

AMADA MIYACHI AMERICA

The World Leader in Hermetic Sealing Systems

MX2000 Operational Manual

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FOREWORD

The purpose of this manual is to supply operating, maintenance and service personnel with the information needed to operate the MX2000.

Should questions arise, or if you have suggestions for improving this manual, please contact:

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NOTICE

Amada Miyachi America may be released from all warranty obligations if repairs or modifications are made by persons other than its own service personnel, or its authorized representatives, unless such repairs or modifications are specifically authorized in writing by Amada Miyachi America.

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1.0 INTRODUCTION

The *MX2000* system is a fully operating Controlled Environment Glovebox designed for laboratory use or with various materials processing equipment. The system is equipped with an automatic or manual control workstation chamber, vacuum bakeout oven, and a flushing pass-thru interchange. The *MX2000* system is designed for integration with any one of Amada Miyachi America's precision seamsealing systems, or other customer supplied materials processing equipment.

2.0 GENERAL SAFETY WARNING

Warning

Throughout this equipment lethal voltages exist. Contact with voltages present in this system may cause serious or fatal injuries. Please read this and all manuals completely and note all cautions and warnings before attempting to install, to operate or to maintain the system.

It is of the utmost importance that the service or test personnel be completely familiar with all aspects of this equipment and operation. During any diagnostic test involving motion, be sure hands are clear of all moving parts

3.0 STANDARD SYSTEM SPECIFICATIONS

3.1 ENCLOSURE

- Glove Ports: Two (2) or Four (4) - **8"** (203mm) diameter ports
- Enclosure size: **48"** (1219mm) or **56"** (1423mm) (**L**) x **39"** (990mm) (**D**) x **36"** (914mm) (**H**). Custom sizes are available
- Pressure Control: Manual Set Rotometer or Automated Pressure Control Mechanism
- Lighting: 39 Watt Fluorescent
- Input Voltage: 208-240 Volts, 50 /60 Hz, Single Phase
- Input Current: 30 Amperes
- Gas Input: N2 @ 80 PSIG (551 KPa)
- Optional analyzers: Oxygen, Moisture, Helium

3.2 END LOADING INTERCHANGE 14" STAINLESS STEEL

- Material: Type 304 electro-polished stainless steel
- Size (internal): **14.0"** (356mm) (**L**) x **7 5/8"** (194mm) (**H**) x **7 5/8"** (194mm) (**W**)
- Controls: Manual Backfill On / Off and Vacuum On/Off. Optional Automated Backfill and Vacuum.
- Vacuum Level Options: 20 mTorr (1 mTorr optional)
- Door operation: Manual Doors with Manual Lock

3.3 END LOADING INTERCHANGE 18" STAINLESS STEEL

- Material: Type 304 electro-polished stainless steel
- Size (internal): **18.0"** (457mm) (**L**) x **11"** (279mm) (**H**) x **12"** (304mm) (**W**)
- Vacuum Level Options: 20 mTorr (1 mTorr optional)
- Controls: Manual Backfill On / Off and Vacuum On/Off. Optional Automated Backfill and Vacuum.
- Door operation: Manual Doors with Automatic Lock

3.4 VACUUM BAKE OVEN 14'' STAINLESS STEEL

Material: Type 304 electro-polished stainless steel
Size (internal): **14.0''** (356mm) (**L**) x **7 5/8''** (194mm) (**H**) x **7 5/8''** (194mm) (**W**)
Vacuum Level Options: 20 mTorr (1 mTorr optional)
Max. Temp: 125° C (200° C. optional)
Temperature Variance: $\pm 5^{\circ}\text{C}$
Heater zone: 1 Zone
Safety Over Temp: 150° Centigrade for low temperature oven and 220 ° Centigrade for high temperature oven. **Note:** adjustable to any temperature up to $274^{\circ}\text{C} \pm 10^{\circ}\text{C}$
Controls: Manual Backfill On / Off and Vacuum On/Off. Optional Automated Backfill and Vacuum.
Door operation: Manual Doors with Manual Lock

3.5 VACUUM BAKE OVEN 18'' STAINLESS STEEL

Material: Type 304 electro-polished stainless steel
Size (internal): **18.0''** (457mm) (**L**) x **11''** (279mm) (**H**) x **12''** (304mm) (**W**)
Vacuum Level Options: 20 mTorr (1 mTorr optional)
Max. Temp: 200° C
Temperature Variance: $\pm 5^{\circ}\text{C}$
Heater zone: 4 Zones
Safety Over Temp: 220 ° Centigrade. **Note:** adjustable to any temperature up to $274^{\circ}\text{C} \pm 10^{\circ}\text{C}$
Controls: Manual Backfill On / Off and Vacuum On/Off. Optional Automated Backfill and Vacuum.
Door Operation: Manual Doors with Automatic Lock

3.6 VACUUM BAKE OVEN 18'' STAINLESS STEEL HEATED SHELF

- Material: Type 304 electro-polished stainless steel
- Shelf Material: Type 304 electro-polished stainless steel or anodized aluminum
- Size (internal): **18.0''** (457mm) (**L**) x **11''** (279mm) (**H**) x **12''** (304mm) (**W**)
- Vacuum Level Options: 20 mTorr (1mTorr optional)
- Max. Temp: 200° C (300° C optional for Al shelf only)
- Temperature Variance: $\pm 5^{\circ}\text{C}$ for stainless steel shelf and $\pm 2^{\circ}\text{C}$ for aluminum shelf
- Heater zone: 3 Zones (2 shelves and 1 radiator)
- Safety Over Temp: 220° Centigrade for 200°C and 320°C for 300°C . **Note:** adjustable to any temperature up to 274° C $\pm 10^{\circ}\text{C}$
- Controls: Manual Backfill On / Off and Vacuum On/Off. Optional Automated Backfill and Vacuum.
- Door Operation: Manual Doors with Automatic Lock

4.0 INSTALLATION AND HOOK-UP

4.1 UNPACKING:

The *MX2000* system is shipped fully assembled. Remove all packing materials and visually inspect the system for obvious signs of shipping damage. Report any damage immediately to the carrier. The carrier claims agent must file a report with the user which can then be forwarded to:

**AMADA MIYACHI AMERICA
1820 S. Myrtle Ave
Monrovia, CA 91016 USA**

The Service Department will advise the customer on the actions to be taken to repair or replace damaged equipment.

4.2 POSITIONING:

When positioning the system, observe the following requirements:
Allow a minimum of 24 inches (61cm) behind the system for access to the service inputs, and at least 18 inches (45cm) at each end of the system for service accessibility.

4.3 ELECTRICAL and GASES SERVICE REQUIREMENTS

4.3.1 ELECTRICAL SERVICE

The electrical service input is located on the rear panel of the control console. The service input is as follows: 208-240 VAC, 50/60 Hz, Single Phase, 30 Amps.

4.3.2 GASES SERVICE

The inert gas input for the system is on the main gas rotometer located on the left side wall of the enclosure, above the interchange. The service input is as follows:

Inert Gas @ 80 PSIG (551 kPa) min. Filtered & regulated supply 3/8 O.D. tube fitting.

5.0 ENCLOSURE CONTROLS & OPERATION

5.1 ENCLOSURE PRESSURE CONTROL

The *MX2000* system is equipped with manual or optional automated control devices which maintain an inert atmosphere within the work chamber enclosure. A simplified sequence for utilizing the enclosure includes:

Glovebox Pressure Control-70

Consist of a rotometer on the input, and a purge check valve on the output. The rotometer can be adjusted between 0-50 SCFH, and the purge check valve will open when the pressure reaches 1.7 inches of water column or higher.

Increasing the flow of the rotometer creates an increase in pressure causing the purge check valve to open which in turn purges the enclosure.

Glovebox Pressure Control-73/74

The input consist of a rotometer in parallel with an inlet solenoid valve. The output consist of an overpressure check valve, a purge on/off valve, a purge check valve and an overpressure solenoid valve.

The input solenoid valve is controlled by a pressure differential switch which can be adjusted to maintain a controlled pressure in the enclosure. The pressure differential switch is adjustable from 0.4-4.0 inches of water column.

The output solenoid valve is controlled by another pressure differential switch which can also be adjusted to prevent an overpressure condition. This pressure differential switch is also adjustable from 0.4-4.0 inches of water column. Purging is done by opening the purge on/off valve on the output side and increasing the flow of the input rotometer.

5.2 ENCLOSURE CONTROL CONSOLE

All electrical components for environmental control processes are located in the control console(s) located atop the vacuum bakeout oven and/or interchange. The main electrical supply line connector is located in the rear of one of the control consoles. The switch on the rear panel is a circuit breaker which provide overload protection to the circuits. Front panel system controls are as follows:

WATLOW TEMPERATURE CONTROLLER – provides temperature control for the oven heater. Temperature can be manually set or automatically set using the profile feature of the controller. Profiles can be created to set up vacuum bake out schedule. The controller is also able to toggle both the vacuum pump and backfill solenoid on or off. For more information please consult the Watlow manual.

VACUUM PUMP circuit breaker - turns the vacuum pump on / off.

OVEN BACKFILL push-button switch which activates the Nitrogen purge for the vacuum bakeout oven.

VACUUM GAUGE provides real-time display of vacuum level inside the oven measured in Torr

5.3 ENCLOSURE SYSTEM START-UP

Before applying power to any portion of the system, be sure the following items are checked and or cleared. It is assumed that the system is in its final operating position, the weld head has been aligned, and the system is ready for welding.

Check to see that the vacuum bakeout oven and flush interchange doors are closed and latched.

Verify the electrical service input requirements are met, and all power connections are plugged in.

Verify the proper line pressures for all gases are correct and that all tube connections are tight.

Check to see that the vacuum hose connections are tight, and the power connection is made to the rear panel of the control console.

5.4 SYSTEM POWER-UP

Turn the enclosure system on by flipping the **MAIN POWER** circuit breaker to the ON position.

5.5 ENCLOSURE PURGE

The enclosure gas input control allows dry nitrogen to fill the enclosure, displacing the moisture laden air through a purge control valve. The overpressure valve bleeds off excess pressure when the operator moves the gloves into the enclosure. When the gloves are withdrawn from the enclosure, the valve prevents ambient air from being drawn back into the enclosure.

Before the enclosure can be purged, it must be fully secured from the ambient atmosphere. Close all oven and interchange doors. Be sure the gloves are secured to the access ports. The overpressure check valve on the rear prevents the enclosure from over-pressurizing.

When introducing materials or components into the enclosure, or when removing materials or components from the enclosure, the interchange acts as the pass through between the room (ambient) environment and the inert environment of the enclosure. In order to keep the integrity of the inert environment, a vacuum pump down cycle followed by a backfill is required before items are moved into the interchange.

When removing materials from the enclosure, be sure that both interchange outer doors are closed and latched. Once the interchange has purged, open the inner door between the interchange and the enclosure. Move the materials into the interchange and close and latch the inner door. Open the outer door, and remove the materials from the interchange. Close and latch the outer door. Before attempting to open the inner door again, a purge of the interchange is required. This prevents the ambient atmosphere from contaminating the enclosure inert atmosphere. For introducing materials into the enclosure, the same procedure must be followed. For systems with automatic lock, the door will automatically latch when closed.

5.6 OVEN OPERATION

The *MX2000* vacuum bake out oven is equipped with heat, vacuum, and gas backfill (purge) controls.

Oven temperature is strictly controlled by the solid state temperature controller which provides a continuous digital display of the bakeout process temperature. A type J thermocouple probe imbedded in the oven wall provides monitoring of the temperature.

For the 14 inch oven, the oven heater is a one-piece "wrap around" heater, which completely blankets the outer walls of the oven.

For the 18 inch oven, the oven heaters are five-piece silicone sheath heater with one piece on each of the top, front and bottom sides and two pieces on the rear of the oven where the vacuum tube protrudes.

For the heated shelf oven, the heaters are heating rods inserted from the rear of the oven. The heater rods are also used to support the shelf.

For more information on the bakeout process, please consult the temperature controller manual.

The vacuum pumping system can be initiated automatically by the temperature controller or manually by the **VACUUM PUMP** circuit breaker located on the control console. The digital vacuum gauge displays the vacuum level in Torr. The gauge reads 760 Torr in normal atmospheric pressure. The vacuum gauge will gradually decrease to approximately 20 mTorr as the pump continues to operate. An optional turbomolecular pump is available which can decrease the vacuum level further to 1 mTorr.

At the end of the bakeout or vacuum bakeout cycle, the oven must be backfilled (purged) with inert gas so that the materials in the oven can be introduced into the enclosure for processing without contaminating the inert enclosure atmosphere. The backfill is actuated automatically by the temperature controller or manually by pushing the front panel **BACKFILL** push button. The button must be held until the vacuum gauge reads approximately 760 Torr before the inner door can be opened.

Once 760 Torr has been reached, release the backfill push button. The materials in the vacuum oven can now be introduced into the enclosure. Open the inner oven door and remove the materials from the oven. Close the oven door and make sure that it is latched.

As with the flush interchange, always perform a vacuum pump down and a backfill at some point after the outer door has been opened and closed and before the inner door is opened. This prevents enclosure environment contamination.

NEVER LEAVE AN OVEN OR INTERCHANGE OUTER DOOR OPEN WHILE ITS INNER DOOR IS OPEN. THE ENCLOSURE ENVIRONMENT WILL BECOME CONTAMINATED WITH ROOM ATMOSPHERE AND COMPONENTS MAY NOT BE PROCESSED TO SPECIFICATION.

There are no user serviceable parts for the oven assembly. Please contact the service department if component failure within the oven assembly is suspected. **Do not attempt to remove the insulating material surrounding the oven without first consulting the service department.**

5.7 ANALYZERS

Optional analyzers include oxygen analyzer, moisture monitor and helium analyzer. The oxygen analyzer measures the oxygen level inside the glovebox while the moisture monitor measures the amount of moisture. The helium analyzer detects the amount of helium in the glovebox.

5.8 STEP DOWN TRANSFORMER

The step down transformer converts the 208-240 VAC input into 110-120 VAC output. This voltage is required for various electronic devices in the MX-2000 system.

5.9 CIRCULATOR

The circulator pumps glycol antifreeze substance into the metal ring attached to the inner and outer edge of the oven. The purpose is to lower the temperature of the outer and inner door when the oven is running and to prevent the gasket from heat damage.

5.10 TURBOMOLECULAR PUMP

The turbomolecular pump is optional in addition to the regular vacuum pump. Using this turbomolecular pump, a vacuum level of 1 mtorr can be achieved. The turbomolecular pump will turn on when the vacuum pump is on.

6.0 SYSTEM MAINTENANCE

The *MX2000 ATMOSPHERIC ENCLOSURE* is designed to provide long, trouble free service. A regular schedule for preventive maintenance will minimize corrective maintenance problems. If trouble cannot be easily corrected, qualified service technicians should be called.

Field Service assistance is available; by telephone @ (626) 303-5676 or (626) 930-8546.

GENERAL SAFETY WARNING: Throughout this equipment, lethal voltages exist. It is of the utmost importance that the service or maintenance personnel be completely familiar with all aspects of this equipment and its operation.

6.1 ENCLOSURE MAINTENANCE

Regularly inspect all power cords, control leads, cables, and gas lines for signs of wear and loose connections.

6.1.1 WINDOW

The glass window in all systems is custom cut for each system. Your actual size is kept on file in our Customer Service file, and is also on the system Serial Number sheet, included with the system documentation. If the window is in need of replacement, it should be removed and brought to the nearest glass fabricator for measurement and replacement. The window is 1/4" thick laminated automotive safety glass, made up of two pieces of glass laminated together with an anti-shatter clear center core.

6.1.2 ENCLOSURE GLOVES

The **MX2000** system employs butyl rubber or Neoprene gloves. The gloves should only be cleaned with mild soap and water solution. The life of the gloves is strictly related to the care used by the operator. They should be inspected at least once a week and replaced once a year.

6.1.3 VACUUM OVEN DOOR SEALS

The vacuum oven employs 30 durometer, pigment-free silicone O-rings for the 14" oven or a silicone square gasket for the 18" oven as the door seals. Under normal use, the seals will last 1-2 years, but should be examined every month. The seals are held in place by use of a dovetail groove machined into the door plate for the 14" oven or flowable silicone for the 18" oven. In addition to examining the seal itself for signs of degradation, the sealing surface on the oven structure should be kept clean, and free of any foreign matter which could cause the seal to not mate flush to the oven.

6.1.4 OTHER MAINTENANCE

For maintenance of vacuum pump, vacuum gauge, various analyzers, circulator and all other components, please refer to each specific individual manual.