WELKER

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR WELKER® EXTERNAL SAND RELIEF

MODELS
ESR-1, ESR-2

DRAWING NUMBERS
AD089BN
AD089BO

MANUAL NUMBER
IOM-251

REVISION
Rev. 0, 05/01/2025

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SAFETY

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® ESR-1 and ESR-2 Relief Valves. For further information and instructions, please refer to the Installation, Operation, and Maintenance *(IOM)* Manuals *for each individual component. A list of relevant component* IOM Manuals *is provided in the* Appendix *to 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 inspectors' 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 these ESR-1 and ESR-2 External Sand Reliefs is of a mechanical nature.

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

If you received a damaged ESR-1 or ESR-2 Relief Valve, 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® at 1.281.491.2331.

**The following procedures have been written for use with standard Welker® parts and equipment. Assemblies that have been modified might have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker® *ESR-1 and ESR-2* External Sand Relief Valves are designed to protect instruments and regulators from overpressurization. The ESR-1 and ESR-2 are specifically designed to enable samplers to sample product containing sand or debris. The sampler gains protection from the External Sand Relief as well as from check valves designed for sandy oils. For example, the ESR-1 or ESR-2 can be used to protect the Welker® InLoop™ ACE Crude Oil Sampler (refer to *Welker® IOM-224*), which is capable of sampling product containing sand. The ESR-1 and ESR-2 can also be used for inline relief.

For operating pressures above 200 psig, the differential ESR-2 External Sand Relief is required. For pressures below 200 psig, either the ESR-1 or the non-differential ESR-2 External Sand Relief is required.

The ESR-1 and ESR-2 Relief Valves are designed to handle a range of low-capacity and high-capacity cylinders and instruments, based on the force applied by the selected spring. The springs are interchangeable based on customer pressure requirements.

Welker® might custom design the ESR-1 and/or ESR-2 to suit the particular application and specifications of each customer.

1.3 Specifications

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

The ESR-1 and ESR-2 External Sand Relief valves should be set to approximately 50 psig above maximum pipeline operating pressure.

For operating pressures above 200 psig, the differential ESR-2 External Sand Relief is required. For pressures below 200 psig, either the ESR-1 or the non-differential ESR-2 External Sand Relief is required.

If requested at the time of the order, the ESR-1 and ESR-2 External Sand Relief valves come factory-set by the manufacturer.

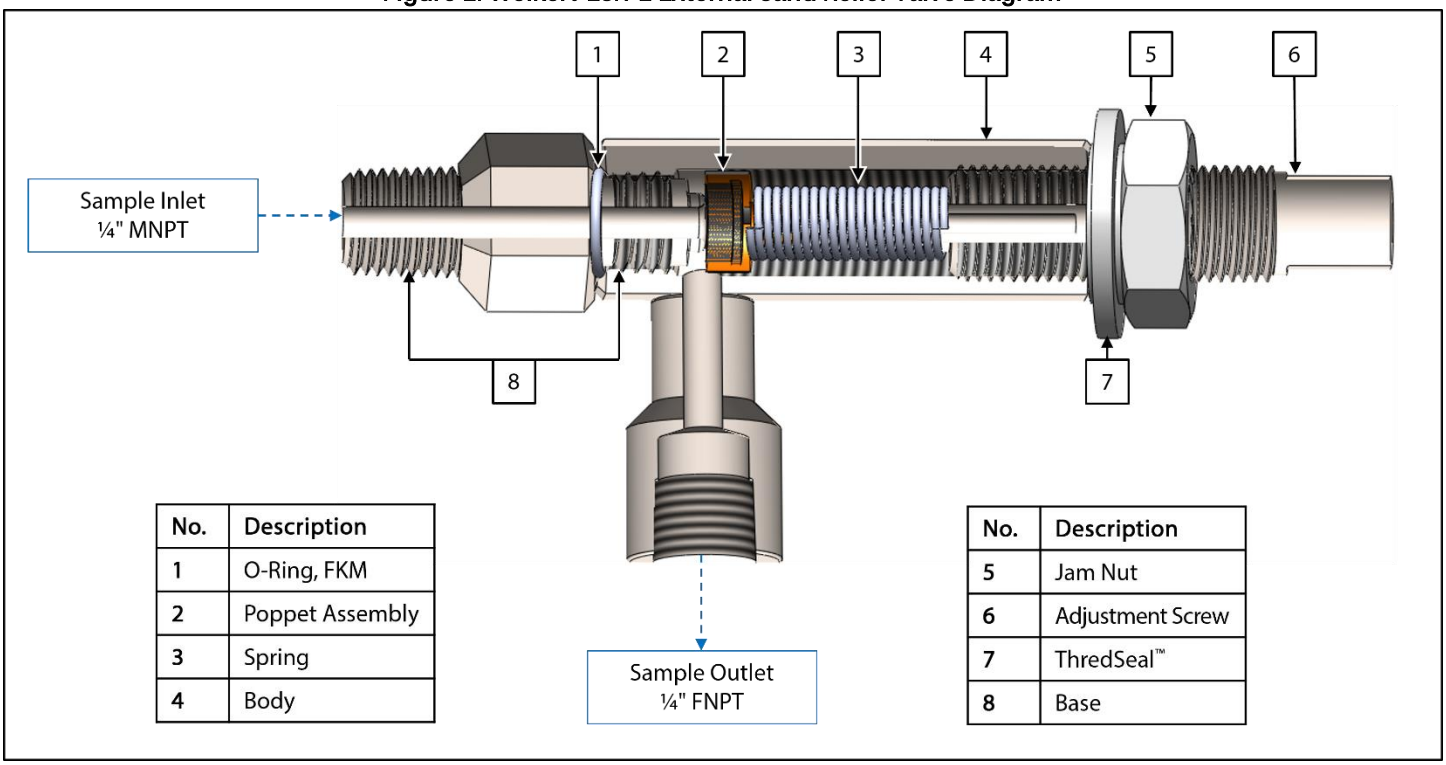
Table 1: Welker® ESR-1 External Relief Valve Specifications

Application	Overpressurization Relief Under Sandy Conditions	
Product Compatibility	Gas, Light Liquid, Light Crude Oil, Heavy Crude Oil	
Materials of Construction	316/316L Stainless Steel, PTFE, and FKM or FKM VG109	
Maximum Allowable Inlet Pressure	1500 psig (*103.42 barg*)	
Maximum Allowable Sense Pressure	1500 psig (*103.42 barg*)	
Maximum Allowable Outlet Pressure	1500 psig (*103.42 barg*)	
Operating Temperature Ranges	**FKM:** -20 °F to 120 °F (*-28.8 °C to 48.8 °C*) **FKM VG109:** -50 °F to 120 °F (*-45.5 °C to 48.8 °C*)	
Operation	Piston-Operated	
Connections	**Inlet:** ¼" MNPT **Outlet:** ¼" FNPT	
Spring Ranges	**Nominal Pressure Range**	**Color Code**
	50–350 psig (*3.44–24.13 barg*)	Blue
	350–750 psig (*24.13–51.71 barg*)	Yellow
	750–1500 psig (*51.71–103.42 barg*)	Purple
Approximate Weight	1 lb	
Approximate Dimensions	5" x 1⅛" x 2 ¼" (Length x Width x Height)	
Features	Externally Adjustable Replaceable Poppet Assembly Setting Lock Mechanism Tension Spring	
Options	Pre-Set Relief Sulfinert-Treated Wetted Parts CE Compliance CRN Certification NACE Compliance	

Table 2: Welker® ESR-2 External Relief Valve Specifications			
Application	Overpressurization Relief Under Sandy Conditions		
Product Compatibility	Gas, Light Liquid, Light Crude Oil, Heavy Crude Oil		
Materials of Construction	316/316L Stainless Steel, PTFE, and FKM or FKM VG109		
Maximum Allowable Inlet Pressure	1500 psig (*103.42 barg*)		
Maximum Allowable Sense Pressure	1500 psig (*103.42 barg*)		
Maximum Allowable Outlet Pressure	1500 psig (*103.42 barg*)		
Operating Temperature Ranges	**FKM:** -20 °F to 120 °F (*-28.8 °C to 48.8 °C*) **FKM VG109:** -50 °F to 120 °F (*-45.5 °C to 48.8 °C*)		
Operation	Piston-Operated		
Connections	**Inlet:** ¼" MNPT **Outlet:** ¼" FNPT **Sense Inlet:** ¼" FNPT		
Spring Ranges	**Differential Option**	**Nominal Pressure Range**	**Color Code**
	5–35 psig (*.34–2.41 barg*)	10–75 psig (*.68–5.17 barg*)	Blue
	10–100 psig (*.68–6.89 barg*)	75–150 psig (*5.17–10.34 barg*)	Yellow
	100–300 psig (*6.89–20.68 barg*)	150–350 psig (*10.34–24.13 barg*)	Purple
	–	350–750 psig (*24.13–51.71 barg*)	Orange
	–	750–1250 psig (*51.71–86.18 barg*)	Brown (Use With Hard Seal Only)
Approximate Weight	1 lb		
Approximate Dimensions	5½" x 1⅛" x 1¾" (Length x Width x Height)		
Features	Externally Adjustable Repairable Poppet Assembly Setting Lock Mechanism Tension Spring		
Options	Differential Pressure Pre-Set Relief Sulfinert-Treated Wetted Parts CE Compliance CRN Certification NACE Compliance		

1.4 Equipment Diagrams

Figure 1: Welker® ESR-1 External Sand Relief Valve Diagram



No.	Description
1	O-Ring, FKM
2	Poppet Assembly
3	Spring
4	Body

No.	Description
5	Jam Nut
6	Adjustment Screw
7	ThredSeal™
8	Base

Figure 2: Welker® ESR-2 External Sand Relief Valve Connections Diagram

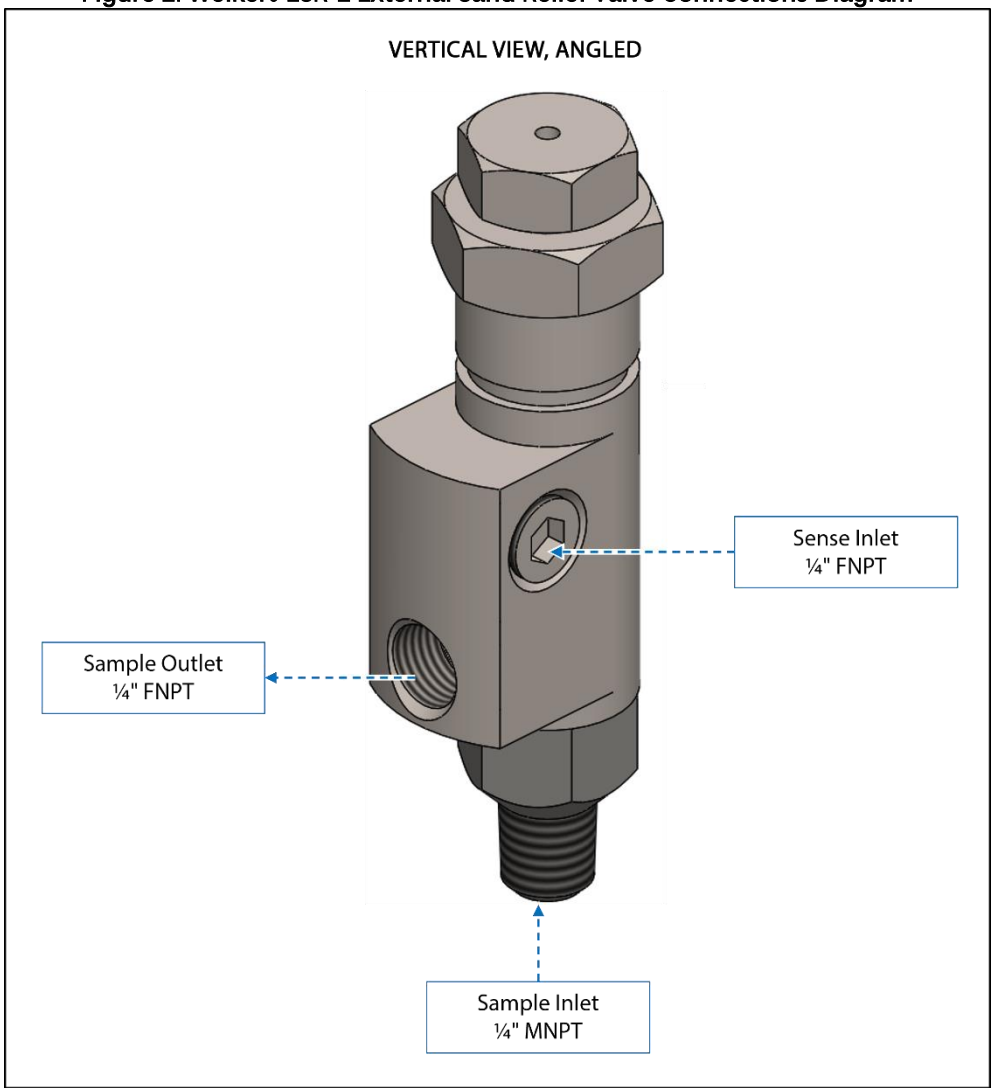
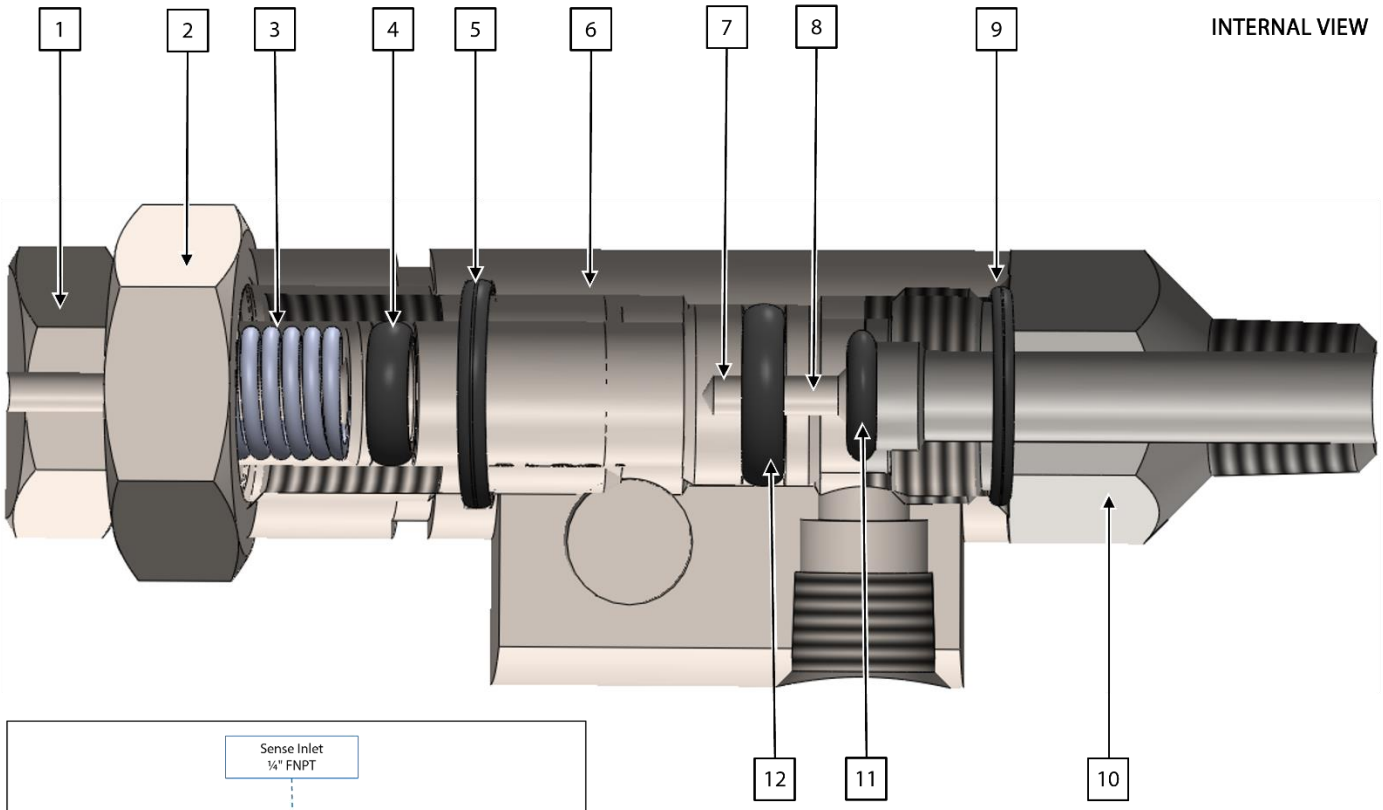
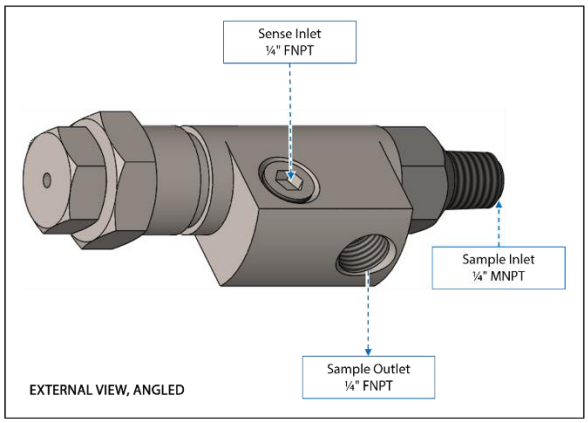


Figure 3: Welker® ESR-2 External Sand Relief Valve Diagram





No.	Description
1	Adjustment Screw
2	Jam Nut
3	Spring
4	O-Ring
5	O-Ring
6	Body

No.	Description
7	Poppet Assembly
8	Poppet Screw
9	O-Ring
10	Base
11	O-Ring*
12	O-Ring**

*90 Durometer or Higher Is Required Unless Pressure Range Is 0–150 psig.
**Not Required for Differential Pressure Relief.

SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin

After unpacking the Welker® External Sand Relief, check it for compliance and any damage that might have occurred during shipment. Immediately contact a Welker® representative if you received a damaged ESR-1 or ESR-2 External Sand Relief.

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

To accomplish the installation and operation, Welker® recommends having the following items available:

a. PTFE Tape or Pipe Dope
b. Wrench

2.2 Setting, Testing, and Installation

To accurately set the ESR-1 or ESR-2 Relief Valve, a safe gas source, regulator, and pressure gauge are needed.

Setting the ESR-1 or ESR-2 Relief Valve

1. Connect the regulator to a safe gas source.
2. Screw the adjustment screw of the ESR-1 or ESR-2 clockwise to fully close the relief valve.
3. Install the ESR-1 or ESR-2 to the regulator.
4. Set the regulator to the desired pressure, and then apply auxiliary gas through the regulator to the relief valve.
5. Using a wrench, turn the adjustment screw (*Figure 1* or *Figure 3*) of the ESR-1 or ESR-2 Relief Valve counterclockwise until pressure starts to relieve. A hissing sound will be audible.

Use a wrench to turn the adjustment screw.

6. Using a wrench, turn the adjustment screw (*Figure 1* or *Figure 3*) of the ESR-1 or ESR-2 clockwise until the hissing sound stops and the ESR-1 or ESR-2 obtains a positive shutoff.

Testing the ESR-1 or ESR-2 Relief Valve

7. Set the regulator to a pressure slightly below the ESR-1 or ESR-2 set point, and then slowly increase the pressure of the regulator until it is slightly higher than the relief valve set point. A hissing sound should be audible.
8. Slowly decrease the pressure of the regulator until it is slightly below the ESR-1 or ESR-2 relief valve set point. The hissing sound should stop as the relief valve reseats.
9. If the relief valve does not begin to relieve pressure or does not reseat, it might be necessary to repeat steps 4 through 6 to reset the relief valve.
10. If the relief valve is to be used with the regulator it was set with, reset the regulator to the desired point.

Installing the ESR-1 or ESR-2 Relief Valve

11. Either wrap the threads of the ESR-1 or ESR-2 External Sand Relief valve with PTFE tape or apply pipe dope to the threads.
12. Using a wrench, install the ESR-1 or ESR-2 External Sand Relief valve to the correct port on the instrument it will be relieving.
13. Installation is complete, and the ESR-1 or ESR-2 External Sand Relief valve is now operational.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker® recommends that the unit have standard maintenance every six (6) months under normal operating conditions.** In cases of severe service, dirty conditions, excessive usage, or other unique applications that might lead to excess wear on the unit, a more frequent maintenance schedule might be appropriate.
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs to 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, because it might 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 might vary by model.
    a. Wrench
    b. Needle Nose Pliers
    c. Seal Pick

3.2 Maintenance

Maintaining the ESR-1 or ESR-2 Relief Valve

1. If the ESR-1 or ESR-2 is connected to a supply source, isolate and depressurize the ESR-1 or ESR-2 External Sand Relief from the supply source.
2. Unscrew the ESR-1 or ESR-2 from the instrument to which it is attached.
3. Unscrew the base from the body (*Figure 1* or *Figure 3*).

> Inspect valves in the complete system of which the ESR-1 or ESR-2 is a part for leaks and repair or replace as necessary during reinstallation.

4. Replace the O-ring on the base of the ESR-1 or ESR-2 Relief Valve (*Figure 1* or *Figure 3*).
5. Unscrew the jam nut from the adjustment screw (*Figure 1* or *Figure 3*).
6. Inspect the base for scratches or other damage (*Figure 1* or *Figure 3*. If scratches or other damage are present on the base, replace the base.
7. Inspect the elastomer on the poppet. If it is damaged on the ESR-1, replace the poppet assembly. If it is damaged on the ESR-2, the poppet assembly can either be repaired or replaced.
8. Inspect all O-rings (*Figure 1* or *Figure 3*) and replace as needed.
9. Reassemble the ESR-1 or ESR-2 Relief Valve (*Figure 1* or *Figure 3*).
10. After inspecting the reassembled ESR-1 or ESR-2 Relief Valve, bench test or adjust the setting and tighten the jam nut.
11. The ESR-1 or ESR-2 External Sand Relief Valve is now ready to be reinstalled to the instrument to which it was attached.

APPENDIX: REFERENCED OR ATTACHED DOCUMENTS

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

- None

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

- None

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

- Assembly Drawing: AD089BO (Welker® ESR-1 External Sand Relief)
- Assembly Drawing: AD089BN (Welker® ESR-2 External Sand Relief)

NOTES

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