APSX-PIM USER MANUAL

Plastic Injection Machine

APSX-PIM V2 User Manual V4.4

ADVANCED PRODUCTION SYSTEMS

APSX, LLC.

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This equipment manual is intended to provide information for safe operation and maintenance. APSX reserves the right to change equipment to continually improve the equipment, features, and/or performance. These changes may result in different and/or additional safety measures communicated to customers through bulletins as changes occur.

General Information

Please schedule a call or video session through our website: https://apsx.com/scheduling
Phone Support Number: 1-513-716-5992 (10AM-3PM EST Weekdays)
For non-emergency questions, you may also email support@apsx.com

Product Upgrades

Upgrades may be available that can improve your APSX-PIM V2. If you have the APSX-PIM V1 (ended around mid 2019), there may not be any available upgrades. To see what upgrades are available for your machine, please visit www.apsx.com or email us.

Spare Parts

All spare parts for APSX-PIM can be ordered online at www.apsx.com.

Unauthorized Modifications

Under no circumstances should any changes or modifications be made to the electrical circuits, mechanical structures, or the safety devices to the machine and guarding on the mold without the prior, written permission of APSX LLC.

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Injection Molding Process

It is a science but is also a kind of art.

The injection molding of thermoplastic resins is a well-known and widely practiced application. It constitutes a significant processing technique for converting plastics into a variety of end-use products. The process involves heating the solid pellets to melt, transferring them to a mold, and holding it under pressure until it freezes or solidify.

Plastic molding compounds represent a range of chemical types. Each type has its specific processing characteristics that must be considered and understood before being successfully molded.

Processing Characteristics

The physical and chemical properties of plastic dictate how it must be molded. Among these are:

- Melting or softening temperature
- Energy content (specific heat and latent heat)
- Melt viscosity
- Stability and behavior at melt temperatures
- Freezing rate, crystallization rate, and cycle time
- Shrinkage

Example for Polypropylene

For example, the PP, a frequently used plastic, has listed physical, mechanical, impact, and thermal properties. Specific gravity, mass flow rate, tensile strength, Izod impact, and deflection temperature under load are properties that make a difference when processing injection molding.

Some Terms for Injection Molding

ASTM: Abbreviation for American Society for Testing and Materials.

Barrel: The section of a molding machine containing the feed screw or the plunger and the area where resin heating and mixing occurs.

Blushing: The tendency of a plastic article to turn white or chalky in highly stressed areas.

Bubbles: Air or gas pockets that have formed in the material of the component.

Burned: Showing evidence of excessive heating during processing or use of plastic, as evidenced by blistering, discoloration, distortion, or destruction of the surface.

Cavity: A depression, or a set of matching recesses, in a plastics-forming mold that forms the outer surfaces of the molded articles.

Clamp: The part of an injection molding machine incorporating the platens that provide the force necessary to hold the mold closed during injection of the molten resin and open the mold to eject the molded part.

Clamping Area: The largest rated molding area an injection press can hold under full molding pressure.

Clamping Force: The force applied to the mold to keep it closed, in opposition to the compressed molding material's fluid pressure within the mold cavity and the runner system.

Cold Flow Lines: Imperfections within the part wall due to thickening or solidification of resin before full cavity fill.

Conversions (Commonly Used in Injection Molding)

BAR = 14.50 psi

°C x 1.8 + 32 = °F

Liters/min x 0.2642 = Gal/min

Inches x 25.4 = mm

Flow rate = ((# of cavities) x (volume per cavity))/(injection time)

Cooling time: the elapsed time required for the melt to reach its Vicat softening temperature.

Core: A protrusion in a plastics forming mold that forms the inner surfaces of the molded articles.

Cycle Time: The time required by an injection molding system to mold a part and return to its original position/state.

Draft: A Slight taper in a mold wall designed to facilitate removing the molded object from the mold.

Drag Marks: A form of deep scratch or scratches on the surface of the component usually caused by the part's ejection.

Drooling: The leakage of molten resin from nozzle or nozzle sprue bushing area while filling or shooting the mold.

Ejection Pin: A rod, pin, or sleeve pushes a molded part off a core or out of a mold's cavity.

Ejector Rod: A bar that actuates the ejector assembly when the mold opens.

Family mold: A mold that produces non-identical parts simultaneously from multiple cavities.

Fill pressure: the injection pressure required to fill the cavity.

Fill Time (also known as an injection): Time required to fill the cavity or mold.

Flash: Any excess material formed and attached to the component along a seam or mold parting line.

Flow (Fill) Rate: the volume of material passing a fixed point per unit time.

Gate: The channel through which the molten resin flows from the runner into the cavity.

Injection Molding Pressure: The pressure applied to the cross-sectional area of the molding cylinder.

Injection Molding: The method of forming objects from granular or powdered plastics, most often of the thermoplastic type, in which the materials are fed from a hopper to a heated chamber in which it is softened a ram or screw forces the

material into a mold. The pressure is maintained until the mass has hardened sufficiently for removal from the mold.

Insert Molding: Insert molding is the process of molding plastic around preformed metal inserts.

Machine Shot Capacity: Refers to the maximum volume of thermoplastic resin, which can be displaced or injected by the injection ram in a single stroke.

Material Safety Data Sheets: Documentation regarding the toxicity or hazards associated with contact with some substances. The manufacturer of the plastic prepares these datasheets.

Melt Flow Rate (MFR): A measure of the molten viscosity of a polymer determined by the weight of polymer extruded through an orifice under specified pressure and temperature conditions.

Mold (n): A hollow form or matrix into which a plastic material is placed and imparts its final shape as a finished article.

Mold (v): To impart shape to a plastic mass using a confining cavity or matrix.

Mold Temperature: the temperature at which the mold is maintained.

Multi-Cavity Mold: A mold having two or more impressions for forming finished items in one cycle.

Packing: The filling of the mold cavity or cavities as full as possible without causing undue stress on the molds or causing the flash to appear on the finished parts.

Parting line: The marking on the part indicates where the two halves of the mold met.

Pellets: Tablets or granules of uniform size, consisting of resins or mixtures with compounding additives, prepared for molding operations by extrusion and chopping into short segments.

Platens: The mounting plates of a press on which the mold halves are attached.

Purging: In injection molding, the cleaning of one color or type of material from the machine by forcing it out with the new color or material to be used in subsequent production.

Runner: In an injection mold, the feed channel, usually of circular cross-section, connects the sprue with the cavity gate. The term is also used for the plastic piece formed in this channel.

Shrinkage Allowance: The dimensional allowance must be made in molds to compensate for the shrinkage of the plastic compound on cooling.

Sink Mark: an indentation on the part's surface due to significant local change in the wall section. The mark will occur in the thicker area.

Sprue: The feed opening provided in injection molding between the nozzle and cavity or runner system.

Tie-Bar Spacing: The space between the horizontal tie-bars on an injection molding machine. This measurement limits molds' size that can be placed between the tie-bars and into the molding machine.

Tool: In injection molding, the term is sometimes used to describe the mold.

Undercut: A protuberance or indentation that impedes withdrawal from a two-piece rigid mold.

Vent: A shallow channel or opening cut in the cavity to allow air or gases to escape as the melt fills the cavity.

Virgin Material: Any plastic compound or resin that has not been subjected to use or processing other than that required for its original manufacture.

Warpage: Distortion caused by nonuniform internal stresses.

Weld Line: Melted material flows together during molding to form a visible line or lines on a finished part that may cause weakening or break the component.

Safety Precautions

APSX-PIM is a small and low-pressure machine. However, the following safety precautions should be taken before and during the machine's use.

Electrical Safety:

The machine must be connected to a dedicated 110V power circuit. Touching it to uncovered electrical control panel parts can put you at risk of fatal injury. Do not abuse the power cord. Do not twist, bend, scrape, pull, pinch.

Never service the machine with the power connected.

The electrical panel covers should be in place and fastened to the machine at all times, except when the machine is being serviced. There is high voltage throughout the electrical cabinet (including the circuit boards and logic circuits). In addition, some components operate at high temperatures; therefore, extreme caution is required.

Personal Safety:

Use appropriate eye protection while operating the machine. Skin contact with molten plastic can inflict severe burns. This could happen when the machine under pressure ejects molten plastic through the nozzle.

Purging should be performed carefully with the guard gates closed. The machine has multiple parts that have high-temperature levels that the user should never touch with bare hands. Those parts are electric motors, cylinder barrel, heater assembly, mold structure, and hopper assembly.

Molten plastic material can appear cold on the surface but remain very hot inside. Wear personal protective equipment when handling hot plastic material. A face shield or safety goggles, heat resistant protective gloves, safety shoes, non-melting fiber pants, and long sleeve shirts should be worn at all times.

If molten polymer does contact the skin, cool the affected area immediately with cold water or an ice pack and get medical attention for a thermal burn. Do not attempt to peel the polymer from the skin.

The machine has multiple parts that have high-temperature levels that the user should never touch with bare hands. Those parts are electric motors, cylinder barrel, heater assembly, mold structure, and hopper assembly.

Operation Safety:

Off-Gases Ventilation: During the molding, some amount of gas is released. As a general principle, local exhaust ventilation is recommended during the process of all plastic heating. Injection molding typically releases substantially less volatile material, so it requires less ventilation. But during purging, volatile releases are similar to that in extrusion. Extra care in avoiding the inhalation of fumes is recommended. Local exhaust ventilation should be used to convey such fumes outside the workplace.

Slipping Hazards: Pellets of plastics are a slipping hazard if spilled on the floor. They are cylindrical in shape and have a low coefficient of friction. Any spills should be swept up or cleaned immediately. There should be a vacuum cleaner available to collect spilled pellets from the ground.

Physical Hazards: The machine has multiple moving mechanical parts under load. Placing hands in between those moving parts such as springs, metal blocks, chains, and cylinders can cause a severe injury. Never reach into the machine when it is going through its injection cycle.

[e-STOP] is the red switch located on the front of the control panel. When you press the [e-STOP], the machine stops. Use [e-STOP] in case of an emergency. Turn the e-STOP clockwise a quarter turn to release back to power on mode.

Moving and Storing the Machine:

The machine is too heavy for one person to move or lift. Never try to move or lift the machine without proper equipment. Do not exceed the rated capacity of the lifting equipment.

Disconnect the main power plug from the outlet and store the machine when not in use.

Store the APSX-PIM in a dry location, protect the wires from excessive UV exposure and avoid operating the machine immediately after significant temperature changes that could cause condensation buildup inside the machine. If possible, store the machine in a watertight container or a plastic bag and use desiccant to prevent moisture buildup.

During the Operation:

The machine should only be used for its intended purpose by an authorized and trained individual, as described in the manual. Never leave the machine unattended without placing a warning sign around it for others not authorized to use the device.

Make sure the machine is securely placed on a safe table or bench before operating. Use the saddles provided to secure the machine on the bench. Place the machine shafts on the saddles on both edges of the machine.

Never try to inject the plastic until it has reached the proper operating temperature.

As with any power tool, do not use the machine if you are tired, distracted, or impaired.

Safety Alerts:

The **DANGER** safety alert indicates an imminently hazardous situation that if not avoided, could result in death or serious injury.

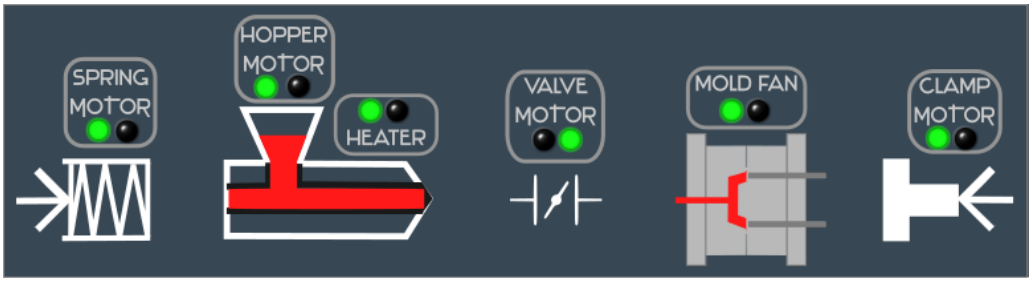
The **WARNING** safety alert indicates a potentially hazardous situation that if not avoided, could result in death or severe injury.

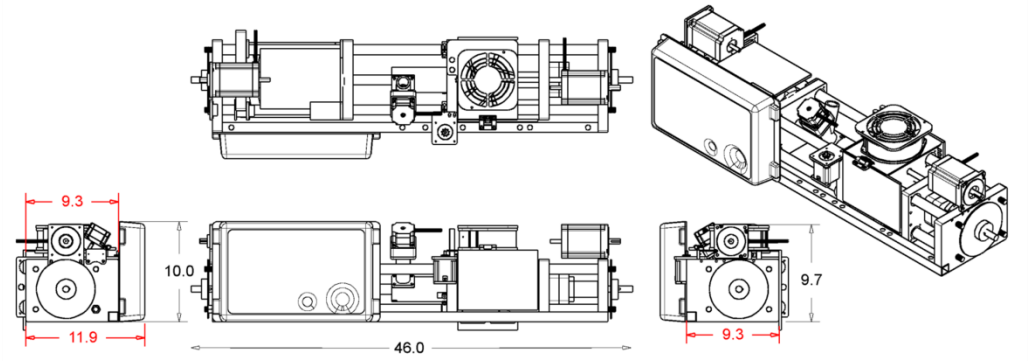
The **CAUTION** safety alert indicates a potentially hazardous situation that, if not avoided, could result in property damage.

APSX-PIM Injection Molding Machine

APSX-PIM is a fully automatic electric desktop injection molding machine. It runs with 115VAC power with no water or hydraulic connection required. It can generate 5 tons of clamp force and can inject 30 cu-cm of plastic at a time up to **315 C** degrees. The standard mold size is 6” (H) by 4.8” (W).

APSX-PIM consists of multiple small sections. Electric motors and precise sensors control the machine. The user has a touch screen PC attached to the machine for setup and operational controls.





Moving the APSX-PIM to Its Location

Please be aware of the following precautions when moving the APSX-PIM to another location or carrying it out from the shipping crate.

The start up process is very simple: Open the crate, place the APSX-PIM on a desk or stand, plug and start using.

Content of the crate:

- APSX-PIM Injection Machine
- Tablet PC
- Test mold (installed)
- 2 lbs of PP pellets
- APSX INJECTION software (installed)
- Kill-A-Watt volt meter

There is an optional stand that can be used with the APSX-PIM.

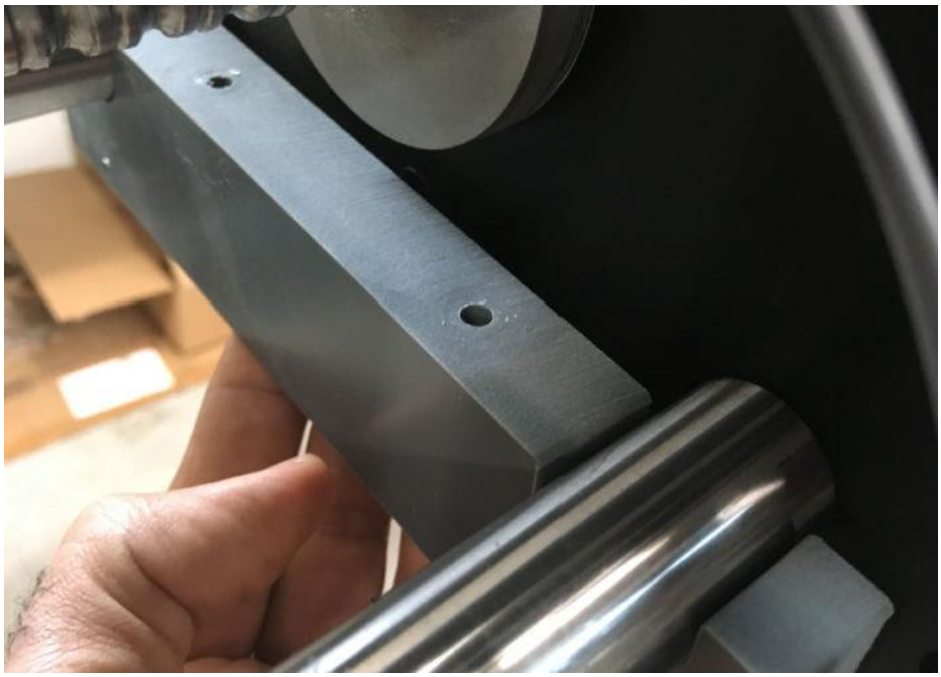
1 - Open the top of the crate
The machine is mounted to the crate by using two U-bolts. Put the other items aside before you start unscrewing the U-bolt mounting nuts. Remove the Tablet PC box, and PP pellets bag.

APSX-PIM machine is not a light machine. Therefore, have some help for lifting it onto a sturdy desktop or APSX-PIM stand.

Always use the chain hook holes located on the clamp motor and injection motor mount plates. They are designed specifically for lifting. You can use a small size hydraulic lift or a similar tool.

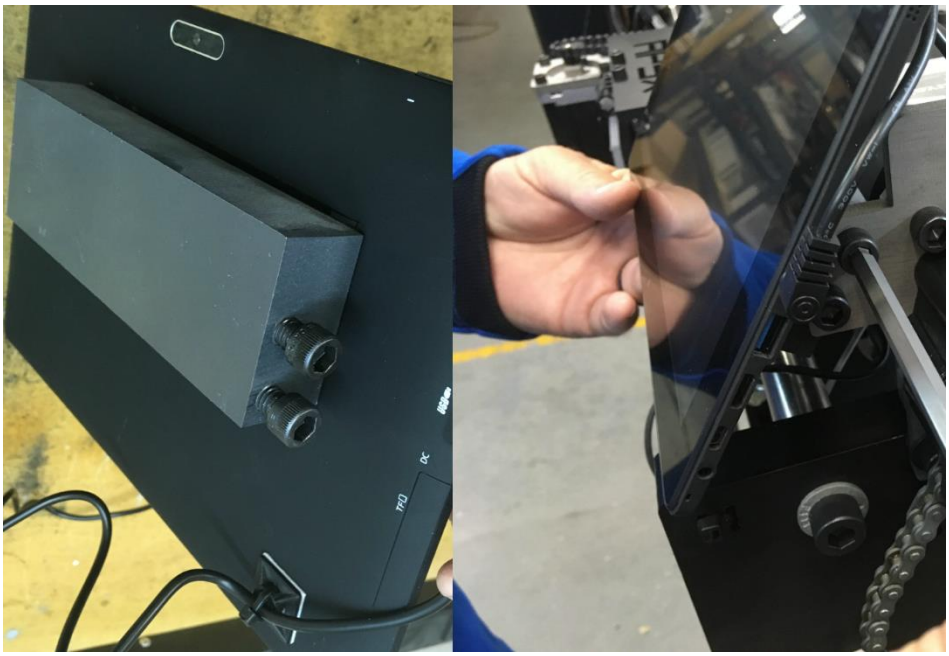
2 - Install the saddles

APSX-PIM comes with two saddles to sit on. You can place them on the desktop or the stand.

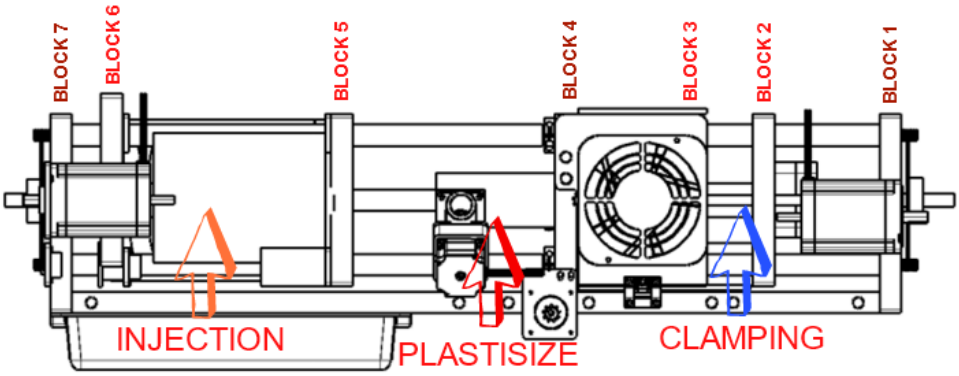


3 - Assemble the Tablet PC

Open the tablet PC box and find the tablet PC and the power adapter. There are two screws to mount on the machine's clamping side.



Make Your First Part with the APSX-PIM Test Mold



APSX-PIM TOP VIEW

Once you place the machine in its place, you can use the APSX-PIM and the "test mold" installed on it. The test mold is for you to experiment with the machine and learn the settings available to you. The APSX-PIM is fully electric and runs on a regular 115VAC outlet. It does NOT use any hydraulics or air components.

The user must check if the machine hopper and hopper feeder pipes are cleaned, and there are no obstructions from the previous injection session.

Ensure that the USB cable is not inserted into the Tablet PC yet. Plug the power cord into a standard wall outlet with a 20AMP fuse and wait for the humming sound from the motors. If you use the Kill-A-Watt tool that comes with the machine, you can monitor the voltage and also the watt consumption. The power consumption rate is 750W on average and 1400W at peak.

If you have to use a power extension cable, use a thick gauge (12 AWG) and the shortest possible (10 ft).

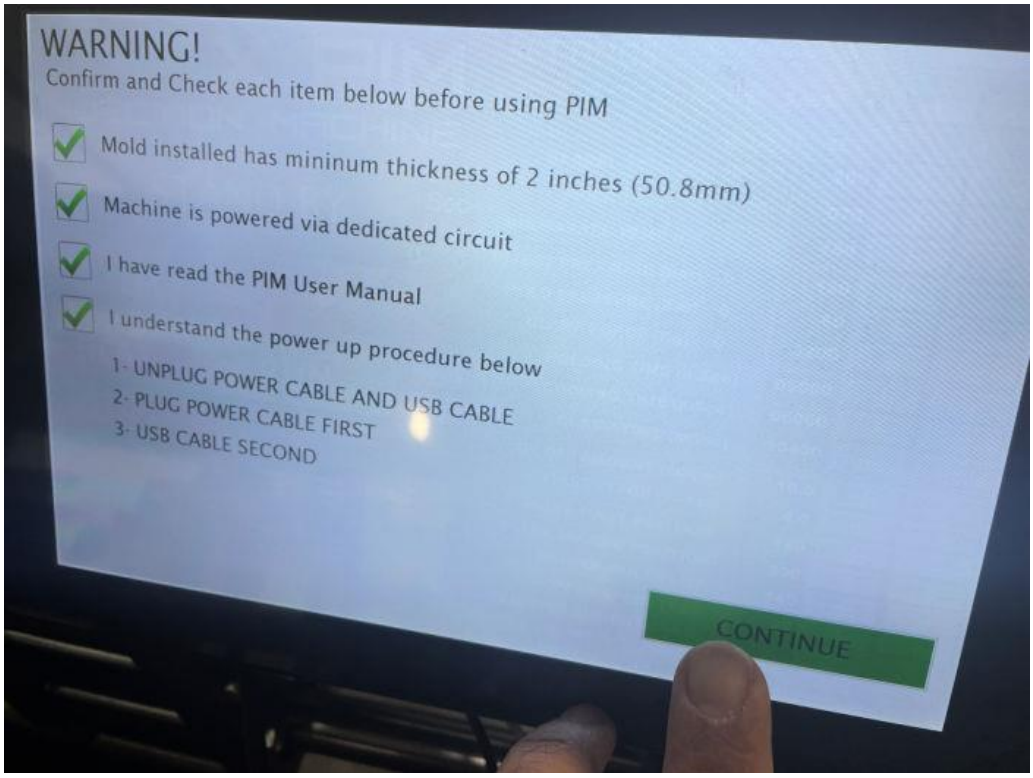
There is a particular power-up process that needs to be performed in order. The user **powers the machine from a regular 110VAC wall outlet THEN connects the USB cable to the tablet**.

Plug the USB cable to the Tablet PC and wait for the digital sound. The key is to watch for fast-moving numbers at the bottom right corner of the software screen. We call it the heartbeat.

Ensure that the hopper has plastic pellets inside. You will use the 2 lbs natural PP that we provide you with the machine. The test mold is designed for only the PP, PE, TPO and TPE. It may not perform well for other materials.

If it is not ON already, click on the APSX_INJECTION icon on the desktop to start the software.

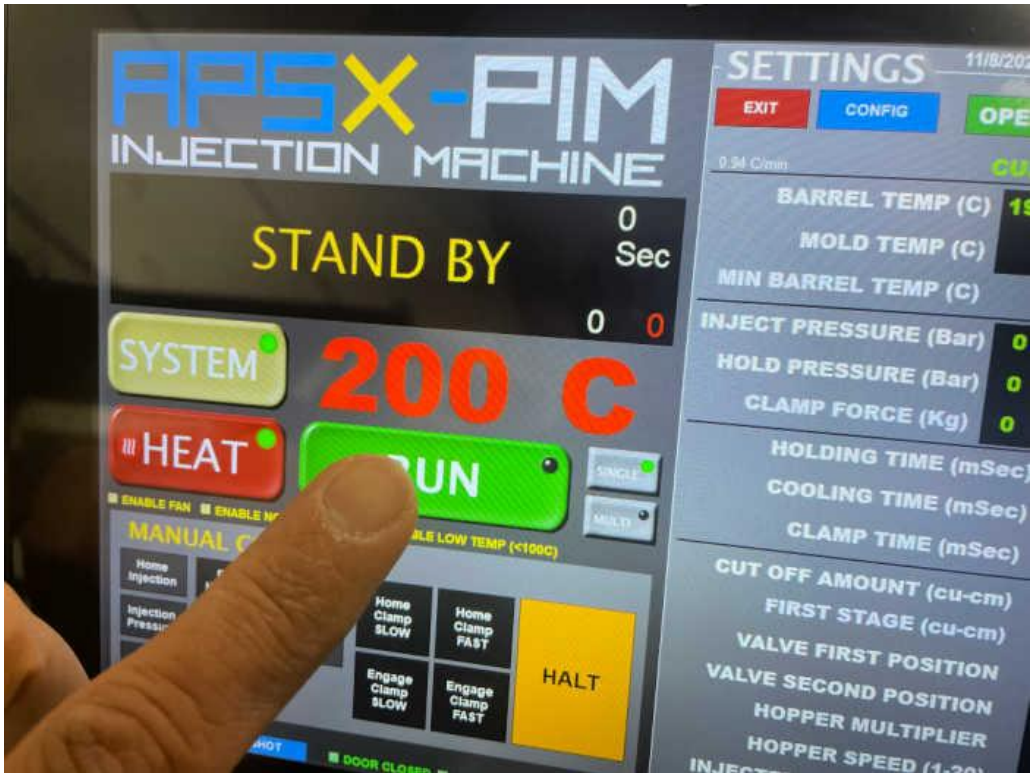
Push the system button and read the warning message as a popup window. Check all the boxes to confirm.



Push the HEAT button to start the heating process. It may take 15-20 minutes from the room temperature to 200C.

Double check that the clamp switch (page 23) located on the front upper shaft is mounted tightly and does not move around. Push the home clamp and home injection buttons to ensure that they are at their home positions. The machine comes with some natural PP plastic inside the barrel. We use that plastic for testing the machine. If there are no plastics inside the barrel, prime it again by pushing the Run Hopper button.

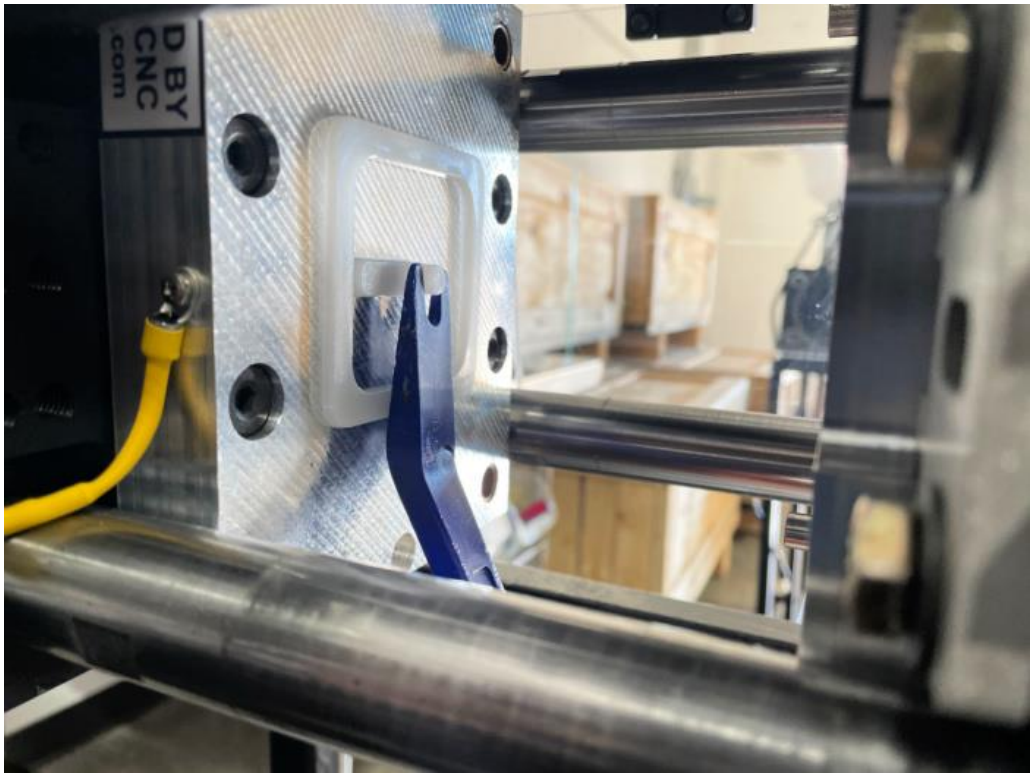
When you are ready (without idling the machine on the heat for more than 5 minutes), start the cycle (single) by pushing the RUN button. The heater will automatically turn off after 5 minutes of non use to prevent material degradation.



The cycle takes about a minute to complete. You can follow the user screen to see at which stage the machine is: Clamping, Injecting, Holding, Cooling, Homing and Completed.

At the end of the cycle, please use the provided plastic picker to pick the part from the mold. When you are ready, you can run another cycle to make your next part. DO NOT TOUCH THE MOLD since it is hot.

Please play with the parameters to see the effect on the plastic part to learn the injection molding concept by doing it.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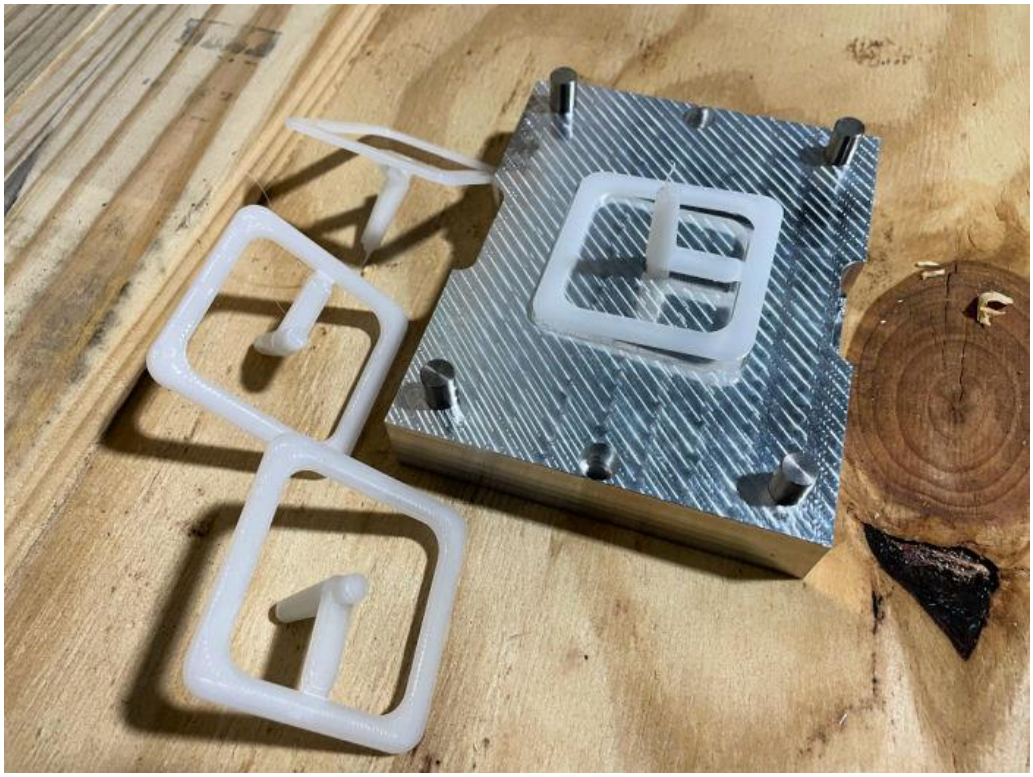


Installing a Mold

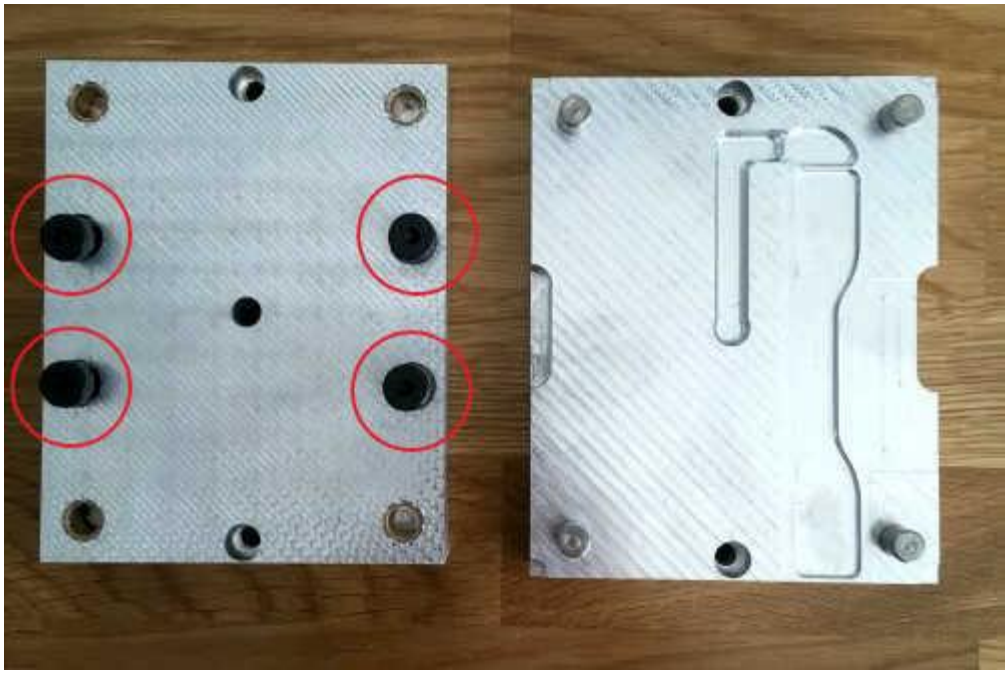
There is an order of operation to power up the machine. First, plug the power cord into a standard wall outlet. Then plug the USB cable into the tablet PC.

NOTE: ALWAYS USE A MOLD WITH A TOTAL THICKNESS EQUAL or GREATER THAN 2 INCHES FOR A PROPER CLAMPING.

Take the fan assembly cover by removing the two nuts.

Remove the temperature sensor on the current mold by removing the small screw in front of the mold.

MOLDS WITH SHOULDER BOLT MOUNTS ON THE LEFT SIDE
Remove the four shoulder bolts on the left side of the mold. These bolts are slightly longer on purpose. They allow us to leave a gap between the mold and the nozzle plate. This helps to prevent the barrel and the nozzle plate from losing heat at a high rate. We also suggest using an insulator (Peek) at the back of the left side mold for most of the plastic material to help with this same goal.



MOLDS WITH CLAWS ON THE LEFT SIDE
Loosen the mold claw bolts on the left side of the mold by holding the mold by hand and using a half inch wrench. Push the claws out from the mold. Slide the mold up carefully.

RIGHT SIDE OF THE MOLD
Loosen the mold claws on the right side, slide them back to the outer position away from the mold. Put the mold aside.

INSTALL THE NEW MOLD
Now you can slide the new mold's right side into its place.

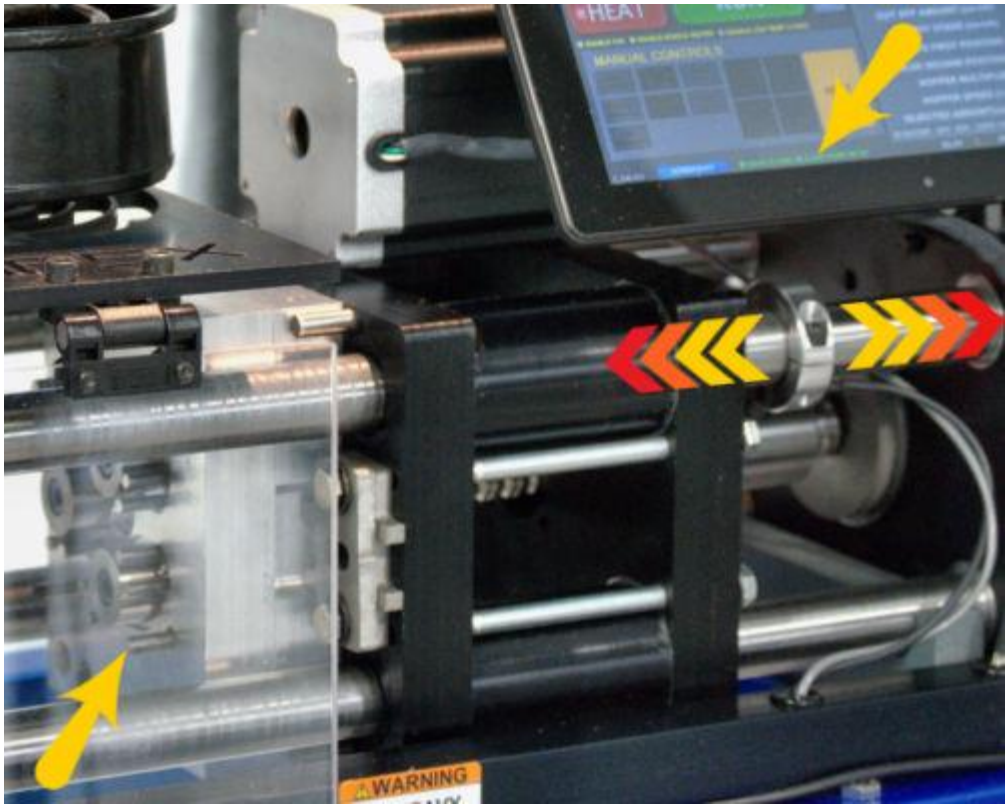
Push the claws all the way into the grooves, then finger tighten the bolts on both the front and backside. The top surface of the mold should be slightly lower than block 3's top surface for proper alignment.

Install the left side mold to block 4 by using the shoulder bolts.

Clamp the mold by pressing the Engage Clamp Fast button. When it gets 1/8 inch close to the mold, press the Engage Clamp Slow button.

INSTALLING THE MOLDS WITH EJECTOR PINS
Slide the clamp switch to the left. Press the home the clamp fast button (manual buttons).

Adjust the position of the clamp switch so that the ejector pins are fully out. The machine stops when the clamp switch detects block 3. The key is not to hit the ejector bearing to the mold by sliding the clamp switch too far right.



Press the Home Clamp Slow button once. Gradually slide the clamp switch to the right and watch the ejector pins and the check box at the bottom of the user screen. When you are satisfied with the switch location, tighten the bolt on the switch. REMEMBER: If you move the switch too far right, you may hit the back of the mold and damage it.

Put the fan assembly and the temperature sensor back in their positions.

Add plastic to the hopper. Turn the heat button on and wait for the set barrel temperature to be reached.

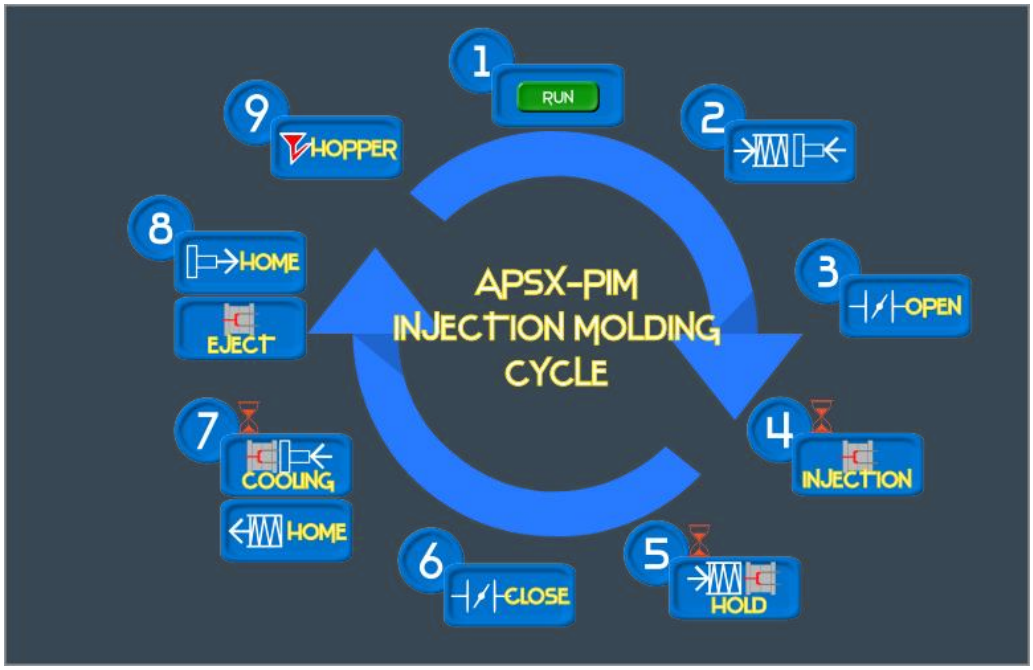
Set your parameters for injection molding and "save" or "open" the pre-set settings profile you need before pressing the RUN button at Single cycle mode.

You may need to adjust the clamp time setting if the mold is touching the other side of the mold at high speed mode or switching to slow speed mode too early (far away from the mold). You need to have about 1/8 inches gap at the end of the clamp time set to achieve more accurate clamp force readings.

Injection Molding Process Settings (User Screen)

APSX-PIM CYCLE:

The machine performs the injection molding functions of plasticizing, clamping, injection, and ejection accordingly and completes the job as set by the user. These automatic steps are for one single injection cycle.



The user interface is connected to the machine via the USB cable. There are three sections on the user interface: The main dashboard, the manual controls, and the settings.

APSX-PIM User Screen

Main Dashboard

The dashboard has a status message display on top. It shows the current injection cycle step and also notifies the user when necessary.

- STAND BY: Ready for the operation command.
- CLAMPING: Clamp block (2 & 3) is approaching the mold area. Be cautious.
- INJECTING: The nozzle opens, and the plastic is injected into the mold cavity.
- HOLDING: The injection pressure drops to the holding pressure to secure a 100% fill rate.
- COOLING: The machine is waiting for the injected plastic to cool down.
- HOMING: Clamp and injection travel back to their home locations for the next injection cycle.

The status display also shows the cycle timer in seconds. The number on the bottom right corner shows the cycle count until you reset by pressing on it.

SYSTEM button: It turns ON or OFF the system components such as motors and sensors.

HEAT button: It turns ON or OFF the heaters on the barrel. The nozzle heaters are always ON unless the ENABLE NOZZLE HEATER checkbox is not checked. If

there is a need to lower the barrel temperature to less than 100C, the checkbox ENABLE LOW TEMP should be checked. If you do not need to use the fan for cooling, please uncheck the ENABLE FAn checkbox.

If the machine is idle for 5 minutes, all heaters are turned off to prevent the degradation of plastic inside the barrel.

TEMPERATURE display: The current temperature of the plastic in the barrel.

RUN button: The button to start or stop the injection cycle.

SINGLE cycle mode: The machine stops and waits when it completes one cycle. To start the next cycle, you need to press the RUN button again.

MULTI cycle mode: The machine does not stop at the end of a cycle. It fills the barrel and moves on to the next cycle. It should be used only with a mold with an ejector system.

APSX-PIM Manual Controls

They are to control the machine motors manually. They can be used when installing a mold or for testing the machine motors. To stop the motors, please use the HALT button.

Injection controls:

- HOME INJECTION: Sends the injection side back to its home location. The machine should be homed before pressing the RUN button.
- INJECTION PRESSURE: Starts the injection motor to generate the injection pressure up to the set pressure - DO NOT USE IT UNTIL THE BARREL TEMPERATURE REACHES TO SET VALUE.
- HOLD PRESSURE: Moves the injection pressure to the hold pressure set by the user - DO NOT USE IT UNTIL THE BARREL TEMPERATURE REACHES TO SET VALUE.

Hopper controls:

- RUN HOPPER: Pushes the plastic pellets to the barrel - DO NOT USE IT UNTIL THE BARREL TEMPERATURE REACHES TO SET VALUE.
- STOP HOPPER: Stops the hopper motor.

Nozzle valve controls:

- OPEN VALVE: Starts the valve motor to open the nozzle valve 100% to let the under-pressure hot plastic flow into the mold cavity - DO NOT USE IT UNTIL THE BARREL TEMPERATURE REACHES TO SET VALUE.
- CLOSE VALVE: Closes the nozzle valve.

Clamp controls:

- HOME CLAMP: Moves the clamp mechanism back to its home base where the clamp switch is set. There are SLOW and FAST modes. The machine should be homed before pressing the RUN button.
- ENGAGE CLAMP: Starts the clamp motor for clamping action. There are SLOW and FAST modes. The final clamping action occurs in SLOW mode.

HALT: It stops on all motors during the manual control actions. It stops the entire injection cycle. Before homing the system, you need to hit the halt button again to activate the manual control buttons.

ABORT (RUN): It aborts the cycle, then homes clamp and injection motors DURING the injection cycle mode. You need to hit the RUN again to restart the process.

E-STOP button on the control panel: Turns off all motors, shuts down the system and disables the heat.

APSX-PIM Settings

The settings section has several controls to optimize the injection cycle for each mold installed and plastic type used.

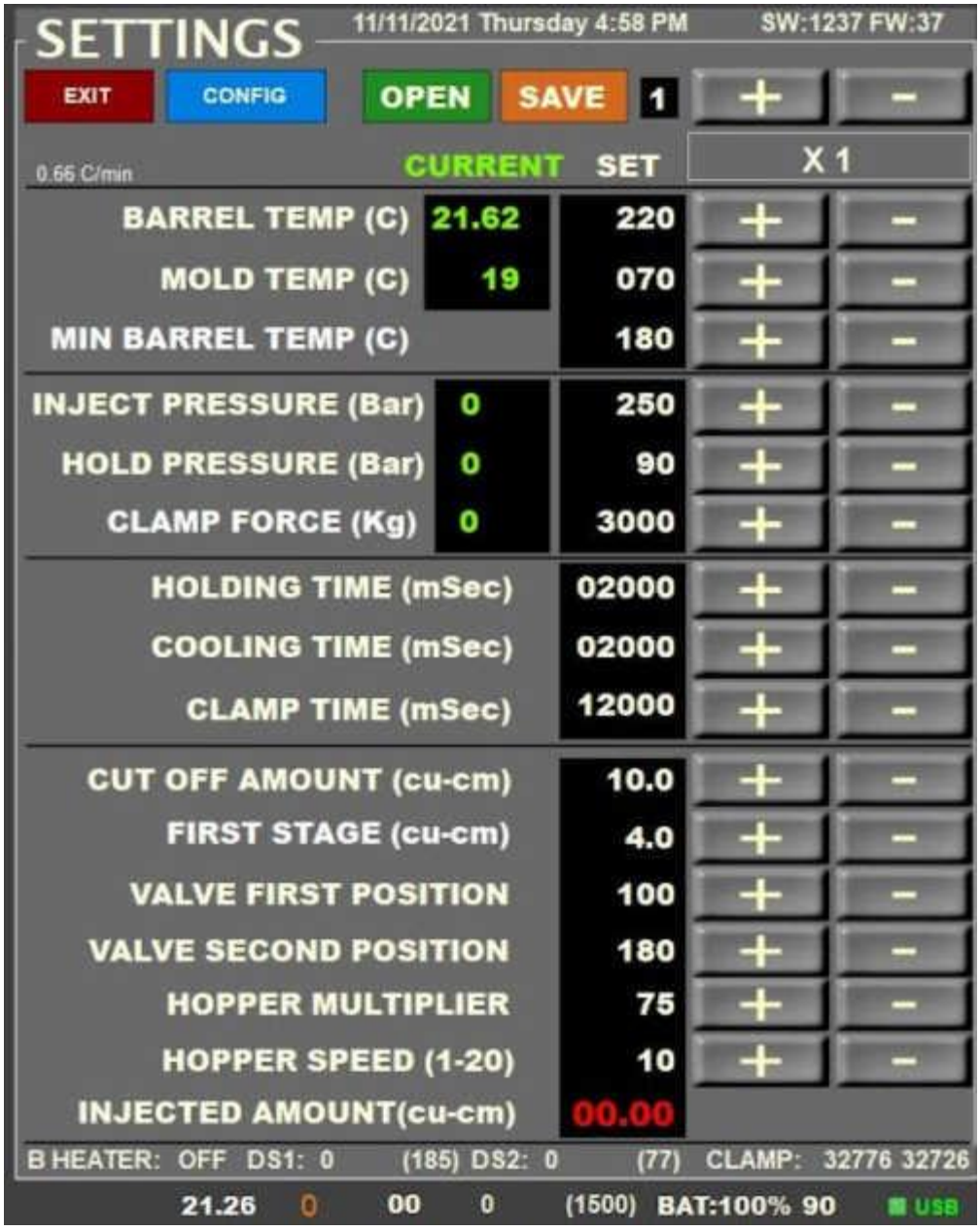
SAVE: Once the parameters are optimized, press this button to store the settings for the profile number shown next to it. The picture below shows the settings for profile number 1. You can change the profile number by using the plus (+) and negative (-) sign buttons.

OPEN: Press this button to recall a specific settings profile number.

EXIT: Press this button to exit from the application.

CONFIG: You can control settings behind the scene, such as fast clamp speed, clamp calibration etc.

X1/X10 button: You can change the parameters by using the + and - buttons in small increments when in X1 mode. In X10 mode, the parameters can be changed in larger increments.



TEMPERATURES

BARREL TEMPERATURE: The current and the set temperatures of the barrel in Celsius. It is suggested to set for plastic's processing temperature.

MOLD TEMPERATURE: The current and the set temperatures of the mold in Celsius. The mold can be kept at about 50C at room temperature by using the existing variable speed fan system.

MINIMUM TEMPERATURE: If the barrel temperature drops below this minimum temperature, it will wait to reach that temperature before running. It should be set at least higher than the material's melt temperature.

INJECTION PRESSURE and CLAMP FORCE

INJECTION PRESSURE: The current and the set pressures applied to the plastic inside the barrel in BAR. It is suggested to follow plastic's prospectus.

HOLD PRESSURE: The current and the set holding pressures applied to the plastic inside the barrel in BAR. The rest of the part will be injected (packed) to complete the final details at this pressure.

CLAMP FORCE: The current and set clamp force in Kgs are applied to the mold when fully clamped.

TIMES

HOLDING TIME: The time in msec set to keep the mold at the holding pressure. In the end, the nozzle valve closes.

COOLING TIME: The time in msec set to keep the plastic in the mold after the nozzle valve is closed. After this, the homing stage starts.

CLAMP TIME: The machine clamp mechanism moves towards the mold at a certain speed then switches to a slower speed when it gets about 1/8 inches to the mold to complete the clamping at that slow speed. The clamp time is the travel time in milliseconds of the clamp side at a faster speed. Depending on the clamp switch position and the mold thickness, the clamp time needs to be adjusted for a proper clamping procedure. If it is too high, the clamping occurs at a fast speed and may not be accurate. If it is too low, the clamping travel takes too much time since it moves at a slow speed, too long to reach the mold and the cycle may be aborted.

PART CHARACTERISTICS

CUT-OFF AMOUNT: The amount in cu-cm that the machine closes that valve and stops injection. It can be used as a safety measure. Typically, it can be 1.5 times the part volume.

FIRST STAGE: The initial stage of the injection process. APSX recommends this number be set at 40% of the total part volume. For example, if your total part volume, including the sprue, is 10cu-cm, then set the first stage to 4cu-cm.

VALVE FIRST POSITION: The machine opens the nozzle valve for the first position when both the clamping and the set injection pressure are completed and achieved. It controls the angle of the nozzle pin - 200 max value means 90 degrees (fully) open.

VALVE SECOND POSITION: The nozzle valve switches to the second position when the first stage amount is reached. At that moment, the injection pressure switches to holding pressure and stays there until holding time is expired.

HOPPER MULTIPLIER: Increase the hopper multiplier value if the barrel is not filled enough after each cycle. If the discharge hole on the barrel discharges too much plastic out, decrease the hopper multiplier value.

HOPPER SPEED: It controls how fast the hopper motor turns. You can adjust this when you use different types of plastics until you get a good fill rate.

STATUS INDICATORS

The checkboxes at the bottom of the screen indicate when the switches are on or off. USB status is also shown as “CONNECTED”. Tablet PC battery level is also shown.

Purging the Barrel

Warning: USE PERSONAL PROTECTIVE EQUIPMENT BEFORE PURGING.

SAFETY: PRESSURIZED HEATED PLASTIC CAN CAUSE SEVERE BURNS. THE NOZZLE VALVE SHOULD BE OPEN AT ALL TIMES DURING PURGING TO PREVENT SPLATTERING.

If you switch to a different plastic material to process a different part, the purging process may be required.

If all motor movements are verified ok in manual-operation state, you can perform the purging process. Ideally, use a purging material, natural HDPE plastic pellets, or an equivalent product. Repeat the purging process 3-5 times with manual controls until all the old material is removed from the barrel.

- Remove the mold and have the nozzle plate area clean
- Load the hopper with purging material and run the hopper until the barrel is fully primed
- Set the HEAT on and wait until a minimum of 200 C or until you've reached the specific melting point of your plastic.
- Set the holding pressure at a low pressure, i.e., 50 - Open the valve.
- Take your safety measures with goggles and have the mold gate closed
- Use the HOLD PRESSURE button to start the purging process. Increase the pressure if necessary.
- Once the plunger has pressed all the way into the barrel, press HOME INJECTION
- Repeat this process multiple times until the discharged material is visually the same as the purging material

Plastic Material Tips

Plastic materials have specifications listed by the manufacturers.

Some of them are critical to know before making plastic parts with the APSX-PIM injection molding machine.

Physical Properties
Melt Flow Rate (MFR) based on the ASTM D1238 (230C/2.16kg) test procedure in grams / 10 minutes: APSX-PIM likes to have a material with an MFR higher than 15. The higher it is, the better.

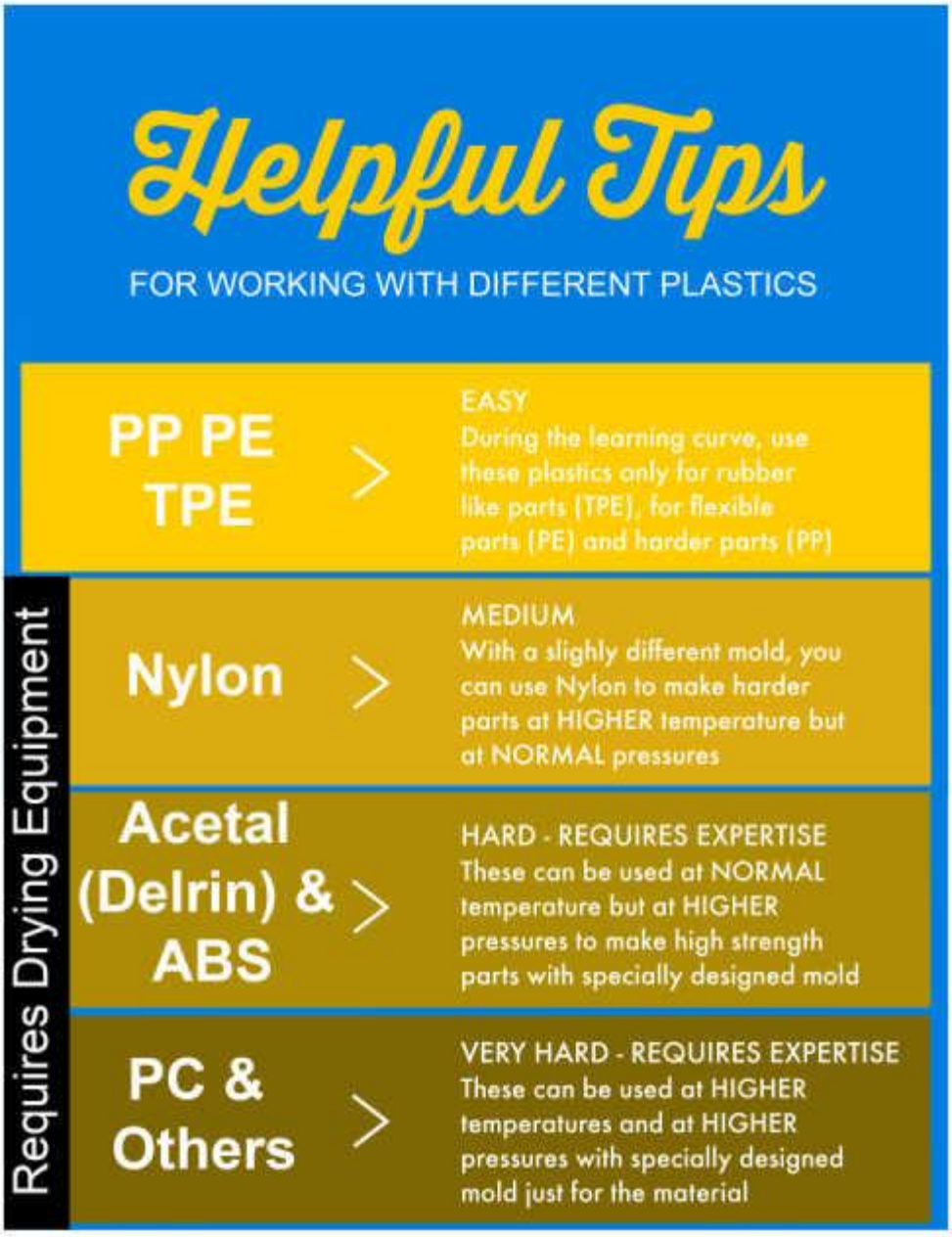
Injection Properties
Drying temperature and drying time: Some materials require a "drying" procedure before using them. Otherwise, the injection process will not produce quality parts due to the humidity content inside the plastic. You can use a small oven to perform this process.

Processing Temperature: There is always a temperature range for processing the plastic material. That range should not exceed 310 Celsius since there is a max limit for the APSX-PIM barrel temperature. 99% of the plastic materials for the injection molding process are within this range. There are some exotic materials similar to Peek or Ultem with processing temperatures close to 400 Celsius.

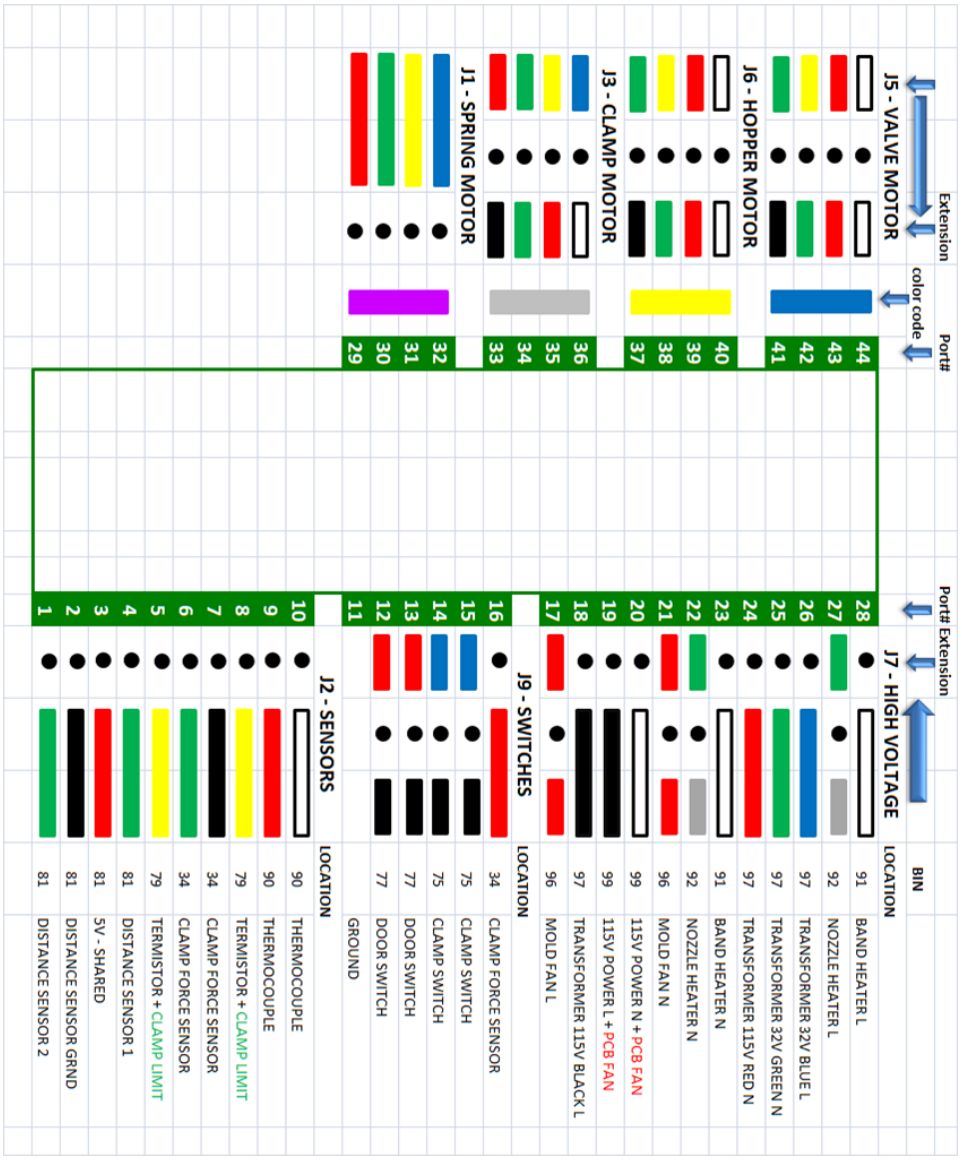
Specific Applications
You should be good to use Polypropylene (PP) most of the time. If you need an ABS like material, you can try glass filled Polypropylene (PP-GF). ABS needs "drying", but PP does not, and PP is the most user friendly plastic to use. HDPE, TPE and TPO are also other user friendly choices.

Thin walls: You may want to go with a high flow material such as Nylon.

Strength: If you want to replace some metal parts in your application and need a strong plastic, you may want to go with a high strength material such as Delrin (Acetal). If you need a clear appearance, you can try Polycarbonate (PC), but chemical resistance would be an issue.


Helpful Tips
FOR WORKING WITH DIFFERENT PLASTICS
PP PE TPE
EASY
During the learning curve, use these plastics only for rubber like parts (TPE), for flexible parts (PE) and harder parts (PP)
Requires Drying Equipment
Nylon
MEDIUM
With a slighly different mold, you can use Nylon to make harder parts at HIGHER temperature but at NORMAL pressures
Acetal (Delrin) & ABS
HARD - REQUIRES EXPERTISE
These can be used at NORMAL temperature but at HIGHER pressures to make high strength parts with specially designed mold
PC & Others
VERY HARD - REQUIRES EXPERTISE
These can be used at HIGHER temperatures and at HIGHER pressures with specially designed mold just for the material

Wiring Diagram



Machine Specs

	SAE	Metric
Piston Dia [in / cm]	1	2.54
Injection Volume [cu-in / cu-cm]	1.83	30
Injection Pressure [PSI / BAR]	5000	345
Clamping Force [lbs / tons]	11023	5
Opening Stroke w/ & w/o Ejector Plate [in / cm]	5.5-7.0	13.97-17.78
Max Processing temp [F / C]	600	315
Weight [lbs / kgs]	250	113
Standard Mold Size [in / cm]	4.8" (W) X 6.0" (H)	12.19cm (W) X 15.24cm (H)
Machine Dimensions [in / cm]	43" (L) X 10" (W) X 15" (H)	109cm (L) X 25.4cm (W) X 38cm (H)
Shipping Crate Dimensions [in / cm]	48" (L) X 16" (W) X 19" (H)	122cm (L) X 40.6cm (W) X 48.3cm (H
Steel Bar Frame Diameter [in / cm]	1	2.54
Tie Bar Top Clearance [in / cm]	5	12.7
Min Power Supply [V]	115	
Heating Power [W]	1250	
Plastic Materials for Injection	Polycarbonate (PC), Acetal (Delrin), ABS, PC/ABS, Nylon (PA6), Polypropylene (PP), Polystyrene (PS), Polyethylene (PE), Thermoplastic Polyolefin (TPO)	
Warranty	1 year	

Troubleshooting

Suggested Actions (Try in order recommended) / Problem Areas	Increase Injection Pressure	Descrease Injection Pressure	Increase Fill Speed	Decrease Fill Speed	Increase Barrel Temperature	Decrease Barrel Temperature	Increase Mold Temperature	Decrease Mold Temperature	Increase Nozzle Temperature	Decrease Nozzle Temperature	Decrease Cycle Time	Increase Cycle Time	Increase Size of Gate	Enlarge Vents	Change Gate Location	Increase Clamp Force	Repair/Modify Mold	Purge or Clean the Barrel	Increase Pellet Drying Time	Use a Low Viscosity (high MFR) Plastic
Drooling						2				1				3						
Short Shots	1		2		3		4						6	5						7
Sinks	1			2	4	5		3				7	6							
Voids in Part	1			2	3	4							5	6						7
Flash		2		3				4								1	5			
Burn Spots on Part				2				1					4	3	5					
Black Specks				4	1	3												2		
Poor Weld Lines	1		2		3		4						5		6					7
Parts Stick in Mold		1		2								3								
Warpage	2		3	4				5				1			6					
Sprue Sticking									2		1						3			
Flow Lines	2		1				5								4		3			
Dull/Gloss Surface	2						1						4				3			
Brittleness						1	4				2								3	
Bubbles	5					3	4							1					2	

Support

As with all APSX products, APSX-PIM desktop injection machines are backed by our technical support team to ensure your satisfaction. We support your machine via email, scheduled video calls, phone support, and with our extensive online resources, so you can be 100% sure that when you choose APSX, you've made a perfect selection.

Video conference assisted help is available via calendar scheduling
1 year email support between 10AM-3PM EST.

SPARE PARTS

100% in stock for crucial parts, APSX-PIM is designed with ease of maintenance in mind. Spare parts are in stock at our Cincinnati location. All critical part orders are shipped on the same day. The machine is designed with simplicity in mind, so it is nearly maintenance free.

LIMITED WARRANTY

12 months REPAIR OR REPLACEMENT warranty condition also applies to returned machines for inspection or repair. The manufacturer's liability shall be limited to repairing, replacing parts or components at the discretion of the manufacturer. Direct sales and video/phone support are part of the equation that allows us to provide high value at a low cost. Once we determine the problem remotely via video conference, we can resolve it with a replacement part with video instructions. You must be comfortable with general electric and mechanical repair concepts, including the appropriate safety procedures, before working on your machine. If you do not have the required skills, you will need to find someone locally to assist you. Components subject to wear during normal use and over time, such as metal surfaces, labels or decals, finish and condition, seals, safety gates, cabling, electric motor shafts, heaters, etc., are excluded from this warranty. Warranty of general machine tolerances is void if the machine is taken out of the crate without following the lifting directions below, disassembled, or altered by the customer. The manufacturer is not responsible for any damage to parts, machines, business premises, or other property of the buyer or for any other incidental or consequential damages that may be caused by a malfunction of the machine or its components.

APSX LLC Terms can be found here: https://apsx.com/terms

Suggested Tools

Kill-A-Watt

Kill-A-Watt meter monitors the power consumption during the machine operation to ensure all the power consuming parts are in good working condition.

The LCD screen shows all meter readings: Volts, Current, Watts, Frequency and Power. Press the Watt/VA key once. Watts will be displayed as the active power.

Connect the Kill-A-Watt to 120V power and then to the APSX-PIM power cord.

15/16" Wrench

Use it for turning the clamp or spring ballbearings/washers manually from the sides. Simply attach the wrench to the nut on the sides next to Block 1 or Block

7, then turn manually when the machine is not powered. The ball bearings/washers should spin against Blocks 1 and 7 freely, with a little friction by the turn of your hand. If there is no friction, or they do not spin at all, then adjust accordingly.

7/16", ½", ¾" Wrenches
Use 7/16" wrench for the bolts on the hopper motor mounts. Use 1/2" wrench for the bolts on the mold clamps. Use 3/4" wrench for the bolts on Blocks 1 and 7 that hold the 1" steel shafts in place.

3/16", ¼" and M4 Hex Keys
Use 3/16" hex key for the bolts on the shaft collars, clamp switch collar, hopper weldment to the barrel, mold fan plates, mold gates. Use 1/4" hex key for the bolts on the motor mounts to blocks and the electronic cover.

Maintenance

Due to the friction of moving parts on your machine, periodically, we recommend visual inspection and lubrication of the following areas:

-Approximately every 500 hours of run time or at your best discretion-

-Apply synthetic 10W-30 oil on all areas where block bushings slide on the metal shafts, Blocks 2, 3, 5, and 6. (Use a thin even coating on metal shafts)

-Apply synthetic grease or generic chain lube to lubricate spring, clamp, and valve motor chains.

-Apply synthetic grease to ball screws on Blocks 6 and 2.