INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® INFLOW™ CRUDE OIL SAMPLER
MANUAL INSERTION

DRAWING NUMBERS
AD087CO
AD087CO.O
AD087CP
AD087CT

MANUAL NUMBER
IOM-052

REVISION
Rev. G, 10/02/2024

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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

SECTION 1: PRODUCT INFORMATION

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 might have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker® *inFlow™ Crude Oil Sampler* is an isokinetic probe sampler designed to extract a representative sample of liquid product from the flowing stream. When used with a pipeline isolation valve, the inFlow™ can be safely inserted and retracted manually in up to 40 psig operating pressure without interfering with or venting pipeline pressure.

The inFlow™ features an adjustable insertion length to accommodate different pipeline sizes. 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® might custom design the inFlow™ to suit the particular application and specifications of each customer.

1.3 Important Information

1. The lubrication port should remain open and protected from insects and dirt at all times except when performing maintenance on a sampler that has been isolated from pipeline pressure and/or removed from the pipeline.

A customer-supplied muffler or needle valve must be installed to the lubrication port for insect and dirt protection. If a needle valve is installed, it must remain open at all times.

Welker® recommends installing a needle valve to the lubrication port, because it can be closed in the event of seal failure to stop the leak until the unit can be removed from service.

2. Prior to injecting lubricant into the lubrication port, the customer-supplied muffler or needle valve must be removed and an appropriately sized grease fitting installed.

DO NOT USE excessive pressure when injecting lubricant into the lubrication port, because applying excessive pressure could damage the seals.

3. After lubricant has been injected into the lubrication port, the grease fitting must be removed and the customer-supplied muffler or needle valve reinstalled before the sampler can be exposed to pipeline pressure and returned to operation.

Failure to remove the grease fitting and return the customer-supplied muffler or needle valve to the lubrication port prior to exposing the sampler to pipeline pressure could result in a product leak and/or injury to the operator.

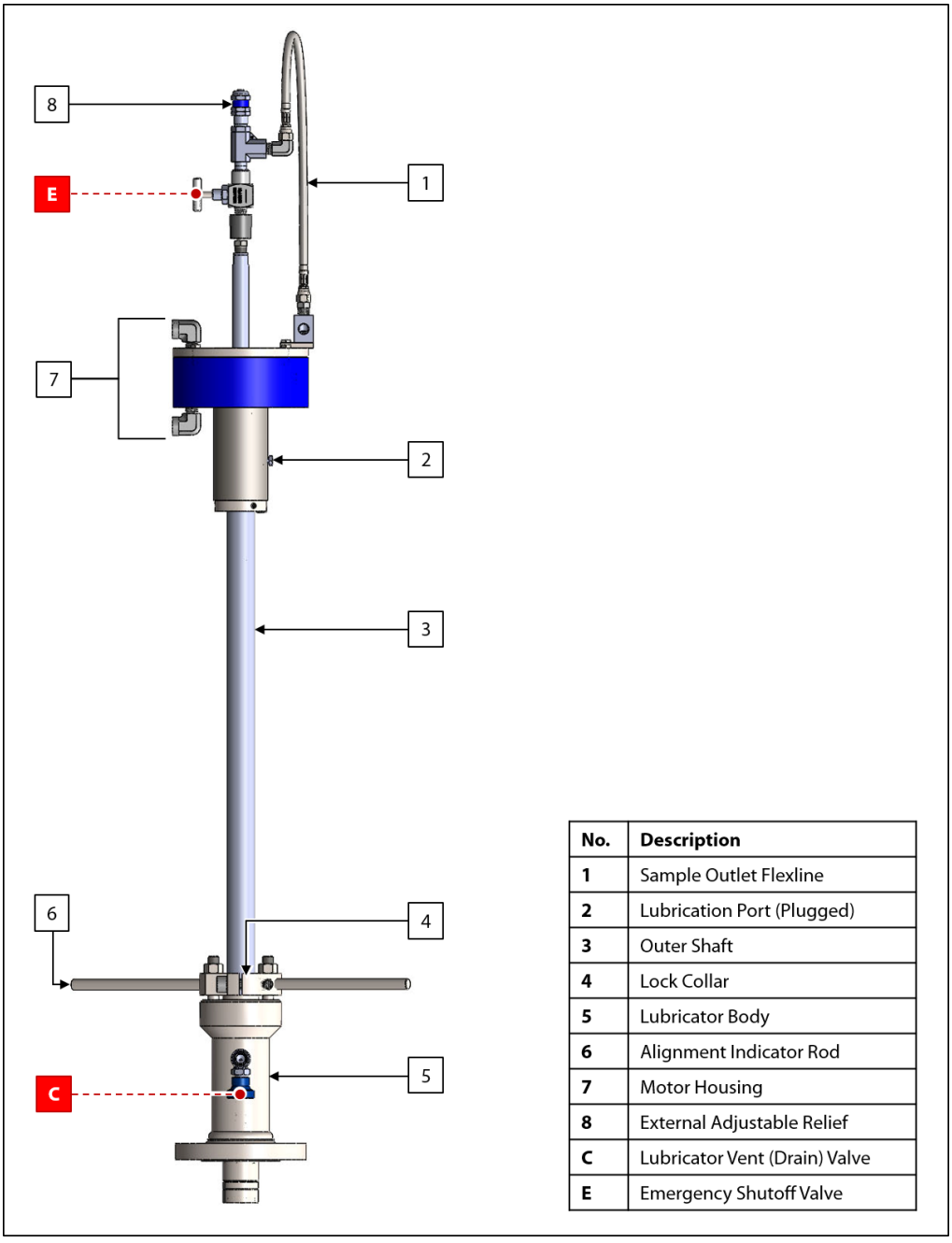
1.4 Specifications

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 might vary depending on the customization of your equipment.**

Table 1: Welker® 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 Lubricator Body, PTFE, Buna Non-Wetted Seals, and FKM Wetted Seals Others Available
Maximum Allowable Operating Pressure	**Class 150 Stainless Steel:** 275 psig @ -20 °F to 100 °F (*18 barg @ -28 °C to 37 °C*) **Class 150 Carbon Steel:** 285 psig @ -20 °F to 100 °F (*19 barg @ -28 °C to 37 °C*) **Class 300 Stainless Steel:** 720 psig @ -20 °F to 100 °F (*49 barg @ -28 °C to 37 °C*) **Class 300 Carbon Steel:** 740 psig @ -20 °F to 100 °F (*51 barg @ -28 °C to 37 °C*) **Class 600 Stainless Steel:** 1440 psig @ -20 °F to 100 °F (*99 barg @ -28 °C to 37 °C*) **Class 600 Carbon Steel:** 1480 psig @ -20 °F to 100 °F (*102 barg @ -28 °C to 37 °C*) **2" MNPT:** 2160 psig @ -20 °F to 120 °F (*148 barg @ -28 °C to 48 °C*) Others Available
Maximum Allowable Insertion/Retraction Pressure	40 psig (*2.7 barg*)
Pipeline Connection	**Size:** 2" **Rating:** 150, 300, or 600 ANSI RF Others Available
Sample Outlet Connection	¼" FNPT
Motor Housing Actuation Ports	¼" FNPT (Standard) ½" FNPT
Insertion Length	0–18" (*0–45 cm*) 0–24" (*0–60 cm*) (Standard) 0–36" (*0–91 cm*) Others Available
Utility Requirements	**Hydraulic or Pneumatic Supply for Motor Operation:** 40–45 psig (*2.7–3.1 barg*) **Inert Gas Supply for Purge Operation:** ¼" FNPT Connection (Optional)
Sample Volume	**B-Style Collection Head:** 0.5 cc, 1.0 cc (Standard), 1.5 cc, or 2.0 cc **C-Style Collection Head (Long Motor):** 10–30 cc **C-Style Collection Head (Short Motor):** 0–12 cc **D-Style Collection Head (Long Motor):** 3–7 cc (½" piston) or 5–12 cc (¾" piston) **D-Style Collection Head (Short Motor):** 0–2 cc (½" piston) or 0–5 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 Packing Adjustment Nut Purge Tube

1.5 Equipment Diagrams

Figure 1: Welker® inFlow™ Diagram



No.	Description
1	Sample Outlet Flexline
2	Lubrication Port (Plugged)
3	Outer Shaft
4	Lock Collar
5	Lubricator Body
6	Alignment Indicator Rod
7	Motor Housing
8	External Adjustable Relief
C	Lubricator Vent (Drain) Valve
E	Emergency Shutoff Valve

Figure 2: Welker® inFlow™ Connections Diagram

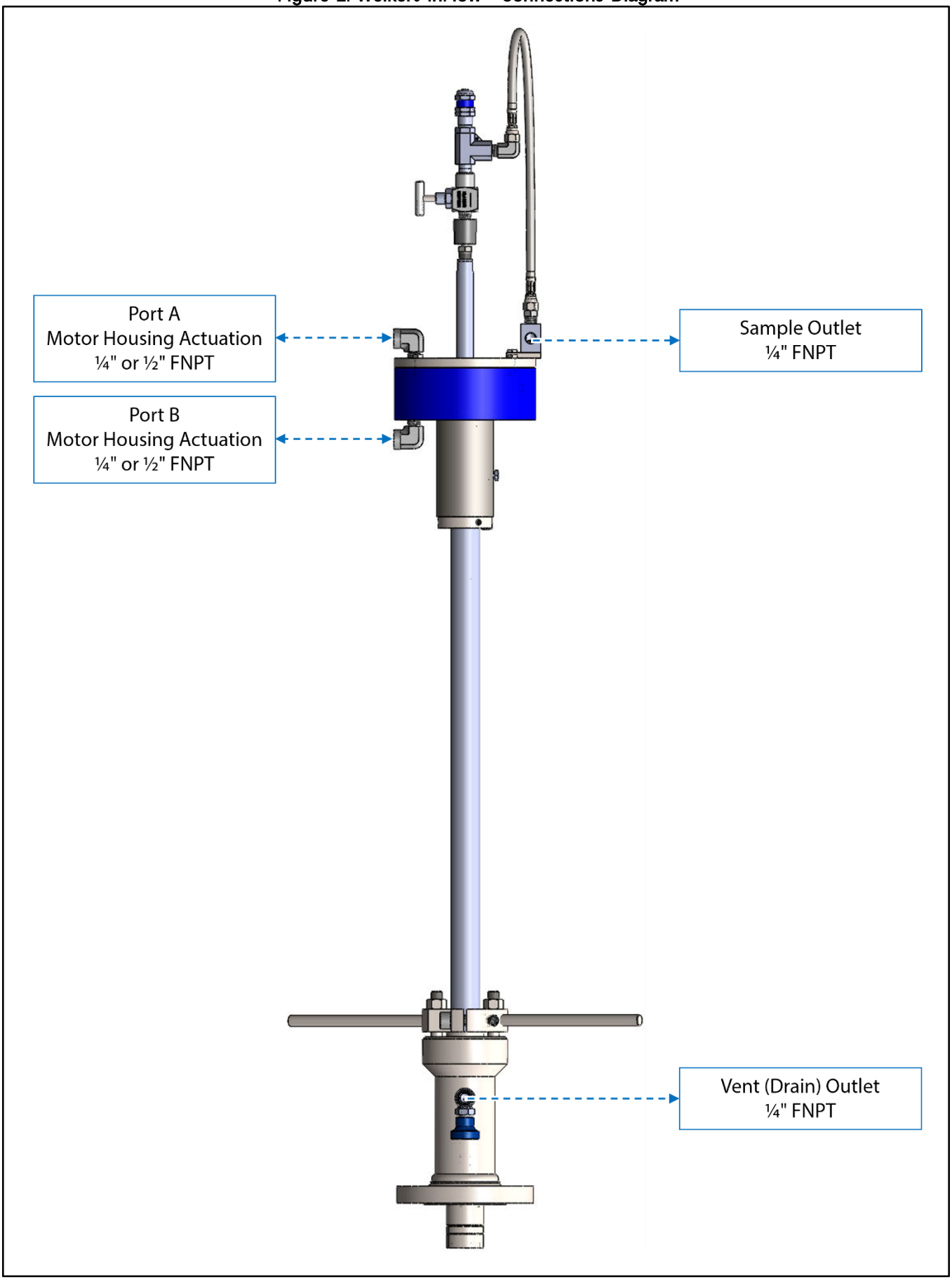
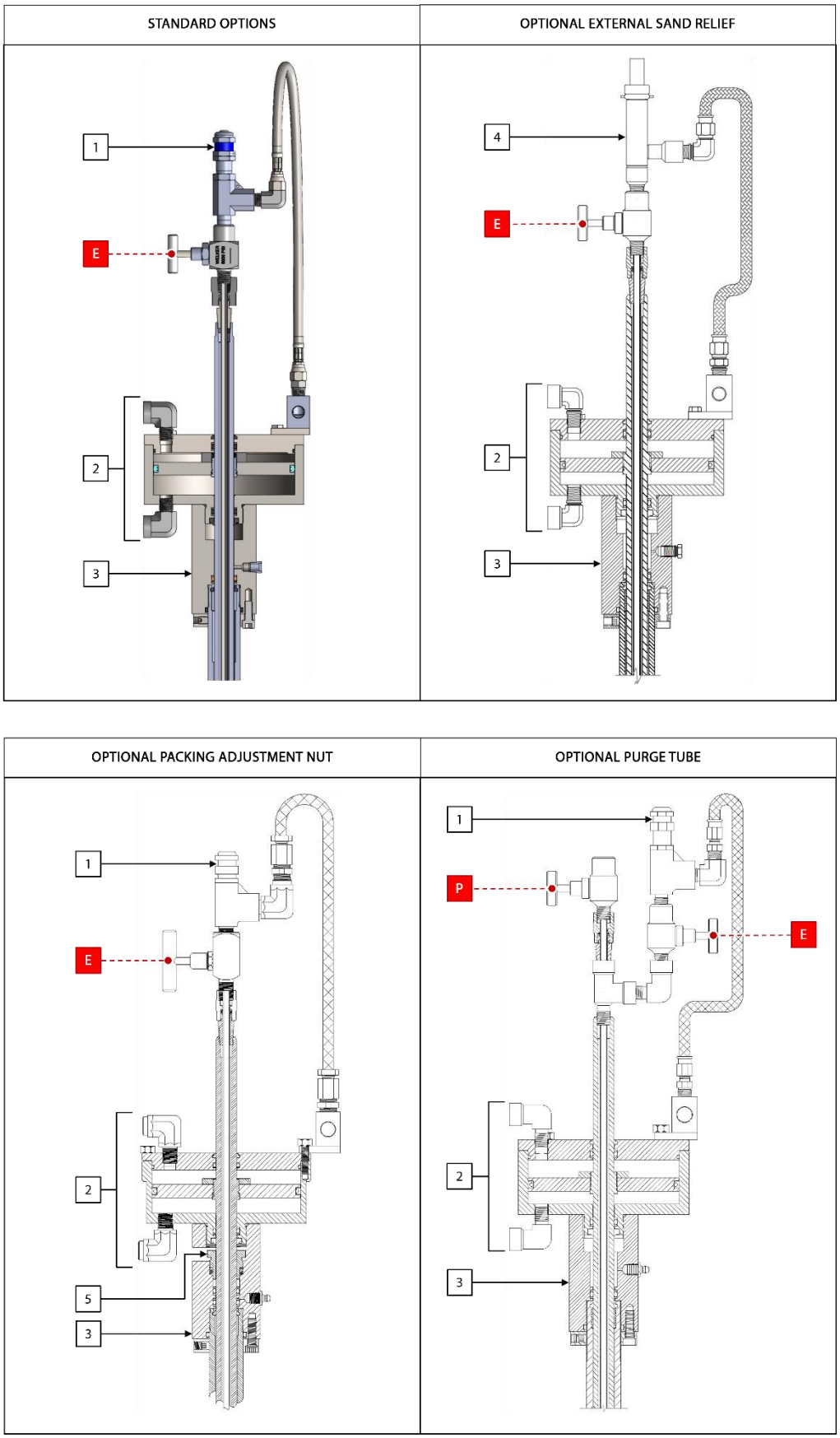


Figure 3: Welker® inFlow™ Options Diagram



No.	Description
1	External Adjustable Relief
2	Motor Housing
3	Body
4	External Sand Relief
5	Packing Adjustment Nut
E	Emergency Shutoff Valve
P	Purge Valve

SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin

After unpacking the unit, check the equipment for compliance and any damage that might 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.

Take care not to close the pipeline isolation valve on the insertion shaft while the shaft is inserted in the pipeline. This is the most common cause of damage to Welker® probes.

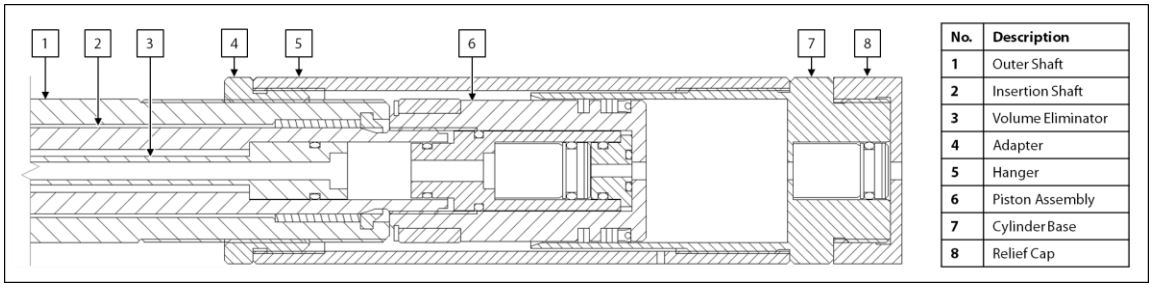
1. Welker® recommends that the unit be installed to the side of the pipe and inserted into the center one-third (⅓) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.
2. Locate the unit at least two to four pipe diameters downstream of an inline static mixer or other flow conditioning system.
3. Handle the unit with care. Avoid bending the insertion shaft, which has a polished surface that travels through seals.
4. Operate the unit slowly and smoothly while inserting and retracting to avoid damaging the unit.

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*.

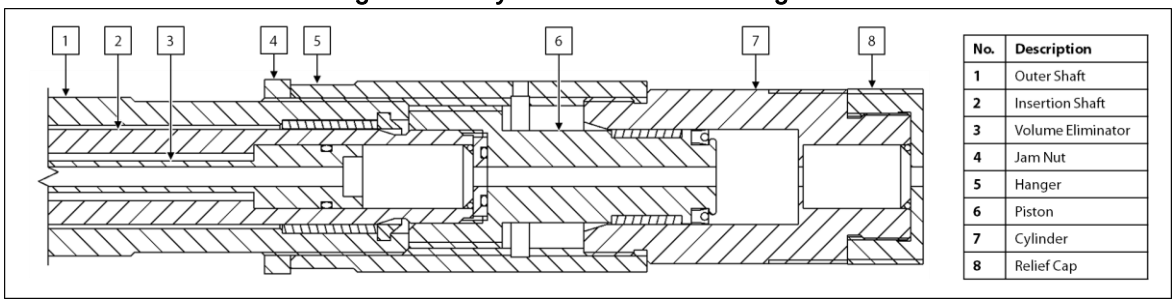
Welker® can pre-set the sample volume if noted at the time of order.

Figure 4: C-Style Collection Head Diagram



No.	Description
1	Outer Shaft
2	Insertion Shaft
3	Volume Eliminator
4	Adapter
5	Hanger
6	Piston Assembly
7	Cylinder Base
8	Relief Cap

Figure 5: D-Style Collection Head Diagram



No.	Description
1	Outer Shaft
2	Insertion Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	Piston
7	Cylinder
8	Relief Cap

1. Loosen the adapter (*Figure 4*) or the jam nut (*Figure 5*) 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:

- 1 cc if the inFlow™ is equipped with the C-Style collection head.
- 0.2 cc if the inFlow™ is equipped with the ½" piston D-Style collection head.
- 0.5 cc if the inFlow™ is equipped with the ¾" piston D-Style collection head.

4. Once the desired sample volume has been reached, firmly tighten the adapter or 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 C- or D-Style collection head, it is not necessary to bring the inFlow™ into alignment prior to installation; proceed to step 8.

Aligning the Lock Collar

2. Determine the direction of product flow in the pipeline.
3. Lay the inFlow™ on a smooth, clean surface.
4. If the collection head is not fully visible, gently pull the collection head out of the lubricator body.

Note that the lock collar must be loose in order to pull the collection head out of the lubricator body.

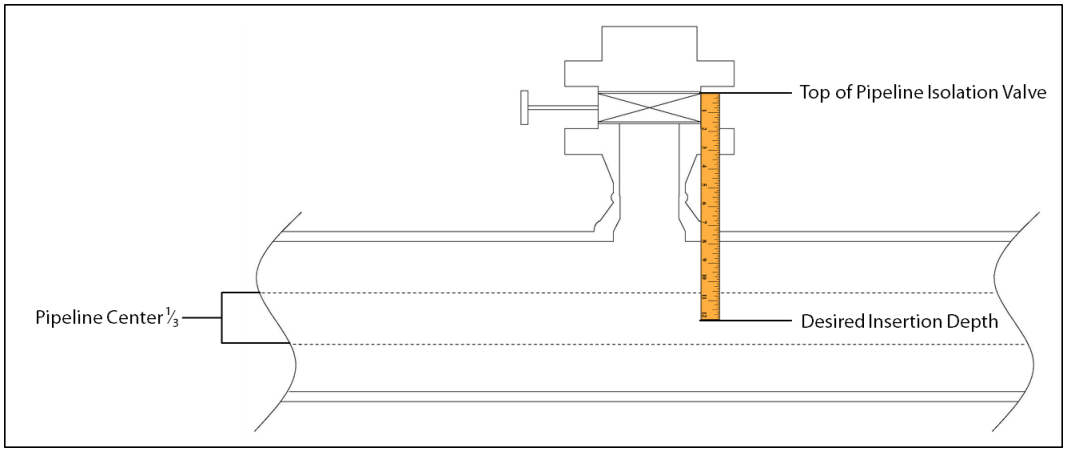
5. Loosen the jam nut, and then turn the hanger. The opening in the collection head should face the direction of product flow so that the flowing stream will pass through the opening.
6. Tighten the jam nut on the collection head to prevent the collection head from turning.
7. Align the alignment indicator rod on the lock collar with the opening in the collection head. This should bring the lock collar into alignment with the standoffs on the lubricator body.

When the unit is installed to the pipeline, the alignment indicator rod will be an external reference point to the collection head opening.

Setting the Insertion Length

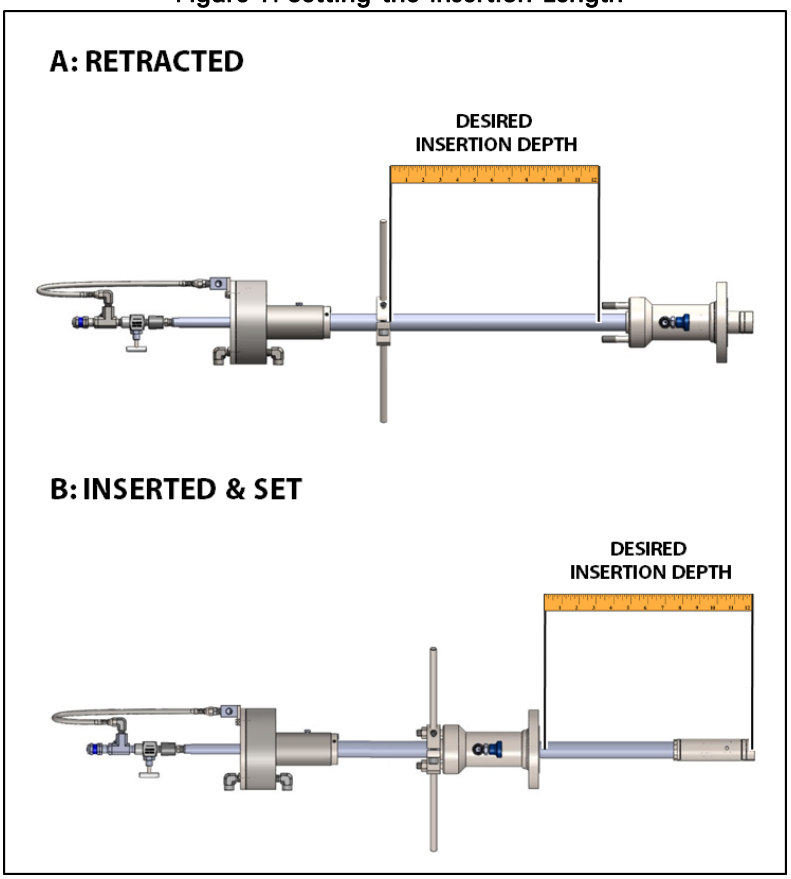
8. Prior to installing the inFlow™, the length the insertion shaft will need to travel inside the pipeline must be determined. Measure the distance the insertion shaft must travel from the top of the pipeline isolation valve to the desired insertion depth (e.g., the center one-third (⅓) of the pipeline) (*Figure 6*). This will be the shaft insertion length.

Figure 6: Determining the Insertion Depth



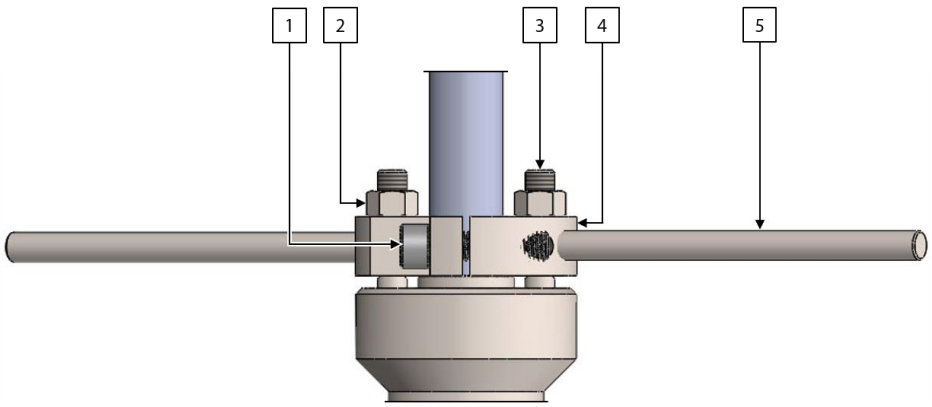
9. Pull up on the insertion shaft to ensure that it is fully retracted. The end of the collection head should be flush with or in close proximity to the flange face (*Figure 7*).
10. Beginning at the top edge of the standoffs, measure along the insertion shaft to the desired insertion length (*Figure 7*). As needed, use a felt tip pen to mark this point.

Figure 7: Setting the Insertion Length



11. Remove the hex nuts from the standoffs (*Figure 8*).

Figure 8: Lock Collar Diagram



No.	Description
1	Cap Screw (Qty. 2)
2	Hex Nut (Qty. 2)
3	Standoff (Qty. 2)
4	Lock Collar (2 Pieces)
5	Alignment Indicator Rod

12. Loosen the cap screws on the sides of the lock collar (*Figure 8*).
13. Carefully slide the lock collar up the shaft to the shaft insertion length, taking care not to scratch the outer shaft.
14. As necessary, ensure that the alignment indicator rod is still aligned with the opening in the collection head.
15. Tighten the cap screws on the sides of the lock collar to secure the lock collar to the outer shaft at the marked point (*Figure 8*).

This procedure ensures that the insertion length will be mechanically limited by the lock collar and that the lock collar will hold the probe in place when under pressure.

2.4 Installing the Unit

At pressures above 40 psig, the inFlow™ cannot be safely inserted or retracted manually. To insert the inFlow™, the pipeline pressure will need to be reduced to 40 psig or below.

At least two (2) people are required to correctly and safely insert the inFlow™ into the pipeline.

1. Close all valves on the inFlow™.
2. Secure the inFlow™ to a full port pipeline isolation valve.

For long probes installed horizontally, Welker® recommends field installation of bracing support for the outlet end of the probe to offset the cantilever effect and prevent bending of the shaft. Any bracing or support installed should NOT contact the probe shaft, because scratching or other damage to the shaft might lead to loss of integrity of the sealing surface.

Lubricator vent (drain) valve C on the lubricator body must be pointed down.

3. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
4. Using the alignment indicator rod, manually insert the shaft slowly into the pipeline. The alignment indicator rod should be parallel to the pipeline.
5. Secure the inFlow™ in place by guiding the lock collar over the standoffs on the lubricator body and firmly tightening the hex nuts (*Figure 8*).

DO NOT RELEASE the inFlow™ until the lock collar has been secured to the lubricator body.

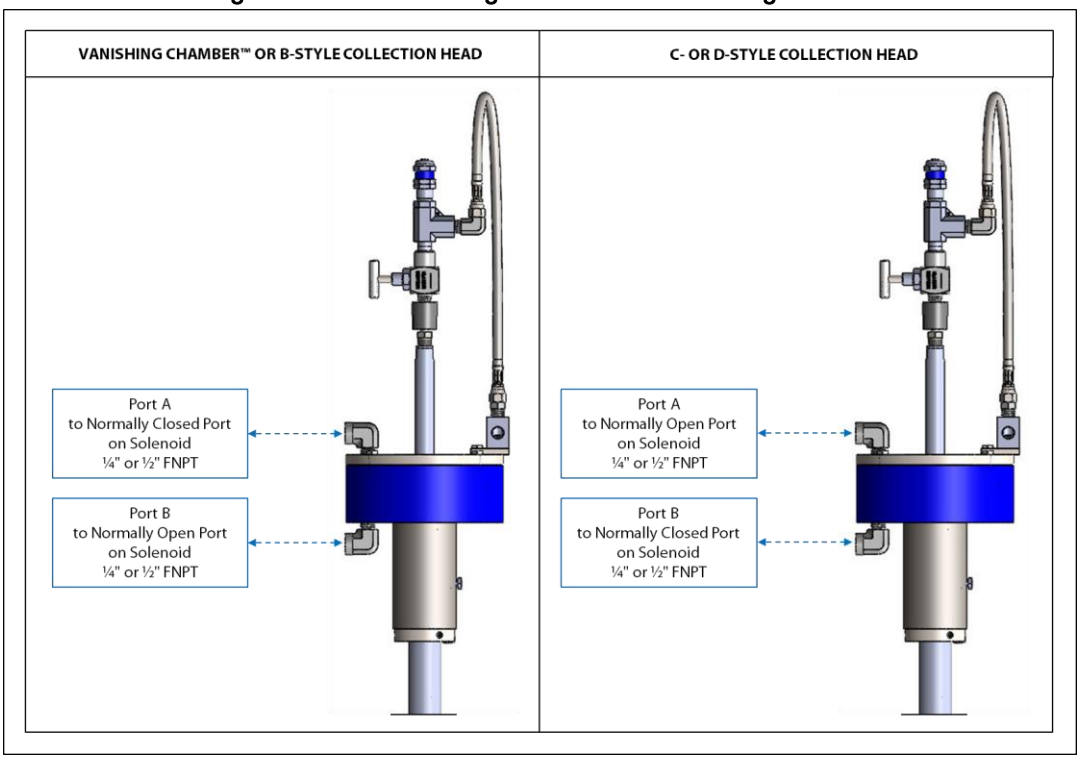
If the lock collar does not align with the standoffs, the inFlow™ might be out of alignment. See Section 2.3, Preparing the Unit for Installation, for instructions on properly aligning the unit.

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

6. When the inFlow™ is inserted and secured, use ¼" tubing to connect from the sample outlet to an appropriate customer-supplied sample container, such as a Welker® TCC Optimum™ Transportable Crude Oil Container.
7. 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 9*). Use appropriately sized tubing to connect from the normally closed port on the solenoid to port A on the motor housing (*Figure 9*).

8. If the inFlow™ is equipped with a C- or 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 9*). Use appropriately sized tubing to connect from the normally closed port on the solenoid to port B on the motor housing (*Figure 9*).

Figure 9: 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."

9. Open emergency shutoff valve E (*Figure 1*).
10. 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 to 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.

11. 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 13*).

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 40–45 psig.
3. Set the timer or controller to actuate the solenoid at the desired sampling actuation frequency based on the sampling equations provided (*Figure 10*).

Figure 10: Sampling Frequency Equations

Liquid Sampling, Proportional-to-Flow Collection
Equation 1: Number of Samples Needed $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$ ***Equation 2: Proportional-to-Flow*** $\text{Volume of Flow Between Sample Grabs} = \frac{\text{Batch Size (Total Volume to Be Sampled)}}{\text{Number of Samples Needed (Eq. 1)}}$
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.*
Liquid Sampling, Timed Collection
Equation 1: Number of Samples Needed $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$ ***Equation 2: Timed Sampling*** $\text{Time Between Sample Grabs} = \frac{\text{Total Time in Sample Period}}{\text{Number of Samples Needed (Eq. 1)}}$
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.*

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 might 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 3*).

> Welker® recommends using nitrogen or helium as the insert 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. Turn ON the inert gas supply.
4. Open purge valve P (*Figure 3*).
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 3*).
8. Disconnect the inert gas supply from purge valve P (*Figure 3*).

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 might 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 then tighten the packing adjustment nut to stop the leak until the unit can be removed for service (*Figure 3*).

2.8 Retracting the Unit

At pressures above 40 psig, the inFlow™ cannot be safely inserted or retracted manually. To retract the inFlow™, the pipeline pressure will need to be reduced to 40 psig or below.

At least two (2) people are required to correctly and safely retract the inFlow™ from the pipeline.

To avoid injury, DO NOT stand over the sampler motor housing during retraction.

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. With one person firmly pushing on the top of the motor housing of the inFlow™, another person can remove the hex nuts securing the lock collar to the standoffs on the lubricator body (*Figure 8*).

Failure to ensure that adequate pressure is applied to the top of the unit at the motor housing prior to retraction could result in unexpected retraction of the insertion shaft at great speed, which could damage the unit or injure the operator.

7. If the pipeline is under pressure, the insertion shaft will begin to retract from the pipeline. If the pipeline is not under pressure, it might be necessary to manually pull on the insertion shaft to retract the shaft.
8. Once the shaft has been fully retracted from the pipeline, close the pipeline isolation valve to isolate the unit from pressure.
9. Loosen the cap screws on the sides of the lock collar, and then slide the lock collar down onto the standoffs on the lubricator body.
10. Tighten the hex nuts to secure the lock collar to the standoffs on the lubricator body to prevent the insertion shaft from moving while the unit is being removed from the pipeline.
11. Slowly open lubricator vent (drain) valve C to bleed any pressure or liquids trapped in the lubricator body (*Figure 1*).
12. If complete removal of the inFlow™ from the pipeline is desired, the unit is now ready to be removed from the pipeline isolation valve for maintenance or to be relocated.
13. If the inFlow™ will remain secured to the pipeline after retraction, ensure that the lock collar has been properly secured to the standoffs on the lubricator body.

SECTION 3: MAINTENANCE

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 might lead to excess wear on the unit, a more frequent maintenance schedule might 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, because it might 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 might vary by model.
    a. Adjustable Wrench (Qty = 2)
    b. Crimp
    c. Hex Key Set
    d. High Pressure Grease Gun
    e. Needle Nose Pliers
    f. Reversible Snap Ring Pliers
    g. Seal Pick
    h. Tongue and Groove Pliers

3.2 Maintenance

1. Prior to performing maintenance, the unit must be removed from the pipeline. See *Section 2.8, Retracting the Unit,* for instructions on retracting the insertion shaft and 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 loosen the jam nut and turn the adjusting screw on the external sand relief counterclockwise (*Figure 13*). If the inFlow™ is equipped with the optional purge tube, open purge valve P to relieve any trapped pressure (*Figure 14*).
3. Lay the inFlow™ on a smooth, clean surface.

Collection Head Assembly

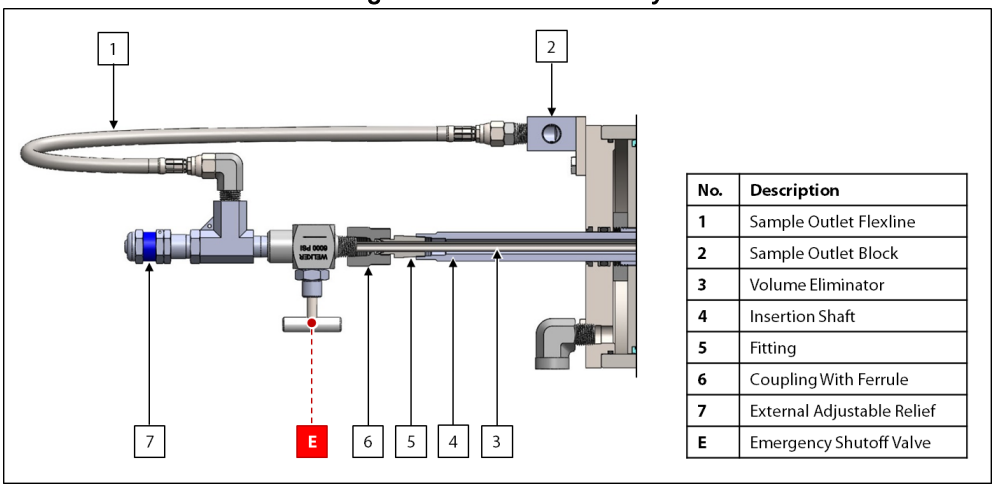
Welker® recommends noting the position of the jam nut on the outer shaft to ease reassembly.

4. Loosen the lock collar, and then expose the collection head manually by gently pushing the collection head out of the lubricator body.
5. Unscrew and remove the collection head assembly from the outer shaft.
6. Refer to *Appendix B, B-Style Collection Head Maintenance, Appendix C, C-Style Collection Head Maintenance, Appendix D, D-Style Collection Head Maintenance,* or *Appendix E, Vanishing Chamber™ Collection Head Maintenance,* for instructions on performing maintenance on the collection head.

Outlet Assembly

7. If the inFlow™ is not equipped with the optional purge tube, continue to step 8. If the inFlow™ is equipped with the optional purge tube, proceed to step 20.

Figure 11: Outlet Assembly



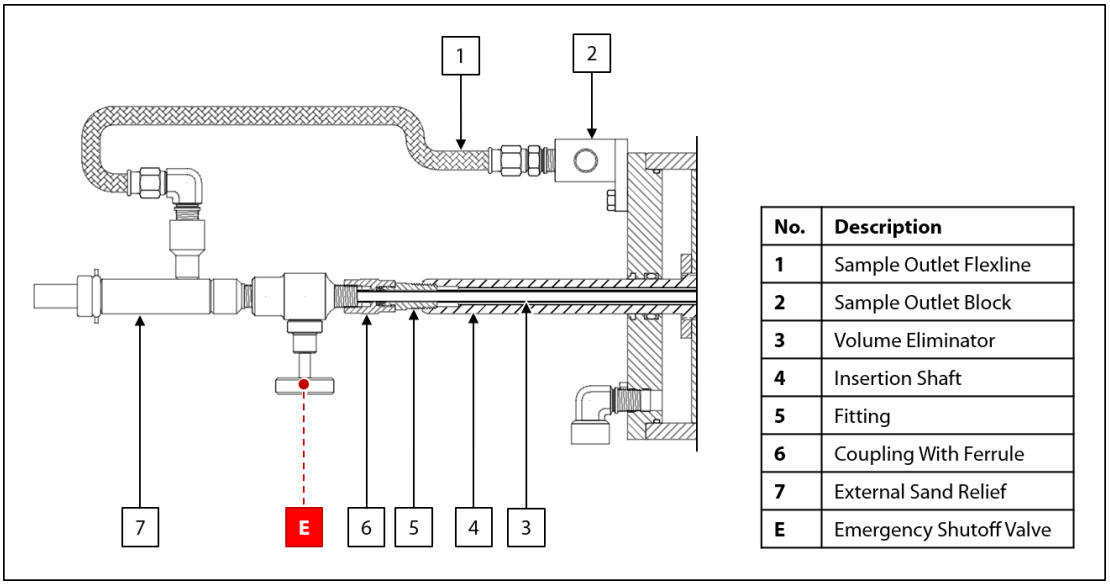
No.	Description
1	Sample Outlet Flexline
2	Sample Outlet Block
3	Volume Eliminator
4	Insertion Shaft
5	Fitting
6	Coupling With Ferrule
7	External Adjustable Relief
E	Emergency Shutoff Valve

8. Unscrew the sample outlet flexline from the sample outlet block.
9. 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.
10. 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 24. If the inFlow™ is equipped with the optional external sand relief, continue to step 11.

External Sand Relief (Optional)

11. Unscrew the external sand relief from emergency shutoff valve E (*Figure 12*).

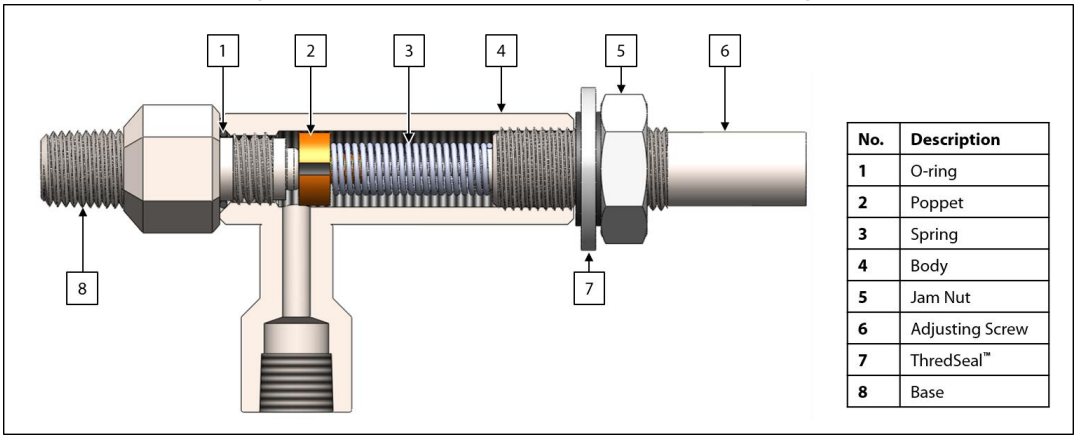
Figure 12: Outlet Assembly With Optional External Sand Relief



No.	Description
1	Sample Outlet Flexline
2	Sample Outlet Block
3	Volume Eliminator
4	Insertion Shaft
5	Fitting
6	Coupling With Ferrule
7	External Sand Relief
E	Emergency Shutoff Valve

12. Unscrew the base of the external sand relief from the body (*Figure 13*).

Figure 13: External Sand Relief Maintenance Diagram



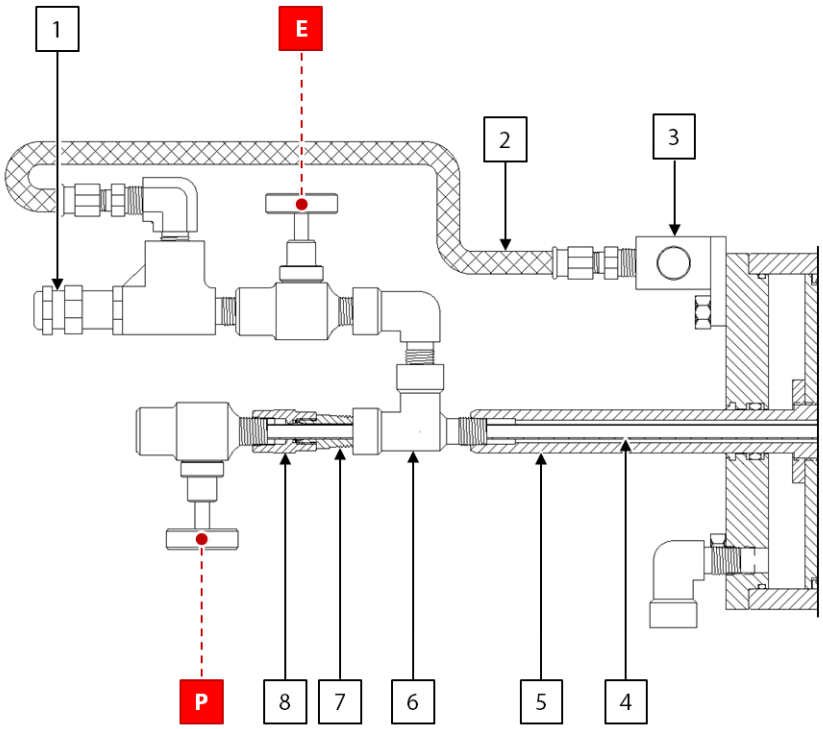
No.	Description
1	O-ring
2	Poppet
3	Spring
4	Body
5	Jam Nut
6	Adjusting Screw
7	ThredSeal™
8	Base

13. Replace the O-ring on the base.
14. Unscrew the jam nut from the adjusting screw.
15. Inspect the poppet for scratches or other damage. If scratches or other damage are present on the poppet (face) seat, replace the poppet.
16. Reassemble the external sand relief.
17. Screw the external sand relief into emergency shutoff valve E (*Figure 12*).
18. Screw the flexline into the elbow in the external sand relief (*Figure 12*).
19. Proceed to step 24 for instructions on disassembling the upper housing.

Purge Tube (Optional)

20. Unscrew the sample outlet flexline from the sample outlet block (*Figure 14*).

Figure 14: Outlet Assembly With Optional Purge

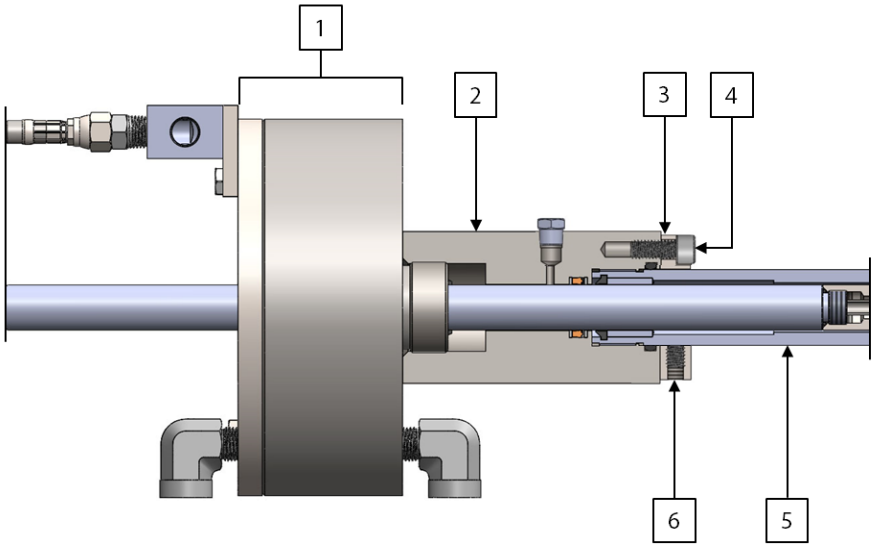


No.	Description
1	External Adjustable Relief
2	Sample Outlet Flexline
3	Sample Outlet Block
4	Purge Tube
5	Insertion Shaft
6	Tee
7	Fitting
8	Coupling With Ferrule
E	Emergency Shutoff Valve
P	Purge Valve

21. 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.
22. Maintain the external relief. 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 11–18 for maintenance instructions.
23. Continue to step 24 for instructions on disassembling the upper housing.

Disassembling the Upper Housing

Figure 15: Upper Housing Assembly

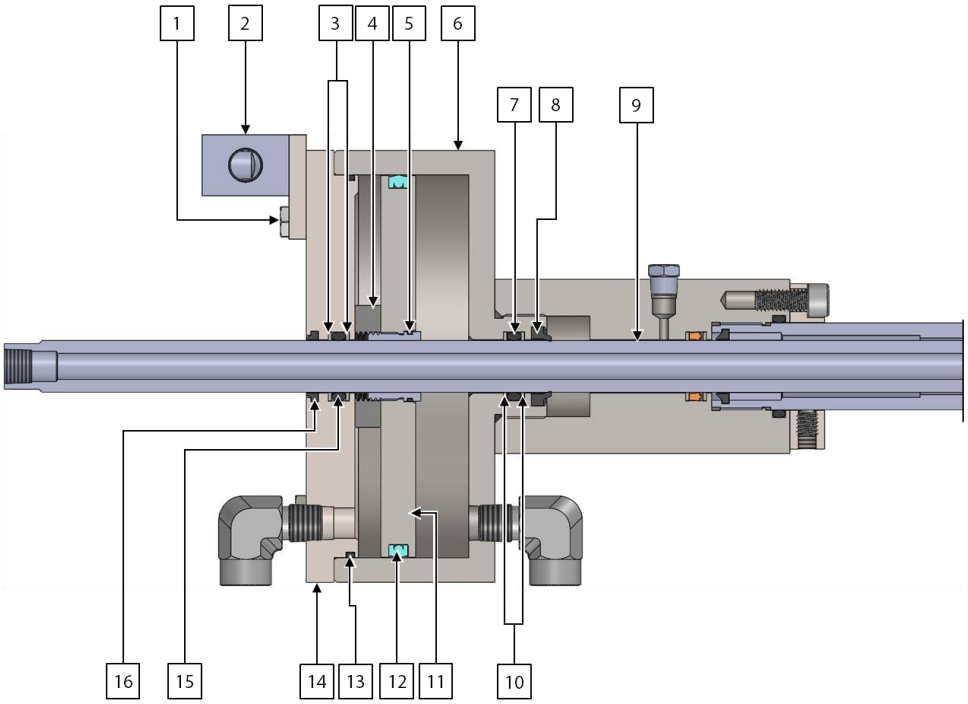


No.	Description
1	Motor Housing
2	Body
3	Motor Locking Clamp
4	Cap Screw
5	Outer Shaft
6	Setscrew (Qty. 3)

24. Unscrew the setscrews from the motor locking clamp at the base of the body.
25. Unscrew and remove the connected upper housing from the outer shaft. 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.
26. Unscrew the machine screws from the top cap and carefully remove the top cap from the motor housing (*Figure 16*).
27. Unscrew the motor housing from the body 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 of otherwise damage the insertion shaft.

Motor Housing Assembly

Figure 16: Motor Housing Assembly



No.	Description
1	Machine Screw (Qty. 4)
2	Sample Outlet Block
3	Back Up (Qty. 2)
4	Lock Collar
5	O-ring
6	Motor Housing
7	O-ring
8	Wiper Ring
9	Insertion Shaft
10	Back Up (Qty. 2)
11	Piston
12	Crown Seal
13	O-ring
14	Top Cap
15	O-ring
16	Wiper Ring

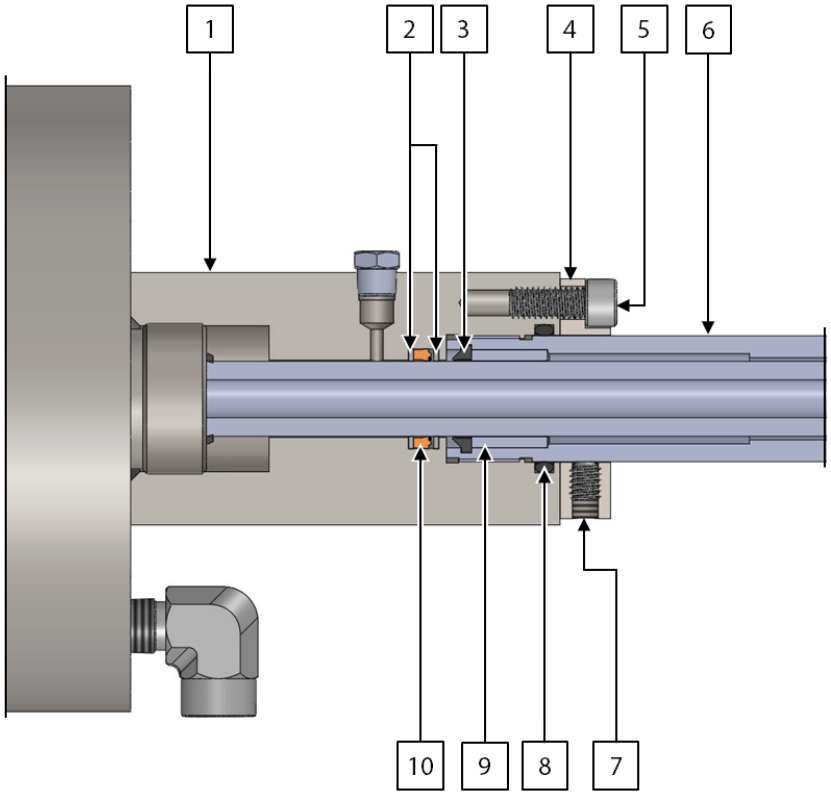
28. Replace the O-rings and backups on the top cap.
29. Inspect the wiper ring in the top cap. Replace it if it shows signs of wear or damage.
30. Replace the O-ring and crown seal on the piston.
31. Replace the O-ring and backups in the motor housing.
32. Inspect the wiper ring in the motor housing.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

Body

34. Unscrew the cap screw connecting the motor locking clamp to the body, and then separate the motor locking clamp from the body. Set the motor locking clamp aside.
35. If the inFlow™ is not equipped with the optional packing adjustment nut, continue to step 36. If the inFlow™ is equipped with the optional packing adjustment nut, proceed to step 43.

Without Optional Packing Adjustment Nut

Figure 17: Body Without Optional Packing Adjustment Nut

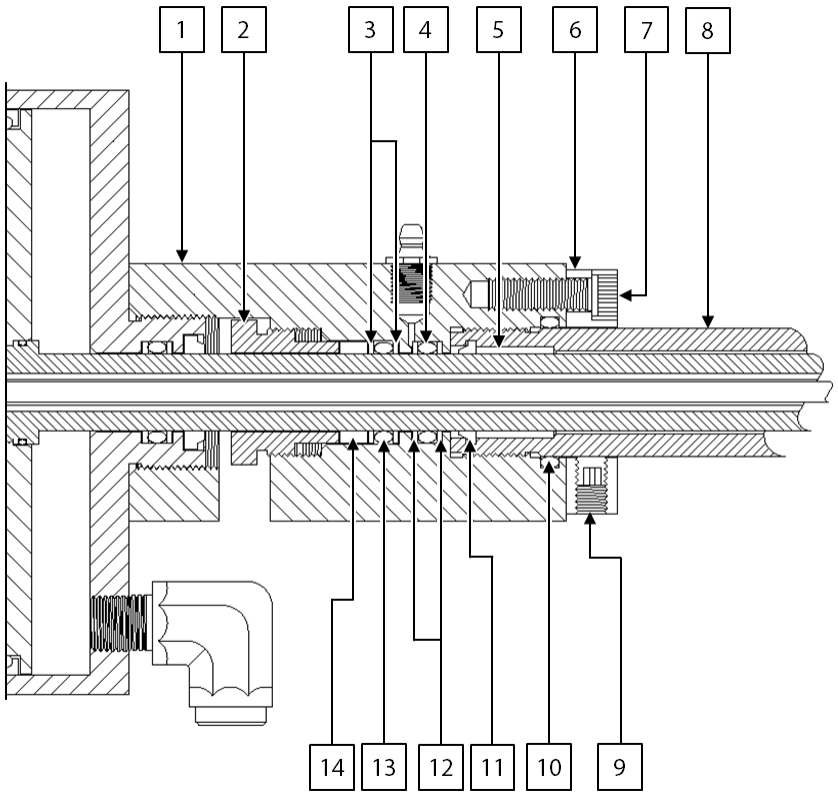


No.	Description
1	Body
2	Back Up (Qty. 2)
3	Wiper Ring
4	Motor Locking Clamp
5	Cap Screw
6	Outer Shaft
7	Setscrew (Qty. 3)
8	O-ring
9	Shaft Bearing
10	PolyPak®

36. Replace the O-ring, backups, and PolyPak® in the body.
37. Inspect the wiper ring and shaft bearing in the outer shaft. Replace them if they show signs of wear or damage.
38. Using the cap screw, secure the motor locking clamp to the body.
39. Carefully screw the motor housing into the body.
40. Insert the top cap into the motor housing and bolt in place.
41. Set the upper housing assembly and insertion shaft aside.
42. Proceed to step 53 for instructions on performing maintenance on the lubricator body.

With Optional Packing Adjustment Nut

Figure 18: Body With Optional Packing Adjustment Nut

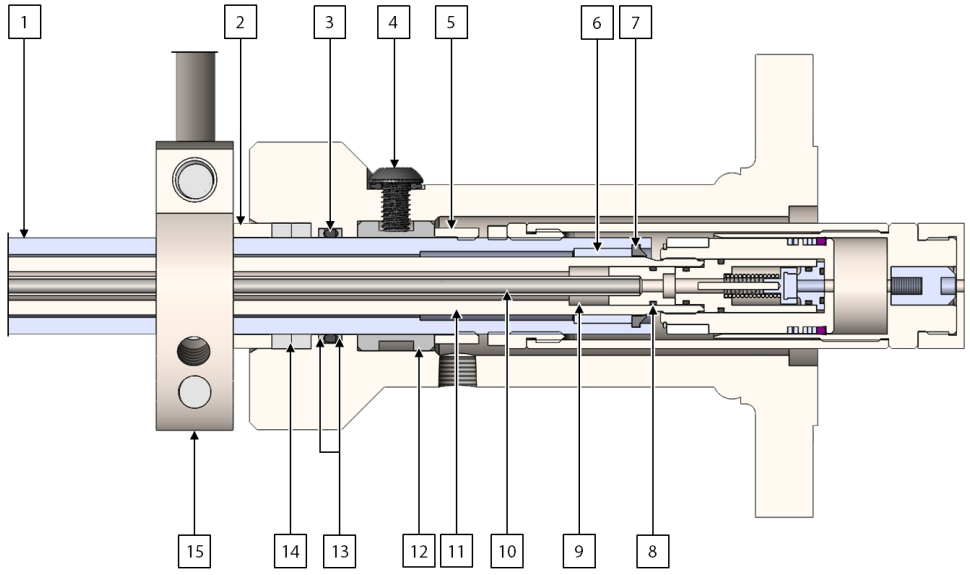


No.	Description
1	Body
2	Packing Adjustment Nut
3	Back Up (Qty. 2)
4	O-ring
5	Shaft Bearing
6	Motor Locking Clamp
7	Cap Screw
8	Outer Shaft
9	Setscrew (Qty. 3)
10	O-ring
11	Wiper Ring
12	Back Up (Qty. 2)
13	O-ring
14	Bearing

43. Unscrew the packing adjustment nut from the body.
44. Replace the O-rings and backups in the body.
45. Inspect the bearing. Replace it if it shows signs of wear or damage.
46. Inspect the wiper ring and shaft bearing in the outer shaft. Replace them if they show signs of wear or damage.
47. Screw the packing adjustment nut into the body.
48. Using the cap screw, secure the motor locking clamp to the body.
49. Carefully screw the motor housing into the body.
50. Insert the top cap into the motor housing and bolt in place.
51. Set the upper housing assembly and insertion shaft aside.
52. Continue to step 53 for instructions on maintaining the lubricator body.

Lubricator Body and Shaft Maintenance

Figure 19: Lubricator Body Detail



No.	Description
1	Outer Shaft
2	Packing Sleeve
3	O-ring
4	Stat-O-Seal® & Buttonhead Socket Cap Screw
5	Stop Ring
6	Shaft Bearing
7	Wiper Ring
8	O-ring
9	Volume Eliminator Body
10	Volume Eliminator
11	Insertion Shaft
12	Lubricator Bushing
13	Back Up (Qty. 2)
14	Graphite Packing
15	Lock Collar

53. Remove the stop ring from the outer shaft.
54. With the stop ring, collection head, and upper housing assembly removed, carefully pull the outer shaft out of the lubricator body.
55. Inspect the outer shaft for scratches or damage. If scratches or damage are present, repair or replace as necessary.
56. Inspect the wiper ring and shaft bearing in the outer shaft. Replace if they show signs of wear or damage.
57. Replace the graphite packing, O-ring, backups, and Stat-O-Seal® in the lubricator body.
58. Install the packing sleeve on top of the replacement graphite packing in the top of the lubricator body.

Reassembly

59. Slide the outer shaft into the lubricator body.
60. Ensure that the lock collar is on the outer shaft, and then tighten the lock collar cap screws.
61. With the upper housing assembly attached to the insertion shaft, insert the insertion shaft into the outer shaft, and then tighten the thread of the body to the outer shaft.
62. Tighten the setscrews in the motor locking clamp to secure the upper housing assembly to the outer shaft.
63. If applicable, insert the volume eliminator into the insertion shaft, and then screw the outlet assembly into the insertion shaft.
64. If applicable, insert the purge tube into the insertion shaft, and then screw the purge assembly into the insertion shaft.
65. Reconnect the flexline at the sample outlet block.
66. Return the stop ring to the outer shaft.
67. Tighten the collection head onto the outer shaft.
68. The unit is now ready for installation.

3.3 Troubleshooting Guidelines

Table 2: Welker® inFlow™ Troubleshooting Guidelines		
Issues	**Possible Causes**	**Solutions**
The inFlow™ is not actuating properly.	The hydraulic supply might be too low or not operating.	Inspect the electrohydraulic unit (EHUC). Add hydraulic oil as necessary. If the EHUC is not operating, refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the EHUC.
	The pneumatic supply might 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 might 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 *Installation, Operation, and Maintenance* (IOM) *Manual* for the solenoid.
The sample container is not filling.	The inlet valve on the sample container might be closed.	Ensure that the sample inlet valve on the sample container is open during sampling.
	The outlet on the sample container might 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 *Section 2.2, Setting the Volume*, for instructions on adjusting the sample volume.
	The inFlow™ might 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 (*Figure 10*).
	The relief on the inFlow™ might be set too high.	Check the setting on the relief and adjust as necessary.

Table 2: Welker® inFlow™ Troubleshooting Guidelines (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 *Section 2.2, Setting the Sample Volume,* for instructions on adjusting the sample volume.
	The inFlow™ might 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 (*Figure 10*).
	The relief on the inFlow™ might 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 reference or for use with this unit:

- IOM-105: Welker® NV-1 and NV-2 Instrument Valves
- IOM-112: Welker® Electrohydraulic Unit (EHUC)
- IOM-117: Welker® TCC-1 Transportable Crude Oil Container
- IOM-134: Welker® Checkpoint™ Sample Bite Verification Panel
- IOM-165: Welker® PNP Plug & Purge Panel
- IOM-186: Welker® TCC Optimum™ Transportable Crude Oil Container
- IOM-197: Welker® TCC-5 Transportable Crude Oil Container
- IOM-206: Welker® TCC-2 Transportable Crude Oil Container
- IOM-207: Welker® TCC-3 Transportable Crude Oil Container
- IOM-208: Welker® TCC-10 Transportable Crude Oil Container

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

- ENERPAC® Model P-392 – Instructions for Using an Optional Hydraulic Hand Pump (Welker® IOM-V522)
- Kepner Products Company Kepsel® Cartridge Insert Valves (Welker® IOM-V078)
- Parker Hannifin Corporation Fluoropolymer Hose (Welker® IOM-V174)
- Swagelok Company Proportional Relief Valves R Series (Welker® IOM-V086)

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

- Assembly Drawing: AD087CO (Welker® inFlow™ With Optional Packing Adjustment Nut)
- Assembly Drawing: AD087CO.O (Standard Welker® inFlow™)
- Assembly Drawing: AD087CP (Welker® inFlow™ With Optional Purge Tube)
- Assembly Drawing: AD087CT (Welker® inFlow™ With Optional External Sand Relief)
- Collection Head Drawing: AD084BB (Welker® Vanishing Chamber™ Collection Head With Cartridge Relief)
- Collection Head Drawing: AD084BO (Welker® Vanishing Chamber™ Collection Head With B-Style Inline Relief)
- Collection Head Drawing: AD130BO (Welker® Vanishing Chamber™ Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD168BC (C-Style Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD168BO (C-Style Collection Head With Cartridge Relief)
- Collection Head Drawing: AD168BQ (C-Style Collection Head With B-Style Inline 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.

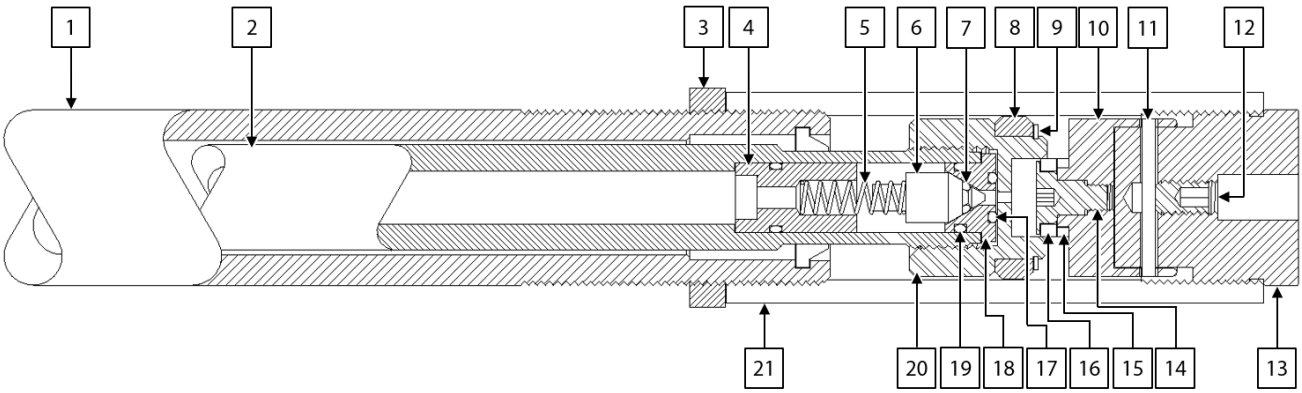
The B-Style and sand internal reliefs are spring loaded and might pop out when removing the cylinder.

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

Internal Relief Maintenance

B-Style

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



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Jam Nut
4	Volume Eliminator Body
5	Spring*
6	Poppet*
7	O-ring*
8	Adjustment Ring

No.	Description
9	Snap Ring
10	Piston
11	Holding Pin
12	Setscrew
13	Cylinder Base
14	Retainer
15	Piston Bearing
16	Welker Seal

No.	Description
17	O-ring*
18	Seat*
19	O-ring*
20	Cylinder
21	Hanger
Parts With an Asterisk (*) Are Included in the 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.

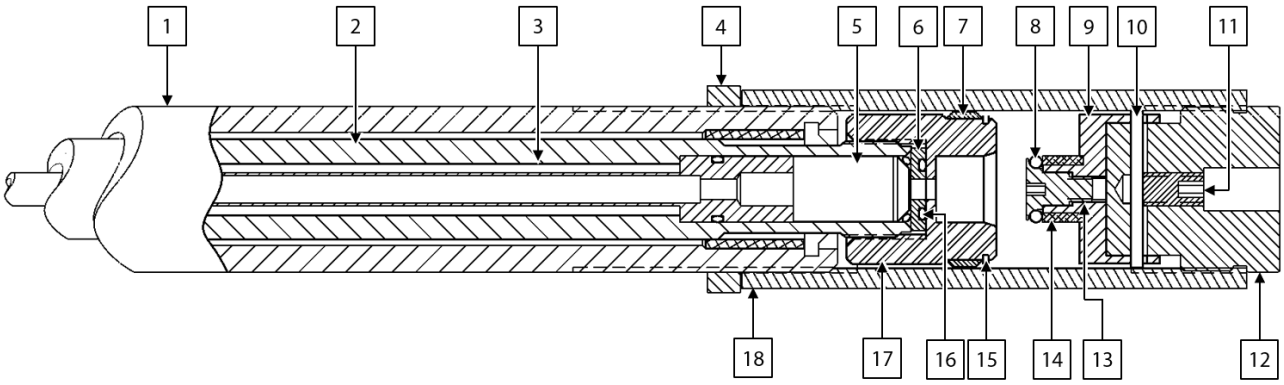
> The cylinder must be attached securely to the inner shaft.

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



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Cartridge Check Valve (Internal Relief)
6	Seat

No.	Description
7	Adjustment Ring
8	Welker Seal
9	Piston
10	Holding Pin
11	Setscrew
12	Cylinder Base

No.	Description
13	Retainer
14	Piston Bearing
15	Snap Ring
16	O-ring
17	Cylinder
18	Hanger

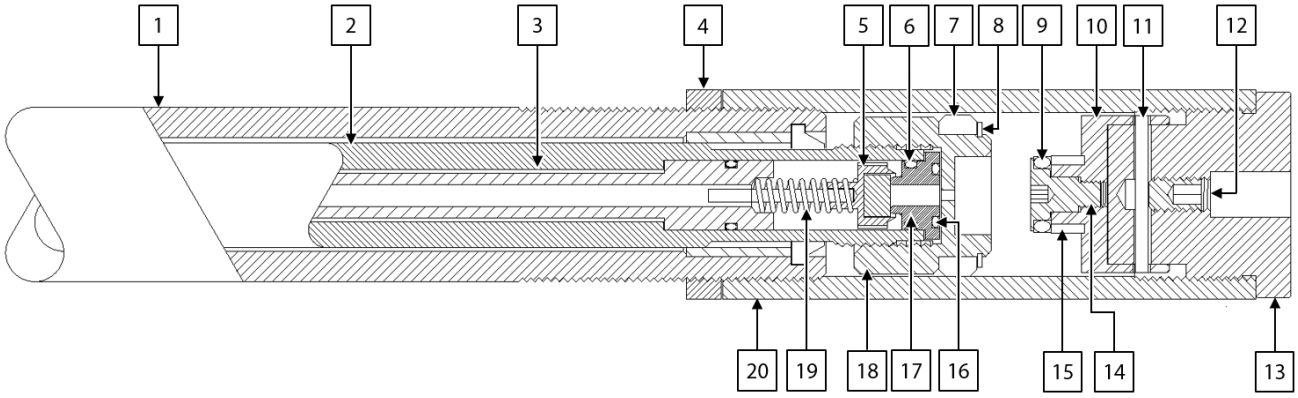
26. Replace the O-ring on the seat.
27. Install the seat to the cylinder.
28. Install a replacement cartridge check valve to the cylinder.
29. Carefully screw the cartridge style internal relief assembly onto the inner shaft.

The cylinder must be attached securely to the inner shaft.

30. Proceed to step 41 for reassembly instructions.

Sand Style

Figure B3: B-Style Collection Head With Sand Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Poppet*
6	O-ring*
7	Adjustment Ring
8	Snap Ring

No.	Description
9	Welker Seal
10	Piston
11	Holding Pin
12	Setscrew
13	Cylinder Base
14	Retainer
15	Piston Bearing

No.	Description
16	O-ring*
17	Seat*
18	Cylinder
19	Spring*
20	Hanger
Parts With an Asterisk (*) Are Included in the Internal 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 $^{3}/_{16}$" (*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 $^{3}/_{16}$" (*5 mm*) gap.

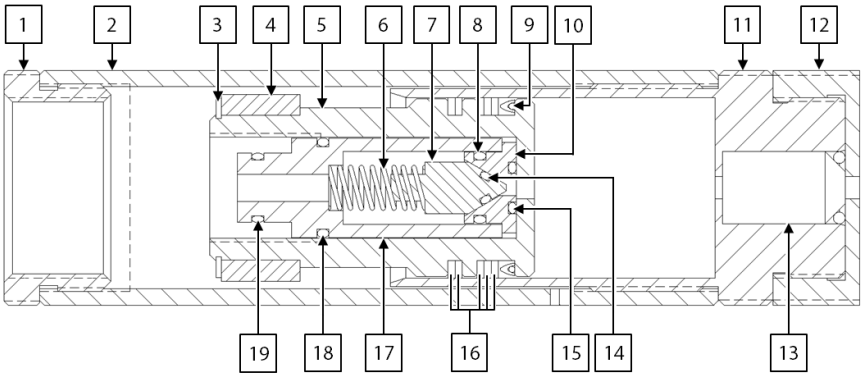
APPENDIX C: C-STYLE COLLECTION HEAD MAINTENANCE

1. Unscrew the relief cap from the cylinder base.
2. Unscrew the cylinder base from the hanger.
3. Remove the cartridge check valve from the cylinder base.
4. Install a replacement cartridge check valve to the cylinder base.
5. Screw the relief cap onto the cylinder base.
6. As necessary, loosen the jam nut.
7. Unscrew the hanger from the adapter.
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 unscrew the piston from the inner shaft.
10. If the collection head is equipped with a B-Style internal relief, continue to step 11. If the collection head is equipped with a cartridge style internal relief, proceed to step 26. If the collection head is equipped with an internal sand relief, proceed to step 38.

Internal Relief Maintenance

B-Style

Figure C1: C-Style Collection Head With B-Style Internal Relief



No.	Description
1	Adapter
2	Hanger
3	Snap Ring
4	Bearing
5	Piston
6	Spring*
7	Poppet*

No.	Description
8	O-ring*
9	PolyPak®
10	Seat*
11	Cylinder Base
12	Relief Cap
13	Cartridge Valve (Inlet Relief)
14	O-ring*

No.	Description
15	O-ring*
16	Back Up (Qty. 5)
17	Relief Extension
18	O-ring
19	O-ring
Parts With an Asterisk (*) Are Included in the Internal Relief	

11. Remove the relief extension from the piston.
12. Remove the seat from the piston.
13. Inspect the spring for damage or wear. Replace as necessary.
14. Inspect the poppet for damage or wear. Replace as necessary.
15. Replace the O-ring on the poppet.
16. Inspect the seat for damage or wear. Replace as necessary.
17. Replace the O-rings on the seat.
18. Replace the backups and PolyPak® on the piston.
19. Replace the O-rings on the relief extension.
20. Install the seat to the piston.
21. Install the poppet to the seat.
22. Install the spring to the poppet.
23. Carefully install the relief extension to the piston.
24. Carefully screw the B-Style internal relief assembly onto the inner shaft.

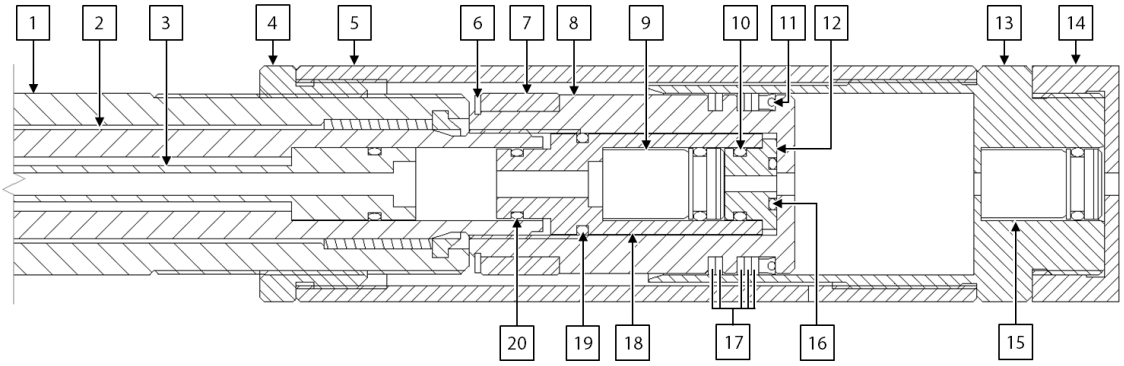
The piston must be attached securely to the inner shaft.

25. Proceed to step 53 for reassembly instructions.

Cartridge Style

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

Figure C2: C-Style Collection Head With Cartridge Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Adapter
5	Hanger
6	Snap Ring
7	Bearing
8	Piston

No.	Description
9	Cartridge Check Valve (Internal Relief)
10	O-ring
11	PolyPak®
12	Seat
13	Cylinder Base
14	Relief Cap

No.	Description
15	Cartridge Check Valve (Inlet Relief)
16	O-ring
17	Back Up (Qty. 5)
18	Relief Extension
19	O-ring
20	O-ring

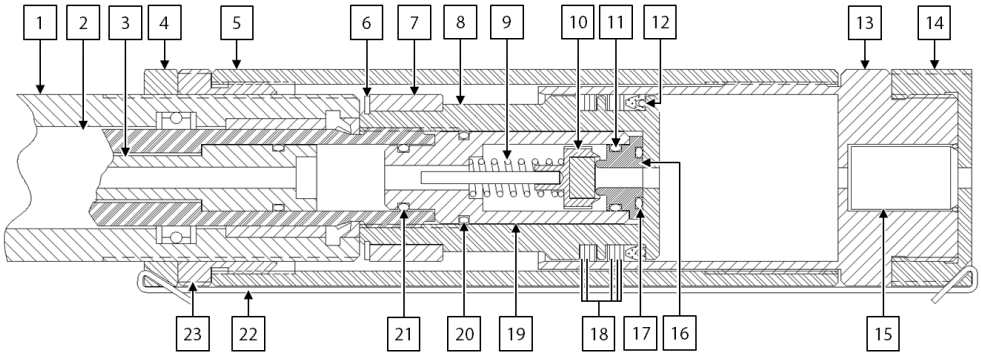
26. Remove the relief extension from the piston.
27. Remove the seat from the piston.
28. Remove the cartridge check valve from the piston.
29. Inspect the seat for damage or wear. Replace as necessary.
30. Replace the O-rings on the seat.
31. Replace the backups and PolyPak® on the piston.
32. Replace the O-rings on the relief extension.
33. Install the seat to the piston.
34. Install a replacement cartridge check valve to the relief extension.
35. Carefully install the relief extension to the piston.
36. Carefully screw the cartridge style inline relief assembly onto the inner shaft.

The piston must be attached securely to the inner shaft.

37. Proceed to step 53 for reassembly instructions.

Sand Style

Figure C3: C-Style Collection Head With Sand Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	Snap Ring
7	Bearing
8	Piston
9	Spring*

No.	Description
10	Poppet*
11	O-ring*
12	PolyPak®
13	Cylinder Base
14	Relief Cap
15	Cartridge Check Valve (Inlet Relief)
16	Seat*
17	O-ring*

No.	Description
18	Back Up (Qty. 5)
19	Relief Extension
20	O-ring
21	O-ring
22	Connecting Wire
23	Adapter
Parts With an Asterisk (*) Are Included in the Internal Relief	

38. Remove the relief extension from the piston.
39. Remove the poppet and spring from the piston.
40. Remove the seat from the piston.
41. Inspect the seat for damage or wear. Replace as necessary.
42. Inspect the spring for damage or wear. Replace as necessary.
43. Inspect the poppet for damage or wear. Replace as necessary.
44. Replace the O-rings on the seat.
45. Replace the backups and PolyPak® on the piston.
46. Replace the O-rings on the relief extension.
47. Install the seat to the piston.
48. Install the poppet to the seat.
49. Install the spring to the poppet.
50. Carefully install the relief extension to the piston.
51. Carefully screw the internal sand relief assembly onto the inner shaft.

The piston must be attached securely to the inner shaft.

52. Continue to step 53 for reassembly instructions.

Reassembly

53. For maximum sample volume, ensure that the bottom of the adapter is flush with the bottom of the insertion shaft.
54. Screw the cylinder base into the hanger.
55. Screw the hanger onto the adapter.
56. Using a wrench, tighten the jam nut, cylinder base, and relief cap.
57. As necessary, connect a safety wire from the opening in the relief cap to the jam nut. Ensure that the safety wire is wrapped in a counterclockwise rotation to prevent the associated threads from unscrewing from each other.

If a replacement safety wire is not available, ensure that the relief cap is securely tightened so that it can withstand the pressure of the flowing stream.

APPENDIX D: 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 might pop out when removing the cylinder.

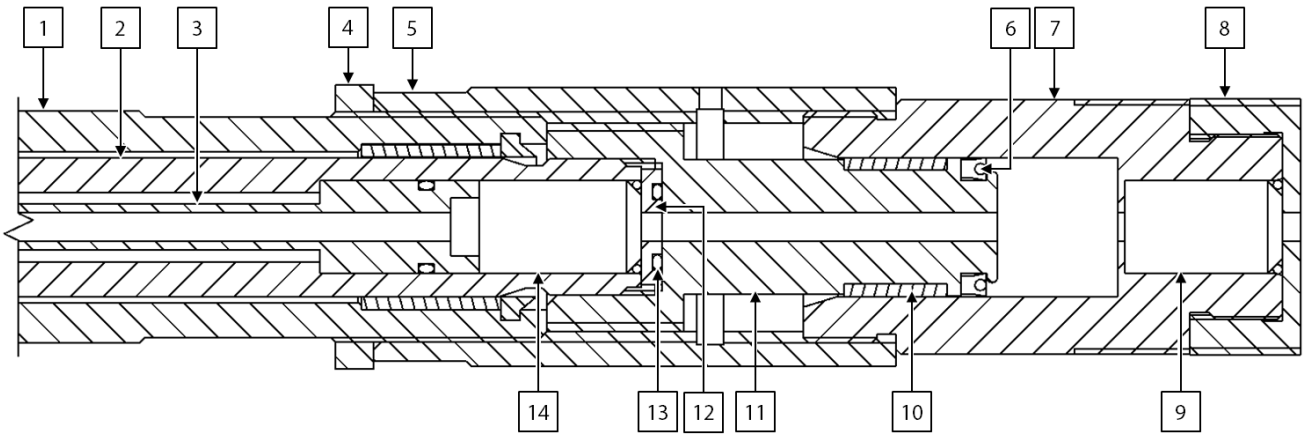
8. If the collection head is equipped with a cartridge style internal relief, continue to step 9. If the collection head is equipped with an internal sand relief, proceed to step 18.

Internal Relief Maintenance Cartridge

Style

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

Figure D1: D-Style Collection Head With Cartridge Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	PolyPak®

No.	Description
7	Cylinder
8	Relief Cap
9	Cartridge Check Valve (Inlet Relief)
10	Bushing

No.	Description
11	Piston
12	Seat
13	O-ring
14	Check Cartridge Valve (Internal Relief)

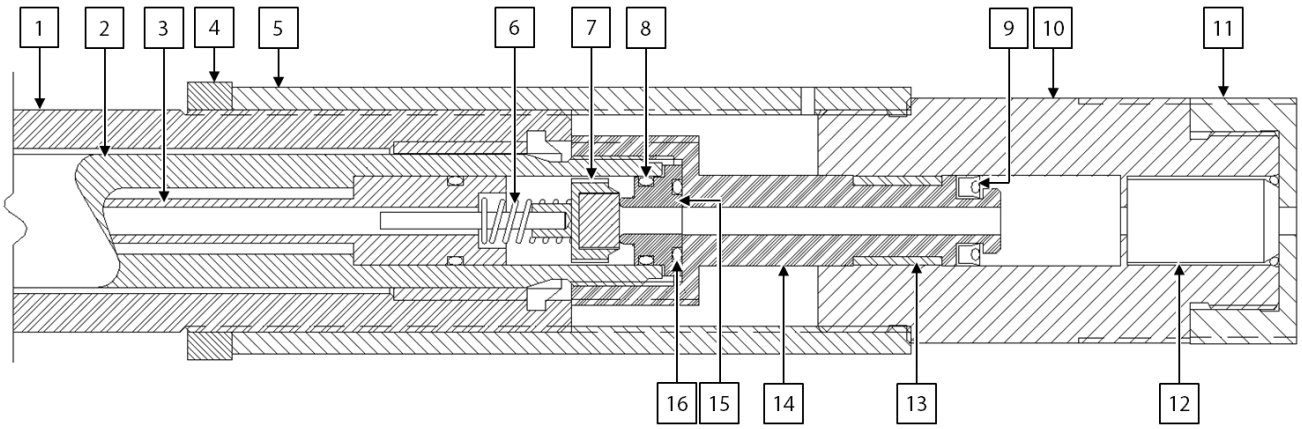
9. Remove the seat from the piston.
10. Inspect the seat for damage or wear. Replace as necessary.
11. Replace the O-ring on the seat.
12. Install the seat to the piston.
13. Install a replacement cartridge check valve to the inner shaft.
14. Carefully screw the piston onto the inner shaft.

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.

Sand Style

Figure D2: D-Style Collection Head With Sand Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	Spring*
7	Poppet*

No.	Description
8	O-ring*
9	PolyPak®
10	Cylinder
11	Relief Cap
12	Cartridge Check Valve (Inlet Relief)

No.	Description
13	Bushing
14	Piston
15	Seat*
16	O-ring*
Parts With an Asterisk (*) Are Included in the Internal Relief	

18. Remove the seat from the piston.
19. Inspect the seat for damage or wear. Replace as necessary.
20. Inspect the spring for damage or wear. Replace as necessary.
21. Inspect 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 E: WELKER® VANISHING CHAMBER™ COLLECTION CUP 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 collection head 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.

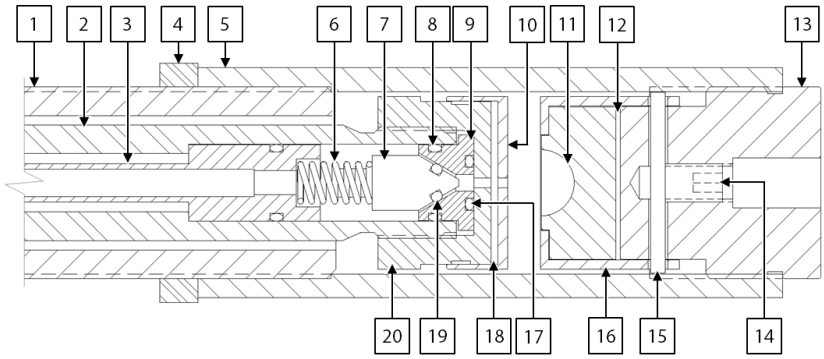
The B-Style and sand internal reliefs are spring loaded and might pop out when removing the cylinder.

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

Internal Relief Maintenance

B-Style

Figure E1: Vanishing Chamber™ Collection Head With B-Style Internal Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	Spring*
7	Poppet*
8	O-ring*

No.	Description
9	Seat*
10	Vacuum Breaker™ Disc
11	Collection Cup
12	Non-extrusion Disc
13	Cylinder Base
14	Setscrew
15	Holding Pin

No.	Description
16	Collection Head Shield
17	O-ring*
18	Spider Seal
19	O-ring*
20	Anvil

Parts With an Asterisk (*) Are Included in the Internal Relief

11. Remove the seat from the anvil.
12. Inspect the spring for damage or wear. Replace as necessary.
13. Inspect the poppet for damage or wear. Replace as necessary.
14. Replace the O-ring on the poppet.
15. Inspect 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.

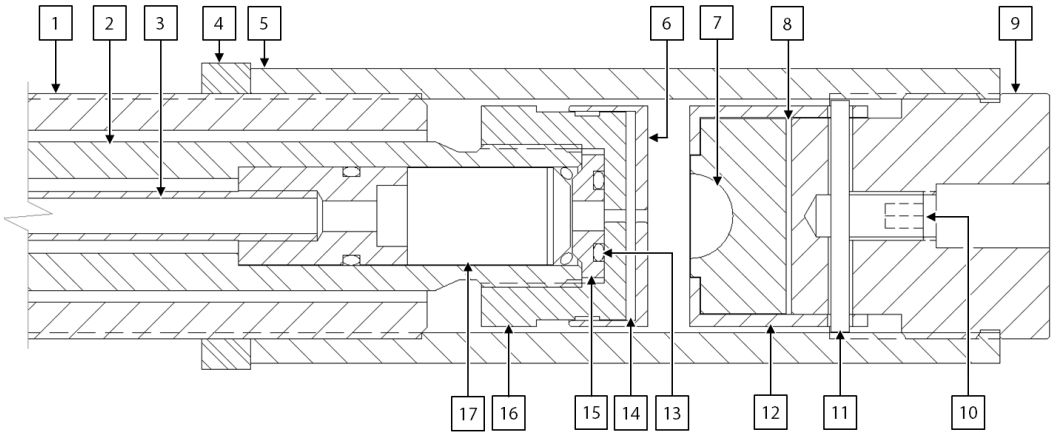
The anvil must be attached securely to the inner shaft.

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 E2: Vanishing Chamber™ Collection Head With Cartridge Style Relief



No.	Description
1	Outer Shaft
2	Inner Shaft
3	Volume Eliminator
4	Jam Nut
5	Hanger
6	Vacuum Breaker™ Disc

No.	Description
7	Collection Cup
8	Non-extrusion Disc
9	Cylinder Base
10	Setscrew
11	Holding Pin
12	Collection Head Shield

No.	Description
13	O-ring
14	Spider Seal
15	Seat
16	Anvil
17	Check Cartridge Valve (Internal Relief)

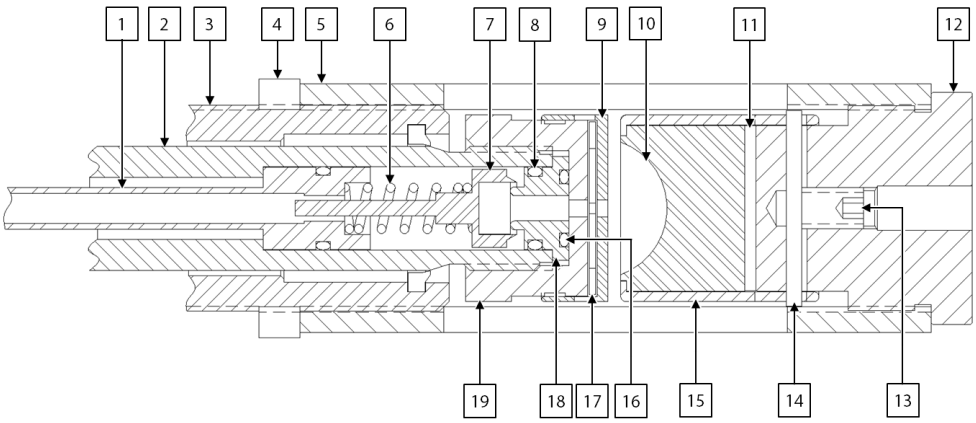
25. Remove the seat from the anvil.
26. Inspect the seat for damage or wear. Replace as necessary.
27. Replace the O-ring on the seat.
28. Remove the Vacuum Breaker™ disc from the anvil.
29. Install the seat to the anvil.
30. Install a replacement check valve cartridge to the inner shaft.
31. Install 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.

Sand Style

Figure E3: Vanishing Chamber™ Collection Head With Sand Relief



No.	Description
1	Volume Eliminator
2	Inner Shaft
3	Outer Shaft
4	Jam Nut
5	Hanger
6	Spring*
7	Poppet*

No.	Description
8	O-ring*
9	Vacuum Breaker™ Disc
10	Collection Cup
11	Non-extrusion Disc
12	Cylinder Base
13	Setscrew
14	Holding Pin

No.	Description
15	Collection Head Shield
16	O-ring*
17	Spider Seal
18	Seat*
19	Anvil
Parts With an Asterisk (*) Are Included in the Internal Relief	

36. Remove the seat from the anvil.
37. Inspect the seat for damage or wear. Replace as necessary.
38. Inspect the spring for damage or wear. Replace as necessary.
39. Inspect 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 $^{3}/_{16}$" (*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 $^{3}/_{16}$" (*5 mm*) gap.

NOTES

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