

# Fisher® TBX-T Desuperheater

The Fisher TBX-T desuperheater can be used in many applications to efficiently reduce the temperature of superheated steam to the desired set point. The TBX-T desuperheater is available for installation in steam lines from DN200 through DN1200 (NPS 8 through 48) in diameter and are capable of maintaining steam temperatures to within 6°C (10°F) of saturation temperatures.

Water atomization and vaporization are key elements in any steam conditioning application. The TBX-T design incorporates a spraywater manifold of variable geometry AF nozzles that 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 (see figure 4). Years of research in spray atomization and vaporization were key to optimizing the water injection system. Extensive use of CFD analysis, in addition to field performance feedback, was used to validate spray system enhancements.

## Features

- **Precise Spraywater Injection**-- CFD designed spray manifold determines water injection point and insertion depth to maximize mixing and quick vaporization.
- **Thermal Liner in Body**-- The TBX-T has the option of including an integral thermal liner inside the steam pipe. This construction is most commonly used in boiler interstage attemperation applications, where the desuperheater is exposed to high thermal cycling and stress, high steam velocities, and flow-induced vibration. The liner minimizes the potential for thermal shock when cool water is introduced to the unit that is already heated to the operating steam temperature.



- **TBX-T**--The TBX-T desuperheater incorporates a spraywater manifold of variable geometry Type AF nozzles that 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 (see figure 3).

The TBX-T desuperheater can be configured with a pressure reducing valve (PRV) immediately upstream, with an integral diffuser, or as a standalone device.

The TBX-T (figure 1) is normally used when an application requires a separation of the pressure reduction and desuperheating functions. The TBX-T is equipped with a water supply manifold which includes a spraywater connection (NPS 1 to 4) and 2 to 4 AF nozzles (AF14 - AF44) per manifold. The manifold (multiple manifolds are also possible) provides cooling water flow to a number of individual spray nozzles installed in the pipe wall of the outlet section. The result is a fine spray injected radially into the high turbulence of the axial steam flow. The combination of large surface area contact of the water and high turbulence in the steam make for very efficient mixing and rapid vaporization.

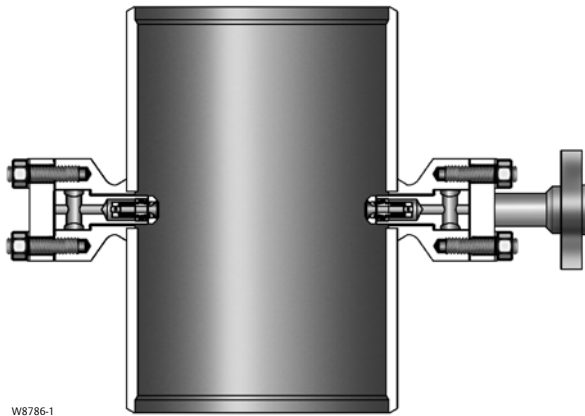


**Table 1. Specifications**

<p><b>Connections</b>  <b>Steam Line:</b> NPS 8 to 48; CL150 to CL2500; BWE, RF, and RTJ  <b>Spraywater:</b> NPS 1 to NPS 4, CL150 to CL2500, RF</p> <p><b>Maximum Pressure Rating<sup>(1)</sup></b>                  Consistent with applicable pressure-temperature ratings per ASME B16.34</p> <p><b>Inherent Rangeability</b>                  Up to 50:1. The ratio of maximum to minimum controllable <math>C_v</math> is dependent upon the available water pressure differential</p> <p><b>Spraywater Pressure Required<sup>(2)</sup></b>                  3.5 to 35 bar (50 to 500 psi) greater than steam line pressure</p>	<p><b>Maximum Unit <math>C_v</math> (for Spraywater Flow)</b>                   Contact your Emerson Process Management sales office</p> <p><b>Construction Materials</b>   <b>Steam Pipe:</b> ■ SA105 carbon steel, ■ SA182 Grade F22 (2-1/4 Cr-1 Mo) ■ SA182 Grade F91 (9 Cr-1 Mo-V)  <b>Nozzles:</b> ■ S41000 stainless steel  <b>Gaskets:</b> ■ N06600/Graphite  <b>Bolting:</b> ■ SA193 Grade B7, ■ SA193 Grade B16, ■ N07718</p>
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1. Do not exceed the pressure or temperature limits in this bulletin, nor any applicable code or standard limitations.  
 2. A function of required turndown and equipment selection.

**Figure 1. Fisher TBX-T Cooler**



**Figure 2. Fisher TBX-T Desuperheater with Optional Liner**



## Principle of Operation

For the most efficient use of heat energy from steam, it is necessary to reduce the temperature of steam to near the saturation temperature. With steam that is at or near the saturation temperature, it is possible to recover the large amount of energy that was put into the steam when it was heated from water to steam. Desuperheating, or attenuation as it is sometimes called, is most often used to • improve thermal efficiency of heat transfer processes by using steam near saturation, • control unintentional superheat from pressure reduction of the steam, and • protect

downstream equipment and piping from elevated temperatures and pressure.

In the TBX-T desuperheater, spraywater is supplied to the manifold and distributed to the nozzles. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions. The TBX-T desuperheater can be configured with a pressure reducing valve (PRV) immediately upstream, with an integral diffuser, or as a standalone device. Dimensions are dependent of the design requirements. Consult your Emerson Process Management sales office with service conditions to obtain dimensions.

Figure 3. Fisher TBX-T Desuperheater

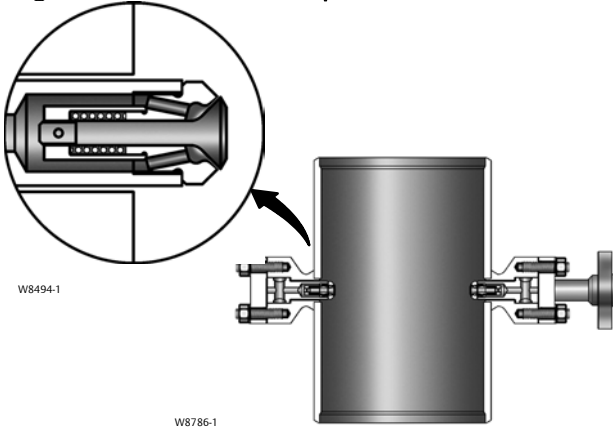
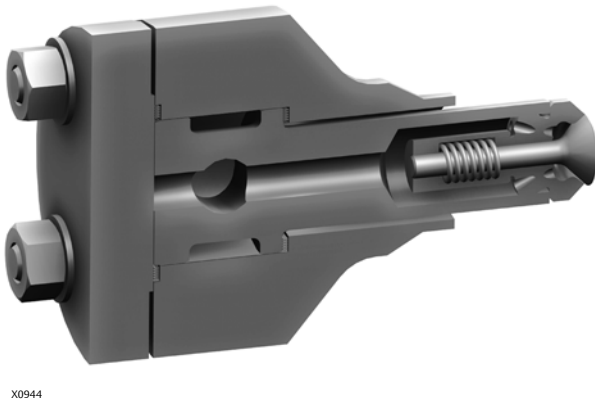


Figure 4. Detail of Spray Nozzle



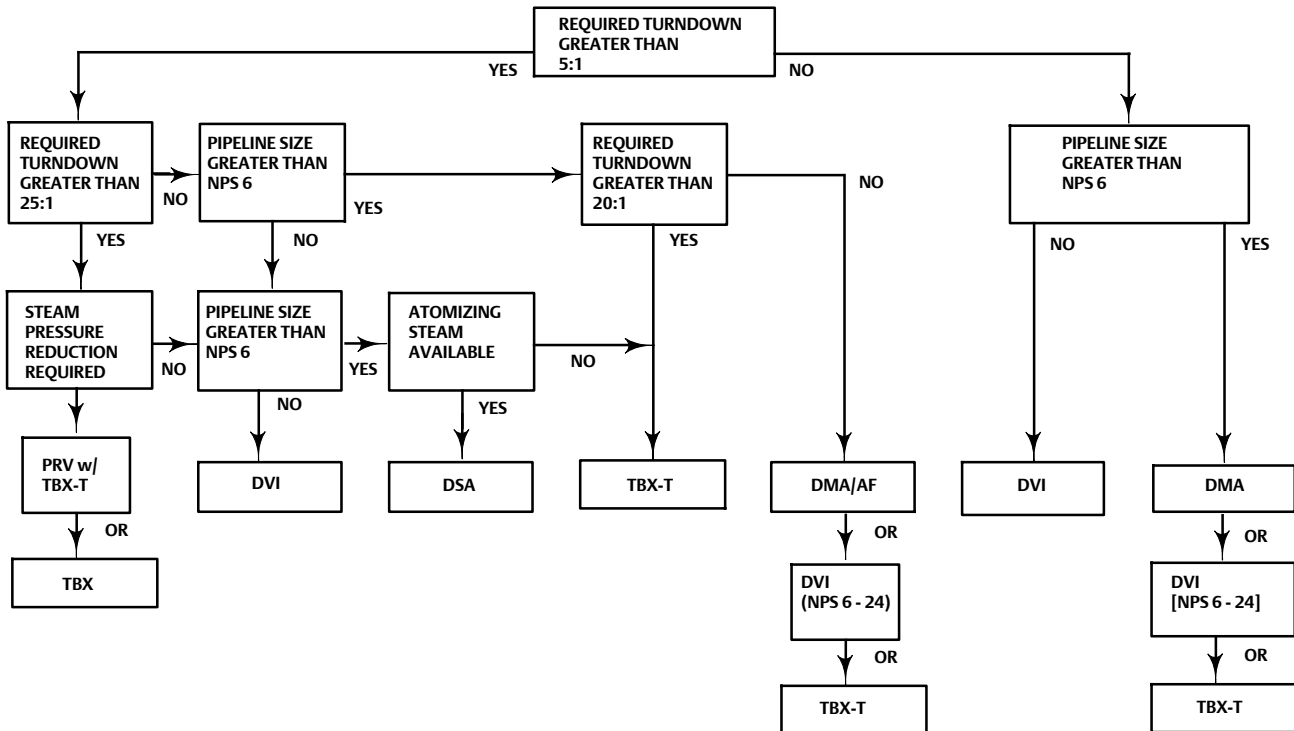
## Ordering Information

Use the flow chart in figure 5 to select the appropriate desuperheater for your requirements.

When ordering, specify the following information. Items 1 through 5 are required for desuperheater sizing.

1. Maximum, normal, and minimum steam flow rate.
2. Steam pressure and temperature at the inlet and outlet.
3. Spraywater pressure and temperature.
4. Design conditions, if different from operating conditions.
5. Steam line size.
6. Desuperheater steam connection size, type, and rating.
7. Spraywater connection size from table 1.

Figure 5. Selection Flow Chart



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