

**FCM100**

**FRONT CLOSING  
MICRO DISPENSE VALVE**

**Version: B12-1788**

**Operation Manual**



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# **FCM100**

## **Front Closing Stainless Steel Micro Dispense Valve**

Thank you for purchasing the FCM100 dispensing valve from PVA. Before attempting to operate the FCM100, 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.

### **Theory of Operation**

The FCM100 is a high pressure, front closing stainless steel micro dispense valve designed to apply fluids using a non-contact method. Typical applications include dispensing small dots or lines of low viscosity fluids.

The FCM100 has a divorced design comprising of two major sections. These include:

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

The air section is an aluminum body with a simple piston/cylinder combination used to open and close the valve. A micrometer adjustment in the upper air body controls how far the piston and needle assembly can retract thus regulating the rate of fluid flow. The micrometer will display a distance that the piston and needle will travel.

The fluid section is a stainless steel body, which includes a needle and seat combination to control fluid flow. Fluid dispenses as the needle retracts out of the seat, then stops as the needle moves back into the seat. The micrometer adjustment regulates the distance that the needle can retract out of the seat thus controlling the orifice size and rate of fluid flow. Fluids typically include low viscosity conformal coatings or underfills.

Wetted parts on the FCM100 include:

- 303, 304 stainless steel
- Teflon
- Kalrez

## Nozzle Options

The FCM100 valve is available with several different gauge size dispense nozzles (17). Different nozzle sizes are easily interchangeable to the valve by removing the nozzle lock nut (12). Nozzle sizes are selected based on the size dot or bead of material that is to be applied. A 22 gauge nozzle will give you the largest dot and wider bead width while the 30 gauge nozzle will offer the smallest dot size and smallest bead width.

Valves are supplied from the factory with one nozzle included. Below is a chart showing part number that are used to specify the nozzle that is supplied with a valve, the available gauge sizes, inside diameters of the nozzles, and part number for each individual nozzle.

<u>Valve Part Number</u>	<u>Nozzle Size</u>	<u>Nozzle ID</u>	<u>Nozzle Part Number</u>
FCM100-22G	22 gauge	0.016"	PV-22005A
FCM100-25G	25 gauge	0.010"	PV-25007A
FCM100-27G	27 gauge	0.008"	PV-27005A
FCM100-28G	28 gauge	0.007"	PV-28004A
FCM100-30G	30 gauge	0.006"	PV-30001A

## 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.

## Periodic Maintenance

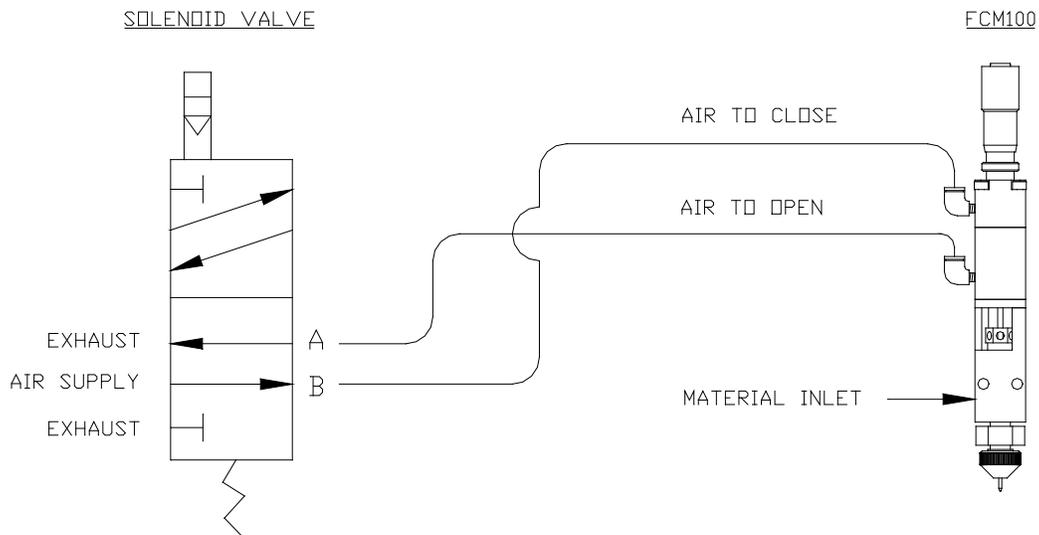
Refer to the FCM100 cross sectional view for location of parts referenced in the following procedures.

- 1) Lubricate the packing (5) on the FCM100 valve every 200 hrs by placing a few drops of mineral oil or other light oil inside the packing nut.  
\*Note: PVA offers a 2.5cc mineral oil lubrication kit; [Part#: B62-0752](#)
- 2) The packing nut (6) may require occasional tightening, as wear occurs in order to prevent leaks through the packing.

## Setup

The FCM100 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 furthest from the midsection of the valve is air to close the valve. The port located closest to the mid-section of the valve is air to open the valve. Quick connect air fittings are typically supplied with the FCM100 to fit 5/32" tubing. Note that the valve should be normally in the closed position.

Fluid is supplied to the FCM100 through the 1/8"fnpt port located on the stainless steel fluid section of the valve.



## Tool Kit

PVA offers standard tool kits for all dispensing valves. The tool kit for the FCM100 is part number **B12-1986**, which includes all necessary tools and lubricating grease to perform maintenance on this dispense valve:

**B12-1986** Includes:

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

## Operation

Refer to assembly drawing **112-2420** for part reference numbers.

- 1) Plumb up the valve as outlined above in the **Setup** procedures.
- 2) Regulate the air pressure operating the valve between 60-100psi.
- 3) Making sure that the valve is not aimed toward anyone, cycle the valve several times. When the valve is cycling, the piston can be heard hitting the micrometer adjustment, and the needle (3) can be seen going up and down in the center. If the valve is not cycling properly, refer to the **Troubleshooting** section.
- 4) When the fluid delivery system is connected to the valve, pressurize the material to be dispensed.
- 5) Once again, cycle the valve open to purge. Fluid should begin to dispense from the tip of the valve, continue dispensing until all air is removed.
- 6) Check fluid connection and packing nut (6) for leaks. If the valve is leaking, refer to the **Troubleshooting** section.
- 7) Turn the micrometer adjustment (11) until the desired flow rate is achieved. Turning the adjustment clockwise toward zero will decrease the material flow rate and counter-clockwise will increase the material flow rate. If the micrometer adjustment is turned all the way down to zero, it will stop fluid flow entirely.
- 8) Once the micrometer setting is determined, the collar (E) on the micrometer (11) can be turned clockwise to lock the adjustment.

Note: Refer to **Troubleshooting** section for any problems.

## Routine Cleaning and Disassembly

Cleaning and rebuilding the valve will be required from time to time. A spare parts kit, part # **FCM1-SP** is available with all the normal wear parts included.

- 1) Begin disassembly by removing air and fluid pressure from the valve.
  - 2) Remove all pneumatic tubing and fluid delivery fittings, hoses, etc. from the valve.
  - 3) Using the tip of a 3/32" Allen key, loosen the packing nut (6).
  - 4) Using the same 3/32" Allen key, evenly remove the two machine screws (22) that are located on the same corners as the fluid section standoffs (4). Note: During removal that there is a spring (18) forcing the air section away from the fluid section.
  - 5) Pull the air section (red anodized portion) away from the fluid section (stainless steel portion).
  - 6) Clean off the tip of the stainless steel needle (3).
  - 7) From the fluid section of the valve, unthread and remove the packing nut (6), and the packing (5).
  - 8) Unthread and remove the nozzle lock nut (12) followed by the nozzle (17).
  - 9) Unthread and remove the nozzle adapter (1) from the fluid section (4).
  - 10) Using pliers, pull the seat (2) out of the fluid section (4) and remove the 006 Kalrez o-ring (16) from the seat. Note: If stuck, the seat can be pushed through from the opposite side of the fluid section.
  - 11) Clean all of the wetted parts thoroughly with an appropriate solvent.
  - 12) On the air section, use a standard 3/32" Allen key to evenly remove the final two machine screws (21) that thread into the end cap (7). Note: During removal that the spring (18) will force the air section apart.
  - 13) Separate the upper air body (10) from the lower air body (8) to remove the spring (18) then slide the end cap (7) off the needle (3).
  - 14) Holding the lower air body (8) in one hand, grab the needle (3) and push the needle and piston (9) assembly out of the lower air body.
  - 15) Remove the 004 Buna o-ring (15) from the lower air body (8).
  - 16) Hold the piston (9) with an adjustable wrench then using the 5/64" Allen key unthread and remove the set screw (19) to remove the needle (3) and remove the 014 Buna o-ring (13) from the piston (9).
  - 17) Remove the 014 Buna o-ring (13) from the upper air body (10) then use a 1/16" Allen key to remove the set screw (20).
  - 18) Using pliers grip the collar (E) or body (D) of the micrometer (11) and turn counter-clockwise to loosen then unthread and remove from the upper air body (10) by hand.
  - 19) Remove the 007 Buna o-ring (14) from the micrometer (11).
- 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.
- A small amount of removable thread locker should be applied to the set screw (19).
- Assemble the air section and fluid section separately prior to connecting the assemblies.

### Air Section

1. Mount one 007 Buna o-ring (14) on the end (F) of the micrometer (11) and slide it up to the threads.
2. Thread the micrometer (11) into the upper air body (10) hand tight.
3. Holding the collar (E) of the micrometer (11) turn the dial (C) counter-clockwise until the number 5 can be seen on the gauge (D).
4. Using pliers grab the gauge (D) section of the micrometer and turn clockwise to snug it onto the upper air body (10).
5. Use a 1/16" Allen key to assemble the set screw (20) into the upper air section (10) securing the micrometer (11) in place.
6. Mount one 014 Buna o-ring (13) on the end of the upper air body (10).
7. Drop the needle (3) into the piston (9) and assemble with the set screw (19) using an adjustable wrench and 5/64" Allen key to tighten.
8. Mount the 014 Buna o-ring (13) onto the piston (9).
9. Apply a small amount of silicone grease to the inside of the lower air body (8) then drop in the piston and needle assembly.
10. Mount the 004 Buna o-ring (15) on the end of the needle and slide it down into the groove in the end of the lower air body (8).
11. Slide the end cap (7) onto the needle up to the lower air body (8), place the spring (18) on top of the piston (9), and assemble the two air bodies using two machine screws (21) tightening with a 3/32" Allen key. Note: Be sure the air holes are lined up on the same face.

### Fluid Section

1. Drop the packing (5) into the fluid section (4), and screw in the packing nut (6) but leave finger tight until assembled with the air section.
2. Mount the 006 Kalrez o-ring (16) on the seat (2) and push the seat into the bottom of the fluid section (4). When inserting the seat, work the o-ring into the fluid body with finger to prevent shearing of the edge of the o-ring.
3. Thread the nozzle adapter (1) onto the fluid body (4) and tighten with an adjustable wrench.
4. Drop the nozzle (17) into the bottom groove of the nozzle lock nut (12) and thread the assembly onto the nozzle adapter (1).

## Assemble Sections

- 1) Be sure the micrometer adjustment (11) is backed out far enough so at least the number 1 can be seen on the gauge (D).
- 2) Apply a small amount of silicone grease to the end of the needle (3) and insert it into the packing nut (6). Connect the sections using the two machine screws (22) tightening them down evenly using a 3/32" Allen key.
- 3) Using the tip of a 3/32" Allen key, tighten the packing nut (6).

## Spare Parts

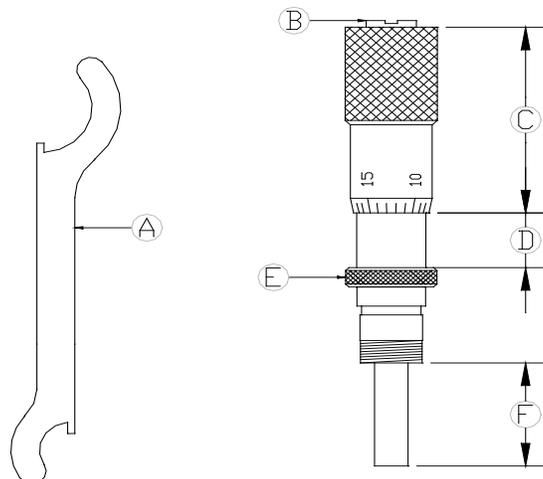
PVA offers standard spare parts kits for all dispensing valves. These kits are stocked for immediate shipment and allow replacement of all wearable parts of the valve.

The spare parts kit for the FCM100, product number **FCM1-SP**, includes the following components:

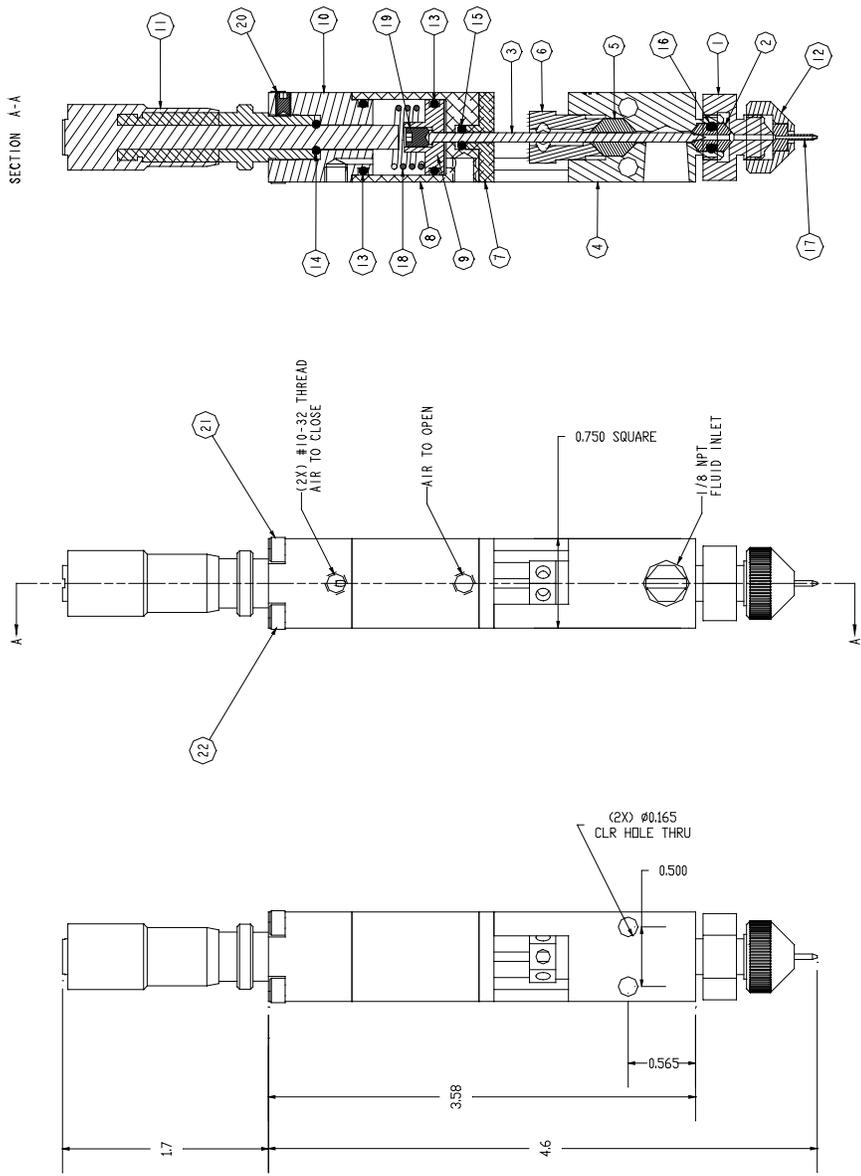
**FCM1-SP** Includes:

Qty	Part Number	Description
1	V302	Seat
1	114-5247	Needle
1	V305	Packing, Teflon
2	VLV-014B	O-ring, Buna
1	VLV-007B	O-ring, Buna
1	VLV-006K	O-ring, Kalrez
1	VLV-004B	O-ring, Buna
1	PT17184	Micrometer Adjust Wrench

## Micrometer Adjustment Breakdown



SECTION A-A



REV	REVISION DESCRIPTION	DRN BY	DATE	DESIGN REV	DESIGN	REV	DESCRIPTION	DRN BY	DATE	DESIGN	MATERIAL:
A	REF. BOM # B12-1788	RJB	10JUL08	RJB							<b>PVA</b>
B	CHANGED ITEM 12 P/N	RJB	27OCT08	RJB							TITLE: FCM100-xxG DWG#: 112-2420

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QTY: -  
SHEET: 1 OF 1  
REV: B

**BILL OF MATERIALS FOR FC100-MC (B12-1788):**

Refer to Drawing #112-2420

<b>Item</b>	<b>Part Number</b>	<b>Description</b>	<b>Quantity</b>
1	114-7293	Nozzle Adapter	1
2	V302	Seat	1
3	114-5247	Needle	1
4	114-6933	Fluid Section	1
5	V305	Packing	1
6	V306	Packing Nut	1
7	V200	End Cap	1
8	V201	Lower Air Body	1
9	V202	Piston	1
10	114-6556	Upper Air Body	1
11	01423	Micrometer Head	1
12	114-8274	Lock Nut, Nozzle	1
13	VLV-014B	O-Ring	2
14	VLV-007B	O-Ring	1
15	VLV-004B	O-Ring	1
16	VLV-006K	O-Ring	1
17	PV-xxxxxA	Nozzle	1
-	PV-22005A	22 gauge nozzle	
	PV-25007A	25 gauge nozzle	
	PV-27005A	27 gauge nozzle	
	PV-28004A	28 gauge nozzle	
	PV-30001A	30 gauge nozzle	
18	V050	Spring	1
19	V001	Set Screw	1
20	01469	Set Screw	2
21	SH5-40x1.75"	Cap Screw	2
22	SH5-40x2.0"	Cap Screw	2
23 (A)	PT17184	Micrometer Adjust Wrench	1

## Troubleshooting

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Valve does not cycle	<ul style="list-style-type: none"> <li>- Air pressure to air section too low</li> <li>- Packing nut is too tight</li> <li>- Micrometer adjustment is bottomed out</li> <li>- Material is cured in the valve</li> <li>- Valve was assembled w/o lubricating the O-ring seals</li> </ul>	<ul style="list-style-type: none"> <li>- Increase air pressure to 60-100 psi</li> <li>- Loosen packing nut until valve just begins to cycle, retighten</li> <li>- Back out micrometer adjustment by turning it counter-clockwise</li> <li>- Disassemble and clean valve</li> <li>- Disassemble valve, lubricate seals and re-assemble</li> </ul>
Material leaks from valve tip	<ul style="list-style-type: none"> <li>- Packing nut is too tight</li> <li>- Needle and/or seat are worn</li> <li>- Air bubble trapped in fluid body or in dispense needle</li> </ul>	<ul style="list-style-type: none"> <li>- Loosen packing nut</li> <li>- Replace parts as necessary</li> <li>- Flip valve upside down and cycle until air bubbles are removed</li> </ul>
Valve leaks from mid-section	<ul style="list-style-type: none"> <li>- Packing nut is loose</li> <li>- Packing is worn</li> </ul>	<ul style="list-style-type: none"> <li>- Tighten packing nut until snug</li> <li>- Replace packing</li> </ul>
Valve does not dispense anything	<ul style="list-style-type: none"> <li>- Fluid pressure is too low</li> <li>- Material cured in fluid section</li> <li>- Micrometer adjustment bolt is set too close to zero</li> </ul>	<ul style="list-style-type: none"> <li>- Increase fluid pressure</li> <li>- Disassemble valve and clean</li> <li>- Back out micrometer adjustment by turning it counter-clockwise</li> </ul>
Air bubbles in fluid	<ul style="list-style-type: none"> <li>- Valve not properly purged</li> <li>- Problem with fluid delivery system</li> </ul>	<ul style="list-style-type: none"> <li>- Flip valve upside down and cycle until air bubbles are removed</li> <li>- Diagnose and repair.</li> </ul>
Dispense rate too fast	<ul style="list-style-type: none"> <li>- Micrometer Adjustment set out too far</li> </ul>	<ul style="list-style-type: none"> <li>- Turn micrometer adjustment bolt clockwise toward the zero mark</li> </ul>
Dispense rate too slow	<ul style="list-style-type: none"> <li>- Micrometer Adjustment bolt set too close to the zero mark</li> </ul>	<ul style="list-style-type: none"> <li>- Turn micrometer adjustment bolt counter-clockwise</li> </ul>
Fluid does not dispense straight from the nozzle	<ul style="list-style-type: none"> <li>- Fluid pressure too low</li> <li>- Material cured on nozzle tip</li> </ul>	<ul style="list-style-type: none"> <li>- Increase fluid pressure until fluid dispenses vertically</li> <li>- Clean tip with cloth or solvent</li> </ul>

## **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 is 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: \_\_\_\_\_