

Model 50 Diaphragm Valve Specification

The Model 50 is a pneumatically operated diaphragm valve specifically designed for process gas chromatography. It uses pressure-on-diaphragm activation with no other moving parts. The valve can inject vapor samples and switches columns simultaneously. It is capable of switching gasses up to 75 psig (515 kPa).

The Model 50 valve operates over 10 million cycles on clean samples. It is a double-acting valve requiring two actuation signals for operation. To insure proper sealing of the diaphragms, actuation pressure should be 25 psig higher than the carrier gas or sample gas pressure. The valve is normally activated by clean instrument air but can be activated by carrier gas with negligible consumption. The valve does not introduce appreciable dead volume to the chromatographic system as indicated by the symmetrical peak shape at very low flow rates.



Configuration

Valve Type	Double-acting, pneumatically operated
Number of Ports	10
Flow Paths	On state: flow between ports 1 & 10, 2 & 3, 4 & 5, 8 & 9 Off state: flow between ports 1 & 2, 3 & 4, 5 & 6, 7 & 8, 9 & 10 Note: flow between ports 6 & 7 is always blocked

Performance

Sample Types	Gas vapor samples only, free of particulates
Actuation Gas	Inert gas, particulate free
Switching Time	20 ms (Typical in Advance Maxum gas chromatographs.) In other uses, actual switching time is dependent on the type of solenoids used to deliver the pneumatic signal to the valve and the size of the pneumatic tubing to the valve.
Sample Filtration	5 micron
Maximum Actuation Pressure	100 psig (690 kPa); must be 20-25 psig (140-175 kPa) higher than maximum carrier gas or sample gas pressure
Maximum Port Pressure (Carrier or Sample)	75 psig (515 kPa); contact factory for higher pressure options
Minimum Port Pressure (Carrier or Sample)	5 psi (35 kPa)
Pressure Drop	< 5 psi (35 kPa) for 200 scc/min (air) Pressure drop was measured in air at room temperature with flow from port to port. Actual pressure drop will vary with temperature and gas type. Pressure drop through the sample loop is dependent on the inside diameter and length of the sample loop.
Maximum Temperature	390 °F (200 °C); contact factory for higher temperature options
Carrier Gas Flow	0.3 ml/min to 40 ml/min; contact factory for higher flow options
Mean Time Between Failures	>10,000,000 cycles at 250 °F (120 °C) >4,000,000 cycles at 390 °F (200 °C) Valve failure is typically caused by particulates preventing the diaphragms from sealing against the center plate or long term wear resulting in deformation of the diaphragms.

Installation

Mounting	2 clearance holes for mounting screws
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Actuation & Sample Connections

1/16" (1.6 mm) OD tubing with Valco or Swagelok fittings

Dimensions

Height: 1 5/16" (33 mm)
 Body Diameter: 1 1/2" (38 mm)
 Outside Diameter: 2" (50 mm)

Weight

0.5 lb (0.25 kg)

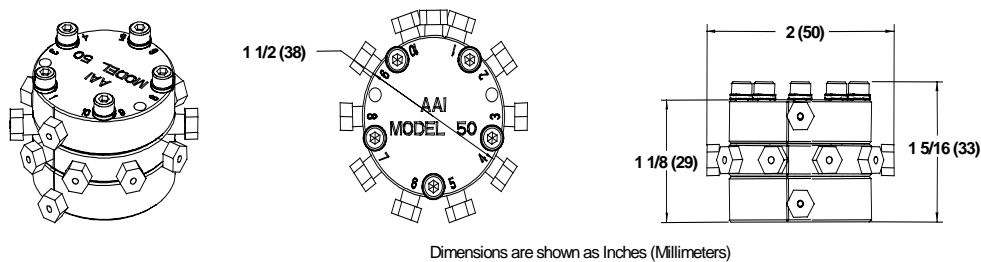
Materials of Construction

Body: 316 stainless steel
 Diaphragms: Teflon coated stainless steel

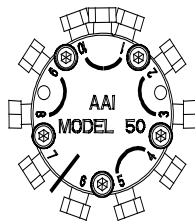
Customer Part Numbers

AAI Part Number	Part Description	1999 US Sales Price
2017660-801	VALVE, MODEL 50,10 PORT	\$1,075
2001165-002	MODEL 50 MOUNTING BRACKET	\$ 20
2020164-001	MODEL 50 REPAIR KIT	\$ 325
2020281-001	VALVE ASSEMBLY FIXTURE	\$ 150

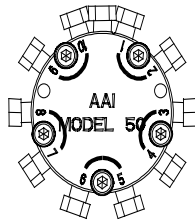
Valve Diagrams



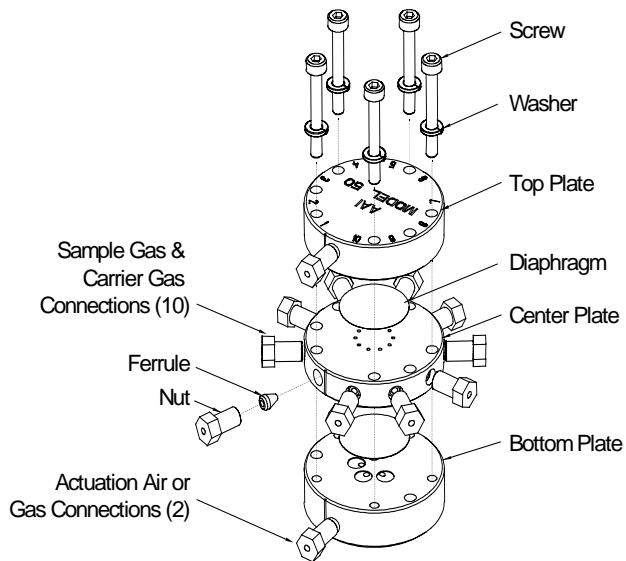
Flow Path in On Position



Flow Path in Off Position



Valve Assembly



Model 50 Valve - 2017660-801

Technical Notes

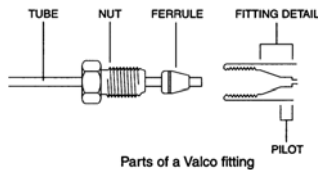
Valve Maintenance Summary

Please refer to the Model 50 Maintenance instruction found in the Advance Maxum Maintenance Manual. Here is a short summary of the assembly, disassembly and maintenance instructions.

Particulates introduced to the valve either from the sample or from the columns can contribute to valve failure. The failure mode is port to port leakage caused by particulates preventing the diaphragms from sealing against the center plate of the valve.

The valve is serviced by disassembly and thorough cleaning to remove all particulates. Ultrasonic cleansing with a suitable detergent, such as Alconox®, works very well. **During the cleaning and re-assembly process, care must be taken to avoid scratching or damaging the polished surfaces of the valve.** After cleaning, the valve is reassembled using new Teflon® coated stainless steel diaphragms. **Used diaphragms will not work.** Notice the alignment marks on the three sections of the valve near the actuation ports. The valve should be reassembled so that these marks line up. It is possible to have the center plate reversed so take care at this point. The screws should be tightened evenly to 6-8 inch pounds.

Valco & Swagelok Fittings



The port are machined for a 1/16" Valco internal nut. The Valco ferrule or the 2 piece swagelok ferrule can be used. It is important to follow the manufactures procedures when cutting tubing and seating ferrules to ensure that the fitting does not leak.

Use a wheel cutting tool (Supelco 58692-U) to score the tubing, then with a pair of straightening pliers (Supelco 58646) and a pair of needle nose pliers snap the tubing at the score line. Make certain that all tubing ends are cut square with the tube axis, and that both the ID and the OD are thoroughly deburred, use a deburring tool (Supelco 58804). Inspect the end of the tubing where the ferrule will seat for scratches along its length. Visible scratches along the tubing where the ferrule will seat are not acceptable, but those behind the front edge of the ferrule will not interfere with the integrity of the fitting.

Valco recommends the following steps to assemble a fitting;

1. Slide the nut and ferrule onto the tubing.
2. Insert this assembly into the fitting detail (valve body), screwing the nut 2 or 3 turns by hand.
3. Push the tubing all the way forward into the detail so that it seats firmly.
4. Manually turn the nut until it is finger tight.
5. Turn the nut 1/4 turn (90 deg) past the point where the ferrule first starts to grab the tubing.
6. Remove the fitting and inspect it. The ferrule may be free to spin axially on the tubing but should have no lateral movement along the tubing. If it does reinstall the fitting and tighten it another 1/8 turn past finger tight. Remove re-inspect and repeat if necessary.

Port to Port Leaks

Sample and Carrier Gas must be turned off before the Actuation Gas is turned off. Without Actuation Gas the Model 50 Valve is in an undefined state and the flow path of the carrier or sample can not be controlled. Any leaks in the Actuation Gas lines could result in a lower Actuation Gas pressure which could result in port to port leaks. The symptoms can include small peaks, repeatability problems, contaminated columns and noise on the detector.

Smaller Diaphragm

The valve now has a smaller Diaphragm. The smaller diaphragm allows a concentrated force to be applied directly to the diaphragm. With this additional force on the diaphragm we have virtually stopped all port to port leaks across the diaphragms. The new diaphragm is 3/4" diameter and is made of stainless steel with a Teflon® coating. The Model 50 repair kit (AAI PN 2020164-001) includes 20 diaphragms, 10 screws and 10 valco fittings.

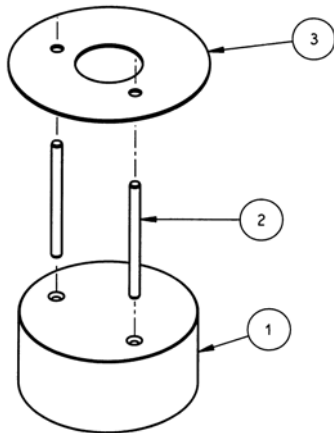
Valve Markings

The valve has an alignment line down the side of the valve. Rotate the three plates until this line on all three plates line up.

The top plate is marked with a 1 for ON near the Actuation Gas port and a 0 for OFF on the bottom plate near its Actuation Gas port. This will help customers know which flow path is active based on which Actuation Port has pressure.

Replacing Diaphragms

Use the Valve Assembly Fixture, AAI PN 2020281-001 properly align the Diaphragms when rebuilding the Model 50 Valve. The fixture (see figure in left column) consist of a base(1), 2 guide pins(2) and a diaphragm placement disc(3). The new smaller diaphragm does not have holes in it to aid in aligning the diaphragm in the center of the valve. This fixture will allow the user to place the diaphragm in the center of the valve. If the diaphragm is not in the center it may leak.



Valve Assembly Fixture 2020281-001

1. With the pins installed in the fixture base place the bottom plate of the valve on the base. The pins should fit in the mounting holes on the bottom plate and hold it in place.

2. Place the placement disc on the bottom plate.

3. Lay the diaphragm inside the hole in the placement disc.

4. Carefully remove the placement disc without moving the diaphragm.

5. Place the middle plate on the valve. Check the alignment mark on the side of the plate it should align with the mark on the bottom plate. If not the middle plate is upside down, remove it, turn it over and reinstall it correctly.

6. Repeat steps 2, 3 and 4 with the middle plate.

7. Place the top plate on the valve.

8. Install the 5 screws and washers finger tight.

9. Tighten the screws down evenly (2.5mm allen wrench) to 6 to 8 inch-pounds of torque. (6.5 Torque Wrench 1631005-001)

10. Remove the assembled valve from the valve fixture.