

# DHG-9000J/JB High Temperature Convection Oven

## Operation Manual



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Thanks for purchasing MTI's product, please carefully read this manual before operation, MTI has no responsibility for the damage caused by customer's misuse.

MTI has right to upgrade the product without informing customer, please regularly go to our web [www.mtixtl.com](http://www.mtixtl.com) to get the latest information.

## Introduction

- DHG-9000J Mechanical Convection Oven combines forced-air circulation to achieve dependable, uniform conditions for variety of laboratory applications.
- 30 segments programmable precision temperature controller with +/- 1 °C accuracy.
- Quality steel and fibrous refractory shells allow Max. working temperature up to 400 °C.
- 4" x 18"x18" large stainless steel chamber with two shelves.
- A gentle downward flow along the inside of the chamber provides less disruption of sample material.

## Specification

Model Number	DHG-9000J	DHG-9000JB
Amps	16	10
Chamber Dimensions D x H x W	14" (35 cm) x 18"(45cm) x 18 " (45cm)	14" (35 cm) x 14" (35 cm) x 14" (35 cm)
Chamber Volume	71 liters	43 liters
Operating Temp Range C	25°C - 400 °C	25°C - 400 °C
Recommended Heating Rate	5°C / sec	5°C / sec
Maximum Heating Rate	7°C / sec	7°C / sec
Overall Dimensions D x H x W	26" x 26" x 32"	23" x 24" x 31"
Temp Uniformity at 100	+/- 3°C	+/- 3°C
Volts	208 - 240 VAC	208 - 240 VAC
Watts	3200	2200
Net weight (kg)	90	80

## Operation

MTI's technicians always run a test operation before shipping out the products. Customer shall read this instruction carefully and get familiar with various functions of this product before operating on it.

## Operating environment

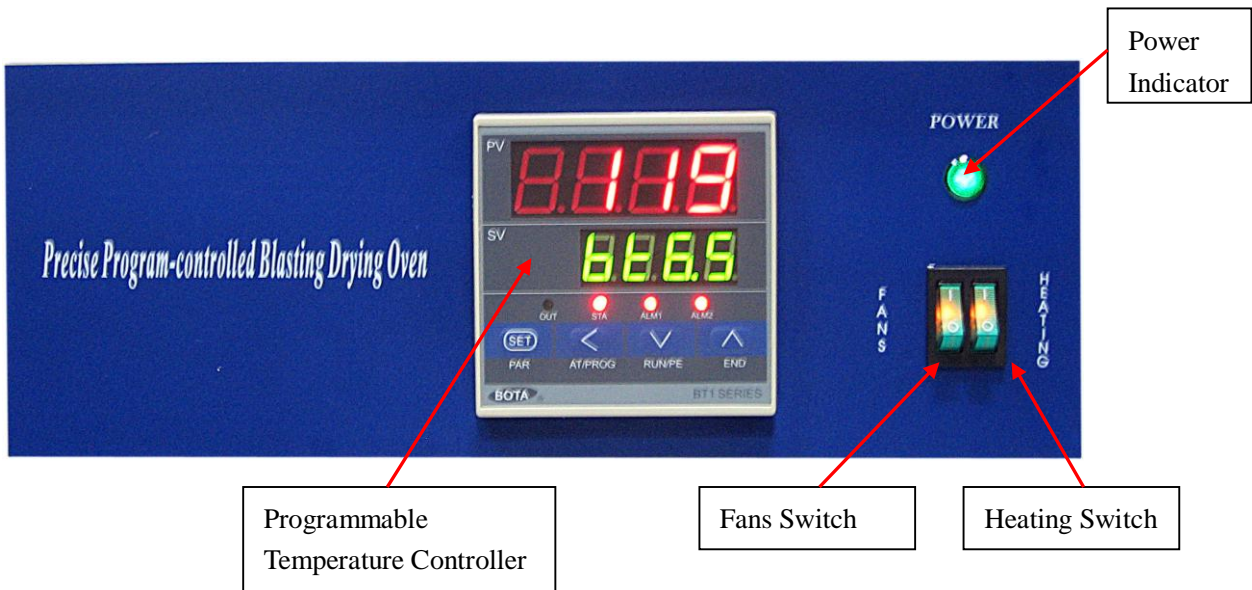
The operating environment information in the following table may be helpful if you plan to safely operate the instrument:

- The construction request a dry, hard and flat surface;
- The instrument shall be kept indoor with nice ventilation and avoided direct

- sunlight;
- Operating temperature: 20 °C~400 °C;
- Relative humidity (noncondensing): 10%~85%;
- Dust-free.

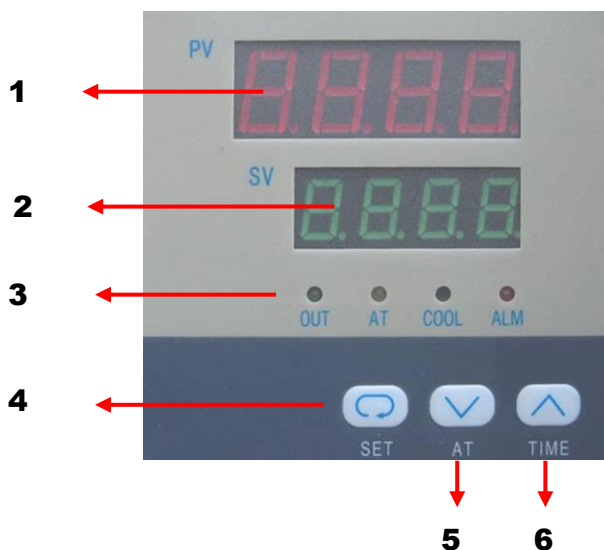
**⚠ WARNING:** To reduce the possibility of heat-related injuries or of overheating the instrument, do not place the instrument too close to the side wall or obstruct the air vents. Keep the instrument at least 1 meter in distance from the side wall.

## Structure of the panel



## Temperature control

### Controller interface



1. PV (present value)
2. SV (setting value)
3. Status indicator
  - OUT (output)
  - AT (auto-tune)
  - COOL (cooling)
  - ALM (alarm)
4. "Set" button (abbr. **SET**)
5. Decrease/Auto-tune (abbr. ▼)
6. Increase/time record (abbr. ▲)

### Parameter Set Up

- Press and release the **SET** button one time. The controller will enter the user defined menu. Press and release the SET button to change the parameter option and then press ▲ or ▼ to modify the value of corresponding parameter.

- Press and hold button for 5 seconds. The controller will enter the system menu. The method to modify system parameters is in the same way.

## Parameters

Param.	Name	Setting Range	Description	Default
<b>PP</b>	Segment Set	1-28	Total 28 segments can be set by user. If the PP is set to be "1", there is 1 segment. The oven will shut down when the time is up (if time is set). If the PP is set to be "2" or more, it follows the sequence from the first segment (PP01) to the next segment (PP02) and then the next next.	User defined
<b>SO</b>	Set value	0~400°C	The target temperature	User defined
<b>TI</b>	Dwell Time	0~999minutes	The "TI" function will start once the actual value (PV) reaches the set value (SV). If the TI is set to be "0", the timer function will be deactivated. The oven will keep dwelling at the temperature according to the current set value (SV) until manually shut down.	User defined
<b>Po</b>	Power output	0~100	The value of "Po" represents the percentage of the power output. Adjusting the limit the power output and change the temperature heat-up rate.	User defined
<b>SHP</b>	Temp. Alarm	0~400	The value of "SHP" represents the range of the temperature deviation between the PV and SV. If the actual deviation is more than the value of "SHP", the power will be cut off and "ALM" light will be on until the temperature is return into the required range.	2
<b>P</b>	Proportional	0~9999	Larger the value of "P", lower the system-gain	
<b>I</b>	Integral	0~9999	Larger the value of "I", weaker the effect.	
<b>d</b>	Differential	0~9999	Larger the value of "d", stronger the differential effect. And this can decrease the possibility of overshoot.	
<b>T</b>	Control cycle	1~99 seconds	"T" represents the specific control method of the relay.	2
<b>Sc1</b>	Zero Correction	-99.9~+99.9°C	"Sc1" represents the 0 point correction for the error caused by the thermal couple compensating wire.	
<b>Sc2</b>	Full Scale Correction	-99.9~+99.9°C	"Sc2" represents the full scale point correction for the error caused by the thermal couple	

			compensating wire.	
<b>Lok</b>	lock	0-2	Set to be "0", all the parameter can be modified freely. Set to be "1", only the user defined parameters can be modified. Set to be "2", none of the parameters can be modified.	0

### Temperature Setting Method

1. Power on the oven. Wait for a few seconds for the self-test and then the controller enters the temperature displaying interface. PV window is showing the real temperature in the oven chamber. SV window is showing the set value of the temperature. *(The oven will start heating several seconds after turning on the power automatically.)*
2. Press and release **SET** one time. Then the PV window indicates "PP". SV window indicates "1" which means the 1<sup>st</sup> segment. *(Now if press and release SET for more times, the PV window will show more parameters in sequence as So1, TI1 and Po1. And finally return to "PP". The corresponding values will be showing in SV window. Please remember when the value of "PP" is set to be "N" ("N" could be 1 to 28), then all the parameters will determine the N<sup>th</sup> segment only.)*
3. Press and release **SET** again. PV window shows "So01". Now use ▲ or ▼ to set the required temperature. And then accordingly, set the other parameters for the 1<sup>st</sup> segment. (TI1 and Po1) *(If there is no specific need, please set the "Po" to 100 as default.)*
4. Change the value of "PP" to 2~28. And set values for each segment in the same way.
5. **Please make sure the values of "SO" and "TI" in the unnecessary segments are "0".**
6. Finally press and hold **SET** for 5 seconds to return to normal state.

### Heat-up Process

In order to prevent the temperature overshooting as well as extend the service life of door gasket, please do the multi-step heat-up process as follows to increase temperature:

Prompt	Input Data	Description
So01	X	Target temperature of the first heatup stage
TI01	10	Hold 10 min at X degree C before reaching the target temp.
So02	T	Target temperature of the second heatup stage
TI02	9999	Holding time at your target temperature

T-50=X

T is your final target temperature.

X is your target temperature of the first stage (the temperature should be hold before reach the final target temperature)

## PID Parameters

PID consists of three parameters: P (proportional), I (integral) and d (differential). They are associated with each other. The correct combination of these three parameters can improve the performance of the oven to a large extent.

- **Auto-tune**

Auto-tune is the function which can automatically adjust the PID parameters in order to optimizing the temperature control. When the temperature control is not stable, please do the auto-tune for the oven as following procedure:

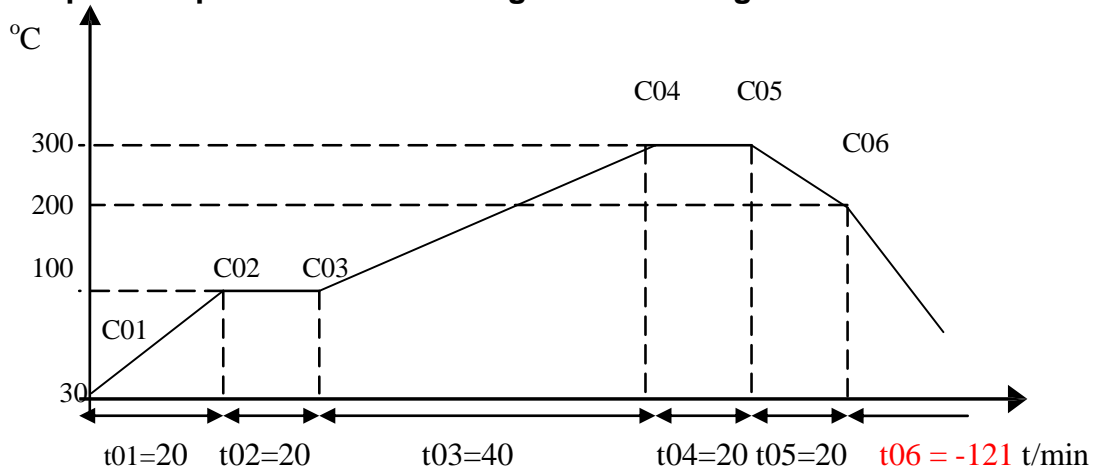
1. Set up the temperature to 70 – 80°C.
2. Press and hold the ▼ button for 5 seconds until the “AT” light is on (yellow) which indicates the oven is doing auto-tune.
3. The auto-tune will finish after two periods of fluctuation and the “AT” light turns off. The new PID parameters will be automatically stored.

- **Manual adjustment**

1. P (proportional): If there is a large overshoot temperature, please increase value of “P”. If you want to raise the temperature faster, lower the P value.
2. I (integral): If the temperature fluctuation is too large, increase I or contrarily.
3. d (differential): The value is generally between 1/5 ~1/4 of parameter I.

## Illustration of Temperature Segment Setting

### Setting Example: Temperature Control Program with 6-segments



According to figure 1 above, all segments was recorded in the following:

Prompt	Input Data	Description
C01	30	Initial Temperature
T01	20	Heat-up time 20 minutes from 30-100 °C in the first segment
C02	100	Target temperature of the first heat-up stage
T02	20	Keep 20 minutes at 100 °C in the second segment
C03	100	Target temperature of the third stage
T03	40	Heat-up time 40 minutes from 100-300°C in the third segment
C04	300	Target temperature of the fourth stage
T04	20	Keep 20 minutes at 300°C in the fourth segment

C05	300	Target temperature of the fifth cooling stage
T05	20	Cooling time 20 minutes from 300-200°C
C06	200	Beginning temperature of the sixth stage
T06	-121	Program end, Out-put power off. Furnace cooling down naturally. (t06 = -121 is an order to stop running)

## Troubleshooting for typical Problems

### Troubleshooting resources

- Refer to “Quick troubleshooting”, the next section in this chapter;
- Visit MTI web site link: [WWW.MTIXTL.COM](http://WWW.MTIXTL.COM) for additional information about the instrument through Help and Support;
- Contact us by tell: 510-525-3070 or email: info@mtixtl.com.

### Maintenance and Caution

The drying oven should be put in a room with good ventilation, and the explosive and combustible goods should not be placed around or inside it.

Space inside chamber is required for hot air circulation.

Both inside and outside the oven should always be clean and it should be covered with a dustproof plastic cover and put in a dry environment if it is left idle for a long period of time.

For the purpose of heat discharge, it is not advisable to put anything on top of the lid of this equipment.

Regularly check the flexibility of switches and instrument keys.

The power should be cut off and the power cord be unplugged while maintenance and job done.

### Quick Troubleshooting

Tro	C	Solu
1. No power	1. Disconnection of plug or power failure 2. Fuse broken	1. Plug on the power or make proper wiring 2. Change fuse

2. No temperature rise in the oven	<ol style="list-style-type: none"> <li>1. Low preset temperature</li> <li>2. Defective heater</li> <li>3. Defective temperature controller</li> <li>4. Defective circulating fan</li> <li>5. Not start the instrument switch</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust preset temperature</li> <li>2. Change heater</li> <li>3. Change temperature controller</li> <li>4. Change circulating fan</li> <li>5. Start the instrument switch</li> </ol>
3. Large difference between the actual temperature and the preset value	<ol style="list-style-type: none"> <li>1. Defective sensor</li> <li>2. Defective temperature controller</li> </ol>	<ol style="list-style-type: none"> <li>5. Change sensor</li> <li>6. Change temperature controller</li> </ol>
4. Abnormal temperature overshoot alarming	<ol style="list-style-type: none"> <li>1. Preset temperature too low</li> <li>2. Defective temperature controller</li> </ol>	<ol style="list-style-type: none"> <li>7. Adjust the preset temperature</li> <li>8. Change temperature controller</li> </ol>

If you have any questions please call or email us, MTI engineers will help you within 24 hours.