



Laboratory Equipment Pty Ltd

INSTRUCTION MANUAL FOR PRECISION VACUUM OVENS

Laboratory Equipment Pty Ltd
"Proudly Australian Owned and Operated."
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Introduction

Congratulations on the choice of a Labec quality product. Labec products are manufactured, tested and calibrated to meet published standard specifications under our strict quality assurance guidelines.

This Instruction Manual is for the guidance of operators of Labec Ovens and should be read before the oven 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 oven. If, however, there are any questions that remain unanswered then the customer should contact our Service Department.

Unpacking

Remove all packing and protective wrapping from both interior and exterior of the unit. Check the unit 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 unit 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 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.

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 oven close to a power point and 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.

Location

Select a location free from draughts and away from direct sunlight or other heat sources.

Temperature Control

Labec ovens are fitted with a Digital PID controller inserted in the working space of the chamber. The controller has been calibrated at 140°C with a maximum temperature of 200°C, and before any adjustments to temperature settings are made allow the oven temperature to stabilise for at least one hour.

Operation

Connect the chamber to an alternating current supply of voltage as specified on the rating plate mounted on the side or rear of the chamber.

DANGER: THIS UNIT MUST NOT BE CONNECTED TO DIRECT CURRENT SUPPLY

Turn the mains power on, set the temperature controller to the required temperature and check to see that the illuminating lamp is illuminated (amber light on the digital temperature controller).

Final adjustment of the temperature controller may be required after the chamber has reached operating temperature and this should be checked with a suitable thermometer located in the chamber (A thermometer is not supplied with the chamber).

Loading the oven shelves shall be of such design as will not impede the circulation of fresh air or the exhaust from the oven. It has been demonstrated experimentally, that the use of grid-type shelves covering more than one half of the shelf area may lead to considerable increase temperature differential. Notwithstanding the requirements of this clause, serious blockage may occur when the oven is heavily loaded with stock. The best procedure in such cases is to insert the loaded shelves after heating up the oven. To ensure even heat and air distribution leave gaps between the products on the shelves and a minimum of 50mm from each of the walls, back and door to allow air to pass around the product.

Caution

Please observe the following safety measures before using your LABEC equipment.

- These units are **NOT FLAME PROOF** and under no circumstances should inflammable, combustible or explosive material be placed in the unit.
- Low ignition temperature materials and those materials which give off inflammable or explosive vapours should not be placed in the unit.
- Avoid heating substances which give off corrosive vapours.
- Users are advised of the dangers of heating combustible materials. The manufacturer can recommend special types of elements, which will prohibit the unit's temperature reaching known ignition points.
- Observe those rules pertaining to wiring and installation of electrical appliances as recommended by the local supply authority.

WARNING

It is detrimental for any of the substances listed in the following table to be inside this equipment. The interior of the unit may be damaged if exposed to any of them. Corrosion of the stainless steel and other surfaces will be directly attributable to the presence of one or more of these substances and will not be a defect or failure for which the manufacturer will accept responsibility.

| ORGANIC SUBSTANCES | SALT | ACIDS | MISCELLANEOUS |
|--------------------|------------------------|-------------------|-----------------|
| ALKAFORM | AMMONIUM BROMIDE | ACETIC | BROMIDE |
| ANAESTHESIA | AMMONIUM CHLORIDE | BORIC | CHLORINE |
| CARBON | CALCIUM CHLORIDE | CARBOLIC (PHENOL) | FLUORINE |
| TETRACHLORIDE | CALCIUM HYPOCHLORITE | CHROMIC | IODINE |
| FORMALDEHYDE | FERRIC CHLORIDE | HYDROCYAIC | SULPHUR DIOXIDE |
| LYSOL(CRESOLS ETC) | HYDROGEN PEROXIDE | NITRIC | |
| TRICHLORETHYLENE | MAGNESIUM CHLORIDE | OXALIC | |
| | MERCURIC CHLORIDE | HYDROCHLORIC | |
| | POTASSIUM CHLORIDE | PHOSPORIC | |
| | POTASSIUM HYPOCHLORITE | SULPHURIC | |
| | POTASSIUM HYPOCHLORITE | SULPHUROUS | |
| | SODIUM CHLORIDE | TARTARIC | |
| | SODIUM HYPOCHLORITE | | |

1. Adaptable scope:

This vacuum drying oven is for use in various laboratories, mines, universities and research institutes to dry and heat objects in a vacuum environment. Drying and heating objects in a vacuum environment has the following advantages:

- (1) Decreases the drying temperature (low pressure and low temperature)
- (2) Avoids oxidation of objects when being heated and prevent objects from being damaged by dirt or grease.
- (3) Avoids heated air killing biological cells.

2. Structure and working principle

Vacuum drying ovens (Hereafter referred to as drying ovens).

The cabinet is made up of high-quality steel sheet with sprayed plastic surface acrylic paint. The Internal chamber is made up of stainless steel armor plate with the shape of a semi-arc. The space between the internal bladder and the outer shell is filled with super-thin glass wool for insulating heat. In the middle of cabinet door, there is a viewing window made up of a double-layer toughened glass. In the inner part beside the door, thick safety glass and a long column like door pin are used. The vacuum system is made up of a vacuum pump (not provided with oven). According to your needs drying, cleaning, filter pot equipment or air-inlet valves can be fitted. The Vacuum pump for this model is optional. (The velocity of the vacuum pump you selected should not be less than 2L/S.)

The Temperature-control system is made up of a sensor (Pt100 platinum resistance), temperature controller, and heater. When receiving the output resistance signal ($100\ \Omega$ for 0°C , 0°C) from the sensor the temperature controller will display in the PV screen real temperature tested from inside of chamber. The temperature controller has the special function of adjusting output power with the PID, testing and correcting temperature error and timing functions. If the PV value is higher than the set value, there will be a warning light and an automatic alarm cut off function will turn off the power to the unit.

Note: 1. RT refers to environment temperature.

3 Intentionally left blank

4. Operating method of the controller

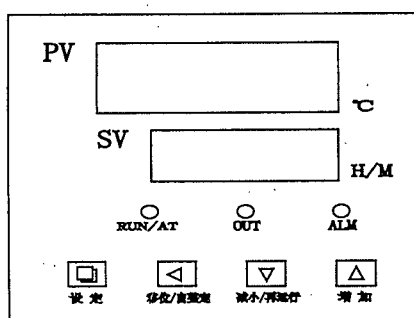
See Annexure A

Safety Thermostat

The oven is fitted with an over heat safety thermostat. It must be set to slightly above the desired set point temperature and will prevent overheating. It will maintain the temperature you set on the thermostat. Set the thermostat by turning to full and allowing the chamber to stabilise at the desired set temperature. Then slowly turn the dial anticlockwise until the power to the heaters turns off (thermostat will click on and off as you pass the chamber temperature), note the temperature on the thermostat at this point. Then turn the dial clockwise again to switch the power back on. Turn the dial anticlockwise again until it is slightly above the temperature at which point you noted the chamber switched off. This is now set around 5°C above the desired set point and will switch off all power to the elements should the oven reach this temperature.

Annexure A

VII. Instrument operation instruction



Indicator definition

- 1) "RUN/AT" indicator: This indicator is bright when the controller is running, when the runtime is over, this indicator is not bright. When the controller enters the auto-tuning of PID, this indicator is flashing.
- 2) "OUT" indicator: If the heater output turns on, this indicator is bright, else this indicator is not bright.
- 3) "ALM" indicator: When the over-temperature alarm occurs, this indicator is bright.

Operation and using

1) When the controller is switched on, display windows show "In index (P, C, K, S)" and the value of temperature range for 3 seconds, then it starts running.

2) Temperature and time settings:

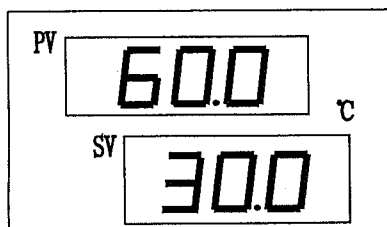
Press the "Set" button, the controller runs into the temperature setting state. Re-press the "Set" button, the controller runs into the time setting state. In setting state, you can use the "◀", "▼" and "▲" buttons to get the required settings. Press the "set" button again, it returns from the setting state and the settings are saved automatically.

If the time is set as "0", the controller will run continuously, the display window of "SV" will display the set point temperature. If the time set value is not equal "0", timers start time when the measuring temperature reaches the set point temperature, the display window of "SV" will display the runtime.

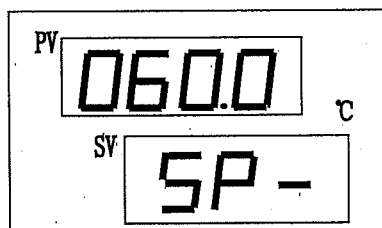
If $En = 0$, when the runtime is over, the "sV" window will display "End", the buzzer will sound for 30s, off all outputs;

If $En = 1$, when the runtime is over, the "sV" window don't show "End", the buzzer sounds for 30 seconds, temperature Continue to constant temperature; After the end of operation, long press "shift / run" button for 3 seconds can restart the timer operation.

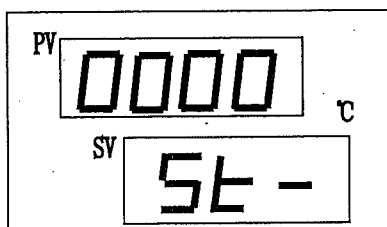
(1) The normal display



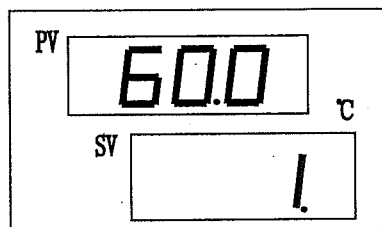
(2) the temperature setting state



(3) the time setting state



(4) Timing display



3) When temperature alarm, the buzzer will sound, "ALM" lights. If a change in temperature setting and over-temperature alarm, "ALM" lights up, but no songs buzzer.

4) When the buzzer sounds, it can be muted by pressing any button.

5) "◀" button: In the setting state, it can shift the set value by pressing the button.

6) "▼" button: In the setting state, it can reduce the set value by pressing the button. If press and hold the button, the set value will reduce continuously.

7) "▲" button: In the setting status, it can increase the set value by pressing the button. If press and hold the button, the set value will increase continuously.

8) In setting state, the controller will return to run status if without any key press in one minute.

9) If the display window shows "----", it indicates the fault of temperature.

AT function

When the temperature control effect is not ideal for system tuning. Self tuning process temperature can have bigger overshoot, the users in a system setting before please consider this factor.

In not running state, the controller will enter the auto-tuning of PID by pressing the "◀" button for 6s, "RUN/AT" indicator flashes, it will be not bright when the auto-tuning of PID is completed. In the state, compressor into normally open mode, when the auto-tuning of PID after the end of a group of PID parameter, parameter automatic save and return to the normal mode of operation. When running the auto-tuning of PID, it can be stopped by pressing the "◀" button for 6s again.

In the auto-tuning of PID state, if temperature alarm, no songs buzzer and "ALM" don't light, but heating alarm relay automatic disconnect. And "set" keys to effective. In the system self tuning process regardless of whether there is a constant temperature time setting, controller display window lower always display the temperature setting value.

Internal parameters settings

Press the "Set" button for 3 seconds, controller will display the password prompt "Lc". Adjust the password to the required value, then press the "Set" button again, it will run into the internal parameter setting state. if press the "Set" button for another 3 seconds, it will return to the running state.

Parameter list-1:

| Parameter indicator | Name | Instruction of the Parameter's function | (Setting range) factory set value |
|---------------------|-------------------|--|-----------------------------------|
| Lc- | Password | when Lc=3, then we can see and modify parameters | 0 |
| AL- | Alarming setting | When temperature is beyond "SP+AL", the Alarm indicator turns on. The buzzer sounds and the heater output turns off. | (0~100℃) 5 |
| T- | Control cycle | The heat control cycle of temperature | (1~60S) Note 1 |
| P- | Proportional band | Adjustment of proportional parameter. | (1.0~rH) 30 |
| I- | Integration time | Adjustment of integration parameter. | (1~1000S) 400 |
| d- | Differential time | Adjustment of differential parameter. | (0~1000S) 200 |
| Pb- | Zero point adjust | When the zero error comparatively larger, to update this value should be needed. $Pb = \text{measure value} - \text{actual value}$ | (-50~50℃) 0 |
| PK- | Full point adjust | When the full point error also comparatively larger, to update this value should be needed. $PK = 1000 \times (\text{measure value} - \text{actual value}) / \text{actual value}$. | (-999~999) 0 |
| Et- | Timing function | When ET = 0, no timing function; 1 electric start timing, 2 to the value set start timing. | (0~2) Note 2 |

Note 1: If the selection of relay output, heating control cycle should be selected in 20 seconds, the other models for 5 seconds.

Note2: if FCD-300X series, a timing function for 2, other models for 0.

Parameter list-2:

| Parameter indicator | Name | Instruction of the Parameter's function | (Setting range) factory set value |
|---------------------|------------------------------------|--|-----------------------------------|
| Lc- | Password | when Lc=9, then we can see and modify parameters | 0 |
| Co- | Turn off the heat output deviation | when "PV \geq SP+Co", Turn off the heating output. | (0.0~50.0°C) 5.0 |
| Hn- | Constant temperature time mode | 0: minutes time; 1: hours time | (0~1) 0 |
| En- | End of operation temperature | En = 0 end of run off output; En = 1 end run to constant temperature; | (0~1) 0 |
| Lt- | Maximum power output | The heating output maximum power percentage; | (0~100) 100 |
| rH- | Range of temp setting | The value of temperature setting. | Note 3 |

Note3: FCD-30XX: 0~400.0°C(300°C); FCD-31xx: 0~100.0°C(100°C);
FCD-3Kxx: 0~1200°C(1200°C); FCD-3Sxx: 0~1600°C: (1500°C)

Parameter list-3:(LCD series this parameter table as the standard, digital series this parameter table for matching)

| Parameter indicator | Name | Instruction of the Parameter's function | (Setting range) factory set value |
|---------------------|-------------------------------|--|-----------------------------------|
| Lc- | Password | when Lc=23, then we can see and modify parameters | 0 |
| Fc | Fahrenheit temperature switch | 1: for Fahrenheit temperature display; 0: Celsius temperature display | (0~1) 0 |
| bd | internal parameters | Customers should according to the Initial value | (0~1) 0 |
| ad | Address | Communication address | (0~32) 1 |
| p-t | Print interval | When p-t=0, no print | (0~9999s) 0s |

Appendix B – Wiring Diagram

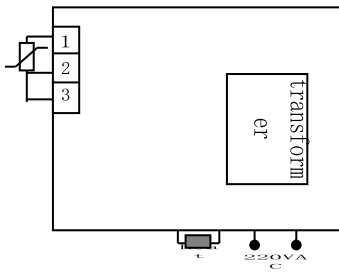


Figure 1 (F C D - 3 x x 0)

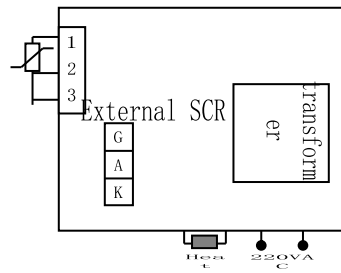


Figure 2 (F C D - 3 x x 3)

**Connect heater to jumper 2 position
and the dial to the jumper 1 position**

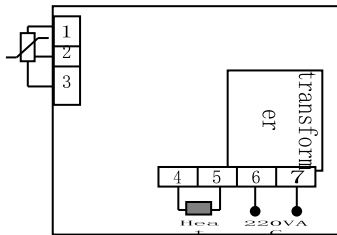


Figure 3 (F C D - 3 x x 2)

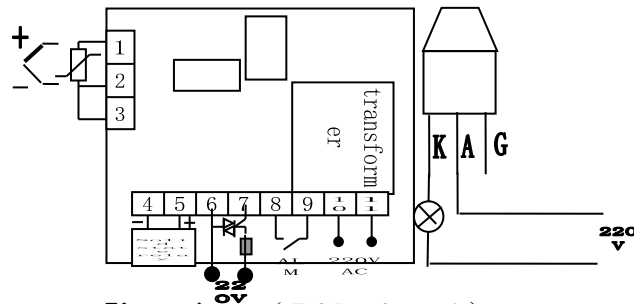


Figure 4^{ov} (F C D - 3 x x 4)

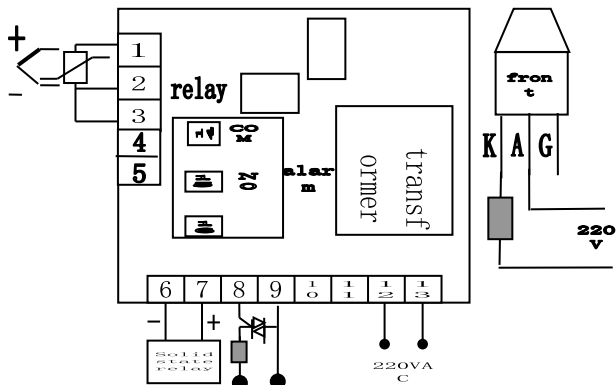


Figure 5 (FCD-3 x x 5)

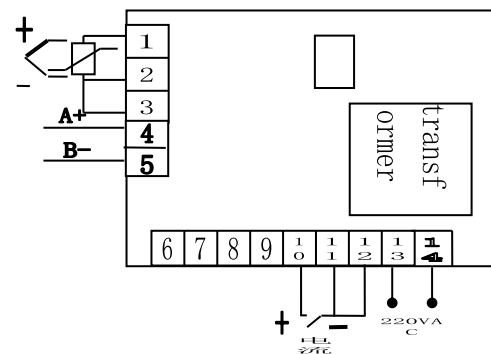


Figure 6 (FCD-3xx6/3xx7)

Appendix C – Structured Diagram

