Installation, Operation, and Maintenance Manual

Welker® Automatic Insertion Heated Regulator

Model

IHRA-4SS

Drawing No.: AD172GY
Manual No.: IOM-050

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.

This manual is intended to be used as a basic installation and operation guide for the Welker® Automatic Insertion Heated Regulator, *IHRA-4SS*. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is given in the Appendix section of this manual.

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Section 1:

SPECIFICATIONS

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 (USA) or 1-281-491-2331.

Notes, Cautions, and Warnings

Notes emphasize information and / or provide additional information to assist the user.

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

Warning messages appear before procedures that, if not observed, could result in personal injury.

*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® *IHRA-4SS* Automatic Insertion Heated Regulator is designed to provide an analyzer with a properly heated sample stream. When used with a pipeline isolation valve, the IHRA-4SS can be safely inserted and retracted without interrupting the flow or operation of the pressurized pipeline. The thermal fins of the IHRA-4SS mitigate the cooling brought on by the Joule-Thomson effect. The length of the flow path across the convection by conduction heat inducer has been maximized to ensure the greatest possible heat transfer given any set of flow conditions.

Welker® may custom design the IHRA-4SS to suit the particular application and specifications of each customer.

1.3 Important Information

1. The unit should always be mounted to a fully ported pipeline isolation valve with a minimum bore of 3/4".
2. Only one analytical instrument should be fed by the IHRA-4SS at a time.
3. **Oil Reservoir:** With the use of a hydraulic oil reservoir, process or auxiliary pressure is applied and released to insert and retract the probe into the pipeline. The oil in the reservoir ensures smooth travel of the insertion shaft. The reservoir is shipped from the factory with the necessary oil volume and orientation. For horizontally-mounted probes, the oil reservoir must be rotated so that it remains vertical. **The oil reservoir will not function properly if oriented horizontally**. Refer to *Section 2.2, Installation & Operation,* 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

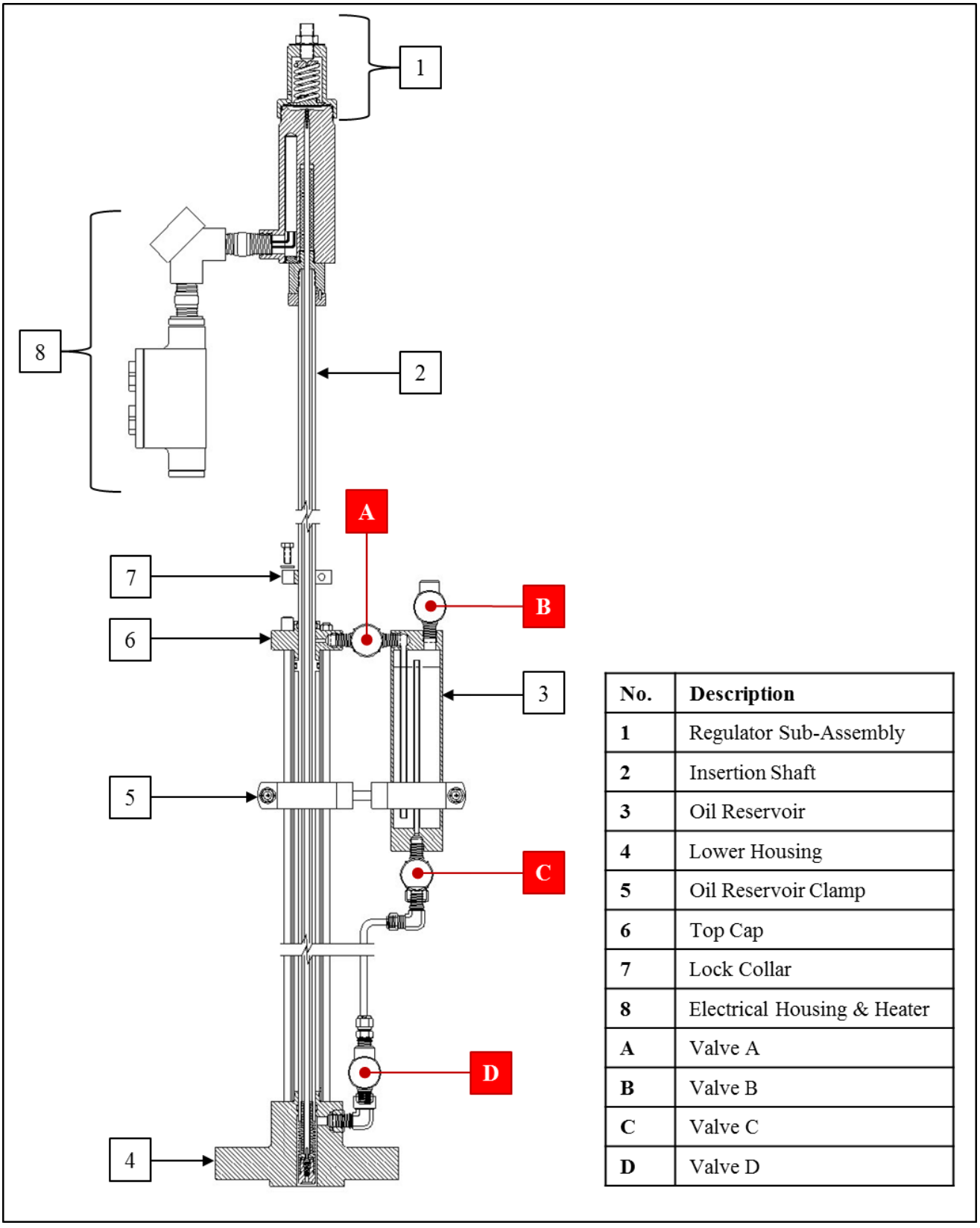
The specifications listed in this section are generalized for this equipment. Welker® can modify the equipment according to your company's needs. However, **please note that the specifications may vary depending on the customization of your product.**

Table 1: IHRA-4SS Specifications

Products Sampled	Natural Gas and Natural Gas Liquids
Application	Vaporization of Sample Stream
Materials of Construction	316 / 316L Stainless Steel, Buna, Teflon®, Viton®
Pipeline Connections	3/4" NPT, 1" NPT (Standard), 1-1/2" NPT, or 1" to 2" Flange
Maximum Allowable Operating Pressure	2160 psig @ -20°F to 100°F (*148 barg @ -28°C to37°C*)
Insertion Depth	12" (*30 cm*) 18" (*45 cm*) 23" (*58 cm*) 24" (*60 cm*) 30" (*76 cm*) 36" (*91 cm*) 42" (*106 cm*) 102" (*259 cm*)
Regulator Type	Diaphragm or Piston
Heating Element	120VAC (Standard)
Area Classification	CSA NEC Class I, Div. 1, Groups C & D (Standard)
Options	CE Compliant Electropolished and Sulfinert®-Treated Sample Exposed Parts IECEx Heated Manifold (Ex d IIC T3 Ta) Insulation Blanket Relief Valve with Gauge

1.5 System Diagram

Figure 1: System Diagram (Flanged Connection; Probe Fully Retracted)



No.	Description
1	Regulator Sub-Assembly
2	Insertion Shaft
3	Oil Reservoir
4	Lower Housing
5	Oil Reservoir Clamp
6	Top Cap
7	Lock Collar
8	Electrical Housing & Heater
A	Valve A
B	Valve B
C	Valve C
D	Valve D

Section 2:

INSTALLATION & OPERATION

2.1 BEFORE YOU BEGIN

After unpacking the unit, check the equipment for compliance and for any damage that may have occurred during shipment. **Claims for damage caused during shipment must be initiated by the receiver and directed to the shipping carrier.** Welker® is not responsible for any damage caused by mishandling by the shipping carrier.

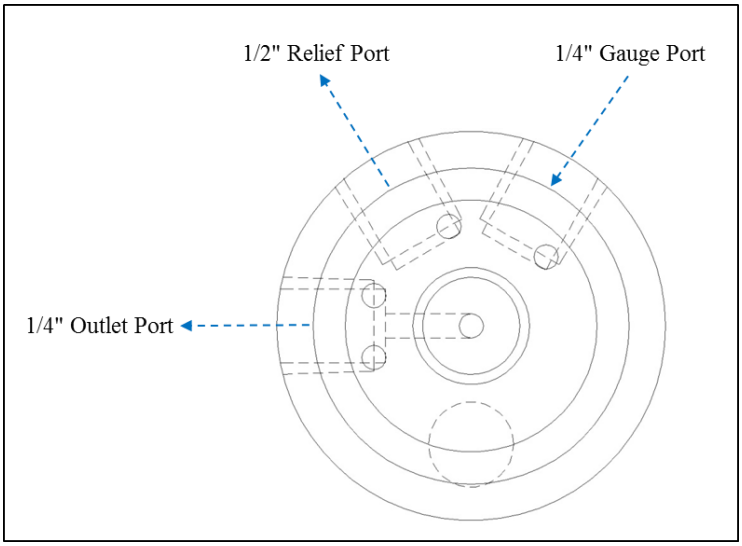
When sealing fittings with PTFE tape, refer to the proper sealing instructions for the tape used.

1. A sample probe is recommended to extract the sample from the center one-third (1/3) of the pipeline or wherever the collected sample will be representative of the product as a whole.
2. For gas sampling applications, Welker® recommends that the probe be installed in the top of the pipe and inserted into the center one-third (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).
3. For liquid sampling applications, Welker® recommends that the probe be installed in the side of the pipe and inserted into the center one-third (1/3) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.

2.2 INSTALLATION & OPERATION

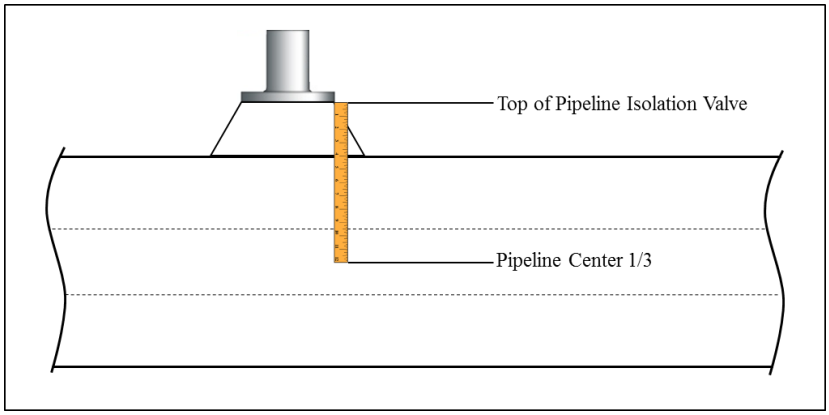
1. As necessary, install a relief valve and gauge in the appropriate ports (*Figure 2*). Welker® will pre-install relief valves and gauges if requested at the time of order.

Figure 2: Port Diagram



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

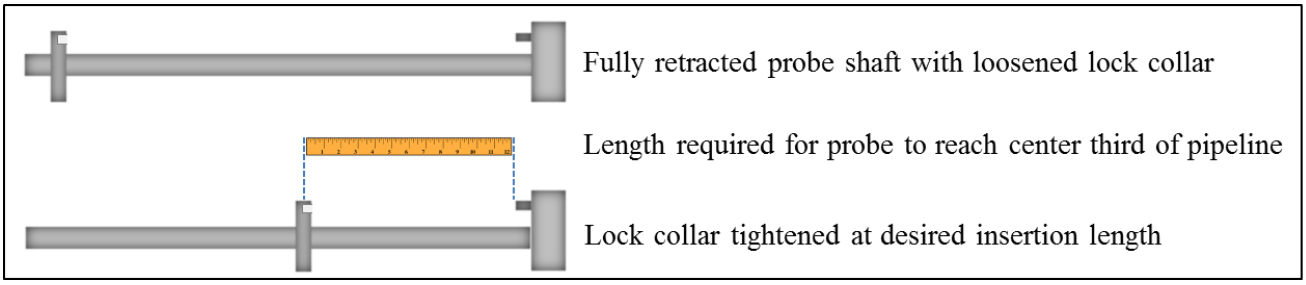
Figure 3: Determining Insertion Depth



3. Pull up on the probe shaft to ensure that it is fully retracted. The end of the probe shaft should be flush with the bottom flange face.
4. Beginning at the top edge of the top cap, measure up on the insertion shaft to the desired insertion length. As needed, use a felt-tip pen to mark this point.

Positioning the Lock Collar

Figure 4: Positioning the Lock Collar



5. Remove the lockdown bolt and washer.
6. Loosen the lock collar and lock screw.
7. Carefully slide the lock collar up the insertion shaft to the probe insertion length, taking care not to scratch the insertion shaft.
8. Tighten the lock screw to secure the lock collar to the insertion shaft at the marked point.

Rotating the Oil Reservoir (As Necessary)

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

9. Disconnect the tubing between valves C and D.
10. Unscrew and remove the oil reservoir clamp from the insertion unit and oil reservoir.

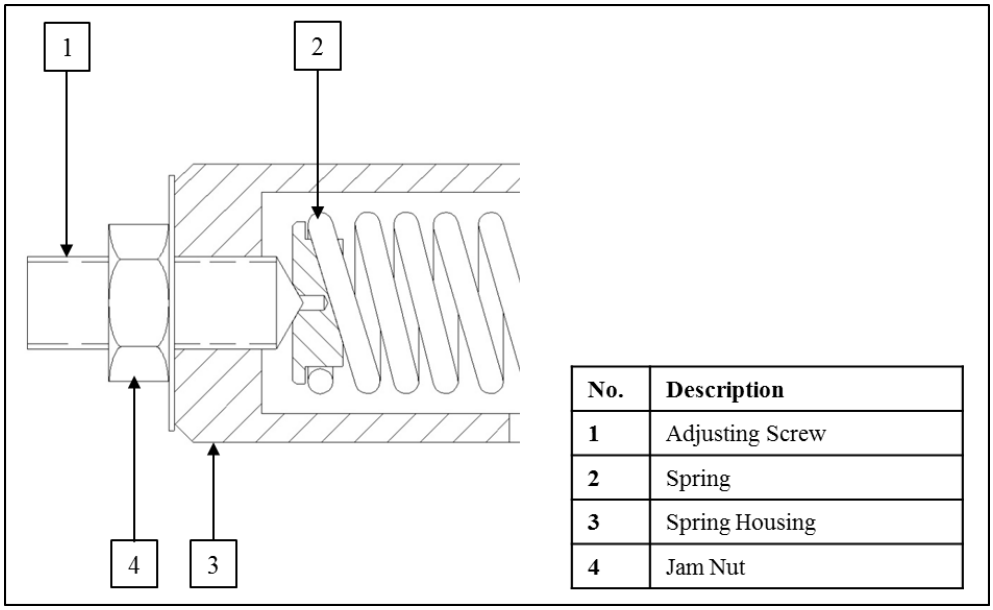
11. Loosen valve A at the top cap.
12. Reposition the oil reservoir so that it is perpendicular to the shaft. Valve C on the oil reservoir should point down.
13. Tighten valve A at the top cap.
14. Measure a new piece of tubing to connect valve C to valve D.
15. Attach nuts and ferrules onto the ends of the new tubing.
16. Using the new tubing, connect valve C to valve D.

Installation Using an Auxiliary Gas

An auxiliary gas supply is OPTIONAL for this unit. However, 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.

17. Ensure that all valves on the oil reservoir are closed.
18. Detach the tubing between valves C and D.
19. Remove valve D from the lower housing and plug the port with a 1/4" NPT plug.
20. Connect the customer-supplied auxiliary gas supply to valve C.
21. Install the unit to the pipeline isolation valve.
22. In a counterclockwise direction, back off the adjusting screw on the regulator subassembly (*Figure 5*) so that the unit is closed (i.e., no setting or tension on the spring).

Figure 5: Outlet Pressure Adjustment



No.	Description
1	Adjusting Screw
2	Spring
3	Spring Housing
4	Jam Nut

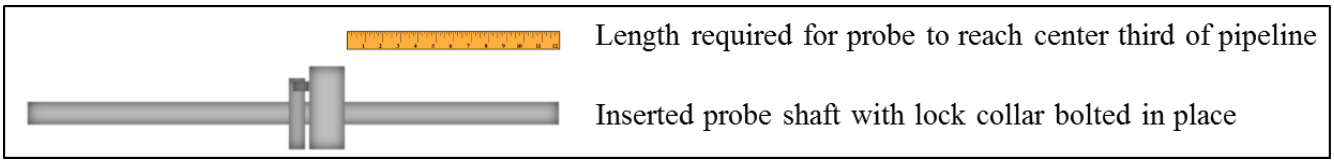
23. Ensure that the outlet port valve on the regulator subassembly is closed.
24. Slowly open the pipeline isolation valve and check for leaks. Repair as necessary.
25. Check the outlet gauge of the IHRA-4SS. The gauge should read 0 psig. If the gauge does not read 0 psig, disassemble the IHRA-4SS and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. See *Section 3.3, Maintenance,* for instructions on disassembling and maintaining the thermal fin subassembly.
26. Open the valve on the auxiliary gas supply and regulate the supply to the pipeline pressure.

27. With valve A open and valve B closed, slowly open valve C. The probe will begin to insert into the pipeline.

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

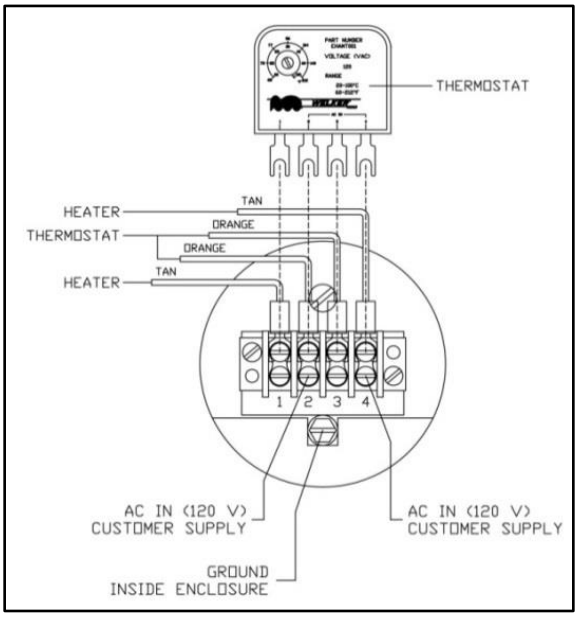
28. Once the lock collar reaches the top cap, close valve C.
29. Secure the lock collar to the top cap with the lockdown bolt and washer (*Figure 6*).

Figure 6: Locking the Lock Collar



30. Check the system for leaks. Repair as necessary.
31. With the customer-supplied electrical power turned off, connect the 120VAC leads to terminals 2 and 4 in the connection box provided (*Figure 7*).

Figure 7: Electrical Diagram



32. Set the adjustment on the thermostat to the desired temperature.
33. Secure the cover to the electrical box and cable gland.
34. Connect tubing from the outlet valve of the IHRA-4SS to the instrument.

Welker® recommends that this tubing be insulated and heat-traced.

35. Loosen the jam nut on the adjusting screw (*Figure 5*).
36. Screw the adjusting screw clockwise to adjust the outlet pressure. Tighten the jam nut when the desired outlet pressure has been set.
37. As necessary, refer to the *Installation, Operations, and Maintenance* (IOM) *Manual* for the Welker® RV-1D Relief Valve for instructions on setting the relief valve.

38. Check the system for leaks. Repair as necessary.
39. Turn the electrical power on to begin operation of the IHRA-4SS. Allow at least thirty (30) minutes for the IHRA-4SS to warm up.

Welker® recommends that the probe be enclosed or insulated to maximize the heating effect of the IHRA-4SS.

Installation Using Pipeline Product (If NOT Using an Auxiliary Gas)

40. Install the unit to the pipeline isolation valve.
41. In a counterclockwise direction, back off the adjusting screw on the regulator subassembly (*Figure 5*) so that the unit is closed (i.e., no setting or tension on the spring).
42. Ensure that all valves on the oil reservoir are closed.
43. Ensure that the outlet port valve on the regulator subassembly is closed.
44. Slowly open the pipeline isolation valve and check for leaks. Repair as necessary.
45. Check the outlet gauge of the IHRA-4SS. The gauge should read 0 psig. If the gauge does not read 0 psig, disassemble the IHRA-4SS and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. See *Section 3.3, Maintenance,* for instructions on disassembling and maintaining the thermal fin subassembly.
46. Slowly open valves C and D to allow pipeline pressure to enter the oil reservoir.
47. Slowly open valve A. The probe will begin to insert into the pipeline.

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

48. Once the lock collar reaches the top cap, close valve A.
49. Secure the lock collar to the top cap with the lockdown bolt and washer.
50. Check the system for leaks. Repair as necessary.
51. With the customer-supplied electrical power turned off, connect the 120VAC leads to terminals 2 and 4 in the connection box provided (*Figure 7*).
52. Set the adjustment on the thermostat to the desired temperature.
53. Secure the cover to the electrical box and cable gland.
54. Connect tubing from the outlet valve of the IHRA-4SS to the instrument.

Welker® recommends that this tubing be insulated and heat-traced.

55. Loosen the jam nut on the adjusting screw (*Figure 5*).
56. Screw the adjusting screw clockwise to adjust the outlet pressure. Tighten the jam nut when the desired outlet pressure has been set.
57. Refer to the *Installation, Operations, and Maintenance* (IOM) *Manual* for the Welker® RV-1D Relief Valve to set the relief valve, as necessary.
58. Check the system for leaks. Repair as necessary.
59. Turn the electrical power on to begin operation of the IHRA-4SS. Allow at least thirty (30) minutes for the IHRA-4SS to warm up.

Welker® recommends that the probe be enclosed or insulated to maximize the heating effect of the IHRA-4SS.

Section 3:

MAINTENANCE

3.1 Before you Begin

1. **Welker® recommends that the unit have regular maintenance every six (6) months under normal operating conditions.** 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 are not lubricated. They should be lightly lubricated before installation. Welker® recommends Dow Corning® 111 (DC 111) or an equivalent lubricant for use with this unit.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.

3.2 Retracting the Probe

1. Turn OFF all electrical power to the unit.

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

2. Disconnect the electrical wiring.
3. Close the outlet valve of the IHRA-4SS and disconnect the tubing from the instrument, relieving any trapped pressure.
4. Open valves C and D to relieve any gas trapped in the lower housing.
5. Open valve A, and then close valves C and D.
6. Remove the lockdown bolt.
7. Slowly open valve B to vent the gas in the reservoir to begin automatically retracting the probe from the pipeline. If pipeline pressure is not sufficient to push the probe out of the line, the probe may be retracted manually.
8. Once the probe is completely retracted, close the pipeline isolation valve.
9. Open the outlet valve of the IHRA-4SS to relieve any trapped pressure.
10. Close all valves on the IHRA-4SS and remove the unit from the pipeline isolation valve.
11. The IHRA-4SS is now ready to be moved to another location or for disassembly.

3.3 Maintenance

1. Once the probe is removed from the pipeline, ensure that valves A, B, C, and D are closed.

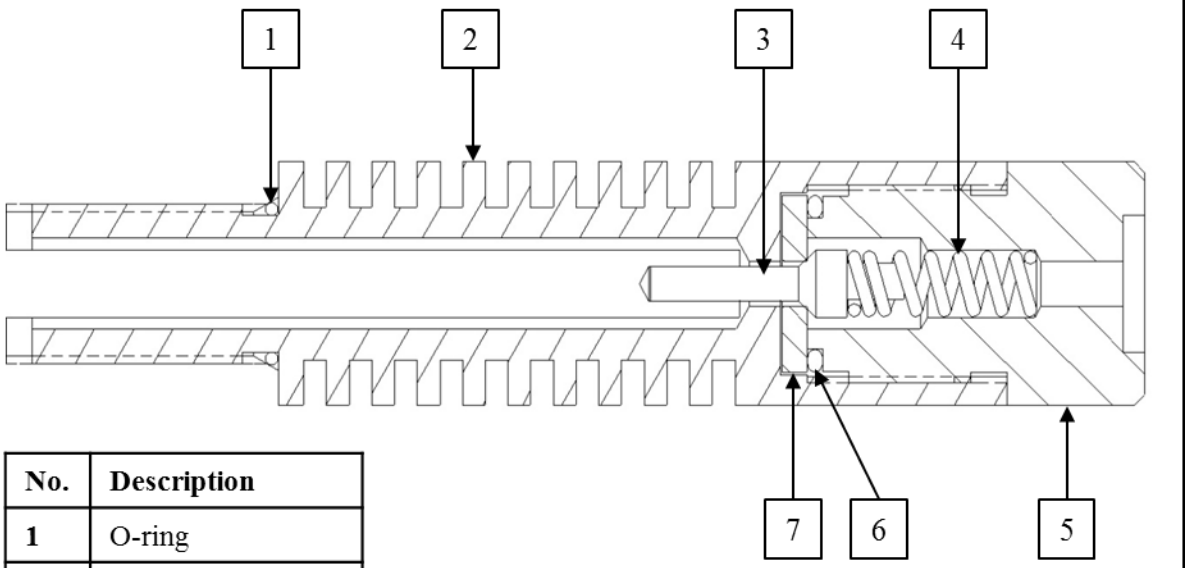
Removing the Oil Reservoir

2. Disconnect the tubing between valves C and D.
3. Unscrew the oil reservoir clamp from around the insertion unit, taking care not to lose the washer and screw.

4. Disconnect the oil reservoir from the top cap of the insertion unit at valve A. Valves A, B, and C should remain connected to the oil reservoir.
5. Set the oil reservoir aside.
6. Push the probe assembly through the lower housing so that the thermal fins are fully exposed.
7. Remove the thermal fin subassembly.
8. When the thermal fin subassembly is removed, the contact rod and push rod should easily slide out (*Figure 11*). As necessary, gently tilt the unit back and forth until both pieces slide out, taking care not to misplace the small contact rod.

Thermal Fin Subassembly Maintenance

Figure 8: Thermal Fin Subassembly Diagram

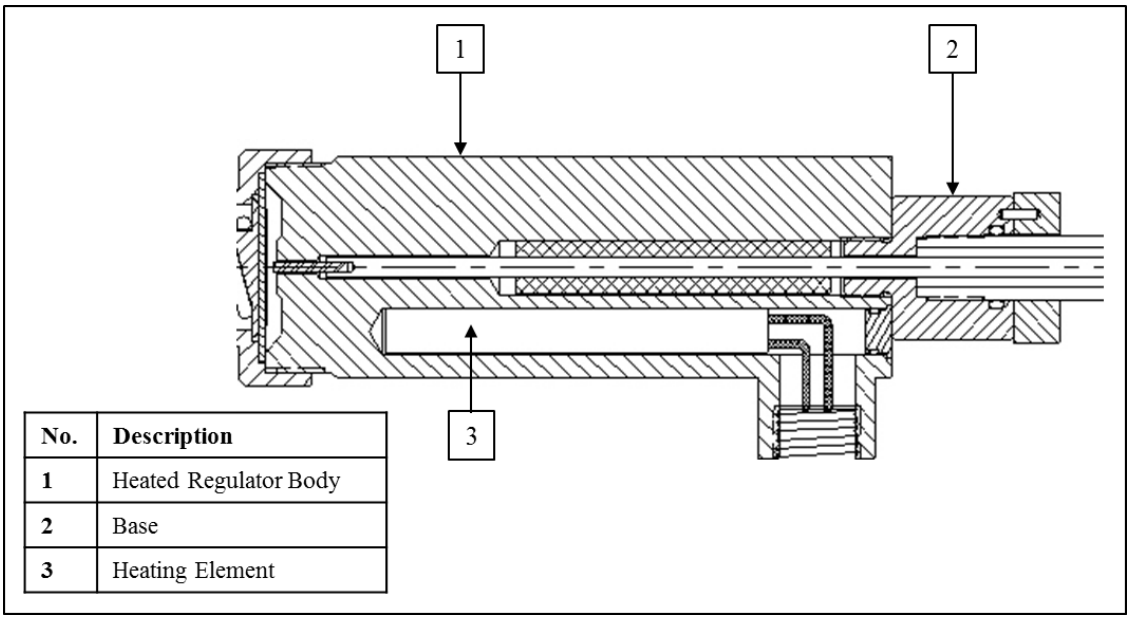


No.	Description
1	O-ring
2	Thermal Fins
3	Poppet
4	Spring
5	Seat Retainer
6	O-ring
7	Seat

9. Remove the seat retainer, spring, and poppet.
10. Examine the seating face of the poppet for scratches or damage. Replace as necessary.
11. Use a small, pointed instrument to carefully remove the seat from the thermal fin subassembly.
12. Visually inspect the seat for debris or scratches. Replace as necessary.
13. Guide the poppet into the seat.
14. Replace the seat retainer O-ring, spring, and the seat retainer. Tighten firmly.
15. Replace the remaining O-ring, and then set the thermal fin subassembly aside.

Heated Regulator Subassembly Maintenance

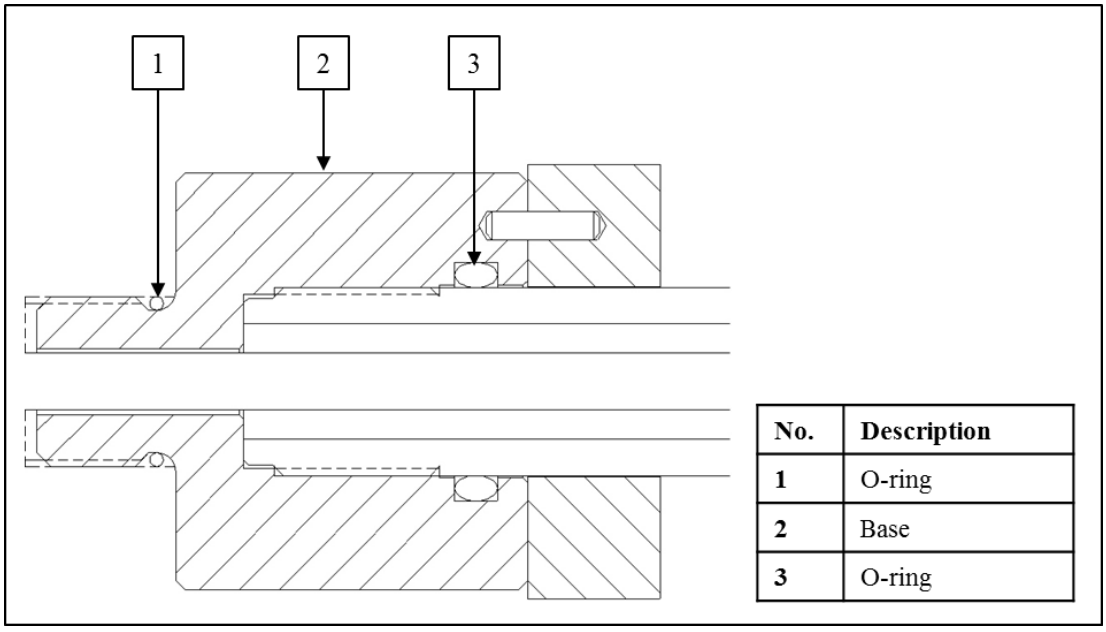
Figure 9: Heated Regulator Subassembly Diagram



No.	Description
1	Heated Regulator Body
2	Base
3	Heating Element

16. Remove the heated regulator body from the base and set it aside.
17. Remove the base from the insertion shaft and replace the O-rings on the base (*Figure 10*).

Figure 10: Base and Insertion Shaft Detail Diagram

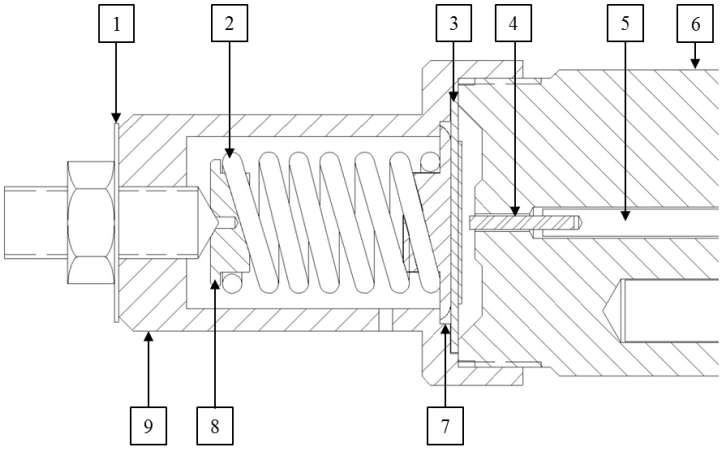


No.	Description
1	O-ring
2	Base
3	O-ring

18. Reinstall the base to the heated regulator subassembly and tighten until there is no thread engagement.

19. Unscrew the spring housing from the heated regulator body (*Figure 11*).

Figure 11: Spring Housing Detail Diagram



No.	Description
1	Spring Range Disc
2	Spring
3	Diaphragm Assembly
4	Contact Rod
5	Push Rod
6	Heated Regulator Body
7	Bottom Spring Guide
8	Spring Guide
9	Spring Housing

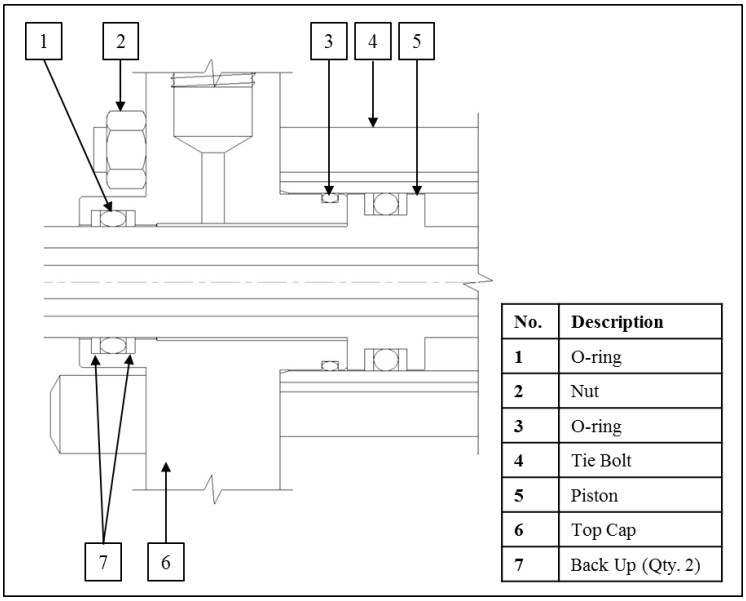
20. Reinstall the diaphragm. The metal pad should face down toward the opening and should face the regulator body when installed.
21. Reinstall the bottom spring guide.
22. Reinstall the spring housing to the heated regulator body and set it aside.

When reassembling the upper housing, HAND-TIGHTEN ONLY.

Top Cap and Lower Housing Maintenance

23. Loosen and remove the lock collar from the insertion shaft.
24. Remove the tie bolt nuts and slide the top cap off the shaft.
25. Replace the O-rings and back ups on the top cap (*Figure 12*).

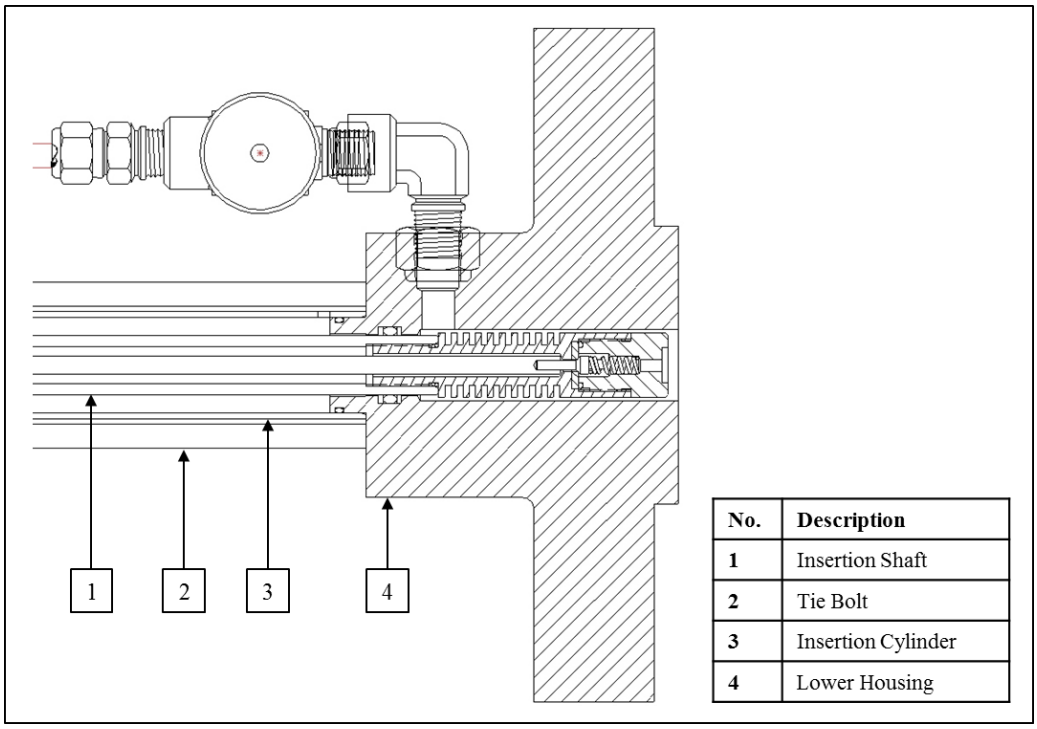
Figure 12: Top Cap Detail Diagram



No.	Description
1	O-ring
2	Nut
3	O-ring
4	Tie Bolt
5	Piston
6	Top Cap
7	Back Up (Qty. 2)

26. Carefully slide the insertion shaft out and the insertion cylinder off of the lower housing (*Figure 13*).

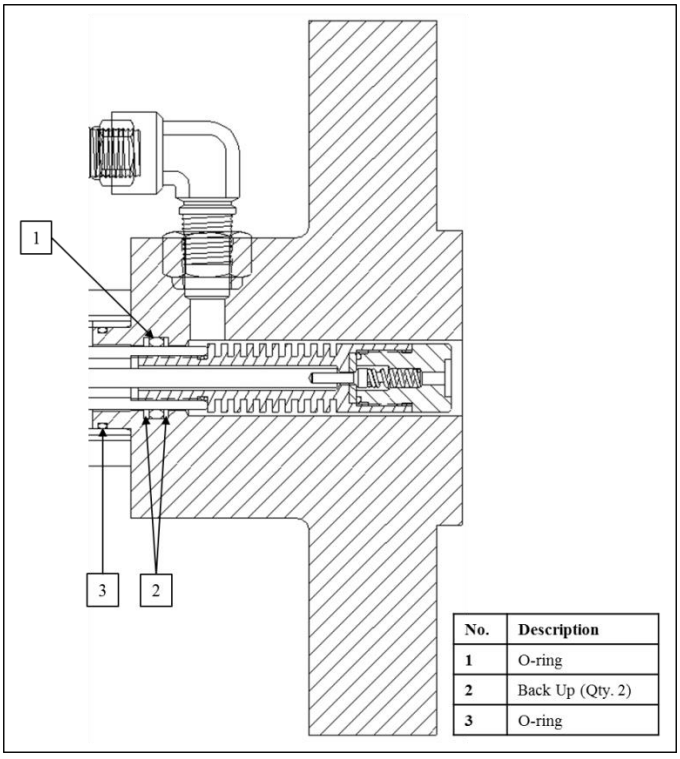
Figure 13: Shaft and Cylinder Diagram



No.	Description
1	Insertion Shaft
2	Tie Bolt
3	Insertion Cylinder
4	Lower Housing

27. Replace the O-rings and back ups on the lower housing (*Figure 14*).

Figure 14: Lower Housing Detail Diagram

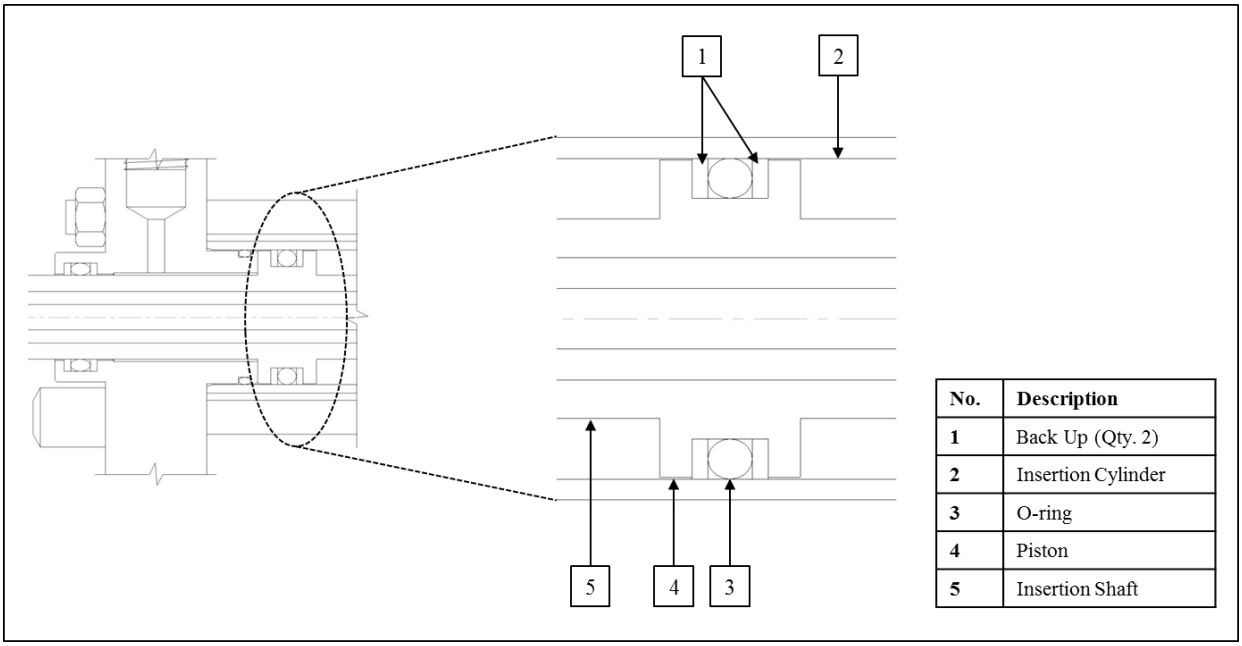


No.	Description
1	O-ring
2	Back Up (Qty. 2)
3	O-ring

Shaft and Cylinder Maintenance

28. Remove the insertion shaft from the insertion cylinder.
29. Replace the O-ring and the back ups on the shaft piston (*Figure 15*).

Figure 15: Shaft Detail Diagram



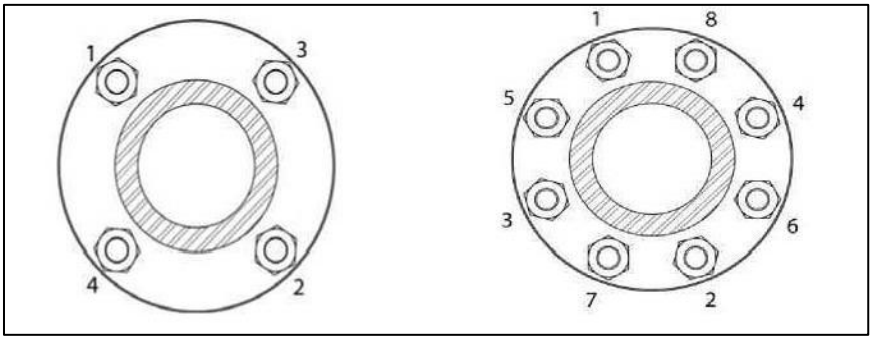
No.	Description
1	Back Up (Qty. 2)
2	Insertion Cylinder
3	O-ring
4	Piston
5	Insertion Shaft

30. Closely examine 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.
31. Closely examine the honed inner diameter of the insertion cylinder for deep 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.

3.4 Reassembly

1. Coat the inside of the top end of the insertion cylinder with lubricant and insert the shorter end of the insertion shaft approximately halfway into the insertion cylinder. The bottom of the insertion cylinder can be identified by its vent hole.
2. Liberally lubricate the insertion shaft.
3. Slide the lower housing onto the bottom end of the insertion shaft.
4. Slide the insertion cylinder onto the lower housing.
5. Slide the top cap onto the top end of the insertion shaft and down to the insertion cylinder.
6. Reinstall the tie bolts and cross-bolt the tie bolt nuts (*Figure 16*).

Figure 16: Cross Bolting Sequence



7. Reinstall the lock collar on the top of the insertion shaft.
8. 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.
9. Reinstall and firmly tighten the thermal fin subassembly.
10. Carefully slide the push rod into the insertion shaft until it slips onto the poppet.
11. Insert the contact rod into the push rod and carefully screw the entire heated regulator subassembly with the base onto the top of the insertion shaft. The unit should screw on easily.

If the unit does not screw on easily, loosen the unit slightly, and then gently move the unit back and forth until the contact rod slips into the regulator body hole.

12. Securely tighten the assembly.
13. Fully retract the insertion shaft.
14. Prepare the oil reservoir for reattachment. Wrap the valve threads with PTFE tape or coat them with pipe dope.
15. Reconnect the tubing between valves C and D.
16. Attach the oil reservoir to the unit. Mount the bracket around the insertion unit and secure with the washer and screw.
17. Reconnect the oil reservoir at the top cap of the insertion unit at valve A.
18. The unit is now ready to be installed.

APPENDIX

ATTACHED DOCUMENTS:

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

- IOM-033: Welker® Relief Valve RV-1D

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

- None

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

- Assembly Drawing: AD172GY

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