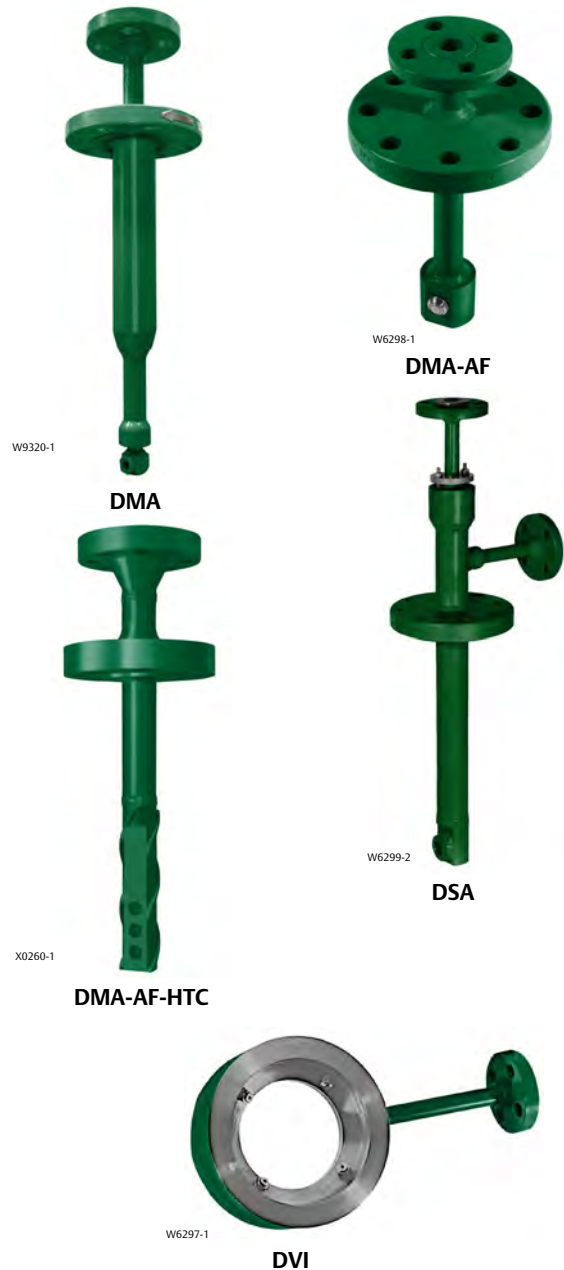


# Fisher™ DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI Desuperheaters

Fisher DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI desuperheaters can be used in many applications to efficiently reduce the temperature of superheated steam to the desired set point. Available variations are mechanically atomized (both fixed geometry and variable geometry) and steam assisted. Desuperheaters are available for installation in steam lines from DN25 through DN1500 (NPS 1 through 60) in diameter and are capable of maintaining steam temperatures to within 6°C (10°F) of saturation temperatures.

## Available Insertion Style Desuperheaters

- **DMA**—A simple mechanically atomized desuperheater with single or multiple, fixed-geometry spray nozzles is intended for applications with nearly constant load. The DMA is installed through a flanged connection on the side of a DN150 (NPS 6) or larger pipeline. Maximum unit  $C_v$  is 3.8.
- **DMA-AF**—A variable-geometry, mechanically atomized, back-pressure-activated desuperheater with one, two, or three spray nozzles is designed for applications requiring control over moderate load fluctuations. The DMA-AF desuperheater (figure 1) is installed through a flanged connection on the side of a DN200 (NPS 8) or larger pipeline. Maximum unit  $C_v$  is 15.0.



- **DMA-AF-HTC**— The DMA-AF-HTC is functionally equivalent to the DMA-AF, however it is structurally suited for severe applications. The most common applications include boiler interstage attenuation, where the desuperheater is exposed to high thermal cycling and stress, high steam velocities and flow induced vibration. In addition to this specific application, the DMA-AF-HTC is suitable for other severe desuperheating application environments. The DMA-AF-HTC uses a construction optimized to move weld joints away from high stress regions.

The desuperheater design incorporates an integral thermal liner inside the desuperheater body pipe. This minimizes the potential for thermal shock when cool water is introduced to the unit that is already heated to the operating steam temperature.

The nozzle mount for the DMA-AF-HTC is engineered to minimize the potential for excitation due to vortex shedding and flow induced vibration. The DMA-AF-HTC desuperheater (figure 3) is installed through a flanged connection on a DN200 (NPS 8) or larger pipeline. Maximum unit  $C_v$  is 15.0.

- **DSA**—The DSA desuperheater uses high-pressure steam for rapid and complete atomization of spraywater in low-velocity steam lines. This desuperheater (figure 2) is installed through a flanged connection on a DN200 (NPS 8) or larger pipeline. This desuperheater is intended for applications requiring high rangeability. Maximum unit  $C_v$  is 9.97.

## Available Ring Style Desuperheaters

- **DVI**—This desuperheater injects spraywater in the outlet of the venturi section, assuring excellent mixing and rapid atomization. The DVI desuperheater (figure 4) is installed between flanges in DN25 through DN600 (NPS 1 through 24) steam lines. There are no moving parts, and the water injection pattern provides rapid and thorough cooling. It is intended for applications with moderate load changes and low-velocity steam. Maximum unit  $C_v$  is 9.48.

## Specifications

### Available Types

- DMA, ■ DMA-AF, ■ DMA-AF-HTC, ■ DSA, and ■ DVI (see the Available Desuperheater Types section for descriptions)

### End Connection Sizes

See table 1

### End Connection Styles

- ASME Raised Face Flanges, ■ ASME RTJ Flanges, and ■ EN1092-1 Flanges

### Maximum Pressure Rating<sup>(1)</sup>

Consistent with applicable pressure-temperature ratings (as shown in table 1) per ASME B16.5 for ASME flanges, or EN1092-1 for PN rated flanges.

### Inherent Rangeability

Up to 50:1. The ratio of maximum to minimum controllable  $C_v$  is dependent upon the available water pressure differential

### Atomizing Steam (Design DSA)

Atomizing steam should be at least 2.0 times the pressure of the steam to be desuperheated. Amount of atomizing steam will be 10% of maximum spraywater flow

### Spray Water Pressure Required<sup>(2)</sup>

3.5 to 35 bar (50 to 500 psi) greater than steam line pressure

### Maximum Unit $C_v$ (for Spraywater Flow)

DMA: 3.8  
DMA-AF: 15.0  
DMA-AF-HTC: 15.0  
DSA: 9.97  
DVI: 9.48

### Construction Materials

Desuperheater Body (all designs except DMA-AF-HTC): ■ Carbon steel, ■ Chrome-moly alloy steel (F22, F91), or ■ 300 series stainless steel  
Desuperheater Body (DMA-AF-HTC): ■ Chrome-moly alloy steel (F22, F91), or ■ Carbon Steel (SA105)  
Note: Nozzle Mount material is cast equivalent to body material

#### Nozzle Material

DMA: ■ 303 or ■ 316  
DMA-AF and DSA: ■ 410 stainless steel  
DMA-AF-HTC: ■ 410 stainless steel or ■ N07718  
DVI: ■ 303 or ■ 316 stainless steel or ■ F22 venturi with drilled hole

### Material Temperature Capabilities<sup>(1)</sup>

See table 2

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.

Table 1. Connection Sizes

DESIGN	STEAM LINE SIZE	STEAM LINE CONNECTION		SPRAYWATER CONNECTION		ATOMIZING STEAM CONNECTION	
		Size	ASME Pressure Rating Raised-Face Flange <sup>(1)</sup>	Size	ASME Pressure Rating Raised-Face Flange <sup>(1)</sup>	Size	ASME Pressure Rating Raised-Face Flange <sup>(1)</sup>
DMA	NPS 6 to 60	NPS 3, 4 or 6	ASME CL150 to 1500	NPS 1, 1-1/2, 2	ASME CL150 - 1500	N/A	N/A
	DN150 to DN1500	DN80, 100 or 150	PN 10 to PN 250	DN25, 40, 50	PN 10 to PN 250	N/A	N/A
DMA-AF	NPS 8 to 60	NPS 3 <sup>(2)</sup> , 4 or 6	ASME CL150 to 1500	NPS 1, 1-1/2, 2	ASME CL150 - 1500	N/A	N/A
	DN200 to DN1500	DN80 <sup>(2)</sup> , 100 or 150	PN 10 to PN 250	DN25, 40, 50	PN 10 to PN 250	N/A	N/A
DMA-AF-HTC	NPS 8 to 60	NPS 3 <sup>(2)</sup> or 4	ASME CL150 to CL2500	NPS 1-1/2 <sup>(3)</sup> , 2	ASME CL150 - 2500	N/A	N/A
	DN200 to DN1500	DN80 <sup>(2)</sup> or 100	PN 10 to PN 400	DN40 <sup>(3)</sup> , 50	PN 10 to PN 400	N/A	N/A
DSA	NPS 8 to 60	NPS 3 <sup>(2)</sup> , 4 or 6	ASME CL150 to 1500	NPS 1, 1-1/2, 2	ASME CL150 - 1500	NPS 1, 1-1/2, 2	ASME CL150 - 1500
	DN200 to DN1500	DN80 <sup>(2)</sup> , 100 or 150	PN 10 to PN 250	DN25, 40, 50	PN 10 to PN 250	DN25, 40, 50	PN 10 to PN 250
DVI	NPS 1 to 8 <sup>(4)</sup>	NPS 1 to 8 <sup>(4)</sup>	ASME CL150 to 1500	NPS 1/2, 3/4, 1, 2	ASME CL150 - 1500	N/A	N/A
	DN25 to DN200 <sup>(4)</sup>	DN25 to DN200 <sup>(4)</sup>	PN 10 to PN 250	DN15, 25, 50	PN 10 to PN 250	N/A	N/A

1. Other standard flanges and connections are also available.  
 2. NPS 3 (DN80) mounting connection not available for some large spray nozzle sizes.  
 3. NPS 1-1/2 (DN40) spraywater connection is only available for CL150 - 900.  
 4. For other sizes, consult your [Emerson sales office](#).

Table 2. Material Temperature Range

BODY FLANGE MATERIAL <sup>(1)</sup>	OPERATING TEMPERATURE RANGE <sup>(2)</sup>	
	°C	°F
SA105	-29 to 427	-20 to 800
SA105/1.0460 <sup>(3)</sup>	-29 to 427	-20 to 800
F22	-29 to 566 <sup>(4)</sup>	-20 to 1050 <sup>(4)</sup>
F91	-29 to 593 <sup>(4)</sup>	-20 to 1100 <sup>(4)</sup>
304 SST	-29 to 593 <sup>(2,4)</sup>	-20 to 1100 <sup>(2,4)</sup>
316 SST	-29 to 593 <sup>(2,4)</sup>	-20 to 1100 <sup>(2,4)</sup>

1. For availability of materials other than those listed, contact your [Emerson sales office](#).  
 2. Temperatures above 538°C (1000°F) require non-standard S31600 or S30400 body material (to FMS20B16).  
 3. SA105 / 1.0460 material is available for PED.  
 4. CL150 terminates at 538°C (1000°F).

## 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 attemperation 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.

The DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI desuperheaters produce a spray of cooling water in a steam line (figure 5). The spraywater cools the steam to near the saturation temperature or to a custom setpoint. The rate of cooling is dependent on spraywater droplet size, distribution, and velocity. The

temperature is controlled by varying the amount of spraywater flow.

In operation, spraywater is supplied to a connection on the desuperheater. A signal from a downstream controller positions an actuator or valve to control the amount of spraywater flow for cooling. The spraywater control valve is a separate valve in the spraywater line.

In the DSA desuperheater, high pressure steam is mixed with the spraywater to produce a critical or near-critical pressure drop in the atomizing steam for a very high velocity. The high velocity disperses the spraywater into very small particles for rapid cooling.

In the DVI desuperheater, spraywater enters the desuperheater water tube. It continues into the distribution chamber and is forced into the injection orifices. Steam enters the desuperheating venturi and is accelerated to maximize the velocity at the point of water injection. The high steam velocity and turbulent steam flow improves mixing of water and steam, increasing rangeability.

Figure 1. Fisher DMA-AF Desuperheater

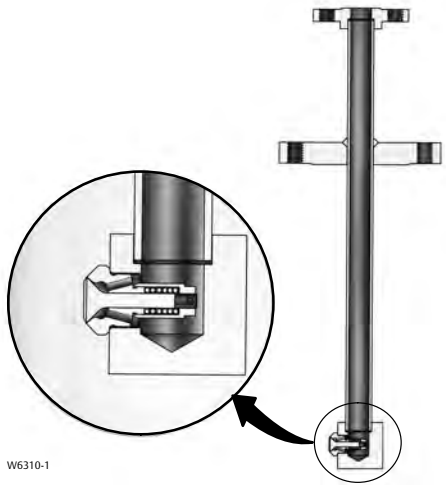


Figure 2. Fisher DSA Desuperheater

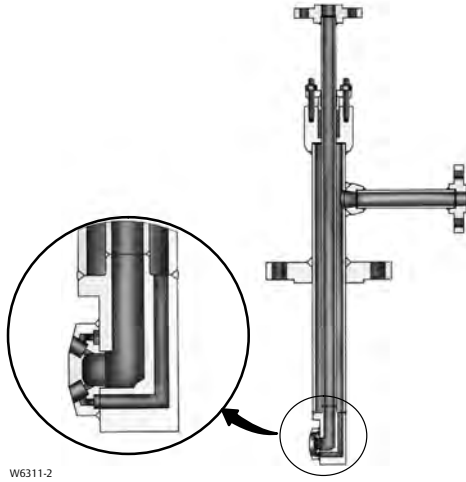


Figure 3. Fisher DMA-AF-HTC Desuperheater

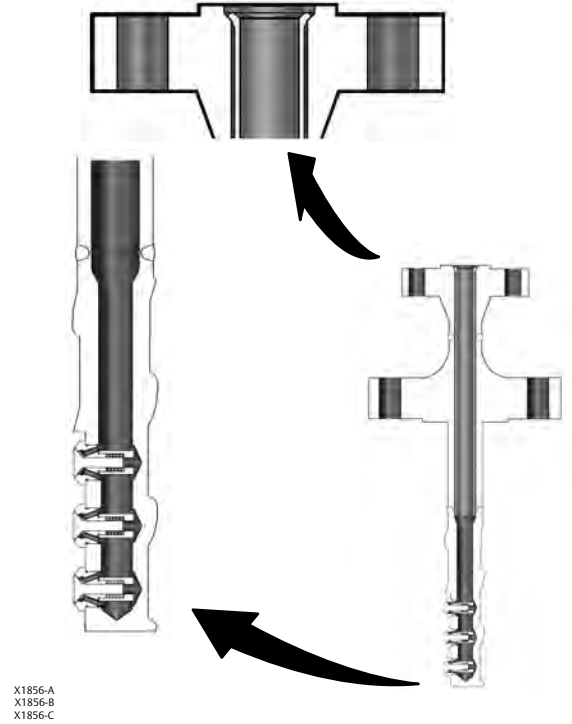


Figure 4. Fisher DVI Desuperheater

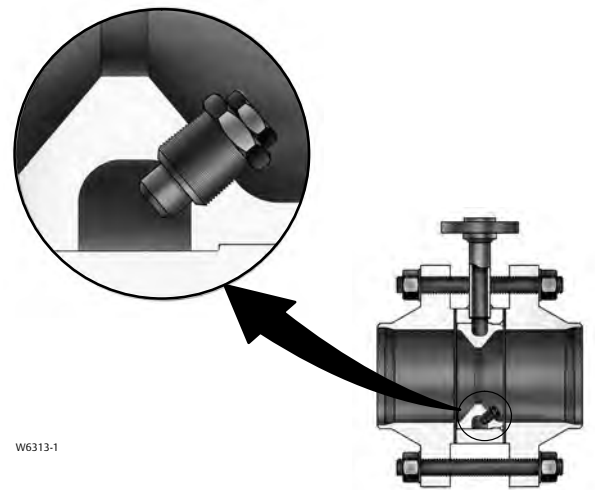
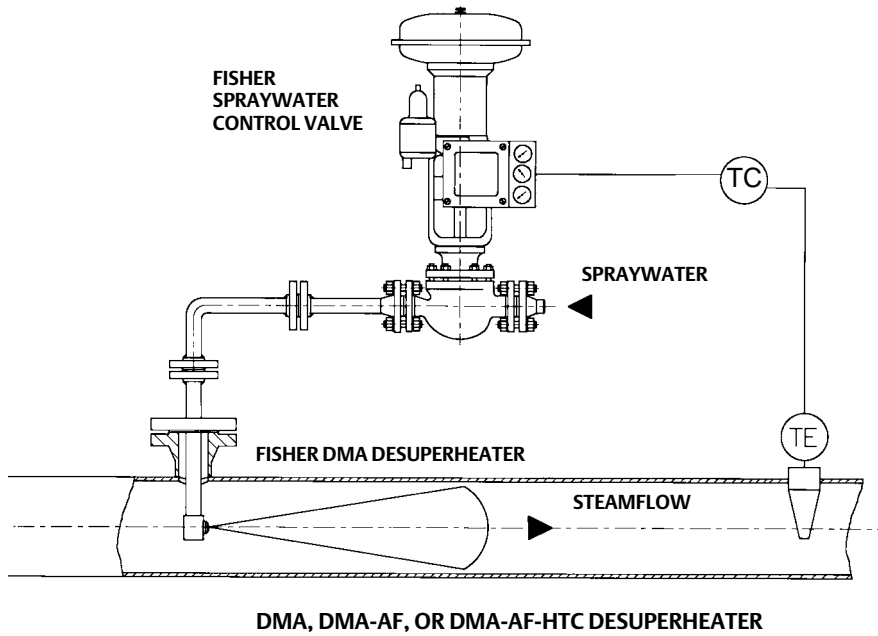
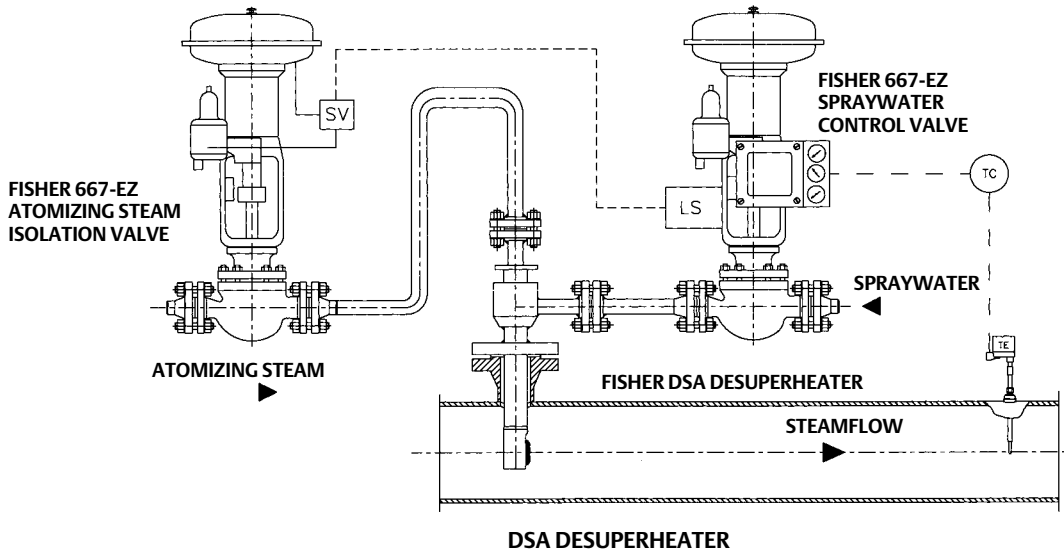
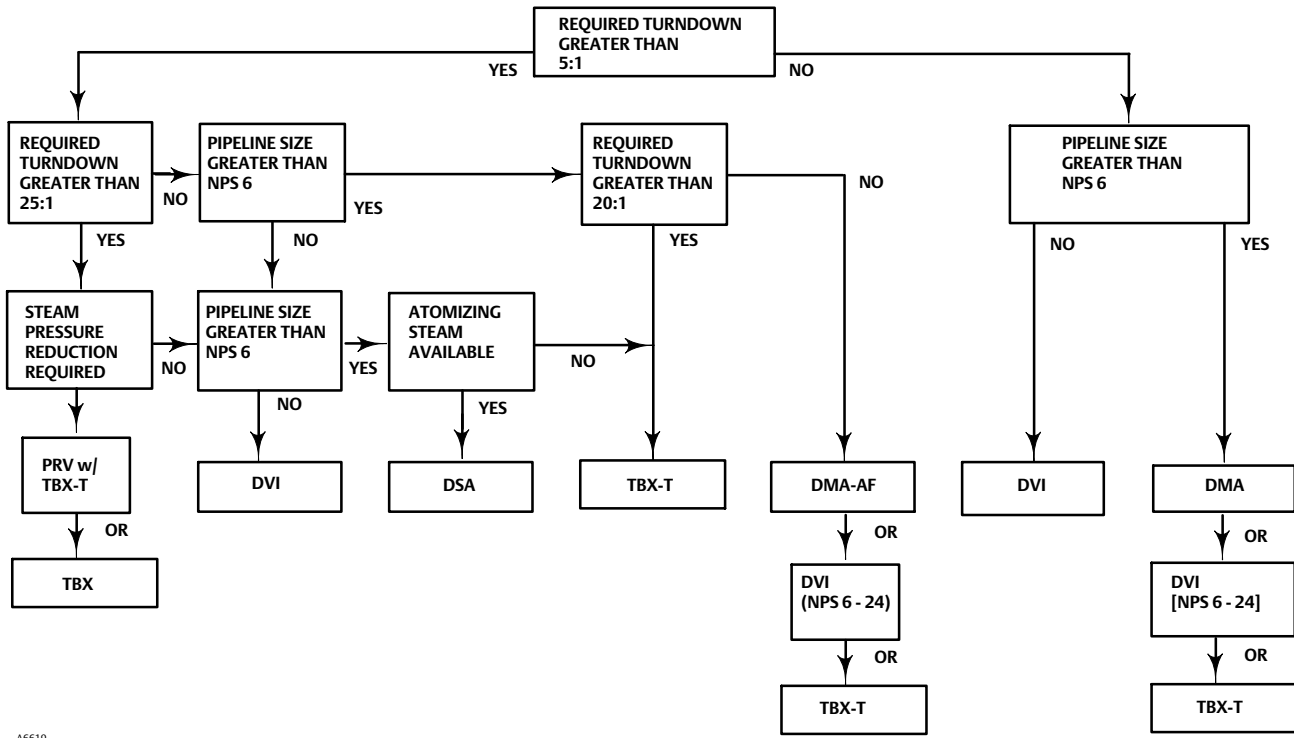


Figure 5. Typical Installation



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Figure 6. Selection Flow Chart



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## Ordering Information

Use the flow chart in figure 6 to select the appropriate desuperheater for your requirements. Dimensions are shown in figures 7, 8, 9, and 10.

When ordering, specify the following information. Items 1 through 6 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. Atomizing steam pressure and temperature (DSA desuperheater only).

5. Design conditions, if different from operating conditions.

6. Steam line size.

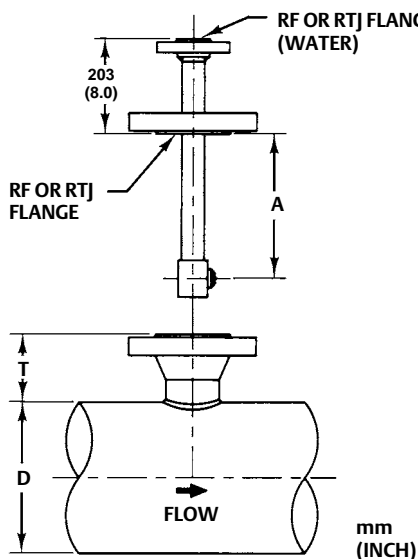
7. Desuperheater steam connection size, type, and rating.

8. Spraywater connection size from table 1.

9. Atomizing steam connection size from table 1 (DSA desuperheater only).



Figure 7. Fisher DMA and DMA-AF Dimensions (also see table 3)



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Table 3. Fisher DMA and DMA-AF Face-to-Face Dimensions

DIMENSION					
A <sup>(2)</sup>		D (Steam Line Size)		T <sup>(2)</sup>	
mm	Inches	NPS	DN	mm	Inches
360	14.19	6 <sup>(1)</sup>	150 <sup>(1)</sup>	273	10.75
		8	200	248	9.75
		10	250	216	8.5
448	17.63	12	300	279	11
		14	350	267	10.5
		16	400	241	9.5
		18	450	216	8.5
524	20.63	20	500	267	10.5
		22	550	241	9.5
		>=24	>=600	216	8.5

1. DMA only. Not available for DMA-AF.  
2. For DMA and DMA-AF with NPS 6 mounting flanges, add 69.6 mm (2.75 in) to the A and T dimensions.

Table 4. Fisher DMA-AF Minimum Mounting I.D.

NOZZLE MODEL	BODY FLANGE SIZE		WATER FLANGE SIZE		BODY PIPE SIZE, NPS	MINIMUM MOUNTING I.D.	
	NPS	DN	NPS	DN		mm	Inches
DMA-MA through DMA-MN	3	80	1, 1-1/2, 2	25, 40, 50	1	73.66	2.9
DMA-A through DMA-U	3	80	1, 1-1/2, 2	25, 40, 50	1	58.42	2.3
DMA-AF-A,B,C	3	80	1, 1-1/2, 2	25, 40, 50	1	66.65	2.624
			1	25	1	66.65	2.624
DMA-AF-D	4	100	1-1/2, 2	40, 50	1-1/2	77.98	3.07
			1	25	1	73.66	2.9
			1-1/2, 2	40, 50	1-1/2	77.98	3.07
DMA-AF-E	3	80	1, 1-1/2, 2	25, 40, 50	1	73.66	2.9
			1	25	1	73.66	2.9
DMA-AF-F	4	100	1-1/2, 2	40, 50	1-1/2	80.06	3.152
			1-1/2, 2	40, 50	1-1/2	87.33	3.438
DMA-AF-G	4	100	1-1/2, 2	40, 50	1-1/2	92.05	3.624
DMA-AF-H	4	100	1-1/2, 2	40, 50	1-1/2	97.18	3.826
DMA-AF-J	6	150	1-1/2, 2	40, 50	1-1/2	129.5	5.1

Figure 8. Fisher DSA Dimensions (also see table 5)

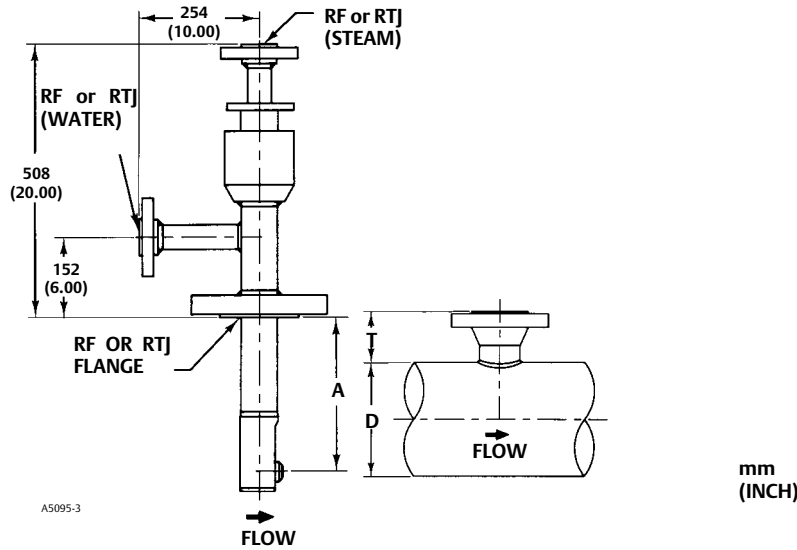


Table 5. Fisher DSA Dimensions

DIMENSION				
A <sup>(1)</sup>		D, NPS Size	T <sup>(1)</sup>	
mm	Inches		mm	Inches
360	14.19	8	248	9.75
		10	216	8.50
448	17.63	12	279	11.00
		14	267	10.50
		16	241	9.50
		18	216	8.50
524	20.63	20	267	10.50
		22	241	9.50
		24	216	8.50
		>24	216	8.50

1. For NPS 6 mounting flange, add 69.6 mm (2.75 inches) to the A and T dimensions. For CL2500 mounting, consult your [Emerson sales office](#).

Figure 9. Fisher DVI Dimensions (also see table 6)

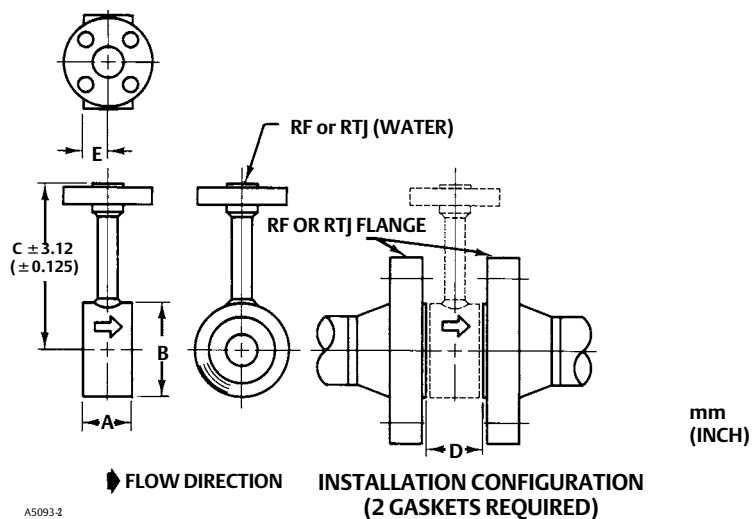


Table 6. Fisher DVI Dimensions

STEAM PIPE SIZE, NPS	RATING	A		B		C		D		E	
		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
1	CL150-CL1500	76	3	51	2.00	254	10	83	3.25	38	1.50
1-1/2	CL150-CL1500	76	3	73	2.88	254	10	83	3.25	38	1.50
2	CL150-CL1500	76	3	92	3.63	254	10	83	3.25	38	1.50
2-1/2	CL150-CL1500	76	3	105	4.13	254	10	83	3.25	38	1.50
3	CL150-CL1500	76	3	127	5.00	254	10	83	3.25	38	1.50
4	CL150-CL1500	76	3	157	6.19	254	10	83	3.25	38	1.50
6	CL150-600	76	3	216	8.50	254	10	83	3.25	38	1.50
	CL900-1500	76	3	216	8.50	406	16	83	3.25	38	1.50
8	CL150	102	4	270	10.63	254	10	108	4.25	51	2.00
	CL300-1500	102	4	270	10.63	406	16	108	4.25	51	2.00
10	CL150-CL1500	102	4	324	12.75	406	16	108	4.25	51	2.00
12	CL150-CL900	152	6	381	15.00	406	16	159	6.25	76	3.00
	CL1500	152	6	381	15.00	508	20	159	6.25	76	3.00
14	CL150-600	152	6	413	16.25	406	16	159	6.25	76	3.00
	CL900-1500	152	6	413	16.25	508	20	159	6.25	76	3.00
16	CL150-300	152	6	470	18.50	406	16	159	6.25	76	3.00
	CL600-1500	152	6	470	18.50	508	20	159	6.25	76	3.00
18	CL150	203	8	533	21.00	406	16	210	8.25	102	4.00
	CL300-900	203	8	533	21.00	508	20	210	8.25	102	4.00
	CL1500	203	8	533	21.00	559	22	210	8.25	102	4.00

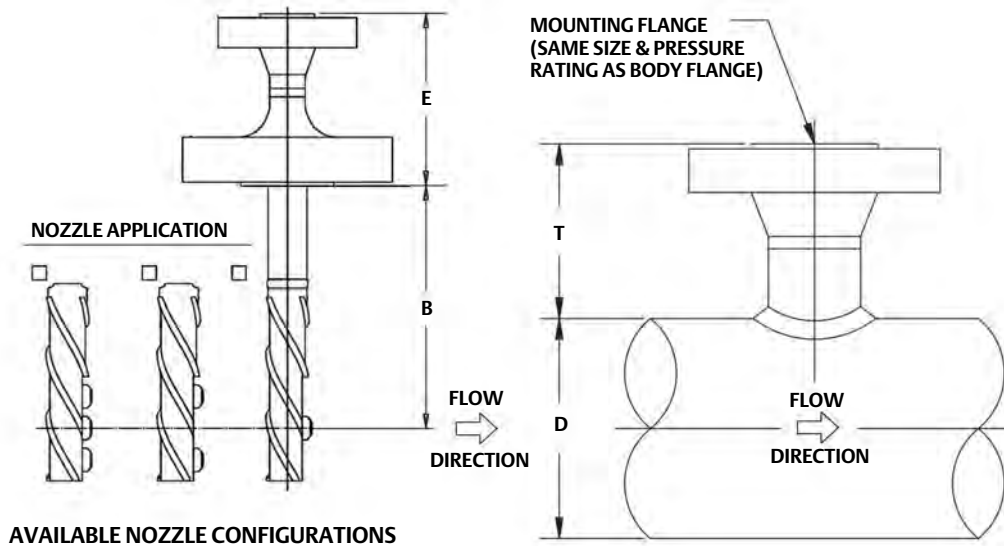
-continued-

Table 6. Fisher DVI Dimensions (continued)

STEAM PIPE SIZE, DN	RATING	A		B		C		D		E	
		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
25	PN10-250	76	3	68	2.677	254	10	83	3.25	38	1.50
40	PN10-250	76	3	88	3.465	254	10	83	3.25	38	1.50
50	PN10-250	76	3	102	4.016	254	10	83	3.25	38	1.50
65	PN10-250	76	3	122	4.803	254	10	83	3.25	38	1.50
80	PN10-250	76	3	138	5.433	254	10	83	3.25	38	1.50
100	PN10-16	76	3	158	6.220	254	10	83	3.25	38	1.50
	PN25-250	76	3	162	6.378	254	10	83	3.25	38	1.50
150	PN10-16	76	3	212	8.346	254 <sup>(1)</sup>	10 <sup>(1)</sup>	83	3.25	38	1.50
	PN25-250	76	3	218	8.583	254 <sup>(1)</sup>	10 <sup>(1)</sup>	83	3.25	38	1.50
200	PN10-16	102	4	268	10.551	406	16	108	4.25	51	2.00
	PN25	102	4	278	10.945	406	16	108	4.25	51	2.00
	PN40-250	102	4	285	11.220	406	16	108	4.25	51	2.00
250	PN10-16	102	4	320	12.598	406	16	108	4.25	51	2.00
	PN25	102	4	335	13.189	406	16	108	4.25	51	2.00
	PN40-250	102	4	345	13.583	406	16	108	4.25	51	2.00
300	PN10	152	6	370	14.567	406	16	159	6.25	76	3.00
	PN16	152	6	378	14.882	406	16	159	6.25	76	3.00
	PN25	152	6	395	15.551	406	16	159	6.25	76	3.00
	PN40-160	152	6	410	16.142	406	16	159	6.25	76	3.00
	PN250	152	6	410	16.142	508	20	159	6.25	76	3.00
350	PN10	152	6	430	16.929	406	16	159	6.25	76	3.00
	PN16	152	6	438	17.244	406	16	159	6.25	76	3.00
	PN25	152	6	450	17.717	406	16	159	6.25	76	3.00
	PN40-100	152	6	465	18.307	406	16	159	6.25	76	3.00
400	PN10	152	6	482	18.976	406	16	159	6.25	76	3.00
	PN16	152	6	490	19.291	406	16	159	6.25	76	3.00
	PN25	152	6	505	19.882	406	16	159	6.25	76	3.00
	PN40-100	152	6	535	21.063	508	20	159	6.25	76	3.00
450	PN10	203	8	532	20.945	508	20	210	8.25	102	4.00
	PN16	203	8	550	21.654	508	20	210	8.25	102	4.00
	PN25	203	8	555	21.850	508	20	210	8.25	102	4.00
	PN40-100	203	8	560	22.047	508	20	210	8.25	102	4.00

1. For DN150 body with DN40, PN160 to PN250 water flange, "C" dimension is 406 mm (16 inches).

Figure 10. Fisher DMA-AF-HTC Dimensions (also see tables 7 and 8)



E1938-1

Table 7. Fisher DMA-AF-HTC Dimensions

WATER FLANGE		DESUPERHEATER BODY FLANGE		DIMENSION E <sup>(1)</sup>	
Size	Pressure Rating	Size	Pressure Rating	mm	Inches
NPS 1-1/2	CL150	NPS 3 or 4	CL150	203	8
	CL300		CL300		
	CL600		CL600		
	CL900		CL900		
DN40	PN10-16	DN80 or DN100	PN10-16	203	8
	PN25-40		PN25-40		
	PN63		PN63		
	PN100		PN100		
	PN160		PN160		
NPS 2	CL150	NPS 3 or 4	CL150	203	8
	CL300		CL300		
	CL600		CL600		
	CL900		CL900	254	10
	CL1500		CL1500		
	CL2500		CL2500		
DN50	PN10-16	DN80 or DN100	PN10-16	203	8
	PN25-40		PN25-40		
	PN63		PN63		
	PN100		PN100		
	PN160		PN160	254	10
	PN250		PN250		
	PN400		PN400		
				292	11.5

1. Other flange rating combinations are available. Contact your [Emerson sales office](#) for installation dimensions.

**Table 8. Fisher DMA-AF-HTC Installation Dimensions**

DIMENSION					
D (Steam Pipe Size)		B (Insertion Length)		T (Height)	
NPS	DN	mm	Inches	mm	Inches
8	200	356	14.00	248	9.75
10	250	356	14.00	216	8.50
12	300	444	17.5	279	11.00
14	350	444	17.5	267	10.50
16	400	444	17.5	241	9.50
18 - 36	450 - 900	444	17.5	216	8.50

**Table 9. Fisher DMA-AF-HTC Minimum Mounting I.D.**

BODY FLANGE SIZE	NOZZLE MODEL	MINIMUM MOUNTING I.D.
NPS3 / DN80	DMA-AF-A,B,C	2.624
	DMA-AF-D,E	2.9
NPS4 / DN100	DMA-AF-A,B,C,D	3.07
	DMA-AF-E	3.152
	DMA-AF-F	3.438
	DMA-AF-G	3.624
	DMA-AF-H	3.826



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