WELKER

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER AUTOMATIC INSERTION HEATED REGULATOR

MODEL
IHRA

DRAWING NUMBER
ADHRA02

MANUAL NUMBER
IOM-156

REVISION
Rev. 1, 03/08/2023

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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 Automatic Insertion Heated Regulator, IHRA. 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 Automatic Insertion 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 Automatic Insertion Heated Regulator, please contact a Welker representative immediately.

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 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 at1-281-491-2331.

**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 *IHRA* Automatic Insertion Heated Regulator provides a conditioned sample stream at the required temperature and pressure for the instrumentation. The thermal exchange fins help mitigate the natural temperature drop that occurs during regulation. The heater is designed to recover heat lost during regulation to help maintain the gas phase of the sample stream.

The IHRA is probe-mounted and can be inserted into the pipeline to collect a sample. The IHRA is designed to be inserted and retracted from a pipeline under pressure. The design of the unit allows the operator to control the movement of the probe safely into and out of the pressurized pipeline through the use of four valves and an oil reservoir. When used with a full-ported isolation valve, the IHRA can be completely installed or removed without interrupting pipeline flow or operations. In order to set the desired output pressure, an adjusting screw on the device is tightened, pushing down on a spring inside of the device.

The enclosure for the electrical parts of the equipment consists of one of two certified flameproof enclosures with either two or three ¾" FNPT entries and a threaded cover connected by means of a certified bushing to a small enclosure with a ½" FNPT entry and an M14 entry that houses the heater cartridge. The M14 x 1.5 entry is closed with a suitably certified blanking element. The certified enclosure houses a terminal block and a heater controller for regulation of the heater cartridge.

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

1.3 Important Certification Information

1. Ensure that the field technician installing the IHRA is trained in the protection practices required to maintain the area classification for electrical equipment in ATEX and IECEx hazardous locations.
2. Before connecting power to the IHRA, the technician shall ensure that cabling components supplied by the end-user are certified for explosion protection flameproof enclosure "d."
3. The cable entry points may reach 173.24 °F (*78.5 °C*). Appropriate selection of cabling components shall be made by the end-user to ensure that the installation of the IHRA maintains its certifications.
4. The phase conductors should have a minimum cross-sectional area no less than 0.8325 mm^2 (18 AWG). The protective earth conductors should have the same or larger cross-sectional area as the phase conductors. All external equipotential bonding connections shall provide an effective connection of a conductor with a minimum cross-sectional area of 4 mm^2.
5. Do not open the certified enclosure until the surface temperature and any stored electrical entry have decayed to the point that the certified enclosure can no longer be a potential ignition source.
6. Ensure that the IHRA is isolated from all incoming and outgoing connections (including neutral conductors) prior to opening the certified enclosure.
7. When removing the IHRA to perform maintenance, ensure that the exposed conductors are correctly terminated in an appropriate enclosure, are insulated and isolated from all power sources, or are properly grounded and isolated from all power sources.
8. When reassembling the certified enclosure, all joints should be thoroughly cleaned and may be lightly lubricated with suitable grease, such as Crouse-Hinds STL or HTL Thread Lubricant, to prevent corrosion and assist in weatherproofing. Use only non-metallic scrapers and non-corrosive cleaning fluids to clean flanges. Keep blind bolt holes clear of grease.

1.4 Specific Conditions of Use

1. Some external parts of the equipment are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The end-user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high pressure steam), which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done with a damp cloth.
2. The equipment shall be operated within an inlet process temperature range of -76 °F to 140 °F (*-60 °C to +60 °C*).

1.5 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 Unit 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.

1.6 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: IHRA Specifications

Products	Natural Gas and Natural Gas Liquids Compatible With the Materials of Construction	
Materials of Construction	**Lower Housing:** Allowable Materials Shown in ASME Boiler and Pressure Vessel Code (ASME B&PVC), ASME B16.5, ASME B31.1, and/or ASME B31.3 **Regulator Body:** 6 Moly Stainless Steel, 17-4 PH Stainless Steel, 304/304L Stainless Steel, 316/316L Stainless Steel, 317/317L Stainless Steel, 321/321H Stainless Steel, 347/347H Stainless Steel, Duplex Stainless Steel, HASTELLOY® C276 Alloy, Inconel Alloy 625, Monel® Alloy 400, and Super Duplex Stainless Steel **Seals:** Varies Based on Customer Specifications and the MAOP and MAOT of the Unit	
Maximum Allowable Operating Pressure	**Bolted:** 6000 psig @ -76 °F to 140 °F (*413 barg @ -60 °C to +60 °C*) **Threaded:** 3600 psig @ -76 °F to 140 °F (*248 barg @ -60 °C to +60 °C*)	
Process Temperature Range	-76 °F to 140 °F (*-60 °C to +60 °C*)	
Pipeline Connection	**NPT** ¾" MNPT 1" MNPT 1½" MNPT 2" MNPT 2½" MNPT 3" MNPT	**Flanged** **Size:** ¾"–8" **Rating:** 1500 and 2500 ANSI
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	0–12" (*0–30 cm*) 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*) 0–102" (0–*259 cm*) Others Available	
Operation	Diaphragm- or Piston-Operated Regulator	

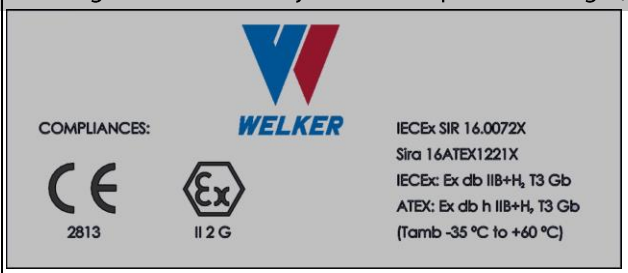
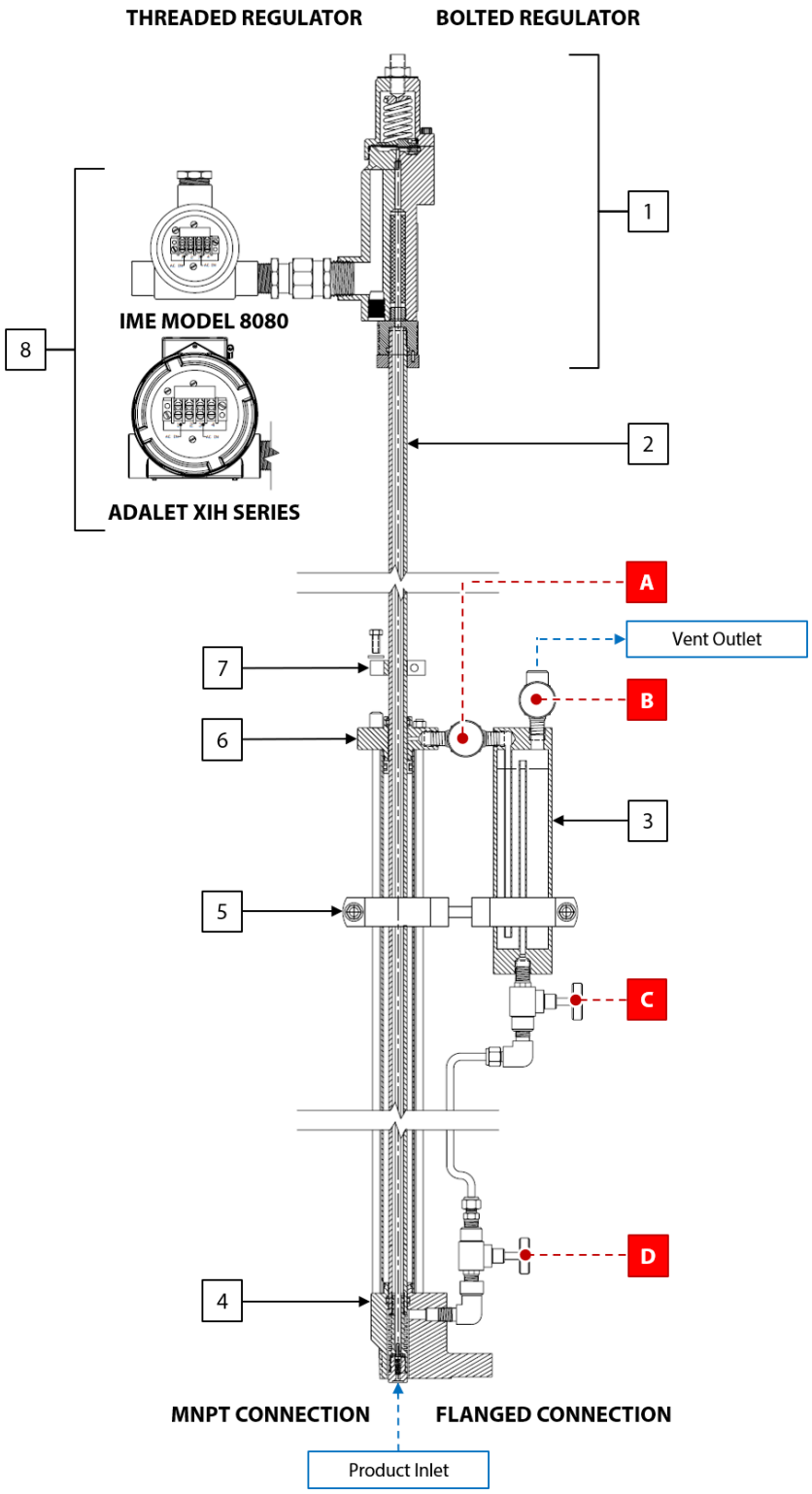
Table 1: IHRA Specifications (Continued)	
Features	Explosion-Proof Certified Enclosure Heating Element With Adjustable Temperature Range (See *Table 2* for Options)
Industry Standards / Product Certifications	 2014/68/EU EN 60079-0:2018 EN 60079-1:2014 EN 80079-36:2016 IEC 60079-0:2017 IEC 60079-1:2014
Options	Probe Tip Relief Valve With Pressure Gauge

Table 2: Heating Element Options				
Electrical Connection	Power	Temperature Range	Current	Resistance
AC 110/120 V	150 W	68 °F to 210 °F (*20 °C to 98 °C*)	1.25 A	196 Ω
	200 W	180 °F to 380 °F (*82 °C to 193 °C*)	1.67 A	75 Ω
AC 220/240 V	100 W	68 °F to 210 °F (*20 °C to 98 °C*)	0.417 A	576 Ω
	200 W	180 °F to 380 °F (*82 °C to 193 °C*)	0.833 A	288 Ω

1.7 Equipment Diagram

Figure 1: IHRA Diagram



No.	Description
1	Heated Regulator Subassembly
2	Insertion Shaft
3	Oil Reservoir
4	Lower Housing
5	Oil Reservoir Clamp
6	Top Cap
7	Lock Collar
8	Certified Enclosure & Heater Controller (Enclosure Options Shown)
A	Insertion/Retraction Valve
B	Vent/Relief Valve
C	Isolation Valve
D	Isolation Valve

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.

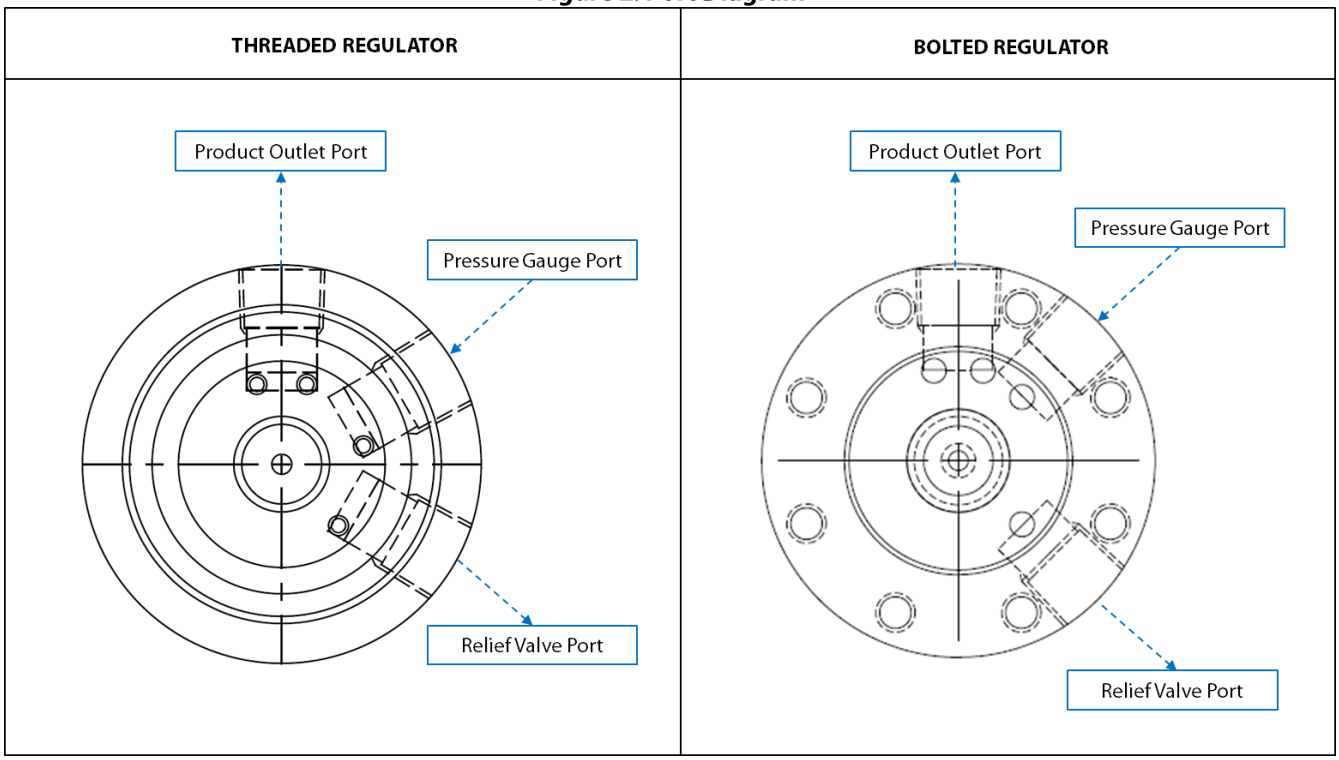
When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

1. A sample probe is recommended to extract sample from the center one-third (⅓) 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 IHRA for Installation

1. As necessary, install a pressure gauge to the pressure gauge port (*Figure 2*).

Figure 2: Port Diagram



Welker can install a relief valve and pressure gauge if requested at the time of order.

2. As necessary, use a safe auxiliary gas supply to set the relief valve to the proper pressure. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief valve for instructions on setting the relief.

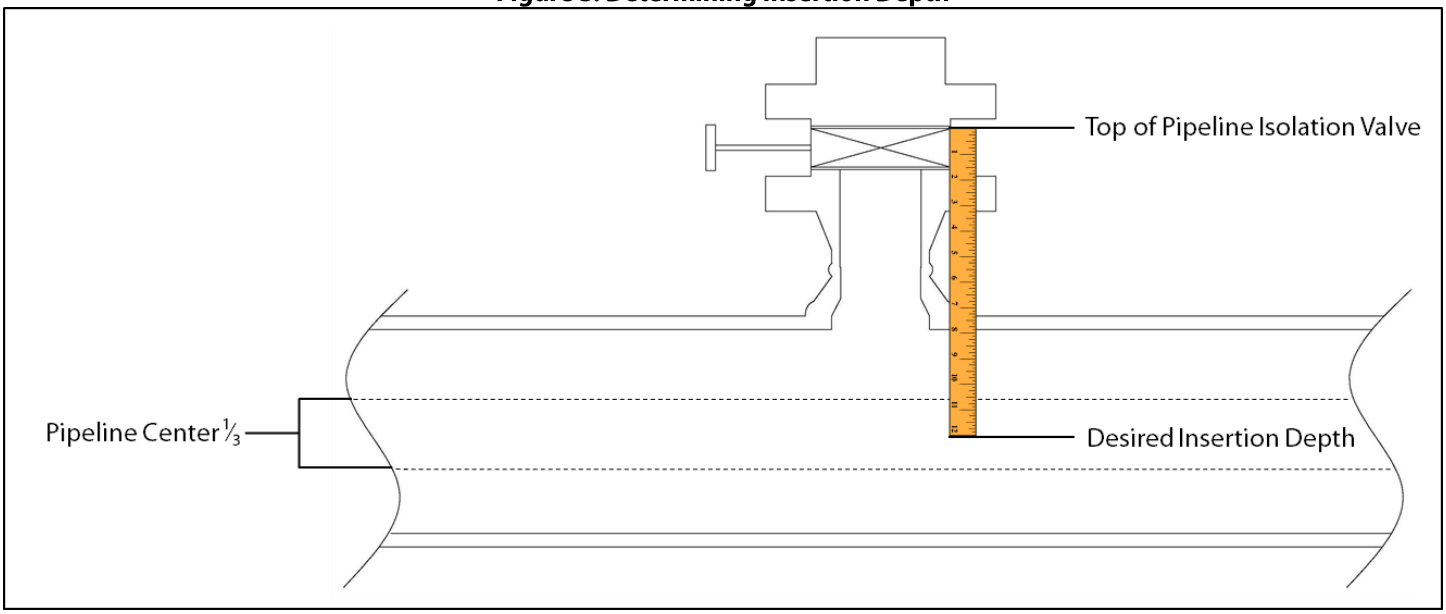
> If a Welker Relief Valve is used, Welker can set the relief valve prior to shipment if requested at the time of order.

3. As necessary, install the set relief valve to the relief valve port (*Figure 2*).

Determining Insertion Depth

4. 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 (⅓) of the pipeline) (*Figure 3*). This will be the shaft insertion length.

Figure 3: Determining Insertion Depth



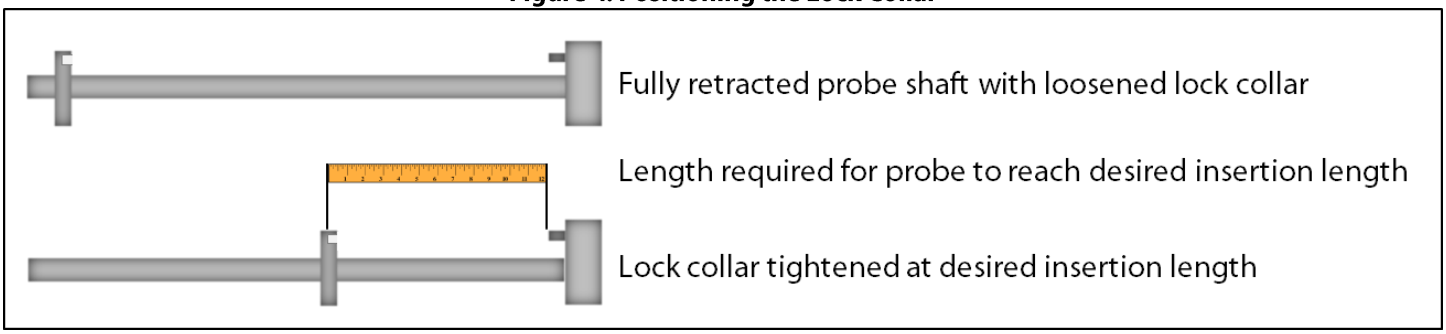
5. Pull up on the insertion shaft to ensure that it is fully retracted. The end of the insertion shaft should be flush with or in close proximity to the bottom face of the lower housing.

> 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.

6. Beginning at the top end of the top cap, measure along the insertion shaft to the desired shaft insertion length. As necessary, use a felt tip pen to mark this point.

Positioning the Lock Collar

Figure 4: Positioning the Lock Collar



7. Remove the lockdown bolt from the top of the lock collar.
8. Loosen the cap screw on the side of the lock collar.
9. Carefully slide the lock collar along the insertion shaft to the desired insertion length, taking care not to scratch the insertion shaft (*Figure 4*).
10. 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 4*).

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

11. If the oil reservoir needs to be rotated, continue to step 12. If the oil reservoir does not need to be rotated, proceed to *Section 2.3, Installing the IHRA*.

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.

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

2.3 Installing the IHRA

Ensure that the operating pressure of the pipeline does not exceed the MAOP of the unit.

Ensure that the field technician installing the IHRA is trained in performing installations as well as the protection practices required to maintain the area classification of the electrical equipment in ATEX and IECEx hazardous locations.

For long probes installed horizontally, Welker recommends field installation of bracing or 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.

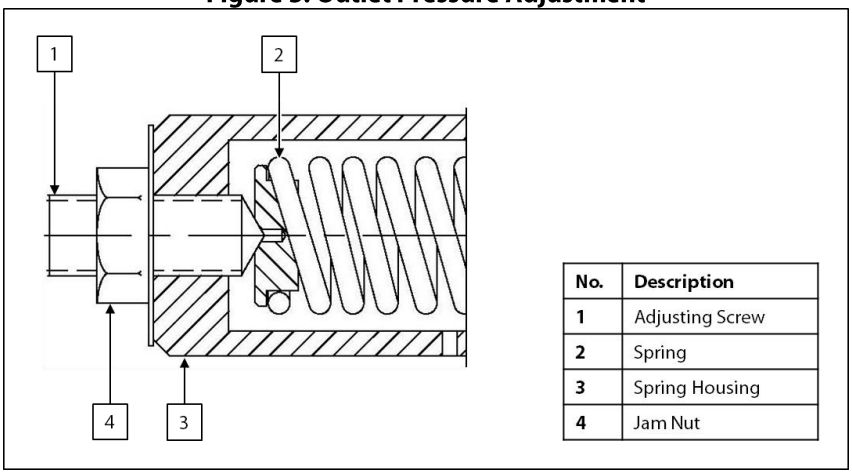
If the unit will be inserted using an auxiliary gas, continue to step 1.
If the unit will be inserted using pipeline product, proceed to step 17.

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 supply (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. 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



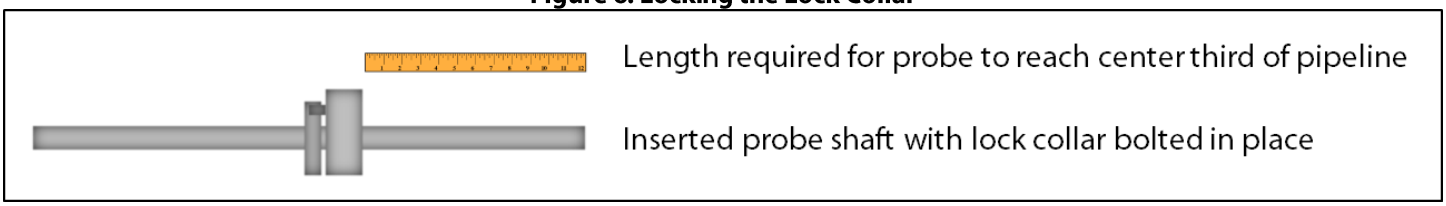
No.	Description
1	Adjusting Screw
2	Spring
3	Spring Housing
4	Jam Nut

8. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
9. Check the outlet pressure gauge on the IHRA. The gauge should read zero (0) psig. If the pressure gauge does not read zero (0) psig, disassemble the IHRA and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. See *Section 3.2, Maintenance,* for instructions on disassembling and maintaining the thermal fin subassembly.
10. Open the valve on the customer-supplied auxiliary gas supply and regulate the supply to pipeline pressure.
11. 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.

12. Once the lock collar reaches the top cap, close isolation valve C.
13. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar (*Figure 6*).

Figure 6: Locking the Lock Collar



14. 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.
15. Disconnect the customer-supplied auxiliary gas supply from isolation valve C.
16. Proceed to step 28 for start-up procedures.

Using Pipeline Product (If Not Using an Auxiliary Gas)

17. Ensure that all valves on the unit are closed.
18. Install the unit to the pipeline isolation valve.
19. 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).
20. Connect vent/relief valve B to a customer-supplied recovery system. Valve B should remain closed.
21. Slowly open the pipeline isolation valve. Check for leaks and repair as necessary.
22. Check the outlet pressure gauge on the IHRA. The gauge should read zero (0) psig. If the pressure gauge does not read zero (0) psig, disassemble the IHRA and check for internal leaking, making sure to examine the poppet and seat retainer in the thermal fin subassembly for damage. See *Section 3.2, Maintenance,* for instructions on disassembling and maintaining the thermal fin subassembly.
23. Slowly open isolation valves C and D to allow pipeline pressure to enter the oil reservoir.
24. 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.

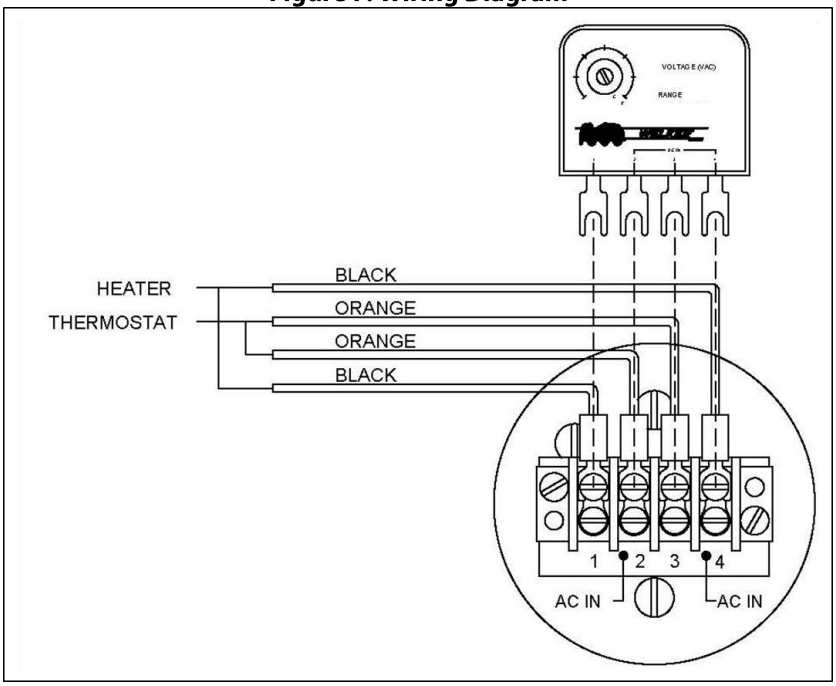
25. Once the lock collar reaches the top cap, close isolation valves C and D.
26. Secure the lock collar to the top cap by installing the lockdown bolt to the top of the lock collar (*Figure 6*).
27. Open vent/relief valve B to relieve pressure trapped in the oil reservoir, and then close vent/relief 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

28. With the customer-supplied electrical power turned OFF, connect the appropriate leads to terminals 2 and 4 in the provided explosion-proof electrical housing (*Figure 7*).

> See *Section 1.3, Important Certification Information,* for information on selecting appropriate cabling components for the unit to ensure it maintains its certifications.

Figure 7: Wiring Diagram



29. Seal conduit connectors using Chico® Sealing Compound or another appropriate sealing compound.

> For systems used in hazardous locations, sealing compound is required to seal all fittings to restrict the passage of gases, vapors, or flames.

30. Adjust the thermostat to the desired temperature.
31. Secure the cover to the explosion-proof electrical housing and cable gland.
32. Install customer-supplied tubing or other fittings to the outlet port on the IHRA (*Figure 2).*

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

33. Loosen the jam nut on the adjusting screw (*Figure 5*).
34. Screw the adjusting screw clockwise to adjust the outlet pressure. Tighten the jam nut on the adjusting screw to secure the adjusting screw at the desired outlet pressure (*Figure 5*).
35. Turn ON the electrical power to begin operation. Allow at least thirty (30) minutes for the IHRA to warm up.

> Welker recommends that the probe be enclosed or insulated to maximize the heating effect of the IHRA.

2.4 Retracting the Unit

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. Ensure that all valves on the unit are closed.
4. Ensure that vent/relief valve B is connected to a customer-supplied recovery system. Valve B should remain closed.
5. 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 6.
If the unit will be retracted using pipeline product, proceed to step 19.

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 recommends the use of an auxiliary gas supply (e.g., clean, dry nitrogen gas) to prevent damage to the insertion cylinder.

6. Ensure that the tubing between isolation valves C and D is detached.
7. Ensure that isolation valve D is plugged.
8. Connect a customer-supplied auxiliary gas supply to isolation valve C.
9. Open the valve on the customer-supplied auxiliary gas supply and regulate the supply to pipeline pressure.
10. 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.

11. Close isolation valve C.
12. Remove the lockdown bolt from the top of the lock collar.
13. 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.

14. 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.

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

When removing the IHRA to perform maintenance, ensure that the exposed conductors are correctly terminated in an appropriate enclosure, are insulted and isolated from all power sources, or are properly grounded and isolated from all power sources.

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.

18. 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.

Using Pipeline Product (If Not Using an Auxiliary Gas)

19. 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.

20. Close insertion/retraction valve A and isolation valves C and D.
21. Remove the lockdown bolt from the top of the lock collar.
22. 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.

23. 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.
24. 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.

When removing the IHRA to perform maintenance, ensure that the exposed conductors are correctly terminated in an appropriate enclosure, are insulted and isolated from all power sources, or are properly grounded and isolated from all power sources.

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.

25. 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.

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance.** Based on the operating conditions and/or site requirements, adjustments to the maintenance schedule may be necessary.
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. Crescent Wrench (Qty. 2)
    b. Gloves
    c. Hex Key Set
    d. Multimeter
    e. Phillips Head Screwdriver

3.2 Maintenance

1. Prior to maintenance, the unit must be removed from the pipeline. See *Section 2.4, Retracting the Unit,* 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 lose the nut and screw.
5. Disconnect the oil reservoir from the top cap of the insertion shaft at insertion/retraction valve A. Valves A, B, and C should remain connected to the oil reservoir.
6. Set the oil reservoir aside.

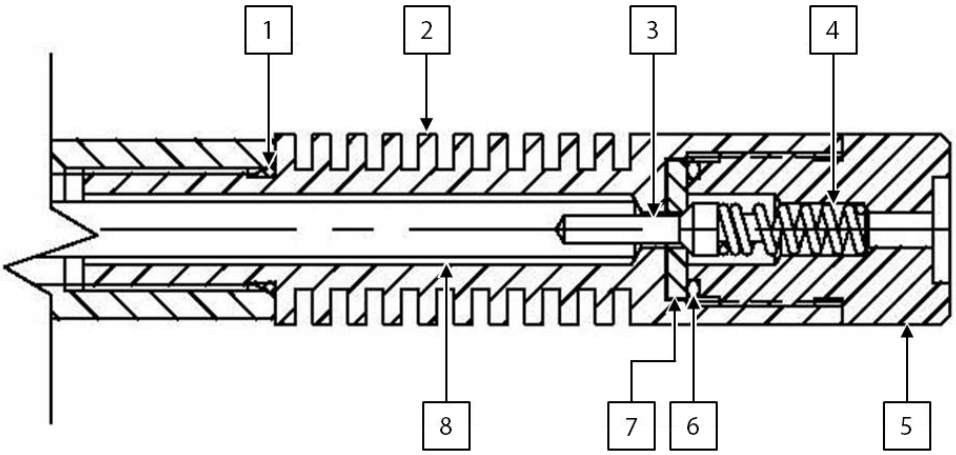
Thermal Fin Subassembly Maintenance

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 8, 9, 10, or 11 & Figure 13, 14, or 15*). As necessary, gently tilt the unit back and forth until both pieces slide out, taking care not to misplace the small contact rod.

To perform maintenance on a standard probe tip, continue to step 10.
To perform maintenance on a coalescing probe tip, proceed to step 23.
To perform maintenance on a cartridge probe tip, proceed to step 40.
To perform maintenance on a sintered filter probe top, proceed to step 45.

Maintenance: Standard Probe Tip

Figure 8: Standard Probe Tip



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

10. While holding the thermal fin subassembly with a crescent wrench, use a second crescent wrench to unscrew the seat retainer.
11. Remove the spring and poppet.
12. 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.

13. Use a small pointed instrument to carefully remove the seat from the thermal fin subassembly.
14. Inspect the seat for debris or scratches. Replace as necessary.

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

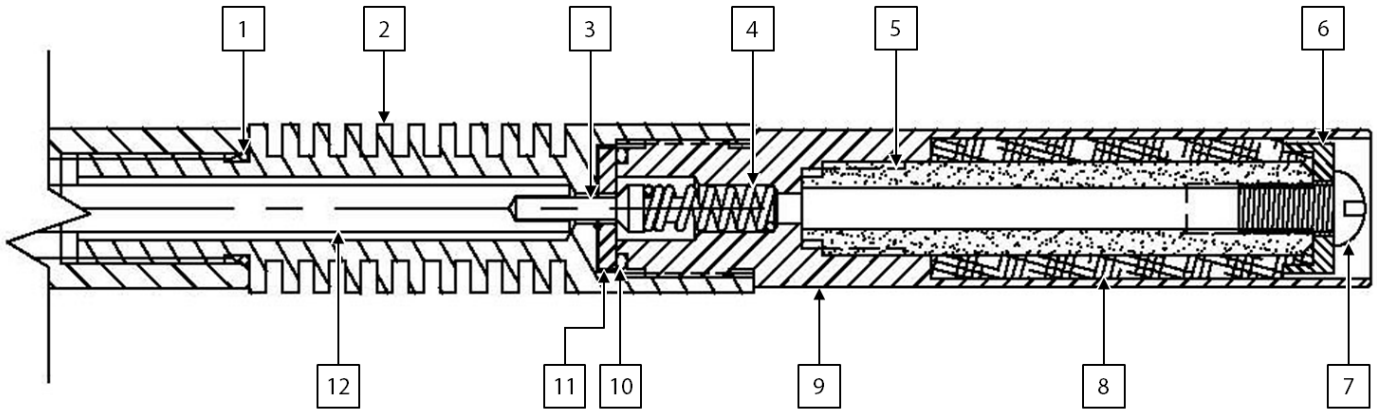
15. Replace the O-ring on the seat retainer.
16. Use solvent to clean the screen in the seat retainer.

> 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.

17. Install the seat to the thermal fin subassembly.
18. Guide the poppet into the seat.
19. Return the spring to the poppet.
20. Return the seat retainer to the thermal fin subassembly and tighten firmly.
21. Replace the O-ring at the base of the thermal fin subassembly, and then set the thermal fin subassembly aside.
22. Proceed to step 60 for instructions on maintaining the regulator body.

Maintenance: Coalescing Probe Tip

Figure 9: Coalescing Probe Tip



No.	Description
1	O-ring
2	Thermal Fins
3	Poppet
4	Spring

No.	Description
5	Flow Adapter
6	Retainer
7	Screw
8	Shredded PTFE

No.	Description
9	Coalescing Body
10	O-ring
11	Seat
12	Push Rod

23. While holding the thermal fin subassembly with a crescent wrench, use a second crescent wrench to unscrew the coalescing body.
24. Remove the spring and poppet.
25. 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.

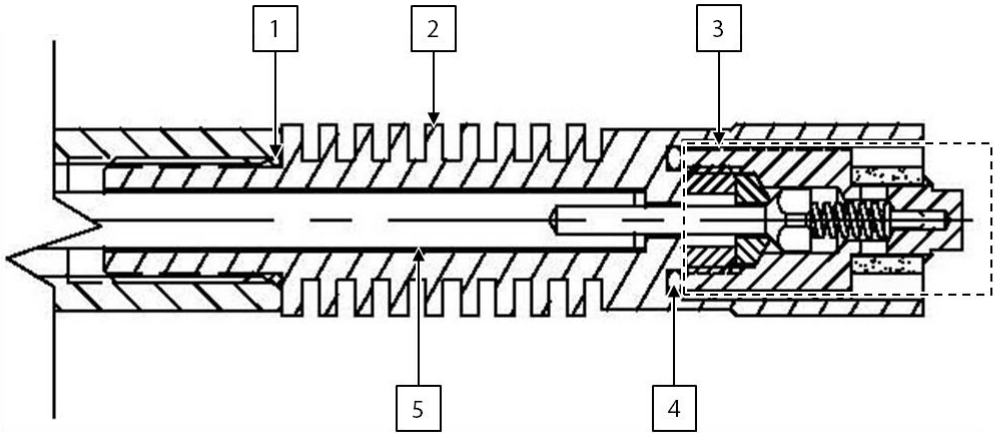
26. Use a small pointed instrument to carefully remove the seat from the thermal fin subassembly.
27. Inspect the seat for debris or scratches. Replace as necessary.

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

28. Replace the O-ring on the coalescing body.
29. Remove the screw from the tip.
30. Remove the retainer from the flow adapter.
31. Remove the shredded PTFE from the coalescing body and dispose of it properly.
32. Install new shredded PTFE to the coalescing body.
33. Return the retainer to the flow adapter, and then secure the retainer to the flow adapter using the screw.
34. Install the seat to the thermal fin subassembly.
35. Guide the poppet into the seat.
36. Return the spring to the poppet.
37. Return the coalescing body to the thermal fin subassembly and tighten firmly.
38. Replace the O-ring at the base of the thermal fin subassembly, and then set the thermal fin subassembly aside.
39. Proceed to step 60 for instructions on maintaining the regulator body.

Maintenance: Cartridge Probe Tip

Figure 10: Cartridge Probe Tip

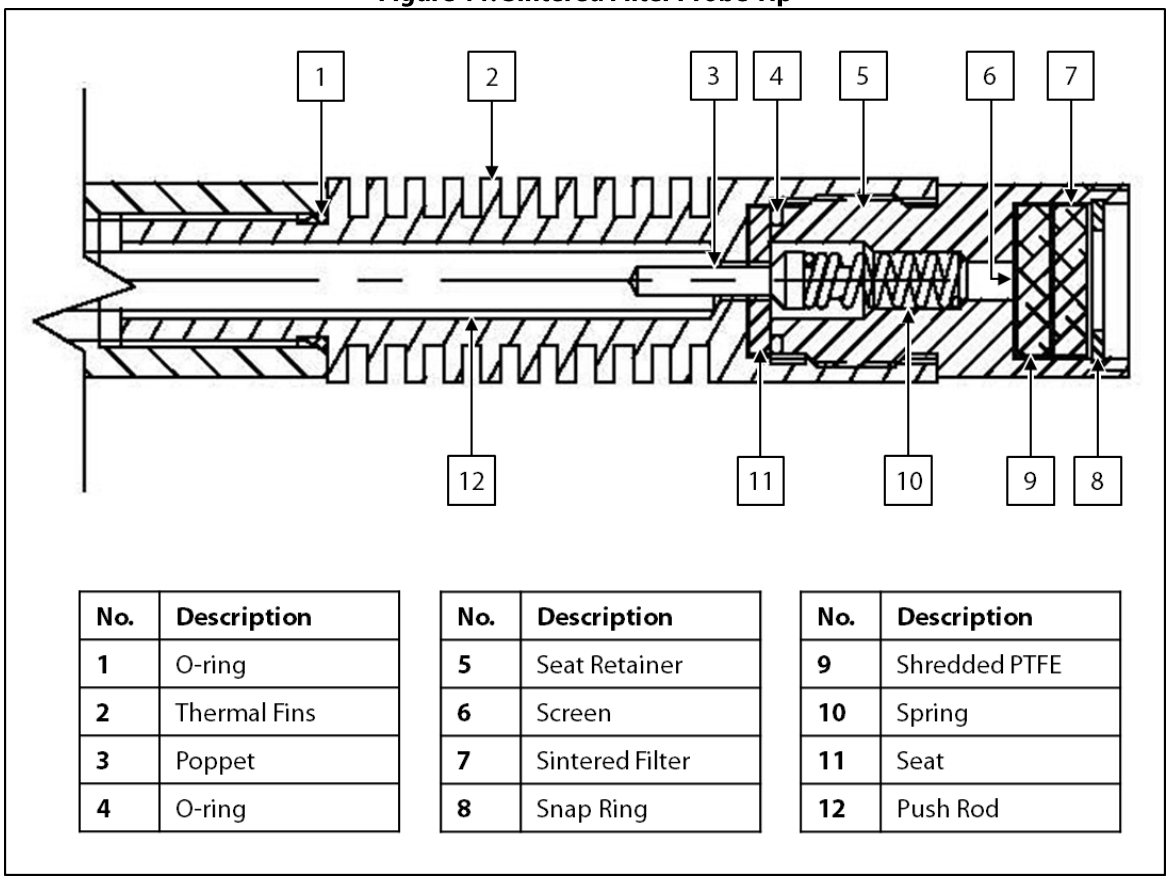


No.	Description
1	O-ring
2	Thermal Fins
3	Cartridge Assembly
4	O-ring
5	Push Rod

40. Remove the cartridge assembly from the thermal fin subassembly.
41. Replace the O-ring in the thermal fin subassembly.
42. Install a replacement cartridge assembly to the thermal fin subassembly.
43. Replace the O-ring at the base of the thermal fin subassembly, and then set the thermal fin subassembly aside.
44. Proceed to step 60 for instructions on maintaining the regulator body.

Maintenance: Sintered Filter Probe Tip

Figure 11: Sintered Filter Probe Tip



No.	Description
1	O-ring
2	Thermal Fins
3	Poppet
4	O-ring

No.	Description
5	Seat Retainer
6	Screen
7	Sintered Filter
8	Snap Ring

No.	Description
9	Shredded PTFE
10	Spring
11	Seat
12	Push Rod

45. While holding the thermal fin subassembly with a crescent wrench, use a second crescent wrench to unscrew the seat retainer *(Figure 11)*.
46. Remove the spring and poppet.
47. 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.

48. Use a small pointed instrument to carefully remove the seat from the thermal fin subassembly *(Figure 11)*.
49. Inspect the seat for debris or scratches. Replace as necessary.

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

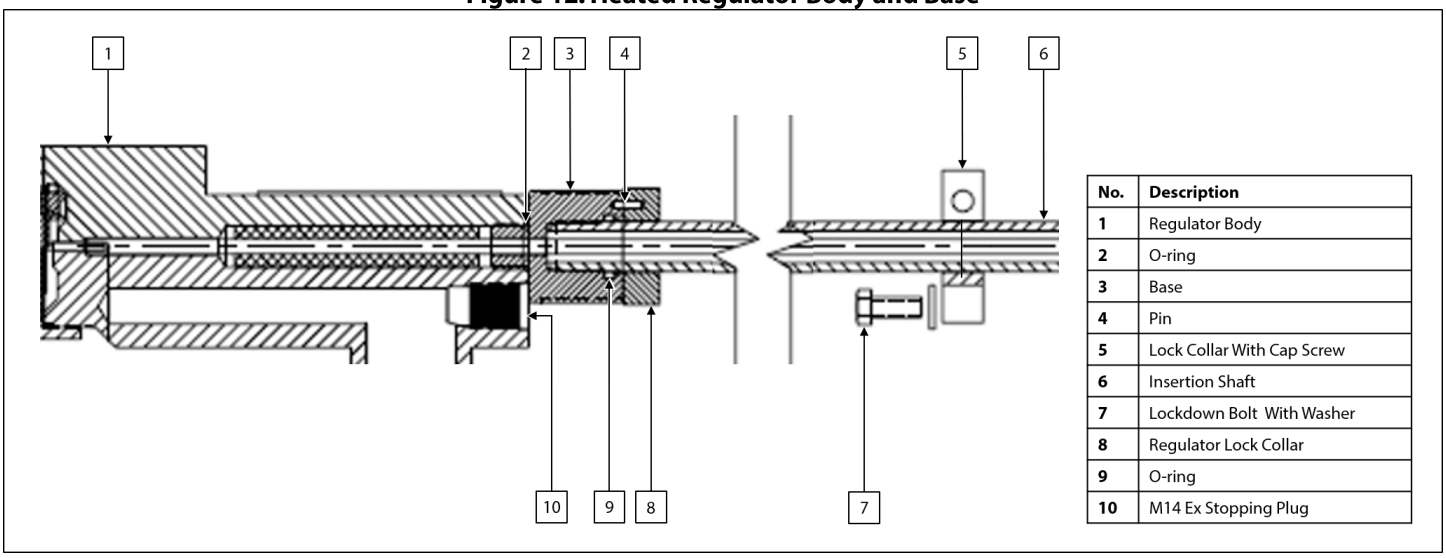
50. Replace the O-ring on the seat retainer *(Figure 11)*.
51. Remove the snap ring, sintered filter, shredded PTFE, and screen from the seat retainer, and then properly dispose of the shredded PTFE *(Figure 11)*.
52. Use solvent to clean the screen.

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.

53. Install new shredded PTFE to the seat retainer *(Figure 11)*.
54. Clean or replace the sintered filter, and then install the sintered filter to the seat retainer.
55. Return the snap ring to the seat retainer.
56. Guide the poppet into the seat.
57. Return the spring to the poppet.
58. Return the seat retainer to the thermal fin subassembly and tighten firmly.
59. Replace the O-ring at the base of the thermal fin subassembly, and then set the thermal fin subassembly aside.
60. Continue to step 61 for instructions on maintaining the regulator body.

Regulator Body Maintenance

Figure 12: Heated Regulator Body and Base



No.	Description
1	Regulator Body
2	O-ring
3	Base
4	Pin
5	Lock Collar With Cap Screw
6	Insertion Shaft
7	Lockdown Bolt With Washer
8	Regulator Lock Collar
9	O-ring
10	M14 Ex Stopping Plug

61. Remove the regulator body from the base and set the regulator body aside.
62. Loosen the lock collar cap screw in the regulator lock collar, and then remove the base and regulator lock collar from the insertion shaft.
63. Separate the base from the regulator lock collar, taking care not to misplace the pin that aligns the regulator lock collar with the base.
64. Replace the O-rings on the base.
65. Assemble the base to the regulator lock collar by aligning the pin in the regulator lock collar with the pin hole in the base.
66. Install the base with regulator lock collar to the regulator body and tighten firmly.

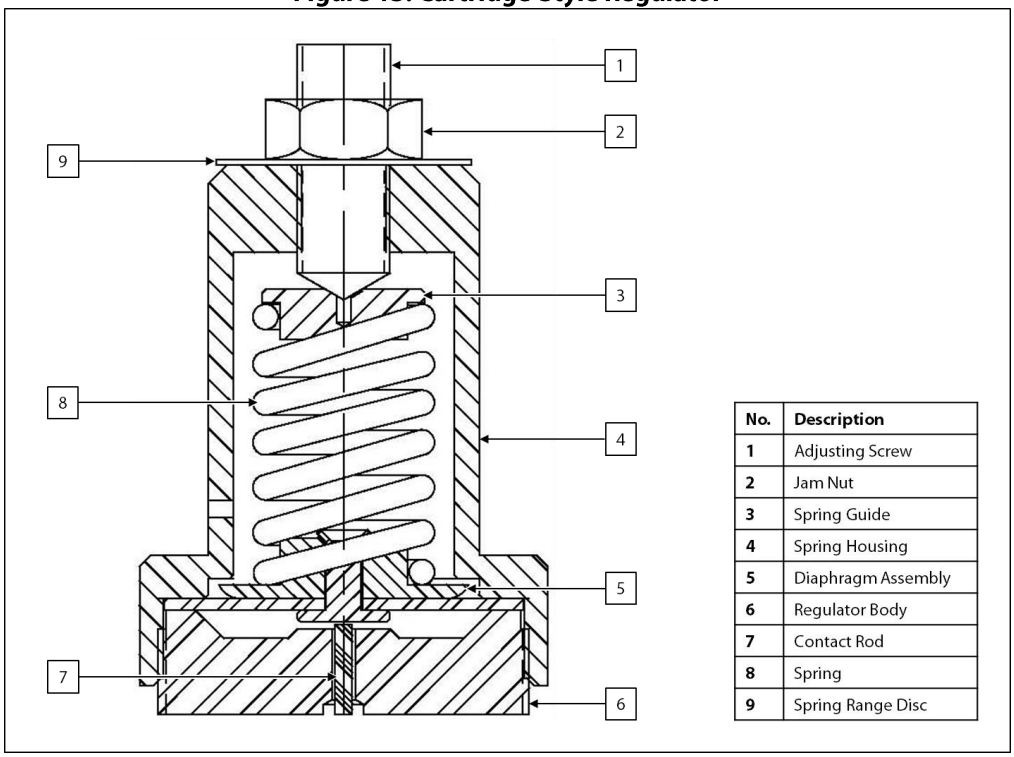
Regulator Upper Housing Maintenance

67. Loosen the jam nut on the adjusting screw.
68. In a counterclockwise direction, back off the adjusting screw to relieve tension on the spring.
69. As necessary, perform maintenance on the relief valve. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief valve for maintenance instructions.
70. Separate the spring housing from the regulator body.

To perform maintenance on a cartridge-style regulator, continue to step 71.
To perform maintenance on a diaphragm-style regulator, proceed to step 78.
To perform maintenance on a piston-style regulator, proceed to step 86.

Maintenance: Cartridge-Style Regulator

Figure 13: Cartridge-Style Regulator



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring Housing
5	Diaphragm Assembly
6	Regulator Body
7	Contact Rod
8	Spring
9	Spring Range Disc

71. Remove the diaphragm assembly, spring, and spring guide.
72. Inspect the diaphragm for wear. If the diaphragm shows signs of wear, the diaphragm assembly must be replaced.

> The diaphragm assembly must be replaced at least every five (5) years. Failure to replace the diaphragm assembly at least every five (5) years voids the certification.

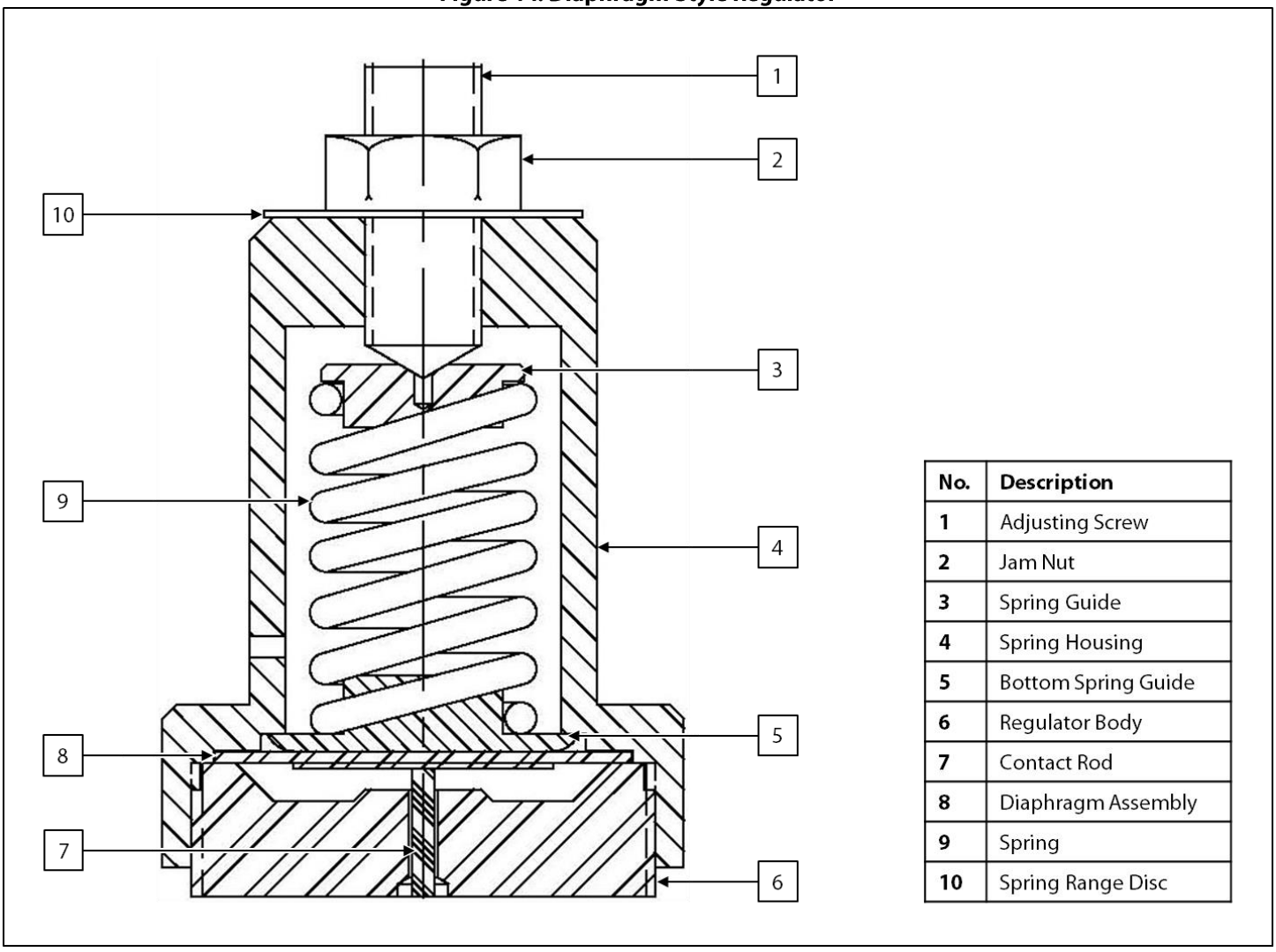
73. Place the diaphragm assembly on the top of the regulator body with the bottom spring guide facing up.
74. Place the spring on the diaphragm assembly. Ensure that the spring is sitting on the bottom spring guide.
75. Return the spring guide to the top of the spring.
76. Install the spring housing to the regulator body.

> When reassembling the upper housing, HAND-TIGHTEN ONLY.

77. Proceed to step 97 for instructions on maintaining the top cap and lower housing.

Maintenance: Diaphragm-Style Regulator

Figure 14: Diaphragm-Style Regulator



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring Housing
5	Bottom Spring Guide
6	Regulator Body
7	Contact Rod
8	Diaphragm Assembly
9	Spring
10	Spring Range Disc

78. Remove the spring guides and spring.
79. Remove the diaphragm assembly.
80. Inspect the diaphragm for wear. Replace as necessary.

The diaphragm assembly must be replaced at least every five (5) years. Failure to replace the diaphragm assembly at least every five (5) years voids the certification.

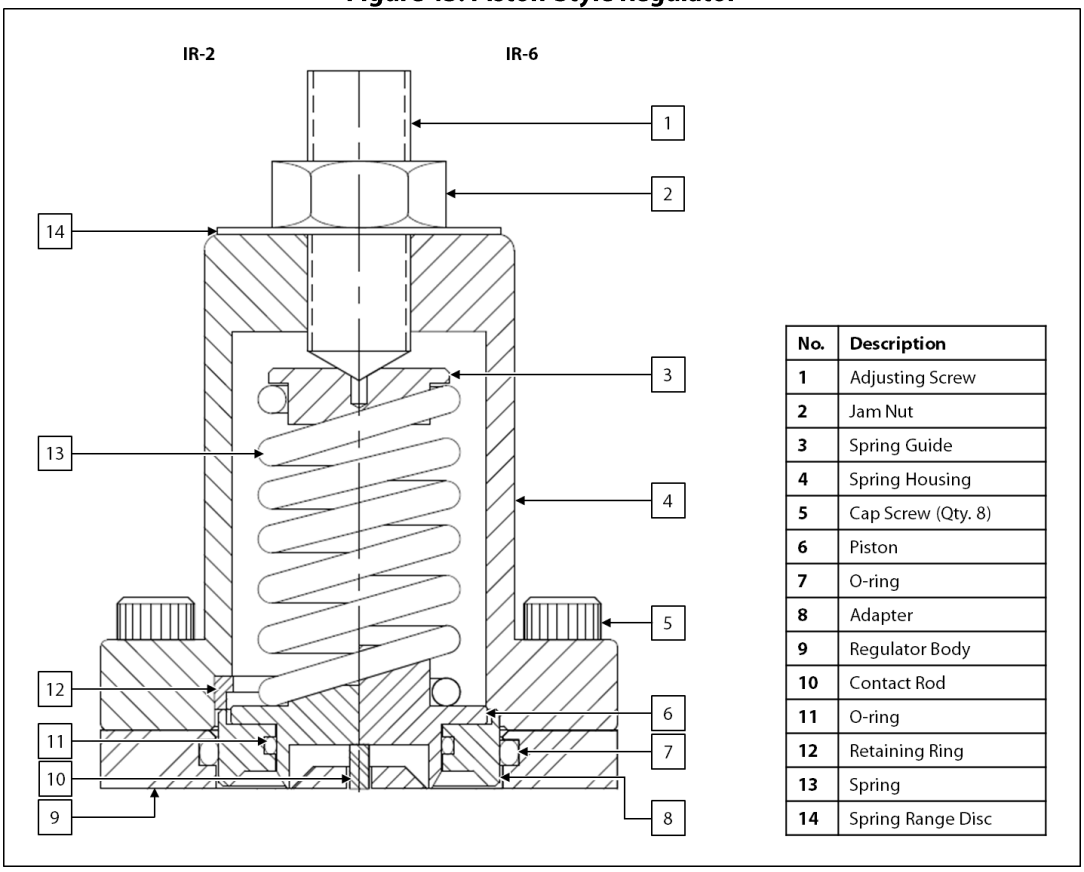
81. Place the diaphragm assembly on top of the regulator body with the bottom spring guide facing up.
82. Place the spring on the diaphragm assembly. Ensure that the spring is sitting on the bottom spring guide.
83. Return the spring guide to the top of the spring.
84. Install the spring housing to the regulator body.

When reassembling the upper housing, HAND-TIGHTEN ONLY.

85. Proceed to step 97 for instructions on maintaining the top cap and lower housing.

Maintenance: Piston-Style Regulator

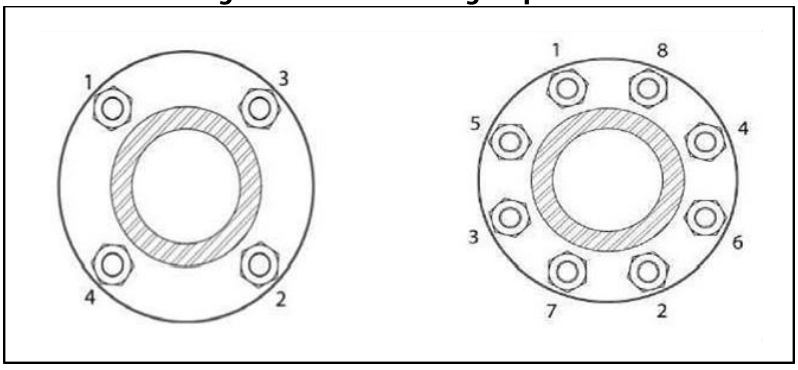
Figure 15: Piston-Style Regulator



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring Housing
5	Cap Screw (Qty. 8)
6	Piston
7	O-ring
8	Adapter
9	Regulator Body
10	Contact Rod
11	O-ring
12	Retaining Ring
13	Spring
14	Spring Range Disc

86. Remove the piston, adapter, spring, and spring guide.
87. Replace the O-ring in the regulator body and in the adapter.
88. As necessary, remove the retaining ring from the spring housing and inspect the retaining ring for scratches or damage. Replace as necessary.
89. Inspect the sealing surfaces of the piston for scratches. Replace as necessary.
90. Install the piston to the adapter, and then install this subassembly to the regulator body with the piston facing up.
91. Place the spring on the piston assembly. Ensure that the spring is sitting on the piston.
92. Return the spring guide to the top of the spring.
93. As necessary, return the retaining ring to the spring housing
94. Install the spring housing to the regulator body.
95. Following a cross-bolting sequence, install the cap screws to the spring housing and then tighten to secure the spring housing to the regulator body (*Figure 16*).

Figure 16: Cross-Bolting Sequence

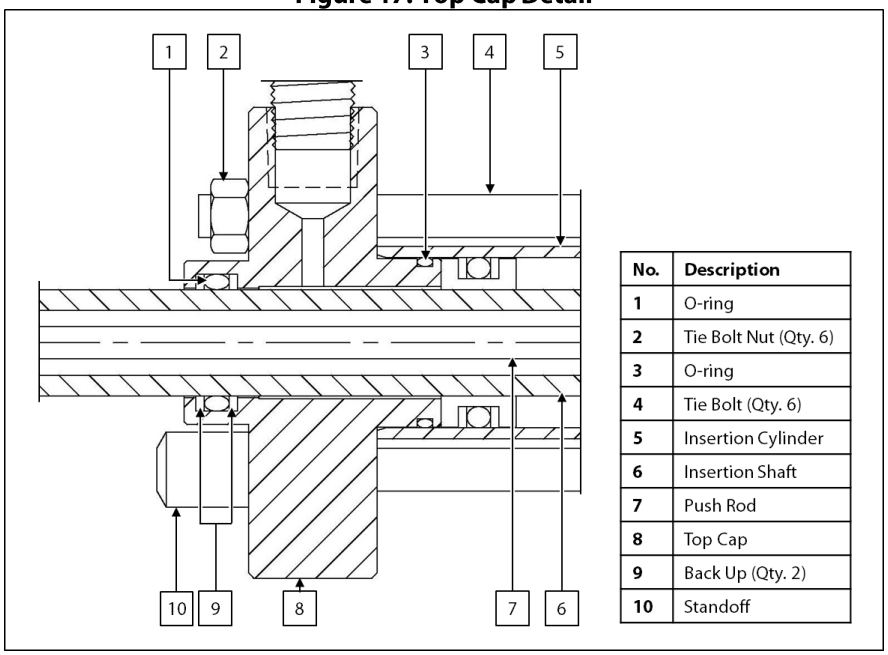


96. Continue to step 97 for instructions on maintaining the top cap and lower housing.

Top Cap and Lower Housing Maintenance

97. Loosen and remove the lock collar from the insertion shaft (*Figure 12*).

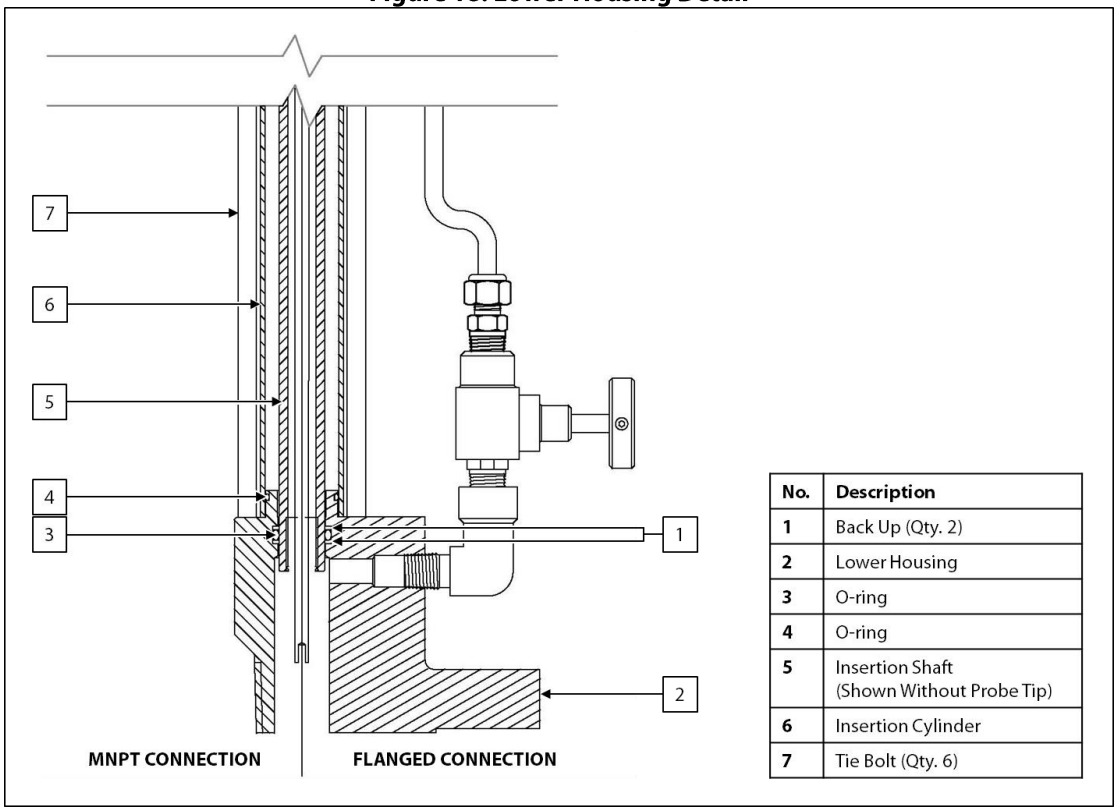
Figure 17: Top Cap Detail



No.	Description
1	O-ring
2	Tie Bolt Nut (Qty. 6)
3	O-ring
4	Tie Bolt (Qty. 6)
5	Insertion Cylinder
6	Insertion Shaft
7	Push Rod
8	Top Cap
9	Back Up (Qty. 2)
10	Standoff

98. Remove the tie bolt nuts and standoff, and then slide the top cap off the shaft.
99. Replace the O-rings and back ups on the top cap.

Figure 18: Lower Housing Detail

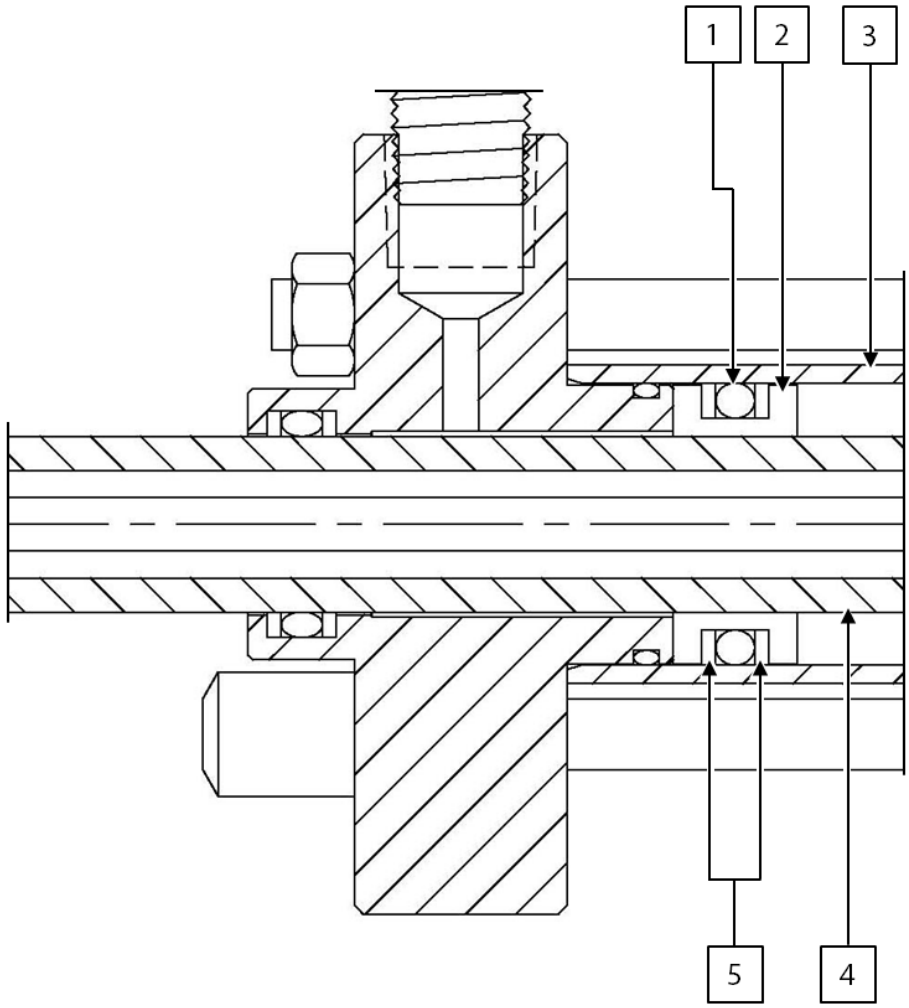


No.	Description
1	Back Up (Qty. 2)
2	Lower Housing
3	O-ring
4	O-ring
5	Insertion Shaft (Shown Without Probe Tip)
6	Insertion Cylinder
7	Tie Bolt (Qty. 6)

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

Shaft and Cylinder Maintenance

Figure 19: Shaft Detail



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

102. Remove the insertion shaft from the insertion cylinder.
103. Replace the O-ring and back ups on the piston.
104. 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.
105. 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

106. 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. The bottom of the insertion cylinder can be identified by its vent hole.
107. Liberally lubricate the insertion shaft.
108. Carefully slide the lower housing onto the bottom end of the insertion shaft.
109. Carefully slide the insertion cylinder onto the lower housing.
110. Carefully slide the top cap onto the top end of the insertion shaft and down to the insertion cylinder.
111. Following a cross-bolting sequence, install the tie bolts and tighten the hex nuts to the appropriate torque (*Figure 16 & Table 3*).

Table 3: Torque Specifications for Tie Bolts

Tie Bolt Diameter	Foot-Pounds (ft·lb)	Kilograms per Meter (kg/m)
⅜"	5–6	0.69–0.82
½"	15–20	2.07–2.76
⅝"	25–30	3.45–4.14
⅞" or 1"	55–65	7.60–8.98

112. Install the standoff to the top cap.
113. Install the lock collar to the top of the insertion shaft.
114. 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.
115. Install the thermal fin subassembly to the insertion shaft and tighten firmly.
116. Carefully slide the push rod into the insertion shaft until it slips onto the poppet.

The push rod should fit easily over the poppet and should not stack on top of the poppet. The IHRA will not be able to be reassembled correctly if the push rod is stacked on top of the poppet.

117. Insert the contact rod into the push rod, and then carefully screw the heated 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.

118. Tighten the lock collar cap screw in the regulator lock collar to secure the heated regulator subassembly to the insertion shaft.
119. Fully retract the insertion shaft.
120. Prepare the oil reservoir for reattachment by wrapping the valve threads with PTFE tape or coating them with pipe dope.
121. If pipeline pressure will be used to install the unit to the pipeline, reconnect the tubing between isolation valves C and D.
122. Reconnect the oil reservoir to the top cap at insertion/retraction valve A.
123. Attach the oil reservoir to the unit. Mount the bracket around the insertion cylinder and secure it with the nut and screw.
124. The unit is now ready for installation. See *Section 2.2, Preparing the Unit for Installation*, and *Section 2.3, Installing the Unit*, for instructions on correctly installing the unit to the pipeline.

Check valves for leaks and repair as necessary during reinstallation.

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 thermostat controller or heating element do not produce heat, replacement is required. The heated regulator subassembly (including the cable gland, electrical housing, and all internal components) must be returned to Welker. This is necessary to ensure the unit maintains its certifications.

Returning Heated Regulator Subassembly to Welker

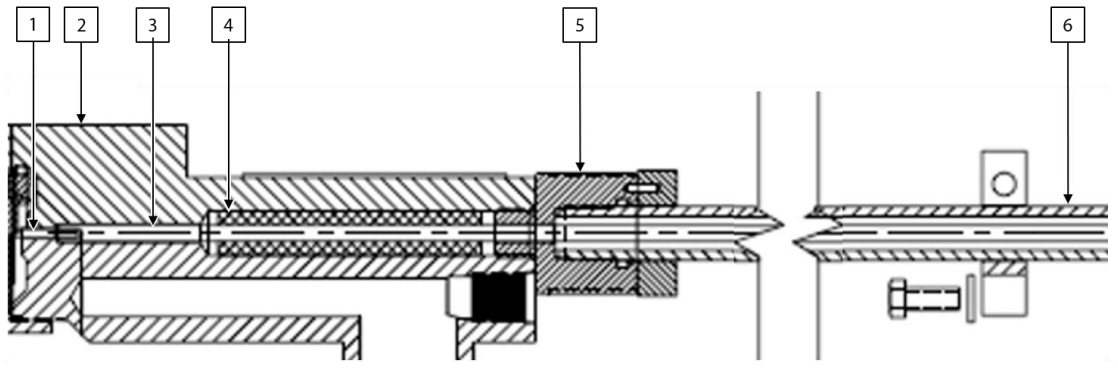
1. Turn OFF all electrical power to the unit and isolate it from all applicable energy sources.

STOP DO NOT open the certified enclosure until it can no longer be a potential ignition source.

STOP Ensure that the IHRA is isolated from all incoming and outgoing connections (including neutral conductors) prior to opening the certified enclosure.

2. Unfasten the set screw, and then remove the cover from the certified enclosure.
3. Disconnect the two (2) power supply leads from the terminal block.
4. Return the cover to the certified enclosure and refasten the set screw.
5. As necessary, disconnect the customer-supplied tubing, fittings, or instrument attached to the unit.
6. Remove the heated regulator subassembly from the base. Ensure that the contact rod and heat baffle remain inside the regulator body (*Figure 20*).

Figure 20: Preparing the Heated Regulator Subassembly for Return to Manufacturer



No.	Description
1	Contact Rod
2	Regulator Body
3	Push Rod
4	Heat Baffle
5	Base
6	Insertion Shaft

7. Remove the push rod from the insertion shaft.
8. Store the push rod and entire unit aside from the heated regulator subassembly (*Figure 1)* in a secure location.
9. Cap off the top of the base to shield the insertion shaft from the elements.
10. Send the heated regulator subassembly to Welker for service.
11. Once the repaired heated regulator subassembly has been received from Welker, the unit may be reassembled.

Reassembly

12. Remove the cap from the base, and then insert the push rod into the insertion shaft.
13. Install the heated regulator subassembly to the base, ensuring that the heat baffle is securely wrapped around the push rod (*Figure 20*).
14. The unit is now ready for installation and operation. See *Section 2, Installation and Operation,* for instructions on correctly installing the unit to the pipeline.

3.4 Troubleshooting

Table 4: IHRA Troubleshooting

Issues	Possible Causes	Solutions
The insertion shaft does not insert or retract smoothly.	Air may be trapped in the oil reservoir.	Slowly open vent/relief valve B to vent any air trapped in the oil reservoir to the atmosphere.
	There may not be enough oil in the oil reservoir.	Remove vent/relief valve B. Add oil to the oil reservoir until the reservoir is three-quarters (¾) full. Install vent/relief valve B to the oil reservoir.
Oil needs to be added to the oil reservoir often.	Oil may be leaking past the insertion shaft O-ring.	Replace the O-ring on the insertion shaft piston. See *Section 3.2, Maintenance,* for instructions.
Pipeline pressure is leaking from the vent hole in the cylinder.	The seals in the lower housing are leaking.	Replace the seals in the lower housing. See *Section 3.2, Maintenance,* for instructions.
The insertion shaft will not retract from the pipeline.	Pipeline pressure may not be high enough to eject the insertion shaft.	Carefully pull up on the insertion shaft until it begins to retract.
	The insertion shaft is bent or damaged inside the pipeline.	Contact Welker for service options.

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-105: Welker NV-1 and NV-2 Instrument Valves
- IOM-234: Welker RV-110A and RV-110V Relief Valves

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

- Adalet Explosionproof Instrument Housing XIH Series Single Ended Housing (Welker IOM-V236)
- International Metal Engineering Pte. Ltd. Model 8080 Explosion Proof Instrument Enclosure (Welker IOM-V237)
- Peppers Cable Glands Limited Cable Gland Type CR-S (Welker IOM-V238)

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: ADHRA02

NOTES

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