

Dip Coating Machine
For Sol-Gel Process
Model **DM 200**

Owner's Manual

LIMITATION OF LIABILITY

In no event shall CHEMAT TECHNOLOGY, INC. be held responsible, nor liable for any direct, indirect, incidental, special or consequential damages or costs whatsoever resulting from or related to the use or misuse of the Dip Master 200 (DM 200). Even if CHEMAT TECHNOLOGY, INC. has been advised, knows or should be aware of the possibility of such damages.

CHEMAT TECHNOLOGY, INC. emphasizes the importance of consulting experienced and qualified professionals to assure the best results from the use of DIP MASTER 200 (DM200).

IMPORTANT SAFETY INSTRUCTIONS

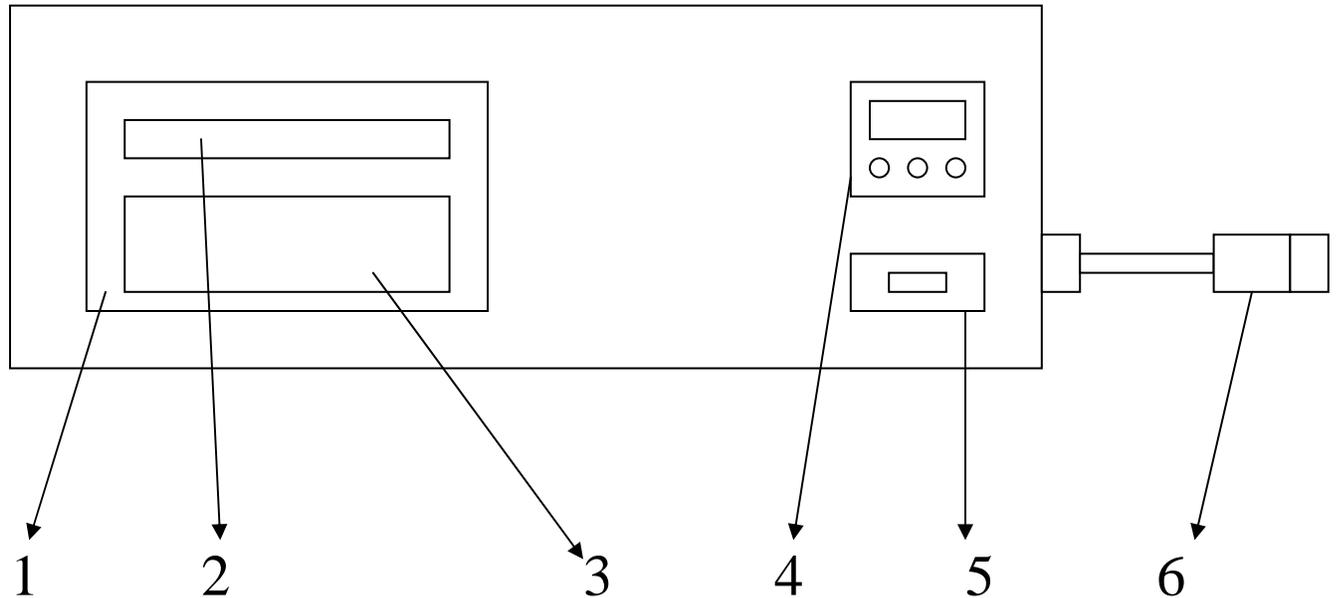
WARNING: When using this equipment, always exercise basic safety precautions, including the following:

1. Read all instructions before using this equipment.
2. Use this equipment only for its intended purpose as described in this booklet.
3. This equipment must be properly installed in accordance with the Installation Instructions before it is used.
4. Do not operate this machine if it has a damaged cord or plug. If it does not operate, or malfunctions, contact your local representative.
5. Do not leave heavy objects on top of the machine.
6. Never turn the machine on with the two side knobs on the close position.
7. This equipment is designed to operate at a temperature of 550 °C. We strongly suggest not to operate the furnace above the specified temperature of 450 °C for an extended period of time, in order to extend its operational life time.
8. Keep this machine out and away of water.
9. Keep the cords away from heated surfaces.
10. If necessary, this equipment should be serviced only by qualified personnel. Any questions and uncertainties should be directed to the manufacturer for a prompt answer.
11. During the service period, all the power to the machine should be turned off.
12. Beware, and avoid contact with any hot surfaces.

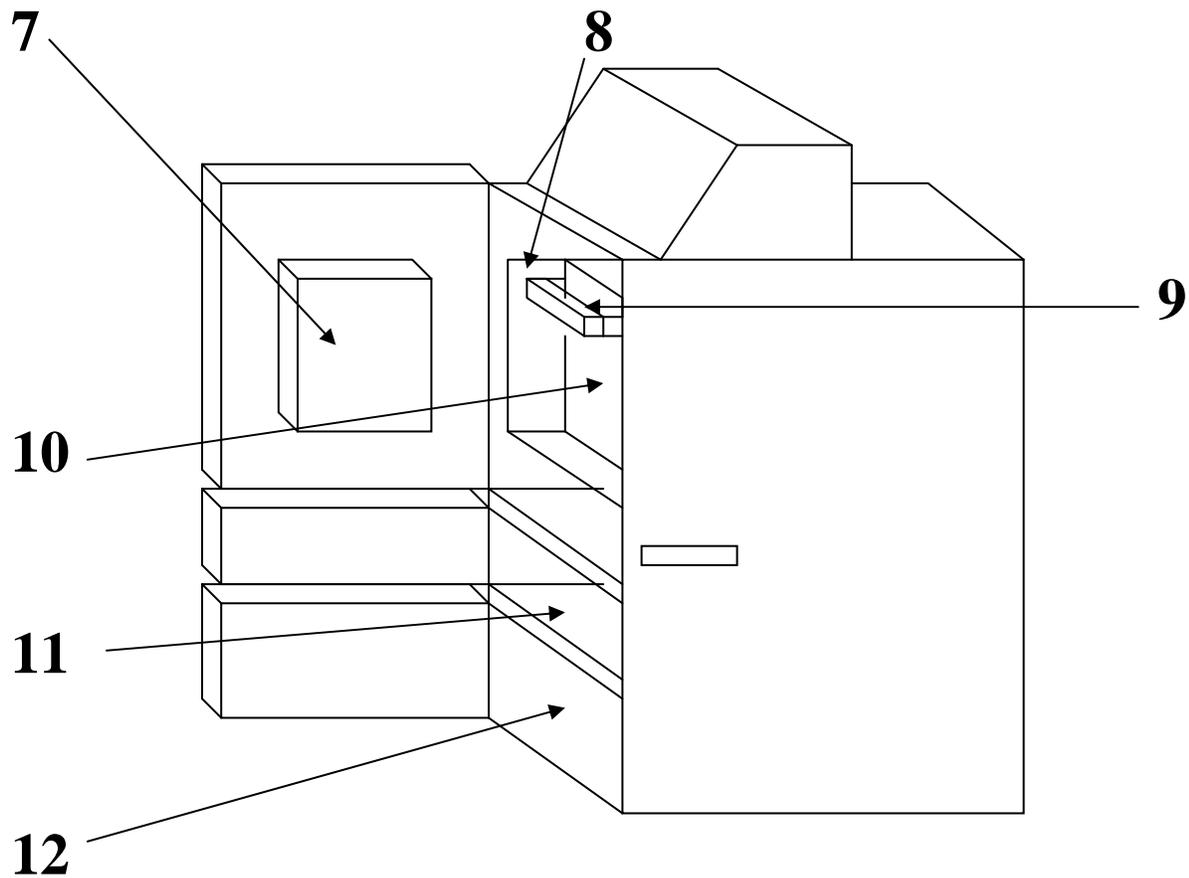
INSTALLATION

1. **LOCATION:** The equipment should be installed in a well ventilated area
2. **POWER:** The power supply for this machine is 220 VAC, 25 A.
3. **CLEARANCE:** Leave enough space at the two sides and back to allow for air circulation, and exhaust connections.
4. **LEVELING:** This machine is equipped with adjustable leveling legs. In the event of ground irregularities, adjust the legs accordingly.

Control panel



1. Z- WORLD PK 2100 Microcontroller
2. PK 2100 display.
3. PK 2100 keypad.
4. JUMO temperature controller.
5. Power switch.
6. RS 232 cable connection.



7. Front heating panel

8. Side and bottom insulating panels. These panels are manufactured to add extra insulation to the heating chamber. **WARNING!** This insulating fixture is only provided as an accessory and is not vital in the curing process. It is to be used under extreme alert and manually during the heating (curing) stage, not before or after. If this fixture is left in the forward position during any other stage, major damage will occur to the equipment, and possibly to the operator.

9. Hanger. This is where the user's substrate holder is mounted.

10. Rear heating panel.

11. Dipping tank compartment. It has a sliding door to separate the curing chamber from the dipping tank compartment. **WARNING!** This sliding door is intended to separate the two chambers when the unit is not operating. If this fixture is left in the close position, major damage will occur to the equipment and possibly to the operator.

12. Storage compartment.

OPERATION

1. Substrate Loading: The DM 200 comes with a hanger to which the user's substrate hanger will mount. CHEMAT TECHNOLOGY provides a number of substrate holders, and customized holders for glass, wafer, and ceramic substrates. To order, contact the sales office.
Mount the substrate hanger evenly for better load distribution
2. Once the hanger is properly placed, close the doors (furnace, and tank compartments) and turn the equipment on. The display screen should temporarily display an introductory message stating the model's name and number, and the name of the company. If the hanger happens to be at any location other than home position (upper most position when the limit switch in the back is reached), the screen will display the message **RESETTING SYSTEM** and the hanger will move upward and return home.
3. The unit will automatically go to the MAIN MENU. The screen should display the following: F1: SET UP, F2: MANUAL, F3: AUTO.
4. The controller can operate the system in two different ways, manually or automatically.
5. If F2 is selected, pressing the arrow keys will move the fixture up or down, accordingly. The MENU key should be pressed to access the MAIN MENU again. **WARNING!** The manual mode bypasses the limit switches response signals and all other safety features. When moving up manually, do not overpass the upper limit switch, **STOP BEFORE**. Otherwise, when the system resets, the fixture will keep moving up, causing major damage.
6. If F3 is pressed, the system will automatically commence the dipping cycle using the last recipe entered.
7. F1 allows the user to edit the recipe and to select the recipe to be used. In either case, the user needs to go through the entire F1 selection sequence. This is purposely done to remind the user of all the parameters pertaining to the recipe being selected.
8. To edit a recipe, do the following:
 1. From the MAIN MENU access the SET UP mode by pressing F1 on the keypad.
 2. Select a recipe to EDIT using the arrow keys. Recipe 0 does not save, only 1 to 4 do. Note: the screen always shows two numbers. The first one is the old selection or previously saved parameter, the second one is the selection or parameter that will be saved after the SET UP mode is completed.

3. Press the MODE key on the keypad to access the next step, Please enter COATING SPEED X.X X.X. Using the arrow keys select the coating speed (withdrawal speed, the immersion speed is constant). The maximum speed is 12 in/cm.
 4. Press the MENU key for the next step. Please enter TANK TIME X.X X.X. Using the arrow keys, select the dwell time in seconds the substrate will remain in the tank.
 5. Press MENU to go to the next step, Please enter CURE TEMP X.X X.X. Use the arrow keys to select the temperature in Celsius.
 6. Press MENU to advance to the next step. Please enter CURE TIME X.X X.X. Using the arrow keys, select the curing time in minutes and fractions of minutes.
 7. Press MENU to advance to the next step. Please enter LOWER LIMIT X.X X.X. Use the arrow keys to select how far down the substrate holder should go.
 8. Press MENU to advance to the next step. Select the address # for serial address. This selection is used when programming the RS-232 interface for remote PC operation. This feature will be explained in detail later
 9. Press MENU to advance to the next step. SAVE NUMBER PERMENT ADD Y/DELETE N. If the user desires to save the recipe permanently in the memory of the microcontroller, press the ADD key; if not, press the DEL key. In either case, the machine is ready to operate under the selected parameters. Press F3, and the unit should run automatically at the determined parameters. Follow the indication and metering displays on the screen.
9. The tank heater is an independent unit, with an independent controller that has no connection to the Z-World PK 2100 microcontroller. To understand its programming and operation, please refer to the JUMO Compact Microprocessor Controller manual.
10. Substrate Cooling and Unloading. Once the dipping cycle is over, the furnace cools naturally. Access the substrate holder with extreme caution since all internal surfaces are very hot. The microcontroller should return to its MAIN MENU screen.

RS-232 Implementation:

1. The Z-World microcontroller can be programmed to allow serial connection and control with a PC through its RS-232 interface. A 9-pin connector is provided with the proper wires connected to the Microcontroller.
2. The RS-232 is a “straight” send and receive (with a ground connection) serial connection. The communication protocol is to be set at a baud rate of 9600, 8-bit data bus transfer, no parity, and 1 bit stop. Example: COM1, 9600, N, 8, 1. The user should be able to set these parameters through the PC host computer.
3. Following, there is a description of the commands to be sent by the host computer to the Z-World microcontroller. These commands are to be provided by some type of high level language chosen by the user. Examples: MS Quick BASIC, C, Visual BASIC, etc. The user is responsible for the coding of the program and usage of the commands.

4. The command: It is composed of 3 major parts

- The **Asterisk**. The asterisk is the first character in every command. It tells the Mcontroller that a signal is arriving from the host computer.
- The **Number**. The number that follows the asterisk is meant to identify the particular Mcontroller unit. Z-World Mcontrollers can be hooked up in series, up to 35 units. In the single Mcontroller case, any number would do. It is conventional to use number 1. Nonetheless, the number that is used in the code in the host PC should be the same as the one picked during the F1 set up in the unit.
- The **Argument**. The argument is the portion of the command that describes the actual action to be performed.
- The general format is then as follows:

*	Unit number	Argument
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Example:

The command that follows stops the program immediately

*1AB

Description: The asterisk tells the Mcontroller to interrupt because new information is coming from the host computer. The 1 refers to unit 1, where the number 1 was previously selected in the Mcontroller unit during F1 set up. AB is the argument, which means STOP.

5. A list with all possible commands follows (Assuming 1 has been assigned to the unit as the ID number):

- | | |
|--------|--|
| *1AA | Auto run. It starts the full dipping cycle. |
| *1AB | Stop. It stops the dipping cycle wherever it is. |
| *1? | Time/Temp. Reads the curing time and temperature in real time. |
| *1RA | Recipe. Reads the recipe number about to be used |
| *1RB | Coating Speed. Reads the real-time coating speed |
| *1RC | Dwell time. Reads dwell time (time substrate remains in the dipping tank) in real time. |
| *1RD | Curing Temp. Reads the curing temp. to be used. |
| *1RE | Cure Time. Reads curing time to be used |
| *1RF | Lower Limit. Reads how far down the substrate holder will move. |
| *1SA # | Set Recipe. Sets the recipe to be used. Note: the command *1SA is followed by a space and then a number from 1 to 5. Example *1SA 5 (sets recipe5) |

*1SB ##.#	Set Coating Speed. Sets the coating speed to be used. Example: *1SB 3.2 (sets speed to 3.2 cm/min)
*1SC ##.#	Set Tank dwell time. Sets the time the substrate remains inside the tank in seconds. Example: *1SC 10
*1SD ###	Set Curing Temp. Sets the curing temperature in Celsius. Example: *1SD 252 (sets curing temp to 252 C).
*1SE ##.#	Sets Curing time. Sets curing time in minutes. Example: *1SE 51 (sets curing time to 51 min).
*1SF ##.#	Sets Lower Limit. Sets the lower limit in inches to which the substrate holder will move. Ex: *1SF 10. Lower Limit is set at 10 inches.

Note: The set commands can be performed when the unit is in the MAIN MENU Mode only.