

# Fisher™ ATST Desuperheater

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Figure 1. Fisher ATST Desuperheater



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## Introduction

### Scope of Manual

This instruction manual includes installation, maintenance, and operation information for the Fisher ATST desuperheater.



Do not install, operate, or maintain an ATST desuperheater without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

### Description

Water atomization and vaporization are key elements in any steam conditioning application. The ATST design incorporates a manifold of patented nozzles to inject atomizing steam and spraywater into process steam. These specialized nozzles produce an optimized spray pattern over a wide operating range. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions. Years of experience with other steam atomized desuperheater designs went into the development of this construction. Extensive use of computational analysis, in addition to field performance feedback, was used to validate spray system performance.

Table 1. Specifications

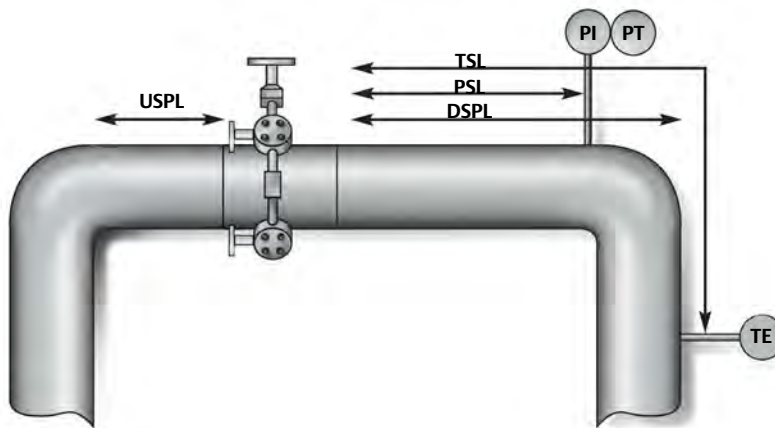
<p><b>Connections<sup>(1)(3)</sup></b></p> <p>Steam Line: NPS 8 through NPS 60 (DN 200 through 1500)                  Spraywater: NPS 1 through 4 (DN 25 through 100)                  Atomizing Steam: NPS 1 (DN 25)</p> <p><b>Connection Types<sup>(1)(3)</sup></b></p> <p>Steam Line (all sizes): ■Buttweld , ■Raised Face Flanges, ■Ring Type Joint Flanges                  Spraywater: ■ASME Buttweld (all sizes), ■Raised Face Flanges (all sizes), ■Ring Type Joint Flanges (all sizes), ■Socket Weld                  Atomizing Steam (all sizes): ■Raised Face Flanges, ■Ring Type Joint Flanges</p> <p><b>Pressure Class<sup>(1)(3)</sup></b></p> <p>Steam Line: According to the customer design pressure and temperature                  Spraywater and Atomizing Steam: ASME CL150 to CL2500<sup>(4)</sup></p>	<p><b>Construction Materials<sup>(5)</sup></b></p> <p>Desuperheater Body and Liner (if applicable):                  ■ Carbon Steel, ■ 2-1/4 Cr-1 Mo ■ 9 Cr-1 Mo-V                  ■ 9 Cr-2 W-V                  Spray Nozzles: ■ R31233 Cobalt-Chrome Alloy                  Gaskets: ■ N06600/Graphite                  Bolting: ■ SA193 Grade B7, ■ SA193 Grade B16, ■ N07718</p> <p><b>Maximum Inlet Pressures<sup>(1)</sup></b></p> <p>Consistent with applicable pressure-temperature ratings per ASME B16.34</p> <p><b>Maximum Unit Cv (for Spraywater Flow)</b></p> <p>Contact your <a href="#">Emerson sales office</a></p> <p><b>Spraywater Pressure Required<sup>(2)</sup></b></p> <p>3.5 to 35 bar (50 to 500 psi) greater than steam line pressure</p> <p><b>Atomizing Steam Pressure Required</b></p> <p>Atomizing steam source pressure typically should be at least 2 times the pressure of the steam to be desuperheated</p>
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1. Do not exceed the pressure or temperature limits in this manual, nor any applicable code or standard limitations.  
 2. A function of required turndown and equipment selection.  
 3. Offerings meet ASME standards. Consult your Emerson sales office for additional options.  
 4. Intermediate rating above CL2500 available upon request. PN ratings also available per pressure requirements of EN1092-1. Consult your Emerson sales office for additional information.  
 5. EN material options available upon request, consult your Emerson sales office for additional information.

## Educational Services

Emerson Automation Solutions  
 Educational Services - Registration  
 Phone: 1-800-338-8158  
 E-mail: [education@emerson.com](mailto:education@emerson.com)  
[emerson.com/mytraining](http://emerson.com/mytraining)

Figure 2. Typical Fisher ATST Installation



KEY:  
 DSPL = DOWNSTREAM STRAIGHT PIPE LENGTH  
 PI = PROPORTIONAL INTEGRAL CONTROLLER  
 PSL = PRESSURE SENSOR LENGTH  
 PT = PRESSURE TRANSMITTER  
 TE = TEMPERATURE SENSOR ELEMENT  
 TSL = TEMPERATURE SENSOR LENGTH  
 USPL = UPSTREAM STRAIGHT PIPE LENGTH

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## Installation

### ⚠ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

Personal injury or equipment damage caused by sudden release of pressure may result if the ATST desuperheater is installed where service conditions could exceed the limits of the pressure rating noted on the nameplate. To avoid such injury or damage, provide a relief valve for over pressure protection as required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

### ⚠ WARNING

When ordered, the desuperheater configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and fluid conditions. Do not apply any other conditions to the desuperheater without first contacting your [Emerson sales office](#).

1. Before installation, all piping upstream of the desuperheater must be cleaned so that no loose materials such as welding slag, dirt or other foreign matter are left in the pipe. Use care to keep foreign matter out of the line openings while preparing the desuperheater installation.

**⚠ WARNING**

Do not lift the desuperheater by its cooler manifold piping. Personal injury or damage to equipment could occur if the desuperheater is improperly lifted into place.

All lifting and rigging must be completed in accordance with federal/national/provincial, state and local regulations and applicable lifting and rigging equipment standards. Only personnel trained in proper lifting and rigging practices shall perform desuperheater assembly lifting, rigging and installation. Because each lift will be unique, the method of lifting the desuperheater assembly, the correct location for attaching and lifting the desuperheater assembly, and what the desuperheater assembly will do when lifted shall be considered for each lift.

Lifting and rigging equipment used to lift, install or remove a desuperheater assembly or component must be properly selected and sized for the weight and configuration of the desuperheater assembly or component being lifted. The weight of the complete desuperheater assembly, including attached accessories, must be taken in consideration for this purpose. The lifting and rigging equipment must be properly maintained and inspected for damage before each use.

Lifting lugs or other lifting equipment attached to the desuperheater must never be used to lift or support the weight of attached piping.

If the ATST is equipped with butt weld ends, the desuperheater body must be supported using a lifting sling or other method that does not place a load or force onto the finished surface of the butt weld ends. The ATST does not have a stable resting condition. The desuperheater inlet and outlet must be fully supported until fully welded (butt weld end connections) or bolted (flanged end connections) into the piping.

2. Arrange lifting slings, or other lifting and rigging equipment appropriate for the desuperheater weight and configuration, around the main steam pipe to safely lift the ATST to the pipe opening.

**⚠ WARNING**

Do not expose the ATST to undue stresses by installing it in bent pipes or flanges. Personal injury and equipment damage could result from flange sealing failure due to improper installation.

3. Flanged Connections—Lubricate the flange connection bolts with a high temperature thread lubricant. Install flange gaskets and connection bolts per accepted practices and tighten securely.
4. Welded Connections—Welding procedures should be in accordance with the applicable codes and the base materials. For preheat, welding electrodes, and postweld heat treatment, refer to the applicable codes and practices applicable for the specific facility. Materials are specified on the customer specification sheet.

**NOTICE**

Depending on desuperheater body materials used, post weld heat treating may be required. If so, damage to internal parts is possible. In general, if post weld heat treating is to be performed, all nozzles should be removed. Contact your [Emerson sales office](#) for additional information.

5. Remove the spraywater control valve and flush the cooling water line until all debris is removed from the line prior to connecting it to the ATST desuperheater. Use only clean sources of cooling water to reduce the possibility of nozzle clogging. A strainer should be installed in the water line as close to the ATST desuperheater as possible. To determine appropriate mesh size, refer to desuperheater sizing and specification document, or contact your Emerson sales office. Review strainer manufacturer's pressure drop curves to determine appropriate strainer body size. You may need to use a strainer that is larger than the water line size.
6. Remove the atomizing steam valve and flush the steam line until all debris is removed from the line prior to connecting it to the ATST desuperheater.

**⚠ WARNING**

**Failure to use a strainer could result in nozzle clogging and subsequent property damage or loss. Uncontrolled temperatures resulting from clogged nozzles may result in equipment or process temperature limits being exceeded. Exceeding system temperature limits could result in property damage or personal injury.**

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7. A length of straight pipe is required downstream of the ATST desuperheater to ensure complete vaporization of cooling water. An example of a typical installation appears in figure 2. Consult the ATST cooler sizing sheet for the required distance of straight pipe. This is unique for each application and is supplied by Emerson.
8. Typically, a temperature sensor will be mounted downstream of the ATST desuperheater. This distance will vary depending on a number of factors including steam velocity and percentage of spraywater. Consult the ATST cooler sizing sheet provided with the unit for this temperature sensor distance. The steam line should not have any branch lines dividing the steam flow between the ATST desuperheater and the temperature sensor. If you have any questions, contact your [Emerson sales office](#).
9. A typical installation is illustrated in figure 2. A temperature sensor (TE) measures changes in temperature and a temperature transmitter (TT) transmits the signal to the temperature control device. The output signal from the controller is sent to the positioner on the cooling water (spraywater) control valve (SWCV). The positioner's output signal strokes the SWCV open, increasing water pressure on the nozzles. Increasing water pressure upstream of the nozzles increases water flow through the nozzles.

The atomizing steam valve operates either as on/off or control depending on application, and the type of operation will be listed in the ATST sizing. In on/off operation, the atomizing steam valve is normally controlled so it fully opens just prior to the spraywater control valve opening. In control operation, the valve signal is modulated based on a downstream pressure target, as noted in the ATST sizing.

## Maintenance

**⚠ WARNING**

**Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:**

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
  - Use bypass valves or completely shut off the process to isolate the desuperheater from process pressure. Relieve process pressure and drain process media from the desuperheater.
  - Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
  - Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
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## Servicing

Table 2. Inspection Summary

Key	Part Description	Inspection Tips and Diagnostics	Repair	Replacement
1	Steam Pipe (not replacement part)	Inspect for erosion, thermal fatigue, and other damage	Consult your local Emerson Service Center or Emerson Accredited Service Provider for a recommendation on necessary weld repair or replacement	
2	Nozzle Body (not replacement part)	Inspect for erosion, thermal fatigue, and other damage	Consult your local Emerson Service Center or Emerson Accredited Service Provider for a recommendation on necessary weld repair or replacement	
3	Nozzle Alignment Pin	Refer to Nozzle Maintenance Section		As needed
7	Nozzle Body Flange	Inspect gasket surfaces for damage that could indicate gasket leakage when spray nozzles are replaced	Replacement Only	As needed
10	Nozzle	Refer to Nozzle Maintenance Section		Replacement every 30-42 months for optimal performance
12	Steam Pipe Liner (not replacement part)	Inspect for erosion, thermal fatigue, and other damage	Consult your local Emerson Service Center or Emerson Accredited Service Provider for a recommendation on necessary weld repair or replacement	

## Nozzle Maintenance and Replacement

When subjected to normal operating conditions, it is possible that wear, blockage, and/or fatigue will occur to the nozzle assembly. During regularly scheduled maintenance, visually inspect the nozzles for wear and blockage. Your local Emerson Service Center or Emerson Accredited Service Provider can help to determine the extent of fatigue and the correct course of action. Poor performing nozzles or nozzle failure is typically caused by wear, corrosion, erosion, and/or blockage. The following instructions will help to determine if any of these problems are present and provide a recommended course of action for each.

### Note

For optimal performance, nozzles should be inspected every 18-24 months and replaced every 30-42 months.

- Loosen and remove the nozzle body flange stud nuts (key 6) and washers (key 4). Then, remove the nozzle body flange assembly (key 7). Inspect the nozzle body flange gasket surfaces for damage. If damage is present, replacement is necessary.

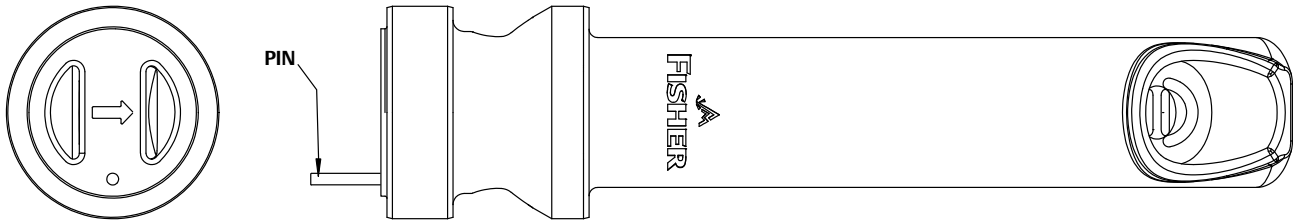
Figure 3. Fisher ATST Nozzle



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2. Remove the nozzle (key 10), nozzle gaskets (key 9), and nozzle body flange gasket (key 8).
3. Inspect the water and atomizing steam injection orifices for excessive wear, erosion/corrosion, or blockage due to particulate. Wear is defined as any cuts, gouges, or widening of the openings at the point of water and steam injection. Erosion/corrosion is defined as any form of rust or erosion of the nozzle. Blockages are defined as small particulate becoming trapped within the flow channels of the nozzle, impeding flow. Replacement of the nozzle is recommended if any of the preceding problems are present.
4. Rinse the nozzle (key 10) to remove any loose particulate that may be present.

Figure 4. Spray Nozzle Alignment Pin Location



GH01927

5. Reassemble in the following order: nozzle gasket (key 9), nozzle body flange gasket (key 8), spray nozzle (key 10), second nozzle gasket (key 9), nozzle alignment pin (key 3), nozzle body flange assembly (key 7), washers (key 4), and stud nuts (key 6). Ensure the nozzle is installed such that the flow arrow is aligned with the direction of process steam flow. It is recommended that any used gaskets be discarded and replaced with new ones.
6. Torque nozzle body flange nuts as indicated in table 3.

Table 3. Recommended Nozzle Body Flange Bolting Torque with Nickel Anti-Seize Lubricant<sup>(1)</sup>

BOLT SIZE, INCH	THREADS PER INCH	LUBRICATION	RECOMMENDED BOLT TORQUE <sup>(2)</sup>	
			N•m	Lbf•ft
5/8	11	Nickel Anti-Seize	163	120
3/4	10		258	190
7/8	9		373	275
1	8		522	385
1-1/8			712	525
1-1/4			942	695
1-3/8			1268	935
1-1/2			1654	1220

1. For other lubricants, contact your [Emerson sales office](#) for recommended bolt torque.  
 2. Torques for lubricated studs with heavy hex nuts.

## Parts Ordering

Each ATST desuperheater is assigned a serial number. Refer to the serial number when contacting your [Emerson sales office](#) for technical assistance. When ordering replacement parts, refer to the serial number and key numbers for each part required. The key numbers in the Parts List and the assembly drawing in figure 5 can be used to help in part identification.

### **⚠ WARNING**

**Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher desuperheater, because they may void your warranty, might adversely affect the performance of the desuperheater, and could cause personal injury and property damage.**

## Parts List

**Note**

Contact your [Emerson sales office](#) for Part Ordering information.

Key	Description
1	Steam Pipe
2	Nozzle Body
3	Nozzle Alignment Pin
4	Nozzle Body Flange Washer
5	Nozzle Body Flange Stud
6	Nozzle Body Flange Stud Nut
7	Nozzle Body Flange Assembly

Key	Description
8*	Nozzle Body Flange Gasket
9*	Nozzle Gasket
10*	Spray Nozzle
11	Steam Pipe Liner Guide Ring
12	Steam Pipe Liner
13	Steam Pipe Liner Retention Pin
14	Nameplate (not shown)



Figure 5. Fisher ATST Desuperheater

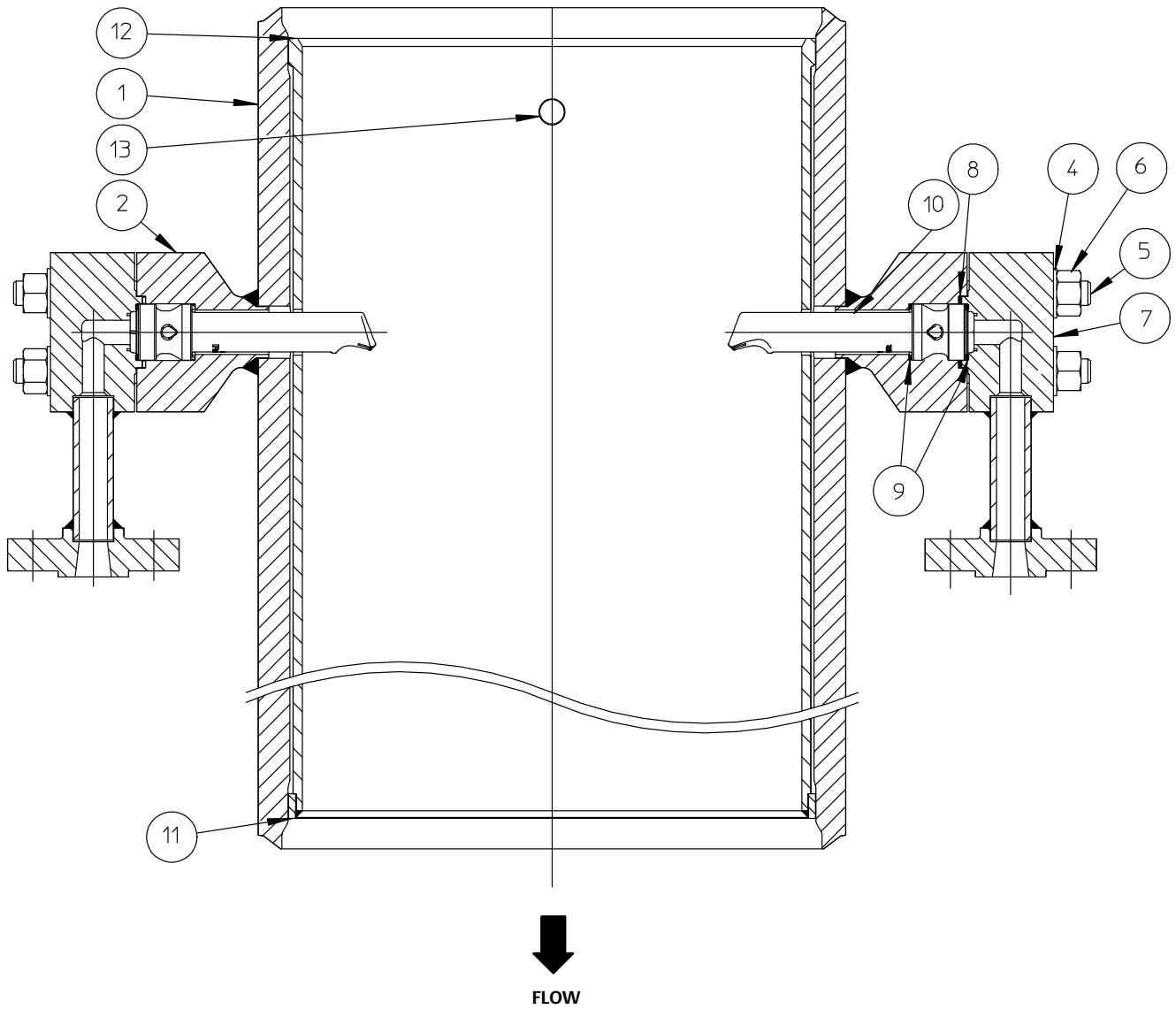
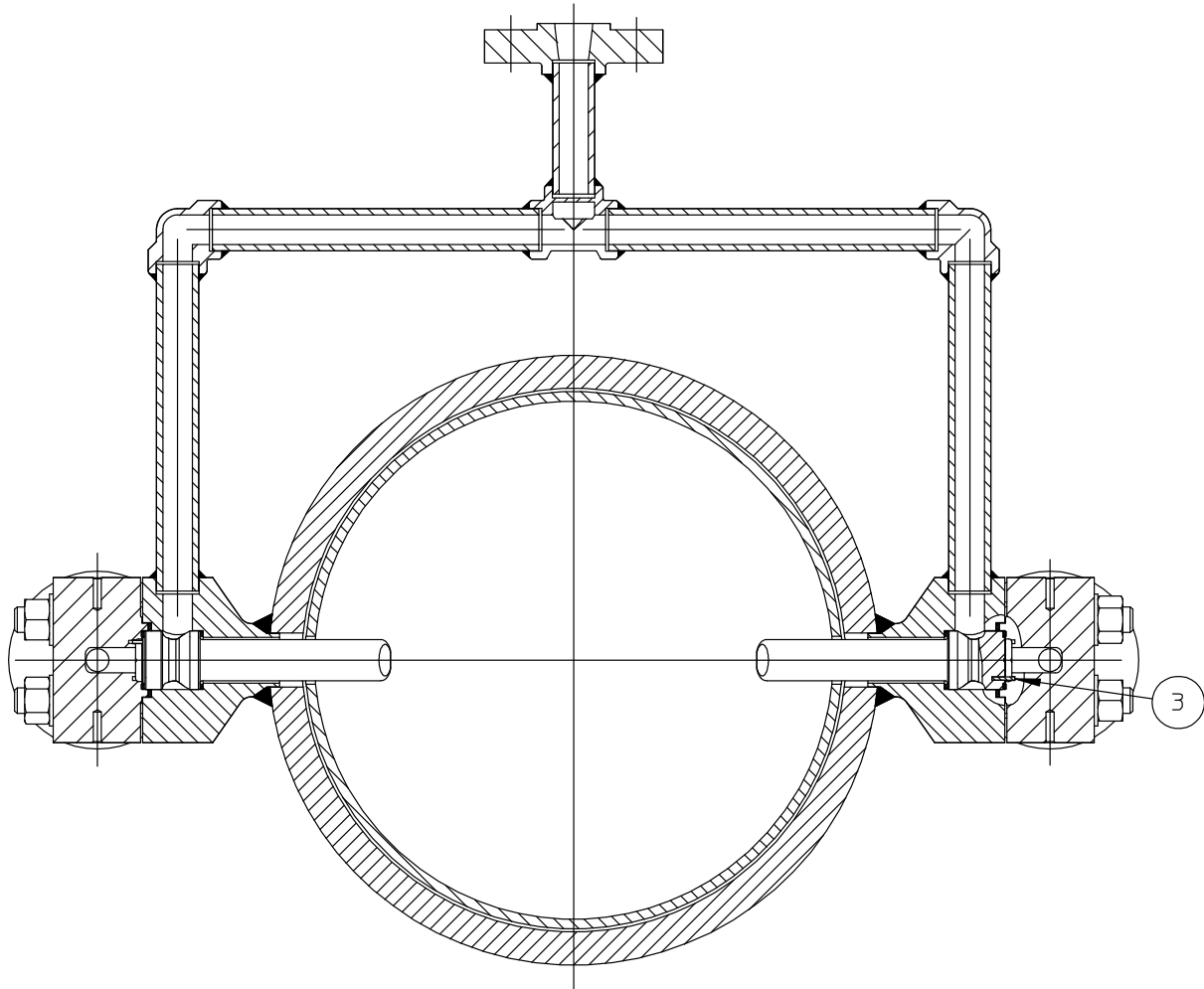


Figure 6. Fisher ATST Desuperheater Alternate View





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