Operating Instructions
Model 8125
Manual Micro-Scale Sample Injector

1.0 DESCRIPTION

Model 8125 is a six-port micro-scale sample injector with a built-in needle port in the handle for sample loading. Five of the stator ports have a dual-size port design and accommodate both 0.5 mm (0.020") and 1/16" OD tubing. Port 3 only accommodates 1/16" OD tubing and allows the tubing to bottom out in the port for low dispersion connections.

2.0 SUPPLIED WITH THE VALVE

Supplied with the valve in a separate bag are RheFlex® Stainless Steel fitting sets for all ports and the following items. A 5 μL sample loop comes standard with the valve.

- Hex Keys
- Wrench
- Needle Port Cleaner
- Vent Tubes
- Mounting Screws

The #22 gauge needle supplied in the valve should be removed from the needle port before using the valve.

3.0 SPECIFICATIONS
- Maximum Operating Pressure: 48 MPa (483 bar, 7000 psi)
- Maximum Operating Temperature: 80°C
- Flow Passage Diameters: 0.33 mm (0.013") and 0.3 mm (0.012")
- Wetted Surfaces: stainless steel and an inert polymer
- Built-in position sensing switch

4.0 IMPORTANT SAFETY NOTICES
4.1 Warning: When using sample loops larger than 100 μL, shield yourself from mobile phase coming out of the needle port when the valve is turned from INJECT to LOAD. Example, 1 mL loop ejects 20 μL upon decompression from 19 MPa (200 bar, 2898 psi).

4.2 Warning: When using the Needle Port Cleaner, empty the syringe slowly to prevent solvent from squirting back at you.

4.3 Caution: Rinse the valve after using buffer solutions to prevent crystals from forming, which can cause damage to the rotor seal and stator face assembly.
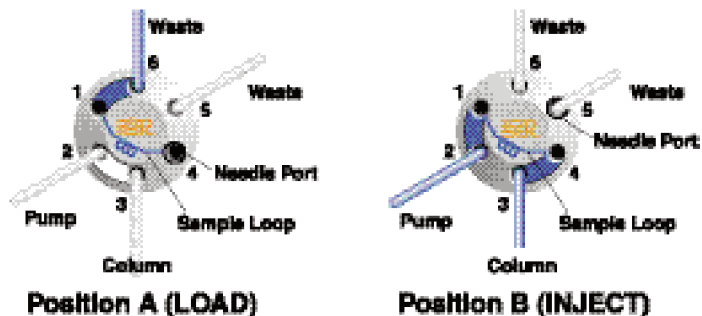

Fig. 1. Flow diagram of Models 8125 and 8126.

5.0 USING PROPER NEEDLES AND TUBING SIZES

5.1 SYRINGE NEEDLES
Use syringes with #22 gauge needles without electrotaper and 90° (square cut) point style. The wrong needle tip can cause damage to the valve.

5.2 TUBING SIZES
Figure 2A shows how 0.5 mm (0.020") and 1/16" OD tubing can connect to five of the stator ports. For low dispersion, use the 0.5 mm (0.020") OD tubing for the sample loop. Since Port 3 is positioned differently in the stator and the internal geometry allows 1/16" OD tubing to bottom out in the port, no cavity forms in the stator port (see Figure 2B). Using 1/16" OD tubing for the column connection will not increase dispersion.

1/16" OD tubing can be used in the pump port and the vent line ports. 1/16" OD tubing can also be used for sample loops when using sample volumes larger than 50 μL. There is a negligible effect on overall dispersion for these sample sizes.

6.0 INSTALLATION
a) To mount the valve on a panel, remove the handle by loosening the two handle set screws. Use the two set screws supplied to fasten the valve to a panel.

b) Replace the handle by tightening the two set screws on the two flats of the shaft.

c) Connect the two vent tubes supplied to Ports 5 and 6. The outlet ends of both vent tubes should be at the same horizontal level as that of the needle port to avoid siphoning.

d) Connect the pump to Port 2 and the column to Port 3. Leave the column disconnected from the valve during initial flushing.
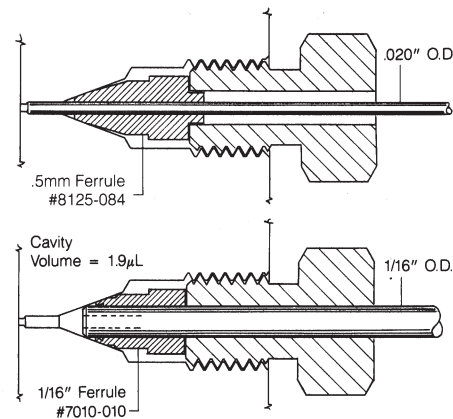

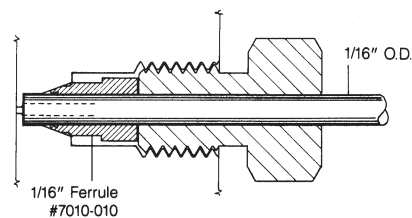**Fig. 2A. Dual-size port design of five of the stator ports.**

Fig. 2B. Port 3 design.

7.0 OPERATION

7.1 FLUSHING THE INJECTOR
In the INJECT position, flush the needle port with about 1 mL of mobile phase using the Needle Port Cleaner as shown in Figure 3. At this time, the pump flushes the loop. See **Warning 4.2**.
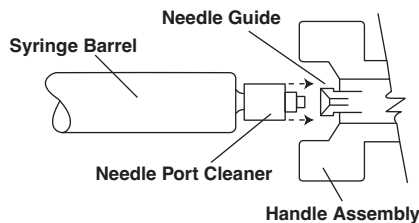
Fig. 3. Use of Needle Port Cleaner.

7.2 MANUAL LOOP LOADING

7.2.1 COMPLETE LOOP FILLING

In complete-filling, the volume of sample injected is set by the volume of the loop (this includes the valve passages). This method produces the highest precision.

Overfill the loop with at least two to five loop volumes of sample. Six to ten loop volumes will provide even better precision. An excess of sample is needed because mobile phase near the wall of the loop is displaced slowly due to the laminar flow effect shown in Figure 4.

To completely fill the loop:
 a) See **Warning 4.1** and turn to LOAD.
 b) Insert the syringe into the needle port. You will feel tightness during the last 2-3 mm of travel as the needle passes through the needle seal and then stops against the stator face.
 c) Load the sample.
 d) Leave the syringe in and turn to INJECT.

7.2.2 PARTIAL LOOP FILLING

If you only have a small quantity of sample, this is the method of choice. In the partial-filling method the volume of sample injected is set by the syringe. In this method, no more than half a loop volume of sample should be loaded into the loop. For example, load no more than 10 μL into a 20 μL loop. With larger than half the loop volume, some of the sample is lost out Vent Line 6. This is because sample flows down the center of the loop at twice the average velocity due to the laminar flow effect shown in Figure 4.

To partially load the loop:
 a) In INJECT, use the Needle Port Cleaner to flush out the needle port with about 1 mL of mobile phase. This will flush out contamination from the earlier injection. This liquid will exit out Vent Line 5.
 b) Follow steps **a-d** in Section 7.2.1.

7.2.3 LOADING BY SUCTION

 a) In LOAD, dip the tube attached to Port 6 into the sample.
 b) Connect an empty syringe to the Needle

Adapter assembly and suck up sample into the loop.
 c) Leave the syringe in position and turn to INJECT.

The syringe can be used many times before it needs to be emptied.

To load the loop with all of the available sample, the loop should be at least four times the volume of sample loaded. The loop is first filled with mobile phase via the dip tube, then the whole sample is drawn into the dip tube and loop, followed by more mobile phase. The sample is now sandwiched between two zones of mobile phase in the loop.
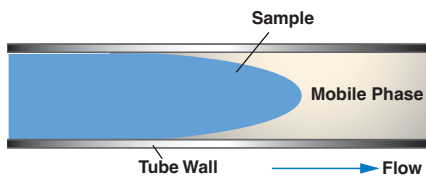

Fig. 4. Laminar flow effect.

8.0 ADJUSTING FOR LEAKAGE OR HIGHER PRESSURE OPERATION

There is a single pressure adjusting screw at the handle end of the valve body. The handle assembly is designed to be used as a tool for adjusting this screw. If you need operation up to a higher pressure or if there is a leak between the stator and stator ring, loosen the two set screws so that the handle slips down the shaft and the two protrusions fit into the slots on the adjusting screw. Tighten the adjusting screw about 1/20th turn. If there is still leakage at this new setting, repeat the process. Replace the rotor seal if the leak continues.

 Note: When the valve is not panel mounted, the adjusting screw can be hard to turn. In this case, loosen the three stator screws 1/4 turn prior to adjusting the screw. Retighten the stator screws before testing for leaks.

Replace the handle and tighten the two set screws on the two flats of the shaft. Confirm that the handle protrusions are out of the slots in the adjusting screw before tightening the set screws. This step is important. If the handle engages the pressure adjusting screw the shaft will not rotate between LOAD and INJECT. See Figure 5.

 Note: If the vent lines from Ports 5 and 6 do not have their outlet ends at the same horizontal level as the needle port, siphoning can result, which is often misinterpreted as a leak. A siphoning leak will stop when the vent lines and needle port tube are empty. A

leak due to a damaged rotor seal will continue.

9.0 MAINTENANCE

The only parts that may need eventual replacement are the rotor seal, isolation seal, and stator face assembly.

The main causes of early failure are:
 a) The wrong needle tip can damage the stator face, which then causes deep scratching of the rotor seal surface.
 b) Abrasive particles in the sample can scratch the rotor seal surface.

Genuine Rheodyne parts are easily replaced by the following instructions. See Section 11.0.

9.1 DISASSEMBLY

To disassemble, refer to Figure 6 and proceed as follows:
 a) Remove the handle assembly.
 b) Remove the three stator screws.
 c) Remove the stator, stator face assembly, and stator ring from the body (the stator face assembly usually remains on the stator).
 d) Pull the rotor seal off the pins.
 e) Pull the isolation seal off the shaft assembly.

9.2 REASSEMBLY

To reassemble, refer to Figures 5, 6, and 7 and proceed as follows:
 a) Slip the new isolation seal (open side facing the handle) onto the stator end of the shaft assembly next to the bearing ring.
 b) Line up the new rotor seal as shown in Figure 7. The rotor seal grooves face the stator.
 c) Replace the stator ring (with black gap ring in place) so that the rotor pin falls between the two milled flat surfaces of the stator ring and the body locating pin enters the mating hole in the body.
 d) Place the pins in the new stator face assembly into the mating holes in the stator.
 e) Replace the stator and stator face assembly on the valve so that the pin in the stator ring enters the mating hole in the stator.
 f) Add the three stator screws. Tighten each screw a 1/2 turn past fingertight.
 g) Replace the handle and tighten the two set screws on the two flats of the shaft. Confirm that the handle protrusions are out of the slots in the body before tightening the set screws. This step is important. If the handle engages the pressure adjusting screw the shaft will not rotate between LOAD and INJECT. See Figure 5.
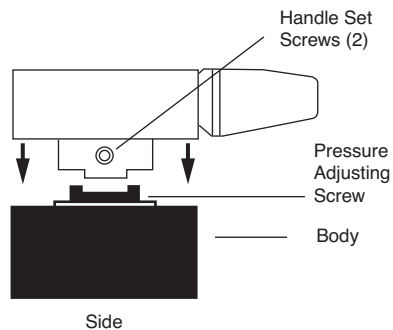
Fig. 5. Valve handle acting as wrench to adjust valve pressure adjusting screw.

9.3 POSITION SENSING SWITCH

The position sensing switch is standard in Model 8125. The switch is a magnetic reed switch actuated by a magnet sealed inside the shaft. The switch is rated for 100 V at 200 mA.

To replace or remove the switch:

a) Remove the handle assembly.

b) Remove the three stator screws.

c) Remove the stator, stator ring, and stop ring.

d) Pull the switch out of the stop ring.

e) Replace with new switch, or leave the hole empty if the switch is not needed.

f) Follow the steps in Section 9.2 to reassemble.

10.0 OPERATING SUGGESTIONS AND TROUBLESHOOTING

10.1 LEAKAGE

If you see liquid between the stator and stator ring, or from the needle port or a vent tube, tighten the pressure adjusting screw as explained in Section 8.0. If this fails to stop the leak then replace the rotor seal and/or stator face assembly.

10.2 NEEDLE SEAL LEAKAGE

Since the outside diameter of syringe needles can vary, the needle seal (Teflon[1] sleeve in the rotor seal) may not seal correctly around a needle that is smaller than average. This will result in the loss of accuracy in loading the sample. To make a good seal, remove the needle from the needle port and push in on the plastic needle guide with the eraser end of a pencil. Repeat if necessary.

10.3 USE OF AQUEOUS BUFFERS OR SALT SOLUTIONS

To prevent the formation of salt crystals in the valve which can scratch the rotor seal, flush out the flow passages and the needle port with water after using salt solutions.

10.4 USE OF HIGH pH SOLUTIONS

The standard rotor seal in Model 8125 is Vespel[1], a polyimide with good wear resistance. Vespel is sensitive to alkaline attack when exposed to solutions having a pH of 10 or more. Use a PEEK or Tefzel[1] rotor seal for alkaline solutions.

10.5 ACCURACY OF SAMPLE LOOPS

Sample loop sizes are not actual values. Actual volumes can differ by ± 10% for a 20 μL loop. Smaller loops show greater differences. For actual injection volume, use the partial-filling manual sample loading method.

11.0 RECOMMENDED SPARE PARTS

Rheodyne offers a RheBuild® Kit for maintaining the quality performance of your valve. The kit includes all the necessary parts (rotor seal, stator face assembly, isolation seal, needle guide, and needle port cleaner), tools, and instructions.
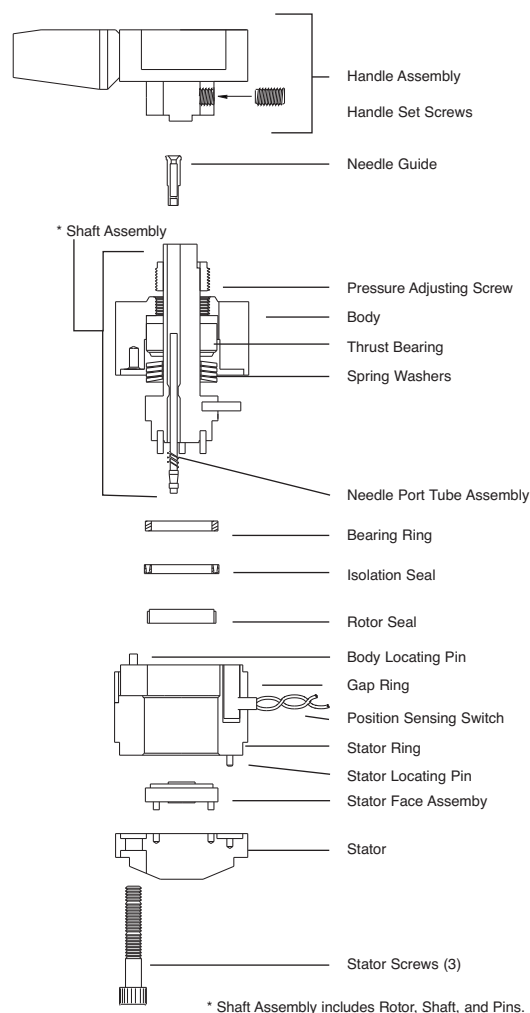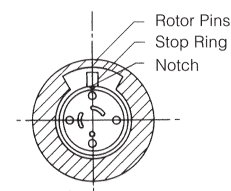
8125-999 RheBuild Kit for 8125

Fig. 7. Correct position of rotor seal (grooves face the stator).

Fig. 6. Exploded view of Model 8125.