



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
FOR WELKER® PITOT PROBES

MODELS

PP-1

PP-2

PP-3

PP-F

DRAWING NUMBER(S)

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AD626BJ

AD843BD.1

PP1239

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SAFETY

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 of operation guide for the Welker® Pitot Probes, PP-1, PP-2, PP-3, and PP-F. For further information and instructions, please refer to the Installation, Operation, and Maintenance (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 inspectors' 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 Pitot Probe 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 Pitot Probe, please contact a Welker® representative immediately.

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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® PP-1, PP-2, PP-3, and PP-F Pitot Probes are designed to create a product loop from the pipeline, through a connected sample or sampling system, and back to the pipeline.

When the Pitot Probe's product outlet and return are connected to a sampler or sampling system, the circulation pump and/or kinetic energy from flow velocity creates a circulation loop, also known as a "hot loop." When in operation, product circulates through the hot loop, continually presenting fresh product to the sampler or sampling system, allowing for collection of representative samples.

Welker® might custom design the PP-1, PP-2, PP-3, and PP-F Pitot Probes 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 might vary depending on the customization of your equipment.

Table 1: Welker® PP-1 Pitot Probe Specifications

Products Sampled	Gases and Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel
Maximum Allowable Operating Pressure	½" MNPT: 7700 psig @ -50 °F to 300 °F (530.89 barg @ -45.55 °C to 148.88 °C) ¾" MNPT: 7300 psig @ -50 °F to 300 °F (503.31 barg @ -45.55 °C to 148.88 °C) 1" MNPT: 5300 psig @ -50 °F to 300 °F (365.42 barg @ -45.55 °C to 148.88 °C)
Connections	Pipeline: ½", ¾", or 1" MNPT Product Inlet and Return: ¼" FNPT
Probe Diameter	¼" (Standard) ⅜"
Feature	Scooped Tip on Inlet Probe
Options	45° Beveled Inlet Probe Tungsten Carbide and Sulfinert®-Treated Sample Exposed Parts CRN Certification

Table 2: Welker® PP-2 Pitot Probe Specifications

Products Sampled	Gases and Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel
Maximum Allowable Operating Pressure	3600 psig @ -20 °F to 120 °F (248.21 barg @ -28.88 °C to 48.88 °C)
Connections	Pipeline: ½", ¾", or 1" MNPT Product Inlet and Return: ¼" FNPT
Probe Diameter	¼" (Standard) ⅜"
Approximate Weight	5 lb
Approximate Dimensions	8" x 2" x 11" (Length x Width x Height) Customer to Specify Probe Length
Features	Ball Valves Scooped Tip on Inlet Probe
Options	45° Beveled Inlet Probe Sulfinert®-Treated Sample Exposed Parts Tungsten Carbide and Sulfinert®-Treated Sample Exposed Parts CRN Certification NACE Compliance

Table 3: Welker® PP-3 Pitot Probe Specifications

Products Sampled	Gases and Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel
Maximum Allowable Operating Pressure	3600 psig @ -20 °F to 120 °F (248.21 barg @ -28.88 °C to 48.88 °C)
Connections	Pipeline: ¾" MNPT (Others Available) Product Inlet and Return: ¼" FNPT
Probe Diameter	⅜"
Features	Needle Valves Scooped Tip on Inlet Probe
Options	45° Beveled Inlet Probe

Table 4: Welker® PP-F Pitot Probe Specifications

Products Sampled	Gases and Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel (Standard) Carbon Steel
Maximum Allowable Operating Pressure	Class 150 Carbon Steel: 285 psig @ -20 °F to 100 °F (19.65 barg @ -28.88 °C to 37.77 °C) Class 150 Stainless Steel: 275 psig @ -20 °F to 100 °F (18.96 barg @ -28.88 °C to 37.77 °C) Class 600 Carbon Steel: 1480 psig @ -20 °F to 100 °F (102.04 barg @ -28.88 °C to 37.77 °C) Class 600 Stainless Steel: 1440 psig @ -20 °F to 100 °F (99.28 barg @ -28.88 °C to 37.77 °C) Class 900 Carbon Steel: 2200 psig @ -20 °F to 100 °F (151.68 barg @ -28.88 °C to 37.77 °C) Class 900 Stainless Steel: 2160 psig @ -20 °F to 100 °F (148.92 barg @ -28.88 °C to 37.77 °C) Class 1500 Carbon Steel: 3705 psig @ -20 °F to 100 °F (255.45 barg @ -28.88 °C to 37.77 °C) Class 1500 Stainless Steel: 3600 psig @ -20 °F to 100 °F (248.21 barg @ -28.88 °C to 37.77 °C)
Pipeline Connection	Size: 1", 2", or 3" Rating: Classes 150, 600, 900, or 1500 Facing: RF or RTJ Others Available
Outlet and Return Connections	¼" FNPT ½" FNPT
Probe Diameter	⅜" (Standard) ½"
Features	Scooped Tip on Inlet Probe Shroud
Options	Inlet and Return Ball Valves NACE Compliance

Figure 1: Welker® PP-1 Pitot Probe Diagram

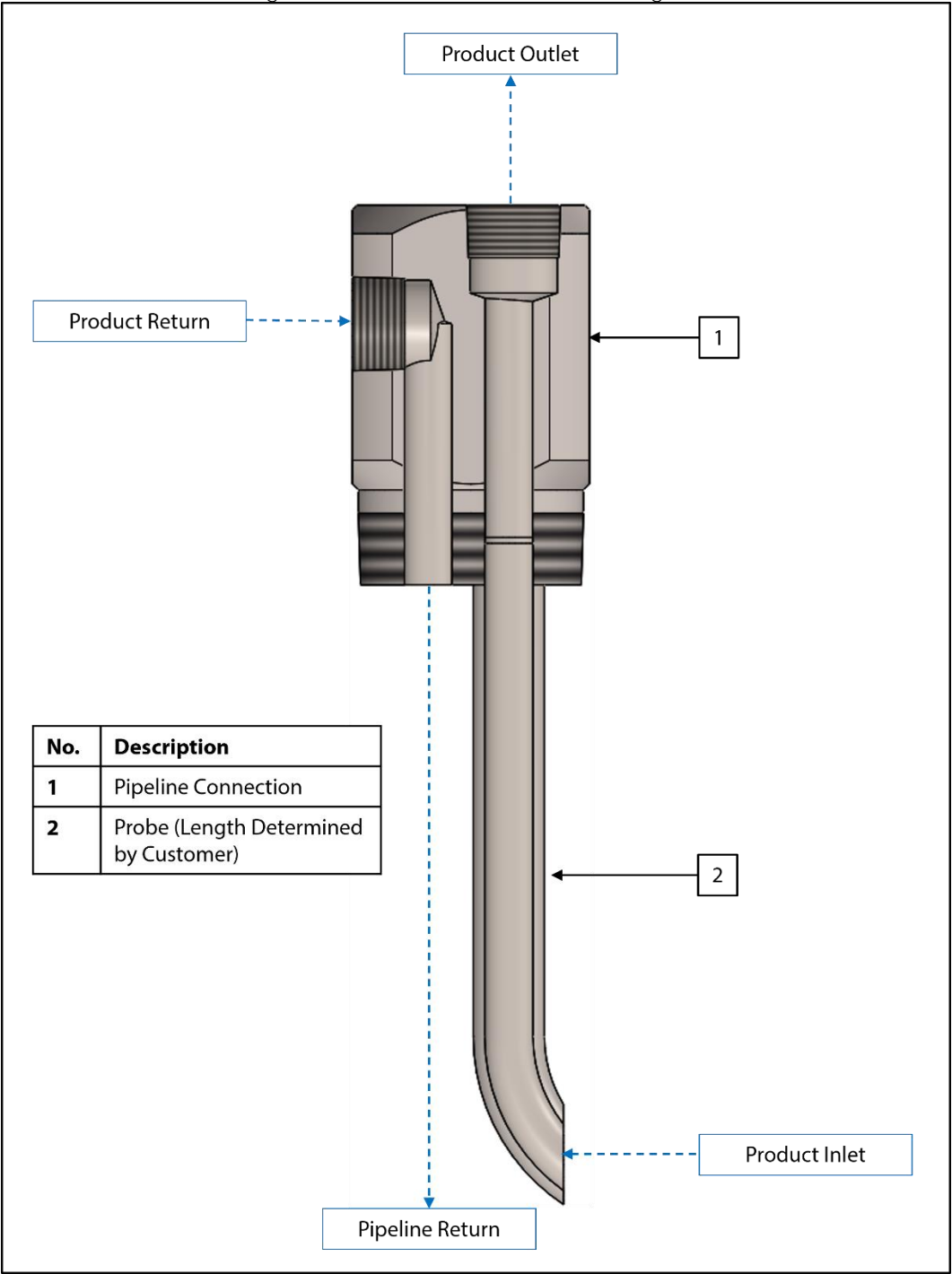


Figure 2: Welker® PP-2 Pitot Probe Diagram

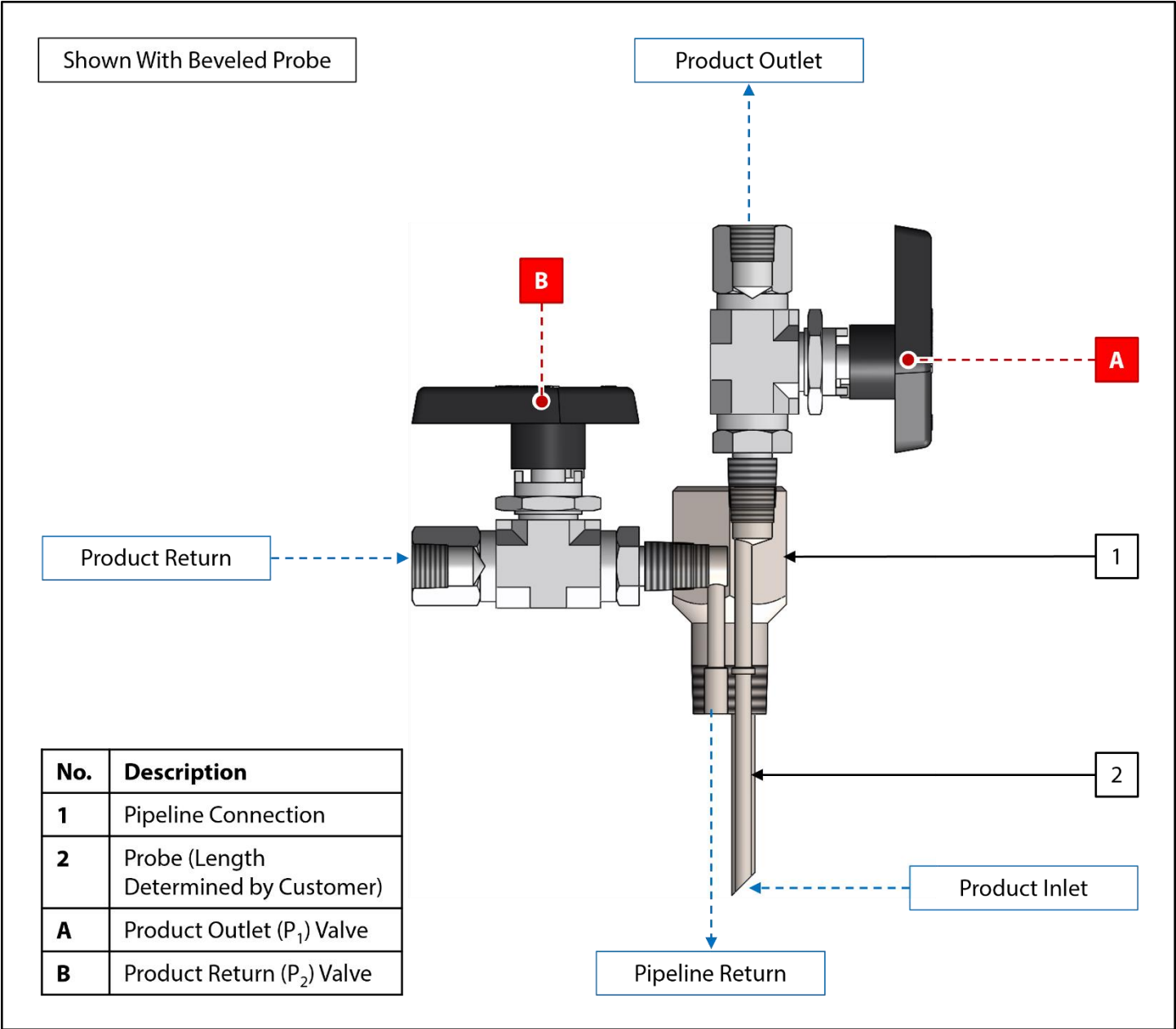


Figure 3: Welker® PP-3 Pitot Probe Diagram

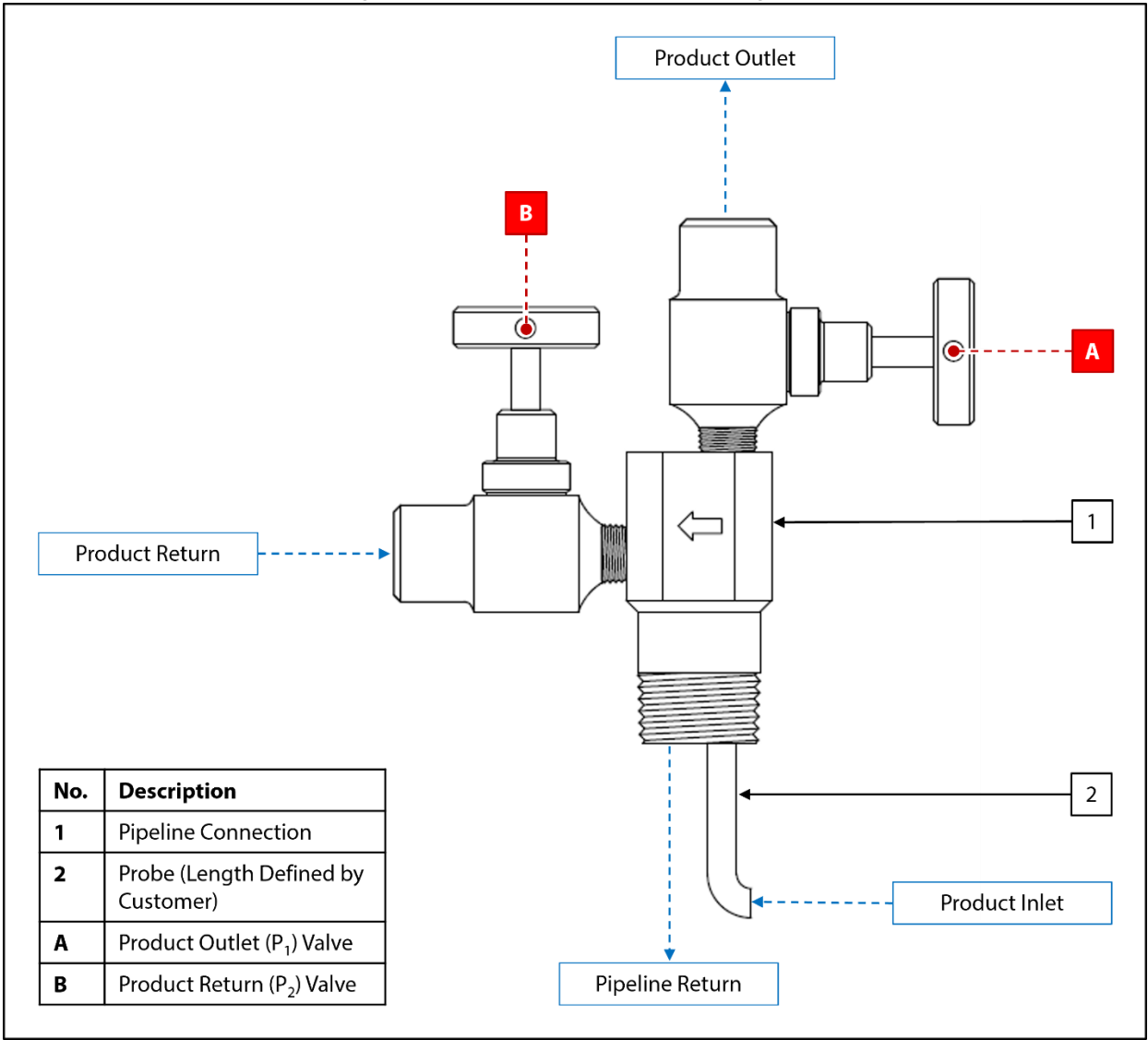
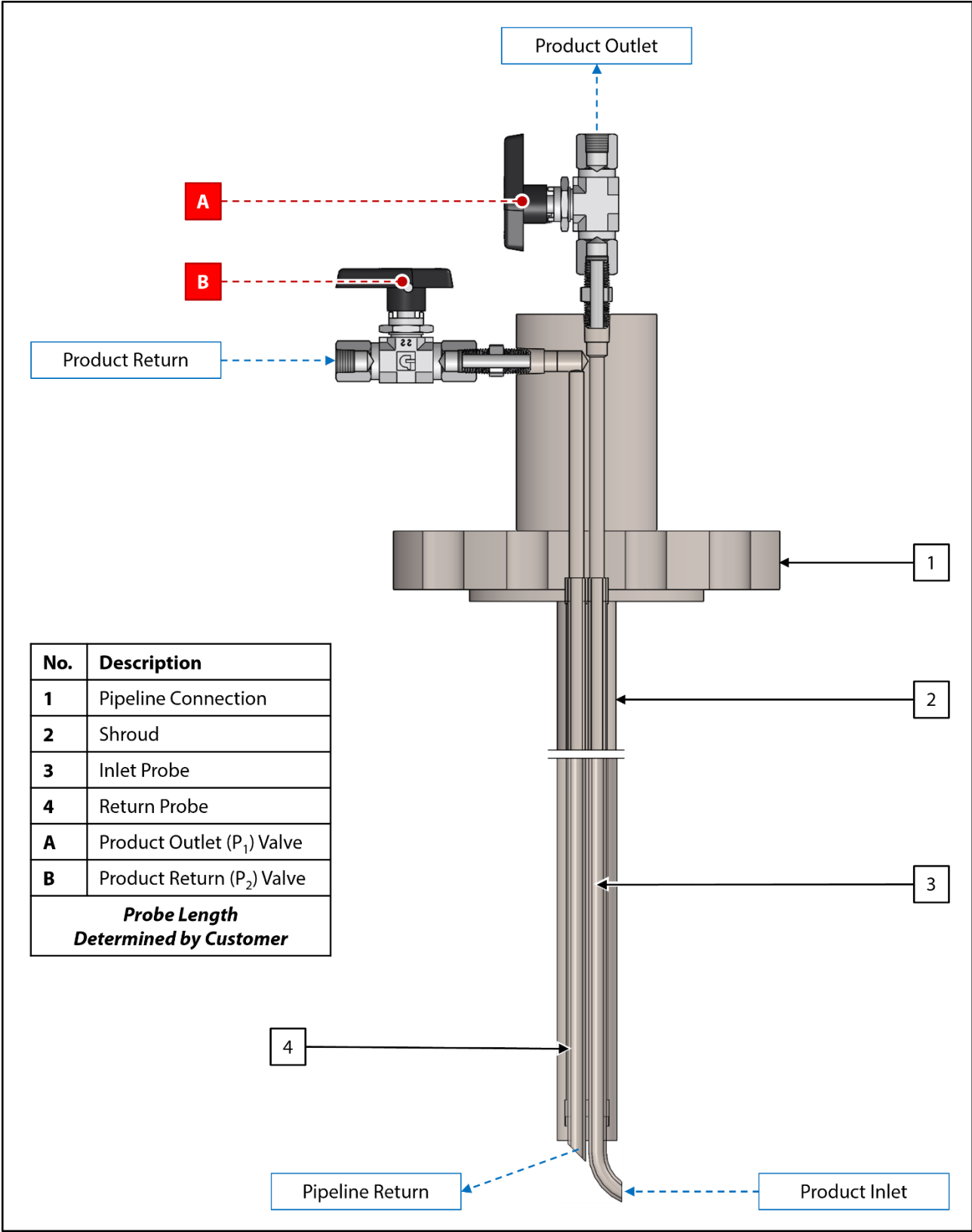


Figure 4: Welker® PP-F Pitot Probe Diagram



SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin



After unpacking the Welker® XXXXX, check it for compliance and any damage that might have occurred during shipment. Immediately contact a Welker® representative if you received a damaged heating cartridge and/or heated sleeve.



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



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 Dow® 111.

1. For sampling applications Welker® recommends that the unit be inserted into the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.
2. For gas sampling applications, Welker® recommends that the unit be installed in the top of the pipe.
3. For liquid sampling applications, Welker® recommends that the unit be installed in the side of the pipe.
4. For liquid sampling applications, locate the unit two to four pipe diameters (2–4D) downstream of an inline static mixer or other flow conditioning system.
5. Handle the unit with care.

2.2 Installation and Operation

1. Depressurize the pipeline.



The pipeline MUST BE depressurized prior to installing and removing the Welker® Pitot Probe.

2. As necessary, install valves to the pipeline connection (*Figure 1*). One will be product outlet (P_1) valve A and the other will be product return (P_2) valve B.
3. Ensure that product outlet (P_1) valve A and product return (P_2) valve B are closed (*Figure 2, Figure 3, or Figure 4*). As necessary, cut off excess tubing from the probe. Using tubing cutters, remove the excess tubing. Then file and smooth the cut edge of the probe.
4. If the probe tip is scooped or beveled, determine the direction of product flow in the pipeline. For the Pitot Probe to function correctly, it must be installed so that the scooped probe tip is open against the direction of product flow.



If applicable, refer to the flow direction stamped on the pipeline connection or handle to determine correct orientation before installing the Pitot Probe to the pipeline.

5. If the Pitot Probe has an MNPT pipeline connection, continue to step 6. If the Pitot Probe has a flanged pipeline connection, proceed to step 9.

MNPT Pipeline Connection

6. Wrap the threads of the threaded pipeline connection with PTFE tape.
7. Install the Pitot Probe to the mating connection on the pipeline and tighten.
8. Proceed to step 14.

Flanged Pipeline Connection

9. Position an appropriately sized gasket on the mating flange connection.
10. Install the Pitot Probe to the mating flange connection.
11. Following a cross-bolting sequence, install bolts and nuts to the flanges.
12. Tighten all bolts to the appropriate torque.
13. Continue to step 14..

Completing Installation

14. Pressurize the pipeline and check for leaks.
15. Use appropriately sized tubing to connect from product outlet (P₁) valve A to the customer equipment (*Figure 2, Figure 3, or Figure 4*).
16. Use appropriately sized tubing to connect from the customer equipment to product return (P₂) valve B (*Figure 2, Figure 3, or Figure 4*).
17. Open product outlet (P₁) valve A and product return (P₂) valve B to begin operation (*Figure 2, Figure 3, or Figure 4*).

2.3 Removing the Pitot Probe

1. Depressurize the pipeline.



The pipeline MUST BE depressurized prior to installing and removing the Welker® Pitot Probe.

2. Close product outlet (P₁) valve A and product return (P₂) valve B (*Figure 2, Figure 3, or Figure 4*).
3. Disconnect customer equipment from the outlet and return.
4. Remove the Pitot Probe from the pipeline.

SECTION 3: MAINTENANCE

1.1 Before You Begin

1. Maintenance is necessary if a leak occurs at one or both valves.
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs to 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, because 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 adjustable wrenches available for maintenance. Please note that the exact tools required might vary by model.

3.2 Maintenance



The pipeline MUST BE depressurized prior to performing maintenance on, installing, and removing the Welker® Pitot Probe.

1. Prior to performing maintenance, the Pitot Probe must be removed from the pipeline. See *Section 2.3, Removing the Pitot Probe*, for instructions on removing the Pitot Probe from the pipeline.



Maintenance is needed when a leak occurs at product outlet (P₁) valve A and/or product return (P₂) valve B.

2. Unscrew product outlet (P₁) valve A and/or product return (P₂) valve B from the pipeline connection (*Figure 2, Figure 3, or Figure 4*).
3. To perform maintenance on product outlet (P₁) valve A and/or product return (P₂) valve B, refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the valve(s).
4. As necessary, clean the probe.
5. Install product outlet (P₁) valve A and/or product return (P₂) valve B to the pipeline connection (*Figure 2, Figure 3, or Figure 4*).
6. Maintenance is now complete. Reinstall the Pitot Probe according to instructions in *Section 2.2, Installation and Operation*.



Check valves for leaks during reinstallation. Repair or replace as necessary.

3.3 Troubleshooting Guidelines

Table 2: Welker® XXXXX Unit Troubleshooting Guidelines		
Issues	Possible Causes	Solutions
Product outlet (P₁) valve A and/or product return (P₂) valve B is leaking.	There is debris in the valve.	Perform maintenance on the valve. For maintenance instructions, refer to the <i>Installation, Operation, and Maintenance (IOM) Manual</i> for the valve.
	The valve O-rings and/or seat are worn or damaged.	Perform maintenance on the valve. For maintenance instructions, refer to the <i>Installation, Operation, and Maintenance (IOM) Manual</i> for the valve.

APPENDIX: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-105: Welker® NV-1 and NV-2 Instrument Valves

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

- Apollo Valves 76-100 Series Stainless Steel Ball Valve With Mounting Pad $\frac{1}{4}$ " - 1" (Welker® IOM-V141)
- Parker Hannifin Corporation Ball Valves B Series (Welker® IOM-V365)
- Parker Hannifin Corporation Ball and Plug Valves (Welker® IOM-V213)

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

- Assembly Drawing: AD626BA (PP-2)
- Assembly Drawing: AD626BJ (PP-3)
- Assembly Drawing: AD843BD.1 (PP-F)
- Machine Drawing: PP1239 (PP-1)

NOTES



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