MACHINE SOLUTIONS INC.

USER MANUAL

BEAHM DESIGNS SPLIT DIE THERMAL BONDER

MODEL 220-B

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BEAHM DESIGNS

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WELCOME

Machine Solutions, Inc. (MSI) would like to take this opportunity to thank you for purchasing your new 220-B Split Die Thermal Bonder machine. At MSI, we are dedicated to bringing innovative process development solutions to both medical device and nonmedical organizations. MSI looks forward to helping your organization provide life-improving devices to your customers, today and tomorrow.

This machine has been thoroughly tested to ensure it meets the highest quality standards and is ready for immediate integration into your production process. Your machine has undergone functional and safety testing to ensure it meets all manufacturing specifications.

MACHINE DESCRIPTION

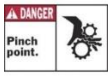
The Beahm Designs Inc. Model 220-B Split Die Thermal Bonder is a system designed for the purpose of performing high quality heat welds and balloon bonds. This unique and simple die head design of the Beahm Designs Split Die Thermal Bonder provides a low-cost quick tool alternative to RF die bonding. The three-parameter operation is easy to set-up and use and simplifies system calibration and process validation. Upgrade options such as axial compression increases versatility and functionality. This system provides you with fast, highly repeatable bonds. Allows you to perform highly precise bonds for demanding applications such as short balloon bonds and ultra-smooth lap & butt welds. Adjustable clamp pressure varies compression force on joint. The ultra-compact design provides you with greater workspace. Featuring Micro-Automation for precision bonding technology.

SAFETY

- Place the system on a level, sturdy surface at an ergonomically viable height for the user.
- Use of eye protection when working with compressed gases and heated materials is advised.
- Connect the electrical umbilical to the die base unit.
- Connect the power cord to the main control unit.
- Connect the air supply to the system and then to a clean, dry, and filtered compressed air source.
- The maximum observed Sound Pressure Level is below 70 dBA.
- Hot die jaws will become hot during operation and, depending on temperature set-point, can cause severe skin burns if contact occurs.

Caution: high voltage. Remove power and use safety precautions when servicing.

Caution: hot surface. Contact may cause burn. Allow to cool before servicing.



Caution: pinch point. Keep hands and body parts clear while in operation.

USER ALERTS

Do not use or otherwise operate the machine in any manner other than that in which it is explicitly intended. Examples: Do not attempt to sit on or climb on the equipment, do not place heavy objects or containers of liquid on the machine, do not to insert any foreign objects into the machine and do not attempt to bypass any guards.

Note: The equipment is not for use with materials that can decompose or ignite below the maximum operating temperature of the machine. Hazards are materials that outgas hazardous substances and or ignite. (260°C/500°F).

Note: This equipment is not for use in an ATEX environment.

CONTENTS

Included with the system are the following contents:

- Heater remote and main control
- IEC Power Cord
- Compressed Air Supply Hose Assembly
- Foot pedal

INSTALLATION

1. Place the system on a level, sturdy surface at an ergonomically viable height for the user.
2. System power is in the OFF position.
3. Connect the power cord to the main control unit.
4. Connect the air supply to the system and then to a 100-125 PSI clean, dry, and filtered compressed air source.
5. Connect main AC power to the power entry module on the rear panel.

System Controls And Features

Located on the front and back panels of the Split Die Thermal Bonder are the following controls and/or displays and their functions:

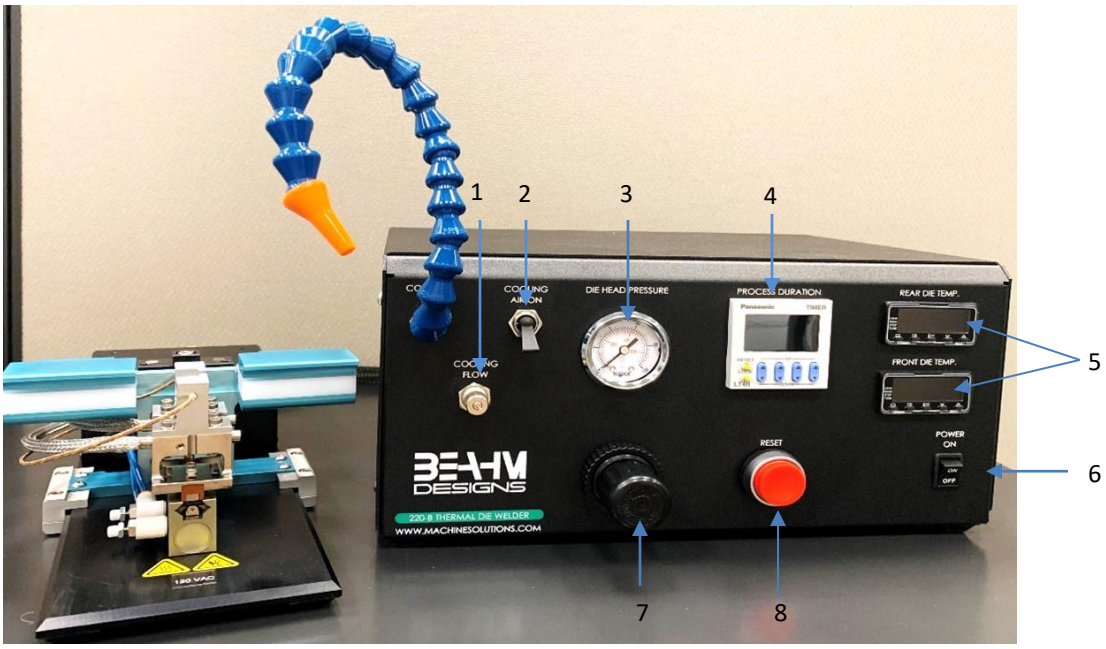


Figure 1. 220-B Split Die Thermal Bonder Front Panel

Table 1. Control and Display Functions (Front)

Item	Function
1	Controls cooling air flow rate
2	Toggles cooling air on/off
3	Displays die head gripper pressure
4	Set timer to desired duration in seconds
5	Sets die temperature on EACH temperature controller
6	Toggles system power and air on and off
7	Regulates the pressure at the PRESS/VAC. Port
8	Timer resets and starts again

Figure 2. 220-B Split Die Thermal Bonder Back Panel

Table 2. Control and Display Functions (Back)

Item	Function
1	Connects to power cord
2	Protects power distribution
3	Controls system air supply
4	Allows connection to foot pedal

RUN PROCESS

1. Assemble components to be bonded over mandrel(s).
2. Measure bond length, tubing overlap or balloon sleeve length.
3. Position the protective sleeve over the bond area.
4. Measure the O.D. of the protective sleeve.
5. Set timer to desired duration in seconds.
6. Position components to be bonded within thermal jaws.
7. Depress footswitch.
8. To cool assembly when cycle is complete, position the heated area at the tip of the cooling air nozzle and toggle the cooling air switch to the “on” position.

PARAMETER SETTINGS

Temperature Controller

Note: Verify what model temperature controller is on the machine

- Refer to page 13, Omron Temperature Controller.
- Refer to page 17, Omega Platinum Temperature Controller.
- Refer to page 17, Eurotherm Temperature Controller.

Pressure Regulator Setting

- Rotate the regulator knob clockwise to increase air pressure, and counterclockwise to decrease air pressure output to the die head actuation cylinder.

Cooling Air ON Toggle

- Place toggle in the up position for cooling air On and toggle down for cooling air Off.

Cooling Air Flow Adjust

- Rotate the Cooling Flow valve counterclockwise to increase the cooling air flow, and clockwise to decrease the cooling air flow.

Process Timer Setting

- Depress the upper half of the rocker buttons to increase time duration, depress the lower half of the blue rocker button to decrease the time duration. Depress the timer reset button for at least 1.0 seconds to accept the new value.

OMRON TEMPERATURE CONTROLLER

Note: Verify what model temperature controller is on the machine

The parameter settings for the temperature controllers have been pre-configured prior to shipment from Machine Solutions, Inc. However, if further details are required, refer to the Omron operating instructions for the model-E5GC temperature controllers included with the manufacturer's literature (delivered with the machine).

Figure 3. Omron E5GC Temperature Controller

Setting Temperature Controller Parameters

The parameter settings, as defined by Machine Solutions, Inc. for specific operational functionality of the individual temperature control units, are detailed below. It is recommended that these parameter settings remain as they appear in the sections to follow. If parameters are changed incorrectly and cannot be restored, please contact service@machinesolutions.com.

Autotuning Temperature Controller

Re-tune the temperature controller if dies are changed or modified, or to correct instability at process temperature.

1. Start with machine at ambient temperature.
2. Power on the machine. Ensure the heater switch (if applicable) is switched to "off" for the next two steps. If machine is not equipped with heater switch, ensure steps are completed quickly to minimize pre-heating.
3. Set controller to process temperature.
4. Follow the procedure shown in Figure 4.
5. If applicable, switch heater switch to "on" once controller is back to home screen. Controller will wait for temperature to stabilize before starting.
   Note: Autotune is active when light next to "TUNE" is lit. The procedure may take up to 30 minutes.

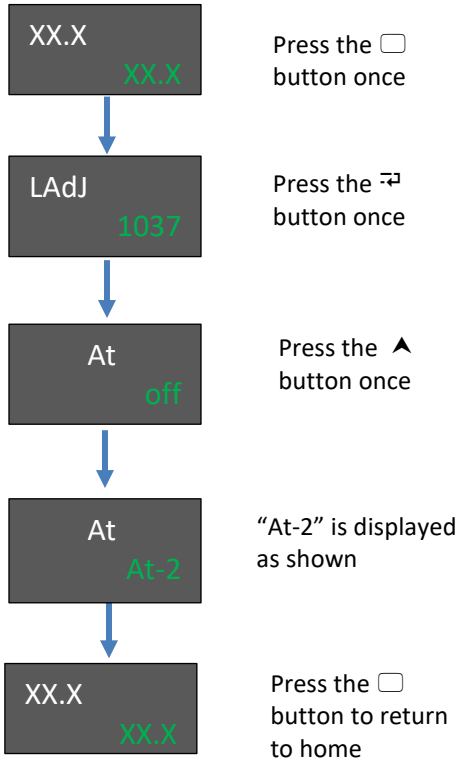


Figure 4. Auto Tune Enable

Configuration of Temperature Controller Alarm

Even after a successful autotune, temperatures may still have a small degree of instability. Temperatures may also drop unexpectedly if there is a fault with the equipment or if accessories are accidentally unplugged. To ensure the equipment notifies operators in the case of an unexpected temperature change, the temperature controllers are programmed with an alarm. Machine Solutions, Inc. recommends a temperature tolerance of ±2.5°F, allowing the temperature to either rise or drop by as much as 2.5°F before the alarm activates. The procedure for configuring the temperature controller alarm is outlined in Figure 5.

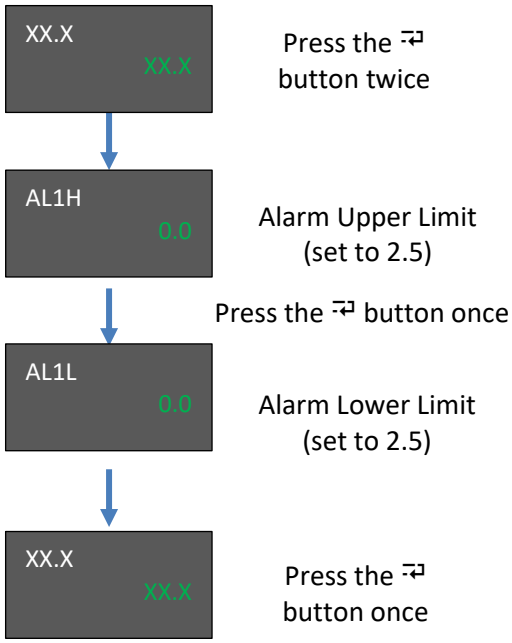


Figure 5. Temperature Alarm Setup

Setting Temperature Controller Offset

If there is a difference between the temperature measured by the thermocouple and the actual temperature of the head, then you may wish to adjust the temperature display with an offset.

There may be a temperature disparity between the temperature controller readout and the actual temperature at the working surfaces of the machine's dies (measured with an external standard). A temperature offset may be desired to reduce or eliminate this disparity.

Offset range -199.9 to 999.9 °F/°C

The following diagram, Figure 6, shows the procedure for inputting a known temperature offset:

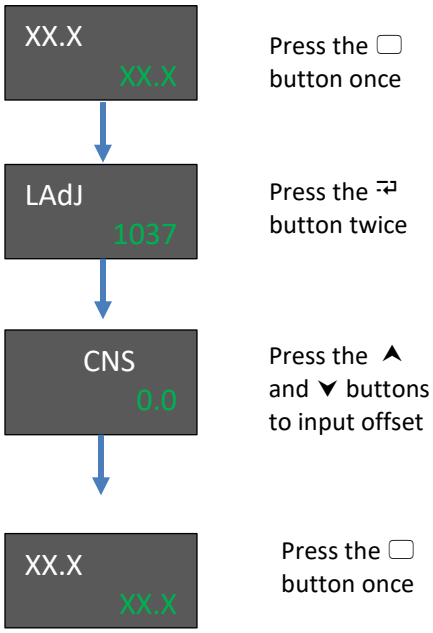


Figure 6. Temperature Offset

OMEGA PLATINUM TEMPERATURE CONTROLLER

Note: Verify what model temperature controller is on the machine.

ATTENTION: PRIOR TO MAKING ADJUSTMENTS, PLEASE SEE THE APPENDIX FOR FURTHER INFORMATION ABOUT THE OMEGA PLATINUM TEMPERATURE CONTROLLER. THE TEMPERATURE CONTROLLERS HAVE BEEN PRE-PROGRAMMED.

Adjusting Temperature on Temperature Controller(s)

Use the PRoG (Programming Mode) Menu

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **SP1** (Setpoint 1 parameter).
↵	Select the **SP1**.
◀ ◀	Set the desired temperature.
↵	Confirm the value. The heaters will ramp to correct temperature.

Resetting the Temperature Controller

Refer to Appendix A for resetting the Omega temperature controller and all temperature control settings.

EUROTHERM TEMPERATURE CONTROLLER

Note: Verify what model temperature controller is on the machine.

Note: Auto-tuning can be performed at any temperature set point within the system operating specifications. This machine needs to be auto tuned at the temperature and air flow that your product will be processed at.

Auto-Tuning

1. Ensure heater power is off and heater is at room temperature.
2. Enter the process temperature setpoint using the ▼ or ▲ buttons.
3. Press ↺ until ***R.TUN*** is displayed.
4. Press ▼ or ▲ to select On.
5. Press ↺ to begin the auto tune process.
6. Turn heater power ON.

Please note, after following this sequence, auto tune can take several minutes to start and complete.

A full description of auto-tune and the purpose of other parameters in the level 2 list is given in the 3200 Manual located online at https://www.eurotherm.com/download/3200-engineering-manual-ha028651-iss-15/

Switching from Fahrenheit to Celsius

1. Press and hold the page button (left most) until Lev 1 appears.
2. Press up arrow to Lev 2 appears.
3. Press scroll to code 0.
4. Press up arrow key for code 2.
5. Press scroll button until units appear.
6. Press up or down arrow key to select C.

OPTIONAL EQUIPMENT

Vee-Guide Attachment (Optional Equipment)

Vee-Guide Attachment AC 226 Accessory Upgrade available, (See Figure 7. below). For additional information on Beahm Designs, Split Die Thermal Bonder Upgrades, please visit http://machinesolutions.com/our-products/

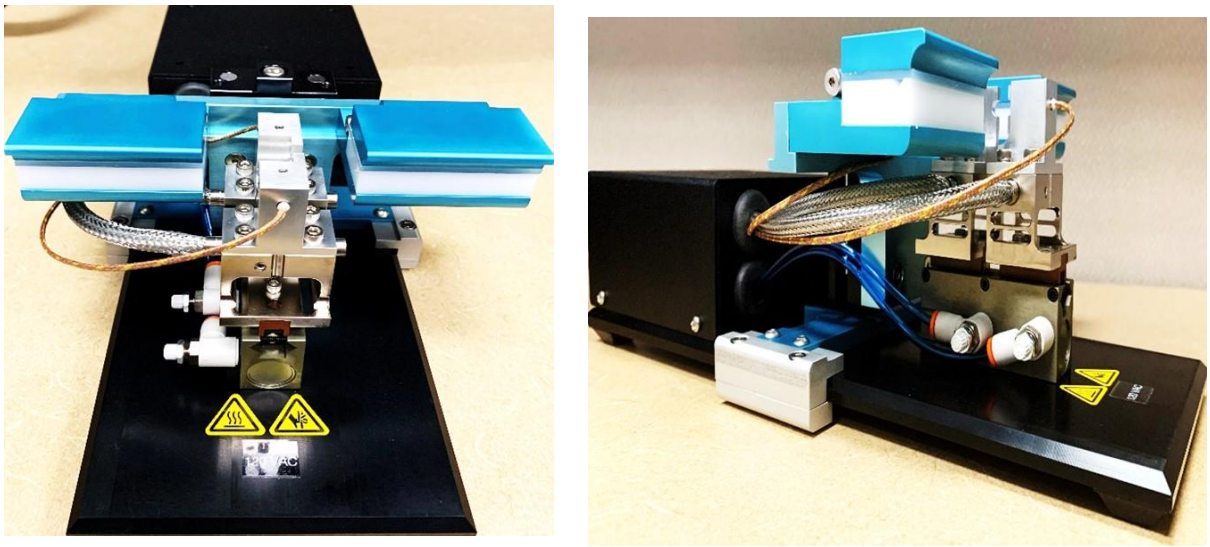


Figure 7. Vee Guide Attachment AC 226 Accessory

MAINTENANCE

Note: Ensure the machine is unplugged for any servicing or maintenance work.
Note: Perform these steps ONLY when the machine is at room temperature.

Caution: pinch point/crush hazard. Keep fingers, hands, and clothing clear of moving parts.

Caution: hot surface. Contact may cause burn. Allow to cool before servicing.

Cleaning

1. Use 99% isopropyl alcohol to wipe down the outside of the machine. Do not attempt to clean the inside of the machine. Machine should not be washed down.
2. Cleaning should be with a soft dry cloth only.

Preventative Maintenance

1. Check power cable for damage every 12 months and replace as needed.
2. Check setting of pre-regulator every 12 months.

Exchanging Die Heads

Caution: ensure that the die heads are cooled to within 15 degrees °F of ambient temperature before proceeding with replacement.

1. Loosen the set screw located on the top of each die head and withdraw the thermocouple.
2. Remove the 4 screws at the base of each die head.
3. Position new die heads in place of removed die heads, install two screws at the base of each die head. Do not overtighten the screws.
4. Install the thermocouple in the rear of each die head and gently tighten the set screw to hold them in place. DO NOT OVER TIGHTEN.

Fuse Replacement

Note: Figures are reference only. They may vary depending on machine model.

1. To replace a blown fuse, turn off machine power by unplugging the power cord from the machine.
2. Remove the insert.
    a. Using a flat head screwdriver, push the fuse insert inward and turn counterclockwise to release.

Figure 8. Removing Fuse Insert

3. Fuse replacement.
    a. Remove the old fuse and replace it with the new one.

Figure 9. Fuse Replacement

4. Insert replacement.
    a. Using a flat head screwdriver, seat the insert by pushing inward and turning clockwise.

Figure 10. Fuse Insert Replacement

Die Head Replacement

Caution: Ensure the die heads are cooled to within 15°F of ambient temperature before proceeding with installation or replacement.

1. Remove the safety cover.
    - Remove two screws from the left side of the safety cover.

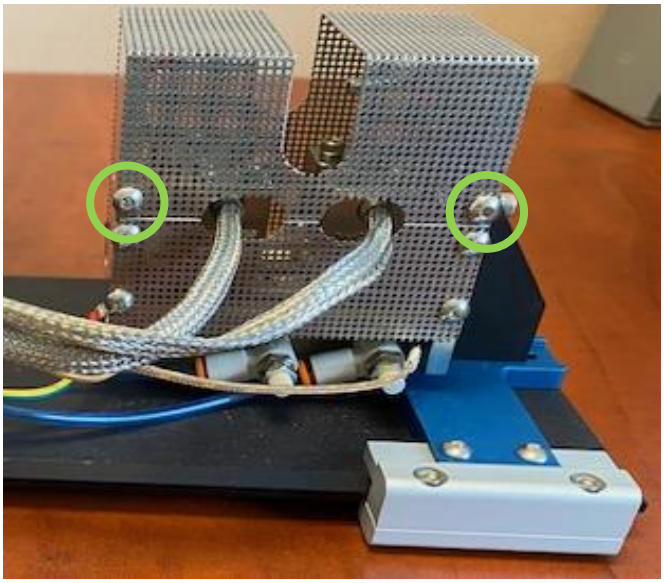


Figure 11. Screws on the Left Side of the Safety Cover

- Remove two screws from the right side of the safety cover.

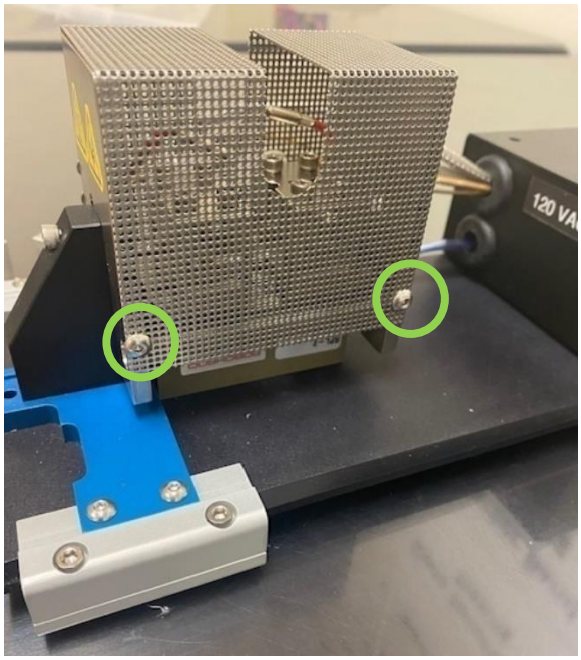


Figure 12. Screws on the Right Side of the Safety Cover

2. Remove the four screws at the base of each die head.

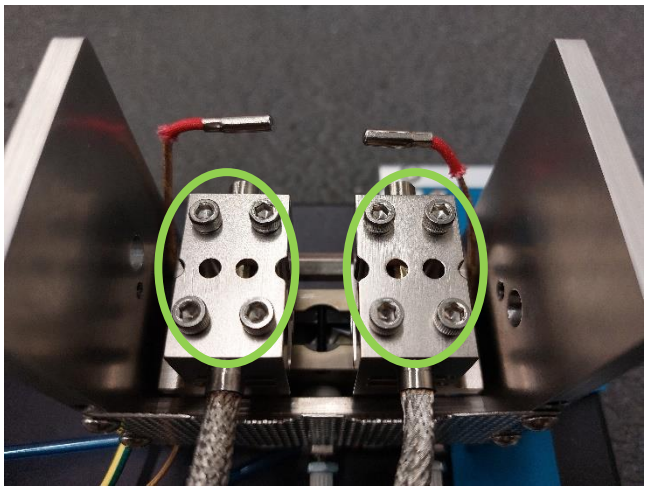


Figure 13. Screws at the Base of the Die Head

3. Position new die heads in place, install the four screws at the base of each die head. Do not overtighten the screws.

4. Install the thermocouple in the rear of each die head and gently tighten the set screw to hold them in place. **DO NOT OVER TIGHTEN.**
    -

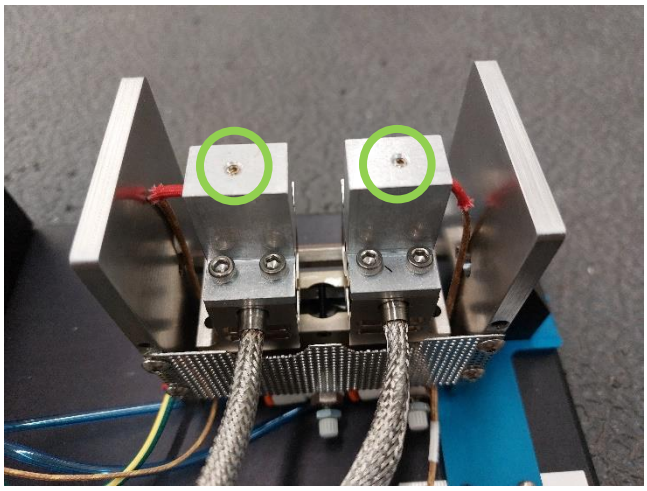


Figure 14. Die Head with Thermocouple and Set Screw

5. Reinstall the eight screws previously removed in Step 2.
6. Reinstall the Safety Cover and four screws previously removed in Step 1.

DIAGNOSTICS AND TROUBLESHOOTING

Table 3. Diagnostics and Troubleshooting

Issue	Possible Causes	Solution
Temperature not stable	• Split Dies replaced • Thermocouple loose	• Auto-tune (MSI recommends auto-tune to process temperature starting from ambient temperature.) • Re-install thermocouple
"S.ERR" displayed (Omron temperature controller)	• T.C sensor break	• Replace thermocouple • Verify complete T.C. path
"Open" displayed (Omega temperature controller)		
"S.br" displayed (Eurotherm temperature controller)		
No heat at dies	• Defective heating element • Defective power control	• Replace heating element • Contact Beahm Designs
.Err code in display	• Temperature controllers • Software failure	• Replace temperature controller
System will not power on	• IEC power cord not fully connected • Fuse needs to be replaced	• Verify installation • Replace fuse

SPECIFICATIONS

Table 4. System Specifications

Description	Range	Accuracy
Temperature	Ambient-500° F	± 2 °F
Die Head Pressure	0-100 psi	± 2 psi

Facility Requirements

- Voltage: 120-240 VAC, 50/60 hz
- Wattage: 10 amps (500 watts)
- Compressed Air: 100-125 psi, clean dry compressed air

CRITICAL PARTS

For replacement or spare parts, please contact us at service@machinesolutions.com, or call 928-556-3109.

Table 5. Critical Spare Parts

Part Number	Description	Quantity
120V – 1153590-001 220V – 1157788-001	HEATER CARTRIDGE	2
1143133-001	THERMOCOUPLE	2
3054593-101	BLANK DIE HEADS PAIR	1
1350774-001	AIR PRESSURE GAUGE	1
1161899-001	TEMPERATURE CONTROLLER, OMEGA	2
110114-002	CONTROLLER, TEMP, OMRON	2

CUSTOMER SUPPORT AND SATISFACTION

Machine Solutions Inc. is proud of the advanced engineering and quality construction of each piece of equipment that we build. It is our goal to provide equipment that exceeds the expectations of the customer. By implementing the highest standards and applying our experience to provide a quality product, we maintain an ongoing, positive working relationship with all our customers.
Machine Solutions Inc. welcomes your comments and inquiries about our products and services.

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WARRANTY AND LIMITATIONS

General Warranty

Machine Solutions Inc. (MSI) warrants its products to be free from defects in material and workmanship in normal everyday use and service for a period of one year from the date of shipment from the factory in Flagstaff, Arizona. MSIs obligation under this warranty shall be limited to the repairing or replacing of the product or parts thereof which upon MSIs inspection reveals them to be defective. MSI reserves the right and option to refund the purchase price in lieu of repair or replacement upon evaluation of the returned original part. Modifications, misuse, attempted repairs by others, improper calibration or operation shall render this guarantee null and void. MSI MAKES NO OTHER WARRANTY REGARDING THIS PRODUCT, INCLUDING ANY EXPRESS OR IMPLIED WARRANTY. SPECIFICALLY, THERE IS NO WARRANTY OF MERCHANTABILITY OF THIS PRODUCT OR OF THE FITNESS OF THE PRODUCT FOR ANY PURPOSES. THE SUITABILITY OF THIS PRODUCT FOR ANY PURPOSE PARTICULAR TO THE CUSTOMER IS FOR THE CUSTOMER, IN ITS SOLE JUDGEMENT, TO DETERMINE. MACHINE SOLUTIONS, INC. ASSUMES NO RESPONSIBILITY FOR THE SELECTION OR USE OF THIS PRODUCT BY CUSTOMER. This product has not been tested or approved by the U.S. Food and Drug Administration or any other agency of the U.S. government. This product is not a consumer product as that term is defined in the Magnuson-Moss Warranty – Federal Trade Commission Improvement Act, 15 U.S.C. § 2301 et seq.

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The equipment and its incorporated technology (collectively referred to herein as the Technology), is protected under issued and pending patents. The Technology is the valuable and proprietary technology, including trade secret technology, belonging to MSI. Much of the Technology is nonpublic and confidential. As our customer, you agree to further assist MSI in the protection of our intellectual property as follows: You agree to keep the Technology you receive confidential at all times, and shall not, without the prior written consent of MSI, disclose the Technology, in whole or in part, to any person outside of your company. You further agree that you shall not reverse engineer, disassemble, decompile, or copy the Technology without the prior written consent of MSI.

In addition, you agree that the equipment will not be used to manufacture anything other than products in which you hold intellectual property rights free of infringement of others. You may not use the equipment to manufacture any product infringing on another's patented rights. By accepting and using the equipment, you agree to defend and indemnify Machine Solutions, Inc., its officers, directors, employees, and agents, from and against any claims of infringement as a result of your use of the equipment.

Regulatory Matters

All equipment validations, product validation, final product QC testing and other testing required by the U.S Food and Drug Administration are the sole responsibility of the customer. Machine Solutions, Inc. shall have no responsibility or liability for the performance of any interventional product on which this equipment is used.

APPENDIX A

Omega Platinum Temperature Controllers

ATTENTION: The initialization portion of the Omega Temperature Controller(s) has been password-protected. Some reasons for this practice to be implemented are:

- Prevent unauthorized Access.
- Avoid Tampering.
- Mitigate user errors.
- User accountability.

For additional information, please contact service@machinesolutions.com

Temperature Controller Layout and Description of Button Actions

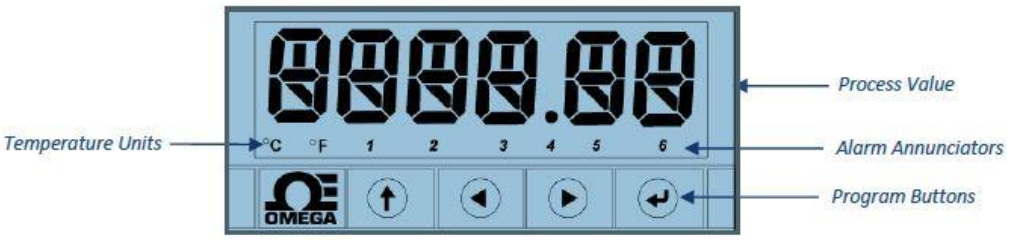

Figure A-1. Controller Layout

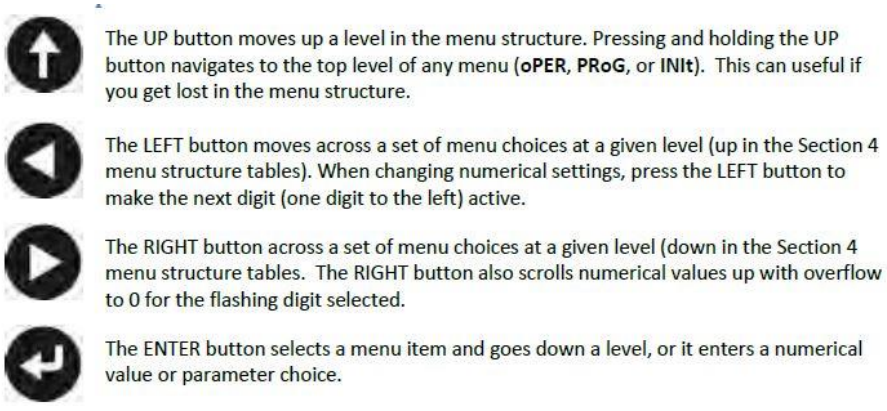

Figure A-2. Description of Button Actions

INIt	Initialization Mode: These settings are rarely changed after initial setup. They include transducer types, calibration, etc.
PRoG	Programming Mode: These settings are frequently changed. They include Set points, Control Modes, Alarms, etc.
oPER	Operating Mode: This mode allows users to switch between Run Mode, Standby Mode, Manual Mode, etc.

Figure A-3. Level 1 Menu

Auto Tune Temperature Controller(s)

Please note, the Omega temperature controllers have been auto tuned and are set for optimal performance. Contact Machine Solutions for further diagnostics and instructions.

The Autotune function will select the tuning algorithm depending on the stability of current process and the error difference between current process and the Control Setpoint (SP1). If the process is relatively stable (i.e: at room temperature), a bump test will be performed to determine the plant characteristics.
If the process is hot, or if the process is within 10% of Control Setpoint, limit cycle oscillation will be performed with the tuning setpoint taken at the process value when the Autotune function is triggered. Autotuning may be performed as many times as needed or when the operating conditions (i.e: process load, or setpoint) have changed significantly. To obtain good tuning results, ensure the process is stable prior to triggering autotune function. The process is stable when it is at ambient temperature, or it is tracking Control Setpoint (SP1) in auto mode.

Note: Ensure the temperature is at room temperature prior to starting the Auto Tune process.

Use the PRoG (Programming Mode) Menu for Steps 1-7

1. Setpoint 1 Configuration (PRoG > SP1 > #)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀◀	Navigate to **SP1** (Setpoint 1 parameter).
▶	Select the **SP1**.
◀◀	Set the process goal value.
↵	Confirm the value.

2. (PRoG> Pld > A.to > 5.00)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	A.to	**5.00**					Set timeout time for autotune

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **Pld**.
↵	Select **Pld**.
◀▶	Navigate to **A.to**.
↵	Select **A.to**
↵	Set to **5.00** minutes or above

3. (PRoG> Pld > GAIN > _P_ > **2.77**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_P_	**2.77**				Manual Proportional Band setting

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **GAIN**.
↵	Select **GAIN**.
◀▶	Navigate to **_P_**
↵	Select **_P_**
↵	Enter **2.77**

4. (PRoG > Pld > GAIN > _I_ > **0.08**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_I_	**0.08**				Manual Integral Factor setting

◀▶	Navigate to **_I_**
↵	Select **_I_**
↵	Enter **0.08**

5. (PRoG> Pld > GAIN > _d_ > 23.87)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_d_	**23.87**				Manual Derivative Factor setting

◀▶	Navigate to **_d_**
↵	Select **_d_**
↵	Enter **23.87**

6. (PRoG > Pld > AdPt > **ENbL**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	AdPt	**ENbL**					Enable fuzzy logic adaptive tuning

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **AdPt**
↵	Select **AdPt**
◀▶	Navigate to **ENbL**
↵	Select **ENbL**

To Begin AutoTune

7. (PRoG > Pld > tUNE > **StRt**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	tUNE	**StRt**					Enable fuzzy logic adaptive tuning

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **tUNE**
↵	Select **tUNE**
↵	Select **StRt**
	Auto Tune starts and displays DONE when completed

Changing Temperature Units on the Temperature Controller

Use Initialization Mode (INIt > RdG > °F °C > **°F**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	°F°C	**°F**					

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀◀	Navigate to **°F°C** (Temperature Units).
↵	Select **°F°C**.
◀◀	Navigate to **°F**
↵	Select **°F**
⇧	Select up button to go back to level 1
◀▶	Navigate to oPER
↵	Select oPER
↵	“RUN” will be displayed.
	Back to temperature readout and normal operating status.

Resetting the Temperature Controller(s) back to factory defaults.

To reset the Omega controller to factory defaults, enter the INIt (Initialization Mode) Menu and follow the steps below.

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
F.dFt	**ok?**						ENTER resets to factory defaults

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **F.dFt**
↵	Select **F.dFt**
◀▶	Navigate to **ok?**
↵	Select **ok?**
	The controller will now be reset. Next, enter the following MSI settings in red.

Resetting the Temperature Controller(s) back to MSI settings.

Use Initialization Mode to set the following parameters 1-7.

1. Thermocouple Input Type (INIt > INPt > t.C. > k)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
INPt	t.C.	**k**					Type K thermocouple

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **INPt** (Input parameter).
↵	Select **INPt**.
◀▶	Navigate to **t.C.** (thermocouple).
↵	Select **t.C.**
◀▶	Navigate to the **K** thermocouple type.
↵	Select **k**.

2. Decimal Point Format (INIt > RdG > dEC.P > FFF.F)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	dEC.P	**FFF.F**					Reading format -999.9 to +999.9

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀◀	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀◀	Navigate to **dEC.P** (Decimal-point Format).
↵	Select **dEC.P**.
◀▶	Navigate to **FFF.F** (One decimal place).
↵	Select **FFF.F**.

3. Temperature Units (INIt > RdG > °F°C > °C)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	°F°C	**°C**					Degrees Celsius annunciator

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀◀	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀◀	Navigate to **°F°C** (Temperature Units). • **°C - Degrees Celsius (factory default), °C annunciator turned on** • **°F - Degrees Fahrenheit, °F annunciator turned on**
↵	Select **°F°C**.
◀◀	Navigate to **°C**
↵	Select **°C**

4. Filter (INIt > RdG > FLtR > 8)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	FLtR	**8**					Readings per displayed value: 8

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀◀	Navigate to the **FLtR** (Filter parameter).
↵	Select **FLtR**.
◀◀	Navigate to **8** (0.4 s)**.**
▶	Select **8.**

5. Normal Color (INIt > RdG > NCLR > GRN)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	NCLR	**GRN**					Default display color: Green

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀◀	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **NCLR** (Normal Color parameter).
↵	Select **NCLR**.
◀▶	Navigate to **GRN (Green)**.
↵	Select **GRN**.

6. Brightness (INIt > RdG > bRGt > HIGH) Brightness setting = HIGH

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	bRGt	**HIGH**					High display brightness

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **bRGt** (Brightness parameter).
↵	Select **bRGt**.
◀▶	Navigate to **HIGH** (High display brightness).
↵	Select **HIGH**.

7. Safety Features (INIt > SFty > PwoN > RSM)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SFty	PwoN	**RSM**					RUN on power up if not previously faulted

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀ ▶	Navigate to **SFty** (Safety Features).
↵	Select **SFty**.
◀ ▶	Navigate to **PwoN** (Power On Confirmation parameter). **Note: PwoN – Requires confirmation before running automatically at startup**
↵	Select **PwoN**.
◀ ▶	Navigate to **RSM.** **Note: RSM – Program runs automatically at startup if not previously in fault state.**
↵	Select **RSM**.

•

8. Configure the USB port

CoMM	USb						Configure the USB port

Use Programming Mode (PRoG) to set the following parameters 9-14.

9. Setpoint 1 Configuration (PRoG > SP1 > #)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ◀	Navigate to **SP1** (Setpoint 1 parameter).
◀	Select the **SP1**.
◀ ◀	Set the process goal value.
◀	Confirm the value.

Sections 10-12 are set for all models except 220B, 320B, 43B, and TF-120
For models 220B, 320B, 43B, and TF-120 skip to Section 13

10. Alarm High/Low setting (PRoG > ALM.1, ALM.2 > type > HI.Lo)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
ALM.1	**Note: This submenu is the same for all other Alarm configurations.**						
	tyPE						
		HI.Lo.					Alarm: process value outside Alarm triggers

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **ALM.1 (**Alarm Configuration 1). **Note: Select Alarm Configuration to set up, change, enable, or disable Alarms. Either or both Alarms can be assigned to trigger display color changes, annunciators, and / or outputs. Either or both Alarm configurations can be assigned to multiple outputs. The ALM.1 and ALM.2 configuration menus have all the same settings and function in the same manner.**

↵	Select **ALM.1.**
◀◀	Navigate to **tyPE** (Alarm Type Parameter). **Note: This parameter will control the basic behavior of the selected alarm.**
↵	Select **tyPE**.
◀◀	Navigate to **HILo**
↵	Select **HILo**

11. Alarm high, low, color reference parameters
    -

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
ALM.1	ALR.H	**2.5**					Alarm high parameter for trigger calculations
ALM.1	ALR.L	**2.5**					Alarm low parameter for trigger calculations
ALM.1	A.CLR	**REd**					Red display when Alarm is active

- Alarm High Reference (PRoG > ALM.1 > ALR.H)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **ALR.H** (Alarm High Reference parameter).
↵	Select **ALR.H**.
◀▶	Set the Alarm High Reference value = 2.5 **Note: One arrow moves the digit and the other moves the value.**
↵	Confirm the value.

- Alarm Low Reference (PRoG > ALM.1 > ALR.L)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **ALR.L** (Alarm Low Reference parameter).
↵	Select **ALR.L**.
◀▶	Set the Alarm Low Reference value = 2.5 **Note: One arrow moves the digit and the other moves the value.**
↵	Confirm the value.

- Alarm Color (PRoG > ALM.1 > A.CLR > REd)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **A.CLR** (Alarm Color parameter).

↵	Select **A.CLR**.
◀ ▶	Navigate to **REd** (Alarm conditions are displayed in red).
↵	Select the **REd**.

12. Output as Alarm 1 (PRoG > dtR1 > ModE > ALM.1)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dtR.1							**dtR.1** is replaced by output type. For example: oUt#
	ModE		Note: **This submenu is the same for all other outputs.**				
		ALM.1					Output is an Alarm using ALM.1 configuration

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **dtR1** (Double Throw Mechanical Relay number 1). Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.
◀	Select **dtR1**.
◀ ▶	Navigate to **ModE**. Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.
↵	Select **ModE**.
◀ ◀	Navigate to **ALM.1**. Note: ALM.1 – Set the output to be an Alarm using the ALM.1 configuration
↵	Select **ALM.1.**

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Section 13 is for Models 220B, 320B, 43B, and TF-120

13. Turn Off Output Channel (PRoG > dtR1 > ModE > oFF)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dtR.1	ModE	**oFF**					Output does nothing

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **dtR1** (Double Throw Mechanical Relay number 1). **Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.**
◀ ▶	Navigate to **ModE**. **Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.**
↵	Select **ModE**.
◀ ◀	Navigate to **oFF.** **Note: oFF – Turn off the output channel**
↵	Select **oFF**.

14. PID Control Mode (PRoG > dc.1 > ModE > Pld)

-

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dc.1							dc.1 is replaced by output type. For example: oUt#
	ModE						
		Pld					PID Control Mode

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **dC1** (DC Pulse output number 1). **Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.**
↵	Select **dC1**.
◀◀	Navigate to **ModE.** **Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.**
↵	Select **ModE**.
◀▶	Navigate to **Pld.** **Note: Pld - Set the output to Proportional-Integral-Derivative (PID) Control Mode.**
↵	Select **Pld**.

-

15. Increase to SP1 (PRoG > PLD >ACtN > RVRS)

-

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	ACtN	**RVRS**					Increase to **SP1** (i.e., heating)

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀◀	Navigate to **Pld.** **Note: Pld – Set the output to Proportional-Integral-Derivative (PID) Control Mode**
↵	Select **Pld**.
◀▶	Navigate to **ACtN.** **Note: ACtN – Determines the action direction for control**
↵	Select **ACtN**.
◀▶	Navigate to **RVRS.** **Note: RVRS – Off when Process Value is > Setpoint, and on when Process Value is < Setpoint (e.g., heating); deadband is applied below Setpoint (factory default)**
↵	Select **RVRS**.

A full description of features can be found here: https://assets.omega.com/manuals/M5451.pdf.

APPENDIX B

Die Head Sizing

- Description: This procedure describes the process of sizing the Thermal Die Head tooling used on Beahm Bonders (model #'s 220B, 320B, 420B, 520B & 620B)

Scope: This document applies to Part # 3054593-001, and 3052819-001 (only applies to 520B and 620B) Thermal Die Heads

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Tools and Equipment: Caliper or micrometer

Reference: Figure B-1. Die Head Sizing

- Procedure:

1. Assemble components to be bonded over mandrel(s) (Refer to Figure B-1, 1-2).
2. Measure bond length, tubing overlap, and balloon sleeve length (Refer to Figure B-1, Steps 1-3).
3. Position protective sleeves (fitted PTFE, PET heat shrink, or Polyolefin heat shrink) over bond location Refer to Figure

- B-1, Steps 1-4).

4. For heat shrink sleeves (PET, Polyolefin etc.), shrink the sleeve onto the bond location.
5. Measure O.D. of protective sleeve at bond location (Refer to Figure B-1, Steps 1-5).
6. Machine the die heads to width based on value in Step 2.
7. Bore hole through heads .003" less than the diameter value in Step 4.
8. For Balloon Shield bore size, add .005" to the product OD (without sleeve).

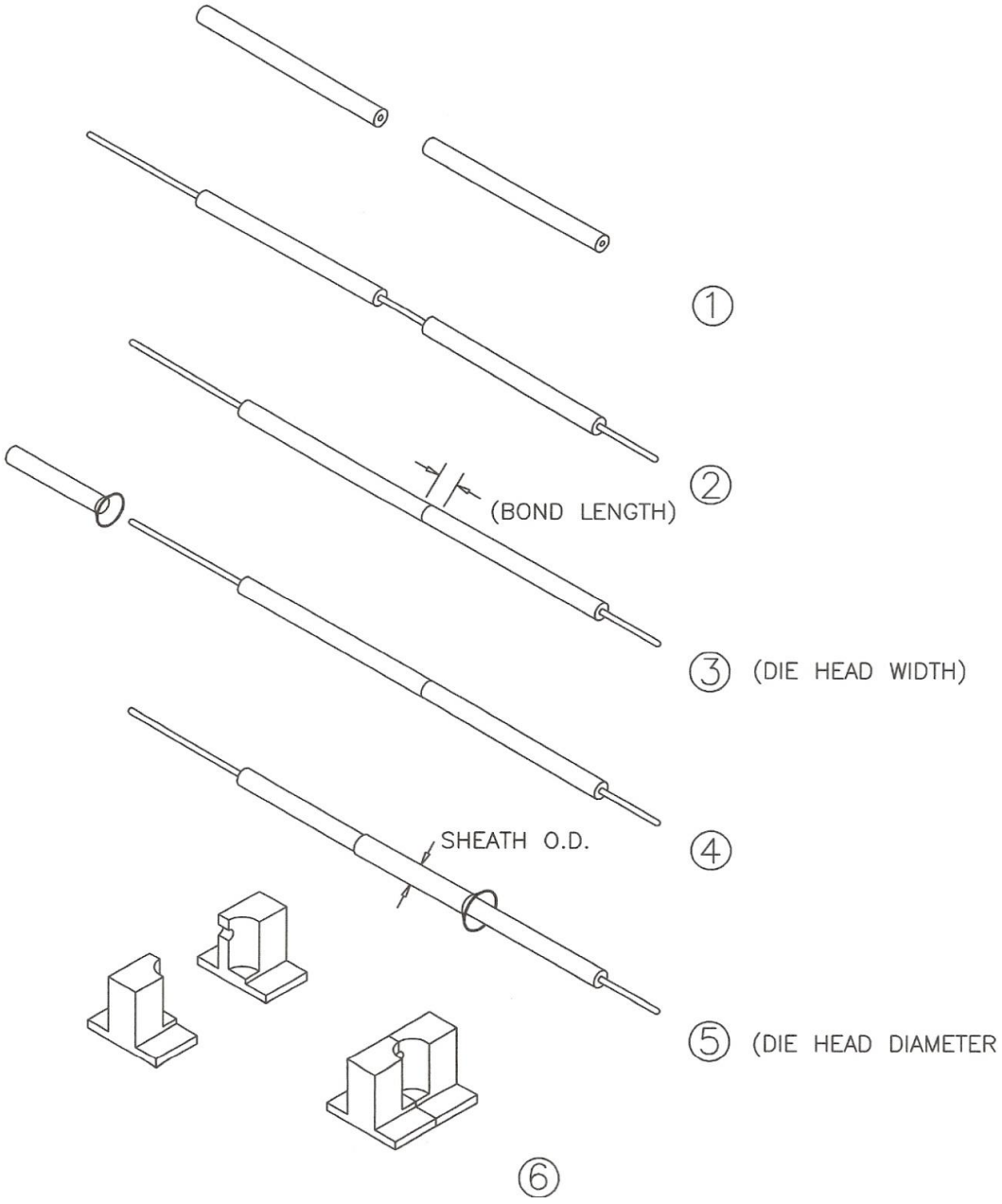

Figure B-1. Die Head Sizing