

Fisher® TBX Steam Conditioning Valve

The Fisher TBX Steam Conditioning Valve (figure 1) is designed to handle the most severe applications in today's cycling power plants as well as provide precise pressure and temperature control for process applications. The TBX incorporates over 20 years of steam conditioning experience and product development. The valve body is designed with the latest finite element analysis (FEA) and computational fluid dynamics (CFD) tools to optimize performance and reliability for demanding steam systems.

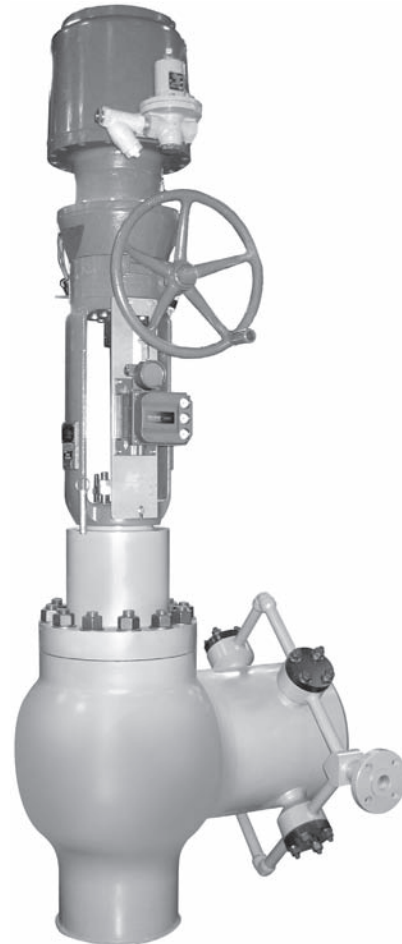
The TBX valve is a flow up design that provides the ultimate combination of performance and maintainability (see figure 3). The TBX valve incorporates low noise Whisper Trim™ technology. The simplified trim configuration is thermally compensated to handle rapid changes in temperatures, as expected during a turbine trip, without any sticking or binding.

Water atomization and vaporization are key elements in any steam conditioning application. The TBX 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 3). 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.

Whisper Trim, and WhisperFlo Cages

To help attenuate aerodynamic noise, Whisper Trim III cages are standard with TBX control valves.

WhisperFlo™ cages (figure 2) are also available to attenuate aerodynamic noise. Contact your Emerson Process Management sales office for more information.



W8740-2A

Figure 1. Fisher TBX Valve Assembly

Features

- **Total Steam Control**—Combines pressure and temperature control in a single valve.
- **Full Pressure Drop Capability**—Rugged cage-guided design enables handling of full pressure drop of main steam.



TBX Valve

- **Noise Attenuation**—Whisper III and WhisperFlo trims help to attenuate the noise by 30 to 40 dBA, respectfully.

- **High Temperature Capability with Standard Class V Shutoff**—Use of the patented Fisher Bore Seal trim gives capability of Class V shutoff as a standard up to 593°C (1100°F). This unique balanced trim is field-proven. See figure 7.

- **Forged Valve Body**—FEA designed valve body can handle the most demanding applications without thermal stress problems.

- **Flow Up Angle**—Permits vertical stem orientation for ease of maintenance in most applications.

- **Thermally Compensated Trim**—The cage is case-hardened for maximum life and is allowed to grow during thermally induced excursions. The plug is continuously guided and employs cobalt-based overlays for guide bands and tight metal-to-metal shutoff against the seat.

- **Easy Maintenance Seat Ring**—No bolting or gaskets used in the flow stream. Welded design provides Class V shutoff and long life. Deep Alloy 6 overlay can be refinished multiple times to maintain tight shutoff.

- **Spiral-Wound Gaskets for Excellent Bonnet Sealing Under All Service Conditions**—Premium gaskets provided with N06600 windings and graphite filler material.

- **Precise Spraywater Injection**—CFD designed spray manifold determines water injection point and insertion depth to maximize mixing and quick vaporization.

- **High Turndown**—Standard trim control rangeability is 50:1. Special construction can provide up to 75:1 turndown.

- **Quick Stroking Actuation**—High performance pneumatic piston actuators with FIELDVUE™ digital valve controllers can achieve full stroke in less than 2 seconds while still maintaining highly accurate step response. Optimized digital valve controllers are available when high stroke speeds are required. Contact your Emerson Process Management sales office for assistance.

- **Performance Diagnostics**—With the self-diagnostic capability, questions can be answered about a valve's performance, without pulling the valve from the line. The present valve/actuator signature (seat load, friction, etc.) can be compared against previously stored signatures to discover performance changes before they cause process control problems.

Options

- **Blowdown Trim**—Protects the working trim and machined surfaces of the valve body during steam blow.

- **Hydro-Plug**— Provides a convenient way to establish hydrotest boundaries associated with using a split pressure class valve.

- **Split Functionality**—When piping dictates, the TBX valve can be provided as separate components allowing the pressure control in the valve body and separate temperature reduction downstream in a steam cooler.

- **Commissioning Service**—Proper installation of blowdown trim and hydro-plug fixtures, along with reassembly and calibration of turbine bypass valves, is critical for the valves to be ready for service when needed. Let skilled Emerson Process Management technicians take care of this vital commissioning service to protect this very important plant asset.

- **Diagnostic Services**—The Emerson Process Management Diagnostic Services Group delivers world class services and innovative technologies for top performance of critical service valves and other production assets.



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Figure 2. Typical WhisperFlo Trim

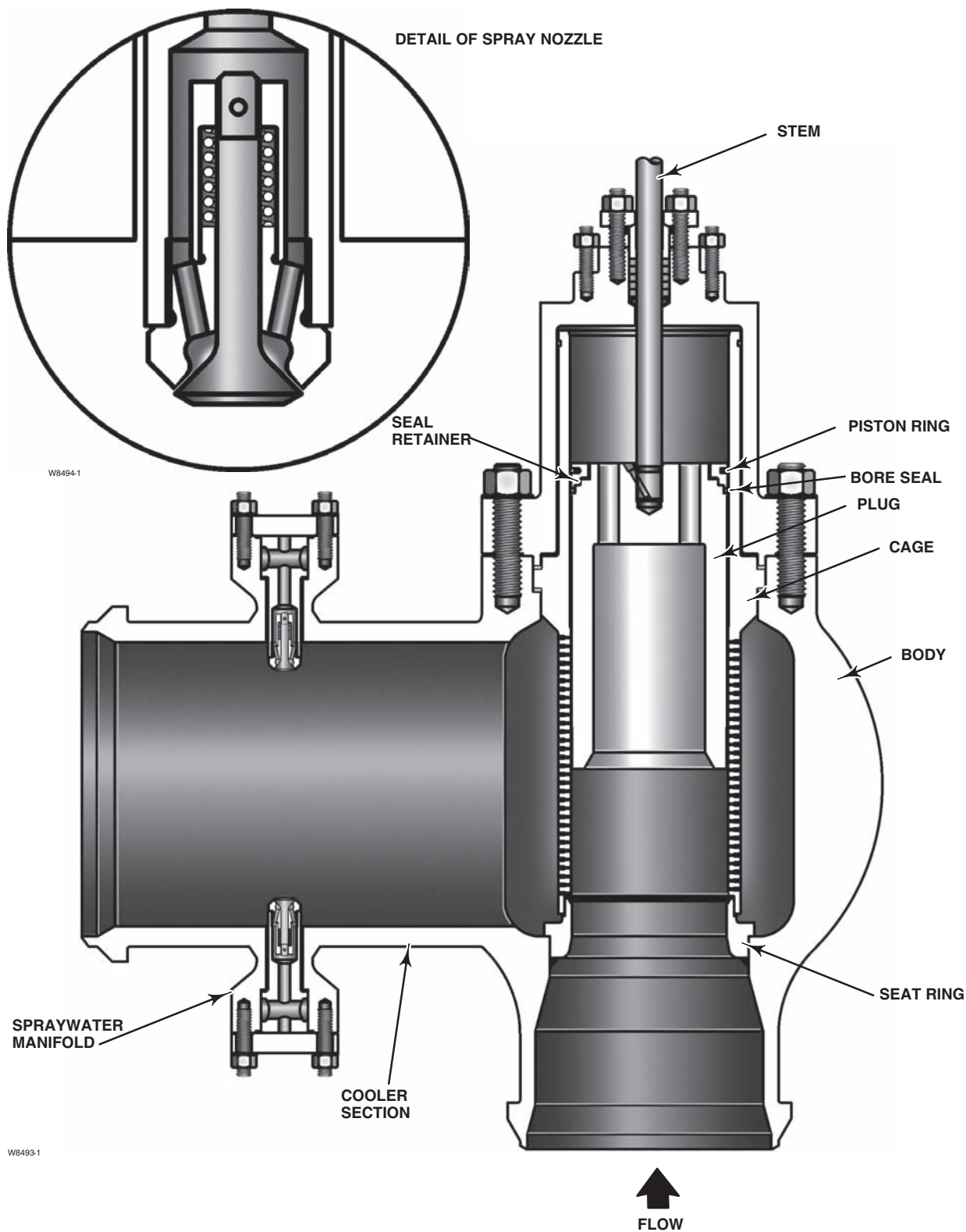
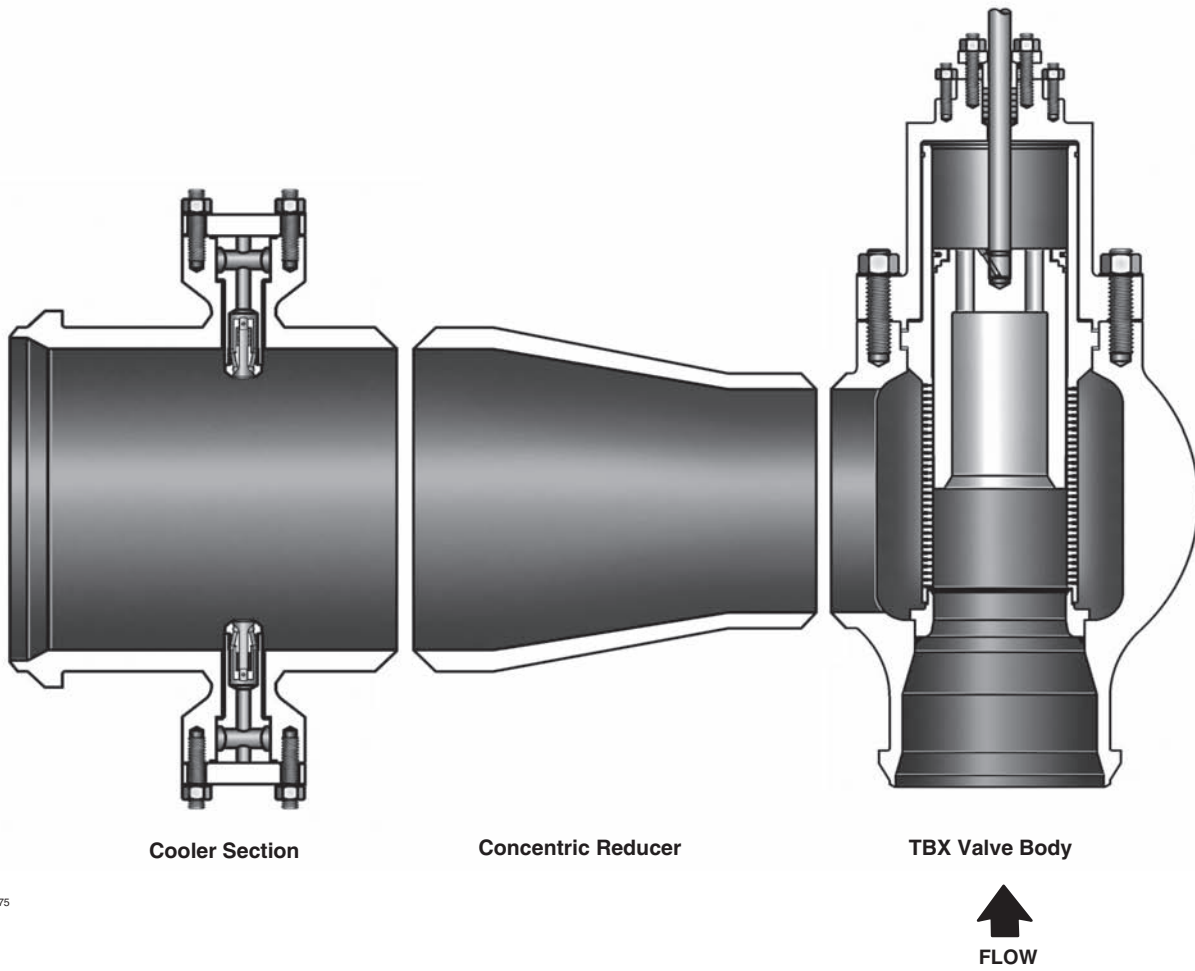
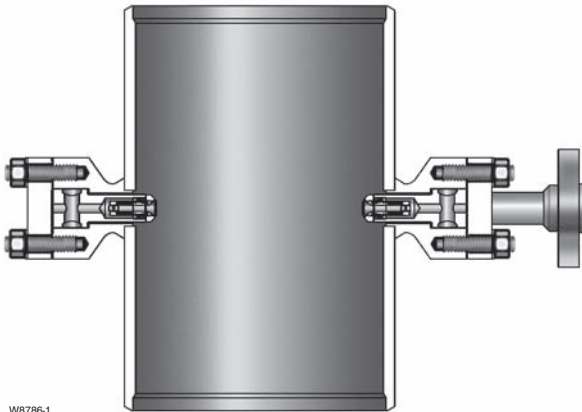


Figure 3. Fisher TBX Operation



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Figure 4. Alternative Fisher TBX Design



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Figure 5. Fisher TBX Cooler

Fisher TBX Steam Cooler

The Steam Cooler (figure 5) is normally used when an application requires a separation of the pressure reduction and desuperheating functions. The Steam Cooler 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.



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Figure 6. Fisher TBX Whisper Trim III Sparger

Fisher TBX Steam Sparger

The Whisper Trim Steam Sparger (figure 6) is a pressure-reducing device used to safely discharge steam into a condenser or turbine exhaust duct. In addition, the Steam Sparger provides backpressure to the turbine bypass valve, limits steam velocity, and allows reduced pipe size between the bypass valve and sparger. The design of the sparger is critical to a properly functioning turbine bypass system. To address flow-induced noise, the steam sparger employs Whisper Trim technology. The sparger design and installation are both key elements when considering total system noise.

System Level Noise

Today's power plants must comply with strict noise limitations, especially those that are located close to residential areas. Satisfying a low fence line noise requirement requires a complete understanding of the system and how individual components can affect the total noise transmitted to the plant boundary. Extensive steam conditioning noise research has been conducted at the Marshalltown research facility, resulting in a new understanding of the impact of sparger installations in turbine exhaust ducts. Testing has revealed critical spatial relationships of multiple spargers that must be maintained to prevent noise generation. This knowledge, together with the application of low noise technology trims and pressure reducing devices, allows the Emerson Process Management research facility to accurately predict the system noise level.

Coefficients

Table 1. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up															Linear Characteristic			
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100		
4 x 8 CL600 to 1500	120	4.70	197	7.75	A1 and A3	C _v	59	131	188	228	253	259	259	259	259	0.65	0.89	
						K _v	51	114	162	197	219	224	224	224	224			224
					A1	F _d	0.063	0.045	0.036	0.031	0.028	0.026	0.024	0.022	0.021			0.020
							0.033	0.023	0.019	0.017	0.015	0.014	0.013	0.012	0.011			0.010
					B1 and B3	C _v	36	81	122	156	184	209	228	244	253			259
							K _v	31	70	105	135	159	181	197	211			219
					B1	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030			0.028
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014			0.014
					B3	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030			0.028
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014			0.014
					C1 and C3	C _v	23	56	84	113	138	159	181	197	216			228
							K _v	20	49	73	97	119	138	157	170			187
C1	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
C3	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
4 x 8 CL2500	120	4.70	197	7.75	A1 and A3	C _v	59	128	178	206	216	219	219	219	0.65	0.89		
						K _v	51	111	154	178	187	189	189	189			189	189
					A1	F _d	0.063	0.045	0.036	0.031	0.028	0.026	0.024	0.022			0.021	0.020
							0.033	0.023	0.019	0.017	0.015	0.014	0.013	0.012			0.011	0.010
					B1 and B3	C _v	36	78	119	150	175	194	206	216			219	209
							K _v	31	68	103	130	151	168	178			187	189
					B1	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031			0.030	0.028
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015			0.014	0.014
					B3	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031			0.030	0.028
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015			0.014	0.014
					C1 and C3	C _v	23	56	84	109	134	153	172	184			197	206
							K _v	20	49	73	95	116	132	149			159	170
C1	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
C3	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
6 x 8 CL600 to 1500 and 8 x 8 through 12 x 8 CL600 to 2500	120	4.70	197	7.75	A1 and A3	C _v	60	141	222	291	356	413	463	506	544	578	0.65	0.89
						K _v	52	122	192	251	308	357	400	438	470	500		
					A1	F _d	0.063	0.045	0.036	0.031	0.028	0.026	0.024	0.022	0.021	0.020		
							0.033	0.023	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.010		
					B1 and B3	C _v	37	81	128	172	219	259	294	331	366	397		
							K _v	32	70	111	149	189	224	254	287	316		
					B1	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030	0.028		
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014	0.014		
					B3	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030	0.028		
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014	0.014		
					C1 and C3	C _v	23	56	84	119	147	178	213	238	266	291		
							K _v	20	49	73	103	127	154	184	205	230		
C1	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
C3	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
6 x 8 CL2500	120	4.70	197	7.75	A1 and A3	C _v	60	141	216	278	334	381	419	450	472	484	0.65	0.89
						K _v	52	122	187	241	289	330	362	389	408	419		
					A1	F _d	0.063	0.045	0.036	0.031	0.028	0.026	0.024	0.022	0.021	0.020		
							0.033	0.023	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.010		
					B1 and B3	C _v	37	81	128	172	209	250	281	313	341	369		
							K _v	32	70	111	149	181	216	243	270	295		
					B1	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030	0.028		
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014	0.014		
					B3	F _d	0.089	0.063	0.051	0.045	0.040	0.036	0.034	0.031	0.030	0.028		
							0.043	0.030	0.025	0.022	0.019	0.018	0.016	0.015	0.014	0.014		
					C1 and C3	C _v	23	56	84	119	147	178	206	231	256	278		
							K _v	20	49	73	103	127	154	178	200	222		
C1	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							
C3	F _d	0.108	0.076	0.062	0.054	0.048	0.044	0.041	0.038	0.036	0.034							
		0.054	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017							

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.

2. Values given are Inlet versus Outlet, i.e. 6x8 is an NPS 6 inlet and an NPS 8 outlet.

3. At 100% travel.

Table 2. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic		
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100		
6 x 12 CL600 to 1500	159	6.25	264	10.38	A1 and A3	C _v	112	253	369	469	553	622	672	703	722	722	0.65	0.89
						K _v	97	219	319	405	478	538	581	608	624	624		
					A1	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					B1 and B3	C _v	67	147	231	306	372	434	488	538	581	619		
						K _v	58	127	200	265	322	376	422	465	503	535		
					B1	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
					B3	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
					C1 and C3	C _v	43	97	147	200	250	297	338	381	419	456		
						K _v	37	84	127	173	216	257	292	330	362	395		
C1	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
C3	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
6 x 12 CL2500	159	6.25	264	10.38	A1 and A3	C _v	112	241	338	413	463	488	488	488	488	488	0.65	0.89
						K _v	97	208	292	357	400	422	422	422	422	422		
					A1	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					A3	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					B1 and B3	C _v	67	147	222	288	341	388	425	453	475	488		
						K _v	58	127	192	249	295	335	368	392	411	422		
					B1	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
					B3	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
C1 and C3	C _v	43	97	147	197	238	278	313	347	375	403							
	K _v	37	84	127	170	205	241	270	300	324	349							
C1	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
C3	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
8 x 12 CL600 to 1500 and 10 x 12 through 14 x 12 CL600 to 2500	159	6.25	264	10.38	A1 and A3	C _v	113	253	394	513	622	722	809	888	953	1009	0.65	0.89
						K _v	97	219	341	443	538	624	700	768	824	873		
					A1	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					A3	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					B1 and B3	C _v	68	147	231	316	394	469	538	600	659	719		
						K _v	58	127	200	273	341	405	465	519	570	622		
					B1	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
					B3	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
C1 and C3	C _v	43	97	147	200	250	303	353	406	450	497							
	K _v	37	84	127	173	216	262	305	351	389	430							
C1	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
C3	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
8 x 12 CL2500	159	6.25	264	10.38	A1 and A3	C _v	112	253	381	494	594	681	750	809	856	888	0.65	0.89
						K _v	97	219	330	427	514	589	649	700	741	768		
					A1	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					A3	F _d	0.048	0.034	0.027	0.024	0.021	0.019	0.018	0.017	0.016	0.015		
							0.025	0.018	0.015	0.013	0.011	0.010	0.010	0.009	0.008	0.008		
					B1 and B3	C _v	67	147	231	316	384	453	516	572	628	675		
						K _v	58	127	200	273	332	392	446	495	543	584		
					B1	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
					B3	F _d	0.064	0.045	0.037	0.032	0.029	0.026	0.024	0.023	0.021	0.020		
							0.033	0.023	0.019	0.016	0.015	0.013	0.012	0.012	0.011	0.010		
C1 and C3	C _v	43	97	147	200	250	303	350	394	438	478							
	K _v	37	84	127	173	216	262	303	341	378	414							
C1	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							
C3	F _d	0.080	0.056	0.046	0.040	0.036	0.033	0.030	0.028	0.027	0.025							
		0.041	0.029	0.024	0.021	0.019	0.017	0.016	0.015	0.014	0.013							

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.
 2. Values given are Inlet versus Outlet, i.e. 6x12 is an NPS 6 inlet and an NPS 12 outlet.
 3. At 100% travel.

Table 3. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic				
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾		
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100				
8 x 16 CL600 to 1500	194	7.62	321	12.62	A1 and A3	C _v	170	372	556	716	853	972	1069	1147	1206	1244	0.65	0.89		
						K _v	147	322	481	619	738	841	924	992	1043	1076				
					A1	F _d	0.039	0.027	0.022	0.019	0.017	0.016	0.015	0.014	0.013	0.012			0.007	0.007
							0.021	0.015	0.012	0.011	0.009	0.009	0.008	0.007	0.007	0.007				
					B1 and B3	C _v	102	225	347	466	569	666	753	834	909	978			0.009	0.009
							K _v	88	195	300	403	492	576	651	722	787				
					B1	F _d	0.053	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017			0.009	0.009
							0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009				
					B3	C _v	64	141	216	294	369	444	509	575	634	691			0.009	0.009
							K _v	56	122	187	254	319	384	441	497	549				
					C1 and C3	C _v	64	141	216	294	369	444	509	575	634	691			0.009	0.009
							K _v	56	122	187	254	319	384	441	497	549				
C1	F _d	0.069	0.049	0.040	0.034	0.031	0.028	0.026	0.024	0.023	0.022	0.009	0.009							
		0.034	0.024	0.020	0.017	0.015	0.014	0.013	0.012	0.011	0.011									
C3	C _v	64	141	216	294	369	444	509	575	634	691	0.009	0.009							
		K _v	56	122	187	254	319	384	441	497	549			597						
8 x 16 CL2500	194	7.62	321	12.62	A1 and A3	C _v	170	366	525	656	763	841	891	913	913	913	0.65	0.89		
						K _v	147	316	454	568	660	727	770	789	789	789				
					A1	F _d	0.039	0.027	0.022	0.019	0.017	0.016	0.015	0.014	0.013	0.012			0.007	0.007
							0.021	0.015	0.012	0.011	0.009	0.009	0.008	0.007	0.007	0.007				
					A3	C _v	102	225	341	444	534	616	688	750	803	844			0.009	0.009
							K _v	88	195	295	384	462	533	595	649	695				
					B1 and B3	C _v	102	225	341	444	534	616	688	750	803	844			0.009	0.009
							K _v	88	195	295	384	462	533	595	649	695				
					B1	F _d	0.053	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017			0.009	0.009
							0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009				
					B3	C _v	64	141	216	294	363	425	484	541	591	641			0.009	0.009
							K _v	56	122	187	254	314	368	419	468	511				
C1 and C3	C _v	64	141	216	294	363	425	484	541	591	641	0.009	0.009							
		K _v	56	122	187	254	314	368	419	468	511			554						
C1	F _d	0.069	0.049	0.040	0.034	0.031	0.028	0.026	0.024	0.023	0.022	0.009	0.009							
		0.034	0.024	0.020	0.017	0.015	0.014	0.013	0.012	0.011	0.011									
C3	C _v	64	141	216	294	363	425	484	541	591	641	0.009	0.009							
		K _v	56	122	187	254	314	368	419	468	511			554						
10 x 16 CL600 to 1500 and 12 x 16 through 16 x 16 CL600 to 2500	194	7.62	321	12.62	A1 and A3	C _v	170	372	575	750	909	1053	1184	1297	1397	1481	0.65	0.89		
						K _v	147	322	497	649	787	911	1024	1122	1208	1281				
					A1	F _d	0.039	0.027	0.022	0.019	0.017	0.016	0.015	0.014	0.013	0.012			0.007	0.007
							0.021	0.015	0.012	0.011	0.009	0.009	0.008	0.007	0.007	0.007				
					A3	C _v	103	225	347	469	588	694	794	891	978	1063			0.009	0.009
							K _v	89	195	300	405	508	600	687	770	846				
					B1 and B3	C _v	103	225	347	469	588	694	794	891	978	1063			0.009	0.009
							K _v	89	195	300	405	508	600	687	770	846				
					B1	F _d	0.053	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017			0.009	0.009
							0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009				
					B3	C _v	65	141	216	294	369	444	522	594	663	725			0.009	0.009
							K _v	56	122	187	254	319	384	451	514	573				
C1 and C3	C _v	65	141	216	294	369	444	522	594	663	725	0.009	0.009							
		K _v	56	122	187	254	319	384	451	514	573			627						
C1	F _d	0.069	0.049	0.040	0.034	0.031	0.028	0.026	0.024	0.023	0.022	0.009	0.009							
		0.034	0.024	0.020	0.017	0.015	0.014	0.013	0.012	0.011	0.011									
C3	C _v	65	141	216	294	369	444	522	594	663	725	0.009	0.009							
		K _v	56	122	187	254	319	384	451	514	573			627						
10 x 16 CL2500	194	7.62	321	12.62	A1 and A3	C _v	170	372	569	734	884	1016	1131	1231	1313	1375	0.65	0.89		
						K _v	147	322	492	635	765	879	979	1065	1135	1189				
					A1	F _d	0.039	0.027	0.022	0.019	0.017	0.016	0.015	0.014	0.013	0.012			0.007	0.007
							0.021	0.015	0.012	0.011	0.009	0.009	0.008	0.007	0.007	0.007				
					A3	C _v	102	225	347	469	578	681	775	866	947	1025			0.009	0.009
							K _v	88	195	300	405	500	589	670	749	819				
					B1 and B3	C _v	102	225	347	469	578	681	775	866	947	1025			0.009	0.009
							K _v	88	195	300	405	500	589	670	749	819				
					B1	F _d	0.053	0.038	0.031	0.027	0.024	0.022	0.020	0.019	0.018	0.017			0.009	0.009
							0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009				
					B3	C _v	64	141	216	294	369	444	519	584	650	709			0.009	0.009
							K _v	56	122	187	254	319	384	449	505	562				
C1 and C3	C _v	64	141	216	294	369	444	519	584	650	709	0.009	0.009							
		K _v	56	122	187	254	319	384	449	505	562			614						
C1	F _d	0.069	0.049	0.040	0.034	0.031	0.028	0.026	0.024	0.023	0.022	0.009	0.009							
		0.034	0.024	0.020	0.017	0.015	0.014	0.013	0.012	0.011	0.011									
C3	C _v	64	141	216	294	369	444	519	584	650	709	0.009	0.009							
		K _v	56	122	187	254	319	384	449	505	562			614						

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.
 2. Values given are Inlet versus Outlet, i.e. 8x16 is an NPS 8 inlet and an NPS 16 outlet.
 3. At 100% travel.

Table 4. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic			
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾	
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100			
10 x 18 CL600 to 1500	234	9.20	391	15.38	A1 and A3	C _v	261	563	841	1078	1288	1469	1622	1747	1844	1913	0.65	0.89	
						K _v	226	487	727	933	1114	1270	1403	1511	1595	1654			
					A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010			0.010
							0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005			0.005
					B1 and B3	C _v	153	325	497	675	825	966	1100	1222	1334	1441			
							K _v	132	281	430	584	714	835	952	1057	1154			1246
					B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014			
							0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007			
					B3	C _v	101	213	325	441	550	666	769	863	956	1044			
							K _v	88	184	281	381	476	576	665	746	827			903
					C1 and C3	C _v	101	213	325	441	550	666	769	863	956	1044			
							K _v	88	184	281	381	476	576	665	746	827			903
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	566	800	1006	1172	1303	1394	1450	1466	1466								
		K _v	226	481	692	870	1014	1127	1206	1254	1268	1268							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	650	788	909	1022	1122	1209	1284								
		K _v	132	281	430	562	681	787	884	970	1046	1111							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	101	213	325	441	547	644	734	819	903	975								
		K _v	88	184	281	381	473	557	635	708	781	843							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	863	1119	1353	1566	1753	1919	2063	2181								
		K _v	226	487	746	968	1170	1354	1516	1660	1784	1887							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	847	997	1144	1278	1406	1528								
		K _v	132	281	430	584	733	862	989	1106	1216	1322							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	102	213	325	441	553	666	781	888	988	1081								
		K _v	88	184	281	381	478	576	676	768	854	935							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	847	1091	1306	1497	1663	1797	1909	1994								
		K _v	226	487	733	943	1130	1295	1438	1554	1652	1725							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	831	975	1113	1241	1356	1466								
		K _v	132	281	430	584	719	843	962	1073	1173	1268							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	101	213	325	441	550	666	772	869	966	1053								
		K _v	88	184	281	381	476	576	668	751	835	911							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	847	1091	1306	1497	1663	1797	1909	1994								
		K _v	226	487	733	943	1130	1295	1438	1554	1652	1725							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	831	975	1113	1241	1356	1466								
		K _v	132	281	430	584	719	843	962	1073	1173	1268							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	101	213	325	441	550	666	772	869	966	1053								
		K _v	88	184	281	381	476	576	668	751	835	911							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	847	1091	1306	1497	1663	1797	1909	1994								
		K _v	226	487	733	943	1130	1295	1438	1554	1652	1725							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	831	975	1113	1241	1356	1466								
		K _v	132	281	430	584	719	843	962	1073	1173	1268							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	101	213	325	441	550	666	772	869	966	1053								
		K _v	88	184	281	381	476	576	668	751	835	911							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	847	1091	1306	1497	1663	1797	1909	1994								
		K _v	226	487	733	943	1130	1295	1438	1554	1652	1725							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	831	975	1113	1241	1356	1466								
		K _v	132	281	430	584	719	843	962	1073	1173	1268							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007								
B3	C _v	101	213	325	441	550	666	772	869	966	1053								
		K _v	88	184	281	381	476	576	668	751	835	911							
C1	F _d	0.056	0.039	0.032	0.028	0.025	0.023	0.021	0.020	0.019	0.018								
		0.028	0.020	0.016	0.014	0.013	0.011	0.011	0.010	0.009	0.009								
C3	C _v	261	563	847	1091	1306	1497	1663	1797	1909	1994								
		K _v	226	487	733	943	1130	1295	1438	1554	1652	1725							
A1	F _d	0.032	0.023	0.019	0.016	0.014	0.013	0.012	0.011	0.011	0.010								
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005								
B1 and B3	C _v	153	325	497	675	831	975	1113	1241	1356	1466								
		K _v	132	281	430	584	719	843	962	1073	1173	1268							
B1	F _d	0.044	0.031	0.026	0.022	0.020	0.018	0.017	0.016	0.015	0.014								
		0.023	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008									

Table 5. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic		
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100		
12 x 20 CL600 to 1500	285	11.20	473	18.62	A1 and A3	C _v	383	813	1213	1553	1859	2125	2350	2538	2681	2791	0.65	0.89
						K _v	331	703	1049	1343	1608	1838	2033	2195	2319	2414		
					A1	F _d	0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009		
							A3	0.014	0.010	0.008	0.007	0.006	0.006	0.005	0.005	0.005		
					B1 and B3	C _v	232	491	747	1000	1225	1434	1631	1813	1978	2128		
						K _v	201	424	646	865	1060	1241	1411	1568	1711	1841		
					B1	F _d	0.037	0.026	0.021	0.018	0.016	0.015	0.014	0.013	0.012	0.012		
							B3	0.019	0.013	0.011	0.009	0.008	0.008	0.007	0.007	0.006		
					C1 and C3	C _v	149	309	469	634	797	959	1103	1244	1378	1503		
						K _v	129	268	405	549	689	830	954	1076	1192	1300		
					C1	F _d	0.047	0.033	0.027	0.023	0.021	0.019	0.018	0.017	0.016	0.015		
							C3	0.023	0.017	0.013	0.012	0.010	0.010	0.009	0.008	0.008		
14 x 20 through 20 x 20 CL600 to 1500	285	11.20	473	18.62	A1 and A3	C _v	383	813	1247	1616	1956	2263	2538	2784	2997	3181	0.65	0.89
						K _v	331	703	1079	1398	1692	1957	2195	2408	2592	2752		
					A1	F _d	0.027	0.019	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.009		
							A3	0.014	0.010	0.008	0.007	0.006	0.006	0.005	0.005	0.005		
					B1 and B3	C _v	233	491	747	1003	1259	1484	1697	1900	2091	2269		
						K _v	201	424	646	868	1089	1284	1468	1644	1808	1962		
					B1	F _d	0.037	0.026	0.021	0.018	0.016	0.015	0.014	0.013	0.012	0.012		
							B3	0.019	0.013	0.011	0.009	0.008	0.008	0.007	0.007	0.006		
					C1 and C3	C _v	150	309	469	634	797	959	1119	1278	1422	1556		
						K _v	129	268	405	549	689	830	968	1106	1230	1346		
					C1	F _d	0.047	0.033	0.027	0.023	0.021	0.019	0.018	0.017	0.016	0.015		
							C3	0.023	0.017	0.013	0.012	0.010	0.010	0.009	0.008	0.008		
16 x 24 CL600 to 1500	349	13.75	581	22.88	A1 and A3	C _v	648	1291	1888	2403	2859	3263	3613	3900	4134	4300	0.65	0.89
						K _v	561	1116	1633	2079	2473	2822	3125	3374	3576	3720		
					A1	F _d	0.022	0.016	0.013	0.011	0.010	0.009	0.008	0.008	0.007	0.007		
							A3	0.012	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004		
					B1 and B3	C _v	386	772	1156	1538	1872	2188	2484	2756	3009	3225		
						K _v	334	668	1000	1330	1619	1892	2149	2384	2603	2790		
					B1	F _d	0.030	0.022	0.018	0.015	0.014	0.012	0.012	0.011	0.010	0.010		
							B3	0.015	0.011	0.009	0.008	0.007	0.006	0.006	0.005	0.005		
					C1 and C3	C _v	251	497	741	984	1231	1478	1703	1913	2113	2291		
						K _v	217	430	641	851	1065	1279	1473	1654	1827	1981		
					C1	F _d	0.038	0.027	0.022	0.019	0.017	0.016	0.014	0.013	0.013	0.012		
							C3	0.019	0.013	0.011	0.010	0.009	0.008	0.007	0.007	0.006		
18 x 24 through 24 x 24 CL600 to 1500	349	13.75	581	22.88	A1 and A3	C _v	648	1291	1931	2481	2981	3438	3850	4213	4531	4781	0.65	0.89
						K _v	561	1116	1671	2146	2579	2973	3330	3644	3920	4136		
					A1	F _d	0.022	0.016	0.013	0.011	0.010	0.009	0.008	0.008	0.007	0.007		
							A3	0.012	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004		
					B1 and B3	C _v	386	772	1156	1538	1916	2250	2569	2869	3150	3394		
						K _v	334	668	1000	1330	1657	1946	2222	2481	2725	2936		
					B1	F _d	0.030	0.022	0.018	0.015	0.014	0.012	0.012	0.011	0.010	0.010		
							B3	0.015	0.011	0.009	0.008	0.007	0.006	0.006	0.005	0.005		
					C1 and C3	C _v	252	497	741	984	1231	1478	1722	1956	2169	2359		
						K _v	218	430	641	851	1065	1279	1489	1692	1876	2041		
					C1	F _d	0.038	0.027	0.022	0.019	0.017	0.016	0.014	0.013	0.013	0.012		
							C3	0.019	0.013	0.011	0.010	0.009	0.008	0.007	0.007	0.006		

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.
 2. Values given are Inlet versus Outlet, i.e. 12x20 is an NPS 12 inlet and an NPS 20 outlet.
 3. At 100% travel.

Table 6. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic		
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100		
18 x 30 CL600 to 900	424	16.70	606	23.88	A1 and A3	C _v	768	1525	2253	2878	3447	3953	4400	4788	5116	5359	0.65	0.89
						K _v	664	1319	1949	2490	2982	3419	3806	4141	4425	4636		
					A1	F _d	0.022	0.015	0.013	0.011	0.010	0.009	0.008	0.008	0.007	0.007		
							0.011	0.008	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.003		
					B1 and B3	C _v	486	969	1444	1928	2356	2756	3131	3481	3809	4088		
						K _v	420	838	1249	1668	2038	2384	2709	3011	3295	3536		
					B1	F _d	0.027	0.019	0.015	0.013	0.012	0.011	0.010	0.009	0.009	0.008		
							0.014	0.010	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.004		
					B3	C _v	313	616	916	1222	1528	1831	2119	2384	2641	2866		
						K _v	271	533	792	1057	1322	1584	1833	2062	2284	2479		
					C1 and C3	C _v	313	616	916	1222	1528	1831	2119	2384	2641	2866		
						K _v	271	533	792	1057	1322	1584	1833	2062	2284	2479		
C1	F _d	0.033	0.024	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.011							
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005							
C3	C _v	313	616	916	1222	1528	1831	2119	2384	2641	2866							
	K _v	271	533	792	1057	1322	1584	1833	2062	2284	2479							
20 x 30 CL600 to 900	424	16.70	606	23.88	A1 and A3	C _v	768	1525	2284	2966	3581	4147	4666	5134	5556	5891	0.65	0.89
						K _v	664	1319	1976	2565	3098	3587	4036	4441	4806	5095		
					A1	F _d	0.022	0.015	0.013	0.011	0.010	0.009	0.008	0.008	0.007	0.007		
							0.011	0.008	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.003		
					A3	C _v	487	969	1444	1928	2403	2838	3238	3619	3984	4300		
						K _v	421	838	1249	1668	2079	2454	2800	3130	3446	3720		
					B1 and B3	C _v	487	969	1444	1928	2403	2838	3238	3619	3984	4300		
						K _v	421	838	1249	1668	2079	2454	2800	3130	3446	3720		
					B1	F _d	0.027	0.019	0.015	0.013	0.012	0.011	0.010	0.009	0.009	0.008		
							0.014	0.010	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.004		
					B3	C _v	313	616	916	1222	1528	1831	2131	2438	2713	2953		
						K _v	271	533	792	1057	1322	1584	1844	2108	2346	2554		
C1 and C3	C _v	313	616	916	1222	1528	1831	2131	2438	2713	2953							
	K _v	271	533	792	1057	1322	1584	1844	2108	2346	2554							
C1	F _d	0.033	0.024	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.011							
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005							
C3	C _v	313	616	916	1222	1528	1831	2131	2438	2713	2953							
	K _v	271	533	792	1057	1322	1584	1844	2108	2346	2554							
22 x 30 through 24 x 30 CL600 to 900	424	16.70	606	23.88	A1 and A3	C _v	768	1525	2284	3009	3650	4247	4797	5306	5775	6153	0.65	0.89
						K _v	665	1319	1976	2603	3157	3674	4149	4590	4995	5322		
					A1	F _d	0.022	0.015	0.013	0.011	0.010	0.009	0.008	0.008	0.007	0.007		
							0.011	0.008	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.003		
					A3	C _v	487	969	1444	1928	2403	2875	3291	3691	4075	4406		
						K _v	421	838	1249	1668	2079	2487	2846	3192	3525	3811		
					B1 and B3	C _v	487	969	1444	1928	2403	2875	3291	3691	4075	4406		
						K _v	421	838	1249	1668	2079	2487	2846	3192	3525	3811		
					B1	F _d	0.027	0.019	0.015	0.013	0.012	0.011	0.010	0.009	0.009	0.008		
							0.014	0.010	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.004		
					B3	C _v	314	619	919	1222	1528	1831	2131	2438	2744	2997		
						K _v	271	535	795	1057	1322	1584	1844	2108	2373	2592		
C1 and C3	C _v	314	619	919	1222	1528	1831	2131	2438	2744	2997							
	K _v	271	535	795	1057	1322	1584	1844	2108	2373	2592							
C1	F _d	0.033	0.024	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.011							
		0.017	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.006	0.005							
C3	C _v	314	619	919	1222	1528	1831	2131	2438	2744	2997							
	K _v	271	535	795	1057	1322	1584	1844	2108	2373	2592							

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.
 2. Values given are Inlet versus Outlet, i.e. 18x30 is an NPS 18 inlet and an NPS 30 outlet.
 3. At 100% travel.

Table 7. Fisher TBX, Whisper Trim III, Flow Up Through the Port⁽¹⁾

Whisper Trim III - Flow Up																Linear Characteristic			
Valve Size, ⁽²⁾ and Inlet Class	Port Diameter		Maximum Travel		Whisper III Levels	Flow Coefficient	Valve Opening—Percent of Total Travel										X _T ⁽³⁾	F _L ⁽³⁾	
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100			
22 x 36 CL600 to 900	507	19.94	606	23.88	A1 and A3	C _v	964	1922	2884	3725	4494	5194	5831	6400	6903	7131	0.65	0.89	
						K _v	834	1662	2495	3222	3887	4493	5044	5536	5971	6169			
					A1	F _d	0.018	0.013	0.010	0.009	0.008	0.007	0.007	0.006	0.006	0.006			0.006
							0.010	0.007	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003			
					B1 and B3	C _v	577	1150	1716	2291	2853	3372	3850	4306	4744	5119			
							K _v	499	995	1484	1981	2468	2917	3330	3725	4103			4428
					B1	F _d	0.025	0.017	0.014	0.012	0.011	0.010	0.009	0.009	0.008	0.008			
							0.012	0.009	0.007	0.006	0.006	0.005	0.005	0.004	0.004	0.004			
					B3	C _v	371	731	1084	1447	1809	2169	2525	2884	3216	3503			
							K _v	321	633	938	1252	1565	1876	2184	2495	2782			3030
					C1 and C3	C _v	371	731	1084	1447	1809	2169	2525	2884	3216	3503			
							K _v	321	633	938	1252	1565	1876	2184	2495	2782			3030
C1	F _d	0.031	0.022	0.018	0.016	0.014	0.013	0.012	0.011	0.010	0.010								
		0.016	0.011	0.009	0.008	0.007	0.006	0.006	0.006	0.005	0.005								
C3	C _v	965	1925	2884	3847	4700	5491	6234	6928	7572	7875								
		K _v	835	1665	2495	3328	4066	4749	5393	5993	6550	6812							
24 x 36 CL600 to 900	507	19.94	606	23.88	A1 and A3	C _v	965	1925	2884	3847	4700	5491	6234	6928	7572	7875	0.65	0.89	
						K _v	835	1665	2495	3328	4066	4749	5393	5993	6550	6812			
					A1	F _d	0.018	0.013	0.010	0.009	0.008	0.007	0.007	0.006	0.006	0.006			
							0.010	0.007	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003			
					A3	C _v	578	1150	1716	2291	2856	3428	3994	4494	4978	5406			
							K _v	500	995	1484	1981	2471	2965	3455	3887	4306			4676
					B1 and B3	C _v	578	1150	1716	2291	2856	3428	3994	4494	4978	5406			
							K _v	500	995	1484	1981	2471	2965	3455	3887	4306			4676
					B1	F _d	0.025	0.017	0.014	0.012	0.011	0.010	0.009	0.009	0.008	0.008			
							0.012	0.009	0.007	0.006	0.006	0.005	0.005	0.004	0.004	0.004			
					B3	C _v	372	731	1088	1447	1809	2169	2525	2884	3250	3581			
							K _v	321	633	941	1252	1565	1876	2184	2495	2811			3098
C1 and C3	C _v	372	731	1088	1447	1809	2169	2525	2884	3250	3581								
		K _v	321	633	941	1252	1565	1876	2184	2495	2811	3098							
C1	F _d	0.031	0.022	0.018	0.016	0.014	0.013	0.012	0.011	0.010	0.010								
		0.016	0.011	0.009	0.008	0.007	0.006	0.006	0.006	0.005	0.005								
C3	C _v	965	1925	2884	3847	4700	5491	6234	6928	7572	7875								
		K _v	835	1665	2495	3328	4066	4749	5393	5993	6550	6812							

1. Reduction of standard inlet size may affect capacity. Consult your Emerson Process Management sales office for additional information.
 2. Values given are Inlet versus Outlet, i.e. 22x36 is an NPS 22 inlet and an NPS 36 outlet.
 3. At 100% travel.

Physical Specifications

End Connection Sizes⁽¹⁾

- NPS #x8⁽²⁾, ■ NPS #x12, ■ NPS #x16,
- NPS #x18, ■ NPS #x20, ■ NPS #x24,
- NPS #x30, and ■ NPS #x36

End Connection Types

- Butt weld (all sizes)
- Raised Face Flanges (all sizes)

Configuration

Angle Pattern (Flow Up)

Valve Body Ratings⁽³⁾

See table 8

Maximum Pressure Drop⁽¹⁾

Valve with Whisper Trim III Cage:

- 0.60 $\Delta P/P_1$ maximum for level A1
- 0.75 $\Delta P/P_1$ maximum for levels B1 and B3
- 0.85 $\Delta P/P_1$ maximum for level C3
- 0.99 $\Delta P/P_1$ maximum for level D3

Valve with WhisperFlo Trim:

- **Levels X, Y, and Z:** 0.94 $\Delta P/P_1$ maximum. If

greater than 0.94 $\Delta P/P_1$, consult your Emerson Process Management sales office

Flow Characteristics⁽⁴⁾

Whisper Trim III Cages: Linear
WhisperFlo: Linear

Flow Direction

Whisper Trim III Cage: Flow up
WhisperFlo: Flow up

Port Diameter and Maximum Travel

See table 8 for Whisper Trim III cages
See table 9 for WhisperFlo

Bonnet Type

Bolted

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

- Class V (standard) (Whisper Trim III)
- Class V (standard) (WhisperFlo)

1. Standard end connection sizes.
2. Values given are Inlet versus Outlet. # represents inlet size, less than or equal to the outlet size, per customer requirements.
3. Not all valve sizes are available in all pressure ratings.
4. Contact your Emerson Process Management sales office for special characterized cages.

Table 8. Valve Size, Inlet Class, Port Diameter, and Maximum Travel for Whisper Trim III

VALVE INLET VS OUTLET ⁽¹⁾	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
		mm	Inches	mm	Inches
# x 8	CL600 to CL2500	120	4.70	197	7.75
# x 12	CL600 to CL2500	159	6.25	264	10.38
# x 16	CL600 to CL2500	194	7.62	321	12.62
# x 18	CL600 to CL2500	234	9.20	391	15.38
# x 20	CL600 to CL1500	285	11.20	473	18.62
# x 24	CL600 to CL1500	349	13.75	581	22.88
# x 30	CL600 to CL900	424	16.70	606	23.88
# x 36	CL600 to CL900	507	19.94	606	23.88

1. # represents any size less than or equal to the outlet size.

Material Specifications

Body/Bonnet

- SA105 (Carbon Steel)
- SA182 Grade F22 (2.25Cr-1Mo)
- SA182 Grade F91 (9Cr-1Mo-V)

Bonnet Bolting

- SA105 Valve Body — SA193 Grade B7 up to 427°C (800°F)
- SA182 Grade F22 Valve Body — SA193 Grade B16 up to 524°C (975°F), N07718 above 524°C (975°F)
- SA182 Grade F91 Valve Body — N07718 up to 593°C (1100°F)

Control Plug

F22 with Alloy 6 guiding and seating surfaces^(1, 2)

Stem

- SA479 Type S20910: up to 427°C (800°F)
- A565 Grade 616: over 427°C (800°F)

Cage

- SA182 Grade F22 Nitrided⁽¹⁾
- S41000 cage, F22 Nitrided retainer⁽²⁾

Seat

- SA105 Valve Body -- Carbon Steel with Alloy 6 Seating Surface
- SA182 Grade F22 Valve Body -- F22 with Alloy 6 Seating Surface
- SA182 Grade F91 Valve Body -- F91 with Alloy 6 Seating Surface

Piston Rings

Alloy 6 with N07750 Expander

Bore Seal

N07718

Gaskets

N07750/Graphite

Packing

Graphite/Flexible Graphite

Nozzles

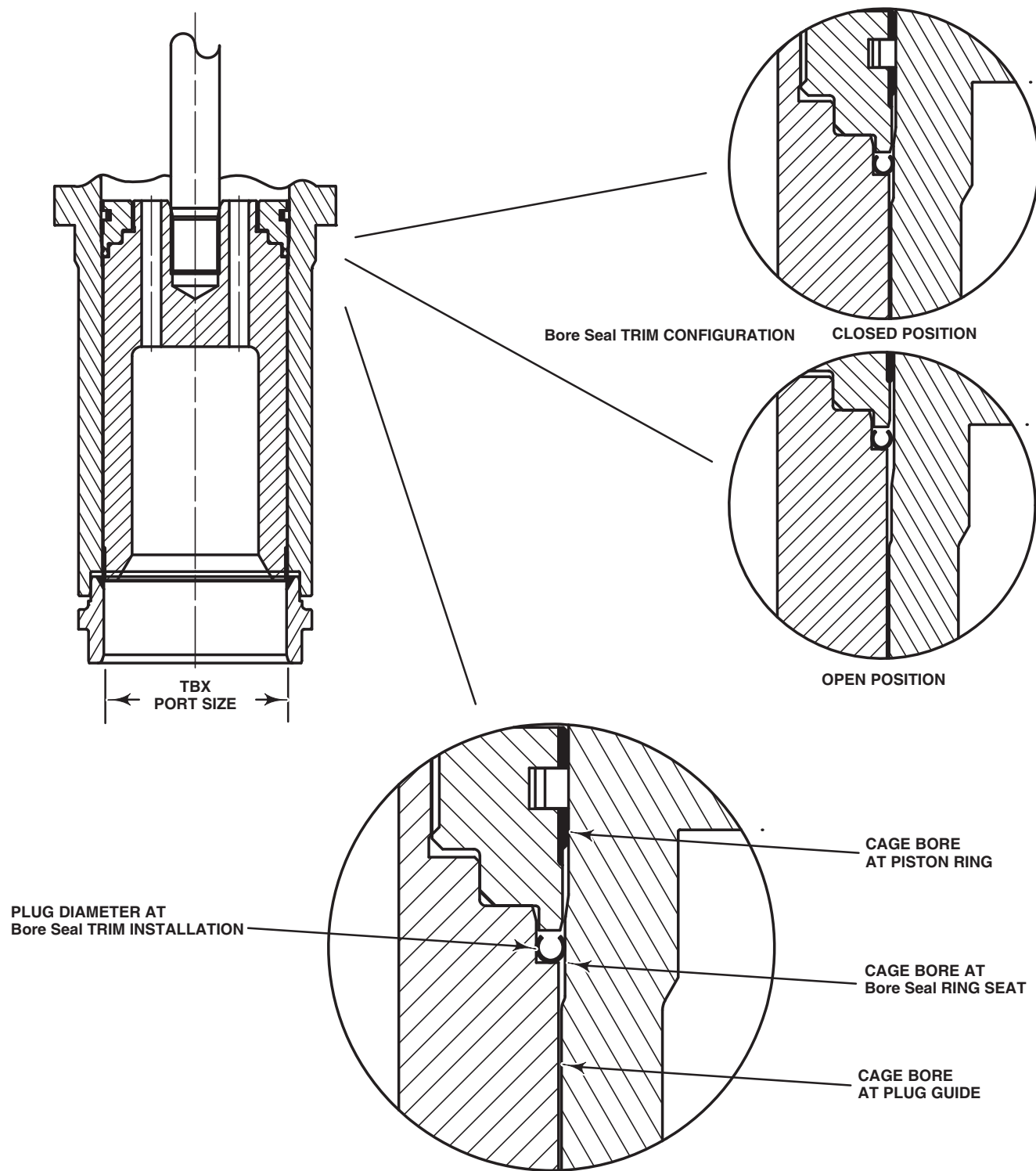
S41000 SST

1. For Whisper III constructions.
2. For WhisperFlo constructions.

Table 9. Valve Size, Inlet Class, Port Diameter, and Maximum Travel for WhisperFlo

VALVE INLET VS OUTLET ⁽¹⁾	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
		mm	Inches	mm	Inches
# x 8	CL600 to CL2500	87.3	3.4375	197	7.75
# x 12	CL600 to CL900	136.5	5.375	264	10.38
	CL1500 to CL2500	108.7	4.28	264	10.38
# x 16	CL600 to CL900	177.8	7	321	12.62
	CL1500 to CL2500	136.5	5.375	321	12.62
# x 18	CL600 to CL900	203.2	8	391	15.38
	CL1500 to CL2500	177.8	7	391	15.38
# x 20	CL600 to CL1500	254	10	473	18.62
# x 24	CL600 to CL900	279.4	11	581	22.88
	CL1500	254	10	581	22.88
# x 30	CL600 to CL900	374.7	14.75	606	23.88
# x 36	CL600 to CL900	463.6	18.25	606	23.88

1. # represents any size less than or equal to the outlet size.



E0921-IL

Figure 7. Fisher TBX Bore Seal Trim in Closed Position

Bore Seal Trim

TBX valves provide Class V leakage as a standard. The design employs a variation of the proven C-seal trim with enhancements for use with the TBX hung cage. The new sealing design is called Bore Seal trim (figure 7). In the Bore Seal trim, the primary plug-to-seat interface is a metal-to-metal line contact while the secondary metallic seal engages a controlled bore region in the cage when the plug is seated. During modulation, the secondary seal does not contact the upper cage wall and the controlled bore region remains protected, which extends the shutoff life of the valve.

Note

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