



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WELKER® INFLOW™ CRUDE OIL SAMPLER

FIXED INSERTION

DRAWING NUMBERS

AD221CH

AD221CL

AD460CR

MANUAL NUMBER

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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® inFlow™ Crude Oil Sampler. 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® 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 inFlow™ Crude Oil Sampler 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 inFlow™ Crude Oil Sampler, 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® 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® *inFlow*™ Crude Oil Sampler is a direct-mount isokinetic probe sampler designed to extract a representative sample of liquid product from the flowing stream.

Sampling may be hydraulically or pneumatically operated but is electronically controlled from a Programmable Logic Controller (PLC) or other signal control system. Sampling may be timed or proportional to flow.

When ordered with the optional internal and external sand reliefs, this sampler is capable of sampling product containing sand or debris. If equipped with the optional purge tube, the *inFlow*™ can be fully evacuated of internal sample volume, thus preparing the sampler for the next sample batch.



For this manual, the term "PLC," or Programmable Logic Controller, will be used to refer to the PLC, DCS, or other signal control system used by the customer to activate and operate the solenoid.

Welker may custom design the inFlow™ 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 customizations of your equipment.**

Table 1: inFlow™ Specifications

Products Sampled	Condensate, Crude Oil, Liquid Products Compatible With the Materials of Construction, Refined Hydrocarbons, and Water	
Materials of Construction	316/316L Stainless Steel Wetted Parts, Carbon Steel Motor and Base, PTFE, Buna Non-Wetted Seals, and Viton® Wetted Seals Others Available	
Maximum Allowable Operating Pressure	150 ANSI Carbon Steel: 285 psig @ -20 °F to 100 °F (19 barg @ -28 °C to 37 °C) 300 ANSI Carbon Steel: 740 psig @ -20 °F to 100 °F (51 barg @ -28 °C to 37 °C) 600 ANSI Carbon Steel: 1480 psig @ -20 °F to 100 °F (102 barg @ -28 °C to 37 °C) 1¼" and 2" MNPT: 2220 psig @ -20 °F to 100 °F (153 barg @ -28 °C to 37 °C) Others Available	
Pipeline Connection	NPT 1¼" 2"	Flanged Size: 2" (Standard), 3", or 4" Rating: 150, 300, or 600 ANSI RF
Sample Outlet Connection	¼" FNPT	
Motor Housing Actuation Ports	¼" FNPT (Standard) ½" FNPT	
Insertion Length	4½" (Without Shaft Extension) (Standard) 6¼" (With Shaft Extension) (Standard) Others Available	
Utility Requirements	Hydraulic or Pneumatic Supply for Motor Operation: 50 psig (3.4 barg) Inert Gas Supply for Purge Operation: ¼" FNPT Connection (Optional)	
Pneumatic Consumption	Air: 0.095 scf/Stroke @ 50 psig (3.4 barg) Natural Gas (With 0.6 Specific Gravity): 0.123 scf/Stroke @ 50 psig (3.4 barg) Nitrogen: 0.097 scf/Stroke @ 50 psig (3.4 barg)	
Sample Volume	B-Style Collection Head: 0.5 cc, 1.0 cc (Standard), 1.5 cc, or 2.0 cc D-Style Collection Head: 1–5 cc (½" piston) or 0.5–10 cc (¾" piston) Vanishing Chamber™ Collection Cup: 0.22 cc, 0.5 cc, 1.0 cc, or 1.5 cc	
Features	External Adjustable Relief Internal Relief Welker® Volume Eliminator	
Options	External Sand Relief Pipeline Spool (With or Without Mixer) Purge Tube CE Compliance NACE Compliance	

1.4 Equipment Diagrams

Figure 1: inFlow™ Diagram

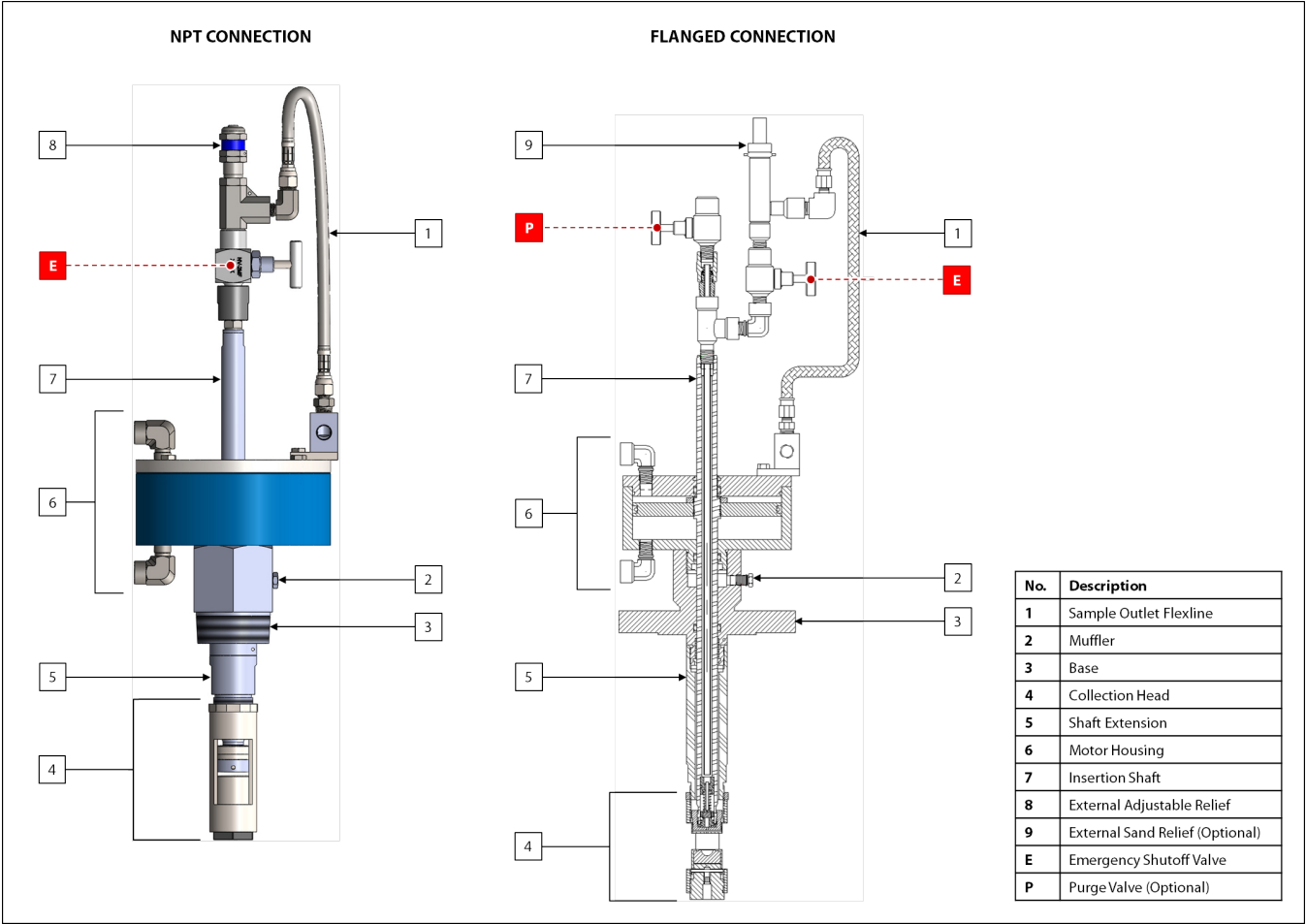


Figure 2: inFlow™ Connections Diagram

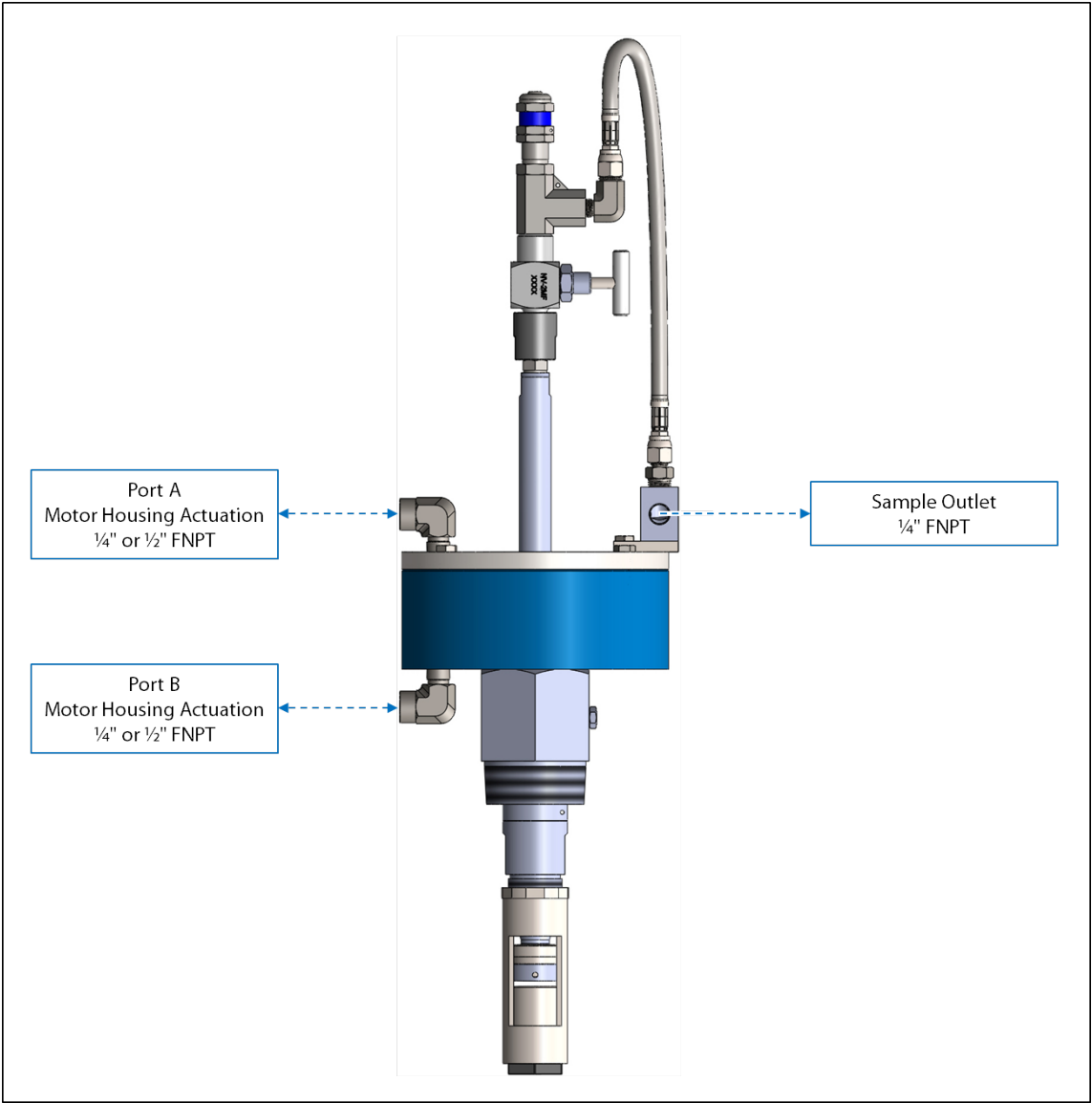
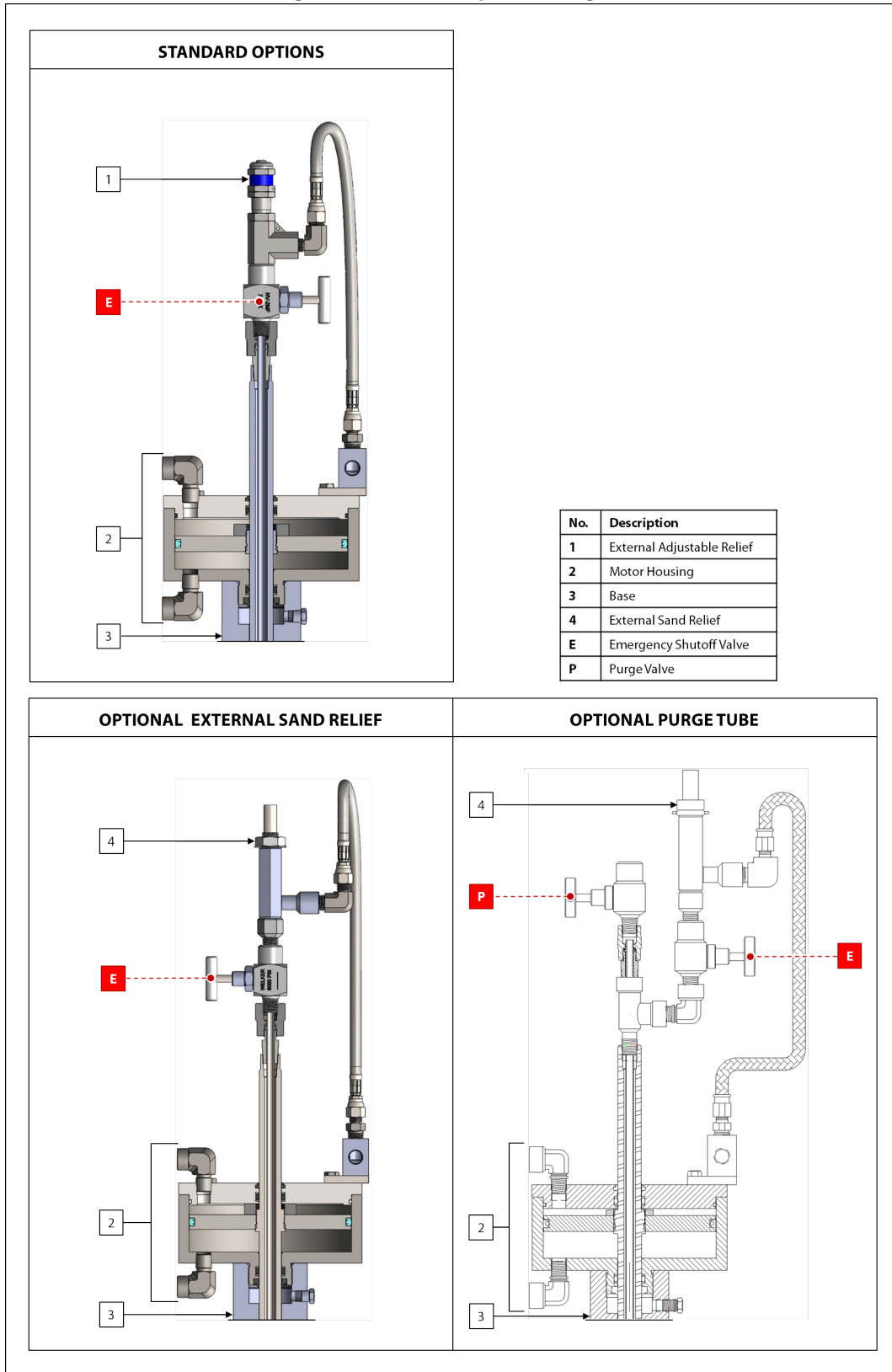


Figure 3: inFlow™ Options Diagram



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.

1. Welker recommends that the unit be installed to the side of the pipe and inserted into the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.
2. Locate the unit two to four pipe diameters (2–4D) downstream of an inline static mixer or other flow conditioning system.
3. Handle the unit with care.

2.2 Setting the Sample Volume

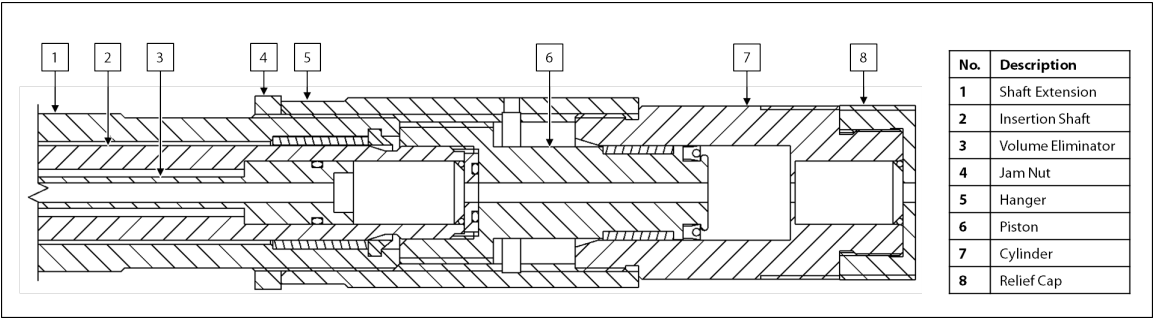


If the inFlow™ is equipped with the B-Style or Vanishing Chamber™ collection head, the sample volume is not adjustable. Proceed to Section 2.3, *Preparing the Unit for Installation*.



Welker can pre-set the sample volume if noted at the time of order.

Figure 4: D-Style Collection Head Diagram



1. Loosen the jam nut on the collection head.
2. To decrease the sample volume, screw the collection head assembly clockwise. This shortens the stroke of the collection head piston.
3. To increase the sample volume, screw the collection head assembly counterclockwise. This lengthens the stroke of the collection head piston.



One full rotation of the collection head is approximately:

- 0.2 cc if the inFlow™ is equipped with the 1/2" piston D-Style collection head.
- 0.5 cc if the inFlow™ is equipped with the 3/4" piston D-Style collection head.

4. Once the desired sample volume has been reached, firmly tighten the jam nut on the collection head to prevent slippage that might lead to inconsistencies in the sample volume.

2.3 Preparing the Unit for Installation

1. If the inFlow™ is equipped with a B-Style or Vanishing Chamber™ collection head, it is necessary to properly align all parts of the inFlow™ prior to installation; continue to step 2. If the inFlow™ is equipped with a D-Style collection head, it is not necessary to bring the inFlow™ into alignment prior to installation; proceed to *Section 2.4, Installing the Unit*.
2. Determine the direction of product flow in the pipeline.
3. Lay the inFlow™ on a smooth, clean surface.
4. Loosen the jam nut, and then turn the hanger. The opening in the collection head should face the direction of product flow so that the flowing stream will pass through the opening.
5. Tighten the jam nut on the collection head to prevent the collection head from turning.
6. Using a felt tip pen, mark the location of the opening in the hanger on the motor housing.



Once the unit is installed to the pipeline, the mark on the motor housing will be an external reference point to the collection head opening.

2.4 Installing the Unit



The pipeline must be depressurized prior to installing and removing the unit.

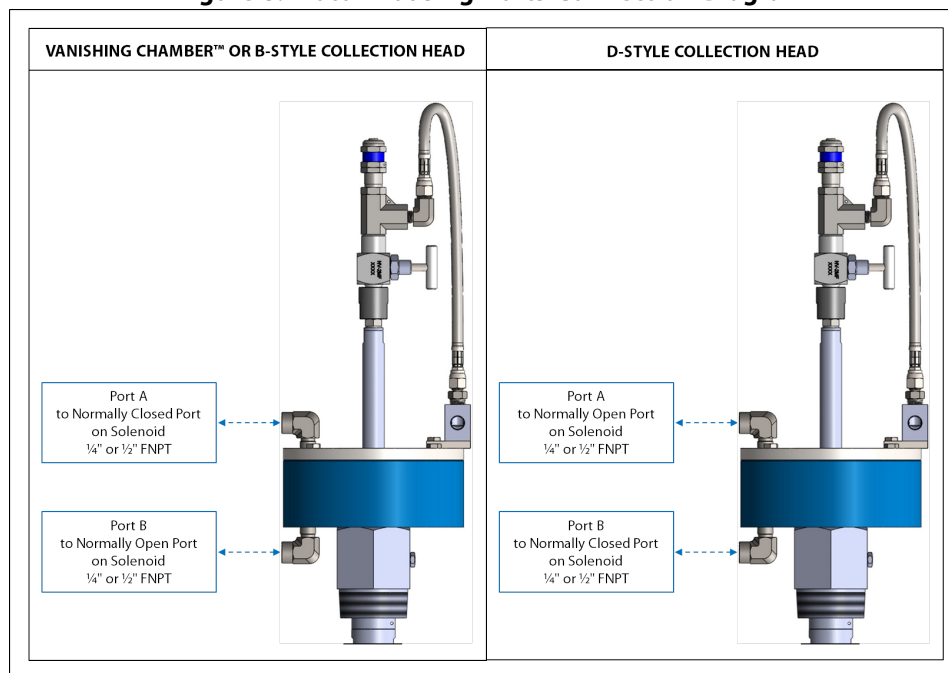
1. Close all valves on the inFlow™.
2. Install the inFlow™ to the pipeline so that the opening in the collection head faces the direction of product flow, as this allows the flowing stream to pass through the opening. As necessary, refer to the mark on the motor housing to ensure the inFlow™ is installed correctly.
3. Secure the inFlow™ to the pipeline.
4. Using ¼" tubing, connect from the sample outlet to an appropriate customer-supplied sample container, such as a Welker® TCC mini Transportable Crude Oil Container.



Customer-supplied ¼" tubing must slope downward from the inFlow™ to the sample container.

5. If the inFlow™ is equipped with a Vanishing Chamber™ or B-Style collection head, use appropriately sized tubing to connect from the normally open port on the solenoid to port B on the motor housing (*Figure 5*). Use appropriately sized tubing to connect from the normally closed port on the solenoid to port A on the motor housing (*Figure 5*).
6. If the inFlow™ is equipped with a D-Style collection head, use appropriately sized tubing to connect from the normally open port on the solenoid to port A on the motor housing (*Figure 5*). Use appropriately sized tubing to connect from the normally closed port on the solenoid to port B on the motor housing (*Figure 5*).

Figure 5: Motor Housing Ports Connection Diagram



The normally open port should be stamped "A" or "NO."
The normally closed port should be stamped "B" or "NC."

7. Pressurize the pipeline.
8. Open emergency shutoff valve E (*Figure 1*).
9. As necessary, adjust the external adjustable relief. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the relief for instructions on adjusting and setting the relief.



The external adjustable relief should be set approximately 100 psig above maximum pipeline operating pressure.



The external adjustable relief comes factory-set by the manufacturer if requested at the time of order.

10. As necessary, adjust the external sand relief. With emergency shutoff valve E open, tighten the jam nut on the external sand relief until no product emerges from the outlet (*Figure 9*).



After the external sand relief valve has been set, emergency shutoff valve E must remain open during sampling. For more information about emergency shutoff valve E, see *Section 2.7, Emergency Shutoff*.



The external sand relief comes factory-set by the manufacturer if requested at the time of order.

2.5 Operating the Unit

- 1. Turn ON the hydraulic or pneumatic supply.
- 2. As necessary, adjust the hydraulic or pneumatic supply to 50 psig.
- 3. Set the timer or controller to actuate the solenoid at the desired sampling actuation frequency based on the sampling equations provided (Figure 6).

Figure 6: Sampling Frequency Equations

Liquid Sampling, Proportional to Flow Collection
<p>Equation 1: Number of Samples Needed</p> $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$
<p>Equation 2: Proportional-to-Flow</p> $\text{Volume of Flow Between Sample Grabs} = \frac{\text{Batch Size (Total Volume to be Sampled)}}{\text{Number of Samples Needed (Eq. 1)}}$
<p>Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what volume of flow) to take each sample.</p>
Liquid Sampling, Timed Collection
<p>Equation 1: Number of Samples Needed</p> $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$
<p>Equation 2: Timed Sampling</p> $\text{Time Between Sample Grabs} = \frac{\text{Total Time in Sample Period}}{\text{Number of Samples Needed (Eq. 1)}}$
<p>Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what amount of time) to take each sample.</p>



Never fill the container above 80% of its capacity. Allow at least 20% room for product expansion should the container be exposed to increased temperatures.



Note the 0.8 in Equation 1 represents the 80% volume limit for liquid sampling.

- 4. Ensure that emergency shutoff valve E is open (Figure 1).
- 5. As necessary, turn on electrical power and activate the hydraulic or pneumatic supply to actuate the solenoid at the set sampling frequency.



At start-up, several actuations may be required to displace trapped air and fill the insertion shaft with product before sample appears at the outlet port.

6. Collect a sample from the sample outlet to ensure that the sample volume collected is the same as the desired sample volume.



Welker recommends the Welker® Checkpoint™ Sample Bite Verification Panel for use with this unit.

2.6 Purging the Unit (Optional)



The purge tube is an option of the inFlow™ that allows the sampler to be completely evacuated of sample from the inlet to the sample container. If the inFlow™ is equipped with the optional purge tube, automated purging can be achieved with the Welker® PNP Plug & Purge Panel.



To prevent cross-contamination between samples, Welker recommends that the inFlow™ be evacuated, or purged, following each sample batch to inject all sampled product remaining in the unit into the sample container.

1. Connect an appropriate customer-supplied nitrogen or other inert gas supply to purge valve P (*Figure 1*).



Welker recommends using nitrogen or helium as the inert gas supply.

2. Set the inert gas supply pressure to approximately 50 psig above the external relief on the inFlow™.



Prior to purging the unit, ensure that the purge pressure (i.e., the purge setting minus the external adjustable relief setting) does not exceed the pressure rating of the sample container.

3. Open purge valve P (*Figure 1*).
4. Turn ON the inert gas supply.
5. Allow product in the inFlow™ to drain. Monitor the sample container for under- or over-purging.



If no inert gas is heard entering the sample container, the purge pressure has been set too low and previous product remains in the sampler.

If more than a burst of inert gas is heard entering the sample container, the purge pressure has been set too high and the operator risks overpressurizing the sample container.

6. Turn off the inert gas supply.
7. Close purge valve P (*Figure 1*).
8. Disconnect the inert gas supply from purge valve P (*Figure 1*).

2.7 Emergency Shutoff

1. If sample begins to free flow from the sample outlet, turn OFF the hydraulic or pneumatic supply to the motor, and then close emergency shutoff valve E (*Figure 1*).



DO NOT operate the pump after emergency shutoff valve E is closed. Operating the pump while emergency shutoff valve E is closed may damage the pump.



Free flow from the sample outlet indicates that the external adjustable relief has not been set correctly or that the external adjustable relief has failed.

2. If leaking becomes evident elsewhere on the inFlow™, turn OFF the hydraulic or pneumatic supply to the motor and remove the unit for service.

2.8 Removing the Unit

1. If the inFlow™ is equipped with the optional purge tube, ensure that the inFlow™ has been purged. See *Section 2.6, Purging the Unit (Optional)*, for instructions on properly purging the inFlow™.
2. Deactivate or turn OFF the hydraulic or pneumatic supply.
3. Depressurize, drain, and disconnect the hydraulic or pneumatic supply lines.
4. Close emergency shutoff valve E (*Figure 1*).
5. Disconnect the sample container from the sample outlet.
6. Depressurize the pipeline.



The pipeline must be depressurized prior to installing and removing the unit.

7. The unit is now ready to be removed from the pipeline for maintenance or to be relocated.

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance under normal operating conditions.**
In cases of severe service, dirty conditions, excessive usage, or other unique applications that may lead to excess wear on the unit, a more frequent maintenance schedule may be appropriate.
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. Adjustable Wrench (Qty. 2)
 - b. Channel Lock Pliers
 - c. Hex Key Set
 - d. Seal Pick

3.2 Maintenance

- 1. Prior to performing maintenance, the unit must be removed from the pipeline. See *Section 2.8, Removing the Unit*, for instructions on removing the unit from the pipeline.
- 2. Relieve any trapped pressure by slowly releasing the spring tension on the external adjustable relief. If the inFlow™ is equipped with the optional external sand relief, back off the jam nut on the external sand relief to relieve any trapped pressure (*Figure 9*). If the inFlow™ is equipped with the optional purge tube, open purge valve P to relieve any trapped pressure (*Figure 10*).
- 3. Lay the inFlow™ on a smooth, clean surface

Collection Head Assembly



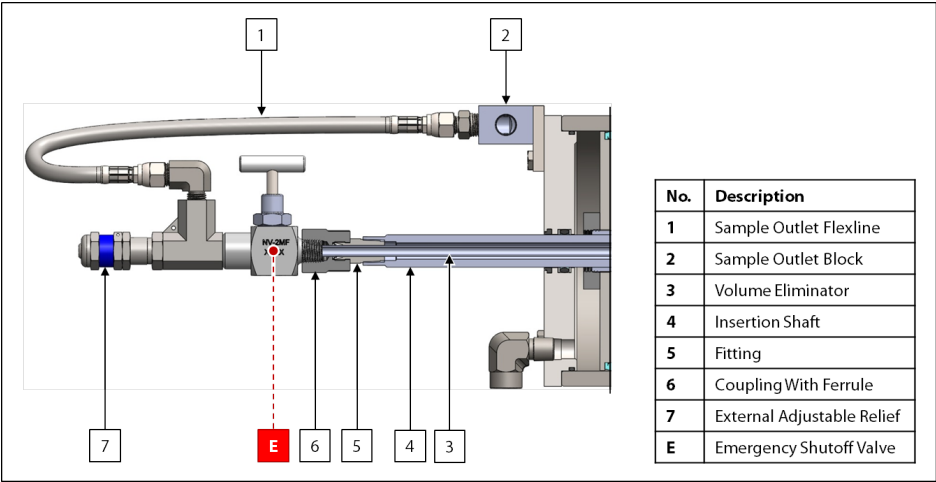
Welker recommends noting the position of the jam nut on the shaft extension to ease reassembly.

- 4. Unscrew and remove the collection head assembly from the shaft extension.
- 5. Refer to *Appendix B, B-Style Collection Head Maintenance*, *Appendix C, D-Style Collection Head Maintenance*, or *Appendix D, Vanishing Chamber™ Collection Head Maintenance*, for instructions on performing maintenance on the collection head.

Outlet Assembly

- 6. If the inFlow™ is not equipped with the optional purge tube, continue to step 7. If the inFlow™ is equipped with the optional purge tube, proceed to step 19.

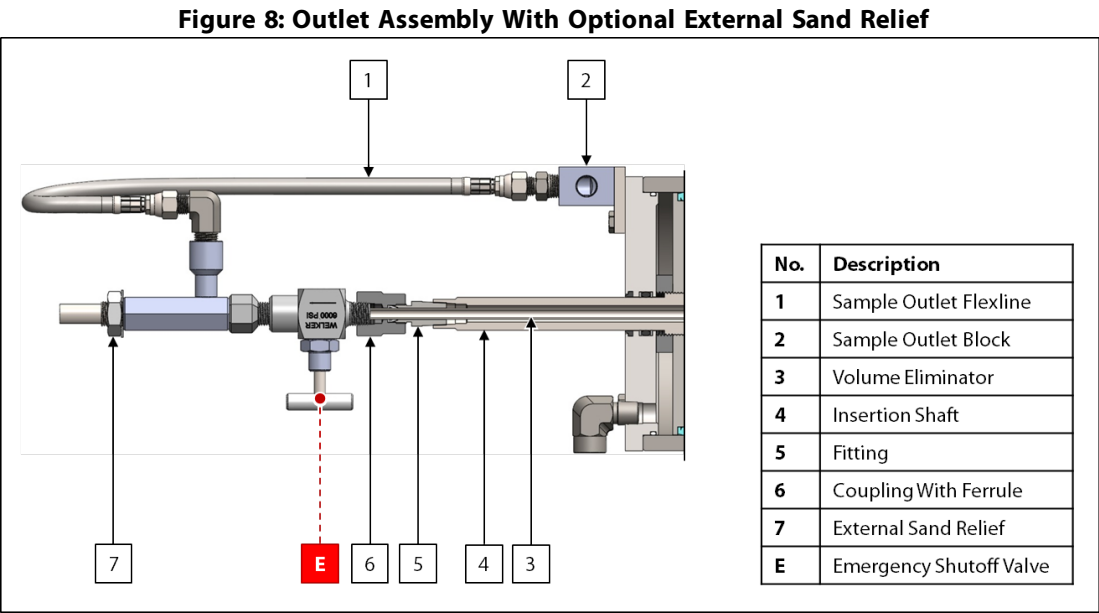
Figure 7: Outlet Assembly



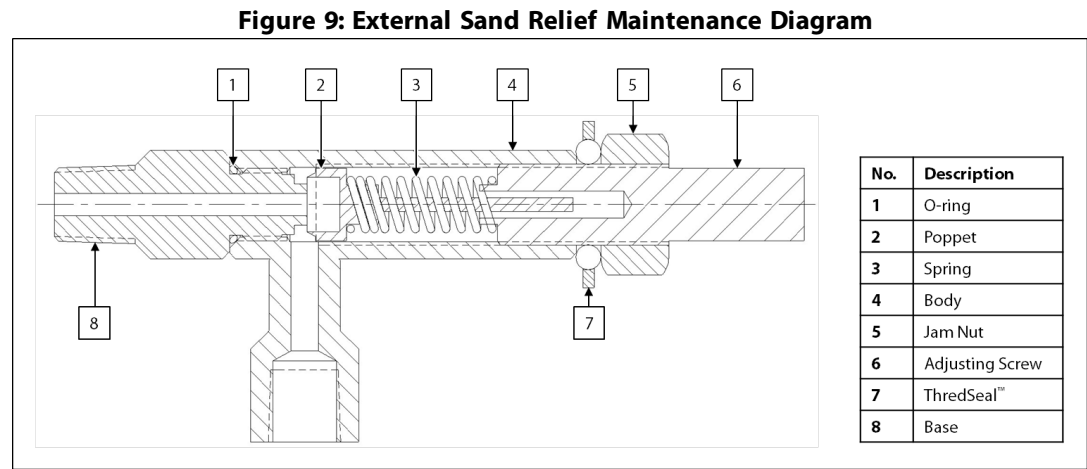
- 7. Unscrew the sample outlet flexline from the sample outlet block.
- 8. Unscrew the outlet assembly from the insertion shaft. Note that the ferrule set, coupling, emergency shutoff valve E, relief valve, and sample outlet flexline will be removed at this time.
- 9. If the inFlow™ is equipped with the external adjustable relief, refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the relief for maintenance instructions, and then proceed to step 23. If the inFlow™ is equipped with the optional external sand relief, continue to step 10.

External Sand Relief (Optional)

10. Unscrew the external sand relief from emergency shutoff valve E (Figure 8).



11. Unscrew the base of the external sand relief from the body (Figure 9).

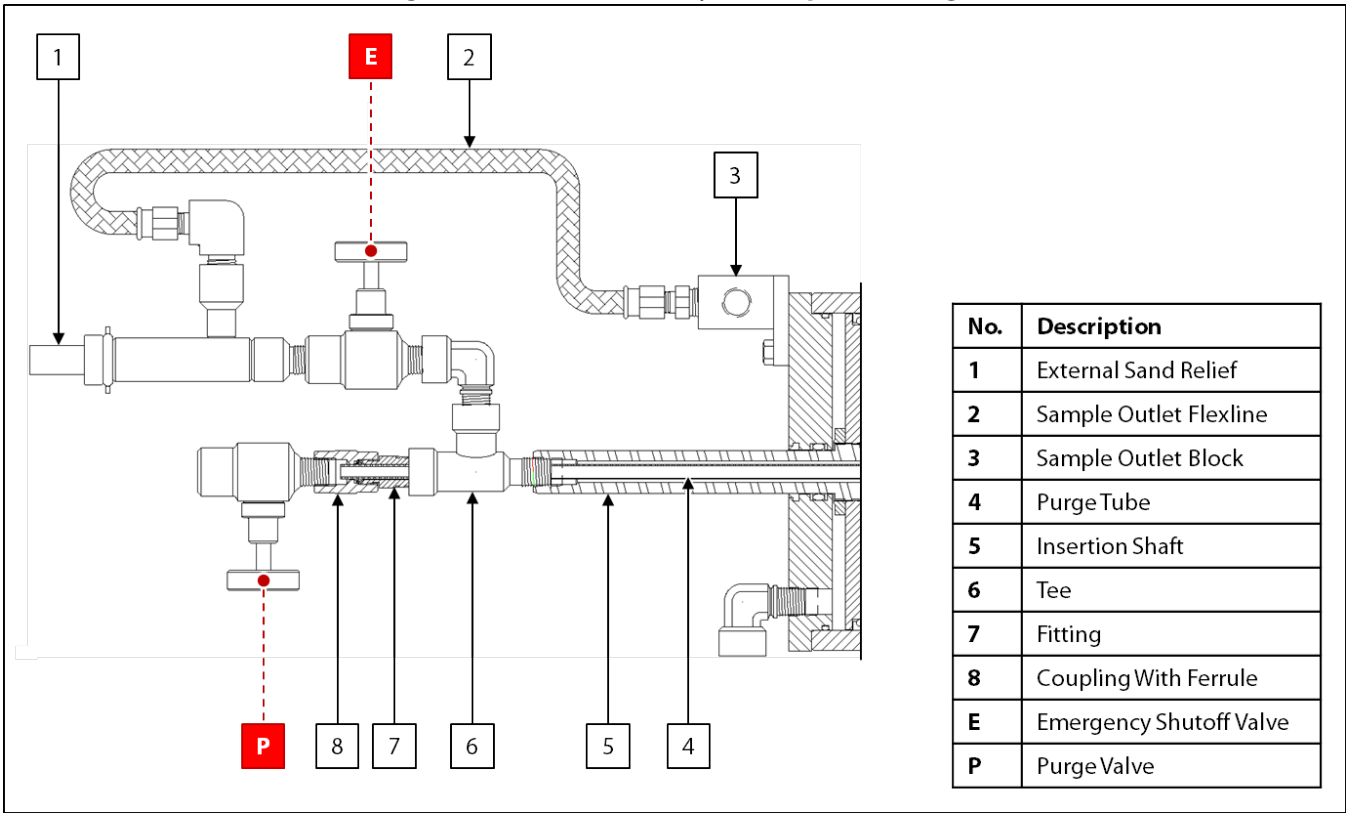


12. Replace the O-ring on the base.
13. Unscrew the jam nut from the adjusting screw.
14. Inspect the poppet for scratches or other damage. If scratches or other damage are present on the poppet (face) seat, replace the poppet.
15. Reassemble the external sand relief.
16. Screw the external sand relief into emergency shutoff valve E (Figure 8).
17. Screw the flexline into the elbow in the external sand relief (Figure 8).
18. Proceed to step 23 for instructions on disassembling the upper housing.

Purge Tube (Optional)

19. Unscrew the sample outlet flexline from the sample outlet block (Figure 10).

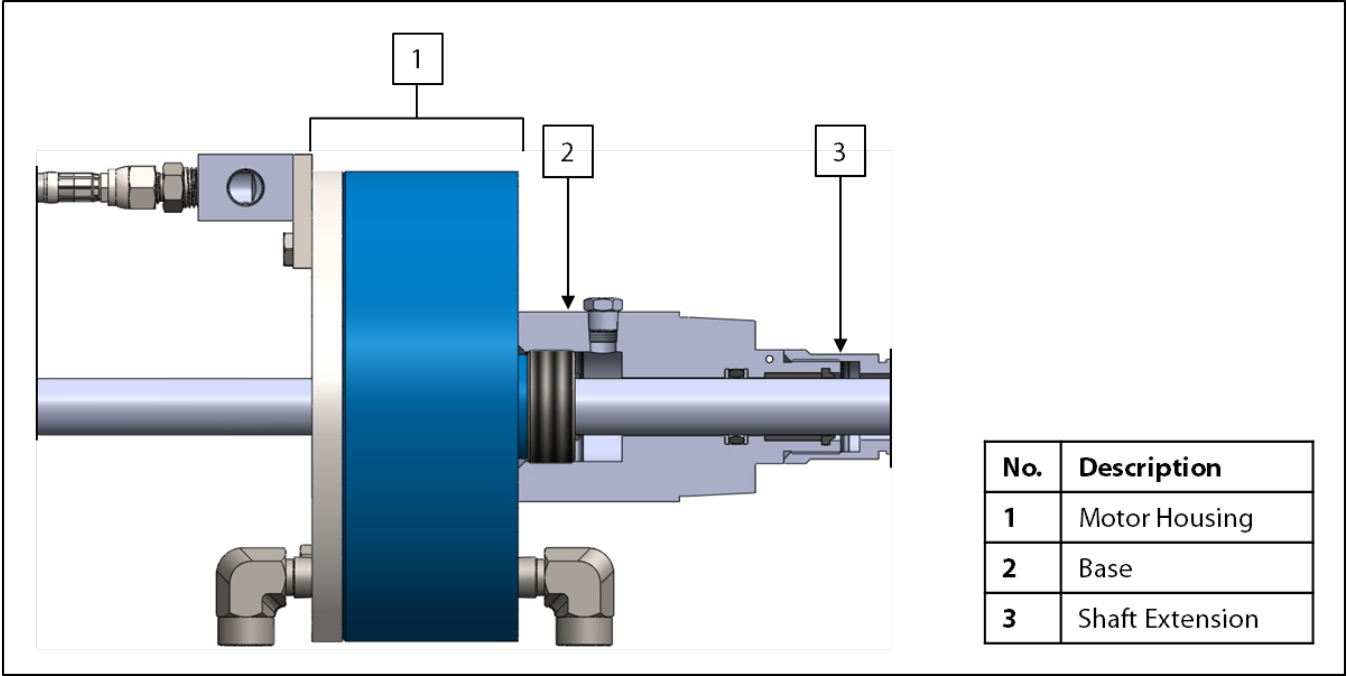
Figure 10: Outlet Assembly With Optional Purge



20. Unscrew the purge assembly at the tee connecting it to the insertion shaft. Note that the long purge tube is attached to the purge assembly and will also be removed at this time. Take care not to bend or otherwise damage the purge tube.
21. If the inFlow™ is equipped with the external adjustable relief, refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the relief for maintenance instructions. If the inFlow™ is equipped with the optional external sand relief, see steps 10–17 for maintenance instructions.
22. Continue to step 23 for instructions on disassembling the upper housing.

Disassembling the Upper Housing

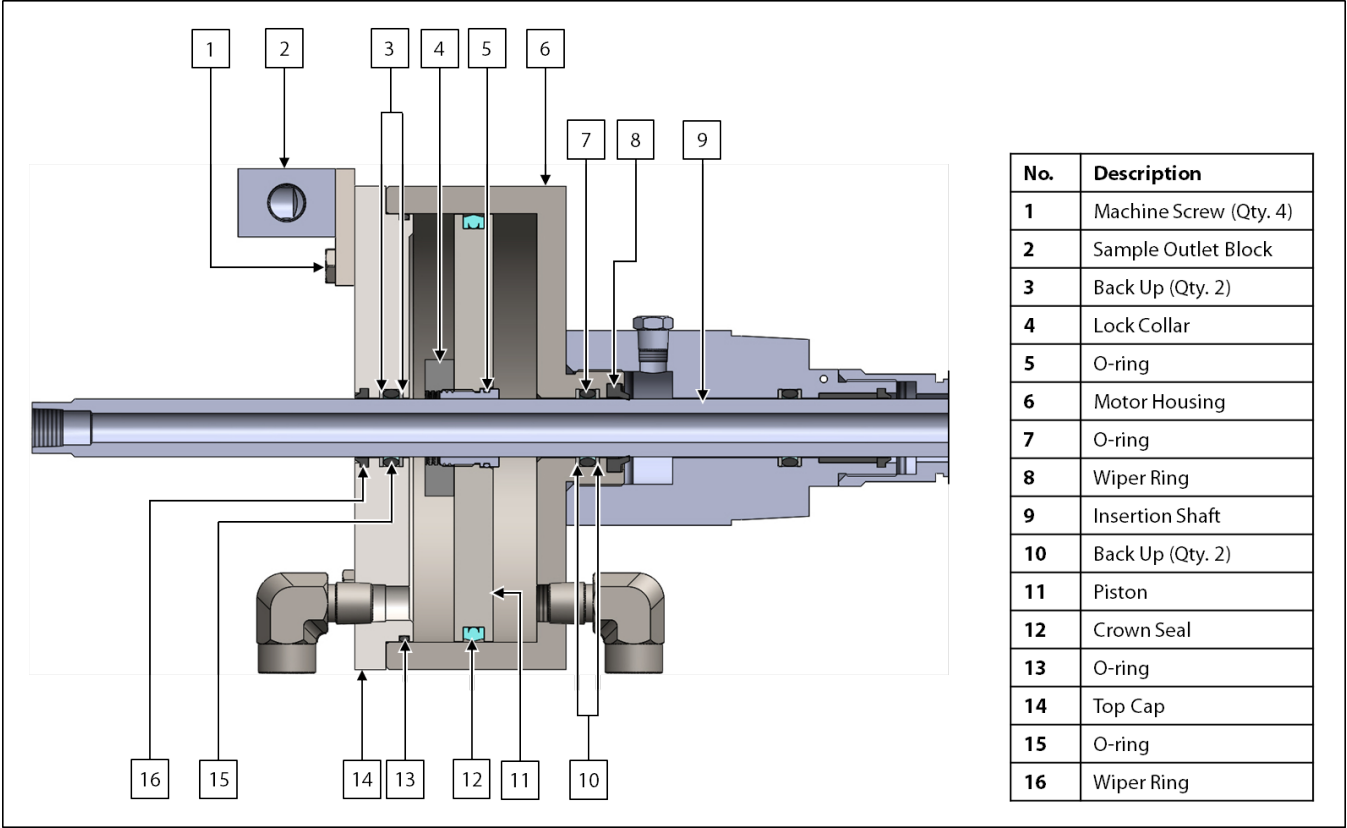
Figure 11: Upper Housing Assembly



- 23. Unscrew and remove the upper housing assembly from the shaft extension. Note that the insertion shaft is attached to this assembly and will be removed at this time. Take care not to scratch or otherwise damage the insertion shaft.
- 24. Unscrew the machine screws from the top cap and carefully remove the top cap from the motor housing (*Figure 12*).
- 25. Unscrew the motor housing from the base and carefully remove the motor housing. Note that the insertion shaft is attached to the motor piston and will be removed at this time. Take care not to scratch or otherwise damage the insertion shaft.

Motor Housing Assembly

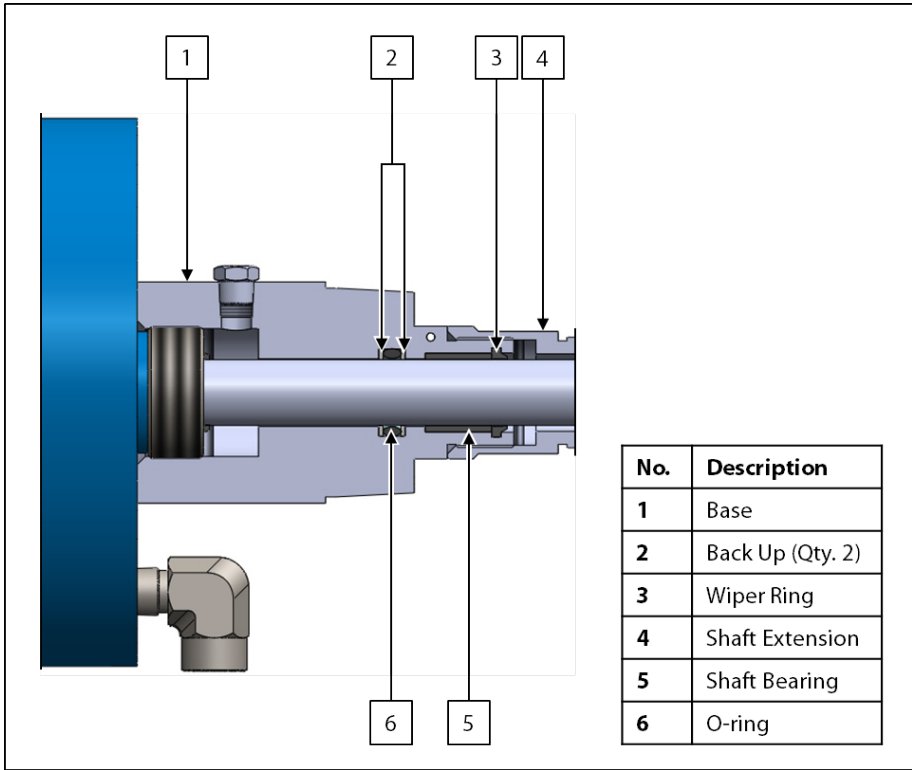
Figure 12: Motor Housing Assembly



- 26. Replace the O-rings and back ups on the top cap.
- 27. Inspect the wiper ring in the top cap. Replace it if it shows signs of wear or damage.
- 28. Replace the O-ring and crown seal on the piston.
- 29. Replace the O-ring and back ups in the motor housing.
- 30. Inspect the wiper ring in the motor housing. Replace it if it shows signs of wear or damage.
- 31. Inspect the polished portion of the insertion shaft. If any scratches or damage are present, repair or replace as necessary.

Base

Figure 13: Base Detail



- 32. Replace the O-ring and back ups in the base.
- 33. Inspect the wiper ring and shaft bearing. Replace if they show signs of wear or damage.
- 34. Screw the shaft extension onto the base.
- 35. Carefully slide the base onto the insertion shaft.
- 36. Carefully screw the motor housing into the base.
- 37. Return the top cap to the top of the insertion shaft and carefully slide the top cap down to the motor housing.
- 38. Bolt the top cap in place.

Reassembly

- 39. If applicable, insert the volume eliminator into the insertion shaft, and then screw the outlet assembly into the insertion shaft.
- 40. If applicable, insert the purge tube into the insertion shaft, and then screw the purge assembly into the insertion shaft.
- 41. Reconnect the flexline at the sample outlet block.
- 42. Tighten the collection head onto the shaft extension.
- 43. The unit is now ready for installation.

3.3 Troubleshooting

Table 2: inFlow™ Troubleshooting		
Issues	Possible Causes	Solutions
The inFlow™ is not actuating properly.	The hydraulic supply may be too low or not operating.	Inspect the electro-hydraulic unit (EHUC). Add hydraulic oil as necessary. If the EHUC is not operating, refer to the <i>Installation, Operation, and Maintenance (IOM) Manual</i> for the EHUC.
	The pneumatic supply may be too high, too low, or not operating.	Inspect the pneumatic supply and regulator to ensure that air is supplied at the appropriate pressure.
	The solenoid may not be operating properly.	Use the manual override button on the solenoid and ensure proper operation. If the solenoid is operating improperly, refer to the <i>Installation, Operation, and Maintenance (IOM) Manual</i> for the solenoid.
The sample container is not filling.	The inlet valve on the sample container may be closed.	Ensure that the sample inlet valve on the sample container is open during sampling.
	The outlet on the sample container may be open.	Ensure that the sample outlet valve on the sample container is closed during sampling.
	The inFlow™ is not collecting the correct sample volume.	Welker recommends the Welker® Checkpoint™ Sample Bite Verification Panel for verifying the sample volume of the inFlow™. See <i>Section 2.2, Setting the Sample Volume</i> , for instructions on adjusting the sample volume.
	The inFlow™ may be set at a slower sampling frequency than desired.	Adjust the inFlow™ to sample at the desired rate. Ensure that the calculations used to determine the sample frequency are correct (<i>Figure 6</i>).
	The relief on the inFlow™ may be set too high.	Check the setting on the relief and adjust as necessary.

Table 2: inFlow™ Troubleshooting (Continued)

Issues	Possible Causes	Solutions
The sample container is filling too quickly.	The inFlow™ is not collecting the correct sample volume.	Welker recommends the Welker® Checkpoint™ Sample Bite Verification Panel for verifying the sample volume of the inFlow™. See <i>Section 2.2, Setting the Sample Volume</i> , for instructions on adjusting the sample volume.
	The inFlow™ may be set at a faster sampling frequency than desired.	Adjust the inFlow™ to sample at the desired rate. Ensure that the calculations used to determine the sample frequency are correct (<i>Figure 6</i>).
	The relief on the inFlow™ may be set too low.	Check the setting on the relief and adjust as necessary.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-036: Welker® Transportable Crude Oil Container (TCC) and Laboratory Mixing Skid (MSTCC) Models
- IOM-105: Welker® NV-1 and NV-2 Instrument Valves
- IOM-117: Welker® Transportable Crude Oil Container (TCC) Carbon Steel and Laboratory Mixing Skid (MSTCC) Models
- IOM-134: Welker® Checkpoint™ Sample Bite Verification Panel
- IOM-165: Welker® PNP Plug & Purge Panel
- IOM-186: Welker® TCC mini Transportable Crude Oil Container

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

- Kepner Products Company Kepsel® Cartridge Insert Valves (Welker® IOM-V078)
- Parker Fluoropolymer Hose (Welker® IOM-V174)
- Swagelok® Proportional Relief Valves R Series (Welker® IOM-V086)

Welker® drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD221CH (inFlow™ NPT Connection With Optional External Sand Relief)
- Assembly Drawing: AD221CL (inFlow™ NPT Connection)
- Assembly Drawing: AD460CR (inFlow™ Flanged Connection With Optional Purge Tube)
- Collection Head Drawing: AD084BB (Vanishing Chamber™ Collection Head With Cartridge Relief)
- Collection Head Drawing: AD084BO (Vanishing Chamber™ Collection Head With B-Style Inline Relief)
- Collection Head Drawing: AD130BO (Vanishing Chamber™ Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD190BO (B-Style Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD224BM (D-Style Collection Head With Cartridge Relief)
- Collection Head Drawing: AD224BP (D-Style Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD375BA (B-Style Collection Head With B-Style Inline Relief)
- Collection Head Drawing: AD375BF (B-Style Collection Head With Cartridge Relief)

APPENDIX B: B-STYLE COLLECTION HEAD MAINTENANCE

1. Loosen the setscrew in the cylinder base, and then remove the holding pin.
2. Separate the cylinder base from the piston.
3. Unscrew the retainer from the piston.
4. Remove the Welker® Seal and piston bearing from the retainer.
5. Inspect the piston bearing for scratches or damage. If scratches or damage are present, repair or replace as necessary.
6. Replace the Welker® Seal.
7. Return the retainer to the piston. Tighten the retainer so that the Welker® Seal and piston bearing are held securely in place.
8. Return the piston to the base and insert the holding pin.
9. Tighten the setscrew in the cylinder base to secure the assembly.



DO NOT over-tighten the setscrew.

10. Unscrew the hanger from the outer shaft.
11. As necessary, apply approximately 40 psig of instrument air to the top of the piston motor to extend the inner shaft beyond the outer shaft.
12. While holding onto the wrench flats on the inner shaft with one wrench, use a second wrench to slowly unscrew the cylinder from the inner shaft.

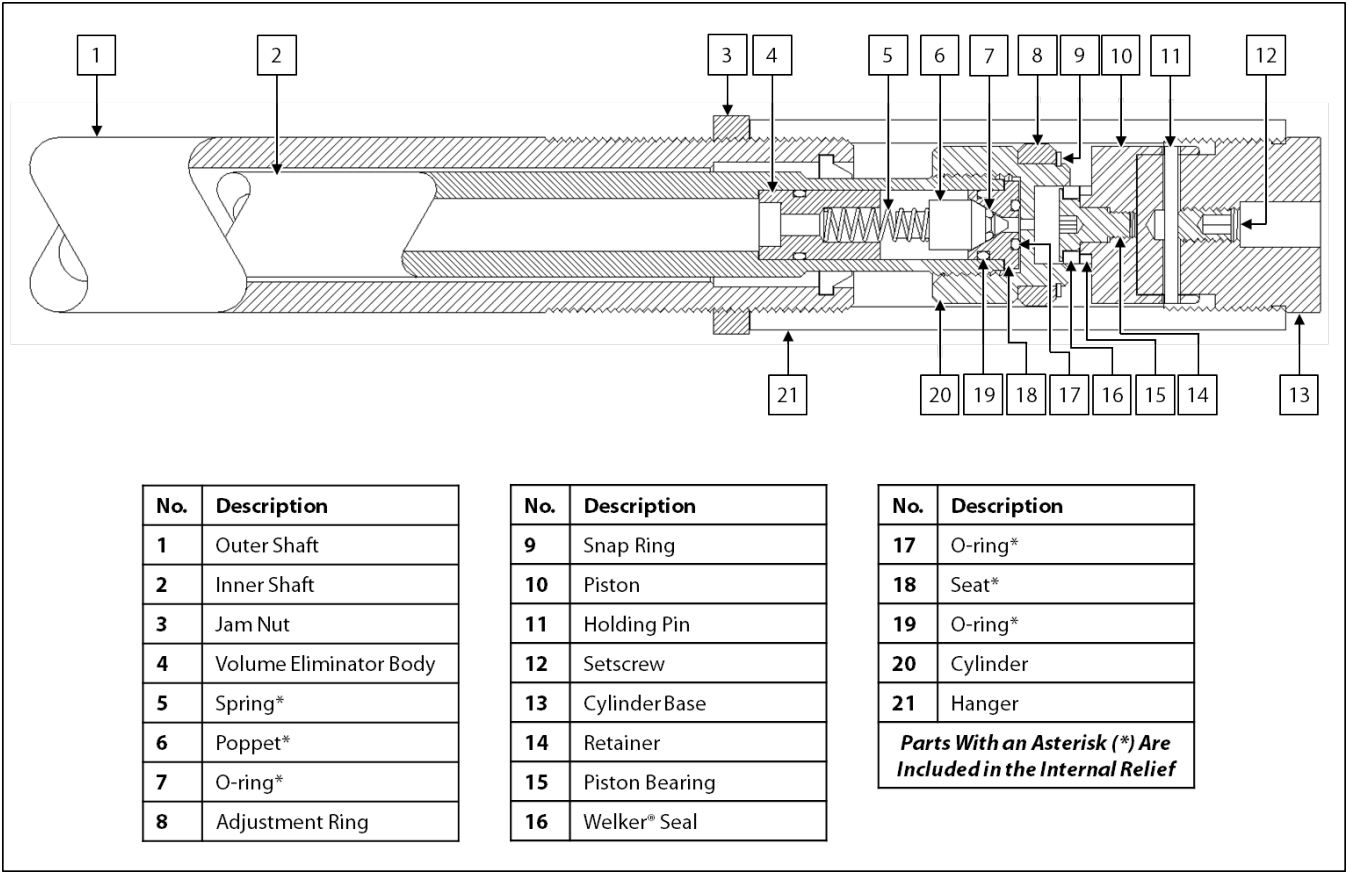


The B-Style and sand internal reliefs are spring loaded and may pop out when removing the cylinder.

13. If the collection head is equipped with the B-style internal relief, continue to step 14. If the collection head is equipped with the cartridge style internal relief, proceed to step 26. If the collection head is equipped with the internal sand relief, proceed to step 31.

B-Style

Figure B1: B-Style Collection Head With B-Style Internal Relief



- 14. Remove the seat from the cylinder.
- 15. Inspect the spring for damage or wear. Replace as necessary.
- 16. Inspect the poppet for damage or wear. Replace as necessary.
- 17. Replace the O-ring on the poppet.
- 18. Inspect the seat for damage or wear. Replace as necessary.
- 19. Replace the O-rings on the seat.
- 20. Install the seat to the cylinder.
- 21. Install the poppet to the seat.
- 22. Install the spring to the poppet.
- 23. Carefully screw the B-style internal relief assembly onto the inner shaft.



The cylinder must be attached securely to the inner shaft.

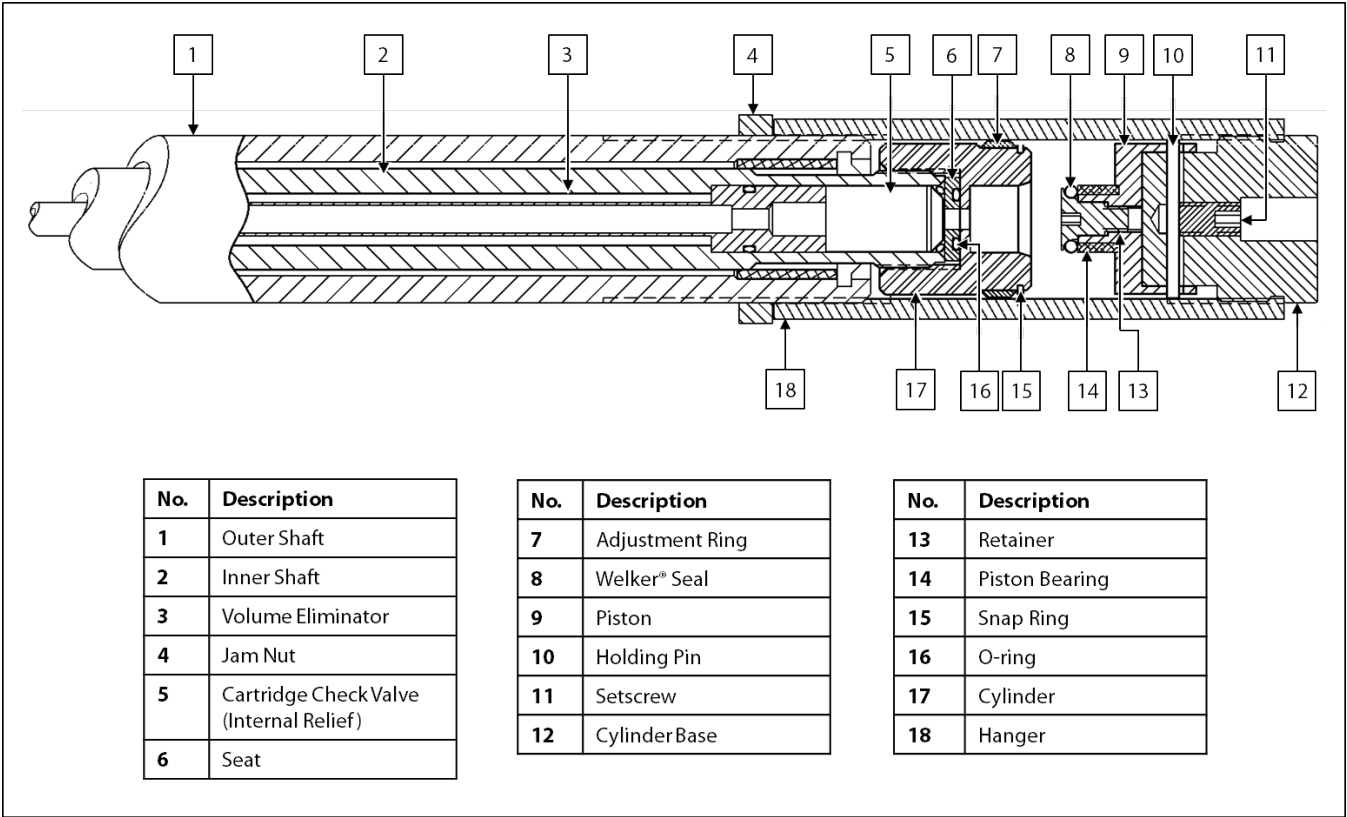
- 24. Screw the jam nut and hanger onto the outer shaft but do not tighten fully.
- 25. Proceed to step 41 for reassembly instructions.

Cartridge Style



This non-adjustable relief is designed for use with constant pressure cylinders and crude oil containers.

Figure B2: B-Style Collection Head With Cartridge Relief



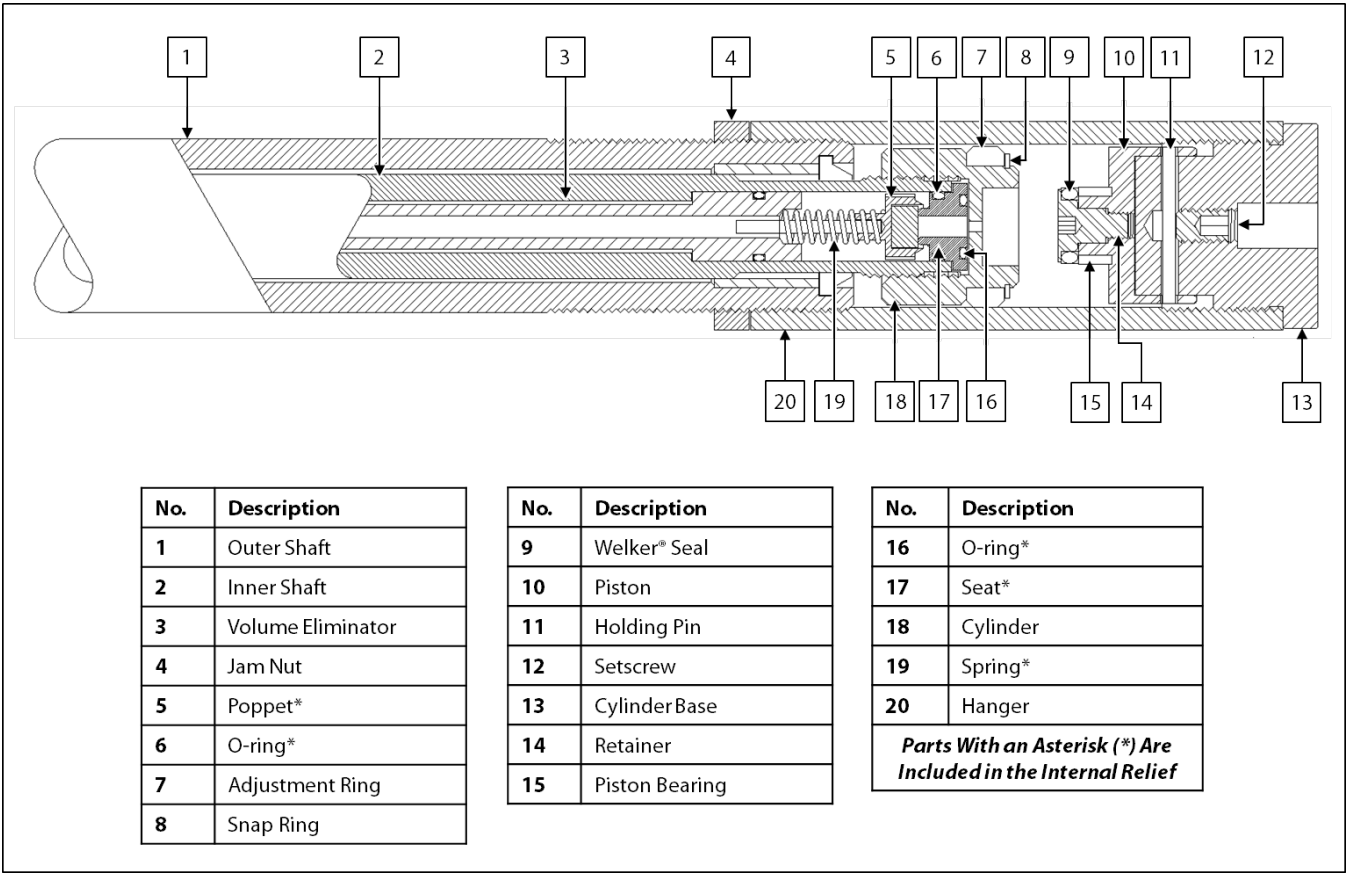
- 26. Replace the O-ring on the seat.
- 27. Install the seat to the cylinder.
- 28. Install a replacement cartridge check valve to the cylinder.
- 29. Carefully screw the cartridge style internal relief assembly onto the inner shaft.



The cylinder must be attached securely to the inner shaft.

- 30. Proceed to step 41 for reassembly instructions.

Figure B3: B-Style Collection Head With Sand Relief



- 31. Remove the seat from the cylinder.
- 32. Inspect the seat for damage or wear. Replace as necessary.
- 33. Inspect the spring for damage or wear. Replace as necessary.
- 34. Inspect the poppet for damage or wear. Replace as necessary.
- 35. Replace the O-rings on the seat.
- 36. Install the seat to the cylinder.
- 37. Install the poppet to the seat.
- 38. Install the spring to the poppet.
- 39. Carefully screw the sand relief assembly onto the inner shaft.



The cylinder must be attached securely to the inner shaft.

- 40. Continue to step 41 for reassembly instructions.

Reassembly

41. Screw the cylinder base / piston assembly into the hanger and tighten.
42. Apply instrument air to the bottom of the piston motor to drive the piston to the top of the housing. This will retract the inner shaft and position the collection head cylinder at maximum volume.
43. Screw the hanger up the outer shaft until the gap between the Welker® Seal and the top edge of the cylinder is approximately $\frac{3}{16}$ " (5 mm).
44. Tighten the jam nut against the hanger.
45. Using a wrench, tighten the cylinder base and jam nut.
46. Test stroke the inFlow™ to ensure proper stroke length. The B-Style collection head should completely close and then return to the $\frac{3}{16}$ " (5 mm) gap.

APPENDIX C: D-STYLE COLLECTION HEAD MAINTENANCE

1. Unscrew the cylinder assembly from the hanger.
2. Unscrew the relief cap from the cylinder.
3. Remove the cartridge check valve from the cylinder.
4. Install a replacement check valve to the cylinder.
5. Screw the relief cap onto the cylinder.
6. Loosen the jam nut, and then unscrew the hanger from the outer shaft.
7. Unscrew the piston from the inner shaft.



The internal sand relief is spring loaded and may pop out when removing the cylinder.

8. If the collection head is equipped with the cartridge style internal relief, continue to step 9. If the collection head is equipped with the internal sand relief, proceed to step 18.

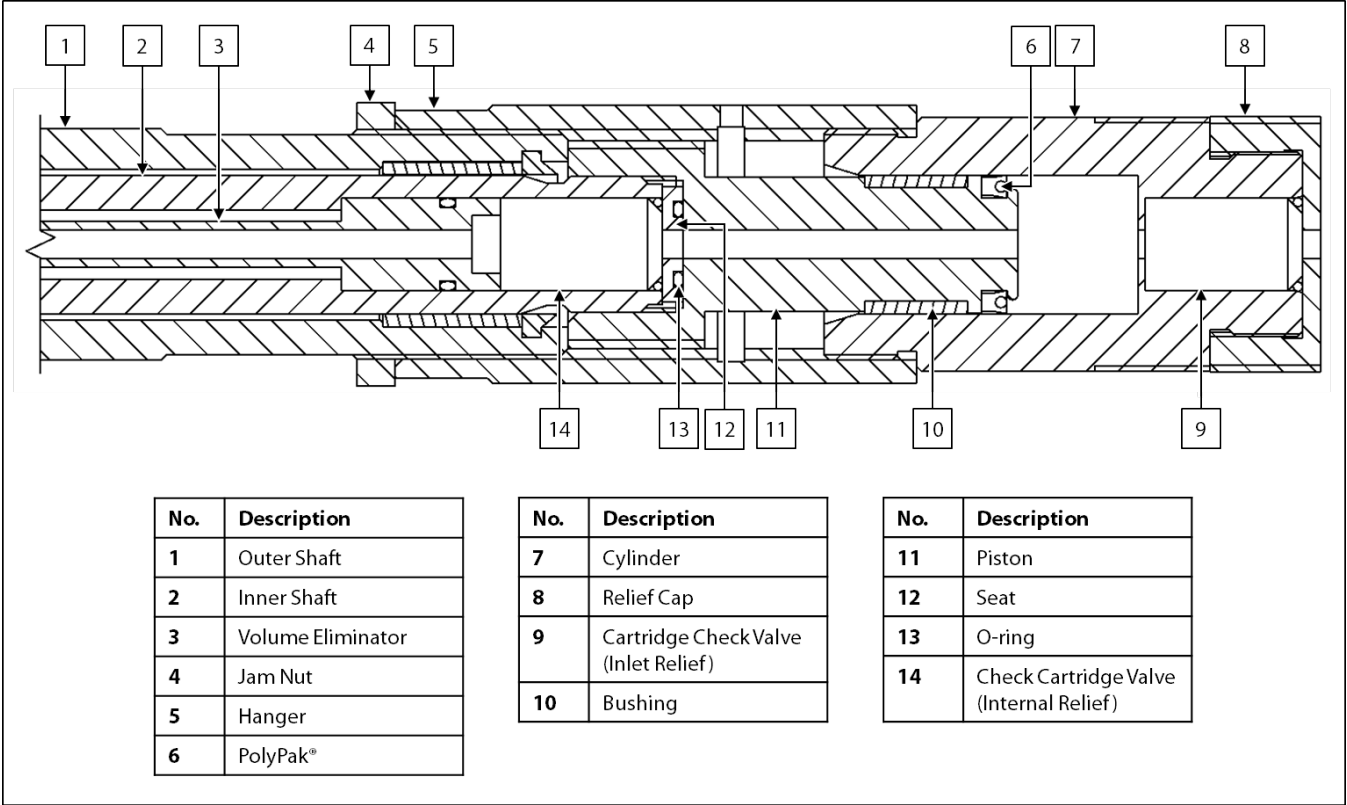
Internal Relief Maintenance

Cartridge Style



This non-adjustable relief is designed for use with constant pressure cylinders and crude oil containers.

Figure C1: D-Style Collection Head With Cartridge Relief



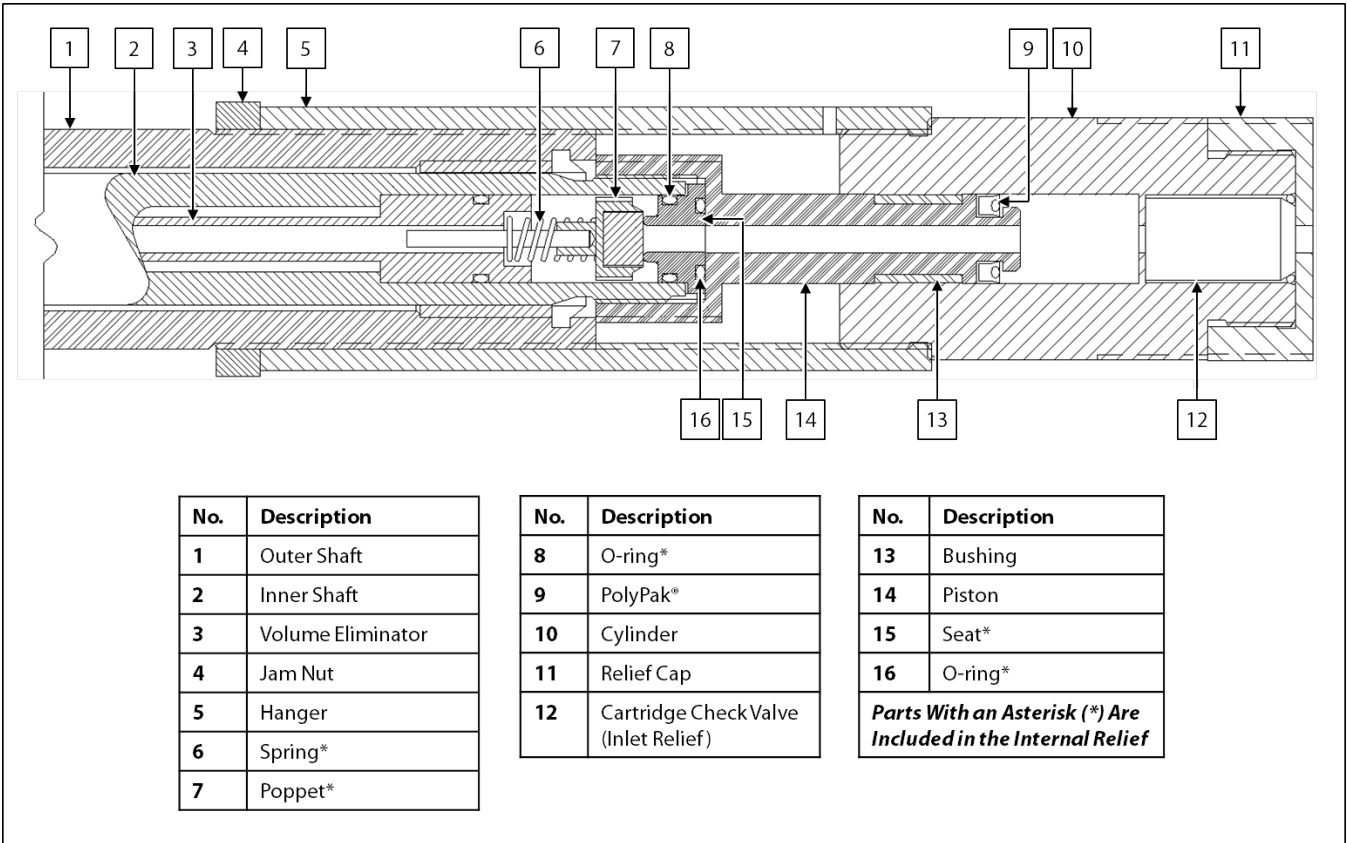
- 9. Remove the seat from the piston.
- 10. Examine the seat for damage or wear. Replace as necessary.
- 11. Replace the O-ring on the seat.
- 12. Install the seat to the piston.
- 13. Install a replacement cartridge check valve to the inner shaft.
- 14. Carefully screw the piston onto the inner shaft.



The piston must be attached securely to the inner shaft.

- 15. Inspect the bushing on the piston for signs of damage or wear. Replace as necessary.
- 16. Replace the PolyPak® on the piston.
- 17. Proceed to step 27 for reassembly instructions.

Figure C2: D-Style Collection Head With Sand Relief



- 18. Remove the seat from the piston.
- 19. Examine the seat for damage or wear. Replace as necessary.
- 20. Examine the spring for damage or wear. Replace as necessary.
- 21. Examine the poppet for damage or wear. Replace as necessary.
- 22. Replace the O-rings on the seat.
- 23. Install the seat to the piston.
- 24. Install the spring to the poppet, and then install the poppet assembly to the inner shaft.
- 25. Carefully screw the piston onto the inner shaft.



The piston must be attached securely to the inner shaft.

- 26. Continue to step 27 for reassembly instructions.

Reassembly

- 27. Screw the cylinder assembly into the hanger.
- 28. Screw the hanger onto the outer shaft.
- 29. Using a wrench, tighten the jam nut to lock the collection head in place.
- 30. Using a wrench, tighten the relief cap.

APPENDIX D: VANISHING CHAMBER™ COLLECTION HEAD MAINTENANCE

1. Loosen the setscrew in the cylinder base, and then remove the holding pin.
2. Separate the cylinder base from the collection head shield.
3. Push the collection cup and non-extrusion disc out of the collection head shield.
4. Lubricate the inside of the collection head shield, and then install the replacement collection cup and non-extrusion disc.
5. Return the shield to the base and insert the holding pin.
6. Tighten the setscrew in the cylinder base to secure the assembly.



DO NOT over-tighten the setscrew.

7. Unscrew the hanger from the outer shaft.
8. As necessary, apply approximately 40 psig of instrument air to the top of the piston motor to extend the inner shaft beyond the outer shaft.
9. While holding onto the wrench flats on the inner shaft with one wrench, use a second wrench to slowly unscrew the anvil from the inner shaft.

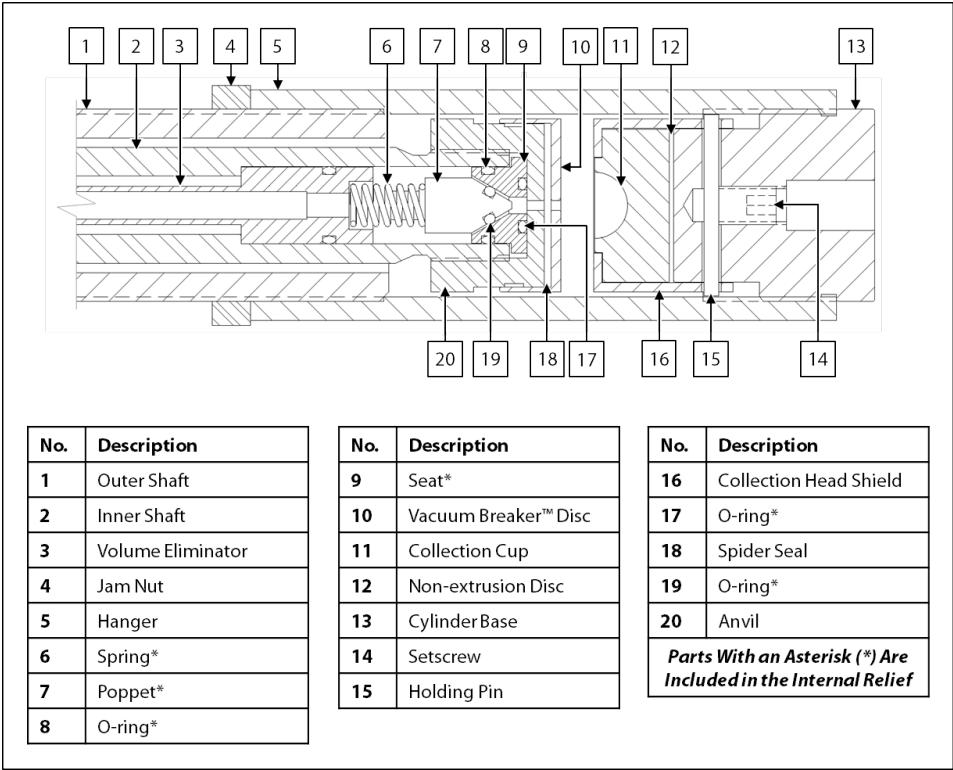


The B-Style and sand internal reliefs are spring loaded and may pop out when removing the cylinder.

10. If the collection head is equipped with a B-style relief, continue to step 11. If the collection head is equipped with the cartridge style internal relief, proceed to step 25. If the collection head is equipped with the internal sand relief, proceed to step 36.

B-Style

Figure D1: Vanishing Chamber™ Collection Head With B-Style Internal Relief



- 11. Remove the seat from the anvil.
- 12. Examine the spring for damage or wear. Replace as necessary.
- 13. Examine the poppet for damage or wear. Replace as necessary.
- 14. Replace the O-ring on the poppet.
- 15. Examine the seat for damage or wear. Replace as necessary.
- 16. Replace the O-rings on the seat.
- 17. Remove the Vacuum Breaker™ disc from the anvil.
- 18. Install a replacement spider seal to the top of the anvil.
- 19. Inspect the Vacuum Breaker™ disc for damage or wear. Replace as necessary.
- 20. Return the Vacuum Breaker™ disc to the top of the anvil.
- 21. Install the seat to the anvil.
- 22. Install the spring to the poppet, and then install the poppet assembly to the inner shaft.
- 23. Carefully install the anvil assembly to the insertion shaft.



The anvil must be attached securely to the inner shaft.

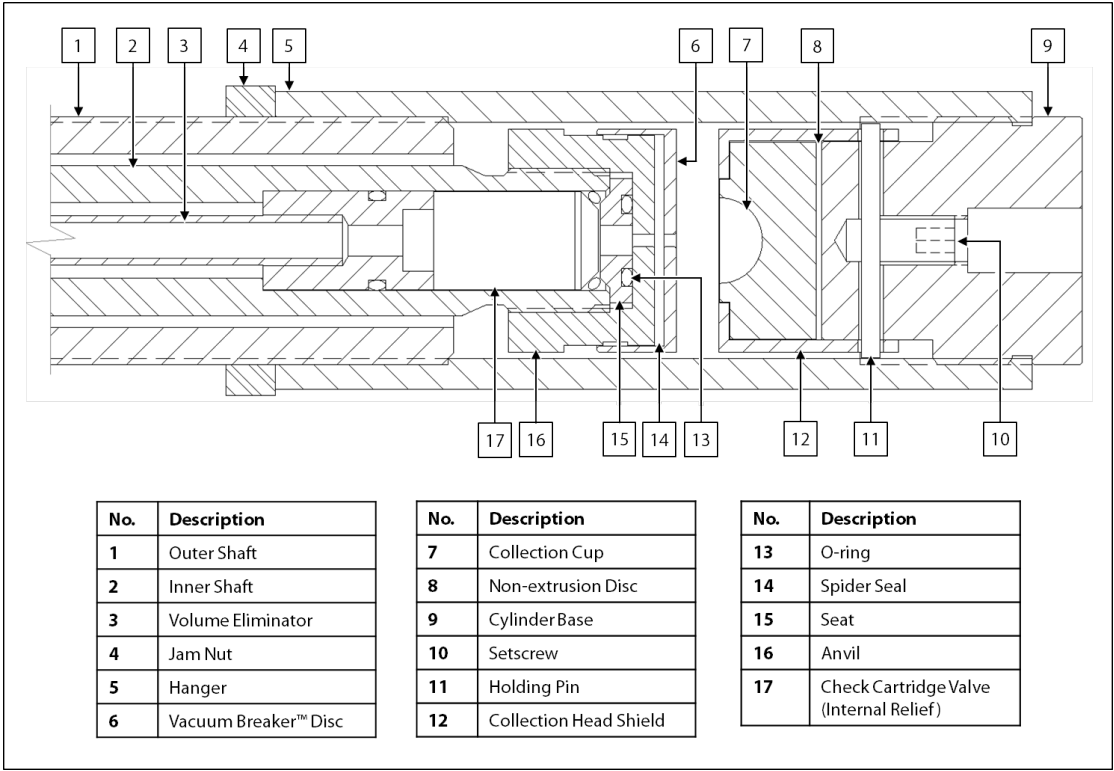
- 24. Proceed to step 49 for reassembly instructions.

Cartridge Style



This non-adjustable relief is designed for use with constant pressure cylinders and crude oil containers.

Figure D2: Vanishing Chamber™ Collection Head With Cartridge Style Relief



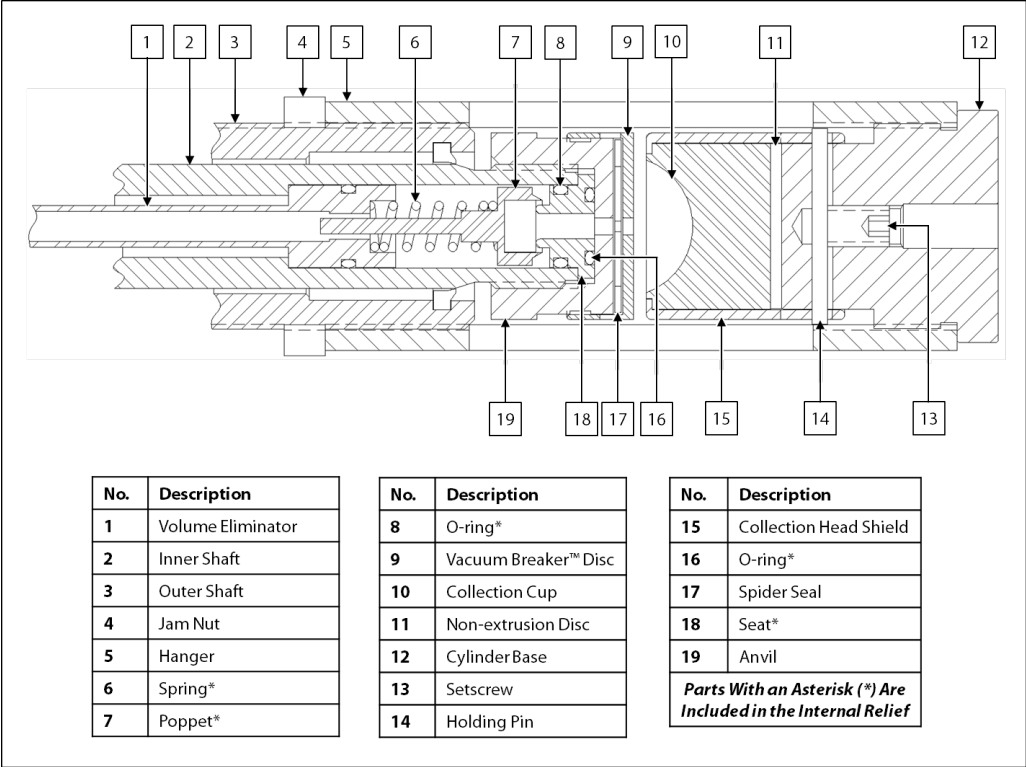
- 25. Remove the seat from the anvil.
- 26. Examine the seat for damage or wear. Replace as necessary.
- 27. Replace the O-ring on the seat.
- 28. Remove the Vacuum Breaker™ disc from the anvil.
- 29. Install the seat to the anvil.
- 30. Install a replacement check valve cartridge to the inner shaft.
- 31. Install a replacement spider seal to the top of the anvil.
- 32. Inspect the Vacuum Breaker™ disc for damage or wear. Replace as necessary.
- 33. Return the Vacuum Breaker™ disc to the anvil.
- 34. Carefully install the anvil assembly to the insertion shaft.



The anvil must be attached securely to the inner shaft.

- 35. Proceed to step 49 for reassembly instructions.

Figure D3: Vanishing Chamber™ Collection Head With Sand Relief



- 36. Remove the seat from the anvil.
- 37. Examine the seat for damage or wear. Replace as necessary.
- 38. Examine the spring for damage or wear. Replace as necessary.
- 39. Examine the poppet for damage or wear. Replace as necessary.
- 40. Replace the O-rings on the seat.
- 41. Remove the Vacuum Breaker™ disc from the anvil.
- 42. Install a replacement spider seal to the top of the anvil.
- 43. Inspect the Vacuum Breaker™ disc for damage or wear. Replace as necessary.
- 44. Return the Vacuum Breaker™ disc to the anvil.
- 45. Install the seat to the anvil.
- 46. Install the spring to the poppet.
- 47. Carefully install the poppet assembly to the inner shaft.



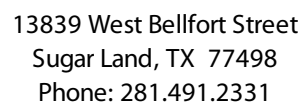
The anvil must be attached securely to the inner shaft.

- 48. Continue to step 49 for reassembly instructions.

Reassembly

49. Screw the cylinder base assembly into the hanger and tighten.
50. Apply instrument air to the bottom of the piston motor to drive the piston to the top of the housing. This will retract the inner shaft to the maximum insertion length.
51. Screw the hanger up the outer shaft until the gap between the anvil and the collection cup is approximately $\frac{3}{16}$ " (5 mm).
52. Tighten the jam nut against the hanger.
53. Using a wrench, tighten the cylinder base and jam nut.
54. Test stroke the inFlow™ to ensure proper stroke length. The Vanishing Chamber™ should collapse without excessive stress on the metal components and then return to the $\frac{3}{16}$ " (5 mm) gap.

NOTES

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