WELKER

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WELKER GAS SAMPLE PUMP

MODEL
GSS-4

DRAWING NUMBERS
AD103C0
AD590C0.1

MANUAL NUMBER
IOM-020

REVISION
Rev. D, 6/7/2018

TABLE OF CONTENTS

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 Gas Sample Pump, GSS-4. 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 Gas Sample Pump 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 Gas Sample Pump, 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 *GSS-4* Gas Sample Pump is a self-purging positive displacement pump designed for use with a sample probe to extract samples from the center one-third (⅓) of a pressurized gas pipeline and collect them in a connected sample cylinder.

The GSS-4 is designed to be installed close to the sample point to eliminate long tubing runs and sample lag time. By minimizing the distance between the product source and the collection head, the GSS-4 ensures quality sample grabs. With every actuation, pressure is applied to the standard Vanishing Chamber™ collection cup, collapsing the cup and fully displacing the trapped sample into the sample cylinder. For high pressure applications, the B-Style collection head is used in place of the Vanishing Chamber™ collection cup.

The diaphragm motor of the GSS-4 is intended to be actuated by process gas; however, in locations where the process gas is not clean and dry, the GSS-4 can be configured for actuation by an auxiliary instrument air supply. The customer-supplied solenoid can be connected to a Programmable Logic Controller (PLC) or other signal control system to operate the GSS-4.

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 GSS-4 to suit the particular application and specifications of each customer.

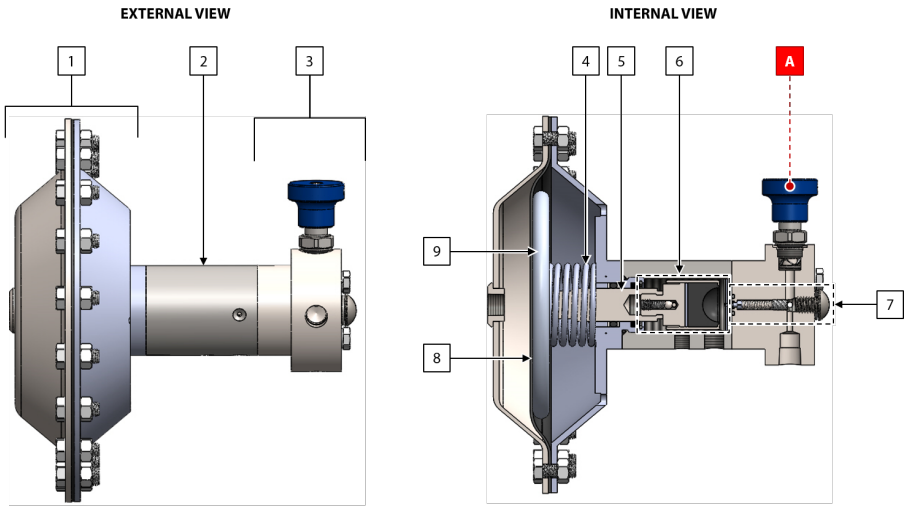
1.3 Specifications

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

Table 1: GSS-4 Specifications	
Products Sampled	Natural Gas and Other Gases Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel, PTFE, and Viton® Others Available
Maximum Allowable Operating Pressure	2160 psig @ -20 °F to 120 °F (*148 barg @ -28 °C to 48 °C*)
Port Connections	¼" FNPT (Standard) ½" FNPT ¾" FNPT 1" FNPT
Sample Volume	**B-Style Collection Head:** 0.5, 1.0, 2.0, or 3.0 cc **Vanishing Chamber™ Collection Cup:** 0.065, 0.22, 0.5, 1.0, or 1.5 cc
Operation	Diaphragm-Operated Motor
Features	Inline Relief Integrated Bypass Manifold With Valve
Options	Mounting Bracket CE Compliance NACE Compliance

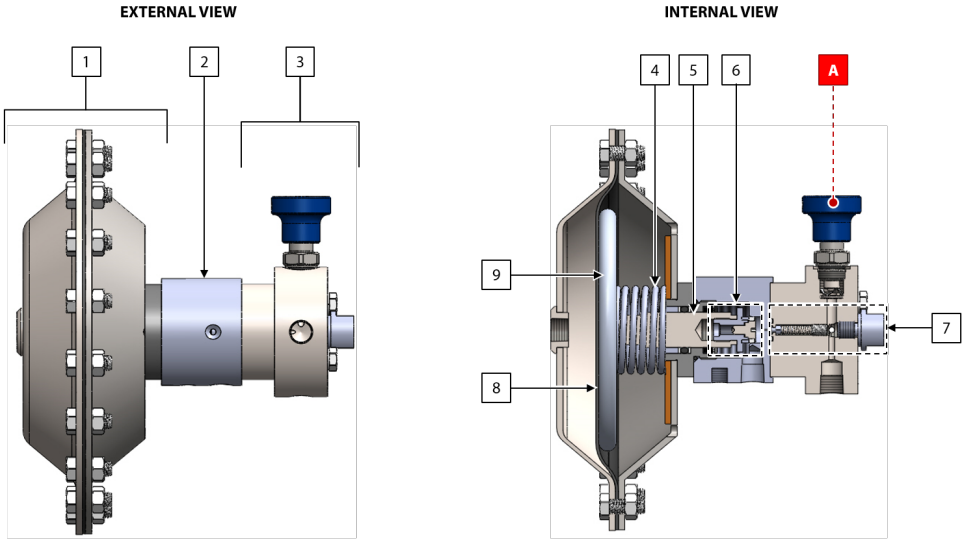
1.4 Equipment Diagrams

Figure 1: GSS-4 With Vanishing Chamber™ Collection Cup



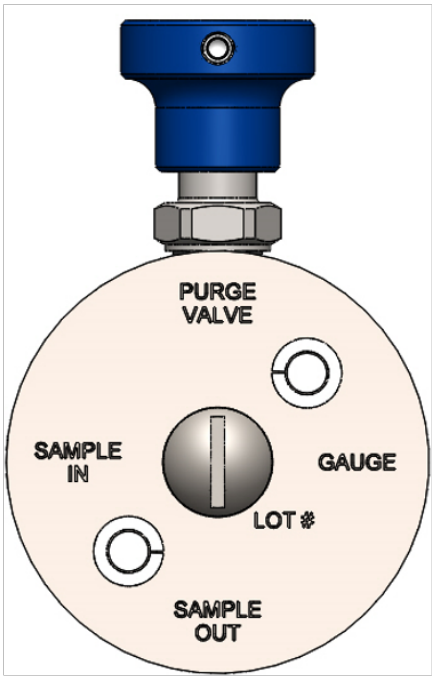
No.	Description
1	Diaphragm Housing
2	Body
3	Base
4	Diaphragm Spring
5	Shaft
6	Vanishing Chamber™ Collection Head
7	Inline Relief
8	Diaphragm
9	Diaphragm Plate
A	Purge Valve

Figure 2: GSS-4 With B-Style Collection Head



No.	Description
1	Diaphragm Housing
2	Body
3	Base
4	Diaphragm Spring
5	Shaft
6	B-Style Collection Head
7	Inline Relief
8	Diaphragm
9	Diaphragm Plate
A	Purge Valve

Figure 3: GSS-4 Port 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 the probe be installed in the top 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 blow-down stack and away from obstructions, elbows, and partially closed valves).
4. Typically, the Welker GSS-4 is installed with a single probe. The unique self-purging design of the GSS-4 uses process gas to supply the solenoid, thus purging the sample line prior to each sample grab. If auxiliary instrument air is used to supply the solenoid, the customer must have 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.

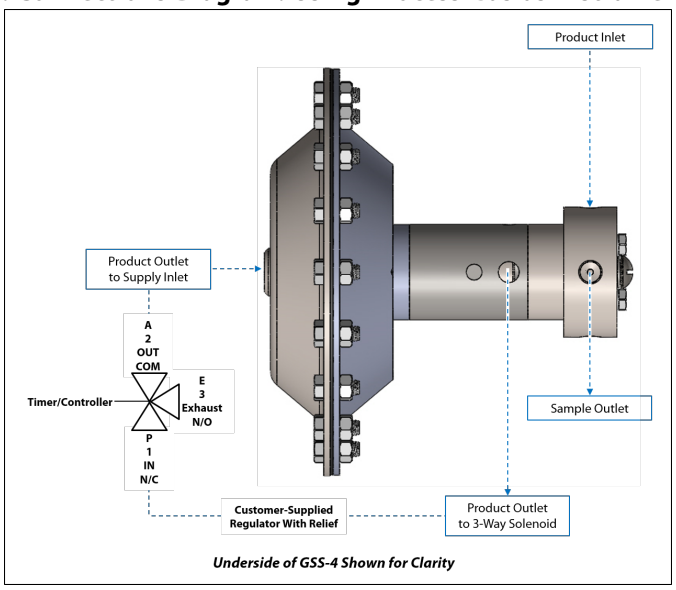
2.2 Installation

The GSS-4 is designed to use process gas as the instrument supply and does not require an auxiliary instrument air supply. However, if process gas is not clean and dry and/or cannot be safely vented to the atmosphere, Welker recommends the use of an auxiliary instrument air supply.

If process gas will be used as the instrument supply, continue to step 1.
If the GSS-4 will be probe-mounted and process gas will be used as the instrument supply, proceed to step 13.
If an auxiliary gas will be used as the instrument supply, proceed to step 24.

Using Process Gas (Preferred)

Figure 4: Connections Diagram: Using Process Gas as Instrument Supply



1. Install the customer-supplied sample probe to the pipeline. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the sample probe for installation instructions.
2. Install the GSS-4 as close to the sample point as possible.

Welker recommends installing the GSS-4 within three feet (3 ft) of the sample point.

To mount the GSS-4 to a wall or stand, install a standoff to the base of the GSS-4.
To mount the GSS-4 to a wall, install an angled bracket to the diaphragm housing.

3. Using appropriately sized tubing, connect from the sample point to the product inlet port on the base of the GSS-4.

> Tubing should slope downward from the GSS-4 to the sample point and be free of sags or loops. No other equipment, including filters, drips, or regulators, should be installed between the GSS-4 and the sample point.

> If pipeline pressure is 1000 psig or above, Welker recommends $\frac{1}{8}$" tubing to ensure a thorough purge.

4. Using appropriately sized tubing, connect from the product outlet port on the body of the GSS-4 to the inlet of a customer-supplied regulator, and then from the outlet of the regulator to the correct port on a customer-supplied 3-way solenoid valve.
5. Using appropriately sized tubing, connect from the correct port on the customer-supplied 3-way solenoid valve to the port on the diaphragm housing of the GSS-4.
6. As necessary, connect from the solenoid exhaust port to a flare.

> If the process gas used to actuate the sampler cannot be safely vented to the atmosphere, Welker recommends connecting from the solenoid exhaust port to a flare.

7. Set the customer-supplied regulator to approximately 65 psig. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the regulator for instructions on setting the regulator.
8. Set the customer-supplied regulator relief valve to approximately 85 psig. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the regulator relief valve for instructions on setting the relief.
9. If a timer or controller will be used to operate the solenoid, connect from the customer-supplied timer or controller to the solenoid.
10. If a Programmable Logic Controller (PLC) will be used to operate the pump solenoid, make the appropriate electrical connections between the PLC and solenoid.

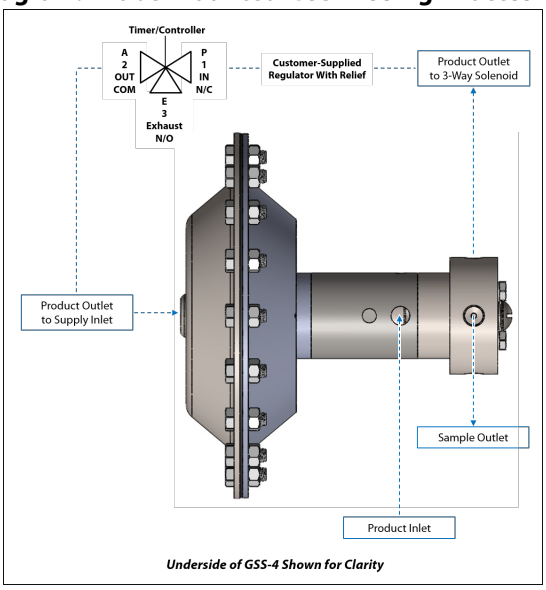
> For this manual, the term "PLC," or Programmable Logic Controller, will be used to refer to the PLC, DCS, or other signal control system used by the customer to activate and operate the solenoid.

11. Install a customer-supplied pressure gauge to the gauge port on the base of the GSS-4 (*Figure 3*).
12. The sample cylinder may now be installed.

> If a Welker SC Single Cavity Cylinder will be used for sample collection, proceed to step 36.
> If a Welker Constant Pressure Cylinder will be used for sample collection, proceed to step 40.

Using Process Gas, Probe-Mounted Sampler

Figure 5: Connections Diagram: Probe Mounted GSS-4 Using Process Gas as Instrument Supply



13. Install the customer-supplied probe to the product inlet port on the body of the GSS-4.
14. Install the probe with installed GSS-4 to the pipeline. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the probe for installation instructions.
15. Using appropriately sized tubing, connect from the product outlet port on the base of the GSS-4 to the inlet of a customer-supplied regulator, and then from the outlet of the regulator to the correct port on a customer-supplied 3-way solenoid valve.
16. Using appropriately sized tubing, connect from the correct port on the customer-supplied 3-way solenoid valve to the port on the diaphragm housing of the GSS-4.
17. As necessary, connect from the solenoid exhaust port to a flare.

If the process gas used to actuate the sampler cannot be safely vented to the atmosphere, Welker recommends connecting from the solenoid exhaust port to a flare.

18. Set the customer-supplied regulator to approximately 65 psig. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the regulator for instructions on setting the regulator.
19. Set the customer-supplied regulator relief valve to approximately 85 psig. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the regulator relief valve for instructions on setting the relief.
20. If a timer or controller will be used to operate the solenoid, connect from the customer-supplied timer or controller to the solenoid.
21. If a Programmable Logic Controller (PLC) will be used to operate the pump solenoid, make the appropriate electrical connections between the PLC and 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.

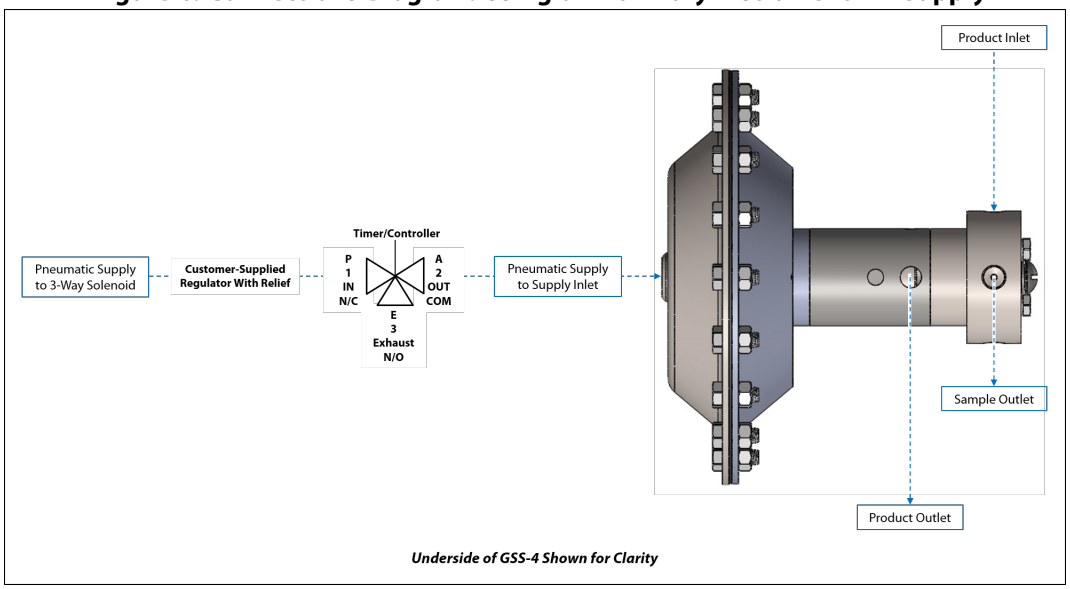
22. Install a customer-supplied pressure gauge to the gauge port on the base of the GSS-4 (*Figure 3*).

23. The sample cylinder may now be installed.

If a Welker SC Single Cavity Cylinder will be used for sample collection, proceed to step 36.
If a Welker Constant Pressure Cylinder will be used for sample collection, proceed to step 40.

Using an Auxiliary Instrument Air Supply (Optional)

Figure 6: Connections Diagram: Using an Auxiliary Instrument Air Supply



24. Install the customer-supplied sample probe to the pipeline. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the sample probe for installation instructions.
25. Install the GSS-4 as close to the sample point as possible.

Welker recommends installing the GSS-4 within three feet (3 ft) of the sample point.

To mount the GSS-4 to a wall or stand, install a standoff to the base of the GSS-4.
To mount the GSS-4 to a wall, install an angled bracket to the diaphragm housing.

26. Using appropriately sized tubing, connect from the sample point to the product inlet port on the base of the GSS-4.

Tubing should slope downward from the GSS-4 to the sample point and be free of sags or loops. No other equipment, including filters, drips, or regulators, should be installed between the GSS-4 and the sample point.

If pipeline pressure is 1000 psig or above, Welker recommends $\frac{1}{8}$" tubing to ensure a thorough purge.

27. Using appropriately sized tubing, connect from the product outlet port on the body of the GSS-4 to the required downstream return. This creates a bypass for the sampler, which will allow for a "real-time" sample to be taken with each actuation of the sampler.
28. Using appropriately sized tubing, connect the customer-supplied clean, dry auxiliary instrument air supply to the inlet of a customer-supplied regulator.
29. Using appropriately sized tubing, connect from the outlet of the regulator to a customer-supplied 3-way solenoid valve, and then connect from the 3-way solenoid valve to the port on the diaphragm housing of the GSS-4.
30. If a timer or controller will be used to operate the solenoid, connect from the customer-supplied timer or controller to the solenoid.
31. If a Programmable Logic Controller (PLC) will be used to operate the pump solenoid, make the appropriate electrical connections between the PLC and 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.

32. Regulate the auxiliary instrument air supply to the pressure appropriate for the application. The auxiliary instrument air supply should be between 40 and 60 psig.

In applications where pipeline pressure is greater than 1500 psig, additional instrument air may be required to take a sample. Increase the instrument air supply and adjust the regulator relief valve as necessary. To protect the diaphragm motor, the instrument air supply should not exceed 100 psig.

33. Set the customer-supplied regulator relief valve to the appropriate pressure. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the regulator relief valve for instructions on setting the relief.
34. Install a customer-supplied pressure gauge to the gauge port on the base of the GSS-4 (*Figure 3*).
35. The sample cylinder may now be installed.

If a Welker SC Single Cavity Cylinder will be used for sample collection, continue to step 36.
If a Welker Constant Pressure Cylinder will be used for sample collection, proceed to step 40.

Installing the Sample Cylinder

SC Single Cavity Cylinder

36. Ensure that the inlet and outlet valves on the SC are closed.
37. Locate the SC as close as possible to the GSS-4.
38. Connect from the sample outlet port on the base of the GSS-4 to the inlet valve of the SC.
39. Installation is now complete.

Constant Pressure Cylinder

40. Ensure that the pre-charge and product inlet valves on the constant pressure cylinder are closed.
41. If the constant pressure cylinder will be pre-charged using an auxiliary gas supply, ensure that the constant pressure cylinder has been pre-charged to the appropriate pressure. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the constant pressure cylinder for instructions on pre-charging the constant pressure cylinder. If the constant pressure cylinder will be pre-charged using pipeline gas, the cylinder will be pre-charged to pipeline pressure during start-up procedures.

The constant pressure cylinder should be pre-charged to pipeline pressure or to 50–100 psig above tank pressure if sampling from an open tank.

42. Tube from the sample outlet on the base of the GSS-4 to the product inlet valve on the constant pressure cylinder.
43. Installation is now complete.

2.3 Start-Up Procedures

Testing the GSS-4

1. If applicable, open the pre-charge inlet valve on the constant pressure cylinder.
2. Ensure that purge valve A is closed (*Figure 1* or *Figure 2*).
3. Open the outlet valve on the customer-supplied probe. Check for leaks and repair as necessary.
4. Read the pressure on the customer-supplied sample outlet pressure gauge. As necessary, adjust the inline relief. If the inline relief does not need to be adjusted, continue to step 5.

When sampling into a Welker SC Single Cavity Cylinder, the pressure gauge should read 0 psig at start-up.

When sampling into a Welker Constant Pressure Cylinder, the pressure gauge should read approximately 200 psig below pipeline pressure at start-up.

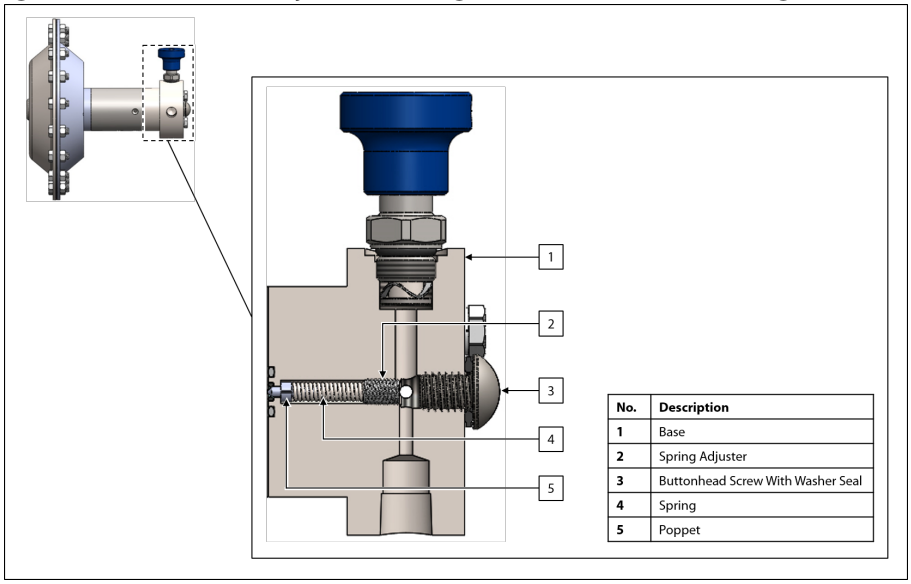
If the inline relief must be adjusted and a Welker SC Single Cavity Cylinder will be used for sample collection, proceed to step 10. If the inline relief must be adjusted and a Welker Constant Pressure Cylinder will be used for sample collection, proceed to step 16.

5. Verify the setting of the customer-supplied regulator and relief. The regulator should be set to approximately 65 psig, and the regulator relief should be set to approximately 85 psig.
6. If an auxiliary instrument air supply will be used to actuate the GSS-4, open the outlet valve on the supply.
7. Actuate the GSS-4. With each actuation, a small pressure increase should be observable on the customer-supplied sample outlet pressure gauge.
8. Bleed off the test pressure from the sample cylinder.
9. Proceed to step 26.

Adjusting the Inline Relief

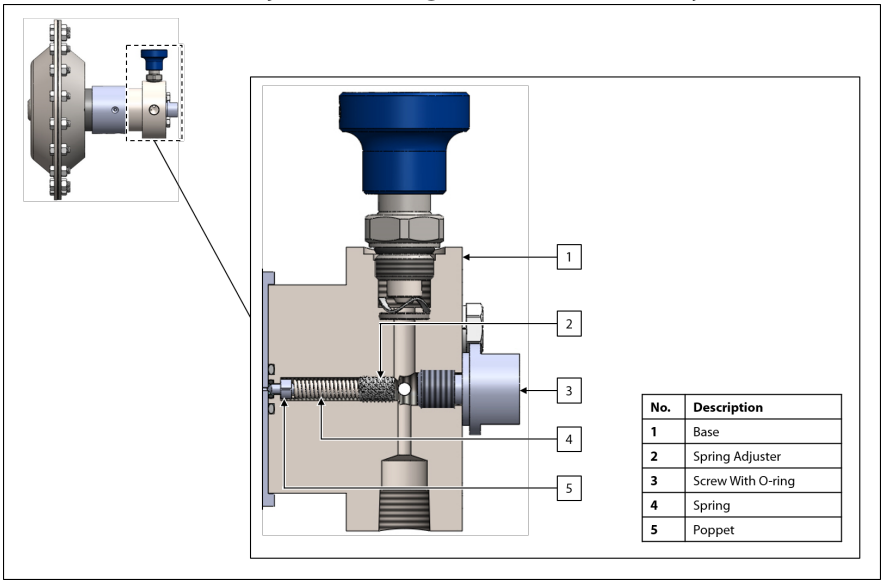
The inline relief is designed to allow product to flow in one direction only. Acting as a check valve, the inline relief will ensure that sample pumped into the sample cylinder cannot flow back to the pipeline even if pipeline pressure drops.

Figure 7: Inline Relief Adjustment Diagram: GSS-4 With Vanishing Chamber™



No.	Description
1	Base
2	Spring Adjuster
3	Buttonhead Screw With Washer Seal
4	Spring
5	Poppet

Figure 8: Inline Relief Adjustment Diagram: GSS-4 With B-Style Collection Head



No.	Description
1	Base
2	Spring Adjuster
3	Screw With O-ring
4	Spring
5	Poppet

SC Cylinder

10. Remove the buttonhead screw and washer seal or screw with O-ring from the end of the base.
11. Insert a hex key through the base to the spring adjuster.
12. Turn the spring adjuster to adjust the spring tension until no gas bleeds through, and then turn the spring adjuster clockwise another full turn.

When sampling into a Welker SC Single Cavity Cylinder, the inline relief must be set to approximately 100 psig above pipeline pressure.

To increase spring tension and raise the relief set point, turn the spring adjuster clockwise.
To decrease spring tension and lower the relief set point, turn the spring adjuster counterclockwise.

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

13. If the GSS-4 is equipped with the Vanishing Chamber™ collection cup, replace the washer seal, and then return the buttonhead screw to the base. If the GSS-4 is equipped with the B-Style collection head, return the screw with O-ring to the base.
14. Verify that the customer-supplied sample outlet pressure gauge reads the pressure appropriate for the sample cylinder. This reading indicates that the inline relief is holding and that sample cannot flow back to the pipeline.

When sampling into a Welker SC Single Cavity Cylinder, the pressure gauge should read 0 psig at start-up.

15. Return to step 5 to continue start-up procedures.

Constant Pressure Cylinder

16. Read the pressure on the customer-supplied sample outlet 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 below pipeline pressure at start-up.

17. If the current inline relief setting is anything other than approximately 200 psig, the inline relief must be adjusted; continue to step 18.
18. Isolate the GSS-4 from pipeline pressure.
19. Remove the buttonhead screw and washer seal or screw with O-ring from the end of the base.
20. Insert a hex key through the base to the spring adjuster.
21. 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 below pipeline pressure at start-up.

> To increase spring tension and raise the relief set point, turn the spring adjuster clockwise.
> To decrease spring tension and lower the relief set point, turn the spring adjuster counterclockwise.

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

22. If the GSS-4 is equipped with the Vanishing Chamber™ collection cup, replace the washer seal, and then return the buttonhead screw to the base. If the GSS-4 is equipped with the B-Style collection head, return the screw with O-ring to the base.
23. Allow full pipeline pressure to reach the GSS-4.
24. Read the pressure on the customer-supplied sample outlet 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 below pipeline pressure at start-up.

25. If the current inline relief setting is approximately 200 psig, the inline relief does not need to be adjusted; return to step 5 to continue start-up procedures. If the current inline relief setting is anything other than approximately 200 psig, the inline relief must be adjusted; repeat steps 18–25 until the inline relief is set to approximately 200 psig.

Purging the Sample Cylinder

Refer to Gas Processors Association (GPA) Standard 2166-86, *Obtaining Natural Gas Samples for Analysis by Gas Chromatography*, for further instructions on GPA-recommended purge methods.

This method is only advisable if the sample cylinder will be used in the same location to sample the same type of product.

26. Purge the sample cylinder.

To purge the Welker SC Single Cavity Cylinder, continue to step 27.
To purge the Welker Constant Pressure Cylinder, proceed to step 34.

SC

27. Slowly open purge valve A (*Figure 1* or *Figure 2*). Check for leaks and repair as necessary.
28. Close purge valve A.
29. Open the outlet valve on the SC.
30. Open purge valve A.
31. Open the inlet valve on the SC.
32. Close purge valve A.
33. Proceed to step 40.

Constant Pressure Cylinder

34. Open the pre-charge supply to the constant pressure cylinder. Check for leaks and repair as necessary.
35. Ensure that the pre-charge valve on the constant pressure cylinder is open. This supplies pre-charge pressure to the constant pressure cylinder and forces the constant pressure cylinder piston to the product side of the cylinder.
36. Open the product inlet valve on the constant pressure cylinder.
37. Ensure that the process connection to the constant pressure cylinder is open. Check for leaks between the pipeline and the constant pressure cylinder and repair as necessary.
38. Purge the tubing between the GSS-4 and the constant pressure cylinder.

If the constant pressure cylinder is equipped with a purge valve, open the purge valve for approximately three to five (3–5) seconds to purge the tubing, and then close the purge valve. Welker recommends plugging the purge valve when not in use. If the constant pressure cylinder is not equipped with a purge valve, the tube fitting at the product inlet of the constant pressure cylinder may be cracked. However, Welker recommends installing a tee with a valve between the sample outlet on the GSS-4 and the product inlet on the constant pressure cylinder to enable the tubing to be purged.

39. Continue to step 40.

Preparing for Sampling

40. Set the PLC to the desired sampling frequency based on the sampling actuation equations provided (*Figure 9*).

Figure 9: Gas Sampling Equations

Gas Sampling, Proportional to Flow Collection
Equation 1: Number of Samples Needed $Number\ of\ Samples\ Needed\ to\ Fill\ to\ 100\% = \frac{Cylinder\ Size\ (cc)}{Bite\ Size\ (cc)}$ ***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.*
Gas Sampling, Timed Collection
Equation 1: Number of Samples Needed $Number\ of\ Samples\ Needed\ to\ Fill\ to\ 100\% = \frac{Cylinder\ Size\ (cc)}{Bite\ Size\ (cc)}$ ***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.*

Note that the sample volume of the B-Style collection head could be 0.5 cc, 1.0 cc, 2.0 cc, or 3.0 cc.
Note that the sample volume of the Vanishing Chamber™ collection cup could be 0.065 cc, 0.22 cc, 0.5 cc, 1.0 cc, or 1.5 cc.

41. Prior to beginning sampling procedures, ensure that purge valve A is closed (*Figure 1* or *Figure 2*).
42. The GSS-4 is now operational.

3.1 Before You Begin

1. **Welker recommends that the unit have standard maintenance every six (6) months 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.

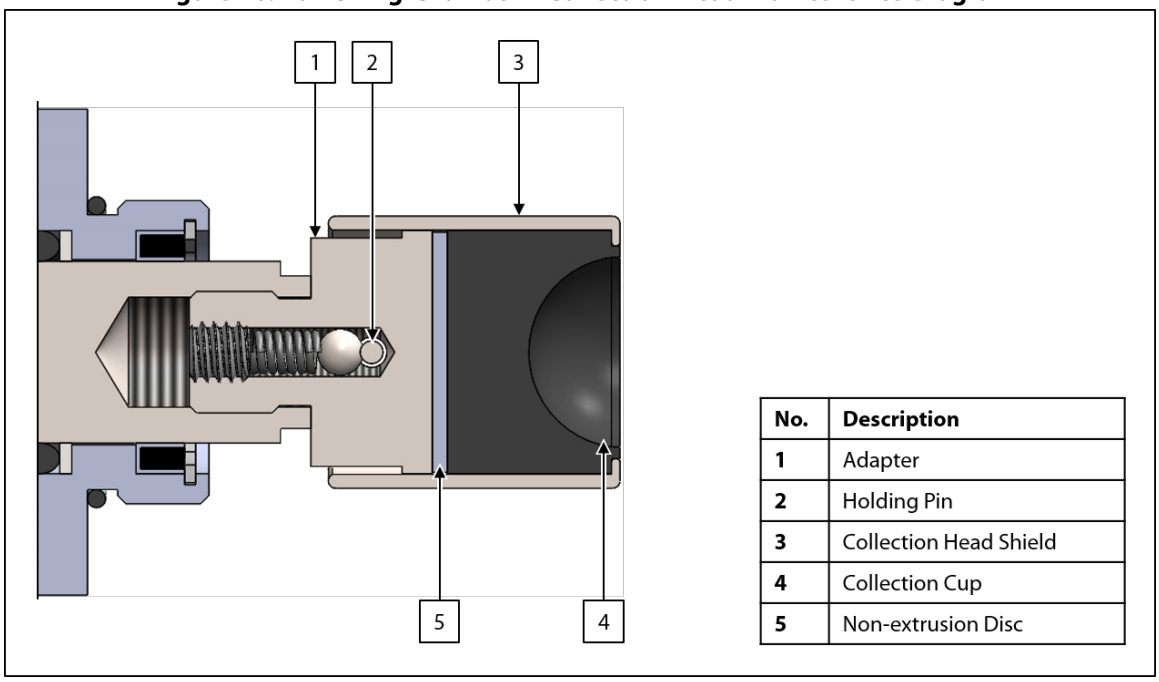
3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.
4. Welker recommends having the following tools available for maintenance. Please note that the exact tools required may vary by model.
    a. ½" Wrench
    b. 6" Adjustable Wrench
    c. Adjustable Pliers
    d. Anti-galling Compound
    e. Hex Key Set
    f. Seal Pick
    g. Snap Ring Pliers
    h. Threadlocker

3.2 Maintenance: GSS-4 With Vanishing Chamber™ Collection Cup

1. Isolate the GSS-4 from pipeline pressure.
2. Turn OFF electrical power to the system and carefully remove all electrical connections.
3. As necessary, disconnect the tubing between the solenoid exhaust and flare.
4. As necessary, disconnect the auxiliary instrument air supply.
5. As necessary, relieve pressure from the tubing connecting the GSS-4 to the sample cylinder.
6. As necessary, remove the GSS-4 from the customer-supplied probe.
7. Unscrew the diaphragm housing from the body, taking care not to misplace the stainless steel Vacuum Breaker™ disc or clear spider seal, which separate from the body with the removal of the diaphragm housing (*Figure 12*). The collection head assembly should now be exposed.

Collection Head Maintenance

Figure 10: Vanishing Chamber™ Collection Head Maintenance Diagram



No.	Description
1	Adapter
2	Holding Pin
3	Collection Head Shield
4	Collection Cup
5	Non-extrusion Disc

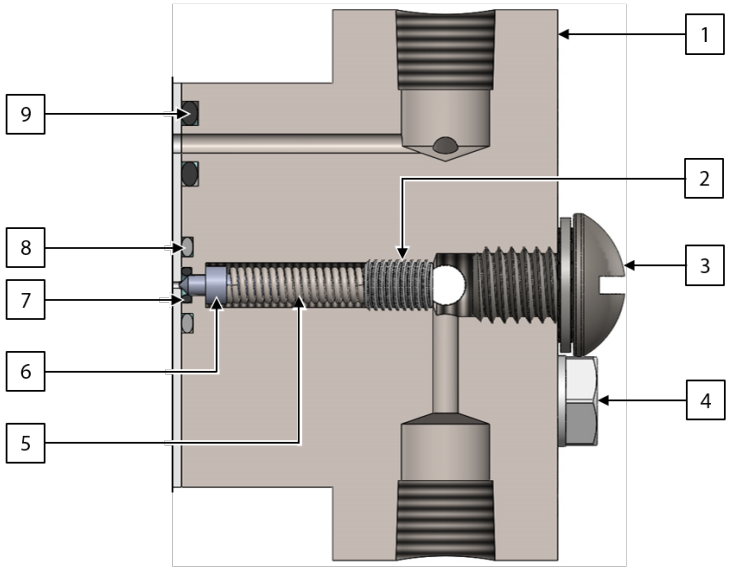
8. Remove the holding pin from the collection head shield, and then separate the collection head shield from the adapter.
9. Push the collection cup and non-extrusion disc out of the collection head shield.
10. Lubricate the inside of the collection head shield, and then install the replacement collection cup and non-extrusion disc.

Welker recommends a non-hydrocarbon-based lubricant, such as Krytox®, for use with this unit.

11. Return the collection head shield to the adapter, and then install the holding pin to secure the collection head shield to the adapter.

Inline Relief Maintenance

Figure 11: Inline Relief Maintenance Diagram



No.	Description
1	Base
2	Spring Adjuster
3	Buttonhead Screw With Washer Seal
4	Machine Screw With Washer (Qty. 2)
5	Spring
6	Poppet
7	O-ring
8	O-ring
9	O-ring

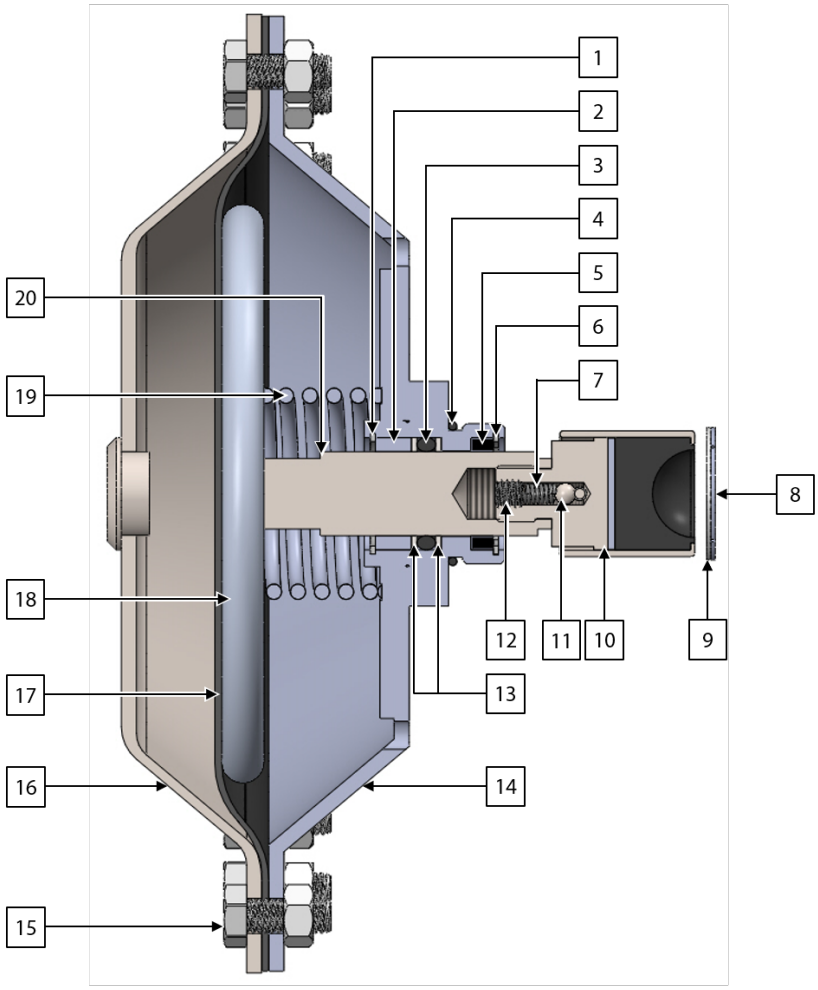
12. Unscrew the machine screws and washers from the base, and then remove the base from the body.
13. Remove the buttonhead screw and washer seal from the end of the base.
14. Insert a hex key through the base to the spring adjuster. Turn the hex key counterclockwise to unscrew and remove the spring adjuster from the base.
15. Remove the spring and poppet from the base.
16. Inspect the seating face of the poppet for debris or scratches. Replace as necessary.

> Debris or scratches on the poppet will prevent positive shutoff of the relief.

17. Replace the O-ring on which the poppet seats.
18. Return the poppet and spring to the base.
19. Using a hex key, screw the spring adjuster into the base.
20. Return the buttonhead screw and washer seal to the end of the base.
21. As necessary, replace the O-rings on the sealing face of the base.
22. Set the base aside.

Diaphragm Housing Maintenance

Figure 12: Diaphragm Housing Maintenance Diagram



No.	Description
1	Snap Ring
2	Bearing
3	O-ring
4	O-ring
5	Seal
6	Snap Ring
7	Collection Head Spring
8	Spider Seal
9	Vacuum Breaker™ Disc
10	Adapter
11	Ball Bearing
12	Hex Screw
13	Back Up (Qty. 2)
14	Lower Diaphragm Case
15	Hex Bolt and Nut (Qty. 18)
16	Upper Diaphragm Case
17	Diaphragm
18	Diaphragm Plate
19	Diaphragm Spring
20	Shaft

23. Unscrew the adapter from the shaft.
24. Unscrew and remove the hex nuts and bolts holding the upper and lower diaphragm cases together.
25. Remove the upper diaphragm case to expose the diaphragm.
26. Remove the diaphragm and inspect it for cracks or other damage. Replace as necessary.
27. Carefully push the shaft until the diaphragm plate clears the lower diaphragm case, and then carefully pull the diaphragm plate, diaphragm spring, and shaft out from the lower diaphragm case.
28. Remove the diaphragm spring from the shaft.
29. Closely 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.
30. Remove the snap ring and seal from the body side of the lower diaphragm case.
31. Replace the seal, and then return the snap ring to the body side of the lower diaphragm case.
32. Remove the snap ring, bearing, back ups, and O-ring from the diaphragm plate side of the lower diaphragm case.
33. Replace the back ups, O-ring, and bearing, and then return the snap ring to the lower diaphragm case.
34. Lightly lubricate the shaft, and then carefully slide the diaphragm spring back onto the shaft.

Reassembly

35. Install the diaphragm spring to the shaft.
36. Carefully push the diaphragm plate assembly through the seals of the lower diaphragm case.
37. Apply an appropriate threadlocker to the adapter threads, and then screw the adapter into the shaft.
38. Attach the diaphragm to the diaphragm plate.
39. Set the upper diaphragm case in place against the lower diaphragm case.
40. Following a cross-bolting sequence, bolt the upper and lower diaphragm cases together and tighten by hand.
41. Using the machine screws and washers, install the base to the body (*Figure 11*). Tighten the machine screws by hand.
42. Return the spider seal to the body.
43. Return the Vacuum Breaker™ disc to the body. It should rest on top of the spider seal in the body.
44. Apply anti-galling compound to the threads on the lower diaphragm case.

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

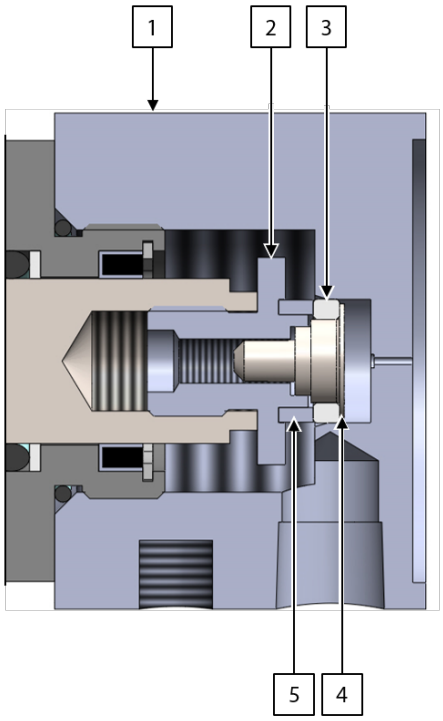
45. Install the body to the diaphragm assembly.
46. Maintenance is now complete. See *Section 2.2, Installation,* and *Section 2.3, Start-Up Procedures*, for instructions on returning the GSS-4 to operation.

3.3 Maintenance: GSS-4 With B-Style Collection Head

1. Isolate the GSS-4 from pipeline pressure.
2. Turn OFF electrical power to the system and carefully remove all electrical connections.
3. As necessary, disconnect the tubing between the solenoid exhaust and flare.
4. As necessary, disconnect the auxiliary instrument air supply.
5. As necessary, relieve pressure from the tubing connecting the GSS-4 to the sample cylinder.
6. As necessary, remove the GSS-4 body from the customer-supplied probe.
7. Unscrew the diaphragm housing from the body. The piston side of the collection head assembly should now be exposed.

Collection Head Maintenance

Figure 13: B-Style Collection Head Maintenance Diagram

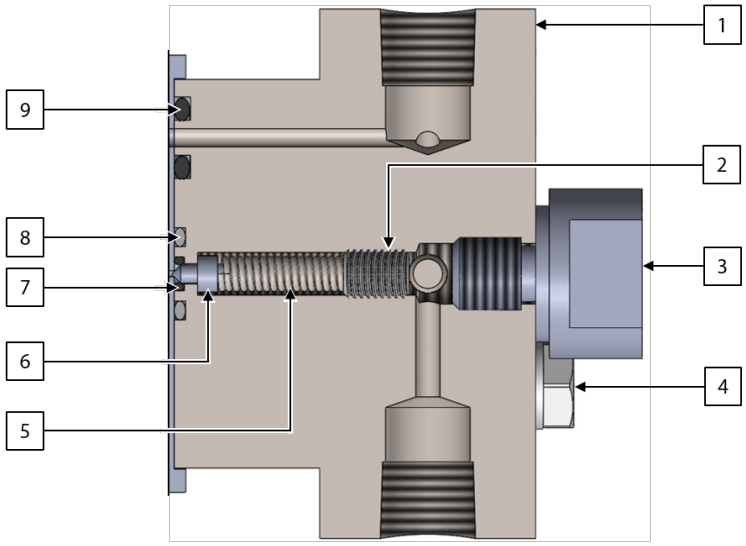


No.	Description
1	Body
2	Piston
3	Seal
4	Retainer
5	Bearing

8. Unscrew the piston from the shaft.
9. Using a hex key, remove the retainer from the piston.
10. Remove the bearing from the piston.
11. Remove the seal from the retainer.
12. Install a replacement bearing to the piston.
13. Install a replacement seal to the retainer.
14. Carefully install the retainer to the piston.
15. Set the collection head aside.

Inline Relief Maintenance

Figure 14: Inline Relief Maintenance Diagram



No.	Description
1	Base
2	Spring Adjuster
3	Screw With O-ring
4	Machine Screw With Washer (Qty. 2)
5	Spring
6	Poppet
7	O-ring
8	O-ring
9	O-ring

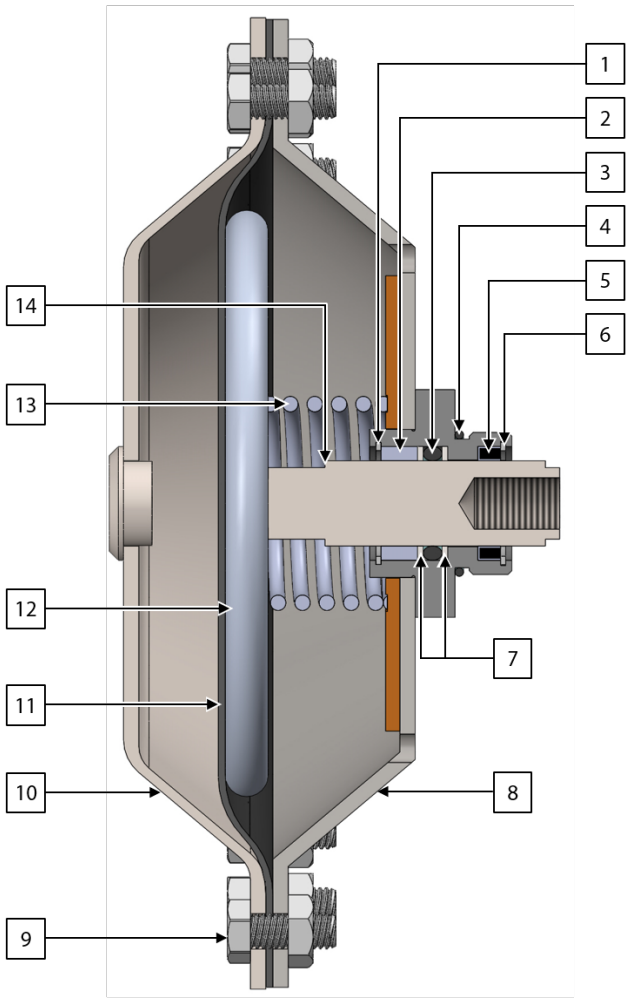
16. Unscrew the machine screws and washers from the base, and then remove the base from the body.
17. Remove the screw with O-ring from the end of the base.
18. Insert a hex key through the base to the spring adjuster. Turn the hex key counterclockwise to unscrew and remove the spring adjuster from the base.
19. Remove the spring and poppet from the base.
20. Inspect the seating face of the poppet for debris or scratches. Replace as necessary.

Debris or scratches on the poppet will prevent positive shutoff of the relief.

21. Replace the O-ring on which the poppet seats.
22. Return the poppet and spring to the base.
23. Using a hex key, screw the spring adjuster into the base.
24. Return the screw with O-ring to the end of the base.
25. As necessary, replace the O-rings on the sealing face of the base.
26. Set the base aside.

Diaphragm Housing Maintenance

Figure 15: Diaphragm Housing Maintenance Diagram



No.	Description
1	Snap Ring
2	Bearing
3	O-ring
4	O-ring
5	Seal
6	Snap Ring
7	Back Up (Qty. 2)
8	Lower Diaphragm Case
9	Hex Bolt and Nut (Qty. 18)
10	Upper Diaphragm Case
11	Diaphragm
12	Diaphragm Plate
13	Diaphragm Spring
14	Shaft

27. Unscrew and remove the hex nuts and bolts holding the upper and lower diaphragm cases together.
28. Remove the upper diaphragm case to expose the diaphragm.
29. Remove the diaphragm and inspect it for cracks or other damage. Replace as necessary.
30. Carefully push the shaft until the diaphragm plate clears the lower diaphragm case, and then carefully pull the diaphragm plate, diaphragm spring, and shaft out from the lower diaphragm case.
31. Remove the diaphragm spring from the shaft.
32. Closely 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.
33. Remove the snap ring and seal from the body side of the lower diaphragm case.
34. Replace the seal, and then return the snap ring to the body side of the lower diaphragm case.
35. Remove the snap ring, bearing, back ups, and O-ring from the diaphragm plate side of the lower diaphragm case.
36. Replace the back ups, O-ring, and bearing, and then return the snap ring to the lower diaphragm case.
37. Lightly lubricate the shaft, and then carefully slide the diaphragm spring back onto the shaft.

Reassembly

38. Install the diaphragm spring to the shaft.
39. Carefully push the diaphragm plate assembly through the seals of the lower diaphragm case.
40. Apply an appropriate threadlocker to the piston threads, and then screw the piston into the shaft.
41. Attach the diaphragm to the diaphragm plate.
42. Set the upper diaphragm case in place against the lower diaphragm case.
43. Following a cross-bolting sequence, bolt the upper and lower diaphragm cases together and tighten by hand.
44. Using the machine screws and washers, install the base to the body (*Figure 14*). Tighten the machine screws by hand.
45. Apply anti-galling compound to the threads on the lower diaphragm case.

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

46. Install the body to the diaphragm assembly.
47. Maintenance is now complete. See *Section 2.2, Installation,* and *Section 2.3, Start-Up Procedures*, for instructions on returning the GSS-4 to operation.

3.4 Troubleshooting

Table 2: GSS-4 Troubleshooting		
Issues	**Possible Causes**	**Solutions**
The GSS-4 is not actuating properly.	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 (i.e., approximately 40–60 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.
The sample cylinder or constant pressure cylinder is not filling.	The pneumatic supply may be too low.	Inspect the pneumatic supply and regulator to ensure that air is supplied at the appropriate pressure (i.e., approximately 40–60 psig).
	The inlet valve on the sample cylinder is closed.	Ensure that the inlet valve on the sample cylinder is open.
	There is a leak between the sample outlet and the sample cylinder.	Check all fittings from the sample outlet to the inlet valve on the sample cylinder for leaks. Repair as necessary.
	The inline relief setting is too high.	See *Section 2.3, Start-Up Procedures,* for instructions on setting the inline relief.
	The GSS-4 is unable to build pressure.	See *Section 2.3, Start-Up Procedures,* for instructions on testing the GSS-4 and ensuring that the sampler will build pressure.
	The Vacuum Breaker™ disc is installed incorrectly or is dirty.	See *Section 3.2, Maintenance: GSS-4 With Vanishing Chamber™ Collection Cup,* for instructions on correct installation of the Vacuum Breaker™ disc.
	The collection cup is damaged.	Install a replacement collection cup to the collection head. See *Section 3.2, Maintenance: GSS-4 With Vanishing Chamber™ Collection Cup,* for instructions.

Table 2: GSS-4 Troubleshooting (Continued)		
Issues	**Possible Causes**	**Solutions**
The single cavity cylinder is filling too quickly.	The inline relief setting is not adequate.	See *Section 2.3, Start-Up Procedures,* for instructions on setting the inline relief
	The sampler may be set at a faster sampling frequency than desired.	Adjust the PLC to sample at the desired rate. Ensure that the calculations used to determine the sample frequency are correct (*Figure 9*).
The constant pressure cylinder is filling too quickly.	The inline relief setting is not adequate. (Applicable only for constant pressure cylinders with solid indicator rods.)	See *Section 2.3, Start-Up Procedures,* for instructions on setting the inline relief.
	The constant pressure cylinder is not pre-charged.	Pre-charge the constant pressure cylinder. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the constant pressure cylinder for instructions
	The GSS-4 may be set at a faster sampling frequency than desired.	Adjust the PLC to sample at the desired rate. Ensure that the calculations used to determine the sample frequency are correct (*Figure 9*).
	The purge valve on the constant pressure cylinder is open. (Applicable only for constant pressure cylinders with solid indicator rods.)	Ensure that the purge valve on the constant pressure cylinder is closed.
	Pressure is leaking past the cylinder piston.	Check the piston seals to ensure they are not leaking. As necessary, replace the piston seals. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the constant pressure cylinder for instructions.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-011: Welker CP-2G, CP-5G, CP-35G, and CP-2G With Premium Purge Constant Pressure Cylinders With Tracker Tube
- IOM-105: Welker NV-1 and NV-2 Instrument Valves
- IOM-146: Welker SC Single Cavity Cylinder

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

- None

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD103CO (GSS-4 With Vanishing Chamber™ Collection Cup)
- Assembly Drawing: AD590CO.1 (GSS-4 With B-Style Collection Head)

NOTES

13839 West Bellfort Street
Sugar Land, TX 77498
Phone: 281.491.2331

welker.com