



**Installation,
Operation,
and
Maintenance
Manual**

**Welker[®] Automatic Insertion
Diffusing Probe
*Model
AIP-3DP***

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 above. 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 in order to improve performance and reliability.

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INTRODUCTION

1. GENERAL

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 1-800-776-7267 in the USA or 1-281-491-2331.

The following procedures have been written for use with standard Welker Engineering parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.

Notes, Warnings, and Cautions



NOTE

Notes emphasize information or set it off from the surrounding text.



CAUTION

Caution messages appear before procedures that, if not observed, could result in damage to equipment.



WARNING

Warnings alert users to a specific procedure or practice that, if not followed correctly, could cause personal injury.

1.2 Product description

The Welker Automatic Insertion Diffusing probe (AIP-3DP) is designed for use in systems where it is desirable to inject a product into a pipeline while the probe remains pressurized. The design of the unit allows the operator to control the movement of the probe into and out of the pipeline safely through the use of four valves and an auxiliary gas supply, instrument air, or process fluid. The injected product saturates a braided nylon wick installed in the bottom of the probe. A diffusing tube surrounds the nylon, and when pipeline pressure flows through the tube and the nylon, product is spread through the pipeline.

Oil Reservoir

With the use of a hydraulic oil reservoir, process or auxiliary pressure is applied on the probe's shaft in order to insert and retract it from the pipeline. The oil in the reservoir applies a hydraulic force on the shaft piston to assure a smooth and safe insertion travel. The reservoir is shipped from the factory with the necessary oil volume. It should be noted that the unit is also shipped from the factory with the assumption that the installation will be vertical. In cases where the unit is mounted horizontally, the operator will have to rotate the reservoir 90 degrees. *Further instructions are given in step 5 of Section 2.2.* **The internals of the reservoir will not function properly if the oil pot is placed in a horizontal position.**

SPECIFICATIONS

N NOTE

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

General	
Products	Gases/Liquids
Materials of Construction	316 Stainless Steel, Viton [®] and PTFE (others available)
Insertion Length	18" (45.72 cm) (others available in 6" increments)
Pipeline Connection	1" MNPT (other NPT and flanged available)
Sample Outlet Connection	1/4" FNPT (others available)
Maximum Allowable Pressure *	1,440 psi @ -20° F to 100 ° F (99 bar @ -29° C to 38° C)

* Maximum allowable pressures may be lower depending on the specifications of the pipeline connection device.

SPECIFICATIONS

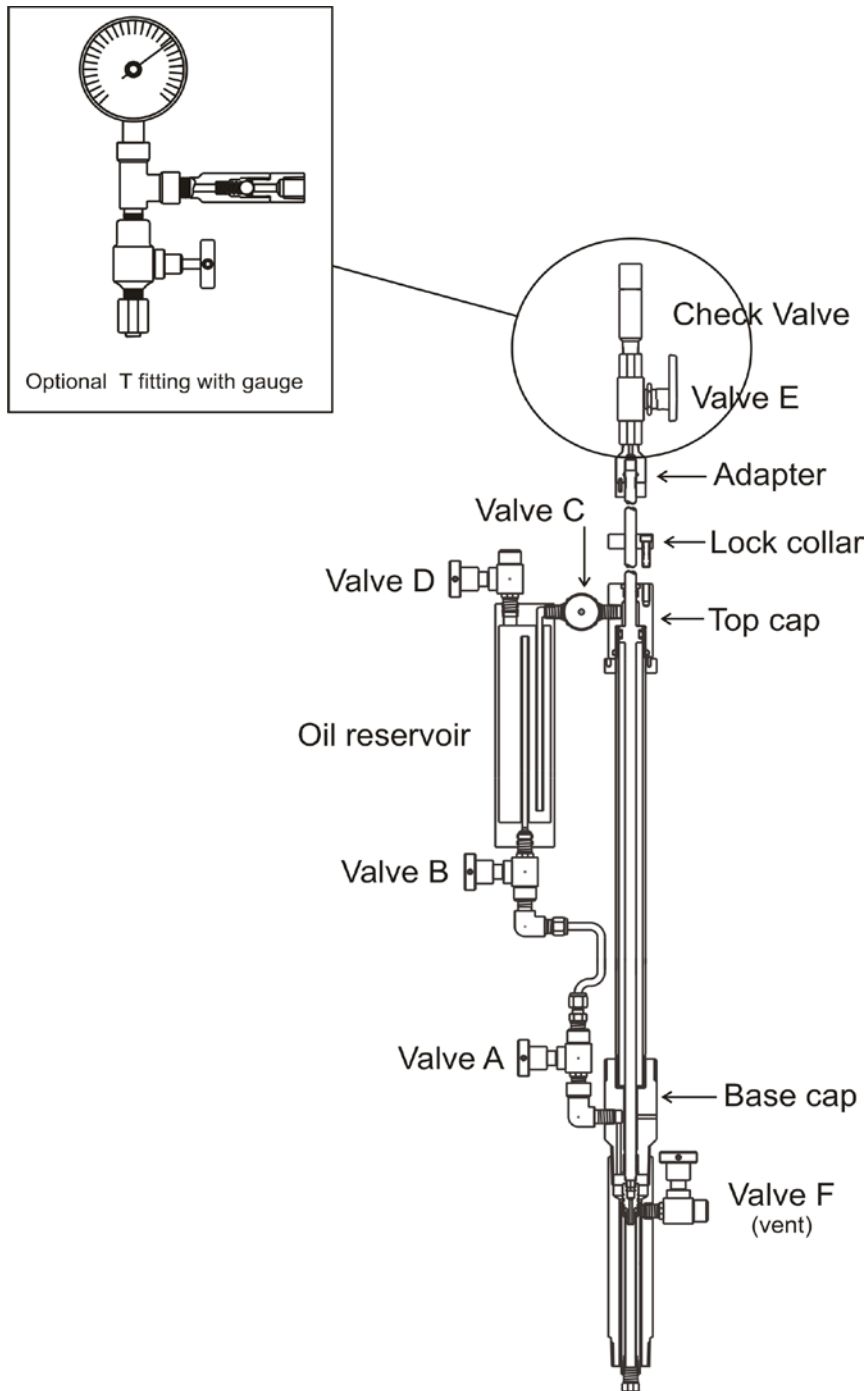


Figure 1

INSTALLATION & OPERATION

2. INSTALLATION INSTRUCTIONS

2.1 General

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

N NOTE

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

N NOTE

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

Recommended Tools

It would be advisable to have the following tools available for installation of the unit. However, tools used will vary depending on probe model.

- Measuring tape
- Small hex key set
- 6" adjustable wrench
- 10" adjustable wrench
- Flat blade screwdriver
- Permanent marker

2.2 Preparing for installation

2.2.1 *Determine the insertion length*

Before installing the probe into the pipeline, the length the insertion shaft will need to travel inside the pipeline must be determined. Measure from the top of the pipeline's isolation valve to the center $\frac{1}{3}$ of the pipeline (see Figure 2).

2.2.2 *Set the insertion length on the shaft*

Once the insertion length of the shaft is determined, this length should be measured on the shaft itself.

- a. Pull up on the shaft to make sure it's fully retracted.
- b. Begin at the top cap, and measure up on the shaft to the desired length.
- c. Mark this point on the shaft, as this is where the lock collar will be positioned.



Figure 2

2.2.3 *Position the lock collar*

- a. Loosen the two set screws in lock collar to the position noted in the previous step.
- b. Tighten the set screws.

INSTALLATION & OPERATION

2.2.4 *Connect an instrument air or auxiliary gas supply*

If the probe is injecting into a pipeline with toxic gas, you will need to use an alternative source for pressure.

- a. Detach the tubing between Valve B and Valve A (see Figure 1).
- b. Remove Valve A from the base cap of the probe.
- c. Plug the opening that is now in the base cap with a ¼" NPT plug.
- d. Connect the auxiliary gas supply to Valve B.

2.2.5 *If installing the unit horizontally, reposition the oil reservoir*

- a. Loosen and detach the tubing between Valve B and Valve A (see Figure 1).
- b. Loosen the screws in the clamp, and remove the clamp from the reservoir.
- c. Reposition the reservoir at a 90° angle, making sure Valve B is aimed downward.
- d. Measure a new piece of tubing to be connected from Valve A to Valve B.
- e. Replace the bolts and elbows onto the ends of the new tubing.
- f. Thread the new tubing to Valve A and Valve B.

2.3 Installing the unit

N NOTE

Make sure all of the unit's valves are closed prior to installation or removal.

2.3.1 Connect the unit to the pipeline via the pipeline isolation valve.

2.3.2 Make sure all the valves on the unit are closed.

2.3.3 **Slowly** open the pipeline isolation valve, and check for leaks. If you are using an auxiliary gas supply, open the supply valve.

2.3.4 Open Valves A and B on the unit to allow pipeline pressure to enter the oil reservoir.

! CAUTION

Valve D should always be closed when pipeline pressure is flowing through Valves A and B. Opening Valve D while pipeline pressure is flowing may cause the oil in the reservoir to erupt from the valve.

2.3.5 **Slowly** open Valve C, located between the oil reservoir and the top cap. The shaft will now begin to insert into the pipeline.

! CAUTION

Opening the valve too quickly may cause the shaft to insert harshly into the pipeline, possibly resulting in damage to the unit.

N NOTE

Once the shaft begins to move, there is no need to open the valve any further. This assures a slow and smooth insertion of the shaft into the pipeline.

2.3.6 Carefully rotate the shaft to align the lock collar and top cap so that the lock collar's screw can be inserted into the top cap (see Figure 3).



Figure 3

2.3.7 Tighten the lock collar screw.

2.3.8 Close Valves A, B, and C. Check for leaks.

2.3.9 Connect the appropriate instrumentation to the unit's check valve (Valve E, Figure 1).

2.3.10 Check the entire system for leaks.

2.3.11 The unit is now in service.

INSTALLATION & OPERATION

2.4 Helpful hints

- 2.4.1 Avoid rough handling of the unit and bending of the shaft. The shaft has a polished surface that travels through seals.
- 2.4.2 Operate the unit slowly and smoothly while inserting and retracting to avoid unnecessary slamming of the lock collar and/or the shaft piston located inside the unit.
- 2.4.3 The most common cause for repairs to an automatic insertion probe is due to the pipeline isolation valve closing on the shaft while it is still inserted into the pipeline. Please avoid this practice.
- 2.4.4 The entire unit should be treated with care.

2.5 Retracting the probe



CAUTION

Instrumentation attached to the unit must be shut down or disconnected prior to retracting.



NOTE

Before retracting the unit, note the pipeline pressure required for insertion.

Recommended Tools

It would be advisable to have the following tools available for retracting the unit; however, tools used will vary depending on probe model.

- Small hex key set
- 6" adjustable wrench
- 10" adjustable wrench
- Flat blade screwdriver

- 2.5.1 Make sure all valves are closed on the probe.



CAUTION

Do not yet close the pipeline isolation valve or auxiliary gas supply valve.

- 2.5.2 **Carefully** disconnect the tubing and instrumentation connected to the check valve, allowing any trapped pressure within the tubing to be released.
- 2.5.3 Loosen the lock collar screw in order to remove the lock collar from the top cap (see Figure 4). At this point, the shaft will remain inside the pipeline.

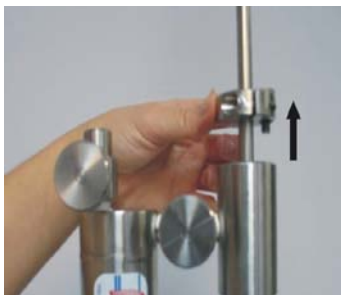


Figure 4

- 2.5.4 With Valve C closed, open Valve D. This will vent the air inside the oil reservoir into the atmosphere, relieving pressure on the shaft piston.



CAUTION

Valves A and B should always be closed when opening Valve D. Opening Valve D while pipeline pressure is flowing may cause the oil in the reservoir to erupt from the valve.

INSTALLATION & OPERATION

- 2.5.5 **Slowly** open Valve C to allow pressure to be relieved from the insertion shaft. The probe will now begin to retract from the pipeline.

N NOTE

Once the shaft begins to move, Valve C does not need to be opened any further. This assures a slow and smooth retraction of the probe.

- 2.5.6 When the probe has completely retracted from the pipeline, close the pipeline isolation valve, cutting off any pressure flowing into the unit.
- 2.5.7 If you are using instrument air or an auxiliary gas supply, close the supply valve.
- 2.5.8 With Valves A and B closed, open valve F to relieve pressure inside the extension sleeve of the probe.
- 2.5.9 Close Valve F.
- 2.5.10 Vent excess pressure in the unit by opening valve E.

N NOTE

If pressure does not stop venting from one or more of the unit's valves, the pipeline isolation valve is possibly leaking.

- 2.5.11 Remove the unit from the pipeline isolation valve.
- 2.5.12 If you are using instrument air or an auxiliary gas supply, disconnect and remove the unit from the supply.
- 2.5.13 The unit is now ready for maintenance or to be moved to another location.

MAINTENANCE

3. MAINTENANCE INSTRUCTIONS

3.1 General

Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit handy for the system in case of unexpected wear or faulty seals. All maintenance and cleaning of the unit should be done on a smooth, clean surface.

N NOTE

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.

N NOTE

Maintenance on the extension assembly, located at the bottom of the probe, can be performed without disassembling the entire unit.

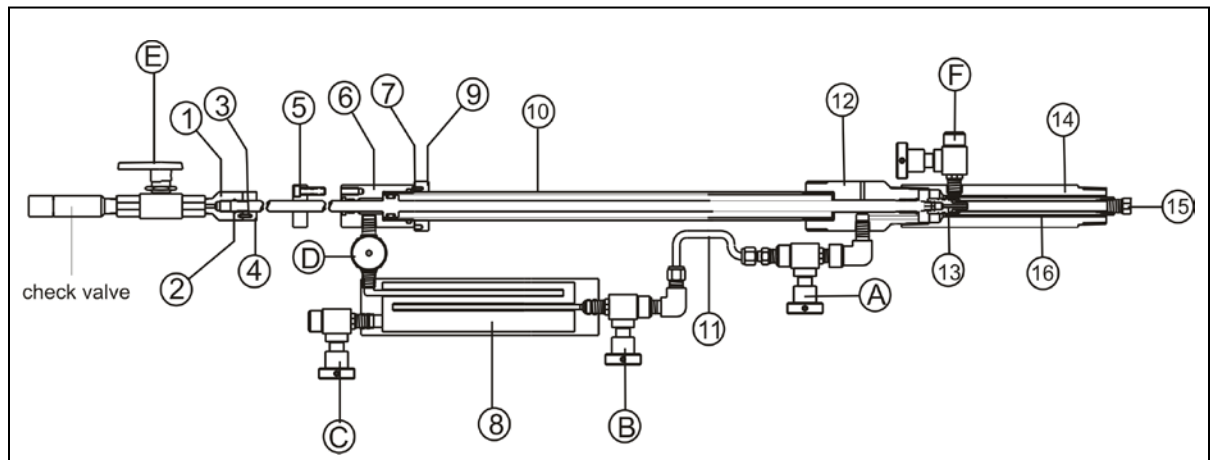


Figure 5

Refer to this Figure throughout the entire maintenance process.

Recommended Tools

It would be advisable to have the following tools available for maintenance of the unit; however, tools used will vary depending on probe model.

- Small hex key set
- 6" adjustable wrench
- 10" adjustable wrench
- 10" channel lock pliers
- Fine grit sandpaper
- Flat blade screwdriver

MAINTENANCE

3.2 Disassembly

- 3.2.1 Close Valve E.
- 3.2.2 Shut down and remove any instrumentation attached to the unit.
- 3.2.3 Close Valves B, C, and D on the oil reservoir (Part 8) and Valve A on the base (Part 11).
- 3.2.4 Disconnect the tubing (Part 10) between Valves A and B.
- 3.2.5 Loosen the screws in the oil reservoir's clamp and remove the clamp from the reservoir (Part 8).
- 3.2.6 Use an adjustable wrench on the body of Valve C to remove the oil reservoir from the top cap (Part 6).
- 3.2.7 Remove the check valve from Valve E.
- 3.2.8 Loosen and remove Valve E from the adapter (Part 1).
- 3.2.9 Loosen the screw in the adapter's collar (Part 4) and slide the collar off the adapter, removing the pin (Part 3).
- 3.2.10 Unscrew the adapter from the shaft.
- 3.2.11 Loosen the set screws in the lock collar (Part 5) and slide the collar off the shaft.
- 3.2.12 Loosen the screw in the top cap's collar (Part 9) and slide the collar off the top cap (Part 6), removing the pin (Part 7).
- 3.2.13 Unscrew the top cap from the cylinder (Part 10), and **carefully** slide the cap off the shaft.



CAUTION

Sliding the cap off the shaft too quickly can cause damage to the shaft.

- 3.2.14 Mark the bottom end of the cylinder for reassembly.



NOTE

The bottom end has a vent hole.

- 3.2.15 Carefully pull the shaft out of the cylinder.
- 3.2.16 Unscrew the base cap (Part 12) and slide it off the cylinder.

3.3 Maintenance

- 3.3.1 Examine the inner surface of the cylinder for a smooth finish. If there are any pits or major scratches, the seals will leak. Call Welker for service options.
- 3.3.2 Examine the outer surface of the cylinder for a smooth finish.
- 3.3.3 Remove and replace the seal (Part 2) in the adapter.
- 3.3.4 Use a pick or a small knife to remove and replace the backups and seals (Parts 23, 24, 17, 18, 19, and 20) in the base and top caps (see Figure 6 and Figure 7).

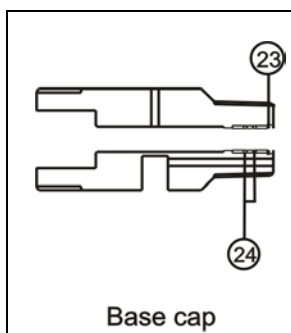


Figure 6

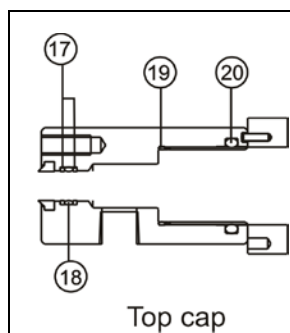


Figure 7

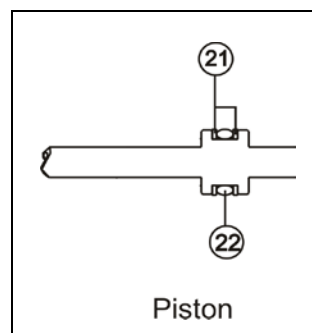


Figure 8

MAINTENANCE

- 3.3.5 Remove and replace the backup (Part 21) and seal (Part 22) on the shaft piston (see Figure 8).



Do not dig into the metal surfaces of the parts when removing O-rings from the O-ring grooves. Scratching the sealing surface can result in a leak. If necessary, dig into the O-ring and replace it during reassembly. If the sealing surface becomes damaged, use a 600-grit wet sand paper strip to smooth the surface and then clean it.



New seals supplied in spare parts kits are not lubricated. They should be lightly coated with lubrication grease (Dow Corning 111 [DC 111] grease or equivalent lubricant) before they are installed into the equipment. This helps with 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 the shaft or cylinder inner diameters to allow smooth transition of parts.

- 3.3.6 *Adding oil to the oil reservoir*

The unit is shipped from the factory with the necessary oil volume. If oil is needed, remove Valve D and add oil until the reservoir is $\frac{3}{4}$ full. Replace Valve D.



Oil can be added while the unit is still assembled and attached to a pipeline. To do so, depressurize the assembly and make sure Valve B is closed before removing Valve D.



If oil needs to be added, it may be due to a leak in the unit.

3.4 Extension assembly maintenance

- 3.4.1 Remove the extension sleeve (Part 14) from the base cap (Part 12).
- 3.4.2 Unscrew the hex plug (Part 15) from the diffusing tube (Part 16).
- 3.4.3 Unscrew the diffusing tube from the base cap.
- 3.4.4 Remove the adapter (Part 1) from the base cap and replace the O-ring (Part 2) in the adapter. The braided nylon wick is attached to the adapter.
- 3.4.5 Inspect the nylon wick for excessive wear or deterioration. Replace if necessary.
- 3.4.6 Reattach the adapter with braided nylon wick to the base cap.
- 3.4.7 Reattach the diffusing tube.
- 3.4.8 Reattach the hex plug to the diffusing tube.
- 3.4.9 Reattach the extension sleeve to the base cap.

3.5 Reassembly

- 3.5.1 Coat the inside-top end of the cylinder with Dow 111 and reinsert the shaft into the cylinder approximately halfway.



The threaded end of the shaft and the top end of the cylinder should be on the same side.

MAINTENANCE

3.5.2 Securely thread the base cap (Part 12) onto the cylinder.

N NOTE

The cylinder has a tapered end and a flat end. The base cap should be threaded onto the flat end.

3.5.3 Slide the top cap collar (Part 4) onto the cylinder and thread the top cap (Part 1) onto the cylinder securely.

3.5.4 Replace the pin in the top cap's collar, and attach the collar to the cap.

3.5.5 Reattach the oil reservoir to Valve C.

3.5.6 Replace the reservoir's clamp onto the reservoir and cylinder. Tighten the screws on the clamp.

3.5.7 Connect the tubing on Valve A to Valve B.

3.5.8 Slide the lock collar (Part 5) onto the shaft and tighten the set screws to hold the collar in place.

3.5.9 Reattach the check valve to the shaft.

3.5.10 Thread Valve E onto the adapter.

3.5.11 Reattach the check valve to Valve E.

3.5.12 Maintenance is now complete. Refer to Sections 2.2 and 2.3 for reinstallation instructions.

TROUBLESHOOTING

4. Troubleshooting guide

The following is a troubleshooting table of issues most commonly associated with the Welker Automatic Insertion Probe models. If you are having a problem that is not listed, or if the solution provided does not repair the problem, please call Welker for service options.

Table 2

PROBLEM	POSSIBLE CAUSE	SOLUTION
The shaft doesn't insert or retract smoothly.	Air may be trapped in the oil reservoir, or the reservoir may need oil.	Check to make sure the oil reservoir is $\frac{3}{4}$ full; vent any air trapped in the reservoir. <i>See step six in Section 3.3.</i> <i>See step four in Section 2.5.</i>
The oil reservoir needs to be refilled often.	Oil may be leaking past the piston seal.	Replace the piston seal, and reassemble the probe. <i>See step five in Section 3.3.</i> <i>See Section 3.2 and 3.5.</i>
Pipeline or process pressure is leaking from the base cap's vent hole.	Seals in the base cap are leaking.	Replace the seals. <i>See step three in Section 3.3.3.</i>
The probe will not retract from the pipeline.	<ul style="list-style-type: none"> • There may not be enough pressure in the pipeline to eject the probe. • The probe is bent inside the pipeline, possibly due to pipeline velocity or the isolation valve closing on the shaft while the shaft is still inserted in the pipeline. 	<ul style="list-style-type: none"> • Gently pull up on the shaft until it begins to retract. • The unit will need to be repaired or replaced. Call Welker for service options.



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