WELKER

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® CONSTANT PRESSURE CYLINDERS
WITH WELKER® SOLID INDICATOR, SYRINGE T-HANDLE, OR VORTEX MIXER

MODEL
CP2SI, CP5SI, CP35SI, CP2SY, CP5SY, CP35SY, CP2M, CP5M, CP35M

DRAWING NUMBER
AD040CO
AD066CO
AD128CD

MANUAL NUMBER
IOM-063

REVISION
Rev. E, 02/01/2024

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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® Constant Pressure Cylinder With Welker® Solid Indicator, Syringe T-Handle, or Vortex Mixer, CP2SI, CP5SI, CP35SI, CP2SY, CP5SY, CP35SY, CP2M, CP5M, CP35M. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in the Appendix to 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 these Constant Pressure Cylinders 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 Constant Pressure Cylinder With Welker® Solid Indicator, Syringe T-Handle, or Vortex Mixer, 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® *CP2SI, CP5SI, CP35SI, CP2SY, CP5SY, CP35SY, CP2M, CP5M, and CP35M* Constant Pressure Cylinders are designed for use in systems where it is necessary to extract and isolate accurate product samples by maintaining a steady pressure from the pipeline to the cylinder. Solid indicator cylinders and vortex mixers are equipped with an indicating ring that has been set to specify when the device is at 80% capacity. Syringe model cylinders have a small mark on the handle to indicate this capacity.

During continuous sampling, when the magnetic indicator reaches the 80% mark, all sampling should be stopped. A pneumatic supply pre-charges the cylinder with pressure to correspond with pipeline pressure. Pre-charging allows the sample to be transferred to the cylinder without there being a pressure drop. A piston within the cylinder helps to purge out air and contaminants prior to taking a sample.

During the purge process, the piston is pushed to the end of the cylinder, also preventing any other possible contaminants from entering. Burst discs and gauges are also included on each end cap of the device. Should the cylinder be overpressurized, these discs will rupture, relieving excess pressure from the cylinder.

The vortex mixer models are equipped with a detachable T-handle and mixing rod used for manual mixing. The syringe cylinder models are designed to allow the device to be filled manually from a vacuum or atmospheric location.

Adjustable Relief Valve (Optional)
The adjustable relief valve functions as a safety device for the unit. During continuous sampling and during transportation of the cylinder, the relief valve assures that the device maintains a constant pressure and does not exceed maximum allowable pressure. The valve will relieve any pressure that exceeds the set pressure.

1.3 Important Information

Please read the following information in its entirety once you have received the Welker® Constant Pressure Cylinder.

- Never fill a cylinder completely full of hydrocarbon liquid or refrigerated gas. Always allow for at least 20% expansion.
- Never transport a cylinder with pressure exceeding D.O.T. regulations (see U.S. Government CFR 49 for D.O.T. regulations). **In cases where the cylinders are exposed to varying temperatures, do not allow the cylinder to exceed the maximum allowable operating pressure indicated in Table 1.**
- Protect the cylinder at all times and handle with care. It is a precision instrument and might contain a flammable or caustic product as well as a valuable representation of your company's product.
- When analysis is complete, the cylinder should be emptied safely and in a safe area by opening the product inlet valve, allowing the pre-charge pressure to push the piston to the product end cap, emptying the cylinder.
- Welker® recommends cleaning and leak testing of the cylinders after each use.
- Because of the design of the cylinder and the incorporated seals, the process of emptying the cylinder will simultaneously wipe the walls of the device clean. The end cap will also be purged clean with the next use.

Welker® might custom design the Constant Pressure Cylinder to suit the particular application and specifications of each customer.

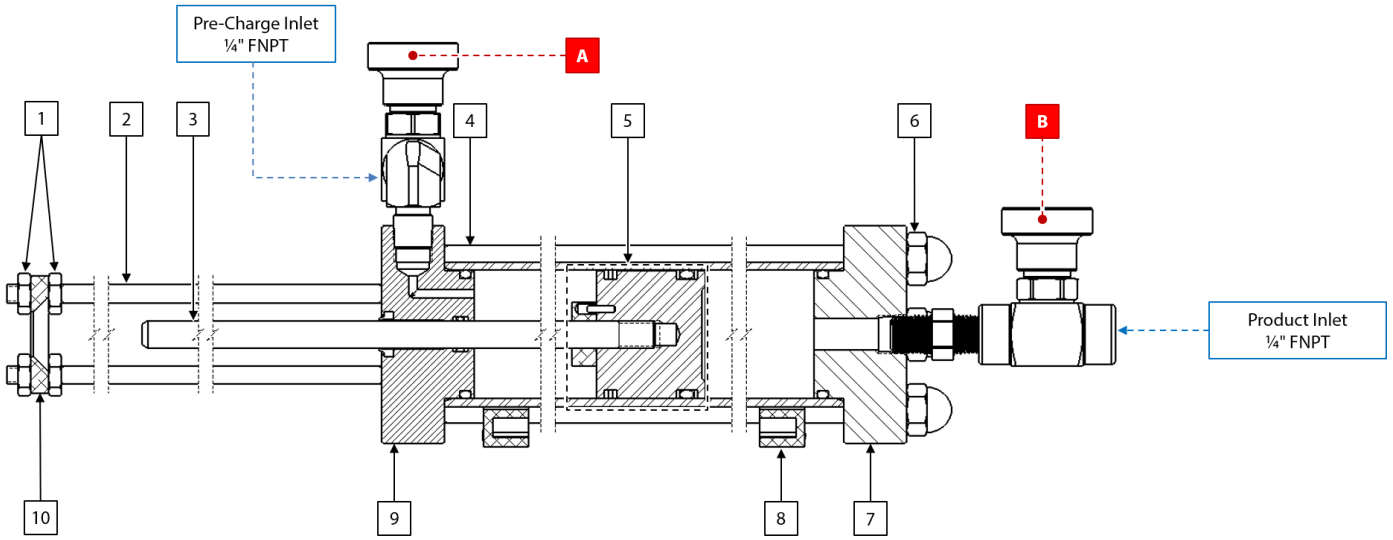
1.4 Specifications

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.**

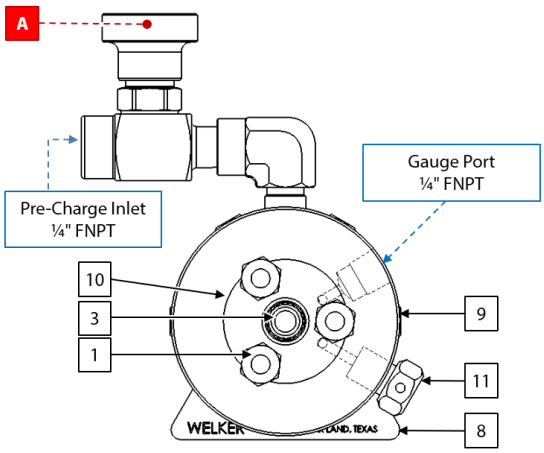
Table 1: Constant Pressure Cylinder With Welker® Solid Indicator, Syringe T-Handle, or Vortex Mixer Specifications	
Products Sampled	Light Liquid Hydrocarbons, Refined Products, Liquid Petroleum Gas, Natural Gas Liquids, Light Crude, and Condensate
Materials of Construction	316 Stainless Steel, FKM, PTFE; Anodized Aluminum (CP-35 Only) (Others Available)
Maximum Allowable Operating Pressure	**CP2 & CP5:** 1800 psig @ -20 °F to 100 °F (*124 barg @ -29 °C to 38 °C*) **CP35:** 600 psig @ -20 °F to 100 °F (*41 barg @ -29 °C to 38 °C*) *NOTE: Maximum allowable temperatures and pressures might be lower depending on the specifications of the pipeline connection device.*
Connections	**Sample Outlet Connection:** ¼" NPT (Others Available) **Sample Inlet Connection:** ¼" NPT (Others Available) **(Optional) Relief Valve Connection:** ½" – 20 UNF (¼" NPT Available)
Container Volume	150 cc, 300 cc, 500 cc, 800 cc, 1000 cc Others Available *Volumes Greater Than 1000 cc Are Not DOT Compliant
Operation	Piston-Operated
Features	T-Handle Mixing Rod Vortex Mixer Burst Relief Cap Indicator Rod
Industry Standards / Product Certifications / Patent	Cylinders Are NACE Compliant, Excluding Gauges & Fittings EN 10204 Type 3.1 Traceability on Welker® Manufactured Parts Patent US4,459,865A Constant Pressure Cylinder With Vortex Mixer CP2 – DOT 3E Cylinder Transportable With DOT-SP 7657
Options	Relief Valve

1.5 Equipment Diagrams

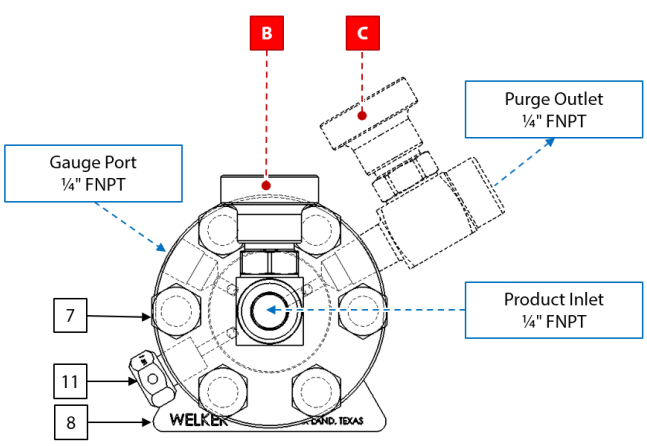
Figure 1: Welker® Constant Pressure Cylinder With Welker® Solid Indicator Diagram



PRE-CHARGE END CAP



PRODUCT END CAP

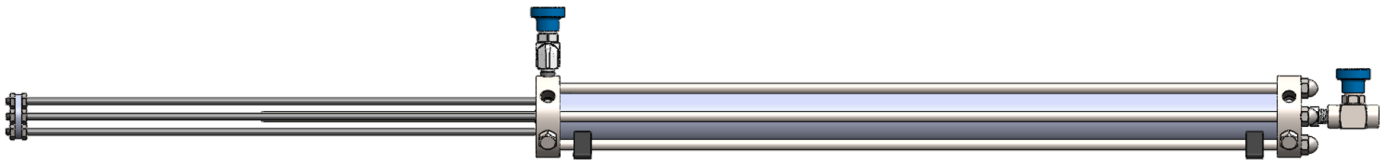


No.	Description
1	Hex Jam Nut (Qty = 6)
2	80% Indicator Bolt (Qty = 3)
3	Indicator Rod
4	Tie Bolt (Qty = 6)
5	Piston Assembly (See *Figure 7*)

No.	Description
6	Crown Nut (Qty = 6)
7	Product End Cap
8	Cylinder Foot (Qty = 2)
9	Pre-Charge End Cap
10	80% Indicator Cap

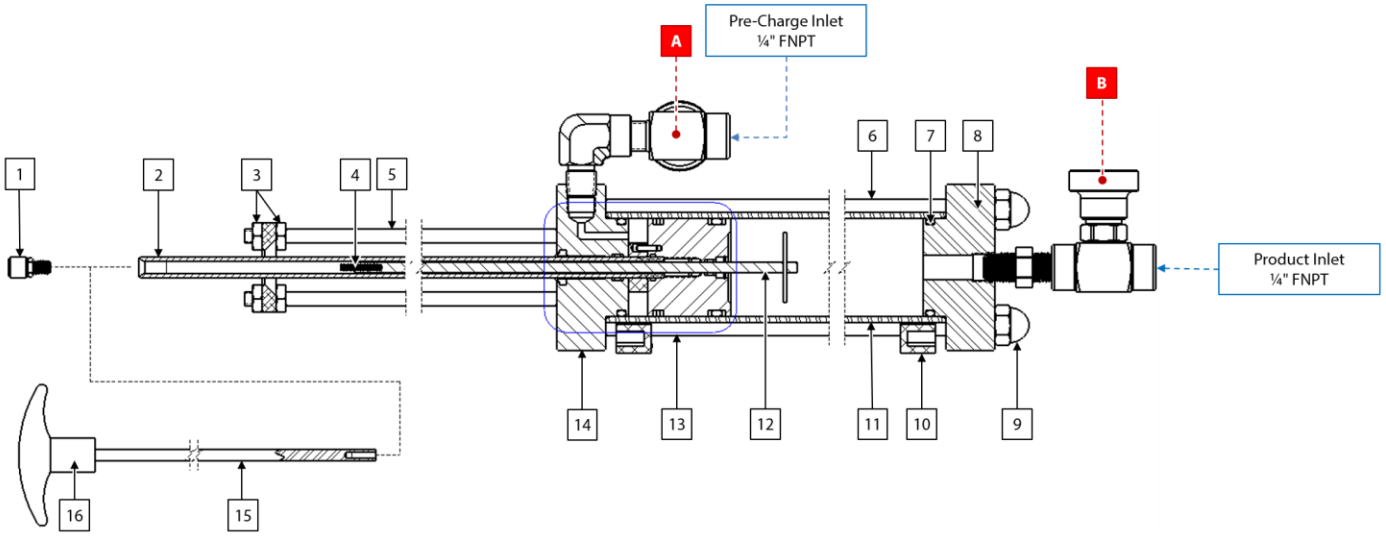
No.	Description
11	Burst Relief Disc With Burst Relief Cap (Qty = 2)
A	Pre-Charge Inlet Valve
B	Product Inlet Valve
C	Purge Valve (Optional)

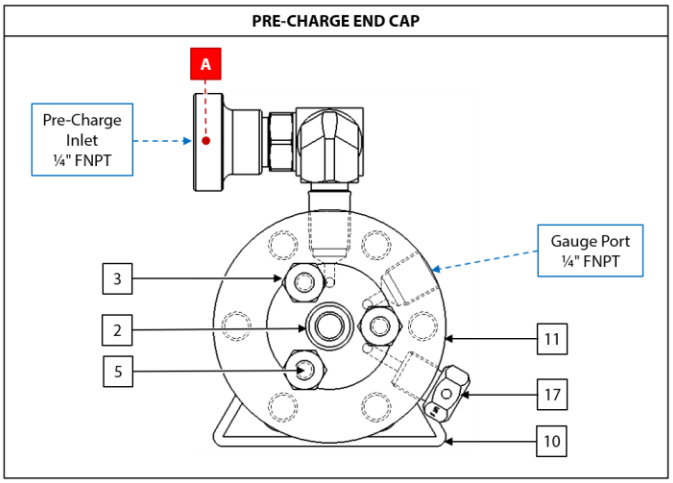
Figure 2: Welker® Constant Pressure Cylinder With Welker® Solid Indicator – Model

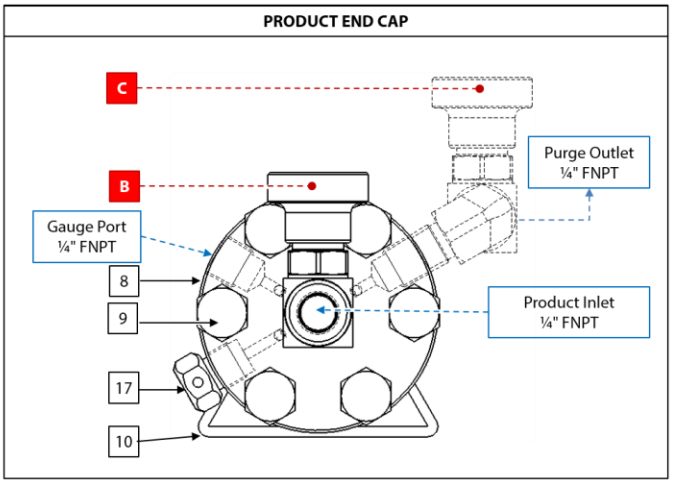


3D MODEL - FRONT VIEW

Figure 3: Welker® Constant Pressure Cylinder With Welker® Vortex Mixer Diagram







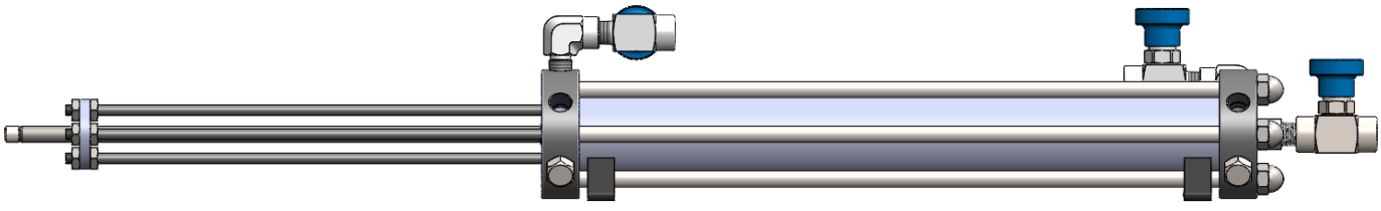
No.	Description
1	Indicator Rod Cap
2	Indicator Rod
3	Jam Nut (Qty = 6)
4	Set Screw
5	80% Indicator Bolt (Qty = 3)

No.	Description
6	Tie Bolt (Qty = 6)
7	O-Ring
8	Product End Cap
9	Crown Nut (Qty = 6)
10	Cylinder Foot (Qty = 2)

No.	Description
11	Cylinder
12	Paddle Rod Assembly
13	Piston Assembly (*See Figure 8*)
14	Pre-Charge End Cap
15	Mixing Rod

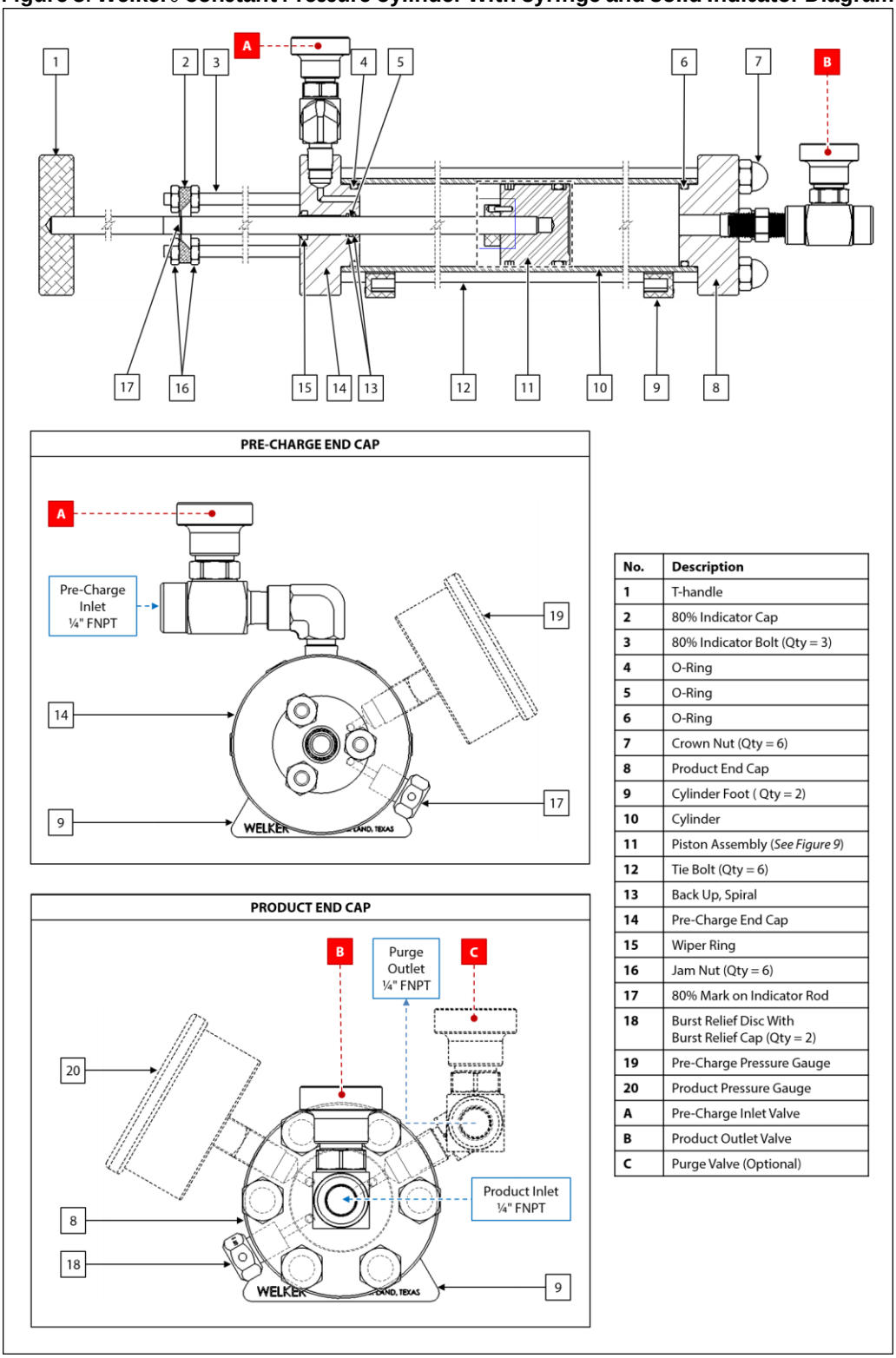
No.	Description
16	T-Handle
17	Bursting Relief Cap (Qty = 2)
A	Pre-Charge Inlet Valve
B	Product Inlet Valve
C	Purge Valve (Optional)

Figure 4: Welker® Constant Pressure Cylinder With Welker® Vortex Mixer – Model



3D MODEL - FRONT VIEW

Figure 5: Welker® Constant Pressure Cylinder With Syringe and Solid Indicator Diagram



No.	Description
1	T-handle
2	80% Indicator Cap
3	80% Indicator Bolt (Qty = 3)
4	O-Ring
5	O-Ring
6	O-Ring
7	Crown Nut (Qty = 6)
8	Product End Cap
9	Cylinder Foot (Qty = 2)
10	Cylinder
11	Piston Assembly (*See Figure 9*)
12	Tie Bolt (Qty = 6)
13	Back Up, Spiral
14	Pre-Charge End Cap
15	Wiper Ring
16	Jam Nut (Qty = 6)
17	80% Mark on Indicator Rod
18	Burst Relief Disc With Burst Relief Cap (Qty = 2)
19	Pre-Charge Pressure Gauge
20	Product Pressure Gauge
A	Pre-Charge Inlet Valve
B	Product Outlet Valve
C	Purge Valve (Optional)

Figure 6: Welker® Constant Pressure Cylinder With Syringe and Solid Indicator Model

3D MODEL - FRONT VIEW

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.

There are two ends to the Constant Pressure Cylinder. These are separated internally by a floating piston assembly. One end is marked PRODUCT INLET; this end can easily be identified by the blue vertical line on the tracker tube. The other end of the cylinder is marked PRE-CHARGE END, and it is marked on the tracker tube with a red vertical line at both 80% full and 100% full.

A sample probe should be located in the least turbulent area available of the flowing product stream. That means it should not be located in a header or blow-down stack and should be located away from obstructions, elbows, and partially closed valves. The sample probe should be installed such that it reaches approximately into the center one-third ($\frac{1}{3}$) of the pipeline.

The sample cylinder should be located as close as is possible to the sample point.

Welker® recommends having the following tools available for use during installation of the Constant Pressure Cylinder. However, the tools used will vary according to the cylinder model.

a. Flexible Hose or Tubing
b. 6" Adjustable Wrench
c. Tubing Cutters
d. Small-Diameter Stainless-Steel Tubing

2.2 Pre-Charging the Cylinder

The pre-charge gas you use must be compatible with the seals in the cylinder. The relief valves and gauges must also be adequate for the pressures used when pre-charging.

Option 1: Connecting the Constant Pressure Cylinder Pre-Charge Valve to the Pipeline (Pressurized Pipeline Only)

Always open valves slowly to avoid slamming the piston from one end to the other. Keep all body parts away from the indicator rod, because it will move when the piston assembly travels.

1. Use small-diameter stainless-steel tubing to connect from an available pipeline valve to the pre-charge inlet valve. Note that if you have the premium purge model, connect from the pipeline valve to the pre-charge inlet port.
2. Make sure all valves are closed on the Constant Pressure Cylinder.
3. Open the pipeline isolation valve.
4. Slowly open the pre-charge inlet valve.
5. Slowly open the product inlet valve to relieve any pressure buildup. The piston assembly will begin to move.
6. The pre-charge gauge should begin to read pressure and will eventually reach pipeline pressure.
7. Once the piston assembly has reached the end of the cylinder, close all valves on the sample cylinder and close the pipeline isolation valve. Check for leaks.
8. Disconnect the tubing from the cylinder and from the pipeline isolation valve.

Option 2: Connecting the Pre-Charge Valve to the Return Port on a Sampler Probe (for Continuous Sampling)

1. Install a valve into the return port of the sampler probe.
2. Make sure all the valves are closed on the Constant Pressure Cylinder.
3. Use small-diameter stainless-steel tubing to connect from the cylinder's pre-charge inlet valve to the valve on the return port of the probe. If you have the premium purge model, connect from the sampler to the pre-charge inlet port.
4. Open the valve on the return port of the sample probe.
5. Slowly open the pre-charge inlet valve.
6. Slowly open the product inlet valve to relieve any pressure buildup. The piston assembly will begin to move.
7. The pre-charge gauge should begin to read pressure and will eventually read the sampler (i.e., pipeline) pressure.
8. Leave the pre-charge valve open during the sampling procedure.
9. Leave the return port valve on the probe open during the sampling procedure.
10. Check for leaks.

Option 3: Using an Auxiliary Pre-Charge Gas

When using an auxiliary gas, the pre-charge side of the cylinder should be pressurized with a regulated gas supply (i.e., nitrogen or helium) and set 50 to 100 psig above pipeline operating pressure, not to exceed the maximum allowable pressure of the device. An adjustable relief valve might be required if this method is used (see *step 1 of Section 2.3*).

1. Make sure all valves on the sample cylinder are closed.
2. Use small-diameter stainless-steel tubing to connect the pre-charge valve to the regulated auxiliary gas supply. If you have the premium purge model, connect from the gas supply to the pre-charge inlet port.
3. Slowly open the valve on the gas supply.
4. Slowly open the pre-charge inlet valve.
5. Slowly open the product inlet valve to relieve any pressure buildup. The piston assembly will begin to move.
6. The pre-charge gauge should begin to read pressure and will eventually read the designated pressure.
7. Once the piston assembly has reached the end of the cylinder, close all valves and check for leaks.
8. Disconnect the tubing from the cylinder and from the pipeline isolation valve.

2.3 Installation

If Option 1 or 3 are used to pre-charge, or if the cylinder is being used for continuous sampling and the pre-charge is NOT connected to the pipeline, it is necessary to install an adjustable, resetting relief valve in order to relieve the pre-charge pressure during continuous sampling.

1. If your Constant Pressure Cylinder is equipped with an adjustable relief valve, use an auxiliary gas supply to set the valve at least 50 to 100 psig above pipeline pressure, not to exceed the maximum allowable working pressure indicated in Table 1 (refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief valve).
2. If your cylinder is not equipped with a product purge valve, create a purge valve by tubing a T-fitting and valve inline between the sample point and the cylinder in order to provide a way to purge the system.

Purging the system of excess air is important to ensure the system is not contaminated by the previous sample.

3. Close the product inlet valve.
4. Connect the product inlet valve to the sample point (i.e., probe or sampler).
5. Proceed to the following section for instructions on how to spot sample the product, or to the section following that for instructions on how to continuously sample the product.

Refer to GPA-2166 (Gas Processors Association) and API 14.1 (American Petroleum Institute) sampling standards for guidance.

2.4 Operation

Spot Sampling

1. Open the product purge valve to purge the system of any contaminants. Close the purge valve.
2. After pre-charging the cylinder above pipeline pressure (see *Section 2.2*), connect the product inlet valve of the cylinder to the sampler outlet port.
3. Slowly open the sampler outlet valve.
4. Slowly open the product inlet valve on the product end cap. The piston will not yet move because pre-charge pressure is above pipeline pressure.
5. With the sampler valve and product valve fully open, slowly open the pre-charge valve or pre-charge purge valve (for premium purge models) to relieve pre-charge pressure. This will allow the sampled product to enter the cylinder and push against the piston. This ensures that no pressure loss is encountered.

Relieving the pre-charge too quickly can produce a pressure drop and, as a result, an inaccurate sample. A bleed plug can be installed on the pre-charge valve to regulate the relieving rate. The bleed plug will allow only a small amount of pressure to exit, ensuring that pre-charge pressure is relieved steadily.

6. When the desired amount of sample is extracted, close all valves on the cylinder.
7. Close the probe (i.e., sampler) outlet valve.
8. Carefully disconnect the cylinder from the probe, allowing the trapped product between the probe and cylinder valves to vent.
9. Plug or cap all valves on the cylinder.
10. Make a note of pressure, locations, and so forth, on the information tag, according to the customer's company's policy.
11. Check all fittings for leaks.
12. The cylinder is now ready for product removal. Welker® recommends placing the cylinder in a carrying case to provide maximum protection during transportation. Check with your company for transportation procedures and requirements.

Continuous Sampling (Not Applicable to Syringe Models)

1. Pre-charge the sample cylinder (see *Section 2.2*) and connect the product inlet end of the cylinder to the sampler outlet port. If you have the premium purge model, connect the sampler from the outlet port to the product inlet port.
2. Slowly open the product purge valve to purge the system of any contaminants. Close the purge valve. Welker® recommends plugging the purge valve when not in use.
3. Open the sample outlet valve.
4. Slowly open the product valve on the product end cap. The piston will not yet move because pre-charge pressure is above pipeline pressure.

The automatic sampler will push product against the piston, causing the pre-charge pressure to relieve from the adjustable relief and/or to be pushed into the pipeline.

5. Turn the sampler off when the cylinder is at 80% capacity. This allows a 20% margin for possible expansion due to temperature changes.
6. When the desired amount of sample is extracted, close all valves on the cylinder.
7. Open the purge valve for approximately 3 to 6 seconds to purge trapped air and residue, and then close the valve. Welker® recommends plugging the purge valve when not in use.
8. Close the sampler outlet valve.
9. Carefully disconnect the cylinder from the sampler, allowing the trapped product between the sampler outlet valve and the product inlet valve to vent.
10. Plug or cap all valves on the cylinder.
11. Record pressure, locations, and so forth, on the information tag according to the customer's company's policy.
12. Check all fittings for leaks.
13. The cylinder is now ready for product removal. Welker® recommends placing the cylinder in a carrying case to provide maximum protection during transportation. Check with your company for transportation procedures and requirements.

Spot Sampling From a Vacuum or Non-Pressurized Source (Applicable Only to Syringe Models)

Pre-charging the system is not necessary if the source is not pressurized. The pre-charge valve should remain open during the entire operation.

1. Open the product inlet valve
2. Push down the T-handle indicator.
3. Connect the product inlet valve to the sample source and open all valves between.
4. Slowly pull the T-handle until it is fully extended.
5. Push down the handle to fully insert the piston assembly and purge the connection of excess air.
6. Pull the T-handle until the desired amount of sample is extracted.
7. Close all valves on the cylinder.
8. Close any valves connected to the sample source.
9. Carefully remove the cylinder from the probe (i.e., sampler), allowing the trapped product between the probe and cylinder valves to vent.
10. Plug or cap all valves on the cylinder.
11. Make a note of pressure, locations, and so forth on the information tag according to the company's policy.
12. Check all fittings for leaks.
13. The cylinder is now ready for product removal. Welker® recommends placing the cylinder in a carrying case to provide maximum protection during transportation. Check with your company for transportation procedures and requirements.

Mixing the Collected Sample (Applicable Only to Vortex Mixer Models)

1. Locate the detachable T-handle that is shipped with the unit.
2. Remove the indicator rod cap.
3. Slide the T-handle onto the hollow indicator rod.
4. Thread the T-handle onto the vortex mixer shaft.
5. To mix the contents of the cylinder, repeatedly push down and pull up on the T-handle.
6. After mixing is complete, unscrew the T-handle and replace the indicator rod cap.

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, as it might adversely affect analytical instrument results.

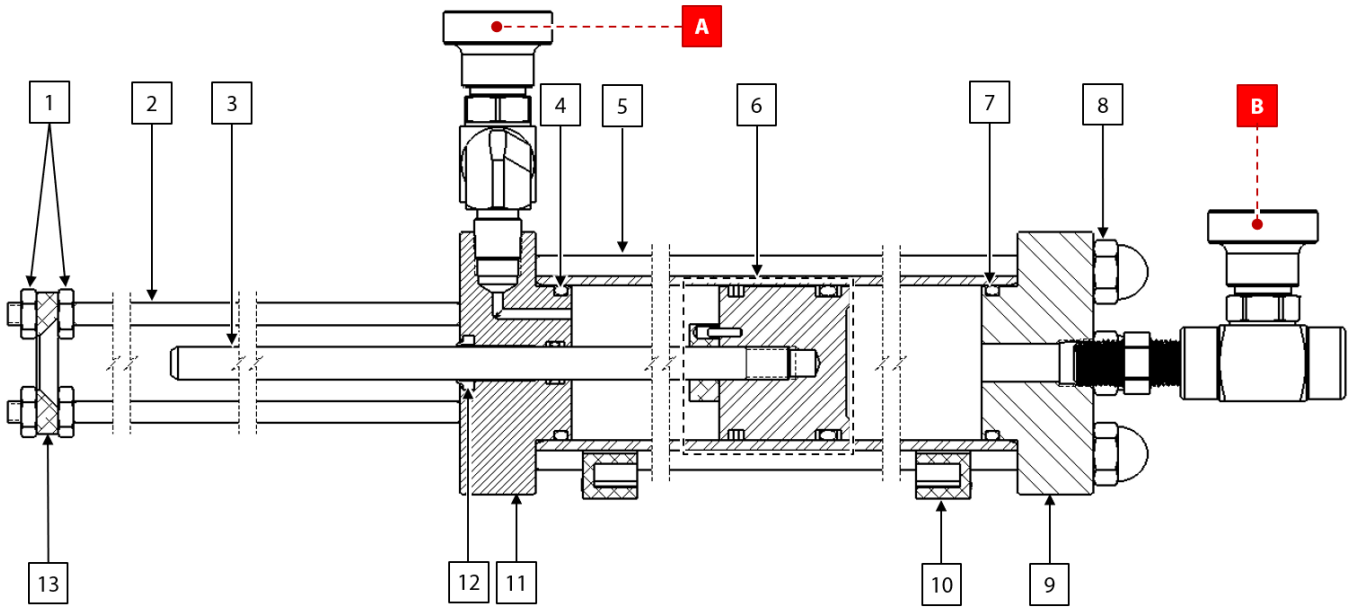
For sample-exposed seals, Welker® recommends non-hydrocarbon-based lubricants, such as Krytox®.
For non-sample-exposed seals, Welker® recommends either non-hydrocarbon-based lubricants or silicone-based lubricants, such as Molykote® 111.

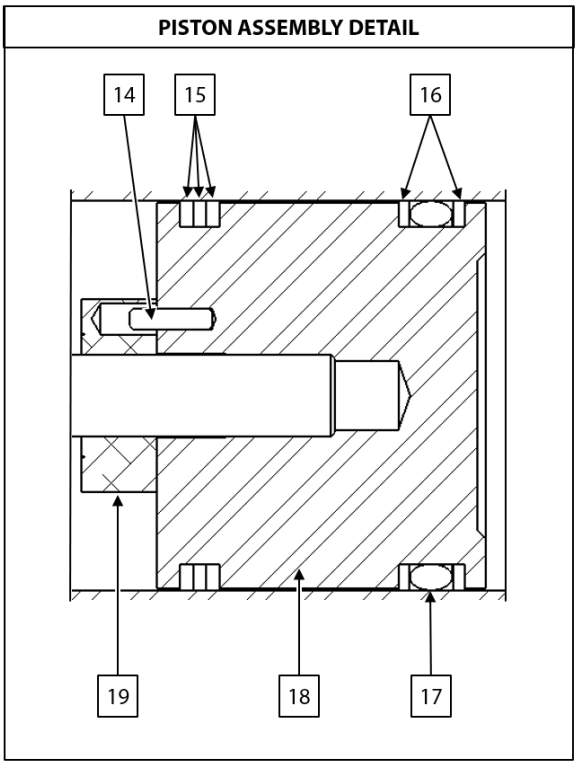
After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

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 depending on cylinder model and connectors used.
    a. Small Hex Key Set
    b. 6" Adjustable Wrench
    c. 10" Adjustable Wrench
    d. 10" Channel Lock Pliers
    e. Fine Grit Sandpaper
    f. Flat Blade Screwdriver
    g. Torque Wrench
    h. O-Ring Kit

3.2 Maintenance Equipment Diagrams

Figure 7: Welker® Constant Pressure Cylinder With Welker® Solid Indicator Maintenance Diagram

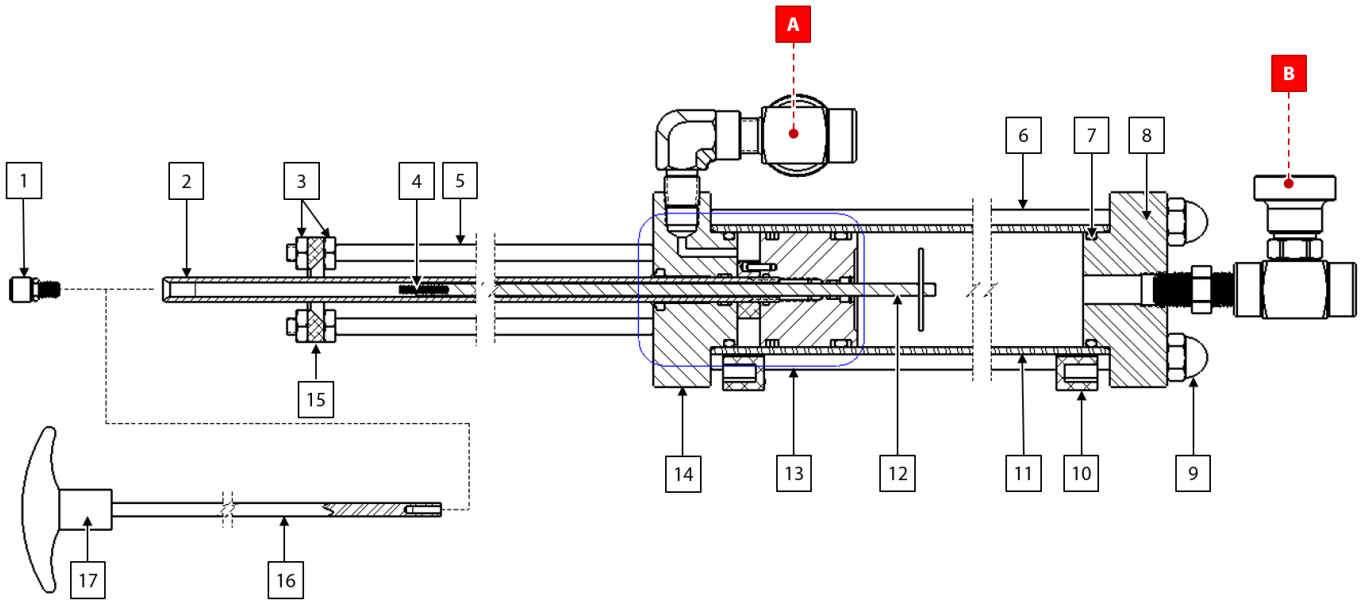




No.	Description
1	Hex Jam Nut (Qty = 6)
2	80% Indicator Bolt (Qty = 3)
3	Indicator Rod
4	O-Ring
5	Tie Bolt (Qty = 6)
6	Piston Assembly (*See Detail*)
7	O-Ring
8	Crown Nut (Qty = 6)
9	Product End Cap
10	Cylinder Foot (Qty = 2)
11	Pre-Charge End Cap

No.	Description
12	Wiper Ring
13	80% Indicator Cap
14	Pin
15	Back Up (Qty = 3)
16	Back Up (Qty = 2)
17	O-Ring
18	Piston
19	Lock Collar With Setscrew
A	Pre-Charge Inlet Valve
B	Product Inlet Valve

Figure 8: Welker® Constant Pressure Cylinder With Welker® Vortex Mixer Maintenance Diagram



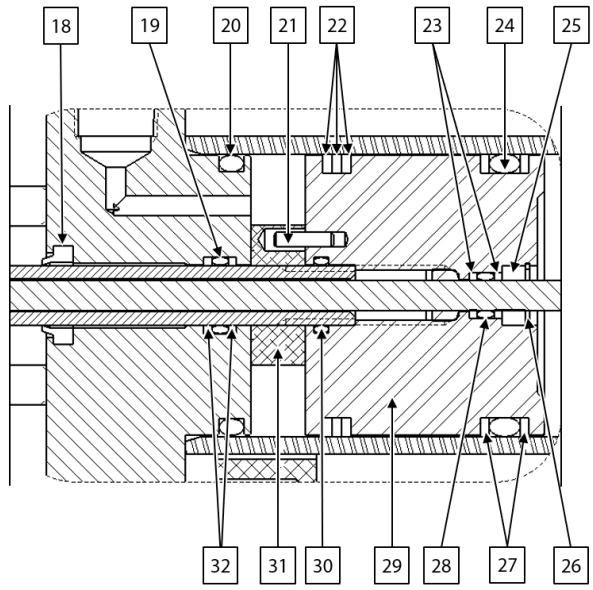
No.	Description
1	Indicator Rod Cap
2	Indicator Rod
3	Hex Jam Nut (Qty = 6)
4	Set Screw
5	80% Indicator Bolt (Qty = 3)

No.	Description
6	Tie Bolt (Qty = 6)
7	O-Ring
8	Product End Cap
9	Crown Nut (Qty = 6)
10	Cylinder Foot (Qty = 2)

No.	Description
11	Cylinder
12	Paddle Rod Assembly
13	Piston Assembly (*See Detail*)
14	Pre-Charge End Cap
15	80% Indicator Cap

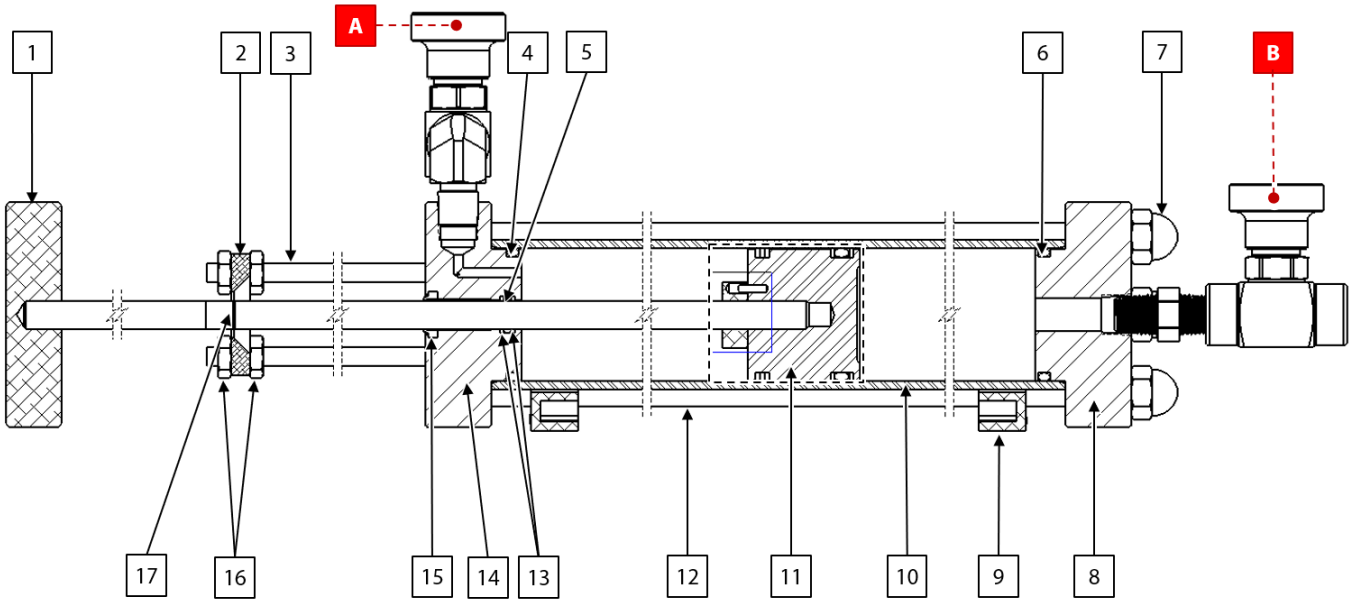
No.	Description
16	Mixing Rod
17	T-Handle
A	Pre-Charge Inlet Valve
B	Product Inlet Valve

PISTON ASSEMBLY DETAIL

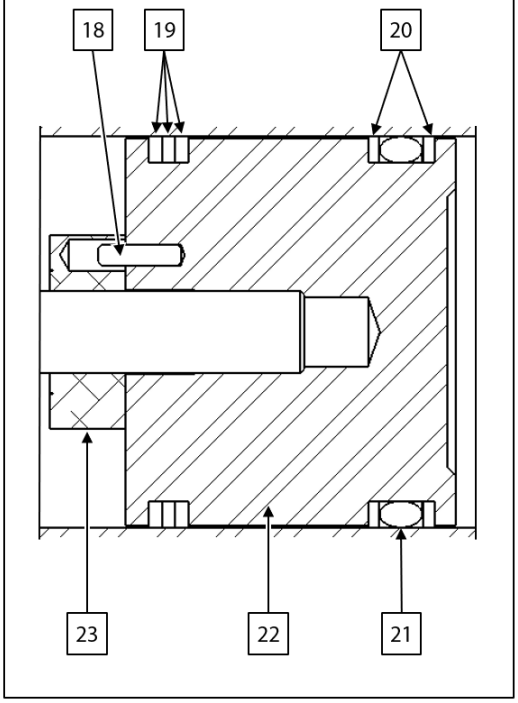


No.	Description
18	Wiper Ring
19	O-Ring
20	O-Ring
21	Pin
22	Back Up, Split
23	Back Up, Solid
24	O-Ring
25	Bal Seal
26	Snap Ring
27	Back Up, Spiral
28	O-Ring
29	Piston
30	O-Ring
31	Lock Collar
32	Back Up, Spiral

Figure 9: Welker® Constant Pressure Cylinder With Syringe and Solid Indicator Maintenance Diagram



PISTON ASSEMBLY DETAIL



No.	Description
1	T-handle
2	80% Indicator Cap
3	80% Indicator Bolt (Qty = 3)
4	O-Ring
5	O-Ring
6	O-Ring
7	Crown Nut (Qty = 6)
8	Product End Cap
9	Cylinder Foot (Qty = 2)
10	Cylinder
11	Piston Assembly (*See Detail*)
12	Tie Bolt (Qty = 6)
13	Back Up, Spiral

No.	Description
14	Pre-Charge End Cap
15	Wiper Ring
16	Jam Nut (Qty = 6)
17	80% Mark on Indicator Rod
18	Pin
19	Back Up (Qty = 3)
20	Back Up (Qty = 2)
21	O-Ring
22	Piston
23	Lock Collar With Setscrew
A	Pre-Charge Inlet Valve
B	Product Inlet Valve

3.3 Disassembly Instructions

1. Make sure the unit is depressurized prior to maintenance.
2. If the unit is not yet disconnected from the sampling system, continue to the next step. It is already disconnected, proceed to step 9.

Check valves for leaks and repair as necessary during reinstallation.

3. Close the outlet valve on the sample device (i.e., probe or sampler).
4. Close the product valve on the cylinder.
5. Disconnect the cylinder from the sample device.
6. If an auxiliary gas supply remains connected to the cylinder pre-charge, close the valve on the gas supply.
7. Close the pre-charge inlet valve.
8. Disconnect the unit from the gas supply.
9. Relieve pressure from the product and pre-charge ends of the cylinder.
10. Remove the cylinder feet.
11. Remove the six hex nuts and the six tie bolts.
12. For the syringe model, remove the T-handle carefully, without scratching or damaging the indicator rod.
13. Remove the 80% indicator bolts and the solid indicator
14. Remove both the product end cap and the pre-charge end cap.

Burst discs should be replaced after 6 to 10 cylinder fillings or at least once a year. While the discs do help to maintain the product, they are designed as a safety device to prevent overpressurization of the cylinder.

15. When necessary, replace the burst discs:
    - Insert the clear seal.
    - Insert the rupture disc after the clear seal. The dome should face out.
    - Torque the bursting relief caps to the proper specification (see *Table 2*).

Table 2: Torque Specifications for Cylinder Rupture Disc Caps

Pressure Range (psig)	Torque Requirements	Torque Requirements
0–300	50 in-lbs	5.6 Nm
301–5000	20 ft-lbs	27 Nm
5001–6000	24 ft-lbs	32 Nm
6001–7000	29 ft-lbs	39 Nm
7001–10,000	38 ft-lbs	52 Nm

16. If there is an adjustable relief valve on either end cap, remove it and replace all seals within the part (refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the adjustable relief valve).

Be careful when removing O-rings from the O-ring grooves. Scratching the sealing surface can result in a leak. If necessary, carefully extract the O-ring and replace it during reassembly. Should the sealing surface become damaged, use a 600-grit wet sandpaper strip to carefully smooth the surface, after which the surface should be cleaned. Check the ball bearing for any signs of wear or damage. Replace if necessary.

3.4 Maintenance Instructions

1. If you have the vortex mixer model, pull out the paddle rod.
2. Hold the indicator rod and pull the cylinder off the piston assembly.
3. If you have the vortex mixer model, remove the lock collar and pin, then unscrew the indicator rod.
4. Clean all parts.
5. Remove and replace the backups and O-ring on the piston ends.
6. Remove and replace the seals on the face of the piston end.
7. If you have the vortex mixer model, remove and replace the snap ring, bal seal, backup, and O-ring inside the piston.
8. Remove and replace the seals on each end cap.
9. Remove and replace the wiper on the pre-charge end cap.
9. Remove and replace the backup and O-ring on the pre-charge end cap.
10. Wipe down the inside of cylinder and dry carefully (also see *Section 3.5*). Also wipe down all other parts and dry carefully.
11. Closely examine the honed surface of the cylinder. Scratches and pits will cause the seals to leak.

The following are causes to return the device to the manufacturer: Scratches or pitting that cause migration of gas from one side to the other and/or any damage to the outside cylinder shell that might compromise the cylinder wall thickness.

3.5 Reassembly Instructions

1. If you have the vortex mixer model, reinsert the indicator rod into the piston assembly and replace the lock collar and pin. Reassemble the piston assembly. Carefully reinsert the piston assembly back into the cylinder. Be careful not to scratch the cylinder or damage the seals. Make sure that the direction of piston assembly insertion is correct. The female end of the piston goes toward the pre-charge end cap and the male end goes toward the product end cap.
2. Carefully slide the cylinder to the pre-charge end cap, then carefully slide the six tie bolts back into the product end cap so that the nuts are facing the outside of the end cap.
3. If you have the vortex mixer model, reattach the paddle rod.
4. Slide the product end cap back onto the six tie bolts.
5. Tighten the nuts to the correct torque (see *Table 3*) using a cross-bolting sequence.

Table 3: Torque Specifications for Tie Bolts

Diameter of Tie Bolt	Torque Requirements	Torque Requirements
⅜" (CP-2, etc.)	5–6 in-lbs	.69–.82 KG/M
⅝" (CP-5, etc.)	23–30 ft-lbs	3.45–4.14 KG/M

6. Reattach the 80% indicator rods and the solid indicator.
7. Pressure up the cylinder at one end with an inert gas supply and test for leaks. Repeat the process from the opposite end. Pressurize slowly to avoid slamming the piston assembly from one end to the other.
8. Welker® recommends using helium to test for leaks.

3.6 Cleaning the Constant Pressure Cylinder

Regular cleaning of the cylinder is essential for the device's proper functioning. Solvent cleaning is normally done during scheduled maintenance. However, some companies require such cleaning before each cylinder is put into service. Any debris or residue that is not removed from the cylinder will contaminate the results of the next sample extracted from the cylinder. Welker® recommends cleaning and leak testing the cylinder after each use.

Welker® recommends cleaning and leak testing the cylinder after each use.

Cleaning a Constant Pressure Cylinder Can Be Accomplished One of the Following Three Ways:

1. Purging with helium:

- Fill and empty the cylinder with helium repeatedly.
- Take a sample of the helium to test for trace amounts of hydrocarbons.

If hydrocarbons are present in the analysis, the system has not been adequately cleaned and further purging will be necessary. If hydrocarbons persist in remaining present, a solvent cleaning might be required. After cleaning with solvent, purge with helium to remove the solvent. Analyze the helium to verify the solvent and hydrocarbons have been removed.

- If no hydrocarbons are found at this point, cleaning is complete.

2. Purging with new product:

- Purge the cylinder using the product to be sampled. This can be accomplished each time the cylinder is put into service. This method is acceptable only if the cylinder will be used in one location.

3. Cleaning with solvent:

- Fill and empty the cylinder repeatedly with solvent.
- Use an inert gas to dry and purge the cylinder.
- Purge the system with helium (see *#1 above*) to verify the system is free of contaminants.

3.7 Troubleshooting Guidelines

Table 4: Welker® Constant Pressure Cylinder Troubleshooting Guidelines		
Issues	**Possible Causes**	**Solutions**
Gas is migrating from one side of the cylinder to another.	Cylinder scratches or pitting.	Return the device to the manufacturer.
Cylinder wall thickness is compromised.	Damage to the outside of the cylinder.	Return the device to the manufacturer.
Gauge indicates a loss of pressure.	There is a leak from one of the fittings.	Use a leak detector to check all fittings for leaks. Replace thread sealant.
	There is a leak from the burst discs.	Ensure that the burst discs are properly torqued (see *Table 2*). If the problem persists, the discs might need to be replaced.
	The cylinder experienced a temperature drop.	Restore the temperature to pipeline temperature.
	There is a defective valve.	Repair or restore the defective valve.
Pressure is leaking across the piston.	Seals in the piston are leaking.	Disassemble and clean the unit. Inspect the cylinder for scratches. Replace seals in the piston and reassemble. (See *Sections 3.3* to *3.5*.)
Pressure is leaking from the indicator rod.	Seals in the pre-charge end cap are leaking.	Disassemble the unit. Replace pre-charge end cap seals. Inspect the rod for scratches and reassemble. (See *Section 3.3*.)
The pre-charge or product end cap is leaking.	The burst disc is leaking.	Replace the burst disc. (See *Section 3.3*.)
	There is a loose fitting.	Tighten the fittings.
	The seat on the purge valve is leaking.	Replace the seat.

3.8 Safety Issue Warning for Liquid Sample Cylinders

Please read the following information in its entirety once you have received the Welker® Constant Pressure Cylinder.

After drawing the sample into the cylinder, the inlet and pre-charge valves should be closed. The sample line is then disconnected from the cylinder and the cylinder is completely isolated from the process. Paperwork is processed and the cylinder is prepared for transport. Prior to transporting the cylinder, it is a common and recommended practice to plug or cap the valves on the cylinder. These valves might terminate with a female NPT or a male NPT. The female valves are typically plugged, while the male valves are typically capped.

In the case of liquid sampling and due to the potential extremes of thermal expansion of many LPG products, caution should be taken to ensure that any residual liquid is drained, blown, or absorbed from the accessible exterior dead volume of the valve body (downstream of the seat) prior to plugging or capping the valve.

It is common to see temperature differentials of as much as 100 °F (38 °C) or more. Liquid samples drawn at -40 °F to -50 °F (-40 °C to -46 °C) can be transported in shipping cases that might see ambient temperatures as high as 100 °F to 160 °F (38 °C to 71 °C), and at times might exceed 160 °F (71 °C).

Operators should be familiar with the basic and general physical properties of the product they are sampling so they can adequately estimate the expansion potential of the sampled product within the cylinder and therefore allow ample outage for expansion to occur. In a majority of cases, 80% fill and 20% pre-charge is acceptable, but certain products might require a larger inert gas pre-charge ratio (i.e., 70%/30% or 60%/40%).

Burst discs are installed on these cylinders to protect the cylinder from structural failure. The operator must be aware that flammable product will be released should overpressurization of the working pressure of the cylinder occur. It is therefore important to allow for ample expansion within the cylinder prior to rupture disc activation.

If you have any questions, please contact Welker® at 1.281.491.2331.

APPENDIX: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-011: Welker® Constant Pressure Cylinders With Tracker Tube—Models CP-2G, CP-5G, CP-35G, and CP-2G With Premium Purge
- IOM-012: Welker® Constant Pressure Cylinder–High Pressure With Tracker Tube (Non-Mixer)—Model CP-2G-HP
- IOM-013: Welker® Constant Pressure Cylinders With Tracker Tube and Gravity Mixer—Models CP2GM and CP5GM
- IOM-014: Welker® Constant Pressure Cylinder–High Pressure With Welker® Magnetic Indicator (With Gravity Mixer)—Model CP2GM-HP
- IOM-033: Welker® Relief Valve—Models RV-1, RV-2, RV-2CP, RV-3
- IOM-115: Welker® Constant Pressure Cylinders–High Pressure With Welker® Solid Indicator, T-Handle, or Vortex Mixer—Model CP2M-HP

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: AD040CO (Welker® Constant Pressure Sample Cylinder CP-2S, With Solid Indicator)
- Assembly Drawing: AD066CO (Welker® Constant Pressure Sample Cylinder CP-2M, With Vortex Mixer)
- Assembly Drawing: AD128CD (Welker® Constant Pressure Sample Cylinder CP-2SYA, With Syringe T-Handle and Solid Indicator)

NOTES

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