

Fisher™ DSA Steam-Atomized Desuperheater

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Figure 1. Fisher DSA Steam-Atomized Desuperheater



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Introduction

Scope of Manual

This instruction manual includes installation and operation information for the Fisher DSA steam-atomized desuperheater.

Do not install, operate, or maintain a DSA 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](#) or Local Business Partner before proceeding.

Description

The DSA steam-atomized desuperheater (figure 1) serves a wide range of desuperheating applications. It is best suited for those installations requiring high rangeability in low steam velocity pipelines. With adequate controls, this unit provides an efficient means of atomizing spraywater over wide fluctuations in flow rate while maintaining downstream steam temperature to within 6 to 8°C (10 to 15°F) of saturation. The DSA desuperheater is easily installed directly into the steam line. The standard mounting is with the desuperheater perpendicular to the steam line. However, the DSA desuperheater can be made to fit angle or elbow installations.

Table 1. Specifications

<p>Steam Line Sizes ■ NPS 6 to 60</p> <p>Steam Line Connection Sizes NPS ■ 3, ■ 4, and ■ 6 ■ CL150, ■ CL300, ■ CL600, ■ CL900, ■ CL1500, and ■ CL2500 raised-face flange</p> <p>Spraywater and Atomizing Steam Connection Sizes NPS ■ 1, ■ 1-1/2, and ■ 2 ■ CL150, ■ CL300, ■ CL600, ■ CL900, ■ CL1500, and ■ CL2500 raised-face flange</p> <p>Maximum Inlet Pressures⁽¹⁾ Consistent with applicable CL150, 300, 600, 900, 1500, or 2500 pressure-temperature ratings per ASME B16.34</p>	<p>Inherent Rangeability⁽²⁾ Up to 50:1</p> <p>Spraywater Pressure Required 3.5 to 35 bar (50 to 500 psi) greater than steam line pressure</p> <p>Minimum Steam Velocity 1.5 m/s (5 feet per second) depending on actual operating conditions</p> <p>Atomizing Steam Atomizing steam should be at least 2.0 times the pressure of the steam to be desuperheated. Total atomizing steam flow (lb/hr) will be 10 to 15 percent of the maximum spraywater flow (lb/hr).</p>
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1. Do not exceed the pressure or temperature limits in this instruction manual, nor any applicable code or standard limitations.
 2. Ratio of maximum to minimum controllable Cv.

Principle of Operation

The DSA desuperheater utilizes the energy of atomizing steam to produce a fine spray of cooling water for injection into the steam line. An external spraywater control valve controls the quantity of cooling water. The water flows into the desuperheater and fills the main body of the unit just ahead of the atomizing head. Here the water is directed into a number of flow channels where it is mixed and atomized by the high velocity atomizing steam (see figure 3).

The atomizing steam is controlled via an automatic or manual shutoff valve. The steam flows down the center of the desuperheater body toward the atomizing head. Here too, the steam is directed into a number of flow channels. These channels are sized to produce a critical pressure drop. This assures very high steam velocities and maximum kinetic energy for spraywater atomization.

The atomizing steam mixes with the cooling water and produces a spraywater cloud with almost infinite surface area. This spray cloud is almost instantaneously vaporized when injected into the main steam line, resulting in steam at a reduced temperature.

The atomizing steam tube inside the desuperheater is only secured at the atomizing head. The packing box on top allows for the free movement of the unit due to thermal expansion from steam/water temperature differentials.

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 desuperheater is installed where service conditions could exceed the limits given in table 1 or 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.

CAUTION

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 Automation Solutions sales office.

1. Insert the DSA desuperheater into the flanged pipe stud on the steam line (see figure 2 for the proper “T” length dimension). Bolt the unit to the pipe in accordance with standard piping practice.
2. Clean and flush out the cooling water line before connecting to the desuperheater. Use only clean sources of cooling water. Use of clean water decreases wear to the valve trim and prevents clogging of the desuperheater by solid particles.

⚠ WARNING

Personal injury or property damage could result from clogging of the desuperheater. Emerson Automation Solutions recommends installation of a strainer and isolating valve on the water line leading to the desuperheater. Failure to do so may result in clogging of the desuperheater by solid particles, thus hampering temperature control of the steam.

3. A straight run of pipe is required downstream of the desuperheater to assure complete vaporization of cooling water. Consult the desuperheater certified drawing for the required distance of straight pipe.
4. The temperature sensor should be mounted according to manufacturer's instructions. Minimum distance to the sensor is approximately 9.1 m (30 feet) downstream of the desuperheater. This distance changes with higher velocity steam flow and percentage of spraywater required. Consult the desuperheater certified drawing for the exact distance.
5. Allow no branching out from the steam line, to divide the steam flow, between the temperature sensor and the desuperheater.

A typical control loop is illustrated in figure 4. A temperature sensor generates a pneumatic instrument air signal through a transmitter. This signal is transmitted to a remote mounted temperature indicating control station. The output signal from the control station is sent to the positioner on the spraywater control valve. The positioner output signal is piped to the actuator, which strokes the valve and controls the flow of cooling water to the desuperheater. The atomizing steam valve is normally controlled so that it fully opens as soon as the spraywater control valve starts to open.

⚠ WARNING

Personal injury could result from packing leakage. Valve packing was tightened prior to shipment; however some readjustment will be required to meet specific service conditions.

Operating Instructions

Verification of Control Instrumentation

Note

The following steps assume that a local controller is used. If all controls are through a DCS, adjust verification steps accordingly.

1. Connect the instrument air supply lines to the temperature transmitter, indicating control station, and valve positioner in accordance with instrumentation manufacturer's instructions.
2. Switch the controller to manual control.

Note

If 0.4 to 2.0 bar (6 to 30 psig) or another range is used, adjust the instrument air signal referenced in the following steps accordingly.

3. This instruction manual assumes an instrument air signal of 0.2 to 1.0 bar (3 to 15 psig). Adjust the instrument air signal to 0.2 bar (3 psig). Check that the water valve is completely closed. Adjust the positioner, if necessary.
4. Now adjust the instrument air signal to 1.0 bar (15 psig). Check that the water valve opens to its full travel. Adjust the positioner to correct the range and re-zero if needed, by referring to step 3. Check to ensure the atomizing steam valve opens as soon as the spraywater control valve begins to open.
5. Thereafter, check that the controller is responding so that rising steam temperature gives an increasing instrument air signal.
6. Adjust the instrument air signal to 0.6 bar (9 psig).
7. Verify that the atomizing steam valve has opened.
8. Open the water supply.
9. Observe the downstream steam temperature.
10. Increase the instrument air signal to 0.8 bar (11 psig). Check that the steam temperature decreases.
11. Adjust the instrument air signal to 0.5 bar (7 psig) and check that the steam temperature rises.

Note

If the temperature does not fall when the instrument air signal is increased, the cause may be that either the water isolation valve has not been opened or that the steam temperature is close to saturation. If the latter is the case, set the instrument air signal to 0.3 bar (4 psig) [spraywater valve slightly open] and increase to 0.4 bar (6 psig). Check if the temperature decreases.

12. When satisfactory coordination between the instrument air signal and steam temperature is reached, adjust the controller according to directions of the manufacturer.
13. Switch the controller to "automatic" for automatic positioning.

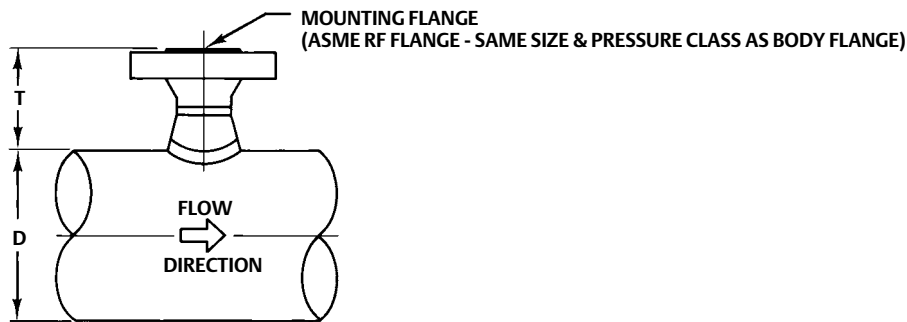
Note

For more detailed calibration information, refer to the instrument manufacturer's operating instructions.

Figure 2. "T" Dimension

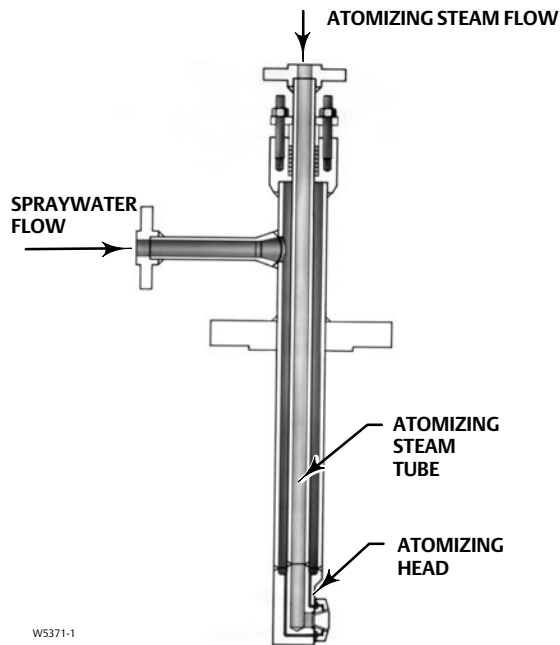
D NPS	T	
	mm	Inches
6 Nominal	273.1	10.75
8 Nominal	247.7	9.75
10 Nominal	215.9	8.5
12 Nominal	279.4	11
14 Nominal	266.7	10.5
16 Nominal	241.3	9.5
18 Nominal	215.9	8.5
20 Nominal	266.7	10.5
22 Nominal	241.3	9.5
24 Nominal	215.9	8.5
> 24 Nominal	215.9	8.5

For the NPS 6 mounting flange, add 69.9 mm (2.75 inches) to the "T" dimension.



INSTALLATION CONFIGURATION (1 GASKET REQUIRED)
NOTE: ALL FLANGE BOLT HOLES STRADDLE STEAM PIPE CENTERLINE

Figure 3. Detail of Fisher DSA Desuperheater



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Figure 4. Control Loop with Fisher DSA Desuperheater

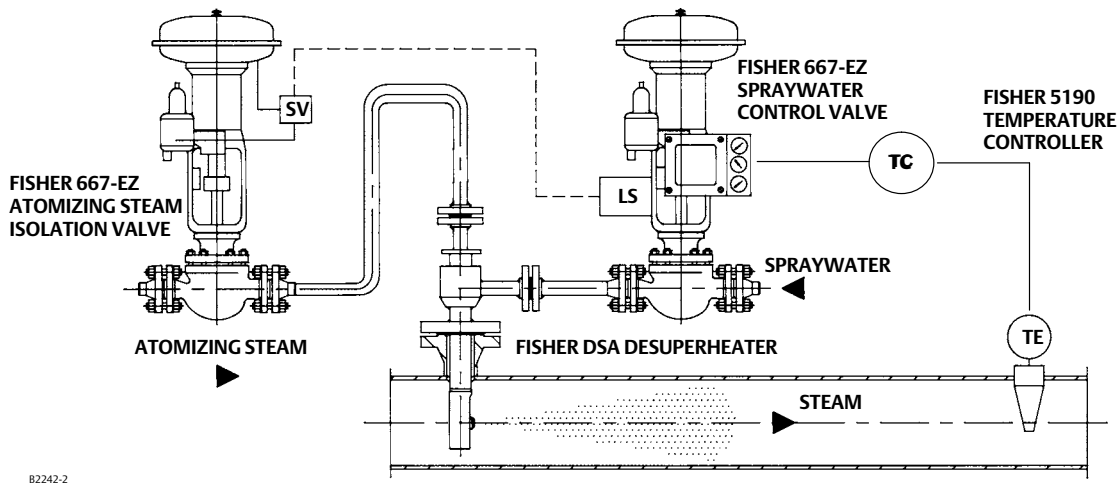
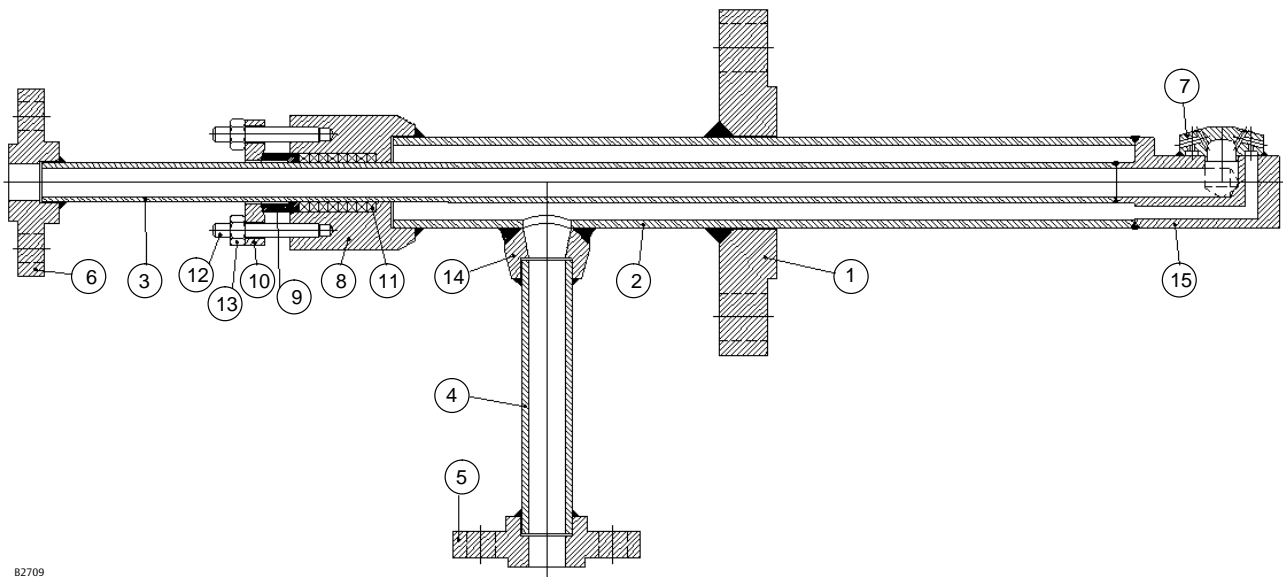


Figure 5. Fisher DSA Assembly



Maintenance Instructions

⚠ WARNING

Avoid personal injury from sudden release of process pressure. Before performing any maintenance operations:

- Do not remove the actuator from the desuperheater while the valve is still pressurized.

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuators. Be sure the actuators cannot suddenly open or close the atomizing steam or spraywater control valves.
- Completely shut off the process to isolate the DSA desuperheater from process pressure. Relieve process pressure and drain the process media before servicing the unit.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The desuperheater packing box may contain process fluids that are pressurized, *even when the desuperheater has been removed from the pipeline*. Process fluids may spray out under pressure when removing the packing hardware or packing rings.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Servicing

Although the DSA desuperheater is a simple design requiring almost no maintenance, it may be necessary to repack the unit if a steam packing leak should develop.

⚠ WARNING

Residual system pressure may be released during the following steps if the system was improperly isolated or vented. Use extreme care to prevent personal injury while loosening any fasteners in the pressure boundary.

1. Slowly and evenly loosen the gland nuts (key 13, figure 5) and remove them from the gland studs (key 12, figure 5).
2. Pull back the gland flange (key 10, figure 5) and gland follower (key 9, figure 5) from the stuffing box.
3. Using a suitable packing pick, remove the packing (key 11, figure 5) from the stuffing box.
4. Reinstall packing (key 11, figure 5), making sure to push down each ring as far as possible with the gland follower (key 9, figure 5) prior to installing the next ring. This process can be made somewhat easier by lubricating each ring with grease similar to copper-based anti-seize or heavy duty anti-seize.
5. After installation of the new packing set, gland follower and gland flange, tighten the gland nuts (key 13, figure 5) to seal the packing on the steam pipe from leakage.
6. After ensuring that the DSA desuperheater is properly reinstalled in the pipeline, the unit may be returned to service. The DSA desuperheater should be monitored as the unit is brought on line to ensure that there are no leaks in the connections.

Table 1. Troubleshooting Guide

Problem	Possible Solution
Temperature setpoint is not reached	Check water source availability and pressure
Temperature setpoint is not reached	Check nozzle(s) for plugging
Temperature setpoint is not reached	Make sure that steam saturation pressure is not above setpoint
Temperature setpoint is not reached	Check to ensure full actuator stroke is reached
Temperature is below setpoint	Check temperature control loop - reset
Temperature is below setpoint	Check nozzle for fouling/poor spray pattern - clean/replace
Temperature is below setpoint	Check temperature sensor location - relocate per guidelines
Temperature oscillates around setpoint	Tune control system parameters
Temperature oscillates around setpoint	Temperature setpoint may be too close to saturation
Water in steam line	Check atomizing steam supply pressure and valve opening
Water in steam line	Check that steam traps are functioning properly
Water in steam line when steam line isolated	Check for leakage of spraywater control valve
Water in steam line	Review piping configuration for downstream tees and elbows

Troubleshooting

Table 1 is a basic first line troubleshooting guide. Contact your [Emerson sales office](#) or Local Business Partner for assistance if you are unable to resolve your field operation problem.

Parts Ordering

Each DSA desuperheater is assigned a serial number that can be found on the DSA desuperheater body or on a tag attached to the mounting flange. Refer to the serial number when contacting your Emerson sales office or Local Business Partner for technical assistance. When ordering a replacement part, refer to the serial number and key number. The key numbers 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 Automation Solutions should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Parts List

Key	Description	Key	Description
1	Body Flange	8	Stuffing Box
2	Body Pipe	9	Gland Follower
3	Steam Pipe	10	Gland Flange
4	Water Pipe	11*	Packing
5	Water Flange	12	Gland Stud
6	Steam Flange	13	Gland Nut
7	Sprat Head	14	Water Sockolet
		15	Sprayhead Block

*Recommended spare parts

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