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MOLDMAN SYSTEMS™

LOW-PRESSURE MOLDING

MOLDMAN™ 8200

Operations Manual

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For machines starting with serial number 82-02-0063
Software revision R2.03

1.0 Introduction

1.1 Introduction

Moldman Systems LLC would like to thank you for purchasing a **Mold-man™ 8200 and Melt-man 2000** high performance shuttle table injection molding system for low-pressure molding. This machine is designed specifically for low-pressure molding with high performance polyamide resins.

This machine can be operated with either one [standard] or two [optional] Melt-man 2000 melt units for maximum operational flexibility. The melt-units integrate seamlessly with The Mold-man 8200 control system. Both the Mold-man 8200 and one or two Melt-man 2000 melt-units are controlled through easy to navigate touchscreens.

The Mold-man™ 8200 is designed for safe and simple operation. When the relevant molding parameters such as pressure and timers have been set in the self explanatory set-up screens, the machine can be placed in production mode by the simple push of a button. In production mode, no values can be changed. However, the cycle counter can be reset from the production screen.

The molding machines for low-pressure molding melt the raw materials completely prior to injecting into the mold-set. It is critical that operators and maintenance personnel familiarize themselves with the relevant portions of this manual. Please pay special attention to the maintenance and cleaning guidelines for the equipment. They are key to successful, long-term operation of these machines.

Moldman Systems LLC will support you by technical support. Please contact us when we can be of service. Congratulations with your purchase of a **Mold-man™ 8200** and good luck with your low-pressure molding applications!

Moldman Systems LLC

NOTE!
All personnel involved in set-up, operation and maintenance of this machine must familiarize themselves with the guidelines in this manual. Read and follow the safety guidelines herein and in manuals for integrated equipment such as the Melt-man 2000 melt units.

NOTE!
Keep this manual near the machine and available to anyone involved in the installation, set-up, operation or maintenance of the equipment. The guidelines in this manual must be followed to ensure safe working conditions. Injury or death could result from not following the guidelines herein.

1.2 Type and origin

Machine model:	Mold-man™ 8200
Type:	Low-pressure injection molding machine
Weight:	1750 lbs [795 kg].
Overall dimensions:	76” W x 45.5” D x 77” H [1925 x 1150 x 1950 mm]
Manufacturer:	Moldman Systems LLC 4649 Aircenter Circle Ste. 101 Reno, Nevada 89502 Phone: (775) 332-1600 www.moldmansystems.com
Melt unit:	Melt-man™ 2000
Type:	Hot-melt adhesive processing unit
Weight:	275 lbs [125 kg].
Overall dimensions:	23” W x 26” D x 48.5” H [575 x 650 x 1230 mm]
Manufacturer:	Moldman Systems LLC 4649 Aircenter Circle Ste. 101 Reno, Nevada 89502 Phone: (775) 332-1600 www.moldmansystems.com

1.3 Intended use

The Mold-man™ 8200 insert molding machine is designed for encapsulation of various electronic components, molding of molding of wiring harness components, grommets, connectors and plugs utilizing low-pressure molding.

WARNING!

The machine should only be used with thermoplastic polyamide hot melt resins such as Macromelt material.

WARNING!

The unit is designed for and only intended for use as described within this manual. Using the machine for any other applications or in a manner not consistent with this manual will void the warranty of the machine and could lead to injury or death.

Moldman Systems LLC cannot be liable for any incident resulting from unintended use. Please contact Moldman Systems LLC if you have any questions. Phone #: (775) 332-1600.

1.4 Setup and space requirements

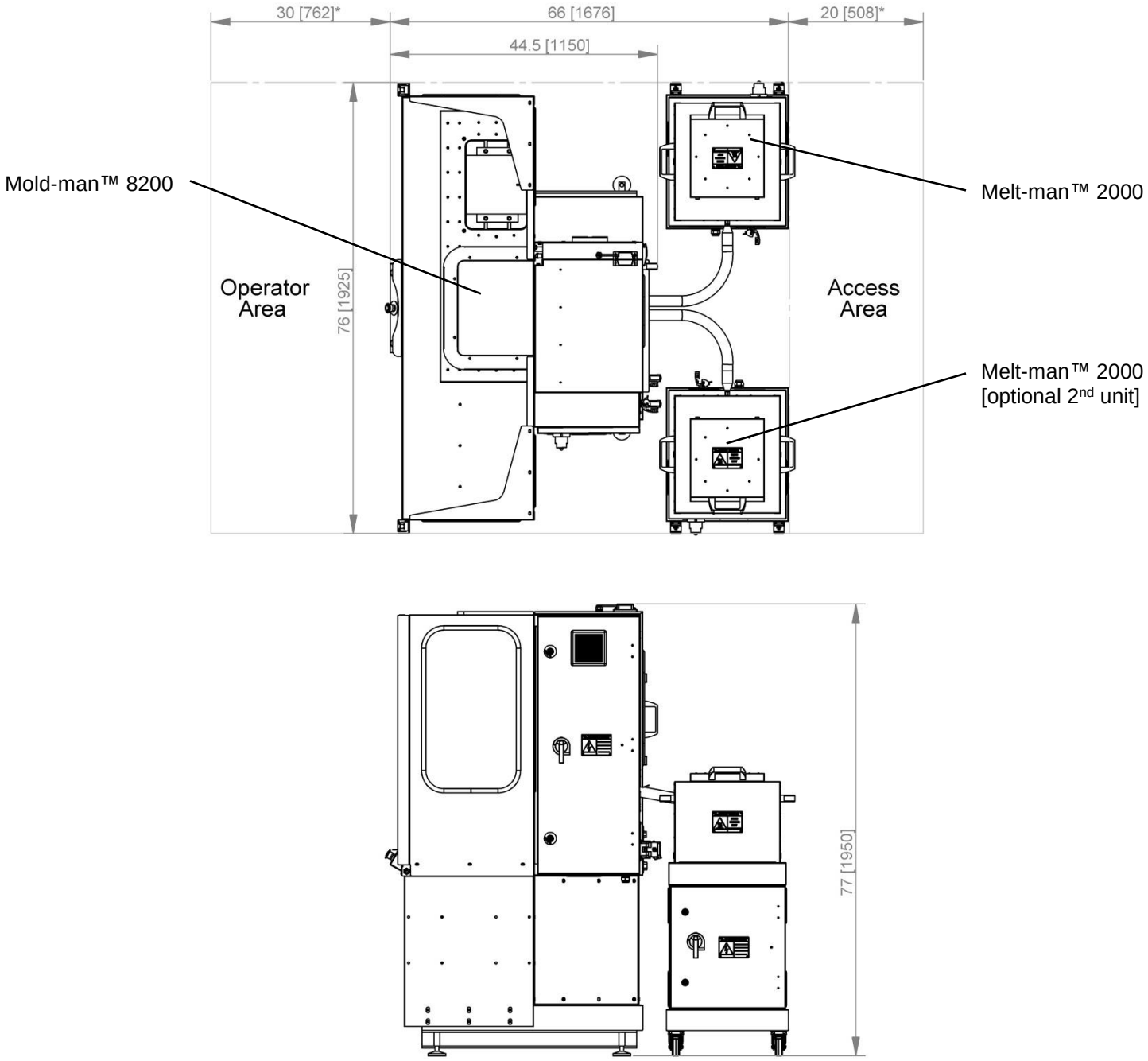


Fig. 1-1 Equipment set-up, dimensions in inches [MM], * denoted dimensions are recommended minimums

The Mold-man™ 8200 machine is designed for low-pressure molding. This high capacity shuttle table production machine for insert molding is easy and safe to operate. When the machine is ready, operation simply consists of inserting components and activating one of the actuation buttons.

The upper and lower mold platens are prepared for water cooling. It is not necessary to drill cooling lines and install couplings in the individual aluminum mold-sets. The mold-sets are cooled directly by the mold platens. Cooling water connections are at the back of the machine.
The Mold-man™ 8200 utilizes a permanent engagement system, for the injection nozzle. The nozzle stays engaged in the upper mold half. This is made possible through the use of materials with different heat transfer coefficients. The lower mold platen has two pneumatic ejector systems with 20 mm stroke.

The machine has servo electric powered axis for primary motion namely the clamp and the shuttle table. In addition the clamp features a pneumatically actuated booster that generates the full clamping force when the mold-set is closed.

A pneumatic system controls all secondary motions e.g. ejectors, nozzle valves, clamp booster etc,. The pneumatic system is located behind the access panel on the left side of the frame.
The electrical enclosure on the right side of the machine contains the electric components and the control system of the machine. All parameter input and status indication of the machine are facilitated by the touch screen located in the front panel of the electrical enclosure. A PLC controls and monitors the molding sequence, all motion and user inputs.

The Mold-man 8200 is, as a standard option, delivered with one Melt-man 2000 unit and optionally with a second Melt-man 2000. This melt unit delivers the molten material for the molding process to the Mold-man™ 8200. The Mold-man 8200™ and the Melt-man 2000 melt unit were tested as one system at the factory. The melt unit shipped with a heated hose and the injection nozzle attached. Both pieces of equipment are ready to be installed and setup as an integrated system once they are unpacked. The two pieces of equipment are arranged as shown in fig. 1-1

WARNING!

If two or more Mold-man 8200 machines are set-up next to each other, there is a potential for interference from the safety light curtain of the neighboring machines. This could create a potentially hazardous situation, please contact Moldman Systems LLC for assistance!

1.5 Mold-man™ 8200 overview

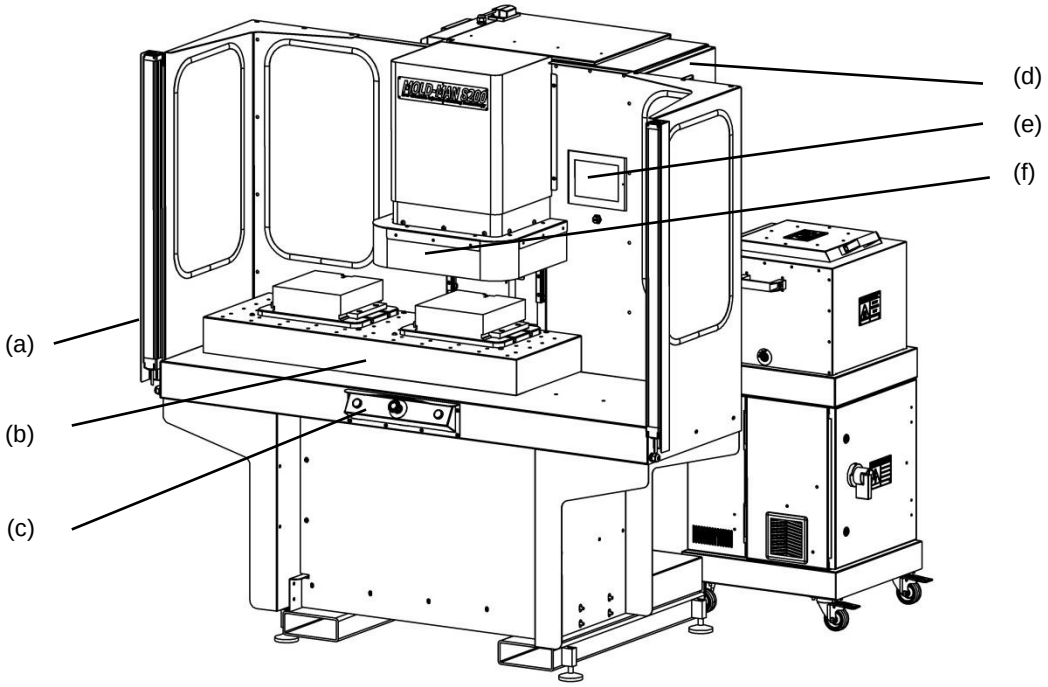


Fig. 1-2

(a) Safety light curtain
(b) Shuttle table
(c) Actuation buttons & emergency stop
(d) Electrical enclosure
(e) Touch screen
(f) Clamp with safety shield

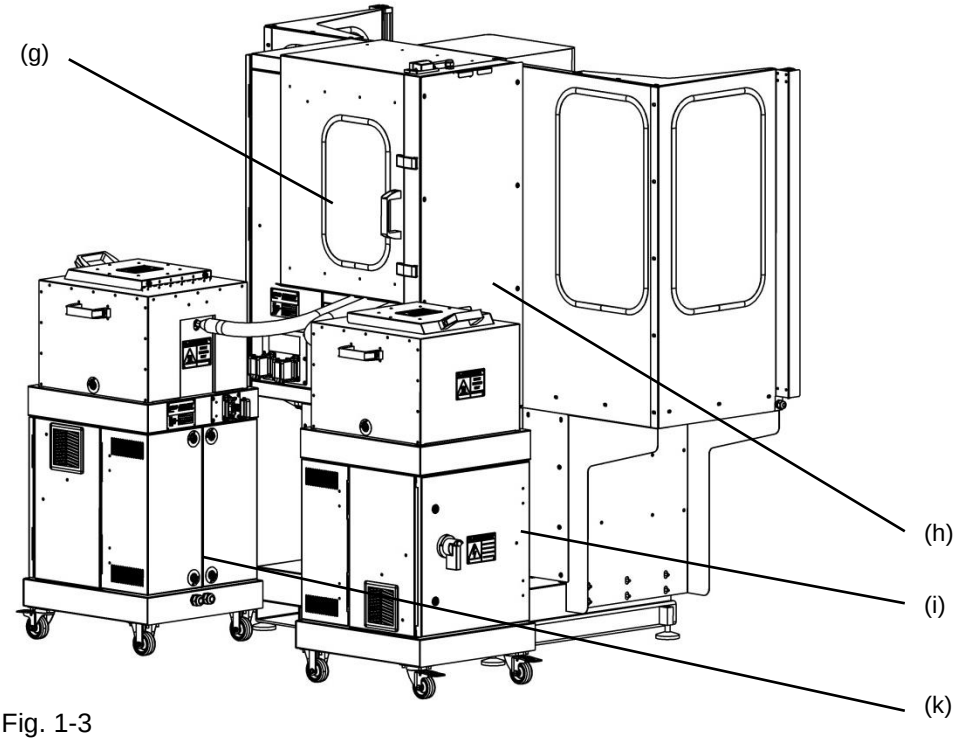


Fig. 1-3

(g) Access door
(h) Fluid power access panel
(i) Melt-man 2000
(k) Melt-man 2000 [optional 2nd unit]

The Mold-man™ 8200 was designed with ultimate operator safety in mind. The clamp and shuttle table motions are safe guarded by the safety light curtain (a). “Breaking” the safety light curtain will prevent clamp (f) and shuttle table (b) motion or stop them immediately if in a motion sequence. Pressing the emergency stop button (c) will have the same effect on shuttle table and clamp motion as “breaking” the safety light curtain. In addition the power to all heaters of attached Melt-man 2000 melt-units will be removed and air pressure will vented from part of pneumatic system.

WARNING!

Parts of the pneumatic system of the Mold-man 8200 will remain under pressure, even if the machine is turned off and/or disconnected from the air supply!

The access door (g) is safe guarded by a coded magnet switch, which when the door is opened will inhibit shuttle table and clamp motion.

WARNING!

The machine is equipped with safety shields and safety interlocking devices. Do not remove these or in any other way modify the machine from the original design.

2.0 Safety

.

Operation of the Mold-man™ 8200 machine is simple. However, safety must be a prime concern. Strictly adhere to the Warning messages and Notes contained in this manual

WARNING!
The equipment processes materials at temperature up to 475°F. The melt unit, hose and nozzle are HOT! The hot molten material can cause severe burns! Always wear protective, heat resistant gloves and protective clothing! Always use safety glasses! Do not touch molten material! Even hardened material can still be very hot! Parts of the machine can remain hot for up to 8 hours after machine is turned off.

NOTE!
In case of burns the exposed body parts must be cooled with water immediately. Hold the burned area under cold, running water for at least 30 minutes. Seek medical attention.

WARNING!
The machine is equipped with safety shields and safety interlocking devices. Do not remove these or in any other way modify the machine from the original design.

WARNING!
Prior to performing any maintenance on the machine, all utilities must be turned off and disconnected. This includes electrical power, air and water supply. Parts of the machine are pneumatically operated and contain fluid under pressures even after the machine has been disconnected from all utilities. Fluid pressure must be safely bled off prior to any maintenance or injury could occur.

WARNING!
Turn off the machine main power supply immediately in case of malfunction – the main power switch is located on the right side of the machine.

WARNING!
Only qualified personnel should perform maintenance and repairs on machine.

3.0 Installation

WARNING!

Transportation, lifting and installation of the equipment may only be performed by qualified and authorized personnel.

3.1 Lifting of Mold-man 8200

The Mold-man™ 8200 machine may only be lifted by the built-in lifting receptacles utilizing a forklift of sufficient capacity. The weight of the machine is 1750 lbs. [795 kg]. Engage the forklift into the built-in lifting receptacles are found on the lower frame [Fig. 3-1]. Ensure that the forks support the entire length of the lifting receptacles.

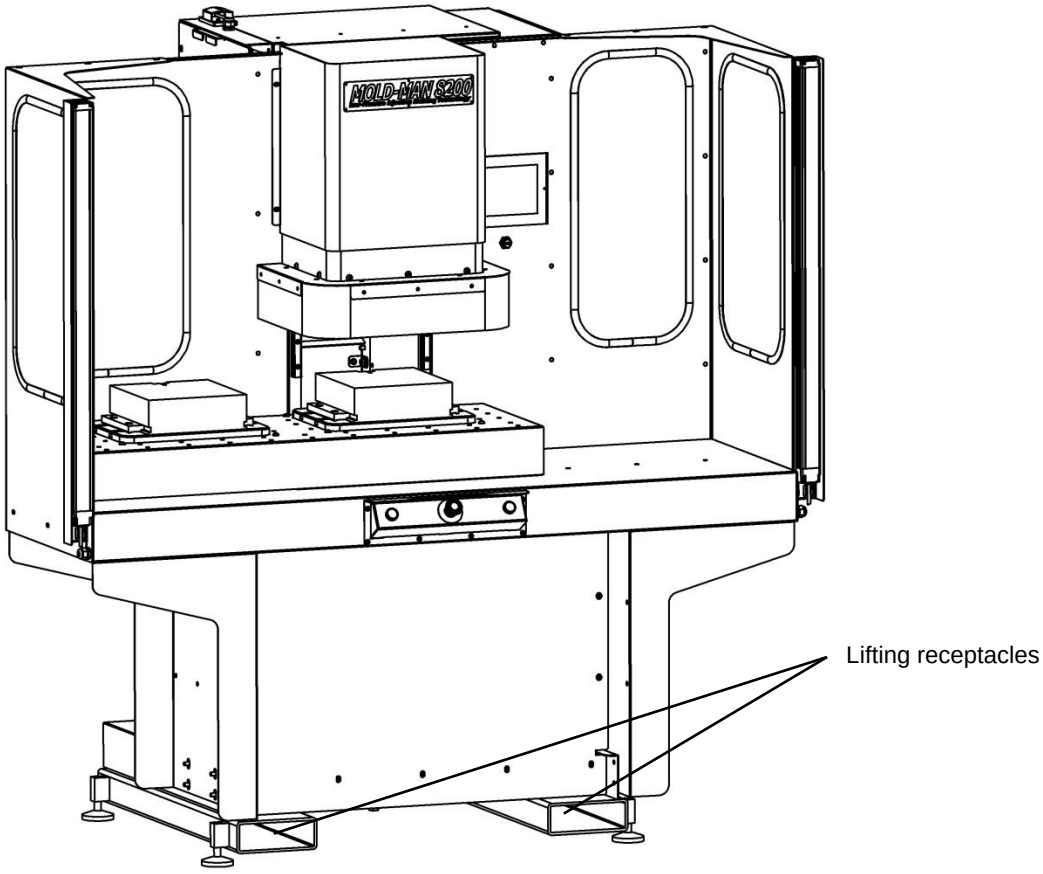


Fig. 3-1

The Machine must be set up on a flat and level surface. There are four adjustable leveling feet to level the machine.

3.2 Utility connections for Mold-man 8200

WARNING!

To minimize the risk of potential safety problems, please follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and may change with time. Please determine which codes should be followed, and verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

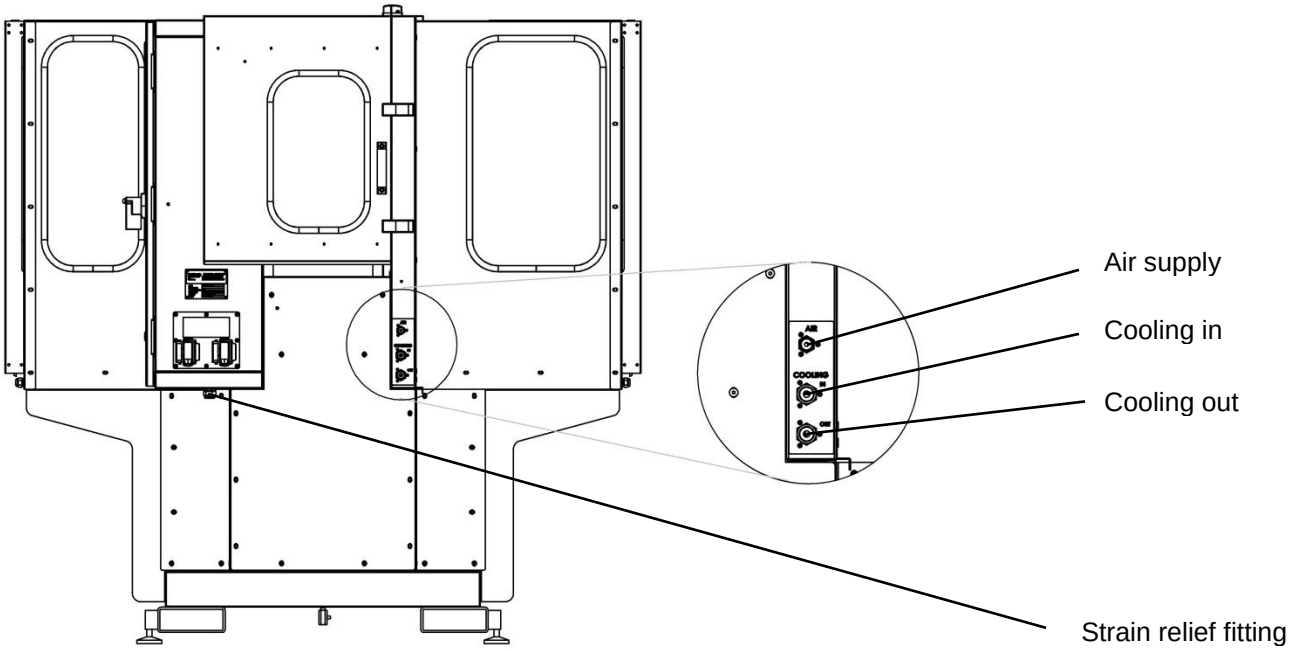


Fig. 3-2 Mold-man 8200 Utility connection points

3.2.1 Electrical connection for Mold-man 8200

The bottom panel of the Mold-man 8200 electrical enclosure is equipped with a strain relief fitting [Fig. 3-2] to feed the main power cable into the electrical enclosure. The machine requires a power supply of the following capacity: 200-240 VAC, single phase, 50/60 Hz, 30 Ampere.
Ground is connected to terminal marked with grounding symbol and 200-240VAC is connected to terminals "L1" and "N/L2". In electrical systems with a neutral conductor, the neutral is connected to terminal "N/L2".

3.2.2 Air supply connection for Mold-man 8200

Dry, filtered air at minimum 90 PSI [6 bar] and 2.0 SCFM [60 lpm] is connected to the 3/8" FNPT connection labeled "Air ".

3.2.3 Cooling supply connection for Mold-man 8200

Consistent chilled water or a water/glycol mixture supply is required for the operation of the machine. A re-circulating water chiller with temperature variation of no more than 2ºF is recommended. The chiller is connected to the two 1/2" FNPT connections, located on the back. The chiller outlet port is connected to the "Cooling In" fitting, the chiller inlet port is connected to the "Cooling Out" fitting.
Inlet pressure should be at least 7 PSI [0.5 bar] and not exceed 60 PSI [4 bar].

3.3 Connecting the Melt-man 2000 to utilities and the Mold-man 8200

3.3.1 Electrical connection for Melt-man 2000

The bottom base panel of the Melt-man 2000 is equipped with a strain relief fitting to feed the main power cable into the electrical enclosure. The machine requires a power supply of the following capacity: 200-240 VAC, single phase, 50/60 Hz, 30 Ampere.
Ground is connected to terminal marked with grounding symbol and 200-240VAC is connected to terminals "L1" and "N/L2". In electrical systems with a neutral conductor, the neutral is connected to terminal "N/L2".

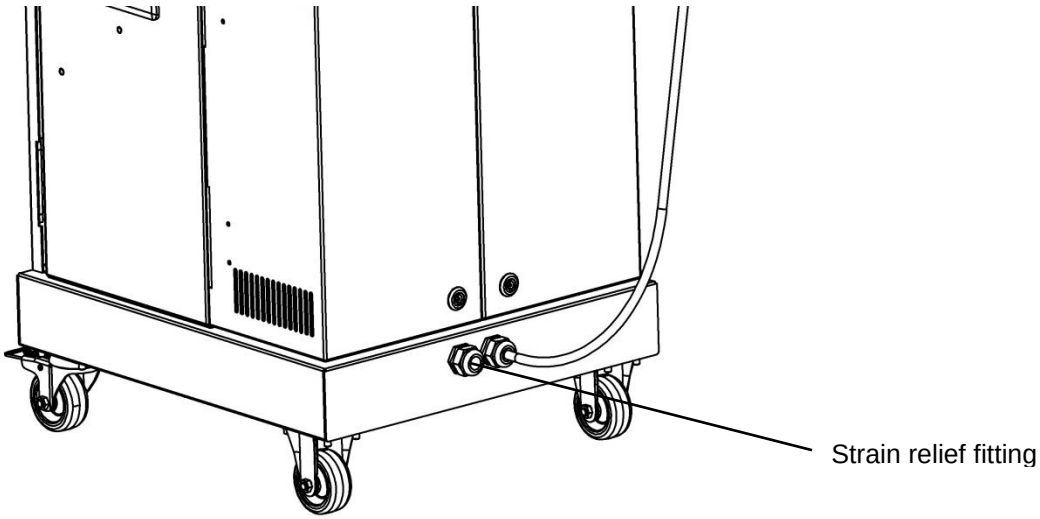


Fig. 3-3 Melt-man 2000 electrical power entry

3.3.2 Connecting Melt-man 2000 to Mold-man 8200

One or two Melt-man 2000 melt-units can be connected to the Mold-man 8200 by simply plugging the Melt-man connector into the Mold-man 8200 connector receptacles located at the back of the electrical enclosure.

WARNING!

Make sure that only corresponding Melt-man 2000 units are connected to the Mold-man 8200 receptacles. Only connectors labeled “1” should be connected to the receptacle labeled “1”. Likewise, only connectors that are labeled “2” should be connected to the receptacle that is labeled “2”.

Fig. 3-4 Melt-man 2000 connection to Mold-man 8200

4.0 Operation

4.1 Introduction

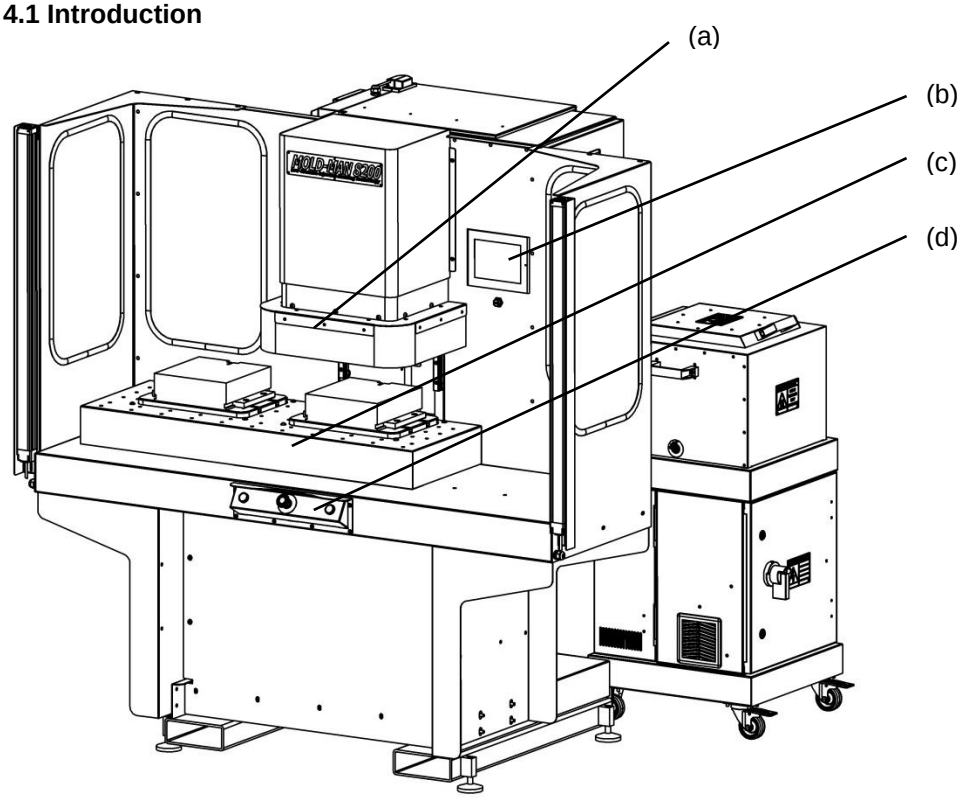


Fig. 4-1 Operator station

WARNING!
The Mold-man 8200 is designed for single person operation only. Ensure that the equipment is only operated by one operator and no other persons are in the close proximity during operations.

The Mold-man 8200 operator station is designed for easy setup of your molding operations. It consists of the two actuation buttons and the emergency stop button at the front of the machine (d), a touch-screen for parameter entry and machine status information (b), the clamp and clamp shield (a) and the shuttle table (c). Once the machine is setup and ready, operation simply consists of inserting components and activating one of the actuation buttons.

4.2 Touch screen navigation

When the machine is powered up the touchscreen first displays a boot up screen as shown in Fig. 4-2. Once the boot up process is complete the screen show in Fig. 4.3 is displayed. Pushing the square button above the word “start” will display the production mode screen

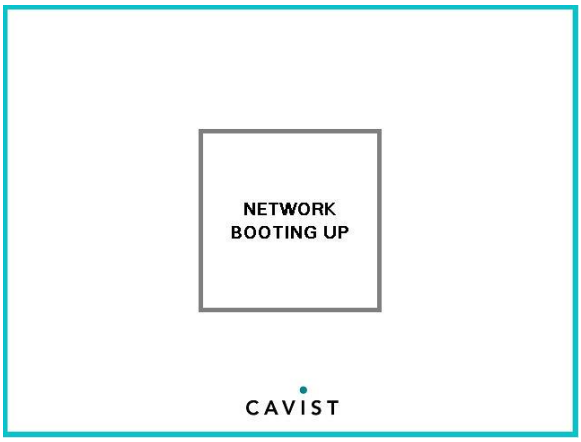


Fig. 4-2 Boot up screen

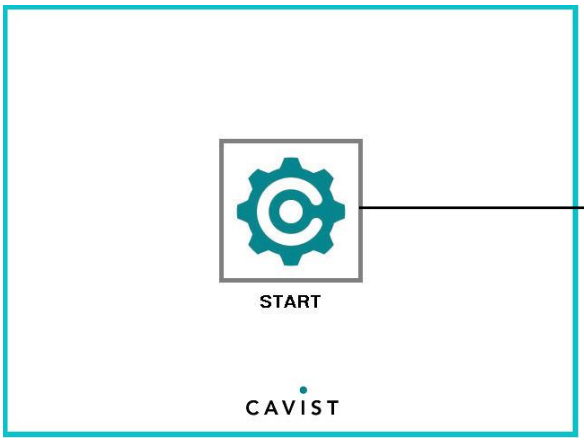


Fig. 4-3 Start up screen

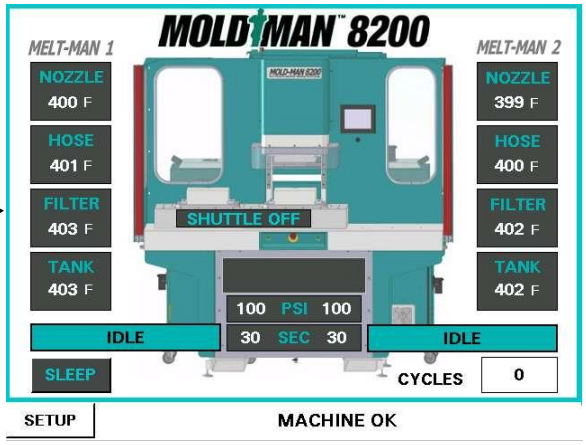


Fig. 4-3 Production mode screen

The production mode screen is with the exception of a reset able cycle counter and a ‘sleep’ mode button an information only screen. It gives molding sequence and machine status information during standard operation. The setup screen is your link to setting of all machine parameters.

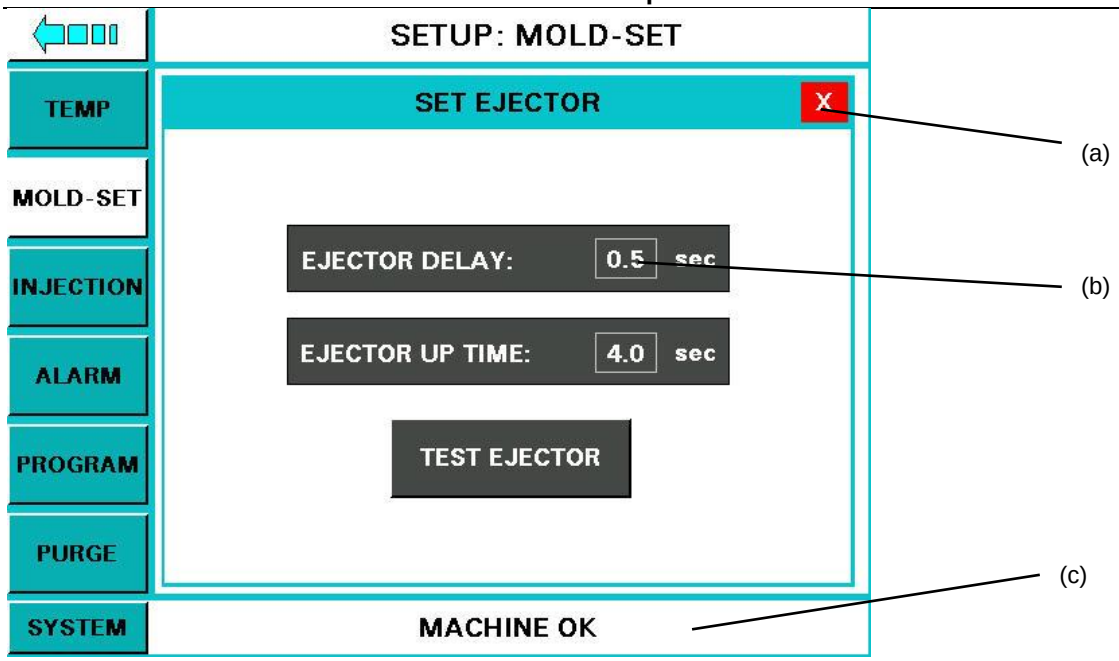


Fig. 4-4 Sample screen

All screens feature a certain commonality. All screens that accept a user input have outline boxes (b) for the values that can be changed. Touching the value in the outline box brings up a pop up screen where the new entry can be made. Those screens also feature a “X” button on red background in the upper right hand corner of the screen (a). Pressing this button closes the current screen and displays the previous one. In addition all screens have a common status bar at the bottom (c), which can display the following messages:

MACHINE OK	No alarms are present and machine can be operated.
LIGHT CURTAIN ACTIVATED	The safety light curtain is interrupted, preventing clamp or shuttle table motion from occurring.
ACCESS DOOR OPEN	This message is displayed when access door at the back of the machine is not closed.
CLAMP OBSTRUCTED	The Clamp could not reach its closed position.
TEMPERATURE LOW - MELT-MAN X	This message is displayed when the actual melt unit temperature zones are below 360F.
TEMPERATURE OUT OF RANGE – MELTMAN X	This message is displayed when the actual melt unit temperature zones are in between 360F and set point minus 10F.
CAN NETWORK ERROR	The Mold-man 8200 and the Melt-man unit(s) are not properly communicating over the network.
CAVITY OVERFILL	The fill step settings are too large or a blockage in the hose, nozzle or mold-set has occurred.
AIR PRESSURE LOW	Air supply pressure to the machine is insufficient.
EJECTOR TEST - CLAMP NOT AT TOP	To test the ejector in setup mode the clamp needs to be at the top position.
MOVE - SHUTTLE NEEDS TO BE AT RIGHT OR LEFT	To move the clamp up or down in setup mode the shuttle table needs to be at the right or left end position.
MOVE - CLAMP NEEDS TO BE AT TOP	To move the shuttle in setup mode the clamp needs to be at the top position.
AUTOMATIC TEMPERATURE TURNDOWN	After two hours of inactivity the machine automatically lowers the temperature of all

	temperature control loops to 275F to reduce degradation of molding material.
NO BOOSTER ENGAGED SIGNAL	The booster is moved to its engaged position, but the corresponding 'engaged' position switch is missing the signal.
NO BOOSTER RETRACTED SIGNAL	The booster is moved to its retracted position, but the corresponding 'retracted' position switch is missing the signal.
SOFT-CLOSE ERROR	The machine was not able to close the tool with the current soft-close setting.
CLAMP OVER-TRAVEL	The clamp travelled below the zero position.
SERVO ERROR - CLAMP	A fault in the Mold-man 8200 clamp servo drive has occurred.
SERVO ERROR - SHUTTLE	A fault in the Mold-man 8200 shuttle servo drive has occurred.
MAIN POWER OFF - MELT-MAN X	Main power voltage for the Melt-man indicated is not present.
SERVO ERROR - MELT-MAN X	A fault in the Melt-man pump servo drive has occurred.

4.2.1 Production mode

The machine is in production mode after the start button is pushed. The screen as shown in fig. 4-5 is displayed.

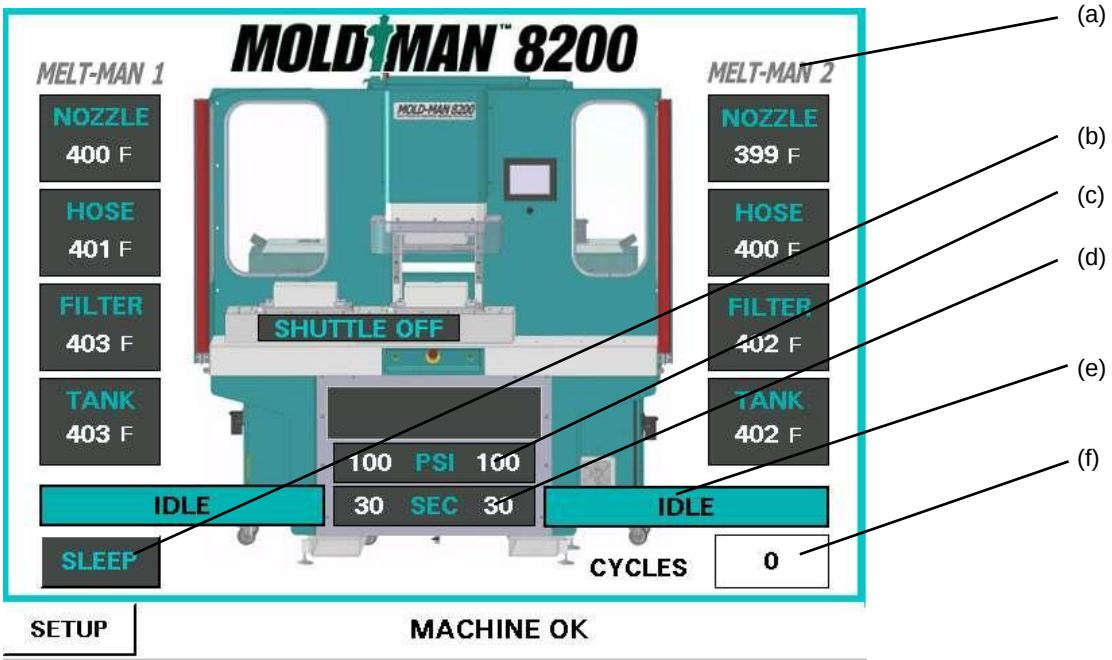


Fig. 4-5 Production mode screen

The production mode screen is with the exception of a reset able cycle counter (f) and the 'sleep' mode button (b) an information only screen. It gives molding sequence status and temperature zone information during standard operation. One or two Melt-man temperature "columns" (a), pressure readouts (c), cycle time (d) and molding sequence status (e) are displayed depending on the number of Melt-man units that are connected to the Mold-man 8200. If two Melt-man units are connected the production mode screen looks as shown in Fig. 4-5. If one Melt-man unit is connected to the Mold-man 8200, only the readouts on the left [Melt-man1] or the readouts on the right [Melt-man 2] are visible, depending on which Melt-man is connected.

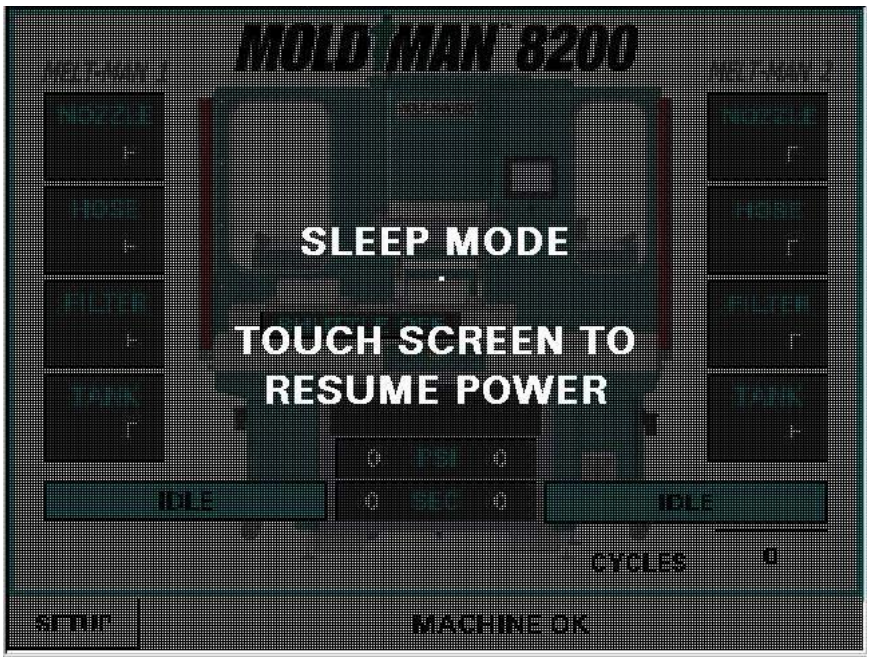
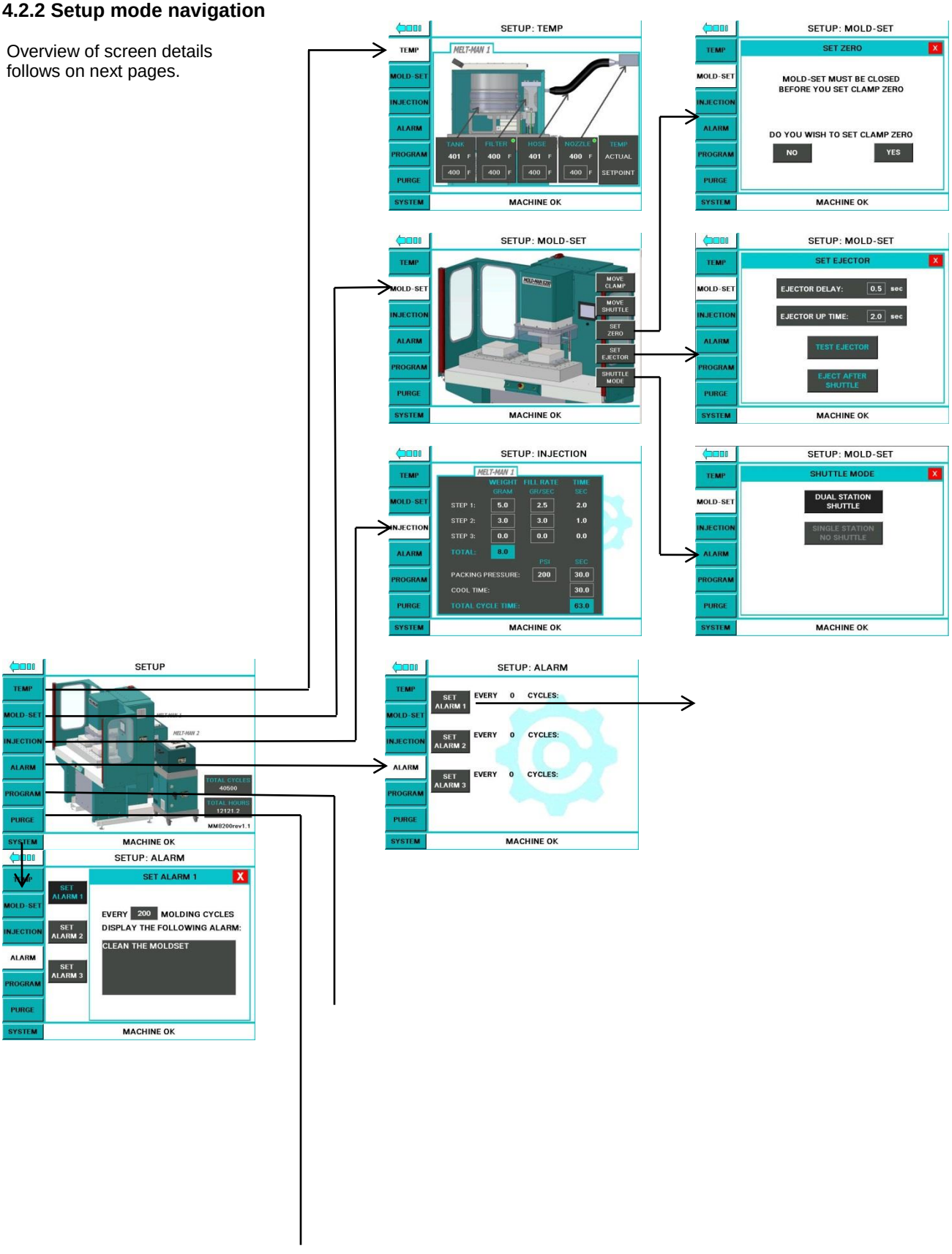


Fig. 4-6 'Power Save Mode' screen

If the 'sleep' mode button, (b) in Fig. 4-5, is pressed for a few seconds, the machine will enter a 'power save mode' or 'sleep mode'. After pressing the 'sleep mode' button the screen shown in Fig. 4-6 is displayed. In this mode all temperature control loops will stop heating. Place the machine in this mode if you would like an automatic startup using the weekly timer function or anytime that the machine is going to be idle for an extended period of time. To exit the 'sleep mode' simply touch the screen.

4.2.2 Setup mode navigation

Overview of screen details follows on next pages.



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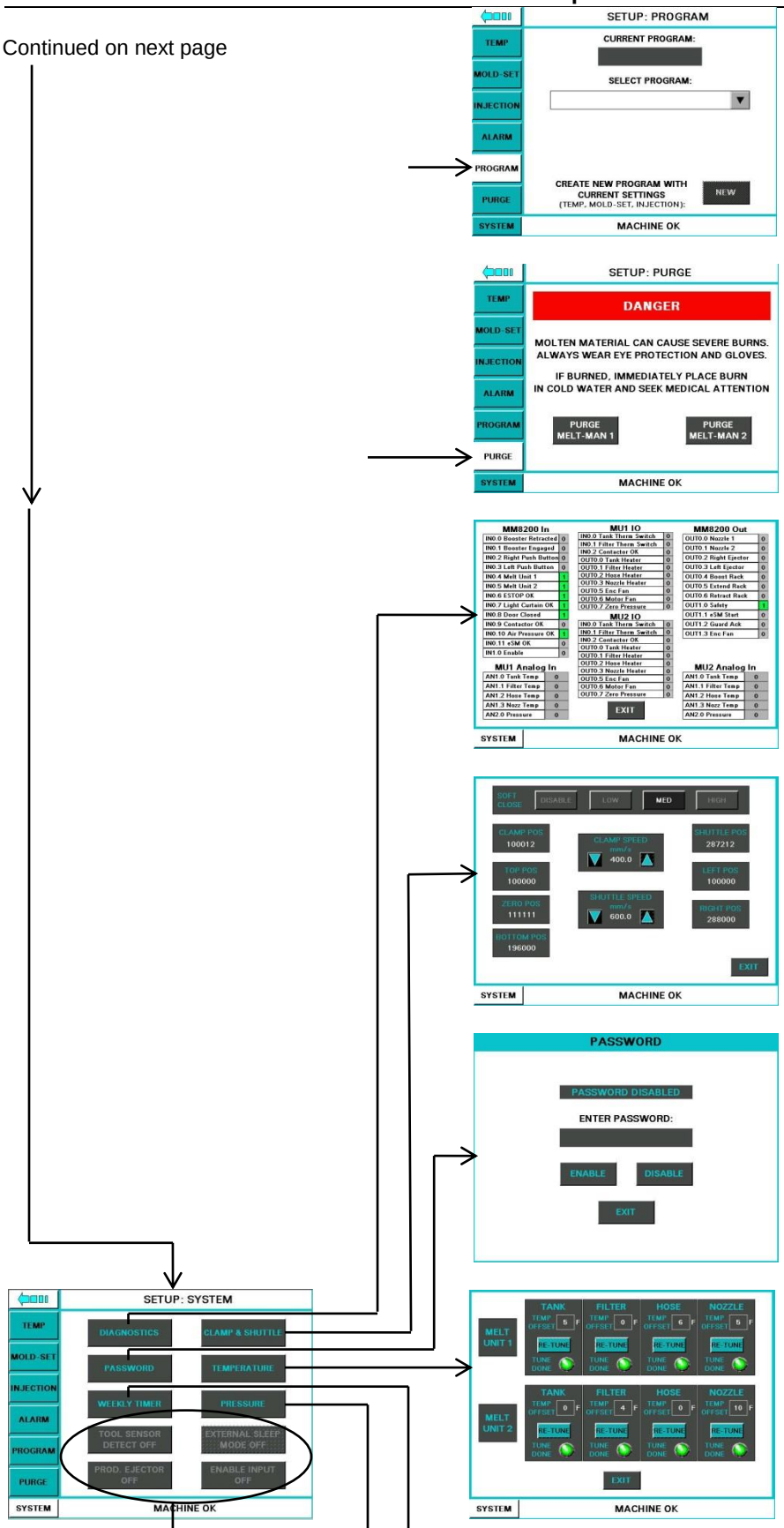
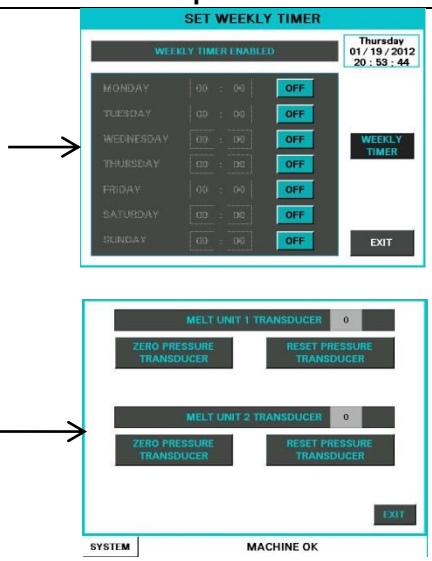


Buttons are on/off functions and do not forward to a new screen.



4.2.3 Setup screen

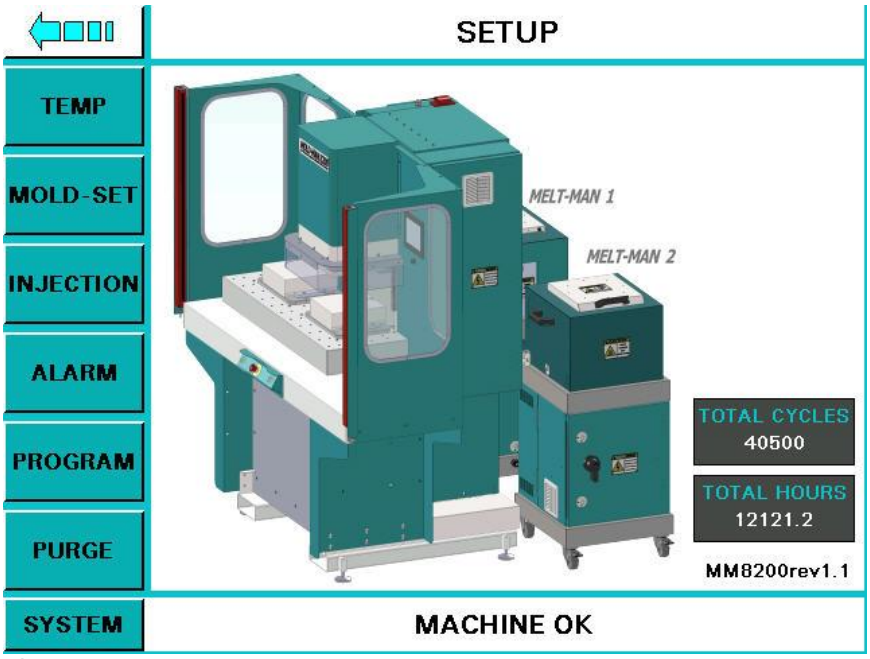


Fig. 4-7 Setup screen

This set-up screen is your link to setting of all machine parameters. The Menu bar on the left including the “return” arrow in the top left corner he displayed throughout all the setup screens. Pushing the “return” arrow will display the production mode screen. It can be activated from all setup screens. The individual buttons are as follows:

TEMP	Advances to Temperature screen
MOLD-SET	Advances to the Mold-set setup screen
INJECTION	Advances to the Injection setup screen
ALARM	Advances to the Alarm setup screen
PURGE	Advances to the Purge setup screen
SYSTEM	Advances to the System screen

In addition, the Setup Screen displays a Total Hour and Total Cycle counter in the lower right hand corner. The individual setup screens are explained in greater detail on the following pages.

4.2.4 Temperature setup screen

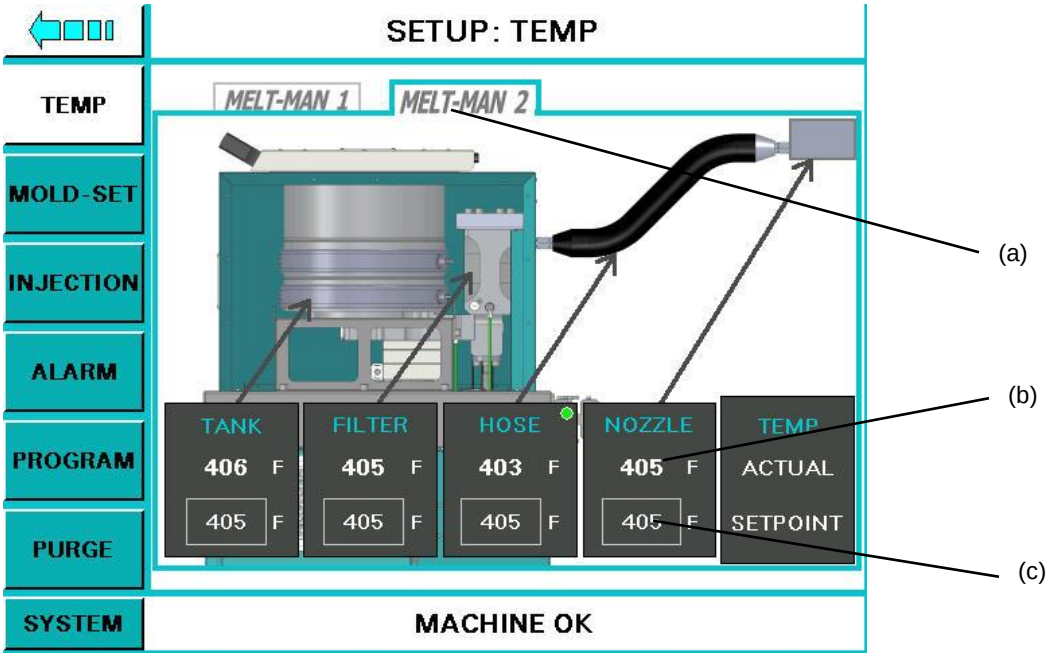


Fig. 4-8 Temperature setup screen

This screen is used to set the temperatures for the different temperature zones for the Melt-man. One or two tabs (a) are available depending on the number of Melt-man units that are connected to the Mold-man 8200. If two Melt-man units are connected as shown in Fig. 4-8 the tabs can be pushed to switch between the temperature screens of the two units.
There are four temperature zones for each Melt-man, Tank, Filter, Hose and Nozzle. Each zone has two temperature displays, the actual temperature (b) and the set point (c). Pushing the outline box around the set point (c) lets you adjust the set point temperature in a separate pop up screen.

NOTE!

The minimum temperature for the machine to operate is 360F. Maximum set point temperature is 475F.

The machine is equipped with an automatic temperature turn-down feature. If the machine has not been operated for 2 hours, the temperature set-points for all temperature zones will automatically be reduced to 275ºF. The machine resets to the original set-point temperatures when the actuation buttons, the E-stop button or the touchscreen is actuated.

IMPORTANT!

Please observe and follow manufactures recommendations for setting correct temperatures to process molding materials.

4.2.5 Mold-set setup screen

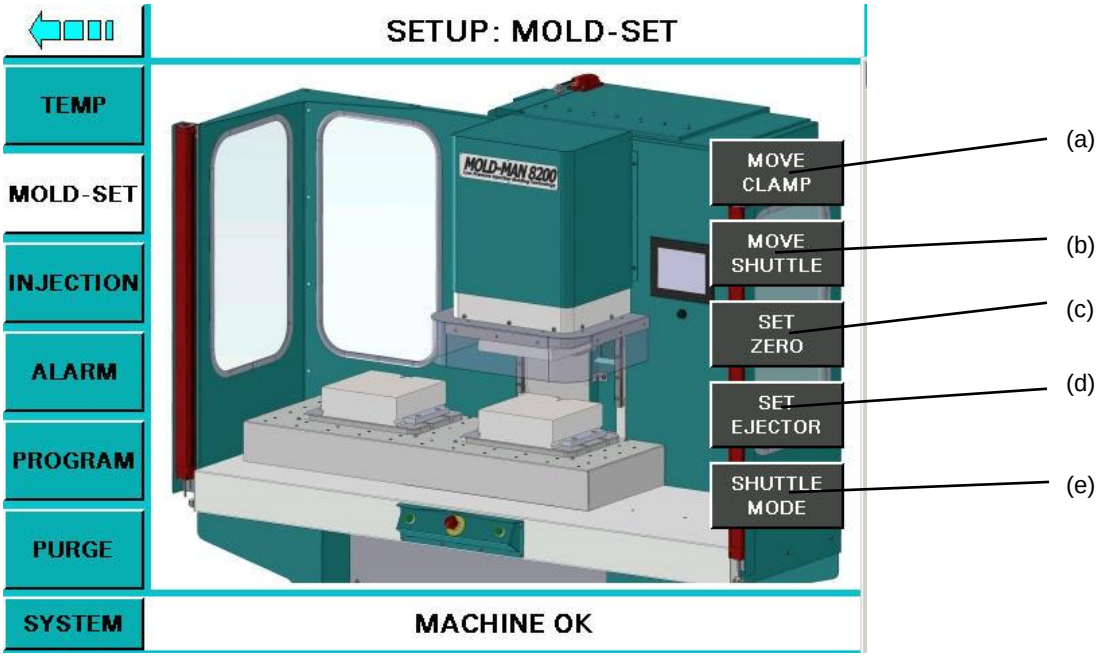


Fig. 4-9 Mold-set setup screen

The Mold-set setup screen is used when installing a new mold-set, please refer to chapter 4.3 for the installation procedure. Pushing the “Move Clamp” button (a) will enable clamp motion. Use the right actuation button to move the clamp down, use the left actuation button to move the clamp up. Pushing the “Move Shuttle” button (b) will enable shuttle table motion. Use the right actuation button to move the shuttle table to the right and use the left actuation button to move the shuttle table to the left.
Pushing the “Set Zero” (c), “Set Ejector” (d) or “Shuttle Mode” (e) buttons brings up another screen, which are described in chapter 4.2.6, 4.2.7 and 4.2.8 respectively.

4.2.6 Set clamp zero screen

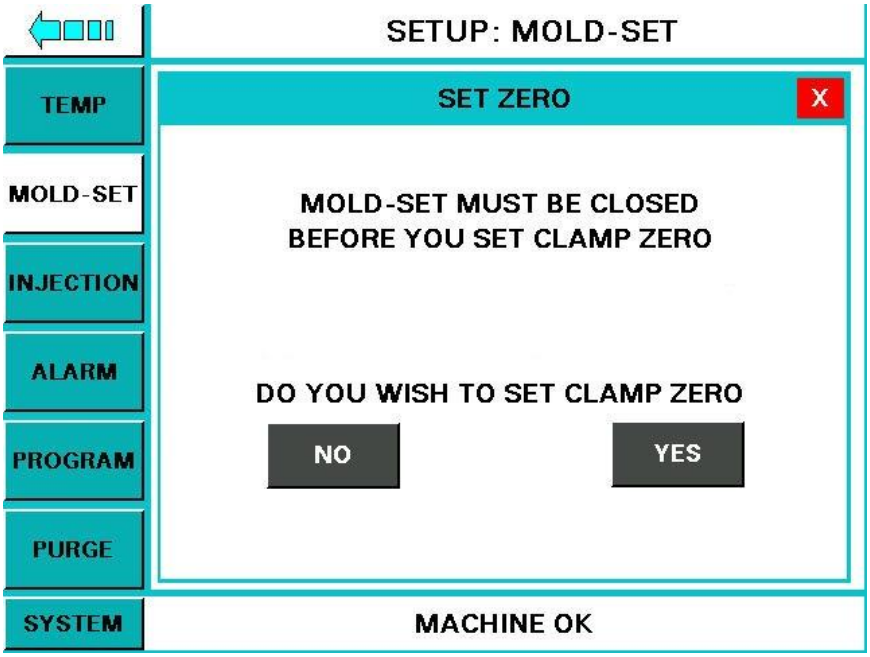


Fig. 4-10 Set clamp zero screen

IMPORTANT!
Before the Set Clamp Zero Function is used the installed mold-set must be completely closed!

After it is verified that the installed mold set is completely closed, the clamp can be set to its closed or zero position by pushing the “Yes” button. The message “Clamp Zero Is Set” is displayed as, shown below, in the message bar in the center of the screen to acknowledge the setting. Pushing the No button will not set a new clamp zero position. Press the “X” button in the upper right hand corner to exit the screen.

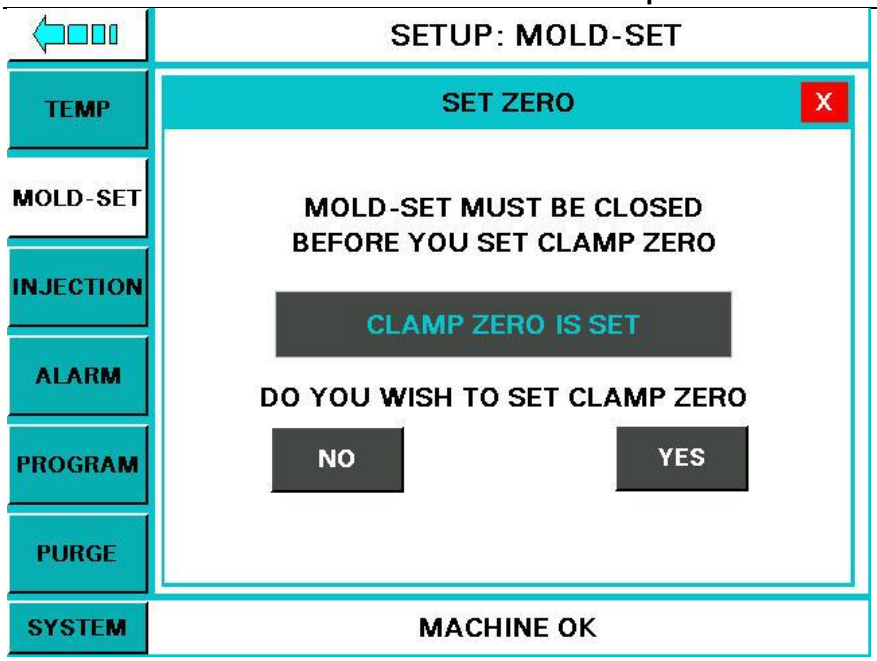


Fig. 4-10 Set clamp zero screen

4.2.7 Set ejector screen

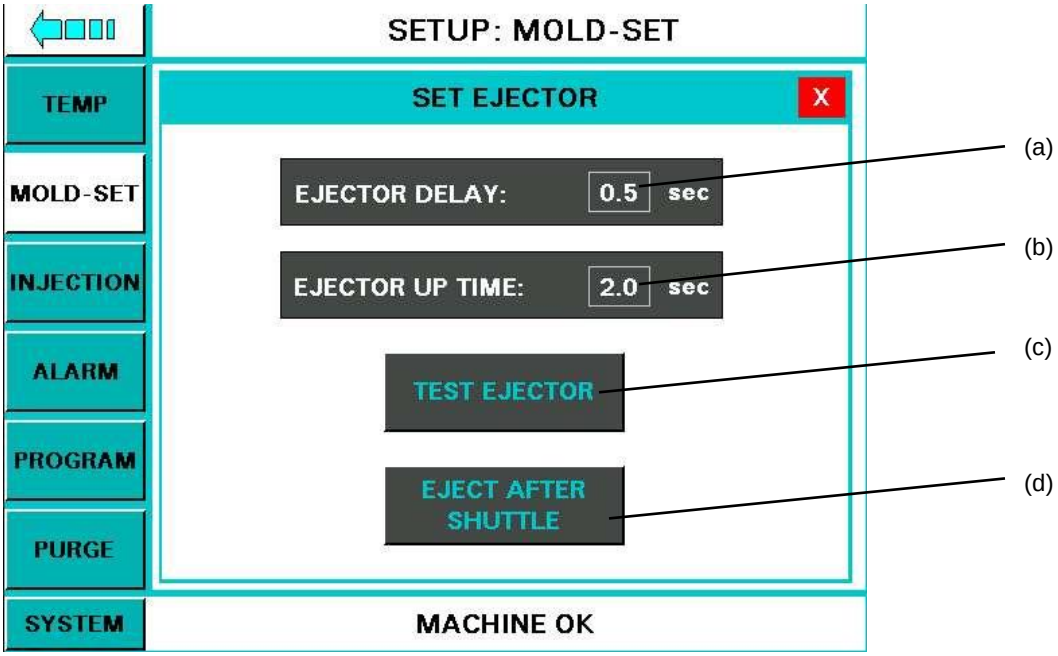


Fig. 4-11 Set ejector screen

The ejectors are activated in production mode after the injection cycle is completed and the clamp reaches its top position. The “Ejector Delay” will delay the activation of the ejector after the clamp has reached its top position by the time entered in outline box (a). The “Ejector Up Time” is the amount of time that the ejector stays in the upper position after the clamp has reached its top position or if set, after the “Ejector Delay” time has elapsed. Use outline box (b) to adjust the “Ejector Up Time”. Use the “Test Ejector” (c) button to test the current settings, both ejectors will be operated during the test cycle. Button (d) lets you choose between ejection before or after the shuttle motion. Setting both timers to zero will deactivate the ejector motion. Maximum timer value is 9.9 seconds.

4.2.8 Set shuttle mode

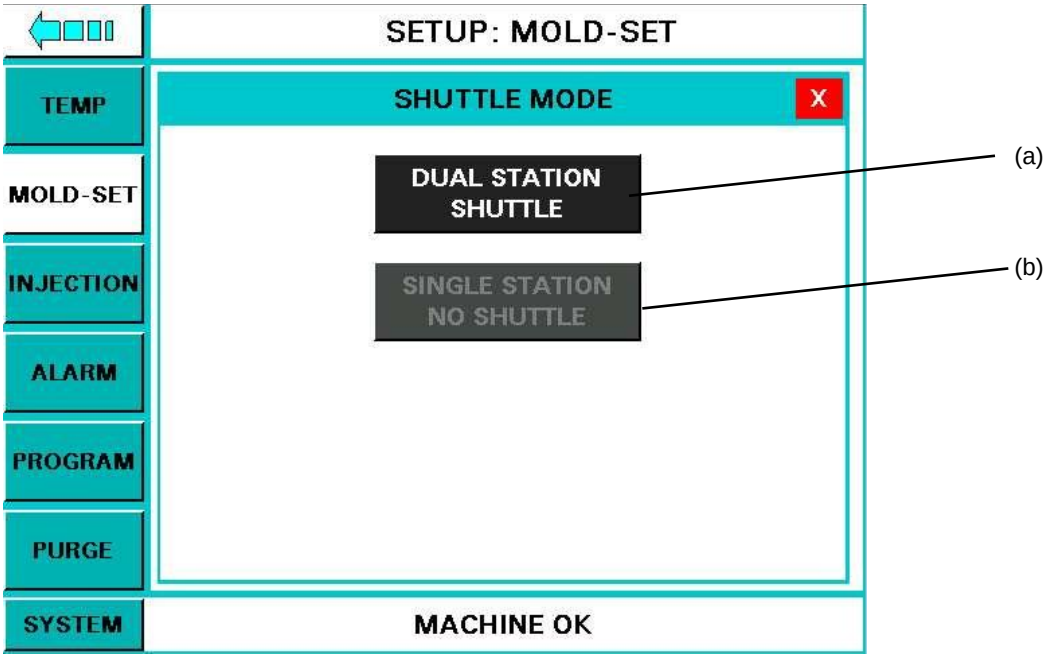


Fig. 4-12 Set shuttle mode screen

The “Shuttle Mode” setup screen allows the user to set different operating modes for the shuttle table. If the “Dual Station Shuttle” (a) button is pushed, the shuttle table moves to the opposite side after one of the actuation buttons is pushed before moving the clamp down and initiating an injection cycle. Pushing the “Single Station No Shuttle” (b) button disables shuttle motion and the shuttle table will remain in its current, left or right end position.

4.2.9 Injection setup screen

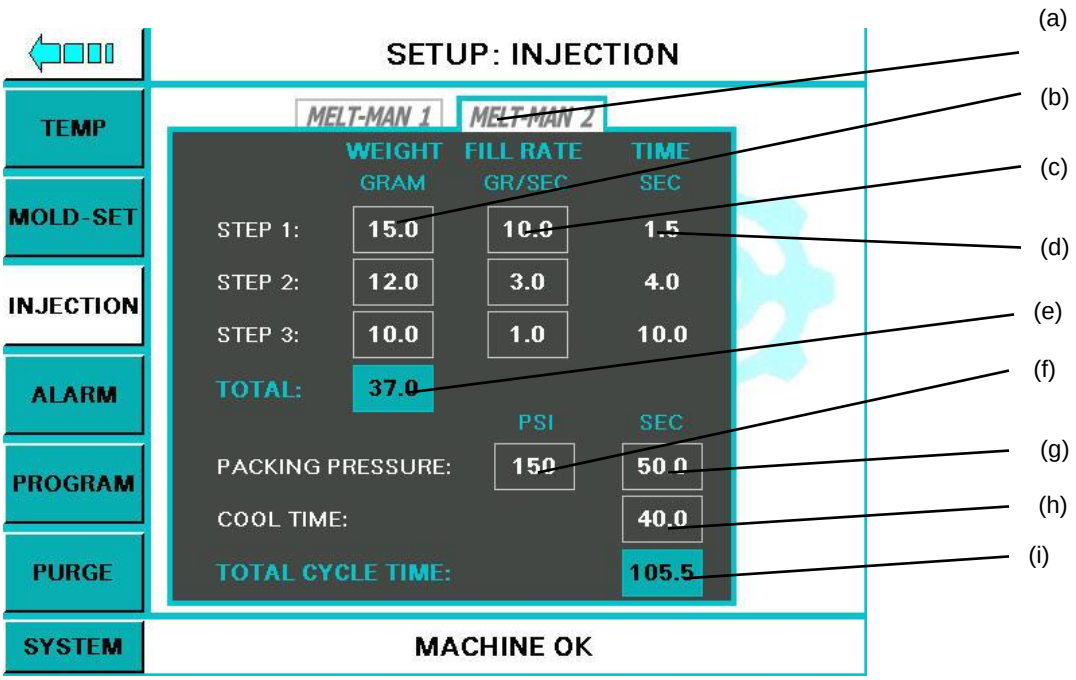


Fig. 4-13 Injection setup screen

The injection screen allows the user to setup and adjust the injection cycle. One or two tabs (a) are available depending on the number of Melt-man units that are connected to the Mold-man 8200. If two Melt-man units are connected as shown in Fig. 4-13 the tabs can be pushed to switch between the injection screens of the two units.
Up to three injection steps allow for a specified amount of material to be injected with a specified fill rate [speed] for each of the three steps. Most applications only require the use of one step. The weight to be injected for each step can be adjusted by pushing outline box (b). It can be adjusted in 0.1 gram increments and the maximum weight that can be specified is 999.9 grams. The fill rate represents the speed with which the material is injected during the fill step, it is adjustable in 0.1 gr/sec increments and the maximum fill rate is 20.0 gr/sec. Adjust the fill rate by pushing on outline box (c). The Duration of each fill step is automatically calculated and displayed in the “Time” column (c). The total weight of all three fill steps is automatically calculated as well and displayed at (e).
If the injection setup is correct, packing pressure is the pressure that the cavity will be pressurized at when completely full. Maximum pressure is 750 PSI [52 bar]. Adjust the injection pressure by pushing the outline box (f). The timer (g) adjusts the duration that the machine will pressurize [pack] the mold-set cavity. Cool time (h) completes the cycle and is the time that the machine will keep the mold-set closed without further pressurizing [packing] the cavity.
The machine automatically calculates the total injection cycle time and displays it in the lower right hand corner (i).

NOTE!
Most applications will only require the use of STEP 1. The molding cycle will automatically skip STEP 2 and STEP 3 and go directly to PACKING.

NOTE!
If the viscosity of the material is too high, i.e. due to a low temperature, it might not be possible to achieve the maximum fill rate.

4.2.10 Alarm setup screen

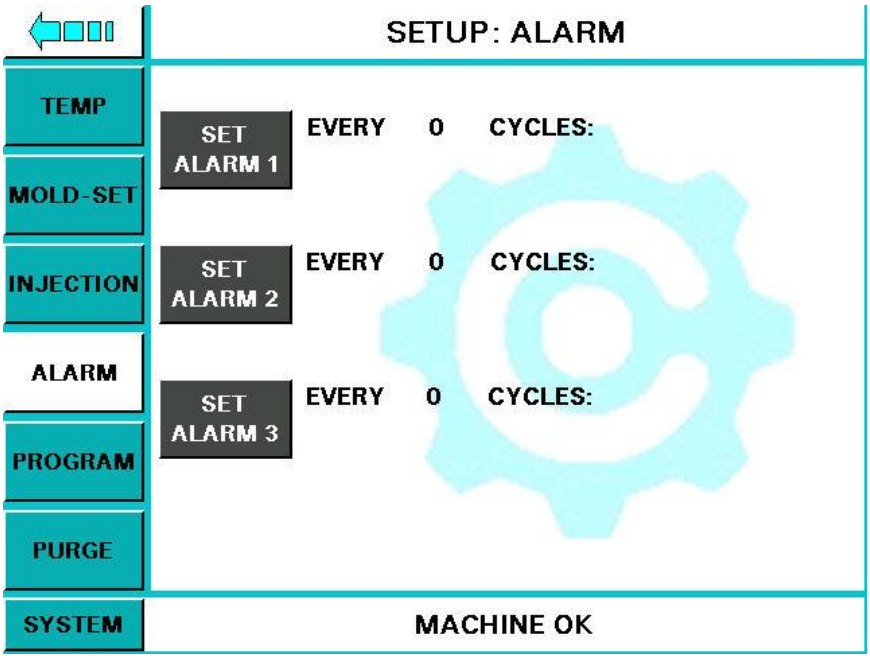


Fig. 4-14 Alarm setup screen

In this screen Fig. 4-14 you select to edit the alarm counts and the alarm messages for either “Alarm 1” ,“Alarm 2” and/or “Alarm3”. Pushing one of the “Set Alarm #” buttons will display the screen shown below.

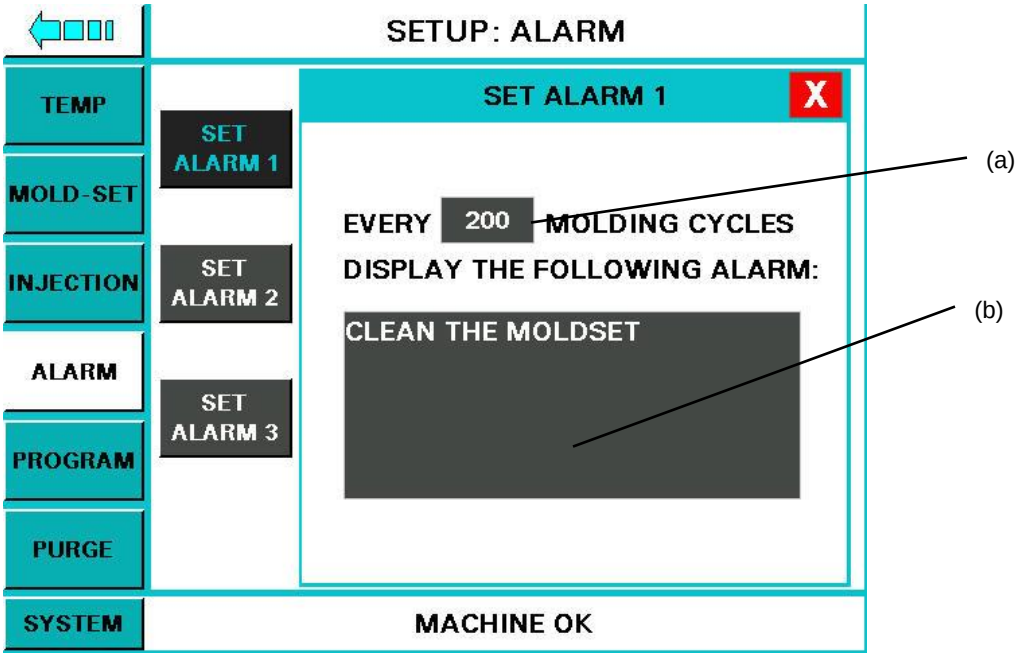


Fig. 4-15 Set Alarm screen

This screen lets you specify the alarm interval (a) at which the alarm message entered in (b) will be displayed during production mode. Push each of the boxes (a) or (b) to adjust the molding cycle count (a) and message (b). Once the specified molding cycle count has been reached during production mode the message entered in (b) will be displayed and further molding cycles will be inhibited unless the alarm message is acknowledged

by the operator by pushing a “OK” button. To exit the screen press the “X” button in the upper right hand corner.

4.2.11 Purge setup screen

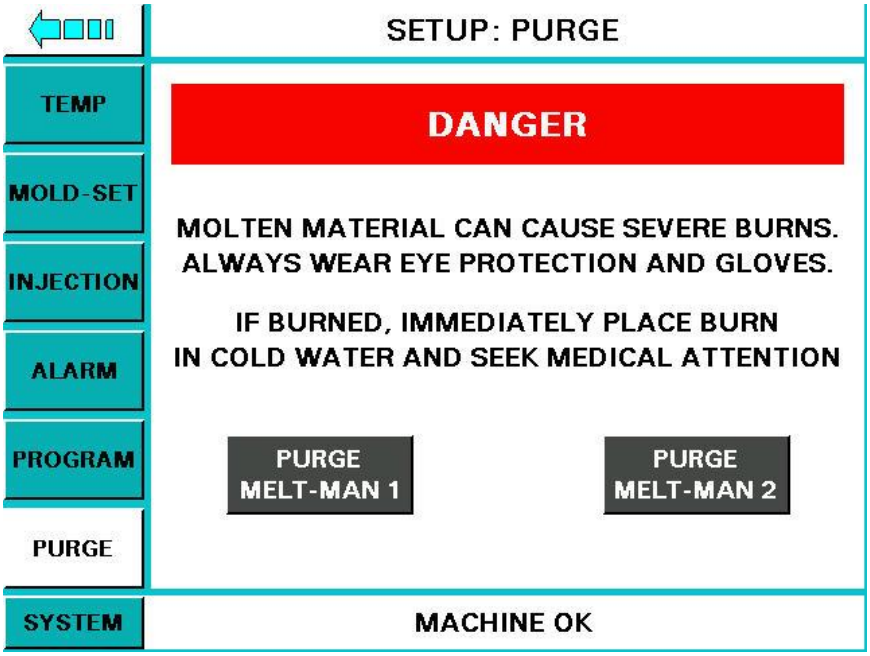


Fig. 4-16 Purge setup screen

This screen displays either one or two buttons depending on the number of Melt-man units that are connected to the Mold-man 8200. Pressing the “Purge Melt-man #” button will start material flow through the nozzle of the corresponding Melt-man unit for the duration the button is pushed. Only purge material with the clamp safety shield in place, ensuring that it safely covers the nozzle! Ensure that purged material is captured by a suitable, heat resistant container! Always wear eye protection, gloves and protective clothing when handling hot material!
Clean any leftover material from the nozzle bracket after purging is complete!

WARNING!
Molten material is hot and can cause severe burns. When reservoir is empty, the nozzle may sputter because of air**.** Always wear eye protection, gloves and protective clothing when purging and handling hot material!

WARNING!
Only purge material with the clamp safety shield in place, ensuring that it safely covers the nozzle! Ensure that the purged material is captured by a suitable, heat resistant container.

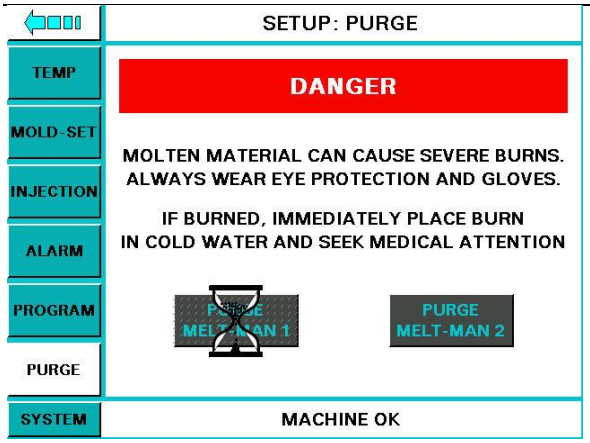


Fig. 4-16 Purge setup screen

Once the purge button is released, an hourglass appears as shown in figure XX for approximately 3 seconds. The machine performs a zeroing of the pressure transducer as described in chapter 4.2.18. During that time the purge is inoperable.

4.2.12 System setup screen

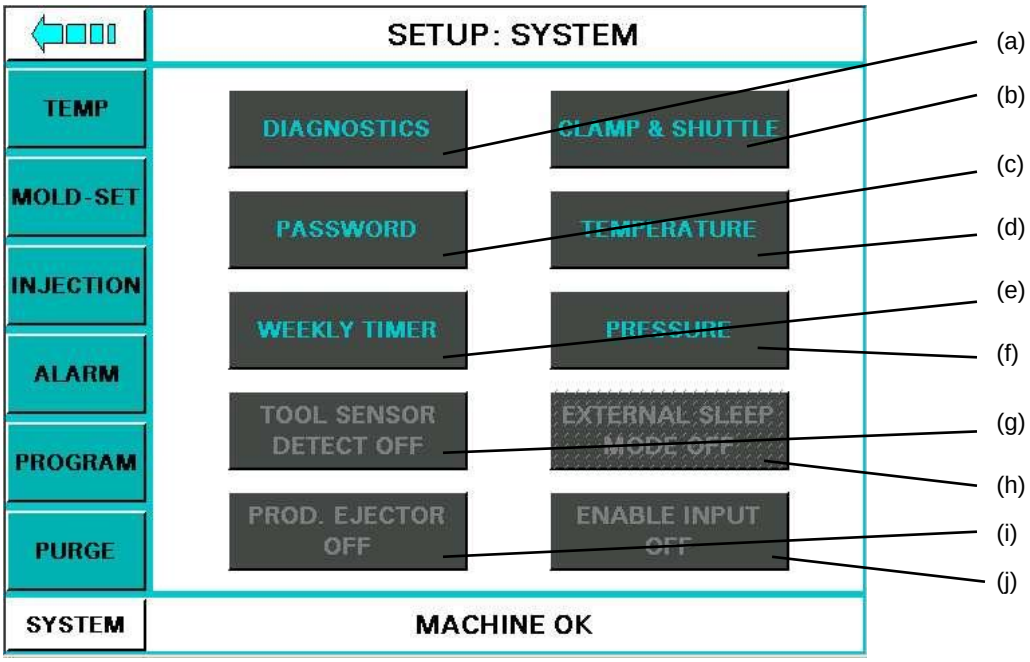


Fig. 4-17 System setup screen

The “System” screen as shown in Fig. 4-17 can be accessed by pressing the “System” button in the lower left hand corner. Buttons (a) through (f) will forward to a new screen, while buttons (g) through (j) are on/off functions. Pushing any of the buttons (g) through (j) will change their status. i.e. from ‘Tool Sensor Detect Off’ to ‘Tool Sensor Detect On’.

4.2.13 System ‘Tool Sensor Detect’

If button (g) is set to ‘Tool Sensor Detect On’ the machine will not start shuttle motion if the corresponding control input [I1.1 (right), I1.2 (left)] is negative [‘0’]. A positive signal at the corresponding control input will allow, shuttle [if in shuttle mode] and clamp motion and the subsequent injection cycle. Should the signal turn negative after the shuttle motion has started the motion will be completed but the clamping cycle will not be initiated. Should the corresponding control input turn negative during clamp motion, it will stop clamp motion if the clamp is between the top position and approximately 10mm above the closed clamp position [‘zero’].

Between approximately 10mm above the closed clamp position and the closed clamp position the clamp will continue to close, regardless of the state of the corresponding control input. This function is typically used to integrate part presence detection in the mold-set.

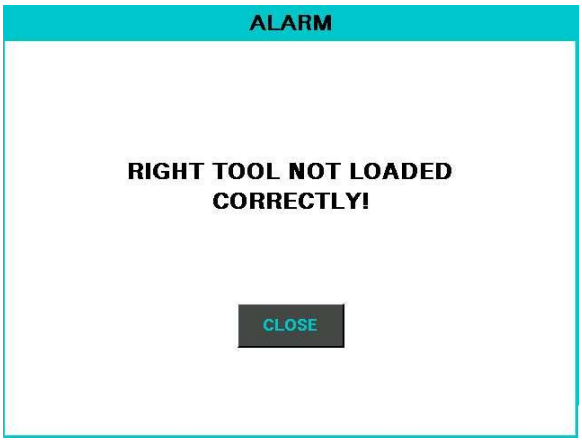


Fig. 4-18 System setup screen

Fig. 4-18 System setup screen

Initiating a molding cycle without the corresponding control input positive will result in a pop-up screen as shown in Fig. 4-18 above.

4.2.14 System 'External Sleep Mode'

If button (h) is set to 'External Sleep Mode On' the machine will be put into 'sleep mode' analogous to the 'sleep mode' described in chapter 4.2.1, if the corresponding control input for this function is negative [I1.3]. A positive control input allows standard operation of the machine.

4.2.15 System 'Prod. Ejector'

If button (i) is set to 'Prod. Ejector On' the production screen as described in chapter 4.2.1 will have an operator accessible ejector button (a) displayed. The button works in toggle mode, pressing it once will bring both ejectors up, pressing it again will retract both ejectors.

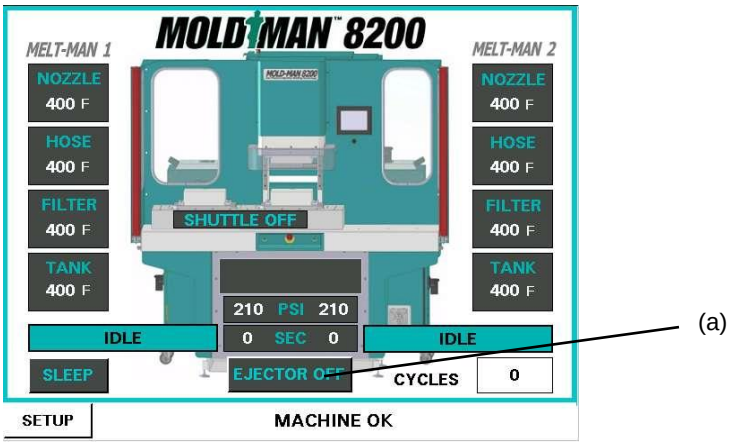


Fig. 4-19 System setup screen

4.2.16 System 'Enable Input'

If button (j) is set to 'Enable Input On', the machine requires a positive signal at the corresponding control input [I1.0] in order to start a cycle. If the control input is negative when initiating a cycle, the machine will not start and a 'No Enable Input' message is displayed in the message bar. The control input for this function will

only be checked at the beginning of the cycle. Once the cycle has started a change to a negative signal at the control input will not interrupt the cycle.

Functionality of buttons (a) through (f) is explained on the following pages.

4.2.17 System diagnostic screen

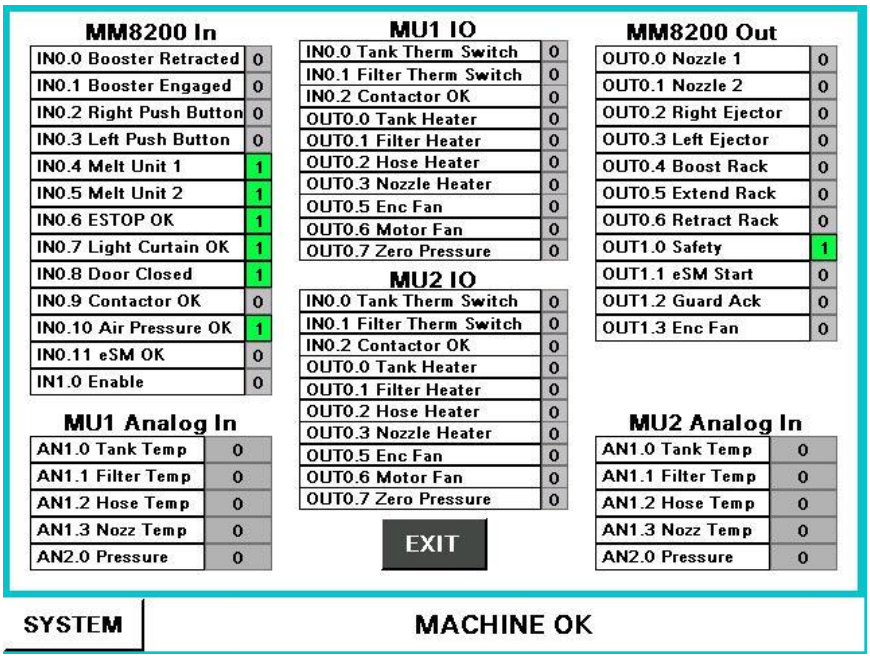


Fig. 4-20 Diagnostics setup screen

The diagnostics screen provides real-time readout of machine parameters, sensors status etc. to aid in troubleshooting. Discrete I/O status is indicated by green or “1” for ON and gray or “0” for OFF. Analog I/O is displayed in internal counts.

4.2.18 System clamp & shuttle screen

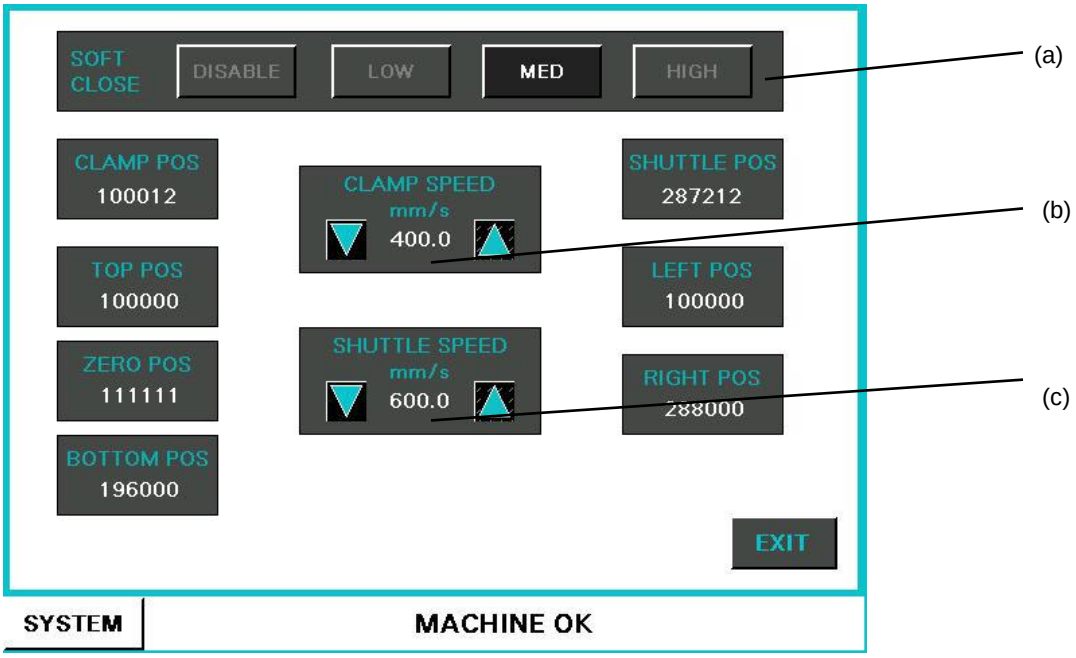


Fig. 4-21 Clamp & Shuttle setup screen

The clamp & shuttle page lets the user adjust the speed for the clamp and the shuttle in production mode. Clamp speed can be adjusted from 200mm/s to 400 mm/s in 50mm/s steps by jogging the up/down arrow buttons in field (b). Shuttle speed can be adjusted from 300mm/s to 600 mm/s in 50mm/s steps by jogging the up/down arrow buttons in field (c). The initial closing force of the clamp can be adjusted through the soft-close panel (a). Three levels of initial closing force are available 'Low', 'Med' and 'High'. Choosing to 'Disable' the soft-close closes the clamp with maximum available force. This setting has no impact on the clamping force that is applied after the soft-close has occurred and the clamp is completely closed. Most applications will run best with the soft-close set at 'Med'.

In addition, there are position readouts for the clamp on the left side of the screen and for the shuttle table on the right side of the screen. All position readout are in internal counts. 'Clamp Pos' is the current clamp position and changes when the clamp moves. 'Zero Pos' is the position at which the mold-set is closed and can vary for different mold-sets. 'Top Pos' and 'Bottom Pos' are fixed counts that represent the corresponding end of stroke positions for the clamp.

'Shuttle Pos' is the current shuttle table position and changes when the shuttle table moves. 'Left Pos' and 'Right Pos' are fixed counts that represent the corresponding end of stroke positions for the shuttle table.

4.2.19 System password screen

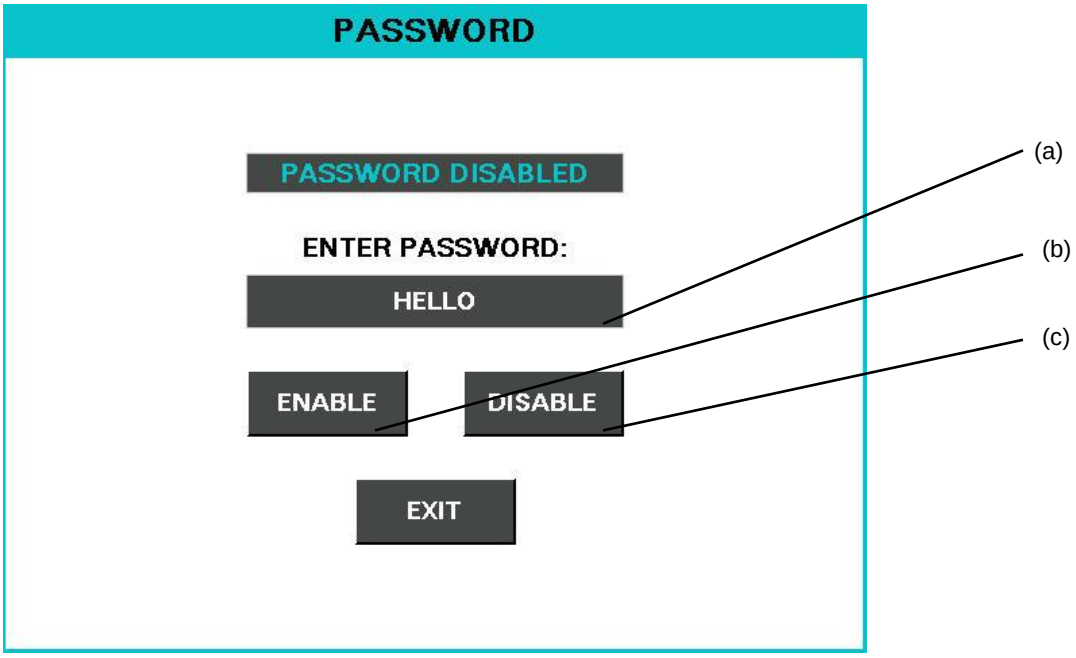


Fig. 4-22 Password setup screen

Pushing the “Password” button will display the screen shown above in Fig. 4-22. This screen allows you to set a password to restrict access to all setup screens. Push the ‘Enable’ (b) button and then push the black outline box (a) to enter the password. To disable the password protection push button (c). A status readout at the top of the screen shows if the password function is enabled or disabled.
When trying to access the setup screens by pressing the ‘Setup’ button on the production screen, the user will be prompted for the password if the function is enabled.

NOTE!
If you forget your password, call Moldman Systems LLC for a reset password to gain access to the setup screens again.

4.2.20 System temperature screen

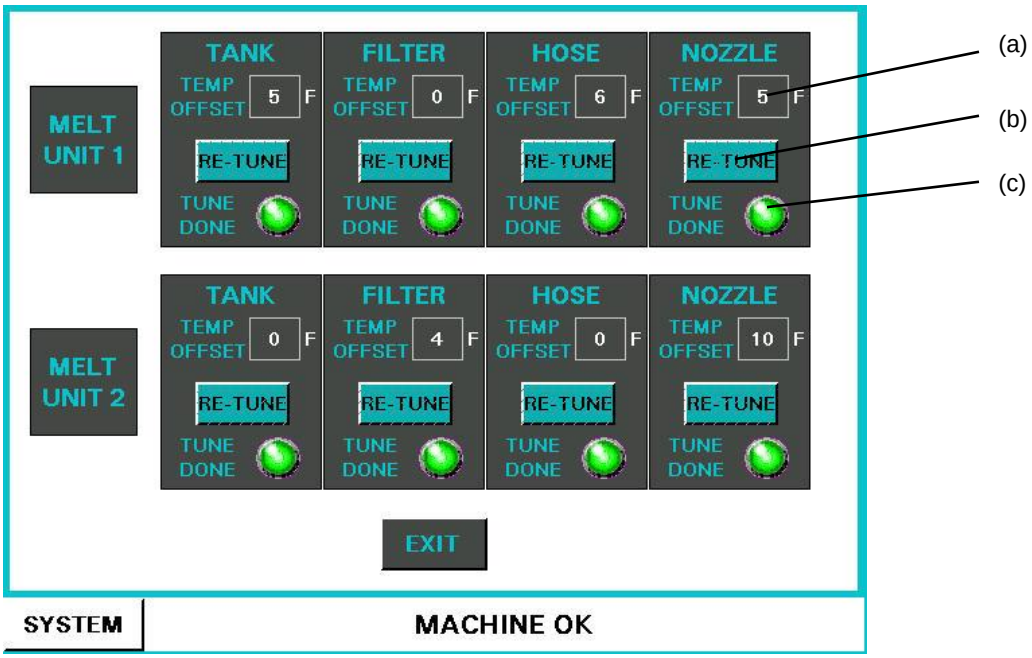


Fig. 4-23 Temperature setup screen

The system setup temperature screen allows the re-tuning of each individual temperature control loop. A retune can only be initiated if the current control loop temperature is 10F below its set-point. If this condition is not met the retune function is not available and the corresponding button (b) is grayed out. To initiate a retune, simply push the 'Re-tune' button (b) of the desired temperature control loop. The green 'Tune Done' light (c) will turn off to indicate that tuning is in progress. Once finished, the light will turn on again to indicate that the tuning is completed.
In addition to the retune feature each temperature control loop can be offset +/-20F. This allows for adjustment of the readout or current temperature for each control loop. This is best done at room temperature with all control loop set-points set to '0'. Adjust the offset for each control loop, by pushing the outline field (a) and enter the correction value so that it matches the current room temperature.

4.2.21 System weekly timer

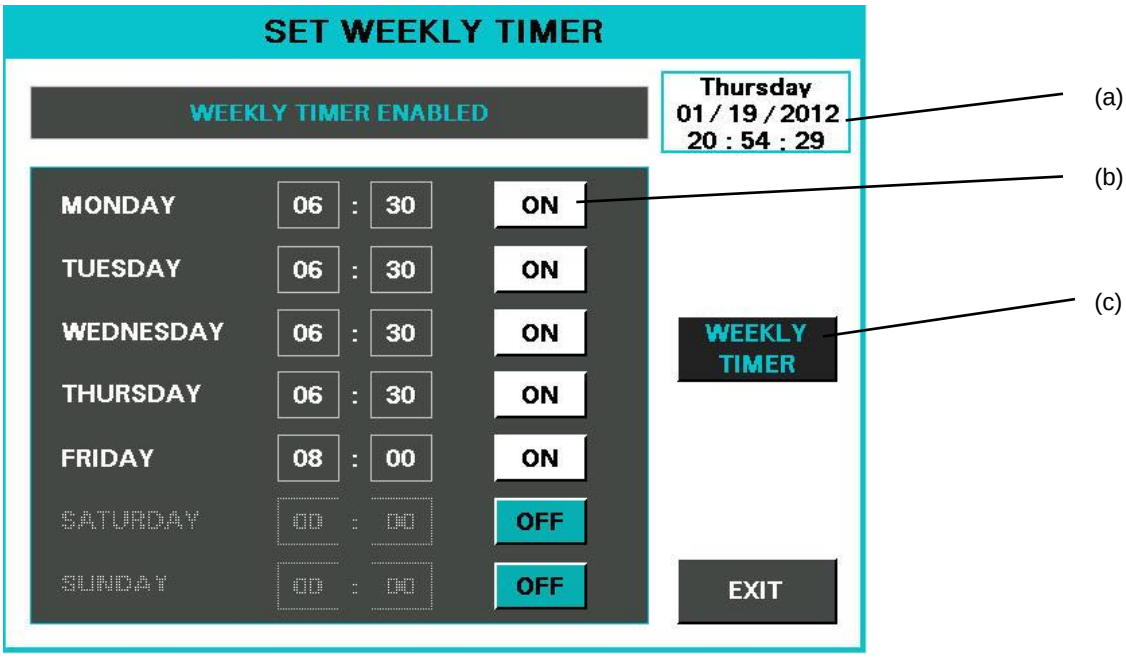


Fig. 4-42 Weekly timer setup screen

Pushing the “Weekly timer” button will display the screen shown above in Fig. 4-24. This screen allows you to set a startup times for the melt-unit(s) for each weekday. Set the current date and time by pushing the outline box (a) and the screen in Fig. 4-25 is displayed. The time is set in 24 hour format.
Each weekday has an on/off (b) button associated with it. Turning the button to ‘On’ will enable the time entry fields to the left of the button. Here the startup time can be entered for the particular weekday. Again, the time is in the 24 hour format.

NOTE!

It is important that the machine is NOT turned off at the main disconnect for the automatic start up to work. Use the ‘sleep’ mode to place the machine in an ‘energy save’ mode and to allow it to turn on at the specified time.

Pushing the ‘Weekly timer’ (c) button will enable or disable the weekly timer function.

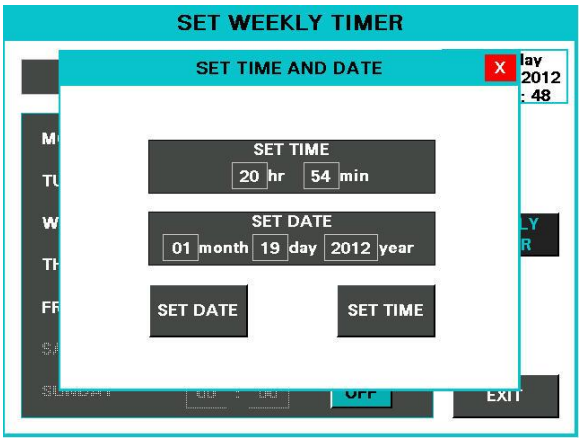


Fig. 4-25 Set Time and date setup screen

4.2.22 System pressure screen

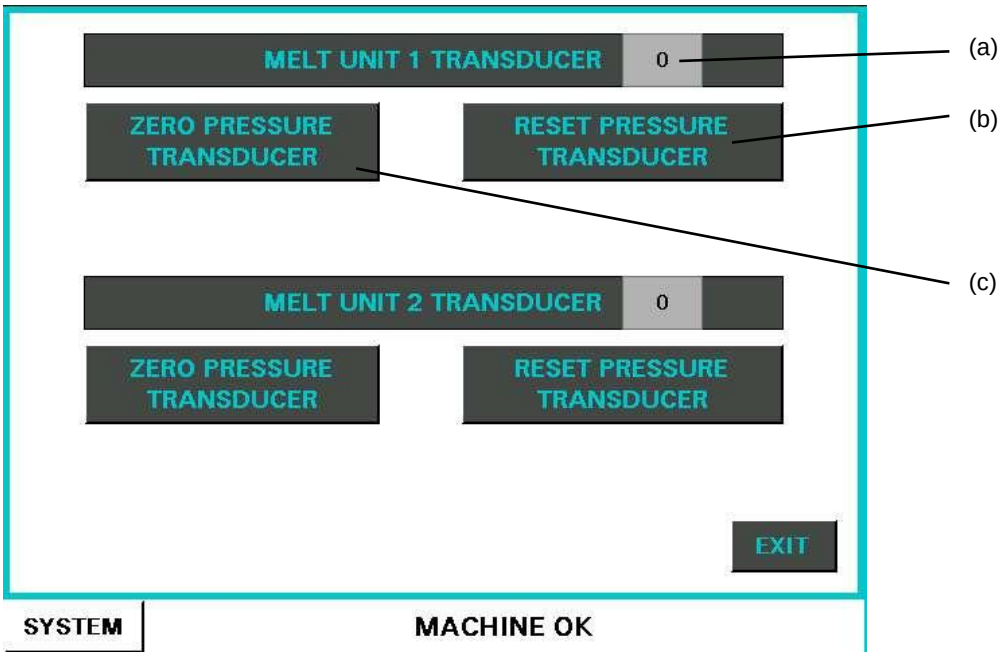


Fig. 4-26 Pressure setup screen

This screen allows the user to zero the pressure transducer and to reset the transducer to the factory calibration for zero and span.

IMPORTANT!
Both functions on this screen open the nozzle valve to bleed of hydraulic system pressure. The clamp needs to be in the open position before imitating either function. Ensure that the machine is at operating temperature! Make sure that the clamp safety shield is in place, ensuring that it safely covers the nozzle! Ensure that the purged material is captured by a suitable, heat resistant container. Always wear eye protection, gloves and protective clothing!

To zero the pressure transducer push the 'Zero Pressure Transducer' button (c). The nozzle valve opens to bleed of hydraulic pressure in the system and the transducer will be set to zero. This function takes approximately 2 seconds. The current pressure count values are displayed in field (a) and should be near zero after this function is executed.
To reset the pressure transducer's zero and span values to the factory calibration, push the 'Reset Pressure Transducer' button (b). The nozzle valve opens to bleed of hydraulic pressure in the system and the transducer will be reset. This function takes about 65 seconds to execute. Make sure to initiate a transducer zero by pushing button (c) after you have reset the transducer.

4.3 Mold-set installation

- Mold-set installation starts with the shuttle table in its right position and with the clamp fully open and the clamp safety shield removed.
- Use a lint-free rag to wipe and clean the mounting surfaces of all mold halves, the shuttle table and the upper mold platen.

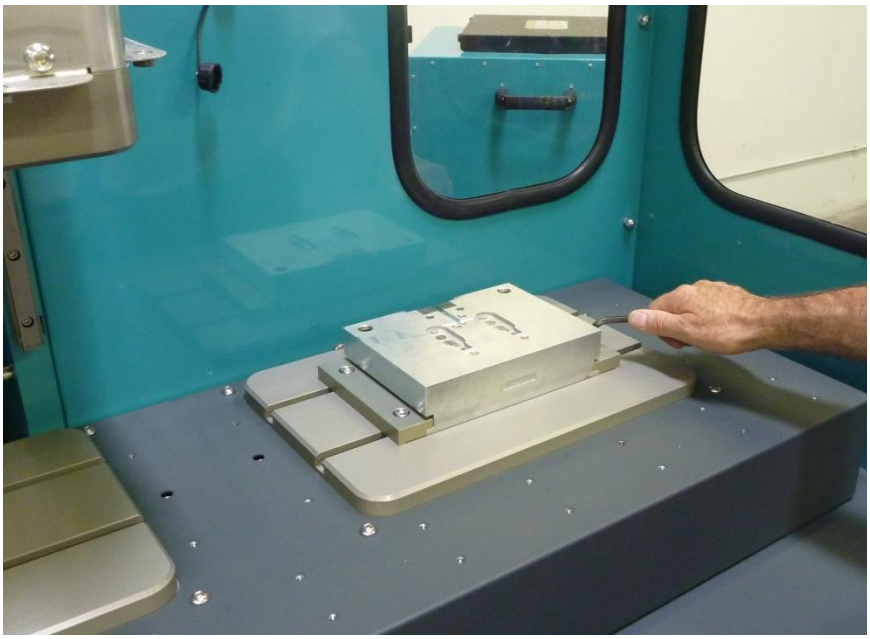


Fig. 4-27

- Place one lower mold-half carefully on the right shuttle table side. If a mold-set with ejectors is used, make sure the boss for mold-set ejectors fits into the ejector well.
- Make sure that the lower mold-half is centered around the ejector well with the front of the mold-half being parallel to the front edge of the lower mold platen.
- Make sure that the mold-half is centered left to right on the lower mold platen as well.
- Position a mold fastener in the T-slots on either side of the mold-half and secure over the lip on the lower mold half. The 8mm socket head cap screws are tightened with a 6 mm Allen key to 11 ft-lb (15 Nm) torque.

Fig. 4-28

- Place the upper mold-half onto the previously installed lower mold-half by carefully engaging the mold-set guide-pins into the guide bushings.

Fig. 4-29

- Move the shuttle table to its left end position. Lower the clamp until the mold-set is completely closed.
- Position a mold fastener in the T-slots on either side of the mold-half and secure over the lip on the lower mold half. The 8mm socket head cap screws are tightened with a 6 mm Allen key to 11 ft-lb (15 Nm) torque.
- Set zero position with mold-set closed. Please refer to Section 4.2.6.

NOTE!

If the machine is used in single station mode without shuttle table operation, please go to section 4.4.
If the set-up is for shuttle table operation, please continue below.

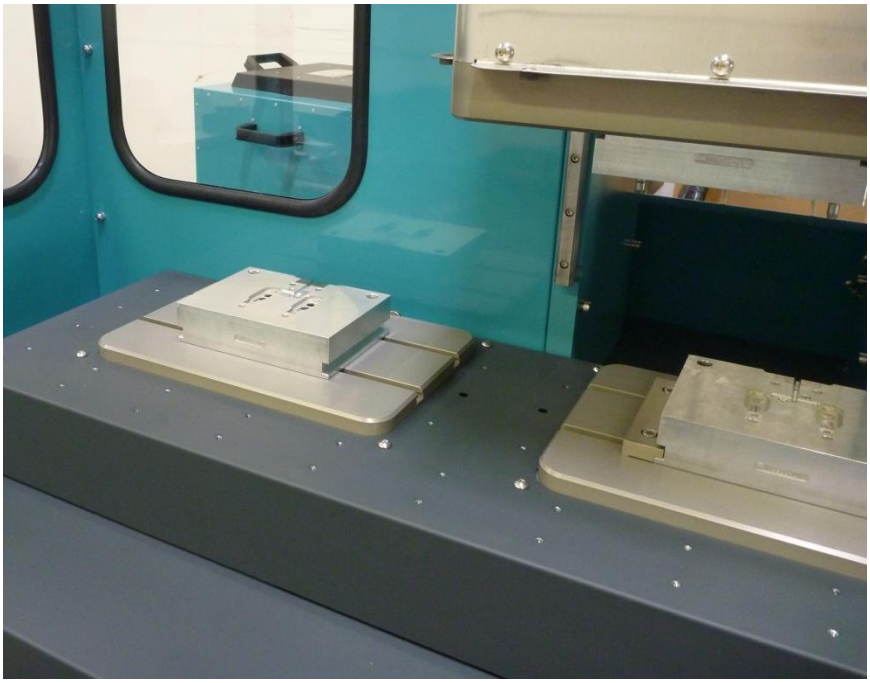


Fig. 4-30

- Place the second lower mold-half carefully on the left shuttle table side. If a mold-set with ejectors is used, make sure the boss for mold-set ejectors fits into the ejector well.
- Make sure that the lower mold-half is centered around the ejector well with the front of the mold-half being parallel to the front edge of the lower mold platen.
- Make sure that the mold-half is centered left to right on the lower mold platen as well.
- Position a mold fastener a small distance away from the mold in the T-slots on either side of the mold-half. Do not engage or tighten the mold fasteners!

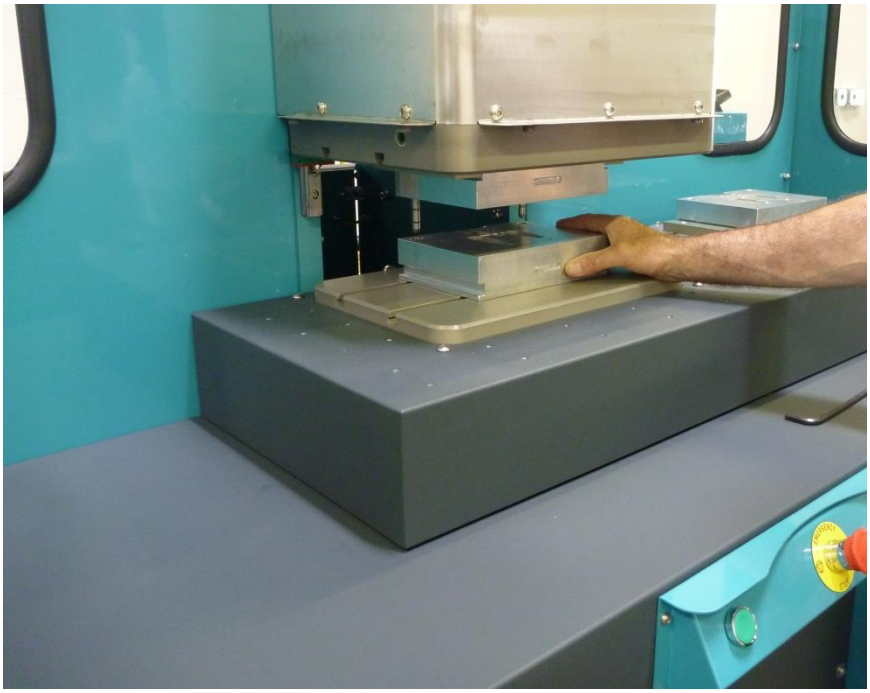


Fig. 4-31

- Move the shuttle table to its right end position.
- Lower the clamp very carefully and verify that the mold-set guide pins engage properly into the guide bushings. Stop lowering the clamp just prior to the mold-set guide pins engaging to fine adjust the positioning of the lower mold-half if necessary.

Fig. 4-32

- Close the clamp completely.
- Secure the 2 mold fasteners over the lip on the second lower mold-half. The 8mm socket head cap screws are tightened with a 6 mm Allen key to 11 ft-lb (15 Nm) torque.

Fig. 4-33

- Install the clamp safety shield as shown in Fig. 4-33

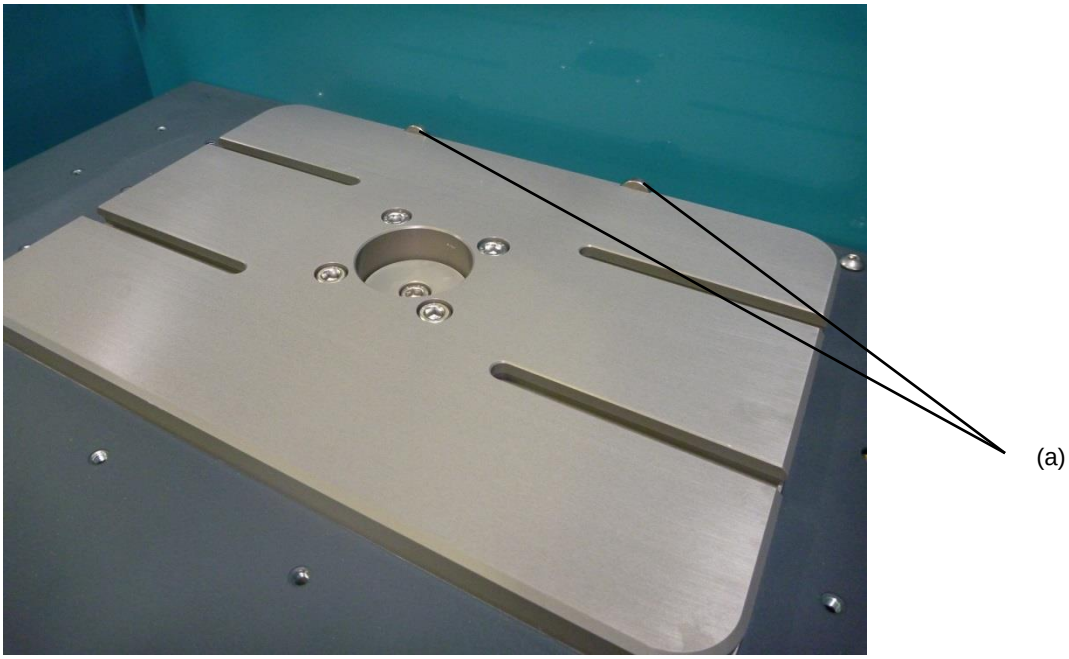


Fig.4-34. Mold-set stops

Each of the lower mold platens has two mold-set stops (a) as illustrated in Fig. 4-34. Please double check clearance between the nozzle assembly and the mold-set stops (a) on mold sets that have an “off center” nozzle mount or two nozzle mount locations. It might be necessary to remove the mold-set stops!

4.4 Nozzle installation

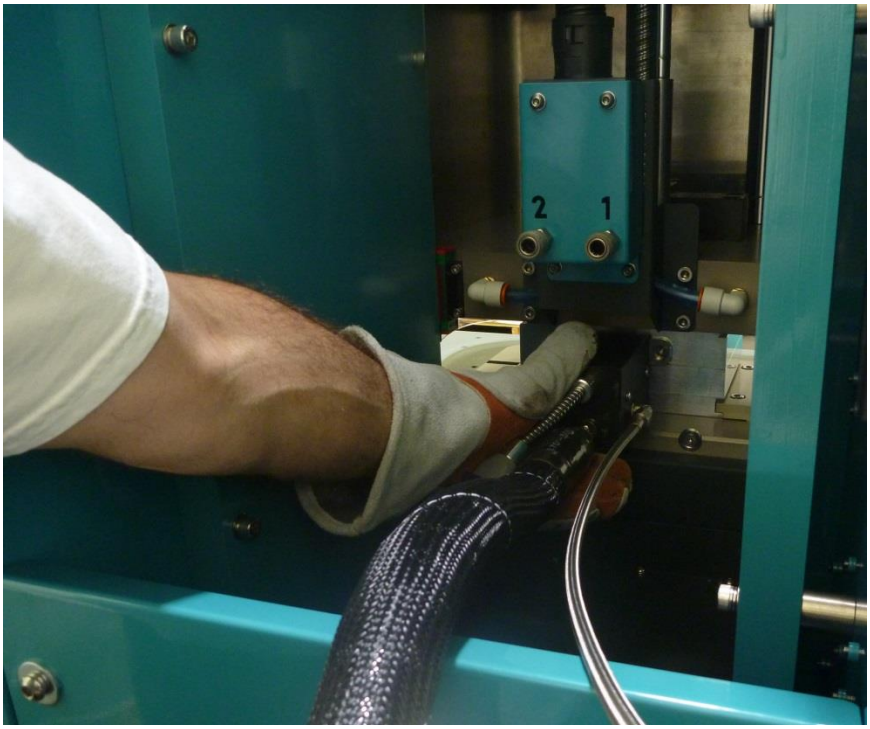


Fig. 4-35

- With the clamp closed from the last mold-set installation step open the access door at the back of the machine by opening the two latches and sliding it to the left.

WARNING!

The equipment processes materials at temperature up to 475°F. The melt unit, hose, injection gun assembly and nozzle are HOT! The hot molten material can cause severe burns! Always wear protective, heat resistant gloves and protective clothing! Always use safety glasses! Do not touch molten material! Even hardened material can still be very hot! Parts of the machine can remain hot for up to 4 hours after machine is turned off.

- Before mounting the nozzle assembly ensure that the mounting bracket, (b) in Fig. 4-36 below, is free of any material residue.
- Wearing heat resistant gloves hold the nozzle assembly as shown in in Fig. 4-35 and start engaging the mounting bracket (b) into the mounting bracket cavity (a) of the upper mold-half.
- Once fully engaged, insert two M8x20 socket head cap screw [(c) in fig. 4-36] in each of the two mounting holes and tighten them with a 6 mm Allen key to 11 ft-lb (15 Nm) torque.

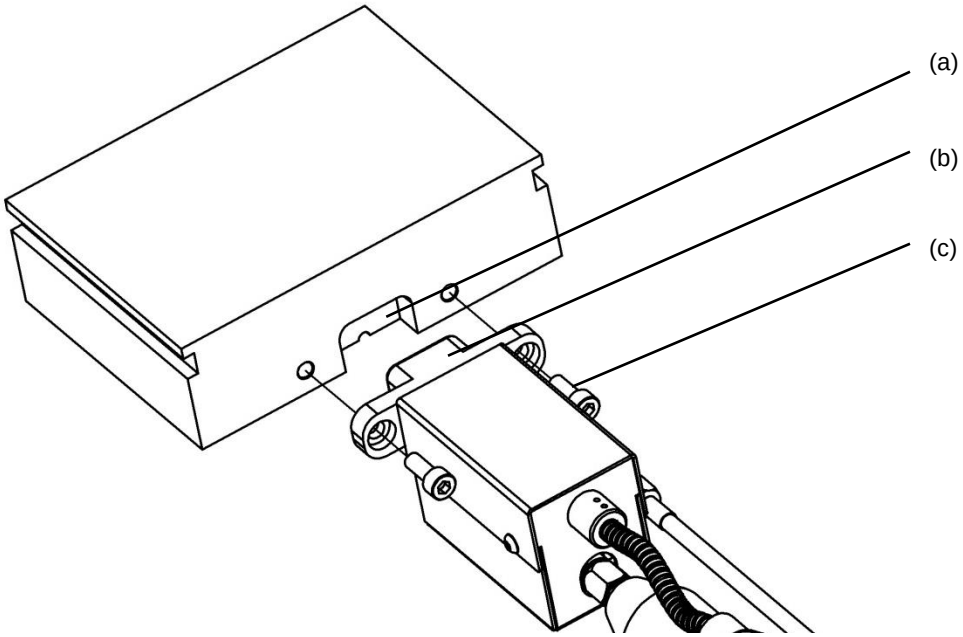


Fig. 4-36 Injection gun engagement detail

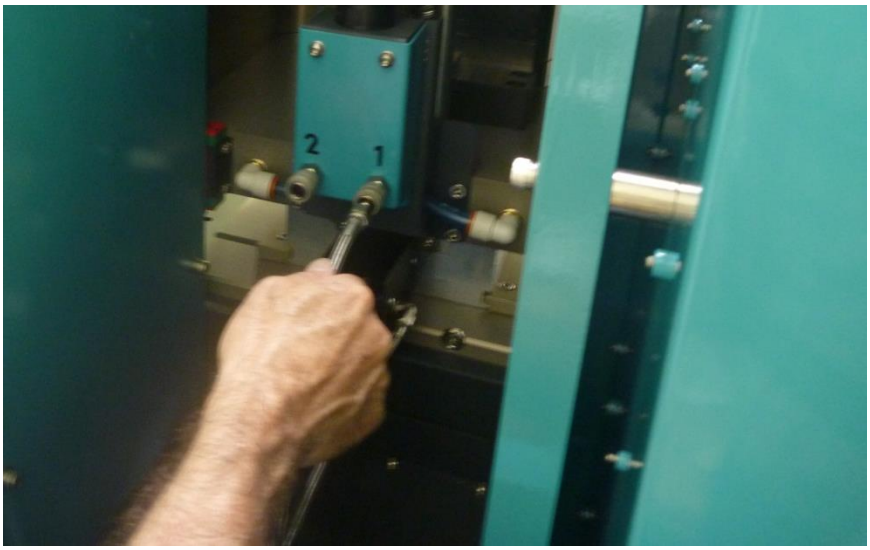


Fig. 4-37 Nozzle air connection

- Connect the nozzle air hose to the appropriate quick disconnect coupling as shown in Fig. 4-37. For Melt-man units connected to receptacle “1” [see chapter 3.3.2] plug the air hose into the coupling labeled “1”. Correspondingly connect the air hose into coupling “2” for Melt-man units connected to receptacle “2”.

4.5 Machine start up and production

Starting up the Mold-man™ 8200 molding machine is very simple. Please follow these guidelines:

- Confirm air and water supply to the machine.
- Turn on Main Power Supply switch at the right hand side of machine.
- Turn on the melt unit with power supply switch at the front of the unit.
- Ensure that there is enough Macromelt material in the melt unit for the intended production.
- The melt unit and the connected hose and injection gun have to warm up for approximately 45 minutes before machine is ready for production. During that phase the Mold-man™ 8200 will display the message "Temperature low" in the status bar of the touch screen.
- Once all components have reached operating temperatures the message will change to "Machine OK".
- The machine is ready for production now.
- Position components to be molded in the lower mold half cavity.
- Activate one of the actuation buttons momentarily.
- The clamp will close and machine will start the injection sequence of the molding cycle.
- The injector nozzle will open and start filling the cavity. After injection time is complete, the cooling cycle starts.
- When cooling cycle is completed, the mold-set will open.
- The machine is ready for the next cycle.

4.6 Purging material from melt unit

WARNING!

Molten material is hot and can cause severe burns. When reservoir is empty, the nozzle may sputter**.**
Always wear eye protection, gloves and protective clothing when handling hot material!
Ensure that the purged material is captured by a suitable, heat resistant container.

Purging through the nozzle must be performed while the nozzle assembly is installed in an upper mold-half. Locate a suitable, heat resistant container below the nozzle tip. This container must fit within the confines of the safety shield as the shield must be in place during purging operations. Please refer to section 4.2.10.
Start purging and ensure that the container does not overflow.
Remove container after material has cooled down.

4.7 Normal stop

Turn off the Main Power Switch at the machine and the melt unit(s)

4.8 Emergency stop

Push the red E-STOP button. The machine will vent off the air. Rotate the E-STOP button to reset machine.

4.9 Cycle interruption and reset (production mode)

	Light curtain interrupted	E-stop activated
Shuttle motion	Stops shuttle motion. Push actuation button to resume shuttle motion in previous direction.	Stops shuttle motion. Release E-stop and push actuation button to resume shuttle motion in previous direction.
Clamp motion	Stops clamp motion. Push actuation button to resume clamp motion in previous direction.	Stops clamp motion. Release E-stop, clamp automatically retracts to the top after a few seconds.*)
Injection	No effect, injection continues.	Stops injection. Release E-stop, clamp automatically retracts to the top after a few seconds.*)

*) It is possible that the e-stop reset results in a brief clamp servo error, in which case the clamp does not automatically retracts to the top. Pushing an actuation button will initiate another cycle in the current shuttle position

A cycle that has been aborted by an emergency stop will resume on the same shuttle station left or right, if in shuttle mode.

5.0 Mold-set run-in

5.1 Purpose

This is intended to aid in the run-in or troubleshooting of a Low Pressure Molding application on a Mold-man 8200 machine. It gives basic guidelines for how to approach a “first shot” as well as how to dial in the optimum molding parameters. We offer separate documents for Component Design for Low Pressure Molding and Mold-set Design for Low Pressure Molding. The information herein is based on guidelines in these other documents having been followed.

This document offers:

- Guidelines for mold-set run-in
  - Mold-set preparation
  - Component fit
  - Shot size estimation
  - Material selection
  - Selection of first shot molding parameters
  - Molding parameter optimization: Quality and productivity

These guidelines will give a starting point for over-molding of new components and for future optimization of parameters. This optimization will focus on product quality first and then productivity.

5.2 Mold-set Run-in

Before molding in a new mold-set, the mold-set must be prepared by cleaning and applying mold-release agent. Mold release application is critical as you will be molding with adhesives.

It is also the time to confirm that the components to be over-molded fit correctly in the mold-set cavity (ies). Always have some “dummy components” available for initial run-in. These can be unpopulated circuit-boards or non-functional components.

5.3 Mold-set Preparation

These guidelines are based on the mold-set being manufactured according to “Mold-set Design for Low Pressure Molding”. When a new mold-set is put into service, the first order of business is to clean it and treat it with mold-release agent. Cleaning can be done soap and water or alcohol for mold-inserts.

If the mold-set is equipped with ejector system, a more gently cleaning is recommended: Wiping off the surfaces with an alcohol-soaked rag. After cleaning and drying all surfaces should be treated with mold-release agent. The operation and smooth spring-back of the ejectors should be confirmed.

5.4 Component fit

It is always important to confirm that the components to be over-molded fit correctly in the mold-set cavity (ies). If a mold-set has been manufactured based on a solid model only, it is not unusual to find that the actual components differ a bit from the model. The solid model does not account for manufacturing tolerances.

It is critical to confirm that the shut-off areas fit well. If wires or cable exit the cavity, the shut-off around them must be snug. Any shut-off around connectors must have less than 0.05mm (0.002”) clearance or material will flash out. Confirm that fully populated circuit-boards fit correctly and are not “riding” on some taller-than-expected components. Make sure the halves close fully with components in the cavities.

5.5 Shot size estimation

Before molding the first component, you should have a good idea about how large the shot is. Make a good estimate by basic area-times- thickness calculation. The estimate should be for total shot including all cavities and runners. The expected shot size combined with the total parting-line area (in square centimeters, cm^2, or square inches, sq.in.) of the shot will allow you to choose initial molding parameters. You want to make sure that you fill the cavity(ies) completely but do not over-pack components or flash the mold-set. Flashing the mold-set can happen if the total force from injecting into the cavity exceeds the clamping force of the machine. This will lead to scrapped parts and could present a burn hazard.

The Mold-man 8200 machine Injection Screen is designed for you to enter show shot size in grams and grams-per-second flow rate. It will then calculate the flow time required. With a specific gravity very close to 1, one gram of material represents a volume of very close to one cubic centimeter (cm^3). Processing temperatures will affect this relationship but for the purpose of estimating a first shot, it is close enough. Measure the component size in centimeters and the volume calculation (say, length time width time thickness) will come out in cubic centimeters. This is approximately the same number as the shot size in grams.

Most shapes are comprised of box and cylinder shapes or a combination of these. Basic calculations are:

Box volume:	Length x Width x Height	
Cylinder volume:	Length x Diameter x π/4	(where π/4 ~ 0.785)

Deduct the volume of the component to be over-molded – it is the shot size that we are estimating!

5.6 Material selection

The grade of material to be used is based on application requirements. The technical requirements in terms of adhesion, hardness, electrical properties, resistance to fluids, temperature etc will be important in selecting one or more suitable molding compounds. Most of this information is available from the manufacturer. However, adhesive properties cannot readily be determined without testing. There are a vast amount of different substrates (circuit-board solder masks, wire and cable jacket, connector shells etc) that might be over-molded, and adhesion testing is recommended.

For molding the first shot and general optimization using amber material instead of black should be considered. This will allow immediate feedback about quality beyond the surface.

5.7 First shot molding parameters

Weigh the component(s) before molding. You will need this in order to determine the exact shot size.

The material technical data sheet should offer information about recommended processing temperature. Start out in the middle of the recommended range. For most Polyamide based adhesives, this is in the range of 400F to 430F. For Polyolefin based adhesives it may be from 350F to 400F.

Set the processing temperature. The Mold-man 8200 machines have different temperature zones: Tank, filter, hose and nozzle. Set tank temperature at 25F below the processing (injection) temperature to preserve the material. Set filter, hose and nozzle at the processing temperature. Set the mold-set (chiller) temperature to be relative warm (85F).

First shot parameters depend on the application. The following can be used as starting point:

1. Total shot less than 30 gram (30 cc):
    - enter 75% of the calculated total shot size in FILL 1
    - set fill rate to 5 grams per second
    - Set packing pressure at 150#
    - Set packing time at 60 seconds
    - Set cooling time at 60 seconds

2. Total shot more than 30 gram (30 cc)
    - enter 75% of the calculated total shot size in FILL 1
    - set fill rate to 10 grams per second
    - Set packing pressure at 150#
    - Set packing time at 60 seconds
    - Set cooling time at 60 seconds

Note that the cycle-times are very long. This is for safety reasons only. When you mold a first shot, you do not know what the correct parameters are – do not burn yourself by trying to shorten cycle times too much!. Longer cycle times will allow the molding compound to cool down thus minimizing the chance of getting burned. Cycle time optimization takes place after achieving good molding results.

Be careful! If anything un-expected happens activate the E-stop immediately. Do not touch anything – wait five minutes and be very careful not to get burned.

Unusual events may include:

- Molding compounds coming out of the mold-set
- Mold-set flashing (parting-line separation)
- Wires, cables or connectors getting pushed out or leaking molding compound

If any of these events take place, the next step is to determine why and rectify this. This may simply be by adjusting the molding pressure: Reduce it by 50%. Or you could have over-estimated the shot size: Reduce it by 50%. Make big steps initially – fine tuning will follow. It may also be because the mold-set does not offer adequate shut-off or component support: Fix this.

Once you are able to mold a complete shot, the first thing to do is weighing it. Include the runner. Now calculate the shot weight by deducting the original (before molding) weight. This is the shot size. This value is critical for shot optimization as well as cost calculation.

5.8 Molding parameter optimization

Initially the focus is only on quality of the molded components. Optimization (shortening) of cycle time is very easy and is the last step to perform.

Optimization consists of:

1. Ensuring complete over-molding without holes or surface voids
2. Ensuring that molding compound does not reach unintended areas (shut-off areas, inside connectors etc)
3. Minimizing internal voids
4. Optimizing surface quality
5. Cycle time optimization

The starting point for this optimization is evaluating the first shot:

- Did the component get fully over-molded (encapsulated)?
- Did molding compound bleed into unintended places?
- Are there voids inside (only obvious with amber material)
- Is the surface acceptable?

5.9 Complete encapsulation

When a larger area (several cm^2 or ½ sq.in.) is not covered the material has not filled the cavity correctly. The molding parameters may need adjusting:

- It may be necessary to increase shot size entered in FILL 1 (use 10% increments)
- It may be necessary to increase packing pressure (use 10% increments)
- It may be required to increase the temperature so that the material has lower viscosity and flows better (use 20F increments)

The most common reason for incomplete encapsulation is entrapment of air. This can happen where flow fronts meet as the molding compound flows around the components. The low injection pressure does make Low Pressure Molding more prone to air-voids than conventional injection molding. This is addressed by additional venting of the mold-set. Local vent pins can readily be added almost anywhere.

If a thinner section of over-mold does not flow correctly it may be because the above guidelines were not followed. A local vent pin is still the best initial approach to fixing this. Alternatively it may be necessary to modify the cavity shape or consider a two-step over-molding process.

5.10 Bleeding into unintended places

If bleeding into connectors, cables or keep-out areas, there are several potential approaches:

- Improve shut-off if applicable.
- Reduce temperature and/or pressure.
- Pre-seal component if practical.
- Gate closer to problem as this will fill problem area before cavity is pressurized.
- Implement two-step over-molding with first step at very low temperature and pressure to cover leak prone areas.

5.11 Internal voids

There are two kinds of voids:

1. Entrapped air caused by flow problems.
2. Vacuum voids caused by inadequate cavity packing.

Entrapped air can be caused by flowing too fast into the cavity. The molding compound may be “over-shooting” a tall component instead of gently flowing over it and down behind it. First approach should be to reduce flow rate by 50% to see if this cures it. If this helps, the injection can be fine-tuned by using the available FILL steps to slow down and accelerate flow as necessary. It can also be caused by flow fronts that meet and trap air below a circuit-board or similar. In this case it may be necessary to move the gate point or add vent holes in the board. Entrapped air cannot readily be vented out as it is not on the surface of the molded component.

Vacuum voids can be found in several places:

1. Overly thick material sections. After the runner system is frozen off it can no longer compensate for material contraction because of cooling. Very thick sections remain hot and even liquid for some time. The outer surfaces that touch the mold-set cavity cool off first. Inside the thick sections gradually cool down and contract. This can create local vacuum because the outer shape is already frozen solid. This relatively large vacuum can lead to single round bubbles in the thicker sections.
2. By components that sit high on a circuit-board or at cable ends. These voids are caused by the same situation as described above but appear in thinner sections. Here there is an air source: There is air trapped below the chips or inside the cable jacket. A small amount of vacuum will “suck out this air”. These voids will normally be tear-shaped and have the thin end “point” to the air source.

Vacuum voids can sometimes be minimized or eliminated by one or more of the following:

- Increase packing time and or pressure
- Increase mold-set temperature (to keep runner system liquid)
- Lower molding material temperature
- Slower cavity fill
- Under-fill components that sit high
- Seal end of cables
- Using more mold release agent (which may result in the outer surface sinking down instead having internal voids forming.)

It may be necessary to modify the over-mold shape to thin out the thicker sections in order to completely eliminate internal voids. Alternatively a two-step over-molding process can be implemented.

5.12 Surface quality

Molded surface may have various imperfections:

1. Shiny spots or lines
2. Matte/shiny transitions
3. Sink or dimples
4. Blisters
5. Rings or “tears” in gate area or opposite to gate

Shiny spots or lines are typically caused by trapped air. They are common where flow fronts meet, in cavity corners. Better venting is the solution.

Matte to shiny transitions can be difficult to get fully rid off as it is an indirect result of the gentle flow employed in Low Pressure Molding. When material flows into the mold-set cavity, it immediately starts solidifying as it touches the cool mold-set. For larger components it takes several seconds to fill the cavity and actually pressurizing it. The first material has thickened by then and does not get “pushed into the cavity surface” as much as the thinner material flowing in later. This is what causes the shiny to matte transition. I order to minimize this, the mold-set can be run warmer and the flow rate into the cavity be increased. Hot and fast often gives the best surface but higher inflow rate may in turn cause air entrapment or surface voids.

Sink cannot be completely avoided because the molding compounds are un-filled and thus contract a lot. However excessive sink is indicative of:

- Too short packing time
- Too low packing pressure
- Undersized or overly long runner system
- Too small or too long gate or
- Incorrectly located gate(s)

Dimples are indicative of much too short packing time.

Blisters are typically an indication that the molding compound is not dry. These small, thin-skinned blisters often are forming in the direction of the flow away from the gate. The correct fix is to dry the material but sometimes the moisture will flash off if the material is left at temperature for an hour or two in the melt reservoir.

Rings or tear-formed outlines in the gate area or across from the gate are often caused by the initial flow into the mold cavity. This flow can sometimes squirt and hit the cavity across from the gate causing the tear shaped outline. Or the flow will flow into the cavity forming an initial ring at the gate. In either case this material will cool off and when the cavity fills up and flows up around it local matte/shiny transitions occur. Often this can be improved by flowing into the cavity much more slowly: Use FILL 1 to just fill the runner system at a much slower flow rate (maybe 1 to 3 gram per second) and then accelerate the inflow by using FILL 2 to fill the cavity faster. This may require several adjustments but can make a significant difference.

5.13 Productivity

After achieving the best quality molded component possible, it is time to optimize the process from a production stand point. This means lowering processing temperatures, shortening the molding cycle time, and setting up the molding station to be efficient.

Lowering the injection temperature and the mold-set (chiller) temperature will allow shorter cycle times. Lower the temperatures in 10F increments until quality deteriorates. The go back up 10F. This will be the processing temperatures.

The minimum molding cycle time is determined by when a component is packed out correctly and when it is cool enough to handle by operators. For some applications the depth of ejector marks can be the deciding factor. Reduce cooling time first: Reduce by 50%. If components are still OK and can be handled, reduce by 50% again. Otherwise increase by 50% of the last reduction etc. If cool time gets below 5 seconds and parts are still fine, the next step is to reduce packing time. Use the same approach. Note that of the total cycle time only fill time and packing time contribute to product quality. They must be as long as necessary to optimize quality. Cool time mainly ensures that the molded product can be handled.

Set up the molding station so that there is an obvious flow of products. Add any external fixtures to easy component handling and maximize production.

6.0 Maintenance

6.1 General guidelines

WARNING!

Qualified personnel must carry out all maintenance. Maintenance personnel must be familiar with the operation and maintenance of this equipment. They should furthermore be familiar with general safety regulations at the work location.

WARNING!

Maintenance personnel must wear appropriate personnel protection equipment including gloves and safety glasses.

WARNING!

Prior to performing any maintenance on the machine, all utilities must be turned off and disconnected this includes electrical power, air and water supply. Parts of the machine are pneumatically operated and contain fluids under pressure even after the machine has been disconnected from all utilities. Fluid pressure must be safely bled off prior to any maintenance or injury could occur.

WARNING!

The equipment processes materials at temperature up to 475°F. The melt unit, manifold and nozzle are HOT! The hot molten material can cause severe burns! Always wear protective, heat resistant gloves and protective clothing! Always use safety glasses! Do not touch molten material! Even hardened material can still be very hot! Parts of the machine can remain hot for up to 8 hours after machine is turned off.

6.2 Procedure to bleed off pneumatic fluid pressure

There are two parts to the pneumatic system of the Mold-man 8200. One part is depressurized through the main air valve every time the e-stop button is pressed or the machine is turned off at the main disconnect. The second part remains pressurized even after the machine is turned off and/or disconnected from the air supply!

To completely depressurize that part of the pneumatic system of the machine locate the drain valve as described in section 6.3.1. Open the drain valve as described and wait until all air is bled off. The drain valve must be closed before putting the machine back into service.

6.3 Mold-man 8200 maintenance intervals

	Machine part	Maintenance procedure	Interval*
6.3.1	Air Tank	Drain water	Once a month
6.3.2	Air Filter and Water Separator	Drain water	Once a month
6.3.3	Shuttle Table Guides	Lubricate	Every month
6.3.3	Shuttle Table Drive	Lubricate	Every month
6.3.5	Clamp Guides	Lubricate	Every month
6.3.6	Clamp Drive	Lubricate	Every month
6.3.2	Air filter and Water Separator	Replace cartridges	Every 12 month or as needed
6.3.7	External Panels, Windows	Clean	Every 12 month or as needed
6.3.8	Enclosure Air Filters	Clean	Every 12 month or as needed

*) Depending on the operating conditions of the machine these intervals may need to be shortened

6.3.1 Draining of Air Tank

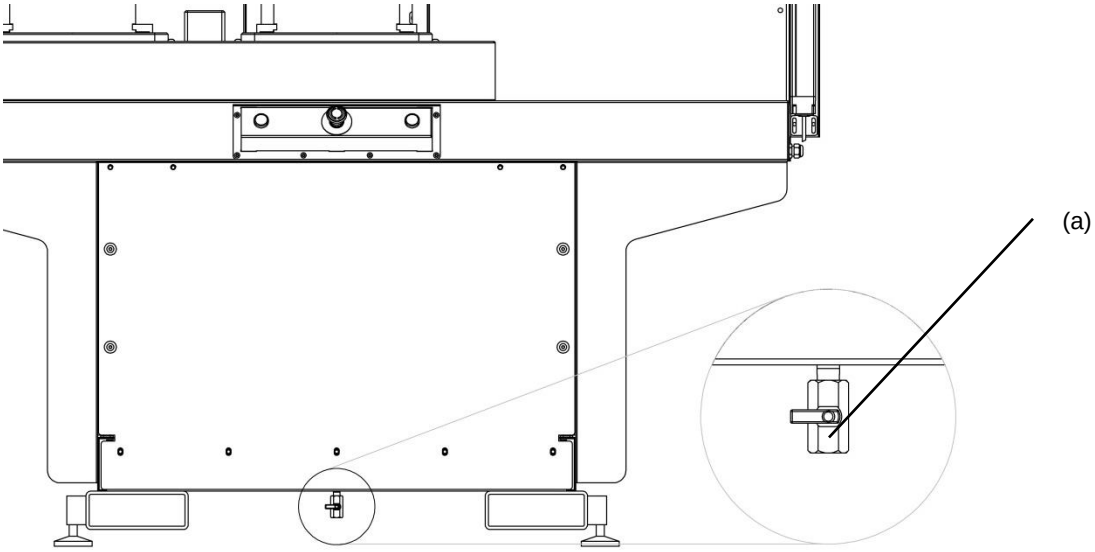


Fig. 6-1 Air Tank Drain Valve

WARNING!

The air tank is part of a pneumatic counterbalance system for the clamp. This system including the air tank remains pressurized even after the machine is turned off and/or disconnected from the air supply!

To drain potential water accumulation from the tank, locate the drain valve (a) as shown in figure 6-1. It is recessed about 12" [305mm] from the front. To open the valve, rotate the handle **carefully** – tank will be under air pressure - counterclockwise into the vertical position and keep open for as long as water is draining from the tank. Use a suitable container and/or rags to collect the water. Close the valve by rotating the handle clockwise into a horizontal position.

To completely depressurize the pneumatic system of the machine, all air from the tank must be completely removed. Open the drain valve as described above and wait until all air is bled off. The drain valve must be closed before putting the machine back into service.

6.3.2 Air Filter and Water Separator

Fig. 6-2 Side Panel

Fig. 6-3 Air Filter and Water Separator

To gain access to the air filter and the water separator, remove the side panel (a) by removing the nine mounting screws on the perimeter as shown in figure 6-2. To drain potential water accumulation from the air filter and the water separator open the screw (d) as shown in figure 6-3 at the bottom of the bowl. Use a suitable container and/or rags to collect the water.

WARNING!

Before replacing the air filter and water separator cartridges turn off the machine and disconnect the air supply to the machine! Bled off remaining pneumatic fluid pressure as described in section 6.2 and 6.3.1!

Before replacing the air filter and water separator cartridges turn off the machine and disconnect the air supply to the machine! Bled off remaining pneumatic fluid pressure as described in section 6.2 and 6.3.1!
Rotate the bowls (c), (d) to remove them and discard the old cartridges and replace them with new ones. Reinstall the bowls (c), (d) making sure that they are securely fastened.

6.3.3 Lubrication of Shuttle Table Guides and Shuttle Table Drive

Use Shell Alvania RL2 grease to lubricate the Shuttle Table Guides and Shuttle Table Drive. The grease is applied using a standard grease gun. To gain access to the grease nipples remove the shuttle table cover (a), figure 6-4, by unscrewing the eight mounting bolts, four around each lower mold platen. Move the shuttle table by using the setup mode to the left and right as necessary. Lubricate the shuttle table guides through grease nipples (b) with 1 cubic inch [16.4 cubic cm] of grease each. Lubricate the shuttle table drive through grease nipple (c) with 0.5 cubic inch [8.2 cubic cm] of grease.

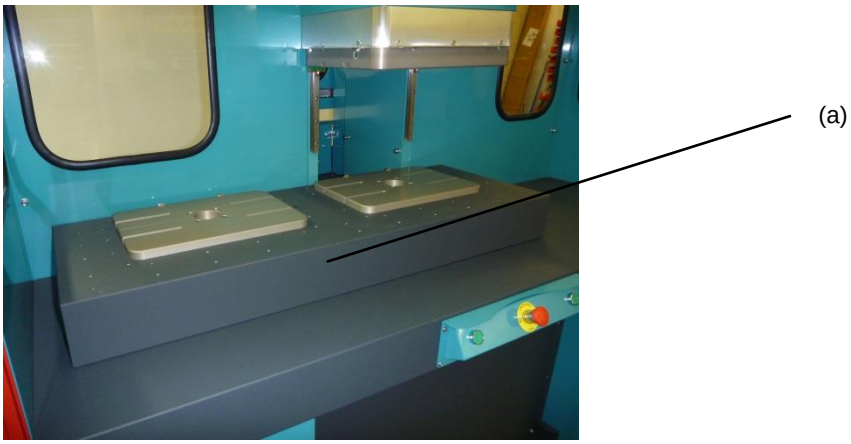


Fig. 6-4 Shuttle Table Cover

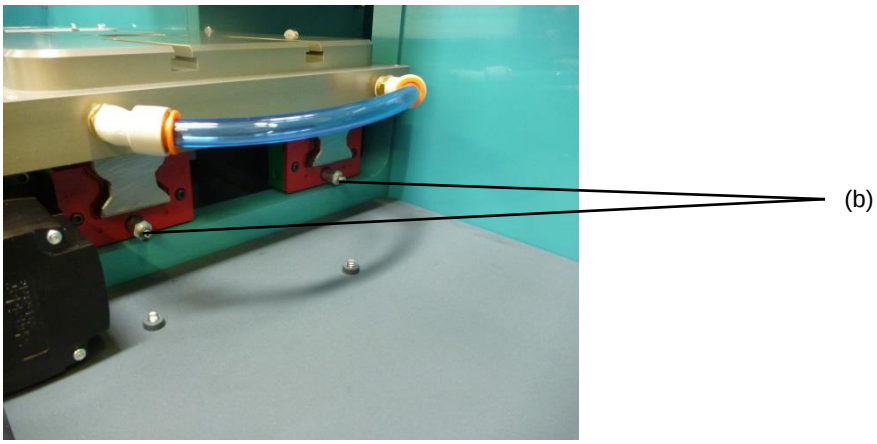


Fig. 6-5 Right Shuttle Table Grease Nipples

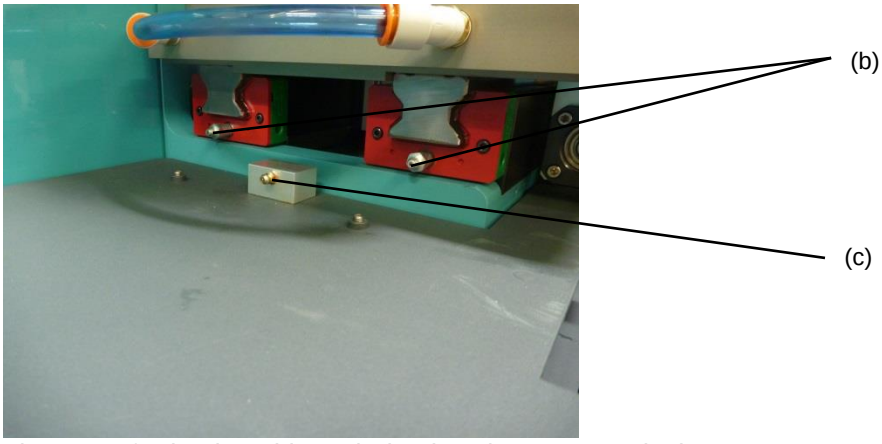


Fig. 6-6 Left Shuttle Table and Shuttle Drive Grease Nipples

6.3.4 Lubrication of Clamp Guides

Use Shell Alvania RL2 grease to lubricate the clamp guides. Lubricate each clamp guide with 0.25 cubic inches [4.1 cubic cm] through the grease nipple (a) shown in figure 6-7.

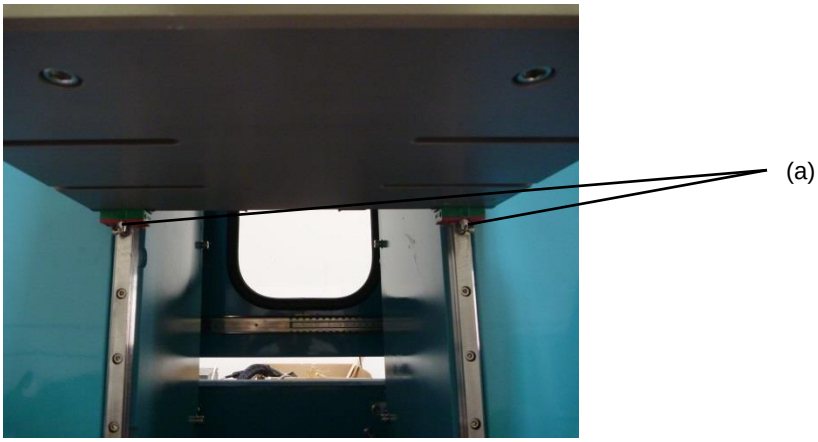


Fig. 6-7 Clamp Guide Grease Nipples

6.3.5 Lubrication of Clamp Drive

To gain access to the clamp drive grease nipples (a), (b) start by removing the mold-set. Use the setup mode to move the clamp to the lowest position. Remove the four screws that mount the top cover and then lift the cover up to take off. Lubricate the clamp drive with Shell Alvania RL2 grease. Supply 2 cubic inches [32.8 cubic cm] through grease nipple (a) and 1 cubic inch [16.4 cubic cm] through grease nipple (b).
Reinstall the top cover and using the setup mode move the clamp ten times from its lowest to its highest position.

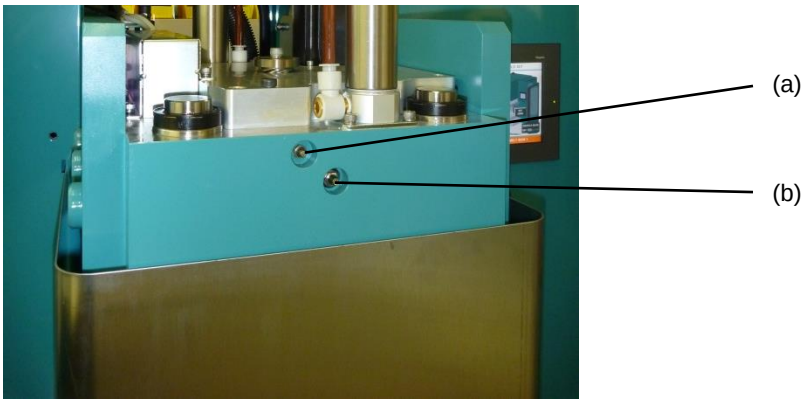


Fig. 6-8 Clamp Drive Grease Nipples

6.3.6 Cleaning of External Panels and Windows

External panels are cleaned with lukewarm soapy water using a soft sponge. Rinse off with clean water and dry with absorbing cloth. Difficult spots can be removed with rubbing alcohol on a soft rag and then cleaned with soapy water as described above. Windows are cleaned with a mild glass cleaner.

6.3.7 Cleaning of Enclosure Air Filters

Fig. 6-9 Enclosure air filter

The electrical enclosure of the Mold-man 8200 has two air filters, one at the bottom and one located at the top of the enclosure door. Remove the louvered section of the air filter by inserting a small screw driver in the provided access slot as shown in figure 6-9 and carefully levering the screwdriver towards you. Remove the filter media and clean with compressed air. Reinstall filter media and louvered section.

6.4 Melt-unit maintenance intervals

	Machine part	Maintenance procedure	Interval*
6.4.2	Reservoir	Clean	Every 300 hours
6.4.3	Material Filter	Replace	Every 300 hours
6.4.4	Injection Nozzle	Inspect, clean	Every day
6.4.5	External panels	Clean	Every 12 month
6.4.6	Enclosure Air Filters	Clean	Every 12 month

*) Depending on the operating conditions of the machine these intervals may need to be shortened

6.4.1 Removing of Reservoir Cover

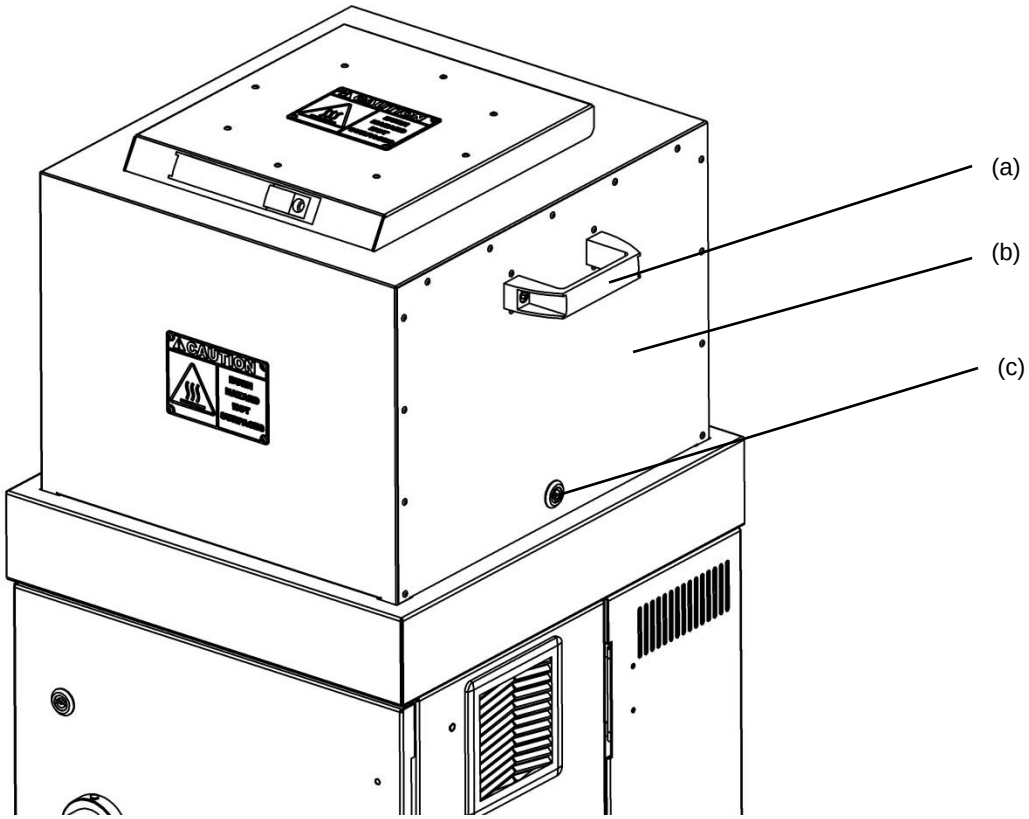


Fig. 6-10 Reservoir Cover

To gain access to the reservoir, filter and drain plug remove the reservoir cover (b) as shown in figure 6-10 by unlocking the locks (c) located on the right and left side by using the key supplied with the machine. The lock on the right side unlocks clockwise, while the lock on the left side unlocks counterclockwise. Lift the reservoir cover up by grabbing the handles (a) on the right and left side.

WARNING!

Covers may be hot! Maintenance personnel must wear appropriate personnel protection equipment including heat resistant gloves and safety glasses.

6.4.2 Cleaning of Reservoir

Cleaning of the melt reservoir is critical to successful operation of the machine and must be performed regularly as outlined in section 6.4. It is largely a manual operation and is performed as follows:

- Turn the machine on and set the reservoir, filter, hose and gun temperatures to melt the material (refer to section 4.2.4)
- Use the purge function to empty the reservoir (refer to section 4.2.10)

WARNING!

Molten material is hot and can cause severe burns. When reservoir is empty, the nozzle may sputter because of air. Always wear eye protection, gloves and protective clothing when handling hot material!

NOTE!

Ensure that the purged material is captured by the suitable heat resistant container.

- Reduce the reservoir temperature to the softening point of the molding material, typically 275°F (135°C) to 290°F (143°C).
- Remove the reservoir cover (refer to section 6.4.1)
- Position a suitable heat resistant container under the drain plug (b) figure 6-11 on front side of reservoir .
- Carefully remove the drain plug (b) and the sealing washer (a) from the reservoir using a 12 mm allen wrench.
- Clean reservoir using wooden or high temperature plastic spatula to remove any charred material.
- Lift as much of the loose charred material out the reservoir as feasible. Push the remainder carefully through the center hole and out through the drain plug opening on front
- Clean the threaded holes and the plugs of molted material. The plugs are carefully reinstalled along with the sealing washer and tightened to 8 ft-lb (11 Nm) torque.

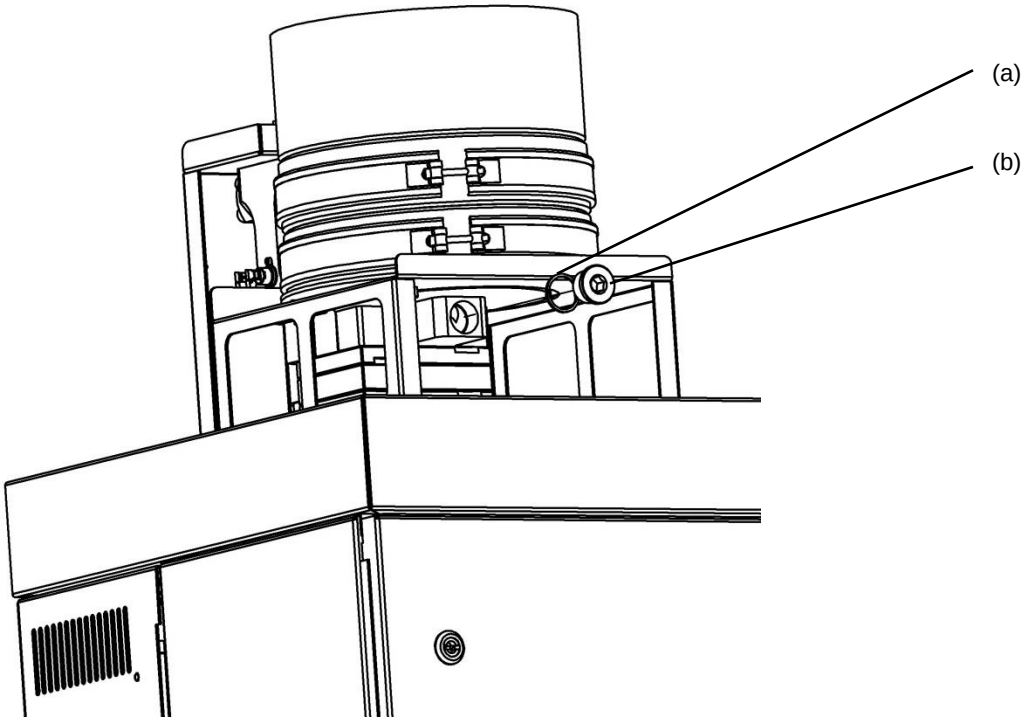


Fig. 6-11 Reservoir Drain Plug

6.4.3 Replacing of Material Filter

Changing the filter is critical to successful operation of the machine and must be performed regularly as outlined in section 6.4. It is performed as follows:

- For filter change, first heat manifold and reservoir to the material softening point typically around 275°F (135°C) to 290°F (143°C).
- Remove six bolts (a) and carefully remove the filter lid (b) with O-ring (c)
- Pull out old filter (d) with needle-nose pliers or by engaging screwdriver into small filter opening.
- After carefully cleaning out any excess material, install new filter with large opening (!) downwards.
- Wipe off mating surfaces, install a new O-ring (c) in filter lid (b)
- Use high temperature anti seize compound on clean threads of bolts (a) and tighten them first to 5 ft-lb (6.7 Nm) following the pattern shown in figure 6-13. Following the tightening pattern again, torque the bolts to 15 ft-lb (20 Nm) torque.

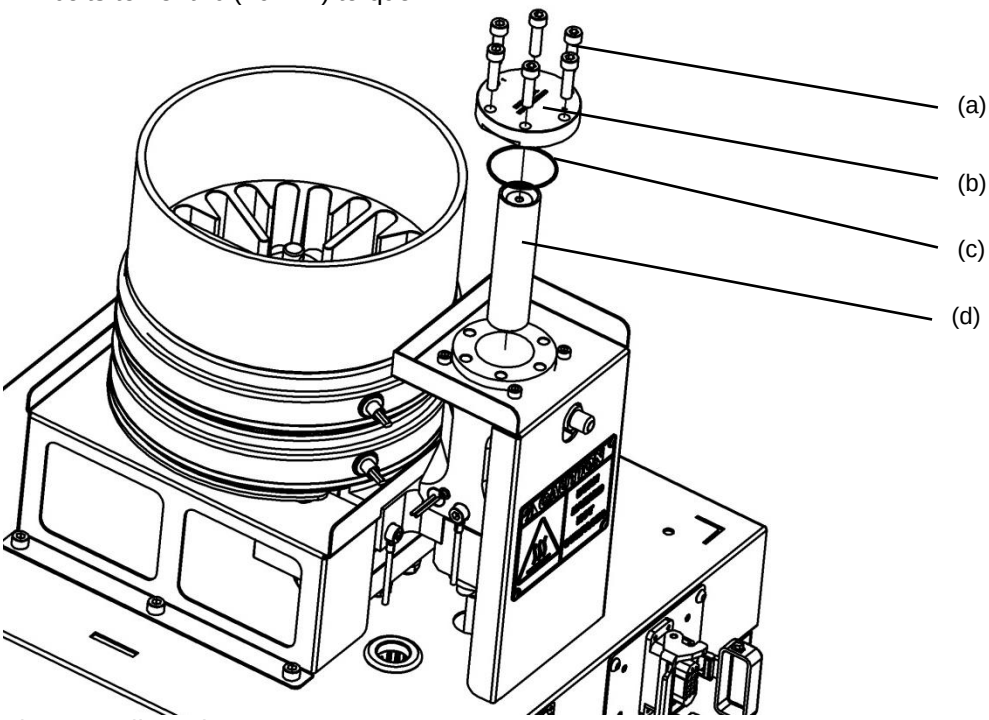


Fig. 6-12 Filter Change

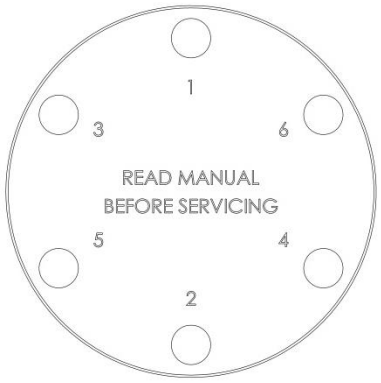


Fig. 6-13 Bolt tightening sequence

6.4.4 Inspection and Cleaning of Nozzle

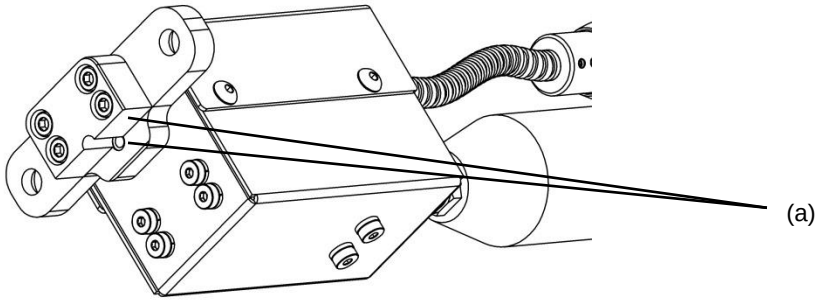


Fig. 6-14 Nozzle

Ensure that the nozzle shut off surfaces (a) are clean from material residue. Use a wooden spatula or similar tool to remove material if necessary.

6.4.5 Cleaning of External Panels

Refer to section 6.3.6 above.

6.4.6 Cleaning of Enclosure Air Filters

The melt-unit enclosure has two air filters one located on each side. For the cleaning procedure refer to section 6.3.7 above.

7.0 Troubleshooting

7.1 Trouble shooting matrix

ISSUE	POSSIBLE CAUSES	CORRECTIVE ACTION
Machine injects too little/no material	Material in reservoir not completely molten	Allow adequate time heat material. Maintain material level above fins and only a small 'island' of non- molten pellets should be visible
	'Center plug' in reservoir missing	Check to make sure that the center plug in the melt reservoir is present
	Nozzle air supply not connected	Ensure that the nozzle air supply hose is connected to the quick disconnect coupling on the machine. See Fig. 4-32, page 37
	Nozzle air supply connected to wrong quick disconnect coupling	Ensure that the nozzle air supply hose is connected to the correct quick disconnect coupling. Melt-unit 1 is connected to the coupling labeled '1' and melt-unit 2 is connected to the coupling labeled '2'.See Fig. 4-32, page 37
	Material filter contaminated Filter installed the wrong way	Replace/clean material filter → see section 6.4.3
	Material jelled/degraded	Purge old material, clean reservoir → see section 6.4.1, refill with new material
	Pump suction blocked by foreign object or jelled material	Purge material from reservoir → see section 6.4.1, refill with new material. Locate and remove foreign object
	Wrong injection settings	Enter correct injection settings → see section 5.7, 5.8 for guidelines
	Air supply pressure to machine low	Supply machine with correct air pressure → see section 3.2.2
	Nozzle Valve drooling	Check for drooling nozzle valve → see section 7.2 Replace nozzle valve if necessary
	Nozzle Valve obstructed	Replace nozzle valve
	Pump motor not turning	Check cable connections to pump motor
	Material with higher density than Macro-melt is used	Use correct material
Machine injects too much material	Wrong injection settings	Enter correct injection settings see section 5.7, 5.8 for guidelines
	Material with lower density than Macro-melt is used	Use correct material
Mold flashes	Air supply pressure to machine low	Supply machine with correct air pressure → see section 3.2.2
	Wrong injection settings	Enter correct injection settings see section 5.7, 5.8 for guidelines

ISSUE	POSSIBLE CAUSES	CORRECTIVE ACTION
Manifold temperature not rising/rising slowly	Fuses blown	Check fuses → see section 7.5
	Solid state relay defective	Replace solid state relay
	Heater defective	Check heater cartridge → see section 7.3
Manifold temperature rising above set-point	Solid state relay defective	Replace solid state relay
Reservoir temperature not rising/ rising slowly	Fuses blown	Check fuses → see section 7.5
	Solid state relay defective	Replace solid state relay
	Heater defective	Check heater cartridge → see section 7.3
Reservoir temperature rising above set-point	Solid state relay defective	Replace solid state relay

7.2. Drooling nozzle valve

A drooling nozzle valve produces small extruded slugs of material even when the machine is not currently in a molding cycle. The material slugs tend to block mold-set gates in subsequent injection cycles. A multi cavity tool that exhibits one cavity that is not or only partially filled is a strong indication of a drooling nozzle valve*). Replace the nozzle valve if it is determined that drooling is occurring.

*) This assumes that molding with the installed mold-set and corresponding injection settings was successful in the past. Use of a new mold-set and/or different injection settings can also result in cavities that are not or only partially filled.

7.3 Verifying heater operation

The easiest way to determine if a heater is operational is to measure the terminal resistance at the fuse terminals inside the electrical enclosure. This should be done with the machine being cold.

WARNING!

Prior to performing the tasks outlined in this section, electrical power to the machine must be turned off and disconnected.

The resistance for the individual heaters is measured between the fuse terminals listed below. It is important that the fuse is removed by opening the fuse holder prior to the measurement. Only use the top terminals of the fuse holders to perform the measurement. If the measured resistance falls outside the value listed in the table below, the defective heater must be identified and replaced.

Location	Terminal	Resistance*)
Tank band heater	FU 20	46.1 Ohms +/- 10%
	FU 21	
Tank band heater	FU22	46.1 Ohms +/- 10%
	FU23	
Filter cartridge heater	FU 24	115.2 Ohms +/- 10%
	FU 25	
Heated hose heater	FU 26	468.3 Ohms +/- 15%
	FU 27	
Gun cartridge heater	FU 28	329.1 Ohms +/- 15%
	FU 29	

If any of the measurements yields results that are outside the specifications listed above remove the heater wires from the terminal blocks and measure the resistance of the individual heater cartridges to verify.

Please also refer to:
Section “9.2 Melt-man electrical enclosure input and output assignment”.

7.4 Checking for blown fuses in the Mold-man 8200NG electrical enclosure

WARNING!

Prior to performing the tasks outlined in this section, electrical power to the machine must be turned off and disconnected.

The fuse blocks for fuses FU 1 through FU 10 have an integrated light that turns on when the fuse is blown.

Alternatively fuses FU1 through FU 10 can be checked by measuring the resistance between the top and bottom terminal on each fuse block.

IMPORTANT!

The cause of the blown fuse must be identified and rectified before machine can be operated again

7.5 Checking for blown fuses in the Melt-man electrical enclosure

WARNING!

Prior to performing the tasks outlined in this section, electrical power to the machine must be turned off and disconnected.

The fuse blocks for fuses FU 20 through FU 29 have an integrated light that turns on when the fuse is blown.

Alternatively fuses FU20 through FU 29 can be checked by measuring the resistance between the top and bottom terminal on each fuse block.

IMPORTANT!

The cause of the blown fuse must be identified and rectified before machine can be operated again

7.6 Verifying temperature sensor operation

Each Melt-man has four temperature sensors, a tank sensor, a filter sensor, a hose sensor and a nozzle sensor. All temperature sensors are 2 wire PT 100 sensors that are terminated directly into an analog input module. The module can be found in the upper left hand corner of the Melt-man electrical enclosure and it is labeled at the bottom of the housing 'TM2AMI4LT'. The terminations are as follows:

Temperature sensor	Terminals	Location *)
Tank	IN0 / NC	#3 / #4
Filter	IN1 / NC	#5 / #6
Hose	IN2 / NC	#8 / #9
Nozzle	IN3 / NC	# 10 / #11

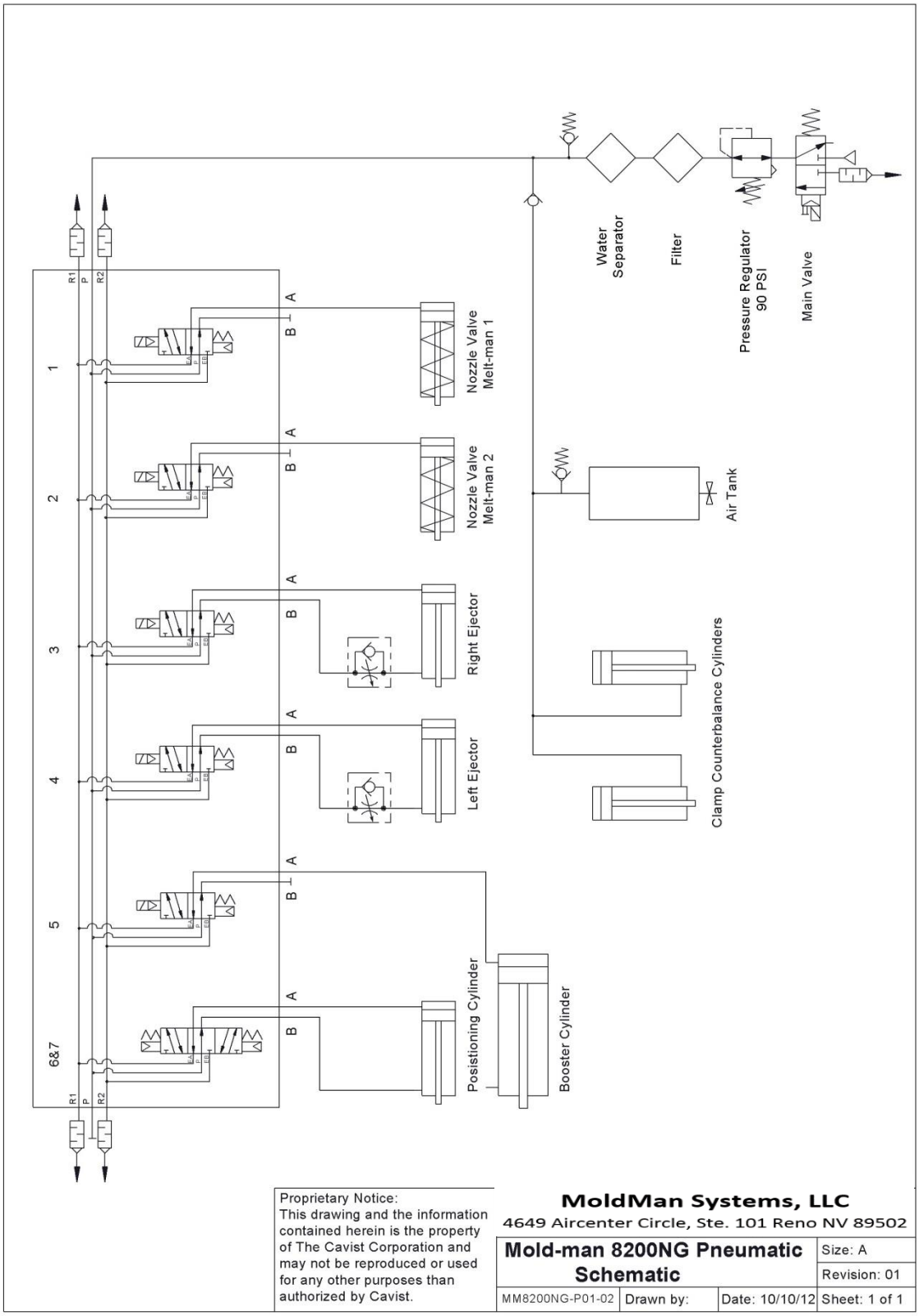
*) counting from the top of the terminal block

Removing a temperature sensor from its termination and adding a resistor across the terminals can help in verifying the correct operation of the analog input module. A 108 Ohm resistance should result in a 68 F +/- 1.5% readout, a 176 Ohm resistance should result in 392 F +/- 1.5% readout. Before performing this test, please ensure that the temperature offset values as described in chapter 4.2.16 are set to '0' for the temperature loop that is being tested. Turn the machine off before connecting the resistor.
In reverse to the above the temperature sensors can be checked by simply setting the temperature to 68F or 392F and after the process temperature has attained the set-point and stabilized the resistance can be measured between the terminals for the different temperature loops as outlined in the table above.

The manufacturer of the analog input module recommends recalibration of the module every 10 years. The module has to be sent to the manufacturer to be recalibrated.

8.0 Pneumatic system

8.1 Mold-man 8200NG Pneumatic Schematic MM8200NG-P-02-01 Sheet 1 of 1



9.0 Electrical enclosure input and output assignment

9.1 Mold-man 8200NG electrical enclosure input and output assignment

Terminal	Device
1BK	COM Nozzle Valve1
1RD	24VDC+ Nozzle Valve1
2BK	COM Nozzle Valve2
2RD	24VDC+ Nozzle Valve2
3BK	COM Right Ejector Valve
3RD	24VDC+ Right Ejector Valve
4BK	COM Left Ejector Valve
4RD	24VDC+ Left Ejector Valve
5BK	COM Booster Valve
5RD	24VDC+ Booster Valve
6BK	COM Positioner Extend Valve
6RD	24VDC+ Positioner Extend Valve
7BK	COM Positioner Retract Valve
7RD	24VDC+ Positioner Retract Valve
8-1	COM Main Air Valve
8-2	24VDC+ Main Air Valve
9BU	COM Magnet Switch Supply
9BN	24VDC+ Magnet Switch Supply
9GY	Magnet Switch I1
9BK	Magnet Switch O1
9PK	Magnet Switch I2
9WH	Magnet Switch O2
10BN	24VDC+ Booster Retracted
10BU	Booster Retracted Signal
11BN	24VDC+ Booster Engaged
11BU	Booster Engaged Signal
12BN	24VDC+ Air Pressure Switch
12BU	Air Pressure Switch Signal

The above terminals are located at the top of the Mold-man 8200 NG electrical enclosure

Terminal	Device	
20BU	COM Enclosure Fan	
20RD	24VDC+ Enslosure Fan	
21-0	24VDC+ E-Stop	
21-1	24VDC+ Buttons	
21-2	E-Stop Channel 1	
21-3	E-Stop Channel 2	
21-4	E-Stop Channel 3	
21-5	E-Stop Channel 4	
21-6	E-Stop Channel 3 return	
21-7	E-Stop Channel 4 return	
21-8	Right Actuation Button	
21-9	Left Actuation Button	
GND	Ground Actuation Enclosure	
GND	Ground light curtain	
22BN	24VDC+ for light curtain	
22BU	24VDC- for light curtain	
22BK	Light curtain receiver OSSD1	
22WH	Light curtain receiver OSSD2	
22RD	Light curtain receiver MPCE/EDM	
22YL	Light curtain receiver start	
22PK	Light curtain receiver aux output	
N/C	Not used	
23BN	24VDC+ for light curtain	
23BU	24VDC- for light curtain	
23WH	MTS	
23BK	MTS return	
GND	Ground light Curtain	
GND	Ground	
24-2	Enable terminal supply	
24-1	Enable terminal return	
L1	230VAC L1 main power	**Customer Supplied Power**
N/L2	230VAC N/L2 main power	
GND	Ground	

The above terminals are located at the bottom of the Mold-man 8200 NG electrical enclosure

9.2 Melt-man electrical enclosure input and output assignment

Terminal	Device
40	Reservoir Thermal Switch
41	Reservoir Thermal Switch
42	Manifold Thermal Switch
43	Manifold Thermal Switch
44	Motor Fan 24VDC COM
45	Motor Fan 24VDC+
4T2	Internal
4T2	Internal
4T2	Internal
4T2	Internal
4T2	Internal
FU20	Reservoir band heater L1 [8A]
FU21	Reservoir band heater L2 [8A]
FU22	Reservoir band heater L1 [8A]
FU23	Reservoir band heater L2 [8A]
FU24	Manifold heater L1 [3A]
FU25	Manifold heater L2 [3A]
FU26	Hose heater L1 [2A]
FU27	Hose heater L2 [2A]
FU28	Gun heater L1 [2A]
FU29	Gun heater L2 [2A]

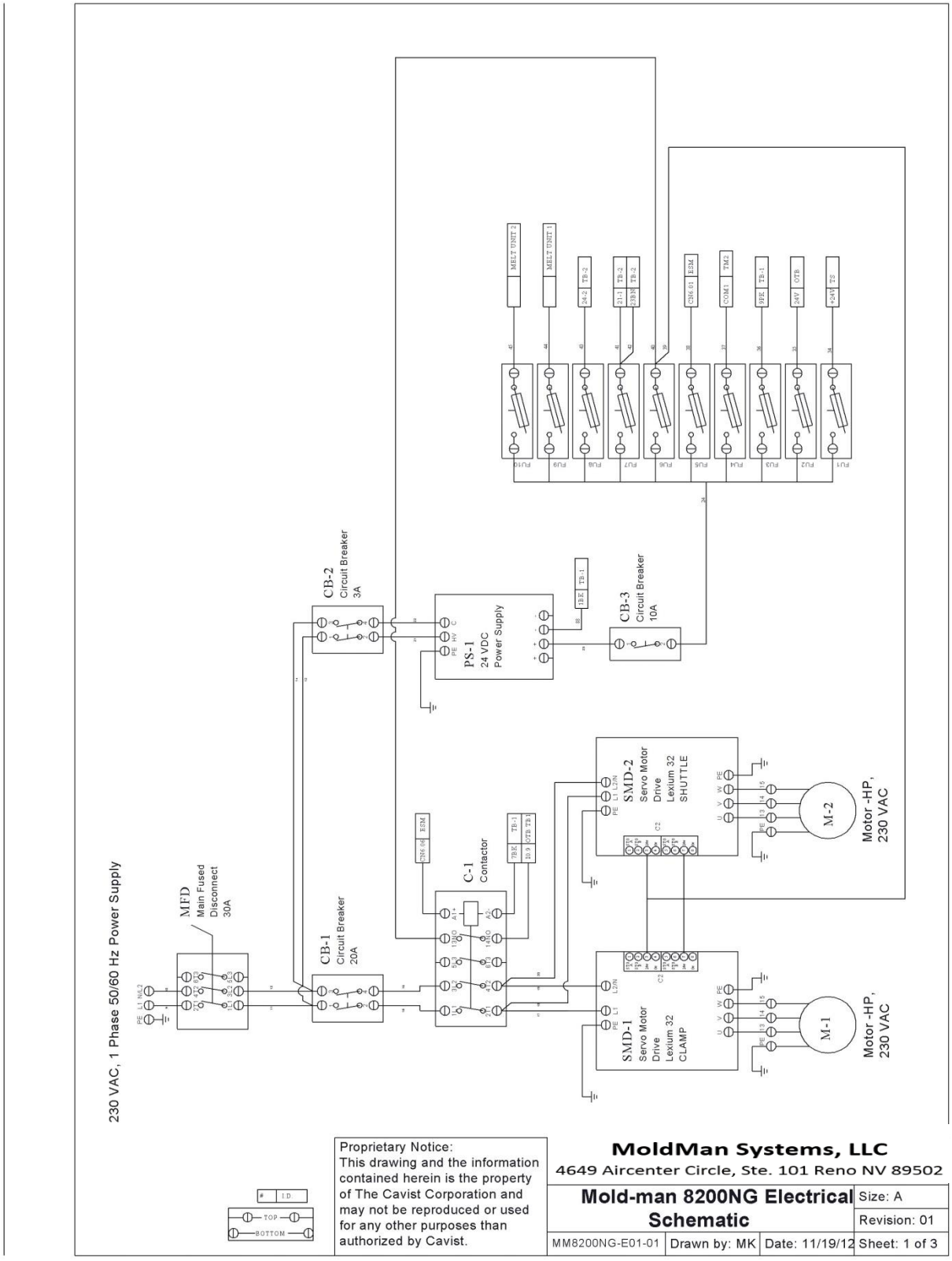
The above terminals are located at the top of the Melt-man electrical enclosure

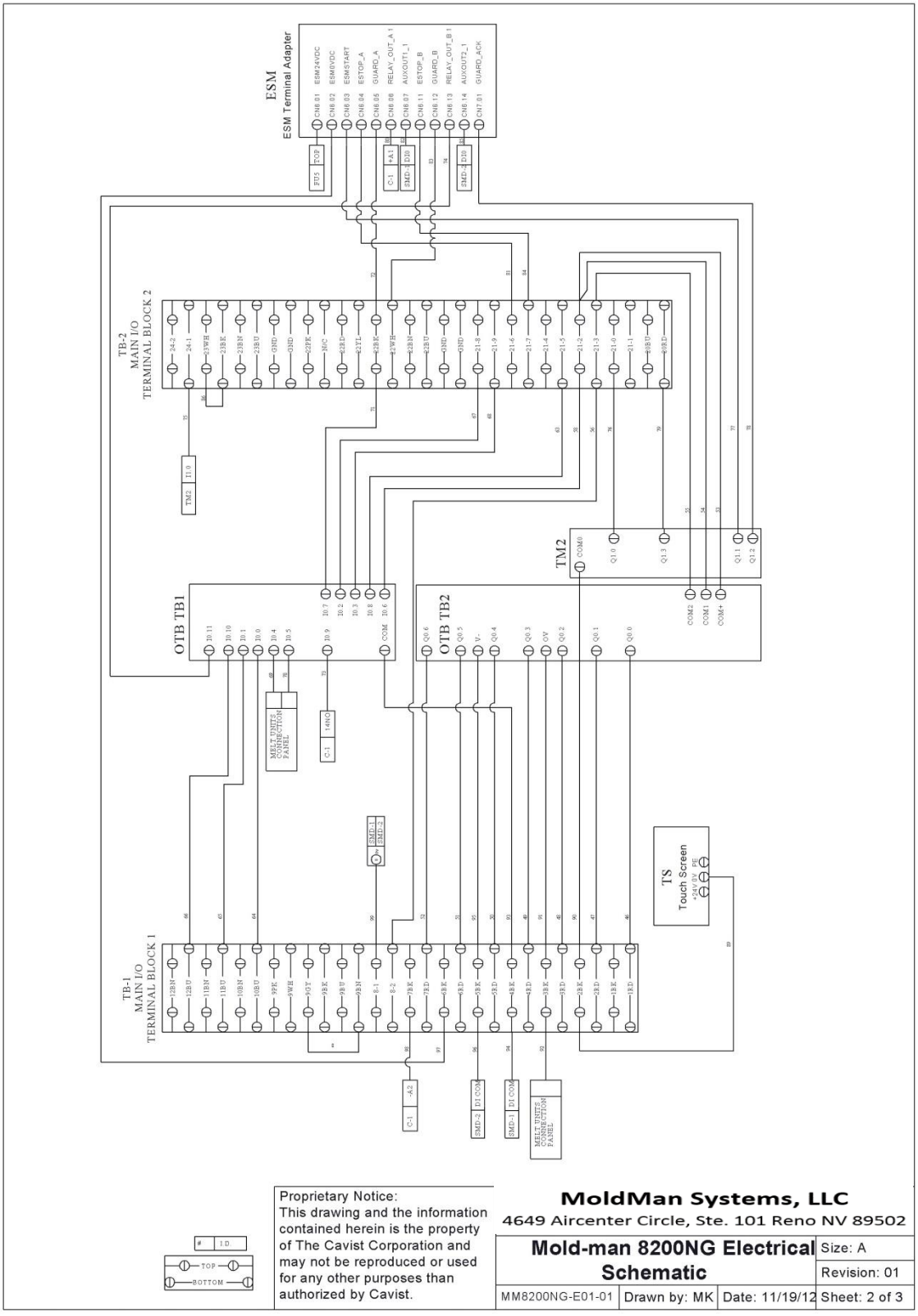
Terminal	Device
BU	Enclosure Fan -
RD	Enclosure Fan +

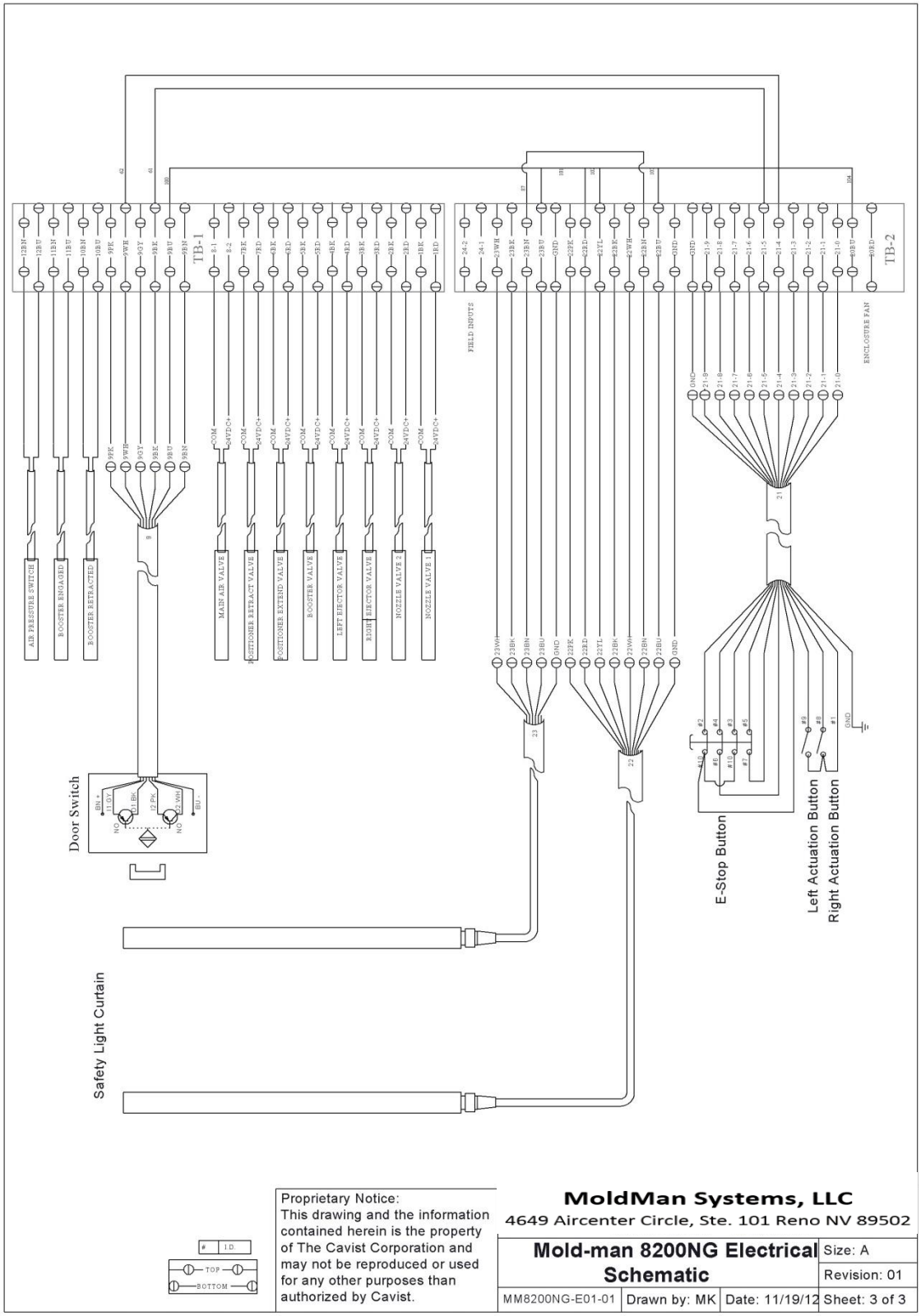
The above terminals are located at in the center of the Melt-man electrical enclosure

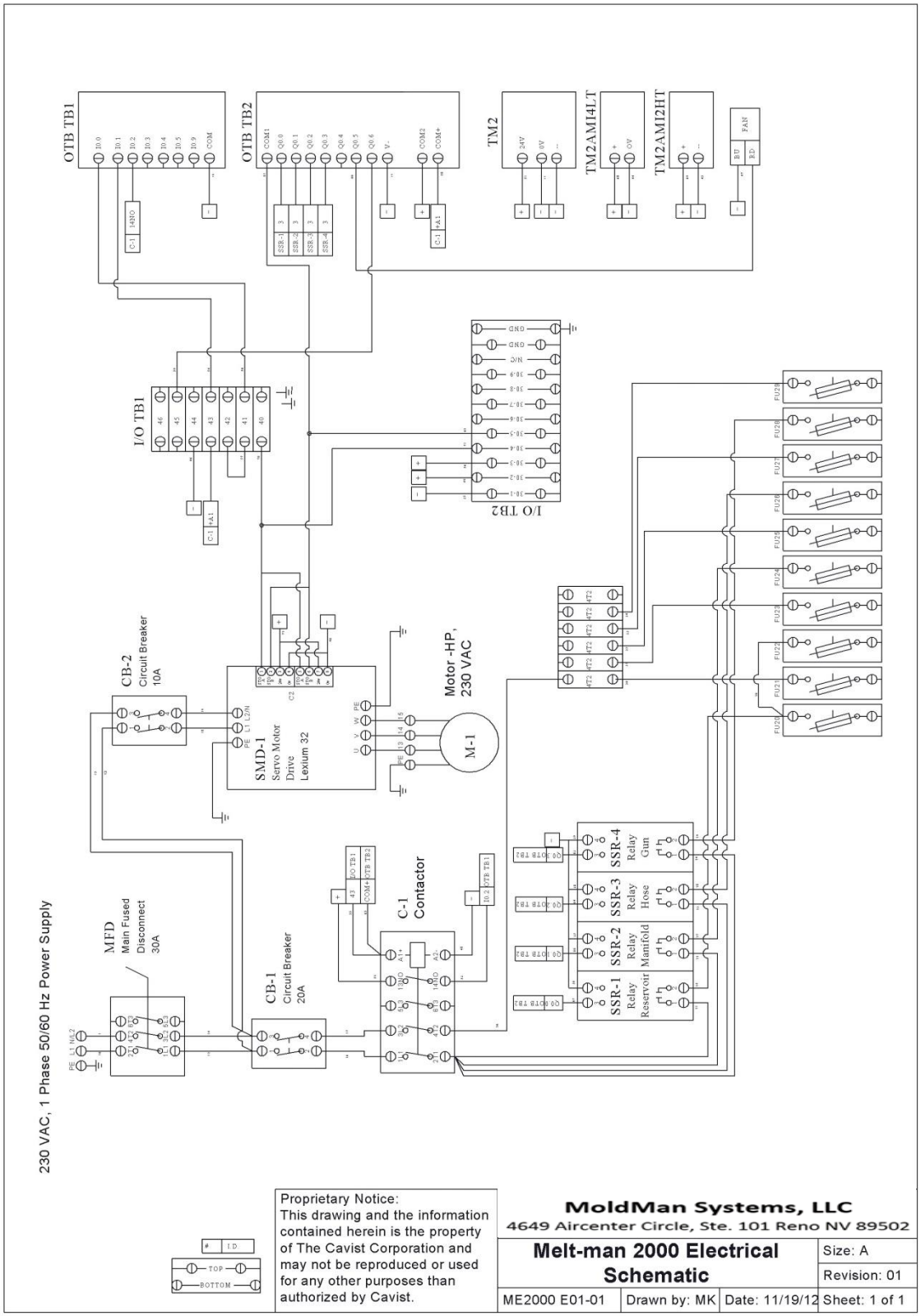
Terminal	Device	
30-1	24 VDC COM	
30-2	24 VDC+	
30-3	Melt-unit presence	
30-4	E-stop1	
30-5	E-stop2	
30-6	White/Orange CAN_H	
30-7	Orange CAN_Lo	
30-8	White/Green CAN_0V	
30-9	Shield	
GND	Ground	
GND	Ground	
L1	230VAC L1 main power	**Customer Supplied Power**
N/L2	230VAC N/L2 main power	
GND	Ground	

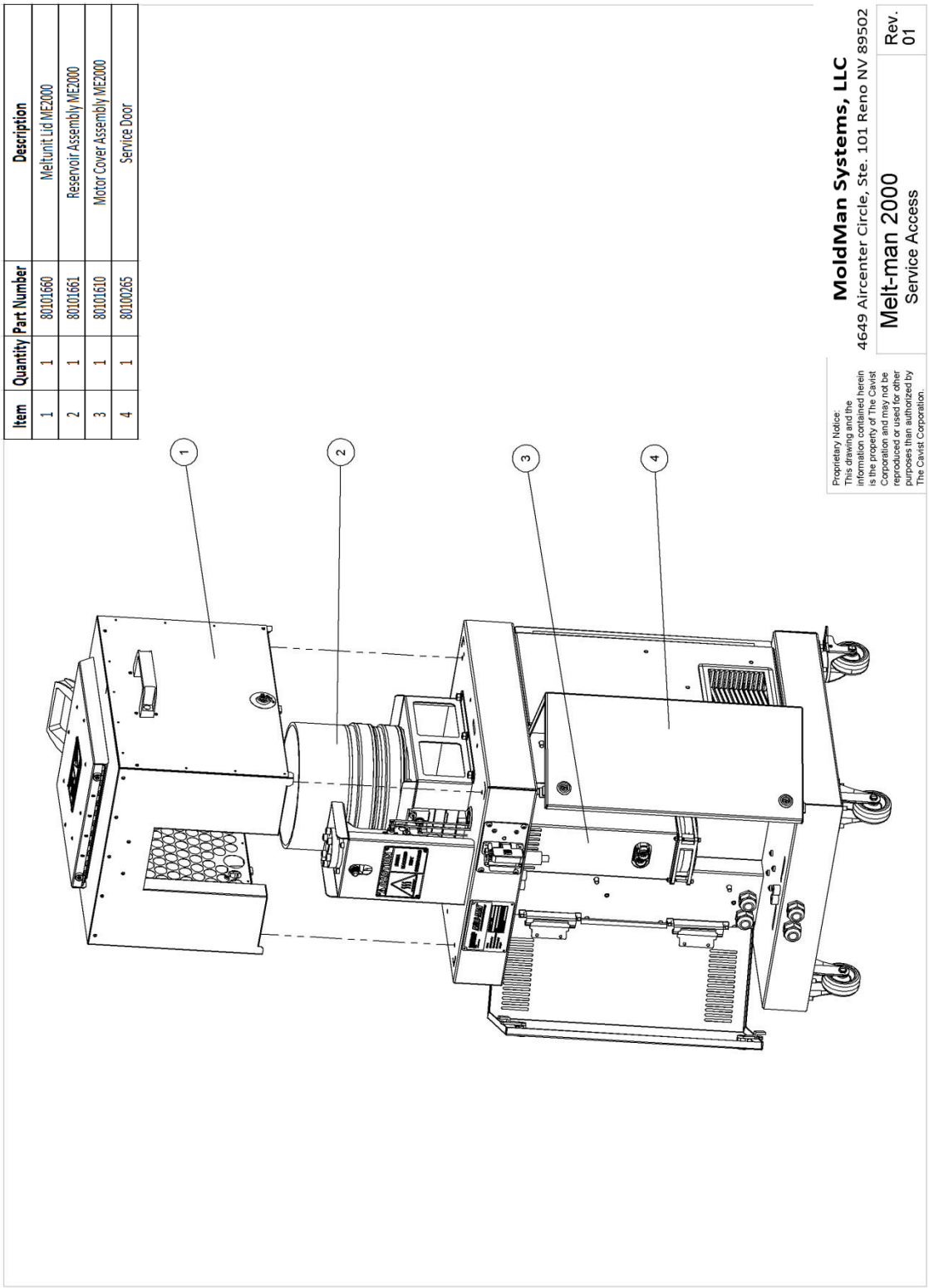
The above terminals are located at the bottom of the Melt-man electrical enclosure



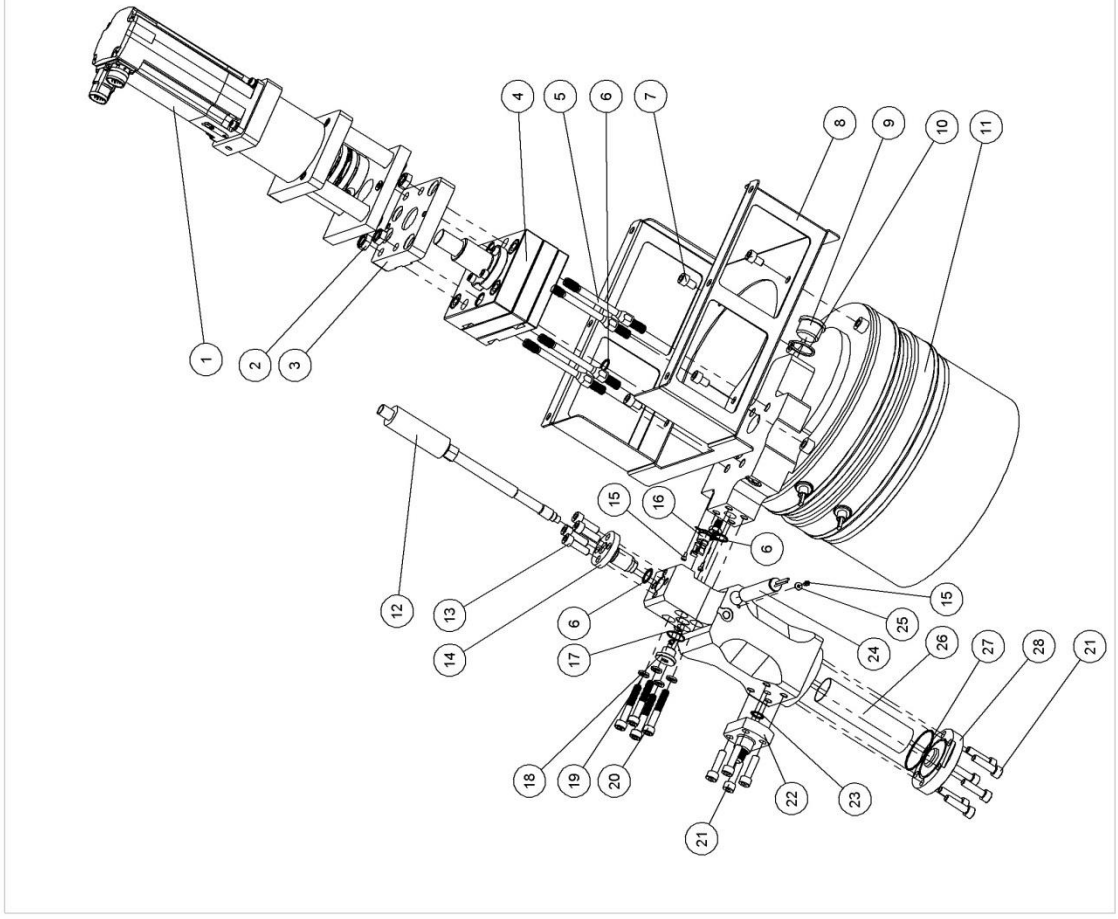








Item	Quantity	Part Number	Description
1	1	80100786	Motor Mount Assembly w/o Pump
2	4	80100730	M10 U-nuts
3	1	80100026	Pump Plate, 303, SS
4	1	80101158	15 CC Spur Gear Pump
5	4	80100024	Pump Mounting Slud
6	3	80100661	Silicone O-Ring 016, red
7	4	80100613	M8x12 SHCS, SS
8	1	80100048	Reservoir Mount
9	1	80101146	Drain plug M27x2.0, black oxy
10	1	80100449	Copper Seal, M27
11	2	80100826	Mica Band Heater D10x11/2", Reservoir ME2000
12	1	80100393	Pressure Transducer 1000PSI
13	4	80100576	M3x25 SHCS, SS
14	1	80100025	Transducer Mount
15	5	80100580	M3x8 SHCS, SS
16	2	80100160	Thermal Switch
17	1	80100663	Silicone O-Ring 018, red
18	1	80100020	M16 Plug, SS
19	4	80100541	M8 Lock Washer, SS
20	4	80100607	M8x50 SHCS, SS
21	10	80100605	M8x30 SHCS, SS
22	1	80100023	Flanged Hydraulic Fitting
23	1	80101698	Silicone O-Ring 014, red
24	1	80101960	Cartridge Heater, 12mm x 160mm
25	1	80100652	M3 Flat Washer
26	1	80101160	Filter cartridge
27	1	80100660	O-Ring 033, PTFE
28	1	80101531	Filter Lid SS303



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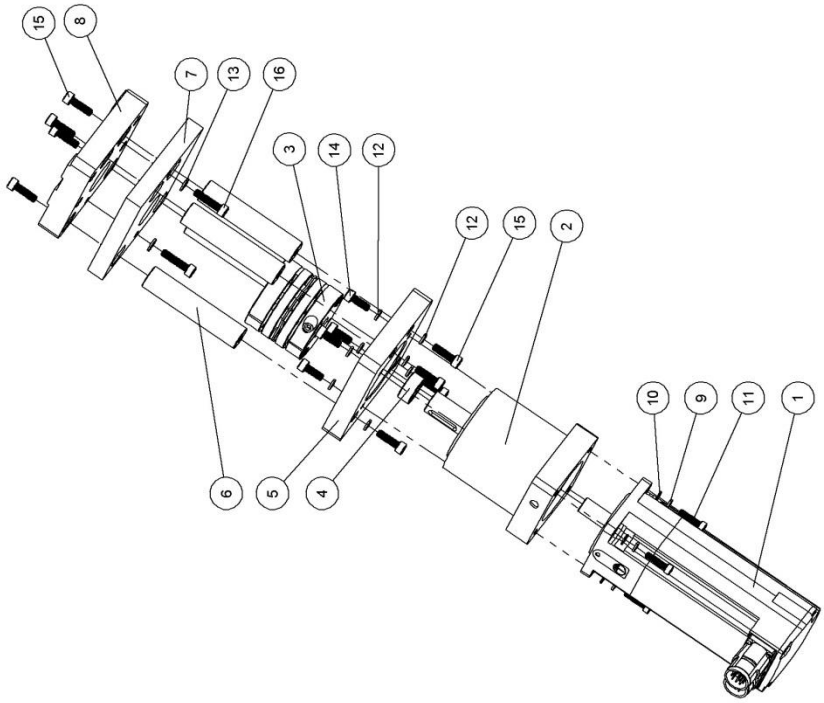
MoldMan Systems, LLC
4649 Aircenter Circle, Ste. 101 Reno NV 89502

Melt-man 2000
Reservoir Assembly

Rev. 01

Item	Quantity	Part Number	Description
1	1	80100904	Servo Motor 70mm IP54 w/o key
2	1	80100924	Gear Box GBX 080 8to1 0703BSH
3	1	80100693	Coupling, Gear pump ME2000
4	1	80100727	Gear Box Spacer
5	1	80100027	Motor Plate, 6061
6	4	80100758	Rotary Shaft
7	1	80100036	Pump Insulation Plate,machined
8	1	80100026	Pump Plate, 303, SS
9	4	80100539	M5 Lock Washer, SS
10	4	80100654	M5 washer, SS
11	4	80100591	M5x20 SHCS, SS
12	8	80100540	M6 Lock Washer, SS
13	2	80100655	M6 Washer, SS
14	4	80100595	M6x16 SHCS,SS
15	8	80100597	M6x20 SHCS, SS
16	2	80100599	M6x25 SHCS, SS

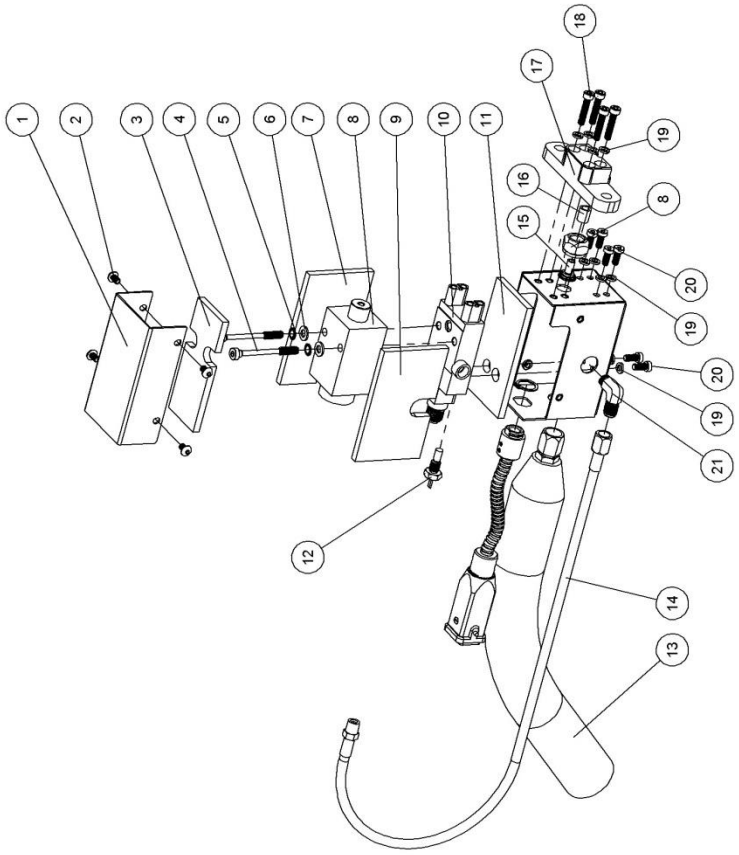


MoldMan Systems, LLC
4649 Aircenter Circle, Ste. 101 Reno NV 89502

Melt-man 2000
Motor Mount Assembly

Rev. 01

Item	Quantity	Part Number	Description
1	1	80100273	Nozzle Top Cover
2	4	80100635	M5x8 BHCS, SS
3	1	80101143	Upper Insulation
4	2	80100647	M6x60 SHCS, SS, Low Head
5	2	80101656	M6 Serrated Belleville Washer
6	1	80100655	M6 Washer, SS
7	1	80101143	Right Insulation
8	1	80100818	H20 LBS Module
9	1	80101143	Left Insulation
10	1	80100029	Nozzle Body
11	1	80101143	Bottom Insulation
12	1	80100827	PT 100 Temperature Sensors
13	1	80101683	Heated Hose PT100 240V
14	1	80100474	High Pressure Braided Hose, SS
15	1	80100033	Nozzle Inner Tube
16	1	80100034	Nozzle Sleeve, ME2000
17	1	80100030	Parting Line Injection Plate, 303, SS
18	4	80101422	M5x25 SHCS, SS
19	10	80100539	M5 Lock Washer, SS
20	6	80100646	M5x12 SHCS, SS, Low Head
21	1	80100483	1/4" x1/8" NPT 90 Deg Elbow



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Melt-man 2000
Nozzle Assembly

Rev. 01