390 Series Control Valve

Figure 1 *Model 390 Control Valve with DFC Actuator*

The 390 Series control valves (Figure 1) are heavy duty globe style control valves. These valves are used in all kinds of demanding applications, including oil and gas production and chemical process. Metal seats are used for increased seat life.

390 Series valves are cage guided, single port valves that can be used in either snap on/off acting or throttling applications of either liquids or gases. A bolted bonnet is standard and a typical actuator is a Dyna-Flo DFC or DFO model linear actuator.

Features

Valve Sizes and Connections
The 390 Series is available in 2", 3", 4" sizes with ANSI 900 or 1500 raised face or RTJ connections.

Standard Low Temperature Construction
The 390 Series use LCC body material and internals rated to -50° F (-46° C).

High Temperature Option
The standard temperature of 450° F (232° C) can be increased with high temperature options.

Cryogenic Service Option
Optional materials and trim details can be used to make the 390 Series suitable for cryogenic service.

Pressure Drop Capabilities
The 390 Series can shut off against inlet pressure equal to ASME B16.34 rating.

Sour Gas Service Capability
The Model 390 can be constructed out of materials that comply with the recommendations of the National Association of Corrosion Engineers (NACE) MR-0175.

Shut Off Classification
Seat leakage options range from ANSI/FCI class II to class V.

Flow Characteristics Selections
The standard flow characteristic is equal percentage. However, linear, quick opening and modified equal percent are also available.

Balanced or Unbalanced Trim Design
Both unbalanced and balanced trim designs are available. The balanced designs use either a pressure assisted seal ring (Model 390) or a piston ring (Model 391) between the plug and the cage.

Paint
Dyna-Flo uses a two part acrylic urethane paint on our valves and actuators. The two part paint has excellent corrosion and humidity resistance and good chemical resistance.

Dyna-Flo Control Valve Services Ltd.
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390 Series Control Valve

Specifications

Configurations

See Table 1

Consult your Dyna-Flo sales office for other available configurations.

Sizes and Connection Styles

Models 390, 391
Size: 2", 3", 4"
Rating: ANSI 900 or 1500
Connections: RF / RTJ

Maximum Inlet Temperatures and Pressures

Consistent with ANSI class rating as per ASME B16.34, unless limited by either material pressure or temperature limitations.

Maximum Pressure Drops

Same as maximum inlet pressure unless otherwise rated by specific trim construction. For Actuator and Valve assembly shut off pressure drops see Tables 7 and 8.

Standard Seat Leakage Classifications

See Table 1.

Dimensions

Valve and Actuator Assembly Dimensions
See Table 3

Valve and Actuator Assembly Dimensions
See Figure 2

Approximate Valve Body and Actuator Weights

See Table 2

Bonnet Bolting

Standard service body to bonnet studs are steel SA193-B7 and steel SA-194-2H nuts.

For NACE-2002 the studs are SA-193-B7M and steel SA-194-2HM for nuts.

For NACE-2003 applications contact Dyna-Flo.

Flow Characteristics

Standard 390 Series characteristic is equal percent with modified equal percent as an option.

Linear and Quick Opening are available - please contact Dyna-Flo.

Packing Type

The standard packing is PTFE V-Ring. Live loaded low emission, graphite and other packing arrangements are also available.

Valve Sizing Coefficients

See Table 4

Trim Sizes and Valve Mounting Connections

See Table 9

Trim Materials

See Table 10

Valve Parts List Material and Temperature Limitations

See Table 5, 6, 10 and 11
See Figure 4

390 Series Control Valve

Table 1

Valve Design Configurations

Valve Model	Size (inch)	Shut Off Capability	Valve Plug	Seal Ring	Guide	Seat
390	2, 3, 4	IV Standard	Balanced	Carbon PTFE with Elgiloy C Spring	Cage	Metal
	2, 3, 4	V Optional	Balanced	Carbon PTFE with Elgiloy C Spring	Cage	Metal
391	2, 3, 4	II Standard	Balanced	Graphite Piston Ring	Cage	Metal
	2, 3, 4	III Optional	Balanced	Graphite Piston Ring	Cage	Metal

Table 2

Approximate Weights
lb (kg)

Valve Size (inch)	Class	Body Only	With Fail Open Actuator	Assembly Weight	With Fail Close Actuator	Assembly Weight
2	900	160 (73)	DFO-2105	242 (110)	DFC-2105	250 (114)
2	1500	160 (73)	DFO-2105	242 (110)	DFC-2105	250 (114)
3	900	275 (125)	DFO-2105	357 (162)	DFC-2105	365 (166)
3	1500	286 (130)	DFO-3156	402 (183)	DFC-3156	408 (185)
4	900	510 (231)	DFO-3156	626 (284)	DFC-3156	632 (286)
4	1500	552 (250)	DFO-3220	787 (357)	DFC-3156	806 (366)

390 Series Control Valve

Table 3

Models 390 and 391
Dimensions Refer to Figure 2
Inches (mm)

Valve Size	Inch	Actuator Size	A	B	C	D DFO	D DFC	E
2″	900# RF	2105	14.75 (375)	3.06 (78)	10.30 (262)	36.25 (921)	40.50 (1029)	16.00 (406)
	900# RTJ	2105	14.88 (378)	3.06 (78)	10.30 (262)	36.25 (921)	40.50 (1029)	16.00 (406)
	1500# RF	2156	14.75 (375)	3.06 (78)	10.30 (262)	36.25 (921)	40.50 (1029)	18.62 (473)
	1500# RTJ	2156	14.88 (378)	3.06 (78)	10.30 (262)	36.25 (921)	40.50 (1029)	18.62 (473)
3″	900# RF	2105	17.38 (441)	4.75 (121)	12.69 (322)	38.63 (981)	42.94 (1091)	16.00 (406)
	900# RTJ	2105	17.50 (445)	4.75 (121)	12.69 (322)	38.63 (981)	42.94 (1091)	16.00 (406)
	1500# RF	2105	18.13 (460)	4.75 (121)	12.69 (322)	38.63 (981)	42.94 (1091)	16.00 (406)
	1500# RTJ	2105	18.25 (464)	4.75 (121)	12.69 (322)	38.63 (981)	42.94 (1091)	16.00 (406)
3″	900# RF	3156	17.38 (441)	4.75 (121)	12.25 (311)	40.70 (1034)	43.10 (1095)	18.62 (473)
	900# RTJ	3156	17.50 (445)	4.75 (121)	12.25 (311)	40.70 (1034)	43.10 (1095)	18.62 (473)
	1500# RF	3156	18.13 (461)	4.75 (121)	12.25 (311)	40.70 (1034)	43.10 (1095)	18.62 (473)
	1500# RTJ	3156	18.25 (464)	4.75 (121)	12.25 (311)	40.70 (1034)	43.10 (1095)	18.62 (473)
4″	900# RF	3156	20.12 (511)	6.88 (175)	11.80 (300)	40.30 (1024)	42.75 (1086)	18.62 (473)
	900# RTJ	3156	20.25 (514)	6.88 (175)	11.80 (300)	40.30 (1024)	42.75 (1086)	18.62 (473)
	1500# RF	3220	20.88 (530)	6.88 (175)	11.80 (300)	44.90 (1140)	48.50 (1232)	21.12 (536)
	1500# RTJ	3220	21.00 (533)	6.88 (175)	11.80 (300)	44.90 (1140)	48.50 (1232)	21.12 (536)

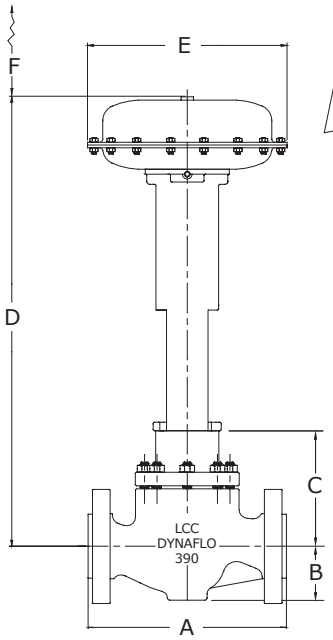

Figure 2 Typical *Valve Assembly with Type DFC or DFO*

F Dimension:
2″ Valve
6.88″ (175 mm)

3″ Valve
6.88″ (175 mm)

3″ Valve
9.12″ (232 mm)
For DFC/DFO 3156

4″ Valve
9.12″ (232 mm)

390 Series Control Valve

Table 4

Models 390 and 391
Valve Sizing Coefficients

Equal Percent

Valve	Port	Travel	Coefficient	Percentage of Valve Travel									
Size	Inches (mm)	Inches (mm)		10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
2″	1.875 (48)	1.125 (29)	C_V	-	1.02	7.53	13.3	19.8	26.4	26.4	32.0	36.2	41.0
			X_T	-	0.745	0.595	0.587	0.593	0.633	0.633	0.721	0.791	0.791
			F_L	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930
3″	2.875 (73)	1.500 (38)	C_V	-	1.21	4.21	11.3	23.0	37.6	53.2	69.5	85.3	92.7
			X_T	-	0.954	0.761	0.600	0.558	0.592	0.661	0.705	0.705	0.768
			F_L	0.92	0.92	0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920
4″	3.625 (92)	1.500 (38)	C_V	3.12	7.35	13.9	23.4	37.9	60.1	90.6	123	147	165
			X_T	0.676	0.551	0.524	0.488	0.449	0.443	0.463	0.509	0.569	0.674
			F_L	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850

Modified Equal Percent

Valve	Port	Travel	Coefficient	Percentage of Valve Travel									
Size	Inches (mm)	Inches (mm)		10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
2″	1.875 (48)	1.500 (38)	C_V	-	2.28	7.52	15.7	24.1	31.6	38.2	43.5	46.7	49.0
			X_T	-	0.641	0.571	0.584	0.634	0.698	0.778	0.803	0.771	0.761
			F_L	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930	0.930
3″	2.875 (73)	2.000 (51)	C_V	0.475	3.07	11.8	26.8	46.6	69.3	89.5	99.0	103	114
			X_T	0.949	0.712	0.55	0.603	0.681	0.697	0.706	0.762	0.856	0.773
			F_L	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
4″	3.625 (92)	2.000 (51)	C_V	4.33	11.3	23.3	45	79.6	121	155	176	191	203
			X_T	0.624	0.482	0.482	0.45	0.453	0.502	0.599	0.695	0.723	0.735
			F_L	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890

For linear and quick opening valve characteristics please contact Dyna-Flo

Relationships of Note:

$C_1 = 39.76\ X_T$

$C_G = C_V C_1$

$K_M = F_L^2$

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390 Series Control Valve

Table 5

Typical Construction Materials

Key	Part Description	Standard Construction	NACE Construction/ Low Temperature
1	BODY	SA352 Gr LCC	SA352 Gr LCC
2	BONNET	SA352 Gr LCC	SA352 Gr LCC
3	PACKING BOX RING	316 SST	316 SST
4	PACKING SPRING	304 SST	-
5	LANTERN RING	-	316 SST
6	RETAINING RING	302 SST	302 SST
7	SPECIAL WASHER	304 SST	304 SST
8	V-RING PACKING SET	PTFE	PTFE (Double)
9	PACKING FOLLOWER	316 SST	316 SST
10	STEM WIPER	FELT	FELT
11	CAGE	17-4PH SST	17-4PH SST DH1150
12	VALVE PLUG / STEM ASS'Y	416 SST PLUG/ Nitronic 50 STRAIN-HARDENED STEM	316 SST with ALLOY 6 SEAT & GUIDE Nitronic 50 Stem
13	SEAT RING	416 SST	316-ALLOY 6
14	SEAL RING	CARBON / PTFE / Elgiloy	CARBON / PTFE / Elgiloy
15	BACKUP RING	316 SST	316 SST
16	PACKING FLANGE	CARBON STEEL-PLATED	CARBON STEEL-PLATED
17	PACKING NUT	SA-194 2H	SA-194 2H
18	PACKING STUD	SA-193 B7	SA-193 B7
19	BONNET STUD	SA-193 B7	SA-193 B7M
20	BONNET NUT	SA-194 2H	SA-194 2HM
21	SEAT RING GASKET	INCONEL 600/GRAPHITE	INCONEL 600/GRAPHITE
22	BONNET GASKET	iNCONEL 600/GRAPHITE	INCONEL 600/GRAPHITE

390 Series Control Valve

Table 6

Typical Construction Materials Cont'd

Key	Part Description	Standard CF8M Construction	High Temp Construction (Model 391 Only)
1	BODY	SA351 Gr CF8M	SA351 Gr CF8M
2	BONNET	SA351 Gr CF8M	SA351 Gr CF8M
3	PACKING BOX RING	316 SST	316 SST
4	PACKING SPRING	-	-
5	LANTERN RING	316 SST	316 SST
6	RETAINING RING	302 SST	Inconel 750
7	SPECIAL WASHER	-	316 SST
8	PACKING SET	PTFE (Double)	GRAPHITE RIBBON FILAMENT
9	PACKING FOLLOWER	316 SST	316 SST
10	UPPER WIPER	FELT	FELT
11	CAGE	316 SST / ENC	17-4PH SST
12	VALVE PLUG / STEM ASS'Y	316 SST with ALLOY 6 SEAT & GUIDE Nitronic 50 Stem	316 SST with ALLOY 6 SEAT & GUIDE Nitronic 50 Stem
13	SEAT RING	316-ALLOY 6	316-ALLOY 6
14	SEAL RING / PISTON RING	CARBON / PTFE / Elgiloy	CARBON / GRAPHITE
15	BACKUP RING	316 SST	316 SST
16	PACKING FLANGE	CARBON STEEL-PLATED	316 SST
17	PACKING NUT	8M	8M
18	PACKING STUD	SA-194 B8M	SA-194 B8M
19	BONNET STUD	SA-194 B8M	SA-194 B8M
20	BONNET NUT	8M	8M
21	SEAT RING GASKET	INCONEL 600/GRAPHITE	INCONEL 600/GRAPHITE
22	BONNET GASKET	INCONEL 600/GRAPHITE	INCONEL 600/GRAPHITE

390 Series Control Valve

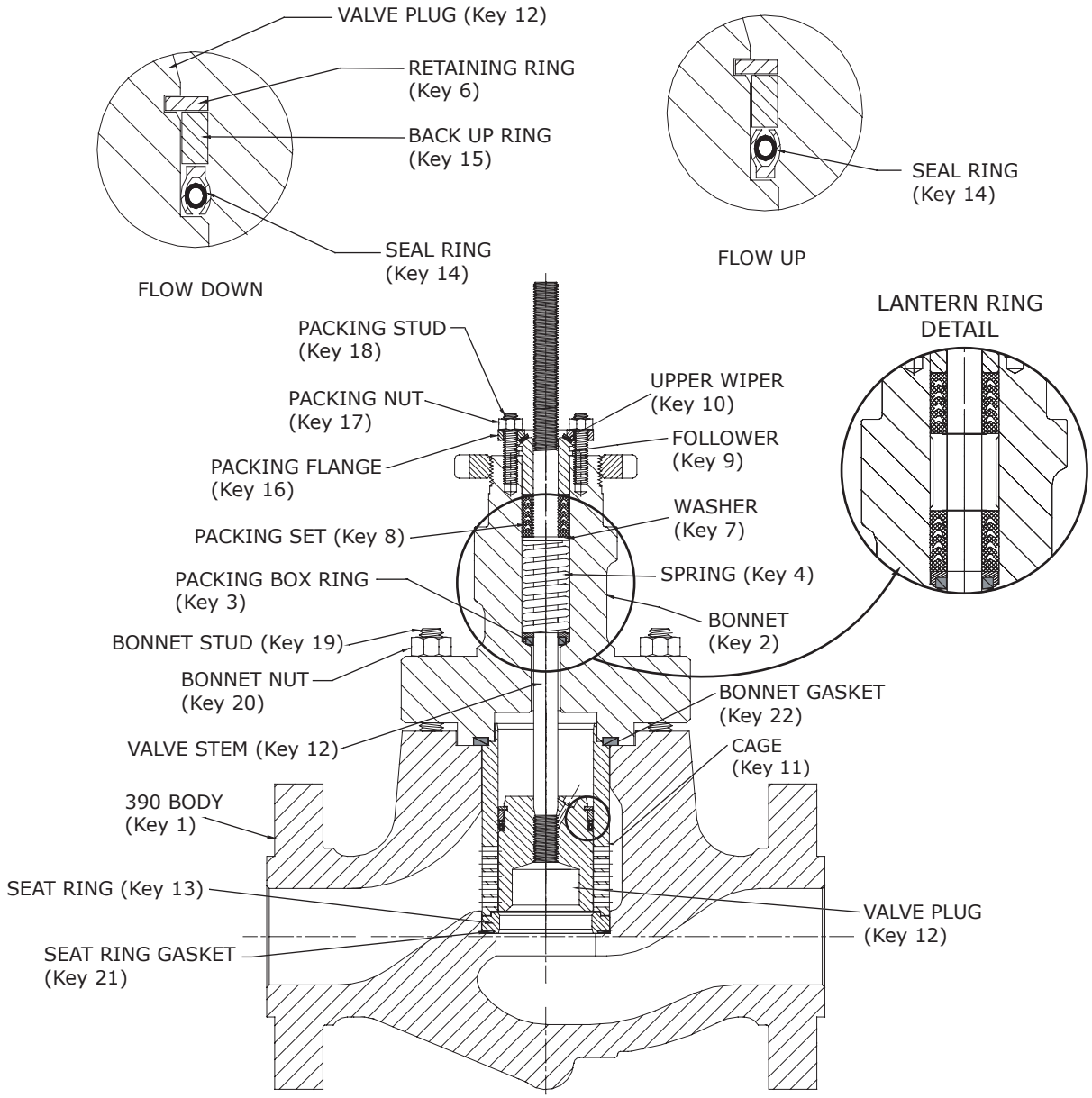


Figure 3 *Cross-section of 390 Series Control Valve*

390 Series Control Valve

Table 7

Fail Open Actuator
Shut Off Capabilities for Model 390
Metal Seat, Class IV Control Valve
35 psig supply pressure

Valve Size (inch)	Actuator Size Pressure Drop psig (kPag)				
	DFO - 2105	DFO - 2156	DFO - 3105	DFO - 3156	DFO - 3220
2″	3750 (25,855)[1]	3750 (25,855)[1]	—	—	—
3″	3750 (25,855)[2]	3750 (25,855)[1]	3750 (25,855)[2]	3750 (25,855)[1]	—
4″	—	—	—	3750 (25,855)[3]	3750 (25,855)[1]

Note
1 - 6 to 26 psig bench range
2 - 6 to 24 psig bench range
3 - 6 to 22 psig bench range

Table 8

Fail Closed Actuator
Shut Off Capabilities for Model 390
Metal Seat, Class IV Control Valve
35 psig supply pressure

Valve Size (inch)	Actuator Size Pressure Drop psig (kPag)				
	DFC - 2105	DFC - 2156	DFC - 3105	DFC - 3156	DFC - 3220
2″	3750 (25,855)[1]	3750 (25,855)[1]	—	—	—
3″	3750 (25,855)[2]	3750 (25,855)[1]	3750 (25,855)[2]	3750 (25,855)[1]	—
4″	—	—	—	2280 (15,720)[2]	3750 (25,855)[3]

Note
1 - 6 to 30 psig Bench Range
2 - 9 to 30 psig Bench Range
3 - 7 to 30 psig Bench Range

390 Series Control Valve

Table 9

Models 390, 391 Port Diameters, Valve Plug Travel, Stem and Valve Mounting Connection Sizes

Valve Size Inch	Port Diameter Inch (mm)	Max Valve Travel Inch (mm)	Stem and Valve Mounting Connection Inch (mm)	
			Stem	Valve
2″	1 7/8 (48)	1 1/2 (38)	1/2 (13)	2 13/16 (71)
3″	2 7/8 (73)	2 (51)	1/2 (13)	2 13/16 (71)
3″	2 7/8 (73)	2 (51)	3/4 (19)	3 9/16 (91)
4″	3 5/8 (98)	2 (51)	3/4 (19)	3 9/16 (91)

Table 10

Trim Options and Temperature Ratings

Trim[4] Spec	Model	Valve Plug	Stem	Cage	Seat Ring	Minimum Temperature	Maximum Temperature	Service
						°F (°C)	°F (°C)	
S	390, 391	416 SST	Nit 50	17-4 PH	416 SST	-20 (-29)	650 (343)[1]	Standard Service
N	390, 391	316 SST/ Alloy 6 Seat and Guide	Nit 50	17-4 PH DHT	316 SST/ Alloy 6	-50 (-46)	650 (343)	NACE[3], Low Temperature
C	390, 391	316 SST/ Alloy 6 Seat and Guide	Nit 50	316 SST ENC	316 SST/ Alloy 6	-50 (-46)	650 (343)	CF8M (316 SST Body) NACE
H	391	316 SST/ Alloy 6 Seat and Guide	Nit 50	17-4 PH	316 SST/ Alloy 6	-50 (-46)	800 (427)[2]	High Temperature

1 Maximum temperature limited by LCC body material
2 When used with CF8M body material
3 Temperatures need to be considered when specifying trim materials for elevated temperatures in corrosive environments, consult factory for further information
4 Trim Spec relates to Model Numbering System on Page 12

Our Commitment of Quality

Dyna-Flo is committed to continuous improvement. All efforts have been taken to maximize the accuracy of this information. Without notification, product specifications and designs may be modified at any time. The issue of this document is for information only, and does not imply suitability, a warranty, or guarantee for a specific service.

390 Series Control Valve

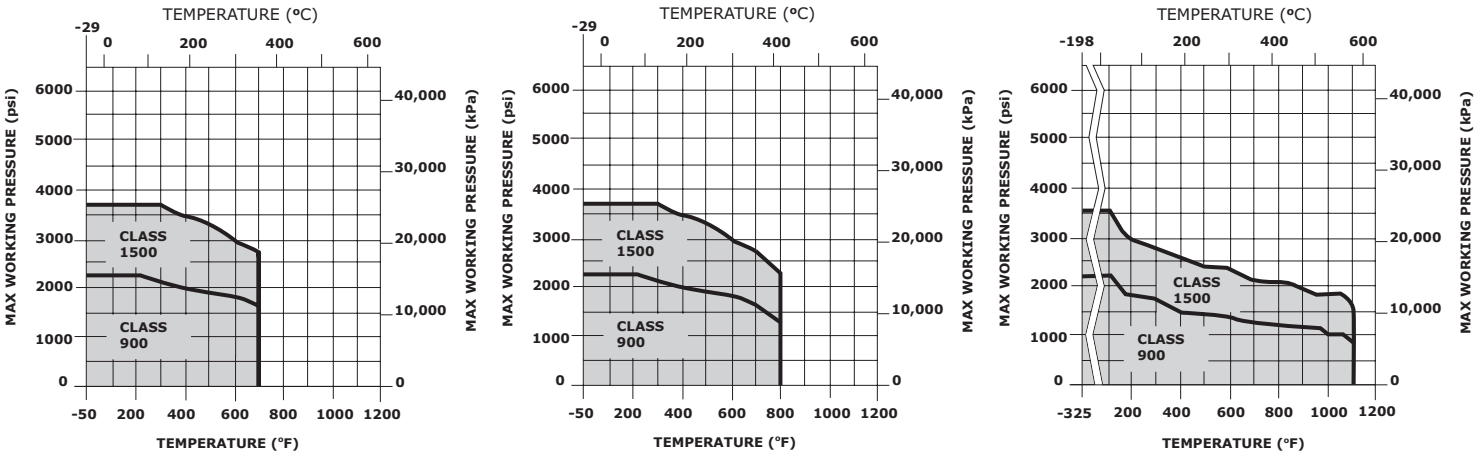


Figure 4 *Pressure / Temperature Charts as per ANSI / ASME B16.34*

Table 11

Materials and Temperature Limits
Parts other than Valve Body and Trim

Model	Part	Material	Minimum Temperature	Maximum Temperature
390	Backup Ring	316 SST	-325°F (198°C)	1100°F (593°C)
	Retaining Ring	302 SST	-425°F (-254°C)	1100°F (593°C)
	Seal Ring	PTFE with Elgiloy Spring	-100°F (-73°C)	450°F (232°C)
391	Piston Ring	Carbon / Graphite	-425°F (-254°C)	800°F (427°C)
390, 391	Bonnet / Cage Gasket	Inconel 600 / Graphite	-400°F (-240°C)	800°F (427°C)
390, 391	Seat Ring Gasket	Inconel 600 / Graphite	-400°F (-240°C)	800°F (427°C)
390, 391	Packing	PTFE V-Ring	-40°F (-40°C)	450°F (232°C)
		Graphite Ribbon / Filament	-425°F (-254°C)	1000°F (537°C)
390, 391	Body to Bonnet Studs Standard	B7	-50°F (-46°C)	700°F (371°C)
	Body to Bonnet Nuts Standard	2H	-50°F (-46°C)	700°F (371°C)
	Body to Bonnet Studs (NACE-2002)	B7M	-50°F (-46°C)	700°F (371°C)
	Body to Bonnet Nuts (NACE-2002)	2HM	-50°F (-46°C)	700°F (371°C)
	Body to Bonnet Studs	B8M	-325°F (-198°C)	800°F (427°C)
	Body to Bonnet Nuts	8M	-325°F (-198°C)	800°F (427°C)

For NACE 2003 body to bonnet studs and nuts please contact Dyna-Flo

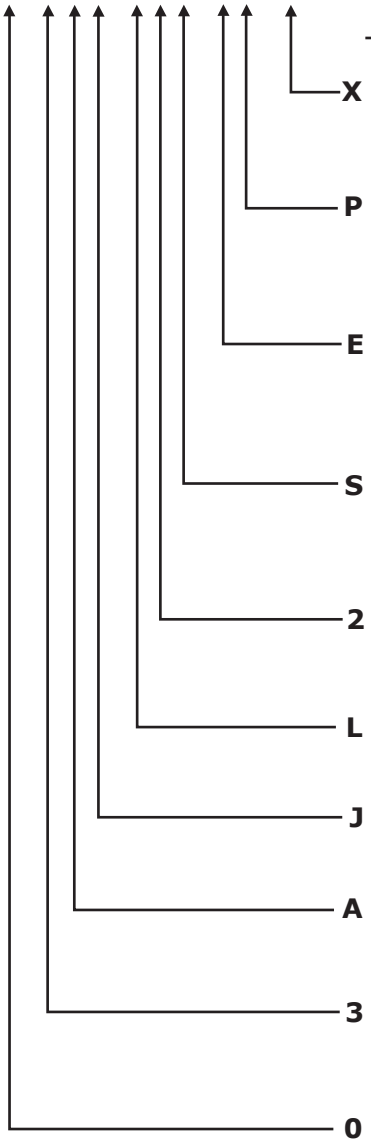
390 Series Control Valve

Ordering Guide

Dyna-Flo 390 Series Control Valve | Model Numbering System

Sample Part Number

390-3AJ-L2S-EP-X



Code	Description		
X	**Special**		
	Packing Style		
P	Spring Loaded PTFE V-Ring	**L**	Live Loaded Graphite
D	Double PTFE V-Ring	**T**	Live Loaded PTFE
G	Graphite High Temp		
	Characteristic		
E	Equal Percentage	**L**	Linear
Q	Quick Open	**M**	Mod. EQ%
	Trim		
S	Standard	**H**	High Temp (391 Only)
N	NACE / Low Temp	**X**	Special
C	CF8M Construction		
	Valve Mounting Connection		
2	2-13/16"	**3**	3-9/16"
	Body Material		
L	LCC	**M**	CF8M
	Connection Style		
F	RF	**J**	RTJ
	ANSI Rating		
A	900#	**B**	1500#
	Valve Size		
2	2 inch	**4**	4 inch
3	3 inch		
	Valve Model		
0	Style 390	**1**	Style 391