

## How to Calibrate Vacuum Oven

**NOTE:** Before calibration, please make sure you are familiar with the procedure of oven heating, otherwise, please review the operation manual.

When you try to achieve more accurate temperature control, you must calibrate temperature of oven and set-up temperature off if any based on your sample and container placed in chamber, because temperature inside oven will vary with size of sample and container changing. Please kindly follow the following procedure to calibrate oven temperature.

### 1. Find hot zone with temperature uniformity

The vacuum oven is heated from side wall of chamber. Temperature varies up to 30 °C from wall to door. You shall find uniform temperature zone (+/- 5 °C) inside chamber before putting your sample in.

MTI's calibration for the oven is as the follow as your reference. (However, you shall calibrate temperature based on your sample size).



Figure 1

- As shown in Fig. 1, **Omega precision Temperature Calibration Kit** (right click [here](#) to open hyperlink) is used in the experiment. Two K type thermal couples are placed inside chamber and attached to creamer sample.
- Use temperature controller to heat the oven to your desired temperature (For details, consult operation manual, this process may be maintain a long time, please set the time parameter named "TI" up to 999 minutes ).
- When the PV displaying on the control panel is to be the desired temperature and stable, apply the function "Auto-tune" (For details, consult operation manual, and then, wait until the this function finish automatically, which may take 30 – 90 minutes ).
- Place the sample or container with thermocouple at the point you are interested in. Waiting for temperature stable within +/- 1 °C, then record temperature from oven display and from thermometer.
- Open the door, wear the gloves, move the sample with thermocouple to another position, then record temperature difference from oven display and thermometer for calibration.
- Repeat step "e" to finish all the positions to be measured, and show all temperature points vs chamber position. (see Fig. 2 )

Below is example that we measure 7 temperature points in hot zone of vacuum at 100 °C. The result shows that the oven has +/-5 °C temperature uniformity at 6"x6" central area (The chamber is 12"x12").

:

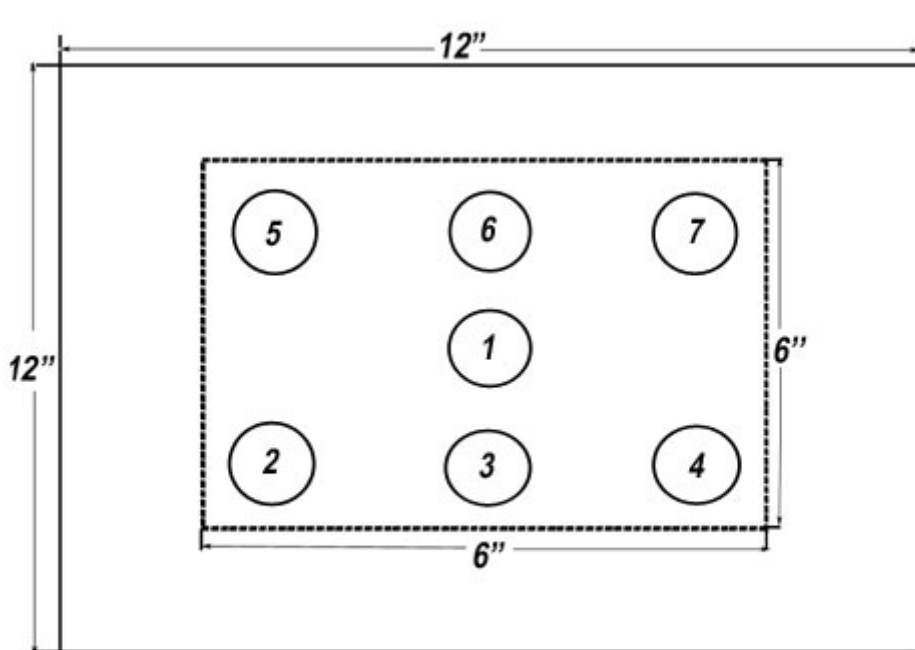


Figure 2

The temperature of the position:

Position Number	Temperature (°C)
1 (reference point in the center)	93
2	95
3	92
4	96
5	97
6	97
7	96

Table 1

When we set the desire temperature is 200 °C, we find the uniformity in this zone is ±10 °C, the data and figure are shown below:

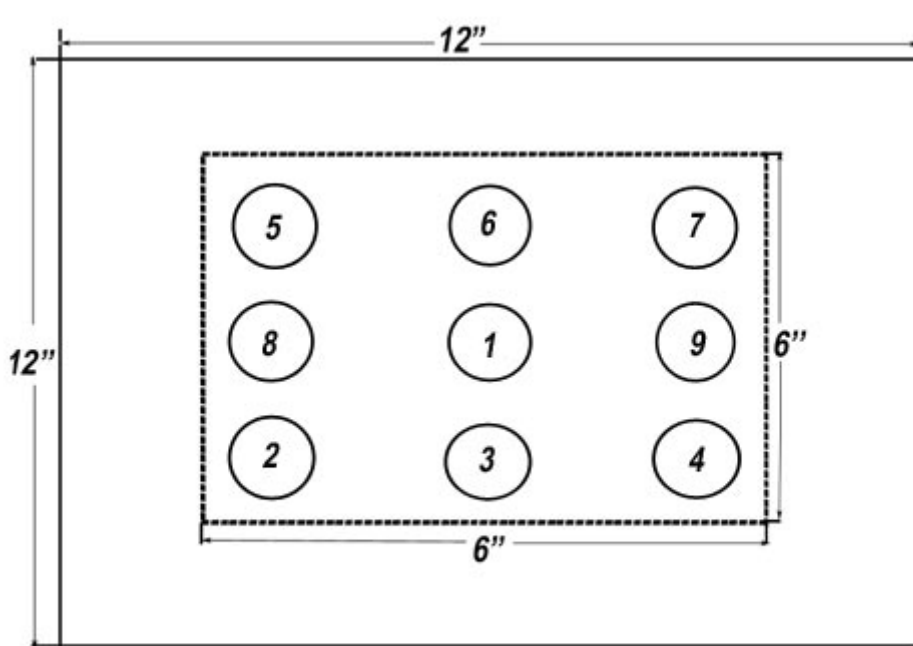


Figure 3

Position Number	Temperature (°C)
1 ( reference point in the center)	186
2	191
3	199
4	192
5	196
6	189
7	196
8	198
9	190

Table 2

2. Temperature offset:

From step 1, you may notice that the readouts from the oven meter and the thermometer are different, so, in order to get the exact value, please do offset as following:

- a. Compare the actual temperature you measured in setp1 with the readout from the oven meter.
- b. Calculate the offset value by the following formula:

$$\text{Offset value} = (\text{error value} * \text{measurement range}) / \text{desired value}$$

- c. Push the function key "SET" 5 seconds. Go to "SC2" and set the new offset value.
- d. Push "SET" key 5 seconds and return to standard display mode.