



# Vacuum Drying Purging Oven

(Controlled by Microchips with Timing Function)

## Operation Manual

**Our Lawyers Say:** This is a general-purpose vacuum oven for professional, industrial or educational use.

It is suitable for a working environment where no flammable, volatile or combustible materials are being heated.

This oven is not intended for hazardous use.

Your satisfaction and safety require a complete understanding of this unit.

Read the instructions thoroughly and be sure all operators are given adequate training before attempting to put the unit in service.

This equipment must be used only for its intended application.

**Our Design Engineers Say:** Your oven is intended for use indoors, at temperatures between 25°C and 40°C, < 80% Relative Humidity. Extreme external temperatures or humidity levels can affect the oven's ability to control temperature.

\* If sample releases vapor under heating, place a dryer between the vacuum pump and the oven to avoid vapor damage to the pump.

\* Always wear thermal gloves and protective goggles during operation.

\* Always use the power cord that comes with the unit. Never modify the cable.

\* Keep oven away from any electromagnetic interference. Do not unplug the oven during normal operation.

\*Do not try to heat flammable/explosive materials or materials that may release corrosive substances.

\*When vacuuming is done, the vacuum valve should be closed first before turning off the power to the vacuum pump; otherwise vacuum pump oil may backflow into the oven.

\*Keep the oven clean at all time; clean the glass and chamber with soft cotton cloth after each use.

\*If oven is to be kept idle for a long time, protect its circuit board with neutral grease or Vaseline to avoid corrosion, and cover the oven entirely to keep it away from dust and moisture.

## 2. Features and specifications

These ovens can greatly reduce drying time by maintaining a consistent vacuum level within the chamber. Oven operation is controlled by a digital microcontroller which is used to achieve temperature precision and accuracy. our vacuum ovens goes through a 24-hour vacuum leak test before leaving our factory.

\*Dual layer observation window with solid tempered safety glass.

\*Radiant wall heating system(Surface Heating Tech) provides optimal uniformity and conserves chamber space.

\*Easy-to-clean 304 stainless steel interior for exceptional durability and ease of maintenance.

\*Adjustable-force latch and door sealing gasket maintain consistent vacuum level.

### **Model:DZF-6050 Vacuum Oven/1.9CF**

Power	220V 50/60Hz 1-PH 5.9 Amps
Power connection	USA standard 3-prong plug
Heaters	1,300 watts.Mica Heating Pads JP tech
Chamber Material	Stainless steel SUS304#
Temperature controller	Low proportional gain, PID control for heater output by microcomputer
Temperature range	Ambient to 100°C
Temperature units	Celsius/Fahrenheit
Temperature accuracy	±1°C/ ±1°F
Dwelling timer range	1-9999 minutes
Chamber dim	415 x 370 x 345mm (WxDxH)
Shelf	Come with 4 removable aluminum heating shelves.
Unit dimensions	710 x 550x 550mm(WxDxH)
Shipping dimensions	840 x 680 x 680mm(WxDxH)
Vacuum level	Better than 500 microns/millitorrs depend on the Vacuum Pump.
Maximum Vacuum	<133Pa
Vacuum Outlet/Gas Inlet	KF-25 Vacuum Port & 1/2"-10mm Hose Port (Gas Back Fill System)
Door gasket material	Silicone
Safety	Built-in circuit breaker, overheat protector
Tempered Glass	15mm tempered safety glass
Shipping weight	81kgs(Packed into Export Woodencase).

Model:DZF-6090 Vacuum Oven/3.2CF

Power	220V 50/60Hz 1-PH 4.5Amps
Power connection	USA standard 3-prong plug
Heaters	1,000 watts.Built inside 2 aluminum shelves for the fastest, most energy efficient and most even heating.
Chamber material	SUS304#
Temperature controller	Low proportional gain, PID control for heater output by microcomputer
Temperature range	Ambient to 100°C
Temperature units	Celsius/Fahrenheit
Temperature accuracy	±1°C/ ±1°F
Dwelling timer range	1-9999 minutes
Chamber dim	18 x 18 x 18" (WxDxH) divided into three sections, arranged vertically.
Shelf	2 non-removable aluminum heated shelves,divided into two 17.5 x 17.5 x4" (WxDxH) sections, arranged vertically.
Unit dimensions	30.9 x 23.4x 27.5"(WxDxH)
Shipping dimensions	33.9 x 27.4 x32.5"(WxDxH)
Vacuum level	Better than 500 microns/millitorrs depend on the Vacuum Pump.
Maximum Vacuum	<133Pa
Vacuum Outlet/Gas Inlet	KF-25 Vacuum Port & 1/2"-10mm Hose Port (Gas Back Fill System)
Door gasket material	Silicone
Safety	Built-in circuit breaker, overheat protector
Tempered Galss	19mm tempered safety glass
Shipping weight	110KG

**Custom Extra 2 removal aluminum shelves for 3.2CF Vacuum Oven.**

Model:DZF-6090 Vacuum Oven/3.4CF

Power	220V 50/60Hz 1-PH 6.8Amps
Power connection	USA standard 3-prong plug
Heaters	1,500 watts.Built inside <b>3</b> aluminum shelves for the fastest, most energy efficient and most even heating.
Chamber material	SUS#304
Temperature controller	Low proportional gain, PID control for heater output by microcomputer
Temperature range	Ambient to 100°C
Temperature units	Celsius/Fahrenheit
Temperature accuracy	±1°C/ ±1°F
Dwelling timer range	1-9999 minutes
Chamber dim	18 x 18 x 18" (WxDxH) divided into three sections, arranged vertically.
Shelf	3 non-removable aluminum heated shelves,divided into two 17.5 x 17.5 x5" (WxDxH) sections, arranged vertically.
Unit dimensions	30.9 x 23.4x 27.5"(WxDxH)
Shipping dimensions	33.9 x 27.4 x32.5"(WxDxH)
Vacuum level	Better than 500 microns/millitorrs depend on the Vacuum Pump.
Maximum Vacuum	<133Pa
Vacuum Outlet/Gas Inlet	KF-25 Vacuum Port & 1/2"-10mm Hose Port (Gas Back Fill System)
Door gasket material	Silicone
Safety	Built-in circuit breaker, overheat protector
Tempered Glass	19mm tempered safety glass
Shipping weight	120KG

**Custom Extra 3 removal aluminum shelves for 3.4CF Vacuum Oven.**

	Model:DZF-6210 Vacuum Oven/7.8Plus
Power	220V 50/60Hz single phase 9.09A
Power connection	USA standard 3-prong plug
Heaters	2000watts. Built inside 5 aluminum shelves for the fastest, most energy efficient and most even heating.
Chamber material	SUS 304#
Temperature controller	Low proportional gain, PID control for heater output by microcomputer
Temperature range	Ambient to 100°C
Temperature units	Celsius/Fahrenheit
Temperature accuracy	±1°C/ ±1°F
Dwelling timer range	1-9999 minutes
Chamber dim	22 x 24 x 25" (WxDxH) divided into three 22 x 24 x 5" (WxDxH) sections, which arranged vertically.
Shelf	5 non-removable aluminum heating shelves with individual in-oven temp sensor, heater and controller (additional stackable shelves available)
Unit dimensions	35 x 31 x 38" (WxDxH)
Shipping dimensions	38 x 35 x 43" (WxDxH)
Vacuum level	Better than 500 microns/millitorrs depend on Vacuum Pump.
Maximum vacuum pressure	<133Pa
<b>Vacuum Pump</b>	<b>13.5 CFM single stage</b>
Vacuum Outlet/Gas Inlet	KF-25 Vacuum Port & 1/2"-10mm Hose Port (Gas Back Fill System)
Door gasket material	Silicone
Tempered Glass	19mm
Unit/shipping weight	220Kgs

**Custom Extra 5 removal aluminum shelves for 7.8Plus Vacuum Oven.**

### 3. Guidelines using the vacuum oven

1. Put your target into the vacuum oven; Close the door; Close the black vacuum release; open the vacuum valve and turn on the power to the vacuum pump to start the purging process, When vacuum level in the oven reaches 30 inch mercury (or read 76cmHg); Close the vacuum valve first BEFORE turn off the vacuum pump.
2. Turn on the Vacuum oven, Set target temperature and confirm it. Temperature in the oven starts to rise and the heating indicator will blink.
3. If your target temperature is low, setting can be done twice to minimize temperature spike. For example, if target temperature is 40°C, the first target temperature value can be set to 30°C, and when temperature rises excessively and starts to drop, set the temperature one more time to 40°C. Thus, temperature overshooting can be reduced or prevented and temperature dwelling state can be started ASAP.
4. Length of drying time should be selected based on humidity level of your sample. In case drying time is long and vacuum level reduces, it is necessary to purge the oven again to restore desired vacuum level (make sure your vacuum pump can work at your target temperature).
5. After purging drying process done, turn off the oven; open the vacuum release valve before opening the door. It is possible that the sealing gasket may stuck onto the glass door and the door cannot be open easily. Wait a while until the gasket restores itself before trying to open the door again.

## 4. Preset target temperature "SP" & Purging working time St

Running mode: after the oven is first turned on, controller will be in running mode.

Setting mode: hold and "Set" button for 6 seconds in running mode to enter into the setting mode.

Controller will return to running mode automatically if no action is taken in 60 seconds.

### 4-1. Setting target temperature and dwelling time

1. Plug in power cable, switch on circuit breaker in the back and turn on the oven.
2. Press 'Set' button once, controller will display "SP", now use "Shift", "Decrease" or "Increase" button to set your target temperature.
3. Press 'Set' again to confirm, controller will display "St", now use "Shift", "Decrease" or "Increase" button to set dwelling time in minutes (you can set it to display in hours with the "Hn" setting). Oven starts timing the first time actual temperature reaches target temperature. If "St" is set to zero, oven will continue to run at target temperature until turned off manually.
4. Press 'Set' again to confirm all settings.
5. When dwelling time is up, the controller will display "End" and buzz for 60 seconds. It can be muted by pressing any button.
6. Press and hold "Reset" for 3 seconds to restart oven operation.
7. During heating, if alarm is set and actual temperature is over that limit, buzzer will sound continuously and "ALM" light will come on. Press any key to mute it.

Prompts	Names	range Default value	Description
Sp	Target Temperature value	Amb+10℃~100℃	Single point control set temperature(℃)
St	Dwelling time	0-9999 (0) minutes	0 = continuous heating, use code "Hn" to change unit

## \*MENU I & MENU II

Under running mode, press and hold "Set" button for 6 seconds; Controller will display "Lc".

Enter **3** and press "Set" for the menu in MENU I

Enter **9** and press "Set" for menu in MENU II.

After you done with the setting change, press and hold "Set" for 3 seconds to **save and exit to running mode.**

### MENU I:

Prompt	Name	Description	default Value
Lc	Pass Key	When Lc = 3, controller enters into the menu below	3
AL	Over-temp alarm	If $SV > (SP + AL)$ , ALM light comes up, buzzer sounds and oven stops heating	0~100(5)
T	Control Cycle	Represents the specific control method of the relay.	5
P	Proportional	Increase P reduce temperature overshooting, decrease P to allow faster heating rate.	35
I	Integral	Increase I to lower temperature fluctuation	1~1000s (200s)
D	Differential	Adjusted to reduce temperature overshooting.	0~1000s (200s)
Pb	Ambient adjustment	Offset the temperature difference ambient and oven when it is turn off. $Pb = \text{temperature measured by exterior thermocouple(s)} - \text{temperature displayed by controller}$	-10~10 (0)
PK	Hot adjustment	Offset the temperature difference between the controller and actual reading inside the oven. (use the calibration formula in 5-2 section)	-999~999 (0)
Et	Timing Function	0: no timer function 1: with timer function, SV window will always display dwelling time. 2: with timer function, SV window will display dwelling time after oven temperature reaches target temperature.	0~2(2)



**MENU II:**

Prompt	Name	Description	default Value
Lc	Pass key	When Lc = 9, controller enters into the menu below	9
Co	Shut off	If SV>(SP+Co), ALM light comes up, buzzer sounds and oven stops heating	0~50(5)
	Heat Function		
Hn	Timer unit	0: minute 1: hour	0-1 (0)
En	Timer end mode	0: stop temperature controller when dwelling time is over 1: continue to display temperature when dwelling time is over	0~1(0)
Lt	Max Watt Output	Max Watt heating Output	0~100 <b>(100)</b>
oP	Door Controll Function	0,Door Controller Function(Close) 1,Door Controller Function (Open)	0~1 (1)
		<b>*The Function is under innovation.</b>	
rH	Max temperature	Set maximum temperature the controller can go to (Do NOT modify. Setting max temperature too high could permanently damage your oven)	0~400 (100)

## AutoTune

1:) Plug on 220Volts 50/60Hz Open the power switch.

2:) Press "set" then increase or decrease to target temp (eg. Sp=33).  
then press "set" (St=0) and then press "set" 6 seconds save and exit.

It is easily to operate in default leaving factory for purging drying process.

If client are not satisfied with target temp (always find over heat problem) during heat process.

How to make it normal working? Easily Follow below steps:

1:) Power Off Vac Oven and Open Door Cool down inside oven temp below 33deg C----(Cool Down 30-50minutes).

2:) Power On. Then Press "set" 6" it will showing Lc" increase 3 then entry into "Menu I" Press "Set" again to find out "P" increase "35" press "set" again I" increase "200" press "set" then D" increase "200" then press "set" 6" save and exit.

3:) Press "AT" 6" it will entry into Autotune Process for (eg 33deg C ) The "AT" light flashing and working to find out the best PID data and save and exit (once it finished the light always light on). Then Power Off. Wait 30 minutes.

Autotune Process function: in order to avoid Over Heating Temp (eg. You want 48deg C if AT, it will not over heat higher than <50deg C) to protect material.

Caution: Autotune Process 50deg C ( 30-50deg C ) the uniform temp working well and without over heat temp.

## 5. How to Calibrate your vacuum oven.

NOTE: Before calibrating your oven, make sure you are familiar with basic oven heating operation. Every oven has been calibrated and tested before leaving our factory, usually self calibration is not necessary. However, if the temperature requirements are very strict, or if target temperature is set around upper or lower limits of the oven temperature range, the measured temperature might not be accurate against the actual temperature in the oven.

### 5-1. Calibration by Auto-Tune (AT)

Use auto-tune to set a more accurate temperature control and faster heating rate.

- a. Set temperature to your maximum target temperature, press "Set" to confirm.
- b. Under running mode, press and hold "Shift/AT" button for 5 seconds until the indicating light "Run/AT" starts to blink. The oven is now in PID auto-tune mode.
- c. After two cycles of fluctuation, auto-tune is done and the AT light goes off. This could take a few hours. The "Set" button is disabled during this period.
- d. New PID parameters are automatically saved for future use.
- e. Now set the target temperature. You will be ready to use the oven.

### 5-2. Calibration by formula

First, calculate the offset value using the formulation below. Then press and hold "Set" button for 3 seconds; controller will display "Lc". Enter 3 and press "Set". Go to "PK" and set it to your calculated offset value.

Press and hold "SET" for 3 seconds to confirm.

Offset value = (temperature measured by exterior thermocouple(s) – temperature displayed by controller) x 1000 / temperature displayed by controller

### 5-3. Calibration by adjusting PID manually (requires experience and practice)

After an auto-tune, if you still feel that temperature is unstable, you can manually adjust PID. PID adjustment is a very useful for you to control the oven temperature in an acceptable range but requires some practice and patience.

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- a. First, adjust P whenever you start a PID adjustment. P represents proportion adjustment; increasing P reduces temperature overshooting, while decreasing P to allow for a faster heating rate. (You may need to try this step a few times before you get the best result).
- b. "I" represents integral time. Increase I to lower temperature fluctuation. It can be used to eliminate the steady-state error after the system enters a steady state by correctly setting P. In other words, I is often used after P. Give I a big value before decreasing P a little, in order to get to a steady state, and then decrease I to eliminate errors under the steady state. Check if the PV is in your desired range. Continue to try to change P and I to get the best result.
- c. "D" represents differential time, which can overcome the unstable and oscillating state. Adjust D to reduce temperature overshooting. It is usually set after I adjustment. Firstly, set D to 0, then gradually increase it to check if you have an acceptable result (In this process, P and I may also be changed).

## 6. Troubleshooting.

Without Power	Without power supply	Check power supply
	Broken power cord or Loose plug	Change power cord
	Circuit breaker is off	Turn on circuit breaker
PV window is displaying "-----", "LLL.L" or "HHH.H"	Faulty pt100 thermocouple or loose connection	Check connection or change thermocouple
	Faulty temperature controller	If the thermocouple is OK and connection is good, replace the temperature controller.
Failure to heat unit  Temperature control Fail	Setting times out	Modify the set time and restart the oven
	Loose connection on temp controller	Check and make sure all connection
	Faulty controller	Replace temperature controller
	Faulty heating element	Replace heating elements
	Parameter error	Reset all parameters to default
	Loose connection on pt-100 thermocouple	Check all connections
	Faulty controller	Replace temperature controller
Preset temperature too low	Adjust preset temperature	
Abnormal alarming for oven temperature	Faulty controller	Replace temperature controller
	Without Vacuum	Vacuum the oven
Large temperature difference between PV value and actual value	Parameter error	Reset all parameters to default
	Sensor of thermometer has been placed at incorrect place	Place the sensor on the oven self

## 8. Support

We offer 2 year limited replacement warranty for all electronic parts from the date we shipped goods. If you find any defective parts caused by manufacturer please feel free to contact us and we will replace them for you.

**420PMUK** is not responsible for any damage or consequence damage caused by misuse. After the warranty period, we will continue to provide support and spare parts at a reasonable cost.