



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER VANISHING CHAMBER™ INJECTION PUMP



MODEL
VCIP

DRAWING NUMBER
AD931AA

MANUAL NUMBER
IOM-230

REVISION
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IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS



Notes emphasize information and/or provide additional information to assist the user.



Caution messages appear before procedures that could result in damage to equipment if not observed.



Warning messages appear before procedures that could result in personal injury if not observed.

This manual is intended to be used as a basic installation and operation guide for the Welker OdorEyes Vanishing Chamber™ Injection Pump, VCIP. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker OdorEyes equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT – Save these instructions for local inspector's use.

IMPORTANT – Observe all governing codes and ordinances.

Note to Installer – Leave these instructions with the end user.

Note to End User – Keep these instructions for future reference.

Installation of this Vanishing Chamber™ Injection Pump is of a mechanical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Vanishing Chamber™ Injection Pump, please contact a Welker representative immediately.

Phone: 281.491.2331

Address: 13839 West Bellfort Street
Sugar Land, TX 77498

1.1 Introduction

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance (IOM) Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.*

If you have any questions, please call Welker at 1-281-491-2331.

**The following procedures have been written for use with standard Welker OdorEyes parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker OdorEyes VCIP Vanishing Chamber™ Injection Pump is a positive displacement pump designed to inject liquid odorant into a pressurized pipeline.

Liquid odorant is trapped inside the vanishing chamber™ collection cup where it is isolated from the operational side of the pump by the bellows diaphragm. The bellows diaphragm protects seals from the odorant, extending seal life and preventing corrosion of metal parts.

The VCIP features a sight glass, inlet and outlet quick-connects, and a detachable injection body for ease of maintenance.

The VCIP is intended to be incorporated into an odorant injection system and not used as a stand-alone pump.

Welker may custom design the VCIP to suit the particular application and specifications of each customer.

1.3 Specifications



The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: VCIP Specifications

Application	Liquid Odorant Injection
Materials of Construction	316/316L Stainless Steel, Anodized Aluminum, Buna, Kalrez®, Kel-F®, PTFE, and Viton® Others Available
Maximum Allowable Operating Pressure	Actuation: 100 psig @ -20 °F to 120 °F (6 barg @ -28 °C to 48 °C) Injection: 2160 psig @ 35 °F to 120 °F (148 barg @ 1 °C to 48 °C) Odorant Inlet: 250 psig @ 35 °F to 120 °F (17 barg @ 1 °C to 48 °C)
Connections	Actuation Port: ¼" FNPT Bleed/Drain: ¼" FNPT (Plugged) Odorant Inlet: ⅜" Quick-Connect Odorant Outlet: ⅜" Quick-Connect
Utility Requirements	Instrument Air Supply
Injection Volume	0.06 cc 0.2 cc 0.5 cc
Operation	Diaphragm-Operated
Weight	Approx. 13 lb
Dimensions	11" x 8 ⁹ / ₁₆ " x 9½" (Length x Width x Height)
Features	Check Valve on Odorant Outlet Detachable Injection Body Mounting Bracket Quick-Connects on Odorant Inlet and Odorant Outlet Sight Glass

Figure 1: VCIP Connection Diagram

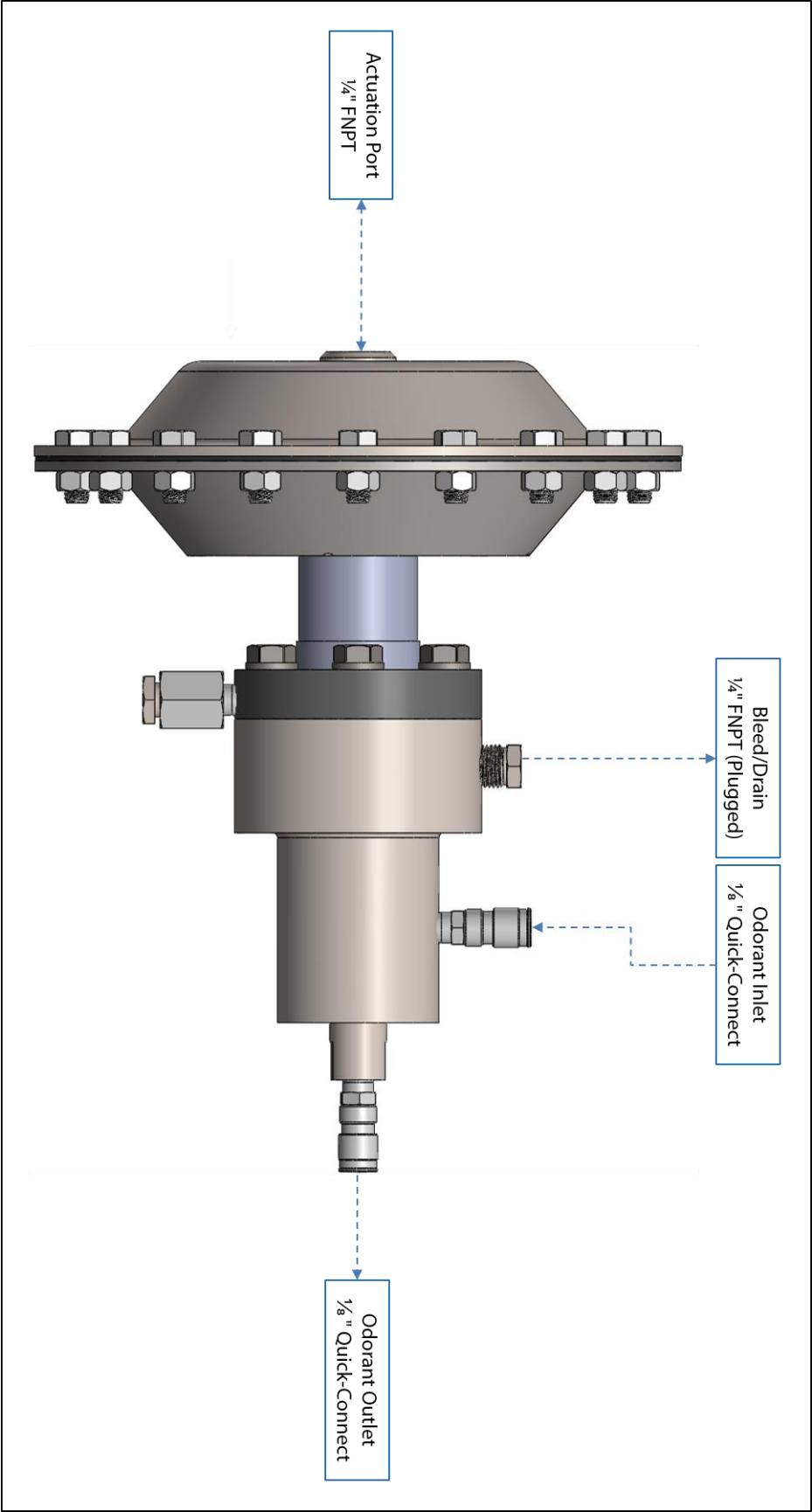
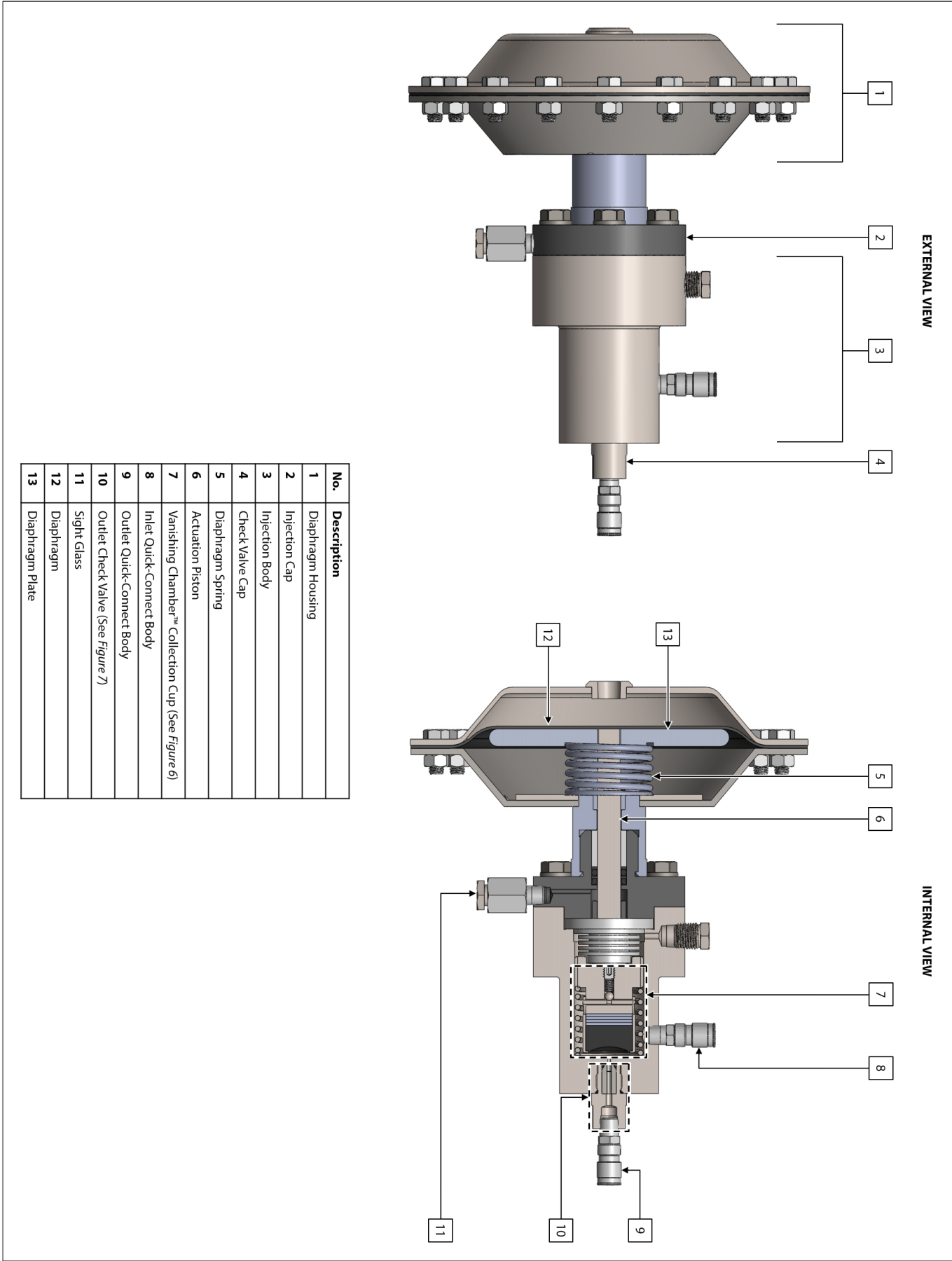


Figure 2: VCIP Diagram



SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin



After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.



When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

2.2 Principles of Operation

1. The customer connects from a pressurized odorant supply to the odorant inlet and from the odorant outlet to the pipeline.
2. When odorant is supplied to the VCIP, it flows through the odorant inlet and is then trapped in the vanishing chamber™ collection cup.
3. Instrument air pressure is applied to the actuation piston, causing the bellows diaphragm to expand. This forces the odorant trapped in the vanishing chamber™ collection cup through the outlet check valve into the pipeline.
4. As instrument air pressure is relieved, the spring returns the actuation piston to the top of the diaphragm housing.
5. The reduced pressure from the instrument air allows the bellows diaphragm to contract, creating space in the vanishing chamber™ collection cup for the odorant to enter.
6. Odorant injection continues according to the system settings.

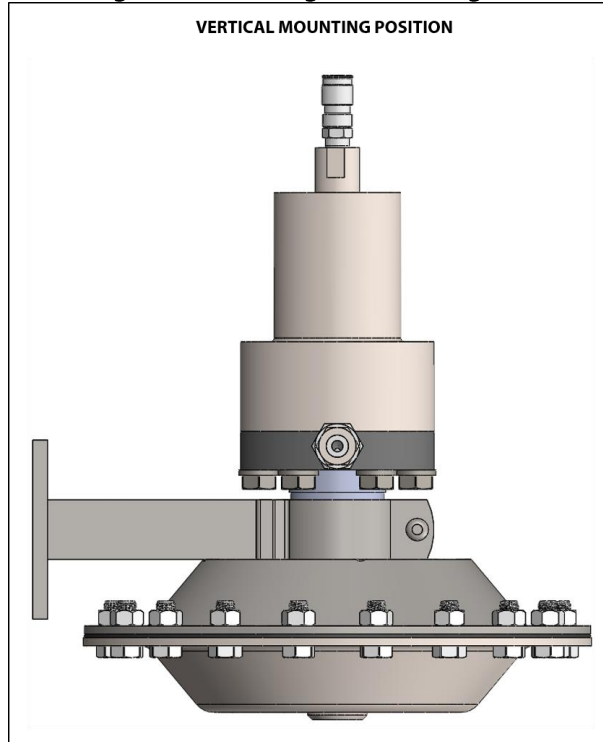
2.3 Installation



The installation instructions are written with the assumption that the VCIP has been purchased as part of a complete injection system.

1. Mount the VCIP in an upright, vertical position within the system enclosure to the mounting bracket (*Figure 3*). The mounting bracket will already be installed inside the system enclosure.

Figure 3: Mounting Position Diagram



This orientation allows all trapped air in the vanishing chamber™ collection cup to be bled off as odorant is supplied to the VCIP during start-up.

2. Using the provided flexlines in the system enclosure, connect from the odorant inlet on the system enclosure to the odorant inlet on the VCIP (*Figure 1*). Grasp the product flexline, and then push the quick-connect into the odorant inlet on the VCIP. The quick-connect will click audibly into place.
3. Using the provided flexlines in the system enclosure, connect from the odorant outlet on the VCIP to the odorant outlet on the system enclosure (*Figure 1*). Grasp the product flexline, and then push the quick-connect into the odorant outlet on the VCIP. The quick-connect will click audibly into place.
4. Connect from the instrument air inlet on the system enclosure to the actuation port on the VCIP (*Figure 1*).

2.4 Start-Up Procedures

1. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the specific odorant injection system in use with the VCIP to determine the proper start-up procedures.



The VCIP is intended to be incorporated into an odorant injection system and not used as a stand-alone pump.



Take the necessary precautions and wear appropriate personal protective equipment (PPE) to protect from potential harm caused by exposure to the injection chemical.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance.** Based on the operating conditions and/or site requirements, adjustments to the maintenance schedule may be necessary.
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs of the system in case of unexpected wear or faulty seals.



New seals supplied in spare parts kits should be lightly lubricated before being installed to ease the installation of the seals and reduce the risk of damage when positioning them on parts. Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.



For sample-exposed seals, Welker recommends non-hydrocarbon-based lubricants, such as Krytox®. For non-sample-exposed seals, Welker recommends either non-hydrocarbon-based lubricants or silicone-based lubricants, such as Molykote® 111.

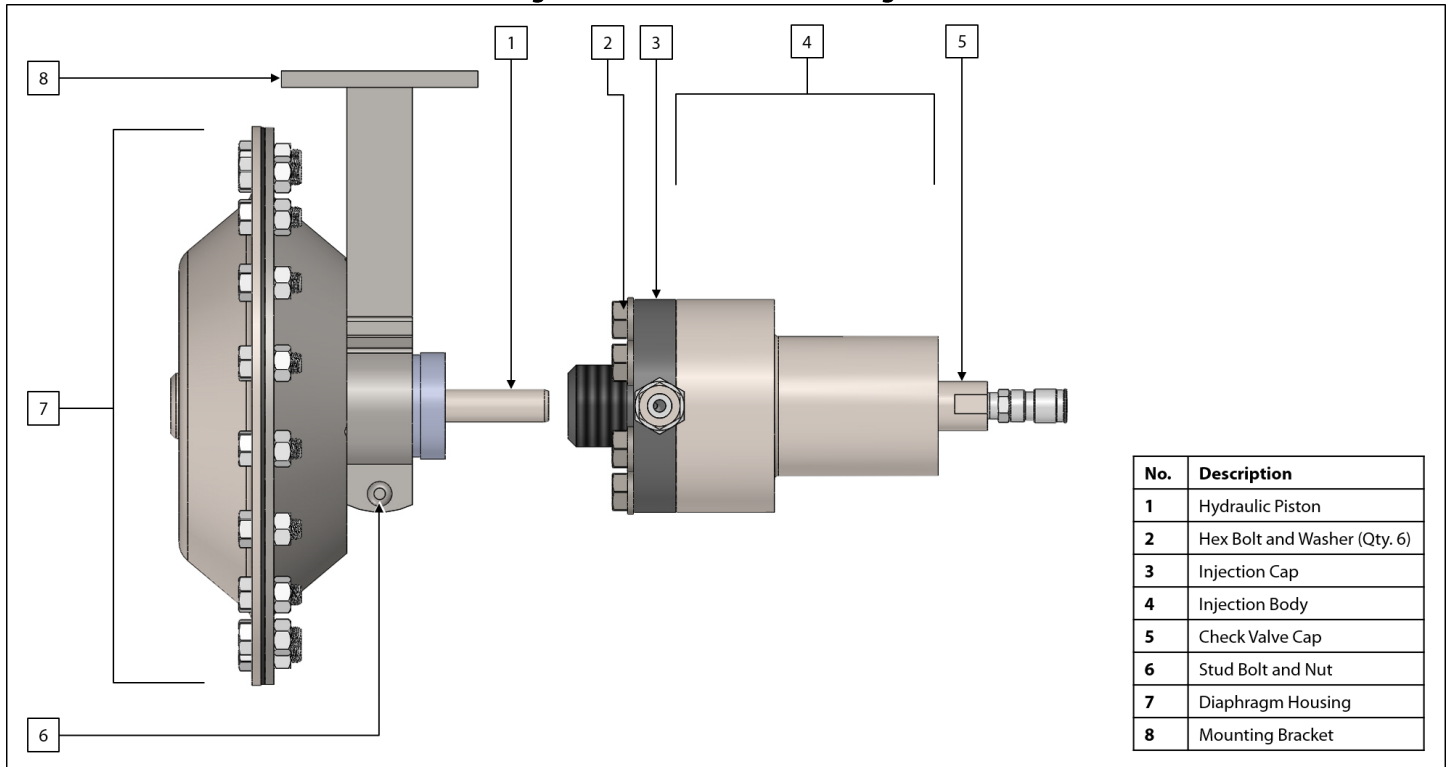


After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.
4. Welker recommends having the following tools available for maintenance. Please note that the exact tools required may vary by model.
 - a. 1/2" Wrench
 - b. 6" Adjustable Wrench
 - c. Adjustable Pliers
 - d. Anti-galling Compound
 - e. Hex Key Set
 - f. Seal Pick
 - g. Snap Ring Pliers
 - h. Threadlocker

3.2 Maintenance

Figure 4: VCIP Maintenance Diagram



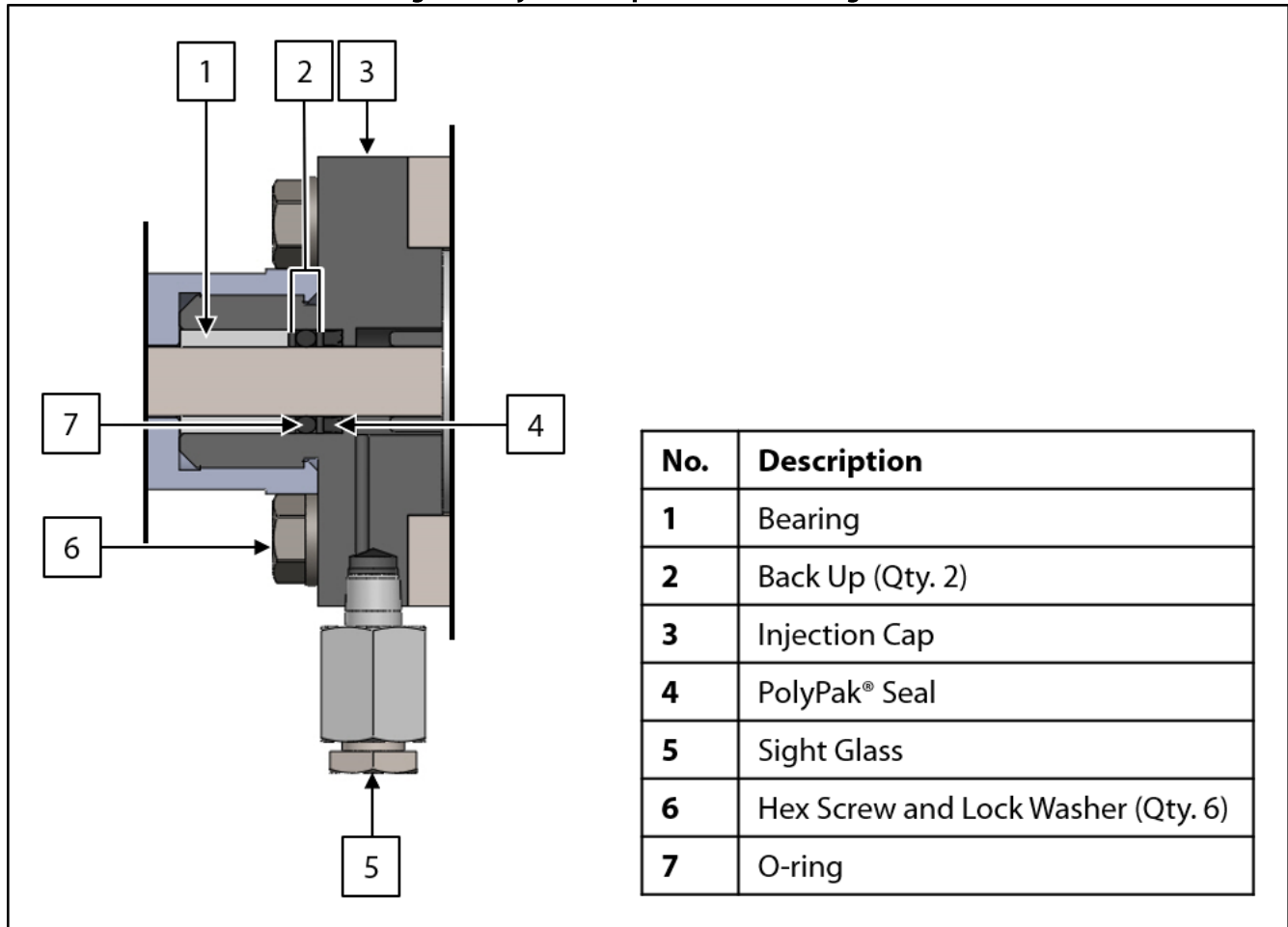
1. Depressurize the system and close all valves.
2. Turn OFF electrical power to the system and carefully remove all electrical connections.
3. Drain the contents of the system to a flare or other appropriate draining location.

Removing the VCIP

4. Disconnect the odorant inlet quick-connect and the odorant outlet quick-connect on the VCIP (*Figure 1* and *Figure 2*). Grip the “sleeve” of each quick-connect on the flexline and pull up and away from the VCIP.
5. Unscrew the stud bolt and nut from the mounting bracket and remove the VCIP (*Figure 4*).

Injection Cap Maintenance

Figure 5: Injection Cap Maintenance Diagram



6. Unscrew the diaphragm housing from the injection cap and injection body (*Figure 4*).
7. As necessary, unscrew the quick-connect fittings from the odorant inlet and the odorant outlet (*Figure 1* and *Figure 2*).
8. Unscrew and remove the hex screws and washers from the injection cap, and then remove the injection cap from the injection body (*Figure 4* and *Figure 5*).
9. Remove the bearing, two (2) back ups, PolyPak® seal, and O-ring from the injection cap (*Figure 5*).
10. Replace the bearing, two (2) back ups, PolyPak® seal, and O-ring.

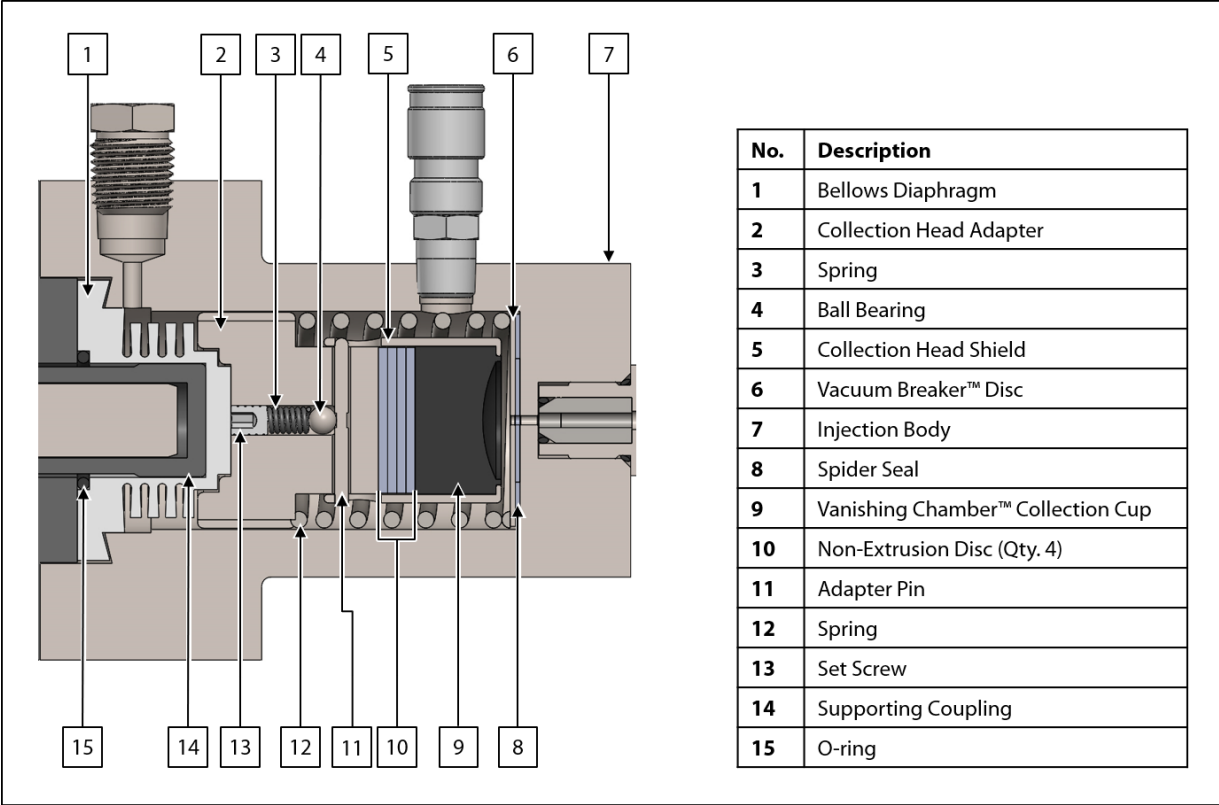


The PolyPak® seal must face downward for proper positioning.

11. Set the injection cap aside.

Injection Body Maintenance

Figure 6: Injection Body Maintenance Diagram



- 12. Remove the supporting coupling from the bellows diaphragm (Figure 6).
- 13. Inspect the surface of the supporting coupling for debris or scratches. Replace as necessary.
- 14. Remove the bellows diaphragm (Figure 6).
- 15. Replace the bellows diaphragm and the O-ring that lies inside the top of the bellows diaphragm (Figure 6).
- 16. Remove the vanishing chamber™ collection cup from the injection body (Figure 2 and Figure 6).
- 17. Remove the spring from the injection body (Figure 6).
- 18. If necessary, remove the Vacuum Breaker™ disc and spider seal.



If the VCIP uses a .06 cc collection cup, a Vacuum Breaker™ disc and spider seal are not necessary.

Vanishing Chamber™ Collection Cup Maintenance

- 19. Remove the adapter pin from the collection head shield, and then separate the collection head shield from the collection head adapter (Figure 6).
- 20. Push the vanishing chamber™ collection cup and four (4) non-extrusion discs out of the collection head shield (Figure 6).
- 21. Inspect and clean the collection head shield (Figure 6). Replace as necessary.
- 22. Install the replacement vanishing chamber™ collection cup and four (4) non-extrusion discs (Figure 6).

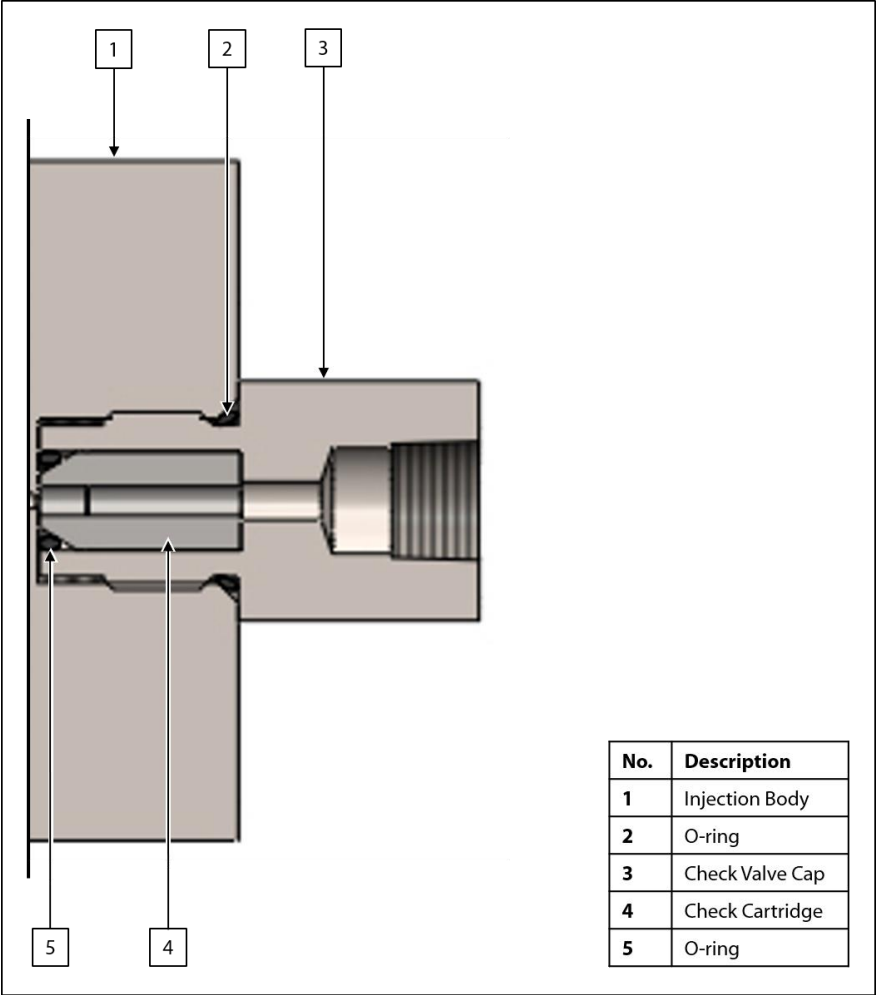


The collection head should be packed tightly with little movement after the addition of the non-extrusion discs.

- 23. Return the collection head shield to the collection head adapter, and then install the holding pin to secure the collection head shield to the collection head adapter (Figure 6).

Outlet Check Valve Maintenance

Figure 7: Outlet Check Valve Maintenance Diagram



- 24. Unscrew the check valve cap from the injection body (Figure 7).
- 25. Remove the two (2) O-rings and the check cartridge from the check valve cap (Figure 7).

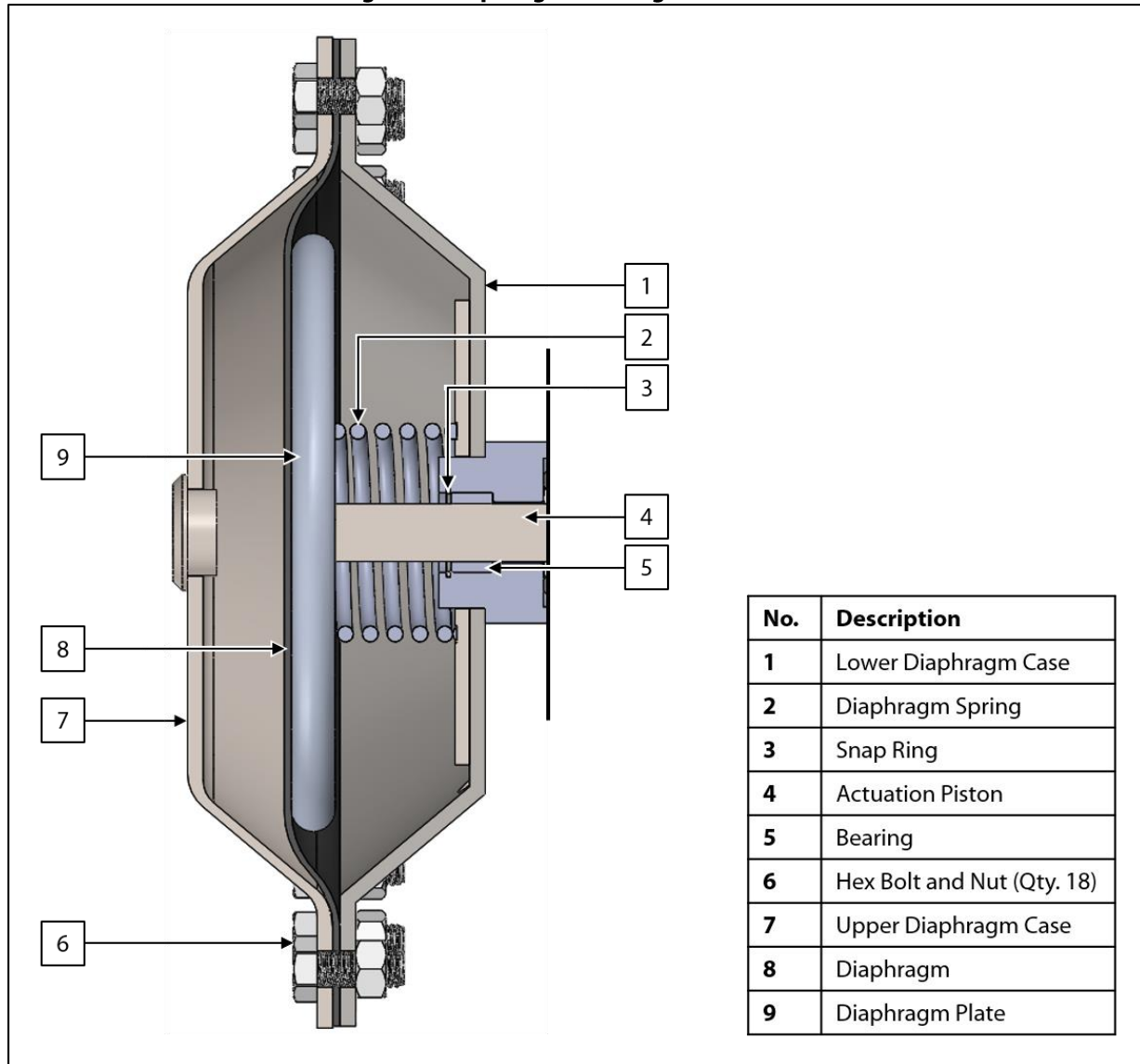


If necessary, use a 1/8" rod or tool to push the check cartridge out of the check valve cap (Figure 7).

- 26. Replace the two (2) O-rings and the check cartridge (Figure 7).
- 27. Screw the check valve cap into the injection body (Figure 7).

Diaphragm Housing Maintenance

Figure 8: Diaphragm Housing Maintenance



28. Unscrew and remove the hex nuts and bolts holding the upper and lower diaphragm cases together (*Figure 8*).
29. Remove the upper diaphragm case to expose the diaphragm (*Figure 8*).
30. Remove the diaphragm and inspect it for cracks or other damage (*Figure 8*). Replace as necessary.
31. Carefully push the actuation piston until the diaphragm plate clears the lower diaphragm case , and then carefully pull the diaphragm plate, diaphragm spring, and actuation piston out from the lower diaphragm case. (*Figure 8*).
32. Remove the diaphragm spring from the actuation piston (*Figure 8*).
33. Closely inspect the polished outer diameter of the actuation piston.



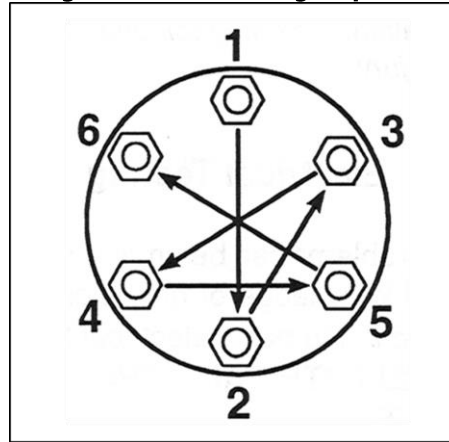
Scratches or pits may cause the seals to leak. If scratches or pits are present, the unit may need to be repaired or replaced. Contact Welker for service options.

34. Remove the snap ring and bearing from the lower diaphragm case (*Figure 8*).
35. Replace the bearing, and then return the snap ring to the lower diaphragm case (*Figure 8*).
36. Lightly lubricate the actuation piston, and then carefully slide the diaphragm spring back onto the actuation piston (*Figure 8*).

Reassembly

37. Carefully push the diaphragm plate assembly through the seals of the lower diaphragm case (*Figure 8*).
38. Attach the diaphragm to the diaphragm plate (*Figure 8*).
39. Set the upper diaphragm case in place against the lower case (*Figure 8*).
40. Following a cross-bolting sequence, bolt the upper and lower diaphragm cases together and tighten by hand (*Figure 8* and *Figure 9*).

Figure 9: Cross-Bolting Sequence



Welker recommends Never-Seez® or an equivalent anti-galling compound for use with this unit.

41. If necessary, return the Vacuum Breaker™ disc and spider seal to the injection body (*Figure 6*).
42. Return the spring to the injection body (*Figure 6*).
43. Insert the vanishing chamber™ collection cup into the injection body (*Figure 2* and *Figure 6*).
44. Insert the new bellows diaphragm (*Figure 6*).
45. Insert the new O-ring to the top of the bellows diaphragm (*Figure 6*).
46. Install the supporting coupling to the bellows diaphragm (*Figure 6*).
47. Set the injection cap in place on top of the injection body (*Figure 4* and *Figure 5*).
48. Following a cross-bolting sequence, bolt the injection cap to the injection body (*Figure 4*, *Figure 5*, and *Figure 9*). The injection cap should be flush with the injection body when tightened.
49. Install the quick-connect fittings to the odorant inlet and the odorant outlet (*Figure 1* and *Figure 2*).
50. Apply anti-galling compound to the threads on the lower diaphragm case (*Figure 8*).
51. Install the injection body and injection cap to the diaphragm housing assembly (*Figure 4*).
52. Attach the VCIP to the mounting bracket in the system enclosure, and then tighten the stud bolt and nut to secure the VCIP (*Figure 4*).
53. Maintenance is now complete. See *Section 2.3, Installation*, and *Section 2.4, Start-Up Procedures*, for instructions on returning the VCIP to operation.

3.3 Troubleshooting

Table 2: VCIP Troubleshooting		
Issues	Possible Causes	Solutions
The VCIP is not actuating properly.	The auxiliary instrument air supply may be too low or not operating.	Inspect the auxiliary instrument air supply and regulator to ensure that air is supplied at the appropriate pressure (i.e., approximately 40–60 psig).
	Pipeline pressure at the site of odorant injection has increased.	Verify that the pressure level of the auxiliary instrument air supply is adequate for the increased pipeline pressure. Allow the VCIP to build enough pressure to overcome the increased pipeline pressure. It may take several strokes for the VCIP to build pressure adequate to overcome the increase. As necessary, adjust the auxiliary instrument air supply pressure.
The VCIP has low to no output.	The outlet check valve on the VCIP is blocked.	Relieve pressure. Beginning at the injection point in the pipeline, work backward to the VCIP, checking the tubing and any attached instruments until the blockage is found.
	Pressure from the pressurized odorant supply is too low.	Verify that the odorant filter is not clogged. Increase the blanket pressure on the pressurized odorant supply.
	The vanishing chamber™ collection cup is not filling with odorant.	Verify that the outlet from the pressurized odorant supply is open to the VCIP. Bleed any trapped air from the injection body. Purge any trapped air in the system.
	The auxiliary instrument air supply is not reaching the VCIP.	Clear any blockages in the instrument air supply line. As necessary, replace the auxiliary instrument air supply.
	The auxiliary instrument air supply is too low to actuate the VCIP.	Adjust the auxiliary instrument air supply pressure to a level appropriate for the pipeline pressure.

Table 2: VCIP Troubleshooting (Continued)

Issues	Possible Causes	Solutions
The VCIP has low to no output. (Continued)	The diaphragm spring is broken.	Replace the diaphragm spring. Inspect the actuation piston for any scratches caused by the broken spring. Replace the actuation piston, if necessary.
	The outlet check valve has failed.	Remove the check valve from the check valve cap (<i>Figure 7</i>). Blow instrument air into one end of each check valve and then into the other end. If instrument air blows through both ways, the check valve needs to be replaced.
	The bellows diaphragm may have ruptured and the odorant can be smelled or seen in the sight glass.	Replace the bellows diaphragm. Contact Welker for service options.
	The spring in the injection body is broken.	Replace the spring in the injection body (<i>Figure 6</i>). Contact Welker for service options.
	The vanishing chamber™ collection cup is not sealing.	Inspect the vanishing chamber™ collection cup for wear and tear. Replace the vanishing chamber™ collection cup, if necessary. Contact Welker for service options.
Trapped air will not purge.	There is a blockage in the odorant inlet line.	Clear any blockages in the odorant inlet line. Beginning at the odorant inlet quick-connect on the VCIP, work backward to the pressurized odorant supply, checking the tubing and any attached instruments until the blockage is found.

Table 2: VCIP Troubleshooting (Continued)

Issues	Possible Causes	Solutions
Odorant is free flowing through the VCIP.	Pipeline pressure at the site of odorant injection is too low.	Verify that the pressure level of the auxiliary instrument air supply is adequate for the decreased pipeline pressure. As necessary, adjust the auxiliary instrument air supply pressure. If odorant continues to free flow after the pressure level of the auxiliary instrument air supply has been reduced, add a regulator after the outlet check valve on the VCIP. Set the regulator slightly higher than the anticipated maximum pipeline pressure to ensure that the VCIP will stroke against the same pressure.
	Pressure from the pressurized odorant supply is too high.	If possible, decrease the blanket pressure on the pressurized odorant supply or remount the VCIP. If the blanket pressure cannot be decreased, add a regulator after the outlet check valve on the VCIP. Set the regulator slightly higher than the anticipated maximum pipeline pressure to ensure that the VCIP will stroke against the same pressure.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

Welker *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- None

Other *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- Kepner Products Company Kepsel® Cartridge Insert Valves (Welker IOM-V078)
- Swagelok Company Quick-Connects QC, QF, QM, and QTM Series (Welker IOM-V088)

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD931AA

NOTES



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