replace fuse at rear of furnace (250V T2A 5 x 20) |

Repair instructions

Ordering spare parts

Safety advice

Replacing the heating plates or the heating elements

Only a qualified electrician may carry out work on the electrical system!

In writing, by phone or via the Internet:

www.nabertherm.com

State the following information from the ratings sign:

- Furnace model
- Production or serial number
- Year of construction

This furnace contains ceramic fibre material in the insulation. In the Federal Republic of Germany actively handling this fibre (e.g. replacing the insulation) is subject to the regulations of the German ordinance concerning hazardous materials, Annex V No. 7 "Artificial mineral fibres" of June 12, 1998. In the other territories of the European Community ceramic fibres are classified by the Directive 98/69/EC of the Commission of December 5, 1997 as follows: CARC. Cat. 2; R 49; Xi R 38. Working on the fibre insulation must therefore be executed in such a way that the fibre dusts released are kept at a minimum.

We recommend wearing a breathing mask (P2 or higher), gloves as well as a protective suit.

Removal

- Remove mains plug
- Remove rear wall covering
- Loosen and remove terminals at the ends of the heating coil
- Pull off wall ducts (at L 3/.. and L 2/10 pull of silicone tubes first)
- Pull out any fixing clamps from the brick lining (furnace chamber)
- Take side ceramic support pipes (L 5/.. - L 15/..) out of the chamber
- Remove the heating plates or the heating elements

Insertion

- Clean furnace chamber and wall ducts from residues.
- If cleaning the wall ducts is not possible, insert new pipes.
- Insert new heating plates or heating elements, push connection ends through the holes.

- Put new fixing clamps* in the brick lining (do not use the old holes).
- Place a small amount of fibre wool* around the connection ends from the outside and plug in wall ducts.
- Create the electrical connections with new terminals*: Hold bottom part of terminals with pliers, tighten the screw.

**are included in the spare parts delivery*

- Cut off any excess twisted wire ends.
If a line must be connected using a cable lug:
Place cable lug onto the thread of the tightened screw and mount with a hexagon nut. Hold screw so that it cannot come loose.
- Mount rear wall cover.

Repair lining

If the insulation of the furnace chamber shows serious damages, it must be repaired.

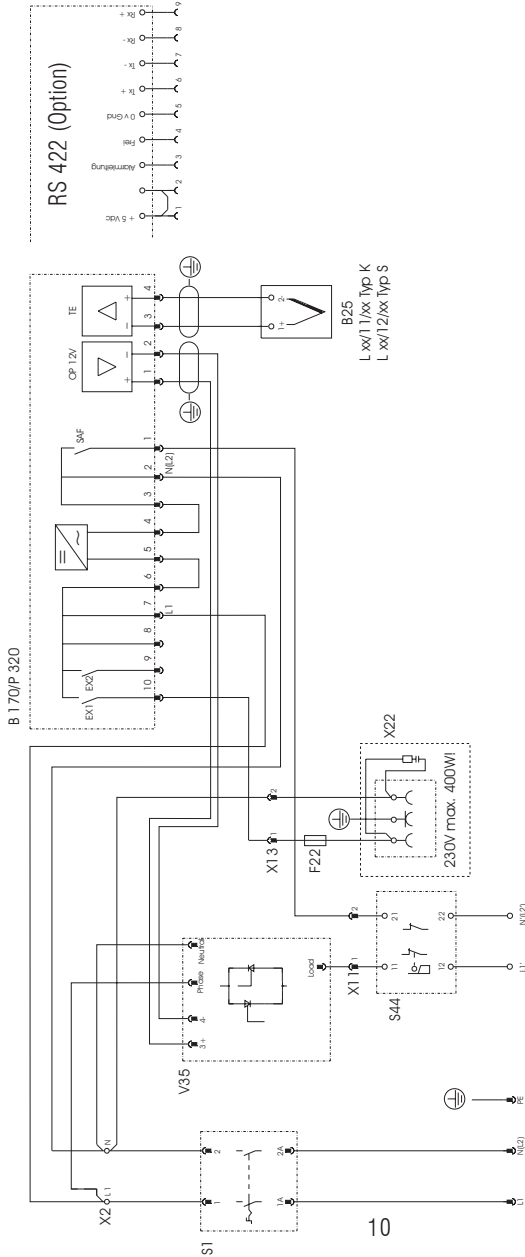
- Remove mains plug
- Remove any remaining dust with vacuum cleaner
- Fill damaged areas with repair kit (Nabertherm service)
- Repair kit must dry for 24 hours before the furnace is operated

Replacing the thermocouple

- Remove mains plug
- Remove the protective covering of the electrical terminals at the back of the furnace
- Remove the safety screw of the thermocouple
- Remove the cable ends of the thermocouple
- Remove defective thermocouple, insert new one
- Connect new thermocouple (observe correct polarity!)
- Attach thermocouple to furnace housing with safety screw
- Mount rear wall cover.

Circuit diagrams

L 2 - 15/11/12/B170/P320 /(SW)/(SKM) and LA with B170/P320
 110-120V, 200-240V ~ 1P/NPE, 2P/PE, 50/60Hz

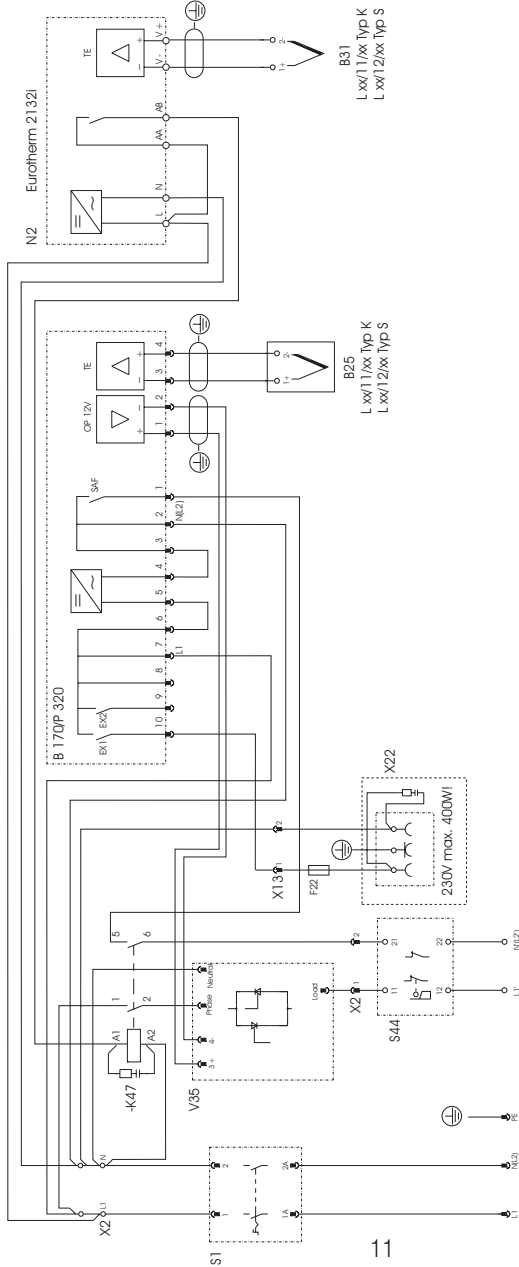


- B25 Thermocouple
- F22 Fuse, socket (5x20, 250V/M2A)
- S1 Mains switch
- S44 Door contact switch
- V35 Semiconductor relay
- X22 Socket (not all models)

See „Wiring of the heating elements“

Power supply see ratings sign

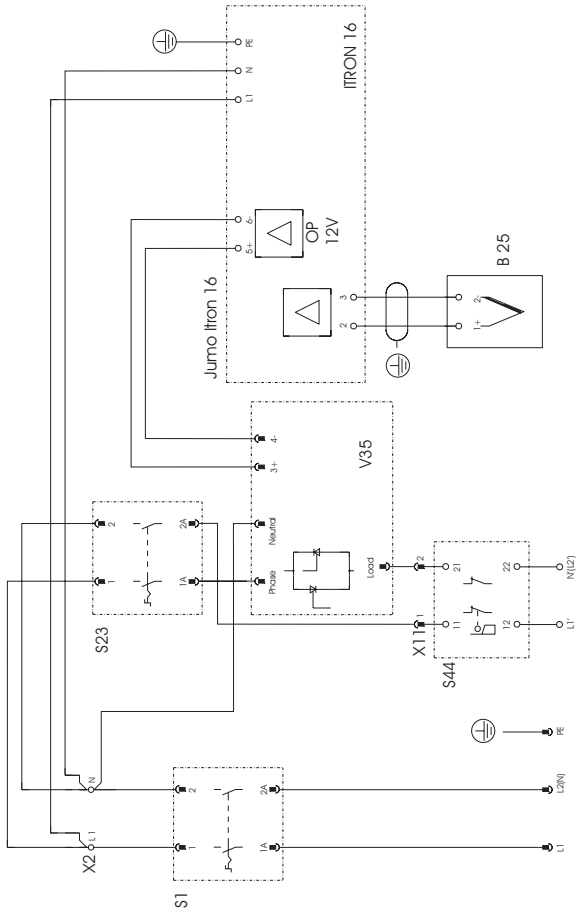
L 2 - 15/11/12/B170/P320 /(SW)/(SKM) and LA with B170/P320 with safety regulator
 2132i, 110-120V, 200-240V ~ 1P/NPE, 2P/PE, 50/60Hz



- B25 Thermocouple, furnace
- B 31 Thermocouple, safety regulator
- F22 Fuse, socket (5x20, 250V/M2A)
- N2 Temperature limiter
- S1 Mains switch
- S44 Door contact switch
- V35 Semiconductor relay
- X22 Socket (not all models)

Power supply see ratings sign
 See „Wiring of the heating elements“

L 2/11, L 4/11, LA.. Controller R6
 110-120V, 200-240V ~ 1P/N/PE + 2P/PE, 50/60Hz

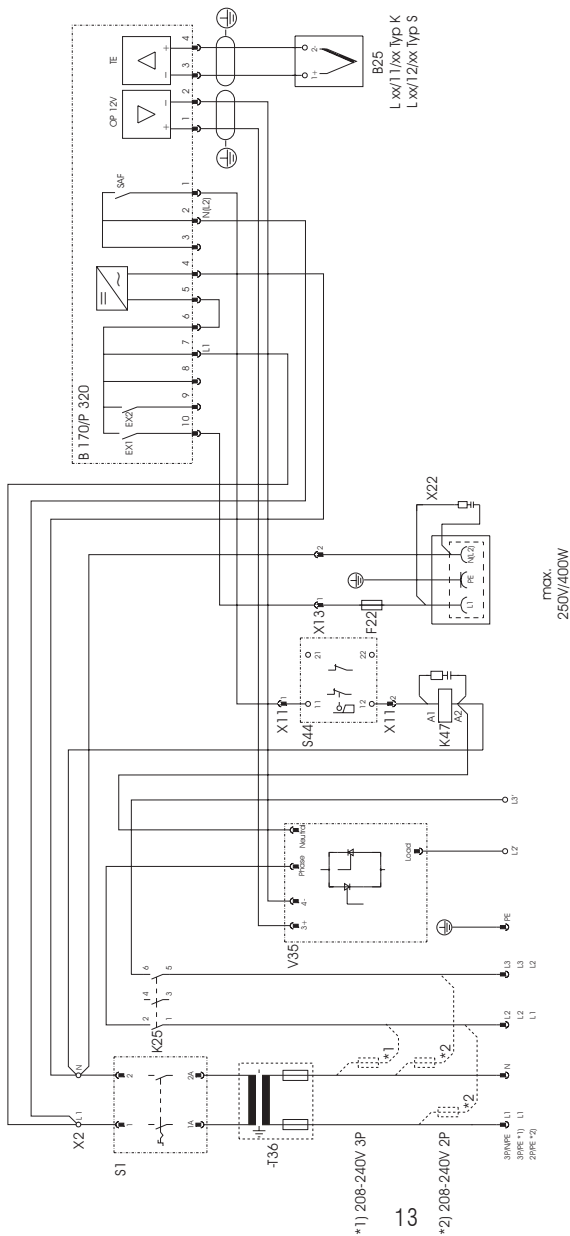


- B25 Thermocouple
- S1 Mains switch
- S23 Switch „Heater ON“
- S44 Door contact switch
- V35 Semiconductor relay

See „Wiring of the heating elements“

Power supply see ratings sign

L 24 - 40/11/12/ with B170/P320
 200-400V ~ 3P/NPE, 3P/PE, 2P/PE 50/60Hz



*1) 208-240V 3P

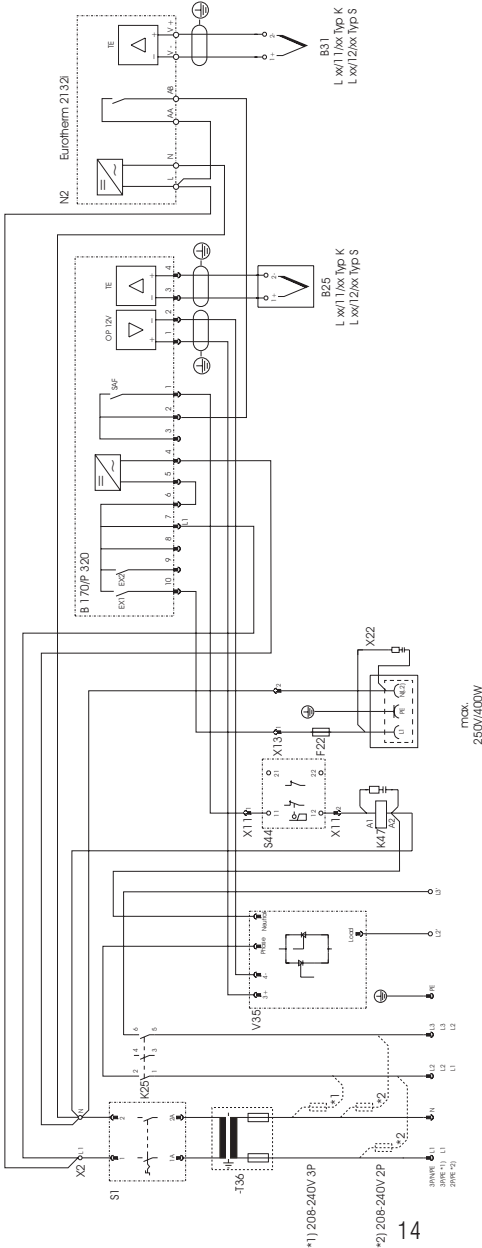
*2) 208-240V 2P

See „Wiring of the heating elements“

Power supply see ratings sign

- B25 Thermocouple, furnace
- B 31 Thermocouple, safety regulator
- F22 Fuse, socket (5x20, 250V/M2A)
- K47 Safety contactor
- S1 Mains switch
- S44 Door contact switch
- T 36 Control transformer (not all models)
- V35 Semiconductor relay
- X22 Socket (not all models)

L 24 - 40/11/12/ with B170/P320 with safety regulator 2132i
 200-400V ~ 3P/NPE, 3P/PE, 2P/PE 50/60Hz

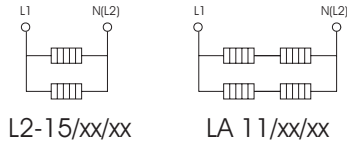


- B25 Thermocouple, furnace
- B 31 Thermocouple, safety regulator
- F22 Fuse, socket (5x20, 250V/M2A)
- K47 Safety contactor
- N2 Safety regulator
- S1 Mains switch
- S44 Door contact switch
- T 36 Control transformer (not all models)
- V35 Semiconductor relay
- X22 Socket (not all models)

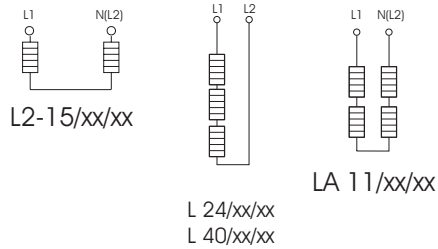
Power supply see ratings sign
 See „Wiring of the heating elements“

Wiring of the heating elements

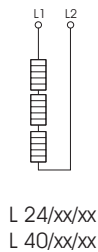
1P/2P 110-120V



1P/2P 200-240V



2P/3P 380-400V



Declarations of conformity

for furnaces with Nabertherm switchgear including Controller

EC – DECLARATION OF CONFORMITY

according to EC Low-Voltage Directive No. 73/23/EC modified through 93/68/EC
and EMC Directive 89/336/EC

Nabertherm GmbH, Bahnhofstr. 20, 28865 Lilienthal

electrically heated chamber furnace

| | | | | | | |
|------------------------|--------------------|-----------------------|-------------------|--------------------|-------------------------|-------------------------|
| Model | L 3/11/..* | L 5/11/..* | L 9/11/..* | L 15/11/..* | L 24/11/..* | L 40/11/..* |
| Temperature | 1100 °C | 1100 °C | 1100 °C | 1100 °C | 1100 °C | 1100 °C |
| Nominal voltage | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 400V 3/N | 400V 3/N |
| Power rating | 1,2 kW | 2,4 kW | 3 kW | 3,6 kW | 4,5 kW | 6 kW |
| Model | L 3/12/..* | L 5/12/..* | L 9/12/..* | L 15/12/..* | L 24/12/..* | L 40/12/..* |
| Temperature | 1200 °C | 1200 °C | 1200 °C | 1200 °C | 1200 °C | 1200 °C |
| Nominal voltage | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 400V 3/N | 400V 3/N |
| Power rating | 1,2 kW | 2,4 kW | 3 kW | 3,6 kW | 4,5 kW | 6 kW |
| Model | L 9/11/SKM* | L 9/11/SW/P320 | L 2/10/R6 | L 4/10/R6 | LA 11/11 R6 od.* | LA 11/12 R6 od.* |
| Temperature | 1100 °C | 1100 °C | 1000 °C | 1000 °C | 1100 °C | 1200 °C |
| Nominal voltage | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ | 230V 1/N ~ |
| Power rating | 3 kW | 3 kW | 1 kW | 1,2 kW | 3 kW | 3 kW |

* Regler B170 or P320

For all Furnaces: With switchgear and Nominal frequency of 50/60 Hz

Harmonized standards / valid EC Directives

EN 746-1

Low-Voltage Directive:

EN 60519-1
EN 61010-1

EN 60519-2

EMC-Directive:

EN 61000-6-1

EN 61000-6-3



Thomas Adamek



Wolfgang Bartilla

Lilienthal, 07.06.2004