

## Blue M Inert Gas Furnace

**Note:** There is a Glossary at the end of this manual.

### Overview

The Blue M IGF-6680E-MP is an electric industrial furnace capable of providing an inert gas atmosphere in the heating chamber. The furnace is controlled by a Pro-Master I microprocessor controller from hell. Temperature is monitored by two thermocouples, one for the controller and one for the overtemperature alarm. The overtemperature alarm is set to 593 °C.

The furnace is to be used for polyimide and wafer bonding only!

Material must be clean and free of hydrocarbons before it is put in the furnace.

Maximum operating temperature: 593 °C.

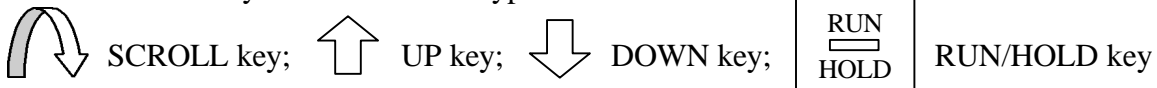
Maximum heating rate: 10 °C per minute.

Maximum allowed temperature for turning furnace toggle switch off: 180 °C.

Purge flow rate: 100 SCFM (standard cubic feet per minute).

Run flow rate: 22.5 SCFM.

Please familiarize yourself with the keypad:



There are two ways to check the settings for a profile:

1.
  - a) Press the **SCROLL** key until the profile number is displayed.
  - b) Press the **DOWN** key, this will run the purge for the profile.
  - c) Press the **RUN/HOLD** key, this will pause the profile.
  - d) Press and hold the **DOWN** key and press the **SCROLL** key. The controller will automatically display all of the values for the profile you chose.
  
2.
  - a) Press the **SCROLL** key until **PEnt** is displayed.
  - b) Press the **DOWN** key. The controller will display **Pn** (profile number).
  - c) Press the **SCROLL** key. Press the **UP** or **DOWN** key for desired value.  
**DO NOT USE PROFILE 8!!! This profile is reserved for the cooling cycle only!**  
Pressing the **SCROLL** key will display the values for the profile you chose.

**Note:** Time is in **HRS.MIN** (NOT hrs.tenths)

## Operating Instructions for a Single Temperature WITHOUT nitrogen purge.

1. Sign in log sheet.

**CAUTION:** Please read instructions carefully, as improper operation will cause destruction of motor bearings.

You ALWAYS need to run 7.5 SCFM nitrogen to protect the door seals. This is the throat flow. This is totally different from nitrogen to purge the chamber.

2. Turn on valves on nitrogen cylinders (face away from the gauges when you do this on any high-pressure cylinder). Check that you have 100 PSIG for each hour of operation plus an additional 200 PSIG for the cool-down.

E.g. (2.5 hours  $\times$  100 PSIG/hour) + (200 PSIG for the cool-down) = 450 PSIG minimum cylinder pressure for 2.5 hours run.

Regulator output should read between 40 and 50 PSIG.

3. Turn on power with the toggle switch. Controller will display initialization messages. When these are done controller will display **oFF**.

4. Adjust the throat flowmeter to 7.5 SCFM.

5. Press the **SCROLL KEY** until **Ctrl** is displayed.

6. Press the **DOWN** key. This turns on the furnace and puts you in the mode to set the temperature. The LED above "OUT 1" will be on and the purge light will be on. The controller will alternately display the current furnace temperature (the LED next to the °C to the right of the display will be on) and the previous setpoint (the green LED under "S.P." directly to the left of the display will be on).

7. Press the **UP** or **DOWN** keys to actually set the temperature you want. This is the setpoint.

The furnace will begin a purge cycle for 27 minutes, even if you are not doing a nitrogen purge. Heating will NOT begin until the purge cycle has ended. Opening the door will RESET the purge timer to zero and the purge cycle will start over.

When the furnace begins heating the purge light will be off and the heat light will be on. The controller will alternately show the current temperature and the setpoint.

The furnace will maintain the setpoint until you turn it off. You must follow the shut down procedure. If you do not, the motor bearings will surely seize and the wrath of Tony Cocco will fall upon you and all your days in MAL shall be filled with woe.

To **shut down** the furnace:

1. Press the **SCROLL KEY** until **Pn8** is displayed.

2. Press the **DOWN** key. This will turn off the heat and start a cooling fan. This process will run automatically for one hour. You can remove your work and turn off the toggle switch when the furnace temperature is below 180 °C.

3. Close valves on nitrogen cylinders.

4. Complete log sheet.

## Instructions for Nitrogen Purge

You need 450 PSIG for the purge plus 25 PSIG per hour of operation. This is in addition to the throat flow.

E.g. for 2.5 hours of operation, not including cool-down:

Throat Flow = 450 PSIG (as calculated above) + 450 PSIG purge + (2.5 hrs × 25 PSIG) = 965 PSIG nitrogen required.

**Important:** During the purge cycle a solenoid-operated valve is automatically opened to allow nitrogen to flow into the heating chamber. When the purge cycle is over this valve closes! You must open the **RUN FLOW ADJUSTMENT VALVE** (located below the flow meters) to allow nitrogen into the heating chamber during the run cycle.

During the 27-minute purge cycle the flow meter should be set to 100 SCFH. This will provide a volume of gas seven times the volume of the chamber to flow through the chamber during the purge cycle.

During the run cycle the flow meter must be readjusted to 22.5 SCFH. Keep the flow at this rate until your sample has cooled enough to expose it to air.

When you are finished turn the **RUN FLOW ADJUSTMENT VALVE** off.

Turn off valves on nitrogen cylinders.

## Instructions for Entering a Profile

1. Get a profile work sheet from this manual.
2. Decide what combination of heat up, cool down, and constant temperatures you want and fill out the profile worksheet.

**Note:** if the desired value is displayed you do not have to press the **UP** or **DOWN** key.

3. Turn on Furnace.
4. Press **SCROLL** key until **PEnt** is displayed.
5. Press **DOWN** key to enter program mode. Controller will display **Pn** (profile number).
6. Press **SCROLL** key. Press **UP** or **DOWN** key for desired value. **DO NOT USE 8!!!** This profile is reserved for cooling cycle only!
7. Press **SCROLL** key. Controller will display **nS** (number of segments).
8. Press **SCROLL** key. Press **UP** or **DOWN** key for desired value.

*If your profile has more than one segment the profile program will loop back to here.*

9. Press **SCROLL** key. Controller will display **rt** (ramp time) and will light the LED above the current segment.
10. Press **SCROLL** key. Press **UP** or **DOWN** key for desired value.
11. Press **SCROLL** key. Controller will display **SP** (setpoint).
12. Press **SCROLL** key (the segment LED will go off for this input). Press **UP** or **DOWN** key for desired value.
13. Press **SCROLL** key. Controller will display **E2** (event 2).
14. Press **SCROLL** key. Press **UP** or **DOWN** key to turn on or off.
15. Press **SCROLL** key. Controller will display **St** (soak time).

16. Press **SCROLL** key. Press **UP** or **DOWN** key for desired value.
17. Press **SCROLL** key.

*If you have entered the last segment in your profile the program will continue below, otherwise it will loop back to **rt** (ramp time).*

18. Controller will display **PLCt** (profile loop count).
19. Press **SCROLL** key. Press **UP** or **DOWN** key for desired value (you should probably set this to **1**).
20. Press **SCROLL** key. Controller will display **dhru**.
21. Press **SCROLL** key. Press **UP** or **DOWN** key and set to **5**.
22. Press **SCROLL** key. Controller will display **dhrd**.
23. Press **SCROLL** key. Press **UP** or **DOWN** key and set to **0.P**
24. Press **SCROLL** key. Controller will display **Pend**.
25. Press **SCROLL** key. Press **UP** or **DOWN** key and set to **0**. This is important!
26. Press **SCROLL** key. Controller will display **Pn** (controller has looped back to beginning of program mode).
27. Press **UP** key to exit programming mode. You are now finished entering your profile.

---

## Blue M Inert Gas Furnace Glossary

**Controller:** The Pro-Master I control unit. The box with all the buttons and lights.

**Event 1:** The heating elements, also the controller itself. Automatically set to on.

**Event 2:** The cooling fan. Blows room air around (not into) furnace chamber.

**Profile:** A set of heating, cooling, or constant temperature periods. A profile may contain up to six segments.

Profile loop count (**PLCt**): Number of times to repeat a profile.

**Ramp:** A change in temperature. Either up (heating) or down (cooling). Always comes before a soak.

**Segment:** A part of a profile that includes one ramp AND one soak (cf.).

**Setpoint:** A temperature.

**Soak:** A period of constant temperature. Always comes after a ramp. Maintains same setpoint as preceding ramp.