INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® AUTOMATIC INSERTION PROBE

MODELS
AIP-1
AIP-2

DRAWING NUMBERS
AD198CA
AD198CM
AD198CO
AD198DK.1
AD455BG
AD455BO
AD455EO

MANUAL NUMBER
IOM-006

REVISION
Rev. K, 01/07/2025

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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 and operation guide for the Welker® Automatic Insertion Probes, AIP-1 and AIP-2. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker® equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker® reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT - Save these instructions for local inspector's use.

IMPORTANT - Observe all governing codes and ordinances.

Note to Installer - Leave these instructions with the end user.

Note to End User - Keep these instructions for future reference.

Installation of this Automatic Insertion 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 Automatic Insertion Probe, 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 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® *AIP-1* and *AIP-2* Automatic Insertion Probes are designed to be used with a pipeline isolation valve so that the unit can be safely inserted and retracted without interrupting the flow or operation of the pressurized pipeline.

The operator controls the insertion and retraction of the probe by manipulating valves and applying either process pressure or pressure from an auxiliary inert gas supply. Insertion lengths can be set with the adjustable lock collar, making the AIP-1 and AIP-2 compatible with multiple pipe sizes.

Welker® might custom design the AIP-1 and AIP-2 to suit the particular application and specifications of each customer.

1.3 Important Information

1. The unit should always be mounted to a full port pipeline isolation valve with a bore that exceeds the probe diameter.
2. **Oil Reservoir:** With the use of a hydraulic oil reservoir, process or auxiliary pressure is applied and released to ensure smooth insertion and retraction of the shaft. Welker® ships the oil reservoir with the necessary oil volume and standard vertical installation. For horizontally-mounted probes, the oil reservoir must be positioned so that it remains vertical while inserted. **The oil reservoir will not function properly if installed horizontally.** The oil reservoir can be positioned at the factory to suit the particular application and specifications of each customer if noted at the time of order. As necessary, see *Section 2.2, Preparing the Unit for Installation,* for instructions on rotating the oil reservoir.

For products containing liquid, sand, or other abrasive contaminants, Welker® recommends the use of an auxiliary gas supply (e.g., clean, dry nitrogen gas) to prevent damage to the insertion cylinder and oil reservoir.

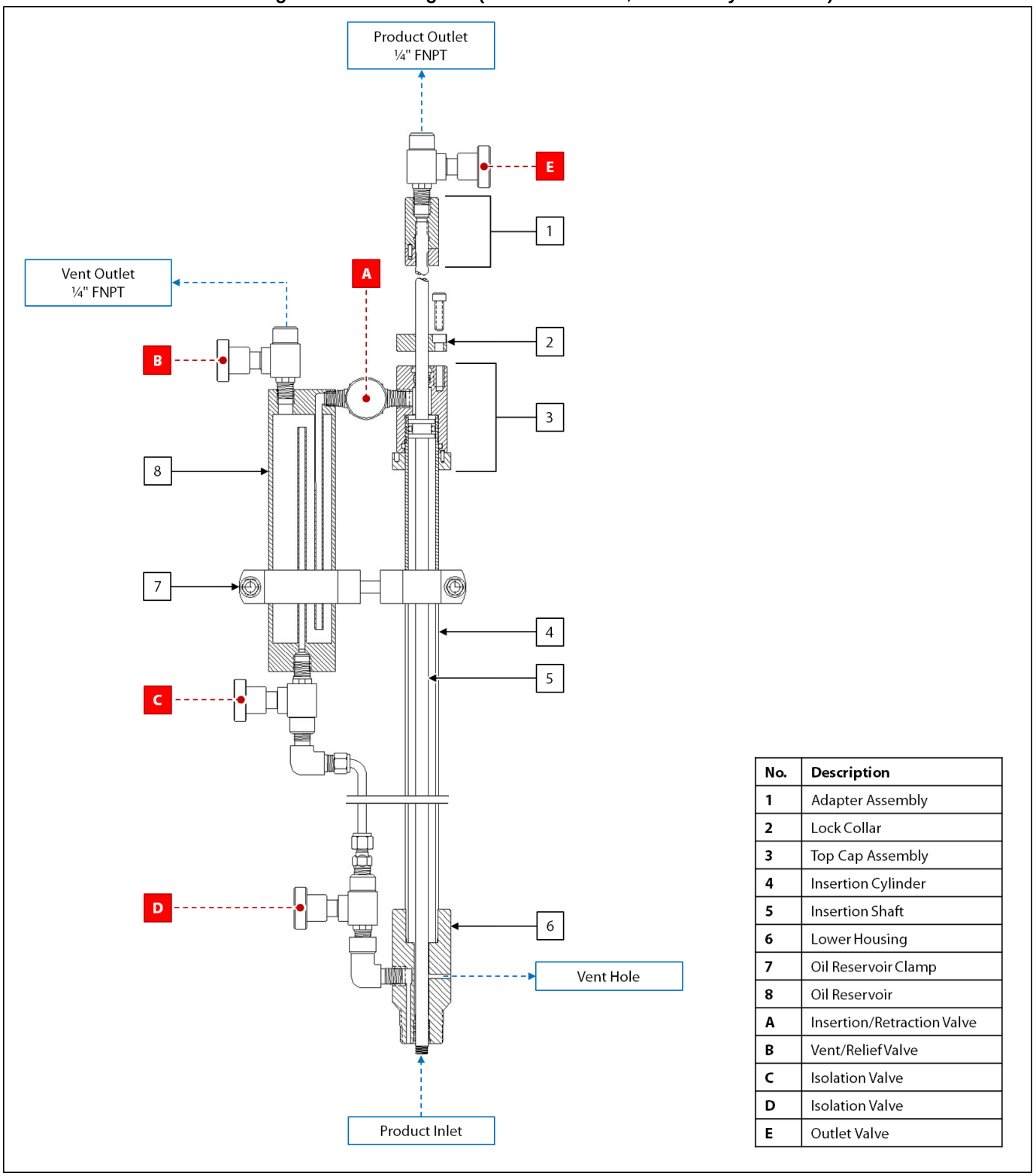
1.4 Specifications

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: AIP-1 and AIP-2 Specifications		
Applications	Injection, Sampling, and Siphoning	
Products Sampled	Gases and Liquids Compatible With the Materials of Construction	
Materials of Construction	316/316L Stainless Steel, PTFE, and Viton® Others Available	
Maximum Allowable Operating Pressure	**150 ANSI:** 275 psig @ -20 °F to 100 °F (*18 barg @ -28 °C to 37 °C*) **300 ANSI:** 720 psig @ -20 °F to 100 °F (*49 barg @ -28 °C to 37 °C*) **600 ANSI:** 1440 psig @ -20 °F to 100 °F (*99 barg @ -28 °C to 37 °C*) **900 ANSI:** 2160 psig @ -20 °F to 100 °F (*148 barg @ -28 °C to 37 °C*) **NPT:** 2160 psig @ -20 °F to 100 °F (*148 barg @ -28 °C to 37 °C*) Others Available	
Pipeline Connection	**NPT** ¾" MNPT 1" MNPT (Standard) 1½" MNPT 2" MNPT	**Flanged** **Size:** ½", ¾", 1", 1½", 2", or 3" **Rating:** 150, 300, 600, and 900
Sample Outlet Connection	¼" FNPT Others Available	
Insertion Lengths	0–18" (*0–45 cm*) 0–24" (*0–60 cm*) 0–30" (*0–76 cm*) 0–36" (*0–91 cm*) Others Available	
Probe Diameters	¼" ⅜" (AIP-1 Standard) ½" ⅝" (AIP-2 Standard) ¾" 1½"	
Mounting	Adjustable (Vertical to Horizontal) Horizontal Vertical (Standard)	
Feature	Hydraulic Oil Reservoir	
Options	Electropolished and Sulfinert®-treated Sample Exposed Parts No Hydraulic Oil Reservoir Probe Tip Spool Volume Eliminator NACE Compliance	

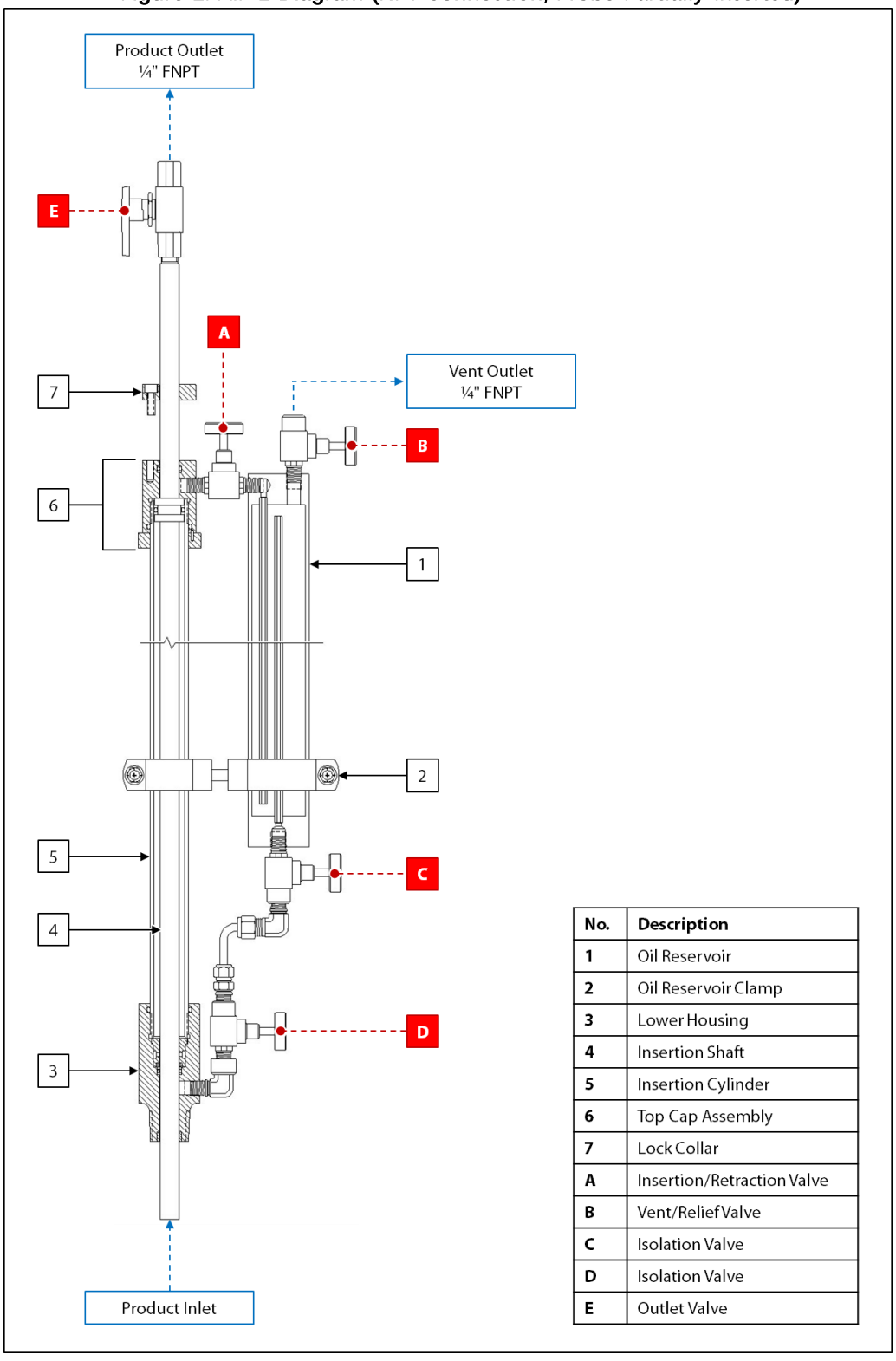
1.5 Equipment Diagrams

Figure 1: AIP-1 Diagram (NPT Connection, Probe Fully Retracted)



No.	Description
1	Adapter Assembly
2	Lock Collar
3	Top Cap Assembly
4	Insertion Cylinder
5	Insertion Shaft
6	Lower Housing
7	Oil Reservoir Clamp
8	Oil Reservoir
A	Insertion/Retraction Valve
B	Vent/Relief Valve
C	Isolation Valve
D	Isolation Valve
E	Outlet Valve

Figure 2: AIP-2 Diagram (NPT Connection, Probe Partially Inserted)



No.	Description
1	Oil Reservoir
2	Oil Reservoir Clamp
3	Lower Housing
4	Insertion Shaft
5	Insertion Cylinder
6	Top Cap Assembly
7	Lock Collar
A	Insertion/Retraction Valve
B	Vent/Relief Valve
C	Isolation Valve
D	Isolation Valve
E	Outlet Valve

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.

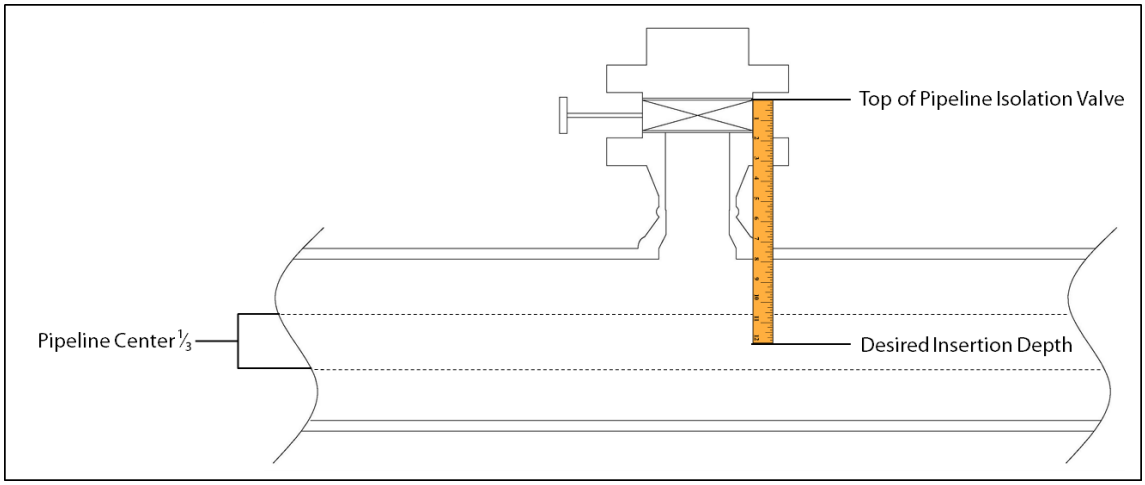
1. For sampling applications, Welker® recommends that the unit be installed to the pipe and inserted into the center one-third (⅓) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.
2. For gas sampling applications, Welker® recommends that the unit be installed in the top of the pipe.
3. 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.
4. For liquid sampling applications, Welker® recommends that the unit be installed in the side of the pipe.
5. Handle the unit with care. Avoid bending and scratching the insertion shaft, which has a polished surface that travels through seals.
6. Operate the unit slowly and smoothly while inserting and retracting to avoid damaging the unit.
7. Take care not to close the pipeline isolation valve on the insertion shaft while the shaft is inserted in the pipeline. This is the most common cause of damage to Welker® probes.

2.2 Preparing the Unit for Installation

Determining Insertion Depth

1. Prior to installation, the distance the insertion shaft will need to travel inside the pipeline must be determined. Measure the distance the shaft must travel from the top of the pipeline isolation valve to the desired insertion depth (e.g., the center one-third (⅓) of the pipeline) (*Figure 3*). This will be the shaft insertion length.

Figure 3: Determining the Insertion Depth



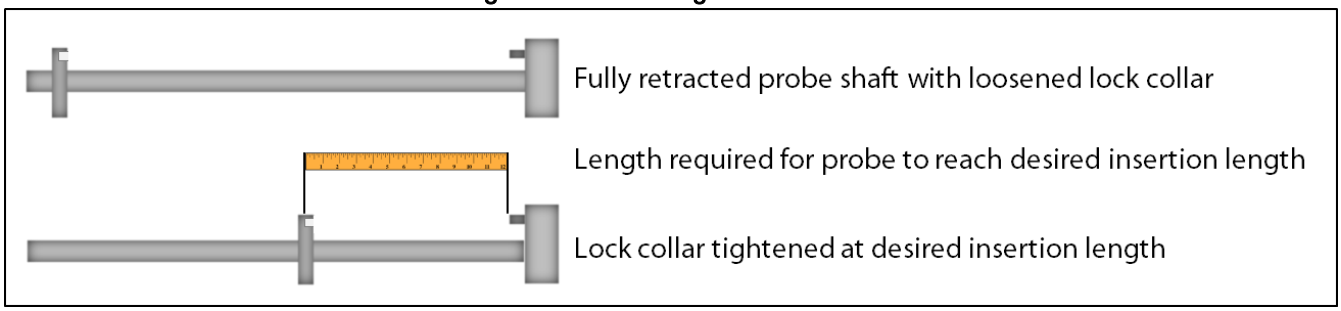
2. Pull up on the insertion shaft to ensure that it is fully retracted. The end of the insertion shaft should be flush with or in close proximity to the bottom face of the lower housing.

> The oil reservoir might need to be relieved of pressure to fully retract the insertion shaft. To relieve pressure in the oil reservoir, open insertion/retraction valve A and vent/relief valve B.

3. Beginning at the top end of the top cap, measure along the insertion shaft to the desired insertion length. As necessary, use a felt tip pen to mark this point.

Positioning the Lock Collar

Figure 4: Positioning the Lock Collar



4. Remove the lockdown bolt from the top of the lock collar.
5. Loosen the cap screws on the side of the lock collar.
6. Carefully slide the lock collar along the insertion shaft to the desired insertion length, taking care not to scratch the insertion shaft (*Figure 4*).
7. Tighten the cap screws on the side of the lock collar to secure the lock collar to the insertion shaft at the marked point (*Figure 4*).

This procedure ensures that the insertion length will be mechanically limited by the lock collar.

8. If the oil reservoir needs to be rotated, continue to step 9. If the oil reservoir does not need to be rotated, proceed to *Section 2.3, Installing the Unit*.

Rotating the Oil Reservoir (As Necessary)

For horizontally mounted probes, the oil reservoir must be positioned so that it remains vertical while inserted. The oil reservoir will not function properly if oriented horizontally.

9. Detach the tubing between isolation valves C and D.
10. Unscrew and remove the oil reservoir clamp from the insertion cylinder and oil reservoir.
11. Loosen insertion/retraction valve A at the top cap.
12. Reposition the oil reservoir so that it is perpendicular to the insertion cylinder. Isolation valve C on the oil reservoir should point down.
13. Tighten insertion/retraction valve A at the top cap.
14. Measure a new piece of tubing to connect isolation valve C to isolation valve D.
15. Attach nuts and ferrules to the ends of the new tubing.
16. Using the new tubing, connect isolation valve C to isolation valve D.

2.3 Installing the Unit

For long probes installed horizontally, Welker® recommends field installation of bracing support for the outlet end of the probe to offset the cantilever effect and prevent bending of the shaft. Any bracing or support installed should NOT contact the probe shaft, as scratching or other damage to the shaft might lead to loss of integrity of the sealing surface.

Installation procedures apply to vertical and horizontal installation. Note the Welker® recommends vertical installation.

If the unit will be inserted using an auxiliary gas, continue to step 1.
If the unit will be inserted using pipeline product, proceed to step 16.
If the unit is designed without an oil reservoir and will be inserted using process fluid, refer to *Appendix B, Inserting and Retracting an Automatic Insertion Probe Using Process Fluid*.

Using an Auxiliary Gas (Optional)

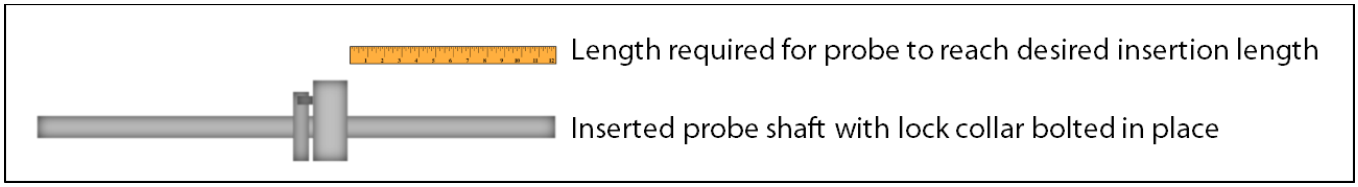
An auxiliary gas supply is OPTIONAL for this unit. However, for products containing liquid, sand, or other abrasive contaminants, Welker® strongly recommends the use of an auxiliary gas (e.g., clean, dry nitrogen gas) to prevent damage to the insertion cylinder.

1. Ensure that all valves on the unit are closed.
2. Detach the tubing between isolation valves C and D (*Figure 1* or *Figure 2*).
3. Plug isolation valve D.
4. Connect a customer-supplied auxiliary gas supply to isolation valve C.
5. Install the unit to the pipeline isolation valve.
6. Connect vent/relief valve B to a customer-supplied recovery system (*Figure 1* or *Figure 2*). Valve B should remain closed.
7. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
8. Open the valve on the customer-supplied auxiliary gas supply and regulate the supply to pipeline pressure.
9. With insertion/retraction valve A open and vent/relief valve B closed, slowly open isolation valve C. The insertion shaft will begin to insert into the pipeline.

Once the insertion shaft begins to insert, do not open the valve any further. The insertion shaft should be inserted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to insert into the pipeline too quickly and might result in damage to the unit.

10. Once the lock collar reaches the top cap, close isolation valve C.
11. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar (*Figure 5*).

Figure 5: Locking the Lock Collar



12. Open vent/relief valve B to relieve pressure trapped in the oil reservoir, and then close vent/relief valve B once pressure has been relieved. The insertion shaft will remain in the pipeline, held mechanically in place by the lock collar.
13. Disconnect the customer-supplied auxiliary gas supply from isolation valve C.
14. Install customer-supplied ¼" tubing or other fittings to the product outlet (*Figure 1* or *Figure 2*).
15. Open product outlet valve E to allow product flow to the customer-supplied tubing run assembly (*Figure 1* or *Figure 2*).

Using Pipeline Product (If Not Using an Auxiliary Gas)

16. Ensure that all valves on the unit are closed.
17. Install the unit to the pipeline isolation valve.
18. Connect vent/relief valve B to a customer-supplied recovery system (*Figure 1* or *Figure 2*). Valve B should remain closed.
19. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
20. Slowly open isolation valves C and D to allow pipeline pressure to enter the oil reservoir.
21. Slowly open insertion/retraction valve A. The insertion shaft will begin to insert into the pipeline.
22.

> Once the insertion shaft begins to insert, do not open the valve any further. The insertion shaft should be inserted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to insert into the pipeline too quickly and might result in damage to the unit.

23. Once the lock collar reaches the top cap, close isolation valves C and D.
24. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar (*Figure 5*).
25. Open vent/relief valve B to relieve pressure trapped in the oil reservoir, and then close vent/relief valve B once pressure has been relieved. The insertion shaft will remain in the pipeline, held in place mechanically by the lock collar.
26. Install customer-supplied ¼" tubing or other fittings to the product outlet (*Figure 1* or *Figure 2*).
27. Open product outlet valve E to allow product flow to the customer-supplied tubing run assembly (*Figure 1* or *Figure 2*).

2.4 Retracting the Unit

> If the unit is designed without an oil reservoir, refer to *Appendix B, Inserting and Retracting an Automatic Insertion Probe Using Process Fluid*, for instructions on retracting the insertion shaft.

1. Ensure that all valves on the unit are closed.
2. Ensure that vent/relief valve B is connected to a customer-supplied recovery system. Valve B should remain closed.
3. Disconnect the customer-supplied tubing, fittings, or instrument attached to the unit.

> **If the unit will be retracted using an auxiliary gas, continue to step 4.**
> **If the unit will be retracted using pipeline product, proceed to step 17.**

Using an Auxiliary Gas (Optional)

An auxiliary gas supply is OPTIONAL for this unit. However, for products containing liquid, sand, or other abrasive contaminants, Welker® strongly recommends the use of an auxiliary gas (e.g., clean, dry nitrogen gas) to prevent damage to the insertion cylinder.

4. Ensure that the tubing between isolation valves C and D is detached.
5. Ensure that isolation valve D is plugged.
6. Connect a customer-supplied auxiliary gas supply to isolation valve C.
7. Open the valve on the customer-supplied auxiliary gas supply and regulate the supply to pipeline pressure.
8. Open insertion/retraction valve A, and then slowly open isolation valve C to ensure that auxiliary pressure is applied to the internal shaft piston.

Failure to ensure that adequate pressure is applied to the internal shaft piston prior to retraction could result in unexpected retraction of the insertion shaft, which could damage the unit or injure the operator.

9. Close isolation valve C.
10. Remove the lockdown bolt from the top of the lock collar.
11. Slowly open vent/relief valve B. This will relieve pressure from the internal shaft piston, allowing the insertion shaft to begin retracting from the pipeline. If pipeline pressure is not sufficient to push the insertion shaft out of the line, the insertion shaft may be retracted manually.

Once the insertion shaft begins to retract, do not open the valve any further. The insertion shaft should be retracted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to retract from the pipeline too quickly and might result in damage to the unit.

If the insertion shaft will not retract from the pipeline automatically or manually, the insertion shaft could be bent or damaged. Contact Welker® for service options.

12. Once the insertion shaft has been fully retracted from the pipeline, close vent/relief valve B, and then close the pipeline isolation valve to isolate the unit from pressure.
13. Disconnect the customer-supplied auxiliary gas supply from isolation valve C.
14. If complete removal of the unit from the pipeline is desired, remove the plug from isolation valve D, and then open isolation valve D to relieve any trapped pressure.
15. Disconnect the customer-supplied recovery system from vent/relief valve B. The unit is now ready to be removed from the pipeline isolation valve for maintenance or to be relocated.

Continuous pressure venting from one or more of the unit's valves might indicate leakage from the pipeline isolation valve. The operator should consult an onsite safety engineer.

16. If the unit will remain secured to the pipeline after retraction, secure the lock collar to the top cap by repositioning the lock collar and tightening the lockdown bolt in the lock collar.

Using Pipeline Product (If Not Using an Auxiliary Gas)

17. Open insertion/retraction valve A, and then slightly open isolation valves C and D to ensure that pipeline pressure is applied to the internal shaft piston.

Failure to ensure that adequate pressure is applied to the internal shaft piston prior to retraction could result in unexpected retraction of the insertion shaft, which could damage the unit or injure the operator.

18. Close isolation valves C and D.
19. Remove the lockdown bolt from the top of the lock collar.
20. Slowly open vent/relief valve B. This will relieve pipeline pressure from the internal shaft piston, allowing the insertion shaft to begin retracting from the pipeline. If pipeline pressure is not sufficient to push the insertion shaft out of the line, the insertion shaft may be retracted manually.

Once the insertion shaft begins to retract, do not open the valve any further. The insertion shaft should be retracted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to retract from the pipeline too quickly and might result in damage to the unit.

If the insertion shaft will not retract from the pipeline automatically or manually, the insertion shaft could be bent or damaged. Contact Welker® for service options.

21. Once the insertion shaft has been fully retracted from the pipeline, close vent/relief valve B, and then close the pipeline isolation valve to isolate the unit from pressure.
22. If complete removal of the unit from the pipeline is desired, open isolation valves C and D to relieve any trapped pressure, and then ensure that the customer-supplied recovery system has been disconnected from vent/relief valve B. The unit is now ready to be removed from the pipeline isolation valve for maintenance or to be relocated.

Continuous pressure venting from one or more of the unit's valves might indicate leakage from the pipeline isolation valve. The operator should consult an onsite safety engineer.

23. If the unit will remain secured to the pipeline after retraction, secure the lock collar to the top cap by repositioning the lock collar and tightening the lockdown bolt in the top of the lock collar.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker® recommends that the unit have standard maintenance under normal operating conditions:** for ***gas sampling*** every six (6) months; and for ***liquid sampling*** every twelve (12) months. 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 by model.
    a. Crescent Wrench (Qty = 2)
    b. Hex Key Set
    c. Seal Pick

3.2 Maintenance

Do not scratch or scrape the metal surfaces of the parts when removing O-rings from the O-ring grooves. Scratching or scraping the sealing surface could result in a leak.

1. Prior to maintenance, the unit must be removed from the pipeline. See *Section 2.4, Retracting the Unit,* for instructions on retracting the insertion shaft and removing the unit from the pipeline.
2. Once the unit is removed from the pipeline, ensure that all valves are closed.

Removing the Oil Reservoir

3. Disconnect the tubing between isolation valves C and D.
4. Unscrew the oil reservoir clamp from around the insertion cylinder, taking care not to misplace the nut and screw.
5. Disconnect the oil reservoir from the top cap at insertion/retraction valve A. Valves A, B, and C should remain connected to the oil reservoir.
6. Verify that the oil reservoir is three-quarters (¾) full.
7. As necessary, remove vent/relief valve B, and then add oil to the oil reservoir. Install vent/relief valve B to the oil reservoir after oil has been added.

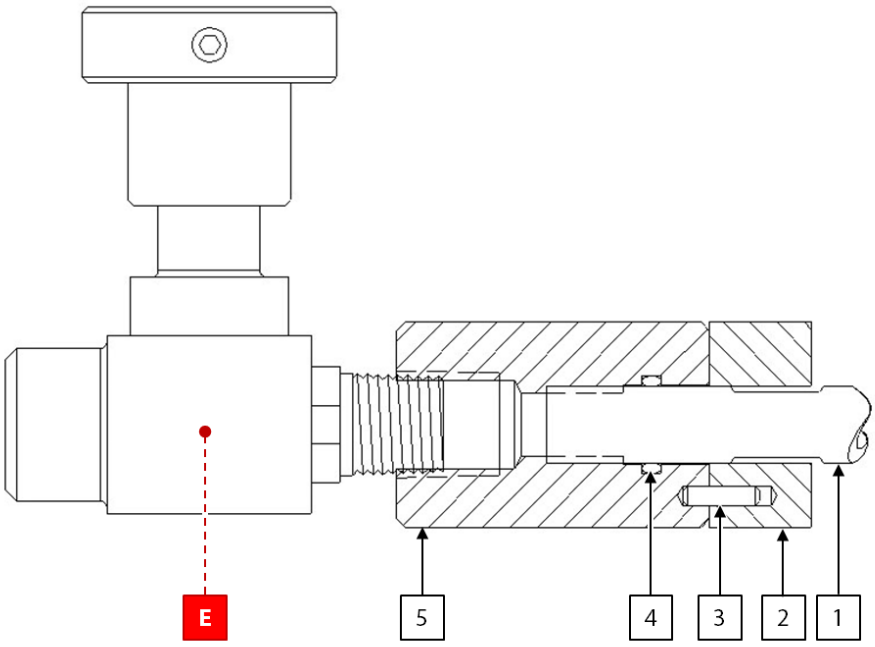
If oil needs to be added to the oil reservoir, this could indicate a leak.

8. Set the oil reservoir aside.

Adapter Assembly

The AIP-2 is not equipped with an adapter assembly. To continue maintenance on the AIP-2, proceed to step 15.

Figure 6: Adapter Assembly Maintenance Diagram (AIP-1 Only)

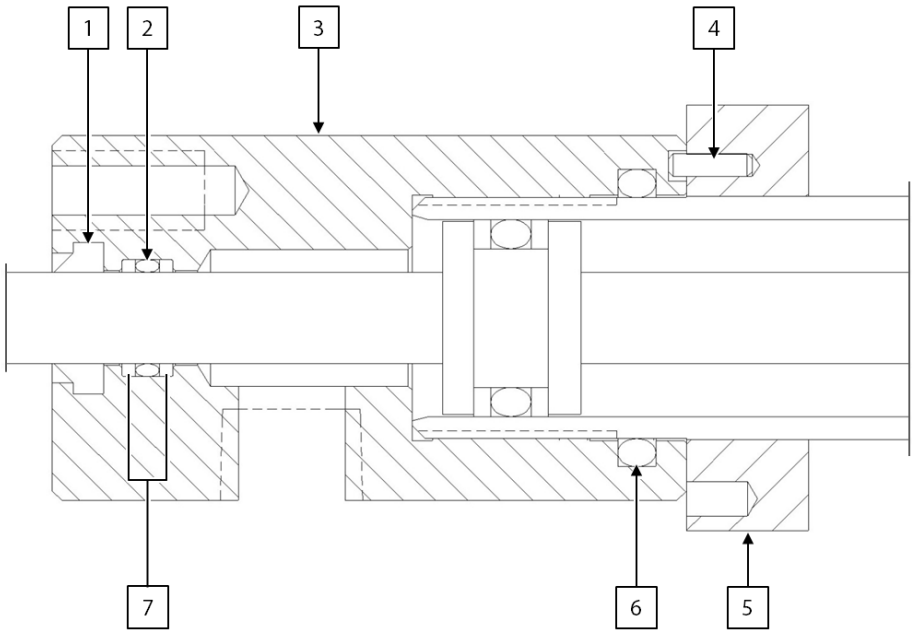


No.	Description
1	Insertion Shaft
2	Adapter Lock Collar
3	Lock Collar Pin
4	O-ring
5	Adapter
E	Outlet Valve

9. Loosen the cap screw in the adapter lock collar.
10. Unscrew the adapter assembly from the insertion shaft.
11. Separate the adapter from the adapter lock collar, taking care not to misplace the pin that aligns the adapter lock collar with the adapter or the screw that secures the adapter lock collar to the insertion shaft.
12. As necessary, clean the adapter.
13. Replace the O-ring in the adapter.
14. Assemble the adapter assembly by aligning the pin in the adapter lock collar with the pin hole in the adapter.

Top Cap Assembly

Figure 7: Top Cap Assembly Maintenance Diagram



No.	Description
1	Wiper Ring
2	O-ring
3	Top Cap
4	Pin
5	Top Cap Lock Collar
6	O-ring
7	Back Up (Qty. 2)

15. If performing maintenance on the AIP-2, unscrew outlet valve E at the fitting from the insertion shaft.
16. Loosen and remove the lock collar from the insertion shaft, taking care not to scratch the insertion shaft.
17. Loosen the cap screw in the top cap lock collar.
18. Unscrew the top cap from the cylinder, taking care not to scratch the insertion shaft.
19. Separate the top cap from the top cap lock collar, taking care not to misplace the pin that aligns the top cap with the top cap lock collar or the screw that secures the top cap lock collar to the insertion cylinder.
20. As necessary, clean the top cap.
21. Replace the back ups, O-rings, and wiper ring in the top of the top cap.
22. Assemble the top cap assembly by aligning the pin in the top cap lock collar with the pin hole in the top cap.

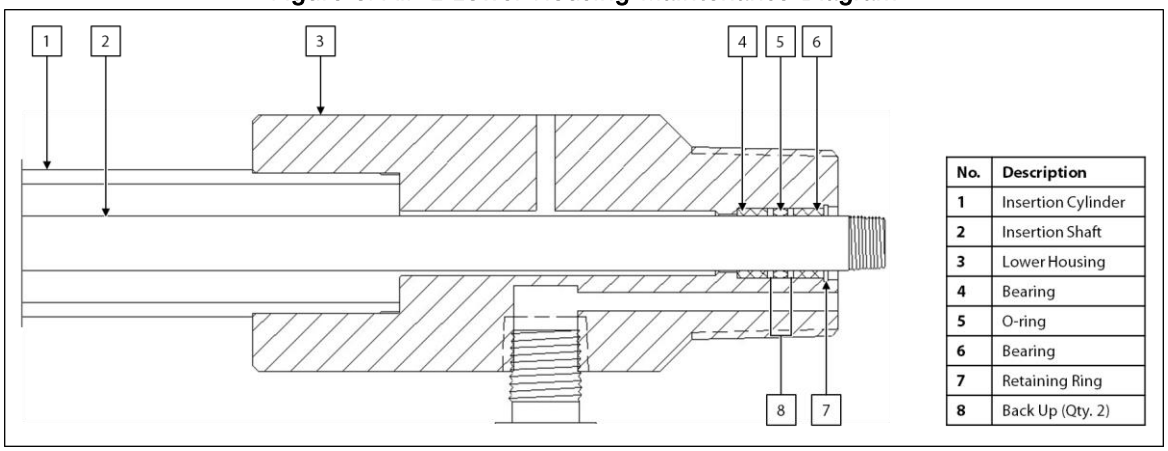
Lower Housing Maintenance

23. Carefully unscrew the insertion cylinder from the lower housing.
24. As necessary, clean the lower housing.

> If performing maintenance on the lower housing of an AIP-1, continue to step 25.
> If performing maintenance on the lower housing of an AIP-2, proceed to step 28.

AIP-1

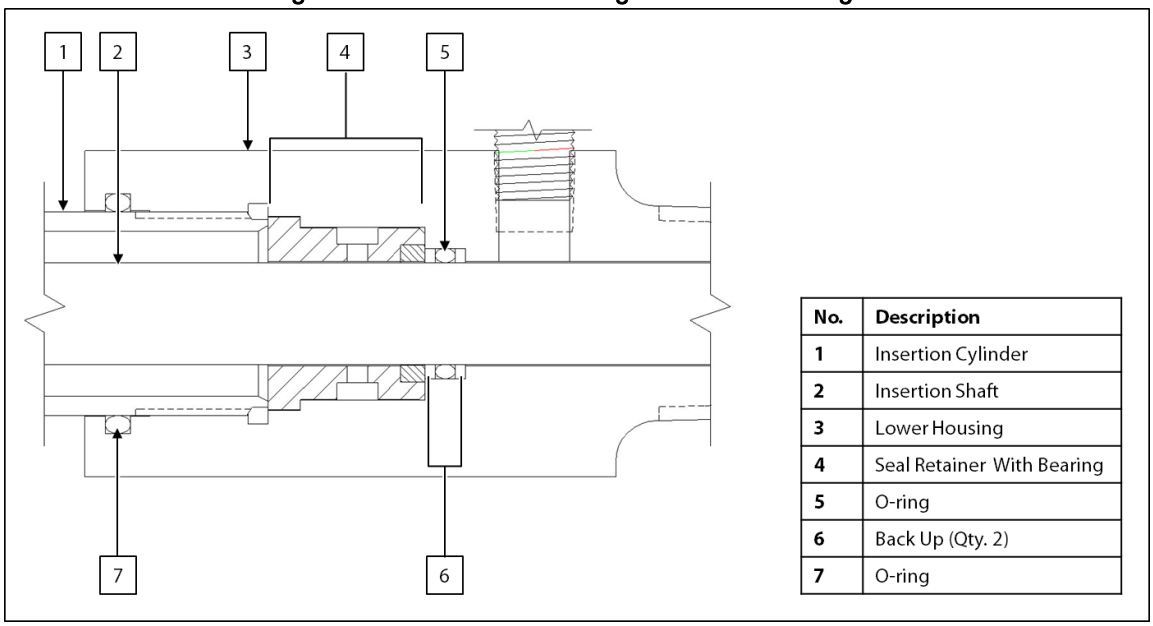
Figure 8: AIP-1 Lower Housing Maintenance Diagram



No.	Description
1	Insertion Cylinder
2	Insertion Shaft
3	Lower Housing
4	Bearing
5	O-ring
6	Bearing
7	Retaining Ring
8	Back Up (Qty. 2)

25. Inspect the retaining ring. Replace if it shows signs of wear or damage.
26. Replace the bearings, back ups, and O-ring in the lower housing.
27. Proceed to step 30.

Figure 9: AIP-2 Lower Housing Maintenance Diagram

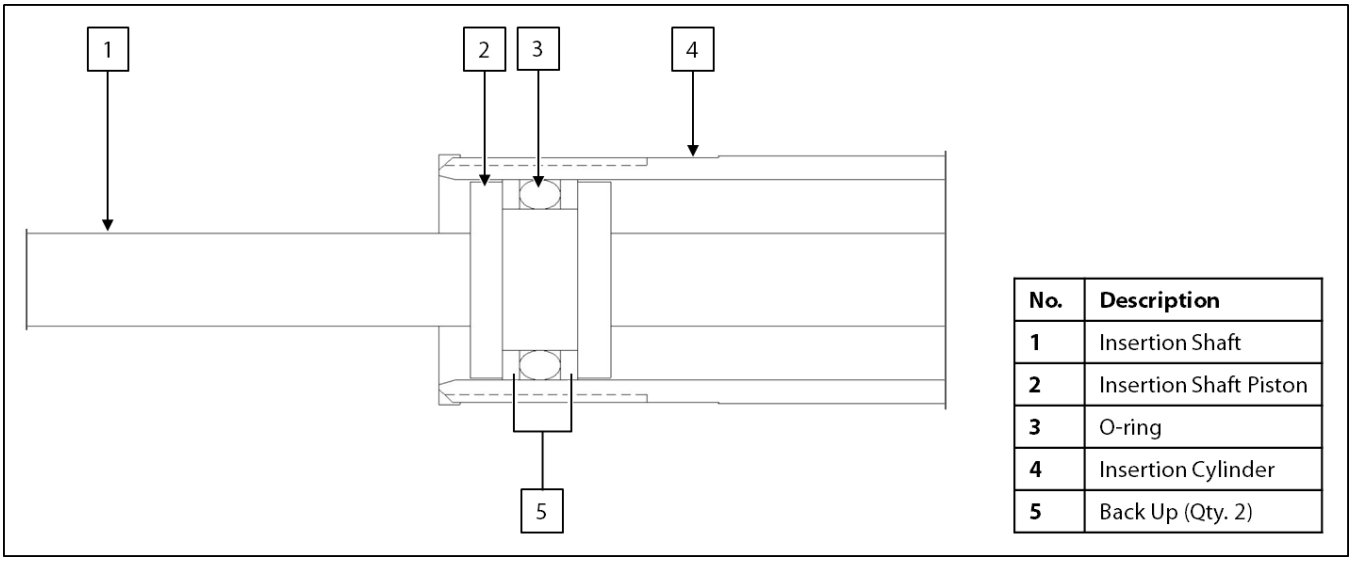


No.	Description
1	Insertion Cylinder
2	Insertion Shaft
3	Lower Housing
4	Seal Retainer With Bearing
5	O-ring
6	Back Up (Qty. 2)
7	O-ring

28. Remove the seal retainer with bearing from the lower housing. Replace if it shows signs of wear or damage.
29. Replace the back ups and O-rings in the lower housing.

Shaft and Cylinder Maintenance

Figure 10: Shaft Detail



No.	Description
1	Insertion Shaft
2	Insertion Shaft Piston
3	O-ring
4	Insertion Cylinder
5	Back Up (Qty. 2)

30. Remove the insertion shaft from the insertion cylinder.
31. Replace the O-ring and back ups on the insertion shaft piston.
32. Inspect the polished outer diameter of the insertion shaft. Scratches or pits might cause the seals to leak. If scratches or pits are present, the unit might need to be repaired or replaced. Contact Welker® for service options.
33. Inspect the honed inner diameter of the insertion cylinder for deep scratches or damage. Scratches or pits might cause the seals to leak. If scratches or pits are present, the unit might need to be repaired or replaced. Contact Welker® for service options.

Reassembly

34. Coat the inside of the top end of the insertion cylinder with lubricant. Then insert the shorter end of the insertion shaft approximately halfway into the insertion cylinder.

> Welker® recommends a silicone-based lubricant, such as Molykote® 111, for use with this unit.

35. Liberally lubricate the insertion shaft.
36. Screw the tapered end of the insertion cylinder into the lower housing.
37. Carefully slide the top cap assembly onto the top end of the insertion shaft down to the insertion cylinder, taking care not to scratch the insertion shaft.
38. Screw the top cap assembly onto the insertion cylinder, and then tighten the cap screw in the top cap lock collar to secure the assembly to the insertion cylinder.
39. Carefully return the lock collar to the top of the insertion shaft, and then tighten the cap screw in the side of the lock collar to hold the collar in place.
40. If performing maintenance on the AIP-1, screw the adapter assembly onto the top end of the insertion shaft, and then tighten the cap screw in the side of the adapter lock collar to secure it to the insertion shaft.
41. If performing maintenance on the AIP-2, screw outlet valve E and its fitting into the top of the insertion shaft.
42. Fully retract the insertion shaft.
43. Prepare the oil reservoir for reattachment by wrapping the valve threads with PTFE tape or coating them with pipe dope.
44. If pipeline pressure will be used to insert the probe into the pipeline, connect the tubing between isolation valves C and D.
45. Reconnect the oil reservoir to the top cap at insertion/retraction valve A.
46. Attach the oil reservoir to the unit. Mount the oil reservoir clamp around the insertion cylinder and secure it with the nut and screw.
47. The unit is now ready for installation. See *Section 2.2, Preparing the Unit for Installation,* and *Section 2.3, Installing the Unit*, for instructions on correctly installing the unit to the pipeline.

> Check valves for leaks and repair or replace as necessary during reinstallation.

3.3 Troubleshooting

Table 2: AIP-1 and AIP-2 Troubleshooting		
Issues	**Possible Causes**	**Solutions**
The insertion shaft does not insert or retract smoothly.	Air might be trapped in the oil reservoir.	Slowly open vent/relief valve B to vent any air trapped in the oil reservoir to the atmosphere.
	There might not be enough oil in the oil reservoir.	Remove vent/relief valve B. Add oil to the oil reservoir until the reservoir is three-quarters (¾) full. Install vent/relief valve B to the oil reservoir.
Oil needs to be added to the oil reservoir often.	Oil might be leaking past the insertion shaft piston O-ring.	Replace the O-ring on the insertion shaft piston. See *Section 3.2, Maintenance*, for instructions.
Pipeline pressure is leaking from the vent hole in the lower housing.	The seals in the lower housing are leaking.	Replace the seals in the lower housing. See *Section 3.2, Maintenance,* for instructions.
The insertion shaft will not retract from the pipeline.	Pipeline pressure might not be high enough to retract the insertion shaft.	Carefully pull up on the insertion shaft until it begins to retract.
	The insertion shaft is bent or damaged inside the pipeline.	Contact Welker® for service options.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

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

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

- Parker Hannifin Corporation Ball and Plug Valves (Welker® IOM-V213)
- Swagelok Company Ball Valves 60 Series (Welker® IOM-V018)
- Swagelok Company Plug Valves P4T and P6T Series (Welker® IOM-V102)

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

- Assembly Drawing: AD198CA (AIP-2, Flanged Connection)
- Assembly Drawing: AD198CM (AIP-2, Flanged Connection With Spool)
- Assembly Drawing: AD198CO (AIP-2, NPT Connection)
- Assembly Drawing: AD198DK.1 (AIP-2, Flanged Connection, No Oil Reservoir)
- Assembly Drawing: AD455BG (AIP-1, Flanged Connection)
- Assembly Drawing: AD455BO (AIP-1, NPT Connection)
- Assembly Drawing: AD455EO (AIP-1, Flanged Connection, No Oil Reservoir)

APPENDIX B: INSERTING AND RETRACTING AN AUTOMATIC INSERTION PROBE USING PROCESS FLUID

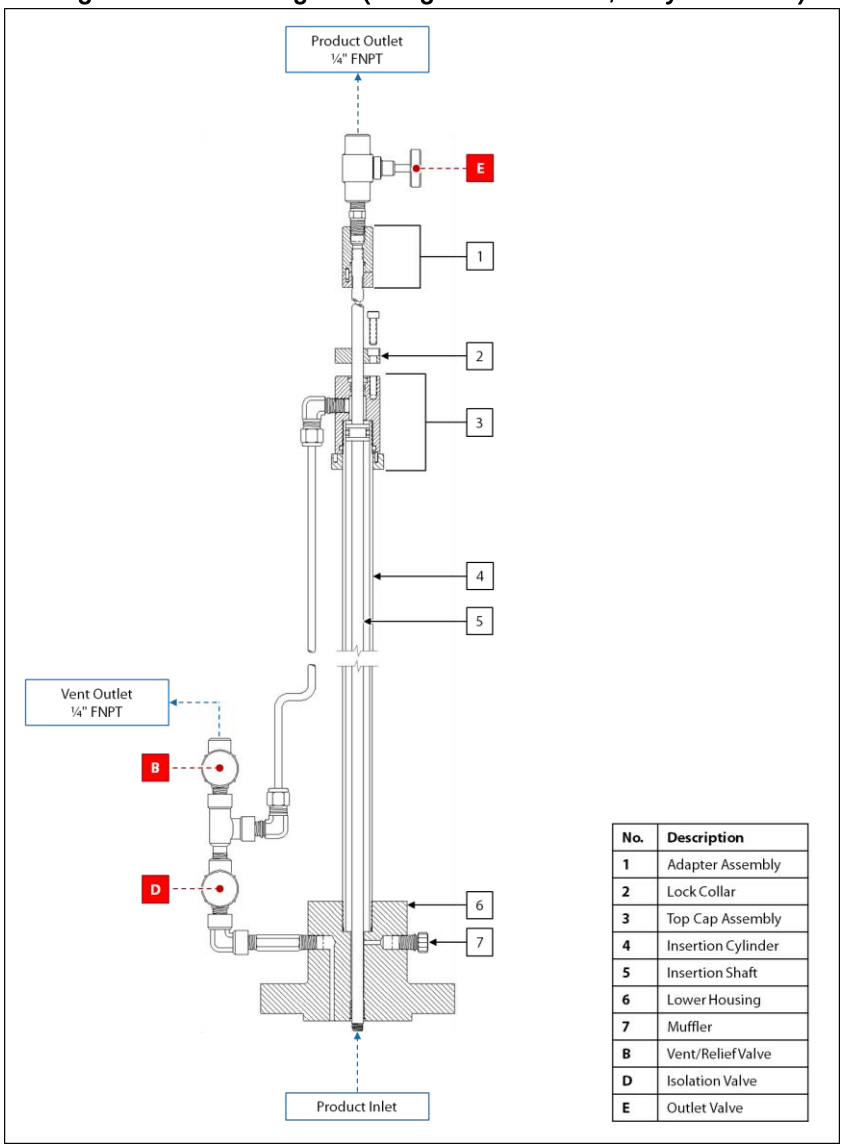
B1.1 Product Description

The Welker® *AIP-1* and *AIP-2* Automatic Insertion Probes without a hydraulic oil reservoir are designed for use in liquid systems where it is desirable to maintain normal operating pressure in the pipeline during insertion and retraction. These AIPs can be safely inserted and retracted through a full port pipeline isolation valve using instrument valves and pipeline pressure.

Welker® might custom design the AIP-1 and AIP-2 to suit the particular application and specifications of each customer.

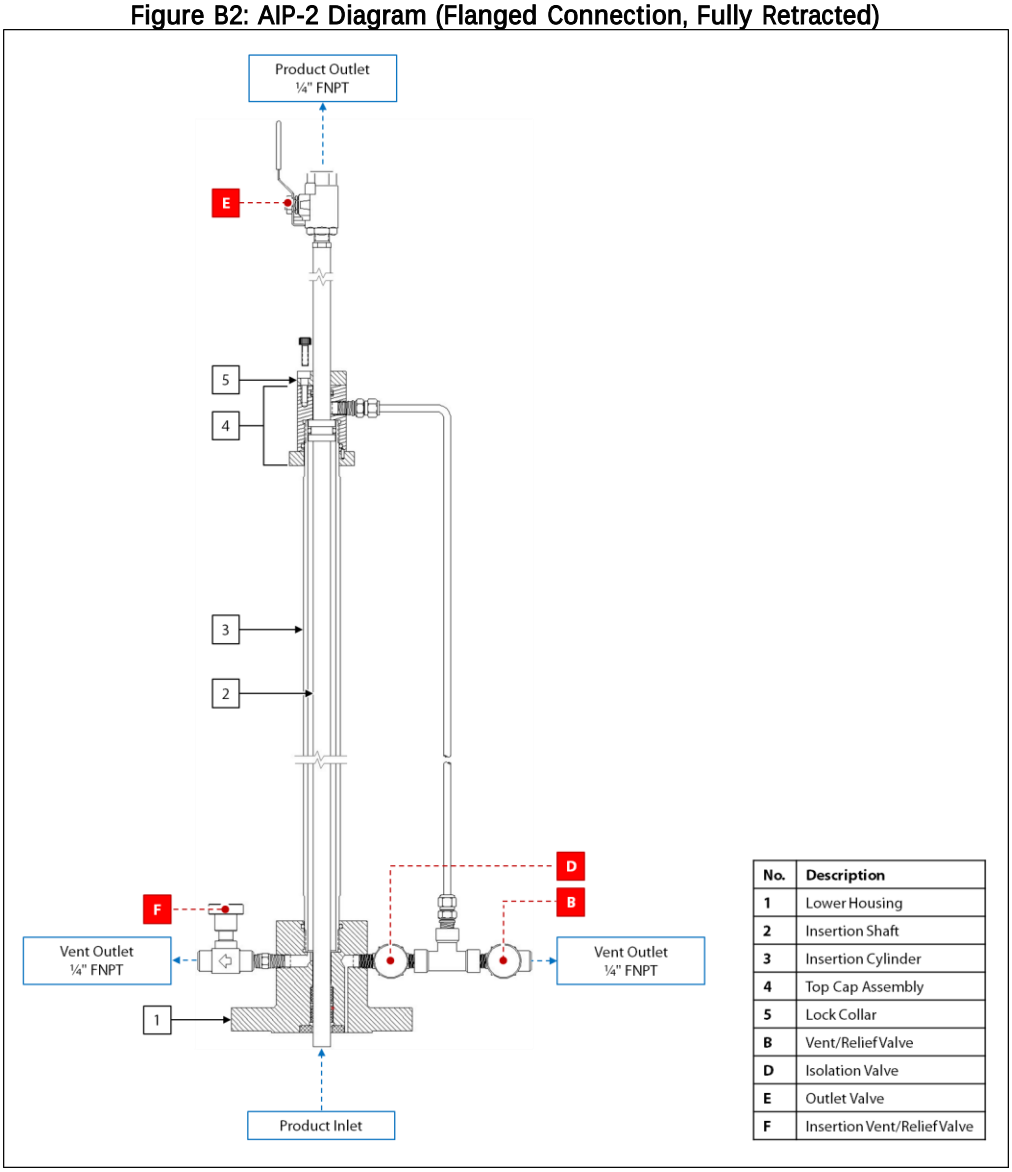
B1.2 Equipment Diagrams

Figure B1: AIP-1 Diagram (Flanged Connection, Fully Retracted)



No.	Description
1	Adapter Assembly
2	Lock Collar
3	Top Cap Assembly
4	Insertion Cylinder
5	Insertion Shaft
6	Lower Housing
7	Muffler
B	Vent/Relief Valve
D	Isolation Valve
E	Outlet Valve

Figure B2: AIP-2 Diagram (Flanged Connection, Fully Retracted)



No.	Description
1	Lower Housing
2	Insertion Shaft
3	Insertion Cylinder
4	Top Cap Assembly
5	Lock Collar
B	Vent/Relief Valve
D	Isolation Valve
E	Outlet Valve
F	Insertion Vent/Relief Valve

B1.3 Inserting the Unit

1. Ensure that all valves on the unit are closed.
2. Install the unit to the pipeline isolation valve.
3. Connect vent/relief valve B to a customer-supplied recovery system. Valve B should remain closed.
4. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
5. Slowly open isolation valve D. The insertion shaft will begin to insert into the pipeline.

Once the insertion shaft begins to insert, do not open the valve any further. The insertion shaft should be inserted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to insert into the pipeline too quickly and might result in damage to the unit.

6. As necessary, open insertion vent/relief valve F to relieve pressure within the insertion cylinder.
7. Once the lock collar reaches the top cap, close isolation valve D.
8. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar.
9. Open vent/relief valve B to relieve pipeline pressure. The insertion shaft will remain in the pipeline, held mechanically in place by the lock collar.
10. Close vent/relief valve B. As necessary, close insertion vent/relief valve F.
11. Install customer-supplied ¼" tubing or other fittings to the product outlet.
12. Open product outlet valve E to allow product flow to the customer-supplied tubing run assembly.

B1.4 Retracting the Unit

1. Ensure that all valves on the unit are closed.
2. Disconnect the customer-supplied tubing, fittings, or instrument attached to the unit.
3. Slightly open isolation valve D to ensure that pipeline pressure is applied to the internal shaft piston.

Failure to ensure that adequate pressure is applied to the internal shaft piston prior to retraction could result in unexpected retraction of the insertion shaft, which could damage the unit and/or injure the operator.

4. Close isolation valve D.
5. Remove the lockdown bolt from the top of the lock collar.
6. Slowly open vent/relief valve B. This will relieve pipeline pressure from the internal shaft piston, allowing the insertion shaft to begin retracting from the pipeline. If pipeline pressure is not sufficient to push the insertion shaft out of the line, the insertion shaft may be retracted manually.

When the insertion shaft begins to retract, do not open the valve any further. The insertion shaft should be retracted slowly and smoothly. Opening the valve too quickly or too much might cause the insertion shaft to retract from the pipeline too quickly and could result in damage to the unit.

If the insertion shaft will not retract from the pipeline automatically or manually, the insertion shaft could be bent or damaged. Contact Welker® for service options.

7. Once the insertion shaft has been fully retracted from the pipeline, close vent/relief valve B, and then close the pipeline isolation valve to isolate the unit from pressure.
8. If complete removal of the unit from the pipeline is desired, open isolation valve D to relieve any trapped pressure, and then ensure that the customer-supplied recovery system has been disconnected from vent/relief valve B. The unit is now ready to be removed from the pipeline isolation valve for maintenance or to be relocated.
9. If the unit will remain secured to the pipeline after retraction, secure the lock collar to the top cap by repositioning the lock collar and tightening the lockdown bolt in the top of the lock collar.

NOTES

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