Drying Oven
FM-DO-A107

Index

1. Safety Measures

- Flammable and volatile chemicals are not in the box.
- If the odor, or Odor smoke, immediately turns off the power supply, users do not blindly repair it.
- The surface of the walls of the box liner and equipment is to be regularly cleaned to maintain cleanliness and increase the transparency of the glass. Do not use acids, alkalis, or other corrosive solutions to wipe the outer surface.
- Device is unused for long periods, unplug the power cord to prevent equipment damage, and periodically (usually quarterly) the conditions of use to run for 2-3 days to get rid of the moisture of the electrical part, to avoid damage to the device.

2. Introduction

Drying Oven FM-DO-A107 can accommodate 50 L of sample and works in high temperature range of 50 to 400 °C. Employs forced convection mechanism to maintain uniform internal environment. Built with high-quality brushed stainless steel for corrosion-free operation. Insulated with thickened aluminum silicate and synthetic silicone sealing for enhanced thermal protection. Our Drying Oven is integrated with over-temperature protection system for additional safety.

3. Features

- ✓ PID controller
- ✓ PT100 temperature sensor
- ✓ High-definition LCD display
- ✓ Antimicrobial powder coating
- ✓ Leakage protector

4. Specifications

Model	FM-DO-A107
Capacity	50 L
Temperature Range	50 to 400 °C
Temperature Fluctuation	± 0.5 °C
Temperature Resolution	0.1 °C
Temperature Uniformity	± 2.5 %
Temperature Sensor Type	PT100
Circulation Mode	Forced Convection
Controller	PID
Timer	1 to 9999
Display	High-definition LCD
Internal Material	High-quality brushed stainless steel
External Material	Electro-galvanized steel with antimicrobial powder coating
Safety Features	Leakage protector, Over-temperature alarm
Power Consumption	2500 W
Power Supply	AC 220 V, 50/60 Hz
Packaging DimensionsW × D × H	970 × 750 × 840
Net Weight	60 kg
Gross Weight	70 kg

5. Applications

Drying Oven removes moisture from samples in industries such as food, environmental testing, chemicals, textiles, material science, and semiconductors.

6. Instrument Introduction

- Drying oven with high-quality cold-rolled steel, the surface electrostatic powder coating, the coating is hard and solid, with strong antirust ability.
- Studio for high-quality stainless-steel mirror, the rounded shape, smooth, smooth, easy to clean.
- Between the cabinet and studio, filled ultra-fine glass wool insulation material, has good insulation, and effectively guarantees the stable and accurate temperature inside and the use of the environment.
- Built-in glass door, that is observed inside the heating items, but also good heat insulation effect.
- The drying oven design has reasonable hot air circulation channels, and the inside temperature distribution is more uniform temperature rises faster.
- The temperature Controller uses the fuzzy PID Control, optional RS485 communications (including operating software), and micro-printer function, particularly suitable for laboratory and analytical instruments, it's full-featured and easy to operate (For details, refer to Temperature controller details).
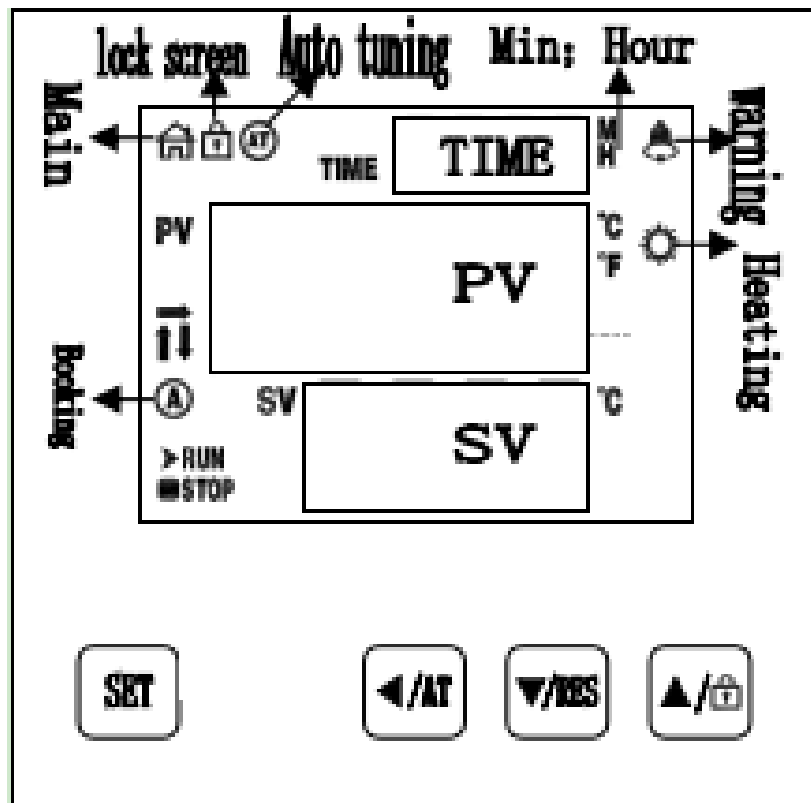
6.1 Temperature Controller

Figure-1

6.2 Indicator Definitions

【**Main**】: In the normal working state (non-setting state), the lamp will be on, otherwise it will be off.

【**Lock**】: It will be on when the screen is locked, otherwise it will be off.

【**AT**】: The lamp flashes during temperature self-adjustment and goes out instead.

【**Alarm**】: The lamp will be on when there is a temperature deviation alarm or abnormal temperature measurement. It will flash when there is a temperature deviation alarm. Under normal conditions, it will be off.

【**Heating**】: The lamp will be on when there is heating output, otherwise it will be off.

【**A**】: The lamp will flash in reservation timing, otherwise it will be off.

【**RUN/STOP**】: Only STOP lights up at the end of timing, and RUN lights up in other states.

【↑/→/↓】: It will flash when heating, constant temperature, and cooling.

7. Installation

Installation and Commissioning

- Transportation, be careful not to force on the glass, or collisions drying oven.
- After the landing this equipment should be placed on a stable, such as uneven ground should be amended.
- Do not use in direct sunlight or high temperature and humidity instruments.
- This equipment should be kept away from sources of electromagnetic interference, and the grounding line of the equipment should be effectively grounded.
- In the normal operation of the equipment, the drying oven contained objects that should be placed so as not to affect the air circulation to ensure uniform temperature inside the drying oven.
- Power do not close behind, do not let the instruments or other items on the power cord, so as not to damage the power cord.

8. Operations

8.1 Instructions for Use

- Open the door, pour the objects into the drying oven on the shelf, and close the door.
- Powered on the panel right of the Power switch to the "1" position, then the instrument digital display indicates that the device into a working state.
- By manipulating the temperature controller on the control panel, the inside temperature setting you need.
- Instrument to work, the inside temperature gradually reaches the set value, after the required incubation time, the work is completed.
- Turn the power off until the inside temperature is close to the ambient temperature, open the door, and remove the object.

Note:
Pay attention to the temperature inside the drying oven and open the door to take the matter so as not to burn!

Special Note

- A product factory has all been rigorously tested, generally not to be corrected, such as the use of environmental degradation slightly, environmental temperature super appropriate range, the temperature will display the value inside the actual temperature errors. As outside the scope of technical indicators, you can refer to the temperature controller operating instructions for correction.
- Instruments in normal working conditions, such as opening the door for too long, or temporarily closing the door inside the temperature some fluctuations, which is normal.
- Test Note: inside the test temperature, using 0. 1 precision mercury thermometers and mercury-side on the inside the geometric center.

8.2 Operation and Use

1) **Without timing function**
   In the main screen state, click the 【Set】 to enter the temperature Setting state, the PV area displays prompt SP, and the SV area displays the temperature Setting value, which can be modified to the required Setting value through the 【shift】、【increase】、【decrease】, then click the 【Set】 to exit the Setting state, and the Setting value will be saved automatically.

2) **With timing function**
   - In the main screen state, click the 【Set】 to enter the temperature Setting state, the PV area displays the prompt SP, the SV area displays the temperature Setting value, and the modification method is the same as above; then click the 【Set】 to enter the time Setting state, the PV area displays the prompt ST, TIME area displays the time Setting value; then click 【Set】 to exit the Setting state, and the Setting value will be saved automatically.

- When the Setting time is "0", it means continuous operation. When the Setting time is not "0", before the timing starts, if the timing direction is count-down, the TIME area will display the timing time; if the timing is count-up, the TIME area will display "0". When the timing starts, the "indicator" will flash. When the time is up, the operation will end. The TIME area will display End, and the buzzer will beep for EST seconds (see **Parameter TABLE-1**). At this time, long press the 【decrease】 for 3 seconds, and the operation can be restarted.

3) **Reservation function (see Parameter TABLE-6)**
   When a reservation time is Set, heating operation is prohibited. In reservation timing, an indicator flashes, and the count-down TIME area displays the reservation running time.

4) **Abnormal temperature measurement alarm**
   If the PV area displays "----", it means that the temperature sensor is faulty, the temperature exceeds the measuring range, or the controller itself is faulty. The controller will automatically disconnect the heating output, the buzzer will sound continuously, and the alarm light will be on. Kindly check the temperature sensor and it's wiring carefully.

5) **Deviation over temperature alarm (see Parameter TABLE-1)**
   When the upper deviation over temperature alarm occurs in the process, the buzzer beeps, the alarm light is continuously on, and the heating output is disconnected. When the lower deviation over temperature, the alarm will occur and flash. If the over-temperature alarm is generated due to changing the temperature Setting value, the alarm light will be on, but the buzzer will not sound.

6) **Lock screen function**
   Three screen locking modes are provided. See [7. **Parameter TABLE-1**] for details.
   Password unlocking: In the lock screen state, click the 【increase】, the input password prompt PA is displayed in the PV area, and the password is displayed in the SV area. After entering the correct password, click the 【Set】to unlock.

7) **Buzzer**
   When the buzzer sounds, press any keys to silence.

8.3 Auto Tuning System

- When the temperature control effect is not ideal, the system can be auto tuned. There will be a large overshoot in the process of auto-tuning. Kindly consider this factor before system auto-tuning.

- In the running state and the main screen state, long press the 【shift】 for 6 seconds to enter the system auto-tuning selection state. The PV area displays the auto-tuning prompt AT, and the SV area displays "0". You can click the 【increase】 or 【decrease】 to select the display "1", and then click the 【Set】 to enter the system auto-tuning state. The AT light flashes. After the auto-tuning is completed, the AT light stops flashing the controller will get a better set of PID parameters and save them automatically. In the process of system auto-tuning, long press the 【shift】 for 6 seconds to stop the auto-tuning program.
- In the process of system auto-tuning, if there is an over-temperature alarm of upper deviation, the alarm light will not be on and the buzzer will not sound, but the alarm relay will be automatically disconnected. In the process of system auto-tuning, the【Set】 is invalid.

8.4 Internal Temperature Parameter Setting

In the main screen state, long press the【Set】for 3 seconds, the password prompt LC will be displayed in the PV area, and the password will be displayed in the SV area. Modify the required password through【increase】、【decrease】and 【shift】, and then click the 【Set】. If the password is incorrect, the instrument will automatically return to the main screen state. If the password is correct, enter the internal parameter setting state, and then click the【Set】to modify each parameter in turn. In this process, long press the【Set】for 3 seconds to exit this state, and the parameter value will be saved automatically. See the table below for details:

Description
In the parameter Table, the temperature setting is referred to as SP, the temperature measurement is referred to as PV.

Parameter TABLE-1

The Indicator	Parameter Name	Description of the parameter function	(Range) Initial value
Lc	Password.	Lc=3, parameter values can be viewed and modified.	0
ALH	Upper Deviation Over-temperature Alarm	PV>SP+ALH, over-temperature alarm of upper deviation.	(0~100.0℃) 20.0
ALL	Lower Deviation Over-temperature Alarm	PV<SP-ALL, over-temperature alarm of upper deviation Description: ALL=0, the lower deviation alarm is invalid.	(0~100.0℃) 0
Pb	Temperature Measurement Deviation Correction	Used to correct errors in temperature measurement. Pb = Actual temperature－PV.	(-50.0~50.0℃) 0

Drying Oven FM-DO-A107

PL	Temperature Measurement Slope Correction	It is commonly used to correct errors arising from high-temperature measurements. PL = 1000 * (Actual temperature −PV) ÷ PV Description: In Parameter 【TABLE - 4】, En = 1. This feature is invalid.	(-999~999) 0
ndT	Timing Mode	0: No-timing; 1: Cconstant temperature timing; 2: Run timing.	(0~2) 1
Tdn	Timing direction.	0: Count-up; 1: Count-down	(0~1) 0
Hn	Time Unit.	0: Minute; 1: Hour	(0~1) 0
SPd	Constant Temperature Deviation	SP−SP d ≤PV≤SP＋SP d, Enter a constant temperature state.	(0.1~50.0℃) 0.5
EST	End Timing Prompt Time	When the timing is over, the buzzer will prompt the time. Note: EST = 9999, iindicates a permanent prompt.	(0~9999s) 60
EH	End Timing Constant Temperature Controller	0: Turn off the heating output after timing. 1: Keep constant temperature control after timing	(0~1) 0
LF	Lock Screen Function	0: Lockless screen function. 1: Lock screen function, unlock without password. 2: Lock screen function, need password to unlock.	(0~2) 0
LdT	Lock Screen Delay	In the main screen state, if no key is pressed in the delay LDT time, the controller will automatically lock the screen. Description: LDT = 600, the delay screen locking function is invalid	(10~600s) 30
PAd	Unlock Password	The password must be entered to unlock it.	(0~9999) 1
Add	Mail Address	Local Address Description: PC-E9000 has no communication function.	(1~32) 1

Argument TABLE -2

The Indicator	Parameter Name	Description of the parameter function	(Range) Initial value
Lc	Password	Lc=6, parameter values can be viewed and modified	0
dP	Demarcation Point	High and low-temperature PID control demarcation point. When SP≤ DP, it is low-temperature control, otherwise it is high-temperature control.	(0~M°C) M
T	Control period	Heating control period.	(1~30s) 5
P1	Proportional Band 1	The time proportion regulation in low-temperature control. Description: P1 = 0, it is digit controlling. Note: when P1 = 0, it is position control.	(0~300.0°C) 35.0
I1	Integral time 1	Integral regulation in low-temperature control.	(1~2000s) 300
d1	Differential time 1	Differential regulation in low-temperature control.	(0~1000s) 200
nP1	Power Output 1	Maximum power percentage of heating output at low-temperature control.	(0~100%) 100
nH1	Heating Off Deviation 1	In low-temperature control, if PV ≥ SP + nh1, it will turn off the heating. Description: Kindlyuse this parameter with caution!	(0~50.0°C) 50.0
P2	Proportional Band 2	The time proportion regulation is in high-temperature control. Description: P2 = 0, it is digit controlling. Note: when P1 = 0, it is position control.	(0~300.0°C) 35.0
I2	Integral Time 2	Integral regulation in high-temperature control.	(1~2000s) 300
d2	Differential Time 2	Differential regulation in high-temperature control.	(0~1000s) 200
nP2	Power Output 2	Maximum power percentage of heating output at high-temperature control.	(0~100%) 100
nH2	Heating Off Deviation 2	In high-temperature control, if PV ≥ SP + nh2, it will turn off the heating. Description: Kindly use this parameter with caution!	(0~50.0°C) 50.0

Drying Oven FM-DO-A107

Argument TABLE -3

The Indicator	Parameter Name	Description of the parameter function	(Range) Initial value
Lc	Password.	Lc=9, parameter values can be viewed and modified	0
doT	Display Decimal point	0: No decimal point for temperature measurement and set value. 1: The temperature measurement and the set value have 1 decimal point.	(0~1) 1
oPn	Door Control Function	0: No use; 1: Use Note1	(0~1) 0
SPL	Minimum. Set value	The minimum value of the temperature setting.	(-50.0~20.0℃) 0
SPH	Maximum Set value	The maximum value of the temperature setting.	(20.0~M℃) 300.0
ouT	Heating. Output Mode	0: normal state. 1: The alarm relay output (normally opening point) is changed to heating output, and the original heating output is invalid. Note2	(0~1) 0
db	Nonsense Region	The nonsense region of the temperature measurement.	(0~5.0) 0.0
ndo	Switch Output Mode	0: At the end of timing. 1: Over-temperature alarm. 2: Enter the constant temperature state Note3	(0~2) 1
ndA	Temperature Alarm Mode	0: Only the temperature deviation over-temperature alarm. 1: Temperature up and down deviation over-temperature alarm concurrently.	(0~1) 0

Note 1: To avoid misjudgment, kindly select to turn off the open-door judgment function for the equipment that does not need to open the door or the temperature drops quickly.
Note 2: When the out value changes from 0 to 1, the heating control T period automatically changes to 20 seconds and saves; when the out value changes from 1 to 0, the heating control T period automatically changes to 5 seconds and saves. This function is only applicable to PC-9x01 (driving solid-state SSR output). It is forbidden to change the initial value of other types of instruments, otherwise the control will be abnormal!
Note 3: Only PC-D9201 (driving solid-state SSR with switch output) has this function. Switch output means that the normal opening point of the switch relay is closed.

Argument TABLE -4

The Indicator	Parameter Name	Description of the parameter function	(Range) Initial value
Lc	Password.	Lc=12, parameter values can be viewed and modified.	0
En	Correction Enable	0: disable multi-segment correction function; 1: Enable Note: when En = 1, parameter TABLE-1 is invalid.	(0~1) 0
U1	Correction Point 1	If PV≤U1, use E1 to correct the temperature slope.	(0-MMC)) M
E1	Correction Point 1	E1 = Actual temperature－PV	(Note4) 0
U2	Correction point 2	If PV≤U2, use E2 to correct the temperature slope.	(U1-M-C) M M
E2	Correction point 2	E2 = Actual temperature－PV	(Note4) 0
U3	Correction point 3	If PV≤U3, use E1 to correct the temperature slope.	(U2-M-C)) M M
E3	Correction point 3	E3 = Actual temperature－PV	(For4) 0

Note4: Temperature Unit is Celsius: -180. 0~180. 0; Temperature Unit is Fahrenheit: -180. 0~324. 0

Description: Before adopting this correction, Pb in 【**parameter TABLE-1**】 should be equal to 0, and the measured value of temperature display should be equal to the corrected value + Pb.

Argument TABLE 5

The Indicator	Name	Description of the parameter function	(Range) Initial value
Lc	Password	Lc=27, parameter values can be viewed and modified at Lc s27.	0
Fc	Temperature unit	0: Celsius; 1: Fahrenheit.	Note5

Note 5: Type PT100: (0~1) 0; K-type thermocouple: (0~0) 0

Argument TABLE 6

The Indicator	Name	Description of the parameter function	(Range) Initial value
Lc	Password	Lc=81, parameter values can be viewed and modified	0
APT	Reservation Time	Set power-up time Description: APT = 0, this function is invalid.	(0~9999 min) 0

Argument TABLE 7

The Indicator	Name	Description of the parameter function	(Range) Initial value
Lc	Password	Lc=567, parameter values can be viewed and modified	0
rST	Factory Reset	0: Cancel; 1: Conform.	(0~1) 0

9. Accessories

Shelves – 2

Optional Accessories

Accessories	Quantity
Spare shelf	1
Multi-segment programable controller	1
USB port /RS485 port/ 232 port/ Built-in printer (Only 1 can be selected)	1
Digital independent temperature limiter	1

Fison Instruments Ltd 272 Bath Street Glasgow G2 4JR UK
Email: info@fison.com | Website: www.fison.com