

Model 590 Control Valves

Technical Sales Bulletin

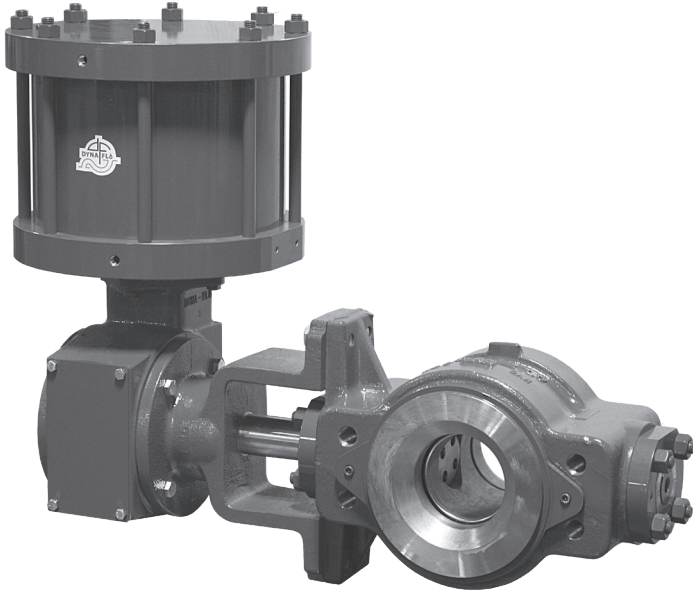


Figure 1 Dyna-Flo Model 590 6 inch Rotary Control Valve with Size 112 DFRP Actuator

The Model 590 series rotary ball style control valve is used in all kinds of demanding applications, in oil and gas production and chemical process industries. It is also suited to high flow, low pressure drop services. The 590 series is used in both throttling and on/off control of liquids or gases.

The straight through unrestricted flow path provides higher capacity than globe style valves. A splined shaft provides accurate control in throttling operations and flexibility in actuation options. The 590 series, when combined with a Model DFRP piston actuator, is a rugged control valve assembly, to which a wide variety of positioners and accessories can be mounted.

The Model 590 control valve is manufactured to a high level of quality specifications to ensure superior performance and customer satisfaction.

Features

Higher Flow Capacity

The straight through flow path allows increased capacity and minimum pressure drop compared to conventional globe style valves.

Full ASME Class Shutoff Capabilities

In most applications the Model 590 is capable of full static differential pressure shutoff.

Simplified Maintenance

Precise machined tolerances allow for easy replacement of the ball seal. Shaft seals can be easily replaced without the removal of the shafts.

Positive Ball to Shaft Connection

A tapered tri-lobe polygon facilitates a positive connection at the ball for more precise and reliable control.

High Cycle Life

High cycle PTFE lined bearings allow for minimum wear in control applications. The balanced shaft design reduces wear caused by end thrust especially with higher pressures.

Tight Shutoff

Standard shutoff capabilities are 0.0001 percent of maximum rated capacity.

Precise Flow Control

The Model 590 offers a good balance of high flow capacity and control.

NACE Compliant

NACE MR0175 standard construction.

Live Loaded Packing Standard

Live loaded packing is now our standard offering.



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SPECIFICATIONS

Available Valve Configurations

The 4", 6", 8", 10", 12", and 16" flangeless valves will mate ASME Class 600 and 900. Refer to Table 1.

Rotary ball valve assembly available with:

- Single Ball Seal
- Dual Ball Seal
- Flow Ring

Maximum Inlet Pressure

4 through 12 inch valve body consistent with Class 600 and 900 ASME B16.34.

16 inch valve body consistent with Class 600 ASME B16.34.

Maximum Allowable Shutoff Pressure Drop

Single Seal and Dual Seal: Refer to Figure 10.

Flow Ring: Limited by the pressure/temperature rating of the valve body.

Material Temperature Capabilities

Single Seal and Dual Seal:

- 50°F to 180°F (-46°C to 82°C) LCC Body.
- 20°F to 180°F (-29°C to 82°C) WCC* Body.
- 50°F to 180°F (-46°C to 82°C) CF8M Body.

Flow Ring with Fluorocarbon O-Rings:

- 50°F to 400°F (-46°C to 204°C) LCC Body.
- 20°F to 400°F (-29°C to 204°C) WCC* Body.
- 50°F to 400°F (-46°C to 204°C) CF8M Body.

***Note:** WCC body material is special order.

Construction Materials

Refer to Table 8 for construction materials. Contact your Dyna-Flo sales office for more information and other options.

Flow Direction (Refer to Figures 3, 4, 8, & 9)

Single Seal Configuration: Forward flow only.

Dual Seal Configuration: Required for bidirectional flow shutoff.

Flow Ring Configuration: Forward or reverse flow.

Actuator Mounting

Right-hand, or Left-hand (as viewed from seal end of valve).
In one of 4 positions (12 (Std.), 3, 6, and 9 o'clock) with respect to the valve body in a horizontal pipe.

Maximum Ball Rotation

90 degrees.

Shutoff Classification

Single Seal and Dual Seal: 0.0001% of maximum valve capacity (less than 1% of Class IV, ANSI/FCI 70-2 and IEC 60534-4).

Flow Ring: 1% of maximum valve capacity

Flow Characteristic

Modified Equal Percentage

Valve Dimensions

Refer to Figure 2 for valve diagram.

Refer to Tables 3 to 7 for valve dimensions.

Refer to Tables 3 & 5 for shaft & bore diameters.

Approximate Valve Weight

Refer to Table 2.

Valve Sizing Coefficients

Refer to Table 9.

For more information and other options contact your Dyna-Flo sales office.

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Table 1

Model 590 Available Valve Size and ASME Rating

Valve Size Inch	ASME Rating	
4	600	900
6	600	900
8	600	900
10	600	900
12	600	900
16	600	

Table 2

Model 590 Approximate Valve Weight (without actuator)

Valve Size Inch	lb (Kg)
4	160 (73)
6	290 (132)
8	490 (222)
10	760 (345)
12	950 (431)
16	1700 (771)

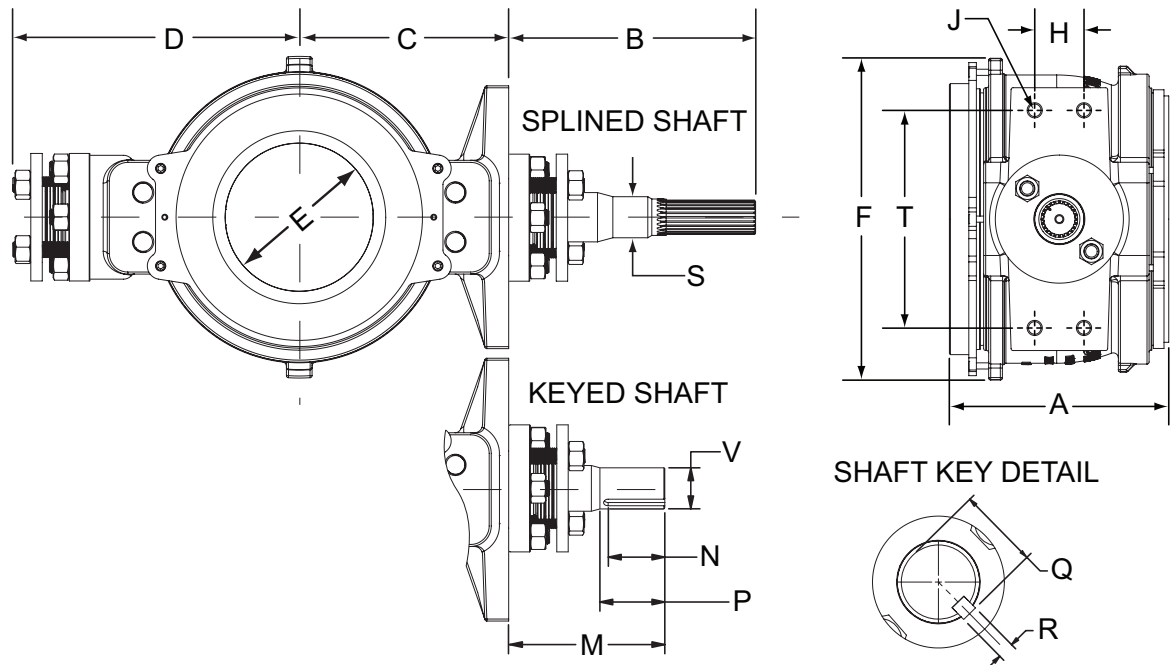


Figure 2 Model 590 Valve Dimensions Diagram



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Table 3

Model 590 Valve Dimensions Inch (mm)

Valve Size	Dimensional Reference					
	B	S		C	D	E (Bore Diameter)
		Spline Diameter	Shaft Diameter			
4"	8.19 (208)	1.00 (25.4)	1.25 (31.8)	6.38 (162)	8.76 (223)	3.00 (76.2)
6"	14.00 (356)	1.50 (38.1)	2.00 (50.8)	7.62 (194)	11.38 (289)	4.00 (101.6)
8"	14.00 (356)	2.00 (50.8)	2.50 (63.5)	10.62 (270)	14.82 (376)	6.00 (152.4)
10"	14.00 (356)	2.00 (50.8)	2.75 (69.9)	11.31 (287)	15.55 (395)	7.38 (187.5)
12"	14.00 (356)	2.00 (50.8)	3.00 (76.2)	12.75 (324)	16.75 (425)	9.00 (228.6)
16"	18.50 (470)	2.00 (50.8)	4.00 (101.6)	15.44 (392)	21.00 (533)	11.50 (292.1)

ASME Class: 600 and 900 (16 Inch ASME 600 Only)

• Envelope Dimensions are + / - 0.25 in. (6.4 mm) • Face to Face Tolerance Per ASME

Table 4

Model 590 Valve Dimensions Continued Inch (mm)

Valve Size	Dimensional Reference				
	A	F	T	H	J
4"	7.62 (194)	11.00 (279)	9.25 (235)	1.81 (46)	5/8 - 11 UNC
6"	9.00 (229)	12.88 (327)	10.75 (273)	2.00 (51)	3/4 - 10 UNC
8"	9.56 (243)	16.25 (413)	13.25 (337)	3.00 (76)	7/8 - 9 UNC
10"	11.69 (297)	17.50 (445)	13.25 (337)	3.00 (76)	7/8 - 9 UNC
12"	13.31 (338)	19.00 (483)	13.25 (337)	3.00 (76)	7/8 - 9 UNC
16"	15.75 (400)	24.12 (613)	21.00 (533)	5.00 (127)	1-1/4 - 7 UNC

ASME Class: 600 and 900 (16 Inch ASME 600 Only)

• Envelope Dimensions are + / - 0.25 in. (6.4 mm) • Face to Face Tolerance Per ASME

Table 5

Model 590 Keyed Shaft Dimensions Inch (mm)

Valve Size	Dimensional Reference					
	V Shaft Diameter	M	P	N	Q	R
4"	1.13 (28.7)	5.00 (127)	2.38 (60.5)	2.00 (50.8)	1.24 (31.5)	0.25 (6.35)
6"	1.87 (47.5)	6.45 (164)	2.13 (54.1)	1.75 (44.5)	2.09 (53.1)	0.50 (12.7)
8"	2.25 (57.2)	7.62 (194)	3.55 (90.2)	3.00 (76.2)	2.47 (62.7)	0.50 (1.7)
10"	2.50 (63.5)	8.50 (216)	4.25 (108)	3.50 (88.9)	2.77 (70.4)	0.63 (16.0)
12"	2.50 (63.5)	8.31 (211)	4.25 (108)	3.50 (88.9)	2.77 (70.4)	0.63 (16.0)
16"	3.25 (82.6)	11.50 (292)	4.35 (108)	3.50 (88.9)	3.58 (90.9)	0.75 (19.1)

ASME Class: 600 and 900 (16 Inch ASME 600 Only)

• Envelope Dimensions are + / - 0.25 in. (6.4 mm)

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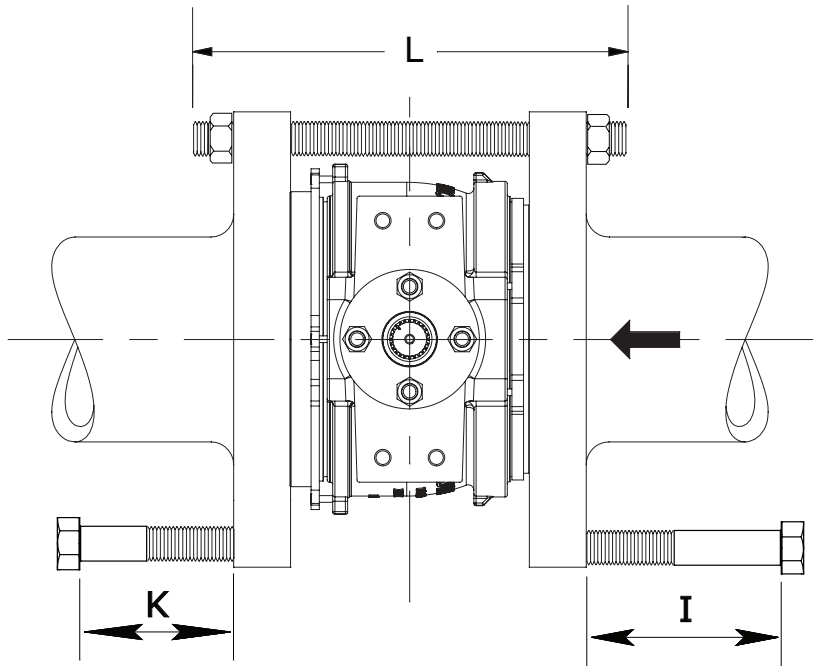


Figure 3
590 Flange Bolting
Dimensions

NOTE: Longer cap screws (Key I) are needed for the side of the valve with less body material (typically the inlet side of the valve for single seal construction).

Table 6

Model 590 Valve Dimensions - Flange Bolting - Class 600 Inch

Valve Size	Dimensional Reference												TPI
	RF						RTJ						
	I	QTY.	K	QTY.	L	QTY.	I	QTY.	K	QTY.	L	QTY.	
4"	-	-	-	-	13.50	8	-	-	-	-	14.50	8	7/8 - 9
6"	4.63	4	4.63	4	16.25	8	4.88	4	4.88	4	16.25	8	1 - 8
8"	5.50	4	5.38	4	17.50	8	5.63	4	5.50	4	17.75	8	1-1/8 - 8
10"	6.25	4	6.38	4	20.75	12	6.50	4	6.50	4	20.75	12	1-1/4 - 8
12"	7.00	4	6.00	4	23.00	16	7.00	4	6.50	4	23.00	16	1-1/4 - 8
16"	7.75	4	7.75	4	26.00	16	8.00	4	8.00	4	26.50	16	1-1/2 - 8

Table 7

Model 590 Valve Dimensions - Flange Bolting - Class 900 Inch

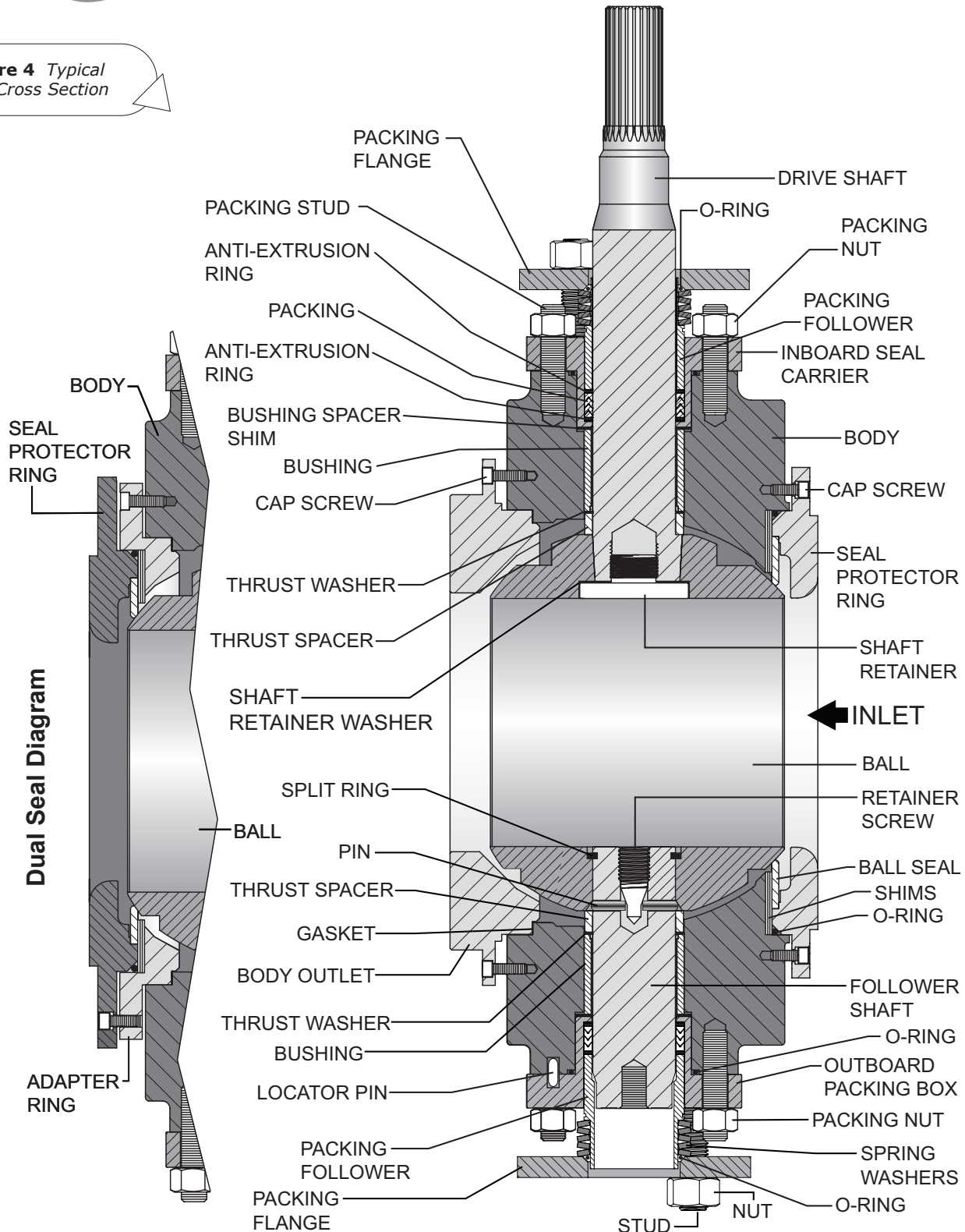
Valve Size	Dimensional Reference												TPI
	RF						RTJ						
	I	QTY.	K	QTY.	L	QTY.	I	QTY.	K	QTY.	L	QTY.	
4"	4.88	4	4.88	4	14.75	4	4.88	4	5.13	4	14.75	4	1-1/8 - 8
6"	5.00	4	5.00	4	17.50	8	5.00	4	5.25	4	17.50	8	1-1/8 - 8
8"	6.00	4	5.88	4	19.00	8	6.00	4	6.13	4	19.00	8	1-3/8 - 8
10"	6.63	4	6.75	4	21.50	12	6.63	4	6.88	4	21.50	12	1-3/8 - 8
12"	7.25	4	6.63	4	24.00	16	7.25	4	7.50	4	24.00	16	1-3/8 - 8

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Figure 4 Typical 590 Cross Section



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Table 8

Model 590 Construction Materials (Refer to Figures 4, 5, and 6)

Part Description	Material
Body	LCC, WCC ⁽¹⁾ , CF8M
Ball	Steel / Chrome Plated (Std.), S31600 / Chrome Plated
Seal Protector Ring	LCC, WCC ⁽¹⁾ , CF8M, A537 CL1 ⁽²⁾ , A516 Gr70 ⁽²⁾ , S31600
Drive Shaft	S20910
Follower Shaft	S20910
Live Loaded Packing Flange	S31600/S31603 (316/316L) Dual Grade
Live Loaded Packing Flange O-ring	Nitrile
Spring Washers	S17700
Live Loaded Packing Stud	B8M
Live Loaded Packing Nut	8M
Live Loaded Packing Follower (Inboard)	S31600/S31603 (316/316L) Dual Grade
Live Loaded Packing Follower (Outboard)	S31600/S31603 (316/316L) Dual Grade
Live Loaded Packing Box	S31600/S31603 (316/316L) Dual Grade
Anti-extrusion Ring	Graphite
PTFE Packing Set	CPTFE
Packing Box Ring	S31600/S31603 (316/316L) Dual Grade
Body Outlet	LCC, WCC ⁽¹⁾ , CF8M, A537 CL1 ⁽²⁾ , A516 Gr70 ⁽²⁾ , S31600
Bushing Spacer Shims	S31600/S31603 (316/316L) Dual Grade
Bushing	S31600/S31603 (316/316L) Dual Grade / CPTFE
Thrust Washer	CTFE
Thrust Spacer	S31600/S31603 (316/316L) Dual Grade
Shaft Retainer	S20910
Shaft Retainer Washer	S31600/S31603 (316/316L) Dual Grade
Ball Seal	Acetal
O-Ring, Seal Protector Ring	Fluorocarbon
Cap Screw	Plated Steel
Retainer Screw	18-8
Split Ring	S31600/S31603 (316/316L) Dual Grade
Pin	S31600/S31603 (316/316L) Dual Grade
Cap Screw	Plated Steel
Gasket	PTFE
Adapter Ring	LCC, WCC ⁽¹⁾ , CF8M, A537 CL1 ⁽²⁾ , A516 Gr70 ⁽²⁾ , S31600
Flow Ring	LCC, WCC ⁽¹⁾ , CF8M, A537 CL1 ⁽²⁾ , A516 Gr70 ⁽²⁾ , S31600
Shims	S31600/S31603 (316/316L) Dual Grade

NOTE 1 - WCC material is special order for all parts. **NOTE 2** - Charpy Impact Tested to -50°F (-46°C).



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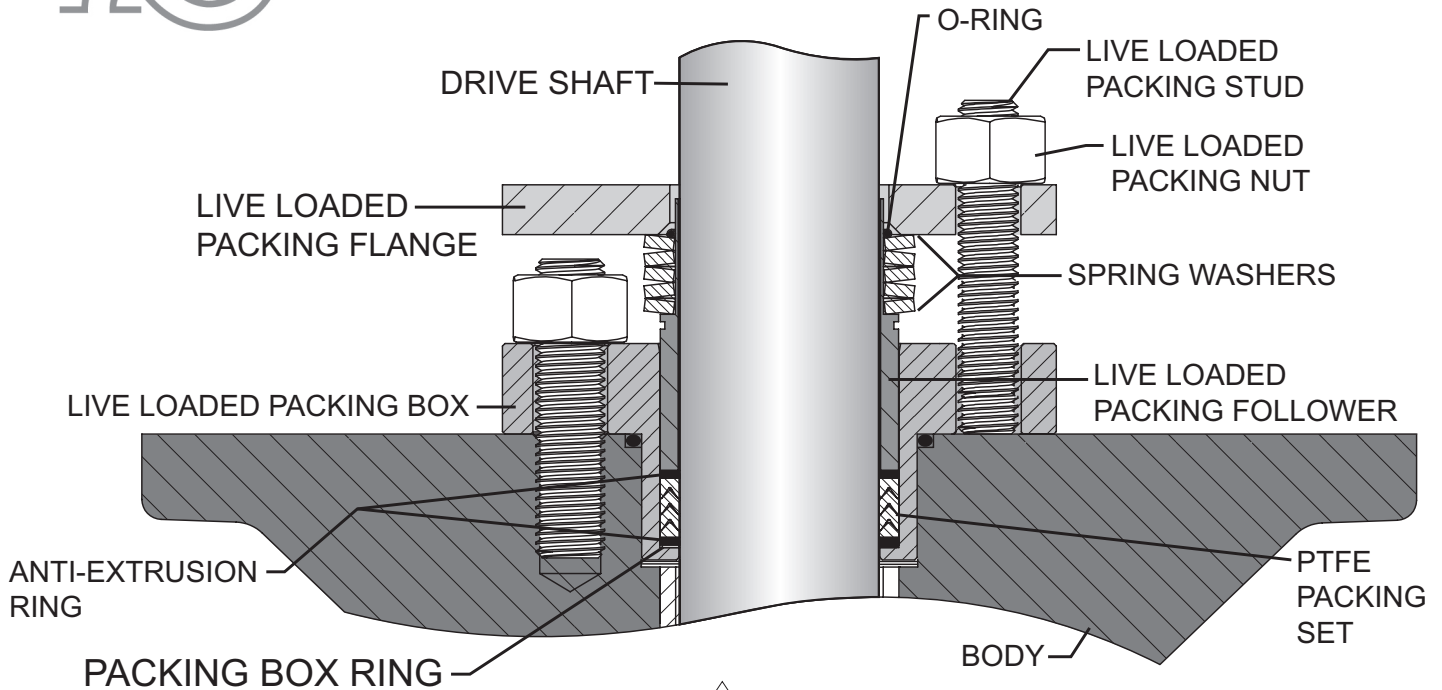


Figure 5 Live Loaded Packing Configuration - Inboard

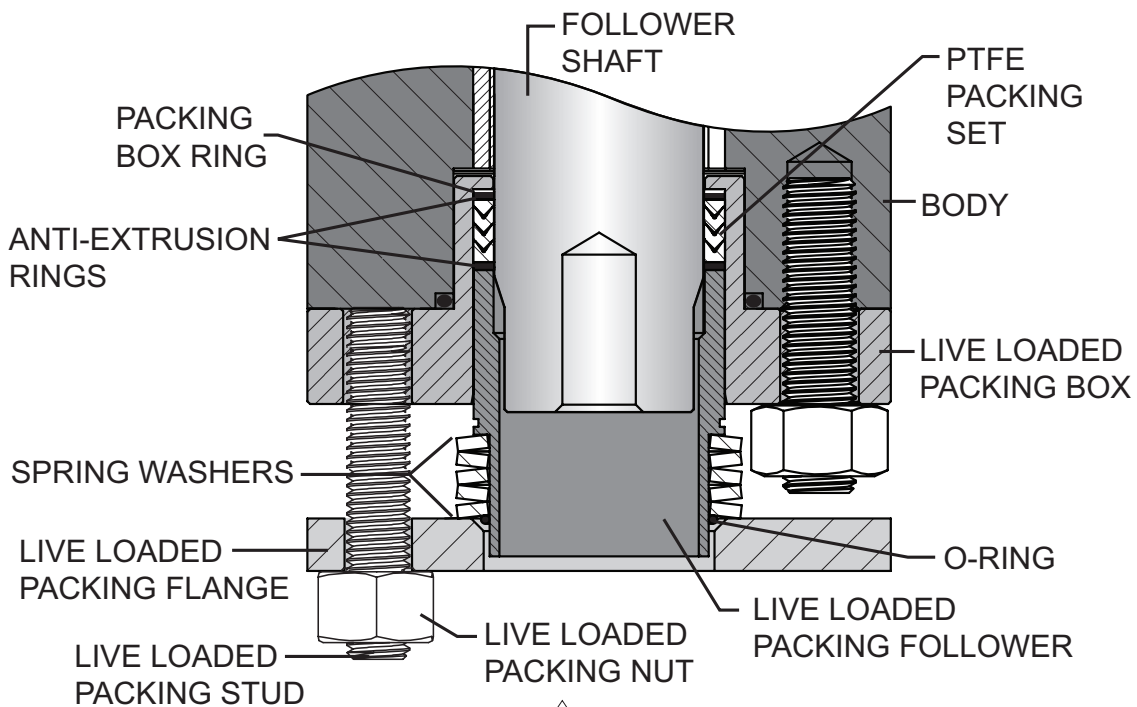


Figure 6 Live Loaded Packing Configuration - Outboard

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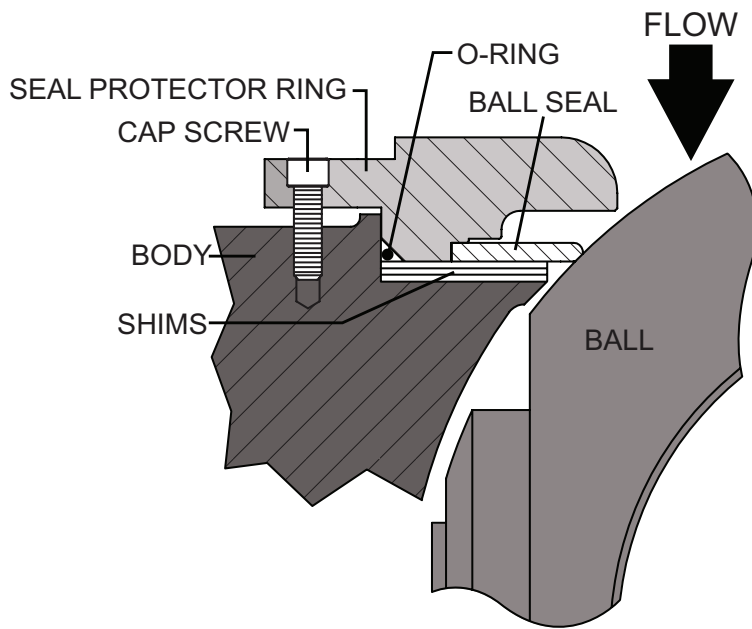


Figure 8 *Ball Seal Detail*

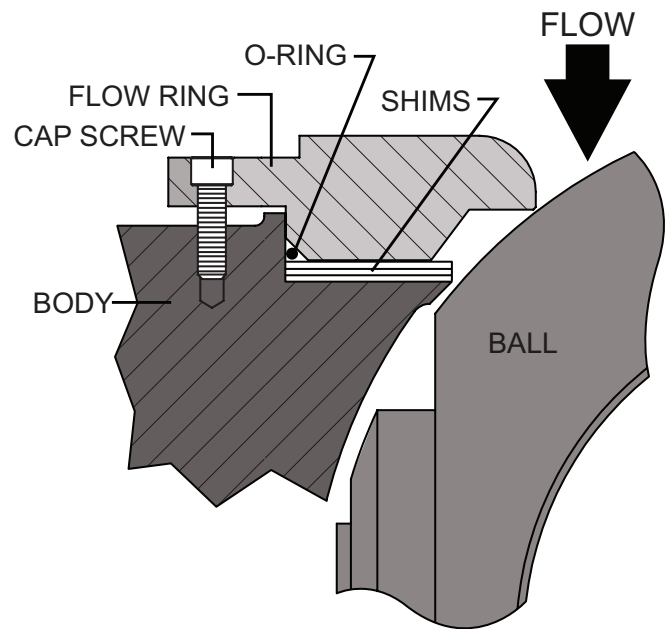
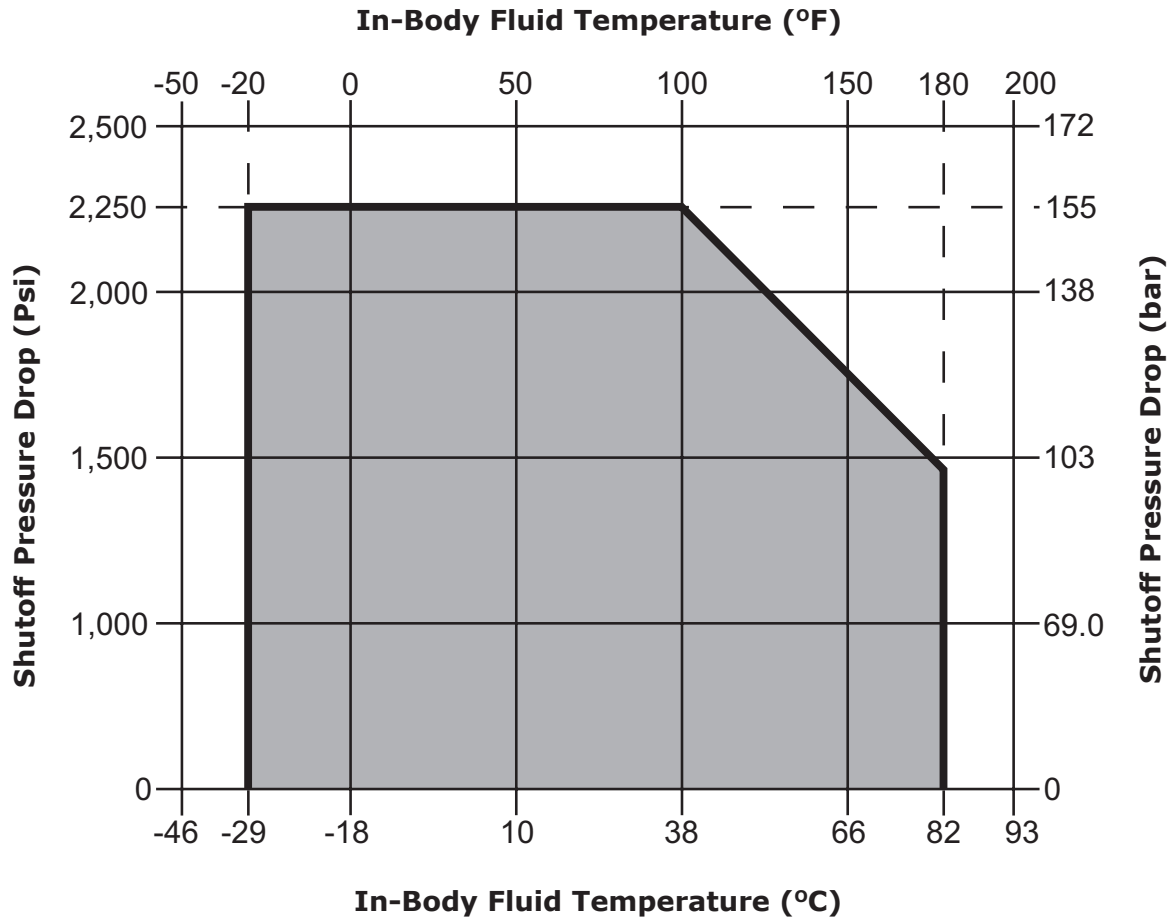


Figure 9 *Flow Ring Detail*



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NOTE: Do not exceed the pressure/temperature limitations in the above chart or the body rating, whichever is lower.

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Figure 10 Model 590 Maximum Allowable Shutoff Pressure Drops - Single Seal and Dual Seal

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Table 9

Model 590 Equal Percentage Sizing Coefficients Forward or Reverse Flow

Valve Size		Degrees Opening								
		10	20	30	40	50	60	70	80	90
4 inch	C _v	0	6.74	19.0	39.9	68.9	114	182	335	498
	X _T	0.66	0.66	0.77	0.76	0.71	0.59	0.47	0.26	0.17
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.45	0.49	0.69	0.84	0.92	0.96	0.98	1.00	1.00
6 inch	C _v	0	15.7	42.8	76.1	130	203	308	567	855
	X _T	0.99	0.99	0.83	0.90	0.76	0.64	0.54	0.28	0.17
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.54	0.54	0.69	0.83	0.90	0.94	0.97	1.00	1.00
8 inch	C _v	1.48	27.9	91.8	177	308	478	720	1220	2188
	X _T	0.35	0.92	0.81	0.85	0.63	0.58	0.48	0.29	0.14
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.45	0.59	0.75	0.85	0.92	0.96	0.98	0.99	1.00
10 inch	C _v	42.8	85.5	174	306	484	764	1150	1800	3045
	X _T	0.33	0.59	0.75	0.72	0.68	0.57	0.43	0.29	0.15
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.60	0.62	0.77	0.86	0.92	0.96	0.98	0.99	1.00
12 inch	C _v	40.6	122	267	499	812	1230	1870	3060	5801
	X _T	0.24	0.88	0.88	0.78	0.60	0.49	0.38	0.23	0.10
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.40	0.64	0.78	0.87	0.93	0.97	0.98	0.99	1.00
16 inch	C _v	68.3	203	447	813	1340	2030	3010	4630	8130
	X _T	0.46	0.71	0.87	0.83	0.66	0.51	0.42	0.27	0.13
	F _L	0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
	F _d	0.42	0.66	0.79	0.87	0.93	0.97	0.98	1.00	1.00

Relationships Of Note:

$$C_1 = 39.76\sqrt{X_T}$$

$$C_g = C_v C_1$$

$$K_m = F_L^2$$



Model 590 Control Valves

MODEL NUMBERING SYSTEM

SAMPLE PART NUMBER: 590-8-CLS-PN

VALVE SIZE						8		
4	4 INCH	6	6 INCH	8	8 INCH		10	10 INCH
12	12 INCH	16	16 INCH					
BALL MATERIAL						-		
-	STEEL / CRPL	S	S31600 / CRPL					
ASME RATING / END CONNECTION						C		
C	600 RF	D	900 RF	E	600 RTJ		F	900 RTJ
BODY MATERIAL						L		
L	LCC	W	WCC ⁽¹⁾	M	CF8M			
BALL SEAL CONFIGURATION						S		
S	SINGLE SEAL	D	DUAL SEAL	F	FLOW RING			
PAINT						-		
-	DFPS-01 (STANDARD)			2	DFPS-02 (SEVERE SERVICE)			
3	DFPS-03 (HIGH TEMPERATURE)							
SHAFT SEALS						P		
L	LIVE LOADED PTFE PACKING							
SHAFT MATERIAL / STYLE						N		
N	S20910 SPLINED			K	S20910 KEYED			

NOTES:

- 1 - WCC material is special order for all parts.
- 2 - This option must be used when mounting the valve to another manufacturer supplied actuator, the use of a non-Dyna-Flo supplied mounting yoke will void warranty.

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