Installation, Operation & Maintenance Manual

Welker® Constant Pressure Cylinder With Welker® Magnetic Indicator (Non-mixer)

Model
CP4G

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide to operations. Correct operating and/or installation techniques, however, are the responsibility of the end user. Welker reserves the right to make changes to this and all products to improve performance and reliability.

13839 West Bellfort
Sugar Land, Texas 77498-1671
U.S.A.
Tel.: (800) 776-7267
Tel.: (281) 491-2331
Fax: (281) 491-8344
www.welkereng.com

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1. INSTALLATION

1.1 General

We appreciate your business and your choice of Welker products. The Installation, Operation and Maintenance liability for this product becomes that of the purchaser at the time of receipt. Reading the applicable IO&M Manual prior to installation and operation of this equipment is required so that you have a full understanding of its application and performance prior to commencement of use. If you have any questions, please call 1-800-776-7267 or 1-281-491-2331 in the USA.

Welker Constant Pressure Sample Cylinders are designed to:

- provide a sample receiver capable of maintaining the product at pipeline pressures
- offer laboratory repeatability
- provide safety in handling a sample

1.2 Installation Instructions

1.2.1 After unpacking the unit, check it for compliance and any damages that may have occurred during shipment.

NOTE: Claims for damages caused during shipment must be initiated by the receiver to the carrier. Welker is not responsible for any damages caused from mishandling by the shipping company.

1.2.2 There are two ends to the cylinder, separated internally by a floating piston. One end is marked “product inlet” and the other is the “precharge end.”

NOTE: Always open all valves slowly so as not to slam piston from one end to the other, as this may cause the piston magnet to shatter.

1.2.3 If your sample cylinder has an adjustable relief, it must be set to 100 psi above maximum pipeline pressure (see Section 5).

1.2.4 After precharging the cylinder (see Section 2.2), attach the product inlet end of the cylinder to the sampler outlet for continuous sampling or sample probe for spot sampling. Use small diameter (1/8" or 1/4" O.D.) stainless steel tubing, and use PTFE tape on fittings to prevent leaks. Any leaks during transfer of product to the cylinder will harm the integrity of the sample and render it non-representative of the sample source.

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

1.2.5 A constant pressure sample cylinder can be mounted vertically or horizontally.

2. OPERATION INSTRUCTIONS

2.1 Important Notes

2.1.1 Never fill a cylinder completely full of hydrocarbon liquid. Always allow for at least 20% expansion.

2.1.2 Never transport a cylinder at pressure exceeding D.O.T. regulations (see U.S. Government CFR 49 for D.O.T. regulations). For high-pressure models and non-D.O.T. versions, do not transport at pressures exceeding maximum working pressure.

2.1.3 Protect the cylinder at all times and handle with care. It is a precision instrument and may contain both a flammable product as well as a very valuable representation of your company's product.

2.1.4 When analysis is complete, the cylinder should be emptied in a safe area by opening the product inlet valve, allowing the precharge pressure to push the piston to the product end cap, and thus empty the cylinder.

2.1.5 The walls of the cylinder will be virtually wiped clean as the cylinder is emptied because of the design of the cylinder and its seals. The end cap will be purged clean with the next usage.

2.1.6 These cylinders are equipped with an internal magnet. If the pistons are slammed from one end to the other, the magnet can be damaged, causing internal damage to the cylinder. Avoid this misuse of the cylinder. The magnets cannot be damaged by normal usage.

2.2 Precharging the sample cylinder

IMPORTANT: Never precharge a sample cylinder with a liquid!

2.2.1 Precharging a constant pressure sample cylinder with a precharge gas can be done one of three ways:

2.2.2 Connect the cylinder precharge valve to the pipeline (recommended).

2.2.2.1 Use small diameter stainless steel tubing to connect the precharge valve to an available pipeline isolation valve.

2.2.2.2 Make sure all valves are closed on the sample cylinder.

2.2.2.3 Open the pipeline isolation valve.

2.2.2.4 Slowly open the precharge valve to allow for possible piston movement.

2.2.2.5 The precharge gauge should now show some pressure and ultimately reach pipeline pressure.

2.2.2.6 Close precharge valve and check for leaks.

2.2.2.7 Disconnect from the pipeline.

2.2.3 Connect the cylinder precharge valve to an extra port in the sampler probe.

2.2.3.1 If connecting the cylinder to an extra port in the sampler probe, a valve will need to be installed in this port.

2.2.3.2 Use small diameter stainless steel tubing to connect the precharge valve to the valve on the extra port of the sampler probe.

2.2.3.3 Make sure all valves are closed on the sample cylinder.

2.2.3.4 Open the valve on the extra port of the sample probe.

2.2.3.5 Slowly open the precharge valve to allow for possible piston movement.

2.2.3.6 The precharge gauge should soon read the line pressure.

2.2.3.7 Check for leaks and leave the precharge valve and extra port valve open during sample procedure.

2.2.4 Use of an auxiliary precharge gas.

NOTE: When using an auxiliary gas, the precharge side of the cylinder should be pressurized with nitrogen or helium to 100 psi above maximum line pressure. An adjustable relief valve may be required if this method is used.

2.2.4.1 Use small diameter stainless steel tubing to connect the precharge valve to the auxiliary gas supply.

2.2.4.2 Make sure all valves are closed on the sample cylinder.

2.2.4.3 Allow gas supply to reach precharge valve.

2.2.4.4 Slowly open the precharge valve to allow for possible piston movement.

2.2.4.5 The precharge gauge should soon read the recommended pressure.

2.2.4.6 Close precharge valve and check for leaks.

2.2.4.7 Vent the gas between the auxiliary gas valve and the precharge valve.

2.2.4.8 Disconnect from the auxiliary gas supply.

2.3 Spot Sampling

NOTE: Refer to GPA-2166 and API 14.1 sampling standards for guidance.

2.3.1 After precharging the cylinder (see Section 2.2), attach the product inlet end of the cylinder to the sample probe valve.

2.3.2 Slowly open the probe valve.

2.3.3 Slowly open the cylinder product valve on “product inlet” end cap. Piston will not move because precharge is above pipeline pressure.

2.3.4 Purge the tubing between the sampler and cylinder by cracking the tube fitting on the cylinder inlet.

NOTE: If your constant pressure cylinder is equipped with a product purge valve, open it to purge the tubing for approximately 3-5 seconds and close. When possible, plug

purge valve when not in use. If your cylinder is not equipped with a purge valve, we recommend that a "T" and valve be used just prior to the inlet valve to provide a purge system.

2.3.5 With the probe valve and product inlet valve fully open, slowly bleed precharge gas through precharge valve. This will allow sampled product to enter the cylinder and push against piston. Thus, no pressure loss is encountered.

NOTE: Always let product push into cylinder. Do not bleed precharge so fast that the product is drawn into cylinder. A bleed plug can be used to govern the bleed rate.

2.3.6 The CP4 cylinders are equipped with an external magnetic indicator (see Figure 1) that shows the location of the piston inside the cylinder. The cylinder has an indication of "0%" for empty and "80%" for when the cylinder is filled to 80% of its capacity. Close the precharge valve, then the product inlet valve quickly when the tip of the magnetic tracker reaches the 80% mark. This allows for a 20% cushion for possible expansion due to temperature changes.

2.3.7 After closing the valves on the cylinder, close the probe valve and carefully remove the cylinder allowing the trapped product between the probe and cylinder valves to vent.

2.3.8 Plug or cap all valves on the cylinder and record pressure, locations, etc., on the information tag according to company policy. Check all fittings for leaks.

2.3.9 Place the cylinder into a carrying case to provide maximum protection in transportation. Check with your company for transportation procedures and requirements.

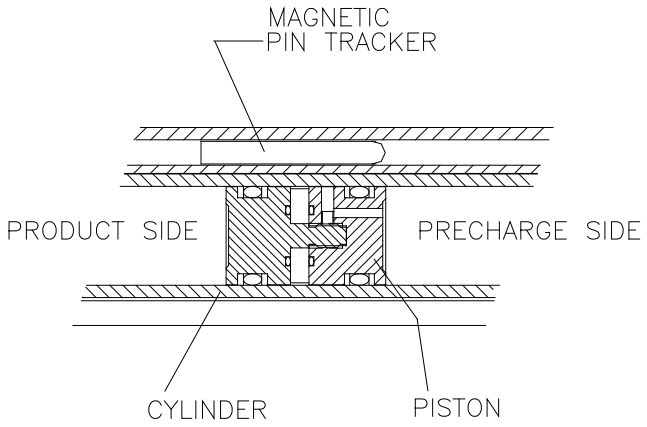

Figure 1

2.4 Continuous Sampling

2.4.1 Precharge the sample cylinder (see Section 2.2), and connect the product inlet end of the cylinder to the sampler outlet port.

2.4.2 Slowly open the cylinder product valve on "product inlet" end cap. The piston will not move because precharge is at pipeline pressure.

2.4.3 Purge the tubing between the sampler and cylinder by cracking the tube fitting on the cylinder inlet.

NOTE: If your constant pressure cylinder is equipped with a product purge valve, open it to purge the tubing for approximately 3-5 seconds and close. When possible, plug purge valve when not in use. If your cylinder is not equipped with a purge valve, we recommend that a "T" and valve be used just prior to the inlet valve to provide a purge system.

2.4.4 When the automatic sampler begins to collect samples and inject them into the cylinder; it allows the sampled product to enter the cylinder and push against the piston. Thus, no pressure loss is encountered.

NOTE: Always let product push into cylinder. Do not bleed precharge so fast that the product is drawn into cylinder.

2.4.5 The CP4 cylinders are equipped with an external magnetic indicator (see Figure 1) that shows the location of the piston inside the cylinder. The cylinder has an indication of "0%" for empty and "80%" for when the cylinder is filled to 80% of its capacity. When the tip of the magnetic tracker reaches the 80% mark, the continuous sampling should be stopped. The precharge and the product inlet valve should then be closed. This allows for a 20% cushion for possible expansion due to temperature changes.

2.4.6 Close the probe valve, the sampler "sample out" valve and carefully remove the cylinder allowing the trapped product between the "sample out" valve and the product inlet valve to vent.

2.4.7 Plug or cap all valves on the cylinder and record pressure, locations, etc., on the information tag according to company policy. Check all fittings for leaks.

2.4.8 Place the cylinder into a carrying case to provide maximum protection in transportation. Check with your company for transportation procedures and requirements.

3. MAINTENANCE

Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit handy for the system in case of encountering unexpected wear or faulty seals.

We recommend that the unit have annual maintenance under normal operating conditions. In the case of severe service, dirty conditions, excessive cycling usage or other unique applications that may subject the equipment to unpredictable circumstances, a more frequent maintenance schedule may be appropriate.

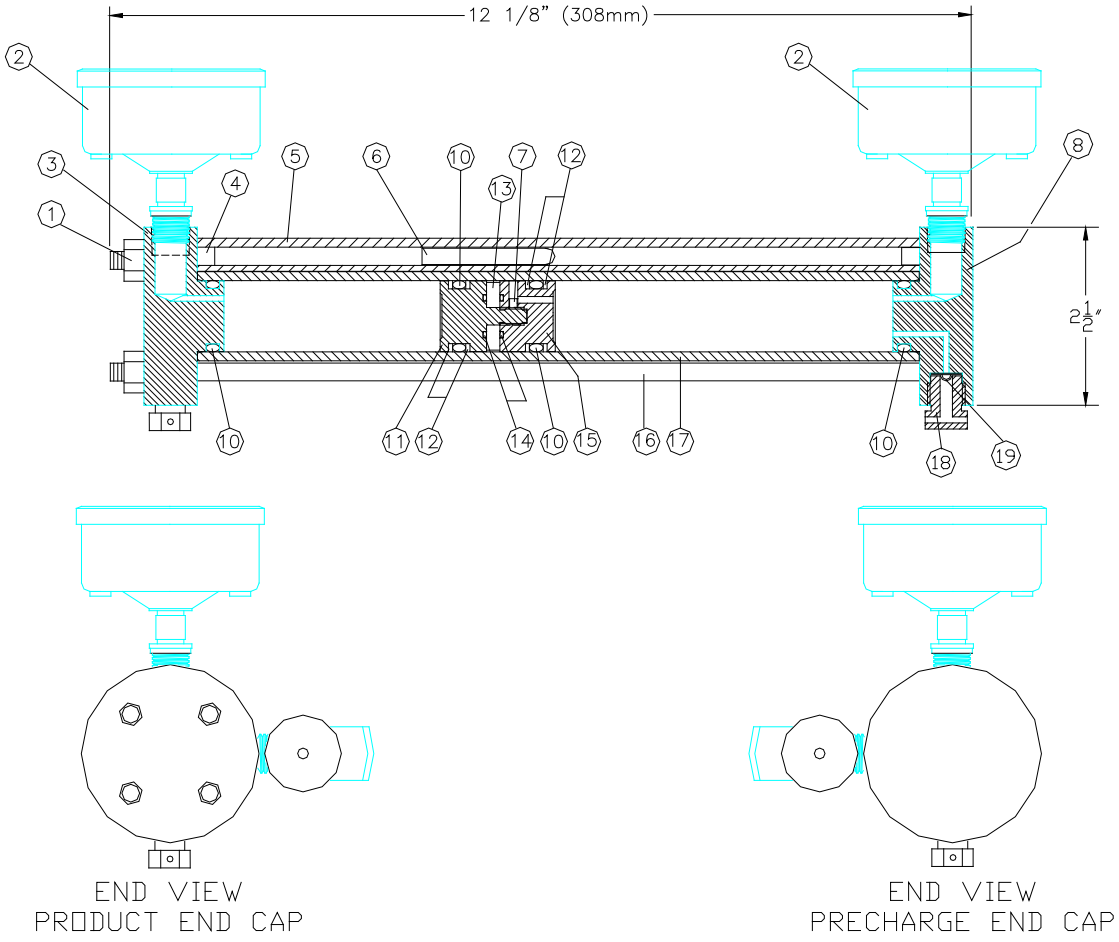

FIGURE 2

3.1 Maintenance Instructions

NOTE: New seals supplied in spare parts kits are not lubricated. They should be lightly coated with lubrication grease (silicone grease or other) before they are installed into the equipment. This helps in the installation of the seals while reducing the risk of damage when positioning them on the parts. After the seals are installed, some additional lubrication can be applied to shafts or cylinder inner diameters to allow smooth transition of parts.

In the case of Constant Pressure Sample Cylinders, the lubrication grease should be applied sufficiently but lightly (Krytox® is preferred). Wipe excess lubrication from the seals as it may have an adverse effect on some analytical instrument results.

3.1.1 Relieve pressure from the product and precharge ends of the cylinder (refer to Figure 2).

3.1.2 Remove nuts #1 (4 each) and tie bolts #16 (4 each).

3.1.3 Remove end caps #3 and #8.

3.1.4 Check the burst discs #18 on each end cap for rupturing.

3.1.5 If either is ruptured they must be replaced. Make sure you torque the bursting relief caps to the proper specification. When replacing a rupture disc and seat, insert the seat first followed by the rupture disc with the bubble out.

NOTE: Burst discs should be replaced after 6-10 cylinder fillings or at least once a year. The burst disc is designed for multiple cylinder fillings, but not an infinite number of fillings. A burst disc is designed to prevent over pressurization of the cylinder, not for maintaining the product itself.

TORQUE SPECIFICATIONS FOR CYLINDER RUPTURE DISC CAPS

PRESSURE RANGE (psi)	TORQUE REQUIRMENTS	
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

3.1.6 If there is an adjustable relief on the precharge side, remove it and replace all seals within the part (see drawing).

3.1.7 If there is a check valve on the precharge end, it must be removed to change the seals.

3.1.7.1 Remove valve from upstream body on precharge end cap.

3.1.7.2 Remove upstream body from precharge end cap.

3.1.7.3 Replace seals.

3.1.7.4 Reassemble the check valve and precharge valve to the precharge end cap.

3.1.8 With a broom stick or soft non-metallic rod push piston out of the cylinder #17.

3.1.9 Take apart the female and male ends of the piston assembly #11 and #15 carefully.

3.1.10 Clean parts before changing seals.

3.1.11 Replace the seals #14 (2 each) on the face of the piston ends.

3.1.12 Put the piston back together. When screwing the piston together make sure that the polarity of the magnet is correct so that the pin tracker will track the piston.

3.1.13 Replace seals #10 on female and male end of the piston.

3.1.14 Replace seals #10 (2 each) on the end caps.

3.1.15 Clean the inside of cylinder and dry carefully (see Section 4).

3.1.16 Closely examine the honed surface of the cylinder. Scratches and pits will cause the seals to leak.

Cause for rejection (return to manufacturer)

- Scratches or pitting allows for migration of inert gas from one side to the other.
- Any damage to outside cylinder shell that may compromise the cylinder wall thickness.

3.2 Re-assembly Instructions

3.2.1 Insert piston back into cylinder #17 carefully. Again, be careful not to scratch the cylinder or damage the seals. Make sure that the direction of piston insertion is correct. The female end #15 of piston goes toward the precharge end cap #8 (see Figure 3).

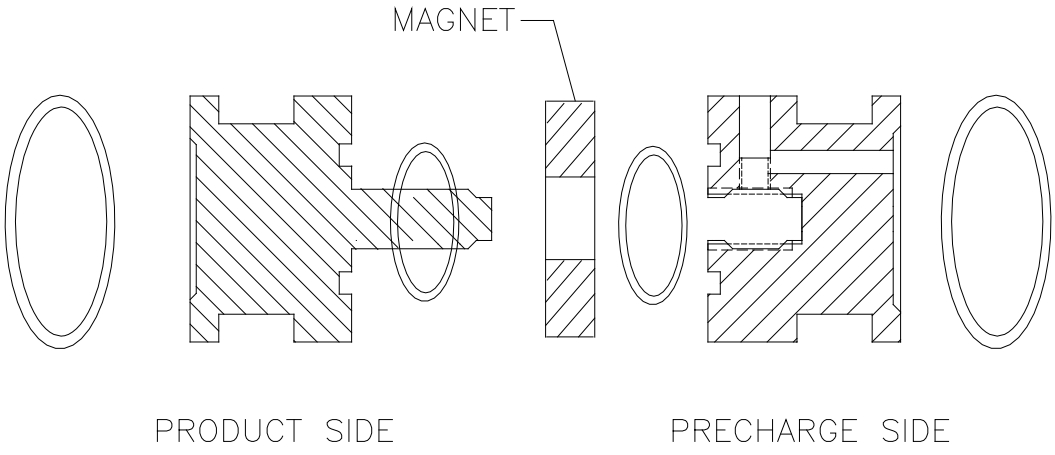

FIGURE 3

3.2.2 Install precharge end cap in the 100% end of the cylinder.

3.2.3 Replace the tracker pin #6 into the tracker tube #5 with the round end toward the precharge end cap, and install the tracker tube so that the tracker tube pin #4 is inserted into the tracker tube.

NOTE: You will have to rotate the cylinder to line up the tracker tube and the precharge markers on the cylinder. Again, be sure that 100% is at the precharge end of the cylinder.

3.2.4 Install the product end cap #3 placing the tube seat around the tracker tube.

3.2.5 Replace the tie bolts #16 (4 each) and tighten nuts #1 (4 each) to the correct torque using a cross bolting sequence.

TORQUE SPECIFICATIONS FOR CYLINDER TIE BOLTS

SERIES	FOOT POUNDS	INCH POUNDS
CP-4	5-6	60-72

3.2.6 Pressure up cylinder at one end with inert gas and test for leaks. Repeat the process from the opposite end.

4. CYLINDER CLEANING

The cleaning and inspection of constant pressure sample cylinders cannot be emphasized enough. Any contamination not removed from a cylinder will affect the results of the next sample taken into that cylinder. Welker recommends cleaning and leak testing of the cylinders after each use.

4.1 Methods

4.1.1 Purging with helium.

4.1.1.1 The most common method is to purge the cylinder with helium. After purging, a sample of the helium is analyzed and observed for trace amounts of hydrocarbons. Further purging may be necessary. If hydrocarbons or contaminates remain present, a solvent cleaning may be required. After cleaning with solvent, helium purge to remove the solvent and analyze the helium to verify the solvent and hydrocarbons have been removed.

4.1.1.2 Solvent cleaning is normally done during scheduled maintenance; however, some companies require this before each cylinder is put into service.

4.1.2 Purging with new product.

4.1.2.1 Purge the cylinder using the product to be sampled to remove the last sample. This can be accomplished each time the cylinder is put into service.

4.1.3 Purging with steam.

4.1.3.1 Steam cleaning of the cylinder is a method sometimes used. This requires drying and purging of the cylinder with an inert gas.

5. ADJUSTABLE RELIEF INSTRUCTIONS

5.1 General Information

The function of an adjustable relief is to assure that the sample cylinder maintains the proper pressure on the product, but does not exceed the design pressure of the cylinder during compression of the precharge gas in continuous sampling procedures.

5.2 For constant pressure cylinders

5.2.1 Determine maximum pipeline pressure (i.e., 1,000 psi).

5.2.2 With both valves closed, attach the precharge valve to a 1,000 psi source.

5.2.3 Slowly open the precharge valve to prevent slamming the piston to one side.

5.2.4 With a hex wrench, reach inside the relief to the spring adjustment screw.

5.2.5 Adjust the spring screw until gas can be heard venting through the relief.

NOTE: For a *Whitey Nupro* relief, rotate the spring cap.

5.2.6 Retighten the relief just until gas is no longer venting.

5.2.7 The precharge gauge should then read whatever line pressure is being fed to the cylinder (i.e. 1,000 psi).

5.2.8 Now turn the adjustment screw one full turn clockwise. This will assure that the relief is set at approximately 100 psi above maximum line pressure.

5.2.9 Maintenance

5.2.9.1 Remove the spring adjustment screw, spring, and poppet. Examine the poppet sealing surface for damage. Replace, if necessary.

5.2.9.2 Reassemble the pieces.

5.2.9.3 Relief is now ready to be reset.

6. DOT EXEMPTION (see attached)

7. SAFETY ISSUE WARNING FOR LIQUID SAMPLE CYLINDERS

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. Paper work 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 may 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 remaining residue 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 not uncommon to see temperature differentials of as much as 100° F (38° C) or more. Liquid samples that are drawn at -40°F to -50° F (-40°C to -46° C) can then be transported in shipping cases that may see ambient temperatures as high as 100° F to 160° F (38°C to 71° C) conditions and at times may exceed 160° F (71° C).

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

Tables are available to make these determinations.

Rupture discs are installed on these cylinders to protect them from structural failure. The operator must be aware that flammable product will be released in the event of over-pressurization of the working pressure of the cylinder and therefore it is important to allow for ample expansion within the cylinder prior to attainment of the rupture disc activation. Rupture disc ranges and cylinder working pressures are determined by the U.S. Department of Transportation and these guidelines and rules are found in CFR-49.

If you have any questions, please contact Welker.