MACHINE SOLUTIONS INC.

USER MANUAL

# BEAHM DESIGNS THERMAL TRAVERSER

## MODEL 410-A

BEAHM DESIGNS

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# WELCOME

Machine Solutions, Inc. (MSI) would like to take this opportunity to thank you for purchasing your new 410-A Thermal Traverser 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.

# MACHINE DESCRIPTION

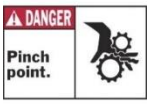
The Beahm Designs Inc. Model 410-A Lamination System is a system for the purpose of recovering heat shrinkable materials onto a catheter shaft type of substrate by means of traversing a thermal nozzle along the length of the materials at a controlled speed.

# SAFETY

- Throughout this document, WARNINGS, CAUTIONS, and NOTES notify the reader of important and critical information.
- Use of eye protection when working with compressed gases and heated materials is advised.
- The maximum observed Sound Pressure Level is below 70 dBA.

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

**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:

1. IEC Power Cord
2. Compressed Air Supply Hose Assembly

# INSTALLATION

## *Uncrating*

1. Remove all lag screws that hold the machine to the crate.
2. Carefully remove the machine from the crate.
3. Remove the four, ¼ inch, machine bolts attached to the 2x4 wood on the bottom of the machine.
4. Unwrap the machine by removing the cellophane stretch wrap.

## *Leveling*

1. Place the system on a sturdy, and level surface.
2. Connect the power cord to the system and then to a 110-240 VAC 50/60 Hz. Outlet.
3. Connect the air supply hose assembly to the system and then to a clean, dry, and filtered compressed air source.
4. Auto-tune Temperature Controllers (please refer to Page 9. for procedure details).

## *Connections*


**Figure 1. Back side input panel**

**Caution: high voltage.**

1. Locate the input panel on the rear panel of the machine. See Figure 1.
2. Connect a power cord to the power connector.
3. Plug the power cord into a source with the following specifications:

**Important: Connecting to the wrong voltage will result in machine damage not covered under warranty.**

- 120 or 240 VAC (refer to the machine label)
- 50/60 Hz

## *Emergency Stop*

A single emergency stop twist-to release switch is connected to a safety relay in the electrical enclosure.


**Figure 2. E-Stop Button**


**Caution: hot surface. Door can be opened when E-Stop is depressed or during power outage.**

Remember: Ensure tooling is cooled to room temperature before servicing.

# SETUP AND CONFIGURATION

Proper sizing of the **thermal nozzle** and alignment of the tooling are crucial to optimizing process results and repeatability. The following guidelines are the recommended methods however all applications vary, and several iterations of tooling process development may be required and may not follow all of the recommended guidelines.

**Thermal Nozzle Diameter -** The nozzle diameter should be .187”-.25” larger than the material to be processed.

**Thermal Nozzle Width -** The factory supplied width of 0.5” is optimal for lamination speed. (Custom sizes, made-to-order available).

**Left (Proximal) Grip -** This assembly must not be moved from its factory mounted position or damage to the system may occur.

**Grip-to-Grip Distance -** Position the right (distal) grip such that the heads do not grip the heat shrink but securely hold the product mandrel; Loosen the two fasteners at the bottom-rear of the assembly. Reposition the assembly and then tighten the two fasteners.

**System Options -** Many optional accessories are available to enhance the functionality

of the system and improve process yield. Contact Beahm Designs' sales department or visit our web site www.beahmdesigns.com for more information on available accessories and to request a quote. Examples of available accessories are;

-Vision systems with or without on-screen crosshair line generators.
-Laser line generators.
-Extended product support trays/guides.
-Product grip nests/alignment tooling.

# System Controls and Features

Located on the front panel are the following controls and/or displays and their function:


**Figure 3. 410-A Thermal Traverser Front panel**

**Table 1. 410-A Thermal Traverser Control and Display Functions**

| Item | Function |
|---|---|
| 1 | Controls the heated air set point |
| 2 | Indicates when heater power is on by illuminating, off when not illuminated |
| 3 | Indicates when system power on by illuminating, off when not illuminated |
| 4 | Returns all system power and air following an Emergency Stop |
| 5 | Toggles heater power on and off |
| 6 | Interrupts all system power and air |
| 7 | Initiates process sequence |
| 8 | Interrupts the process sequence and resets the system timer |
| 9 | Meters the heater air flow rate |
| 10 | Displays the grip pressure |
| 11 | Inputs traverse speed and distance parameters and displays operator prompts |
| 12 | Controls the pressure to the product grips |

# PARAMETER SETTINGS

**Temperature** - Depress and hold the up or down arrow key of the temperature controller to scroll to the desired temperature. After 2 seconds the new value will be accepted, and the temperature will ramp to the new set point.

**Grip Head Pressure** - Rotate the regulator knob clockwise or counterclockwise until the pressure gauge displays the desired value.

**Nozzle/Lamination Profiles** - Follow Human Machine Interface (HMI) screen prompts, based on the program loaded, to enter lamination speed, length, and delay parameters.

**Heater Air Flow** - Rotate the flow meter knob clockwise or counterclockwise until the flow rate reaches the desired level.

# RUN PROCESS

1. On initial power up, if the heater assembly is not in the “home” position the HMI will display the prompt “PRESS START TO RESET”. Ensure the main door is closed and depress the start switch to reset the system.
2. Once reset, the HMI will display the prompt “PRESS YES TO ACCESS PARAMETERS, NO TO CONTINUE” If yes is depressed, system parameters will be accessed. If NO is selected, the system will run the last entered values, even after a power cycle.
3. If YES selected;
    - ***“Traverse Delay”*** will delay the heater nozzle from traversing for the duration entered in seconds.
    - ***“Laminate speed”*** Zone 1-4; will determine the speed in mm/sec. at which the thermal nozzle will travel along the components.
    - ***“Laminate Length”*** Zone 1-4; will determine the length in mm that the thermal nozzle will travel along the components.
4. Load product between the product grips and activate the grips.
5. Close the main door and depress the **START** button. The thermal nozzle will extend to the product, remain at the start position for the set delay duration then traverse along the parts.
6. Upon return to the start position (home), open the main door and depress the **START** button.
7. Deactivate the grips and remove the product.

## *Abort Process Sequence*

This process may be aborted at any time during operation.

1. Depress the stop/reset switch.
2. The system will home, and the product will be released.
3. Remove product.

# CALIBRATION

**IMPORTANT NOTES:**

**Calibration should be performed by a certified service, preferably with the system in the location of use. Calibration procedures are the domain of these service providers.**

**Calibration refers to the process of verifying that each of the systems' instruments that controls a process parameter is within specification.**

**Calibration DOES NOT refer to the process of measuring the temperature at the center of the thermal nozzle and "matching" the value to the temperature controller set point.**

**The measured value at the thermal nozzle will rarely match the temperature controller set point and the delta will increase towards the center of the nozzle.**

**For temperature stability verification it is recommended that the air be measured .062"-.093" from the exit point of one of the flow ports. Stability should be +/-2.0 Degrees over one hour or at a minimum over the duration of a typical process cycle (customer/product specific)**

**Flow meters must be verified vs. calibrated since they cannot be adjusted if out of manufacturers specifications.**

- Calibrate the temperature controller annually.
- Calibrate the pressure gauge annually.
- Verify the actuator speed and distance annually.
- Verify the heater air flow meter annually.

# TEMPERATURE CONTROLLER (3216E)

## *Switching from Fahrenheit to Celsius*

**If the system is equipped with the Eurotherm model 3216, use the following instructions:**

a. Press and hold the page button (left most) until Lev 1 appears.
b. Press up arrow to Lev 2 appears.
c. Press scroll to code 0.
d. Press up arrow key for code 2.
e. Press scroll button until units appear.
f. Press up or down arrow key to select C.

## *Auto-Tuning*

**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.**

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/](https://www.eurotherm.com/download/3200-engineering-manual-ha028651-iss-15/)

# MAINTENANCE

**Note: Ensure the machine is unplugged for any servicing or maintenance work.**

**Note: Perform these steps ONLY when the thermal nozzle 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. The machine should not be washed down.
2. Cleaning should be with a soft dry cloth only.

## *Exchanging Thermal Nozzle (s)*

**Figure 4. Thermal Nozzles**

1. Loosen the set screw at the top of the nozzle adapter.

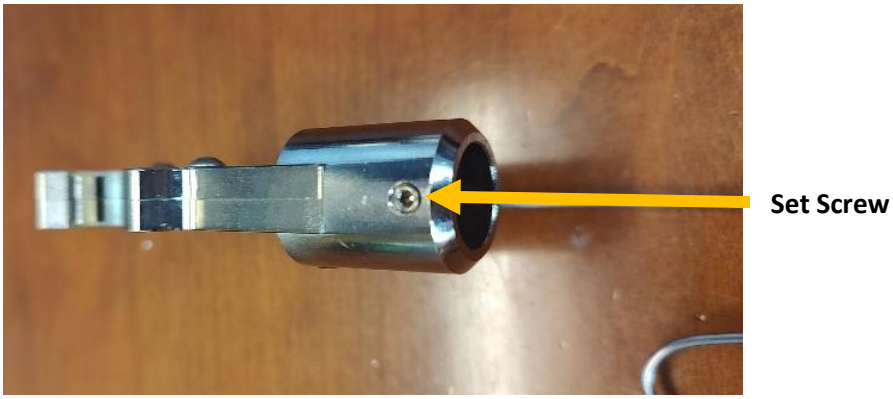



**Figure 5. Nozzle Set Screw**

2. Slide the nozzle while simultaneously removing the thermocouple connector.

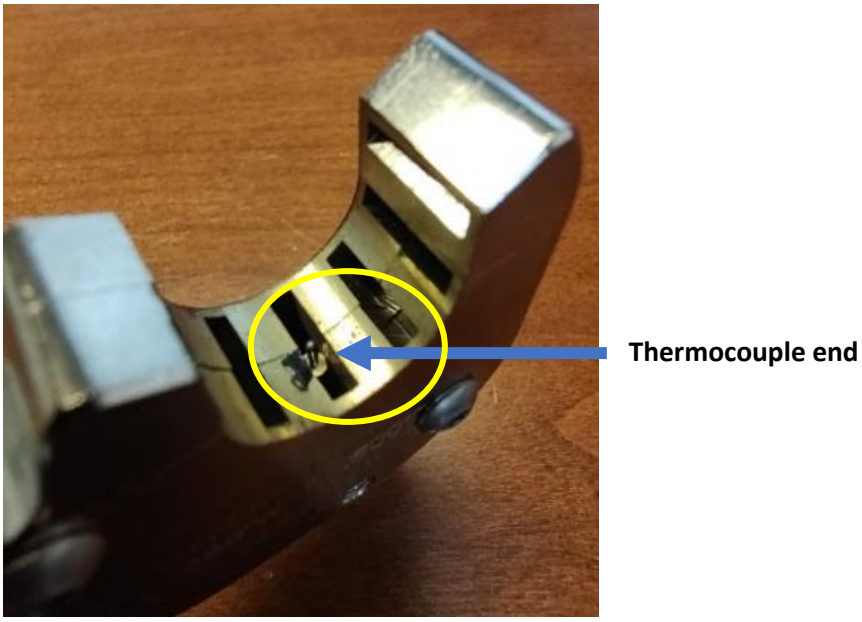



**Figure 6. Thermocouple Tip**

3. Install the replacement nozzle/thermocouple connector.
4. Tighten the set screw in the adapter.

## *Exchanging Grip Heads*

1. Remove the fasteners in each grip head.
2. Replace the grip head with the alternate.
3. Reinstall the mounting fasteners.

## *Aligning Tooling*

**Note: Alignment should be performed on a prepared product subassembly.**
**Alignment MUST be performed with system power off.**
**Alignment MUST be performed with heads at ambient temperature.**
**Alignment MUST be performed on a flat and reasonably level surface.**

1. Place a lamination subassembly within the proximal and distal grip assemblies.
2. Adjust the Vee guide and each grip such that the lamination subassembly is centered within the nozzle opening.

## *Fuse Replacement*

The machine has two fuses located in the power entry module on the back of the machine.

1. To replace a blown fuse, remove machine power by unplugging the power cord from the machine.
2. Remove the cover of the power entry module using a screwdriver in the screwdriver slot (Refer to **Figure 7**).

**Important: A blown fuse may indicate machine malfunction. If a fuse blows before exceeding its expected lifespan, then perform troubleshooting procedures. Contact MSI if the problem persists.**

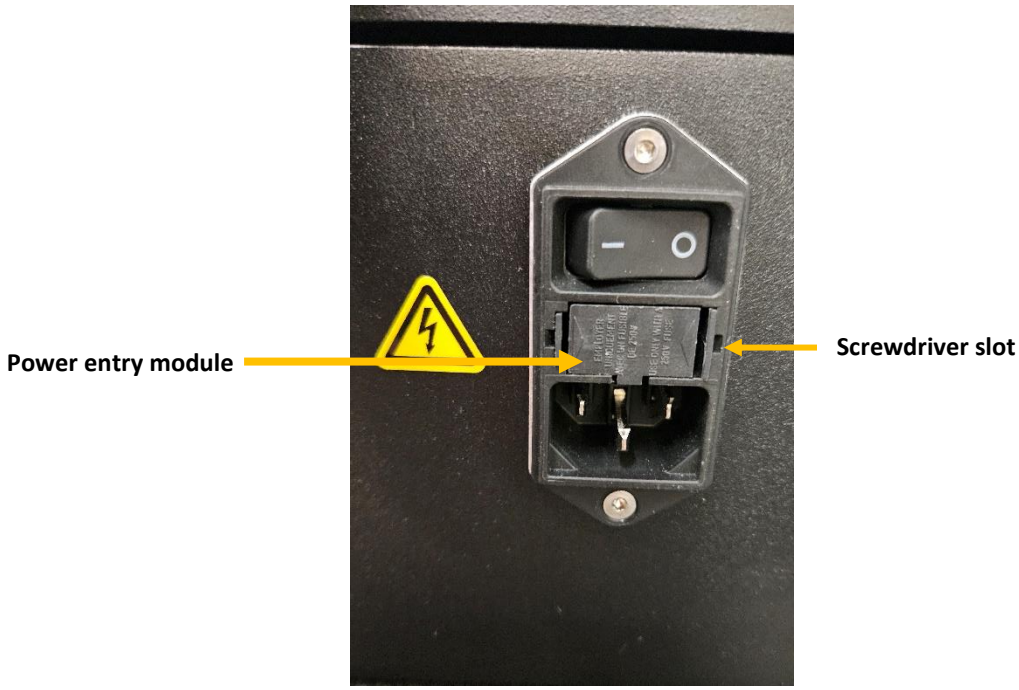



**Figure 7. Fuse Replacement; Main Power**

3. Remove the fuse holder (Refer to **Figure 8**).

**Figure 8. Power Entry Module Fuses**

4. Remove the old fuse from the holder.
5. Insert the new fuse. Orientation of the fuse is not important.
6. Reinsert fuse holder. Ensure the left and right sides clip into place.

# DIAGNOSTICS AND TROUBLESHOOTING

**Table 2. Diagnostics and Troubleshooting**

| Issue | Possible Causes | Solution |
|---|---|---|
| Temperature not stable | • Thermal Nozzle replaced<br>• Thermocouple loose | • Auto-tune<br>• Re-install thermocouple |
| S.br | • Sensor Break<br>• Thermocouple not installed | • Determine break and repair<br>• Install thermocouple |
| No heat at nozzle | • Heater air flow too low<br>• Defective heating element<br>• Defective power control | • Increase air flow<br>• Replace heating element<br>• Contact Beahm Designs |
| .Err code in display | • Temperature controller<br>• Software failure | • Replace temperature controller |
| System will not power on | • Emergency stop switch depressed<br>• IEC power cord not fully connected<br>• Fuse needs to be replaced | • Rotate switch knob to engage<br>• Verify installation<br>• Replace fuse |

# SPECIFICATIONS

**Table 3. System Specifications**

| Description | Range | Resolution | Accuracy |
|---|---|---|---|
| Temperature | 200-750° F | 1.0 deg. | +/-0.75% F.S. |
| Speed | 0.095-20mm/sec. | 0.1mm/sec. | +/-5% |
| Length | 1-XXXmm | 1.0mm | +/-0.8mm/100mm |
| Pressure | 0-100 psi | 2.0 psi | +/-3.5% F.S. |
| Heater Flow | 5-50 SCFH | 5.0 SCFH | +/-7% F.S. |

## *Facility Requirements*

- Voltage: 108-242 VAC 50/60 Hz.
- Wattage: 500 max.
- Compressed Air: 60-125 psi, 0.83 CFM, filtered 50 micron or greater, oil and water free.

# CRITICAL PARTS

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

**Table 4. Critical Spare Parts**

| Part Number | Description | Quantity |
|---|---|---|
| 1150440-001 | Temperature controller | 1 |
| 1148103-001 | Drive/controller | 1 |
| 1148096-001 | HMI Keypad | 1 |
| 1131433-001 | Heater SCR | 1 |
| 110254-001 | Heater | 1 |
| 1330445-003 | 4-way valve | 1 |
| 119106-001 | Relay, PLC, 24VDC, Din Rail, 1PDT | 4 |
| 1145619-001 | Relay 24VDC, integrated, 4 PDT | 1 |

# 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 SERVICING

## *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.