

Design ED, EAD, and EDR Sliding-Stem Control Valves

Design ED, EAD, and EDR single-port control valves shown in figures 1 through 4 have balanced valve plugs, cage guiding, and metal-to-metal seating for all general applications over a wide range of process pressure drops and temperatures. These general purpose, sliding-stem valves are used for either throttling or on-off control of a wide variety of liquids and gases.

The easy-e® Valve Family

Design ED, EAD, and EDR valves are part of the versatile **easy-e** family of industrial control valves from Fisher. **easy-e** valves share the following characteristics:

- Multiple trim material choices
- Trim temperature capability with standard metal seats to 427°C (800°F)
 - FGM gaskets
 - Interchangeable, restricted-capacity trims and full-size trims match variable process flow demands
 - 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
 - Noise in gaseous service may be attenuated by using Whisper Trim® I, Whisper Trim III (figure 10), and WhisperFlo™ cages (figure 12)
 - Optional constructions provide full compliance with National Association of Corrosion Engineers (NACE) recommendations. See page 16.
 - 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts)



W1916-3 / IL

Figure 1. Design ED Control Valve with Type 667 Actuator



Design ED

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Features

- **Compliance with the Clean Air Act**—Optional ENVIRO-SEAL packing systems (figure 7) provide a superior stem seal to prevent the loss of process fluid. The ENVIRO-SEAL packing systems feature PTFE, graphite, or duplex packing with live-loading for reduced packing maintenance.

- **Stable Control at High Pressure Drops**—Rugged cage guiding stabilizes the valve plug at all points during travel. Cage guiding reduces vibration and mechanical noise.

- **More Flow Capacity for Initial Investment**—Streamlined flow passages provide greater capacities. When compared to globe valves of the same line size by other manufacturers, the Design ED, EAD, and EDR provide more flow.

- **Balanced Valve Plug Construction**—Balanced valve plug construction permits use of smaller, lower-cost actuators from Fisher. Also, trim inventory costs are cut because dimensional standardization permits use of most standard **easy-e** trim parts.

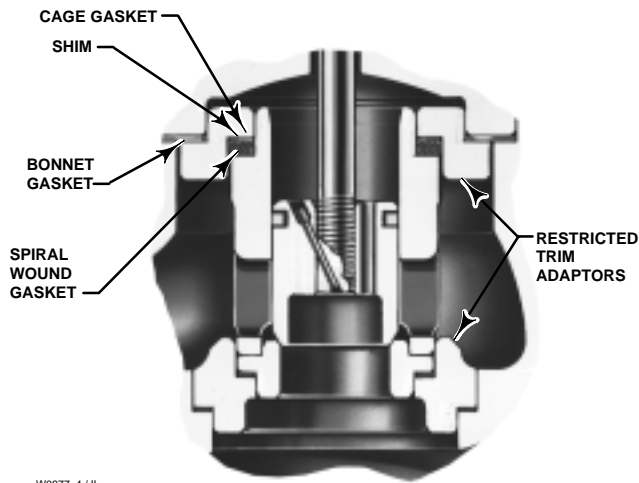
- **High-Temperature Capability with Class IV or Class V Shutoff**—Use of multiple graphite piston rings (figure 2) permit Class IV shutoff up to 593°C (1100°F). Use of C-seal trim (see figure 6) permits Class V shutoff up to 593°C (1100°F).

- **Compliance with European Standards**—Valves are available with dimensions specified by EN/DIN standards. See figure 14.

- **Sour Gas Service Capability**—Special trim and bolting materials are available for applications handling sour fluids and gases. These constructions comply with the recommendations of National Association of Corrosion Engineers (NACE) MR0175. Because of the care exercised by Fisher in procurement and manufacturing, **additional testing and documentation to assure compliance with the NACE standard is not required, in most cases.**

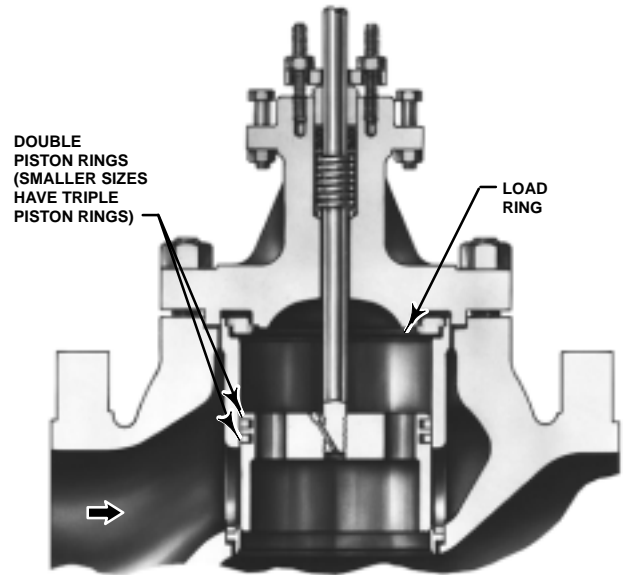
- **Operating Economy**—Increased wear resistance provided by standard hardened stainless steel trim means longer service life.

- **Maintenance Economy**—The valve body can stay in the pipeline during removal of trim parts. The Design EDR valve also features easy valve access without removing the actuator.



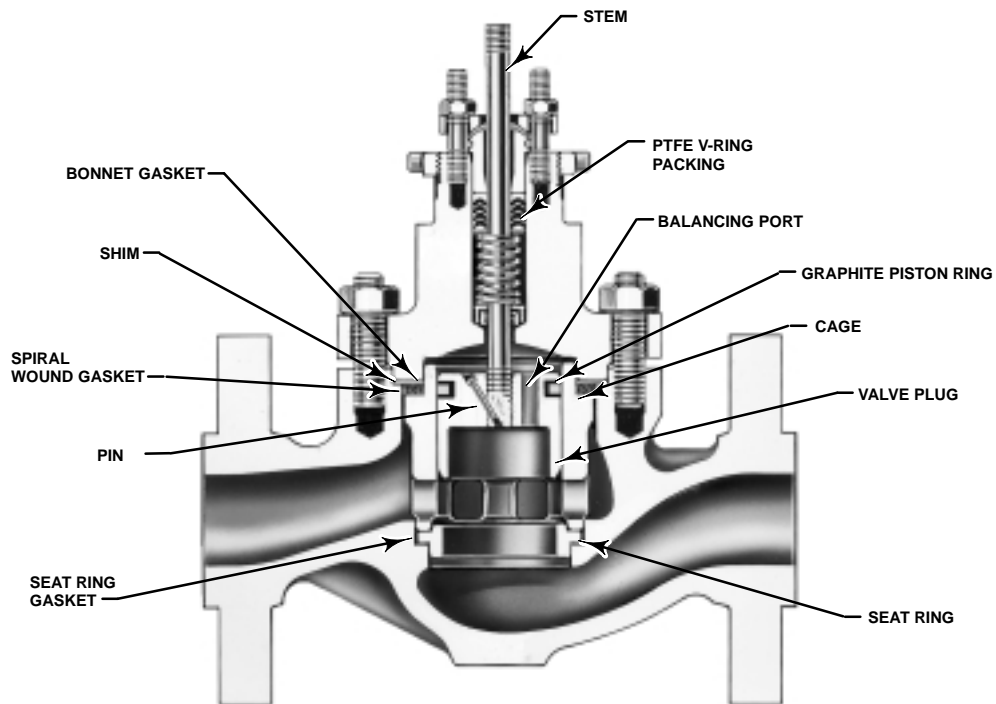
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RESTRICTED TRIM



W3362-1 / IL

8-INCH VALVE WITH OPTIONAL MULTIPLE PISTON RINGS FOR CLASS IV SHUTOFF (ALSO AVAILABLE IN OTHER SIZES)



W0451-4 / IL

STANDARD 1 THROUGH 6-INCH CONSTRUCTION

Figure 2. Design ED Sectional

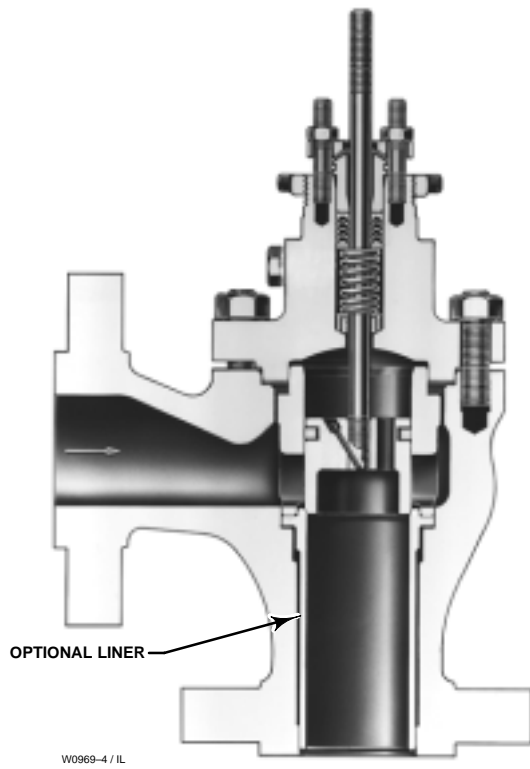


Figure 3. Design EAD Sectional

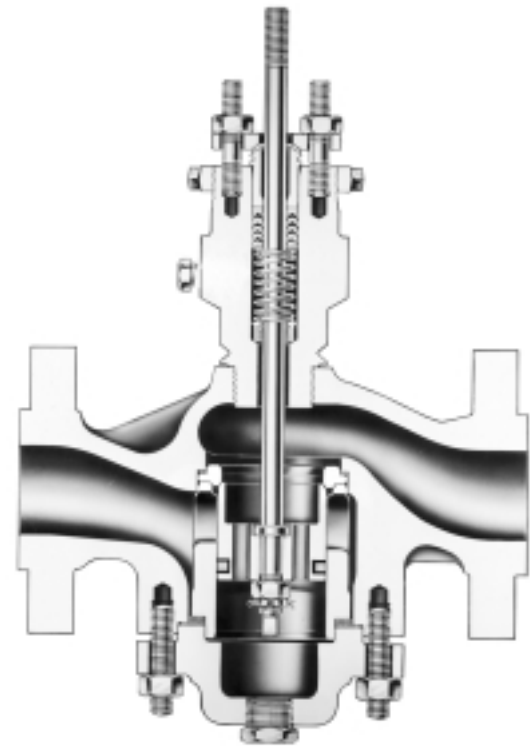


Figure 4. Design EDR Sectional

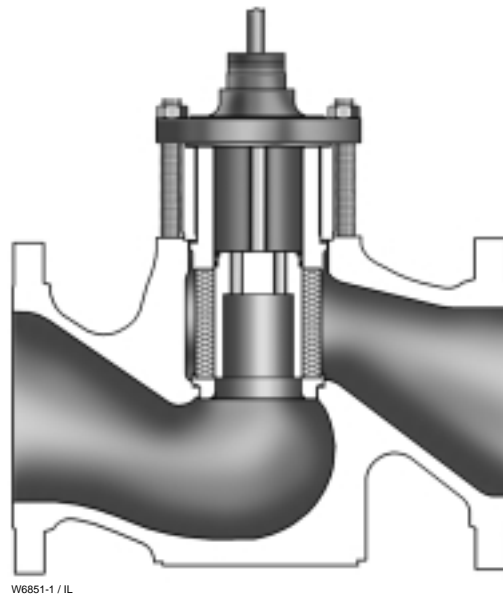


Figure 5. Typical Valve with WhisperFlo Aerodynamic Trim

Table 1. C-seal Shutoff Classification

VALVE DESIGN (CLASS)	VALVE SIZE		PORT DIAMETER		CAGE STYLE	ANSI LEAKAGE CLASS
	Inches	mm	mm	Inches		
Design ED (Class 150-600)	2-1/2	73	2-7/8		Eq. %, Linear, Whisper I, Cav III, 1 stage	V to 593°C (1100°F) [for port diameters from 73 through 203.2 mm (2-7/8 through 8-inch) with optional C-seal trim]
	3	87.3	3-7/16			
	3	73	2-7/8		Cav III, 2 stage	
	4	73	2-7/8			
	4	73	2-7/8	4-3/8	Eq. %, Linear, Whisper I, Cav III, 1 stage	
	6	136.5	5-3/8		Whisper III (A3, B3, C3, D3), Cav III, 2 stage	
		177.8	7		Eq. %, Linear, Whisper I, Cav III, 1 stage	
	8	177.8	7		Cav III, 2 stage	
203.2		8		Eq. %, Linear, Whisper I, Cav III, 1 stage		

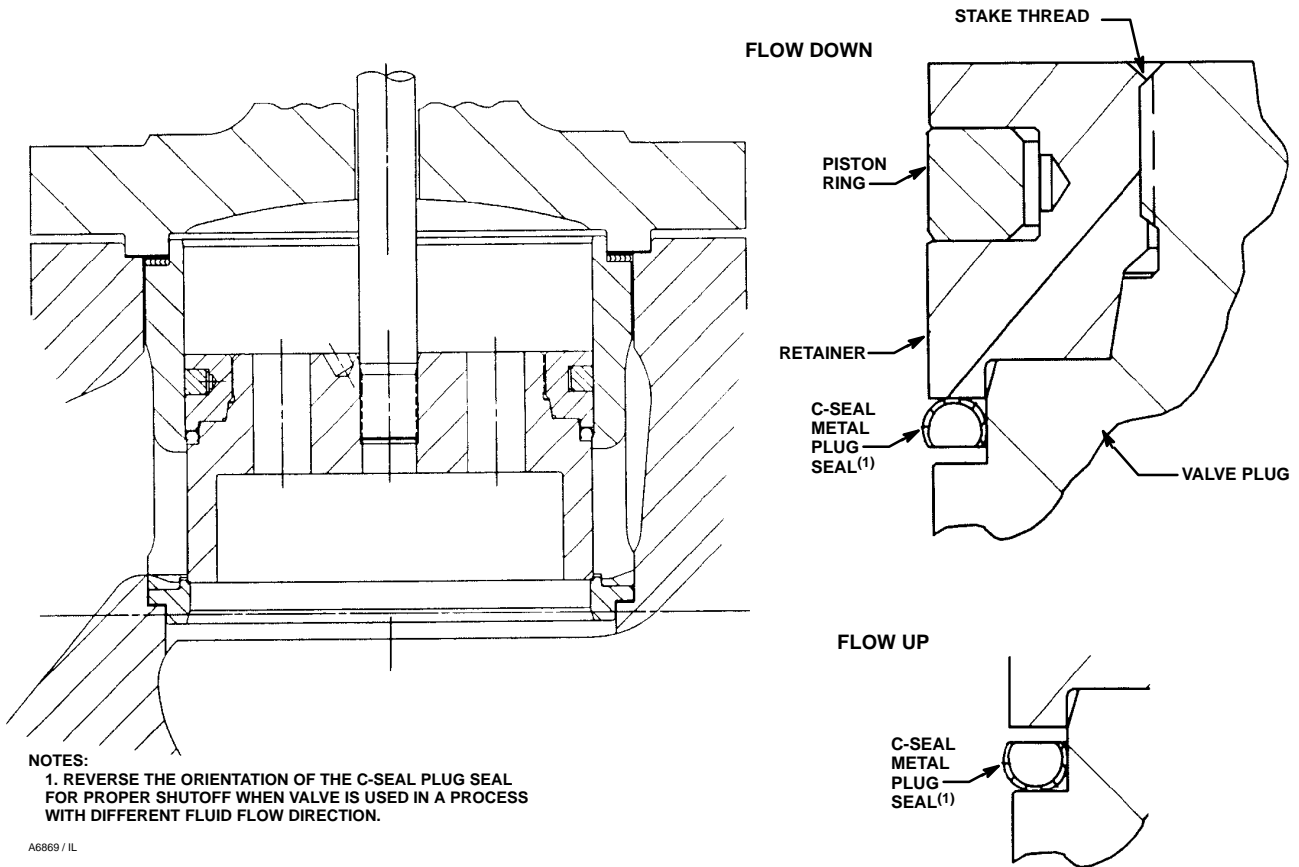


Figure 6. C-seal Trim

Design ED

Table 2. Available Constructions

DESIGN	VALVE SIZE, INCH	VALVE 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							
ED	1, 1-1/2, or 2	X	X	X	X	X	X	X	X	X
	1-1/4	X	---	---	---	---	---	X	---	---
	2-1/2, 3, 4, 6, or 8	---	X	X	X	X	---	---	X	X
EAD	1 or 2	---	X	X	X	X	---	---	---	---
	3, 4, or 6	---	X	X	X	X	---	---	---	---
EDR	1, 1-1/2, or 2	X	X	X	X	X	X	X	X	X
	1-1/4	X	---	---	---	---	---	X	---	---
	2-1/2, 3, or 4	---	X	X	X	X	---	---	X	X

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

C-seal Trim Description

C-seal trim is available for valves with port diameters from 2-7/8 inches through 8 inches.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy, Inconel 718) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

ENVIRO-SEAL and HIGH-SEAL Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer exceptional 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 longer operational life and reliability of these systems also reduces your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, Fisher offers the unique ENVIRO-SEAL packing system (figure 7) and, for service where the customer desires leak-free operations, Fisher offers a unique ENVIRO-SEAL bellows seal system (figure 8). The patented emission control packing system keeps emission concentrations below the EPA 500 ppm requirement.

For a superior stem seal in applications that are not environmentally-sensitive, Fisher offers the HIGH-SEAL graphite packing system (figure 7). The HIGH-SEAL packing system provides superior sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits. ENVIRO-SEAL systems may also be applied for superior stem sealing in higher pressure/temperature applications not requiring EPA compliance.

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

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Design ED

Table 3. Typical Combinations of Metal Trim Parts⁽¹⁾ for all Valves Except Those for NACE Specification, Whisper Trim III, and WhisperFlo Cages

Trim Designation	Valve Plug	Cage	Seat Ring	Liner (Design EAD Valve Only)
1 (standard for Design ED, EAD, and EDR in all valve body materials except CF8M)	S41600 hardened to 38 HRC	CB7Cu-1 hardened to 40 HRC	S41600 or CA15 ⁽²⁾ (410 stainless steel), both hardened to 38 HRC	S41600 hardened to 38 HRC
3 and 3H ⁽³⁾	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 (alloy 6)	R30006 (alloy 6)	---
4	S31600	CB7Cu-1 hardened to 40 HRC	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)	S31600	CF8M with electroless nickel coating (ENC)	S31600	S31600
37 and 37H ⁽³⁾	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	CB7Cu-1 hardened to 40 HRC	R30006 (alloy 6)	

1. Nonferrous-alloy combinations are also available. Consult your Fisher sales office for details.
2. CA15 is used for 6- and 8-inch full-size and restricted-trim valves.
3. Trims 3H and 37H have clearances for high-temperature service.

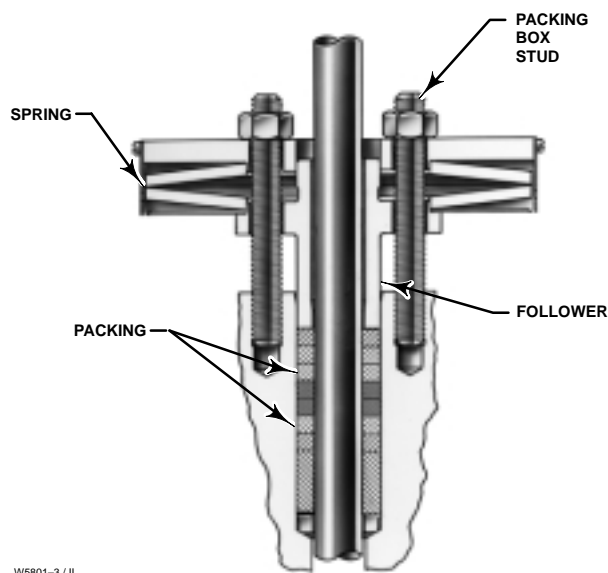
Table 4. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities (6-inch Design ED only)

TRIM DESIGNATION	VALVE PLUG	CAGE	CAGE RETAINER	BAFFLE (FOR LEVEL D3 CAGE ONLY)	SEAT RING	BODY, BONNET & BONNET SPACER	MATERIAL TEMPERATURE CAPABILITY			
							°C		°F	
							Min	Max	Min	Max
301 (standard for all body materials except S31600)	S17400 hardened to 40 HRC	S41600 hardened to 38 HRC	Carbon steel NACE with electroless nickel coating (ENC)	Steel	410 SST hardened to 38 HRC	WCC carbon steel or WC9 chrome moly steel	-29	343	-20	650
						CF8M (316 SST)	-29	163	-20	325
301A	S17400 hardened to 40 HRC	S41600	WCC Ion Nitrided	Steel	S41600	WCC carbon steel or WC9 chrome moly steel	232	427	450	800
304	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S41600 hardened to 38 HRC	Carbon steel NACE with electroless nickel coating (ENC)	Steel	S31600 with seat hard faced with CoCr-A hardfacing alloy	WCC carbon steel, WC9 chrome moly steel	-29	343	-20	650
						CF8M (316 SST)	-29	177	-20	350
313 (NACE compatible) ⁽¹⁾	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S31600 with electroless nickel coating (ENC)	Carbon steel NACE with electroless nickel coating (ENC)	Steel	S31600 with seat hard faced with CoCr-A hardfacing alloy	WCC carbon steel, WC9 chrome moly steel, or CF8M (316 SST)	-29	343	-20	650
315	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	Electrolized 316 SST	Electrolized 316 SST	S31600	S31600 with seat hard faced with CoCr-A hardfacing alloy	WCC carbon steel or WC9 chrome moly steel	-29	260	-20	500
						CF8M (316 SST)	-198	537 ⁽²⁾	-325	1000 ⁽²⁾
318	S31600 with seat and guide hard-faced with CoCr-A	WC9/Ion Nitrided	WC9 Ion Nitrided	WC9	S31600 with seat hard-faced with CoCr-A	WCC carbon steel	-29	427	-20	800
						WC9 chrome moly steel	-29	566	-20	1050

1. Level D3 cage cannot be certified to NACE. Use 316/ENC cage retainer instead.
2. May be used up to 593°C (1100°F) if manufacturing process controls carbon content to 0.04% minimum or 0.08% maximum.

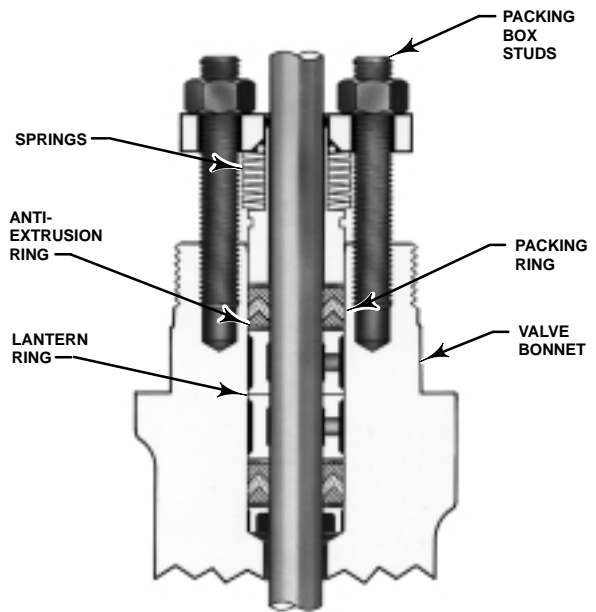
Table 5. WhisperFlo Metal Trim Part Materials and Valve Body/Trim Temperature Capabilities (4- and 6-inch Design ED only)

TRIM DESIGNATION	VALVE BODY	VALVE PLUG	CAGE	CAGE RETAINER	SEAT	MATERIAL TEMPERATURE CAPABILITY			
						°C		°F	
						Min	Max	Min	Max
901	WCC	S41600	S41000	WCC ENC	S41600	-29	343	-20	650
902	WCC	S31600/CoCrA Seat and Guide	S41000	WCC ENC	S31600/CoCrA	-29	343	-20	650
915	WCC	S31600/CoCrA Seat and Guide	S41000/Nitride	WCC/Nitride	S31600/CoCrA	343	427	650	800
916	WC9	S31600/CoCrA Seat and Guide	S41000/Nitride	WC9/Nitride	S31600/CoCrA	343	538	650	1000
926	WCC	S31600/CoCrA Seat and Guide	S41000 NACE	WCC/NACE/ENC	S31600/CoCrA	-29	343	-20	650
936	316 CF8M	S31600/CoCrA Seat and Guide	S31603/CRCT	S31600/ENC	S31600/CoCrA	-198	343	-325	650
946	316 CF8M	S31600/CoCrA Seat and Guide	S31603/CRCT	S31600/Nitride	S31600/CoCrA	343	538	650	1000



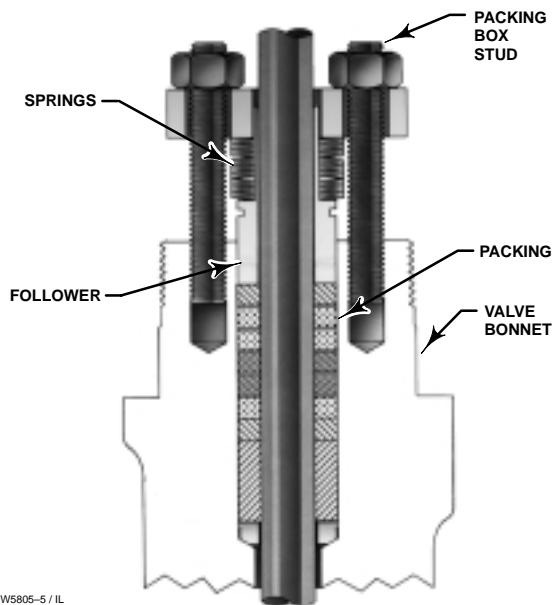
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**TYPICAL HIGH-SEAL PACKING SYSTEM
WITH GRAPHITE PACKING**



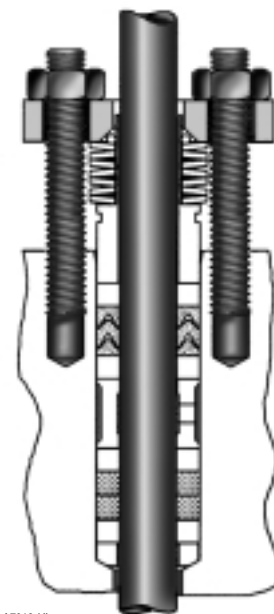
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**TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH PTFE PACKING**



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**TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH GRAPHITE PACKING**



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**TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH DUPLEX PACKING**

Figure 7. ENVIRO-SEAL and HIGH-SEAL Packing Systems



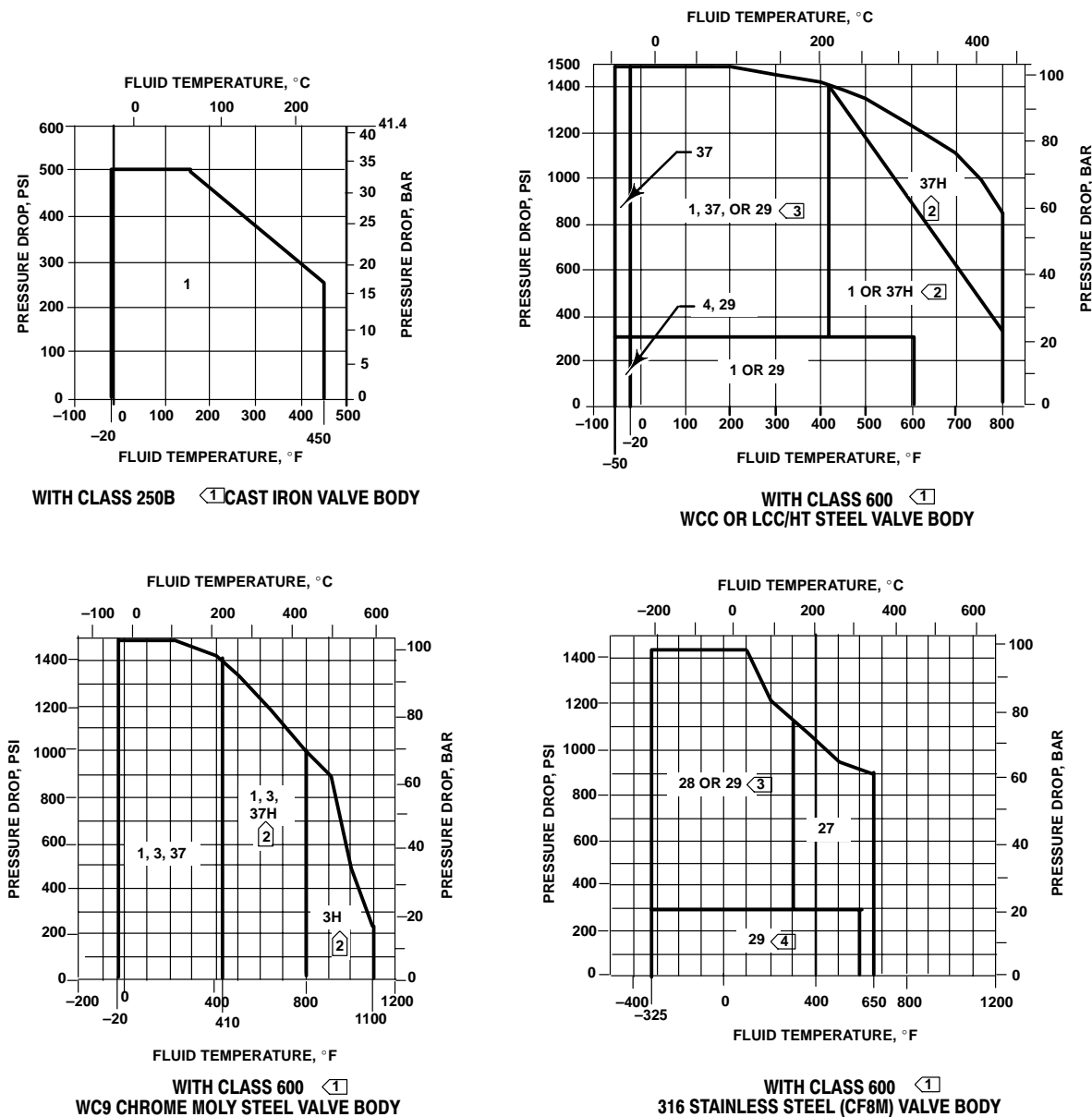
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Figure 8. Cutaway of ENVIRO-SEAL Bellows Seal Bonnet and Internal Shroud, Showing Bellows

Table 6. Materials and Temperature Limits for All Other Parts

PART			MATERIAL	MATERIAL TEMPERATURE CAPABILITY			
				°C		°F	
				Min	Max	Min	Max
Body-to-bonnet bolting. See table 12 for NACE bolting materials and temperature limits	Cast iron valve body	Cap screws	Steel SAE Grade 5	-29	232	-20	450
	WCC, or WC9 valve body	Studs	Steel SA-193-B7	-29	427 ⁽¹⁾	-20	800 ⁽¹⁾
		Nuts	Steel SA-194-2H				
	LCC/HT valve body	Studs	Steel SA-193-B7	-46	343 ⁽¹⁾	-50	650 ⁽¹⁾
		Nuts	Steel SA-194-2H				
	WC9 valve body	Studs	Steel SA-193-B16	-29	566 ⁽¹⁾	-20	1050 ⁽¹⁾
		Nuts	Steel SA-194-7				
	CF8M (316 SST) valve body	Studs	Steel SA-193-B7 (NACE [non-exposed bolting])	-48	427 ⁽¹⁾	-55	800 ⁽¹⁾
		Nuts	Steel SA-194-2H (NACE [non-exposed bolting])				
		Studs	304 stainless steel SA-320-B8	These materials not limiting factors	-198	These materials not limiting factors	-325
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						
Piston ring	Graphite (FMS 17F27)	Oxidizing service	-46 ⁽³⁾	427	-50 ⁽³⁾	800	
		Non-oxidizing service	-46 ⁽³⁾	482	-50 ⁽³⁾	900	
	Graphite (FMS17F39)	Oxidizing service	-46 ⁽³⁾	560	-50 ⁽³⁾	1000	
		Non-oxidizing service	-46 ⁽³⁾	593	-50 ⁽³⁾	1100	
Valve plug stem	S31600 (S20910, NACE Std.)		-198 ⁽²⁾	593	-325 ⁽²⁾	1100	
Pin (Design ED or EAD valve only)	S31600						
Castle nut and cotter pin (Design EDR valve only)	18-8 stainless steel						
Load ring (8 inch Design ED valve only)	S17400		-101	316	-150	600	
	Inconel		-254	593	-425	1100	
	N05500 (K-Monel)		-204	260	-400	500	
Restricted trim adaptors	Cast iron		-73	232	-100	450	
	WCC steel		-29	427	-20	800	
	S31600		-198 ⁽²⁾	593	-325 ⁽²⁾	1100	
Seat ring, bonnet and cage gaskets	FGM (standard)		-198	593 ⁽⁴⁾	-325	1100 ⁽⁴⁾	
	PTFE-coated Monel		-73	149	-100	300	
Spiral wound gaskets	Inconel 600/graphite (FGM-standard)		-198	593 ⁽⁴⁾	-325	1100 ⁽⁴⁾	
	N04400 (Monel)/composition		-73	232	-100	450	
Shim	S31600		These materials not limiting factors				
	N04400 (Monel)						
Packing (temperatures shown are material temperature capabilities). See table 8 for proper bonnet selection.	PTFE V-ring		-40	232	-40	450	
	PTFE/composition		-73	232	-100	450	
	Graphite ribbon/filament		-198	538 ⁽⁶⁾	-325	1000 ⁽⁶⁾	
	Graphite ribbon for high-temperature oxidizing service		371	649	700	1200	
Packing flange, studs and nuts when used with standard bonnet	S31600		-198 ⁽²⁾	593 ⁽¹⁾	-325 ⁽²⁾	1100 ⁽¹⁾	
Packing follower, and packing spring ⁽⁵⁾ or lantern ring	S31600		-198 ⁽²⁾	593	-325 ⁽²⁾	1100	
Packing box ring	S31600						
Extension bonnet bushing	Trims 1 & 4	S41600	-29	427	-20	800	
	Other trims	S31600	-198 ⁽²⁾	427	-325 ⁽²⁾	800	

1. Lubricated nuts are standard.
 2. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
 3. This minimum is due to thermal expansion differential between piston ring and cage at low temperatures.
 4. Except 427°C (800°F) on oxidizing service.
 5. Spring is used only with single PTFE V-ring packing; lantern ring replaces spring in other packings.
 6. Except 371°C (700°F) on oxidizing service.

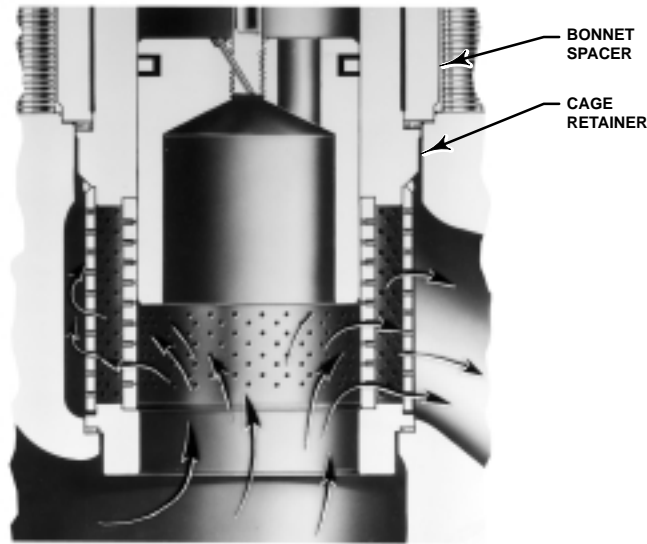


NOTES:

- ① DO NOT EXCEED THE MAXIMUM PRESSURE AND TEMPERATURE FOR THE CLASS RATING OF THE VALVE MATERIAL USED, EVEN THOUGH THE TRIMS SHOWN MAY HAVE HIGHER CAPABILITIES.
- ② BE ESPECIALLY CAREFUL TO SPECIFY SERVICE TEMPERATURE IF TRIM 3 OR 37 IS SELECTED AS DIFFERENT THERMAL EXPANSION RATES REQUIRE SPECIAL PLUG CLEARANCES. SPECIFY TRIM 37H FOR TEMPERATURES ABOVE 210 °C (410 °F). SPECIFY TRIM 3H FOR TEMPERATURES ABOVE 427 °C (800 °F).
- ③ TRIM 29 MAY BE USED UP TO 103 BAR (1500 PSI) WITH CLEAN, DRY GAS.
- 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).

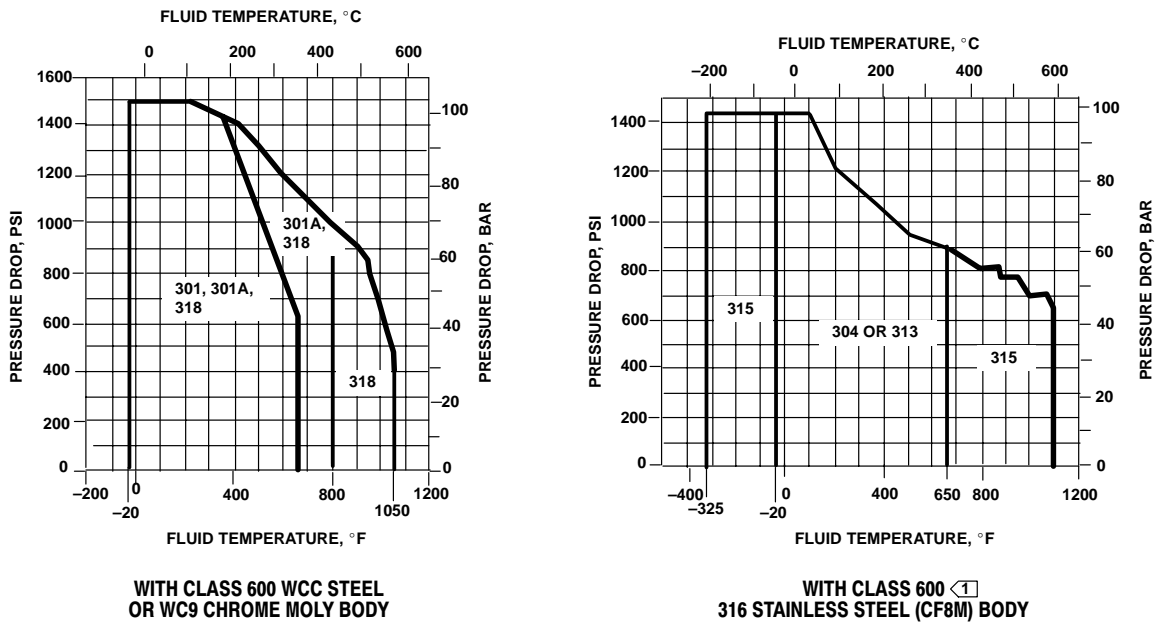
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Figure 9. Typical Trim Used for All Valves Except 4- and 6-Inch Design ED with Whisper Trim III Cage and WhisperFlo Cage



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Figure 10. Whisper Trim III Cage in 6-Inch Design ED Valve



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

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Figure 11. Typical Trim Used for 6-Inch Design ED Valves with Whisper Trim III Cages

Table 7. Valve Body/Trim Temperature Capabilities⁽¹⁾ For All Valves
Except 6-Inch Design ED with Whisper Trim III Cage and 4- and 6-Inch Design ED with WhisperFlo Cage

VALVE BODY/BONNET ⁽²⁾ MATERIAL	TRIM DESIGNATION	VALVE SIZE AND DESIGN	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
Cast iron	1, 3, 27, or 29	All	-29	232	-20	450
	37	All	-29	210	-20	410
	37H	All	210	232	410	450
WCC steel	1	All	-29	427	-20	800
	29	All	-29	316	-20	600
	37	All	-29	210	-20	410
	37H	All	210	427	410	800
WC9 chrome moly steel	1 or 3	All	-29	427	-20	800
	27	All	-29	343	-20	650
	29	All	-29	238	-20	460
	37	All	-29	210	-20	410
	3H	All	427	566	800	1050
LCC/HT steel	1	2 inch in all designs	-29	316	-20	600
		All sizes except 2 inch in all designs	-29	343	-20	650
	4	All	-46	210	-50	410
	29	All	-46	316	-50	600
	37	All	-46	210	-50	410
CF8M (316 stainless steel)	27	All	-198 ⁽³⁾	343	-325 ⁽³⁾	650
	28	All	-198 ⁽³⁾	149	-325 ⁽³⁾	300
	29	All	-198 ⁽³⁾	316	-325 ⁽³⁾	600

1. For metal trim parts only. Restricted trim and full-sized limits are the same.
2. Same material also used for bottom flange, if required.
3. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.



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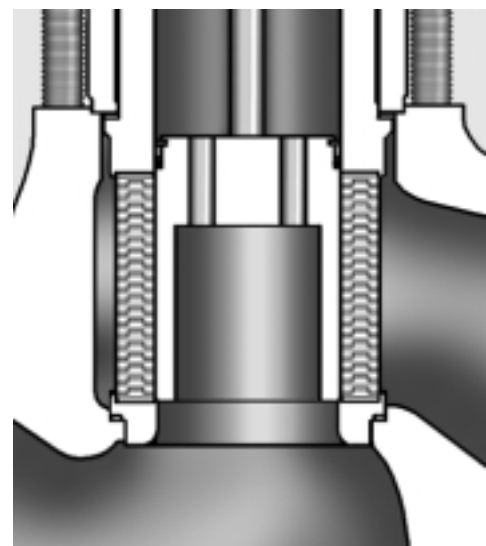


Figure 12. WhisperFlo Cage in 4- and 6-Inch Design ED Valve

Table 8. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS ⁽¹⁾	
		°C	°F
Plain: ■ Standard for all valves through 6-inch valve body size 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	0 to maximum shown in table 6	0 to maximum shown in table 6
Style 1 Cast Extension: ■ Standard for 8-inch valves in S31600 bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-18 to 232	0 to 450
	PTFE/Composition		
	Graphite ribbon/filament	-46 to -18 and above 232	-50 to 0 and above 450
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	-18 to 232	0 to 450
	PTFE/Composition		
	Graphite ribbon/filament	-101 to -18 and above 232	-150 to 0 and above 450
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, <i>ENVIRO-SEAL Bellows Seal Bonnets</i> , for pressure/temperature ratings.	
	Graphite		

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F). 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.

Table 9. Maximum Flow Coefficients for Full-Sized Trim with Equal Percentage Cage and Normal Flow Direction

Valve Design	Valve Size, Inch	C _v at Max. Valve Plug Travel	
ED	1, 1-1/4	17.2	
	1-1/2	35.8	
	2	59.7	
	2-1/2	99.4	
	3	136	
	4	224	
	6	394	
	8 ⁽¹⁾ 8 ⁽²⁾	567 819	
EAD	with liner	1	18.5
		2	48.1
		3	149
		4	152
		6	336
	without liner	1	19.0
		2	47.2
		3	148
		4	156
		6	328
EDR	1, 1-1/4	17.2	
	1-1/2	35.8	
	2	59.7	
	2-1/2	99.4	
	3	136	
	4	224	

1. With 51 mm (2 inch) travel.
2. With 76 mm (3 inch) travel.

Design ED

Table 10. Metal Trim Part Materials for Compliance with NACE MR0175 (Sour Service) Specifications

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal Seat Construction	Optional Liner for Metal Seat (EAD only)	Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin	Load Ring ⁽¹⁾
85	S31600	S31600 with electroless nickel coating (ENC)	S31600	S31600	S20910 (Valve Stem) S31600 (All Other Parts)	N05500 (K-Monel)
86	S31600 with seat hard faced with CoCr-A hardfacing alloy	S31600 with electroless nickel coating (ENC)	R30006 (alloy 6)	---		
87	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S31600 with electroless nickel coating (ENC)	R30006 (alloy 6)	---		

1. 8-inch valve only.

NACE Standard MR0175 Compliance

Standard procurement procedures and manufacturing processes used by Fisher assure that control valves with sour service trims comply with the chemical and physical requirements of NACE standard MR0175. Incoming raw materials are selected for sour service trims by specifications covering chemical composition, forming, hardness, heat treatment, and finish. In addition, the subsequent machining, welding, and heat treatment of the materials being processed into finished parts is strictly regulated by manufacturing standards.

Due to strict start-to-finish manufacturing quality management, Fisher offers a high degree of confidence that the parts and assemblies provided for sour service will comply with MR0175.

Additional testing and documentation to assure compliance with MR0175 is not required, in most cases. However, in cases where documentation is required, the following items can be provided:

- hardness test data
- certificate of compliance to specification
- heat treatment documentation
- chemical and physical test data

The requirements of the NACE standard are very specific and the application of the standard to control valve materials is quite complex. There are, however, some general guidelines that are always followed:

- All carbon steel valve bodies and bonnets are heat-treated to 22 HRC maximum and are post-weld heat-treated.
- Martensitic and cast precipitation hardening stainless steel are not used.
- Control valve packing sets are jam style only.
- Valve stems are made from S20910 (Nitronic 50).
- Primary trim materials are S31600 and alloy 6.
- Flat sheet gaskets are standard graphite/S31600 (316 SST), spiral wound gaskets are standard Inconel 600/graphite
- No machining operations that cause work hardening of the materials are performed in the manufacturing process.
- Plating and coatings are used only over suitable base metals and are not intended for corrosion protection.
- Bolting in NACE MR0175 (non-exposed bolting) material is provided as standard. Bolting in NACE MR0175 (exposed bolting) material is available as an option. See table 12.

Note

Fisher does not assume responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any Fisher product remains solely with the purchaser.

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

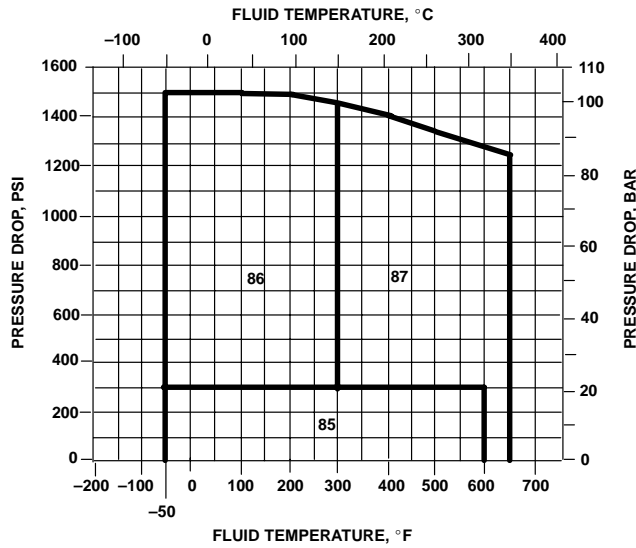
VALVE SIZE, INCH				PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS							
Design ED or EDR		Design EAD						Standard				Optional			
Full-Sized Trim	Restricted-Capacity Trim	Full-Sized Trim	Restricted-Capacity Trim					Stem		Yoke Boss		Stem		Yoke Boss	
				mm	Inch	mm	Inch	mm	Inch	mm	Inch				
1 or 1-1/4	1-1/2	1	2	33.3	1-5/16	19	3/4	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2	---	---	33.3	1-5/16	19	3/4	12.7	1/2	71	2-13/16	---	---	---	---
1-1/2	---	2	---	47.6	1-7/8	19	3/4	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2-1/2	---	3	47.6	1-7/8	19	3/4	1.7	1/2	71	2-13/16	---	---	---	---
2	3	---	4	58.7	2-5/16	29	1-1/8	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
2-1/2	4	3	6	73.0	2-7/8	38	1-1/2	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
3	---	4	---	87.3	3-7/16	38	1-1/2	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
4	---	6	---	87 ⁽³⁾ 111.1	3-7/16 ⁽³⁾ 4-3/8	76 ⁽³⁾ 51	3 ⁽³⁾ 2	12.7	1/2	71	2-13/16	19.1 25.4	3/4 1	90 127	3-9/16 5
6 ⁽¹⁾	---	---	---	177.8 ⁽²⁾ 136 ⁽³⁾	7 ⁽²⁾ 5-3/8 ⁽³⁾	51 ⁽²⁾ 76 ⁽³⁾	2 ⁽²⁾ 3 ⁽³⁾	19.1	3/4	90	3-9/16	25.4 or 31.8	1 or 1-1/4	127	5
8 ⁽¹⁾	---	---	---	203.2	8	51 76	2 3								

1. Not available in Design EDR valve.
2. Standard-travel cages.
3. Whisper Trim III (6-inch Design ED) and WhisperFlo cages (4- and 6-inch Design ED).

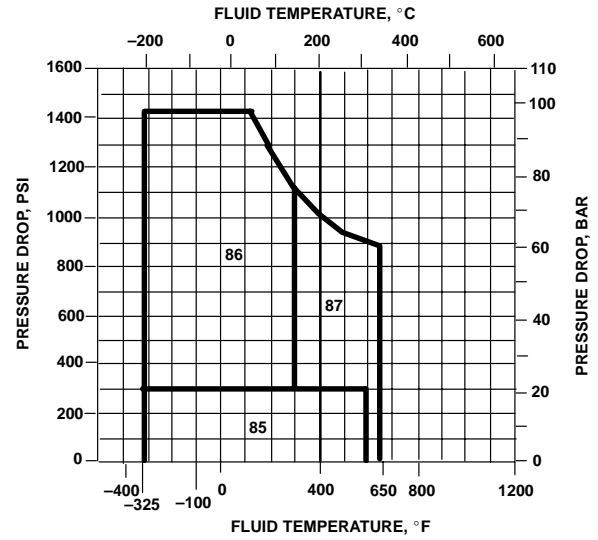
Table 12. Bolting Materials and Temperature Limits for Bolting Compliance with NACE Specification MR0175

VALVE BODY MATERIAL	BOLTING MATERIAL	TEMPERATURE CAPABILITIES					
		°C		°F			
		Min	Max	Min	Max		
NACE MR0175 (non-exposed bolting) (Standard)							
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7		-48 ⁽³⁾	427	-55 ⁽³⁾	800
	Nuts	Steel SA-194-2H					
NACE MR0175 (exposed bolting) (Optional) No Derating of Valve Required							
WCC and CF8M	Studs	Steel SA-564-630 (H1150 dbI ⁽¹⁾)		-46 ⁽³⁾	343	-50 ⁽³⁾	650
	Nuts	Steel SA-194-2HM					
NACE MR0175 (exposed bolting) (Optional) Requires Derating of Valve⁽²⁾ When These Body-to-Bonnet Bolting Materials are Used							
WCC and CF8M	Studs	Steel SA-193-B7M		-48 ⁽³⁾	427	-55 ⁽³⁾	800
	Nuts	Steel SA-194-2HM					

1. Special heat treating required.
2. Derating is not required for Class 300 valves. Derating may be required for valves rated at Class 600. Contact your Fisher sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.
3. -29°C (-20°F) with WCC valve body material.



FOR STANDARD METAL SEATING WITH CLASS 600 ¹ WCC OR LCC/HT VALVE BODY



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

NOTES:

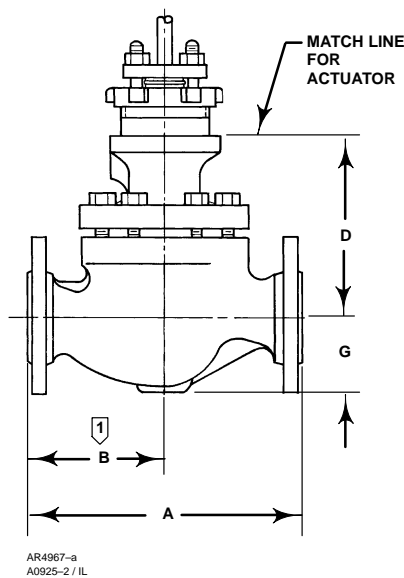
¹ DO NOT EXCEED THE MAXIMUM PRESSURE AND TEMPERATURE FOR THE CLASS RATING OF THE VALVE MATERIAL USED, EVEN THOUGH THE TRIM SHOWN MAY HAVE HIGHER CAPABILITIES.

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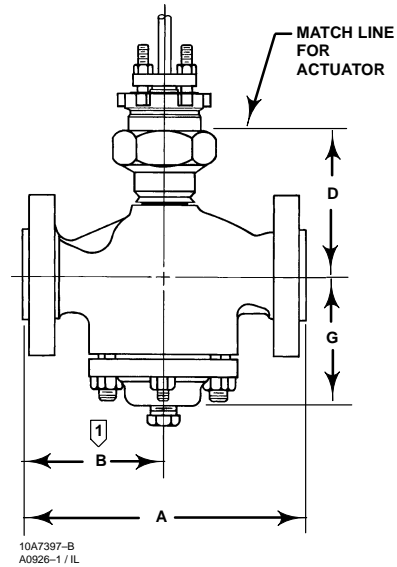
Figure 13. Typical Trim Used for NACE MR0175 Specifications (Sour Service)

VALVE SIZE, INCH	A									G (MAX)	
	Class, End Connection Style ⁽¹⁾									Design ED	Design EDR
	Scrd or SW	125 FF or 150 RF	150 RTJ	250 RF or 300 RF	300 RTJ	BW or 600 RF	600 RTJ	PN16-40 ⁽²⁾	PN63-100 ⁽²⁾		
mm											
1	210	184	197	197	210	210	210	160	230	60	119
1-1/4	229	---	---	---	---	---	---	---	---	60	119
1-1/2	251	222	235	235	248	251	251	200	260	71	116
2	286	254	267	267	282	286	289	230	300	78	133
2-1/2	---	276	292	292	308	311	314	290	340	90	159
3	---	298	311	317	333	337	340	310	380	97	168
4	---	353	365	368	384	394	397	350	430	129	192
6	---	451	464	473	489	508	511	480	550	162	---
8	---	543	556	568	584	610	613	600	650	191	---
Inch											
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25	See mm below	See mm below	2.38	4.69
1-1/4	9.00	---	---	---	---	---	---			2.38	4.69
1-1/2	9.88	8.75	9.25	9.25	9.75	9.75	9.88			2.81	4.56
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06	5.25
2-1/2	---	10.88	11.38	11.50	12.12	12.25	12.38	See mm below	See mm below	3.56	6.25
3	---	11.75	12.25	12.50	13.12	13.25	13.38			3.81	6.62
4	---	13.88	14.38	14.50	15.12	15.50	15.62			5.06	7.56
6	---	17.75	18.25	18.62	19.25	20.00	20.12			5.50	---
8	---	21.38	21.88	22.38	23.00	24.00	24.12	7.50	---		

1. End connection style abbreviations: BW - Butt welding, FF - Flat Faced, Scrd - Screwed, SW - Socket weld, RF - Raised Face, RTJ - Ring Type Joint.
2. 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 Fisher sales office.



DESIGN ED VALVE BODY



DESIGN EDR VALVE BODY

NOTES:
① B = $\frac{A}{2}$

Figure 14. Design ED and EDR Dimensions

VALVE SIZE, INCH	D FOR PLAIN BONNET						
	Design ED				Design EDR		
	Stem Diameter				Stem Diameter		
	mm						
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1
1 or 1-1/4	127	149	---	---	113	124	---
1-1/2	124	146	---	---	122	133	---
2	---	165	162	---	---	148	140
2-1/2	---	187	184	---	---	157	152
3	---	191	187	---	---	167	159
4	---	221	217	238	---	198	191
6 ⁽¹⁾	---	---	251	270	---	---	---
6 ⁽²⁾	---	---	312	330	---	---	---
8	---	---	375 ⁽³⁾	---	---	---	---
	Inch						
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4
1 or 1-1/4	5.00	5.88	---	---	4.44	4.88	---
1-1/2	4.88	5.75	---	---	4.81	5.25	---
2	---	6.50	6.38	---	---	5.81	5.50
2-1/2	---	7.38	7.25	---	---	6.31	6.00
3	---	7.50	7.38	---	---	6.56	6.25
4	---	8.69	8.56	9.38	---	7.81	7.50
6 ⁽¹⁾	---	---	9.88	10.62	---	---	---
6 ⁽²⁾	---	---	12.26	13.00	---	---	---
8	---	---	14.75 ⁽³⁾	---	---	---	---

1. All except Whisper Trim III cages.
2. Whisper Trim III cages.
3. Available only in cast iron or WCC steel for the stem diameter with plain bonnet.

VALVE SIZE, INCH	D FOR EXTENSION AND ENVIRO-SEAL BELLOWS SEAL BONNETS (DESIGN ED 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
1 or 1-1/4	213	251	---	---	303	319	---	321	---	---
1-1/2	210	248	---	---	300	316	---	317	---	---
2	---	267	---	---	---	465	---	---	384	---
2-1/2	---	289	272	---	---	492	---	---	---	---
3	---	292	297	---	---	495	487	---	518	518
4	---	322	327	370	---	526	518	---	541	---
6 ⁽¹⁾	---	---	357	402	---	---	543	---	---	573
6 ⁽²⁾	---	---	418	462	---	---	604	---	---	---
8	---	---	421	450	---	---	621	---	---	---
	Inch									
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4
1 or 1-1/4	8.38	9.88	---	---	11.94	12.56	---	12.62	---	---
1-1/2	8.25	9.75	---	---	11.81	12.44	---	12.50	---	---
2	---	10.50	---	---	---	18.31	---	---	15.12	---
2-1/2	---	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 ⁽¹⁾	---	---	14.06	15.81	---	---	21.38	---	---	22.56
6 ⁽²⁾	---	---	16.44	18.19	---	---	23.76	---	---	---
8	---	---	16.56	17.75	---	---	24.44	---	---	---

1. Standard-travel cages.
2. Whisper Trim III cages.

Figure 14. Design ED and EDR Dimensions (Continued)

Product Bulletin

51.1:ED
March 2002

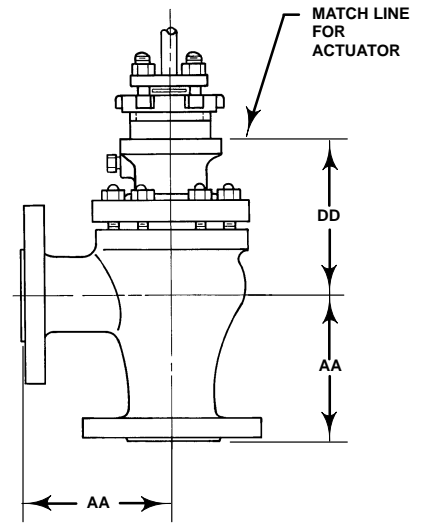
Design ED

VALVE SIZE, INCH	AA					
	Class 150		Class 300		Class 600	
	End Connection Style ⁽¹⁾					
	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
Inch						
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

1. End connection style abbreviations: BW - Butt welding, FF - Flat Faced, Scrd - Screwed, SW - Socket weld, RF - Raised Face, RTJ - Ring Type Joint.

NOTE:
FOR DIMENSIONS OF VALVES WITH DIN (OR OTHER) END CONNECTIONS. CONSULT YOUR FISHER SALES OFFICE.

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VALVE SIZE, INCH	DD										ENVIRO-SEAL Bellows Seal Bonnet	
	Plain Bonnet				Style 1 Extension Bonnet			Style 2 Extension 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		
1	111	133	---	---	197	235	---	291	305	---	Contact your Fisher 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		
Inch												
3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4		ENVIRO-SEAL Bellows Seal Bonnet	
1	4.38	5.25	---	---	7.75	9.25	---	11.44	12.00	---		Contact your Fisher 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		

Figure 15. Design EAD Dimensions

Specifications

Available Configurations

Design ED: Single-port, globe-style control valve with cage guiding, balanced valve plug, and push-down-to-close valve plug action (figures 1 and 2)

Design EAD: Angle version of Design ED control valve, used to facilitate piping or in applications where a self-draining valve is desired (figure 3)

Design EDR: Same as Design ED control valve except with push-down-to-open valve plug action (figure 4)

Valve Sizes

See table 2

End Connection Styles⁽¹⁾⁽²⁾

Cast Iron Valves

Flanged: Design ED, 1- through 8-inch, Class ■ 125 flat-face or ■ 250 raised-face flanges per ASME B16.1

Screwed: Design ED, 1- 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: 1- through 2-inch, consistent with ASME B16.11

Buttwelding: 1- through 8-inch . Schedules 40 or 80 consistent with ASME B16.25

Socket weld end connection style is not available for Design EAD.

Also, see table 2 and figures 14 and 15

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 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 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 follows:

All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See figure 9

Valves with Whisper Trim III Cages (6-inch Design ED): See figure 11 except where further limited by the following max Δ -P/P₁ ratio⁽⁴⁾—0.60 for level A3 cage, 0.75 for level B3 cage, 0.85 for level C3 cage, or 0.99 for level D3 cage

Valves for NACE MR0175 Specifications: See figure 13

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

Class II: Standard

Class III: For valves with single graphite piston ring and 87 mm (3-7/16 inch) or larger port diameter

Class IV: For valves with multiple graphite piston rings and 111 mm (4-3/8 inch) or larger port diameter

Class V High-Temperature: For valves with port diameters from 73 through 203.2 mm (2-7/8 through 8-inch) with optional C-seal trim. See table 1

Construction Materials

Valve Body, Bonnet, and Bonnet Spacer or Bottom Flange, if used: ■ Cast iron, ■ WCC carbon steel, ■ 316 stainless steel, ■ LCC/HT carbon steel, ■ WC9 chrome moly steel, or ■ other materials upon request

Valve Plug, Cage, and Metal Seating Parts

All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See table 3

Valves with Whisper Trim III and WhisperFlo Cages (4- and 6-inch Design ED): See tables 4 and 5

Valves for NACE Specification: See table 10

Bellows Seal Assembly: ■ 316L stainless steel or ■ Monel

All Other Parts: See table 6

—Continued—

Specifications (Continued)

Material Temperature Capabilities⁽²⁾

Valve Body/Trim Combinations

All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See table 7

Valves with Whisper Trim III Cages (6-inch Design ED): See table 4

Valves with WhisperFlo Cages (4- and 6-inch Design ED): See table 5

All Other Parts: See table 6

Flow Characteristics

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

Whisper Trim and WhisperFlo Cages: Linear

Flow Directions

Design ED or EAD: ■ Standard Cage—Normally down, ■ Whisper Trim and WhisperFlo Cages—Always up

Design EDR: ■ Standard Cage—Normally up, ■ Whisper Trim Cage—Always down

Flow Coefficients and Noise Level Prediction

See table 9 and Catalog 12

Port Diameters and Valve Plug Travels

See table 11

Yoke Boss and Stem Diameters

See table 11

Typical Bonnet Styles

■ Plain or ■ extension. See figures 14 and 15 for standard dimensions. See table 8 for selection guidelines.

■ ENVIRO-SEAL bellows seal bonnet. See figure 14 for standard dimensions.

See figure 8 for view of ENVIRO-SEAL bellows

seal bonnet. Also, see Bulletin 59.1:070, *ENVIRO-SEAL Bellows Seal Bonnets*, for further information

Packing Arrangements

■ Single PTFE V-ring (standard), ■ double arrangements, ■ leak-off arrangements, ■ ENVIRO-SEAL packing system. See figure 7 for ENVIRO-SEAL configuration.

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. See Bulletin 59.1:061, *ENVIRO-SEAL Packing Systems for Sliding-Stem Valves*, for further information.

Approximate Weights

1 and 1-1/4 Inch Sizes: 14 kg (30 lb)

1-1/2 Inch Size: 20 kg (45 lb)

2 Inch Size: 39 kg (85 lb)

2-1/2 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

■ Seal welding of Design EDR valve body/bonnet joint for temperatures above 232°C (450°F), ■ lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leak-off service, ■ valve body drain plug, ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, ■ style NS bonnet for seismic service requirements, ■ packings suitable for nuclear service, ■ C-seal trim for Class V high-temperature shutoff

1. DIN (or other) ratings and end connections can usually be supplied; consult your Fisher sales office.
 2. The pressure/temperature limits in this bulletin and in any applicable standard limitations should not be exceeded.
 3. 316 stainless steel (CF8M) valves with SA-193-B7 bonnet bolting are capable of the full Class 600 rating through 427°C (800°F). For higher temperatures or for other bolting materials, the valve may have to be derated. Contact your Fisher sales office for further information. Also note that the ANSI standard does not allow the use of intermediate ratings for flanged valves.
 4. Limitation based on excessive noise increases if max ΔP/P1 ratio for a given cage level is exceeded.

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 500 PPM⁽²⁾

For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full ANSI Class 300 up to 232°C (450°F)

For ENVIRO-SEAL Graphite packing system: 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

Anti-Extrusion Washer: Filled PTFE

Lantern Ring: S31600 (316 stainless steel)

Spring: ■ 17-7PH stainless steel or ■ Inconel

Packing Box Flange: S31600

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

Graphite Packing Systems

Packing Ring: Graphite rings

Spring: ■ 17-7PH stainless steel or ■ Inconel

Packing Box Flange: S31600

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 500 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, reversing the ENVIRO-SEAL PTFE packing rings is not necessary.

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Emerson Process Management

Fisher

Marshalltown, Iowa 50158 USA
Cernay 68700 France
Sao Paulo 05424 Brazil
Singapore 128461

www.Fisher.com

