



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® PLUG & PURGE PANEL

MODEL
PNP

DRAWING NUMBER
AD915AA

MANUAL NUMBER
IOM-165

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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, if not observed, could result in damage to equipment.



Warning messages appear before procedures that, if not observed, could result in personal injury.

This manual is intended to be used as a basic installation and operation guide for the Welker® Plug & Purge Panel, PNP. 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 section 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 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 Plug & Purge Panel 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 Plug & Purge Panel, please contact a Welker® representative immediately.

Phone: 281.491.2331

Address: 13839 West Bellfort Street
Sugar Land, TX 77498

1.1 Introduction

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 *Installation, Operation, and Maintenance (IOM) Manual* 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® PNP Plug & Purge Panel was designed to safely and effectively purge samplers and sampling systems to ensure a representative sample and prevent cross-contamination between samples.

Purge operations are typically performed manually on site, making it difficult to control the purge sequence. Welker applied more than 20 years' experience purging probe samplers to design the PNP and correct common problems associated with manual purging. There is no need to worry about under-purging, over-purging, over-pressurizing sample containers, or wasting inert gas when using the PNP. The inert gas supply is compressed at a set pressure in the Welker® Purge Cylinder with floating piston by a regulator, ensuring that the necessary volume of inert gas is delivered at an adequate pressure, evacuating the sampler of previous product. As an added safety measure, the safety relief valve on the regulator prevents the sample container from being over-pressurized during the purge process.

Optional features further simplify the installation and operation of the PNP. Welker can supply an inert gas tank with the panel, eliminating the need for customers to supply and connect an inert gas tank. Additionally, a pressure transmitter can be installed to the PNP to signal the PLC when the inert gas supply tank needs servicing. The 4-way ball valve can be equipped with an electric actuator to allow the operator to control the purge process remotely from a PLC.



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

Welker may custom design the PNP to suit the particular application and specifications of each customer.

1.3 Safety Warning & Important Information



Please read the following information in its entirety before using the Welker® equipment described in this manual. Failure to adhere to these recommendations may result in equipment damage or personal injury.

1. All customer-supplied equipment should be in good working condition before being connected to the PNP.
2. The safety relief valve on the regulator must be set to prevent over-pressurization.
3. The sample container being purged to must have a safety relief valve to prevent over-pressurization.
4. When determining the appropriate purge pressure, start at a low pressure and increase the pressure in small increments (approximately 5 psig) until the correct purge pressure is determined and set.
5. When determining the appropriate purge pressure, stop increasing the pressure at the first sign of inert gas entering the sample container. This is to prevent over-pressurization of the sample container and also to prevent the escape of light ends, thus preserving the integrity of the sample.

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. However, **please note that the specifications may vary depending on the customization of your product.**

Table 1: Plug & Purge Panel Specifications

Application	Purging Samplers and Sampling Systems of Previous Liquid Product to Ensure Representative Samples and Prevent Cross-Contamination Between Samples
Materials of Construction	316/316L Stainless Steel, PTFE, Viton®
Maximum Allowable Operating Pressure	Actuation: 116 psig @ -20 °F to 120 °F (7 barg @ -28 °C to 48 °C) Downstream of Regulator: 1500 psig @ -20 °F to 120 °F (103 barg @ -28 °C to 48 °C) Pneumatic: 2500 psig @ -15 °F to 120 °F (172 barg @ -26 °C to 47 °C)
Connections	Inert Gas Inlet, Purge Outlet, Solenoid Input, Solenoid Return: 1/4" Tubing Test Port: 1/4" FNPT
Utility Requirements	Inert Gas Supply for Purge Operation Hydraulic or Pneumatic Supply (Optional): 50-116 psig (3-7 barg)
Electrical Connections	Solenoid: 1/2" FNPT, AC 120 V Pressure Transmitter (Optional): 1/2" FNPT, DC 24 V
Volume	25 cc Cylinder and 50 cc Purge (Standard) Others Available
Dimensions	20" Length x 20" Height x 1/4" Width
Features	4-Way Ball Valve Pneumatic Supply Regulator Relief Valve Solenoid
Options	4-Way Ball Valve With Actuator Additional Purge Cylinder(s) Pressure Transmitter With Block and Bleed Valve Skid-Mount With Inert Gas Supply Tank
Electrical Area Classification	NEC Class I, Div. 1, Groups A, B, C, & D, T3

1.5 System Diagrams

Figure 1: Panel Schematic

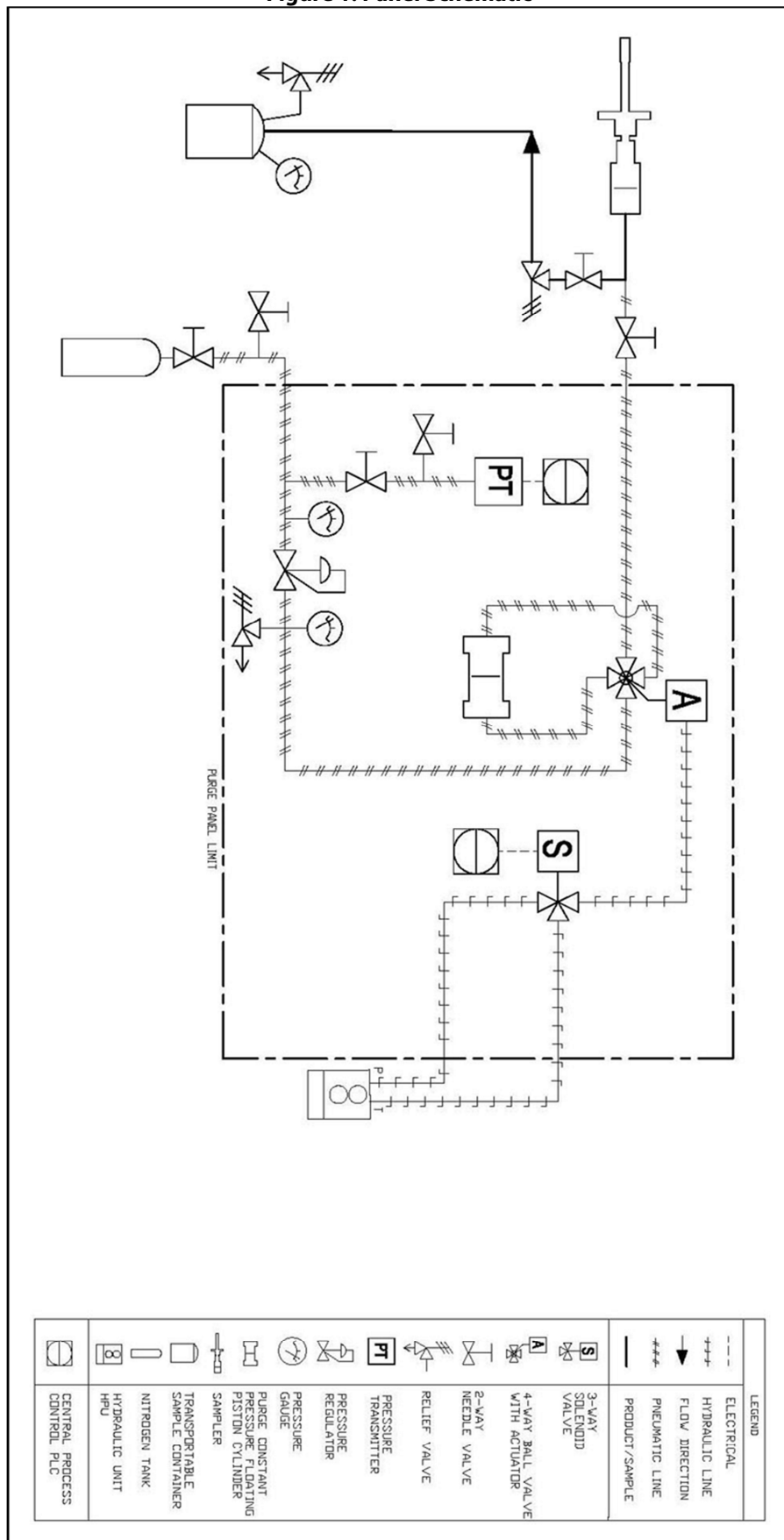


Figure 2: Panel Connections Diagram

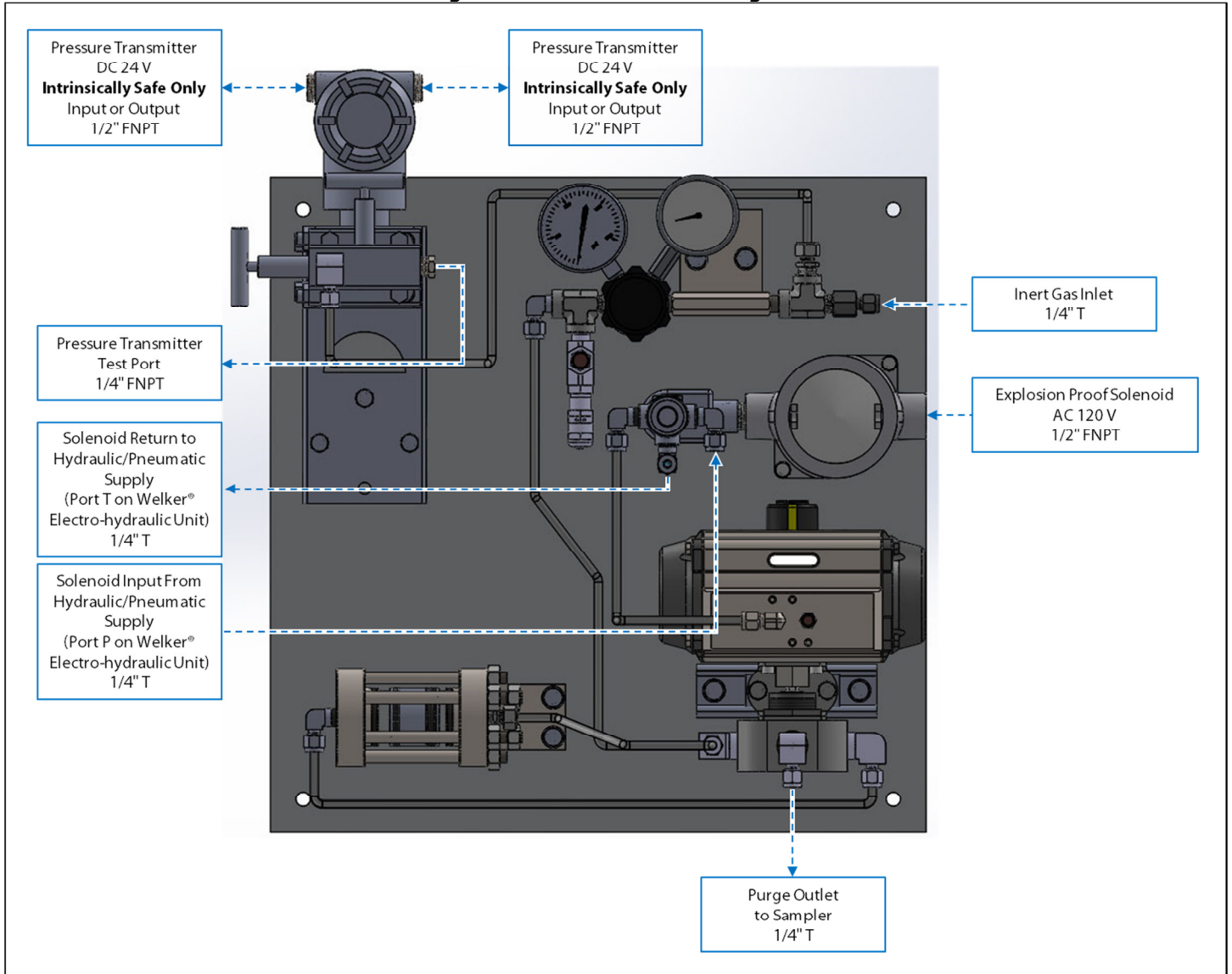
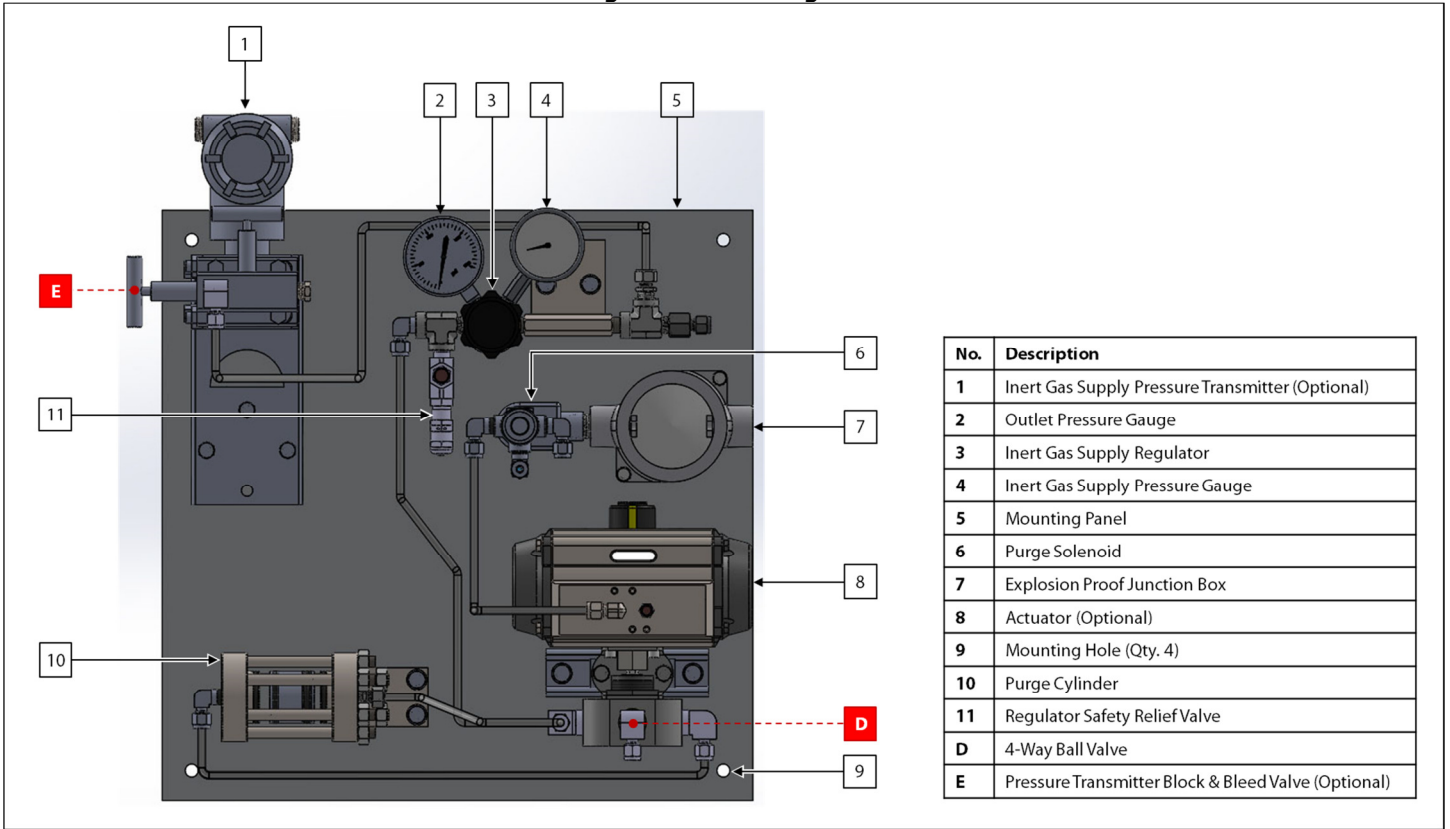


Figure 3: Panel Diagram



SECTION 2: INSTALLATION & OPERATION

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.



The Welker® Plug & Purge Panel will ship panel-mounted and "hard-tube" connected with manufacturer-supplied fittings and hardware. However, the customer will need to supply some tubing and fittings in order to complete the installation of the panel.

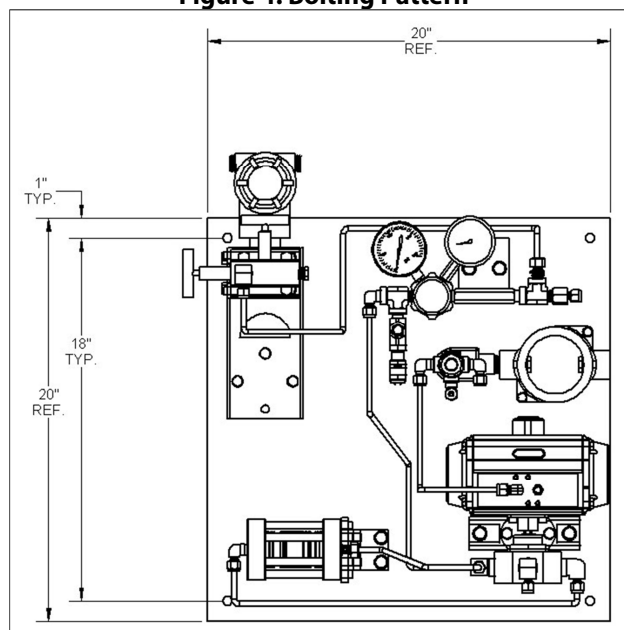
2.2 Principles of Operation

1. A pre-determined volume of inert gas is compressed at a set pressure in a Welker® Purge Cylinder with floating piston. The volume and pressure must be adequate enough to evacuate the sampler and any customer-supplied tubing of previous product.
2. When the 4-way ball valve is actuated, the pressurized volume of inert gas in the purge cylinder is released and directed to the collection head of the sampler, displacing (i.e., purging) the product in the sampler shaft through the sampler's product outlet. This sudden push of product through the product outlet purges the sampler of previous product.
3. When the 4-way ball valve is deactivated, the pressurized volume of inert gas in the purge cylinder is released and directed to the collection head of the sampler, displacing (i.e., purging) the product in the sampler shaft through the sampler's product outlet. This second sudden push of product through the product outlet completes the purge cycle.
4. After the sampler is purged, gravity causes the system sample line to empty into the sample container. This push of product through the sample line to the sample container purges the sample line of previous product.

2.3 Installation

1. Using the provided mounting hardware, mount the panel to a wall or to a 2" pipeline close to the sample point (*Figure 4*).

Figure 4: Bolting Pattern



2. As necessary, connect from a customer-supplied inert gas supply tank to the inert gas inlet on the panel (*Figure 2*).
3. Using 1/4" tubing, connect from the purge outlet on 4-way ball valve D to the purge valve on the sampler (*Figure 2*). If the sampler is not equipped with a purge valve, install a tee to the product outlet on the sampler, and then connect from the tee to the purge outlet on the 4-way ball valve.




Welker recommends installing a valve to the customer-supplied tee. This would allow the sampler to be isolated and easily disconnected from the PNP.

4. Using 1/4" tubing, connect from the hydraulic or pneumatic supply to the solenoid input.
5. Using 1/4" tubing, connect from the solenoid return to the hydraulic supply. If a pneumatic supply is used, the solenoid return can vent to atmosphere.
6. Connect an AC 120 V electrical supply from the PLC to the explosion proof solenoid (*Figure 2*). Refer to the industry standards for appropriate electrical connections to interface with the PLC.
7. As necessary, connect a DC 24 V electrical supply to the pressure transmitter (*Figure 2*).

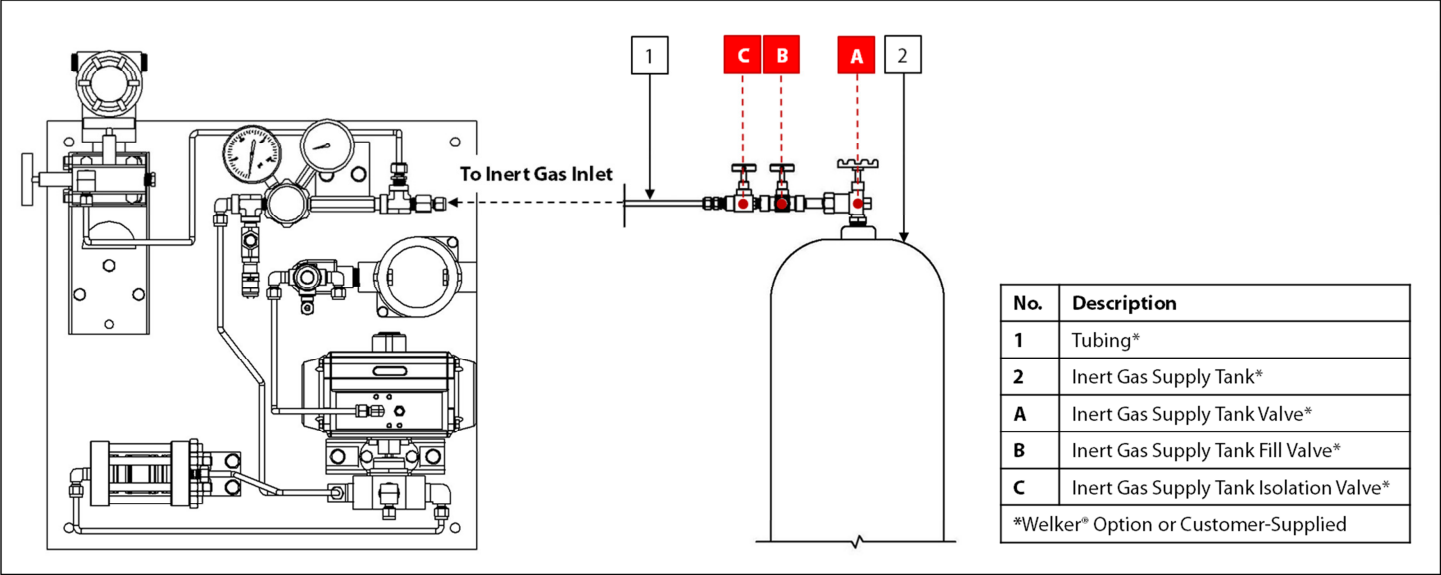
2.4 Start-Up Procedures

Filling or Replacing the Inert Gas Supply Tank




Inert gas tanks are shipped empty from the manufacturer.

Figure 5: Inert Gas Supply Tank Connections



1. Connect an appropriate customer-supplied nitrogen or other inert gas supply container to inert gas supply tank fill valve B located between the valve on the inert gas supply tank (valve A) and the isolation valve (valve C).



The inert gas being used with the PNP must be compatible with the seals in the purge cylinder and appropriate for the application to prevent sample contamination. Welker recommends using nitrogen or helium as the inert gas supply.

2. Open valves A and C, and then slowly open valve B.
3. Allow the inert gas supply tank to fill.
4. Once the inert gas supply tank is full, close inert gas supply tank fill valve B and disconnect the customer-supplied inert gas supply from the inert gas supply tank.
5. During operation, inert gas supply tank valve A and inert gas supply tank isolation valve C should remain open. Inert gas supply tank fill valve should remain closed at all times except when refilling the inert gas supply.
6. If the purge panel is equipped with the optional pressure transmitter, continue to step 7. If the purge panel is not equipped with the optional pressure transmitter, proceed to step 9.

Configuring the Pressure Transmitter (Optional)

7. Configure the pressure transmitter to signal the PLC. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* of the pressure transmitter for instructions on configuring the pressure transmitter.
8. The pressure transmitter will signal the PLC as indicated in Table 2.

Table 2: Pressure Transmitter Signals to PLC	
Empty Inert Gas Supply Tank (0 psig)	4 mA Signal to PLC
Inert Gas Supply Tank in Use (1-1999 psig)	4 mA < Signal to PLC < 20 mA
Full Inert Gas Supply Tank (2000 psig)	20 mA Signal to PLC

Setting the Purge Pressure



When determining the appropriate purge pressure, start at a low pressure and increase the pressure in small increments (approximately 5 psig) until the correct purge pressure is determined and set.



When determining the appropriate purge pressure, stop increasing the pressure when a burst of inert gas is heard entering the sample container. This is to prevent over-pressurization of the sample container and also to prevent the escape of light ends, thus preserving the integrity of the sample.



The inert gas supply pressure must be set high enough to exceed the set point of the external relief on the sampler but not so high as to exceed the pressure rating of the sample container.

9. Beginning at approximately 50 psig above the maximum allowable operating pressure of the sampler or sampling system, determine the appropriate purge pressure for the system. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the regulator for instructions on adjusting the regulator.
10. Manually or remotely energize the purge solenoid and hold for three to four (3-4) seconds.
11. Manually or remotely de-energize the purge solenoid.
12. Wait approximately ten (10) seconds to allow the product in the sampler to drain to the sample container.
13. Monitor the sample container for under- or over-purging.



If no inert gas is heard entering the sample container, the purge pressure has been set too low and previous product remains in the sample line.

If more than a burst of inert gas is heard entering the sample container, the purge pressure has been set too high and the operator risks over-pressurizing the sample container.



If desired, the sample container lid may be removed prior to purge operation so that the purge can be visually verified and the appropriate purge pressure determined. The appropriate purge pressure has been achieved when all previous product has been purged from the sampler into the sample container and a burst of inert gas is audible at the sample container.

14. As necessary, increase the pressure in small increments (approximately 5 psig) and repeat steps 9-12. Continue increasing the pressure until a complete purge is achieved.



A complete purge has been achieved when all previous product has been purged from the sampler into the sample container and a burst of inert gas is audible at the sample container.

15. Once the appropriate purge pressure for the sampler or sampling system has been determined, set the inert gas supply regulator. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the regulator for instructions on setting the regulator.



Setting the inert gas supply regulator also pre-charges the purge cylinder.

16. Note the approximate number of purges the PNP will be able to complete based on the set purge pressure (*Table 3*). This information can be used to determine how frequently the inert gas supply tank needs to be refilled or replaced if the PNP is not equipped with the optional pressure transmitter.

Table 3: Purge Cylinder Information	
Cylinder Pressure (psig)	Approximate Number of Purges*
100	8000
200	3800
300	2400
400	1700
500	1200
600	1000
700	780
800	620
900	500
1000	400
1100	340
1200	270
1300	220
1400	180
1500	140

*Approximate Number of Purges Is Based on a 220 ft³ N₂ Supply Tank With a Starting Pressure of 2000 psig.

2.5 Purge Operation



Prior to purging the sampler or sampling system, ensure that the purge pressure does not exceed the pressure rating of the sample container.



To prevent cross-contamination between samples, Welker recommends that the sampler or sampling system be purged following each sample batch to inject all sampled product remaining in the sampler into the selected sample container.



Ensure that product flow is directed to the sample container.

1. Ensure that the purge valve on the sampler is open.
2. Manually or remotely energize the purge solenoid and hold for three to four (3-4) seconds.
3. Manually or remotely de-energize the purge solenoid.
4. Wait approximately ten (10) seconds to allow the product in the sampler to drain to the sample container.
5. The sampler or sampling system is now purged and ready for the next sample batch.
6. The sample container may be disconnected and replaced any time after the purge has been complete. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* of the sampler or sampling system for instructions on disconnecting and replacing the sample container.

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 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. This eases the installation of the seals and reduces the risk of damage when positioning them on parts. Welker recommends non-hydrocarbon-based lubricants, such as Krytox®, for use with all sample cylinder seals and silicone-based lubricants, such as Molykote® 111, for use with seals not exposed to the sample product.



Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.



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.

3.2 Panel Maintenance

1. During purge operations, monitor the PNP for leaks. If leaks are present, halt operation and repair as necessary.
2. Occasionally, a system component may need to be repaired or removed for manufacturer's recommended maintenance. To perform maintenance on components:
 - a. Depressurize the PNP and close all valves.
 - b. Turn OFF all electrical power to the PNP.
 - c. Disconnect the tubing and remove individual components for maintenance.
 - d. For complete and proper maintenance on individual components, refer to their respective *Installation, Operation, and Maintenance (IOM) Manual*. A list of component *Installation, Operation, and Maintenance (IOM) Manuals* is available in the *Appendix* section of this manual.
 - e. See *Section 3.3, Purge Cylinder Maintenance*, for instructions on properly maintaining the purge cylinder.
 - f. After performing necessary maintenance on component parts, reconnect all instrument tubing.
 - g. Reinstall the PNP according to the instructions in *Section 2.3, Installation*, and *Section 2.4, Start-Up Procedures*.

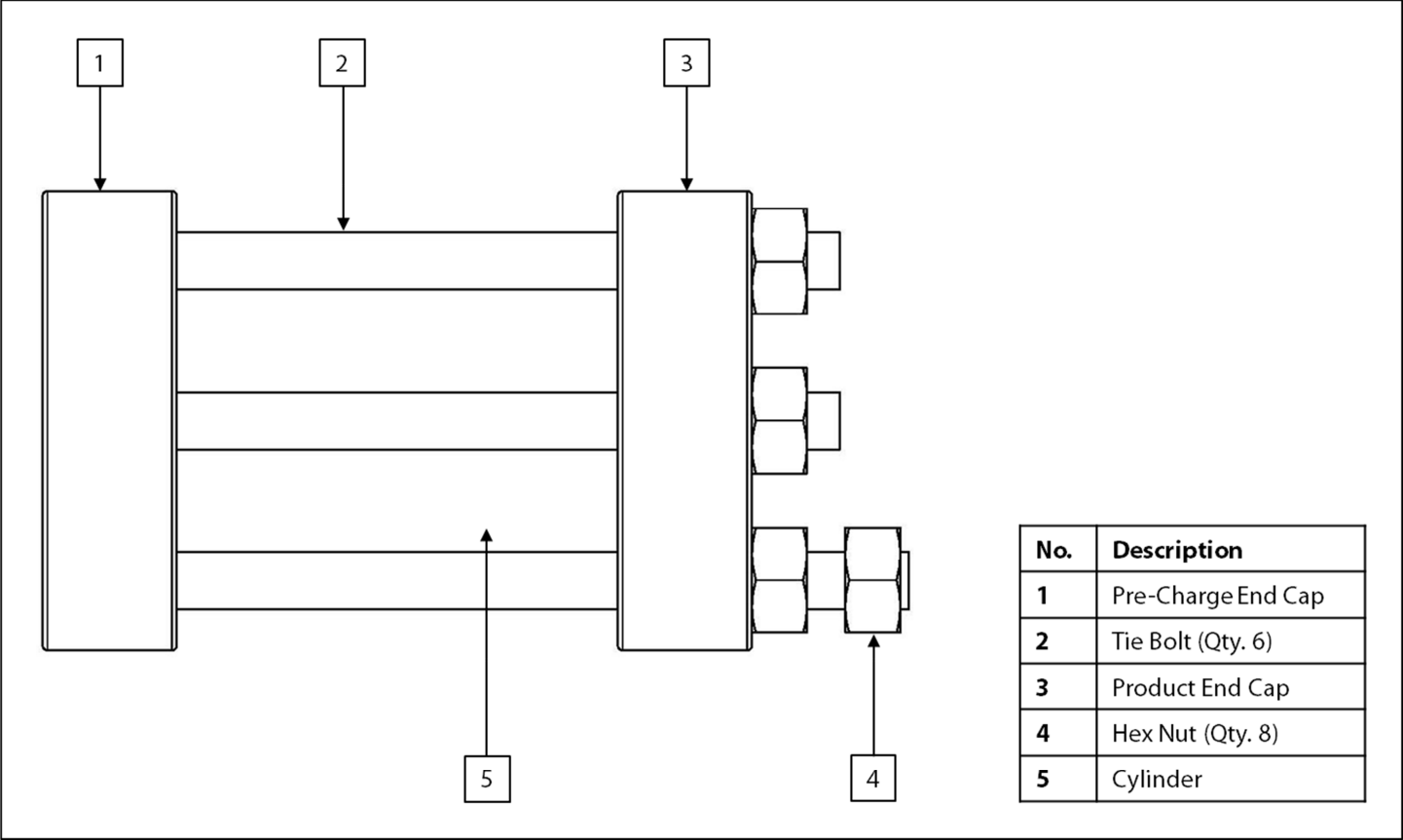


During re-installation check valves for leaks and repair as necessary.

3.3 Purge Cylinder Maintenance

Disassembly

Figure 6: Purge Cylinder Diagram - External

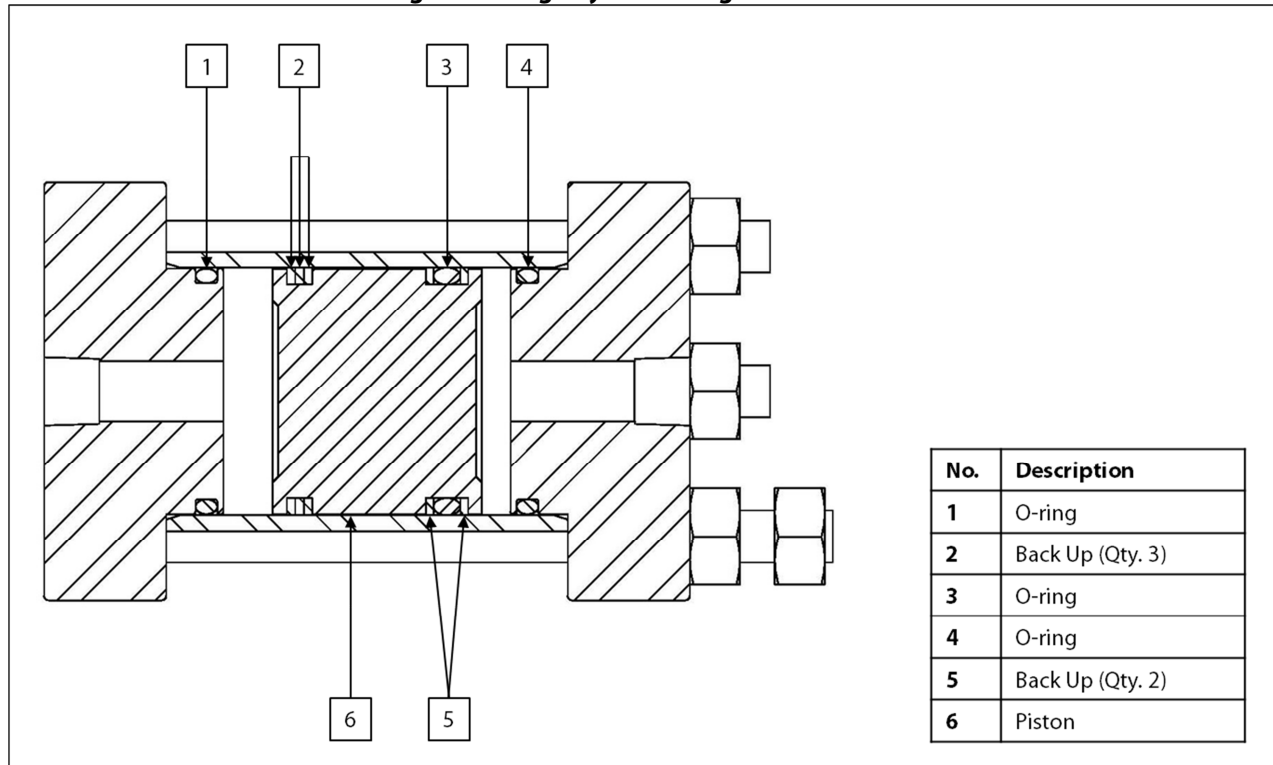


- 1. Unscrew the hex nuts from the tie bolts.
- 2. Remove the product end cap from the cylinder.
- 3. Unscrew the tie bolts from the pre-charge end cap.
- 4. With the piston still inside, carefully remove the cylinder from the pre-charge end cap.
- 5. From the pre-charge side, slowly push the piston out of the cylinder. Note the position of the top and bottom of the piston and cylinder to ease reassembly.

As necessary, use a clean wooden dowel or PVC pipe to gently push the piston out of the cylinder. DO NOT use metal objects, as they may scratch and damage the unit.

Maintenance

Figure 7: Purge Cylinder Diagram – Internal

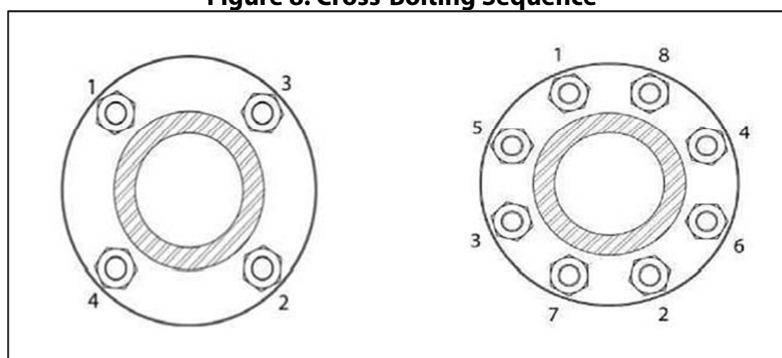


6. Remove the O-ring from the pre-charge end cap and wipe the O-ring groove clean.
7. Replace the O-ring in the pre-charge end cap.
8. Remove the O-ring from the product end cap and wipe the O-ring groove clean.
9. Replace the O-ring in the product end cap.
10. Remove the O-ring and backups from the piston and wipe the seal grooves clean.
11. Replace the O-ring and back ups on the piston.
12. Wipe the inner diameter of the cylinder with a clean, dry cloth.

Reassembly

13. Slide the cylinder onto the pre-charge end cap. Gently push the cylinder down until it seals with the pre-charge end cap.
14. Gently push the piston into the cylinder towards the pre-charge end cap. Ensure that the orientation of the piston is correct.
15. Gently push the product end cap into the cylinder until it seals with the cylinder.
16. Following a cross-bolting sequence, install the tie bolts through the product end cap to the pre-charge end cap, and then tighten the hex nuts at the top of the product end cap to 6 ft-lb using a torque wrench (*Figure 8*).

Figure 8: Cross-Bolting Sequence



3.4 Troubleshooting

Table 4: Troubleshooting

Issues	Possible Causes	Solutions
The system is not being fully purged.	The operator may not be energizing the purge solenoid long enough before de-energizing.	Ensure that the operator energizes the purge solenoid for three to four (3-4) seconds before de-energizing.
	The inert gas supply pressure and volume may be too low.	Check the inert gas supply pressure gauge for the pressure level. Add inert gas to the inert gas supply tank or replace the inert gas supply tank as needed.
The sample container is building too much pressure.	The purge pressure has been set too high.	Reduce the purge pressure to 50 psig above the maximum allowable operating pressure of the sampler/sampling system. As necessary, increase the pressure in small increments (approximately 5 psig) until the appropriate purge pressure has been determined. See <i>Section 2.4, Start-Up Procedures</i> , for additional instructions.
The pressure transmitter is transmitting inaccurate pressure to the PLC.	The pressure transmitter may be malfunctioning or may not be calibrated properly.	Refer to the <i>Installation, Operation, and Maintenance (IOM) Manual</i> for the pressure transmitter.

Referenced or Attached Documents

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

- IOM-189: Welker® inFlow™ ACE Crude Oil Sampler

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

- Parker Skinner™ 7131T, 7132T, and 7133T 3-Way Solenoid Valves (Welker® IOM-V063)
- Swagelok® 40G and 40 Series One-Piece Instrumentation Valves (Welker® IOM-V085)
- Swagelok® R Series Proportional Relief Valves (Welker® IOM-V086)
- TESCOM™ Series 44-1800 Pressure Reducer (Welker® IOM-V084)
- Yokogawa EJX and EJA-E Series Differential Pressure and Pressure Transmitters (Welker® IOM-V095)

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

- System Drawing: AD915AA

NOTES



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