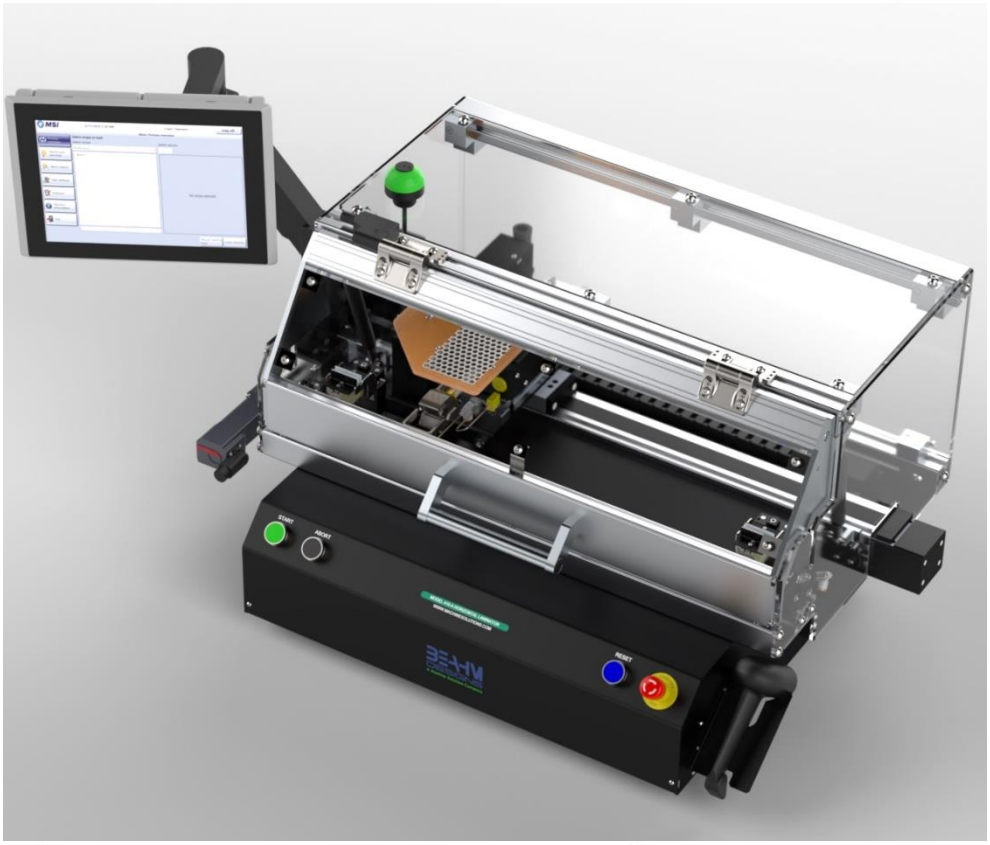
MACHINE SOLUTIONS INC.

USER MANUAL

BEAHM DESIGNS THERMAL TRAVERSER

MODEL 410-A HMI CE



BEAHM DESIGNS

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WELCOME

Thank you for purchasing your new 410-A HMI Thermal Traverser. At Machine Solutions Inc. (MSI), we are dedicated to bringing innovative process development solutions to both medical device and nonmedical organizations. The MSI proprietary segmental technology has been successfully implemented in manufacturing clean rooms on five continents, and continues to expand – meeting, growing, and facilitating the abilities of device companies around the globe. MSI looks forward to helping your organization provide life-improving devices to your customers, today and tomorrow.

MACHINE DESCRIPTION

The model 410-A HMI Thermal Traverser 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.

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SAFETY

- Use of eye protection when working with compressed gases and heated materials is advised.
- The maximum observed Sound Pressure Level is below 70 dBA.
- Die jaws will become hot during operation and, depending on temperature set point, can cause severe skin burns if contact occurs.

Caution: Safety standards require two people to uncrate this machine.

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. (398°C/750°F).
Note: This equipment is not for use in an ATEX environment.

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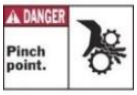
UNCRATING

Caution: This machine weighs 185lb. Safety standards require a minimum of two people to life the lift this machine.

1. Remove the front panel of the crate.
2. Place the crate on the edge of a bench with a corner overhanging. Remove the hex screws. The crate must remain in an upright position.
3. Remove the machine from the crate.

INSTALLATION

Caution: heavy. Do not attempt to move the machine manually. Due to its weight, the machine should be moved with a forklift and placed on a reinforced surface. If a forklift is not available, then ensure adequate personnel and mechanical aids are used.



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

Note: It is recommended that this equipment be placed at a height where the machine is at an ergonomically viable height for the user population.

1. Place the system on a level, sturdy surface.
2. Connect the power cord to the system and then to a 120 or 220 VAC 50/60 Hz. Outlet. (only as specified on the machine label)
3. Connect the air supply hose assembly to the system and then to a clean, dry, and filtered compressed air source.

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Connections

1. Locate the input panel on the rear panel of the machine.
2. Connect a power cable to the power connector.

Figure 1. Rear Power Input

Caution: high voltage.

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

Using 0.25” (6 mm) air tubing, connect the machine to a compressed air source with the following specifications:

- 100 – 120 psi at 1 cfm
- Dried
- Filtered (1 µ)
- Oil free

Note: The machine does not require an oiling system. The components are factory lubricated.

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PROCESS OVERVIEW

The Shrink Laminator is used to heat shrink material on a single catheter assembly. Variable speed and distance controls allow the shrinking to start at any position on the assembly. A fixture grips the devices to be processed. A heater array is mounted on a linear actuator. After the heater array is moved to the home position, the operator installs the catheter in the grip mechanism. The hot air system is brought to the correct temperature. When the process is started, the heater array is moved to a start position. The heater assembly is moved out to the catheter, then the heater array is moved across the length of the catheter through up to ten speed zones. The heater array is retracted and returns to the loading position. The operator can select a recipe file by name from a list or using a barcode scanner. Each file contains the variables used by the process sequence. A passcode is used to control access to the recipe settings, machine settings, and several test screens on the HMI.

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STARTING UP

Power up

Caution: Do not use the machine for production purposes without the safety cover in place.

Remove the safety cover to perform maintenance functions only.

1. Switch the main disconnect to the on (|) position. The main disconnect is located on the rear of the machine.

Figure 2. Main Disconnect

2. Wait for the machine to power up and the operating system to complete loading.

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3. Once the Main Screen is displayed, Turn the E-Stop clockwise and pull it out.

   Note: The machine will not reset until operating system has loaded completely.

4. Press the blue Reset button on the front panel.

Figure 3. E-Stop and Reset

5. The Main screen displays.

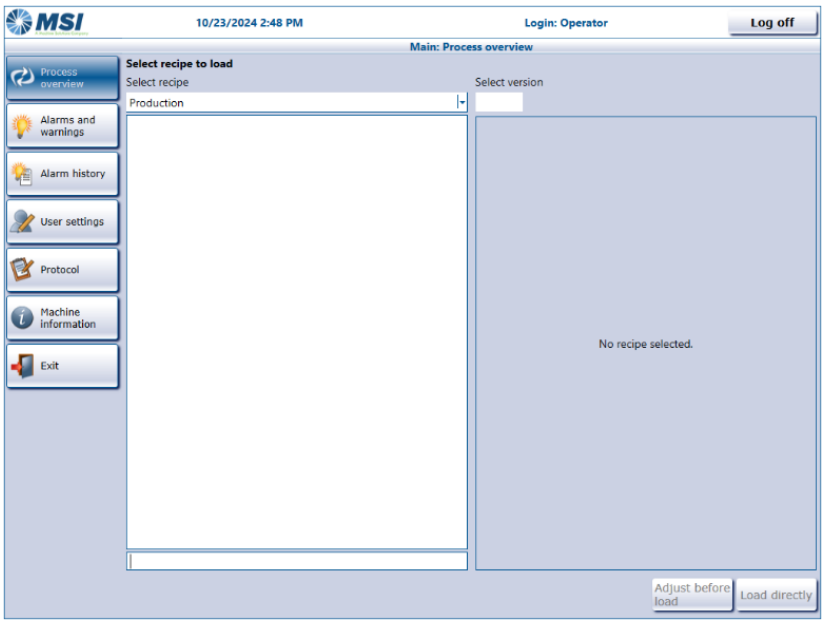

Figure 4. Main Screen

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Emergency stop

1. In case of an emergency, press the E-Stop button to immediately stop all machine motion.

Figure 5. E-Stop

To disengage the E-Stop:

1. Turn the E-Stop clockwise and pull it out.
2. Press the blue reset button (Refer to Figure 3. E-Stop and Reset).

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.

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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. If moved, place the assembly as far left on the rail as possible.

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.

Articulating HMI Screen – Position HMI in an ergonomically viable position for operator. Ensure it does not interfere with door opening.

Barcode Scanner – Position barcode scanner in desired configuration. The barcode scanner mount can be positioned for front or rear facing docking. The front facing docking allows for scanning without the removal of the scanner from the mount with the trigger accessible cutout feature.

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.

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SYSTEM CONTROLS AND FEATURES

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

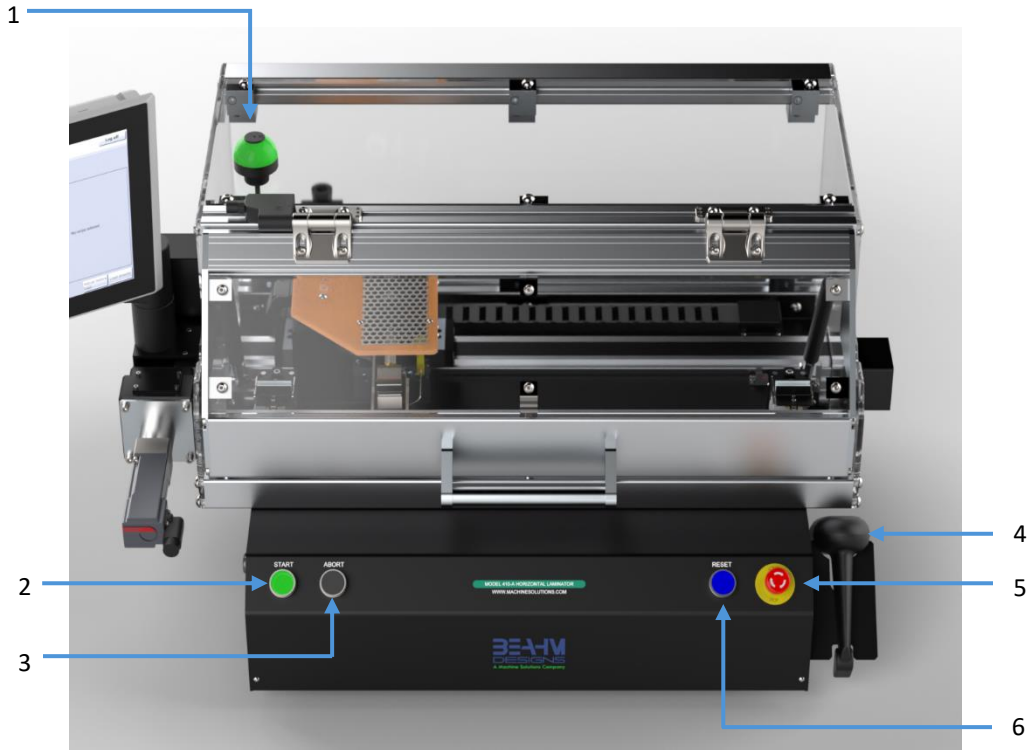

Figure 6. 410-A Thermal Traverser Front panel

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

Item	Function
1	Audible Alarm – Fault is present/End of process Red Indicator – Fault is present Yellow Indicator – Idle state/Waiting for parts to be loaded Green Flashing Indicator – Run process
2	Initiates process sequence, press when luminates green
3	Interrupts process sequence
4	Barcode scanner
5	Interrupts all system power and air
6	Returns all system power and air following an Emergency Stop, press when luminates blue

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Table 2. High Level Functional Summary

Press this button	To access this screen	Which lets you do this
Main	Process overview	Select recipe to load
	Alarms and warnings	Shows active alarms and warnings / reset
	Alarm History	History of past alarms and warnings
Recipes	Edit	Select existing recipe to edit parameters
	Create new	Create new recipe and create parameters
	Create from template	Create new recipe from existing template
	Delete	Delete existing recipes
	Import	Import external recipes from hard drive/USB
	Export	Export existing recipes to hard drive/USB
Settings	General Parameters	MSI Support
	User Settings	Change current user password
	User Accounts	Add/Delete Users / Change all user passwords & roles
	Recipe storages	File and store existing recipes
	Administration	Reset HMI settings / Default settings
	Process data	Process data / documentation location saved
	Unit Settings	Change unit settings
Setup	Manual	Manually control all system functions
	Calibration	Calibrate flow, pressure and temperature
General	Protocol	Time, action and details of protocols
	Process history	Created date, results and operator history
	Machine information	Machine name, manufacturer info and versions
	Exit	Exit and shutdown HMI

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Main Menu Screen

Logging on

Standard Role Logon

Any user type other than the default Operator is required to log on with a password to access restricted functions. There are 5 standard logon roles and default passwords:

Table 3. Roles and Default passwords

Role	User Name	Passwords
Operator	Operator	
Lead	Lead	lead
Technician	Tech	tech
Engineer	Engineer	eng
Administrator	Admin	admin

Each user can be assigned one password. Any number of users may be assigned to the same role

Figure 7. Log ON/Off Screen

To log on using standard user levels:

1. Select '*Log off*' on the upper right-hand corner of the screen. The User-Log On/Off screen appears.
2. Enter in username and password.

Once a user successfully logs on, the HMI returns to the Main Menu screen, and the current user displays in the upper right-hand corner.

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Individual User Level Logon

Individual users can be created and assigned a specified user level. User accounts are not required to have passwords, regardless of access level, but passwords are strongly recommended to enforce access controls.

To create an individual user:

Note: It will be the responsibility of the customer to maintain a user and password log.

1. Select '*Log off*' on the upper right-hand corner of the screen. The User-Log On/Off screen appears.
2. Log in as Administrator.
3. User level will be changed to admin and the User accounts button will appear in the settings drop down.
4. In the User accounts screen select Add user on the bottom right corner.
5. Enter in Login name, User Name, Password and select role.

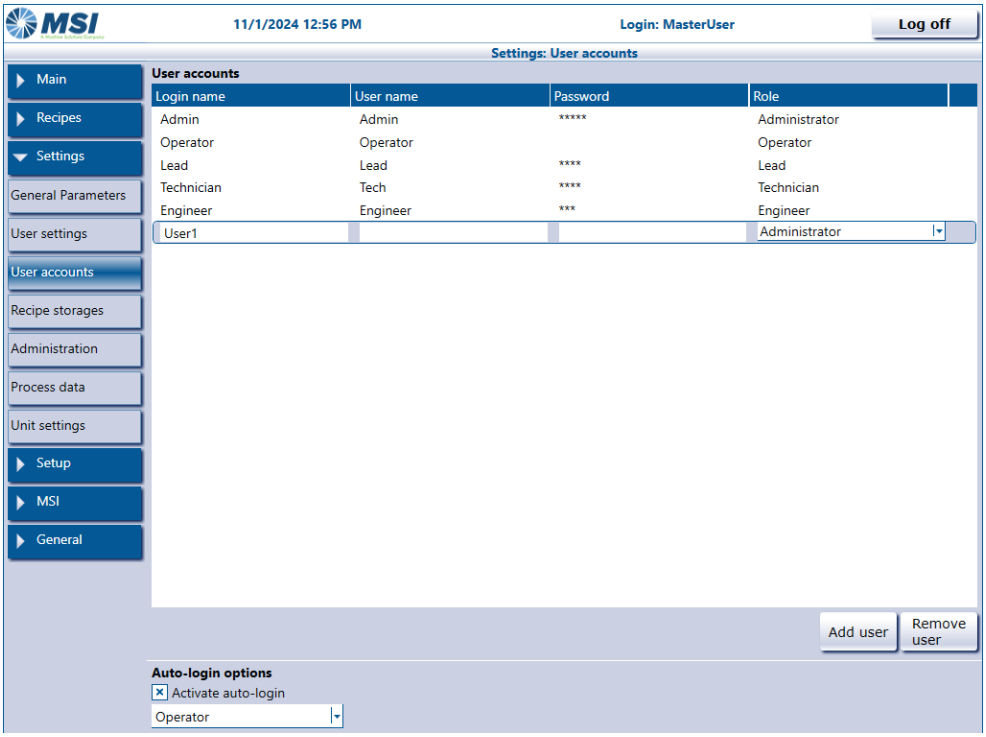

Figure 8. Creating a New User

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Logging off

From the User – Log On/Off screen, select *Log Off* to log off the current user. Will revert back to the login screen.

User management (administrators only)

Users can be added, passwords can be changed, and users can be removed from the User accounts screen under the settings drop down.

To change any password:

Select the user to change password and press the text entry box under password. Keyboard will pop-up, type new password.

To delete an individual user:

Select the user to delete and press the Remove user button on the lower right-hand corner of the screen.

Note: It is not possible to delete the currently logged-in user.

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Shutting down the HMI

Note: HMI must be powered down prior to turning off the machine, failure to do so can result in a corrupt software interface

Navigate to the Exit screen under the General drop down. Press the Shutdown button to open the “Do you really want to shutdown?” pop-up window.

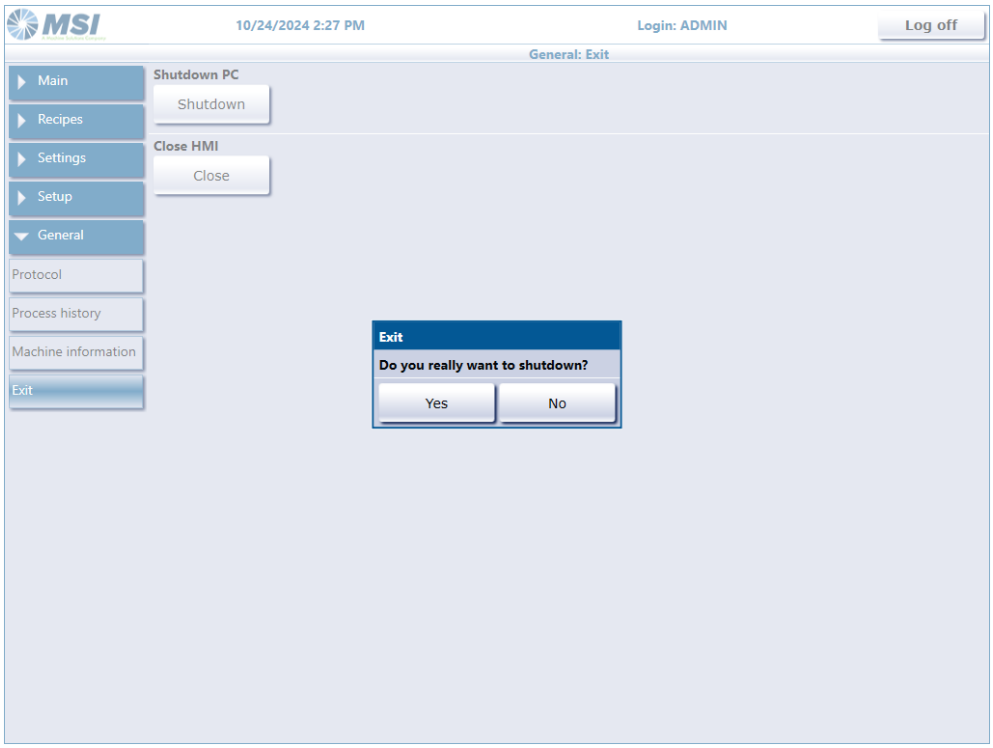

Figure 9. Power Down the HMI pop-up window

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Machine information (About screen)

Note: When calling Machine Solutions for technical support, please have this information ready.

The Machine information screen lists the following information:

- Manufacturer's address and contact information
- Machine model and serial number
- Software version numbers for:
  - Programmable logic controller (PLC)
  - HMI

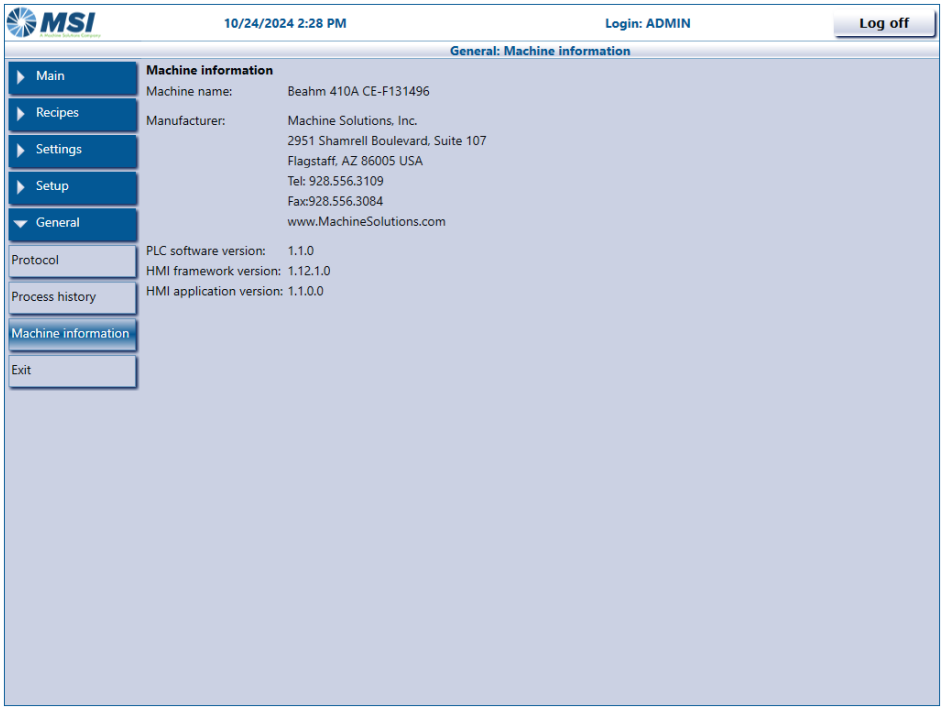

Figure 10. Machine Information screen example

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MSI Support

- Navigate to the General Parameters screen under the settings drop down.
- Pressing the MSI Support button will open a pop-up asking to open MSI support tools.

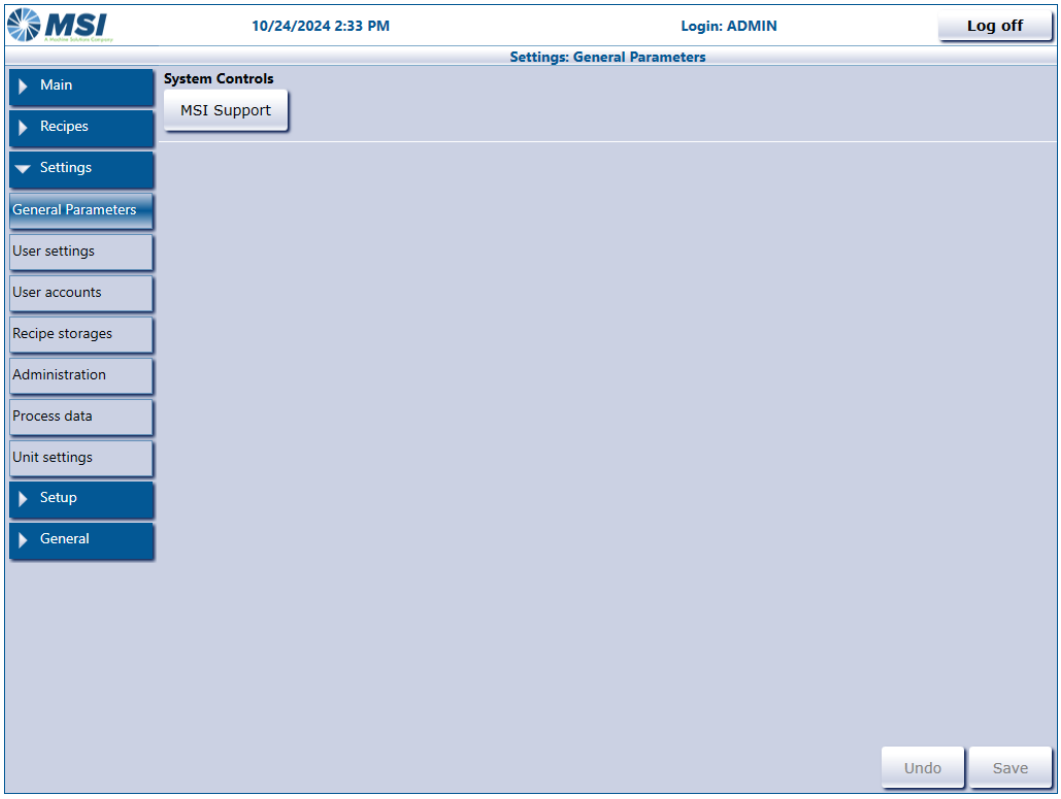

Figure 11. MSI Support

- Selecting Yes will close the HMI project and open Team Viewer for remote support.
  Note: The machine must be connected to an Ethernet connection and have access to the outside internet.
- Provide MSI service team with the Team Viewer UserID and Password to start remote support.

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CALIBRATION

Perform calibration when the following occurs:

- Machine installation
- Incoming airflow changes
- Observation of an out-of-calibration condition

To access this screen:

Login as Tech or higher. Navigate to Calibration screen under the Setup

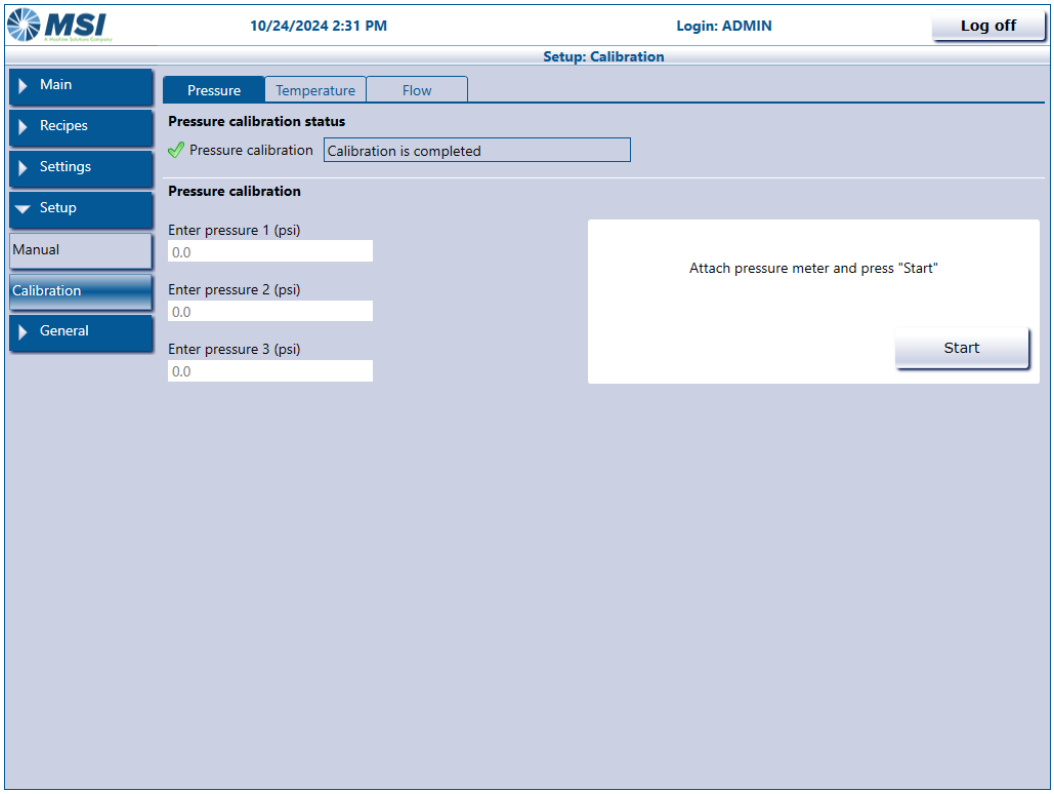

Figure 12. Pressure Calibration Screen

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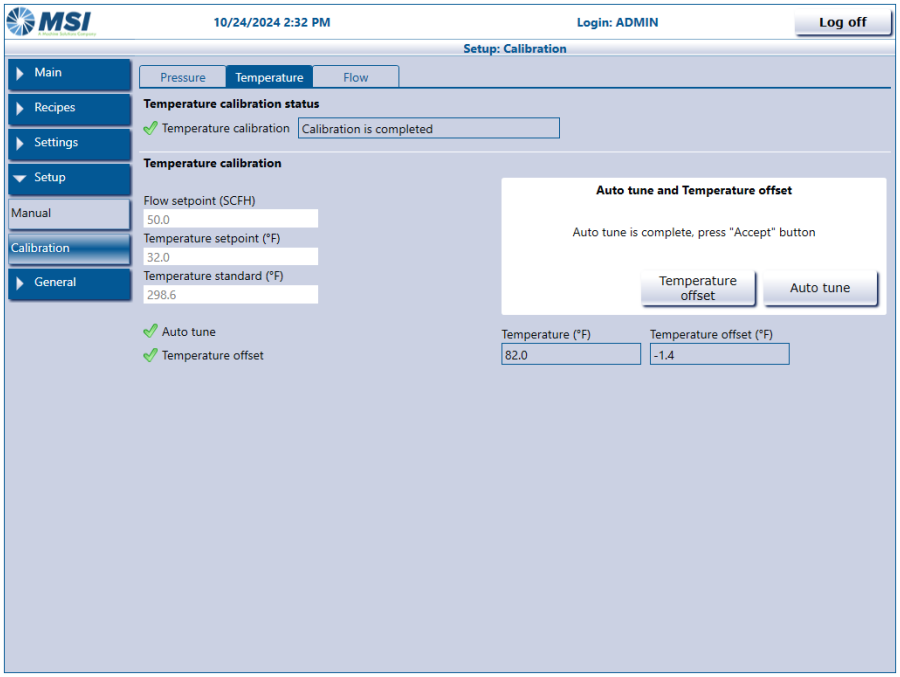

Figure 13. Temperature Calibration Screen

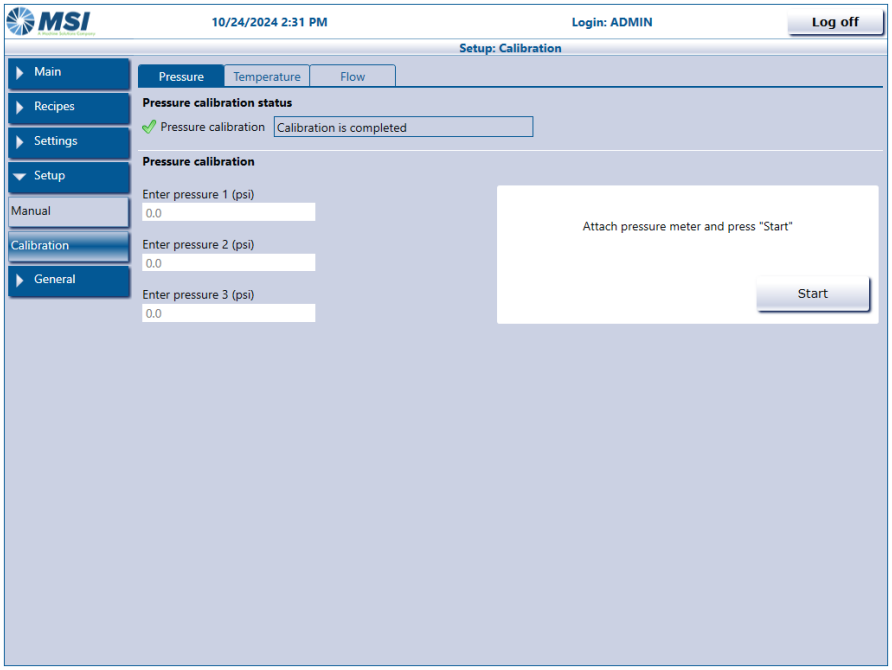

Figure 14. Flow Calibration Screen

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Select units of measure for calibration

Navigate to the Unit settings screen under the Settings drop down. These settings will allow user to select Metric or Imperial units for every machine measurement. Table 4 lists each parameter and the units that may be chosen.

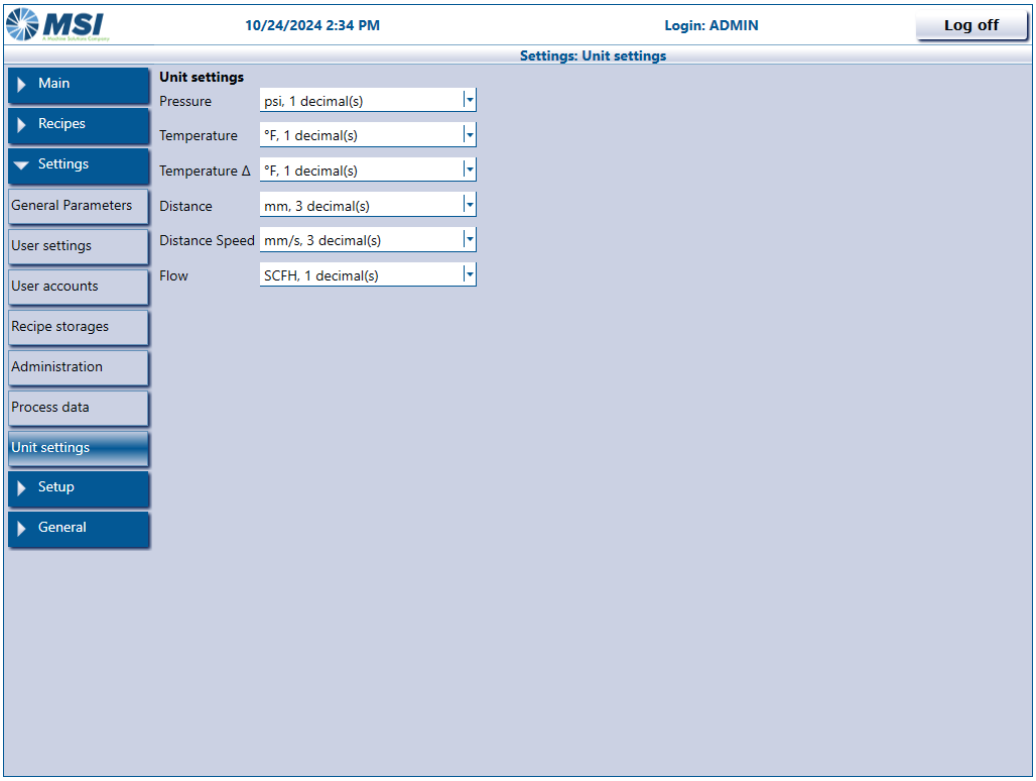

Figure 15. Unit of Measure pop-up

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Table 4. Units of Measurement

Parameter	Units of Measure	
	Metric	**Imperial**
Pressure	Pounds per Square Inch PSI	Pounds per Square Inch (PSI)
Temperature	° Celsius (°C)	° Fahrenheit (°F)
Temperature Δ	° Celsius (°C)	° Fahrenheit (°F)
Distance	millimeters (mm)	Inch (in)
Distance Speed	Millimeters per second (mm/s)	Inches per second (in/s)
Flow	Standard Liters per Minute (SLM)	Standard Cubic Feet per Hour (SCFH) / Standard Cubic Feet per Minute (SCFM)

Note: The "Temperature Δ" unit is used for displaying differences or changes in Temperature. It intentionally does not account for the freezing-point difference between C and F, to represent temperature differences accurately. It is used when displaying the temperature offset on the calibration screen.

Flow Calibration

The flow calibration is performed to standardize the reading from the internal flow meter with an external standard.

To calibrate the flow:

1. Move to the rear of the machine.
2. Remove the back cover on the machine.
3. Disconnect the flow tubing from the position shown. To disconnect, hold orange ring on connector, press the tubing towards the orange connector, then pull the tubing away from the orange ring.

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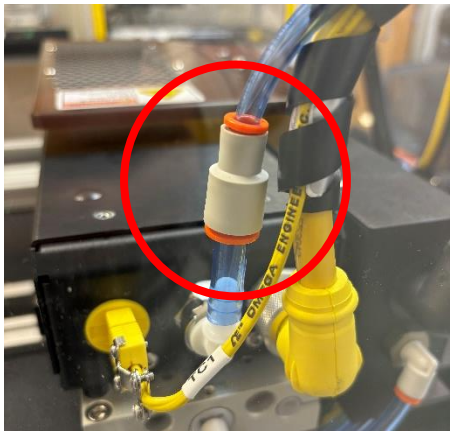

Figure 16. Flow Disconnect Position

4. Connect the flow standard to the positions shown.

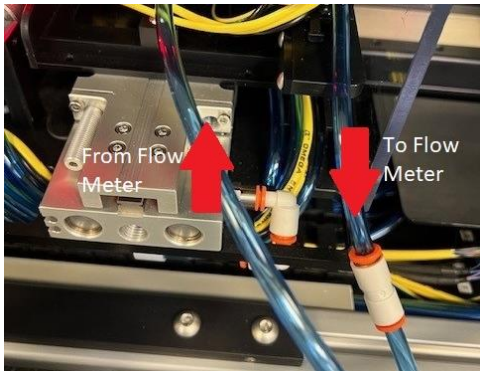

Figure 17. Flow Meter Standard Connections

5. Power up the flow standard and set to zero.

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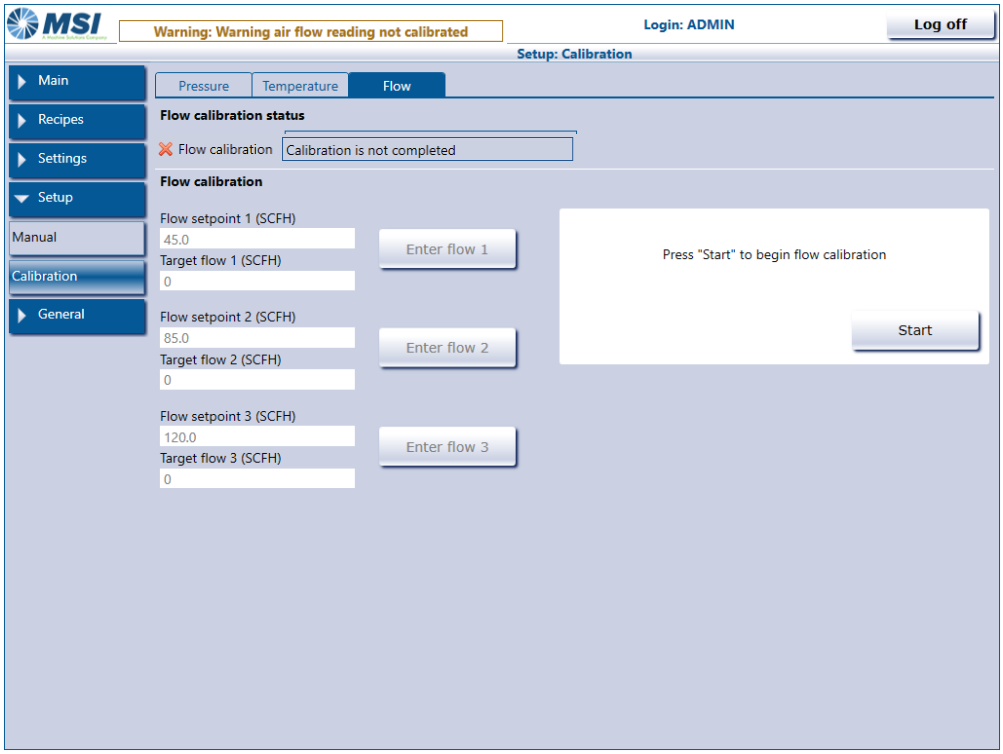

Figure 18. Start Flow Calibration

6. Return to the front of the machine. Navigate to the flow calibration screen and press the Start button to begin flow calibration.
7. Press the Clear and Continue button to zero out previous calibration settings.
8. Enter a flow setpoint into the Flow Setpoint 1 entry box then press the Enter flow 1 button.

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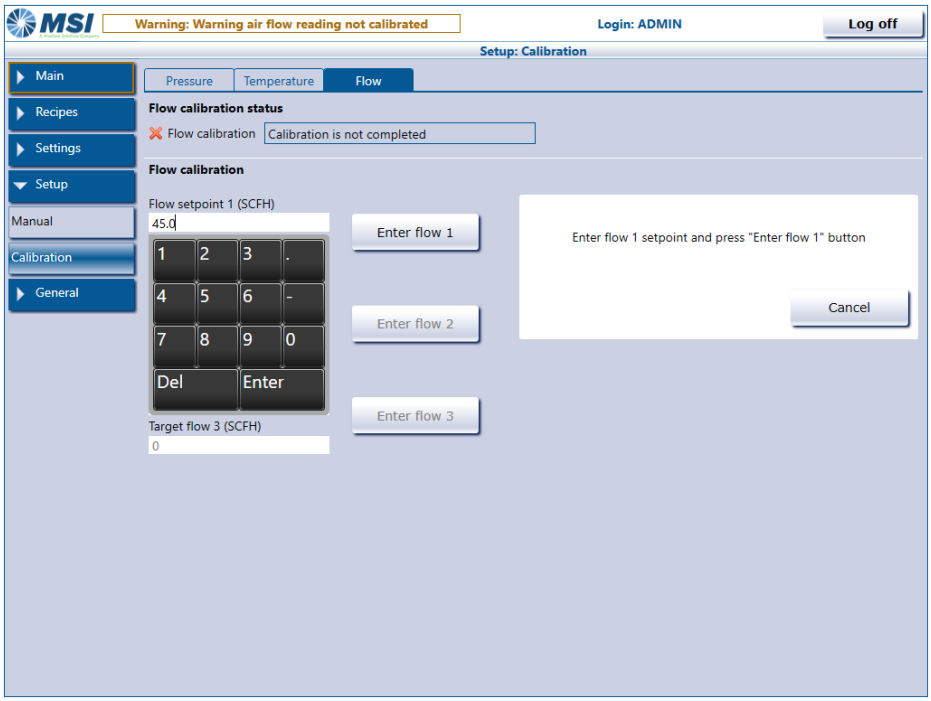

Figure 19. Enter Flow Setpoint

9. Flow will climb to setpoint.
10. Read flow from flow standard and enter the value into the Target flow 1 entry box.
11. Press Enter flow 1 to save the entered value.

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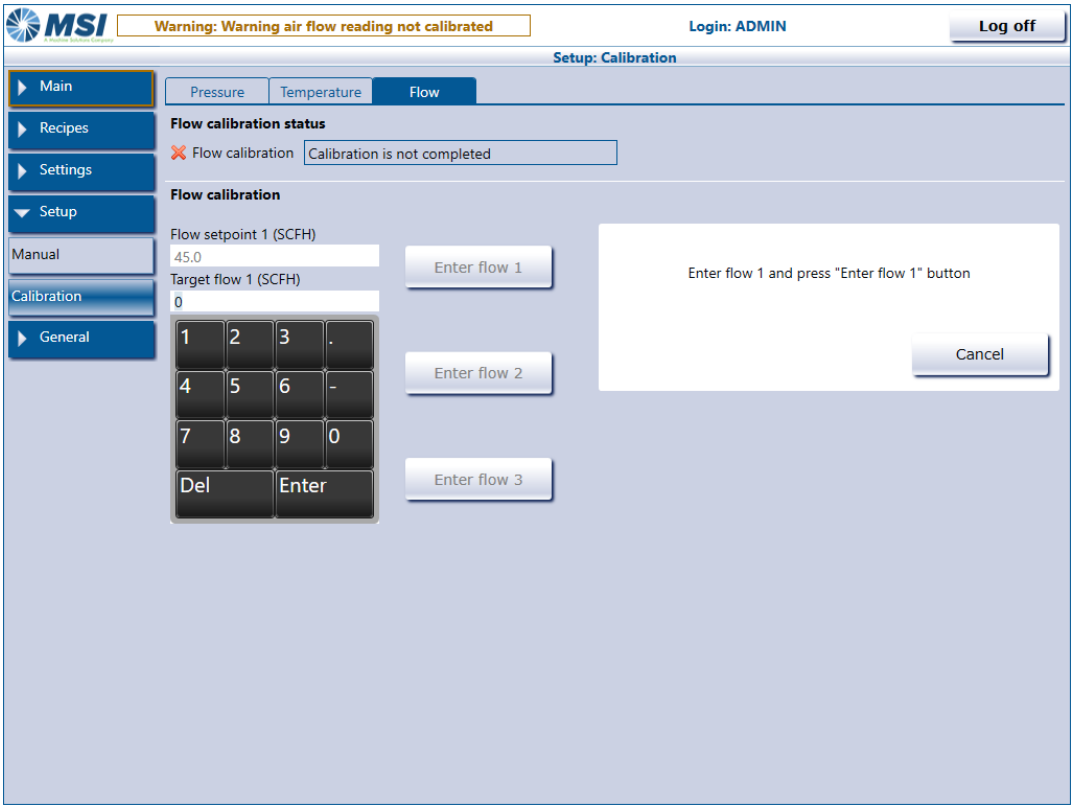

Figure 20. Enter Measured Value

12. Enter a flow setpoint into the Flow Setpoint 2 entry box then press the Enter flow 2 button.
13. Flow will climb to setpoint.
14. Read flow from flow standard and enter the value into the Target flow 2 entry box.
15. Press Enter flow 2 to save the entered value.
16. Enter a flow setpoint into the Flow Setpoint 3 entry box then press the Enter flow 3 button.
17. Flow will climb to setpoint.
18. Read flow from flow standard and enter the value into the Target flow 3 entry box.
19. Press Enter flow 3 to save the entered value.
20. The machine will save all values. Touch the Accept button to complete the calibration.
21. The status on the top will change to completed.

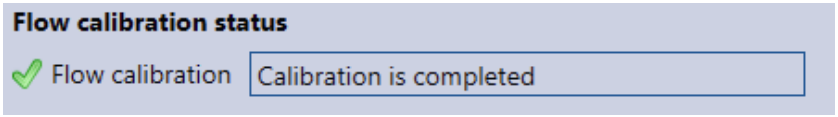

Figure 21. Flow Calibration Complete Status

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Temperature Calibration

MSI performs the Auto-Tune Procedure on the machine before it ships.

Auto-Tuning should be performed when:

- Discrepancy in temperature control stability is found.
- New or different nozzle is installed to machine base.

Temperature offset procedure should be performed at product processing temperature. (MSI performs temperature offset at 250°C prior to shipment.)

- Offset will vary from temperature to temperature.
- Offset should be set specific to product or process that has been selected.

Auto-tune PID Temperature Control Loop

To auto-tune the proportional integral derivative (PID) loop:

1. Start with the nozzle at ambient temperature.
2. Navigate to the Calibration screen in the Setup drop down. Select Temperature tab on the top.
3. Press the Auto tune button on the right side of the screen.

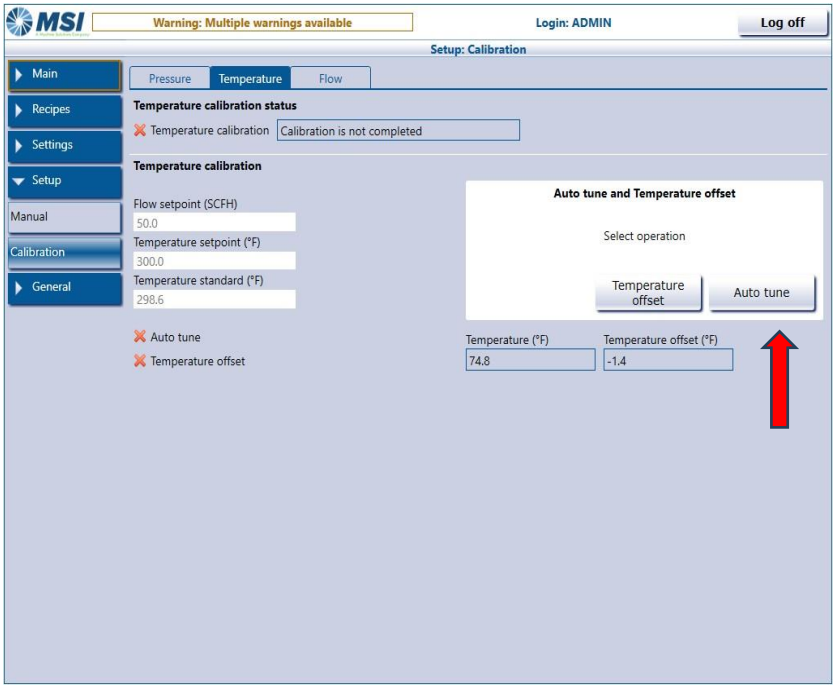

Figure 22. Enable Temperature Auto Tune

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4. Enter a flow rate setpoint and press the Start button. For best results, use the product processing flow rate.

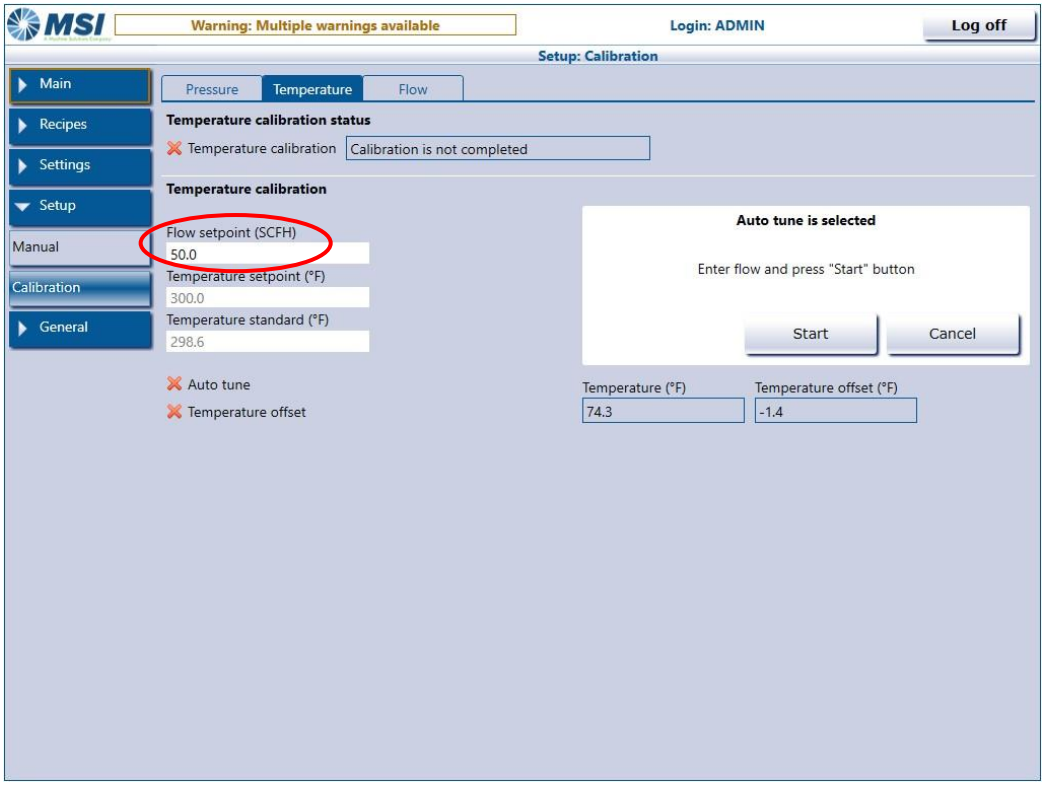

Figure 23. Flow Rate Entry

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5. Once flow has started, enter an auto-tune temperature setpoint and press the Continue button.

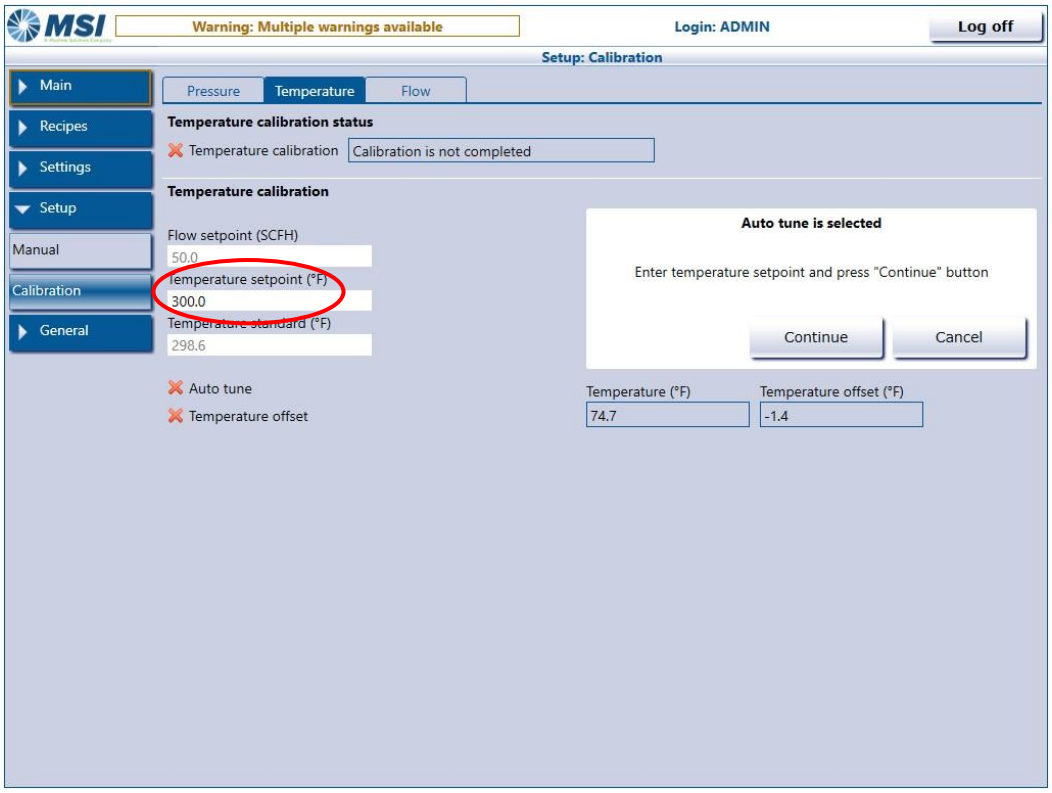

Figure 24. Temperature Setpoint Entry

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6. Auto-tune in progress. Temperature will climb to near the setpoint, recording PID values as it climbs.

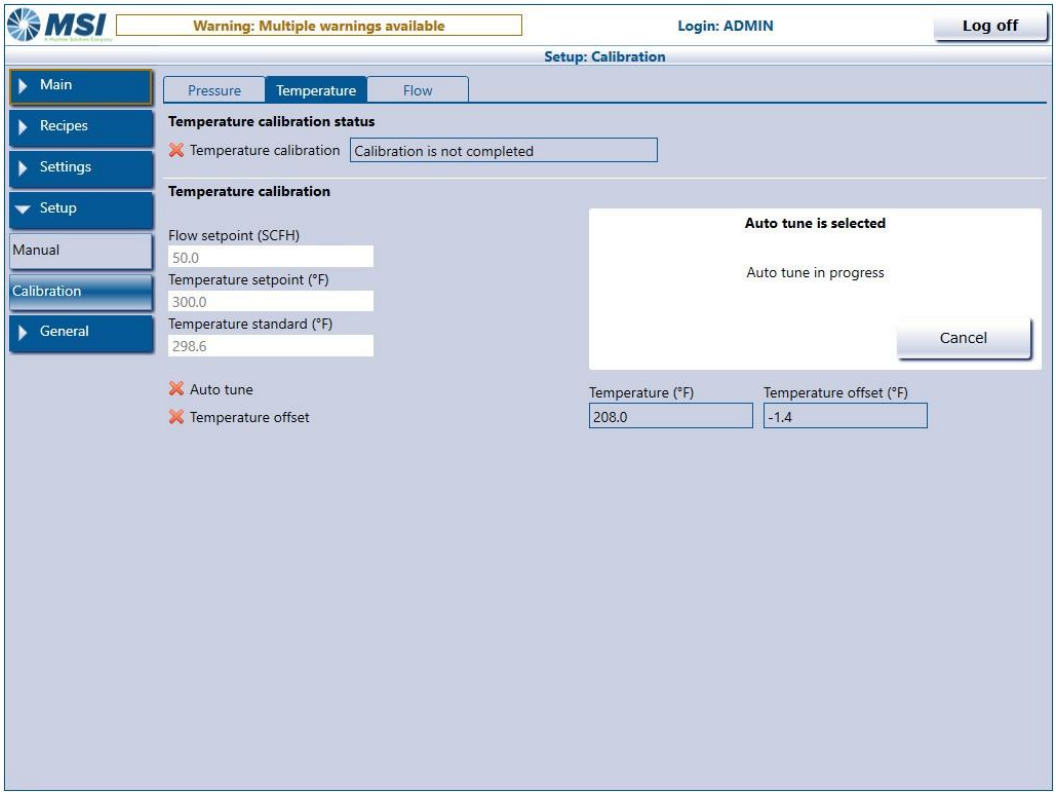

Figure 25. Auto-tune in progress

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7. When complete, press the Accept button to save the PID values.

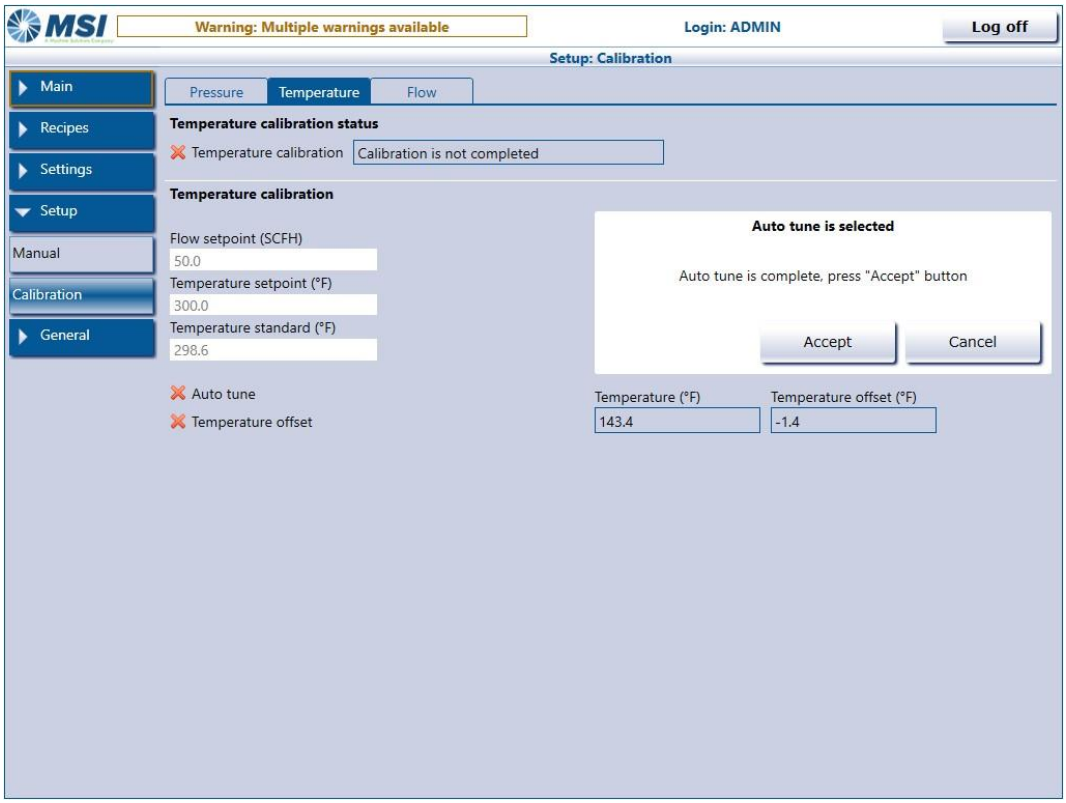

Figure 26. Accept Auto-Tune Button

8. The status on the top will change to completed.

Figure 27. Auto-tun Calibration Complete Status

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Synchronize Nozzle Temperature to a Standard (Temperature Offset)

Reminder: Temperature offset procedure should be performed at product processing temperature.

- Offset will vary from temperature to temperature.
- Offset should be set specific to product/process being run.

1. Select the Temperature Offset button.

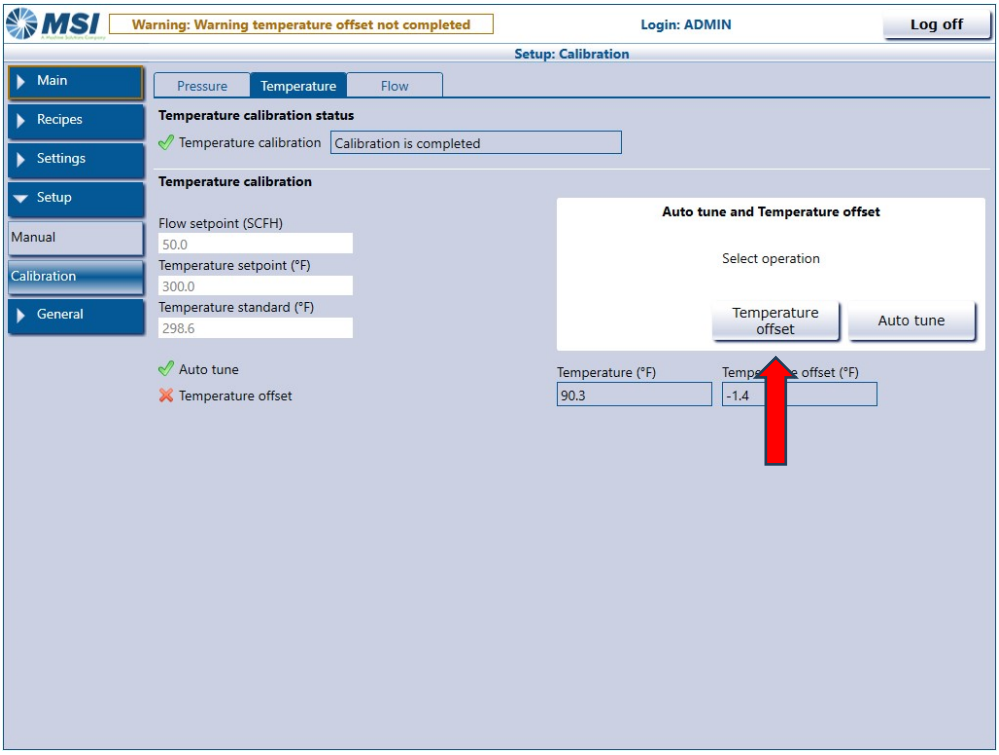

Figure 28. Enable Temperature Offset

2. Insert a temperature standard into the nozzle center.
3. Enter a flow rate value and a temperature setpoint value into the entry boxes then press the Start button.

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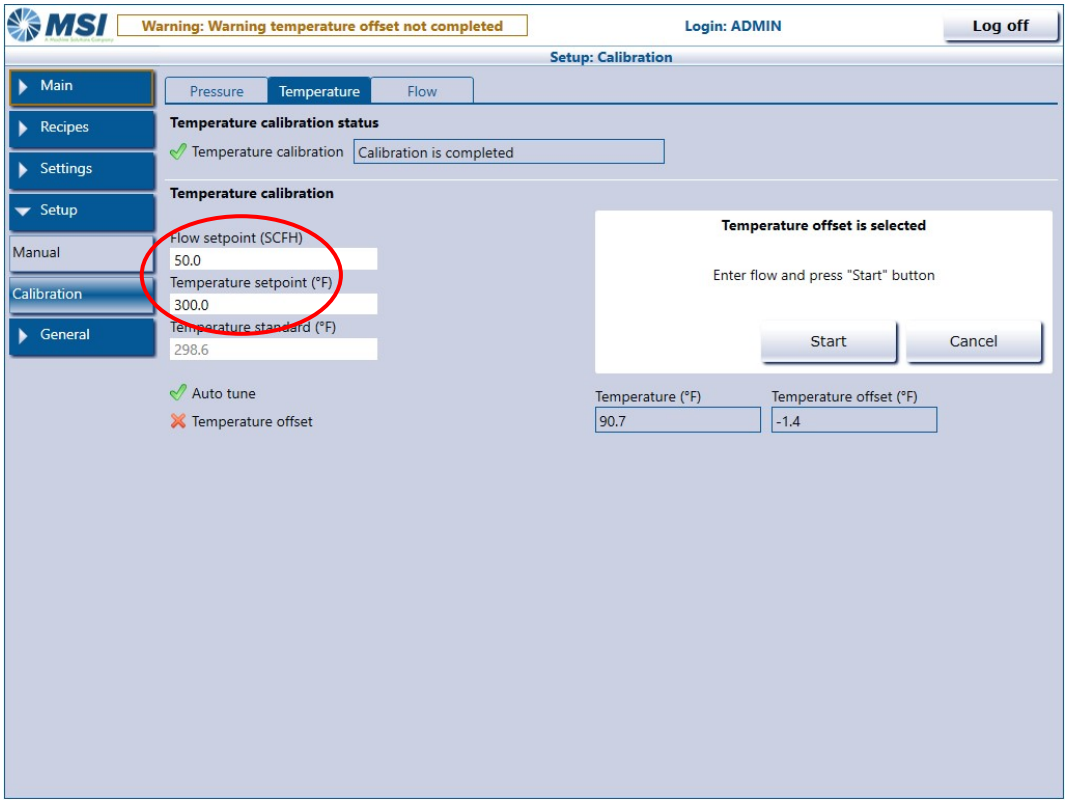

Figure 29. Start Offset Calibration

1. Wait at least 5 minutes for the nozzle to heat up and “soak” (all material has absorbed the heat and is uniform temperature).
2. Record the current reading of the temperature probe in to the “Temperature Standard” field.

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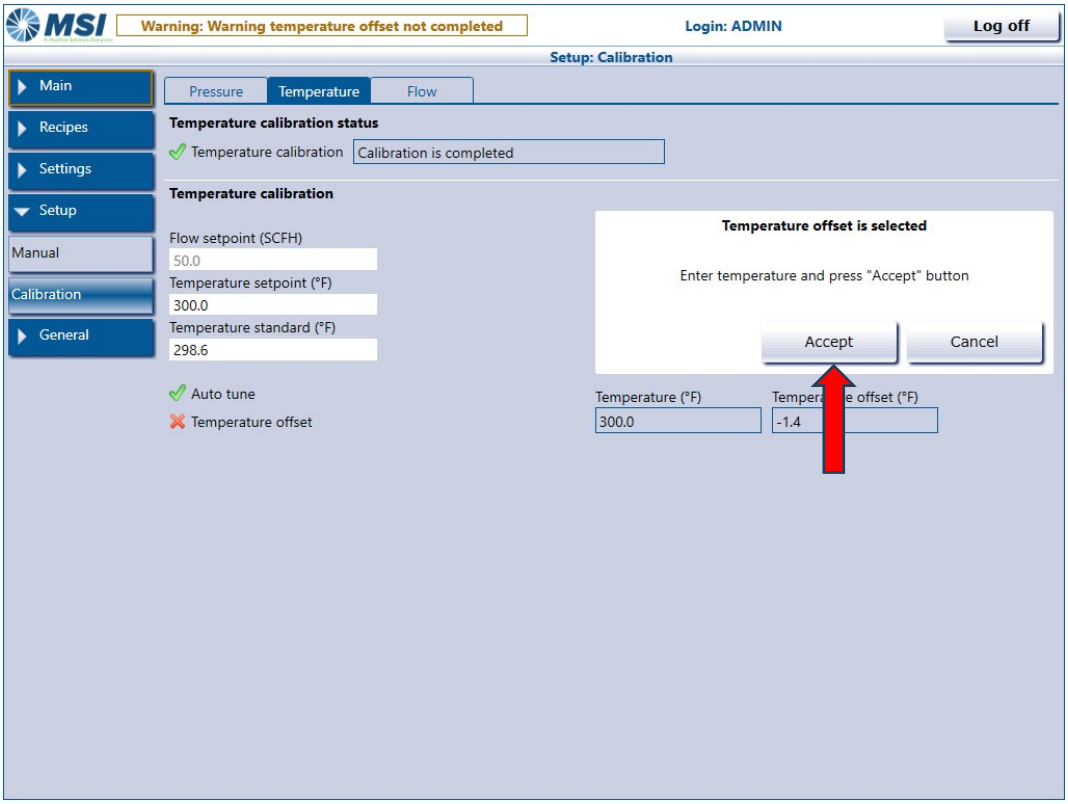

Figure 30. Manual – Accept Offset Calibration

3. Select Accept button to complete the temperature offset.
4. The Complete light will illuminate green.

Notes:

Offset displayed on screen should be the difference between the HMI temperature reading and probe temperature reading.

The "Temperature Standard" field is not meant to be the temperature offset. Enter the actual temperature reported from the temperature calibration standard in this field. If verifying temperature calibration, it must be verified at the temperature used to set offset. (Process Temperature)

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MANUAL CONTROLS (LEAD LEVEL OR HIGHER)

The Manual – Controls screen may be used for process development or functional verification. To access this screen, select Manual on the Setup drop down.

Figure 31. Manual – Controls screen

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The following controls appear on this screen:

Jog Speed

Use this field to set the jog left and jog right rate of travel.

Jog Left / Jog Right

Use the jog left and jog right buttons to move the axis left and right at the Jog Speed (see above).

The Position field will display the current distance from the home position.

Note: The door must be in the closed position and locked for this operation.

Target Temperature

This is the desired temperature that the nozzle will be heated to.

Actual Temperature

Displays the current nozzle temperature as read by the thermocouple.

Manal Temperature Off/On Button

This button controls when the heater is turned on and off.

Note: This button is disabled when airflow is not enabled.

Note: If airflow and heater are both turned on and then airflow is turned off, heater will also be turned off.

Target Pressure

This is the desired pressure for the product grippers.

Actual Pressure

This is the actual pressure feedback from the regulator.

Pressure Off/On Button

This button controls the pressure on and off.

Target Flow

This is the desired airflow that will be pushed through the nozzle.

Actual Flow

This is the actual airflow feedback from the flow controller.

Flow Off/On Button

This button controls the airflow on and off.

Thruster Forward/Retract Button

This button controls the extend and retract of the nozzle head.

Lock/Unlock Door Button

This button locks and unlocks the door.

Note: The door must be in the closed position for this operation. The Door will not lock in the open position.

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RECIPE SETUP

How recipes work

What is a recipe?

A recipe is a set of programmed specifications for each variable parameter of the run process. Recipes reduce operator error and increase repeatability.

Recipe parameters and the run process

1. Flow rate must reach the nominal flow rate before the cycle will start. Any flow outside of the minimum and maximum parameters will cause the process to hold until the nominal value is reached.

2. Temperature must reach the nominal temperature before the cycle will start. Any temperature outside of the minimum and maximum parameter will cause the process to hold until the nominal value is reached.

3. Product is loaded into the machine.

4. The front door is closed.

5. Once the front door is closed it will lock and the operator must press the Cycle Start button.

6. The thruster nozzle carriage moves to the start position.

7. The nozzle will extend or stay retracted and the carriage will then move to the first position at the speed set in the recipe.

8. Once the position is reached, the dwell timer will start and dwell until the timer has expired.

9. Once the cycle has run all entered steps, the nozzle will retract and the thruster nozzle carriage will move to the start position, the door will unlock once back.

10. The operator then removes the completed product and repeats the process.

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RECIPE CONFIGURATION

Log on as Engineer (Level 4) or higher. See Log On/Off section.

Recipe – Browser screen

The Recipe – Browser screen displays list of stored recipes.

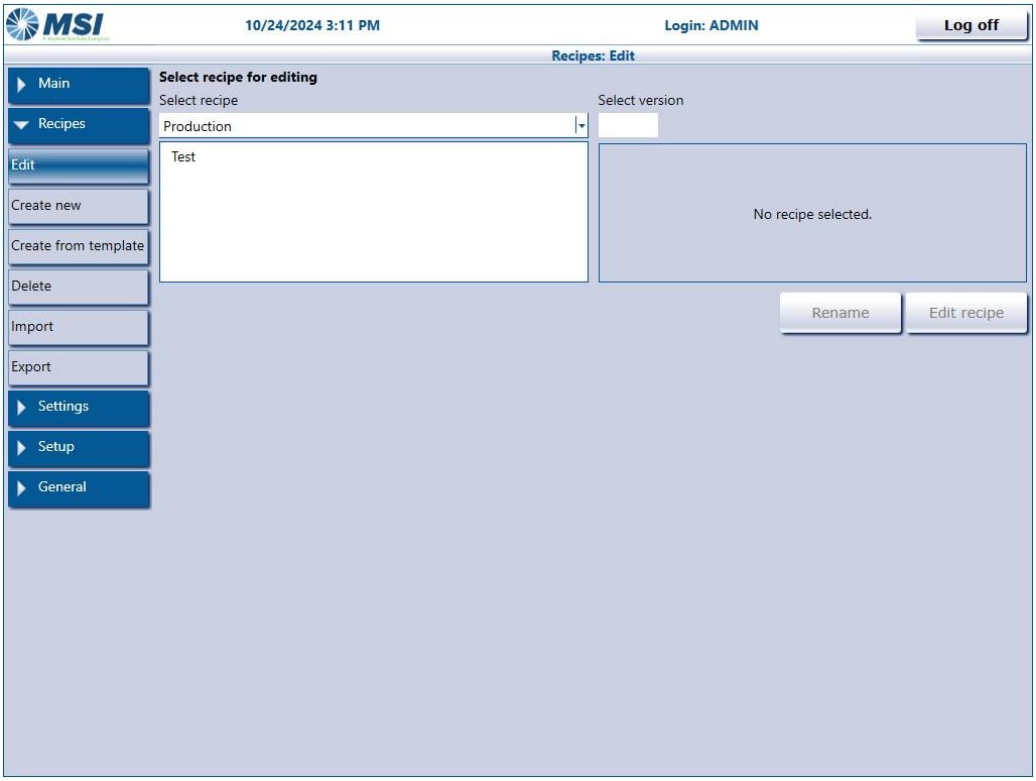

Figure 32. Recipe Browser

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Creating and Editing Recipes

Select Edit on the Recipes drop down. Select the recipe to edit and press the Edit recipe button. This screen allows the engineer to edit recipe parameters. Touch the data entry field for each parameter to modify the value.

Figure 33. Recipe - Edit General Screen

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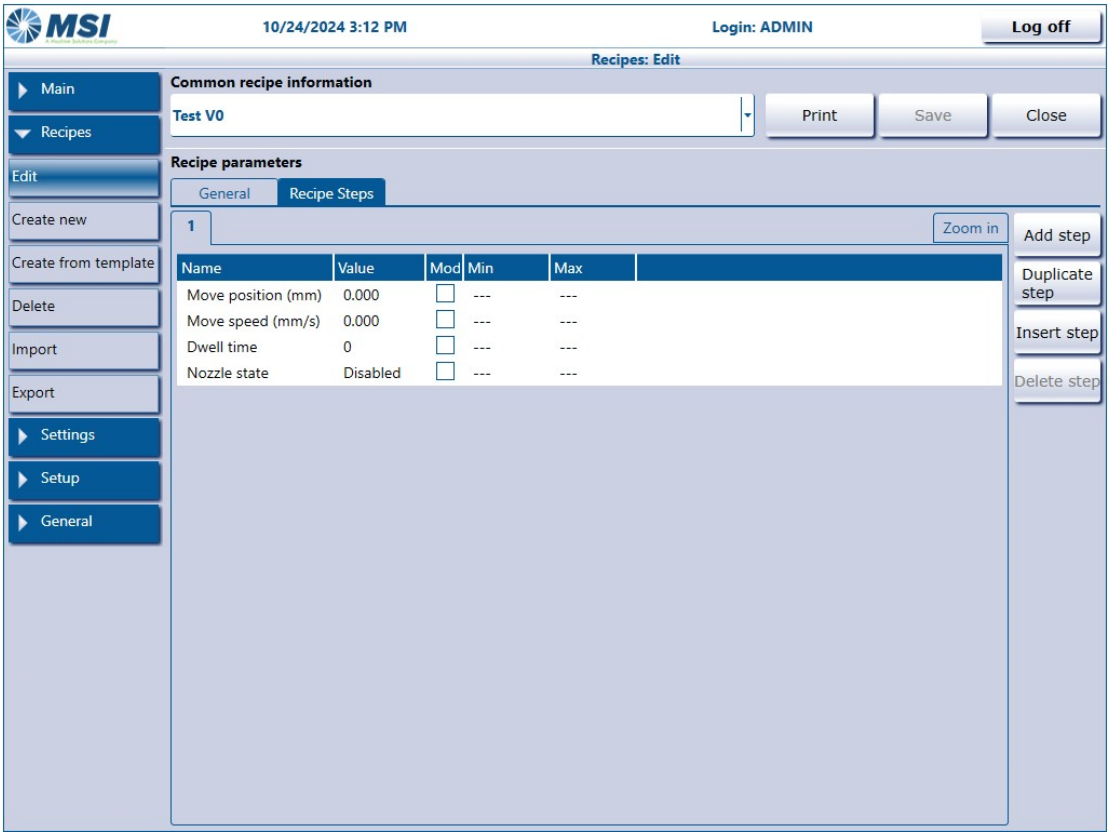

Figure 34. Recipe – Edit Recipe Steps Screen

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The following appears on the screen:

General

Start Position: this is the starting position for the thruster nozzle carrier. The process starts and ends at this position.

Recipe Temperature: this is the nominal temperature setpoint for the process.

Minimum temperature: this is the minimum temperature that the process can run at.

Maximum temperature: this is the maximum temperature that the process can run at.

Heater Flow Rate: this is the nominal flow rate setpoint for the process.

Minimum flow (heater flow rate): this is the minimum flow rate that the process can run at.

Maximum flow (heater flow rate): this is the maximum flow rate that the process can run at.

Gripper Pressure: this is the nominal pressure setpoint for the process.

Recipe Steps

Move Position: this is the position to move the thruster nozzle carriage to.

Move Speed: the velocity that the carriage moves at to the position on the same step number.

Dwell time: amount of time that the carriage will dwell at a position after it has moved to the position.

Nozzle state: this determines whether the nozzle is extended during the step. This state is true for the entire step from movement thru dwell time.

Add step: adds another step to the recipe. (Up to 10 steps can be added.)

Duplicate step: duplicates current step selected.

Insert step: inserts step in between other steps instead of the end.

Delete step: deletes current step selected. (Must have 2 or more steps for this between to be enabled.)

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Importing and Exporting Recipes

1. Select the Import/Export on the Recipes drop down.

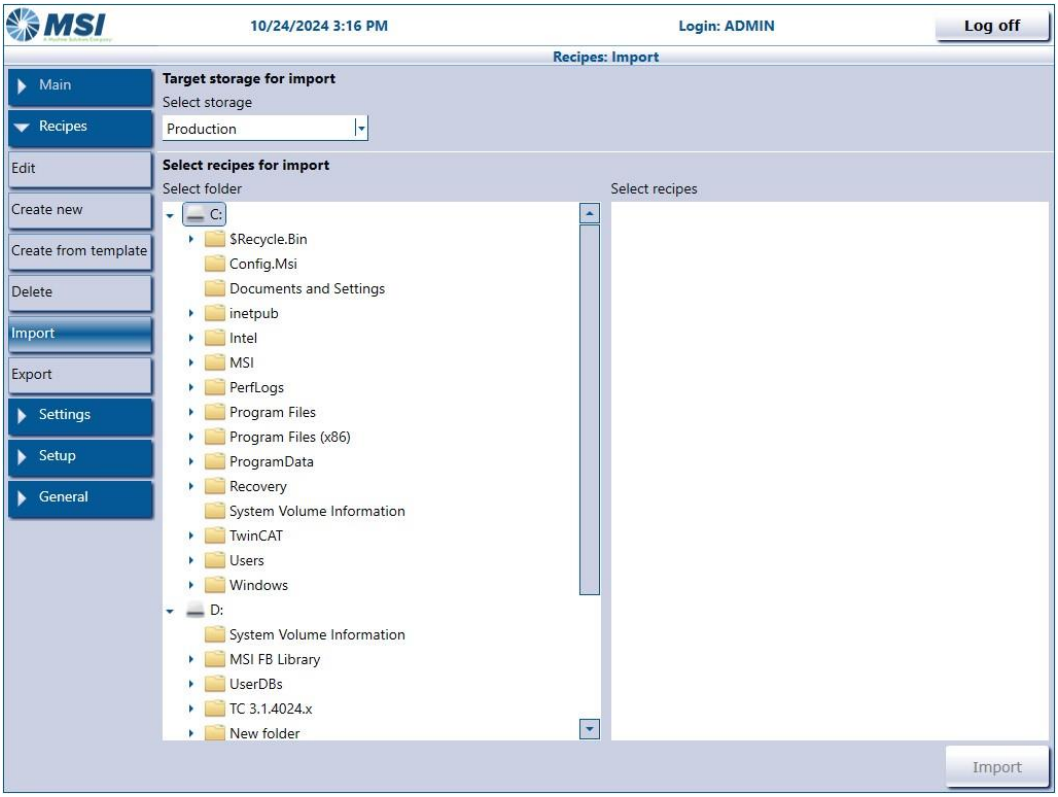

Figure 35. Import Recipes Window

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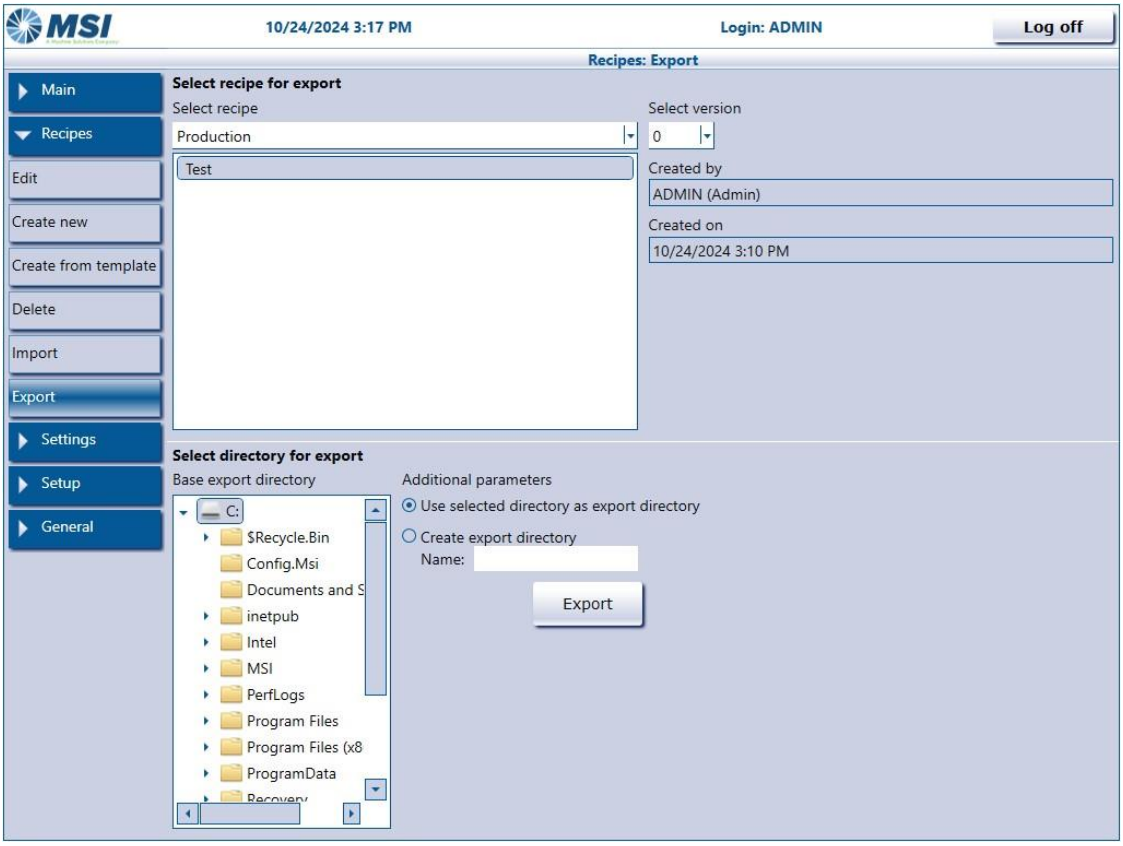

Figure 36. Export Recipes Window

2. Select the files to be exported/ imported.
3. Select the location to be exported/imported.
4. Press the Import/Export button to complete.

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Alarm Screen

Select the Alarms and warnings on the Main drop down. This screen contains information on active faults and warnings. Also see Errors, Alarms, and Troubleshooting.

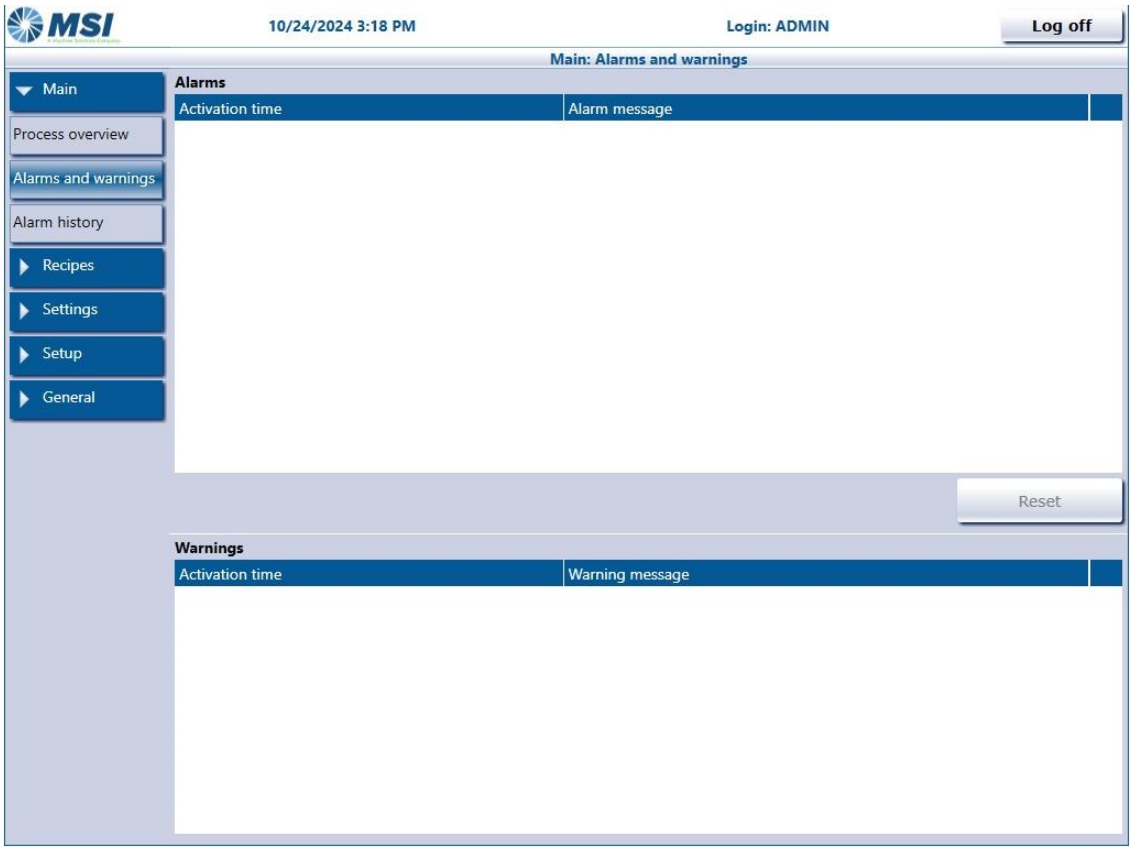

Figure 37. Alarms/Warnings Screen

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Select the Alarm history on the Main drop down. This screen contains information on all current and past alarms saved in cache.

Note: The history cache saves data up to 365 days old. Any item older than 365 days is automatically deleted.

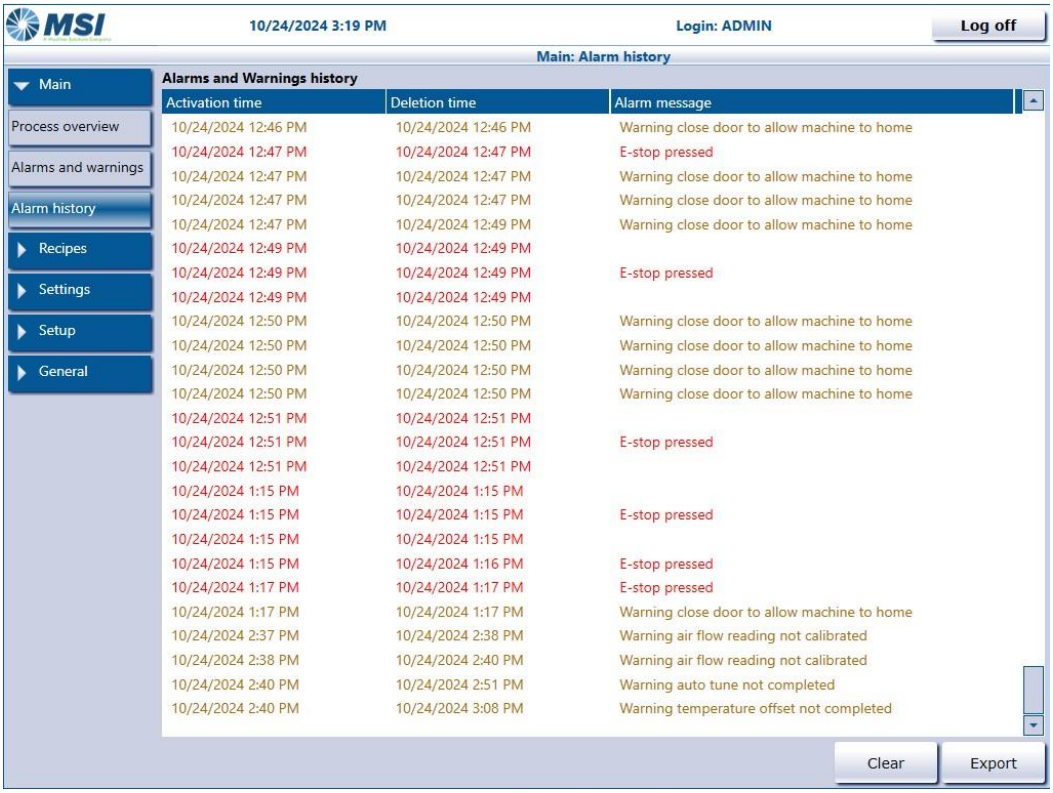

Figure 38. Alarm History Screen

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PROCESS

Process – Information screen

Select *Process Overview* on the Main drop down.

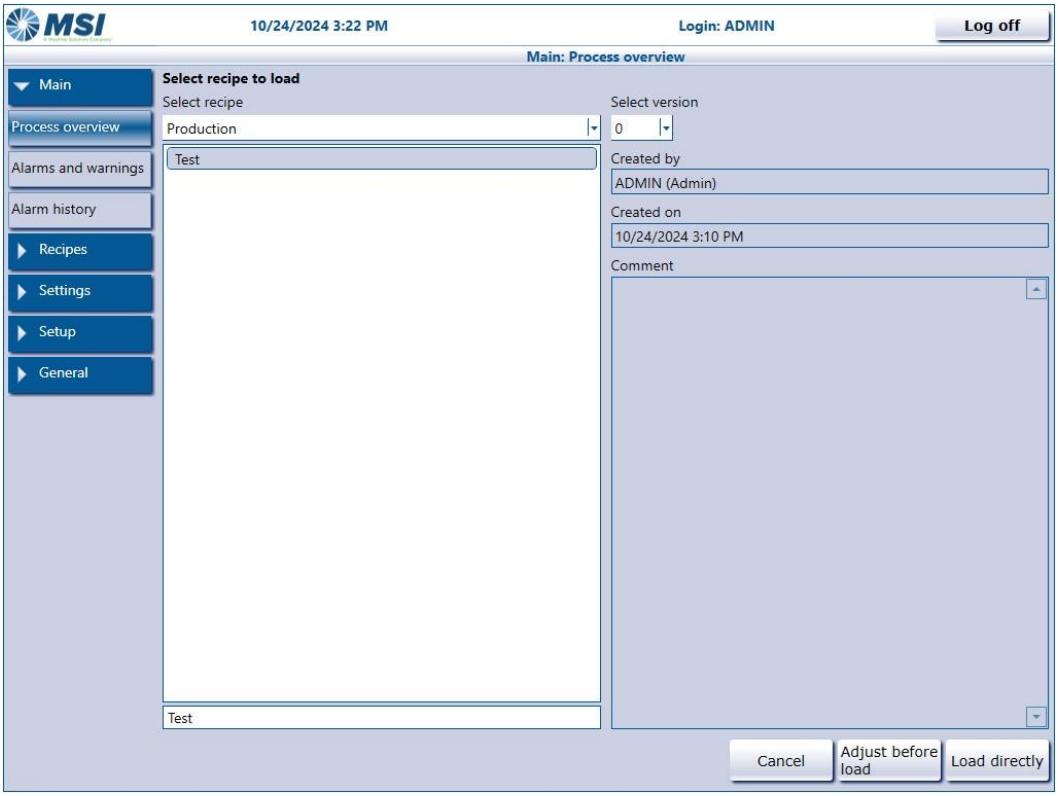

Figure 39. Process Overview Recipe Select - Information Screen

Select a recipe from the list. Double click the recipe to activate the recipe or press the Load directly button to activate. Barcode scanner can also be used to activate the recipe. Recipe name needs to match the barcode being scanned. Select the entry box on the bottom of the list and scan the barcode. If barcode scanned matches a recipe name on the list, recipe will be activated.

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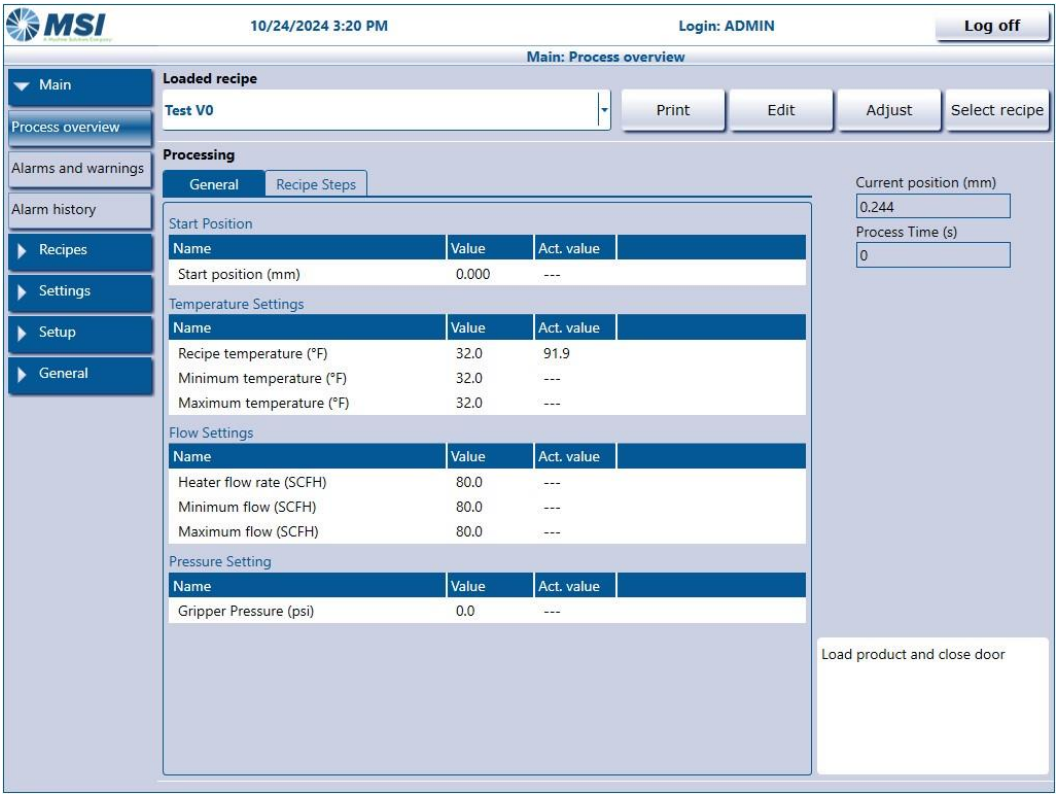

Figure 40. Process Overview Loaded Recipe - Information Screen

This screen displays information regarding the active recipe, as follows:

- Recipe name
- Recipe process parameters
- Current position
- Process time
- Process sequence messages

The following controls can also be found on the screen:

Print: to print current recipe.

Edit: to edit current recipe.

Adjust: to adjust current recipe while running.

Select Recipe: access the Recipe – browser screen to select different recipe.

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Run Lot

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

Caution: Do not use the machine for production purposes without the door cover in place. Remove the safety covers to perform maintenance functions only.

1. Verify the recipe, if the recipe is correct, proceed to step 3.
2. To select a different recipe, from the Process Overview Loaded Recipe - Information Screen, press the *Select Recipe* button to navigate to the Process Overview Recipe Select - Information Screen.
3. Follow process sequence messages to begin run process.
4. Open door to load product and then close door when ready.
5. Flow will start to flow up to the setpoint. Temperature will start to climb to setpoint and stabilize. Messages may show for a few moments as flow and temperature stabilize at the setpoint and move above and below the minimum and maximum setpoints.
6. Doors will lock once flow and temperature stabilize to setpoint.
7. Green light on cycle start button will luminate.
8. Product carrier is then loaded inside of the machine. Press button to begin run process.
9. Carrier will move to start position.
10. Once the start position has been reached, the thruster nozzle are set according to the recipe.
11. The machine will then move to each setpoint position according to the recipe steps.
12. The dwell time will then start (if set) and continue until the timer has expired.
13. At each step the nozzle will be set according to the recipe.
14. The process will continue until all steps have been completed.
15. After all steps are completed, the carriage will move to the start position and the door will unlock.
16. The product is then unloaded and the next product is loaded and the process is repeated.
17. The following messages may appear during the run progress:
    a. *Flow above maximum recipe value*
    b. *Flow above minimum recipe value*
    c. *Flow in Range, Heating to recipe temperature*
    d. *Temperature is above temperature window, please wait*
    e. *Temperature is below temperature window, please wait*
    f. *Move to start position*
    g. *Load product and close door*

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h. *Press cycle start button*
i. *Door locked, moving to start position*
j. *Setting Nozzle*
k. *Moving to position*
l. *Process Dwell*
m. *Move to start position, cycle complete*
n. *Cycle Complete - Open door, Remove product*

Aborting Process

Without exiting the Process overview run screen

To stop the run process at its current state without exiting the lot being ran:

1. Press the *Cycle Abort* button
2. The machine will stop heating and move the carriage to the start position.
3. The door will then be unlocked and the product can be removed or restarted.
4. To start a new cycle – load new product, close the door and press *Cycle Start* when light luminates.
5. When restarting without changing product, the door must still be opened then closed to restart the cycle.

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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

Tools:

- Gloves
- 99% isopropyl alcohol (IPA)
- Lint-free wipes
- Flathead screwdriver
- Allen wrenches (SAE and metric sizes)

Figure 41. Cleaning tools

1. Use 99% isopropyl alcohol to wipe down the carriage and carriers.
2. Use 99% isopropyl alcohol to clean the outside of the machine. Do not attempt to clean the inside of the machine.

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Exchanging Thermal Nozzle (s)

Figure 42. Thermal Nozzles

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

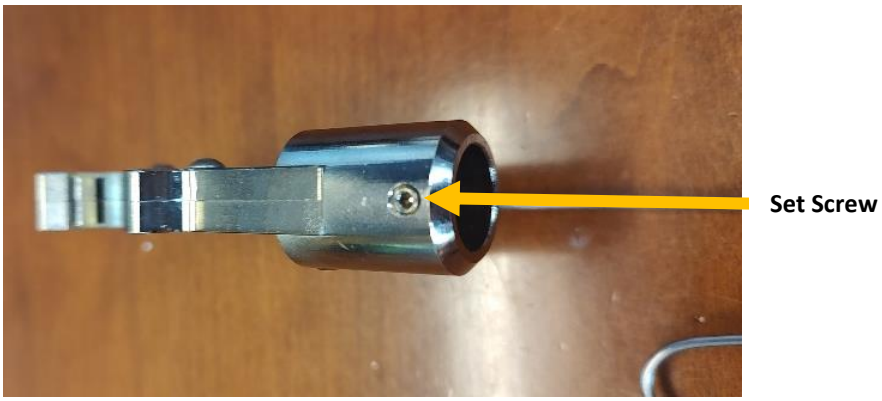

Figure 43. Nozzle Set Screw

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

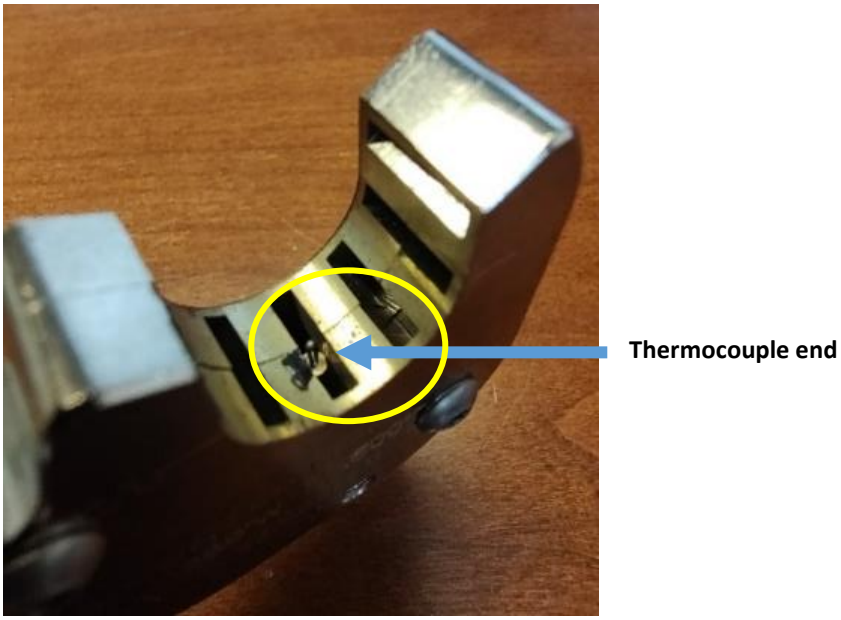

Figure 44. Thermocouple Tip

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.

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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 45**).

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.

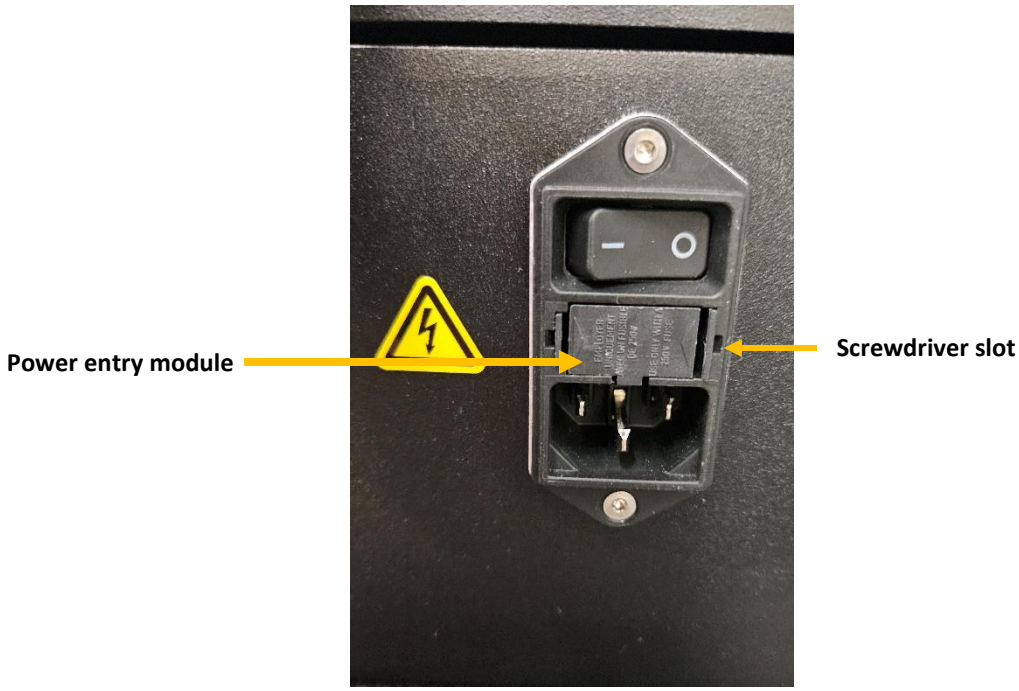

Figure 45. Fuse Replacement; Main Power

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3. Remove the fuse holder (Refer to **Figure 46**).

Figure 46. 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.

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ERRORS, ALARMS, AND TROUBLESHOOTING

MSI Support

1. Log on as Admin.
2. Navigate to the General Parameters in the Settings drop down.
3. Select the MSI Support button.

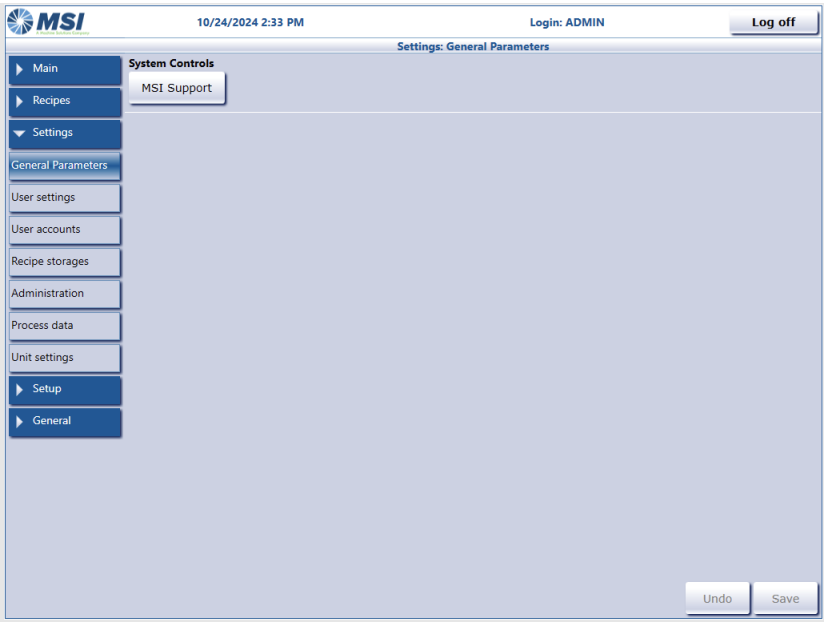

Figure 47. MSI Support Button

4. Select *Yes* to the pop-up window stating that it will close the program.

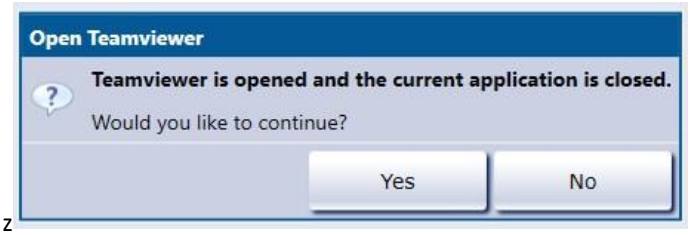

Figure 48. Pop-up Window

5. Ensure Team Viewer is displayed and a UserID and Password is automatically generated.

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Note: The machine must have an internet connection for Team Viewer to properly connect to the server.

Process Alarms

Table 5. Process Alarms

Alarm Name	Description	Remedy
Process Flow Too Low	Air Flow is below the minimum recipe value.	Allow flow to stabilize, this alarm will clear automatically when flow is in range.
Process Flow Too High	Air Flow is above the maximum recipe value.	Allow flow to stabilize, this alarm will clear automatically when flow is in range.
Process Temperature Low	Process Temperature is below minimum recipe value	Allow temperature to stabilize, this alarm will clear automatically when temperature is in range.
Process Temperature High	Process Temperature is above maximum recipe value	Allow temperature to stabilize, this alarm will clear automatically when temperature is in range.
Process Abort	Operator has aborted process	Alarm will clear when machine has stopped the run process and reset the machine for a new process.

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Warning Alarms

Table 6. Warning Alarms

Alarm Name	Description	Remedy
Close door	Close door to allow machine to home	Close door to allow machine to home
Home senor blocked	Home senor is blocked when not supposed to be	E-Stop machine and move carrier off home senor / remove object in front of senor
Nozzle Hot	Nozzle is hot and cooling down.	Warning nozzle is still hot, use caution when opening door.
Flow too Low	Flow level is too low	Check flow level and incoming air pressure.
Flow Calibration Not Completed	Flow calibration is not completed.	Complete the flow calibration.
Pressure Calibration Not Completed	Pressure calibration is not completed.	Complete the pressure calibration.
Temperature Auto Tune Not Completed	Temperature auto tune is not completed.	Complete Auto tune calibration.
Temperature Offset Not Completed	Temperature offset is not completed.	Complete temperature offset.

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System Alarms

Table 7. System Alarms

Alarm Name	Description	Remedy
Estop Relay Fault	Estop relay fault or estop has been pressed.	Reset estop button and press blue reset button. Note: If door is closed when reset button is pressed. Doors will lock and the actuator will find the zero position/home position. If door is open when reset button is pressed. Warning message will display “Warning close door to allow machine to home”
WCState Error	PLC comm error.	Contact MSI Support.
EtherCAT Slave Count Error	PLC card error.	Contact MSI Support.
Motion Error	System activation motor has encountered an error.	Estop and press the blue reset button to reset the motor.
Over Temperature	Temperature has exceeded maximum allowed by PLC/hardware.	Estop the machine and allow temperature to cool to room temperature.
Temperature Open Circuit	Temperature thermocouple has become unplugged.	Check thermocouple connections. Contact MSI Support.

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SPECIFICATIONS

Table 8. System Specifications

Description	Range	Resolution	Accuracy
Temperature	200-750° F Upper temperature range is dependent on nozzle type and size.	1.0 deg.	+/-.75% F.S.
Speed	.1-20 mm/sec.	0.1 mm/sec.	+/- 5%
Length	1-XXXX mm	1.0 mm	+/-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.

Table 9. Machine Specifications

Description	Range/Accuracy
Line Voltage	120/220 VAC
Operating environment	• 60 – 75°F (15 - 24°C) • 0 – 85% relative humidity, noncondensing
Storage temperature	32 – 120°F (0 – 48°C)
Approximate machine weight	185 lbs.
Approximate machine dimensions	Height: 28 IN Width: 60 IN Depth: 24 IN

Facility Requirements

- Voltage: 120/220 VAC 50/60 Hz.
- Wattage: 500 max.
- Compressed Air: 60-125 psi, 0.5 CFM, filtered 1 micron or greater, oil and water free.

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CRITICAL PARTS

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

Table 10. Critical Spart Parts

Part Number	Description	Quantity
1143541-001 1145807-001	CONTROLLER, POWER, 120 VAC CONTROLLER, POWER, 240 VAC	1
1143287-001	RELAY, 24VDC INTEGRATED	1
1343250-001	VALVE, 2-WAY 24 VDC	2
1330445-003	VALVE, SOLENOID, 24VDC, 5-2, PLUG-IN	1
110254-001	HEATER, QUARTZ TUBE	1
1346485-001	FLOW CONTROL, NO DISP, 0-100 LPM, 1-4 NPT, RS232	1
1345768-015	REGULATOR, ELEC-PNE, 1500LPM, 90 PLG, FLAT BRKT	1

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