Laboratory Equipment Pty Ltd

INSTRUCTION MANUAL FOR SMALL FORM MUFFLE FURNACES

Laboratory Equipment Pty Ltd
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Introduction
This Instruction Manual is for the guidance of operators of Laboratory Equipment furnaces and should be read before the furnace is connected to the electricity supply.

It is hoped that this manual will supply all the information that the customer should require for satisfactory operation of the furnace. If, however, there are any questions that remain unanswered then the customer should contact our Service Department.

Please quote the furnace type and serial number from the furnace rating label in all communications with Laboratory Equipment.

Unpacking
Remove all packing and protective wrapping from both interior and exterior of the furnace. Check the furnace for any possible transit damage. Ensure all ordered accessories are present. If any physical damage or shortage is evident, do not discard the packaging material until the furnace is inspected by the distributor, agent or manufacturer.
NOTE: All claims for shortage or damage must be made within fourteen days (14) from delivery.
Subject to our standard published conditions of sale, we have reasonable grounds to believe that we have ensured, so far as it is reasonably practical that the products listed in our catalogue and brochures have been designed and constructed so as to be safe and without risk to health when properly installed and used in their environment by appropriate and trained personnel, and where applicable, in accordance with our published instructions.

Warranty
Laboratory Equipment guarantees this furnace against faulty parts and workmanship for a period of 12 months from the date of purchase. Silicone Carbide elements are covered for 6 months under normal working conditions, Molybdenum disilicide elements carry no warranty. Should any fault occur during the warranty period, other than those caused by neglect or physical damage, Laboratory Equipment will, at its discretion, repair or replace the faulty parts or equipment upon their return to the Laboratory Equipment factory, freight prepaid. Laboratory Equipment accepts no liability for consequential loss or damage caused through operation or malfunction of the furnace.

If the furnace is being operated overseas, advise Laboratory Equipment of the nature of the problem before return and instructions will be given on the removal and replacement of faulty parts to avoid return of complete furnace.

Installation Electrical
This equipment must be tagged and tested according to AS/NZS3760:2010 prior to use and thereafter on a regular basis dependent upon the environment.

It is preferable to locate the furnace close to a powerpoint and it is recommended that double adaptors are not used. Check the total wattage if connecting to multi point outlets. Check the rating plate for power requirements. Installation is to be carried out by a qualified electrician in accordance with the power requirements of the product specifications.

Initial Operation
The first time that the furnace is operated water vapour (steam) will be given off. Some of this steam may condense on the front of the furnace and drip onto the bench below. The case will be hotter than usual as some of the steam condenses on the inside of the furnace case. Heat up rates will also be slightly slower during the initial firing. The water vapour comes from atmospheric moisture that is absorbed by the ceramic fibre insulation during storage. A normal burn in period is 6-8 hours at 1000°C. After burn in and prior to first use (when cool) wipe the residual dust caused during shipment from the furnace with a damp cloth.

Description of Controls
SEE APPENDIX A
SEE ENCLOSED USB - If fitted with a Eurotherm Nanodac Controller.

Factors Influencing Furnace Life

Corrosive Materials
Materials such as sodium containing compounds, fluxes, case hardening compounds, acids and other reactive salts readily penetrate the ceramic lining of the chamber and attack the elements; they may also cause the chamber lining to melt.

When using such materials the furnace must be protected and care must be taken to avoid contamination of the furnace lining. The best method is to use a replaceable work-tube or hearth plate.

Metal Work Pieces
Care should be taken to avoid melting metal into the chamber walls. If metal is melted into the chamber walls the furnace should be switched off immediately. The heating element is cast into the chamber walls, and electricity can be conducted from the element if metal is melted into the walls. The element will need to be replaced to continue operation of the furnace.

Operating Temperature
Although the furnace is designed to operate at the maximum temperature, element life can be significantly prolonged by avoiding unnecessary operation at temperatures around the maximum.

Operating Time
The element deteriorates with time in operation so turning the furnace off when not in use saves element life as well as electricity. Unlike silicon carbide elements, there is no advantage in leaving the furnace switched on.

Use for "Burning Off"
If the furnace is regularly used for burning off materials (especially dental technicians and jewellers) it should be occasionally heated to above 800ºC to remove carbon residues from the chamber. The vent tube at the rear should be checked regularly to ensure that it has not been blocked by condensed residue.

Ceramic Tube Installation
A ceramic tube is included with the furnace. This tube should slide through the hole in the rear of the furnace and allows natural venting. DO NOT fix the tube into position as it should be able to move. Position it evenly between the inner liner and outer rear wall. The tube should angle slightly upwards at the rear as it allows for natural convection. Remove the tube and fill the hole with fibre wool if a more sealed environment is required.

Ashing Furnace to AS1038.4-1995 air/gas inlet tube connection.
Two ceramic tubes are fixed into the furnace. These will be mounted either above or below the furnace ceramic muffle. These tubes flow into slits between the front tile and ceramic muffle. The inlet to the tubes are located at the rear of the furnace. The tubes stop inside the stainless steel sheet metal casing.

Thermocouple
It is advised to check the thermocouple output periodically, either by a calibration test, or by comparing the output with a new reference thermocouple which has been subjected to high temperature for a minimum length of time. Connections for the thermocouple are at the rear behind the rear cover.

Failure to check the thermocouple may result in overheating of the load and furnace.

Safety Controller
If the furnace is fitted with an inbuilt overheat safety protection being Alarm 4 (AL4 = High). It must be set to slightly above the desired set point temperature and will prevent overheating. It will maintain the Alarm Set Value. Change the AL4 value to slightly above the set point temperature as set out in the instruction page. The Alarm will be activated if the furnace exceeds the AL4 value or if the sensor is broken or damaged. If the alarm activates ALM will flash. Reset after temperature falls or fault repaired by pressing Menu and Scroll Keys together for 1 second to acknowledge the alarm (Ack).

Troubleshooting

SYMPTOM	REMEDY
Furnace does not heat - Temperature Controller lights Off.	1. Check furnace plugged in and power switched on. 2. Check that power is available from the power socket by plugging another appliance into the power socket. 3. Call Laboratory Equipment or your local agent for assistance. 4. Check internal RCD has not tripped.
Furnace does not heat - Temperature Controller OP1 and ALM lights are on.	1. Reset alarm (Ack) 2. Check that ramp rate is set correctly; 3. Check door microswitch is engaged. 4. Possible fault relay or element call Laboratory Equipment or your local agent for assistance.
Furnace does not heat - Temperature Controller OP1 is on and ALM light is off.	1. Check that timer is set correctly; 2. Check that timer is reset (i.e. turn off/on); 3. Check door microswitch is engaged. 4. Possible faulty controller - call Laboratory Equipment or your local agent for assistance.
Furnace does not heat - Temperature Controller is indicating *SbEr.*	1. Thermocouple is faulty or has poor connection - check thermocouple and if necessary order replacement from Laboratory Equipment or your local agent.
Furnace overheats - Temperature Controller OP1 light is on.	1. Thermocouple lead wires shorted; 2. Thermocouple removed from furnace; 3. Thermocouple faulty; 4. Call Laboratory Equipment or your local agent for assistance.
Furnace overheats - Temperature Controller OP1 light is off.	1. Relay stuck on. Switch power off and call Laboratory Equipment or your local agent for service.
Temperature indicator reads backwards.	1. Thermocouple connected the wrong way around.

Safety Information

Isolate the furnace from the electrical supply before changing elements or thermocouples or undertaking other routine maintenance. Ensure that the furnace is cold.

When reconnecting the furnace, ensure that the electrical connections are sound including earth supply continuity.

Wear appropriate safety clothing when operating the furnace including a heat resistant face shield (tinted for eye protection), gloves and apron.

Load and unload "hot" work with furnace tongs.

Do NOT use the furnace in the presence of inflammable or combustible chemicals; fire or explosion may result.

To avoid fire, do not expose combustible materials to heat from the open furnace door.

Safety Note Insulation
This furnace contains refractory fibres in its thermal insulation. The materials used may be in the form of fibre blanket or felt, vacuum formed board or shapes, mineral wool slab or loose fill fibre. Normal use of the furnace will not result in any significant level of airborne dust from these materials; but much higher levels may be encountered in maintenance or repair.

Whilst there is no evidence of any long-term health hazards, we strongly recommend that safety precautions are taken whenever the materials are handled.

Exposure to dust from fibre which has been used at high temperature may cause respiratory disease.

When handling fibre always use an approved mask, eye protection, gloves and long sleeved clothing.

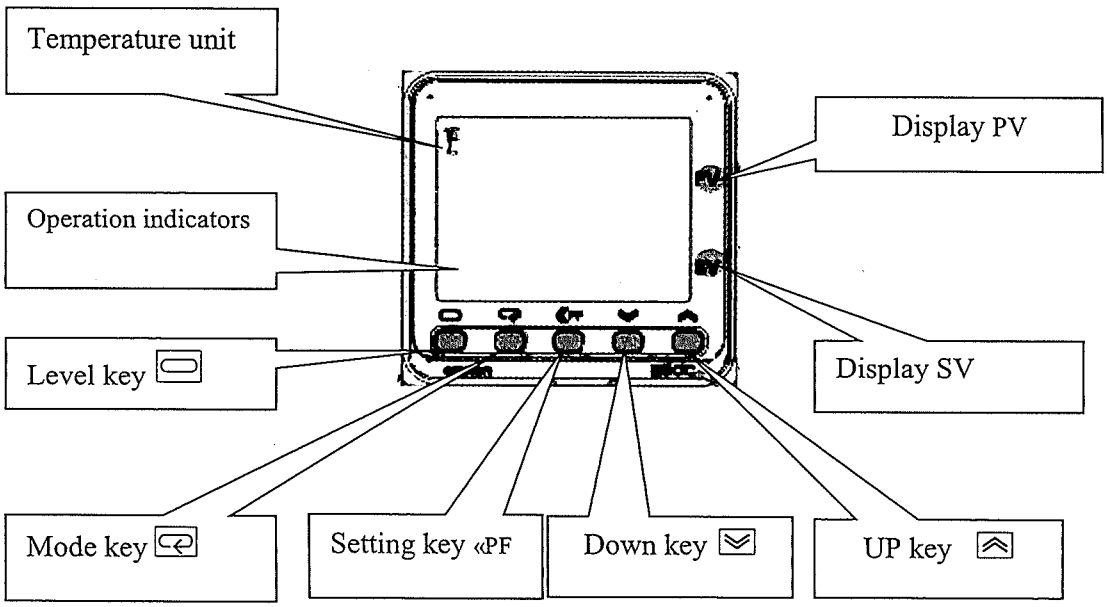
After handling, rinse exposed skin with water and wash work clothing separately.

Before commencing any major repairs we recommend reference to:
- ECFIA Bulletin Number 11
- Guidance Note EH46 (U.K. Health and Safety Executive.)

We will be pleased to provide further information on request. Our Service Department will quote any repairs to be carried out on site at your premises or at our works.

Declaration of Conformity
Each product is thoroughly inspected and tested to not only ensure that it meets the specifications provided, but to also meet Australian Electrical Standard AS3820 and EMC Standard AS/NZ1044:1995,and therefore being accredited with a C Tick label.

1. PARTS OF THE DEVICE AND FUNCTIONS OF THE KEYS



«PF button: every push of the button changes the digit of the parameter being set

PV display the present temperature in the chamber of furnace or a symbol.

SV display the set temperature, a symbol or value of parameter.

OUT1 indicator shines when the heating elements are heating.

STOP indicator shines when the regulator is stopped.

Level key . This key switches on or off a level of adjustment.

Mode key . This key switches parameters.

Down key . Each pressing of this key reduces value of parameter or changes a symbol.

Up key . Each pressing of this key increases value of parameter or changes a symbol.

2. THE CONTROL OF DEVICE

The regulator has two levels of control: operating and adjustment.

Operating level is adjusted automatically at inclusion of device in a network. SV display info-line displays the set temperature, PV display info-line – present temperature in the chamber of furnace.

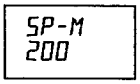
The level of regulation is used for setting of temperature control parameters.

When the voltage supply is off entered values of parameters remain.

3. OPERATING LEVEL

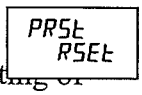
Parameters are switching by short pressing of parameters key. Values of parameters are adjusted by keys "down" and "up" .

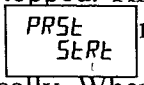
SP-M: displays temperature which should be in the chamber of furnace during set time. For example: if the temperature in chamber should be 200 °C regulator displays:



If speed of heating is switched off at a level of regulation the device does not display this parameter.

PRSt: start of the program (status). If with "down " or "up " keys, we will set: program will be stopped. This is a "reset" status.



If we will set: 

regulator will perform the set program and will switch off heating of furnace automatically. When the program is finished, in SV display the note "End ", is blinking. The device is required to be set on the "reset" status.

SKtR: displays the time (in minutes) till finish of heating. For example: if up to the end of program there are 5 minutes the device displays: SKtR 5 If temperature in the chamber is

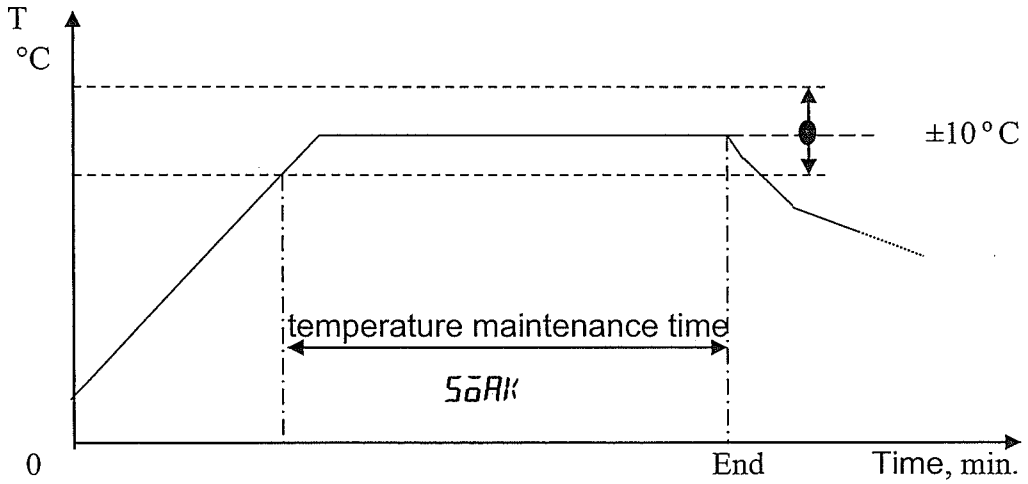
not in the set range of temperature ±10°C, at the certain time, this time is not included to the time of heating.

RS: heating switching on/off. If we will set: R-S RSEt (if R-S RUN), furnace will heat up with the set speed to the fixed working temperature. Temperature will be constant until regulator will be switched off manually, set to R-S StoP status. Parameter AL-2 value

should be equal to furnace maximum temperature.

4. LEVEL OF ADJUSTMENT L.AdJ

Level of regulation is switching on/off by short pressing of the level key. Parameters are switching by short pressing of the parameters key. Values of parameters are setting by "down ⩛" and "up U" keys.



AE: automatic selection of parameter of temperature regulation (PID parameters) (further in text: AT). If the temperature in the chamber of furnace changes and is unstable it is required to switch on AT. AT can be switched on only when regulator executes the program.

When AT is switched: AE AE-2 or AE AE-1 ,the indicator **TUNE** is lighting.

The temperature regulator selects the control parameters and automatically switches off the AT.

SoAK: temperature maintenance time, in minutes (see diagram). For example: if the keeping time is 20 minutes, the device displays: SoAK 20 .

SPRE: speed of heating, °C/minute. For example: if the speed of heating is 5 °C/min, the device displays SPRE 5 . If the speed of heating is switched off (the device displays SPRE oFF),

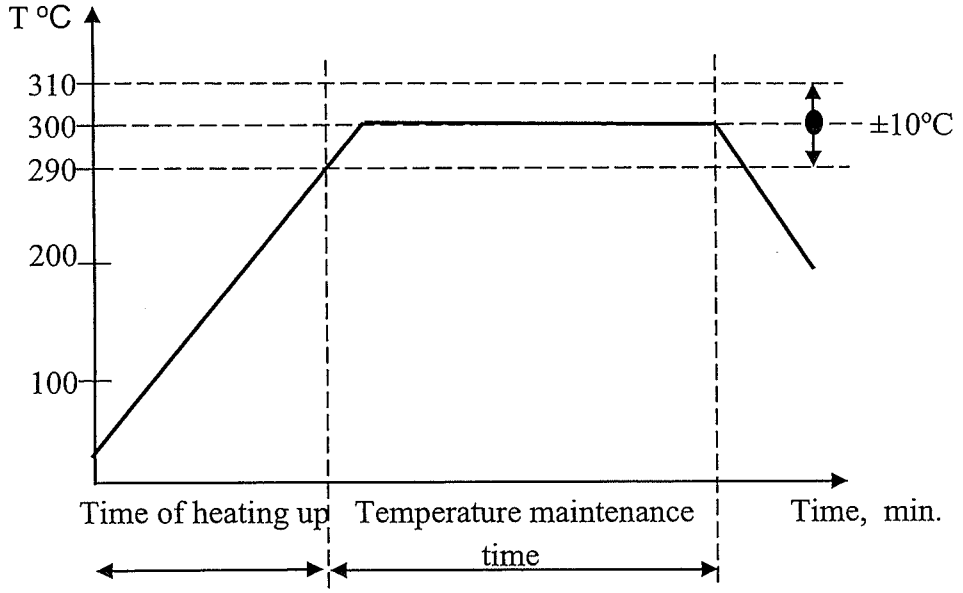
furnace is heating up with the fastest speed.

NOTE:

1. If during 30 seconds any button will not be pressed, the device will automatically return to the initial status, it means: PV No.1 display displays present temperature in the furnace chamber, SV No.2 display – the set temperature.

5. EXAMPLE OF ADJUSTMENT OF THE DEVICE

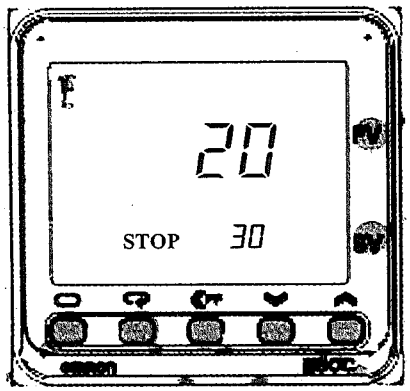
We draw the diagram of technological process



Time of heating up	Speed of heating	Temperature maintenanace time
Counted	SPRt	SoAK
About 60 minutes	5°C in minute	80 minutes

Heat up a furnace up to 300 °C with a speed of 5 °C in minute, the achieved temperature of 300°C is maintained for 80 minutes. After that heating of the furnace is switched off automatically.

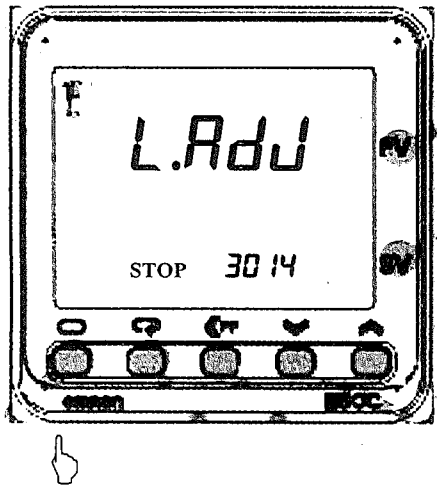
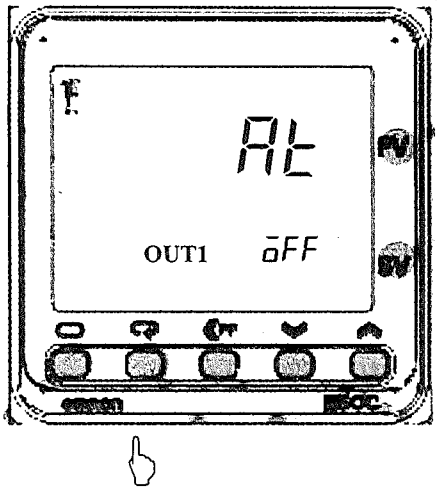
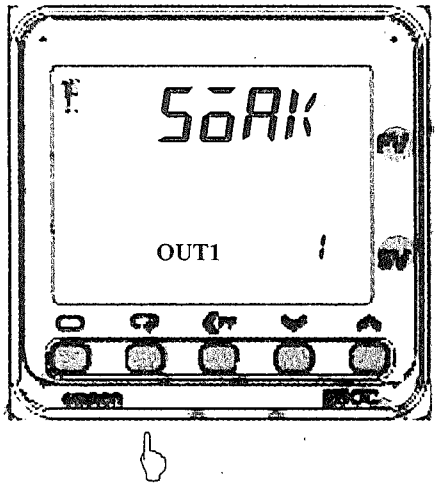
PREPARATION OF THE DEVICE FOR OPERATING

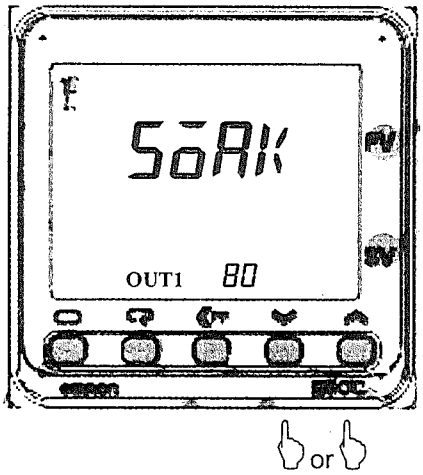
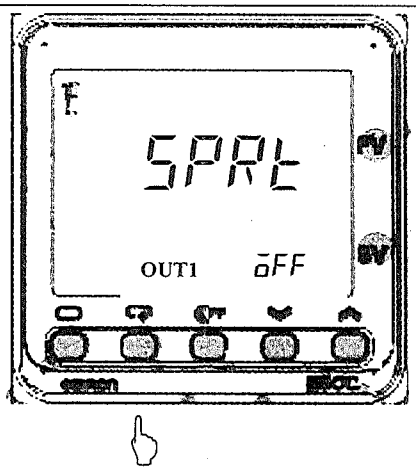
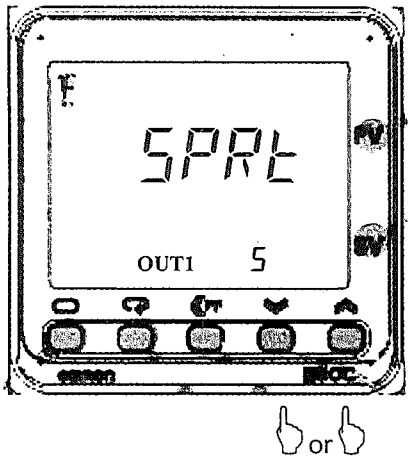


1. PV info-line displays 20°C as a present temperature in the chamber.

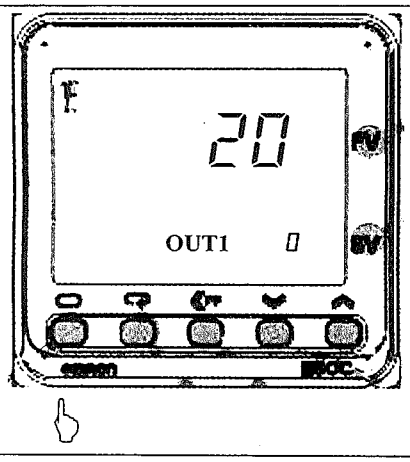
SV info-line displays 30°C as a set temperature.

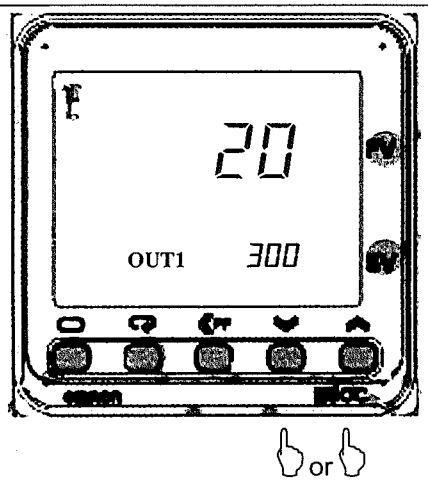
LEVEL OF REGULATION

	2. Short pressing of the level key is switching on the level of adjusment. PV info-line displays L.AdJ SV info-line displays 30 14
	3. Visible only when running the program Shortly press the parameters key until the inscription AL will appear. PV info-line displays AL SV info-line displays oFF
	4. Several times shortly press the parameters key until the inscription SoAK will appear. PV info-line displays SoAK SV info-line displays 1

	5. With the ⩒ ⩓ keys set the time of keeping. PV info-line displays SōAK SV info-line displays 80
	6. Pressing of the ⊂⊃ key is switching on the window of speed settings of heating up. (If status of SPRt is ōFF, then furnace is heating up with the fastest speed) PV info-line displays SPRt SV info-line displays ōFF
	7. With the ⩒ ⩓ keys, set, for example, 5 °C per minute as a speed of heating up. PV info-line displays SPRt SV info-line displays

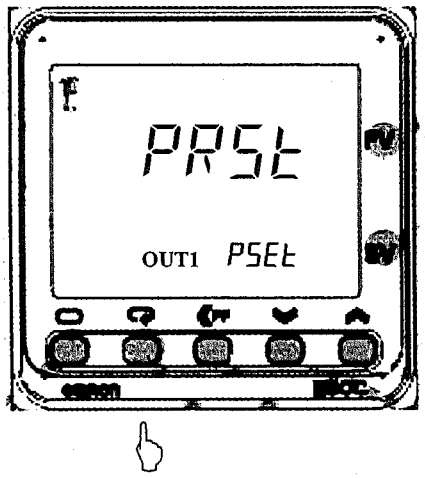
OPERATING LEVEL

	8. Pressing of the ▭ key is switching on the operating level. PV info-line displays, for example, 20 SV info-line displays 0

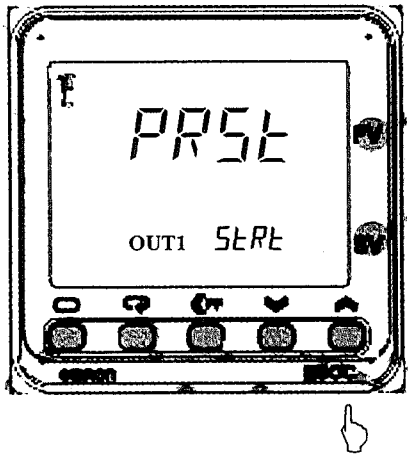


9. With the ⩒ ⩓ keys, set, for example, 300 °C as temperature of operating.
PV info-line displays 20
SV info-line displays 300

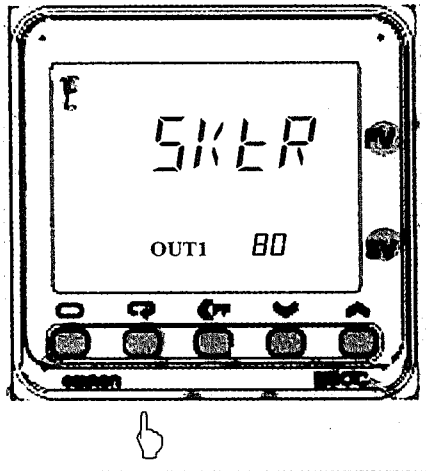
SWITCHING ON THE EXECUTING OF PROGRAM



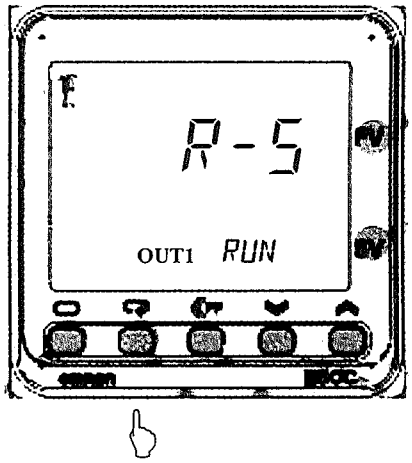
10. Several times press the ⊆ key until the inscription PRSt will appear.
PV info-line displays PRSt
SV info-line displays PSEt



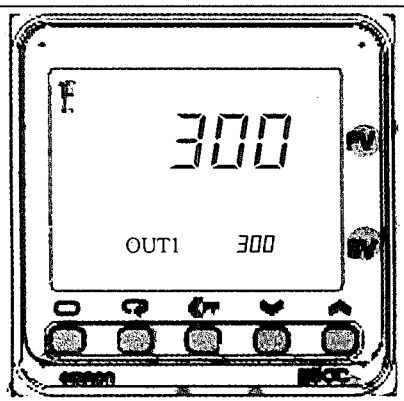
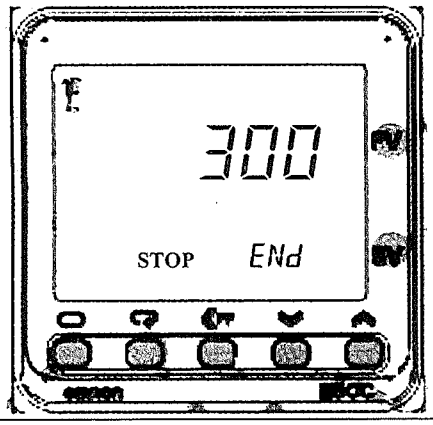
11. Pressing of the ⩓ key is switching on the executing of program, the inscription StRt appears.
PV info-line displays PRSt
SV info-line displays StRt



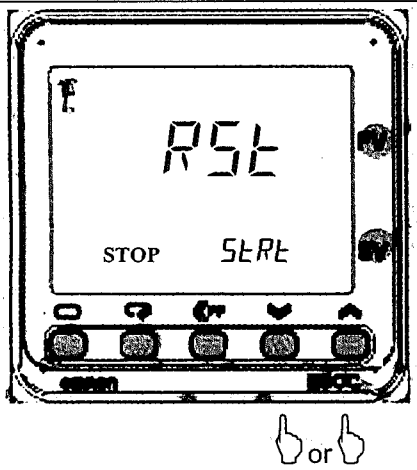
12. Press the ⊆ key, the inscription SKtR will appear.
PV info-line displays SKtR
SV info-line displays 80

	13. Press the ⏎ key, the inscription R-S will appear. PV info-line displays R-S SV info-line displays RUN

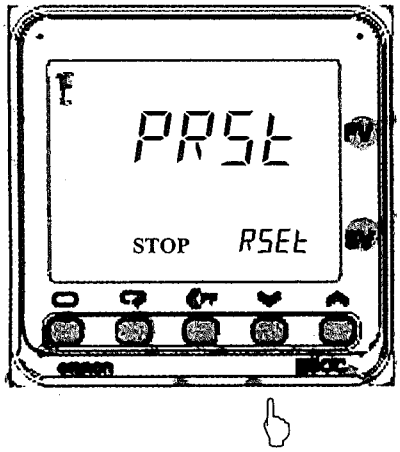
THE EXECUTING OF PROGRAM

	14. The device displays the present temperature in the chamber and the set temperature, for example: PV info-line displays 300 SV info-line displays 300
	15. The end of executing of program PV info-line displays 300 SV info-line displays END (blinking)

SETTING OF THE DEVICE TO THE INITIAL STATUS (RESET)



16. Press the key two times:
PV info-line displays PRST
SV info-line displays STRT



17. Press the key
PV info-line displays PRST
SV info-line displays RSET

If we do not change the heating rate and maintenance time and operating temperature, the program's implementation includes as shown **Inclusions program's execution**.

6. SELF-CHECKING

Possible faults of E5CC regulator:

Info-line displays	Faults	Repairing
S.ERR	Thermoelectric converter or contact cables of thermoelectric converter are broken, failure of A/D converter	Check the thermoelectric converter and contact cables. In case of failure of A/D converter, change the regulator
E111	Failure of inside memory of regulator	Change the regulator
H.ERR	Failure of internal chain of regulator	Change the regulator