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7. SWING ADJUST PUMP MODULE

7.1 DESCRIPTION (Figure 7.1)

The Swing Adjust Pump Module, hereafter referred to as the Pump Module, is comprised of the following major components; a ceramic piston fabrication and a ceramic cylinder pressed into a fluorocarbon case mounted to a stainless steel swing plate. The Pump Module is available in low flow (1/4-28 Internal ports) and high flow (1/4 id compression nut) configurations. The Pump Module is available with either a Kynar or Tefzel case. The Pump Module is within the liquid path and is designed to be detached from the Motor/Base Module for ease of cleaning, decontamination and sterilization.

7.2 OPERATION

When the Pump Module is mounted on the Motor/Base Module, the piston is driven by a spherical bearing mounted within a rotating spindle. This drive arrangement imparts both reciprocating and rotary motion to the piston. The magnitude of the piston's stroke is adjustable by varying the angle of the axis of the pump head relative to the axis of the motor drive shaft. This displacement range is infinitely adjustable within the Pump Module specifications (refer to Table 7.2) and is the same for the low and high flow cases. The displacement adjustment is easily made. Repeatability of 0.1% is obtainable once the stroke length is established.

On each rotation of the piston, the ports are opened alternately and exclusively, first to the inlet and then to the outlet. During the rotation, the piston flat creates the passage way that allows the flow from only one port at a time, positively displacing the liquid. The piston flat acts as a rotary valve, completing one pressure stroke and one suction stroke per revolution as the pump rotates and reciprocates synchronously.

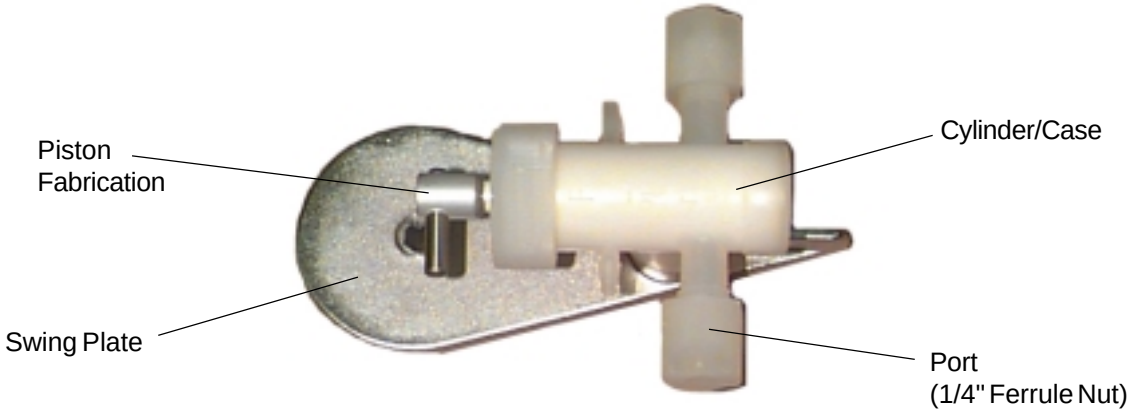


Figure 7.1 Swing Adjust Pump Module

The end of the piston is never drawn back beyond the inlet and outlet ports in normal operation. The piston flat allows only one port to communicate with the interior chamber of the pump cylinder at any one time. The effect is positive mechanical valving, eliminating the need for check valves under normal operations.

The Pump Module, which cannot be driven by either inlet or outlet pressure, essentially acts as a closed valve when the unit is not in operation.

The Pump Module can easily and accurately be set over the full displacement range. By changing the stroke length through the angular adjustment of the swing plate, displacement is changed from zero to the maximum.

7.2.1 Piston/Cylinder Set

The piston/cylinder set is constructed of high density alumina or magnesium stabilized zirconia ceramic. The ceramics are compatible with most acids and bases.

The ceramic piston operates within the ceramic cylinder with no lubrication other than the liquid being dispensed or metered. The natural crystalline structure of the ceramics display zero porosity ensuring zero retention and carry over of one liquid to the next.

7.3 INSTALLATION

The Pump Module typically comes installed on the Motor/Base Module. If it needs to be removed for any reason, refer to the assembly/disassembly procedures in section 7.5.4. Refer to Chapter 2 for instructions on setting up the system for operation.

7.4 OPTIONS

7.4.1 Special Piston/Cylinder Bore Clearances or Modifications

For certain applications, special clearances are required for the piston/cylinder bore. IVEK Corporation determines these clearances by performing application tests using the application fluid. Contact IVEK Corporation for more information.

For certain applications, special machined modifications are required for the piston/cylinder. IVEK Corporation determines these modifications by performing application tests using the application fluid. Contact IVEK Corporation for more information.

7.4.2 Fittings

The following types of fittings are available from IVEK Corporation.

- Barb Fittings x 1/4-28
  1/16", 1/8" and 3/16" (barb size)
- Flangeless Compression Fittings
  1/4-28 (use with 1/16" or 1/8" OD plastic tubing)
  1/4" ID Compression Nuts (use w/1/4" OD plastic tubing)
- Adapters
  1/8" ID Tubing Adapter
  1/4" ID Tubing Adapter
  3/8" ID Tubing Adapter
  1/4"-28 Ferrule Fitting Adapter
  1/2" ID Tubing Adapter
  1/8" OD Tubing Adapter

7.5 MAINTENANCE

CAUTION

Never connect or disconnect the cable from the Motor/Base Module connector while power is on. Damage to the equipment may result.

7.5.1 Preventative Maintenance

The ceramic components for the Pump Module have been designed to last for millions of repetitions without wear.

Preventative maintenance should include careful handling. Always take great care when removing the piston from the cylinder and replacing the piston into the cylinder. Never clean ceramic parts in such a way that they can vibrate against each other. This could cause chipping.

The piston and cylinder are a matched set and should always be kept together. Each piston is identified with a number.

CAUTION

Ceramic piston/cylinder sets are particularly sensitive to neglect and may "seize" if allowed to dry out without adequate cleaning.

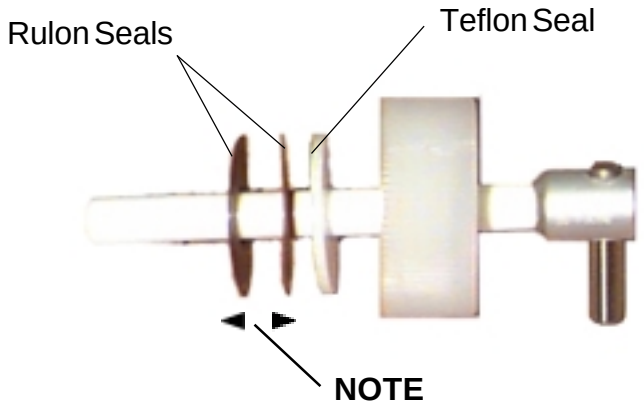
7.5.2 Cleaning

The Pump Module is designed for general use applications. The Pump Module can be flushed in place or removed for soaking or autoclaving, but not completly disassembled. Refer to section 7.5.5 for the assembly/disassembly procedures.

7.5.3 Piston Seals (Figure 7.2)

The two Rulon seals and a Teflon seal serve to minimize external contamination of the piston fabrication and not to contain liquid within the Pump Module.

When properly maintained in a clean condition, the original seals may be expected to last for a considerable amount of time. If removed for any reason, they should be carefully cleansed of all foreign particles and inspected prior to reassembly. Figure 7.2 shows the proper mounting of the piston seals. Refer to Section 7.5.4.2 for assembly/disassembly procedures.



The lips on the Rulon seals should face away from each other.

Figure 7.2 Swing Adjust Pump Module Seal Locations

7.5.4 Rotary Kynar Case Cap (Figure 7.3 Item 5)

The Rotary Kynar Case Cap is screwed onto the case where the piston exits. This cap is made from the same material as the case and is designed to keep the seals and ceramic cylinder in place.

7.5.5 Assembly/Disassembly Procedures

The Pump Module contains the following replaceable parts. (Refer to Figure 7.3)

- Two Rulon Seals (3)
- Teflon Seal (4)
- Rotary Case Cap (5)
- Piston/Cylinder/Case Fabrication (1,6)
- Swing Plate (7)

WARNING

Make sure power is OFF and all hazardous liquids have been flushed from the system prior to performing any disassembly or assembly procedures.

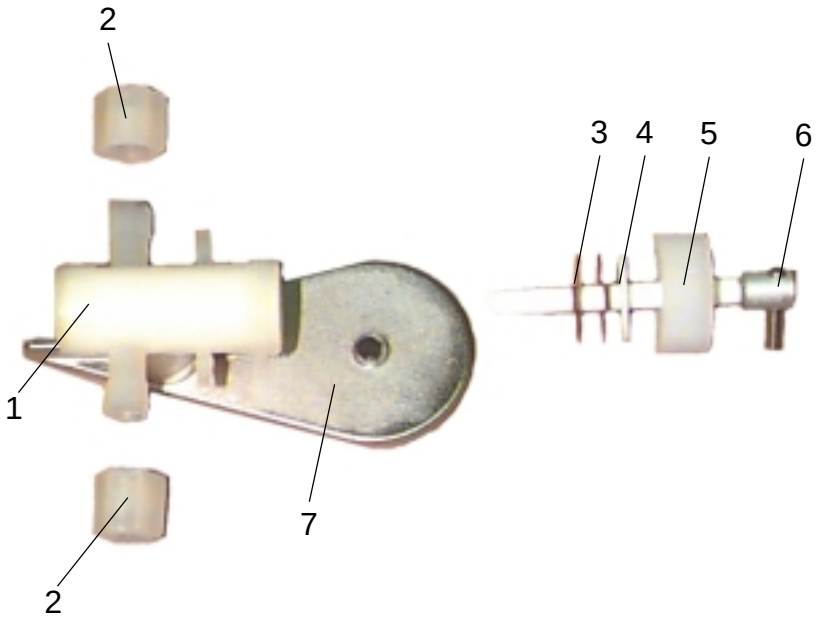


Figure 7.3 Swing Adjust Pump Module

7.5.5.1 Pump Module

Disassembly

Refer To Figure 7.4

1. Loosen two thumbnuts (7) on Motor/Base Module (6).
2. Rotate swing plate (5) to the right.
3. Turn the motor spindle so spherical bearing (1) is at the 3 O'clock position.
4. Lift Pump Module (4) so pivot pin (3) on swing plate (5) disengages from base pivot hole.
5. Pull Pump Module (4) up and away from spherical bearing (1).

CAUTION

Do not allow the piston flat to pass through the Rulon seals. When reinserting the piston, damage to the Rulon seal may result.

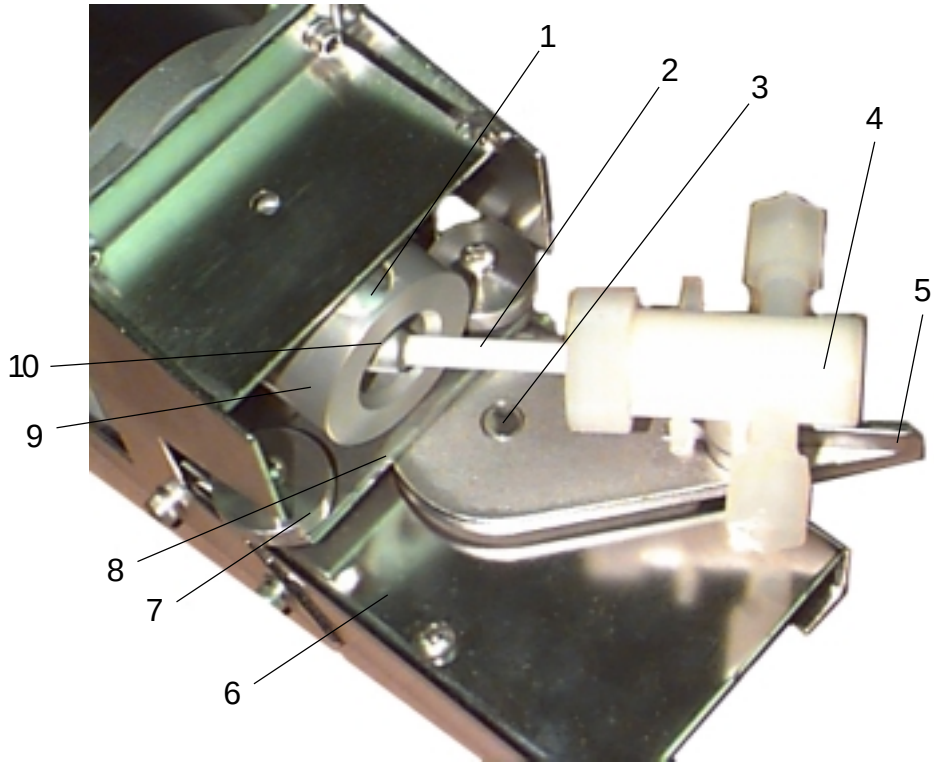


Figure 7.4 Swing Adjust Pump Module Assembly/Disassembly

Assembly

CAUTION

Apply Aqualube lubricant to the drive pin prior to assembly. Apply enough to cover the surface. Failure to lubricate the drive pin may result in damage to the Pump Module and Motor/Base Module.

1. Turn motor spindle (9) so spherical bearing (1) is at the 3 O'clock position.
2. Slide swing plate (5) under the retaining bar (8) while aligning the piston cap pin (10) with spherical bearing (1) on motor spindle (9).
3. Slide piston cap pin (10) into spherical bearing (1) engage the swing plate pivot pin (3) into the base pivot hole.
4. Tighten thumbnuts (7) applying equal pressure on each side of the retaining bar.

7.5.5.2 Rulon Seal, Teflon Seal and Rotary Case Cap (Figure 7.3 Items 3,4,5)

Disassembly

1. Remove the Pump Module (Refer to section 7.5.4.1).
2. Unscrew rotary case cap (5) from case (1) and remove along with piston fabrication (6), Rulon seals (3) and Teflon seal (4).
3. Remove piston fabrication (6) from rotary case cap (5).
4. Remove Rulon seals (3) and Teflon seal (4) from inside of rotary case cap (5).

Assembly

1. Place Rulon seals (3), Teflon seal (4) and rotary case cap (5) onto piston fabrication (6) in order shown in Figure 7.2.

NOTE

The lips on the Rulon seals should face away from each other. (Refer to Figure 7.2)

2. Slide piston fabrication (6) into case (1).
3. Screw rotary case cap (5) onto case (1).
4. Install the Pump Module (Refer to section 7.5.4.1).

7.5.5.3 Case/Cylinder and Piston Fabrication (Figure 7.2 Items 1,6)

Disassembly

1. Remove the Pump Module (Refer to section 7.5.4.1).
2. Unscrew rotary case cap (5) from the case (1).
3. Remove piston fabrication (6) from rotary case cap (5)
4. Remove Rulon seals (3) and Teflon seal (4) from inside of rotary case cap (5).
5. Remove 1/4" ferrule nuts (2) from case (1).
6. Remove 1/4 - 20 x 1/2" socket head hex screw securing case (1) to swing plate (7).
7. Remove case (1) from swing plate (7) without twisting to avoid damaging the molded alignment pins.

Assembly

1. Position case (1) on swing plate (7) making sure alignment pins in case (1) fall into holes in swign plate (7) and secure using 1/4 - 20 x 1/2" socket head hex screw.

NOTE

If the molded alignment pins on the case are missing, the case needs to be replaced.

2. Secure two 1/4" ferrule nuts (2) to case (1). (Finger tighten only)
3. Place Rulon seals (3), Teflon seal (4) and rotary case cap (5) onto piston fabrication (6) in order shown in Figure 7.2.
4. Slide piston fabrication (6) into case (1).
5. Screw rotary case cap (5) onto case (1).
6. Install the Pump Module (Refer to section 7.5.4.1).

7.5.5.4 Swing Plate (Figure 7.2 Items 7)

Disassembly

1. Remove the Pump Module (Refer to section 7.5.4.1).
2. Remove screw securing case (1) to swing plate (7).
3. Remove case (1) from swing plate (7) without twisting to avoid damaging the molded alignment pins.

Assembly

1. Position case (1) on swing plate (7) making sure alignment pins in case (1) fall into holes in swign plate (7) and secure using 1/4 - 20 x 1/2" socket head hex screw.

NOTE

If the molded alignment pins on the case are missing, the case needs to be replaced.

2. Install the Pump Module (Refer to section 7.5.4.1).

7.6 PROBLEM GUIDE

7.6.1 Piston Seized In The Cylinder

If the piston seizes in the cylinder perform the following steps.

CAUTION

DO NOT TRY TO FORCE THE PISTON FREE!
Damage to the piston/cylinder set may occur.

1. Carefully remove the Pump Module and soak in a compatible liquid that will act as a solvent to the application liquid.
2. If the aforementioned procedures fail, contact IVEK for technical help. It may be necessary to ship the Pump Module back to the factory. Provide a note describing, in detail, what conditions caused the seizure and what liquids are being pumped.

It may be necessary to return the Motor/Base Module along with the Pump Module.

Table 7.1 contains a list of possible problems, causes and solutions for the Pump Module.

7.7 SPECIFICATIONS

7.7.1 Volume

Table 7.2 lists the volumetric output of the different size Pump Modules. Refer to the Title Page section of this manual for the Pump Module size provided with your system.

Table 7.1 Common Operational Problems And Solutions

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Air evident in discharge line.	Loose/Damaged Fitting	Tighten/replace fittings.
	Cavitation	Increase inlet tubing size or reduce motor speed.
Piston seizing	Particulate materials entrapped between piston and cylinder.	Disassemble Pump Module and clean all wetted surfaces.
Fluid leaks	Loose/damaged fitting or tubing.	Inspect and replace if necessary.
Fluid not moving in tubing when priming, dispensing or metering.	Bad seals.	Make certain that port fittings in Pump Module are tight and in good condition.
	Bad input tubing connection.	Check reservoir and port tubing connections.
	Broken piston or loose piston cap.	Remove Pump Module and inspect, replace if necessary.
Inconsistent low volume dispenses.	Pump Module case damaged.	Inspect for damage, replace if necessary.
	Air in pump chamber.	Re-Prime system.
Fluid trapped between case and cylinder.	Improper seal.	Return to IVEK for new case.

Table 7.2 Volumetric Output Of Rotary Adjust Pump Modules

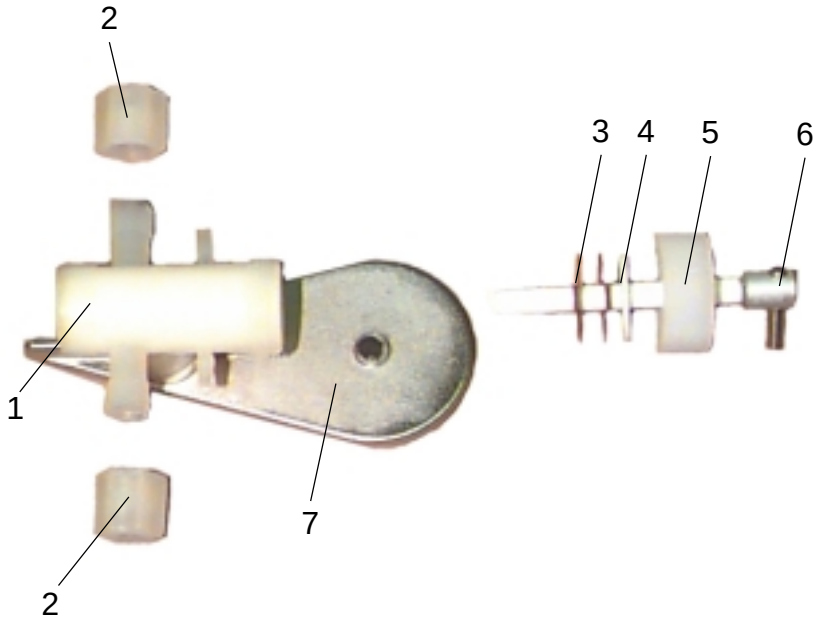
Size	Max Displacement Per Stroke (ml)	Recommended Min Displacement Per Stroke (ml)
B	0.270	0.010
C	0.670	0.025
D	1.480	0.080

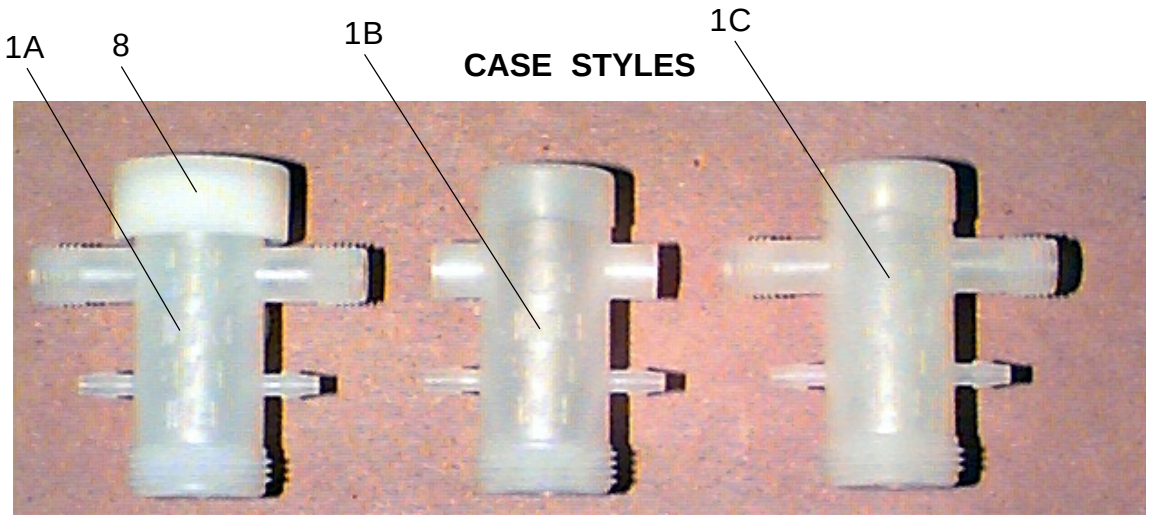
7.8 ILLUSTRATED PARTS BREAKDOWN

The illustrated parts breakdown (Figure 7.5) contains the information required for identifying and ordering parts for the Swing Adjust Pump Module.

NOTE

Kynar case is translucent white in color. (shown)
Tefzel case is brown in color.





High Flow W/End Cap **Low Flow** **High Flow**

Figure 7.5 Rotary Adjust Pump Module (Sheet 1 of 2)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	see chart	**Swing Adjust Pump Module**	1
1A	**	High Flow Case With End Cap, Tefzel	1
1A	**	High Flow Case With End Cap, Kynar	1
1B	**	Low Flow Case, Tefzel	1
1B	**	Low Flow Case, Kynar	1
1C	**	High Flow Case, Tefzel	1
1C	**	High Flow Case, Kynar	1
2	092196	1/4" Ferrule Nut (high flow case)	2
3	**	Rulon Seals	2
4	**	Teflon Seal	1
5	**	Rotary Case Cap, Tefzel	1
5	**	Rotary Case Cap, Kynar	1
6	**	Piston Fabrication	1
7	001506	Swing Plate	1
8	**	End Cap, Tefzel (used on item 1A only)	1
8	**	End Cap, Kynar (used on item 1A only)	1

	Tefzel High Flow Case W/Cap Part Number	Kynar High Flow Case W/Cap Part Number	Kynar High Flow Case Part Number	Tefzel High Flow Case Part Number	Kynar Low Flow Case Part Number	Tefzel Low Flow Case Part Number	Cylinder Bore or Piston Diameter (Approx)
B Size	**	**	092146/1	**	092147/1	**	.2493"/6.332mm
B Size W/Gland	**	**	092146/2	**	092147/2	**	.2493"/6.332mm
C Size	**	**	092146/3	**	092147/3	**	.3942"/10.013mm
C Size W/Gland	**	**	092146/4	**	092147/4	**	.3942"/10.013mm
D Size	**	**	092146/5	**	092147/5	**	.5575"/14.161mm
D Size W/Gland	**	**	092146/6	**	092147/6	**	.5575"/14.161mm

NOTE

******* Contact IVEK Technical Support Department for information on these replacement parts.*

Figure 7.5 Swing Adjust Pump Module (Sheet 2)