



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER PROBE MOUNTED LIQUID ELIMINATOR WITH HEATED REGULATOR

MODEL
LE-2SSK0HR

DRAWING NUMBER
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MANUAL NUMBER
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TABLE OF CONTENTS

	SAFETY	3
1.	PRODUCT INFORMATION	4
1.1	Introduction	4
1.2	Product Description	4
1.3	Specifications	5
1.4	Equipment Diagrams	6
2.	INSTALLATION & OPERATION	9
2.1	Before You Begin	9
2.2	Installation and Operation	9
3.	MAINTENANCE	13
3.1	Before You Begin	13
3.2	Maintenance	14
3.3	Heater Failure	20
3.4	Troubleshooting	23
	APPENDIX	24
	A: Referenced or Attached Documents	24

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 With Heated Regulator, LE-2SSKOHHR. 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 With Heated Regulator is of a mechanical and electrical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Probe Mounted Liquid Eliminator With Heated Regulator, 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-2SSKOHR* Probe Mounted Liquid Eliminator With Heated Regulator is designed to remove free liquids, condensed hydrocarbons, glycol, and amines from and reduce the pressure of gas samples, ensuring the collection of representative samples of the natural gas at flowing conditions and protecting analyzers from damage and contamination. The Welker *HR-4SS* Heated Instrument Regulator ensures an adequate output pressure for instrumentation unable to sustain high pressures is provided, and it prevents temperature and pressure drops that can compromise the composition of the product.

Pipeline product enters the *LE-2SSKOHR* through the probe. As the gas stream passes through the *LE-2SSKOHR* to the sample outlet, the *HR-4SS* reduces the pressure of the gas to the desired output pressure, but any pre-regulated free liquids in the sample stream are separated by a screen and copolymer filter element and returned to the pipeline through the stinger.

Welker may custom design the LE-2SSKOHR to suit the particular application and specifications of each customer.

1.3 Specifications



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

Table 1: LE-2SSKOHHR Specifications

Products Sampled	Gases Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel, PTFE, Teflon®, Viton®
Maximum Allowable Operating Pressure	2160 psig @ -20 °F to 120 °F (148 barg @ -28 °C to 48 °C)
Outlet Connection	¼" FNPT
Pipeline Connection	No NPT ½" MNPT ¾" MNPT 1" MNPT
Output Range	0–25 psig (0–1.7 barg) 0–50 psig (0–3.4 barg) 20–100 psig (1.3–6.8 barg) 75–200 psig (5.1–13.7 barg)
Insertion Length	8" (20.3 cm) (Standard) Others Available
Electrical Connections	Thermostat: AC 120 V, ¾" FNPT
Filtration	Nominal 25 Micron Copolymer Filter Element
Features	Pre-Set Relief Welker HR-4SS Heated Instrument Regulator Welker LE-2SSKO Probe Mounted Liquid Eliminator
Industry Standards	API 14.1 GPA-2166 ISO-10715
Patents	U.S. Patent 6,764,536 and 6,818,045
Option	Pressure Gauge and Relief

1.4 Equipment Diagrams

Figure 1: LE-2SSKOHR Connections Diagram

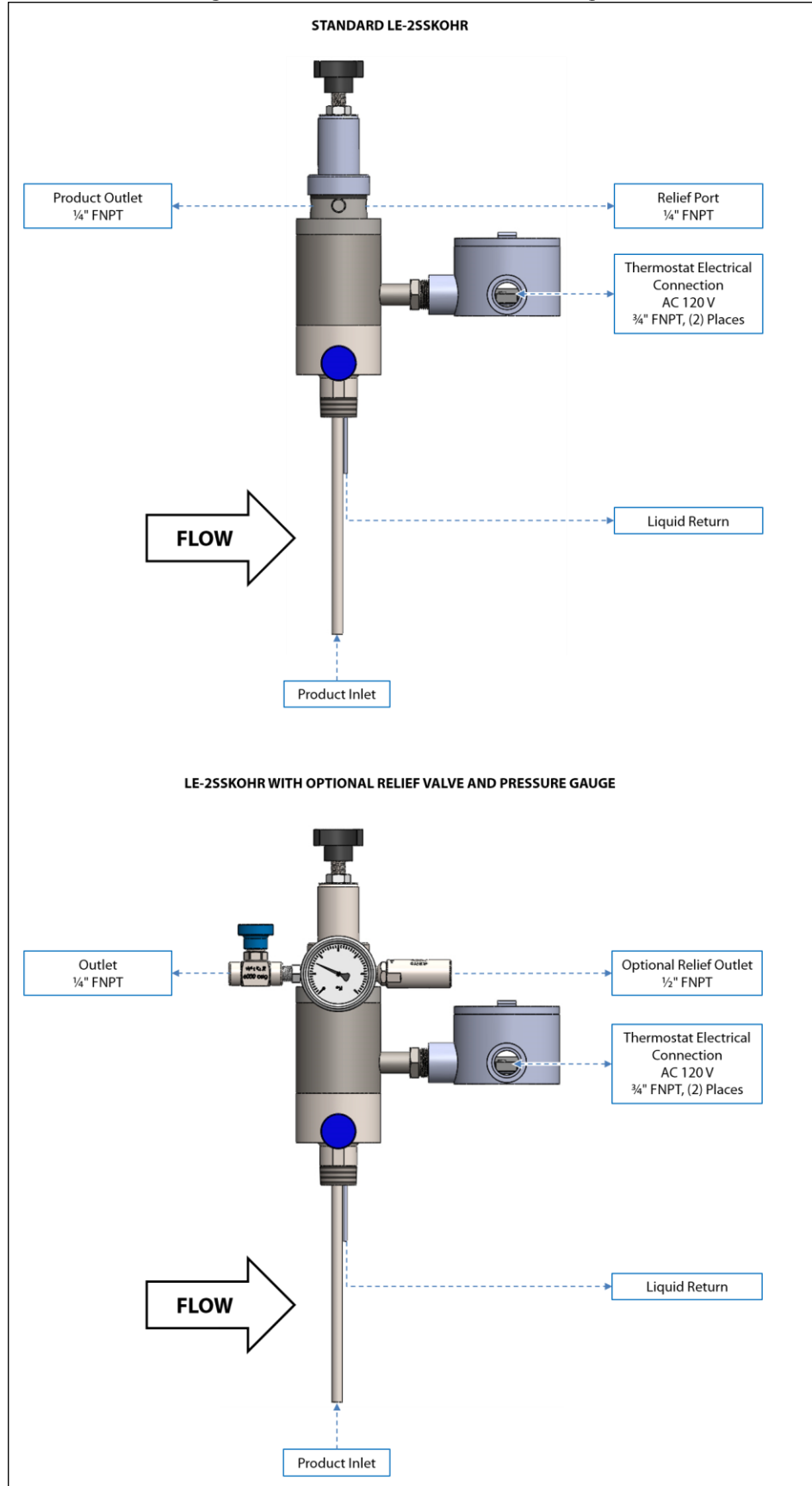


Figure 2: LE-2SSKOHR Diagram

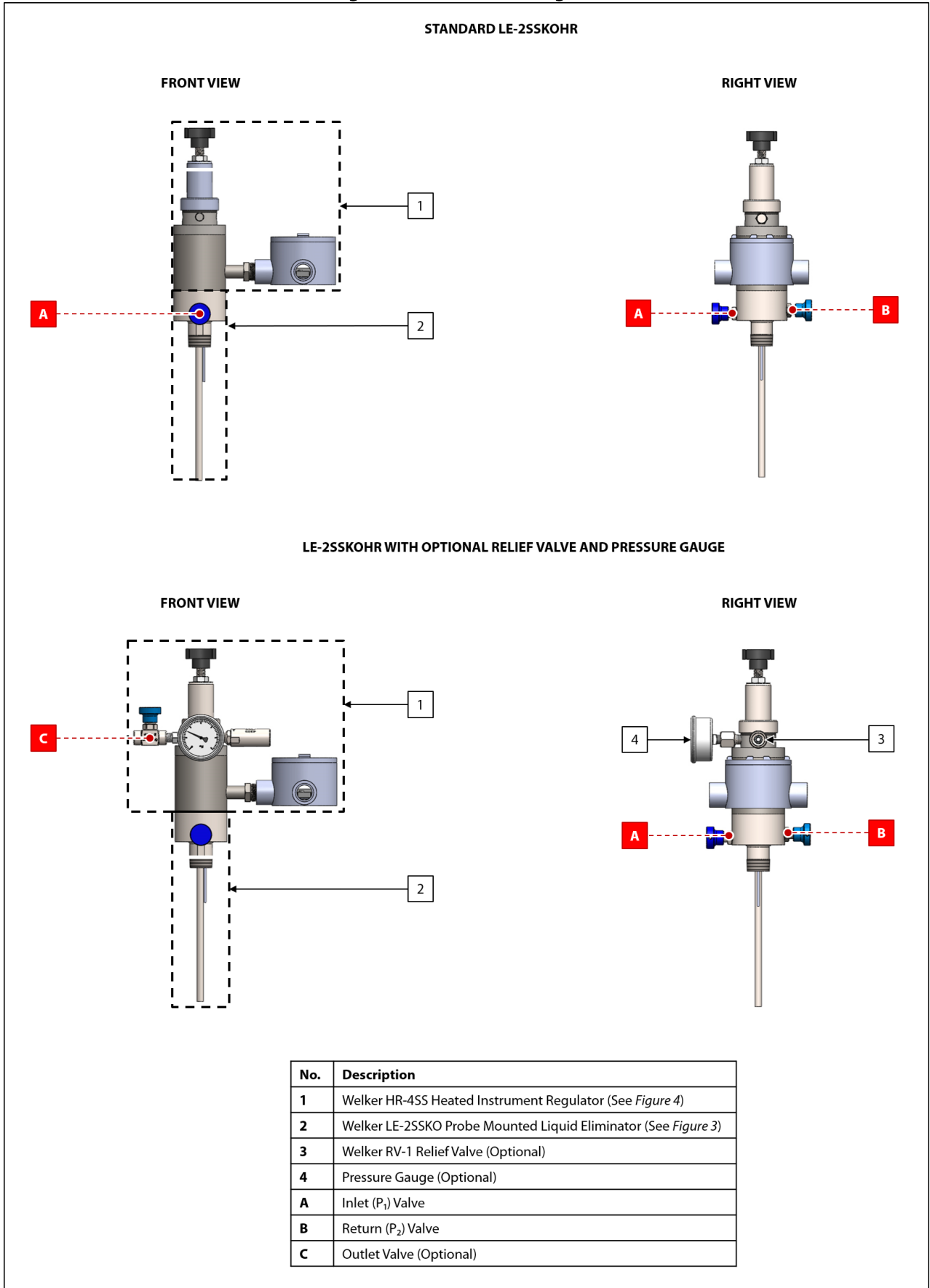


Figure 3: Welker LE-2SSKO Probe Mounted Liquid Eliminator Diagram

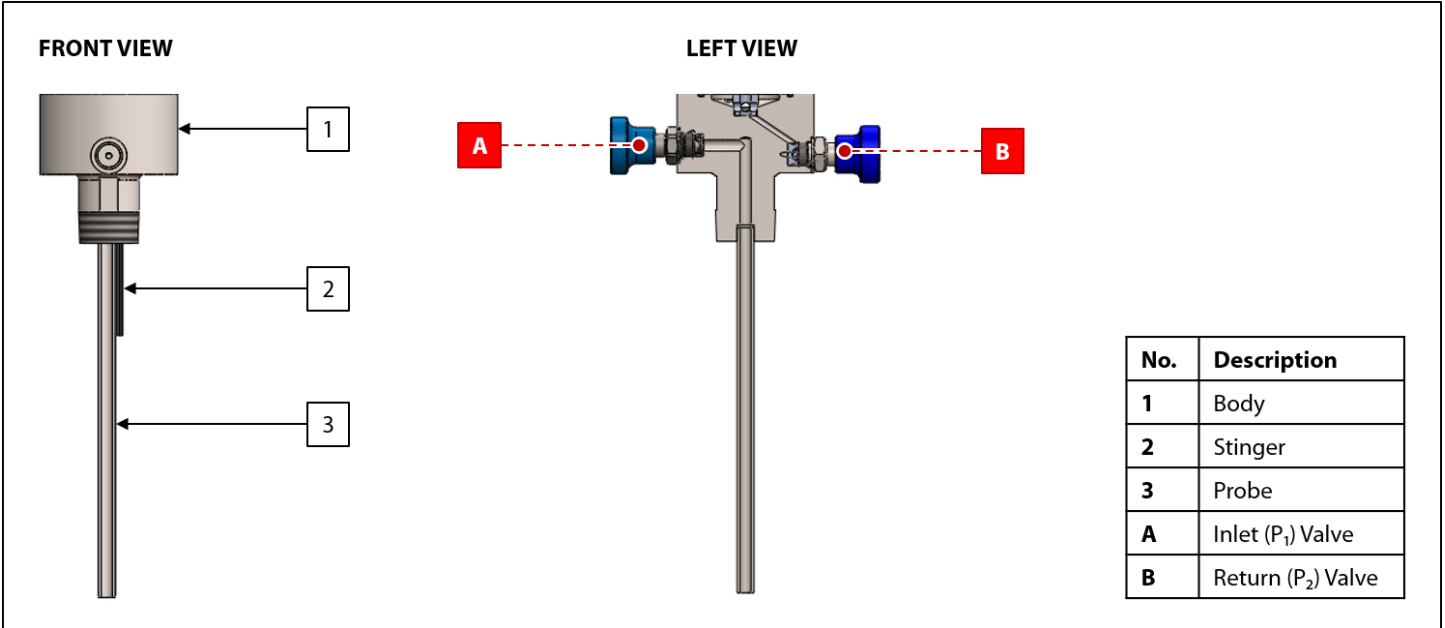
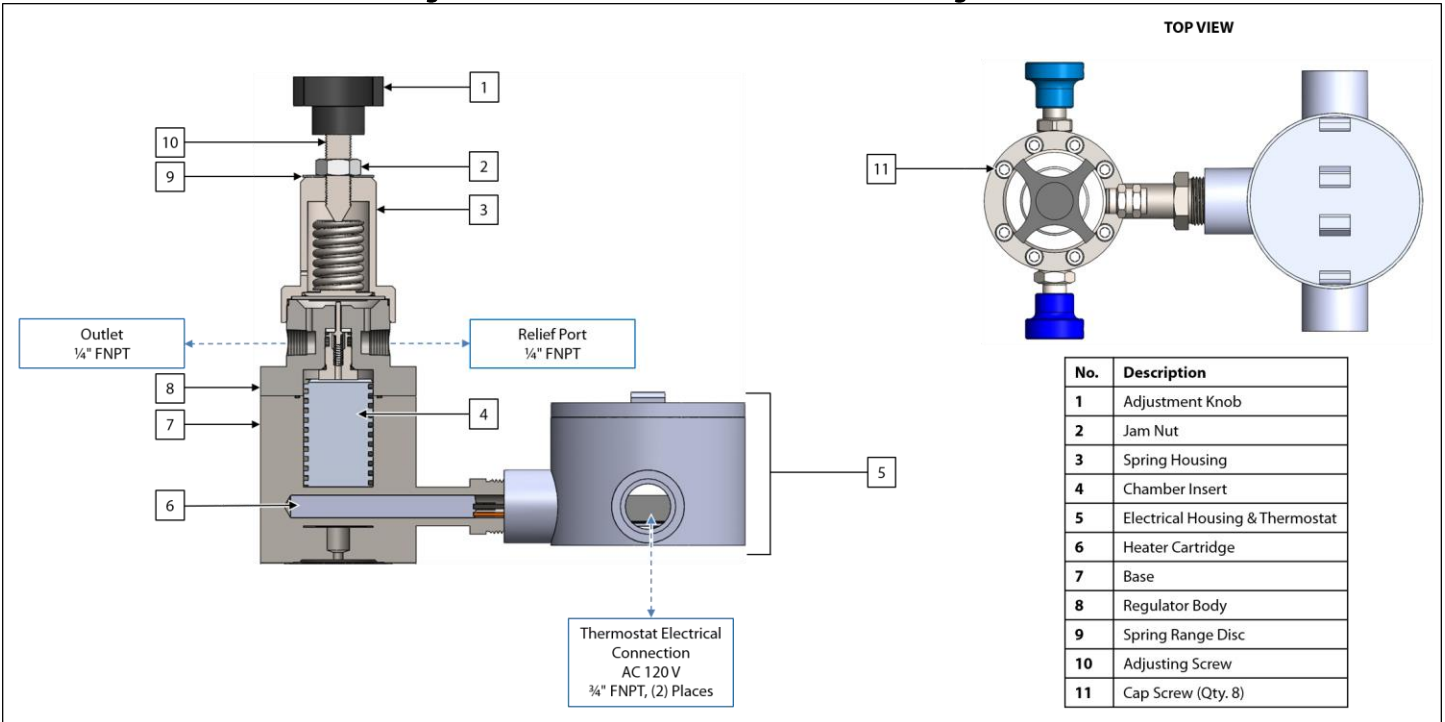


Figure 4: Welker HR-4SS Heated Instrument Regulator



SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin



After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.



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



All electrical connections must meet local and national electric codes, and excessive weight added to the conduit run must be supported.

2.2 Installation and Operation

1. Determine the desired length of the probe. As necessary, cut the probe and stinger to the desired length (*Figure 3*).



Ensure that no shavings or metal pieces remain in the probe after clipping or trimming to size.



Welker recommends that the probe be installed in the top of the pipe and inserted into the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample. The sample probe should be located in the least turbulent area of the flowing stream available (i.e., not in a header or blow-down stack and away from obstructions, elbows, and partially closed valves).

Installing the LE-2SSKOHR

2. Depressurize the pipeline.



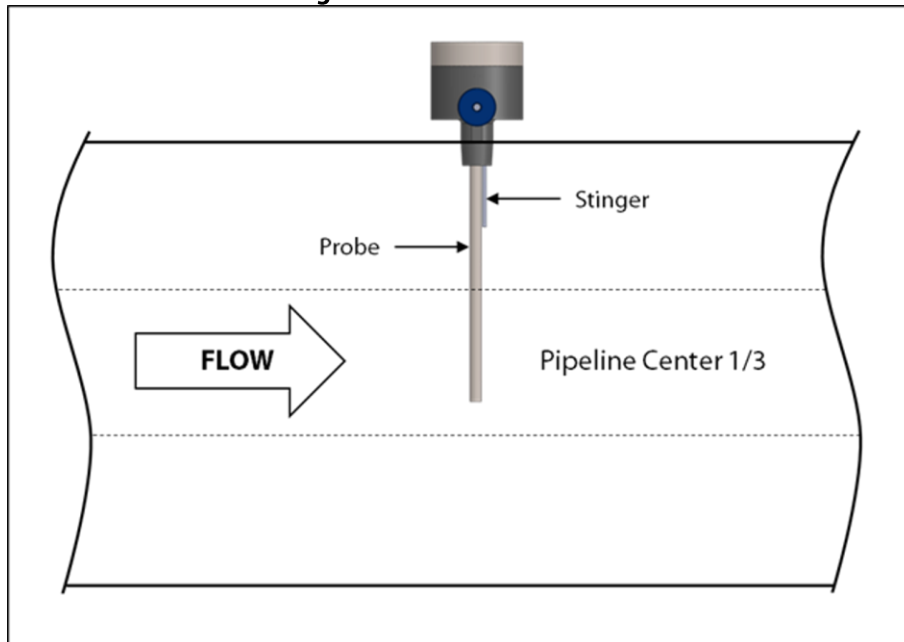
The pipeline must be depressurized prior to installing and removing the unit.

3. Ensure that all valves on the LE-2SSKOHR are closed (*Figure 2*).
4. Ensure that all cap screws on the top cap are tightened (*Figure 4*).
5. As necessary, wrap the threads of the threaded pipeline connection with PTFE tape.
6. Install the LE-2SSKOHR to the pipeline so that the stinger of the LE-2SSKO is downstream of the direction of product flow (*Figure 1, Figure 3, and Figure 5*).



As necessary, refer to the flow direction stamped on the top cap to determine correct orientation before installing the LE-2SSKOHR to the pipeline.

Figure 5: Correct Installation



7. In a counterclockwise direction, back off the adjusting screw of the Welker HR-4SS so that the unit is closed (i.e., no setting or tension on the spring) (*Figure 4*).

System Connections

8. Using customer-supplied ¼" tubing, connect from the product outlet to the analyzer inlet (*Figure 1*).



Welker recommends that this tubing be insulated and heat-traced so the sample maintains its temperature increase prior to reaching the analyzer.



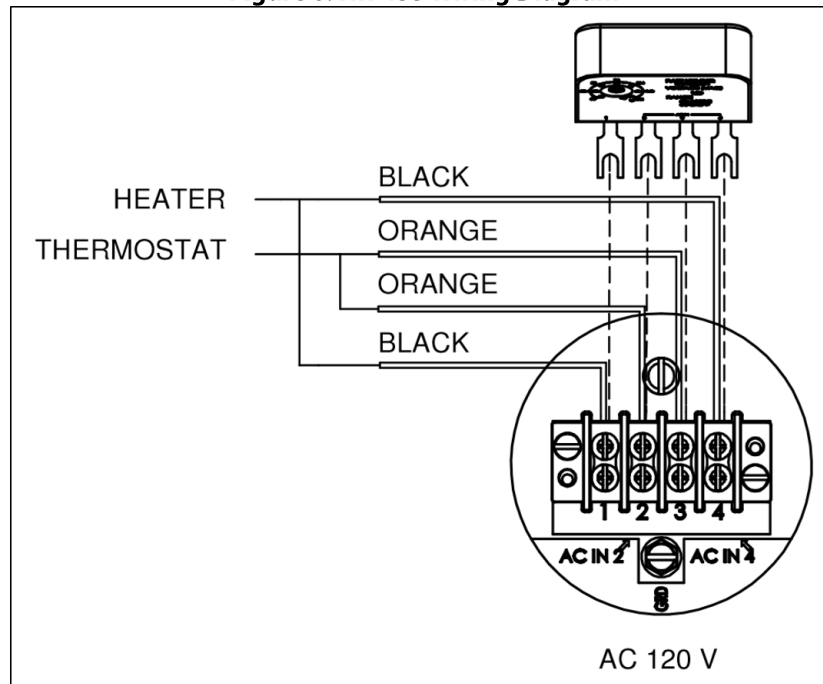
Welker recommends that the probe be enclosed or insulated to maximize the effect of the heater and to protect the probe from the elements.

9. As necessary, install a pressure gauge to the gauge port on the instrument regulator (*Figure 7*).
10. With the customer-supplied electrical power turned OFF, connect the AC 120 V leads to terminals 2 and 4 in the provided electrical housing (*Figure 6*).



If wired incorrectly, the thermostat will be damaged and will need to be replaced.

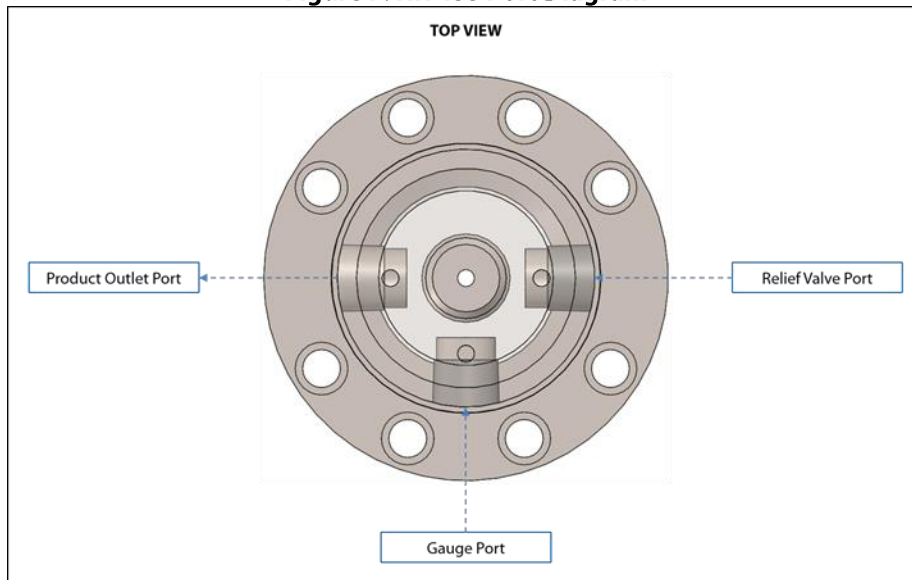
Figure 6: HR-4SS Wiring Diagram



Start-Up Procedures

11. Turn ON the electrical power to begin operation.
12. Adjust the thermostat to the desired temperature. Allow at least thirty (30) minutes for the HR-4SS to warm up.
13. As necessary, install the relief valve to the relief valve port on the HR-4SS (*Figure 4* and *Figure 7*).

Figure 7: HR-4SS Port Diagram



14. Pressurize the pipeline.
15. Set the relief valve using a safe auxiliary pneumatic supply. Refer to the *Installation, Operation, and Maintenance (IOM) Manual* of the relief valve for instructions on setting the relief.



If the heated instrument regulator is used to set the relief, DO NOT exceed the maximum output pressure of the regulator.



DO NOT open inlet (P_1) valve A until the relief valve has been set. Opening inlet (P_1) valve A before the relief valve has been set could overpressurize the heated instrument regulator.



Welker can pre-set the relief if requested at the time of order.

16. Open inlet (P_1) valve A and return (P_2) valve B (*Figure 2* and *Figure 3*). Check for leaks at the pipeline connection and repair as necessary.
17. Loosen the jam nut on the adjusting screw (*Figure 4*).
18. Screw the adjustment knob clockwise to adjust the outlet pressure (*Figure 4*). Tighten the jam nut once the desired outlet pressure has been set.
19. If the LE-2SSKOHR is equipped with the optional outlet valve, adjust the outlet valve to the desired flow rate (*Figure 2*).



Welker recommends a maximum of 4200 cc per minute for the outlet flow rate.

20. Set the analyzer and purge the line to the analyzer in accordance with company policy.
21. The LE-2SSKOHR is now operational.

SECTION 3: MAINTENANCE

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. 6" Adjustable Wrench
 - b. Multimeter
 - c. Seal Pick
 - d. Small Hex Key

3.2 Maintenance

1. Turn OFF all electrical power to the unit.



The heated instrument regulator will be HOT after use. Allow approximately thirty (30) minutes for the regulator to cool down prior to performing maintenance.

2. Close inlet (P₁) valve A and return (P₂) valve B (*Figure 2 and Figure 3*).



Prior to performing maintenance, the LE-2SSKO must be isolated from pipeline pressure. However, the LE-2SSKO does NOT need to be removed from the pipeline to perform standard maintenance.



If maintenance on the body, probe, or stinger is required, the LE-2SSKOHR must be isolated from pipeline pressure and removed from the pipeline before maintenance can be safely performed.

3. Disconnect the electrical wiring and all tubing from the LE-2SSKOHR.

Disassembly

4. Loosen the eight (8) cap screws in the regulator body, and then separate the HR-4SS from the LE-2SSKO (*Figure 8*). Set the HR-4SS aside.

Figure 8: Disassembly Diagram

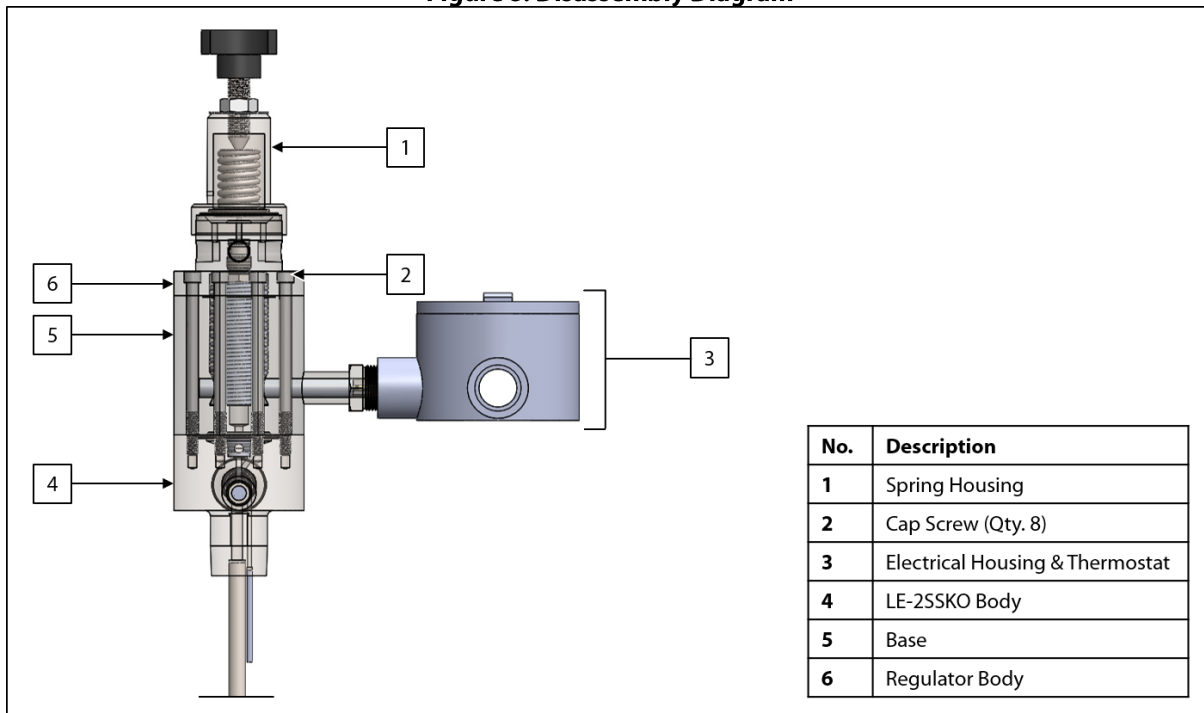
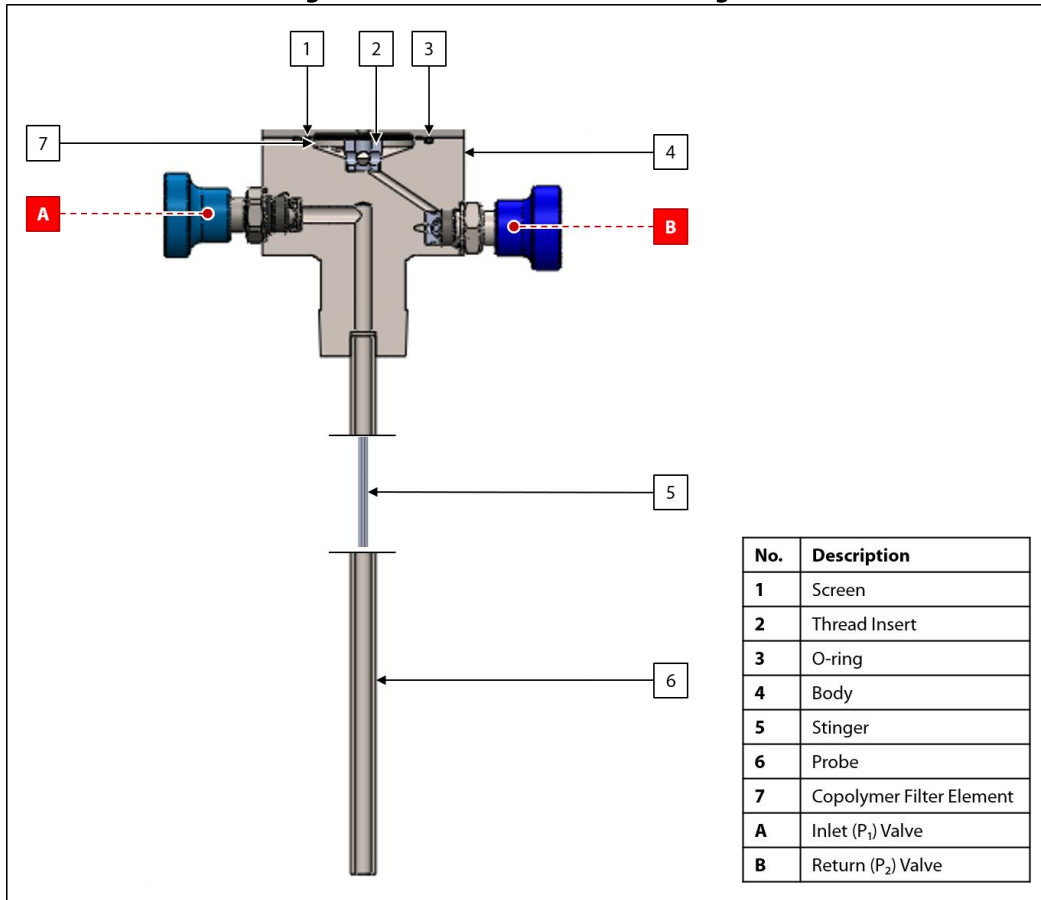


Figure 9: LE-2SSKO Maintenance Diagram



5. Remove the screen (*Figure 9*).
6. Remove the O-ring (*Figure 9*).
7. Remove the copolymer filter element (*Figure 9*).
8. Verify the return is clear. Hold a clean rag over the opening in the body, and then open inlet (P₁) valve A and return (P₂) valve B. If the return is clear, the rag will remain clean. If opening the valves cleared the return, the rag will be dirty. After verifying the return is clear, close inlet (P₁) valve A and return (P₂) valve B.
9. Using a solvent, clean the screen and inside of the body.



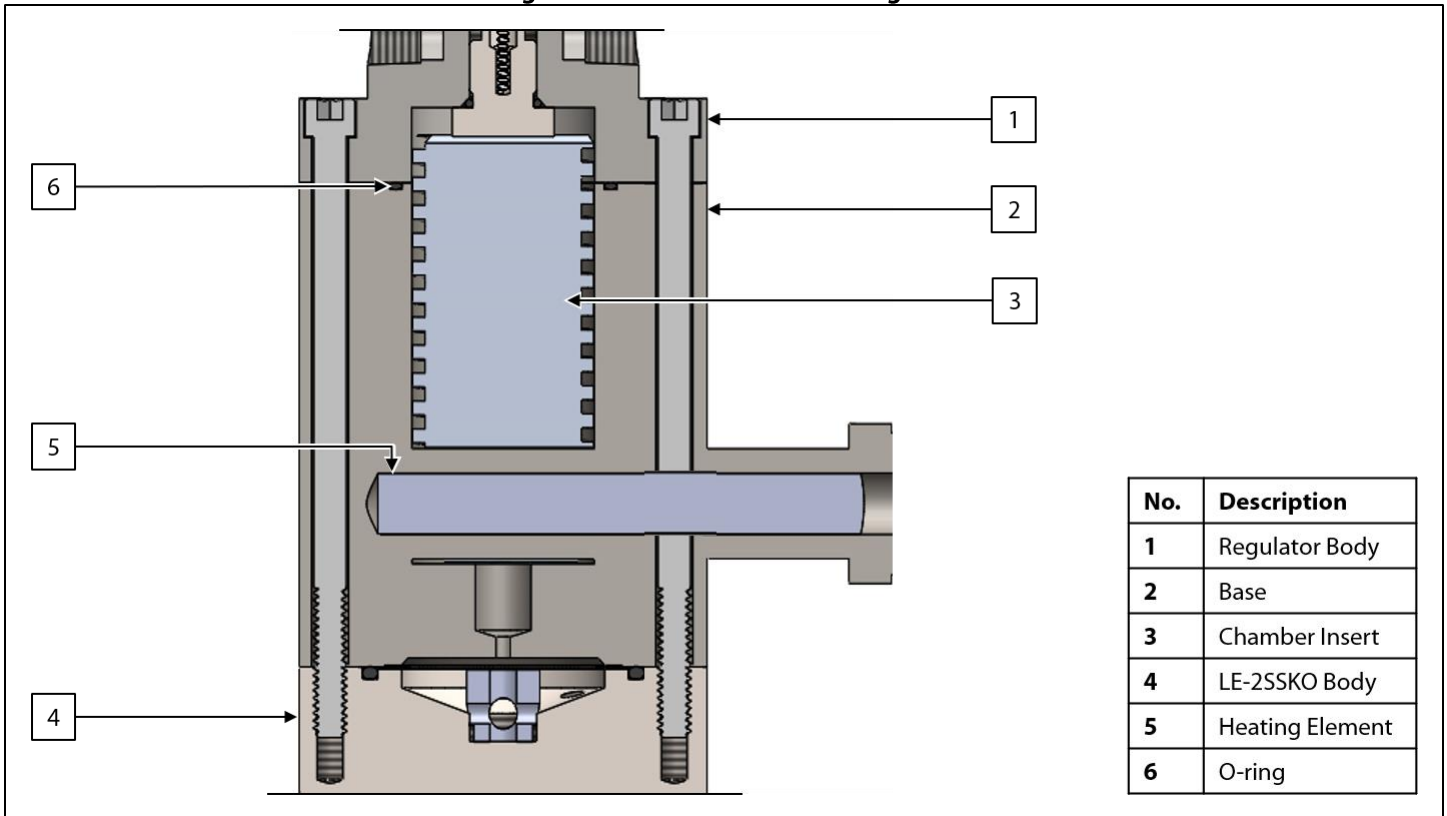
Welker recommends using a solvent, such as rubbing alcohol, that does not leave a film when dry and will not adversely affect analytical instrument results.

10. Replace the copolymer filter element.
11. Replace the O-ring.
12. Return the cleaned screen to the top of the copolymer filter element.

Maintenance: HR-4SS

Base

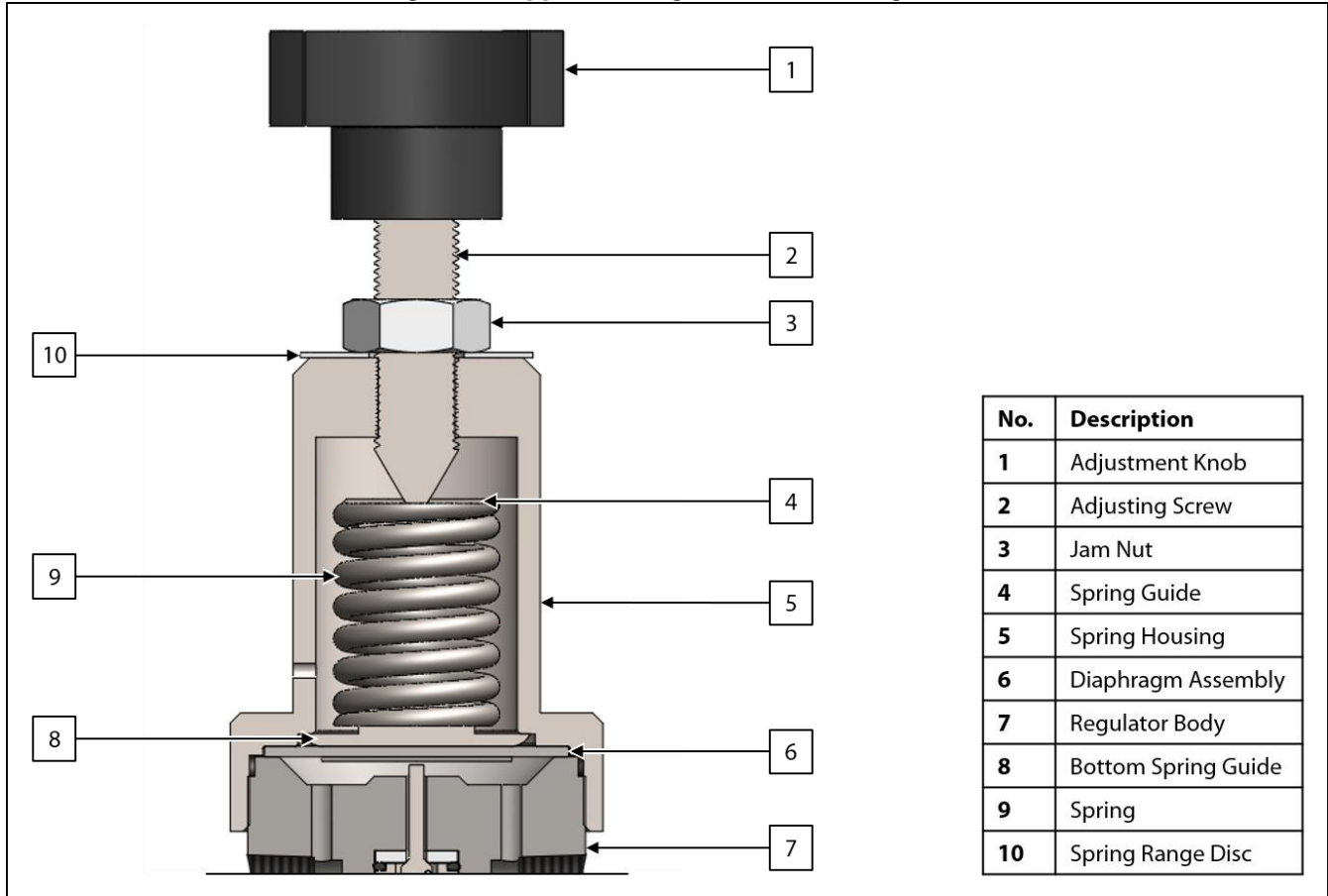
Figure 10: Base Maintenance Diagram



13. Replace the O-ring in the top of the base (*Figure 10*).
14. Remove the chamber insert and inspect it for any dents that would impede the flow of gas (*Figure 10*). Replace as necessary.
15. Return the chamber insert to the base, and then set the base aside.

Upper Housing

Figure 11: Upper Housing Maintenance Diagram



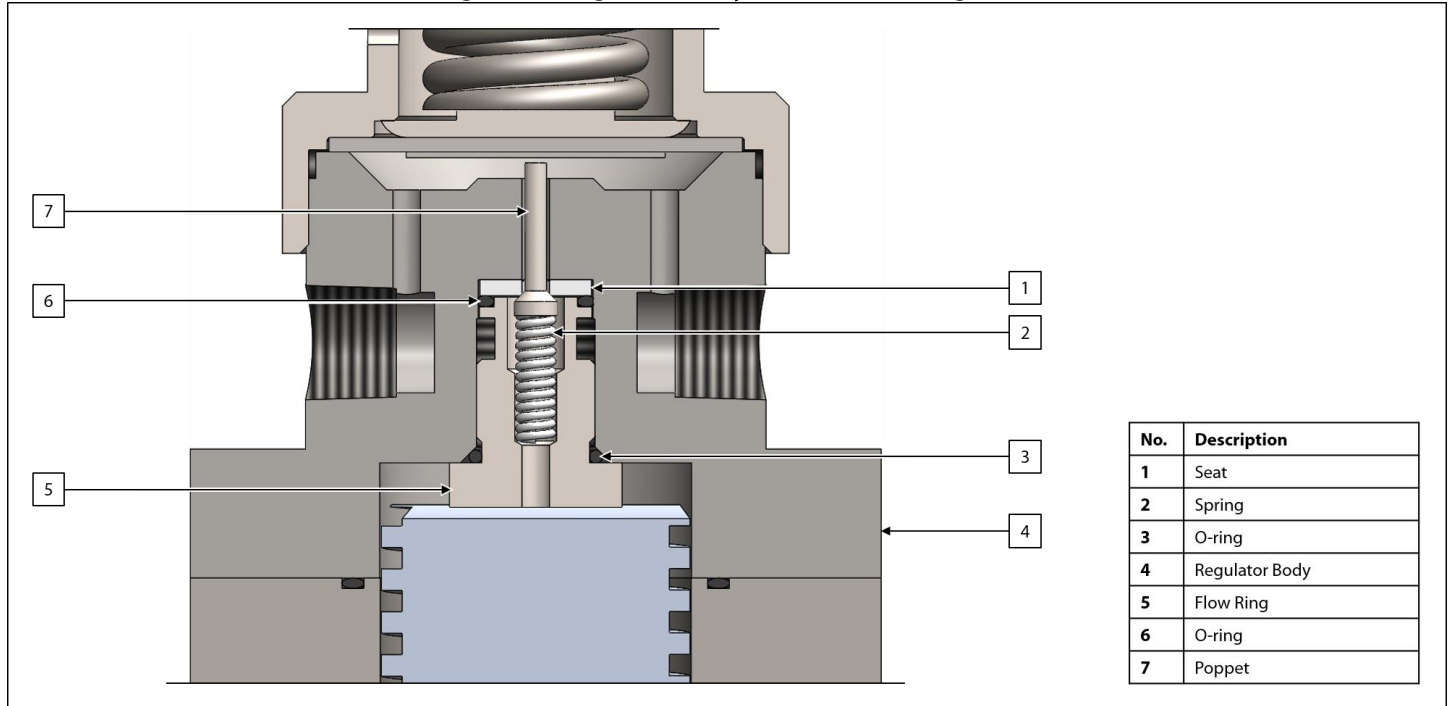
16. Loosen the jam nut on the adjusting screw (*Figure 4* and *Figure 11*).
17. In a counterclockwise direction, back off the adjusting screw to relieve tension on the spring (*Figure 4* and *Figure 11*).
18. As necessary, perform maintenance on the relief valve (*Figure 2*). Refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the relief valve for maintenance instructions.
19. Separate the spring housing from the regulator body (*Figure 4* and *Figure 11*).
20. Remove the spring guides and spring (*Figure 4* and *Figure 11*).
21. Remove the diaphragm assembly (*Figure 4* and *Figure 11*).
22. Inspect the diaphragm for wear. Replace as necessary.
23. Place the diaphragm assembly on top of the regulator body with the bottom spring guide facing up.
24. Place the spring on the diaphragm assembly. Ensure that the spring is sitting on the bottom spring guide.
25. Return the spring guide to the top of the spring.
26. Install the spring housing to the regulator body.



When reassembling the upper housing, HAND-TIGHTEN ONLY.

Regulator Body

Figure 12: Regulator Body Maintenance Diagram



27. Use a small hex key to loosen the flow ring (*Figure 12*).
28. Remove the flow ring, spring, and poppet (*Figure 12*).
29. Examine the seating face of the poppet for scratches or damage. Replace as necessary.



Debris or scratches on the poppet will prevent positive shutoff of the regulator.

30. Use a small pointed instrument to carefully remove the seat from the regulator body (*Figure 12*).
31. Inspect the seat for debris or scratches. Replace as necessary.



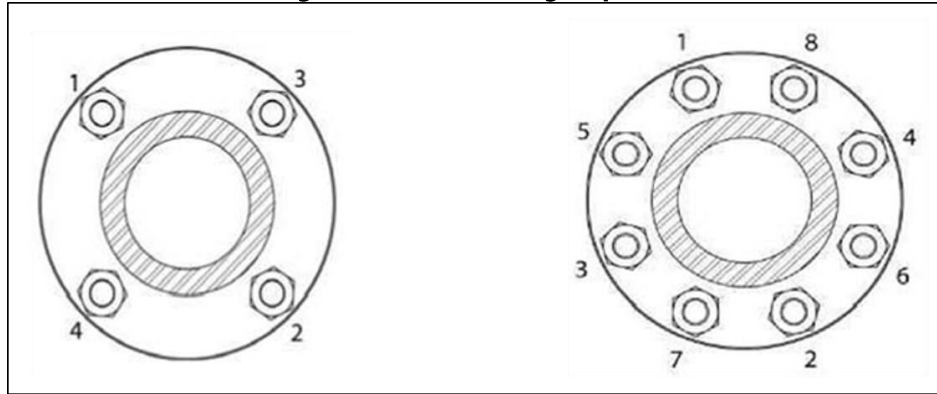
Debris or scratches on the seat will prevent positive shutoff of the regulator.

32. Replace the O-ring on the flow ring (*Figure 12*).
33. Install the seat to the regulator body.
34. Guide the poppet into the seat.
35. Return the spring to the poppet.
36. Return the flow ring to the regulator body and tighten firmly.

Reassembly

37. Return the base to the LE-2SSKO in the pipeline (*Figure 8*).
38. Return the regulator subassembly to the top of the base (*Figure 8*).
39. Following a cross-bolting sequence, insert the eight (8) cap screws through the regulator body and base to the LE-2SSKO, and then firmly tighten (*Figure 8* and *Figure 13*).

Figure 13: Cross-Bolting Sequence



40. Maintenance is now complete.
41. To complete reinstallation and return the LE-2SSKOHR to operation, see *Section 2.2, Installation and Operation*, for instructions.

3.3 Heater Failure



Neither the controller nor the heating element is prone to fail; however, failure is possible in instances of misuse and extreme malfunction of the electrical system.



If the controller or heating element fails, replacement is required.



When reassembling the electrical housing, all joints should be thoroughly cleaned and may be lightly lubricated with suitable grease, such as Crouse-Hinds STL Thread Lubricant, to prevent corrosion and assist in weatherproofing. Use only non-metallic scrapers and non-corrosive cleaning fluids to clean flanges. Keep blind holes clear of grease.

Assessing the Controller

1. Ensure that all electrical power to the unit has been turned OFF and that the electrical wiring has been disconnected.



The heated instrument regulator will be HOT after use. Allow approximately thirty (30) minutes for the regulator to cool down prior to performing maintenance.



DO NOT open the electrical housing until the surface temperature and any stored electrical energy have decayed to the point that it can no longer be a potential ignition source.



Ensure that the heated instrument regulator is isolated from all incoming and outgoing connections (including neutral conductors) prior to opening the electrical housing.

2. Remove the cover from the electrical housing.
3. Disconnect the two (2) power supply leads from the terminal block.
4. As necessary, disconnect the customer-supplied tubing, fittings, or instrument attached to the unit.
5. Connect an appropriate electrical supply to prongs 2 and 4, and then use a multimeter to measure the current across prongs 1 and 4. If the current reads 0 A, the controller needs to be replaced; continue to step 6. If the current reads greater than 0 A, the heating element needs to be assessed for failure; proceed to step 10.

Replacing the Controller

6. Ensure that all electrical power to the unit has been turned OFF and that the electrical wiring has been disconnected.



The heated instrument regulator will be HOT after use. Allow approximately thirty (30) minutes for the regulator to cool down prior to performing maintenance.



DO NOT open the electrical housing until the surface temperature and any stored electrical energy have decayed to the point that it can no longer be a potential ignition source.



Ensure that the heated regulator is isolated from all incoming and outgoing connections (including neutral conductors) prior to opening the electrical housing.

7. Remove the cover from the electrical housing.
8. Disconnect the four (4) controller prongs from the terminal block, and then remove the failed controller.
9. Install a new controller to the electrical housing.

Assessing the Heating Element

10. Ensure that all electrical power to the unit has been turned OFF and that the electrical wiring has been disconnected.



The heated instrument regulator will be HOT after use. Allow approximately thirty (30) minutes for the regulator to cool down prior to performing maintenance.



DO NOT open the electrical housing until the surface temperature and any stored electrical energy have decayed to the point that it can no longer be a potential ignition source.



Ensure that the heated instrument regulator is isolated from all incoming and outgoing connections (including neutral conductors) prior to opening the electrical housing.

11. Remove the cover from the electrical housing.
12. Disconnect the four (4) heating element leads from the terminal block.
13. Using a multimeter, measure the resistance across the two (2) black leads. If the resistance reads "OL" or " ∞ ," the heating element needs to be replaced; continue to step 14. If the resistance reads a numerical value, the heating element does not need to be replaced; proceed to step 22.

Replacing the Heating Element

14. As necessary, disconnect the customer-supplied tubing, fittings, or instrument attached to the unit.
15. Remove the electrical housing from the heated instrument regulator base and pull the heating element out of the base.
16. As necessary, clean the heating element chamber.
17. Prepare the replacement heating element for installation by cutting the leads to the necessary length and crimping on new terminal leads.
18. Lubricate the replacement heating element.



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

19. Insert the replacement heating element into the heating element chamber and ensure that the heating element is fully inserted.
20. Run the leads through the electrical housing entry, and then install the electrical housing to the heated instrument regulator base.
21. Connect the four (4) heating element leads to the terminal block.
22. With customer-supplied electrical power turned OFF, connect the appropriate leads to terminals 2 and 4 in the provided electrical housing (*Figure 6*).
23. Secure the cover to the electrical housing.

3.4 Troubleshooting

Table 2: LE-2SSKOHR Troubleshooting		
Issues	Possible Causes	Solutions
The heated instrument regulator is not achieving positive shutoff.	There may be debris or scratches on the poppet.	Examine the poppet for debris or scratches. Replace as necessary. See <i>Section 3.2, Maintenance</i> , for instructions on replacing the poppet.
	There may be debris or scratches on the seat.	Examine the seat for debris or scratches. Replace as necessary. See <i>Section 3.2, Maintenance</i> , for instructions on replacing the seat.
Regulated gas is not heating to the proper temperature.	The gas flow rate may be too high.	Adjust the outlet pressure to lower the gas flow rate. See <i>Section 2.2, Installation and Operation</i> , for instructions on adjusting the outlet pressure.
Liquid is present in the copolymer filter element or at the product outlet.	The copolymer filter element may be blocked.	Examine the copolymer filter element for blockage. Replace as necessary. See <i>Section 3.2, Maintenance</i> , for instructions on replacing the copolymer filter element.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-033: Welker RV-1, RV-2, RV-2CP, and RV-3 Relief Valves
- IOM-069: Welker LE-2SSKO Probe Mounted Liquid Eliminator
- IOM-078: Welker HR-4SS Heated Instrument Regulator
- IOM-105: Welker NV-1 and NV-2 Instrument Valves

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

- WIKA Bourdon Tube Pressure Gauges Type 232.53 and Type 233.53 (Welker IOM-V171)

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD822BU.10

NOTES



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