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Servo Cartridge Pump

Owner's Manual

Revision A

Precision Valve & Automation
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1. Introduction

Before you operate this system, read the operation and setup manual. This will help you to become familiar with the product and ensure successful operation.

If any questions or problems arise, contact PVA's Technical Support department.

1.1 PVA Contact Information

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1.2 Document History

Revision	Revision Date	Reason for Changes
REV A	May 2021	Initial Release

Note: All photographs and CAD model representations in this document are a "general representation" of the system and its components. The actual appearance of the system and its components can differ based upon customer specific configuration.

1.3 Safety

Certain warning symbols are affixed to the machine and correspond to notations in this manual. Before operating the system, identify these warning labels and read the notices described below. Not all labels may be used on any specific system.



Always wear approved safety glasses when you operate or work near the workcell.



Before you operate the system, read and understand the manuals provided with the unit.



Never put hands or tools in areas with this symbol when the machine is in operation. A dangerous condition may exist.



Read and understand the manuals provided with the unit before any repairs or maintenance is done. Only a qualified individual should do service.



Use caution when there are pressurized vessels. Find and repair any leaks immediately. Always wear appropriate safety equipment when you work with pressurized vessels or vessels that contain chemicals.



Shear hazard from moving parts. Avoid contact.



Do not remove protective guarding.



In situations where inattention could cause either personal injury or damage to equipment, a warning notice is used.



Do not smoke near the machine. Always have a fire extinguisher available for emergency use.



Before performing any repairs or maintenance to the system, turn off power and lock out the power disconnect switch.



Warning notices are used to emphasize that hazardous voltages, current, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use. Only qualified personnel should enter areas designated with this symbol.



Laser light source present. Do not stare directly into the beam. Do not use in the presence of highly reflective surfaces.



Pinch hazard from moving parts. Avoid contact.



Hot surface. Avoid contact.



Warning, Ultraviolet (UV) light hazard. Do not look directly at the UV light source.



This product meets EU standards for health, safety, and environmental protection.



Warning, no open flames.



Electrostatic sensitive device warning. Observe precautions for handling.

1.4 Theory of Operation

The SCTP Servo Cartridge Pump operates by metering material directly from disposable plastic cartridges via a linear drive. There are no moving components or seals to wear, providing a low maintenance solution. Configurations are available for both 20 & 32 oz SEMCO® cartridges.

The SCTP can be used in single component or two component meter-mix applications.

Via a menu driven HMI, the closed loop servo drives enable programming of the following functions:

- Shot Size
- Mix Ratio
- Flow Rate
- Pressure Control
- Auto Purge
- Optional Color Sensors
- Low Level Detection

The machine uses two rams to mechanically extrude material directly from the original plastic cartridges. The rams are operated by the servo motors with closed loop controls provided by the PVA workcell.

The operator must load and unload the cartridges into the system. PVA Portal software is used to control the machine.

1.5 Guidelines

This manual shows how to correctly operate the SCTP with the Endurance metering system. This manual does not replace the manual for your PVA workcell.

- Follow material manufacturer's recommendations.
- Make sure material was/is stored correctly.
- Make sure material is not expired.
- Relieve system pressure when the machine is not in use.
- Follow all instructions in this manual.

1.6 Description of Major Components

This table lists the major SCTP components.

Component	Description
Cartridge Retainer	The cartridge retainer holds the cartridge in position and supports the cartridge while under pressure.
Ram	The ram pushes against the plunger inside the cartridge and extrudes the material out of the cartridge nozzle.
Servo Motor	The motors are connected to gearboxes and control the speed and direction of the ram.
Purge Valve	A manual ball valve for the purpose of purging air or relieving pressure.
Locking Lever	A handle used to secure the canister and lock the retainer in the dispense position.
Pressure Transducer	Reads material pressure.

Figure 1: Overview of SCTP Servo Cartridge Pump Components

For an example of the major SCTP components, refer to the figure below.

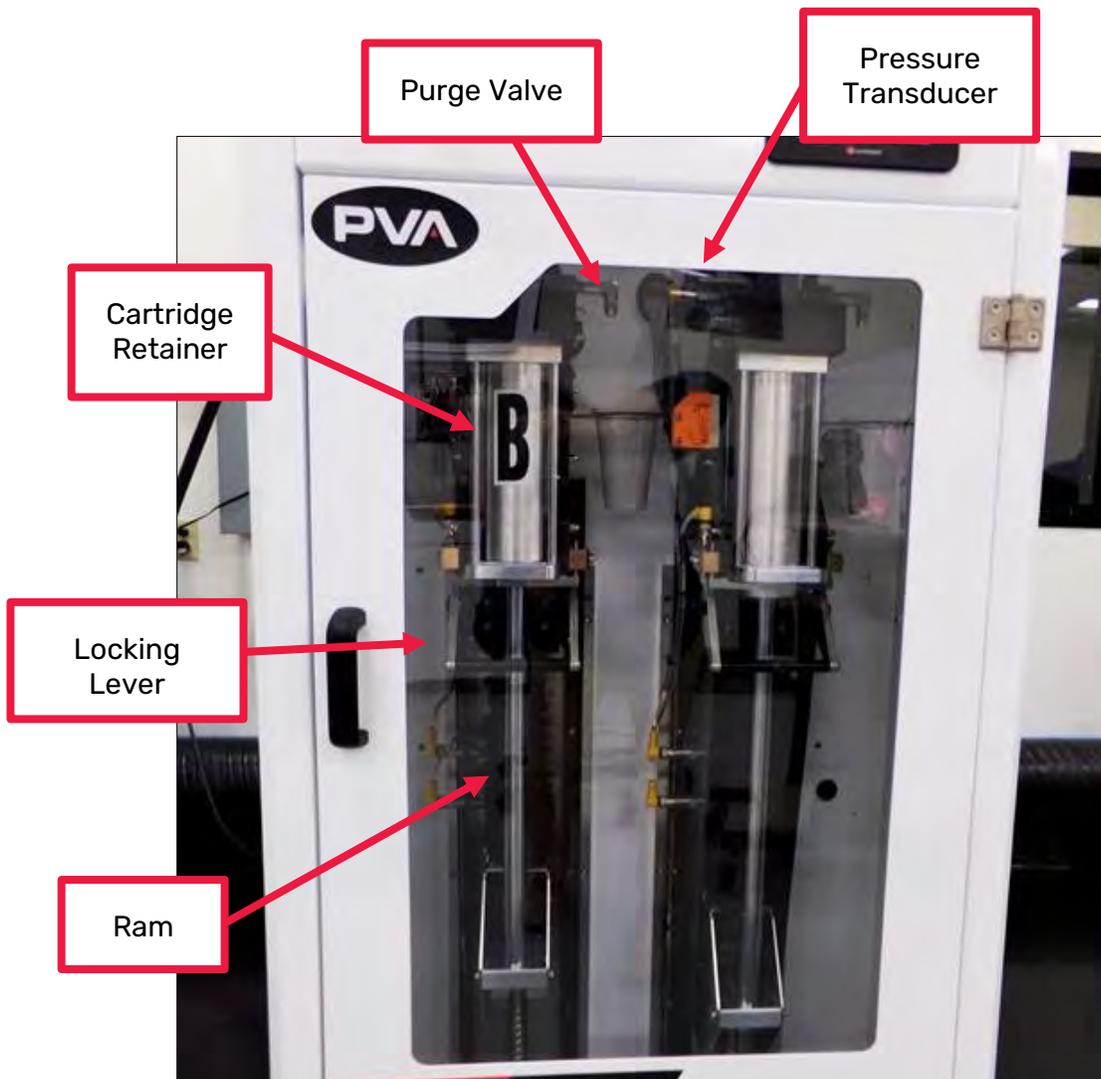


Figure 2: Endurance Machine with Servo Cartridge Pump Configuration

1.7 Personal Protective Equipment

Operators must use eye protection because material contents are under pressure. Always wear gloves when handling materials and solvents. Refer to Material Safety Data Sheet (MSDS) sheets on the material being dispensed for other precautions.

1.8 Waste Disposal

Dispose of all used parts and materials in accordance with local laws and regulations.

2. Setup

Before you operate the pump, know the pump components. Do the steps as instructed.

2.1 System Requirements

While the Endurance does not need to interface with a PVA workcell, this manual outlines the correct use of the Endurance (equipped with SCTP) with a PVA Workcell.

Make Sure:

- All motor cables/sensor cables/communications are correctly connected from the PVA workcell to the machine. Refer to the workcell schematics.
- All hoses, fittings, and valves are connected and tight. Refer to the PVA workcell schematics for the correct plumbing layout.
- PVA workcell is powered up and supplied with the machine air pressure.

WARNING! Become familiar with and test all functionality of the machine before you load any cartridges of material into the machine.



Figure 3: Airline Hookup and Electrical Hookup

2.2 Machine Safety Features

The machine enclosure includes additional safety features including magnetic interlocks. To operate the system or to change modes, the enclosure door **must be closed**. The purge cups and valves can be monitored through the view window on the front of the machine.

Each cartridge retainer has a locking lever and a sensor to make sure the cartridge is correctly locked in place before the ram engages. To prevent the mismatch of material components, optional color sensors indicate when the correct cartridge is loaded.

WARNING: Do not attempt to bypass these safety features!



Figure 4: Machine with Rams in Home Position

3. Pre-Run Checks

Most machine failures, down time, and injuries can be prevented by performing the following pre-run checks:

1. Visually check the PVA workcell and the SCTP to make sure:
 - There are no frayed/kinked wires or hoses.
 - All wires and hose connections are tightly attached.
 - There are no obstacles that interfere with the servo motors, rams, and X, Y, Z motion in the PVA workcell.
2. Make sure that all doors and all electrical cabinets are closed correctly.
3. Make sure the correct air pressure is supplied to the system. Preload pressure is maintained in the **Idle** mode.

NOTE: Failure to correctly supply air will cause system failure and possible damage.

4. Make sure the tension for the dispense hoses that go from the machine to the valve is correct. Insufficient slack in the dispense hoses will damage the machine or workcell.
5. Always engage the red **Emergency Stop** button on the front of the workcell before you start the machine.

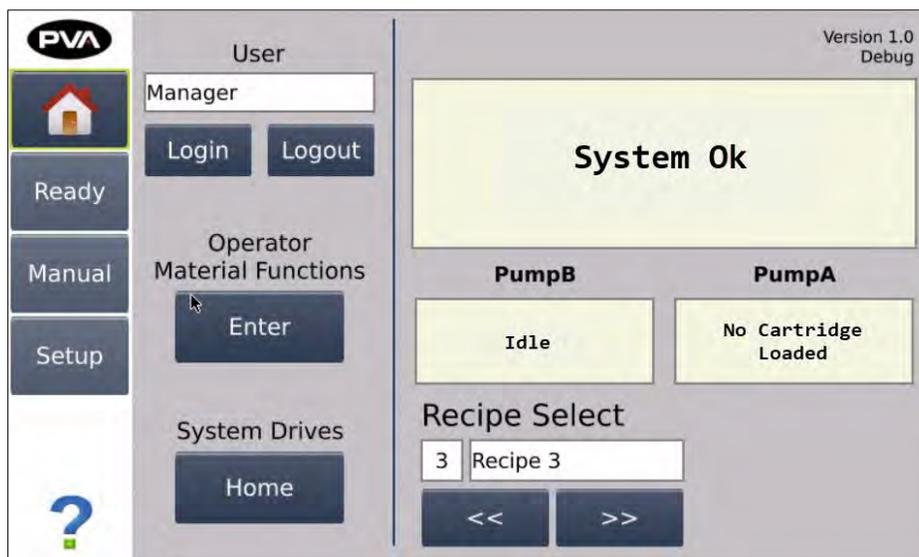


Figure 5: Perform Pre-Run Checks

4. Operation Instructions

The following sections describe the basic operating instructions for the SCTP.

4.1 Summary of Manual Cartridge Functions

From the **Materials** tab, the following summary lists the cartridge functions available in the **Manual** mode:

Unload: This function lowers the ram to the home position so that cartridges can be loaded/unloaded.

Load: After manually loading a new (full) cartridge of material into the machine, this function moves the ram to the start position.

Bleed: This function allows the ram to bleed any air out of the cartridge nozzle. The ball valve should be open and purge cup should be at the outlet of the ball valve. After installing a new cartridge, the ram advances and purges entrapped air.

When bleeding, it is **very important** to make sure that the valve is open.

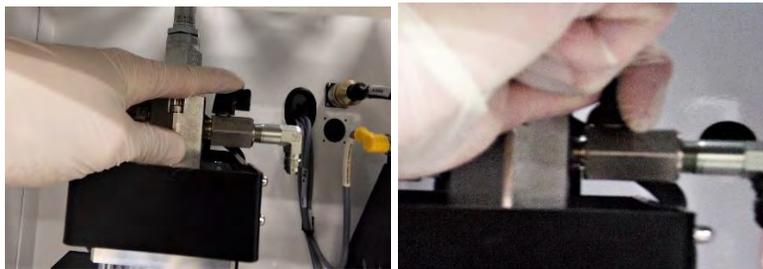


Figure 6: Open Valve (Left) and Closed Valve (Right)

For information on additional functions, refer to the Endurance manual.

4.2 How to Unload a Cartridge

All cartridge procedures can be done to one pump or to both pumps at the same time. If the rams are raised, use the unload procedure to lower the rams so that a new cartridge can be installed. For identification purposes, some manufacturers color-code their material cartridges.

To lower the ram or unload an empty cartridge:

1. Select **Manual** mode.
2. Select the **Material** button.
3. Select a **Cartridge** to unload for the correct pump.

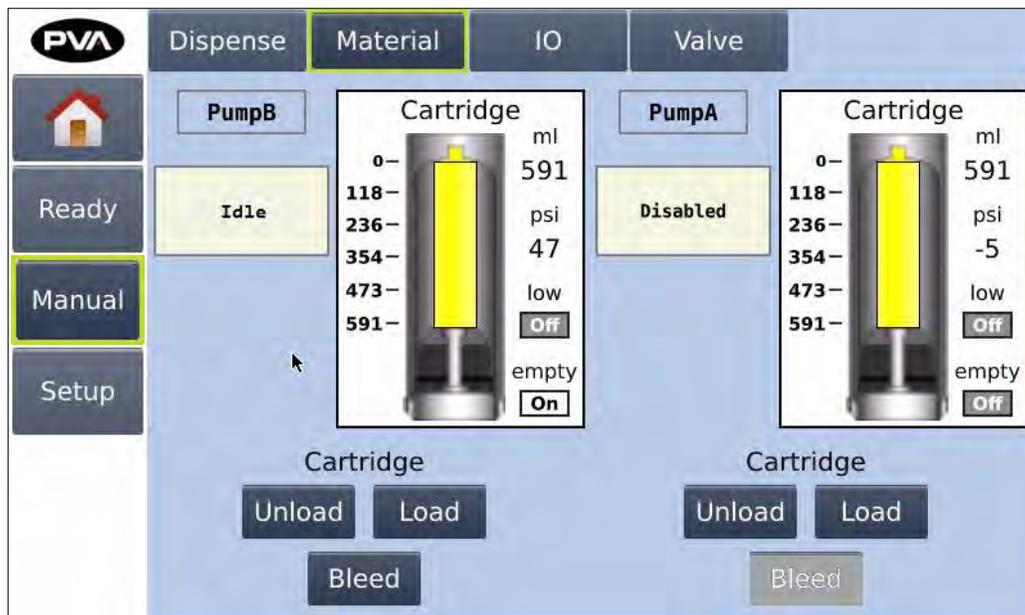


Figure 7: Manual Mode Screen

4. Select the **Unload** button.

The screen will show a wait message and the servo motor will move the ram to the home position.

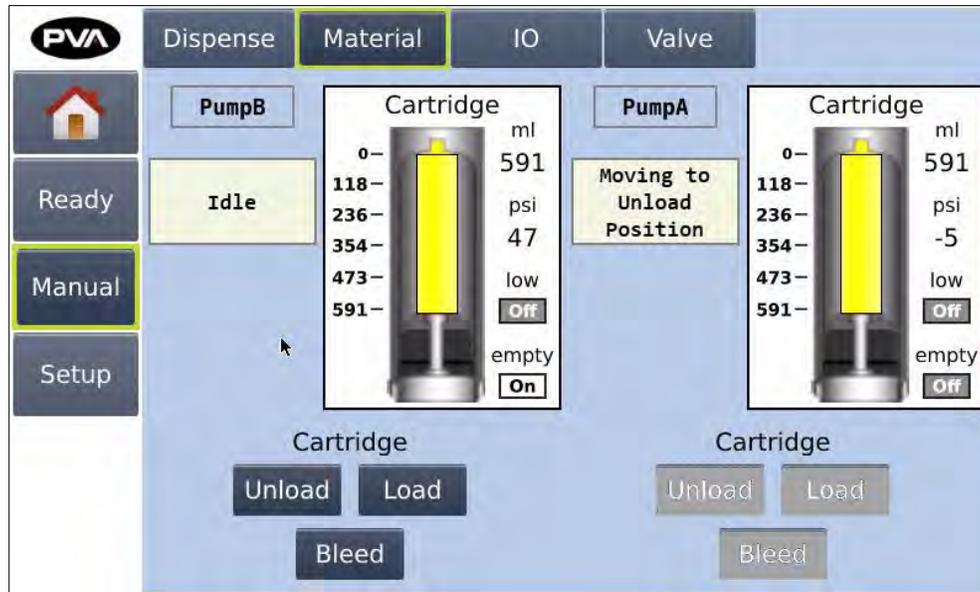


Figure 8: Unloading Message

5. When the servo motor stops and the ram is in the home position, open the enclosure door and lower the cartridge retainer locking lever.



Figure 9: Releasing a Cartridge

6. Remove and discard the old cartridge.



Figure 10: Removing a Cartridge

Continue to next section for instructions on how to load a new cartridge.

4.3 How to Load a Cartridge

To load a new or a partially used cartridge in the empty cartridge retainer:

1. Examine the new cartridge label to verify that it contains the correct material.
2. Make sure the cartridge is clean and has no defects.
3. Remove the plastic cap on the large end of the cartridge and the plug on the end of the cartridge.
4. Save the nozzle plug to seal the cartridge again if necessary.



Figure 11: Remove Plug from New Cartridge

5. Push on the bottom of the cartridge until the material comes up into the nozzle as shown below. This prevents introducing air into the material lines.



Figure 12: Prepare Cartridge for Loading

6. Periodically make sure there is an O-ring installed on the metal feed tube and that the O-ring is not worn.
 - Leaked material on the outside of the canister indicates the O-ring has failed.
 - Depending on the application, it is recommended that soft seals be replaced every three (3) months. Refer to the How to Replace an O-ring section for instructions on how to replace an O-ring.

Note: Soft seals are not under warranty.

7. Insert the new cartridge into the cartridge retainer.
 - Make sure that the cartridge is installed in the correct servo cartridge pump (i.e. Component A is installed in Pump A).
8. Swing the retainer closed and lock the cartridge retainer locking lever. Ensure that the retainer is firmly locked in place and cannot move.
 - If the sensor detects that the retainer is not closed, an error message will be displayed: **MATERIAL CARTRIDGE ERROR – CARTRIDGE UNLOCKED**.
 - To continue, readjust the locking lever and clear the error.

4.4 How to Bleed the Cartridge System

To maintain correct mixing, all air must be correctly bled from the system. Failure to purge air bubbles may cause cartridge failure. This function allows the ram to bleed any air out of the cartridge nozzle.

On initial startup or wetdown of a system, material must be dispensed through the hoses, valves, and manifolds of the cartridge system, as follows:

In Continuous mode, select the **Dispense** button:

- Start at a low flow rate and press until material purges from the valve.
- Once there is material in the hoses, this procedure does not need to be repeated.

4.4.1 To Bleed the System

1. Open the enclosure door and manually open the ball valve for the correct pump.
 - Make sure the purge cup is correctly positioned at the outlet of the ball valve.
 - While the ball valve is open, the ram will advance.



Figure 13: Opening the Ball Valve

2. Close the door.
3. Clear the door fault message.
4. Select **Manual** mode.
5. Select the **Material** button.
6. Press the **Bleed** button until material is dispensed into the purge cup.



Figure 14: Bleeding the Valve

7. After the bleed is complete, open the enclosure door and close the ball valve.
8. Close the door and clear the door fault message.

Repeat the steps above for both pumps, as needed.

9. From the **Setup** menu:
 - Set the rate (mL/min) for each pump (A and B).
 - For modifications to the K-factor (calibration offset), contact Customer Service.
 - Process PSI (min/max) – if out of range, an error message will be displayed.
10. Select the **Ready** button.

4.5 Preload Pressure

This function increases the pressure in the machine to the operating process pressure. Refer to the Endurance manual for more information on this function.

- The preload pressure is adjustable. Refer to the Preload Pressure Adjustment section of this manual.

4.6 Depressurization

When the machine is not in use it is necessary to relieve the pressure. If left under pressure while not dispensing, thermal materials tend to separate, resulting in clogging or non-uniform dispense. If the machine is idle for longer than a few hours, relieve the pressure on the system in either of the following ways:

- Send ram position to the **Refill** position.
- Engage the **Emergency Stop**. Open door and keep the purge valve open until pressure is drained. Close purge valve.

Note: Put a night cap on the valve when not in use.

5. Pump Settings

Pump rates and preload pressure settings can be adjusted based on the material to be dispensed. More information on these options can be found in the Endurance manual under the Setup page.

5.1 Pump Rate Adjustment

To adjust the Pump Rate:

1. Select the **Setup** tab.
2. Select the desired **Recipe** from the list.
3. Select the button for **Pump B** or **Pump A**.
4. Adjust the pump **Dispense Rate** depending on the mix-ratio of the materials, as necessary.
5. Select the **Stop** button to exit Setup mode and save the new values in the system's memory.

5.2 Preload Pressure Adjustment

To adjust the Preload Pressure:

1. Select the **Setup** tab.
2. Select the desired **Recipe** from the list.
3. Select the button for **Pump B** or **Pump A**.
4. Select the **Preload** tab.
5. Adjust the Process PSI, as necessary.
6. Press the **Stop** button to exit Setup mode and save the new values in the system's memory.

6. Maintenance

This section contains general information on scheduling maintenance, O-ring replacement, plumbing schematics and spare parts and accessories.

General Maintenance Schedule

Interval	Action
Daily	<ul style="list-style-type: none"> • Examine and clean the cartridge connections, purge ports, and two-part dispense valve nozzle. • Make sure the mix ratio, flow rate, and the volume of component A and B materials are correct. • Examine the motor cables and material supply hoses for signs of wear, kinks or twists. • Examine O-ring for signs of wear.
3-Months	<ul style="list-style-type: none"> • Replace O-ring, as necessary.

6.1 How to Replace an O-ring

Depending on the application, it is recommended that soft seals be replaced every three (3) months. To replace an O-ring:

1. Using a 4 mm hex key, unscrew the two (2) pressure transducer screws.



Figure 15: Unscrew Transducer Screws

2. Use an O-ring pick to remove the old O-ring.



Figure 16: Removing the O-ring

3. Use an O-ring pick to replace the O-ring (**Part Number #VLV-013V**).



Figure 17: Replacing the O-ring

7. Plumbing Schematic

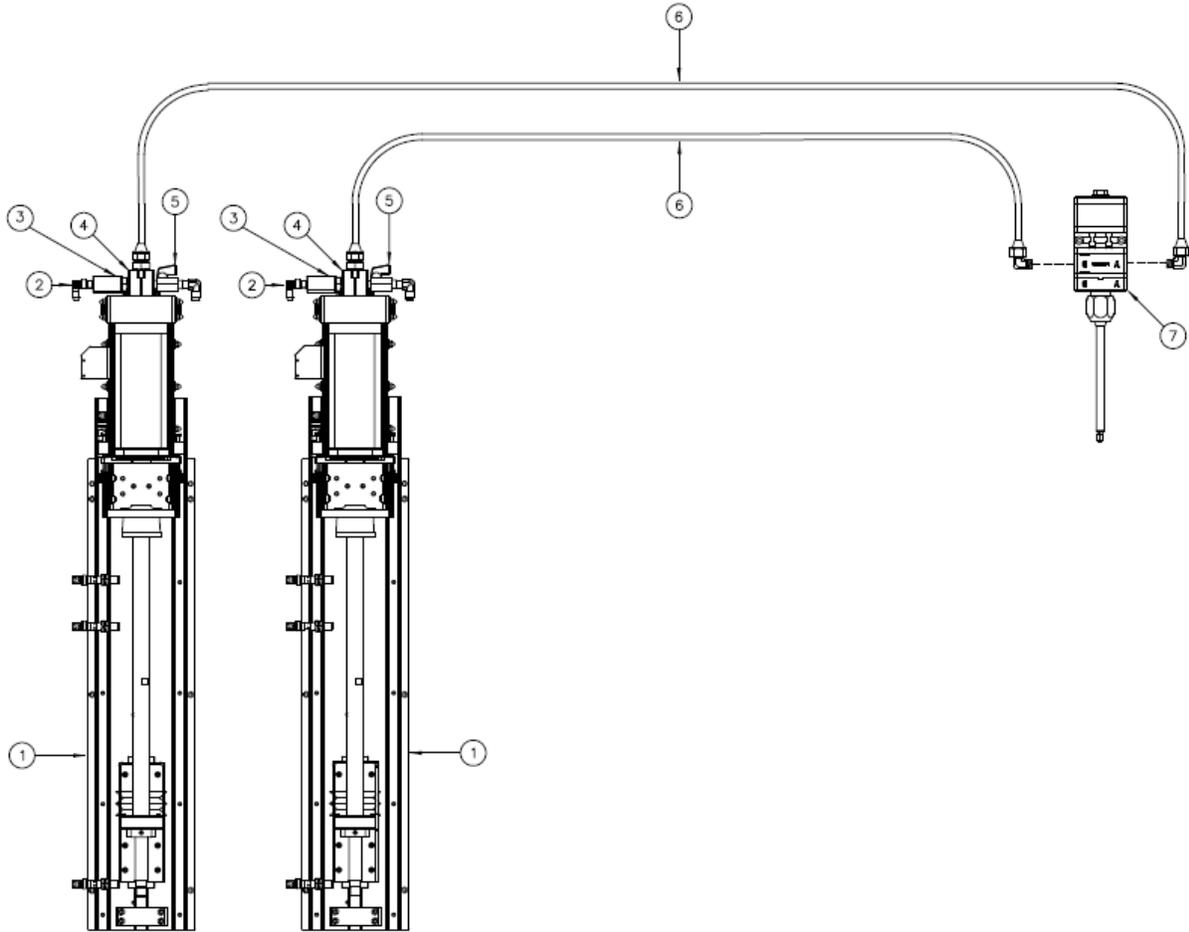


Figure 18: Machine Plumbing Schematic

1	SERVO CARTRIDGE PUMP
2	TRANSDUCER CABLE
3	PRESSURE TRANSDUCER 0-500 PSI
4	BLEED VALVE AND PURGE POSITION
5	BALL VALVE AND PURGE POSITION
6	HOSE
7	DISPENSE VALVE

8. Spare Parts and Accessories

PVA recommends having the following parts on hand for quick replacement.

Description	Part number	Notes
Cartridge sealing O-ring	VLV-013V	
Coupling P/N	612-10861-2	Comes with machine Not a common replacement part.

Figure 19: Spare Parts List

Contact PVA for information on replacement parts or to place an order.

9. Technical Specifications

Description	Part Number	Notes
Shot Volume	<i>Single Component:</i> Minimum: 0.5 ml Maximum: 946 ml <i>Dual Component:</i> Minimum: 1.0 ml Maximum: 1892 ml	
Flow Rate	<i>Single Component:</i> Minimum: 0.1 ml/min Maximum: 300 ml/min <i>Dual Component:</i> Minimum: 1.2 ml/min Maximum: 600 ml/min	
Two-Component Mix Ratio	1:1 – 10:1	
Maximum Pressure	450 psi	

Note: Maximum Dual Component Shot Volume and Maximum Dual Component Flow Rate is dependent on material mix ratio.

10. Troubleshooting

If dispense output is off ratio:

Check that correct desired flow rates are entered into the Endurance HMI.

- Confirm that both pumps are enabled.
- Verify that air is not trapped in the lines.
- Verify that the valve is not clogged or backed up.
- If the problem persists, contact PVA Customer Service.

If recurring over pressure faults occur:

- Confirm that the over pressure ranges set are reasonable.
- Some highly viscous fluids create significant back pressure when flowing. If necessary, reduce rates to keep pressure within operable range.

11. Drawings

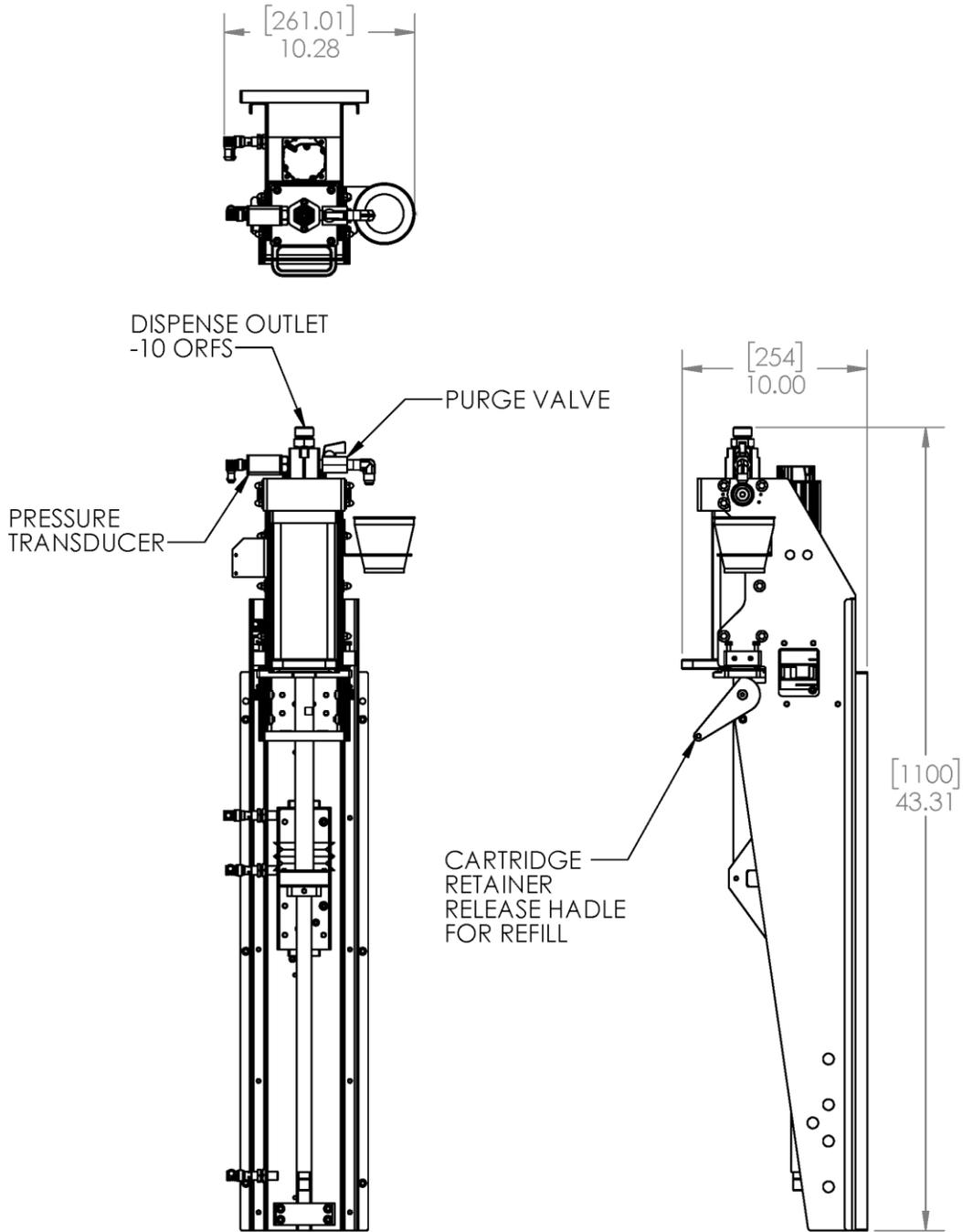


Figure 20: Servo Cartridge Pump Dimensions



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14. PVA Warranty Policy

PVA warrants the enclosed product against defects in material or workmanship on all components for one year from the date of shipment.

The warranty does not extend to components damaged due to misuse, negligence, or installation and operation that are not in accordance with the recommended factory instructions. Unauthorized repair or modification of the enclosed product, and/or the use of spare parts not directly obtained from PVA (or from factory authorized dealers) will void all warranties.

All PVA warranties extend only to the original purchaser. Third party warranty claims will not be honored at any time.

Prior to returning a product for a warranty claim, a return authorization must be obtained from PVA's Technical Support department. Authorization will be issued either via the telephone, facsimile, or in writing upon your request.

To qualify as a valid warranty claim, the defective product must be returned to the factory during the warranty period. Upon return, PVA will repair (or replace) all components found to be defective in material or workmanship.

(Retain this for your records)

Product Information:

PRODUCT: _____

SERIAL NUMBER: _____

DATE OF PURCHASE: _____