

SG₂-4-12

Tube Furnace

Instructions manual

Contents

PREFACE.....	3
1. INTRODUCTION.....	4
2. MAIN TECHNICAL PARAMETERS.....	4
3. INSTALLATION AND USE.....	5
4. COMMON FAULTS AND MAINTENANCE METHODS.....	7
5. DAILY MAINTENANCE AND SAFETY INSTRUCTIONS.....	8
APPENDIX.....	10

Preface

The company produces all kinds of material testing equipments and heat treatment furnaces, the company has professional scientific research institutions and design and development personnel, with strong technical force. Since the establishment of the company, in order to better meet the needs of the market and the majority of users, new products emerge in endlessly, always maintain the domestic leading level, reliable quality, reputation first, timely service, widely welcomed by users.

Before using the machine, please read the instruction carefully, fully understand, and then start using. Please take good care of the machine and use it correctly so that the machine can always maintain high accuracy and good running state.

1. Introduction

The tubular electric furnace is a periodic tubular atmosphere furnace, which uses resistance wire as heating element for sintering, melting and analysis of high-temperature materials in laboratories, industrial and mining enterprises and scientific research institutes.

The electric furnace is divided into two parts, the upper part is electric furnace, the lower part is temperature control, the use of digital programmable temperature controller 16 program control, K division thermocouple, can measure, indicate and control the electric furnace temperature. Temperature is divided into furnace temperature control and tube temperature display.

2. Main technical parameters

2.1. Rated voltage: 200V, single phase, 60Hz;

2.2. Maximum current: 21A

2.3. Electric furnace power: no more than 6.5HP;

2.4. Common temperature: 1832°F;

2.5. Maximum temperature: 2192°F;

2.6. Temperature control accuracy: $\pm 2^\circ\text{F}$;

2.7. Electric furnace voltage: 220V, 60Hz;

2.8. Furnace tube size: inner diameter $\phi 2.36\text{in}$, length 39.3 in;

Heating zone length: 17.32in, constant temperature zone length: 10.24in;

2.9. Temperature rise rate: 0 ~ 38°F/min, temperature rise rate can be adjusted continuously;

2.10. Constant temperature accuracy: 0-1832°C temperature accuracy $\pm 1^\circ\text{F}$;

2.11. Temperature: room temperature ~ 2192°F can be adjusted continuously, temperature rise and cooling rate can be programmed, more than 16 programs set PID intelligent adjustment, temperature uniformity of the studio ($\pm 2^\circ\text{F}/\text{CM}$);

Temperature control mode: intelligent program control, thyristor voltage regulation; Empty furnace heating time ≤ 120 min; Insulation material: polycrystalline mullite fiber.

3. Installation and use

3.1. Use process of tube furnace before work:

3.1.1. Must be placed in the flat indoor work table.

3.1.2. Check the vacuum state in the tube and open the charging valve or vent valve to make the pressure in the tube consistent with the pressure outside the tube;

3.1.3. Check whether the tube is clean, clear debris, ensure that the tube is clean;

3.1.4. Check the installation and fastening of resistance wire and thermocouple lead rod, check whether the instrument is normal;

E. Check whether the furnace door switch is flexible;

F. After ensuring that everything is normal, start to release work parts;

3.2. Use process of tube furnace:

3.2.1. Make sure the power is off when you release the working parts.

3.2.2. Turn on the power supply, press the power switch, set the temperature control curve according to the required working temperature and heating rate, press the work start button, start the instrument operation, make the electric furnace energized, temperature control instrument shows the temperature gradually rising, indicating that the electric furnace and temperature controller are working normally.

3.2.3. When using tube furnace, the furnace temperature shall not exceed the rated temperature to avoid damaging the heating element.

3.2.4, handle gently to avoid damaging the electric heating element, furnace bottom plate, etc.;

3.2.5. It is strictly forbidden to place wet workpieces, and the workpiece heated in the furnace should be kept 1.97 — 2.76 in away from the electric heating element; The workpiece should be placed neatly and not piled up too high to avoid damaging the thermocouple casing.

3.2.6. Check all kinds of instruments and instruments during work. If there is

any abnormality, repair it in time.

3.2.7. When the furnace temperature is above 1292°F, it is not allowed to open the furnace door to cool down or heat out, so as not to shorten the service life of the furnace due to sudden cooling.

3.3. Use process of tube furnace after work:

3.3.1. Turn the Work start up and cut off the power supply.

3.3.2. Gently release the work parts to ensure that the furnace body and workpiece are not damaged.

3.3.3. Reload the furnace and repeat the procedure above.

3.3.4. Clean up the sundries in the tube and ensure that they are clean.

3.3.5. Pay attention to daily maintenance work.

3.3.6. Check regularly whether the connection parts of electric furnace and temperature controller are in good contact.

3.4. Precautions for use of tube furnace

3.4.1. The refractory material of the new furnace contains moisture. In addition, in order to make the heating element generate oxide layer, it must be baked at low temperature for several hours and gradually heated to 1652°F before use, and kept for more than 5 hours, in order to prevent the furnace from breaking due to the rapid change of temperature after damp.

3.4.2. Tube furnace is for the experiment and shall not be used for it. Samples must be stored in a clean crucible and shall not pollute the furnace.

3.4.3. Furnace temperature shall not exceed the highest temperature, so as not to burn the electric heating element, and do not pour any liquid and melted metal into the furnace.

3.4.4. When using tube furnace, pay attention to safety and avoid scalding.

3.4.5. When the tube electric furnace is heated, the furnace coat will become hot, so the furnace should be kept away from combustible materials and easy to heat outside the furnace.

3.4.6. The working life of the heating element depends on the oxide layer on its surface. The destruction of the oxide layer will shorten the life of the heating

element, and each shutdown will damage the oxide layer, so the shutdown should be avoided after the startup.

3.4.7. After several cycles of heating, cracks may appear in the heat preservation material of the furnace. These cracks are caused by thermal expansion and have no effect on the quality of the furnace.

3.4.8. When using tube furnace, always take care of it to prevent accidents caused by self-control failure. Do not use tube furnace when no one is on duty at night.

3.4.9. Temperature should not rise too fast above 752°F, so as not to affect the measurement results and the life of the furnace.

3.4.10. After using tube furnace, cut off the power supply to cool it naturally. Should not open the door immediately, in order to avoid the furnace suddenly cold broken, such as urgent, can first open a small slit to speed up the cooling, until the temperature drops to 392°F, then can open the quick access flange.

3.4.12. Wear gloves when loading the sample to prevent scalding.

3.4.13. Shall not be stained with water and oil sample into the furnace, shall not be stained with water and oil clip loaded sample.

3.4.14. Do not casually touch the electric furnace and the surrounding sample, loading the sample door opening time should be as short as possible, in order to prolong the service life of the electric furnace.

3.4.15. Cut off the power supply after use.

4. Common faults and maintenance methods

4.1. Not heating up

The power supply voltage is normal, the controller works normally, and the ammeter has no display. The likelihood is electric furnace wire break, usable multimeter checks and the electric furnace wire of same specification changes.

The power supply voltage is normal and the controller does not work. The switch inside the controller, fuse and the travel switch of the furnace door can be repaired. If the furnace door is not related to a good controller can not work,

according to the maintenance method of the controller fault maintenance.

4.2. Slow heating

The power supply voltage is normal and the controller works normally. The likelihood is partial electric furnace wire break, usable multimeter is checked, change with electric furnace wire of same specification.

Check whether the temperature control instrument is set to curve heating test, and set to fixed-point temperature control according to the accessories.

4.3. Abnormal temperature

The thermocouple is not inserted into the furnace, causing the furnace temperature to lose control.

The difference between the indexing number of thermocouple and the indexing number of temperature control instrument will cause the difference between the temperature of furnace and the temperature control instrument.

4.4. Some furnace wire is not red

Carefully check the cause of line damage and replace some damaged parts.

If the input indication is normal, the fuse may be broken, the connecting line is loose or the furnace wire is broken. Tighten the pile head of the consolidated line, replace the fuse and connect the furnace wire.

4.5. The seal of tube furnace door is not in place

Furnace door stuck, clean foreign matter. Furnace door is shifted and refastened.

4.6. 6.Vacuum pumping and air leakage

Check the seal of the quick flange connection. If necessary, please remove it and reinstall it again. If possible, please wipe some vacuum grease on the sealing ring.

5. Daily maintenance and safety instructions

5.1. Flat cement workbench or flat ground, the controller should not be placed too close to the electric furnace, to avoid overheating aging components, and even affect the normal work.

5.2. Check whether the power supply and all cables are correctly connected before powering on and heating up.

5.3. In order to ensure safety, the controller, electric furnace need grounding.

5.4. This furnace is only used indoors, and ensure to take out the work piece first power off, to ensure safety.

5.5, the new furnace for the first time or stored for too long to be used again should be oven drying treatment, the process is as follows:

Room temperature ~ 392°F for 1 hour

392°F to 752°F for 1 hour

752°F to 1112°F for 1 hour

1112°F to 1472°F for 1 hour

5.6. When the electric furnace is used, the furnace temperature shall not exceed the rated temperature, so as not to damage the heating element, and it is forbidden to inject all kinds of liquid directly into the furnace to dissolve metal, and often clean the oxide and iron filings in the furnace to protect the inner clean.

5.7. Regularly check the electric furnace, temperature controller and power supply between the wire contact is good, if found loose should be tightened in time.

5.8. This series of electric furnace is suitable for the following working conditions:

- ① The altitude is less than 1000 meters;
- ② Ambient temperature within the range of 23°F~104°F;
- ③ The relative humidity of the environment is not more than 90%;
- ④ There is no conductive dust, explosive gas and corrosive gas around the furnace.
- ⑤ No obvious vibration and bumping.

Appendix: Temperature rise curve setting

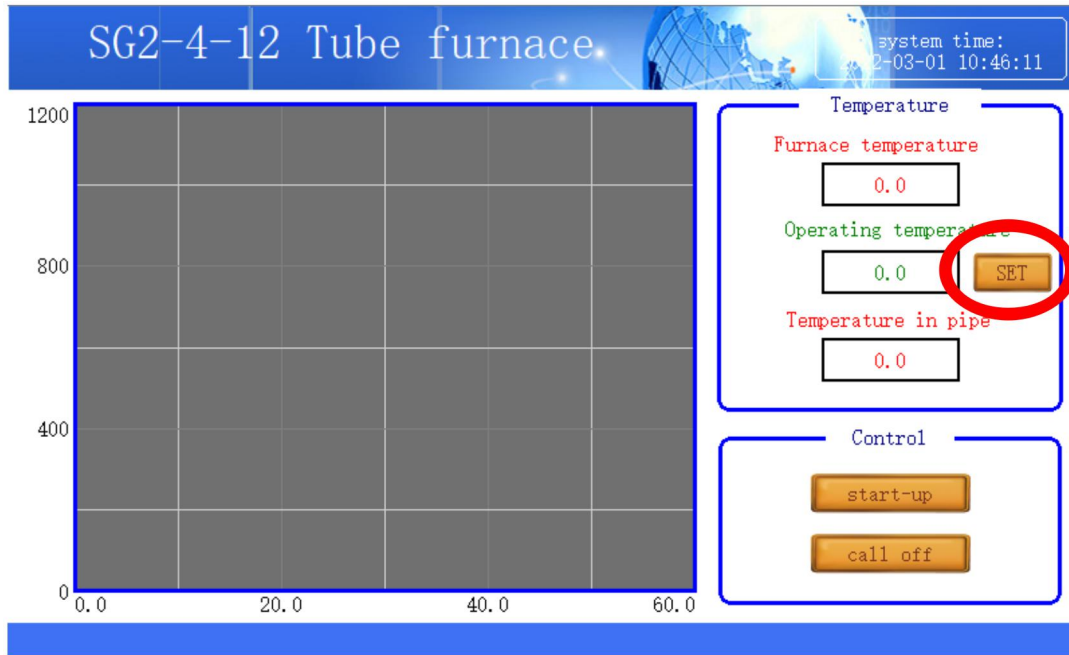


FIG. 1

- 1、Click "SET" button (red circle in FIG. 1) in the main interface to enter the setting of heating curve;
- 2、Enter the setting interface and set the heating curve as required, then press "Return"

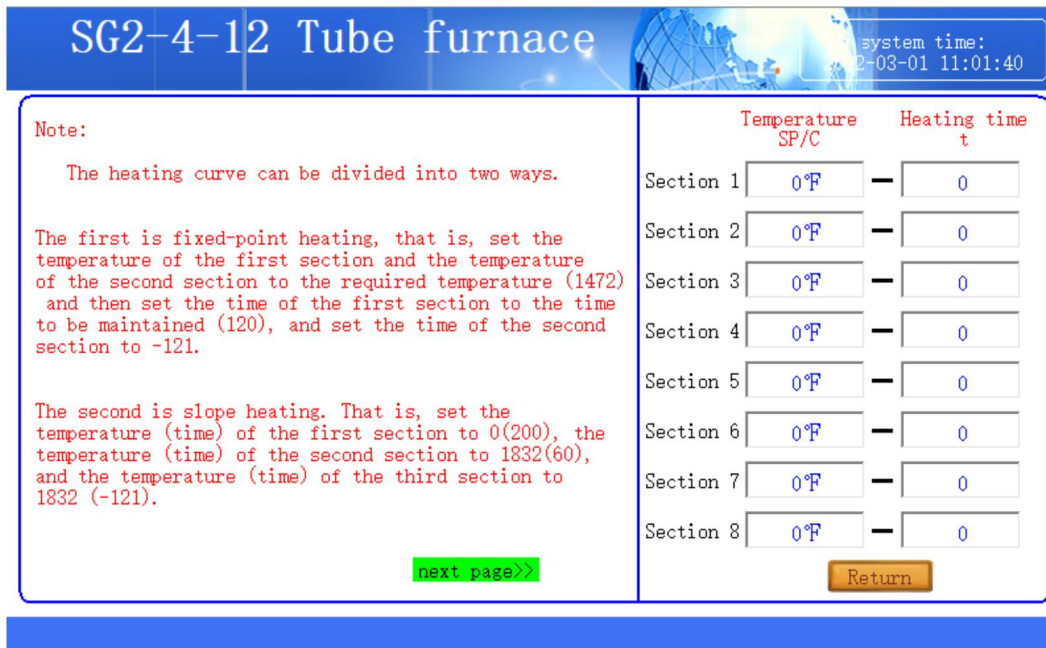


FIG. 2

Note: The heating curve can be divided into two ways.

The first is fixed-point heating, that is, set the temperature of the first section and the temperature of the second section to the required temperature (1472), and then set the time of the first section to the time to be maintained (120), and set the time of the second section to -121.

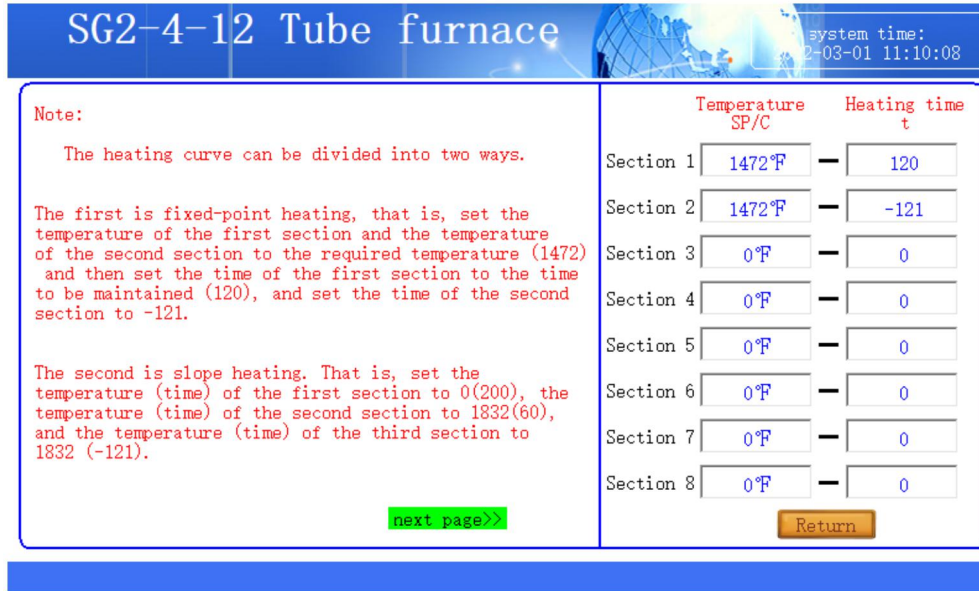


FIG. 3

The second is slope heating. That is, set the temperature (time) of the first section to 0 (200), the temperature (time) of the second section to 1832 (120), and the temperature (time) of the third section to 1832 (-121).

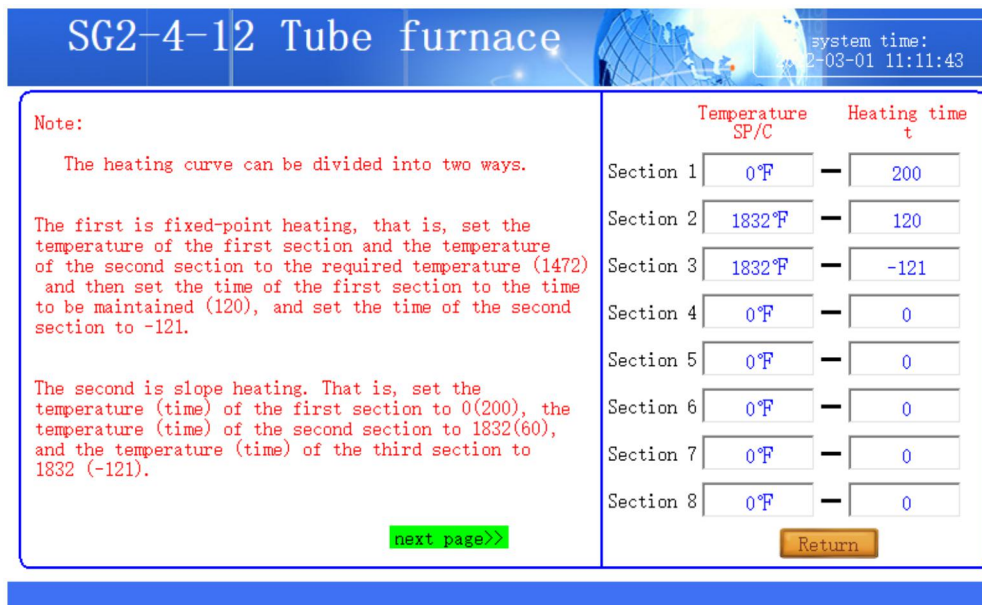


FIG. 4

The first is to rise directly to the target temperature (1472) at the fastest speed and stay at that temperature for 120 minutes (the whole time is 120 minutes, including the initial heating time).

The second is to rise to 1832 at a rate of 9°F per minute and hold for 120 minutes after 1832 (the whole time is 320 minutes, 200 minutes heating time +120 holding time).

Please select the heating method according to the requirements of the sample.

The last "-121" in the heating curve is the stop instruction of the instrument. After setting the heating parameters, a "-121" should be set in the following time.