INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WELKER® INLOOP™ CRUDE OIL SAMPLER

DRAWING NUMBERS
AD585CI
AD659CI
AD659CP
AD842BB

MANUAL NUMBER
IOM-029

REVISION
Rev. F, 8/8/2016

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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® inLoop™ 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 inLoop™ Crude Oil Sampler is of a mechanical and electrical 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 inLoop™ 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 may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker® *inLoop*™ Crude Oil Sampler is a positive displacement pump designed to be incorporated into a liquid sampling system to collect representative samples from a bypass loop and inject them into a connected sample container.

The double-acting piston motor of the inLoop™ is hydraulically or pneumatically operated but electronically controlled. Capable of timed or proportional to flow sampling, the inLoop™ can be connected to a customer Programmable Logic Controller (PLC), Welker® 4P Sample Frequency Controller, Welker® 5T Recycle Timer, or Welker® 6Tc Timer/Controller to operate the solenoid.

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 inLoop™ 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: inLoop™ Specifications	
Application	Bypass Sampling
Products Sampled	Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel, Fluorotrel®, PTFE, and Viton® Others Available
Maximum Allowable Operating Pressure	**150 ANSI Stainless Steel:** 275 psig @ -20 °F to 100 °F (*18 barg @ -28 °C to 37 °C*) **300 ANSI Stainless Steel:** 720 psig @ -20 °F to 100 °F (*49 barg @ -28 °C to 37 °C*) **600 ANSI Stainless Steel:** 1440 psig @ -20 °F to 100 °F (*99 barg @ -28 °C to 37 °C*) **900 ANSI Stainless Steel:** 2160 psig @ -20 °F to 100 °F (*148 barg @ -28 °C to 37 °C*) **1500 ANSI Stainless Steel:** 3600 psig @ -20 °F to 100 °F (*248 barg @ -28 °C to 37 °C*) **FNPT Process Connection:** 3600 psig @ -20 °F to 100 °F (*248 barg @ -28 °C to 37 °C*)
Pipeline Spool Connection (Optional)	**Size:** 1" or 1½" **Rating:** 150, 300, 600, 900, or 1500 ANSI RF Others Available
Process Connection	¼" FNPT ½" FNPT 1" FNPT Others Available
Sample Outlet Connection	¼" FNPT
Motor Housing Actuation Ports	¼" FNPT (Standard) ½" FNPT
Utility Requirements	**Hydraulic or Pneumatic Supply:** 40–65 psig (*2–4 barg*)
Sample Volume	**B-Style Collection Head:** 0.5 cc, 1 cc, or 2 cc **Vanishing Chamber™ Collection Cup:** 0.22 cc, 0.5 cc, 1 cc, or 1.5 cc
Operation	Piston-Operated Motor
Feature	Internal Relief
Options	Body Drain Port Dome External Relief on Sample Outlet Heated Enclosure Mounting Bracket Packing Adjustment Nut Pipeline Spool Solenoid Timer CRN Certification

1.4 Equipment Diagrams

Figure 1: Recommended General Arrangement for the inLoop™

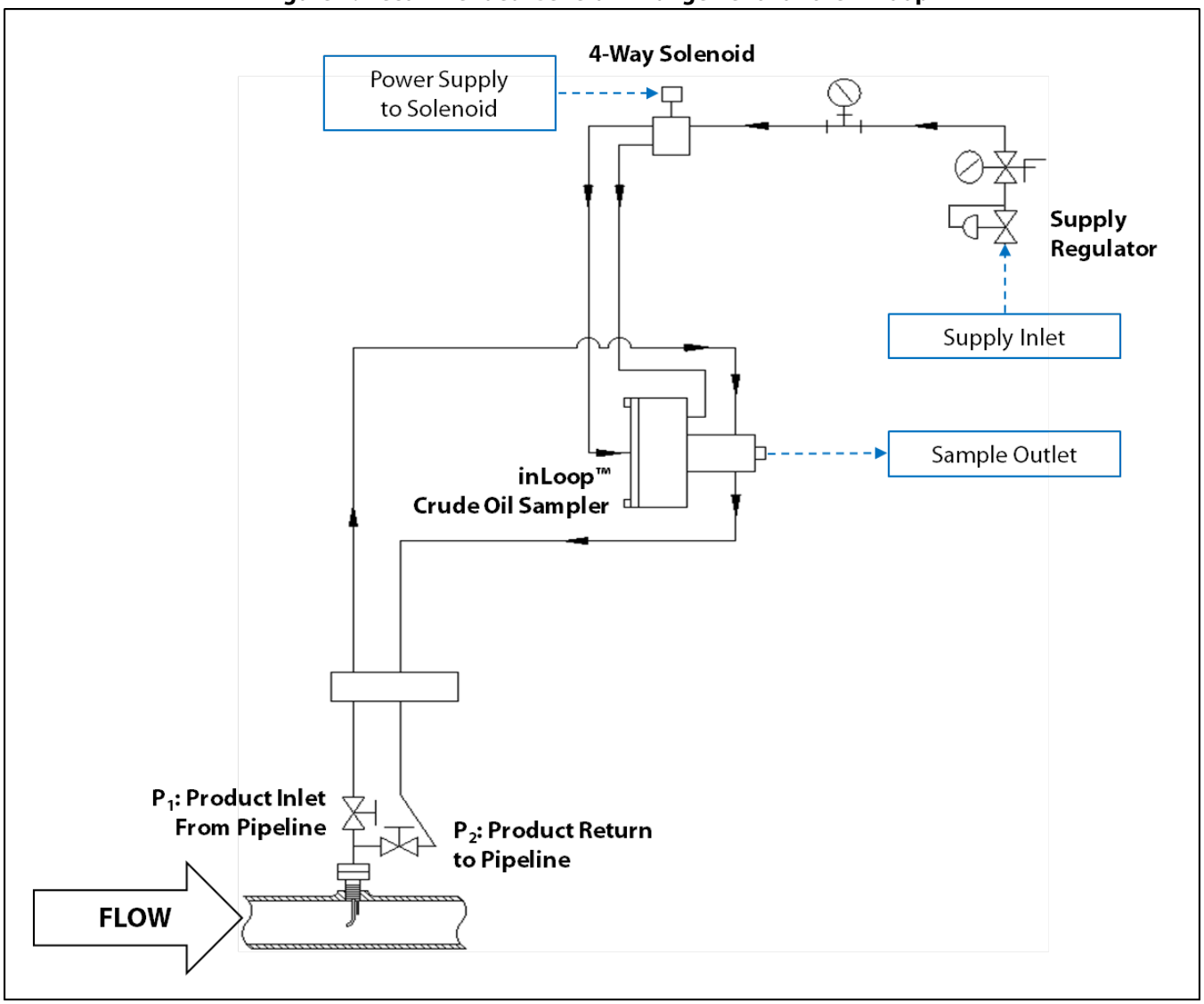
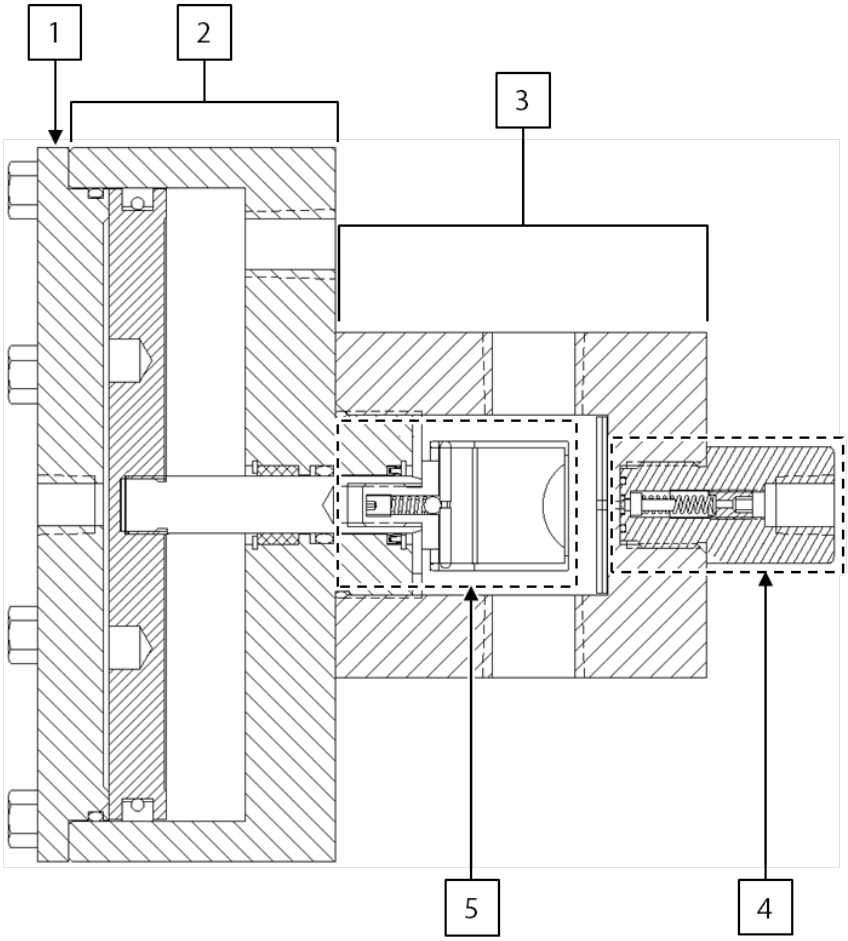


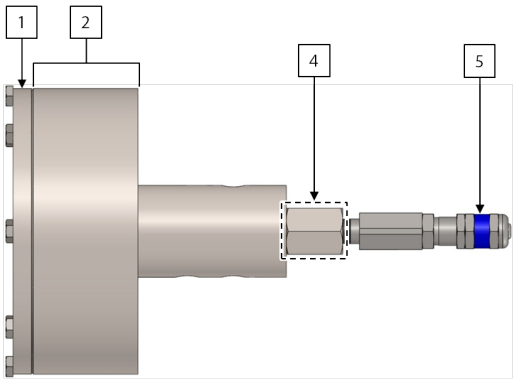
Figure 2: inLoop™ Diagram



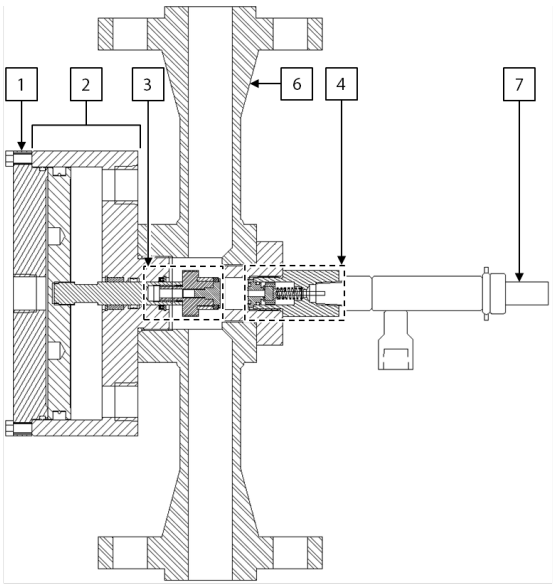
No.	Description
1	Motor Top
2	Motor Housing
3	Body
4	Internal Relief
5	Collection Head

Figure 3: inLoop™ Options Diagram

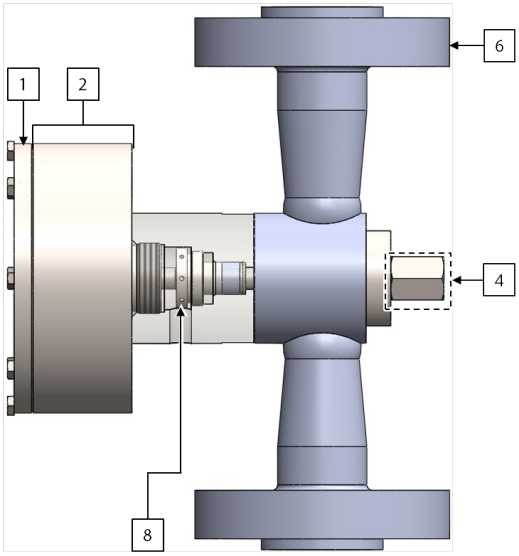
EXTERNAL ADJUSTABLE RELIEF



PIPELINE SPOOL AND EXTERNAL SAND RELIEF

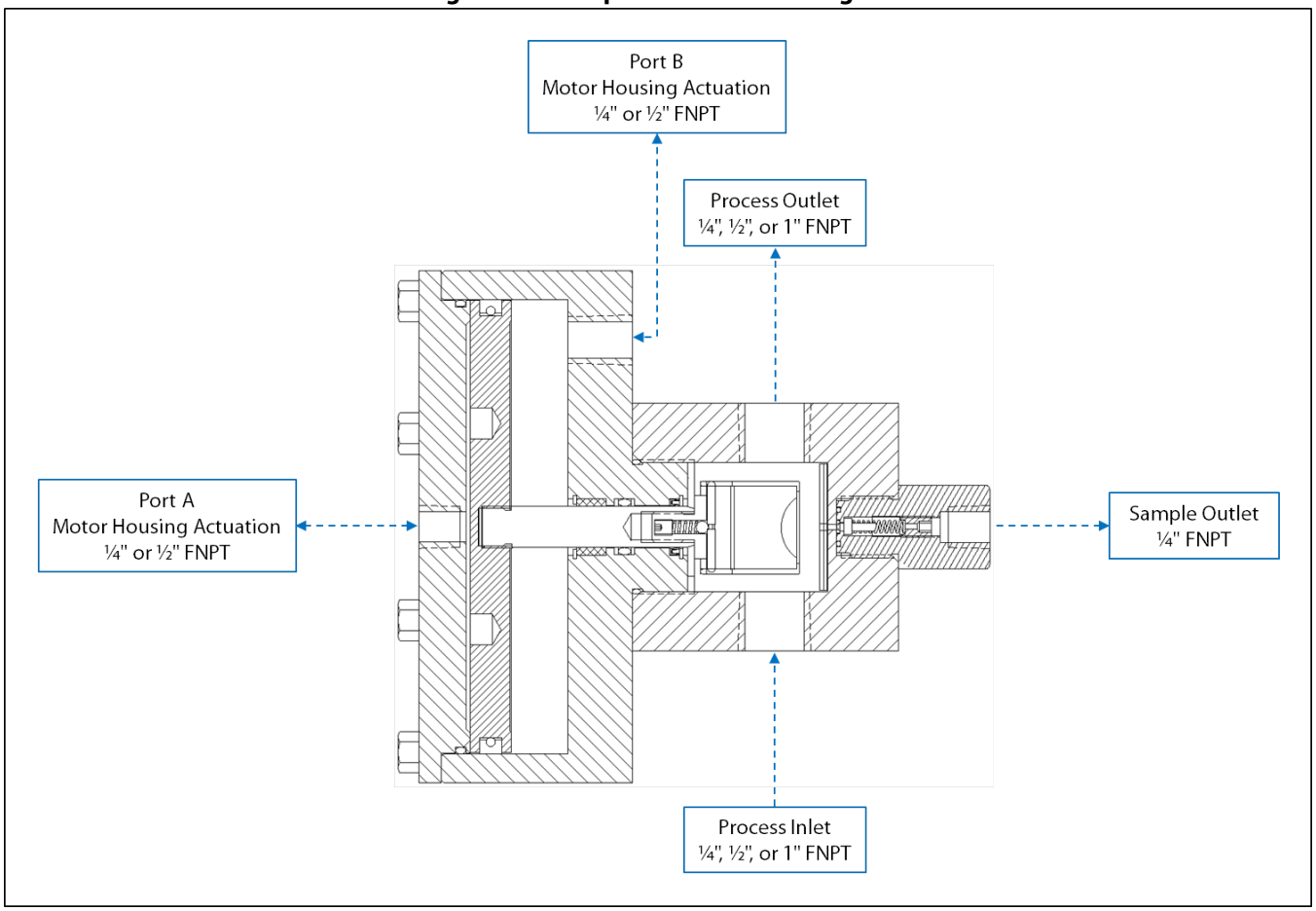


PIPELINE SPOOL AND PACKING ADJUSTMENT NUT



No.	Description
1	Motor Top
2	Motor Housing
3	Collection Head
4	Internal Relief
5	External Adjustable Relief
6	Pipeline Spool
7	External Sand Relief
8	Packing Adjustment Nut

Figure 4: inLoop™ Connections Diagram



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.

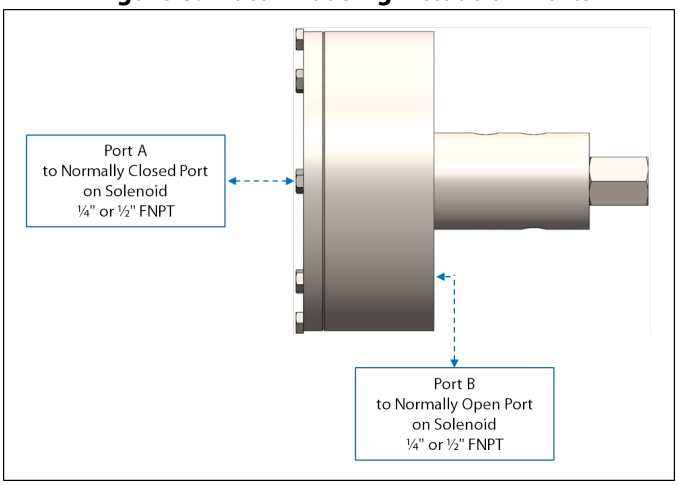
When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

1. The installation instructions are written with the assumption that the sampler has been purchased as part of a complete sampling system. If the sampler has been purchased individually, a sampling system should be constructed in a fashion compatible with the instructions in this *Installation, Operation, and Maintenance* (IOM) *Manual*.
2. Welker recommends that sample be extracted from a probe 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.
3. The sample probe should be located in the least turbulent area of the flowing stream available (i.e., not in a header or non-flowing area and away from obstructions, elbows, and partially closed valves).
4. Typically, the Welker® inLoop™ is installed with a pitot probe or a single probe with a return port downstream of a moderate pressure drop (e.g., an orifice plate or control valve) to create a bypass for the sampler, which will allow for a "real-time" sample to be taken with each actuation of the sampler.

2.2 Installation

1. Install the customer-supplied probe(s) to the pipeline.
2. Locate the inLoop™ as close to the probe(s) as possible. If the inLoop™ is equipped with an optional pipeline spool, install the unit to the depressurized bypass loop, ensuring that it is installed upstream of a static mixer, as necessary.
3. As necessary, use ¼" or ⅜" tubing to connect from the outlet on the customer-supplied pitot probe or upstream probe to the process inlet of the inLoop™ (*Figure 4*).
4. As necessary, use ¼" or ⅜" tubing to connect from the process outlet of the inLoop™ to the return on the customer-supplied pitot probe or downstream probe (*Figure 4*). This creates a bypass for the sampler, which will allow for a "real-time" sample to be taken with each actuation of the sampler.
5. As necessary, connect from the PLC to the solenoid.
6. If the inLoop™ is equipped with a Welker® 4P Sample Frequency Controller, Welker® 5T Recycle Timer, or Welker® 6Tc Timer/Controller, refer to the appropriate *Installation, Operating, and Maintenance* (IOM) *Manual* for wiring instructions.
7. Using ¼" tubing, connect from the normally open port on the solenoid to port B on the motor housing (*Figure 5*). Using ¼" tubing, connect from the normally closed port on the solenoid to port A on the motor housing (*Figure 5*).

Figure 5: Motor Housing Actuation Ports



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

8. Connect the customer-supplied hydraulic or pneumatic supply to the solenoid.
9. Regulate the customer-supplied hydraulic or pneumatic supply to the pressure appropriate for the application. The supply should be between 40 and 65 psig.

Connecting the Sample Cylinder

Install the sample container as close to the inLoop™ as possible.

If an atmospheric container will be used for sample collection, continue to step 10.
If a Welker® Constant Pressure Cylinder will be used for sample collection, proceed to step 13.

Atmospheric Container

10. Ensure that the inlet and outlet valves are closed.
11. Using ⅛" or ¼" tubing, connect from the sample outlet to the inlet of the atmospheric container (*Figure 4*).

Customer-supplied tubing must slope downward from the inLoop™ to the sample container.

12. Installation is now complete.

Welker® Constant Pressure Cylinder

13. Pre-charge the constant pressure cylinder. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the constant pressure cylinder for instructions on pre-charging the constant pressure cylinder.
14. Using ⅛" or ¼" tubing, connect from the sample outlet to the product inlet valve on the constant pressure cylinder (*Figure 4*).
15. Installation is now complete.

2.3 Start-Up Procedures

1. Ensure that all valves are closed.
2. Pressurize the pipeline.
3. As necessary, adjust the inline relief. If the inLoop™ is not equipped with an inline relief, proceed to step 21.

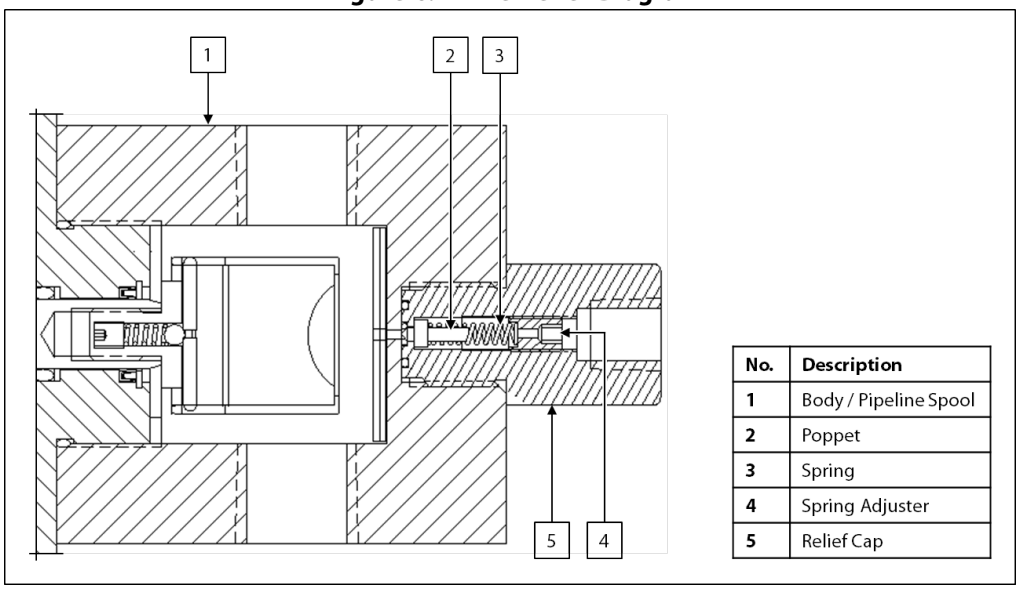
If an atmospheric container will be used for sample collection and the inLoop™ does not have an adjustable inline relief, an external relief is required.

If an atmospheric container will be used for sample collection, continue to step 4
If a Welker® constant pressure cylinder will be used for sample collection, proceed to step 9.

Setting the Inline Relief

The inline relief is designed to allow product to flow in one direction only. Acting as a check valve, the inline relief will ensure that sample pumped into the sample cylinder cannot flow back to the pipeline even if pipeline pressure drops.

Figure 6: Inline Relief Diagram



No.	Description
1	Body / Pipeline Spool
2	Poppet
3	Spring
4	Spring Adjuster
5	Relief Cap

Atmospheric Container

4. Remove the fitting from the relief cap.
5. Insert a hex key through the relief cap to the spring adjuster.
6. Open the valves on the customer probe(s) to allow flow to the bypass loop. Check for leaks and repair as necessary.
7. Turn the spring adjuster to adjust the spring tension until no product bleeds through, and then turn the spring adjuster clockwise another full turn.

When sampling into an atmospheric container, the inline relief must be set to approximately 100 psig above pipeline pressure.

Turning the spring adjuster clockwise increases spring tension.
Turning the spring adjuster counterclockwise decreases spring tension.

Each full clockwise turn of the spring adjuster increases spring tension approximately 100 psig.

8. Return the fitting to the relief cap.

Constant Pressure Cylinder

9. Ensure that the constant pressure cylinder has been pre-charged.
10. Open the valves on the customer probe(s) to allow flow to the bypass loop. Check for leaks and repair as necessary.
11. Read the pressure on the constant pressure cylinder pressure gauge. To determine the current inline relief setting, subtract this pressure reading from the pipeline pressure.

When sampling into a Welker® Constant Pressure Cylinder, the pressure gauge should read approximately 200 psig.

12. If the current inline relief setting is approximately 200 psig, the inline relief does not need to be adjusted; proceed to step 21. If the current inline relief setting is anything other than approximately 200 psig, the inline relief must be adjusted; continue to step 13.
13. Close the valves on the customer probe(s) to isolate the inLoop™ from pipeline pressure.
14. Remove the fitting from the relief cap.
15. Insert a hex key through the relief cap to the spring adjuster.
16. Turn the spring adjuster to adjust the spring tension.

When sampling into a Welker® Constant Pressure Cylinder, the pressure gauge should read approximately 200 psig.

Turning the spring adjuster clockwise increases spring tension.
Turning the spring adjuster counterclockwise decreases spring tension.

Each full clockwise turn of the spring adjuster increases spring tension approximately 100 psig.

17. Return the fitting to the relief cap.
18. Allow full pipeline pressure to reach the inLoop™.
19. Read the pressure on the constant pressure cylinder pressure gauge. To determine the current inline relief setting, subtract this pressure reading from the pipeline pressure.

When sampling into a Welker® Constant Pressure Cylinder, the pressure gauge should read approximately 200 psig.

20. If the current inline relief setting is approximately 200 psig, the inline relief does not need to be adjusted; continue to step 21. If the current inline relief setting is anything other than approximately 200 psig, the inline relief must be adjusted; repeat steps 13–20 until the inline relief is set to approximately 200 psig.

Preparing for Sampling

21. As necessary, ensure that the constant pressure cylinder has been pre-charged and purged.
22. Open the inlet valve on the sample container. Check for leaks and repair as necessary.
23. Set the signal control system to the desired sampling frequency based on the sampling actuation equations provided (*Figure 7*). Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the controller used for instructions on setting the sampling frequency.

Figure 7: Sampling Frequency Equations

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

24. The inLoop™ is now in operation.

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.

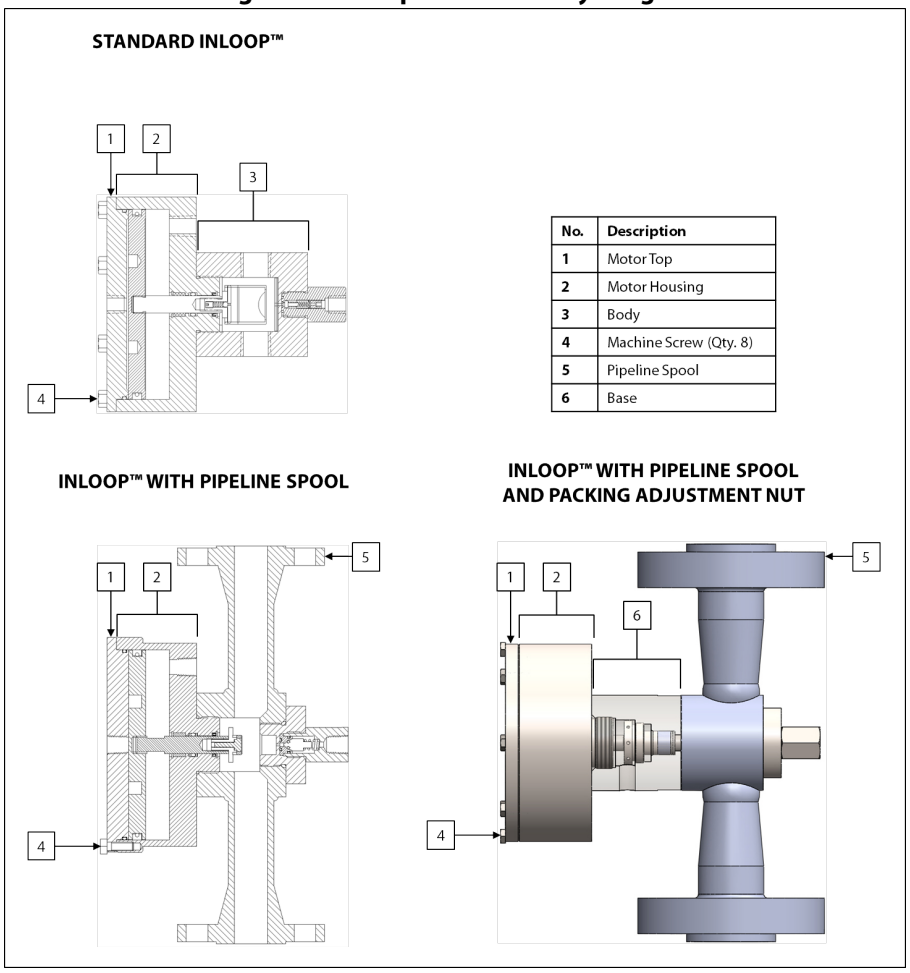
After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

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. Anti-galling Lubricant
    c. Hex Key Set
    d. Seal Pick
    e. Snap Ring Pliers

3.2 Maintenance

1. Close the valves on the customer probe(s) to isolate the inLoop™ from pipeline pressure.
2. Turn OFF electrical power to the system and carefully remove all electrical connections.
3. Depressurize and disconnect the customer-supplied hydraulic or pneumatic supply.
4. Close the inlet valve on the sample container.
5. Relieve pressure from the tubing connecting the inLoop™ to the sample container.
6. As necessary, disconnect tubing from the process inlet and outlet (*Figure 4*).
7. Unscrew the motor housing from the body, pipeline spool, or base (*Figure 8*).

Figure 8: inLoop™ Disassembly Diagram



No.	Description
1	Motor Top
2	Motor Housing
3	Body
4	Machine Screw (Qty. 8)
5	Pipeline Spool
6	Base

8. If the inLoop™ is equipped with a Vanishing Chamber™ collection head, remove the holding pin from the collection head shield, and then separate the collection head shield from the adapter.

Collection Head and Internal Relief Assemblies

9. Refer to *Appendix B, B-Style Collection Head Maintenance,* or *Appendix C, Vanishing Chamber™ Collection Head Maintenance,* for instructions on performing maintenance on the collection head and internal relief.

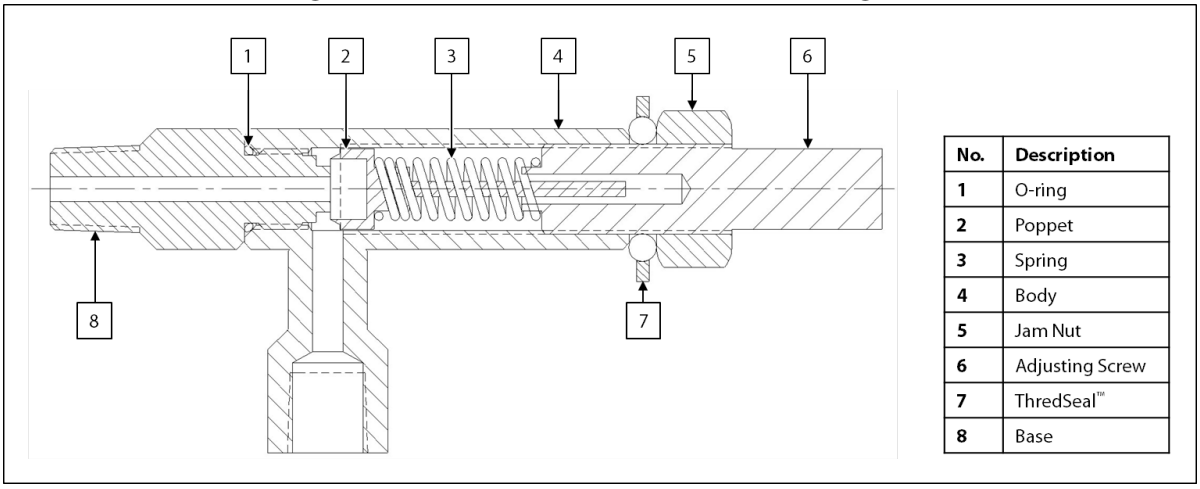
Optional External Relief Assemblies

10. If the inLoop™ is not equipped with any optional external reliefs, proceed to step 19. If the inLoop™ is equipped with an optional external relief, continue to step 11.
11. If the inLoop™ is equipped with the optional external motor housing relief, unscrew the relief from the motor housing, and then refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief for maintenance instructions.
12. If the inLoop™ is equipped with the optional sample outlet relief, unscrew the optional relief from the relief cap.
13. If the inLoop™ is equipped with the optional external adjustable relief, refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief for maintenance instructions, and then proceed to step 19. If the inLoop™ is equipped with the optional external sand relief, continue to step 14.

External Sand Relief

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

Figure 9: External Sand Relief Maintenance Diagram

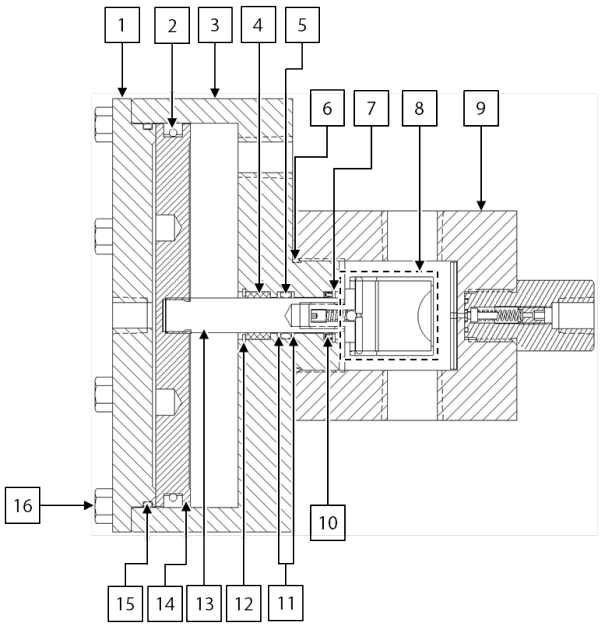


No.	Description
1	O-ring
2	Poppet
3	Spring
4	Body
5	Jam Nut
6	Adjusting Screw
7	ThredSeal™
8	Base

15. Replace the O-ring on the base.
16. Unscrew the jam nut from the adjusting screw.
17. Inspect the poppet for scratches or other damage. If scratches or other damage are present on the poppet (face) seat, replace the poppet.
18. Reassemble the external sand relief, and then set the external sand relief aside.

Motor Housing

Figure 10: Motor Housing Maintenance Diagram

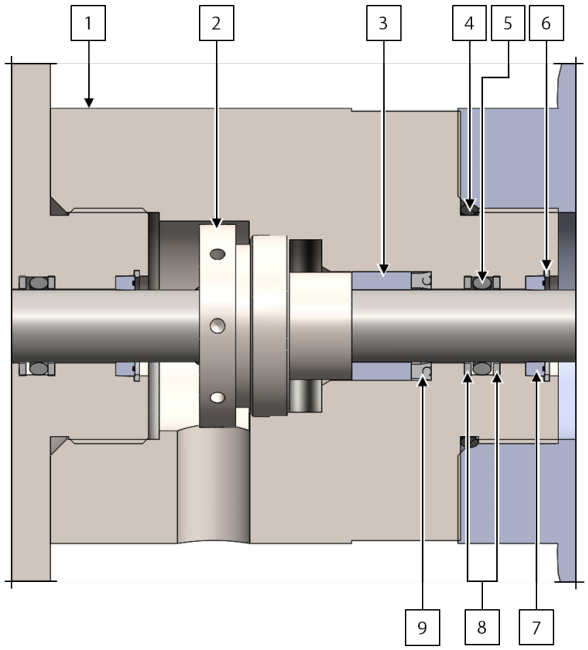


No.	Description
1	Motor Top
2	Crown Seal
3	Motor Housing
4	Bearing
5	O-ring
6	O-ring
7	Snap Ring
8	Collection Head
9	Body / Pipeline Spool
10	Seal
11	Back Up (Qty. 2)
12	Snap Ring
13	Shaft
14	Piston
15	O-ring
16	Machine Screw (Qty. 8)

19. Clean the threads on the motor housing.
20. Unscrew the machine screws, and then remove the motor top from the motor housing.
21. Replace the O-ring on the motor top.
22. Unscrew the piston from the shaft.
23. Carefully remove the piston from the motor housing.
24. Carefully pull the shaft out through the bottom of the motor housing.
25. Replace the crown seal on the piston.
26. Carefully inspect the polished outer diameter of the shaft. Scratches or pits may cause the seals to leak. If scratches or pits are present, the unit may need to be repaired or replaced. Contact Welker for service options.
27. Remove the snap ring and seal from the motor housing.
28. Replace the O-ring on the motor housing.
29. Replace the seal in the motor housing, and then reinstall the snap ring.
30. Remove the snap ring, bearing, back ups, and O-ring from the motor housing.
31. Replace the back ups and O-rings.
32. Examine the bearing for damage or wear. Replace as necessary.
33. Install the snap ring to the motor housing.
34. If the inLoop™ is equipped with the optional packing adjustment nut, continue to step 35. If the inLoop™ is not equipped with the optional packing adjustment nut, proceed to step 43.

Base With Optional Packing Adjustment Nut

Figure 11: Base With Optional Packing Adjustment Nut



No.	Description
1	Base
2	Packing Adjustment Nut
3	Bearing
4	O-ring
5	O-ring
6	Snap Ring
7	Seal
8	Back Up (Qty. 2)
9	PolyPak®

35. Unscrew the packing adjustment nut from the base.
36. Remove the snap ring, seal, back ups, and O-ring from the base.
37. Replace the O-ring, back ups, and seal in the base, and then install the snap ring to the base.
38. Inspect the bearing. Replace if it shows signs of wear or damage.
39. Replace the PolyPak® in the base.
40. Replace the wiper ring in the packing adjustment nut.
41. Screw the packing adjustment nut into the base.
42. Replace the O-ring on the base.

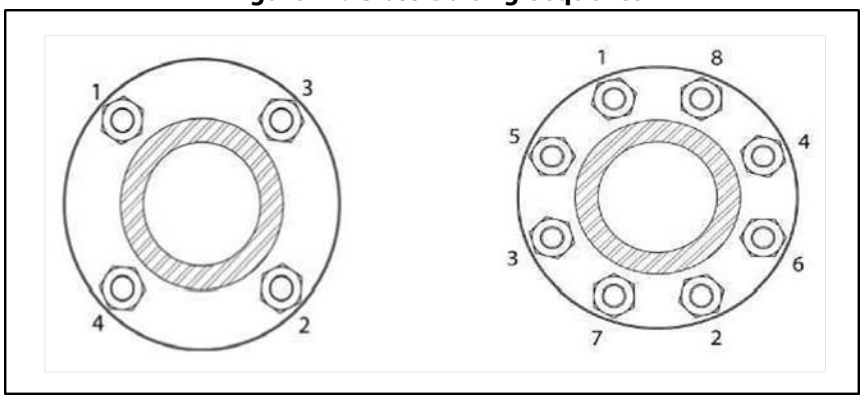
Reassembly

43. Lubricate the shaft, and then carefully install the shaft to the motor housing.
44. Carefully screw the piston onto the shaft.
45. If the inLoop™ is equipped with the B-Style collection head, use a hex key to screw the retainer into the piston.
46. Apply anti-galling compound to the threads on the motor housing.

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

47. Carefully install the motor housing to the body, base, or pipeline spool.
48. Install the motor top to the motor housing.
49. Following a cross-bolting sequence, secure the motor top to the motor housing using the machine screws (*Figure 12*).

Figure 12: Cross-Bolting Sequence



50. If the inLoop™ is equipped with an optional sample outlet relief, screw the relief into the relief cap.
51. Maintenance is now complete. See *Section 2.2, Installation,* for instructions on installing the inLoop™ and *Section 2.3, Start-Up Procedures*, for instructions on returning the inLoop™ to operation.

3.3 Troubleshooting

Table 2: inLoop™ Troubleshooting		
Issues	**Possible Causes**	**Solutions**
Supply pressure is leaking from the motor housing.	The piston seal has failed.	Halt sampling and maintain the inLoop™. See *Section 3.2, Maintenance,* for instructions on replacing the piston seal.
The inLoop™ is not actuating properly.	The hydraulic supply may be too low or not operating.	Inspect the electro-hydraulic unit (EHUC). Ensure that the hydraulic supply is set to approximately 45 psig. Add hydraulic oil if necessary. If the EHUC is not operating properly, refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the EHUC.
	The pneumatic supply may be too low or not operating.	Inspect the pneumatic supply and regulator to ensure that air is supplied at the appropriate pressure (approximately 45 psig).
	The solenoid may not be operating properly.	Use the manual override button to check 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 stroke and exhaust times are too short.	Ensure that the pump cycle is no faster than every four (4) seconds.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-001: Welker® 4P Sample Frequency Controller
- IOM-002: Welker® 6Tc Timer/Controller
- IOM-048: Welker® FIR-1 Filter / Instrument Regulator
- IOM-105: Welker® NV-1 and NV-2 Instrument Valves
- IOM-130: Welker® 5T Recycle Timer
- IOM-131: Welker® LS-14 Constant Pressure Sample Container

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

- ASCO Valve, Inc. General Service Solenoid Valves Series 8342 (Welker® IOM-V139)
- Ashcroft® Type 1005S Commercial Pressure Gauge (Welker® IOM-V271)
- Automatic Timing & Controls 353B Series Shawnee II Digital Programmable Timer (Welker® IOM-V273)
- Automatic Timing & Controls 354B Series Shawnee II High Speed Counter (Welker® IOM-V034)
- Circle Seal Controls 500 Series Adjustable Popoff & Inline Relief Valves (Welker® IOM-V178)
- Kepner Products Company Kepsel® Cartridge Insert Valves (Welker® IOM-V078)
- McDaniel Control, Inc. Stainless Steel Case Utility Gauges (Welker® IOM-V274)
- Norgren® R83 Cylinder Gas Pressure Regulator For Industrial Gas Systems (Welker® IOM-V014)
- Parker Skinner™ 71313, 71315, 71335, 71385, 71395, 7131V, and 7133V 3-Way Solenoid Valves (Welker® IOM-V016)
- Parker Skinner™ General Purpose Solenoid Valves (Welker® IOM-V272)
- Swagelok® Proportional Relief Valves R Series (Welker® IOM-V086)
- Versa Products Company, Inc. C-316 Series Stainless Steel Valves (Welker® IOM-V070)
- WIKA Bourdon Tube Pressure Gauges Types 232.53 and Type 233.53 (Welker® IOM-V171)

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

- Assembly Drawing: AD585CI (inLoop™ With Optional External Sand Relief and B-Style Collection Head With Internal Sand Relief)
- Assembly Drawing: AD659CI (inLoop™ and Vanishing Chamber™ Collection Head With Inline Relief)
- Assembly Drawing: AD659CP (inLoop™ With Optional External Relief and Vanishing Chamber™ Collection Head With Cartridge Relief)
- Assembly Drawing: AD842BB (inLoop™ With Optional Pipeline Spool and Packing Adjustment Nut and B-Style Collection Head With Cartridge Relief)
- Collection Head Drawing: AD585BJ (B-Style Collection Head With B-Style Inline Relief)
- Collection Head Drawing: AD659CR (Vanishing Chamber™ Collection Head With Internal Sand Relief)
- Collection Head Drawing: AD659CU (Vanishing Chamber™ Collection Head With B-Style Inline Relief)

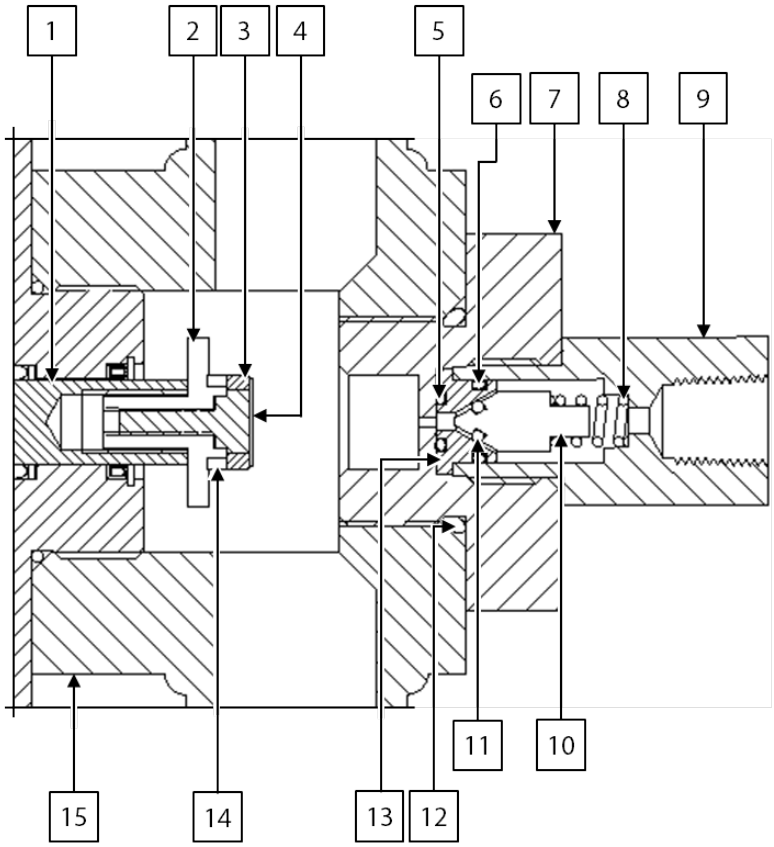
APPENDIX B: B-STYLE COLLECTION HEAD MAINTENANCE

1. Using a hex key, unscrew the retainer from the piston.
2. Remove the bearing and Welker® Seal from the retainer.
3. Inspect the bearing for damage or wear. Replace as necessary.
4. Install the bearing to the piston.
5. Replace the Welker® Seal.
6. Unscrew the adapter from the body / pipeline spool.
7. Replace the O-ring on the adapter.
8. If the collection head is equipped with the B-style internal relief, continue to step 9. If the collection head is equipped with the cartridge style internal relief, proceed to step 22. If the collection head is equipped with the internal sand relief, proceed to step 31.

Internal Relief Maintenance

B-Style

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

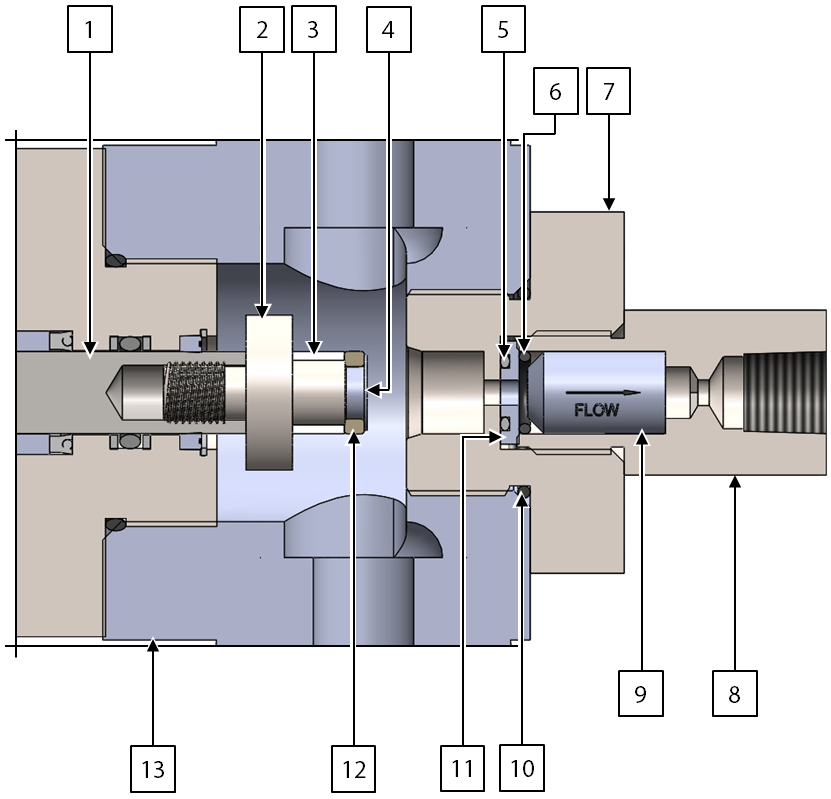


No.	Description
1	Shaft
2	Piston
3	Welker® Seal
4	Retainer
5	O-ring*
6	O-ring*
7	Adapter*
8	Spring*
9	Relief Cap*
10	Poppet*
11	O-ring*
12	O-ring
13	Seat*
14	Bearing
15	Body / Pipeline Spool
Parts With an Asterisk (*) Are Included in the Internal Relief	

9. Unscrew the relief cap from the adapter.
10. Remove the seat from the adapter.
11. Inspect the spring for damage or wear. Replace as necessary.
12. Inspect the poppet for damage or wear. Replace as necessary.
13. Replace the O-ring on the poppet.
14. Inspect the seat for damage or wear. Replace as necessary.
15. Replace the O-rings on the seat.
16. Install the seat to the adapter.
17. Install the poppet to the seat.
18. Install the spring to the poppet.
19. Carefully screw the relief cap into the adapter.
20. Screw the adapter into the body / pipeline spool.
21. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

Cartridge Style

Figure B2: B-Style Collection Head With Cartridge Relief



No.	Description
1	Shaft
2	Piston
3	Bearing
4	Retainer
5	O-ring*
6	O-ring*
7	Adapter*
8	Relief Cap*
9	Check Cartridge Valve*
10	O-ring*
11	Seat*
12	Welker® Seal
13	Body / Pipeline Spool
Parts With an Asterisk (*) Are Included in the Internal Relief	

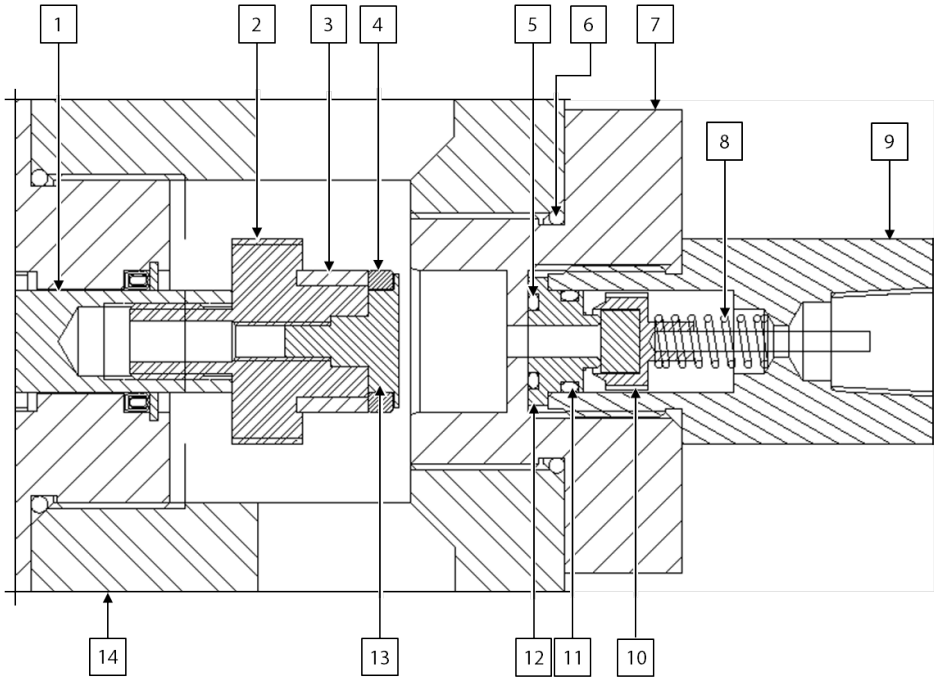
22. Unscrew the relief cap from the adapter.
23. Remove the seat from the adapter.
24. Replace the O-ring on the seat.
25. Install the seat to the cylinder.
26. Install a replacement O-ring on top of the seat.
27. Install a replacement cartridge check valve to the relief cap.

> ⚠ Install the replacement check cartridge so that the arrow points in the direction of product flow.

28. Carefully screw the relief cap into the adapter.
29. Screw the adapter into the body / pipeline spool.
30. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

Sand Style

Figure B3: B-Style Collection Head With Sand Relief



No.	Description
1	Shaft
2	Piston
3	Bearing
4	Welker® Seal
5	O-ring*
6	O-ring*
7	Adapter*
8	Spring*
9	Relief Cap*
10	Poppet*
11	O-ring*
12	Seat*
13	Retainer
14	Body / Pipeline Spool
Parts With an Asterisk (*) Are Included in the Internal Relief	

31. Unscrew the relief cap from the adapter.
32. Remove the seat from the adapter.
33. Inspect the seat for damage or wear. Replace as necessary.
34. Inspect the spring for damage or wear. Replace as necessary.
35. Inspect the poppet for damage or wear. Replace as necessary.
36. Replace the O-rings on the seat.
37. Install the seat to the adapter.
38. Install the poppet to the seat.
39. Install the spring to the poppet.
40. Carefully screw the relief cap into the adapter.
41. Screw the adapter into the body / pipeline spool.
42. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

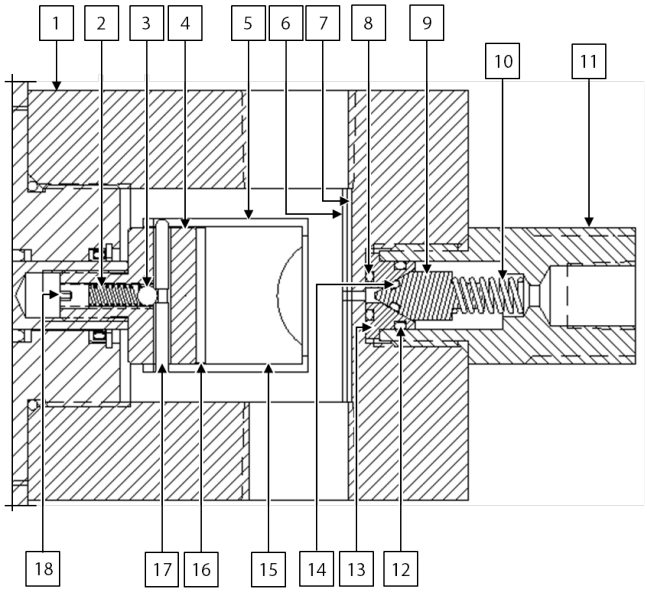
APPENDIX C: VANISHING CHAMBER™ COLLECTION HEAD MAINTENANCE

1. Push the collection cup and non-extrusion disc out of the collection head shield.
2. Lubricate the inside of the collection head shield, and then install the replacement collection cup and non-extrusion disc.
3. Return the collection head shield to the adapter and insert the holding pin.
4. Remove the Vacuum Breaker™ disc and spider seal.
5. Install a replacement spider seal to the body / pipeline spool.
6. Inspect the Vacuum Breaker™ disc for damage or wear. Replace as necessary.
7. Return the Vacuum Breaker™ disc to the top of the spider seal.
8. If the collection head is equipped with the B-style internal relief, proceed to step 9. If the collection head is equipped with the cartridge style internal relief, proceed to step 19. If the collection head is equipped with the inline relief, proceed to step 27. If the collection head is equipped with the internal sand relief, proceed to step 36.

Internal Relief Maintenance

B-Style

Figure C1: Vanishing Chamber™ Collection Head With B-Style Internal Relief



No.	Description
1	Body / Pipeline Spool
2	Spring
3	Ball Bearing
4	Adapter
5	Collection Head Shield
6	Vacuum Breaker™ Disc
7	Spider Seal

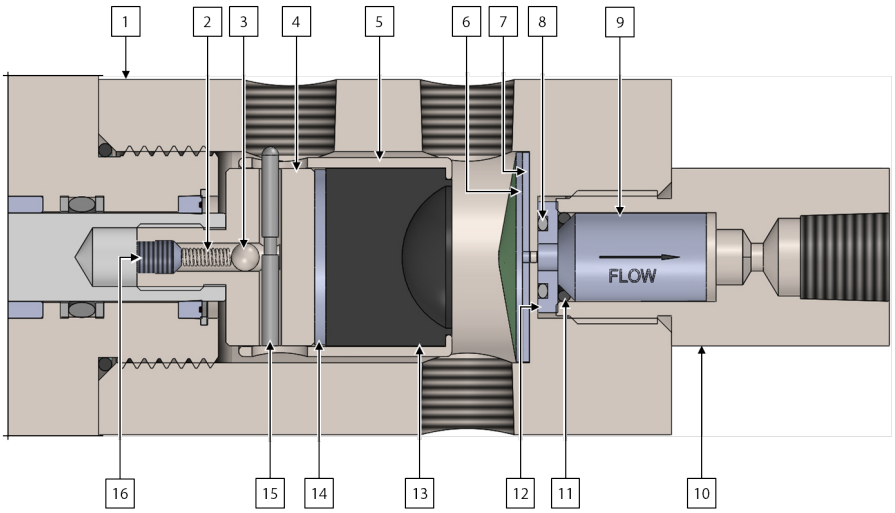
No.	Description
8	O-ring*
9	Poppet*
10	Spring*
11	Relief Cap*
12	O-ring*
13	Seat*
14	O-ring*

No.	Description
15	Collection Cup
16	Non-extrusion Disc
17	Holding Pin
18	Setscrew
Parts With an Asterisk (*) Are Included in the Internal Relief	

9. Unscrew the relief cap from the body / pipeline spool.
10. Remove the seat from the relief cap.
11. Inspect the spring for damage or wear. Replace as necessary.
12. Inspect the poppet for damage or wear. Replace as necessary.
13. Replace the O-ring on the poppet.
14. Inspect the seat for damage or wear. Replace as necessary.
15. Install the seat to the relief cap.
16. Install the spring to the poppet, and then install the poppet assembly to the relief cap.
17. Screw the relief cap into the body / pipeline spool.
18. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

Cartridge Style

Figure C2: Vanishing Chamber™ Collection Head With Cartridge Relief



No.	Description
1	Body / Pipeline Spool
2	Spring
3	Ball Bearing
4	Adapter
5	Collection Head Shield
6	Vacuum Breaker™ Disc
7	Spider Seal
8	O-ring*
9	Check Cartridge Valve*
10	Relief Cap*
11	O-ring*
12	Seat*
13	Collection Cup
14	Non-extrusion Disc
15	Holding Pin
16	Setscrew
Parts With an Asterisk (*) Are Included in the Internal Relief	

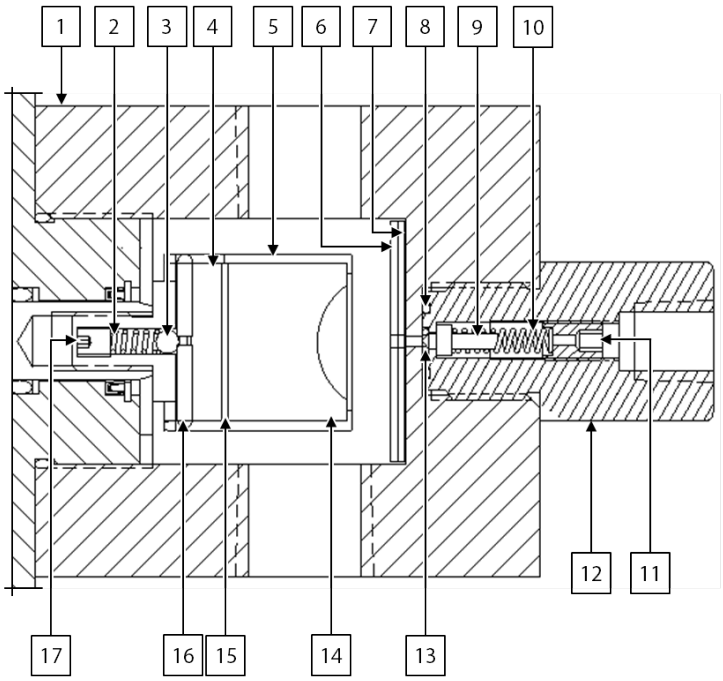
19. Unscrew the relief cap from the body / pipeline spool.
20. Remove the seat from the relief cap.
21. Inspect the seat for damage or wear. Replace as necessary.
22. Replace the O-ring on the seat.
23. Install the seat to the relief cap.
24. Install a replacement check valve cartridge to the relief cap.

> ⚠ Install the replacement check cartridge so that the arrow points in the direction of product flow.

25. Screw the relief cap into the body / pipeline spool.
26. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

Inline Style

Figure C3: Vanishing Chamber™ Collection Head With Inline Relief

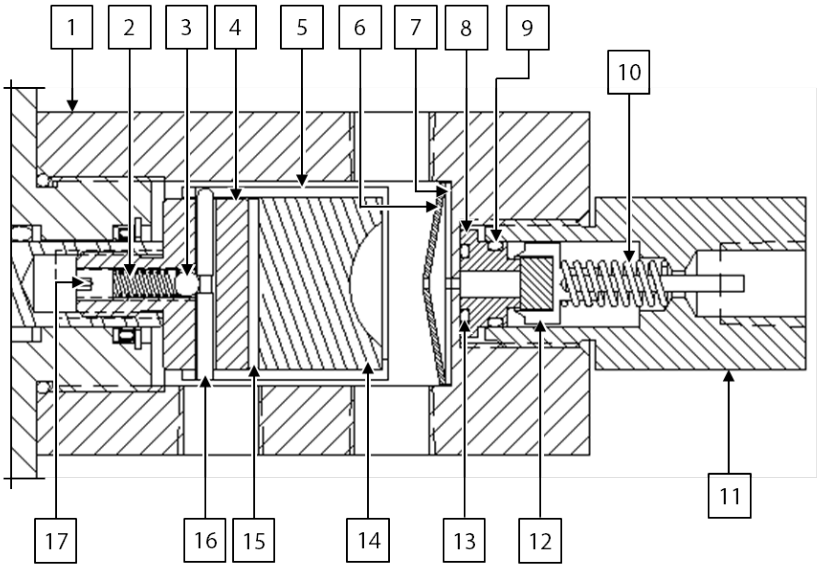


No.	Description
1	Body / Pipeline Spool
2	Spring
3	Ball Bearing
4	Adapter
5	Collection Head Shield
6	Vacuum Breaker™ Disc
7	Spider Seal
8	O-ring*
9	Poppet*
10	Spring*
11	Spring Adjuster*
12	Relief Cap*
13	O-ring*
14	Collection Cup
15	Non-extrusion Disc
16	Holding Pin
17	Setscrew
Parts With an Asterisk (*) Are Included in the Internal Relief	

27. Unscrew the relief cap from the body / pipeline spool.
28. Using a hex key, unscrew the spring adjuster from the relief cap, and then remove the spring and poppet from the relief cap.
29. Inspect the spring for damage or wear. Replace as necessary.
30. Inspect the poppet for damage or wear. Replace as necessary.
31. Replace the O-rings in the relief cap.
32. Carefully screw the relief cap into the body / pipeline spool.
33. Install the spring to the poppet, and then install the spring adjuster to the spring.
34. Using a hex key, screw the spring adjuster into the relief cap.
35. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

Sand Style

Figure C4: Vanishing Chamber™ Collection Head With Sand Relief



No.	Description
1	Body / Pipeline Spool
2	Spring
3	Ball Bearing
4	Adapter
5	Collection Head Shield
6	Vacuum Breaker™ Disc
7	Spider Seal

No.	Description
8	Seat*
9	O-ring*
10	Spring*
11	Relief Cap*
12	Poppet*
13	O-ring*

No.	Description
14	Collection Cup
15	Non-extrusion Disc
16	Holding Pin
17	Setscrew
Parts With an Asterisk (*) Are Included in the Internal Relief	

36. Unscrew the relief cap from the body / pipeline spool.
37. Remove the seat from the relief cap.
38. Inspect the seat for damage or wear. Replace as necessary.
39. Inspect the spring for damage or wear. Replace as necessary.
40. Inspect the poppet for damage or wear. Replace as necessary.
41. Replace the O-rings on the seat.
42. Install the seat to the relief cap.
43. Install the spring to the poppet.
44. Carefully install the poppet assembly to the relief cap.
45. Screw the relief cap into the body / pipeline spool.
46. Continue to the next step in *Section 3.2, Maintenance*, to complete maintenance on the inLoop™.

NOTES

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