INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® AUTOMATIC INSERTION INSTRUMENT REGULATOR

MODEL
IRA-4SS-HP

DRAWING NUMBER
AD863BF

MANUAL NUMBER
IOM-143

REVISION
Rev. A, 12/22/2014

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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, if not observed, could result in damage to equipment.

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

This manual is intended to be used as a basic installation and operation guide for the Welker® Automatic Insertion Instrument Regulator, IRA-4SS-HP. 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.

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 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.

Skill Level – Installation of this Automatic Insertion Instrument Regulator requires basic mechanical skills.

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

If you received a damaged Automatic Insertion Instrument Regulator, you should immediately contact a Welker® representative.

Phone: 281.491.2331
Address: 13839 West Bellfort Street
Sugar Land, TX 77498

SECTION 1: PRODUCT INFORMATION

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 1-281-491-2331.

**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

Designed for high pressure systems, the Welker® *IRA-4SS-HP* Automatic Insertion Instrument Regulator provides an analyzer with a properly regulated sample stream. When used with a pipeline isolation valve, the IRA-4SS-HP can be safely inserted and retracted without interrupting the flow or operation of the pressurized pipeline. Insertion depth can be set with the adjustable lock collar, making the IRA-4SS-HP compatible with multiple pipe sizes. The thermal fins of the IRA-4SS-HP 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 IRA-4SS-HP 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 (1) analytical instrument should be fed by the unit 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 insertion shaft. 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 units, the oil reservoir must be rotated so that it remains vertical. **The oil reservoir will not function properly if installed 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.

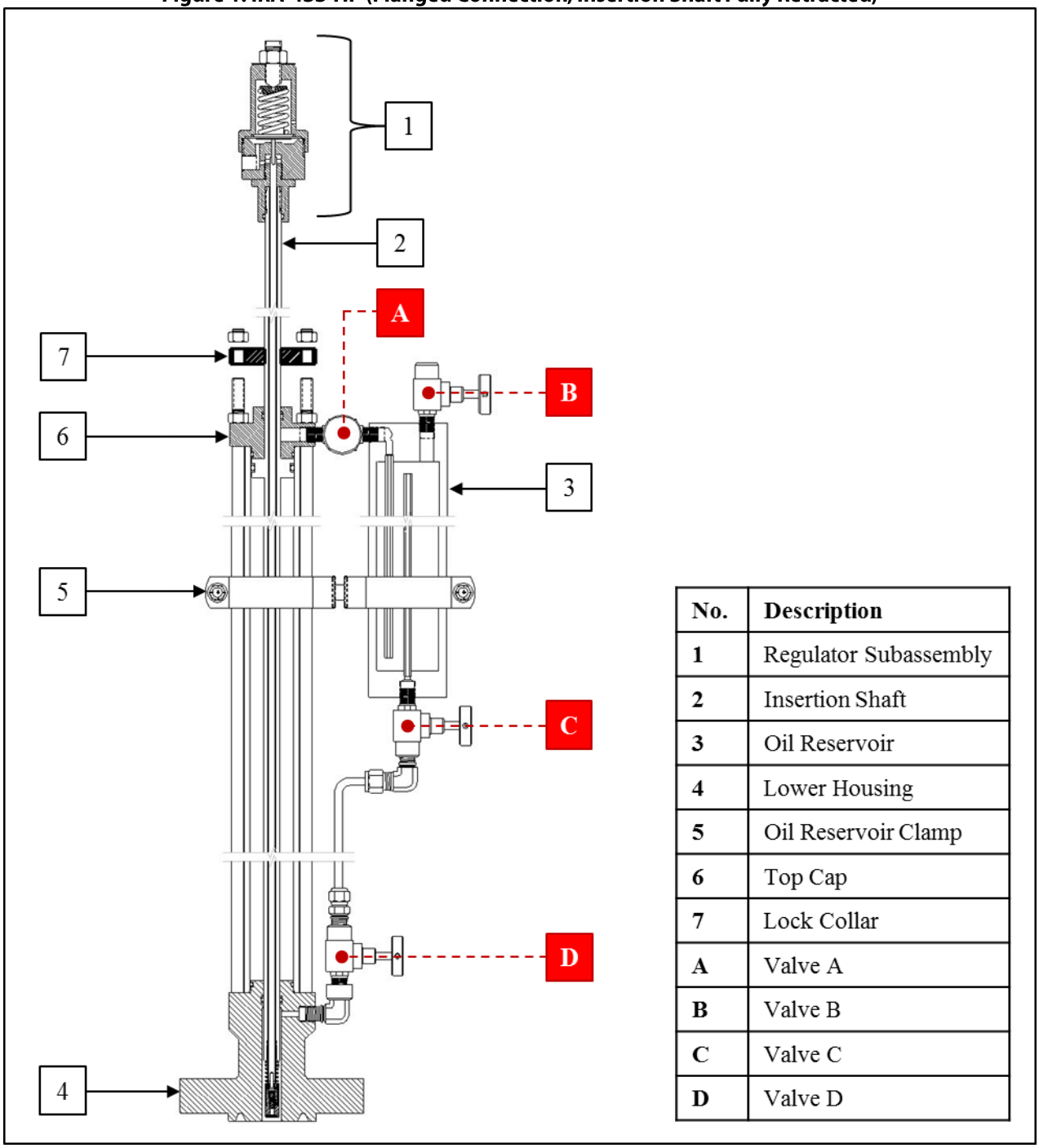
1.4 Specifications

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: IRA-4SS-HP Specifications	
Products Sampled	Natural Gas and Natural Gas Liquids
Materials of Construction	316 / 316L Stainless Steel, PTFE, Teflon®, Viton® Others Available
Maximum Allowable Operating Pressure	3600 psig @ -20°F to 100°F (*248 barg @ -28°C to 37°C*)
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)*
Pipeline Connections	3/4" NPT 1" NPT (Standard) 1-1/2" NPT 2" NPT 1" to 3" Flange
Insertion Depth	18" (*45 cm*) 24" (*60 cm*) 30" (*76 cm*) Others Available
Regulator Type	Diaphragm- or Piston-Operated
Mounting	Vertical (Standard) Others Available
Options	Compliance: CE, CRN, NACE Extension Spool Heated Manifold Insulation Blanket Isolation Ball Valve No Oil Reservoir or Valves Oil Reservoir Connections Oil Reservoir Orientation Outlet Hardware Relief Valve With Pressure Gauge Support Brackets

1.5 System Diagram

Figure 1: IRA-4SS-HP (Flanged Connection; Insertion Shaft Fully Retracted)



No.	Description
1	Regulator Subassembly
2	Insertion Shaft
3	Oil Reservoir
4	Lower Housing
5	Oil Reservoir Clamp
6	Top Cap
7	Lock Collar
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. Immediately contact a Welker® representative if you received damaged equipment.

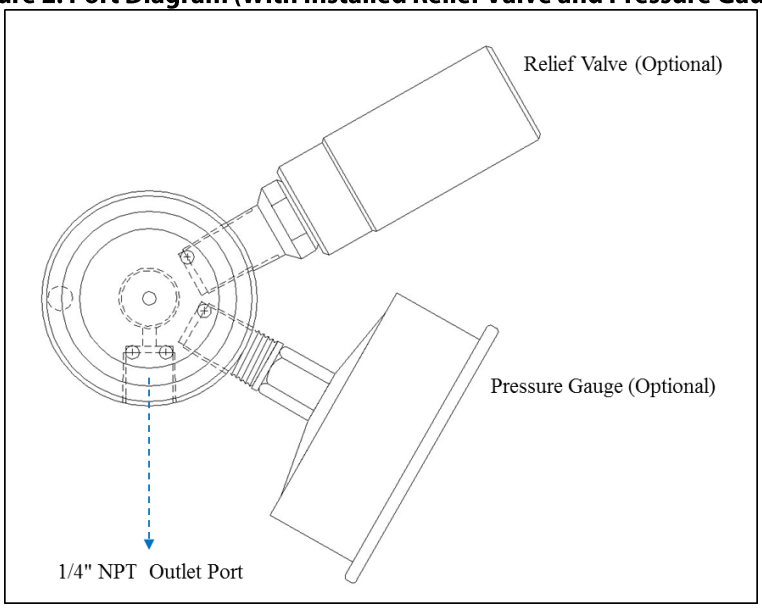
When sealing fittings with PTFE tape, refer to the proper sealing instructions for the tape used.

1. A sample probe is recommended to extract the sample from the center one-third (1/3) of the pipeline in a location where the product is well-mixed and will yield a representative sample.
2. For gas sampling applications, Welker® recommends that the unit be installed in the top of the pipe.
3. For liquid sampling applications, Welker® recommends that the unit be installed in the side of the pipe.
4. Handle the unit with care. Avoid bending the insertion shaft, which has a polished surface that travels through seals.
5. Operate the unit slowly and smoothly while inserting and retracting to avoid damaging the unit.
6. 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 Installation & Operation

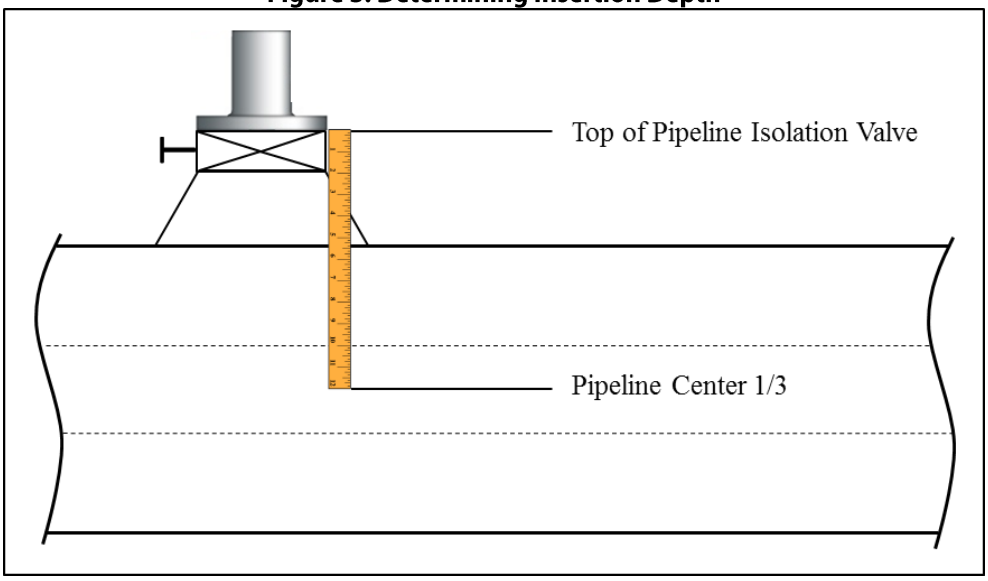
1. As necessary, install a relief valve and pressure gauge in the appropriate ports (*Figure 2*). Welker® will pre-install relief valves and pressure gauges if requested at the time of order.

Figure 2: Port Diagram (With Installed Relief Valve and Pressure Gauge)



2. Prior to installation, the length the insertion shaft will need to travel inside the pipeline must be determined. Measure the distance the insertion shaft 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 shaft insertion length (*Figure 3*).

Figure 3: Determining Insertion Depth



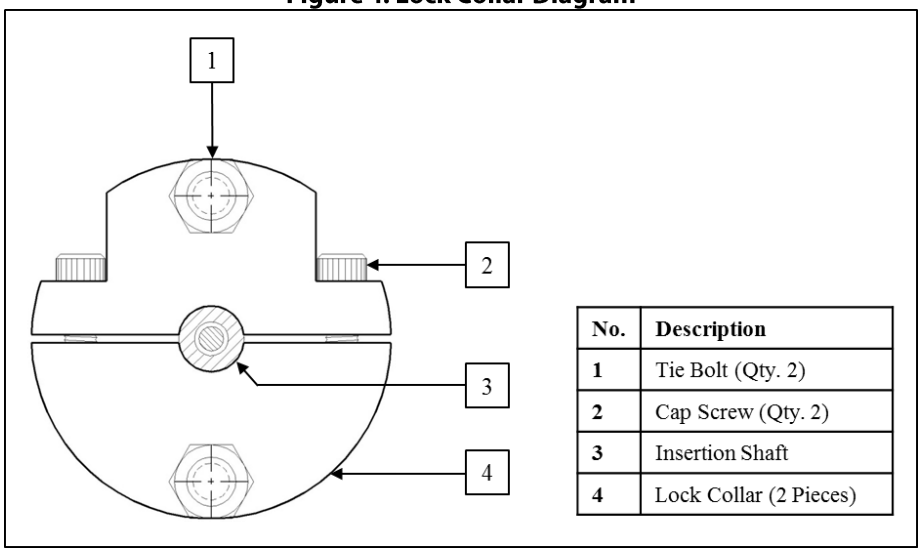
3. Pull up on the insertion shaft to ensure that it is fully retracted. The end of the insertion shaft should be flush with the bottom flange face.

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

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

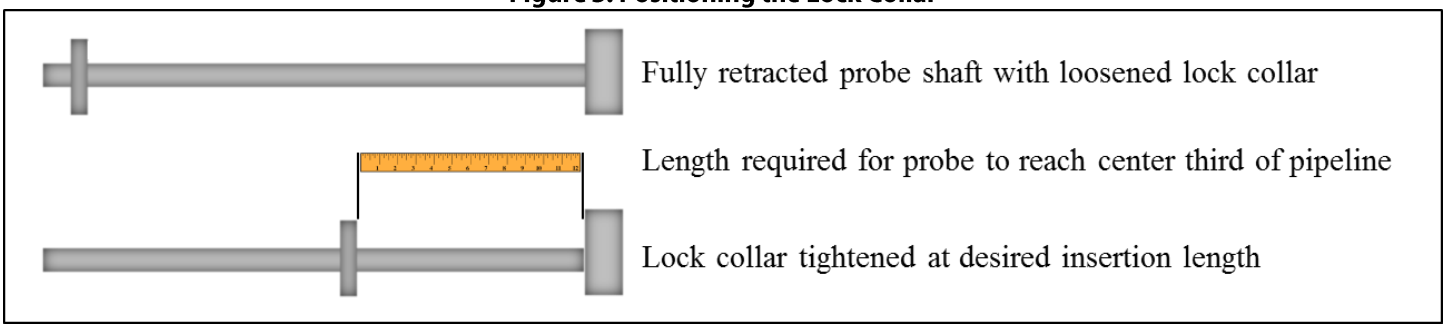
Figure 4: Lock Collar Diagram



No.	Description
1	Tie Bolt (Qty. 2)
2	Cap Screw (Qty. 2)
3	Insertion Shaft
4	Lock Collar (2 Pieces)

5. Remove the hex nuts from the tie bolts at the top of the lock collar.
6. Loosen the cap screws.

Figure 5: Positioning the Lock Collar



7. Carefully slide the lock collar up the insertion shaft to the insertion length, taking care not to scratch the insertion shaft.
8. Tighten the cap screws 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.

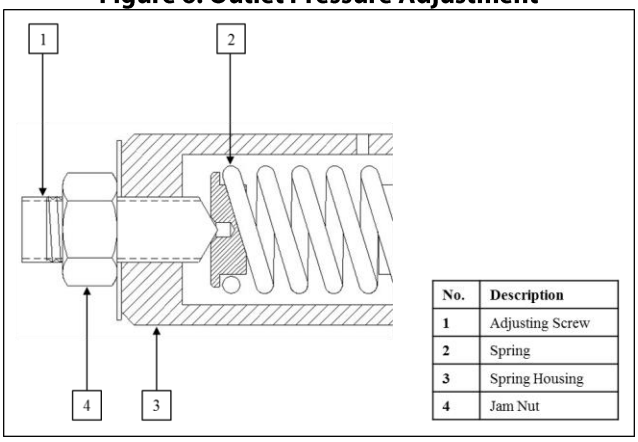
9. Disconnect the tubing between valves C and D.
10. Unscrew and remove the oil reservoir clamp from the insertion shaft and oil reservoir.
11. Loosen valve A at the top cap.
12. Reposition the oil reservoir so that it is perpendicular to the insertion shaft. Valve C on the oil reservoir should point 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 to 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 6*) so that the unit is closed (i.e., no setting or tension on the spring).

Figure 6: Outlet Pressure Adjustment



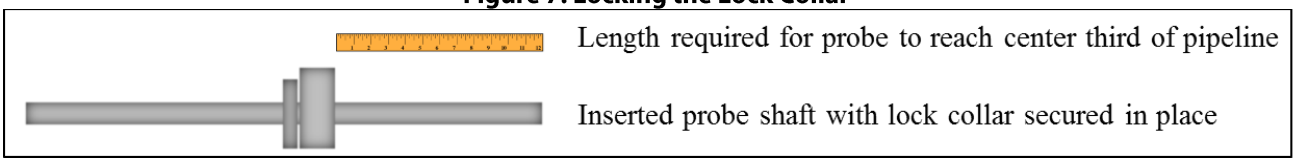
No.	Description
1	Adjusting Screw
2	Spring
3	Spring Housing
4	Jam Nut

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 IRA-4SS-HP. The gauge should read 0 psig. If the gauge does not read 0 psig, disassemble the IRA-4SS-HP and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. Refer to *Section 3.2, 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 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.

28. Once the lock collar reaches the top cap, close valve C.
29. Secure the lock collar to the top cap (*Figure 7*). Screw the hex nuts onto the tie bolts, and then tighten the cap screws.

Figure 7: Locking the Lock Collar



30. Check for leaks. Repair as necessary.
31. Connect tubing from the outlet valve of the unit to the instrument.
32. Loosen the jam nut on the adjusting screw (*Figure 6*).

33. Screw the adjusting screw clockwise to adjust the outlet pressure. Tighten the jam nut when the desired outlet pressure has been set.
34. As necessary, refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the appropriate Welker® relief valve for instructions on setting the relief valve.
35. Check for leaks. Repair as necessary.

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

36. Install the unit to the pipeline isolation valve.
37. In a counterclockwise direction, back off the adjusting screw on the regulator subassembly (*Figure 6*) so that the unit is closed (i.e., no setting or tension on the spring).
38. Ensure that all valves on the oil reservoir are closed.
39. Ensure that the outlet port valve on the regulator subassembly is closed.
40. Slowly open the pipeline isolation valve and check for leaks. Repair as necessary.
41. Check the outlet gauge of the IRA-4SS-HP. The gauge should read 0 psig. If the gauge does not read 0 psig, disassemble the IRA-4SS-HP and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. Refer to *Section 3.2, Maintenance,* for instructions on disassembling and maintaining the thermal fin subassembly.
42. Slowly open valves C and D to allow pipeline pressure to enter the oil reservoir.
43. Slowly open 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.

44. Once the lock collar reaches the top cap, close valve C.
45. Secure the lock collar to the top cap (*Figure 7*). Screw the hex nuts onto the tie bolts, and then tighten the cap screws.
46. Check for leaks. Repair as necessary.
47. Connect tubing from the outlet valve of the unit to the instrument.
48. Loosen the jam nut on the adjusting screw (*Figure 6*).
49. Screw the adjusting screw clockwise to adjust the outlet pressure. Tighten the jam nut when the desired outlet pressure has been set.
50. As necessary, refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the appropriate Welker® relief valve for instructions on setting the relief valve.
51. Check for leaks. Repair as necessary.

2.3 Retraction

1. Close the outlet port valve on the regulator subassembly and disconnect tubing from the instrument, relieving any trapped pressure.
2. Open valves C and D to relieve any gas trapped in the lower housing.
3. Open valve A, and then close valves C and D.
4. Remove the hex nuts from the tie bolts at the top of the lock collar.
5. Slowly open valve B to vent the gas in the oil reservoir to begin automatically retracting the insertion shaft 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.

6. Once the insertion shaft has been fully retracted from the pipeline, close the pipeline isolation valve to isolate the unit from pressure.
7. Open the outlet port valve on the regulator subassembly to relieve any trapped pressure.
8. Close all valves on the unit.
9. The unit is now ready to be removed from the pipeline isolation valve for maintenance or to be relocated.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker® recommends that the unit have regular maintenance every under normal operating conditions:** for ***gas sampling*** every six (6) months; and for ***liquid sampling*** every twelve (12) months. In cases of severe service, dirty conditions, excessive usage, or other unique applications that 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 Maintenance

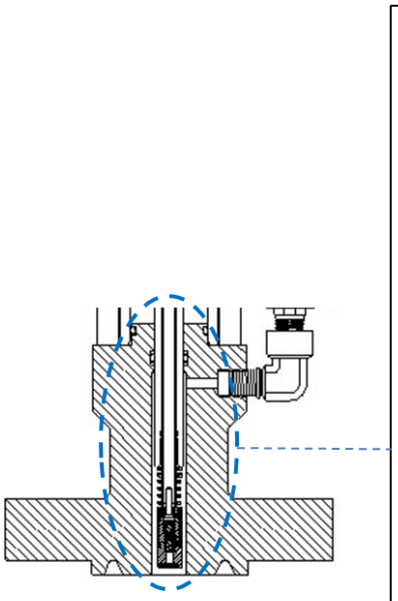
1. Prior to maintenance, the unit must be removed from the pipeline. Refer to *Section 2.3, Retraction,* for instructions on retracting the insertion shaft and removing the unit from the pipeline.
2. Once the unit is removed from the pipeline, ensure that all valves are closed.

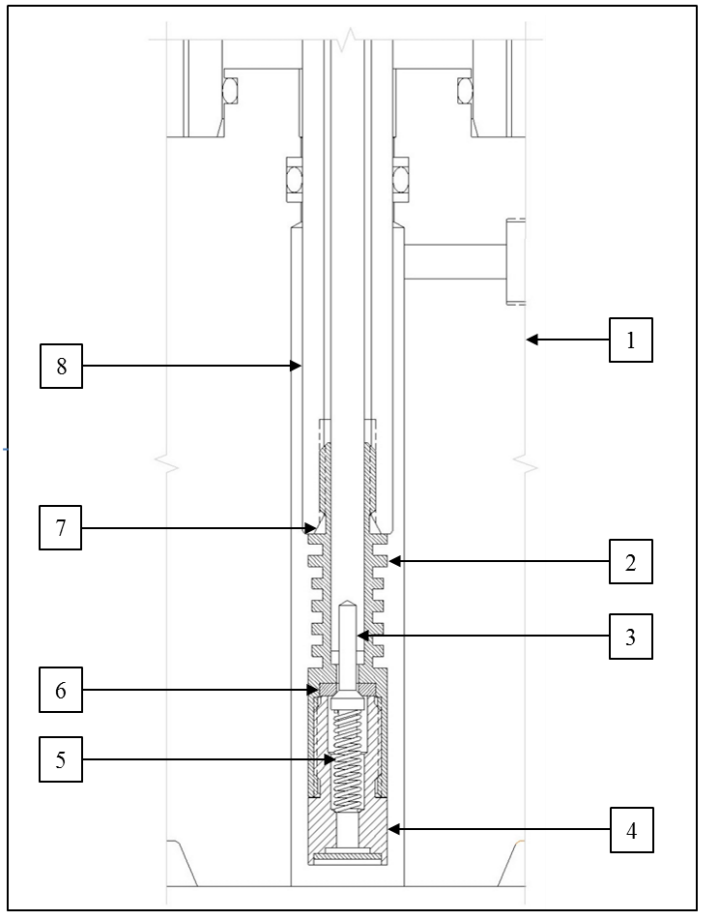
Removing the Oil Reservoir

3. Disconnect the tubing between valves C and D.
4. Unscrew the oil reservoir clamp from around the insertion shaft, taking care not to lose the washer and screw.
5. Disconnect the oil reservoir from the top cap of the insertion shaft at valve A. Valves A, B, and C should remain connected to the oil reservoir.
6. Set the oil reservoir aside.

Thermal Fin Subassembly Maintenance

Figure 8: Thermal Fin Subassembly Diagram



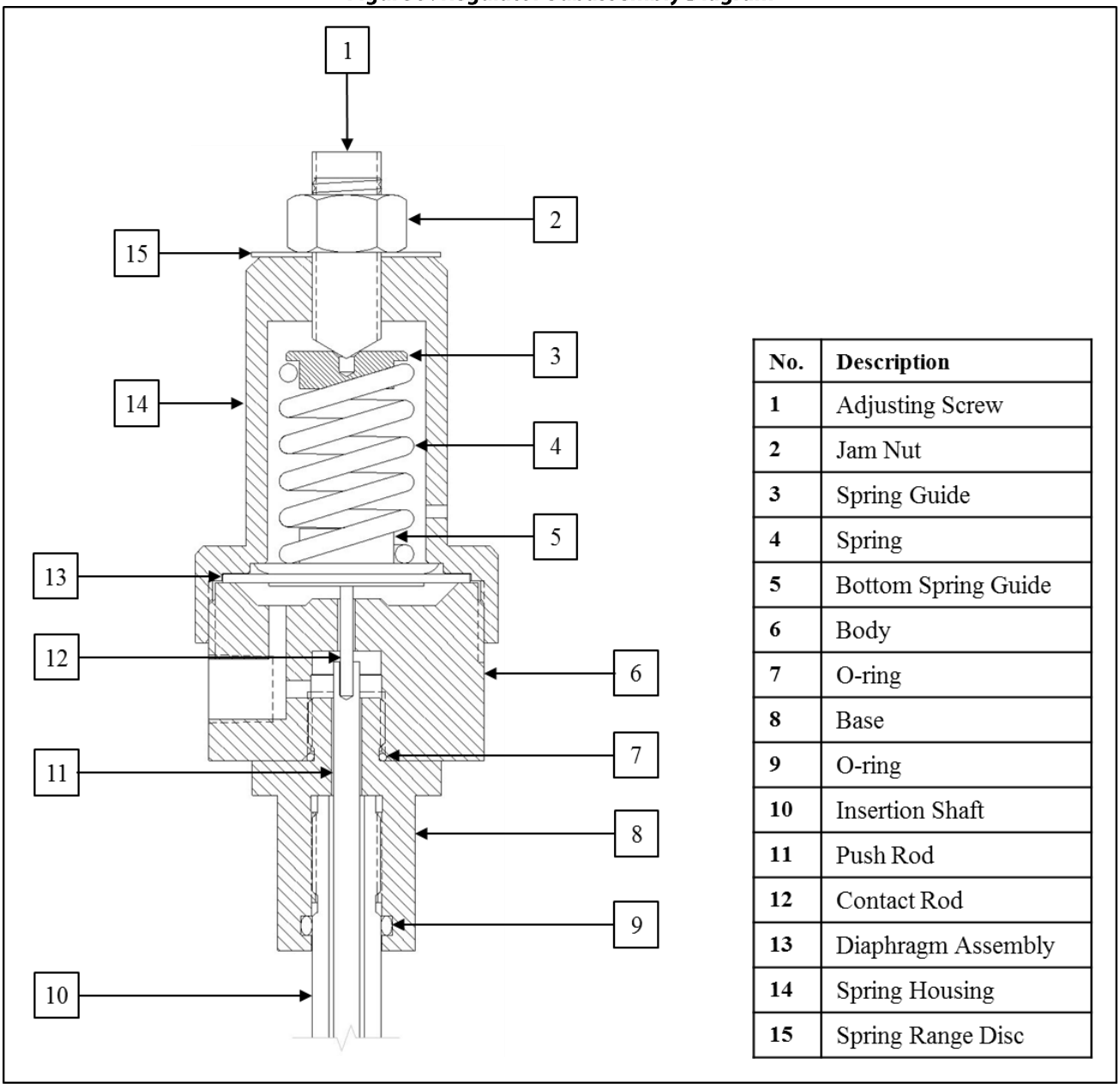


No.	Description
1	Lower Housing
2	Thermal Fins
3	Poppet
4	Seat Retainer
5	Spring
6	Seat
7	O-ring
8	Insertion Shaft

7. Push the insertion shaft through the lower housing so that the thermal fins are fully exposed.
8. Remove the thermal fin subassembly.
9. When the thermal fin subassembly is removed, the contact rod and push rod should easily slide out (*Figure 9*). As necessary, gently tilt the unit back and forth until both pieces slide out, taking care not to misplace the small contact rod.
10. Remove the seat retainer, spring, and poppet.
11. Examine the seating face of the poppet for scratches or damage. Replace as necessary.
12. Use a small, pointed instrument to carefully remove the seat from the thermal fin subassembly.
13. Visually inspect the seat for debris or scratches. Replace as necessary.
14. Guide the poppet into the seat.
15. Replace the spring and seat retainer. Tighten firmly.
16. Replace the O-ring at the base of the thermal fin subassembly, and then set the thermal fin subassembly aside.

Regulator Subassembly Maintenance

Figure 9: Regulator Subassembly Diagram



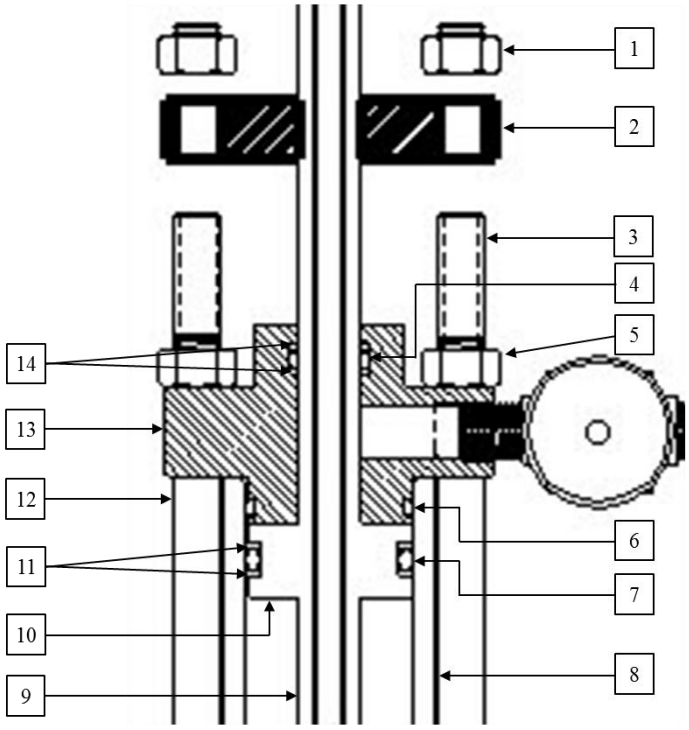
No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring
5	Bottom Spring Guide
6	Body
7	O-ring
8	Base
9	O-ring
10	Insertion Shaft
11	Push Rod
12	Contact Rod
13	Diaphragm Assembly
14	Spring Housing
15	Spring Range Disc

17. Remove the body from the base and set it aside.
18. Remove the base from the insertion shaft and replace the O-rings on the base.
19. Reinstall the base to the body and hand-tighten.
20. Unscrew the spring housing from the body.
21. Reinstall the diaphragm. The metal pad should face down toward the opening and should face the body when installed.
22. Reinstall the bottom spring guide.
23. Reinstall the spring housing to the body and set it aside.

When reassembling the upper housing, HAND-TIGHTEN ONLY.

Top Cap and Lower Housing Maintenance

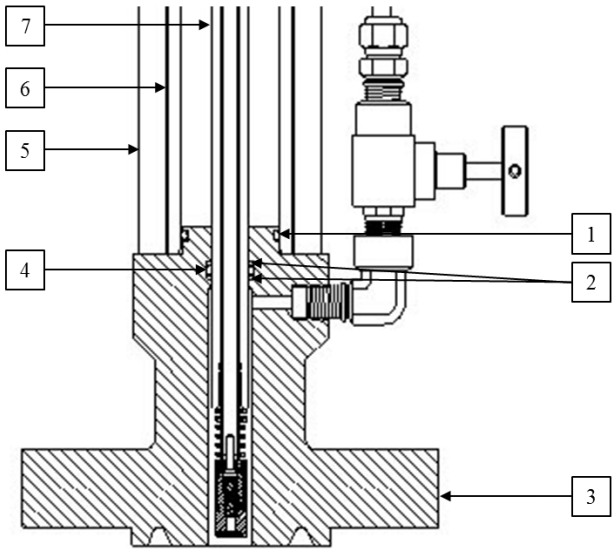
Figure 10: Top Cap Detail Diagram



No.	Description
1	Hex Nut (Qty. 2)
2	Lock Collar
3	Long Tie Bolt (Qty. 2)
4	O-ring
5	Hex Nut (Qty. 4)
6	O-ring
7	O-ring
8	Insertion Cylinder
9	Insertion Shaft
10	Piston
11	Back Up (Qty. 2)
12	Short Tie Bolt (Qty. 4)
13	Top Cap
14	Back Up (Qty. 2)

24. Loosen and remove the lock collar from the insertion shaft, taking care not to scratch the insertion shaft.
25. Remove the tie bolt hex nuts and slide the top cap off the insertion shaft.
26. Replace the O-rings and back ups on the top cap.

Figure 11: Lower Housing Diagram



No.	Description
1	O-ring
2	Back Up (Qty. 2)
3	Lower Housing
4	O-ring
5	Tie Bolt (Qty. 6)
6	Insertion Cylinder
7	Insertion Shaft

27. Carefully slide the insertion shaft out and the insertion cylinder off of the lower housing.
28. Replace the O-rings and back ups on the lower housing.

Shaft and Cylinder Maintenance

29. Remove the insertion shaft from the insertion cylinder.
30. Replace the O-ring and the back ups on the shaft piston (*Figure 10*).
31. 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.
32. 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.

3.3 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.

> Welker® recommends Dow Corning® 111 (DC 111) or an equivalent lubricant for use with this unit.

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. Following a cross-bolting sequence, install the tie bolts and tighten the hex nuts to the appropriate torque (*Figure 12 & Table 2*).

Figure 12: Cross-Bolting Sequence

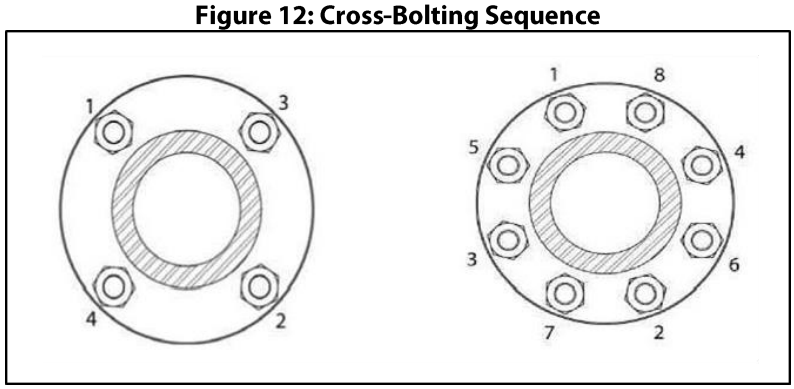


Table 2: Torque Specifications for Tie Bolts

Tie Bolt Diameter	Foot-Pounds (ft·lb)	Kilograms per Meter (kg / m)
3/8"	5-6	0.69-0.82
1/2"	15-20	2.07-2.76
5/8"	23-30	3.45-4.14
7/8" or 1"	55-65	7.60-8.98

7. Reinstall the lock collar on 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 into the poppet.
11. Insert the contact rod into the push rod and carefully screw the regulator subassembly with the base to 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. If pipeline pressure will be used to install the unit to the pipeline, 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* (IOM) *Manuals* suggested for use with this unit:

- IOM-025: Welker® IR-1, IR-2, IR-4, and IR-6 Instrument Regulators
- IOM-033: Welker® RV-1, RV-2, RV-2CP, and RV-3 Relief 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: AD863BF

NOTES

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