



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER PROBE MOUNTED LIQUID ELIMINATOR
WITH AI CONTROL™

MODEL
LE-2SSK0AI

DRAWING NUMBER
AD691BT

MANUAL NUMBER
IOM-154

REVISION
Rev. A, 8/15/2017

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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 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 Probe Mounted Liquid Eliminator, LE-2SSKOAI. 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 Probe Mounted Liquid Eliminator 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 Probe Mounted Liquid Eliminator, 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 may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker *LE-2SSKOAI* Probe Mounted Liquid Eliminator is designed to remove entrained liquids, condensed hydrocarbons, glycol, and amines from gas samples, ensuring the collection of representative samples and protecting analyzers from damage and contamination.

Pipeline product enters the LE-2SSKOAI through the probe. The gas stream passes through the LE-2SSKO subassembly to the sample outlet, but any liquids present are separated from the sample stream by centrifugal flow, a copolymer filter element, and a screen and then returned to the pipeline through the stinger.

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

Welker may custom design the LE-2SSKOAI 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 LE-2SSKOAI 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



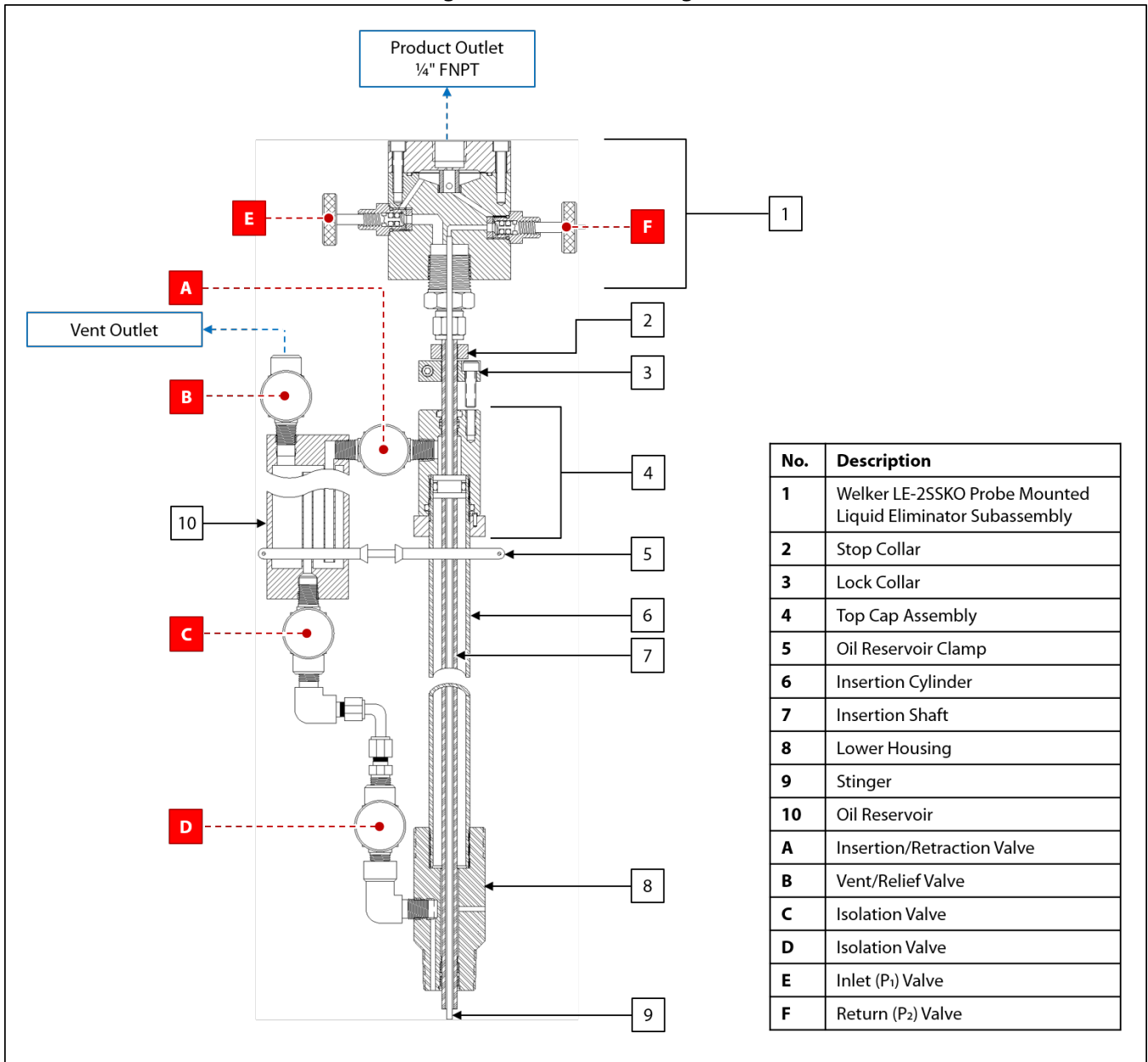
The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: LE-2SSKOAI Specifications

| | | |
|---|--|--|
| Products Sampled | Gases Compatible With the Materials of Construction | |
| Materials of Construction | 304 Stainless Steel, 316/316L Stainless Steel, Delrin®, PTFE, and Viton® | |
| Maximum Allowable Operating Pressure | 1440 psig @ -20 °F to 100 °F (99 barg @ -28 °C to 37 °C) | |
| Pipeline Connection | NPT 3" | Flanged Size: 3" Rating: 150 ANSI |
| Insertion Length | 0–18" (0–45 cm) 0–24" (0–60 cm) 0–30" (0–76 cm) 0–36" (0–91 cm) 0–42" (0–106 cm) | |
| Filter Media | 25 Micron Copolymer Filter Element 304 Stainless Steel Mesh Screen | |
| Features | AI Control™ Double Block and Bleed Valves | |

1.5 Equipment Diagram

Figure 1: LE-2SSKOAI Diagram



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.



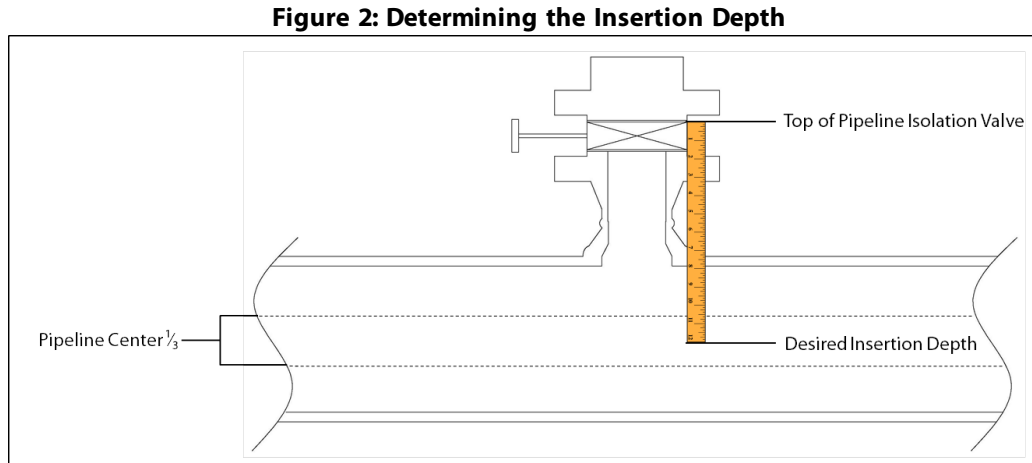
When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

1. A sample probe is recommended to extract sample from the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield a representative sample.
2. Welker recommends that the unit be installed in the top of the pipe.
3. Handle the unit with care. Avoid bending and scratching the insertion shaft, which has a polished surface that travels through seals.
4. Operate the unit slowly and smoothly while inserting and retracting to avoid damaging the unit.
5. 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 LE-2SSKOAI 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 ($\frac{1}{3}$) of the pipeline) (Figure 2). This will be the shaft insertion length.



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.

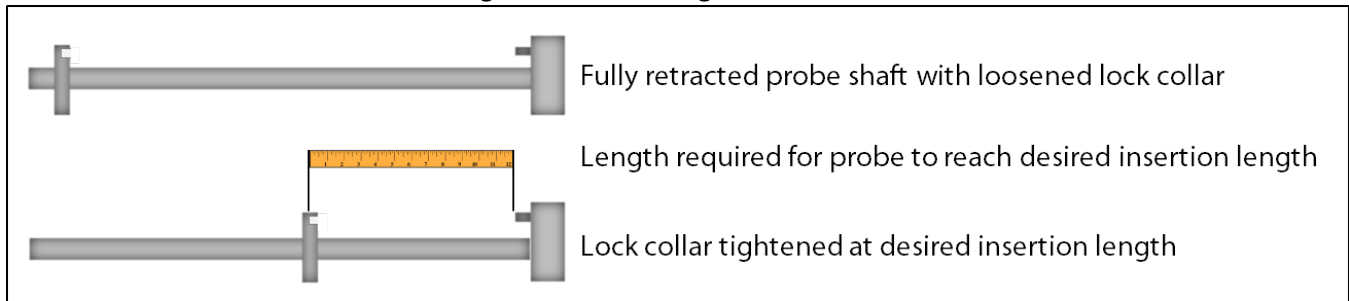


The oil reservoir may need to be relieved of pressure to fully retract the insertion shaft. To relieve pressure in the oil reservoir, open insertion/retraction valve A and vent/relief valve B.

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 3: Positioning the Lock Collar



4. As necessary, loosen the setscrew in the stop collar, and then move the stop collar along the insertion shaft.
5. Remove the lockdown bolt from the top of the lock collar.
6. Loosen the cap screw on the side of the lock collar.
7. Carefully slide the lock collar along the insertion shaft to the desired insertion length, taking care not to scratch the insertion shaft (Figure 3).
8. Tighten the cap screw on the side of the lock collar to secure the lock collar to the insertion shaft at the marked point (Figure 3).



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

9. If the oil reservoir needs to be rotated, continue to step 10. If the oil reservoir does not need to be rotated, proceed to Section 2.3, *Installing the LE-2SSKOAI*.

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.

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

2.3 Installing the LE-2SSKOAI



Ensure that the operating pressure of the pipeline does not exceed the MAOP of 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 may lead to loss of integrity of the sealing surface.



Installation procedures apply to vertical and horizontal installation. Note that 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.

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.

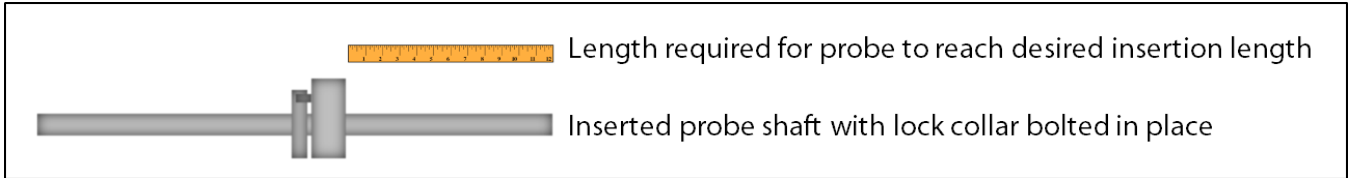
1. Ensure that all valves on the unit are closed.
2. Detach the tubing between isolation valves C and D (*Figure 1*).
3. Plug isolation valve D.
4. Connect a customer-supplied auxiliary gas supply to isolation valve C.
5. Install the unit to the pipeline isolation valve.
6. Connect vent/relief valve B to a customer-supplied recovery system (*Figure 1*). 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 may cause the insertion shaft to insert into the pipeline too quickly and may 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 4*).

Figure 4: Locking the Lock Collar



12. As necessary, place the stop collar at the top of the lock collar, and then tighten the setscrew in the stop collar to secure it to the insertion shaft.
13. 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.
14. Disconnect the customer-supplied auxiliary gas supply from isolation valve C.
15. Proceed to step 26 for start-up procedures.

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*). 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.



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 may cause the insertion shaft to insert into the pipeline too quickly and may result in damage to the unit.

22. Once the lock collar reaches the top cap, close isolation valves C and D.
23. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar (*Figure 4*).
24. As necessary, place the stop collar at the top of the lock collar, and then tighten the setscrew in the stop collar to secure it to the insertion shaft.
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.

Start-Up Procedures

26. Install customer-supplied tubing or other fittings to the outlet port of the LE-2SSKOAI (*Figure 1*). Check for leaks and repair as necessary.
27. Ensure that the cap screws on the top of the LE-2SSKO subassembly are firmly tightened (*Figure 1*).
28. Open inlet (P₁) valve E and return (P₂) valve F (*Figure 1*).
29. The LE-2SSKOAI is now operational.

2.4 Retracting the LE-2SSKOAI

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 21.

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. Loosen the setscrew in the side of the stop collar, and then move the stop collar out of the way of the lock collar.
11. Loosen the lockdown bolt in the top of the lock collar.



DO NOT continue loosening the lockdown bolt if the insertion shaft begins to retract. Retraction of the shaft at this time is an indication of inadequate pressure on the internal shaft piston. Apply additional pressure to the internal shaft piston before proceeding.

12. As necessary, open insertion/retraction valve A, and then slowly open isolation valve C to apply additional auxiliary pressure to the internal shaft piston.
13. Continue loosening the lockdown bolt in the top of the lock collar. If the shaft does not begin to retract, remove the lockdown bolt. If the shaft begins to retract, apply additional auxiliary pressure to the internal shaft piston before proceeding.
14. 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 may cause the insertion shaft to retract from the pipeline too quickly and may 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.

15. 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.
16. Disconnect the customer-supplied auxiliary gas supply from isolation valve C.
17. 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.



Opening isolation valve D will relieve the lower housing of trapped pipeline product. Take the necessary precautions and wear appropriate personal protective equipment (PPE) to protect from potential harm caused by exposure to the pipeline product.

18. 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 may indicate leakage from the pipeline isolation valve. The operator should consult an on-site safety engineer.

19. 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.
20. Place the stop collar at the top of the lock collar, and then tighten the setscrew in the stop collar to secure it to the insertion shaft.

Using Pipeline Product (If Not Using an Auxiliary Gas)

21. 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.

22. Close insertion/retraction valve A and isolation valves C and D.
23. Loosen the setscrew in the side of the stop collar, and then move the stop collar out of the way of the lock collar.
24. Loosen the lockdown bolt in the top of the lock collar.



DO NOT continue loosening the lockdown bolt if the insertion shaft begins to retract. Retraction of the shaft at this time is an indication of inadequate pressure on the internal shaft piston. Apply additional pressure to the internal shaft piston before proceeding.

25. As necessary, open insertion/retraction valve A, and then slowly open isolation valve C to apply additional pipeline pressure to the internal shaft piston.
26. Continue loosening the lockdown bolt in the top of the lock collar. If the shaft does not begin to retract, remove the lockdown bolt. If the shaft begins to retract, apply additional pipeline pressure to the internal shaft piston before proceeding.
27. 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 may cause the insertion shaft to retract from the pipeline too quickly and may 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.

28. 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.
29. 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 may indicate leakage from the pipeline isolation valve. The operator should consult an on-site safety engineer.

30. 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.
31. Place the stop collar at the top of the lock collar, and then tighten the setscrew in the stop collar to secure it to the insertion shaft.

3.1 Before You Begin

1. **Welker recommends that the unit have standard maintenance every six (6) months under normal operating conditions and any time liquid is present in the copolymer filter element or at the product outlet.** 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 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 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 may vary by model.
 - a. Hex Key Set
 - b. Seal Pick
 - c. Small Adjustable Wrench

3.2 Maintenance

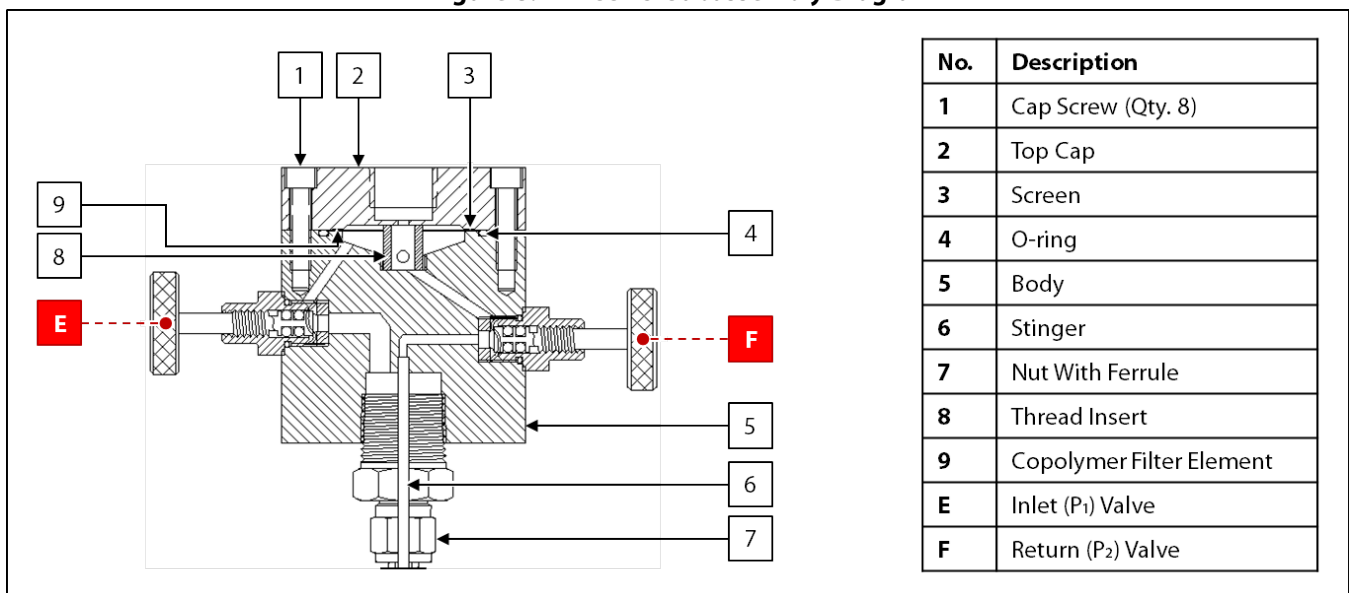
1. Prior to maintenance, the unit must be removed from the pipeline. See *Section 2.4, Retracting the LE-2SSKOAI*, for instructions on retracting the insertion shaft and removing the unit from the pipeline.
2. Once the unit is removed from the pipeline, ensure that all valves are closed.

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. Set the oil reservoir aside.

LE-2SSKO Subassembly Maintenance

Figure 5: LE-2SSKO Subassembly Diagram



7. Unscrew the LE-2SSKO subassembly from the insertion shaft. Note that the long stinger will be removed from the insertion shaft at this time.
8. Unscrew the eight (8) cap screws in the top cap, and then remove the top cap.
9. Remove the screen.
10. Remove the O-ring from the body.
11. Remove the copolymer filter element.
12. Use a solvent to clean the screen and the inside of the body.

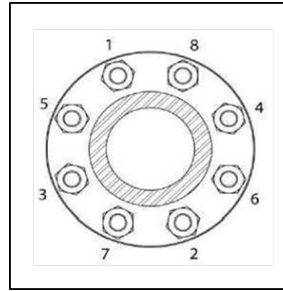


Welker recommends using a solvent, such as rubbing alcohol, that does not leave a film when dry and will not adversely affect analytical instrument results.

13. Replace the copolymer filter element.
14. Replace the O-ring.

15. Return the cleaned screen to the top of the copolymer filter element.
16. Align the top cap with the body, and then reinstall the cap screws following a cross-bolting sequence (*Figure 6*).

Figure 6: Cross-Bolting Sequence



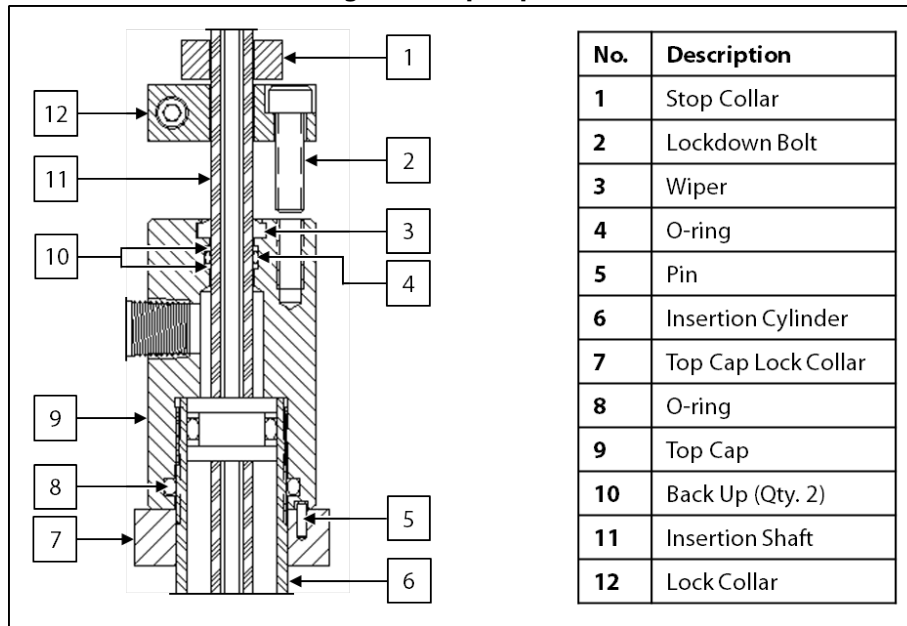
17. As necessary, tighten all cap screws to the correct torque (*Table 2*).

| Table 2: Torque Specifications for Cap Screws | | |
|--|----------------------------|---------------------------|
| Cap Screw Diameter & Threads per Inch | Inch-Pounds (in•lb) | Newton Meter (N m) |
| 1/4" – 20 | 78 | 8 |
| 3/8" – 16 | 247 | 27 |

18. If maintenance is only required on the LE-2SSKO subassembly, maintenance is now complete; return the LE-2SSKO subassembly to the insertion shaft. If maintenance is required on the rest of the unit, continue to step 19.
19. Loosen the nut on the insertion shaft.
20. Using tubing cutters, cut the insertion shaft below the crimp made by the ferrule inside the nut.
21. File the burr left by the tubing cutters and lightly sand the area.

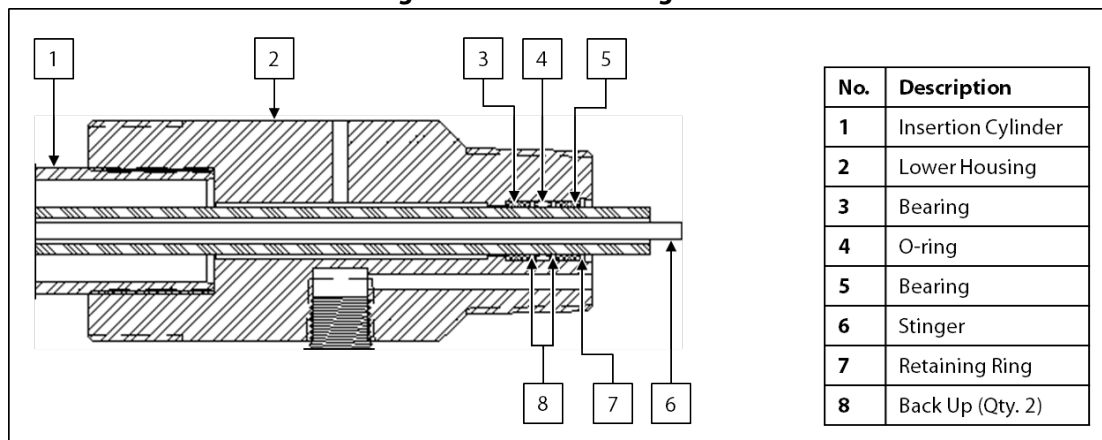
Top Cap and Lower Housing Maintenance

Figure 7: Top Cap Detail



22. Loosen the setscrew in the stop collar, and then remove the stop collar from the insertion shaft.
23. Loosen and remove the lock collar from the insertion shaft.
24. Loosen the cap screw in the top cap lock collar.
25. Unscrew the top cap from the insertion cylinder, taking care not to scratch the insertion shaft.
26. 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.
27. As necessary, clean the top cap.
28. Replace the back ups, O-rings, and wiper in the top cap.
29. Assemble the top cap assembly by aligning the pin in the top cap lock collar with the pin hole in the top cap.

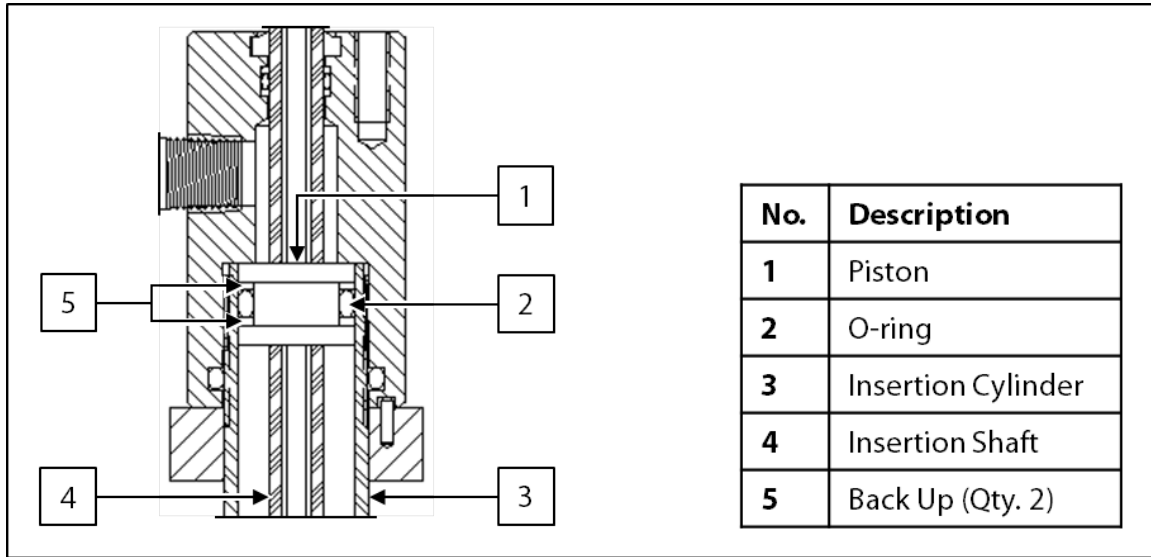
Figure 8: Lower Housing Detail



30. Carefully slide the insertion shaft out of the lower housing.
31. Unscrew the insertion cylinder from the lower housing.
32. Replace the bearings, O-ring, back ups, and retaining ring in the lower housing.

Shaft and Cylinder Maintenance

Figure 9: Shaft Detail



33. Remove the insertion shaft from the insertion cylinder.
34. Replace the O-ring and back ups on the piston.
35. Closely inspect the polished outer diameter of the insertion shaft. Scratches or pits may cause the seals to leak. If scratches or pits are present, the unit may need to be repaired or replaced. Contact Welker for service options.
36. Closely inspect the honed inner diameter of the insertion cylinder for scratches or damage. Scratches or pits may cause the seals to leak. If scratches or pits are present, the unit may need to be repaired or replaced. Contact Welker for service options.

Reassembly

37. Coat the inside of the top end of the insertion cylinder with lubricant, and 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.

38. Liberally lubricate the insertion shaft.
39. Screw the lower housing onto the tapered end of the insertion cylinder.
40. Carefully slide the top cap assembly onto the top end of the insertion shaft and down to the insertion cylinder.
41. Screw the top cap assembly onto the insertion cylinder, and then tighten the cap screw in the side of the top cap lock collar to hold the collar in place.
42. Install the lock collar to the top of the insertion shaft.
43. Install the stop collar to the top of the insertion shaft, and then tighten the setscrew in the stop collar to secure it to the insertion shaft.
44. Move the insertion shaft up and down in the insertion cylinder. If the shaft does not move smoothly, check for damage or incorrect installation. Continuous wear on the insertion shaft may damage the surface finish.
45. Slide a new ferrule onto the insertion shaft, and then return the nut to the shaft.
46. Screw the LE-2SSKO subassembly onto the insertion shaft.
47. Fully retract the insertion shaft.
48. Prepare the oil reservoir for reattachment by wrapping the valve threads with PTFE tape or coating them with pipe dope.
49. If pipeline pressure will be used to install the unit to the pipeline, reconnect the tubing between isolation valves C and D.
50. Reconnect the oil reservoir to the top cap at insertion/retraction valve A.
51. Attach the oil reservoir to the unit. Mount the bracket around the insertion cylinder and secure it with the nut and screw.
52. The unit is now ready for installation. See *Section 2.2, Preparing the LE-2SSKOAI for Installation*, and *Section 2.3, Installing the LE-2SSKOAI*, for instructions on correctly installing the unit to the pipeline.



Check valves for leaks and repair as necessary during reinstallation.

3.3 Troubleshooting

| Table 3: LE-2SSKOAI Troubleshooting | | |
|---|--|---|
| Issues | Possible Causes | Solutions |
| The insertion shaft does not insert or retract smoothly. | <p>Air may be trapped in the oil reservoir.</p> <p>There may not be enough oil in the oil reservoir.</p> | <p>Slowly open vent/relief valve B to vent any air trapped in the oil reservoir to the atmosphere.</p> <p>Remove vent/relief valve B. Add oil to the oil reservoir until the reservoir is three-quarters ($\frac{3}{4}$) full. Install vent/relief valve B to the oil reservoir.</p> |
| Oil needs to be added to the oil reservoir often. | Oil may be leaking past the insertion shaft piston O-ring. | Replace the O-ring on the insertion shaft piston. See <i>Section 3.2, Maintenance</i> , for instructions. |
| Pipeline pressure is leaking from the vent hole. | The seals in the lower housing are leaking. | Replace the seals in the lower housing. See <i>Section 3.2, Maintenance</i> , for instructions. |
| The insertion shaft will not retract from the pipeline. | <p>Pipeline pressure may not be high enough to retract the insertion shaft.</p> <p>The insertion shaft is bent or damaged inside the pipeline.</p> | <p>Carefully pull up on the insertion shaft until it begins to retract.</p> <p>Contact Welker for service options.</p> |

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:

- None

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD691BT

