



MV250

POSITIVE DISPLACEMENT VALVE

Version: B12-3822

Operation Manual

Revision: A

January 2013



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Preface

MV250

Metering Valve, Positive Displacement Dispense Valve

Thank you for purchasing the MV250 dispensing valve from PVA. Before attempting to operate the MV250, we recommend that you take a few minutes and read the following operation and setup manual. This will assist in familiarizing you with the product and ensure a successful installation.

As always, if any questions or problems arise, do not hesitate to contact PVA's Valve Service Department for support. This department can be reached at PVA headquarters via telephone or e-mail.

Again, thank you for your purchase, and we look forward to assisting you in the future as you continue to improve your dispensing processes.

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Theory of Operation

The MV250 is a rod displacement style metering valve designed to dispense small volumes of fluid with the highest degree of accuracy. This true positive displacement valve will dispense one small dot of fluid with each full cycle. Fluid volume is determined by the micrometer adjustment setting and cannot be affected by changes in fluid viscosity due to temperature or changes in fluid delivery pressure.

MV250 volumetric fluid displacement range:

(0.0001 cc – 0.012 cc)

The MV250 has a divorced design comprising of two major sections. These include:

- Air section (red anodized portion)
- Fluid section (stainless steel portion)

Air Section

The air section is an aluminum body with a simple piston/cylinder combination used to cycle the valve. A micrometer adjustment in the upper air body controls how far the piston and needle assembly can retract thus altering the volume of fluid that can be metered and dispensed during each cycle.

Fluid Section

The fluid section is a stainless steel body, which includes a needle, seat, and two integral check valves to make up the metering chamber. The metering chamber fills as the needle retracts away from the seat, then dispenses as the needle moves back toward the seat. Such fluids may include but are not limited to; solvents, epoxies, UV adhesives, silicones, RTV, grease, etc.

The outlet adapter of the MV250 is designed to fit PVA's Micro Dispense Nozzles.

Wetted parts on the MV250 include:

- 303, 304 stainless steel
- Teflon[®]
- Kalrez[®]

Safety

Due to material contents being under pressure eye protection is required for operators. Refer to MSDS sheets on material being dispensed for other precautions.

Setup

The MV250 requires a 2-position, 4-way air solenoid valve to actuate the air section. The valve should be operated with clean, dry air between 60-100psi. Two #10-32 threaded air ports are located on the air section of the valve. The port located closest to the mid-section of the valve is air actuating to fill the fluid chamber. The port located furthest from the mid-section of the valve is air actuating to dispense material. Quick connect air fittings are typically supplied with the MV250 to fit 5/32"od tubing. Note that the valve should be normally in the closed & dispensed position.

Fluid is supplied to the MV250 through the 1/8"npt port located on the stainless steel fluid section of the valve.

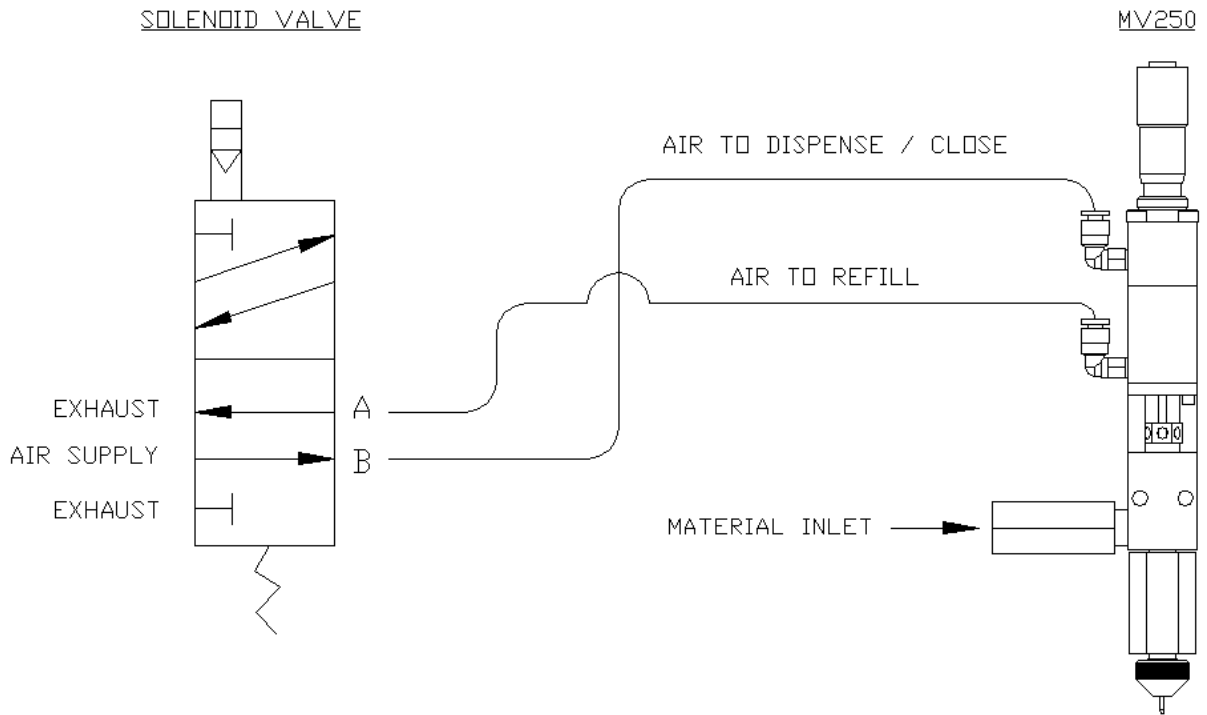


Figure 1: Solenoid Valve

Tool Kit

PVA offers standard tool kits for all dispensing valves. The tool kit for the MV250 is part number B12-1986, which includes all necessary tools and lubricating grease to perform maintenance on this dispense valve.

Figure 2: Tool Kit Contents

Qty	Part Number	Description
2	0266244	8" Adjustable Wrench
2	26563	3/32" Hex Key
1	26561	5/64" Hex Key
1	26559	1/16" Hex Key
1	5516A18	Tweezers
1	B62-0752	Mineral Oil Lubrication Kit, 2.5cc
1	B62-2048	Silicone Lubricant for O-ring, 2.5cc
1	9570K71	Hook and Pick Set
1	0266255	Pliers
2	53085A61	Soft Plastic Covers for Pliers
1	PB135/2	Screw Driver for Micrometer
1	PT17184	Micrometer Adjustment Wrench
1	MM115	Removable Thread Locker

Operation

Refer to assembly drawings 112-5826_2 and Figure: 3 for part reference numbers.

Air Section

- Plumb up the valve as outlined above in the Setup procedure.
- Regulate the air pressure operating the valve between 60-100psi.
- Making sure that the valve is not aimed toward anyone, cycle the valve several times.

Note: When the valve is cycling, the piston should be heard hitting the micrometer adjustment (10), and the needle (1) should be seen going up and down in the center.

If the valve is not cycling properly, refer to the Troubleshooting section.

Fluid Section

- When the fluid delivery system is connected to the valve, pressurize the material to be dispensed at 10 psi.
- To bleed the fluid section, use a 3/32" Hex key to loosen the set screw (19) of the bleed port located on the fluid section (7), being careful not to fully remove the screw.

Note: If fluid does not flow out of the bleed port, slowly increase material pressure until fluid and air bubbles are seen.

Note: Do not exceed 20psi for purging.

- Once material begins to flow steadily and all air bubbles have been bled, tighten the set screw (19) and wipe the valve clean.
- Open the stroke on the valve to full by turning the micrometer adjustment (10) counter clockwise until it reaches its furthest point, about #3 on the dial (D).
- If possible turn the valve vertical so the dispense tip is pointing up in the air. Note: Hold a cloth over the dispense tip to catch fluid flow from the tip.
- Cycle the valve several times until material begins to dispense from the nozzle. Continue to cycle the valve until all air bubbles cease to dispense from the tip and a steady flow of material can be seen with each shot.

Note: If material is dispensing properly, Skip the Additional Bleeding section

Additional Bleeding

Entrapped air inside the fluid section and outlet check valve housing of this metering valve will greatly reduce the repeatability of the dispense volumes or even prevent the valve from fully priming. Air bubbles trapped in this chamber will compress thus altering the amount of fluid that can pass the outlet check valve and dispense.

For additional bleeding, follow these steps:

- Remove fluid pressure from the valve.
- Apply air pressure to the air section of the valve to set the cylinder the in refill position, so the needle (1) is retracted from the seat (9).

- Using an adjustable wrench, unthread and remove the outlet check valve housing (8) from the fluid section (7).
- Holding the outlet check valve housing (8) upright with tip down, fill the well of this housing with the fluid that is being dispensed. (A compatible solvent can also be used)
- Keeping the outlet check valve housing (8) in the upright position, thread the assembly back onto the fluid section (7) and tighten with an adjustable wrench.
- Again pressurize the material to be dispensed between at about 10 psi.
- If possible turn the valve vertical so the dispense tip is pointing up in the air. Note: Hold a cloth over the dispense tip to catch fluid flow from the tip.
- Once again cycle the valve several times until the fluid can be seen dispensing from the tip with some force behind it.

Setting Dispense Volume

- Once all air is eliminated from the metering chamber, the micrometer adjustment (10) can be used to set a specific shot volume to be dispensed each cycle.
- Turning the micrometer adjustment (10) clockwise will decrease the volume of material in each shot, and turning it counter-clockwise will increase the volume of material in each shot.

Note: If the micrometer adjustment is turned all the way down it will not allow fluid to be dispensed.

- Once the micrometer adjustment (10) setting is determined, the collar (E) can be turned clockwise to lock the setting in place.

Note: Refer to Troubleshooting section for any problems.

Periodic Maintenance

Refer to the MV250 cross sectional view for location of parts referenced in the following procedures.

- Lubricate the packing (5) and o-ring (24) on the MV250 valve every ~200 hrs by placing a few drops of mineral oil or other light oil inside the packing nut (4).

Note: PVA offers a 2.5cc mineral oil lubrication kit; Part#: B62-0752.

- The packing nut (4) may require occasional tightening, as wear occurs in order to prevent leaks through the packing.

Routine Cleaning and Disassembly

Cleaning and rebuilding the valve will be required from time to time. A spare parts kit, part # MV250-SP is available with all the normal wear parts included.

- Begin disassembly by removing air and fluid pressure from the valve.
- Remove all pneumatic tubing and fluid delivery fittings, hoses, etc. from the valve.

- Using the tip of a 3/32" Hex key, loosen the packing nut (4).
- Using the same 3/32" Hex key, evenly remove the two machine screws (17) that thread into the fluid body standoffs (7).

Note: During removal that there is a spring (11) forcing the air section away from the fluid section.

- Pull the air section (red anodized portion) away from the fluid section (stainless steel portion).
- Clean off the tip of the stainless steel needle (1).
- From the fluid section of the valve, unthread and remove the packing nut (4), followed by the packing (5) and o-ring (24).
- Unthread and remove the nozzle lock nut (3) from the outlet check valve housing (8) then remove the dispense nozzle (15) from the lock nut.
- Using an adjustable wrench, unthread and remove the outlet check valve housing (8) from the fluid section (7).
- Use pliers pull the seat (9) out of the fluid section (7) and remove the 006 Kalrez[®] O-ring (25) from the seat.

Note: If stuck, the seat can be pushed through from the opposite side of the fluid section.

- Using an adjustable wrench, unthread and remove the inlet check valve housing (6) from the fluid section (7) and remove the 007 Kalrez[®] O-ring (27) from the housing.
- With a standard 3/32" Hex Key, remove the bleeder set screws (19) from the fluid section (7).
- Submerge the inlet and outlet check valve housings (6, 8) in solvent.
- Clean all other wetted parts thoroughly with an appropriate solvent.
- On the air section, use a standard 3/32" Hex Key to evenly remove the final two machine screws (16) that thread into the end cap (20).

Note: During removal that the spring (11) will force the air section apart.

- Separate the upper air body (2) from the lower air body (21) to remove the spring (11) then slide the end cap (20) off of the needle (1).
- Holding the lower air body (21) in one hand, grab the needle (1) then push the needle and piston (22) assembly out of the lower air body.
- Remove the 004 Buna O-ring (23) from the lower air body (21).
- Hold the piston (22) with an adjustable wrench then use a 5/64" Hex key to unthread and remove the set screw (18) to remove the needle(1) then remove the 014 Buna O-ring (28) from the piston.
- Remove the 014 Buna O-ring (28) from the upper air body (2).
- Using a 1/16" Hex Key loosen but do not remove the set screw (12) that secures the micrometer adjustment (10) to the upper air body (2).
- Using soft tip pliers grip the collar (E) or midsection (D) of the micrometer adjustment (10) and turn counter-clockwise to loosen then unthread and remove from the upper air body (2) by hand.
- Remove the 007 Buna O-ring (26) from the micrometer adjustment (10).

Replace components with spares provided in the spare parts kit.

Assembly Instructions

General

- All O-rings must be lubricated with a small amount of silicone grease.

Note: PVA offers a 2.5cc silicon o-ring lubrication kit; Part#: B62-2048.

- A small amount of removable thread locker should be applied to the set screw (18).
- Assemble the air section and fluid section separately prior to connecting the two pieces.

Air Section

- Mount one 007 Buna O-ring (26) on the end (F) of the micrometer (10) and slide it up to the threads.
- Thread the micrometer (10) into the upper air body (2) hand tight.
- Holding the collar (E) of the micrometer (10) turn the dial (C) counter-clockwise until the number 5 can be seen on the midsection (D).
- Using soft tip pliers grab the midsection (D) section of the micrometer (10) and turn clockwise to snug it onto the upper air body (2).
- Thread the set screw (12) into the upper air body (2) and tighten with a 1/16" Hex Key.
- Mount one 014 Buna O-ring (28) on the end of the upper air body (2).
- Drop the needle (1) into the piston (22) and assemble with the set screw (18) using an adjustable wrench and 5/64" Hex key to tighten.
- Mount the other 014 Buna O-ring (28) onto the piston (22).
- Apply a small amount of silicone grease to the inside of the lower air body (21) then drop in the piston and needle assembly.
- Mount the 004 Buna O-ring (23) on the end of the needle (1) and slide it down into the groove in the end of the lower air body (21).
- Slide the end cap (20) onto the needle up to the lower air body (21), place the spring (11) on top of the piston (22), and assemble the two air bodies using two machine screws (16) tightening with a 3/32" Hex key.

Note: Be sure the air holes are lined up on the same face and will align with the fluid inlet check valve housing (6).

Fluid Section

- Place the 004 Kalrez[®] O-ring (24) into the groove of the packing (5).
- Insert the packing (5) into the fluid section (7), cone side first with the o-ring (24) facing outward, and screw in the packing nut (4) but leave finger tight until assembled with the air section.
- Mount the 006 Kalrez[®] O-ring (25) on the seat (9) and push the seat into the bottom of the fluid section (7), cone side first. When inserting the seat, work the O-ring into the fluid body with finger to prevent shearing of the edge of the O-ring.

- Thread the outlet check valve housing (8) onto the bottom of the fluid section (7) and tighten with an adjustable wrench.
- Place the 007 Kalrez[®] O-ring (27) into the groove of the inlet check valve housing (6).
- Thread the inlet check valve housing (6) into the side of the fluid section (7) and tighten with an adjustable wrench.
- Drop the micro dispense nozzle (15) into the nozzle lock nut (3) then thread the lock nut onto the outlet check valve housing (8).
- Thread the set screws (19) into the fluid section (7) and tighten using a 3/32" Hex key.

Assemble Sections

- Be sure the micrometer adjustment (10) is backed out far enough so at least the number 1 can be seen on the midsection (D).
- Apply a small amount of silicone grease to the end of the needle (1) then insert it into the packing nut (4) and slide the two sections together.
- Align the air holes of the air section on the same face as the fluid inlet check valve (6) then connect the sections using the two machine screws (17) tightening them down evenly using a 3/32" Hex key.
- Using the tip of a 3/32" Hex key, tighten the packing nut (4).

Setting Micrometer to Zero

When assembling the valve it will be necessary to re-calibrate the micrometer adjust back to the zero position.

- Using the wrench (A), insert the inside tip of the small end into the orifice of the midsection (D) and rotate it clockwise until the numbered centerline is on a side that can most easily be viewed by the operator.

Note: Valves are supplied from the factory with the center line located on the same face of the fluid inlet.

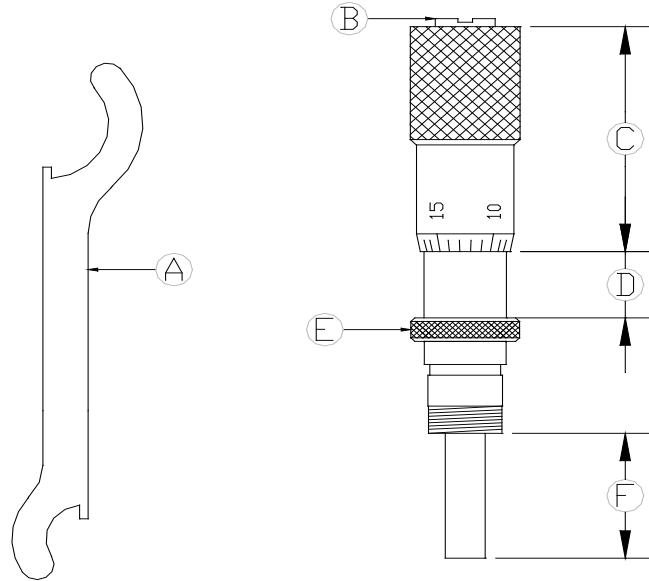
- Turn the dial (C) clockwise until the end (F) hits the piston (10).
- Using soft tip pliers, hold the knurled end of the dial (C) tightly and loosen the screw (B) using a flat head screw driver.

Note: Loosen the screw 3-4 turns only. It is not necessary to fully remove the screw.

- Using a soft dead blow hammer, tap the dial (C) of the micrometer adjust to unlock it from the mid section (D). The dial will now spin freely.
- Rotate the dial (C) to align the zero mark of the dial with the numbered centerline of the midsection (D) and press down firmly to secure the dial in place.
- Hold the dial (C) securely in one hand maintaining alignment with the zero mark and numbered centerline, then carefully tighten the screw (B) using the flat head screw driver to lock the micrometer adjustment.

Micrometer Adjustment Breakdown

Figure 3: Micrometer Adjustment Breakdown



Reference Letter	Section Description
A	Micrometer Wrench
B	Top Screw
C	Dial
D	Micrometer Midsection
E	Collar
F	Micrometer End

Figure 4: Micrometer Section Key

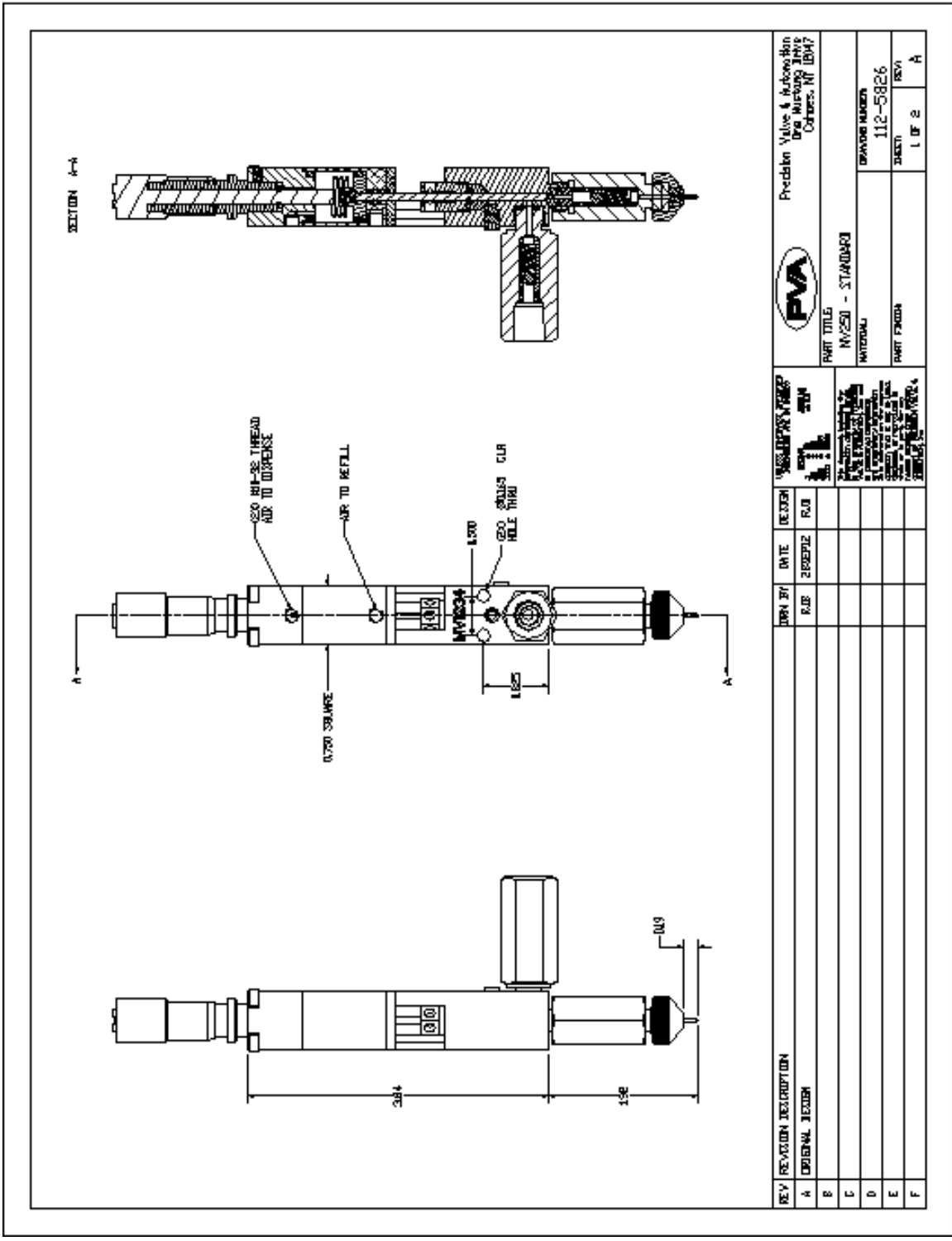
Spare Parts

PVA offers standard spare parts kits for all dispensing valves. These kits are stocked for immediate shipment and allow replacement of all wearable parts of the valve.

The spare parts kit for this valve, product number MV25-SP, includes the following components:
MV25-SP Includes:

Figure 5: Spare Parts Kit Contents

Qty	Part Number	Description
1	114-4750	Needle
1	214-6507	Seat
1	214-3441	Packing w/o-ring groove
1	VLV-004B	004 Buna O-ring
1	VLV-004K	004 Kalrez [®] O-ring
1	VLV-006K	006 Kalrez [®] O-ring
1	VLV-007B	007 Buna O-ring
1	VLV-007K	007 Kalrez [®] O-ring
2	VLV-014B	014 Buna O-ring



REV	REVISION DESCRIPTION	DATE	DESIGN	DATE	REVISION	REASON	APPROVED BY	DATE
A	ORIGINAL DESIGN							
B								
C								
D								
E								
F								

		Precision Valve & Automation Dept. of Mechanical Engineering Cornell University Ithaca, NY 14853	
PART TITLE MV250 - STANDARD		DRAWING NUMBER 112-5826	
MATERIAL STAINLESS STEEL		PART NUMBER 1 OF 2	
DRAWN BY J. B. ...		CHECKED BY ...	

Figure 6: Drawing 112-5826_1

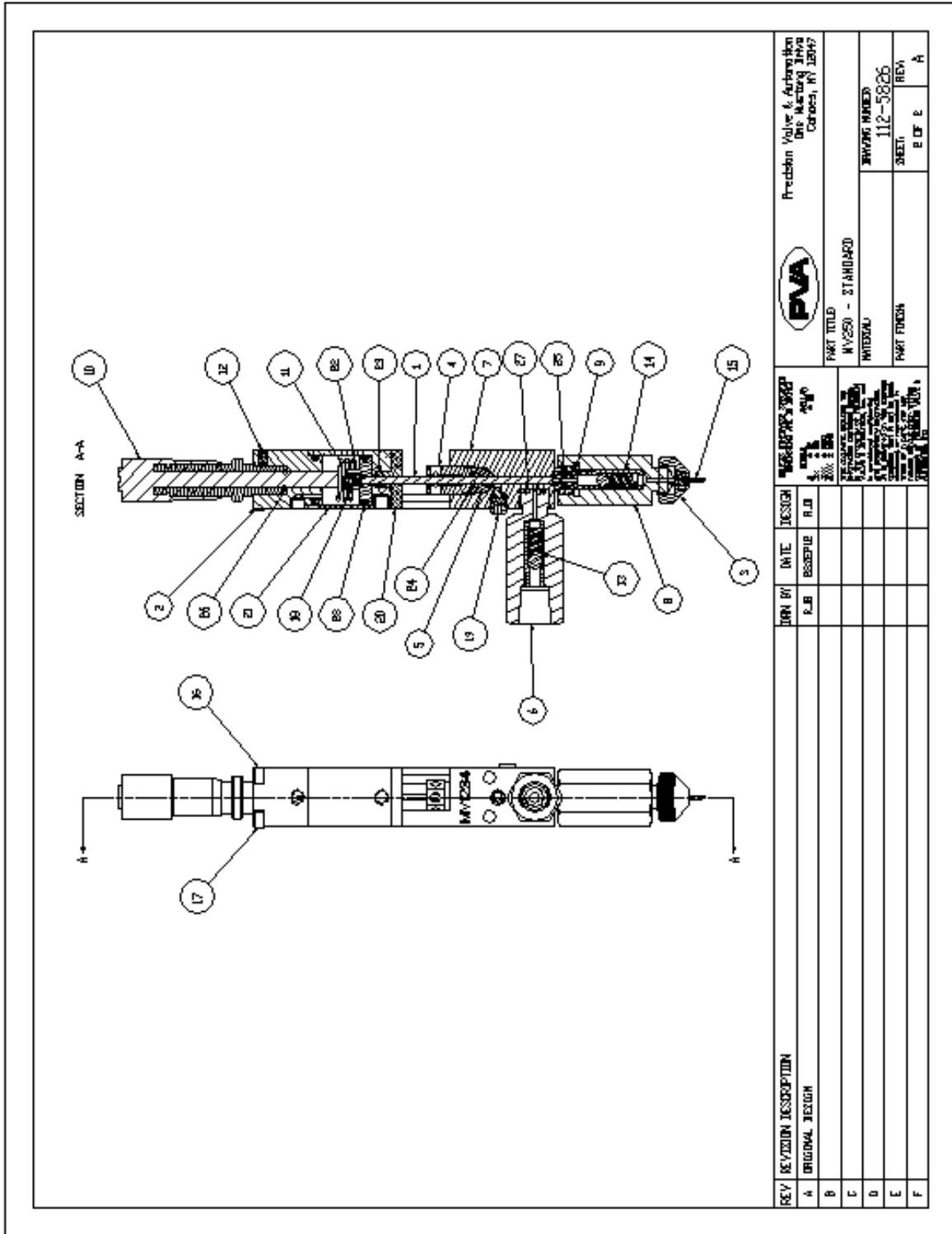


Figure 7: Drawing 112-5826_2

Bill of Materials for MV250:

Version: B12-3822

Figure 8: Bill of Materials for Figure 7

Item	Part Number	Description	Quantity
1	114-4750	Needle	1
2	114-6556	Upper Air Body	1
3	114-8274	Nozzle Lock Nut	1
4	114-9206	Packing Nut	1
5	214-3441	Packing w/ O-ring Groove	1
6	214-6176	Check Valve Body, Inlet	1
7	214-6180	Fluid Body	1
8	214-6212	Check Valve Body, Outlet	1
9	214-6507	Seat	1
10	01423	Micrometer Adjustment	1
11	01344	Spring	1
12	01469	Set Screw	1
13	02367	Check Valve, Inlet	1
14	02368	Check Valve, Outlet	1
15	* TBD	Micro Dispense Nozzle	1
16	SH5-40x1.75	Socket Head Cap Screw	2
17	SH5-40x2.0	Socket Head Cap Screw	2
18	V001	Set Screw	1
19	V007	Bleeder Plug	2
20	V200	End Cap	1
21	V201	Lower Air body	1
22	V202	Piston	1
23	VLV-004B	004 Buna O-ring	1
24	VLV-004K	004 Kalrez [®] O-ring	1
25	VLV-006K	006 Kalrez [®] O-ring	1
26	VLV-007B	007 Buna O-ring	1
27	VLV-007K	007 Kalrez [®] O-ring	1
28	VLV-014B	014 Buna O-ring	2

* Refer to PVA's data sheet on Micro Dispense Nozzles for a list of available nozzle options.

Troubleshooting

Problem	Possible Cause	Corrective Action
Valve does not cycle	<p>Air pressure to air section too low</p> <p>Packing nut is too tight</p> <p>Micrometer adjustment is bottomed out</p> <p>Material is cured in the valve</p> <p>Valve was assembled without lubricating the O-ring seals</p>	<p>Increase air pressure to 60-100 psi</p> <p>Loosen packing nut until valve just begins to cycle, retighten</p> <p>Back out micrometer adjustment by turning it counter-clockwise</p> <p>Disassemble and clean valve</p> <p>Disassemble valve, lubricate seals and re-assemble</p>
Material leaks from valve tip	<p>Packing nut is too tight</p> <p>Air bubble trapped in fluid body, needle adapter, or dispense needle</p> <p>Check valve is worn</p>	<p>Loosen packing nut</p> <p>Flip valve upside down and cycle until air bubbles are removed, or loosen set screw on fluid body to bleed air</p> <p>Replace parts as necessary</p>
Valve leaks from mid-section	<p>Packing nut is loose</p> <p>Packing is worn</p> <p>O-Ring is worn</p>	<p>Tighten packing nut until snug</p> <p>Replace packing</p> <p>Replace o-Ring</p>
Valve does not dispense anything	<p>Air trapped in fluid body, needle adapter, or dispense needle</p> <p>Valve is not cycling</p> <p>Fluid pressure is too low</p> <p>Material cured in fluid section</p> <p>Micrometer adjustment set too low</p>	<p>Flip valve upside down and cycle until air bubbles are removed, or loosen set screw on fluid body to bleed air</p> <p>See above</p> <p>Increase fluid pressure</p> <p>Disassemble and clean valve</p> <p>Back out micrometer adjustment by turning it counter-clockwise</p>
Air bubbles in fluid	<p>Valve not properly purged</p> <p>Problem with fluid delivery system</p>	<p>Flip valve upside down and cycle until air bubbles are removed, or loosen set screw on fluid body to bleed air</p> <p>Diagnose and repair.</p>
Inconsistent shot sizes	<p>Improper material viscosity</p> <p>Air trapped in material being dispensed</p>	<p>No solution</p> <p>Flip valve upside down and cycle until air bubbles are removed, or loosen set screw on fluid body to bleed air</p>

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 customer service 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: _____