Design ES and EAS Sliding-Stem Control Valves

Design ES and EAS general-purpose control valves (figures 1, 2, and 3) are used for throttling or on-off control of a wide variety of liquids and gases. Both valve designs have single ports, unbalanced valve plugs, and cage guiding.

In both designs, metal-to-metal seating is standard for all general applications over a wide range of pressure drops and temperatures. Metal-to-PTFE seating is optional for more stringent shutoff requirements.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

The easy-e® Valve Family

Design ES and EAS valves are part of the versatile easy-e family of Fisher® industrial control valves. easy-e valves share the following characteristics.

- Multiple trim material choices
- Trim temperature capability with standard metal seats to 427°C (800°F)
- Flexible graphite gaskets
- Interchangeable, restricted-capacity trims and full-flow trims to match variable process flow demands
- Trim part interchangeability that permits reconfiguring the valve to a different design variation
- Different cage/plug styles provide particular flow characteristics for highly-specialized applications. The standard cage comes in three different flow characteristics:
  - quick-opening
  - linear
  - equal percentage

W2174–1/IL

Figure 1. Design ES Control Valve with Type 657 Actuator

Contents

- Whisper Trim® I cages (figure 2) that attenuate aerodynamic noise in gaseous service are available for all sizes except the 8-inch Design ES valve.

- Optional constructions provide material compatibility with NACE MR0175-2002.

- 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts).

Features

- **Compliance with the Clean Air Act—** Optional ENVIRO-SEAL packing systems (figure 4) provide an improved stem seal to help prevent the loss of process fluid. The ENVIRO-SEAL packing systems feature PTFE, Graphite ULF, or Duplex packing with live-loading for reduced packing maintenance.

- **Valve Plug Stability—** Rugged cage guiding provides increased valve plug stability, which reduces vibration and mechanical noise.

- **Economy—** Streamlined flow passages provide higher efficiency and greater capacities per initial investment.

- **Cost-Effective Operation—** Increased wear resistance of the standard hardened stainless steel trim means longer-lasting service. Also, trim inventory costs are cut because dimensional standardization permits use of most standard easy-e trim parts.

- **Easy Maintenance—** The valve can stay in the pipeline during removal of trim parts for inspection or maintenance.

- **Long-Lasting Shutoff Capability with PTFE Seating—** Controlled compression of optional seat construction protects PTFE disk between metal disk seat and disk retainer (figure 2). The flowstream contacts only the edge of the disk during normal operation.

- **Compliance with European Standards—** Valves are available with dimensions specified by EN/DIN standards. See figure 8 and the note in figure 9.

- **Sour Service Capability—** Materials are available for applications handling sour fluids and gases. These materials comply with the requirements of NACE MR0175-2002.

Note

Neither Emerson®, Emerson Process Management™, Fisher, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

Table 1. Class VI Shutoff Availability

Type	Port Size, Inches	Seat	Minimum Seat Load
ES	≤ 7	Metal	300 lbs/lineal inch

Table 2. Class VI Trim Materials

TYPE	CAGE/SEAT RING RETAINER	VALVE PLUG	SEAT RING	TRIM TEMPERATURE LIMIT	
				°C	°F
ES	S31600 (316 SST) / ENC	S31600/CoCr-A (alloy 6) seat w/ radiused seat (special design)	S31600 w/ wide beveled seat (special design)	Not a limiting factor	Not a limiting factor

ENVIRO-SEAL®, HIGH-SEAL™ Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer excellent sealing capabilities. They easily install in your existing valves or can be purchased with new valves. These systems may help prevent the loss of process fluid. The long operational life and reliability of these systems also helps to reduce your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique Fisher ENVIRO-SEAL packing system (figure 4) and a unique ENVIRO-SEAL bellows seal system (figure 5) are offered. The patented emission control packing system helps to keep emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the Fisher HIGH-SEAL Graphite ULF packing system is offered. The HIGH-SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or Duplex packing, and the HIGH-SEAL packing systems, Graphite ULF and graphite composite, feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

Class VI Shutoff Capabilities

Design ES valves with metal seat constructions can provide ANSI/FCI Class VI shutoff capabilities. See tables 1 and 2.

Table 3. Available Valve Body Constructions

DESIGN	VALVE SIZE, INCHES	BODY MATERIAL AND END CONNECTION STYLE(1)								
		Carbon Steel, Alloy Steel, or Stainless Steel Valve Body						Cast Iron Valve Body		
		Screwed	RF or RTJ Flanged			Butt-welding	Socket Weld	Screwed	Class 125 FF Flanged	Class 250 RF Flanged
			Class 150	Class 300	Class 600					
ES	0.5 or 0.75	X	- - -	- - -	- - -	- - -	X	X	- - -	- - -
	1, 1.5, or 2	X	X	X	X	X	X	X	X	X
	1.25	X	- - -	- - -	- - -	- - -	- - -	X	- - -	- - -
	2.5, 3, 4, 6, or 8	- - -	X	X	X	X	- - -	- - -	X	X
EAS	1 or 2	- - -	X	X	X	X	- - -	- - -	- - -	- - -
	3, 4, or 6	- - -	X	X	X	X	- - -	- - -	- - -	- - -

X = Available Construction.
1. End connection style abbreviations: FF - Flat Faced, RF - Raised Face, RTJ - Ring Type Joint.

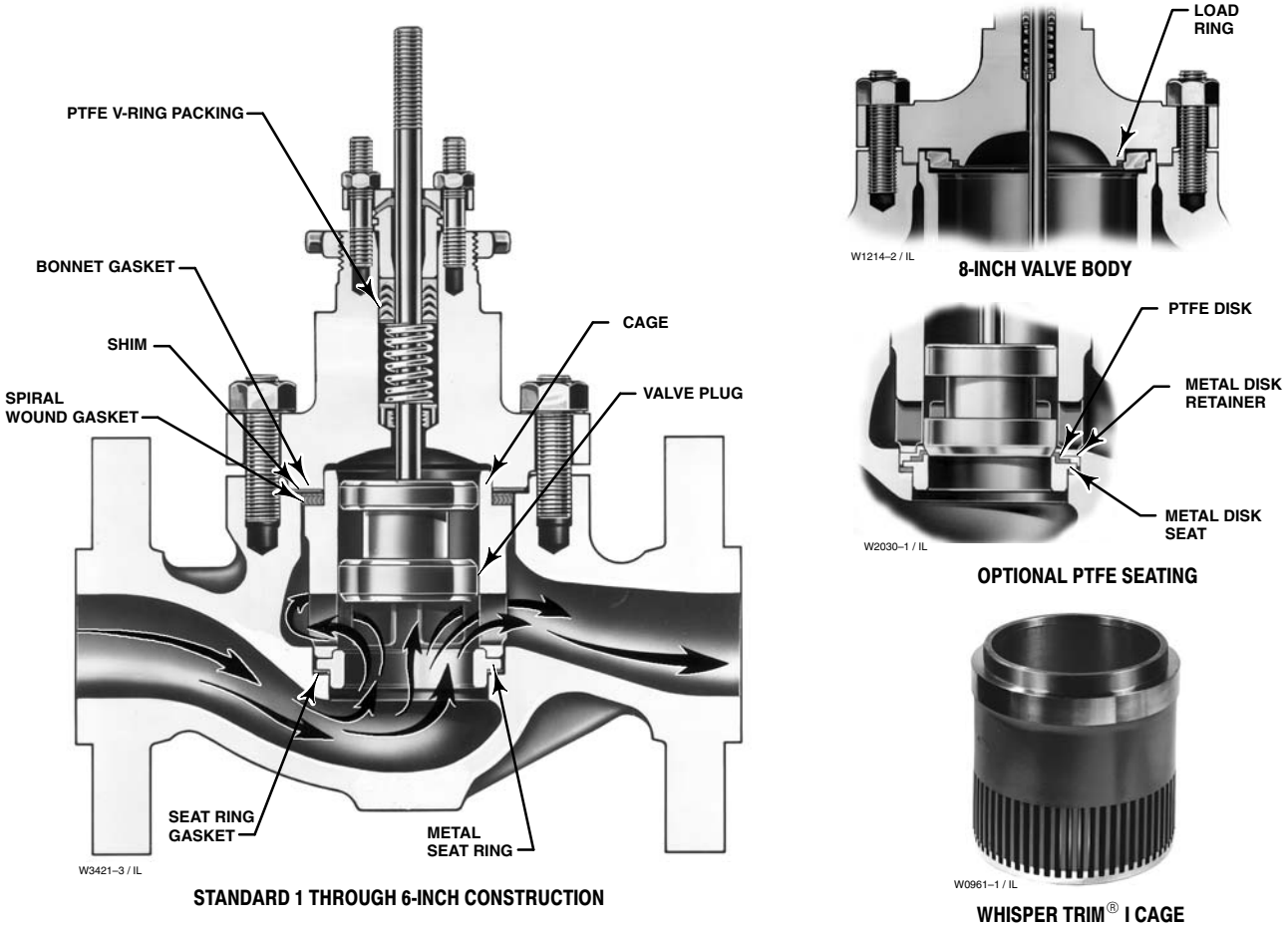


Figure 2. Design ES Sectional

Table 4. Typical Combinations of Metal Trim Parts(1) for all Valves Except Those for NACE Specification and Whisper Trim® III Cages

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal-Seat Construction	Optional Liner (Metal-Seat Design EAS Body Only)	Disk Seat and Retainer for Optional PTFE-Seat Construction
1 (standard for metal-seat Designs ES and EAS in all body materials except CF8M)	S41600 HT	CB7Cu-1 HT	S41600 HT or CA15 HT(1) (410 stainless steel)	S41600 HT	- - -
3	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 (alloy 6)	R30006 (alloy 6)	- - -	- - -
4	S31600	CB7Cu-1 HT	S31600	S31600	S31600
27	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	CF8M with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -	- - -
28	S31600 with seat hard faced with CoCr-A hardfacing alloy				
29 (standard for CF8M bodies in all designs regardless of seat construction)	S31600	CF8M with electroless nickel coating (ENC)	S31600	S31600	S31600
37	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	CB7Cu-1 HT	R30006 (alloy 6)	- - -	- - -
57 (standard for PTFE-seat constructions in all designs and body materials except CF8M)	S41600 alloy HT	CB7Cu-1 HT	- - -	- - -	S31600

1. CA15 is used for 6- and 8-inch full-size and restricted-trim valves.

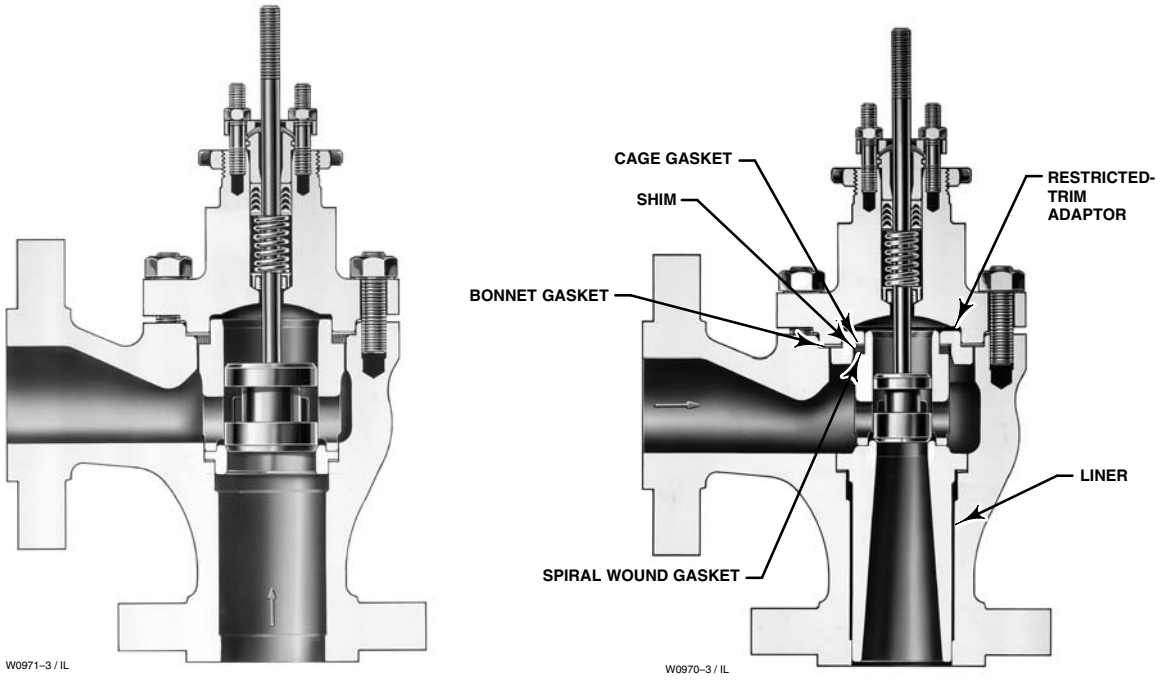


Figure 3. Design EAS Sectional

Table 5. Body/Trim Temperature Capabilities for Metal Trim Parts Only

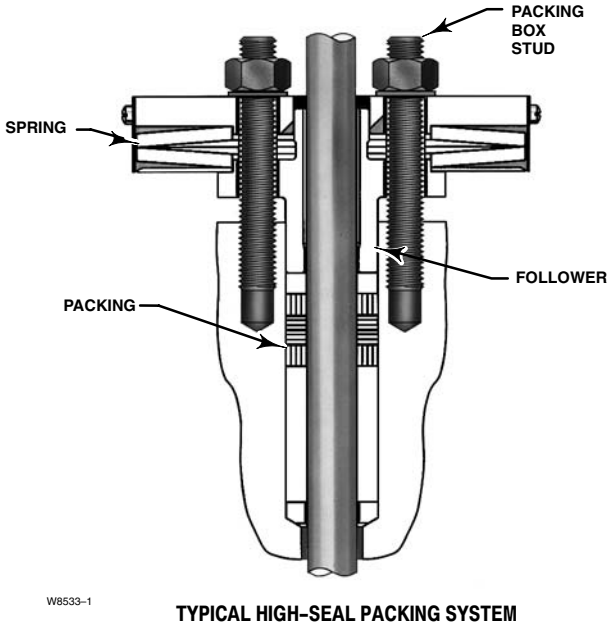
BODY/BONNET MATERIAL (ALSO FOR BOTTOM FLANGE IF USED)	TRIM DESIGNATION	VALVE SIZE AND DESIGN	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
Cast iron	1, 3, 27, 29, 37, or 57	All	–29	232	–20	450
WCC steel	1, 37, or 57	All	–29	427	–20	800
	29	All	–29	316	–20	600
	54	All	–29	260	–20	500
CF8M (316 SST)	27	All	–198(1)	343	–325(1)	650
	28	All	–198(1)	149	–325(1)	300
	29	All	–198(1)	316	–325(1)	600
LCC steel	1	All	–29	343	–20	650
	4	All	–46	210	–50	410
	29	All	–46	316	–50	600
	37	All	–46	343	–50	650
WC9 chrome moly steel	1, 37, or 57	All	–29	427	–20	800
	3	All	–29	566	–20	1050
	27	Sizes through 3 inches all designs; 8 inch ES	–29	343	–20	650
		4 or 6 inch ES and EAS	–29	343	–20	650
	29	All	–29	316	–20	600

1. May be used down to –254°C (–425°F) if manufacturing process includes Charpy impact test.

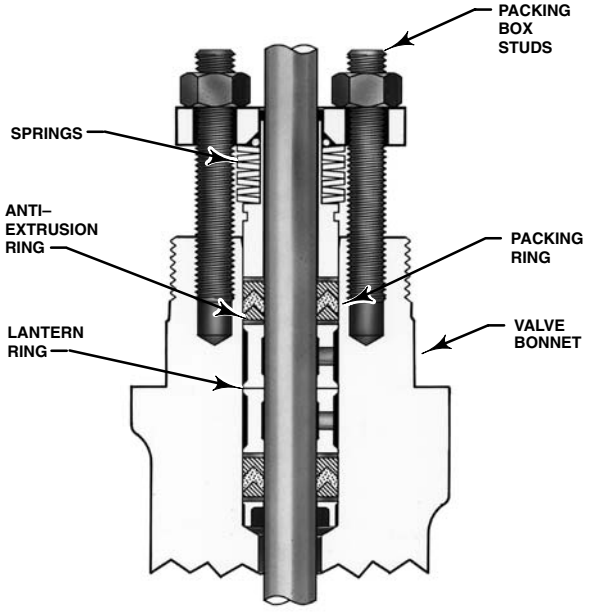
Table 6. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS(1)	
		°C	°F
Plain: ■Standard for all valves through 6-inch with 2-13/16 yoke boss diameter ■Standard for 6-inch and 8-inch valves in cast iron and WCC steel bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	–18 to 232	0 to 450
	PTFE/Composition	–18 to 232	0 to 450
	Graphite ribbon/filament	–18 to maximum shown in table 8	0 to maximum shown in table 8
Style 1 Cast Extension: ■Standard for 8-inch valves in S31600 bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-46 to 427	–50 to 800
	PTFE/Composition		
	Graphite ribbon/filament	–46 to maximum shown in table 8	–50 to maximum shown in table 8
Style 2 Cast Extension: ■Optional for 2-inch through 4-inch valve sizes with 2-13/16 inch yoke boss diameter ■Optional for 6-inch and 8-inch valves with 3-9/16 yoke boss diameter. Not available for 8-inch valve in S31600 bonnet material	PTFE V-ring	–101 to 427	–150 to 800
	PTFE/Composition		
	Graphite ribbon/filament	–101 to maximum shown in table 8	–150 to maximum shown in table 8
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, for pressure/temperature ratings.	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, for pressure/temperature ratings.
	Graphite ULF		

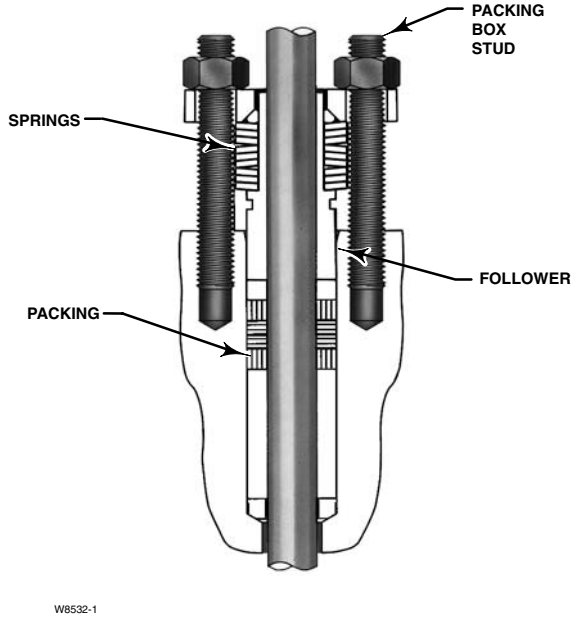
1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.



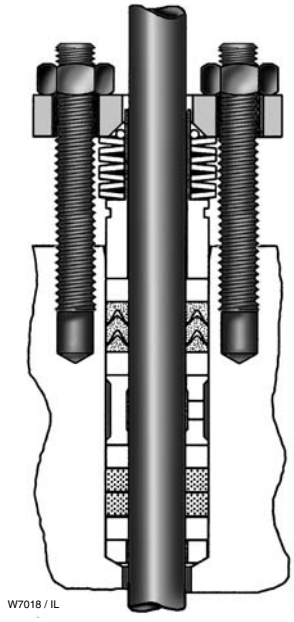
TYPICAL HIGH–SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO–SEAL PACKING SYSTEM WITH PTFE PACKING



TYPICAL ENVIRO–SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH DUPLEX PACKING

Figure 4. ENVIRO-SEAL® and HIGH-SEAL™ Packing Systems

Table 7. Maximum Flow Coefficients for Full-Sized Trim with Equal Percentage Cage and Normal Flow Direction(1)

Valve Design	Valve Size, Inches	C_v at Max Valve Plug Travel
ES	0.5	6.53(2)
	0.75	14.2(2)
	1, 1.25	17.4
	1.5	33.4
	2	56.2
	2.5	82.7
	3	121
	4	203
	6	357
	8	808
EAS (flow down)	1	19.0
	2	47.2
	3	148
	4	156
	6	328

1. Except where indicated. Flow coefficients for linear and quick-opening cages normally are somewhat greater.
2. Quick-opening cage.

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Figure 5. ENVIRO-SEAL® Bellows Seal Bonnet

Table 8. Materials and Temperature Limits for All Other Parts

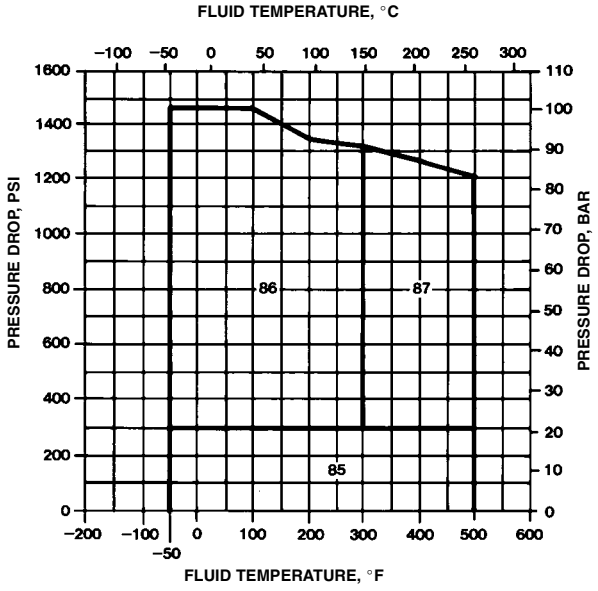
PART			MATERIAL	MATERIAL TEMPERATURE CAPABILITIES			
				°C		°F	
				Minimum	Maximum	Minimum	Maximum
Body-to-bonnet bolting. See table 10 for NACE bolting materials and temperatures	Cast iron body	Cap screws	Steel SAE Grade 5	–29	232	–20	450
	WCC or WC9 body	Studs	Steel SA-193-B7	–29	427(1)	–20	800(1)
		Nuts	Steel SA-194-2H				
	316 stainless steel (CF8M)	Studs	Steel SA-193-B7 (std)	–48	427(1)	–55	800(1)
		Nuts	Steel SA-194-2H (std)				
		Studs	304 stainless steel SA-320-B8	–198	38	–325	100
		Nuts	304 stainless steel SA-194-8				
		Studs	316 stainless steel SA-193-B8M (strain-hardened)	–198(2)	427(1)	–325(2)	800(1)
		Nuts	316 stainless steel SA-194-8M				
		Studs	316 stainless steel SA-194-B8M (annealed)	–198(2)	These materials not limiting factors	–325(2)	These materials not limiting factors
		Nuts	316 stainless steel SA-194-8M				
	LCC body	Studs	Steel SA-193-B7	–46	343(1)	–50	650(1)
		Nuts	Steel SA-194-2H				
	WC9 body	Studs	Steel SA-193-B16	–29	566(1)	–20	1050(1)
		Nuts	Steel SA-194-7				
Optional disk			PTFE	–73	204	–100	400
Valve plug stem			316 stainless steel	–198(2)	593	–325(2)	1100
Pin (Design ES or EAS valve only)			316 stainless steel				
Load ring	(8-inch Design ES valve only)		17-4PH stainless steel	–101	316	–150	600
			N06600	–254	593	–425	1100
			N05500 Nickel Alloy	–240	260	–400	500
Restricted trim adaptors			Cast iron	–73	232	–100	450
			WCC steel	–29	427	–20	800
			316 stainless steel	–198(2)	593	–325(2)	1100
Seat ring, bonnet, and cage gaskets			Flexible Graphite (standard)	–198	593(3)	–325	1100(3)
			PTFE-coated N04400 Nickel Alloy	–73	149	–100	300
Spiral wound gaskets			N06600 Nickel Alloy 600/graphite (Flexible Graphite) standard	–198	593(3)	–325	1100(3)
			N04400 Nickel Alloy/composition	–73	232	–100	450
Shim			316 stainless steel	These materials not limiting factors			
			N04400 Nickel Alloy	These materials not limiting factors			
Packing	(temperatures shown are material temperature capabilities)	See table 6 for proper bonnet selection	PTFE V-ring	–40	232	–40	450
			PTFE/composition	–73	232	–100	450
			Graphite ribbon/filament	–198	538(4)	–325	1000(4)
			Graphite ribbon for high-temperature oxidizing service	371	649	700	1200
Packing flange studs, and nuts when used with standard bonnet			316 stainless steel	–198(2)	593	–325(2)	1100
Packing follower and packing spring (single PTFE V-ring packing) or lantern ring (other packing arrangements)			316 stainless steel	–198(2)	593	–325(2)	1100
Packing box ring			316 stainless steel	–198(2)	593	–325(2)	1100
Extension bonnet bushing	Trims 1 & 4		416 stainless steel	–29	427	–20	800
	Other trims		316 stainless steel	–198(2)	593	–325(2)	1100

1. Lubricated nuts are standard.
2. May be used down to –254°C (–425°F) if manufacturing process includes Charpy impact test.
3. Except 427°C (800°F) on oxidizing service.
4. Except 371°C (700°F) on oxidizing service.

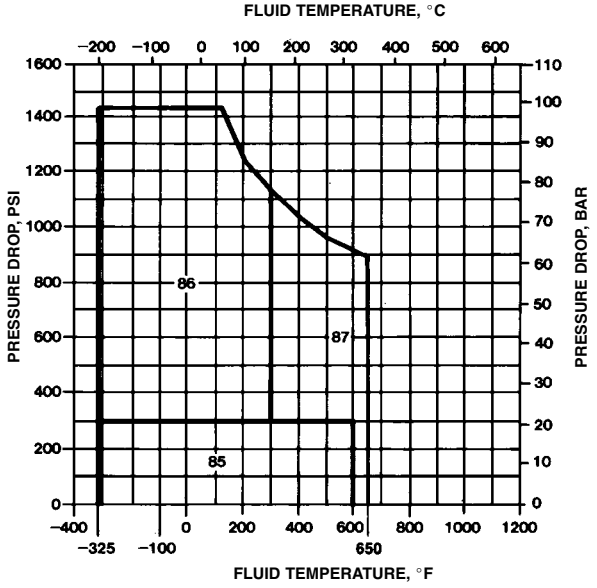
Table 9. Metal Trim Part Materials for Compatibility with NACE MR0175-2002 (Sour Service) Specifications, Environmental Restrictions Apply, Refer to Standard

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal Seat Construction	Optional Liner for Metal Seat (EAS only)	Disk Seat and Retainer for Optional PTFE-Seat Construction	Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin	Load Ring(1)
85	S31600	S31600 with electroless nickel coating (ENC)	S31600	S31600	- - -	Valve stem is S20910 All other parts are S31600	N05500
85C(2)	S31600	S31600 with electroless nickel coating (ENC)	- - -	- - -	S31600		
86	S31600 with seat hard faced with CoCr-A hard facing alloy	S31600 with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -	- - -		
87	S31600 with seat and guide hard faced with CoCr-A hard facing alloy	S31600 with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -	- - -		
87C(2)	S31600 with seat and guide hard faced with CoCr-A hard facing alloy	S31600 with electroless nickel coating (ENC)	- - -	- - -	S31600		

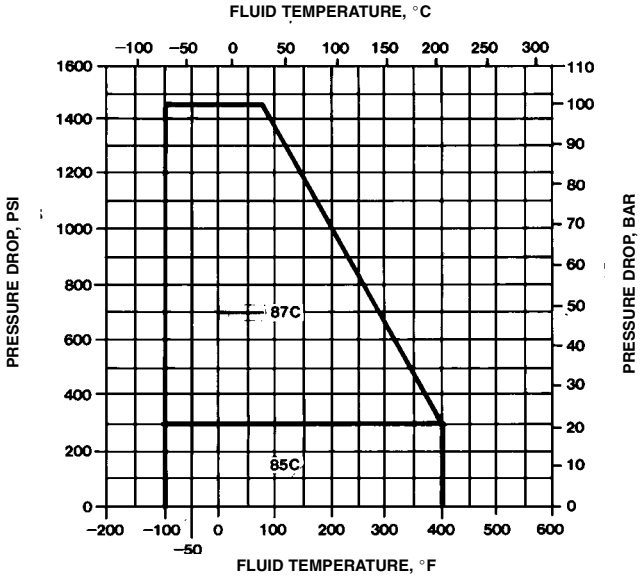
1. 8-inch valve only.
2. 85C and 87C are trims for PTFE-seat construction.



FOR STANDARD METAL SEATING WITH CLASS 600 〈1〉 WCC OR LCC BODY



FOR STANDARD METAL SEATING WITH CLASS 600 〈1〉 316 STAINLESS STEEL (CF8M) BODY



FOR OPTIONAL PTFE SEATING WITH ALL BODY MATERIALS〈1〉

NOTE:
〈1〉 DO NOT EXCEED THE MAXIMUM PRESSURE AND TEMPERATURE FOR THE CLASS RATING OF THE BODY MATERIAL USED, EVEN THOUGH THE TRIMS SHOWN MAY HAVE HIGHER CAPABILITIES.

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Figure 6. Typical Trim Used for NACE MR0175-2002, (Sour Service)

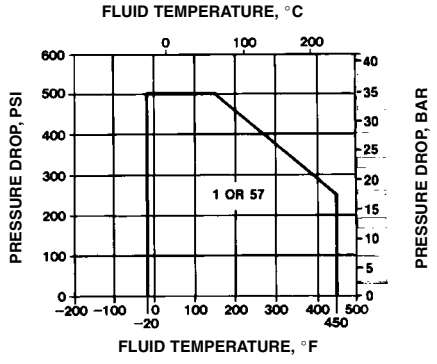
Table 10. Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Min	Max	Min	Max
NACE MR0175-2002 (non-exposed bolting) (Standard)						
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7	–48(2)	427	–55(2)	800
	Nuts	Steel SA-194-2H				
NACE MR0175-2002 (exposed bolting) (Optional) Requires Derating of Valve(1) When These Body-to-Body Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	–48(2)	427	–55(2)	800
	Nuts	Steel SA-194-2HM				

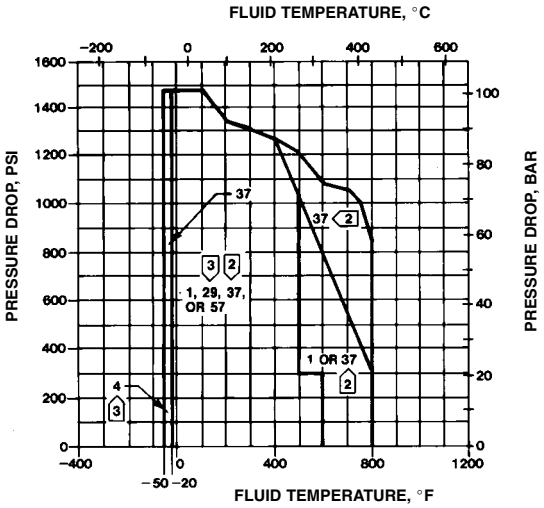
1. Derating is not required for Class 300 valves. Derating may be required for valves rated at Class 600. Contact your Emerson Process Management sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.
2. WCC is limited to –29°C (–20°F).

Table 11. Port Diameters, Valve Plug Travel, and Stem and Yoke Boss Diameters

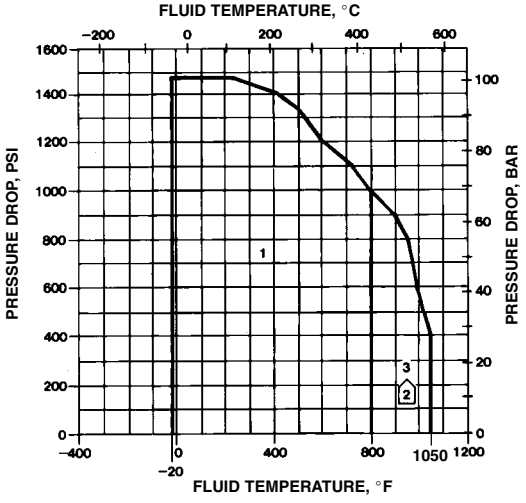
VALVE SIZE, INCHES				PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS							
Design ES		Design EAS						Standard				Optional			
								Stem		Yoke Boss		Stem		Yoke Boss	
Full-Sized Trim	Restricted-Capacity Trim	Full-Sized Trim	Restricted-Capacity Trim	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
1 or 1.25	1.5	1	2	33.3	1.3125	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
- - -	2	- - -	- - -	33.3	1.3125	19	0.75	12.7	1/2	71	2-13/16	- - -	- - -	- - -	- - -
1.5	- - -	2	- - -	47.6	1.875	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
- - -	2.5	- - -	3	47.6	1.875	19	0.75	12.7	1/2	71	2-13/16	- - -	- - -	- - -	- - -
2	3	- - -	4	58.7	2.3125	29	1.125	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
2.5	4	3	6	73.0	2.875	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
3	- - -	4	- - -	87.3	3.4375	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
4	- - -	6	- - -	111.1	4.375	51	2	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
												25.4	1	127	5
6	- - -	- - -	- - -	177.8	7	51	2	19.1	3/4	90	3-9/16	25.4 or 31.8	1 or 1-1/4	127	5
8	- - -	- - -	- - -	203.2	8	51	2								
						76	3								



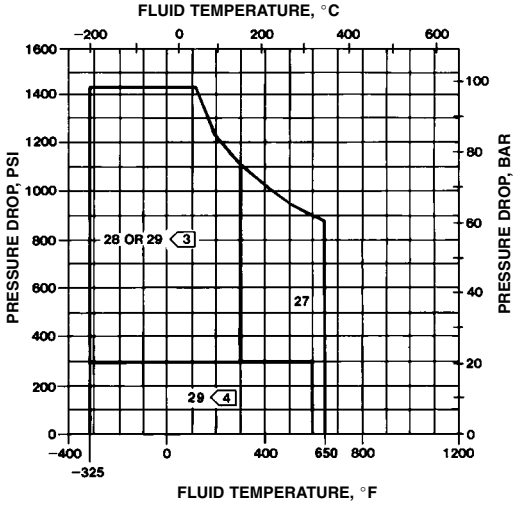
FOR STANDARD METAL SEATING WITH CLASS 250B [1] CAST IRON BODY



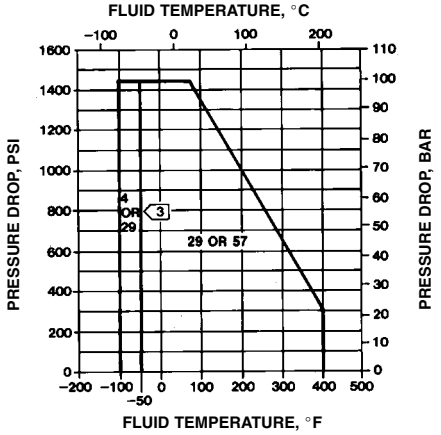
FOR STANDARD METAL SEATING WITH CLASS 600 [1] WCC OR LCC STEEL BODY



FOR STANDARD METAL SEATING WITH CLASS 600 [1] WC9 CHROME MOLY STEEL BODY



FOR STANDARD METAL SEATING WITH CLASS 600 [1] 316 STAINLESS STEEL (CF8M) BODY



FOR OPTIONAL PTFE SEATING WITH ALL BODY MATERIALS [1]

C0459–5 / IL

NOTE:

[1] DO NOT EXCEED THE MAXIMUM PRESSURE AND TEMPERATURE FOR THE CLASS RATING OF THE BODY MATERIAL USED, EVEN THOUGH THE TRIMS SHOWN MAY HAVE HIGHER CAPABILITIES.

[2] BE ESPECIALLY CAREFUL TO SPECIFY SERVICE TEMPERATURE IF TRIMS 3, 4, OR 37 ARE SELECTED, AS DIFFERENT THERMAL EXPANSION RATES REQUIRE SPECIAL PLUG CLEARANCES, ALSO, USE TRIM 37 INSTEAD OF TRIM 4 FOR NONLUBRICATING FLUIDS SUCH AS SUPERHEATED STEAM OR DRY GASES BETWEEN 149 AND 316°C (300 AND 600°F).

[3] TRIMS 4 AND 29 CAN BE USED TO PRESSURE DROP SHOWN ONLY WITH CLEAN, DRY GAS. FOR OTHER THAN CLEAN, DRY GAS, TRIMS 4 AND 29 CAN BE USED ONLY UP TO 21 BAR (300 PSI).

[4] USE TRIM 27 INSTEAD OF TRIM 29 FOR NONLUBRICATING FLUIDS SUCH AS SUPERHEATED STEAM OR DRY GASES BETWEEN 149 AND 316°C (300 AND 600°F).

Figure 7. Typical Trim Use for All Valve Bodies Except Those for NACE Specifications

Table 12. Design ES Dimensions

VALVE SIZE, INCHES	A									G(MAX)
	Scrd or SW	125 FF or 150 RF	150 RTJ	250 RF or 300 RF	300 RTJ	BW or 600 RF	600 RTJ	DIN PN 16-40(1)	DIN PN 63-100(1)	Design ES
mm										
0.5, 0.75	165	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	54
1	210	184	197	197	210	210	210	160	230	56
1.25	229	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	56
1.5	251	222	235	235	248	251	251	200	260	71
2	286	254	267	267	282	286	289	230	300	78
2.5	- - -	276	292	292	308	311	314	290	340	90
3	- - -	298	311	317	333	337	340	310	380	97
4	- - -	353	365	368	384	394	397	350	430	129
6	- - -	451	464	473	489	508	511	480	550	162
8	- - -	543	556	568	584	610	613	600	650	191
Inches										
0.5, 0.75	6.50	- - -	- - -	- - -	- - -	- - -	- - -	See mm above	See mm above	2.12
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25			2.38
1.25	9.00	- - -	- - -	- - -	- - -	- - -	- - -			2.38
1.5	9.88	8.75	9.25	9.25	9.75	9.88	9.88			2.81
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06
2.5	- - -	10.88	11.38	11.50	12.12	12.25	12.38			3.56
3	- - -	11.75	12.25	12.50	13.12	13.25	13.38			3.81
4	- - -	13.88	14.38	14.50	15.12	15.50	15.62			5.06
6	- - -	17.75	18.25	18.62	19.25	20.00	20.12			6.38
8	- - -	21.38	21.88	22.38	23.00	24.00	24.12			7.50

1. Valves which meet DIN flange standards and have DIN face-to-face dimensions are available only from Europe. Valves which meet DIN flange standards but not DIN face-to-face standards are available in the US. Consult your Emerson Process Management sales office.

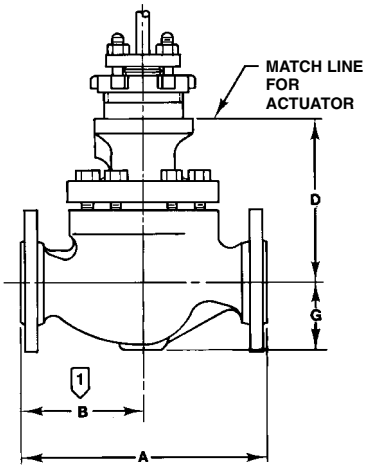


Figure 8. Design ES Dimensions (also see tables 12, 13, and 14)

Table 13. Design ES Dimensions

VALVE SIZE, INCHES	D FOR PLAIN BONNET			
	Design ES			
	Stem Diameter			
	mm			
	9.5	12.7	19.1	25.4 or 31.8
0.5, 0.75, 1, 1.25	127	149	- - -	- - -
1.5	124	146	- - -	- - -
2	- - -	165	162	- - -
2.5	- - -	187	184	- - -
3	- - -	191	187	- - -
4	- - -	221	217	238
6	- - -	- - -	251	270
8	- - -	- - -	375(1)	426
	Inches			
	3/8	1/2	3/4	1 or 1-1/4
0.5, 0.75, 1, 1.25	5.00	5.88	- - -	- - -
1.5	4.88	5.75	- - -	- - -
2	- - -	6.50	6.38	- - -
2.5	- - -	7.38	7.25	- - -
3	- - -	7.50	7.38	- - -
4	- - -	8.69	8.56	9.38
6	- - -	- - -	9.88	10.62
8	- - -	- - -	14.75(1)	16.75

1. Available only in cast iron or WCC steel for the stem diameter with plain bonnet.

Table 14. Design ES Dimensions

VALVE SIZE, INCHES	D FOR EXTENSION AND ENVIRO-SEAL BELLOWS SEAL BONNETS (DESIGN ES ONLY)									
	Style 1 Ext. Bonnet				Style 2 Ext. Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter				Stem Diameter			Stem Diameter		
	mm									
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1
0.5, 0.75, 1, 1.25	213	251	- - -	- - -	303	319	- - -	321	- - -	- - -
1.5	210	248	- - -	- - -	300	316	- - -	317	- - -	- - -
2	- - -	267	- - -	- - -	- - -	465	- - -	- - -	384	- - -
2.5	- - -	289	272	- - -	- - -	492	- - -	- - -	- - -	- - -
3	- - -	292	297	- - -	- - -	495	487	- - -	518	518
4	- - -	322	327	370	- - -	526	518	- - -	541	- - -
6	- - -	- - -	357	402	- - -	- - -	543	- - -	- - -	573
8	- - -	- - -	421	450	- - -	- - -	621	- - -	- - -	- - -
	Inches									
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4
0.5, 0.75, 1, 1.25	8.38	9.88	- - -	- - -	11.94	12.56	- - -	12.62	- - -	- - -
1.5	8.25	9.75	- - -	- - -	11.81	12.44	- - -	12.50	- - -	- - -
2	- - -	10.50	- - -	- - -	- - -	18.31	- - -	- - -	15.12	- - -
2.5	- - -	11.38	10.69	- - -	- - -	19.38	- - -	- - -	- - -	- - -
3	- - -	11.50	11.69	- - -	- - -	19.50	19.19	- - -	20.38	20.38
4	- - -	12.69	12.88	14.56	- - -	20.69	20.38	- - -	21.31	- - -
6	- - -	- - -	14.06	15.81	- - -	- - -	21.38	- - -	- - -	22.56
8	- - -	- - -	16.56	17.75	- - -	- - -	24.44	- - -	- - -	- - -

Table 15. Design EAS Dimensions

VALVE SIZE, INCHES	AA					
	Class 150		Class 300		Class 600	
	RF	RTJ	RF	RTJ	BW, SW, or RF	RTJ
	mm					
1	92	98	98	105	105	105
2	127	133	133	141	143	144
3	149	156	159	167	168	170
4	176	183	184	197	197	198
6	225	232	237	244	254	256
	Inches					
1	3.62	3.88	3.88	4.12	4.12	4.12
2	5.00	5.25	5.25	5.56	5.62	5.69
3	5.88	6.12	6.25	6.56	6.62	6.69
4	6.94	7.19	7.25	7.56	7.75	7.81
6	8.88	9.12	9.31	9.62	10.00	10.06

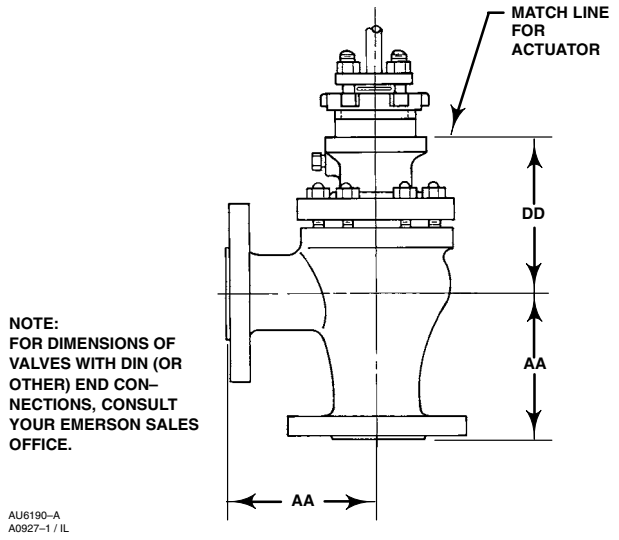


Figure 9. Design EAS Dimensions (also see tables 15 and 16)

Table 16. Design EAS Dimensions

VALVE SIZE, INCHES	DD												
	Plain Bonnet				Style 1 Extension Bonnet			Style 2 Extension Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter												
	mm												
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1	9.5	12.7	19.1
1	111	133	- - -	- - -	197	235	- - -	291	305	- - -	Contact your nearest Emerson sales office		
2	98	121	- - -	- - -	184	223	- - -	278	291	- - -			
3	- - -	149	146	- - -	- - -	251	256	- - -	454	- - -			
4	- - -	140	137	- - -	- - -	241	246	- - -	445	437			
6	- - -	144	141	187	- - -	246	251	- - -	449	441			
	Inches												
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4	3/8	1/2	3/4
1	4.38	5.25	- - -	- - -	7.75	9.25	- - -	11.44	12.00	- - -	Contact your nearest Emerson sales office		
2	3.88	4.75	- - -	- - -	7.25	8.75	- - -	10.94	11.44	- - -			
3	- - -	5.88	5.75	- - -	- - -	9.88	10.06	- - -	17.88	- - -			
4	- - -	5.50	5.38	- - -	- - -	9.50	9.69	- - -	17.50	17.19			
6	- - -	5.69	5.56	7.38	- - -	9.69	9.88	- - -	17.69	17.38			

Coefficients

Table 17. Design ES, Class 125 to 600, Quick Opening Cage

Quick Opening - Flow Up																**Quick Opening Characteristic**
Valve Size, Inches	**Port Diameter**		**Maximum Travel**		**Flow Coeffi-cient**	**Valve Opening—Percent of Total Travel**										
	mm	**Inches**	**mm**(1)	**Inches**(1)		**Coeffs. for 6 mm (0.25 in.) Travel**(2)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**F_L**(3)
0.5	33.3	1.3125	19	0.75	C_v	6.27	4.00	5.63	6.22	6.35	6.44	6.48	6.52	6.53	6.53	6.53	0.88
					K_v	*5.42*	*3.46*	*4.87*	*5.38*	*5.49*	*5.57*	*5.61*	*5.64*	*5.65*	*5.65*	*5.65*	- - -
					X_T	0.665	0.681	0.711	0.653	0.651	0.640	0.632	0.624	0.622	0.622	0.622	- - -
0.75	33.3	1.3125	19	0.75	C_v	12.3	4.94	8.80	11.8	13.1	13.8	14.1	14.2	14.2	14.2	14.2	0.83
					K_v	*10.6*	*4.27*	*7.61*	*10.2*	*11.3*	*11.9*	*12.2*	*12.3*	*12.3*	*12.3*	*12.3*	- - -
					X_T	0.593	0.576	0.688	0.605	0.571	0.552	0.539	0.534	0.534	0.534	0.534	- - -
1 & 1.25	33.3	1.3125	19	0.75	C_v	16.3	5.24	10.0	15.0	18.4	20.3	21.0	21.1	21.3	21.4	21.4	0.89
					K_v	*14.1*	*4.53*	*8.65*	*13.0*	*15.9*	*17.6*	*18.2*	*18.3*	*18.4*	*18.5*	*18.5*	- - -
					X_T	0.661	0.540	0.664	0.656	0.660	0.641	0.650	0.663	0.654	0.648	0.650	- - -
1.5	47.6	1.875	19	0.75	C_v	24.4	7.60	15.1	22.3	28.2	33.4	37.0	38.0	38.0	38.0	38.0	0.94
					K_v	*21.1*	*6.57*	*13.1*	*19.3*	*24.4*	*28.9*	*32.0*	*32.9*	*32.9*	*32.9*	*32.9*	- - -
					X_T	0.645	0.577	0.613	0.639	0.684	0.703	0.713	0.743	0.777	0.789	0.789	- - -
	33.3 (4)	1.3125 (4)	19	0.75	C_v	18.0	4.83	10.4	16.2	21.4	25.6	28.2	29.8	30.2	30.3	30.4	0.94
					K_v	*15.6*	*4.18*	*9.00*	*14.0*	*18.5*	*22.1*	*24.4*	*25.8*	*26.1*	*26.2*	*26.3*	- - -
					X_T	0.605	0.611	0.607	0.588	0.598	0.610	0.651	0.666	0.699	0.708	0.717	- - -
2	58.7	2.3125	29	1.125	C_v	35.3	14.3	31.1	48.6	59.3	65.2	67.2	67.2	67.2	67.2	67.2	0.93
					K_v	*30.5*	*12.4*	*26.9*	*42.0*	*51.3*	*56.4*	*58.1*	*58.1*	*58.1*	*58.1*	*58.1*	- - -
					X_T	0.607	0.633	0.627	0.619	0.732	0.758	0.771	0.797	0.810	0.810	0.810	- - -
	33.3 (4)	1.3125 (4)	19	0.75	C_v	18.6	5.12	10.5	16.7	22.2	26.9	30.9	33.9	36.3	38.1	39.4	0.91
					K_v	*16.1*	*4.43*	*9.08*	*14.4*	*19.2*	*23.3*	*26.7*	*29.3*	*31.4*	*33.0*	*34.1*	- - -
					X_T	0.560	0.588	0.617	0.565	0.571	0.640	0.722	0.796	0.826	0.785	0.734	- - -
2.5	73.0	2.875	38	1.5	C_v	35.3	21.8	42.0	66.6	83.8	91.1	93.1	93.1	93.1	93.1	93.1	0.91
					K_v	*30.5*	*18.9*	*36.3*	*57.6*	*72.5*	*78.8*	*80.5*	*80.5*	*80.5*	*80.5*	*80.5*	- - -
					X_T	0.675	0.659	0.684	0.720	0.790	0.795	0.827	0.848	0.868	0.868	0.868	- - -
	47.6 (4)	1.875 (4)	19	0.75	C_v	26.1	7.40	15.5	23.3	31.4	39.8	48.4	56.1	61.7	62.3	69.2	0.95
					K_v	*22.6*	*6.40*	*13.4*	*20.2*	*27.2*	*34.4*	*41.9*	*48.5*	*53.4*	*53.9*	*59.9*	- - -
					X_T	0.609	0.636	0.599	0.612	0.619	0.692	0.747	0.824	0.859	0.842	- - -	- - -
3	87.3	34375	38	1.5	C_v	37.4	23.3	45.5	78.3	106	120	130	136	143	146	150	0.87
					K_v	*32.4*	*20.2*	*39.4*	*67.7*	*91.7*	*104*	*112*	*118*	*124*	*126*	*130*	- - -
					X_T	0.590	0.585	0.592	0.602	0.685	0.740	0.726	0.737	0.731	0.733	0.720	- - -
	58.7 (4)	2.3125 (4)	29	1.125	C_v	36.3	14.7	32.4	51.2	68.8	83.1	94.3	103	108	112	115	0.91
					K_v	*31.4*	*12.7*	*28.0*	*44.3*	*59.5*	*71.9*	*81.6*	*89.1*	*93.4*	*96.9*	*99.5*	- - -
					X_T	0.564	0.609	0.565	0.565	0.593	0.679	0.729	0.751	0.774	0.785	0.752	- - -

-continued-

Table 17. Design ES, Class 125 to 600, Quick Opening Cage (continued)

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel											F_L[3]
	mm	Inches	mm[1]	Inches[1]		Coeffs. for 6 mm (0.25 in.) Travel[2]	10	20	30	40	50	60	70	80	90	100	
4	111.1	4.375	51	2	C_v	46.3	39.0	77.3	132	174	198	215	225	230	234	235	0.89
					K_v	*40.0*	*33.7*	*66.9*	*114*	*151*	*171*	*186*	*195*	*199*	*202*	*203*	- - -
					X_T	0.647	0.642	0.691	0.714	0.763	0.768	0.763	0.769	0.775	0.783	0.780	- - -
	73.0 (4)	2.875 (4)	38	1.5	C_v	41.2	26.9	47.2	76.4	108	135	156	169	178	181	183	0.88
					K_v	*35.6*	*23.3*	*40.8*	*66.1*	*93.4*	*117*	*135*	*146*	*154*	*157*	*158*	- - -
					X_T	0.613	0.524	0.683	0.669	0.664	0.688	0.741	0.783	0.763	0.752	0.736	- - -
6	177.8	7	51	2	C_v	102	89.9	162	255	322	365	395	418	436	455	469	0.82
					K_v	*88.2*	*77.8*	*140*	*221*	*279*	*316*	*342*	*362*	*377*	*394*	*406*	- - -
					X_T	0.642	0.572	0.612	0.601	0.652	0.664	0.677	0.681	0.701	0.698	0.700	- - -
	111.1 (4)	4.375 (4)	51	2	C_v	66.1	49.8	108	164	217	255	274	282	290	291	302	0.90
					K_v	*57.2*	*43.1*	*93.4*	*142*	*188*	*221*	*237*	*244*	*251*	*252*	*261*	- - -
					X_T	0.667	0.711	0.630	0.619	0.650	0.724	0.814	0.883	0.883	0.909	0.860	- - -
8	203.2	8	51	2	C_v	122	94.4	205	323	441	539	622	677	720	759	787	0.85
					K_v	*106*	*81.7*	*177*	*279*	*381*	*466*	*538*	*586*	*623*	*657*	*681*	- - -
					X_T	0.616	0.683	0.607	0.575	0.603	0.682	0.726	0.772	0.809	0.814	0.814	- - -
	203.2	8	76	3	C_v	122	156	337	490	612	700	759	796	827	844	875	0.85
					K_v	*106*	*135*	*292*	*424*	*529*	*606*	*657*	*689*	*715*	*730*	*757*	- - -
					X_T	0.616	0.520	0.561	0.654	0.757	0.804	0.814	0.818	0.801	0.810	0.774	- - -

1. When using Type 655-EC as a control valve for on-off service, the maximum travel for sizing purposes is 19 mm (0.75 inch),
2. When sizing self-operated regulators, use coefficients listed for 6 mm (0.25 inch) travel.
3. At 100% travel.
4. Restricted trim

Table 18. Design ES, Class 125 to 600, Linear Cage

Linear - Flow Up

Linear Characteristic

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1 & 1.25	33.3	1.3125	19	0.75	C_v	2.27	4.12	6.23	8.54	11.0	13.4	15.8	17.8	19.3	20.1	0.89
					K_v	*1.96*	*3.56*	*5.39*	*7.39*	*9.52*	*11.6*	*13.7*	*15.4*	*16.7*	*17.4*	- - -
					X_T	0.691	0.691	0.690	0.696	0.696	0.708	0.709	0.705	0.702	0.690	- - -
1.5	47.6	1.875	19	0.75	C_v	3.56	7.01	11.1	15.1	19.0	22.9	26.7	30.0	33.1	34.9	0.92
					K_v	*3.08*	*6.06*	*9.60*	*13.1*	*16.4*	*19.8*	*23.1*	*25.9*	*28.6*	*30.2*	- - -
					X_T	0.628	0.582	0.604	0.647	0.683	0.699	0.715	0.737	0.741	0.764	- - -
	33.3 (3)	1.3125 (3)	19	0.75	C_v	2.42	4.30	6.40	8.77	11.5	14.6	17.8	21.1	24.3	26.9	0.95
					K_v	*2.09*	*3.72*	*5.54*	*7.59*	*9.95*	*12.6*	*15.4*	*18.3*	*21.0*	*23.3*	- - -
					X_T	0.648	0.682	0.712	0.693	0.664	0.678	0.701	0.732	0.756	0.799	- - -
2	58.7	2.3125	29	1.125	C_v	8.49	17.1	25.9	35.3	44.4	52.9	59.2	62.0	63.9	65.3	0.91
					K_v	*7.34*	*14.8*	*22.4*	*30.5*	*38.4*	*45.8*	*51.2*	*53.6*	*55.3*	*56.5*	- - -
					X_T	0.618	0.635	0.689	0.710	0.723	0.732	0.742	0.759	0.761	0.762	- - -
	33.3 (3)	1.3125 (3)	19	0.75	C_v	2.22	4.11	6.06	8.25	11.0	14.3	18.0	21.8	26.0	30.9	0.91
					K_v	*1.92*	*3.56*	*5.24*	*7.14*	*9.52*	*12.4*	*15.6*	*18.9*	*22.5*	*26.7*	- - -
					X_T	0.725	0.694	0.729	0.746	0.688	0.675	0.667	0.686	0.711	0.722	- - -
2.5	73.0	2.875	38	1.5	C_v	10.4	22.2	34.9	47.1	58.2	66.6	73.7	79.3	84.4	86.5	0.93
					K_v	*9.00*	*19.2*	*30.2*	*40.7*	*50.3*	*57.6*	*63.8*	*68.6*	*73.0*	*74.8*	- - -
					X_T	0.672	0.727	0.739	0.776	0.783	0.832	0.858	0.877	0.854	0.866	- - -
	47.6 (3)	1.875 (3)	19	0.75	C_v	3.50	6.85	10.8	14.8	18.9	23.3	28.2	34.1	41.1	48.6	0.93
					K_v	*3.03*	*5.93*	*9.34*	*12.8*	*16.3*	*20.2*	*24.4*	*29.5*	*35.6*	*42.0*	- - -
					X_T	0.617	0.627	0.679	0.716	0.740	0.752	0.783	0.774	0.778	0.783	- - -
3	87.3	3.4375	38	1.5	C_v	15.3	34.3	52.8	71.4	87.8	101	112	121	129	135	0.89
					K_v	*13.2*	*29.7*	*45.7*	*61.8*	*75.9*	*87.4*	*96.9*	*105*	*112*	*117*	- - -
					X_T	0.607	0.631	0.663	0.694	0.720	0.742	0.762	0.786	0.771	0.751	- - -
	58.7 (3)	2.3125 (3)	29	1.125	C_v	6.39	13.0	20.7	29.1	38.2	47.9	58.0	68.4	79.3	88.8	0.91
					K_v	*5.53*	*11.2*	*17.9*	*25.2*	*33.0*	*41.4*	*50.2*	*59.2*	*68.6*	*76.8*	- - -
					X_T	0.662	0.677	0.704	0.677	0.648	0.646	0.643	0.658	0.714	0.742	- - -

-continued-

Table 18. Design ES, Class 125 to 600, Linear Cage (continued)

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
4	111.1	4.375	51	2	C_v	23.7	46.4	72.9	98.2	122	145	165	183	199	212	0.89
					K_v	*20.5*	*40.1*	*63.1*	*84.9*	*106*	*125*	*143*	*158*	*172*	*183*	- - -
					X_T	0.553	0.619	0.644	0.680	0.713	0.737	0.743	0.823	0.816	0.791	- - -
	73.0 (3)	2.875 (3)	38	1.5	C_v	10.6	22.5	35.0	47.5	60.2	73.1	88.0	103	120	139	0.93
					K_v	*9.17*	*19.5*	*30.3*	*41.1*	*52.1*	*63.2*	*76.1*	*89.1*	*104*	*120*	- - -
					X_T	0.613	0.671	0.698	0.718	0.718	0.731	0.722	0.751	0.769	0.780	- - -
6	177.8	7	51	2	C_v	55.0	118	180	235	280	312	341	368	390	417	0.81
					K_v	*47.6*	*102*	*156*	*203*	*242*	*270*	*295*	*318*	*337*	*361*	- - -
					X_T	0.597	0.683	0.701	0.687	0.767	0.791	0.787	0.792	0.794	0.745	- - -
	111.1 (3)	4.375 (3)	51	2	C_v	15.7	35.8	60.2	86.2	115	146	179	215	247	271	0.89
					K_v	*13.6*	*31.0*	*52.1*	*74.6*	*99.5*	*126*	*180*	*186*	*214*	*234*	- - -
					X_T	0.678	0.668	0.676	0.683	0.668	0.645	0.668	0.695	0.759	0.817	- - -
8[2]	203.2	8	51	2	C_v	66.6	147	221	292	375	450	522	592	652	701	0.84
					K_v	*57.6*	*127*	*191*	*253*	*324*	*389*	*452*	*512*	*564*	*606*	- - -
					X_T	0.758	0.588	0.597	0.637	0.640	0.676	0.702	0.720	0.738	0.757	- - -
8	203.2	8	76	3	C_v	100	213	330	451	553	648	719	773	809	836	0.85
					K_v	*86.5*	*184*	*285*	*390*	*478*	*561*	*622*	*669*	*700*	*723*	- - -
					X_T	0.616	0.624	0.669	0.691	0.738	0.747	0.762	0.780	0.787	0.799	- - -

1. At 100% travel.
2. If coefficients listed above for the 8 inch linear cage with 51 mm (2 inch) travel are not sufficient for your application, consider using the quick opening cage. The 8 inch quick opening cage with 51 mm (2 inch) travel has approximately a linear characteristic.
3. Restricted trim.

Table 19. Design ES, Class 125 to 600, Equal Percentage Cage

Equal Percentage - Flow Up

Equal Percentage Characteristic

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1 & 1.25	33.3	1.3125	19	0.75	C_v	0.783	1.29	1.86	2.71	4.18	6.44	9.54	13.1	15.7	17.4	0.95
					K_v	*0.677*	*1.12*	*1.61*	*2.34*	*3.62*	*5.57*	*8.25*	*11.3*	*13.6*	*15.1*	- - -
					X_T	0.754	0.794	0.763	0.670	0.652	0.621	0.630	0.677	0.718	0.721	- - -
1.5	47.6	1.875	19	0.75	C_v	1.54	2.52	3.57	4.94	7.41	11.6	17.2	23.5	28.7	33.4	0.94
					K_v	*1.33*	*2.18*	*3.09*	*4.27*	*6.41*	*10.0*	*14.9*	*20.3*	*24.8*	*28.9*	- - -
					X_T	0.674	0.670	0.694	0.731	0.706	0.681	0.698	0.692	0.789	0.793	- - -
	33.3 (2)	1.3125 (2)	19	0.75	C_v	0.882	1.35	1.89	2.52	3.68	5.52	8.13	12.0	16.6	21.0	0.96
					K_v	*0.763*	*1.17*	*1.63*	*2.18*	*3.18*	*4.77*	*7.03*	*10.4*	*14.4*	*18.2*	- - -
					X_T	0.858	0.845	0.867	0.810	0.833	0.755	0.776	0.766	0.766	0.766	- - -
2	58.7	2.3125	29	1.125	C_v	1.74	3.15	4.72	6.91	10.6	16.3	25.0	36.7	47.8	56.2	0.92
					K_v	*1.51*	*2.72*	*4.08*	*5.98*	*9.17*	*14.1*	*21.6*	*31.7*	*41.3*	*48.6*	- - -
					X_T	0.863	0.848	0.849	0.805	0.782	0.778	0.792	0.772	0.847	0.848	- - -
	33.3 (2)	1.3125 (2)	19	0.75	C_v	0.849	1.34	1.83	2.39	3.43	5.12	7.49	11.2	15.8	20.8	0.91
					K_v	*0.734*	*1.16*	*1.58*	*2.07*	*2.97*	*4.43*	*6.48*	*9.69*	*13.7*	*18.0*	- - -
					X_T	0.844	0.778	0.803	0.767	0.791	0.764	0.764	0.764	0.755	0.728	- - -
2.5	73.0	2.875	38	1.5	C_v	4.05	7.19	10.6	14.5	21.2	31.6	45.5	64.2	77.7	82.7	0.93
					K_v	*3.50*	*6.22*	*9.17*	*12.5*	*18.3*	*27.3*	*39.4*	*55.5*	*67.2*	*71.5*	- - -
					X_T	0.747	0.768	0.745	0.779	0.764	0.744	0.783	0.802	0.841	0.878	- - -
	47.6 (2)	1.875 (2)	19	0.75	C_v	1.43	2.37	3.34	4.76	7.25	11.3	17.3	24.2	31.8	40.3	0.95
					K_v	*1.24*	*2.05*	*2.89*	*4.12*	*6.27*	*9.77*	*15.0*	*20.9*	*27.5*	*34.9*	- - -
					X_T	0.664	0.721	0.741	0.765	0.679	0.681	0.678	0.681	0.748	0.744	- - -
3	87.3	3.4375	38	1.5	C_v	4.05	6.84	10.0	15.0	23.8	37.8	59.0	87.1	110	121	0.89
					K_v	*3.50*	*5.92*	*8.65*	*13.0*	*20.6*	*32.7*	*51.0*	*75.3*	*95.2*	*105*	- - -
					X_T	0.768	0.757	0.761	0.757	0.758	0.571	0.754	0.756	0.758	0.757	- - -
	58.7 (2)	2.3125 (2)	29	1.125	C_v	2.74	3.44	4.86	6.95	10.6	16.5	25.0	37.7	52.7	67.5	0..94
					K_v	*2.37*	*2.98*	*4.20*	*6.01*	*9.17*	*14.3*	*21.6*	*32.6*	*45.6*	*58.4*	- - -
					X_T	0.753	0.748	0.756	0.783	0.786	0.741	0.736	0.732	0.737	0.738	- - -
4	111.1	4.375	51	2	C_v	6.56	11.4	17.3	27.0	42.2	66.4	103	146	184	203	0.91
					K_v	*5.67*	*9.86*	*15.0*	*23.4*	*36.5*	*57.4*	*89.1*	*126*	*159*	*176*	- - -
					X_T	0.722	0.717	0.739	0.772	0.738	0.718	0.718	0.736	0.792	0.822	- - -
	73.0 (2)	2.875 (2)	38	1.5	C_v	3.96	7.14	10.6	14.5	21.1	31.7	48.0	69.7	95.6	121	0.94
					K_v	*3.43*	*6.18*	*9.17*	*12.5*	*18.3*	*27.4*	*41.5*	*60.3*	*82.7*	*105*	- - -
					X_T	0.792	0.803	0.770	0.767	0.760	0.725	0.703	0.717	0.763	0.764	- - -

-continued-

Table 19. Design ES, Class 125 to 600, Equal Percentage Cage (continued)

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
6	177.8	7	51	2	C_v	13.2	24.6	41.1	62.5	97.1	155	223	286	326	357	0.86
					K_v	*11.4*	*21.3*	*35.6*	*54.1*	*84.0*	*134*	*193*	*247*	*282*	*309*	- - -
					X_T	0.723	0.737	0.767	0.846	0.803	0.781	0.808	0.826	0.847	0.816	- - -
	111.1 (2)	4.375 (2)	51	2	C_v	4.96	9.02	14.0	24.2	39.4	60.8	94.6	144	199	233	0.91
					K_v	*4.29*	*7.80*	*12.1*	*20.9*	*34.1*	*52.6*	*81.8*	*125*	*172*	*202*	- - -
					X_T	0.842	0.792	0.778	0.709	0.723	0.739	0.729	0.706	0.719	0.806	- - -
8	203.2	8	51	2	C_v	18.8	33.6	53.6	79.8	114	168	242	345	467	570	0.85
					K_v	*16.3*	*29.1*	*46.4*	*69.0*	*98.6*	*145*	*209*	*298*	*404*	*493*	- - -
					X_T	0.874	0.865	0.769	0.748	0.731	0.697	0.712	0.707	0.697	0.694	- - -
	203.2	8	76	3	C_v	25.9	53.3	97.8	178	299	461	618	727	768	808	0.85
					K_v	*22.4*	*46.1*	*84.6*	*154*	*259*	*399*	*535*	*629*	*664*	*699*	- - -
					X_T	0.825	0.728	0.681	0.616	0.678	0.716	0.735	0.793	0.825	0.827	- - -

1. At 100% travel.
2. Restricted trim.

Table 20. Design ES, Class 125 to 600, Whisper Trim® I Cage, Flow Up through the Port

Whisper Trim I

Linear Characteristic

Valve Size,(1) Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel									
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100
1 & 1.25	33.3	1.3125	19	0.75	C_v	3.16	6.97	11.8	15.1	16.5	17.2	17.3	17.4	17.4	18.4
					K_v	*2.73*	*6.03*	*10.2*	*13.1*	*14.3*	*14.9*	*15.0*	*15.1*	*15.1*	*15.9*
					X_T	0.828	0.747	0.553	0.570	0.645	0.667	0.686	0.694	0.709	0.678
1.5	47.6	1.875	19	0.75	C_v	3.42	8.78	14.6	22.2	27.7	31.6	34.0	35.1	36.0	37.2
					K_v	*2.96*	*7.59*	*12.6*	*19.2*	*24.0*	*27.3*	*29.4*	*30.4*	*31.1*	*32.2*
					X_T	0.635	0.649	0.594	0.455	0.457	0.504	0.563	0.625	0.648	0.640
	33.3 (2)	1.3125 (2)	19	0.75	C_v	2.84	6.74	11.3	17.4	22.1	25.6	27.7	28.7	29.1	29.3
					K_v	*2.46*	*5.83*	*9.77*	*15.1*	*19.1*	*22.1*	*24.0*	*24.8*	*25.2*	*25.3*
					X_T	0.669	0.709	0.563	0.424	0.401	0.428	0.487	0.569	0.661	0.711
2	58.7	2.3125	29	1.125	C_v	8.27	21.8	35.3	47.3	55.1	60.2	63.2	65.3	66.8	67.8
					K_v	*7.15*	*18.9*	*30.5*	*40.9*	*47.7*	*52.1*	*54.7*	*56.5*	*57.8*	*58.6*
					X_T	0.647	0.411	0.347	0.352	0.409	0.499	0.577	0.622	0.647	0.656
	33.3 (2)	1.3125 (2)	19	0.75	C_v	3.62	7.07	12.2	18.4	23.3	27.6	31.1	34.0	35.8	37.0
					K_v	*3.13*	*6.12*	*10.6*	*15.9*	*20.2*	*23.9*	*26.9*	*29.4*	*31.0*	*32.0*
					X_T	0.620	0.769	0.559	0.420	0.390	0.396	0.408	0.440	0.475	0.494
2.5	73.0	2.875	38	1.5	C_v	12.8	33.9	55.0	70.6	80.0	85.4	88.5	90.3	91.1	91.7
					K_v	*11.1*	*29.3*	*47.6*	*61.1*	*69.2*	*73.9*	*76.6*	*78.1*	*78.8*	*79.3*
					X_T	0.766	0.476	0.377	0.388	0.460	0.540	0.590	0.631	0.660	0.669
	47.6 (2)	1.875 (2)	19	0.75	C_v	3.07	8.65	15.3	23.4	31.2	36.8	43.4	48.3	52.1	55.8
					K_v	*2.66*	*7.48*	*13.2*	*20.2*	*27.0*	*31.8*	*37.5*	*41.8*	*45.1*	*48.3*
					X_T	0.766	0.766	0.613	0.450	0.384	0.389	0.380	0.399	0.420	0.428
3	87.3	3.4375	38	1.5	C_v	11.1	36.0	60.3	81.9	99.6	111	119	124	128	131
					K_v	*9.60*	*31.1*	*52.2*	*70.8*	*86.2*	*96.0*	*103*	*107*	*111*	*113*
					X_T	0.766	0.649	0.451	0.415	0.416	0.469	0.522	0.566	0.595	0.603
	58.7 (2)	2.3125 (2)	29	1.125	C_v	6.63	18.1	30.8	43.4	56.1	67.1	77.8	87.2	95.9	102
					K_v	*5.73*	*15.7*	*26.6*	*37.5*	*48.5*	*58.0*	*67.3*	*75.4*	*83.0*	*88.2*
					X_T	0.766	0.662	0.483	0.424	0.395	0.387	0.385	0.387	0.395	0.397
4	111.1	4.375	51	2	C_v	25.1	56.5	85.6	111	128	139	147	151	208	211
					K_v	*21.7*	*48.9*	*74.0*	*96.0*	*111*	*120*	*127*	*131*	*180*	*183*
					X_T	1.222	0.807	0.683	0.680	0.786	0.909	1.017	1.109	0.635	0.645
	73.0 (2)	2.875 (2)	38	1.5	C_v	12.8	33.9	56.6	76.4	96.3	114	130	143	156	164
					K_v	*11.1*	*29.3*	*49.0*	*66.1*	*83.3*	*98.6*	*112*	*124*	*135*	*142*
					X_T	0.766	0.471	0.350	0.332	0.317	0.325	0.331	0.349	0.361	0.377
6	177.8	7	51	2	C_v	54.1	114	174	231	281	319	349	369	387	401
					K_v	*46.8*	*98.6*	*151*	*200*	*243*	*276*	*302*	*319*	*335*	*347*
					X_T	0.407	0.453	0.409	0.367	0.383	0.419	0.450	0.487	0.514	0.532
8	203.2	8	76	3	C_v	84.6	229	360	462	531	607	660	695	712	735
					K_v	*73.2*	*198*	*311*	*400*	*459*	*525*	*571*	*601*	*616*	*636*
					X_T	0.729	0.409	0.346	0.354	0.410	0.451	0.507	0.560	0.602	0.633
			29	4	C_v	132	318	464	566	641	693	724	742	760	773
					K_v	*114*	*275*	*401*	*490*	*554*	*599*	*626*	*642*	*657*	*669*
					X_T	0.499	0.358	0.371	0.422	0.482	0.542	0.604	0.659	0.682	0.675

1. 6-inch E-body with restricted Whisper Trim not available. Use EW body where this trim is desired.
2. Restricted trim.

Table 21. Design ES, Class 125 to 600, Whisper Trim® III Cage, Flow Up through the Port

Whisper Trim III

Linear Characteristic(1)

Valve Size,(2) Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										X_T(3)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
A3 $\Delta P/P_1 \leq 0.6$																
6	136.5	5.375	76	3	C_v	4.67(4)	74.0	111	147	183	219	254	288	322	353	0.563
					K_v	*4.04*	*64.0*	*96.0*	*127*	*158*	*189*	*220*	*249*	*279*	*305*	- - -
B3 $\Delta P/P_1 \leq 0.75$																
6	136.5	5.375	76	3	C_v	4.67(4)	41.3	61.7	82.3	103	123	144	164	184	203	0.563
					K_v	*4.04*	*35.7*	*53.4*	*71.2*	*89.1*	*106*	*125*	*142*	*159*	*176*	- - -
C3 $\Delta P/P_1 \leq 0.85$																
6	136.5	5.375	76	3	C_v	4.67(4)	28.0	41.3	55.3	69.3	83.0	97.0	110	124	138	0.563
					K_v	*4.04*	*24.2*	*35.7*	*47.8*	*59.9*	*71.8*	*83.9*	*95.2*	*107*	*119*	- - -
D3 $\Delta P/P_1 \leq 0.99$																
6	136.5	5.375	76	3	C_v	4.67(4)	6.67	9.50	19.9	31.4	46.0	61.0	75.7	89.7	104	0.563
					K_v	*4.04*	*5.77*	*8.22*	*17.2*	*27.2*	*39.8*	*52.8*	*65.5*	*77.6*	*90.0*	- - -

1. Level D exhibits an equal percentage characteristic for the first 38 mm (1.5 inches) of travel, then linear characteristic.
2. 6-inch E-body with restricted Whisper Trim not available. Use EW body where this trim is desired.
3. This column lists XT factors for Whisper Trim III cages at 100% travel.
4. This coefficient is minimum rather than 10% open. Valves should not be required to throttle at less than the specified minimum coefficient for an extended period of time. Erosion damage to the valve may result.

Table 22. Design EAS, Quick Opening Cage, Flow Up

Quick Opening

Quick Opening Characteristic

Valve Size, Inches	Port Diameter		Maximum Travel(1)		Flow Coefficient	Coeffs. for 6 mm (0.25 in) Travel(2)	Valve Opening—Percent of Total Travel										F_L(3)
	mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100	
1	33.3	1.3125	19	0.75	C_v	15.6	4.90	9.94	14.3	17.9	20.5	22.3	23.3	23.6	23.8	23.9	0.90
					K_v	*13.5*	*4.24*	*8.60*	*12.4*	*15.5*	*17.7*	*19.3*	*20.2*	*20.4*	*20.6*	*20.7*	- - -
					X_T	0.719	0.726	0.736	0.722	0.709	0.670	0.646	0.625	0.614	0.607	0.604	- - -
2	47.6	1.875	19	0.75	C_v	29.2	7.90	16.4	25.8	35.9	44.8	53.3	59.9	64.2	67.2	69.9	0.81
					K_v	*25.3*	*6.83*	*14.2*	*22.3*	*31.1*	*38.8*	*46.1*	*51.8*	*55.5*	*58.1*	*60.5*	- - -
					X_T	0.648	0.601	0.631	0.645	0.641	0.646	0.628	0.622	0.631	0.622	0.602	- - -
	33.3 (4)	1.3125 (4)	19	0.75	C_v	16.7	5.43	10.2	15.1	20.3	26.1	31.4	35.2	37.5	39.2	40.5	0.87
					K_v	*14.4*	*4.70*	*8.82*	*13.1*	*17.6*	*22.6*	*27.2*	*30.4*	*32.4*	*33.9*	*35.0*	- - -
					X_T	0.632	0.591	0.631	0.632	0.621	0.638	0.673	0.739	0.786	0.763	0.726	- - -
3	73.0	2.875	38	1.5	C_v	38.8	24.5	47.3	79.1	106	125	139	154	168	177	184	0.90
					K_v	*33.6*	*21.2*	*40.9*	*68.4*	*91.7*	*108*	*120*	*133*	*145*	*153*	*159*	- - -
					X_T	0.638	0.630	0.637	0.619	0.693	0.729	0.705	0.641	0.596	0.569	0.563	- - -
	47.6 (4)	1.875 (4)	19	0.75	C_v	29.7	7.34	15.9	26.8	36.4	45.3	53.7	60.7	66.6	71.8	76.5	0.97
					K_v	*25.7*	*6.35*	*13.8*	*23.2*	*31.5*	*39.2*	*46.5*	*52.5*	*57.6*	*62.1*	*66.2*	- - -
					X_T	0.568	0.598	0.594	0.561	0.571	0.623	0.664	0.713	0.778	0.820	0.819	- - -
4	87.3	3.4375	38	1.5	C_v	37.5	23.8	46.3	79.6	116	150	176	197	217	233	245	0.79
					K_v	*32.4*	*20.6*	*40.0*	*68.9*	*100*	*130*	*152*	*170*	*188*	*202*	*212*	- - -
					X_T	0.608	0.594	0.604	0.621	0.646	0.632	0.619	0.613	0.605	0.593	0.590	- - -
	58.7 (4)	2.3125 (4)	29	1.125	C_v	31.5	14.2	28.4	45.2	63.2	80.6	96.1	109	119	129	135	0.81
					K_v	*27.2*	*12.3*	*24.6*	*39.1*	*54.7*	*69.7*	*83.1*	*94.3*	*103*	*112*	*117*	- - -
					X_T	0.624	0.622	0.623	0.617	0.626	0.665	0.706	0.740	0.771	0.666	0.625	- - -
6	111.1	4.375	51	2	C_v	51.1	40.0	84.3	138	194	246	293	340	378	403	409	0.78
					K_v	*44.2*	*34.6*	*72.9*	*119*	*168*	*213*	*253*	*294*	*327*	*349*	*354*	- - -
					X_T	0.582	0.581	0.585	0.587	0.584	0.582	0.583	0.585	0.578	0.582	0.584	- - -
	73.0 (4)	2.875 (4)	38	1.5	C_v	36.5	21.3	45.3	71.4	98.9	123	142	159	175	186	192	0.81
					K_v	*31.6*	*18.4*	*39.2*	*61.8*	*85.5*	*106*	*123*	*138*	*151*	*161*	*166*	- - -
					X_T	0.721	0.720	0.722	0.718	0.717	0.718	0.723	0.718	0.715	0.731	0.719	- - -

1. When using Type 655-EAS as a control valve for on-off service, the maximum travel for sizing purposes is 19 mm (0.75 in.).
2. When sizing self-operated regulators, use coefficients listed for 6 mm (0.25 in.) travel.
3. At 100% travel.
4. Restricted trim.

Table 23. Design EAS, Linear Cage, Flow Up

Linear

Linear Characteristic

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	33.3	1.3125	19	0.75	C_v	3.97	6.17	8.40	10.7	12.9	15.3	17.9	20.3	22.3	24.2	0.92
					K_v	*3.43*	*5.34*	*7.27*	*9.26*	*11.2*	*13.2*	*15.5*	*17.6*	*19.3*	*20.9*	- - -
					X_T	0.712	0.697	0.699	0.704	0.734	0.730	0.693	0.644	0.609	0.577	- - -
2	47.6	1.875	19	0.75	C_v	5.20	6.97	11.0	15.2	19.6	24.5	30.3	36.7	42.8	49.1	0.85
					K_v	*4.50*	*6.03*	*9.52*	*13.1*	*17.0*	*21.2*	*26.2*	*31.7*	*37.0*	*42.5*	- - -
					X_T	0.584	0.600	0.618	0.660	0.658	0.664	0.669	0.679	0.698	0.697	- - -
	33.3 (2)	1.3125 (2)	19	0.75	C_v	2.45	4.35	6.44	8.80	11.8	15.4	19.4	23.6	28.1	32.7	0.89
					K_v	*2.11*	*3.76*	*5.57*	*7.61*	*10.2*	*13.3*	*16.8*	*20.4*	*24.3*	*28.3*	- - -
					X_T	0.723	0.723	0.749	0.736	0.690	0.651	0.642	0.655	0.688	0.720	- - -
3	73.0	2.875	38	1.5	C_v	10.5	22.9	35.5	48.7	61.8	76.3	91.3	109	129	149	0.85
					K_v	*9.08*	*19.8*	*30.7*	*42.1*	*53.5*	*66.0*	*79.0*	*94.3*	*112*	*129*	- - -
					X_T	0.651	0.649	0.691	0.692	0.701	0.698	0.702	0.686	0.666	0.646	- - -
	47.6 (2)	1.875 (2)	19	0.75	C_v	3.62	6.94	10.7	14.9	19.0	23.9	28.9	34.9	42.4	51.0	0.92
					K_v	*3.13*	*6.00*	*9.26*	*12.9*	*16.4*	*20.7*	*25.0*	*30.2*	*36.7*	*44.1*	- - -
					X_T	0.506	0.634	0.723	0.673	0.723	0.704	0.722	0.739	0.721	0.703	- - -
4	87.3	3.4375	38	1.5	C_v	12.9	28.6	45.5	67.8	88.4	108	129	151	174	196	0.81
					K_v	*11.2*	*24.7*	*39.4*	*58.6*	*76.5*	*93.4*	*112*	*131*	*151*	*170*	- - -
					X_T	0.616	0.648	0.661	0.676	0.687	0.698	0.688	0.672	0.661	0.656	- - -
	58.7 (2)	2.3125 (2)	29	1.125	C_v	6.84	13.9	22.1	31.2	40.9	51.3	62.0	73.2	84.8	95.0	0.87
					K_v	*5.92*	*12.0*	*19.1*	*27.0*	*35.4*	*44.4*	*53.6*	*63.3*	*73.4*	*82.2*	- - -
					X_T	0.647	0.661	0.688	0.655	0.631	0.623	0.625	0.644	0.696	0.723	- - -
6	111.1	4.375	51	2	C_v	26.1	52.3	78.3	105	132	164	200	247	303	361	0.81
					K_v	*22.6*	*45.2*	*67.7*	*90.8*	*114*	*142*	*173*	*214*	*262*	*312*	- - -
					X_T	0.631	0.684	0.727	0.718	0.720	0.690	0.683	0.670	0.647	0.623	- - -
	73.0 (2)	2.875 (2)	38	1.5	C_v	10.5	22.7	35.1	48.0	60.8	74.7	89.6	107	128	150	0.90
					K_v	*9.08*	*19.6*	*30.4*	*41.5*	*52.6*	*64.6*	*77.5*	*92.6*	*111*	*130*	- - -
					X_T	0.675	0.708	0.731	0.757	0.767	0.769	0.772	0.772	0.772	0.771	- - -

1. At 100% travel.
2. Restricted trim.

Table 24. Design EAS, Equal Percentage Cage, Flow Up

Equal Percentage

Equal Percentage Characteristic

Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	33.3	1.3125	19	0.75	C_v	1.29	1.87	2.59	3.85	5.59	8.46	12.5	16.9	20.9	23.5	0.82
					K_v	*1.12*	*1.62*	*2.24*	*3.33*	*4.84*	*7.32*	*10.8*	*14.6*	*18.1*	*20.3*	- - -
					X_T	0.812	0.771	0.674	0.702	0.730	0.714	0.723	0.669	0.633	0.579	- - -
2	47.6	1.875	19	0.75	C_v	1.41	2.41	3.43	4.86	7.26	11.3	17.3	24.5	32.6	40.8	0.91
					K_v	*1.22*	*2.09*	*2.97*	*4.20*	*6.28*	*9.78*	*15.0*	*21.2*	*28.2*	*35.3*	- - -
					X_T	0.724	0.736	0.727	0.738	0.723	0.714	0.646	0.680	0.673	0.725	- - -
	33.3 (2)	1.3125 (2)	19	0.75	C_v	0.850	1.35	1.87	2.42	3.64	5.54	8.22	11.9	16.6	21.8	0.95
					K_v	*0.735*	*1.17*	*1.62*	*2.09*	*3.15*	*4.79*	*7.11*	*10.3*	*14.4*	*18.9*	- - -
					X_T	0.858	0.827	0.846	0.800	0.810	0.675	0.644	0.696	0.727	0.760	- - -
3	73.0	2.875	38	1.5	C_v	4.16	6.90	10.4	14.7	21.2	32.6	49.3	73.3	101	128	0.85
					K_v	*3.60*	*5.97*	*9.00*	*12.7*	*18.3*	*28.2*	*42.6*	*63.4*	*87.4*	*111*	- - -
					X_T	0.718	0.867	0.770	0.743	0.766	0.712	0.683	0.687	0.671	0.670	- - -
	47.6 (2)	1.875 (2)	19	0.75	C_v	1.48	2.44	3.47	4.87	7.31	10.9	16.7	24.5	33.0	41.3	0.91
					K_v	*1.28*	*2.11*	*3.00*	*4.21*	*6.32*	*9.43*	*14.4*	*21.2*	*28.5*	*35.7*	- - -
					X_T	0.713	0.737	0.747	0.780	0.749	0.744	0.733	0.704	0.720	0.749	- - -
4	87.3	3.4375	38	1.5	C_v	3.63	6.33	9.32	13.9	21.0	32.9	52.5	81.7	115	148	0.84
					K_v	*3.14*	*5.48*	*8.06*	*12.0*	*18.2*	*28.5*	*45.4*	*70.7*	*99.5*	*128*	- - -
					X_T	0.839	0.776	0.784	0.799	0.793	0.699	0.776	0.724	0.697	0.691	- - -
	58.7 (2)	2.3125 (2)	29	1.125	C_v	1.94	3.36	4.81	6.76	10.7	16.4	25.0	36.8	51.4	67.6	0.91
					K_v	*1.68*	*2.91*	*4.16*	*5.85*	*9.26*	*14.2*	*21.6*	*31.8*	*44.5*	*58.5*	- - -
					X_T	0.693	0.694	0.692	0.794	0.792	0.724	0.694	0.676	0.692	0.692	- - -
6	111.1	4.375	51	2	C_v	5.21	10.3	16.9	28.0	45.6	73.5	121	184	251	310	0.84
					K_v	*4.51*	*8.91*	*14.6*	*24.2*	*39.4*	*63.6*	*105*	*159*	*217*	*268*	- - -
					X_T	0.968	0.846	0.801	0.794	0.769	0.770	0.728	0.712	0.687	0.690	- - -
	73.0 (2)	2.875 (2)	38	1.5	C_v	4.12	7.27	10.5	14.6	21.4	32.1	47.9	71.3	97.0	126	0.90
					K_v	*3.56*	*6.29*	*9.08*	*12.6*	*18.5*	*27.8*	*41.4*	*61.7*	*83.9*	*109*	- - -
					X_T	0.728	0.763	0.772	0.790	0.778	0.774	0.778	0.750	0.777	0.776	- - -

1. At 100% travel.
2. Restricted trim.

Table 25. Design EAS, Whisper Trim® I Cage, Flow Up

Whisper Trim I														**Linear Characteristic**
Valve Size, Inches	**Port Diameter**		**Maximum Travel**		**Flow Coeffi-cient**	**Valve Opening—Percent of Total Travel**								
	mm	**Inches**	**mm**	**Inches**		**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
1	33.3	1.3125	19	0.75	C_v	2.30	5.62	8.95	12.5	15.6	17.6	20.7	22.8	24.5	25.5
					K_v	*1.99*	*4.86*	*7.74*	*10.8*	*13.5*	*15.2*	*17.9*	*19.7*	*21.2*	*22.1*
					X_T	0.351	0.377	0.395	0.423	0.419	0.448	0.448	0.467	0.484	0.498
2	47.6	1.875	19	0.75	C_v	4.77	10.6	18.8	26.9	33.2	39.2	44.0	48.8	52.9	56.1
					K_v	*4.13*	*9.17*	*16.3*	*23.3*	*28.7*	*33.9*	*38.1*	*42.2*	*45.8*	*48.5*
					X_T	0.794	0.635	0.409	0.341	0.335	0.339	0.363	0.372	0.383	0.384
3	73.0	2.875	38	1.5	C_v	12.8	33.9	56.6	76.4	96.3	114	130	143	156	164
					K_v	*11.1*	*29.3*	*49.0*	*66.1*	*83.3*	*98.6*	*112*	*124*	*135*	*142*
					X_T	0.638	0.471	0.350	0.332	0.317	0.326	0.331	0.349	0.361	0.377
4	87.3	3.4375	38	1.5	C_v	19.2	49.3	77.6	105	130	153	175	193	209	223
					K_v	*16.6*	*42.6*	*67.1*	*90.8*	*112*	*132*	*151*	*167*	*181*	*193*
					X_T	0.478	0.402	0.371	0.324	0.317	0.336	0.348	0.364	0.385	0.394
6	111.1	4.375	51	2	C_v	31.7	77.5	123	173	214	242	286	313	341	352
					K_v	*27.4*	*67.0*	*106*	*150*	*185*	*209*	*247*	*271*	*295*	*304*
					X_T	0.292	0.318	0.350	0.318	0.320	0.347	0.347	0.377	0.377	0.389

Specifications

Available Configurations

Design ES: Single-port, globe-style control valve with cage guiding, unbalanced valve plug, and push-down-to-close valve plug action (figures 1 and 2).
Design EAS: Angle version of Design ES control valve, used to facilitate piping or in applications where a self-draining valve is desired (figure 3).

Valve Sizes

See table 3

End Connection Styles(1)(2)

Cast Iron Valves.
Flanged: Design ES, 1- through 8-inch, including 1.5 and 2.5 inch (except 1.25 inch), Class ■ 125 flat-face or ■ 250 raised-face flanges per ASME B16.1
Screwed: Design ES, 0.5 through 2-inch, consistent with ASME B16.4
Steel and Stainless Steel Valves.
Flanged: Class ■ 150, 300, or 600 raised-face (RF) or ring-type joint (RTJ) flanges per ASME B16.5
Screwed or Socket Welding: 0.5 through 2-inch, consistent with ASME B16.11
Buttwelding: 1- through 8-inch (except 1.25 inch). Schedules 40 or 80 consistent with ASME B16.25

Maximum Inlet Pressures and Temperatures(1)(2)

As listed below, unless limited by maximum pressure drop or material temperature capabilities
Cast Iron Valves.
Flanged: Consistent with Class 125B or 250B per ASME B16.1
Screwed: Consistent with flanged Class 250 per ASME B16.4
Steel and Stainless Steel Valves.
Flanged: Consistent with Class 150, 300, and 600(3) per ASME B16.34
Screwed or Welding: Consistent with flanged Class 600(3) per ASME B16.34

Maximum Pressure Drop(2)

Same as maximum inlet pressure for specific construction defined above, except where further limited as shown in figures 6 and 7.
Valves for NACE MR0175-2002: See figure 6

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

Metal Seating: Class IV is standard. Class V is optional
PTFE Composition Seating: Class VI

Construction Materials

Body, Bonnet, and Bonnet Spacer or Bottom Flange, if used: ■ Cast iron (except Design EAS), ■ WCC carbon steel,■ 316 stainless steel, ■ LCC carbon steel, ■ WC9 chrome moly steel, or ■ other materials upon request
Valve Plug, Cage, and Metal Seating Parts: See table 4.
All Other Parts: See table 8

Material Temperature Capabilities(2)

Body/Trim Combinations: See tables 4 and 5.
Those For NACE Specification: See tables 9 and 10.
All Other Parts: See table 8

Flow Characteristics

Standard Cages: ■ Quick-opening, ■ linear, or ■ equal percentage
Whisper Trim: Linear

Flow Directions

Design ES.
Standard Cage: Normally up
Whisper Trim Cages: Always up
Design EAS.
Standard Cage: Without liner, flow up or down; with liner, normally down
Whisper Trim Cages: Always up

Flow Coefficients and Noise Level Prediction

See table 7 and Fisher Catalog 12

Port Diameters and Maximum Valve Plug Travels

See table 11

- continued -

Specifications (continued)

Yoke Boss and Stem Diameters

See table 11

Typical Bonnet Styles

■ Plain or ■ extension. See figures 8 and 9 for standard dimensions. See table 6 for selection guidelines

■ ENVIRO-SEAL bellows seal bonnet. See figure 5 for view of ENVIRO-SEAL bellows seal bonnet. Also, see Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, for further information

Packing Arrangements

Standard Material: Single PTFE V-ring
ENVIRO-SEAL Packing: See figure 4.
ENVIRO-SEAL Packing Systems in vacuum service: Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. Do not reverse the ENVIRO-SEAL PTFE packing rings.

Also see Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves, for more information.

Approximate Weights

1 and 1.25 Inch Sizes: 14 kg (30 lb)
1.5 Inch Size: 20 kg (45 lb)
2 Inch Size: 39 kg (85 lb)
2.5 Inch Size: 45 kg (100 lb)
3 Inch Size: 57 kg (125 lb)
4 Inch Size: 77 kg (170 lb)
6 Inch Size: 159 kg (350 lb)
8 Inch Size: 408 kg (900 lb)

Additional Options

■ Lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leakoff service, ■ body drain plug, ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, and ■ Whisper Trim III cage for 6 inch Design ES body

1. DIN (or other) ratings and end connections can usually be supplied; consult your Emerson Process Management sales office.
2. The pressure/temperature limits in this bulletin, and any applicable standard limitations should not be exceeded.
3. Certain bonnet bolting material selections may require a Class 600 easy-e valve assembly to be derated. Contact your Emerson Process Management sales office for more information

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 (1/2), ■ 19.1 (3/4), ■ 25.4 (1), and ■ 31.8 (1-1/4) diameter valve stems

Maximum Pressure/Temperature Limits(1)

To Meet the EPA Fugitive Emission Standard of 100 PPM(2).
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full Class 300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite packing: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

PTFE Packing Systems:.
Packing Ring and Lower Wiper: PTFE V-ring(3)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring

Graphite ULF Packing Systems: Graphite rings
Duplex Packing Systems:.
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Guide Bushings: Carbon graphite
Packing Rings: Graphite composite
Packing Washer: PTFE
Anti-Extrusion Washer: Filled PTFE (not required for graphite or duplex packing)
Lantern Ring: S31600 (316 stainless steel) (not required for graphite packing)
Packing Box Flange: S31600
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

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