



FPG 400 SERIES

Rotary Plug Control Valves

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Series

FPG 400

Rotary Plug Control Valves

Certifications



Features

Model	FPG 400
Type	Rotary Plug Control Valve
Way	2/2
Size	1" ~ 8"
Pressure class	150 ~ 600 LBS
Face to face	ISA-75.08.02 / IEC 60534-3-2
Ends	ASME B 16.5 Class 150 ~ 600, RF, RTJ
Temperature class	-196 ~ 593 °C

Flow characteristic	Modified linear
Shut off class	ANSI/FCI 70-2 Class IV
End connection	FPG 500 Flanged, FPG 500 Wafer
Flow direction	Reverse flow, Forward flow
Flow coefficient rate	100:1
Plug rotation	Counterclockwise rotate 90 degree

FPG 400 Series eccentric rotary plug valve is designed for erosive fluid, coking fluid and other fluids in harsh working conditions, offering the on-off or throttling operation. It features with flange or flangeless (FPG 500 Wafer) mounting style, streamlined flow passage, rigid metal trim and a self-centering valve seat ring design. FPG 400 series valve combines the features of globe valve's rigid construction and the high-efficiency of rotary valve. FPG 400 series valve can be assembled with power or manual operated actuator, the applications cover different areas such as petrol-gas, chemical, power generation and steel industries.

Erosive fluid applications

The valve parts are special designed for erosive fluid applications. The streamlined flow passage, rigid metal trim and a wide selection of anti-corrosive materials gives the valve reliable long cycle life in erosive fluid applications.

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Features

Erosive fluid applications

The valve parts are special designed for erosive fluid applications. The streamlined flow passage, rigid metal trim and a wide selection of anti-corrosive materials gives the valve reliable long cycle life in erosive fluid applications.

Long seat life

Eccentric plug reduce the contact friction with seat when valve is opening, reduce seat wear and tear. When the plug rotate into the seat ring, they automatically lapping and grinding, improving the fit between shutoff surfaces. Full-port, 316 SST, Alloy 6 or VTC seat ring has two shutoff surfaces and can be easily reversed, reducing downtime.

Comprehensive operations

Self-centering seat ring and rugged plug ensure the tight shutoff in both forward flow and reverse flow directions. The reverse flow direction helps to move downstream turbulence away from shutoff surfaces. Full 90 degree plug rotation remove the plug from flow stream, helping to reduce the plug wear and tear. Valve seat ring and retainer have full-port and restricted port available, and can be chosen according to the flow capacity change.

Easy mounting

Flange type end connection comply with different standard, can be connected to different pipelines. Flange helps to eliminate exposed line bolting, reduce the alignment and mounting time, improve valve installations and piping integrity. Flange-less type (wafer) end connection self-centering the pipeline bolting, easy for installation.

Easy assembly and maintenance

The valve plug and seat don't need the special orientation, precision clamping or separate centering for assemble, improve the assembly accuracy and keep it easy to do.

Exceptional Environment Capabilities

The optional ES packing system are designed with very smooth shaft surfaces and live loading to provide exceptional sealing. The seal of the ES system can restrict emissions to less than the EPA(Environmental Protection Agency) limit of 100 ppm (parts per million).

Sour Gas Service Capability

The valve's corrosive design follows NACE standard, construction and trim parts material comply with NACE standard MR-0175-2002, and are available for sour fluids and gases applications.

Durable construction

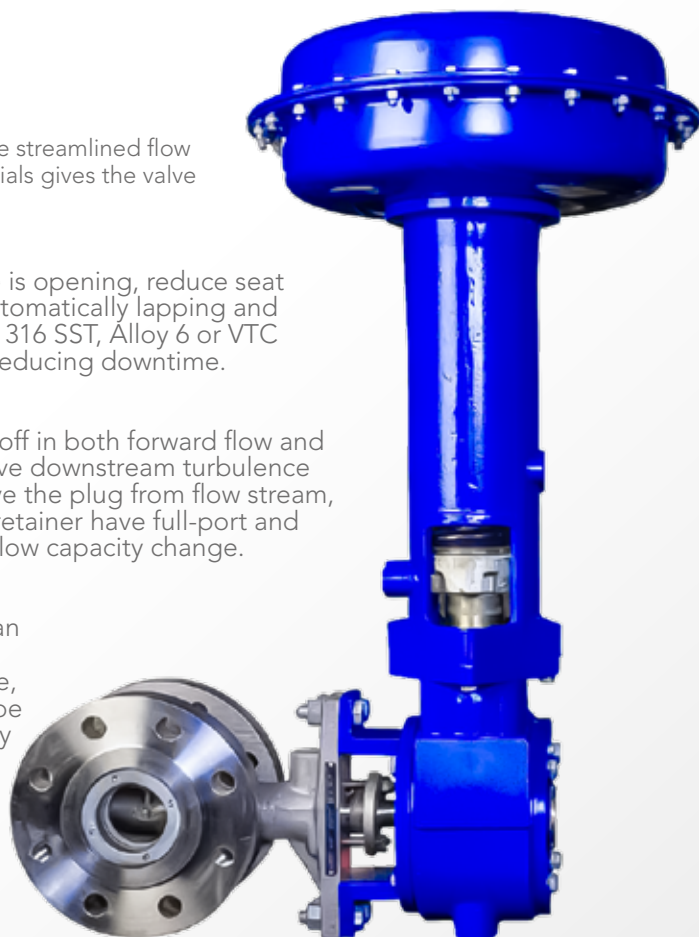
Durable, solid metal or VTC (ceramic) seat ring and valve plug cutoff the flow tightly, without deforming plug arms or employing thin plug seals. Oversize shaft and enforced trim parts are available for high pressure drops.

Reliable performance

The design of seat ring features self-centering , self-laps, and dynamically align with the plug, resulting perfect valve cycle life. Sealed metal bearing help to eliminate the particles build up, avoid the valve shaft seizure in corrosive application.

Multiple construction materials

There are different material combinations for valve plug, seat and retainer in erosive applications. Details in table 10-Trim material combinations.



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Features

Table1. FPG 400 Series eccentric rotary plug control valve Specification

Valve style	Flange style valve assembly Flangeless wafer type (only for size NPS3~8), with reversible (1)metal or VTC (ceramic) valve seat , and splined valve shaft
Valve size	1,1-1/2,2,3,4,6 & 8 inch
End connection and size	RF or RTJ standard flange :1-8 inch (detail in ordering form) Flangeless Wafer : 3-8 inch (detail in ordering form)
Max.inlet pressure	Comply with ASME or EN flange standard
Max.pressure drop	Detail in table 4,5,6,7 & 8
Shutoff classification	ANSI/FCI 70-2 and IEC60534-4 standard Class IV for both flow directions. (0.01% flow with valve full open). Leakage rate for full or restricted port valves are depending the full port flow capacity. Restricted port valve use a reduced port seat added to the full port valve.
Construction material	Valve parts material in table 9 , Trim material combination in table 10
Material temperature range(2)	Detail in table 9
Flow characteristic	Modified linear
Flow direction	Reverse flow(standard) : Fluid pass valve plug then through seat ring, push valve to the close position, recommend for erosive application. Forward flow: Fluid pass the seat ring then valve plug, push valve to open position.
Flow coefficients	Detail in flow coefficient table 12 ~ 19
Flow coefficient rate(3)	100:1
Mounting positions with actuator	Two styles when viewed from upstream side of the valve: right hand & left hand. The mounting position depends on the required valve plug open position and the flow direction by application. More detail in valve mounting description.
Plug rotation	Counterlockwise rotate 90 degree to close(viewed from actuator side)
Actuator action	Push-down-to-close valve (Actuator rod extend to close the valve) Push-down-to-open valve (Actuator rod extend to open the valve) For diaphragm or cylinder actuator,these two actions can be revised on site.
Packing construction	Standard packing design , ES type packing system
Shaft diameter	Detail in Table 10- FPG 400 Series eccentric rotary valve material combination
Dimension and estimate weight	Detail in table 11-dimension and weight
Options	Restricted trim for low flow application (retainer and seat ring) Sealed bearing construction Tungsten carbide trim optional Purged bearing
Notes	1. Not every trim material is reversible, please consult Flapcon™ sales office. 2. Refer to the pressure and temperature limitation tables for all applications. 3. The flow coefficient ratio or range ability is the ratio of maximum flow coefficient to minimum usable flow coefficient.

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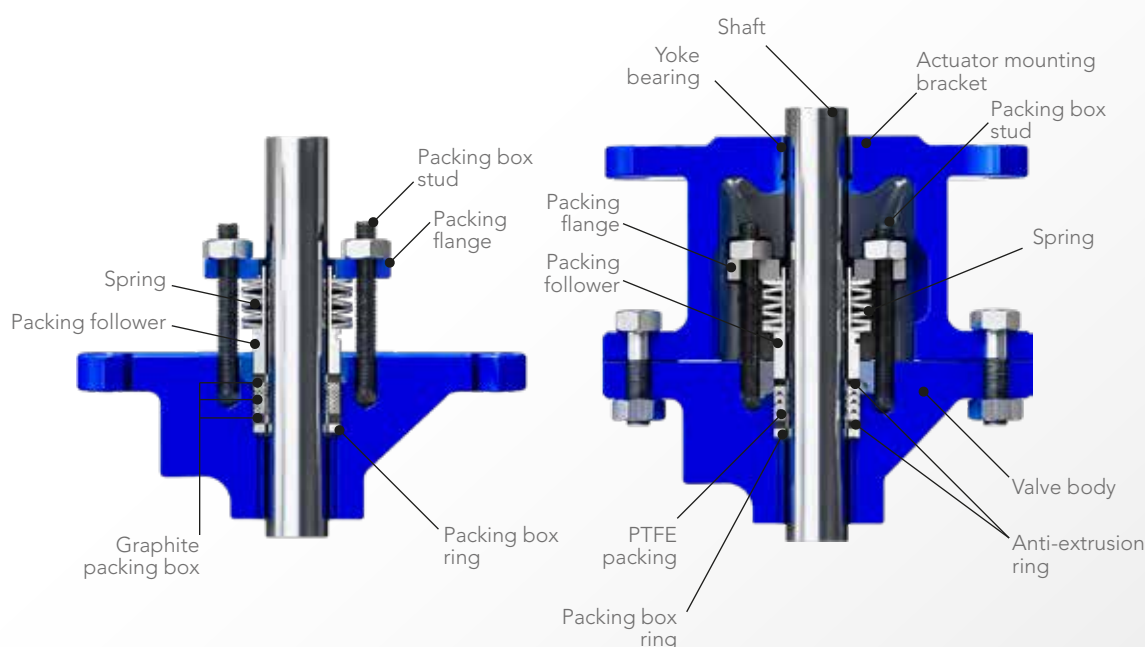
Rotary Plug Control Valves

Packing system

The long-term, consistent sealing performance of the packing system is achieved by the unique design of packing construction and high performance packing material. FPG 400 series valve packing system ensures great guide sealing and load force transfer. Live-loading spring design offers stable load to the packing material during its whole lifetime. The long-life and reliability of these systems also reduce maintenance costs and downtime.

The packing system can be replaced on-site with control valve remains on the pipeline. The packing package has all the spare parts needed for on-line mounting or replacement. FPG 400 series control valve has many packing system design, including V-type Single/Duplex PTFE, Graphite Composition, and ES and HS Type.

We offer two different packing materials: PTFE, which is selected for temperatures below 232°C (450°F) and graphite which was selected for temperatures above 232°C (450°F).



ES type packing arrangement

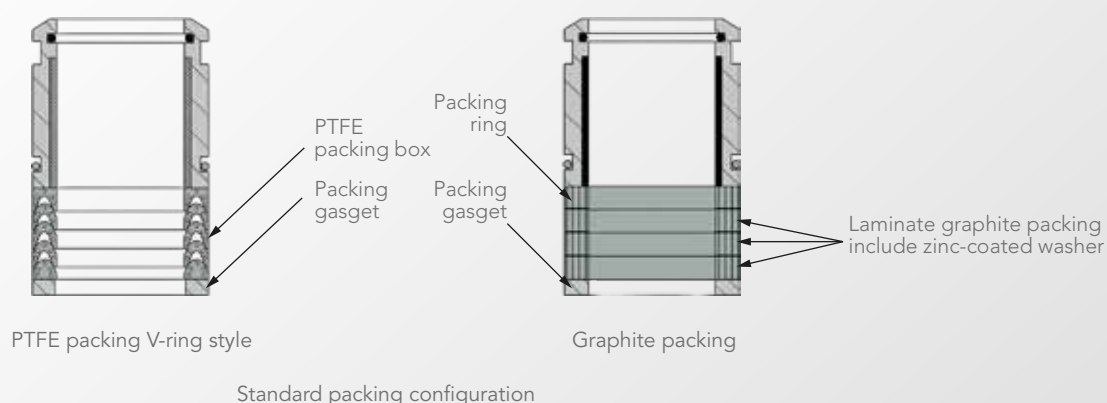


Figure 3. Packing configuration

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Rotary Plug Control Valves

Packing system

Table2. ES type packing system description

Maximum temperature -pressure limitation		Maximum temperature-pressure limitation should comply with requirement of EPA 500PPM application. For ES type PTFE packing material : 232°C (450°F) For ES type graphite material : 316°C (600°F)
Material temperature limit		For ES type PTFE packing: -46~232°C (-50~450°F) For ES type graphite packing: up to 316°C (600°F)
Construction material	PTFE packing system	Packing ring : PTFE V-ring Adapter ring : carbon-filled PTFE V-ring Anti-extrusion ring : High strength polymer Packing box ring : S31600(316SST)
	Graphite packing system	Packing ring : Graphite Anti-extrusion ring : carbon Packing box ring : S31600(316SST)
	Packing flange	S31600(316SST, or other material on request)
	Packing box stud	Steel SA-193-B7
	Packing box nut	Steel SA-194-2H
	Spring package	O-ring : NBR Packing follower : S31600 with carbon-filled PTFE bush Spring: N07718 or S17400



Figure 4.PTFE and graphite packing

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Construction features and seat seal design

Table2. ES type packing system description

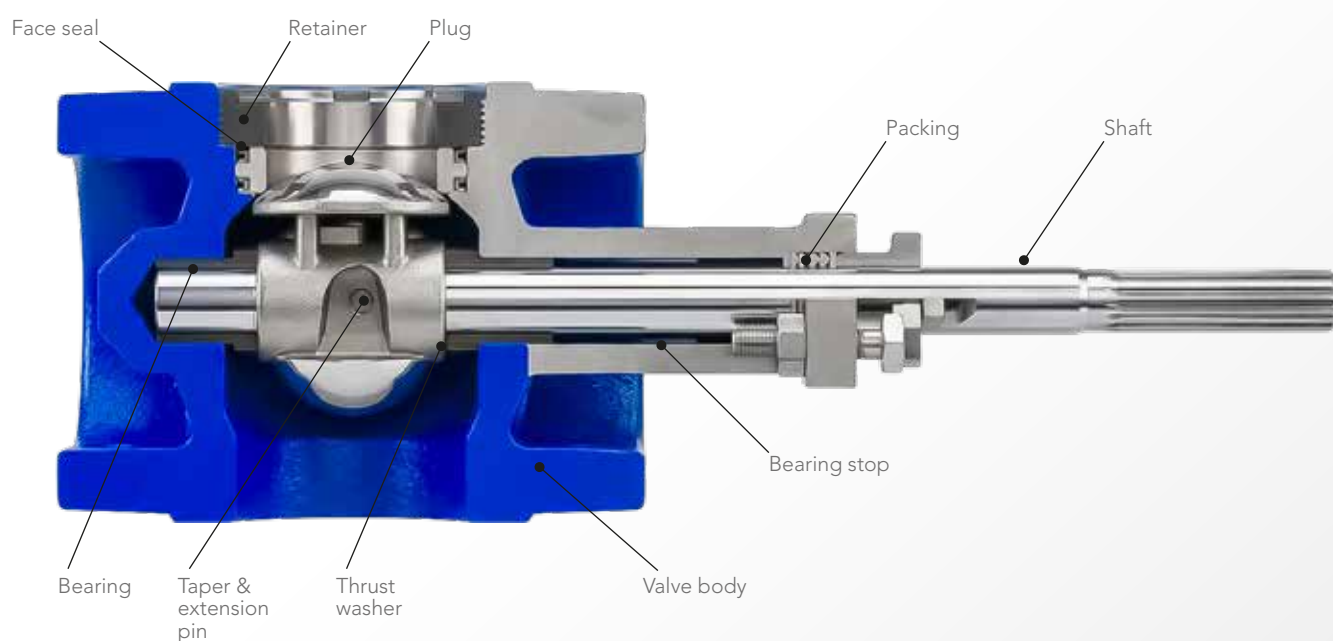


Figure5.Construction drawing

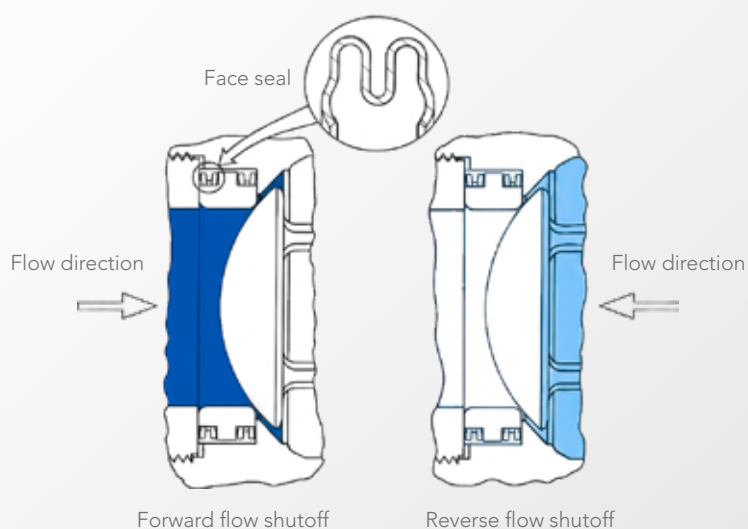


Figure 6.Valve seat seal design

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Rotary Plug Control Valves

Mounting style selection

FPG 400 Series eccentric rotary plug valve can be mounted in any position. But to keep the best valve shutoff performance, we recommend the horizontal position. FPG 400 valve can be installed both in forward flow or reverse flow direction. Forward flow (fluid pass through the valve seat then valve plug) tends to open the valve; Reverse flow (fluid pass through the valve plug then valve seat) tends to close the valve. Reverse flow is recommend for erosive application. Sometimes the special operation may needs a special combination for actuator action (push-down-to-open or close) and valve plug open position (above or below the shaft). Flapcon™ can take customer design with the different combination of valve and actuator.

There are 8 combination to choose, detail description in table3. Please consult Flapcon™ sales office for technical support. More info about material combination can be found in Table 9.

FPG 400 series eccentric rotary valve material temperature range. Please check brochure for RAD & RAT Series rotary actuators.

Mounting style	Action(1)	Position with plug open	
		Forward flow	Reverse flow
Left hand	PDTC	Below shaft(2)	Above shaft
	PDTC	Below shaft(2)	Above shaft
Right hand	PDTC	Above shaft	Below shaft(2)
	PDTC	Above shaft	Below shaft(2)
1. PDTC-Push-down-to-close (Actuator rod extend to close the valve) PDTO-Push-down-to-open (Actuator rod extend to open the valve)			
2. Contact Flapcon™ sales office for fluid application.			



Figure 7.Forward flow left hand mounting

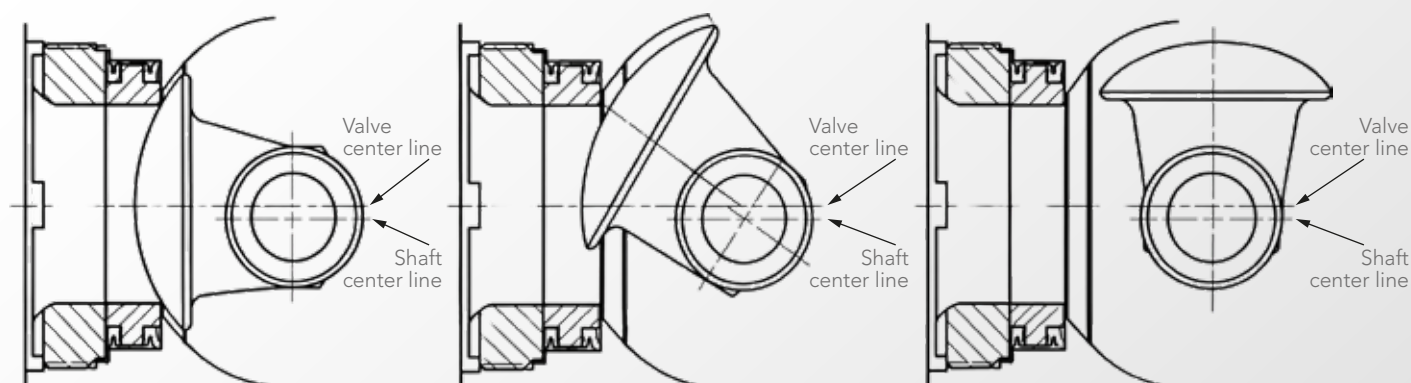


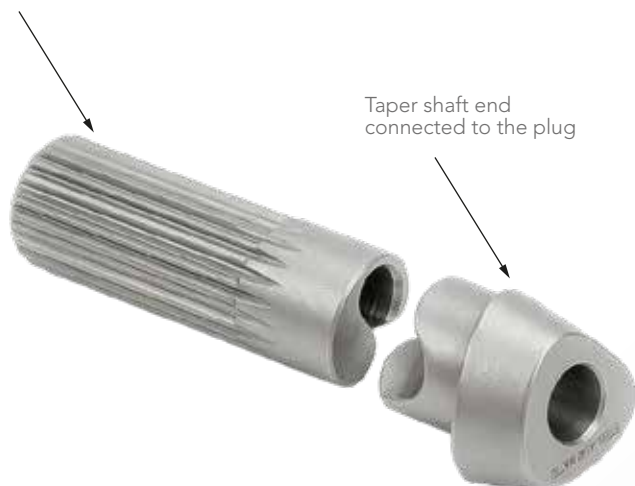
Figure 8. Eccentric rotary plug

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Rotary Plug Control Valves

Mounting style selection

Splined shaft end
connected to the actuator



Splined shaft connected
to the actuator



Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table4. Maximum Allowable Shutoff Pressure Drops for Trim T1, Bar

Valve body material	Bearing material	Temperature °C	Valve body size , NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 ~ 149	68,9	55,2	41,4	41,4	41,4	41,4	24,1
		149 ~ 204	68,9	55,2	41,4	41,4	41,4	41,4	23,8
		204 ~ 316	68,9	55,2	41,4	41,4	41,4	41,4	23,1
	CoCr-A	-29 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	68,9	55,2	41,4	41,4	41,4	20,7	15,2
	PTFE coated/ composition 316 SST	-29 ~ 93	68,9	55,2	41,4	41,4	41,4	41,4	24,1
		93 ~ 149	68,9	55,2	41,4	41,4	41,4	41,4	24.1 (1) 23.1 (2)
		149 ~ 204	68,9	55,2	41,4	41,4	41,4	41,4	23.8 (1) 22.1 (2)
		204 ~ 260	68,9	55,2	41,4	41,4	41,4	41,4	23.4 (1) 21.7 (2)
CF8M SST	CoCr-A	-46 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	65,8	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	62,4	55,2	41,4	41,4	41,4	20,7	15,2
	PTFE coated/ composition 316 SST	-46 ~ 93	68,9	55,2	41,4	41,4	41,4	41,4	24,1
		93 ~ 149	68,9	55,2	41,4	41,4	41,4	41,4	24.1 (1) 23.1 (2)
		149 ~ 204	68,9	55,2	41,4	41,4	41,4	41,4	23.8 (1) 22.1 (2)
		204 ~ 260	68,9	55,2	41,4	41,4	41,4	41,4	23.4 (1) 21.7 (2)

1. For S17400 valve shaft only

2. For ASME SA-479 grade S20910 SST valve shaft only. Pressure drop should suitable for both shaft materials.

Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table 5. Maximum Allowable Shutoff Pressure Drops for Trim T1, Psi

Valve body material	Bearing material	Temperature °F	Valve body size , NPS						
			1	1-1/2	2	3	4	6	8
WCCsteel	S44004	-20 ~ 300	1.000	800	600	600	600	600	350
	S44004	300 ~ 400	1.000	800	600	600	600	600	345
	S44004	400 ~ 600	1.000	800	600	600	600	600	335
	CoCr-A	-20 ~ 400	1.000	800	600	600	600	300	220
	CoCr-A	400 ~ 500	1.000	800	600	600	600	300	220
	CoCr-A	500 ~ 600	1.000	800	600	600	600	300	220
	PTFE coated/ composition 316 SST	-20 ~ 200	1.000	800	600	600	600	600	350
CF8M SST	PTFE coated/ composition 316 SST	200 ~ 300	1.000	800	600	600	600	600	350 (1) 335 (2)
	PTFE coated/ composition 316 SST	300 ~ 400	1.000	800	600	600	600	600	345 (1) 320 (2)
	PTFE coated/ composition 316 SST	400 ~ 500	1.000	800	600	600	600	600	340 (1) 315 (2)
	CoCr-A	-50 ~ 400	1.000	800	600	600	600	300	220
	CoCr-A	400 ~ 500	955	800	600	600	600	300	220
	CoCr-A	500 ~ 600	905	800	600	600	600	300	220
	PTFE coated/ composition 316 SST	-50 ~ 200	1.000	800	600	600	600	600	350
CF8M SST	PTFE coated/ composition 316 SST	200 ~ 300	1.000	800	600	600	600	600	350 (1) 335 (2)
CF8M SST	PTFE coated/ composition 316 SST	300 ~ 400	1.000	800	600	600	600	600	345 (1) 320 (2)
CF8M SST	PTFE coated/ composition 316 SST	400 ~ 500	955	800	600	600	600	600	340 (1) 315 (2)

1. For S17400 valve shaft only

2. For ASME SA-479 grade S20910 SST valve shaft only. Pressure drop should suitable for both shaft materials.

Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table 6. Maximum Allowable Shutoff Pressure Drops for Trim T2 & T3, Bar

Valve body material	Bearing material	Temperature °C	Valve body size, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 ~ 93	103,4	103,4	103,4	103,4	82,7	51,7	24,1
		93 ~ 149	100,3	100,3	99,0	100,3	82,7	51,7	24,1
		149 ~ 204	97,2	97,2	93,8	97,2	82,7	51,0	23,8
		204 ~ 260	91,7	91,7	91,4	91,7	82,7	50,0	23,1
		260 ~ 316	83,4	83,4	83,4	83,4	82,7	49,3	23,1
		316 ~ 343	81,0	81,0	81,0	81,0	81,0	48,3	22,4
		343 ~ 371	78,3	78,3	78,3	78,3	78,3	48,3	22,4
		371 ~ 399	69,6	69,6	69,6	69,6	69,6	46,9	21,7
		399 ~ 427	56,9	56,9	56,9	56,9	56,9	46,9	21,7
	CoCr-A	-29 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		316 ~ 343	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		343 ~ 371	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		371 ~ 399	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		399 ~ 427	56,9	55,2	41,4	41,4	41,4	20,7	15,2
	PTFE coated/ composition 316 SST	-29 ~ 38	103,4	103,4	103,4	103,4	89,6	55,2	24,1
		38 ~ 93	103,4	103,4	103,4	103,4	89,6	55,2	24,1
		93 ~ 149	100,3	100,3	100,3	100,3	89,6	55,2	24.1(1) 23.1(2)
		149 ~ 204	97,2	97,2	97,2	97,2	89,6	54.8(1) 51.0(2)	23.8(1) 22.1(2)
		204 ~ 232	91,7	91,7	91,7	91,7	89,6	53.8(1) 50.0(2)	23.4(1) 21.7(2)
CF8M SST(3)	CoCr-A	-46 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	65,8	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	62,4	55,2	41,4	41,4	41,4	20,7	15,2
		316 ~ 343	61,4	55,2	41,4	41,4	41,4	20,7	15,2
		343 ~ 371	59,6	55,2	41,4	41,4	41,4	20,7	15,2
		371 ~ 399	58,3	55,2	41,4	41,4	41,4	20,7	15,2
		399 ~ 427	57,2	55,2	41,4	41,4	41,4	20,7	15,2
	PTFE coated/ composition 316 SST	-46 ~ 38	99,3	99,3	99,3	99,3	89,6	55,2	24,1
		38 ~ 93	85,5	85,5	85,5	85,5	85,5	55,2	24,1
		93 ~ 149	77,3	77,3	77,3	77,3	77,3	53,1	24.1(1) 23.1(2)
		149 ~ 204	71,0	71,0	71,0	71,0	71,0	54.8(1) 51.0(2)	23.8(1) 22.1(2)
		204 ~ 232	65,8	65,8	65,8	65,8	65,8	53.8(1) 50.0(2)	23.4(1) 21.7(2)

1. For S17400 valve shaft only.

2. For ASME SA-479 grade S20910 SST valve shaft only. Pressure drop should suitable for both shaft materials.

3. The maximum temperature for trim T3 is 316°C.

Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table 7. Maximum Allowable Shutoff Pressure Drops for Trim T2 & T3, Psi

Valve body material	Bearing material	Temperature °F	Valve body size, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-20 ~ 200	1500	1500	1500	1500	1200	750	350
		200 ~ 300	1455	1455	1435	1455	1200	750	350
		300 ~ 400	1410	1410	160	1410	1200	740	345
		400 ~ 500	1330	1330	1325	1330	1200	725	335
		500 ~ 600	1210	1210	1210	1210	1200	715	335
		600 ~ 650	1175	1175	1175	1175	1175	700	325
		650 ~ 700	1135	1135	1135	1135	1135	700	325
		700 ~ 750	1010	1010	1010	1010	1010	680	315
		750 ~ 800	825	825	825	825	825	680	315
	CoCr-A	-20 ~ 400	1000	800	600	600	600	300	220
		400 ~ 500	1000	800	600	600	600	300	220
		500 ~ 600	1000	800	600	600	600	300	220
		600 ~ 650	1000	800	600	600	600	300	220
		650 ~ 700	1000	800	600	600	600	300	220
		700 ~ 750	1000	800	600	600	600	300	220
		750 ~ 800	825	800	600	600	600	300	220
	PTFE coated/ composition 316 SST	-20 ~ 100	1500	1500	1500	1500	1300	800	350
		100 ~ 200	1500	1500	1500	1500	1300	800	350
		200 ~ 300	1455	1455	1455	1455	1300	800	350 (1) 335 (2)
		300 ~ 400	1410	1410	1410	1410	1300	795 (1) 740 (2)	345 (1) 320 (2)
		400 ~ 450	1330	1330	1330	1330	1300	780 (1) 725 (2)	340 (1) 315 (2)
CF8M SST (3)	CoCr-A	-50 ~ 400	1000	800	600	600	600	300	220
		400 ~ 500	955	800	600	600	600	300	220
		500 ~ 600	905	800	600	600	600	300	220
		600 ~ 650	890	800	600	600	600	300	220
		650 ~ 700	865	800	600	600	600	300	220
		700 ~ 750	845	800	600	600	600	300	220
		750 ~ 800	830	800	600	600	600	300	220
	PTFE coated/ composition 316 SST	-50 ~ 100	1440	1440	1440	1440	1300	800	350
		100 ~ 200	1240	1240	1240	1240	1240	800	350
		200 ~ 300	1120	1120	1120	1120	1120	770	350 (1) 335 (2)
		300 ~ 400	1030	1030	1030	1030	1030	795 (1) 740 (2)	345 (1) 320 (2)
		400 ~ 450	955	955	955	955	955	780 (1) 725 (2)	340 (1) 315 (2)

1. For S17400 valve shaft only

2. For ASME SA-479 grade S20910 SST valve shaft only. Pressure drop should be suitable for both shaft materials.

3. The maximum temperature for trim T3 is 600°F.

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Maximum Allowable Shutoff Pressure Drops

Table 8. Maximum Allowable Shutoff Pressure Drops for Trim T4 (1)

Valve body material	Bearing material	Temperature °C	BAR						
			Valve body size , NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 ~ 93	103,4	103,4	70,3	103,4	78,6	52,4	24,1
		93 ~ 149	100,3	100,3	70,3	100,3	78,6	52,4	24,1
		149 ~ 204	97,2	97,2	70,3	97,2	78,6	51,0	23,8
		204 ~ 260	91,7	91,7	70,3	91,7	78,6	50,0	23,1
		260 ~ 316	83,4	83,4	70,3	83,4	78,6	49,3	23,1
		316 ~ 371	78,3	78,3	70,3	78,3	78,3	48,3	22,4
		371 ~ 427	56,9	56,9	56,9	56,9	56,9	46,9	21,7
	CoCr-A	-29 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		316 ~ 371	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		371 ~ 427	56,9	55,2	41,4	41,4	41,4	20,7	15,2
	CF8M SST	-46 ~ 204	68,9	55,2	41,4	41,4	41,4	20,7	15,2
		204 ~ 260	65,8	55,2	41,4	41,4	41,4	20,7	15,2
		260 ~ 316	62,4	55,2	41,4	41,4	41,4	20,7	15,2
		316 ~ 371	59,6	55,2	41,4	41,4	41,4	20,7	15,2
		371 ~ 427	57,2	55,2	41,4	41,4	41,4	20,7	15,2
Valve body material	Bearing material	Temperature °F	PSI						
			Valve body size , NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-20 ~ 200	1.500	1.500	1.020	1.500	1.140	750	350
		200 ~ 300	1.455	1.455	1.020	1.455	1.140	760	350
		300 ~ 400	1.410	1.410	1.020	1.410	1.140	740	345
		400 ~ 500	1.330	1.330	1.020	1.330	1.140	725	335
		500 ~ 600	1.210	1.210	1.020	1.210	1.140	715	335
		600 ~ 700	1.135	1.135	1.020	1.135	1.135	700	325
		700 ~ 800	825	825	825	825	825	680	315
	CoCr-A	-20 ~ 400	1.000	800	600	600	600	300	220
		400 ~ 500	1.000	800	600	600	600	300	220
		500 ~ 600	1.000	800	600	600	600	300	220
		600 ~ 700	1.000	800	600	600	600	300	220
		700 ~ 800	825	800	600	600	600	300	220
	CF8M SST	-50 ~ 400	1.000	800	600	600	600	300	220
		400 ~ 500	955	800	600	600	600	300	220
		500 ~ 600	905	800	600	600	600	300	220
		600 ~ 700	855	800	600	600	600	300	220
		700 ~ 800	830	800	600	600	600	300	220

1. VTC valve trim is not available for water and steam with temperature above 180 °C (360 °F).

Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table 9. FPG 400 series eccentric rotary valve material temperature range (1)

Valve part name	Material		Temperature range	
			°C	°F
Valve body and retainer NPS 1 & NPS 1-1/2	Steel body	S316 retainer	-29 ~ 427	-20 ~ 800
		S31600 retainer with CoCr-A bore		
		S31600 retainer with VTC bore		
	CF8M body	S31600 retainer	-198 ~ 538	-325 ~ 1000
		S31600 retainer with CoCr-A bore		
		S31600 retainer with VTC bore		
Valve body and retainer NPS 2 ~ NPS 8	WCC body	S17400 retainer	-29 ~ 427	-20 ~ 800
		Solid CoCr-A retainer	-29 ~ 427	-20 ~ 800
		S31600 retainer	-29 ~ 260	-20 ~ 500
		Cocr-A retainer with VTC bore	-29 ~ 427	-20 ~ 800
	CF8M body	S31600 retainer	-198 ~ 427	-325 ~ 800
		Solid CoCr-A retainer	-46 ~ 324	-50 ~ 600
		S31600 retainer with CoCr-A bore	-198 ~ 427	-325 ~ 800
		Cocr-A retainer with VTC bore	-46 ~ 427	-50 ~ 800
Seat ring	S31600		-198 ~ 538	-325 ~ 1000
	Solid CoCr-A		-46 ~ 538	-50 ~ 1000
	S31600 with CoCr-A seat		-198 ~ 538	-325 ~ 1000
	Solid VTC		-46 ~ 427	-50 ~ 800
Valve plug	S31600 coated with chrome		-198 ~ 316	-325 ~ 600
	Solid CoCr-A		-46 ~ 427	-50 ~ 800
	S31600 coated with CoCr-A (available for valve size NPS 2" ~ NPS 8")		-198 ~ 538	-325 ~ 1000
	Solid VTC (available for valve size NPS 1" ~ NPS 1-1/2")		-46 ~ 427	-50 ~ 800
	Plug surface is VTC, connect to CoCr-A hub with stud (available for valve size NPS 3" ~ NPS 8")		-46 ~ 427	-50 ~ 800
Valve shaft	S17400		-62 ~ 427	-80 ~ 800
	S20910		-198 ~ 538	-325 ~ 1000
Taper pin & expansion pin	NPS 1" ~ 2" solid VTC valve plug	N10276	-46 ~ 427	-50 ~ 800
	other valve plugs	S20910	-198 ~ 538	-325 ~ 1000
Bearing	PTFE coated / composition 316		-46 ~ 260	-50 ~ 500
	CoCr-A ²		-198 ~ 538	-325 ~ 100
	S44004 ²		-29 ~ 427	-20 ~ 800
O-ring ³ (for Alloy 6 or 440CSST seat bearing)	FKM rubber		-18 ~ 204	0 ~ 400
	NBR		-29 ~ 93	-20 ~ 200
Bearing stop	S31600		-198 ~ 538	-325 ~ 1000
Thrust washer	S17700 for S17400 shaft		-198 ~ 427	-325 ~ 800
	R30016 for S20910 SST shaft		-198 ~ 538	-325 ~ 1000
Face seal	N07718 (NACE MR0175-2002 or PTFE/N10276)		-198 ~ 538	-325 ~ 1000
Retainer gasget	Laminate graphite for valve size NPS 1" & NPS 1-1/2" S31600 for valve size NPS 2" ~ NPS 8"		-198 ~ 538	-325 ~ 1000
Packing ring	PTFE		-46 ~ 260	-50 ~ 500
	PTFE / composition		-73 ~ 260	-100 ~ 500
	Graphite ribbon		-198 ~ 538	-325 ~ 1000
Packing follower	S31600		-198 ~ 538	-325 ~ 1000
Stud and nut	SA-193-B7 stud and SA-194-2H nut		-46 ~ 427	-50 ~ 800
	SA-193-B7M stud and SA-194-2HM nut		-198 ~ 538	-325 ~ 1000
	B&M stud and 8M nut		-198 ~ 538	-325 ~ 1000
Packing box ring	S31600		-198 ~ 538	-325 ~ 1000

1. VTC valve trim are not suitable for water and steam with temperature above 180°C (360°F)

2. Recommend for erosive fluids.

3. Used for sealed bearing construction.

Series FPG 400

Rotary Plug Control Valves

Maximum Allowable Shutoff Pressure Drops

Table 10. FPG 400 Series eccentric rotary valve material combination (1)

Trim Code	Valve plug	Seat Ring	Retainer	Valve shaft	Bearing	O seal ring	Valve body
T1	Chrome coated S31600 (available for valve size NPS 1~NPS 8)	S31600	S17400(only for WCC body) or S31600	S17400	PTFE coated/ composition 316	---	All
					CoCr-A		WCC
				S20910	PTFE coated/ composition 316	---	All
					CoCr-A	---	All
T2	Solid CoCr-A (available for valve size NPS 1~ NPS 4) and CoCr-A coated S31600 (available for valve size NPS 6~ NPS 8)	Solid CoCr-A (available for valve size NPS 1~ NPS 4) and CoCr-A coated S31600 (available for valve size NPS 6~ NPS 8)	S17400(only for WCC body) or S31600	S17400	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					S44004	FKM	WCC
					S44004	NBR	WCC
				S20910	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					CoCr-A	FKM	All
					CoCr-A	FKM	All
T3	Solid CoCr-A (available for valve size NPS 1~NPS 8)	Solid CoCr-A	S31600 with CoCr-A sleeve (available for valve size NPS 1 & NPS 1-1/2)	S17400	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					S44004	FKM	WCC
					S44004	NBR	WCC
			Solid CoCr-A (available for valve size NPS 2~NPS 8)	S20910	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					CoCr-A	FKM	All
					CoCr-A	FKM	All
T4 (2)	Solid VTC (available for valve size NPS 1 & NPS 1-1/2) Plug surface is VTC, connect to CoCr-A hub with stud, level 5 Ti cap screw, 31600 gasket (available for valve size NPS 3~ NPS 8)	Solid VTC	S31600 with VTC material bore (available for valve size NPS 1 & NPS 1-1/2)	S17400	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					S44004	FKM	WCC
					S44004	NBR	WCC
			Solid CoCr-A with VTC material bore (available for valve size NPS 2~ NPS 8)	S20910	PTFE coated/ composition 316	---	All
					CoCr-A	NBR	All
					CoCr-A	FKM	All
					CoCr-A	FKM	All

1. NACE MR0175-2002 trim construction available, please consult Flapcon sales office.

2. VTC valve trim are not suitable for water and steam with temperature above 180°C(360°F)

Series FPG 400

Rotary Plug Control Valves

Dimension and weight

Table 11. FPG 400 Series rotary valve flange & flangeless (wafer) type dimension and estimate weight

Valve size DN	Dimension										Estimate weight					
	A		B		D	K	S (Shaft diameter)(1)	T	U	W	Flange type			Wafer		
	RF	RTJ	RF	RTJ							Pressure rating			Pressure rating		
											CL150	CL300	CL600	CL150	CL300	CL600
	mm										kg					
25	102	108	51	57	187	126	1/2	118	---	11	5,4	5,9	5,9	---	---	---
40	114	122	57	63	187	135	5/8	118	---	14	8,6	9,5	10	---	---	---
50	124	124	62	62	187	151	5/8	118	---	14	9,5	11	13	---	---	---
80	165	165	83	83	213	200	1 1×3/4	152	32	14	19	24	26	16	16	16
100	194	194	97	97	208	216	1-1/4	235	46	18	36	42	50	34	34	34
150	229	229	114	114	208	270	1-1/2 1-1/2×1-1/4	235	46	5/8-Inch 11UNC	54	69	93	50	50	---
200	243	243	121	121	208	318	1-1/2	235	46	5/8-Inch 11UNC	79	98	135	57	68	---
Valve size NPS	inches										Pounds					
1	4	4,25	2	2,25	7,38	4,97	1/2	4,62	---	0,45	12	13	13	---	---	---
1-1/2	4,5	4,75	2,25	2,5	7,38	5,31	5/8	4,62	---	0,56	19	21	23	---	---	---
2	4,88	4,88	2,44	2,44	7,38	5,94	5/8	4,62	---	0,56	21	25	28	---	---	---
3	6,5	6,5	3,25	3,25	8,44	7,88	1 1×3/4	6	1,25	0,56	42	52	57	35	35	35
4	7,62	7,62	3,81	3,81	8,19	8,5	1-1/4	9,25	1,81	0,69	79	93	111	75	75	75
6	9	9	4,5	4,5	8,19	10,6	1-1/2 1-1/2×1-1/4	9,25	1,81	5/8-Inch 11UNC	120	152	204	110	110	---
8	9,56	9,56	4,78	4,78	8,19	12,5	1-1/2	9,25	1,81	5/8-Inch 11UNC	175	217	298	125	150	---

1 Valve shaft diameter should match with spline diameter.

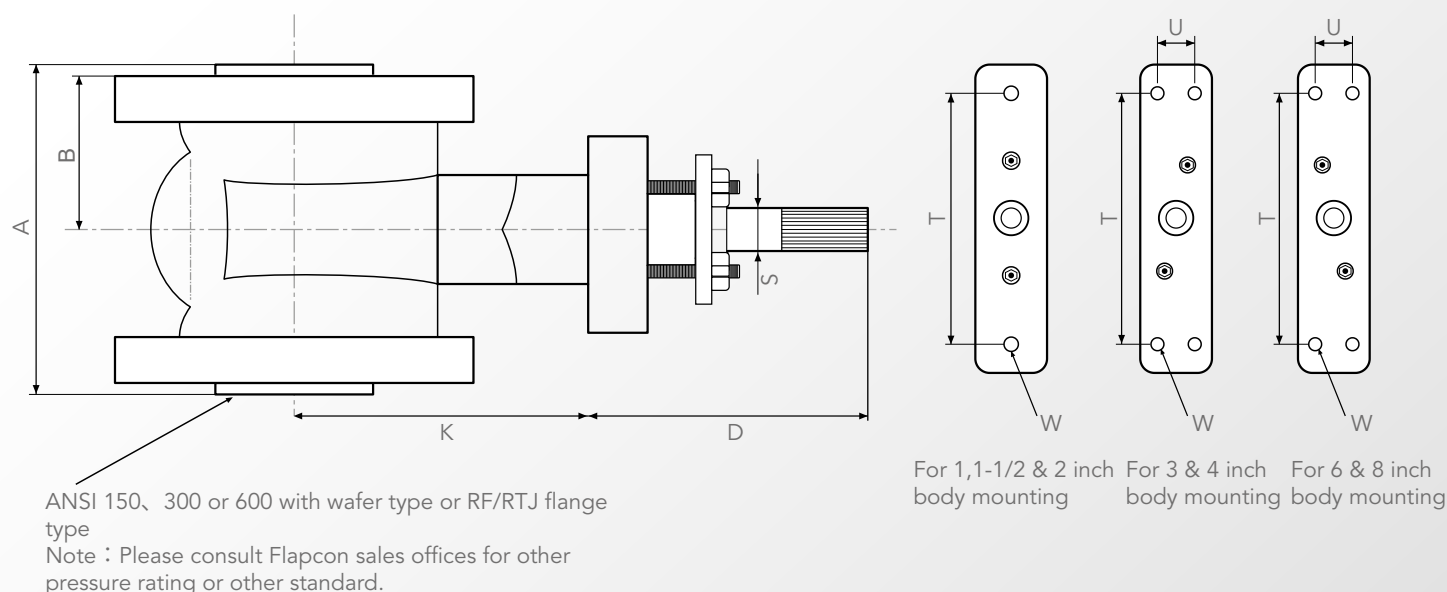


Figure 10.FPG 400 Series flanged valve dimensions

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 12. FPG 400 series rotary plug valve, trim level T1&T2&T3, full port trim, Forward flow

Flow Coefficient	Valve size NPS	Valve rotation (degree)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	1,22	2,89	5,05	7,63	9,94	11,3	11,8	12	12,2
Kv		1,06	2,5	4,37	6,6	8,6	9,77	10,2	10,4	10,6
Fd		0,49	0,64	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,89	0,89	0,88	0,85	0,85	0,85	0,85	0,85	0,85
XT		0,48	0,497	0,508	0,548	0,597	0,632	0,636	0,612	0,593
Cv	1-1/2	2,07	6,15	11,5	16,6	20,7	23,5	25,3	26,1	26,6
Kv		1,79	5,32	9,95	14,4	17,9	20,3	21,9	22,6	23
Fd		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,95	0,85	0,85	0,84	0,84	0,84	0,84	0,84	0,84
XT		0,77	0,476	0,483	0,555	0,616	0,636	0,632	0,601	0,589
Cv	2	4,11	8,73	16,7	27	37,2	43,4	45,8	46,2	46,2
Kv		3,56	7,55	14,4	23,4	32,2	37,5	39,6	40	40
Fd		0,49	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,97	0,92	0,84	0,79	0,77	0,75	0,75	0,74	0,74
XT		0,439	0,422	0,442	0,422	0,422	0,463	0,452	0,442	0,442
Cv	3	8,8	22,7	43,3	71,3	96,8	116	130	138	142
Kv		7,61	19,6	37,5	61,7	83,7	100	112	119	123
Fd		0,46	0,62	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,86	0,84	0,83	0,83	0,83	0,82	0,78	0,77	0,77
XT		0,469	0,544	0,574	0,526	0,497	0,526	0,508	0,476	0,456
Cv	4	16,6	41,3	79,1	123	166	203	230	247	255
Kv		14,3	35,7	68,4	106	144	176	199	214	221
Fd		0,45	0,61	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,85	0,82	0,81	0,81	0,8	0,79	0,77	0,76	0,76
XT		0,439	0,555	0,501	0,466	0,473	0,49	0,48	0,459	0,442
Cv	6	17,5	79,1	155	270	363	434	492	540	565
Kv		15,1	68,4	134	234	314	375	426	467	489
Fd		0,44	0,6	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,97	0,93	0,88	0,82	0,76	0,73	0,72	0,71	0,71
XT		0,879	0,585	0,54	0,456	0,439	0,432	0,436	0,426	0,416
Cv	8	51,5	146	298	481	646	775	879	981	1050
Kv		44,5	126	258	416	559	670	760	849	908
Fd		0,43	0,59	0,72	0,8	0,87	0,92	0,96	0,99	1
FL		0,97	0,93	0,87	0,78	0,72	0,71	0,7	0,69	0,67
XT		0,456	0,605	0,533	0,449	0,413	0,403	0,391	0,372	0,36

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 13. FPG 400 series rotary plug valve, trim level T1&T2&T3, full port trim, reverse flow

Flow Coefficient	Valve size NPS	Valve rotation (deg.)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	1,08	2,82	5,26	9,11	12,4	14,7	15,9	16,4	16,8
Kv		0,93	2,44	4,55	7,88	10,7	12,7	13,8	14,2	14,5
Fd		0,49	0,64	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,8	0,79	0,73	0,63	0,58	0,55	0,56	0,51	0,48
XT		0,172	0,284	0,406	0,357	0,345	0,322	0,3	0,289	0,283
Cv	1-1/2	1,71	5,33	11,3	18,4	24,7	28,6	30,1	30,7	31
Kv		1,48	4,16	9,77	15,9	21,4	24,7	26	26,6	26,8
Fd		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,75	0,74	0,7	0,66	0,64	0,63	0,63	0,63	0,63
XT		0,375	0,442	0,432	0,397	0,369	0,36	0,36	0,357	0,357
Cv	2	2,98	7,4	15,6	27,6	41,9	52,9	56,4	57,2	57,4
Kv		2,58	6,4	13,5	23,9	36,2	45,8	48,8	49,5	49,7
Fd		0,49	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,92	0,89	0,81	0,67	0,6	0,58	0,58	0,58	0,58
XT		0,48	0,476	0,462	0,384	0,308	0,265	0,265	0,265	0,265
Cv	3	7,19	21,4	47	75,4	105	122	132	134	141
Kv		6,22	18,5	40,7	65,2	90,8	106	114	116	122
Fd		0,46	0,62	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,8	0,8	0,77	0,71	0,66	0,65	0,65	0,65	0,65
XT		0,375	0,476	0,487	0,436	0,372	0,378	0,384	0,376	0,357
Cv	4	12,2	39	79,9	124	171	202	222	232	235
Kv		10,6	33,7	69,1	107	148	175	192	201	203
Fd		0,45	0,61	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,9	0,89	0,81	0,73	0,71	0,7	0,69	0,69	0,69
XT		0,522	0,544	0,487	0,456	0,406	0,406	0,416	0,423	0,416
Cv	6	15,1	72,4	156	251	351	438	534	638	717
Kv		13,1	62,6	135	217	304	379	462	552	620
Fd		0,44	0,6	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,85	0,85	0,82	0,77	0,7	0,66	0,61	0,57	0,51
XT		0,416	0,597	0,518	0,522	0,452	0,388	0,336	0,27	0,219
Cv	8	33,5	143	302	485	663	798	871	897	986
Kv		29	124	261	420	573	690	753	776	853
Fd		0,43	0,59	0,72	0,8	0,87	0,92	0,96	0,99	1
FL		0,81	0,81	0,79	0,76	0,68	0,66	0,66	0,66	0,66
XT		0,697	0,593	0,483	0,41	0,354	0,342	0,366	0,403	0,363

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 14. FPG 400 series rotary plug valve, trim level T1&T2&T3, flow-restricted trims, Forward flow

Flow Coefficient	Valve size NPS	Valve rotation (degree)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	0,777	2,09	3,02	3,62	4,53	4,9	4,93	4,96	5,01
Kv		0,672	1,81	2,61	3,13	3,92	4,24	4,26	4,29	4,33
Fd (1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,89	0,89	0,88	0,85	0,82	0,79	0,75	0,74	0,74
XT		0,487	0,391	0,497	0,597	0,508	0,439	0,436	0,429	0,419
Cv	1-1/2	0,632	2,56	4,47	7,15	9,62	10,7	10,8	10,9	10,9
Kv		0,547	2,21	3,87	6,18	8,32	9,26	9,34	9,43	9,43
Fd (1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,84	0,84	0,84	0,82	0,79	0,75	0,73	0,73	0,73
XT		0,559	0,397	0,522	0,574	0,585	0,508	0,497	0,49	0,49
Cv	2	1,3	3,49	5,31	9,64	15,1	17,3	17,3	17,3	17,3
Kv		1,12	3,02	4,59	8,34	13,1	15	15	15	15
Fd (1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,85	0,85	0,84	0,84	0,82	0,79	0,79	0,79	0,79
XT		0,391	0,336	0,452	0,563	0,529	0,462	0,462	0,462	0,462
Cv	3	6,78	11,5	16	26,7	40,2	47,7	48,4	48,4	48,4
Kv		5,86	9,95	13,8	23,1	34,8	41,3	41,9	41,9	41,9
Fd (1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,9	0,88	0,87	0,86	0,85	0,82	0,77	0,77	0,77
XT		0,487	0,501	0,487	0,429	0,459	0,429	0,429	0,429	0,429
Cv	4	10	18,2	24,4	43,7	69,2	90,6	98,2	98,2	98,2
Kv		8,65	15,7	21,2	37,8	59,9	78,4	84,9	84,9	84,9
Fd (1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,95	0,89	0,85	0,84	0,84	0,81	0,77	0,77	0,77
XT		0,426	0,459	0,57	0,504	0,487	0,462	0,426	0,426	0,426
Cv	6	9,5	26,6	41,8	76	129	170	200	200	200
Kv		8,22	23	36,2	65,7	112	147	173	173	173
Fd (1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,97	0,96	0,92	0,86	0,8	0,76	0,74	0,74	0,74
XT		0,995	0,351	0,403	0,487	0,416	0,462	0,41	0,41	0,41
Cv	8	39,9	87,8	155	241	343	448	541	606	623
Kv		34,5	75,9	134	208	297	388	468	524	539
Fd (2)		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,96	0,81	0,8	0,79	0,78	0,76	0,74	0,72	0,7
XT		0,4	0,446	0,459	0,449	0,429	0,413	0,413	0,413	0,391

1. These values are measured with valve rotation of 60 degree.

2. These values are measured with valve rotation of 60 degree.

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 15. FPG 400 series rotary plug valve, trim level T1&T2&T3, flow-restricted trims, Reverse flow

Flow Coefficient	Valve size NPS	Valve rotation (deg.)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	0,634	2,09	3,34	3,96	5,21	5,64	5,7	5,71	5,76
Kv		0,548	1,81	2,89	3,43	4,51	4,88	4,93	4,94	4,98
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
XT		0,23	0,216	0,207	0,406	0,366	0,348	0,339	0,345	0,342
Cv	1-1/2	0,464	1,93	4,21	7,81	11	12,1	12,1	12,2	12,2
Kv		0,401	1,67	3,64	6,76	9,52	10,5	10,5	10,6	10,6
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,93	0,93	0,75	0,72	0,7	0,7	0,7	0,7	0,7
XT		0,97	0,416	0,501	0,467	0,416	0,416	0,416	0,413	0,416
Cv	2	0,965	2,68	4,82	12	17,7	18,7	18,8	18,9	18,9
Kv		0,835	2,31	4,17	10,4	15,3	16,2	16,3	16,3	16,3
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,96	0,96	0,77	0,67	0,62	0,62	0,62	0,62	0,62
XT		0,518	0,508	0,559	0,354	0,351	0,36	0,357	0,354	0,354
Cv	3	5,95	10,6	14,7	29,9	49	56	56,2	56,2	56,7
Kv		5,15	9,17	12,7	25,9	42,4	48,4	48,6	48,6	49
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,8	0,79	0,73	0,64	0,59	0,58	0,58	0,58	0,58
XT		0,429	0,455	0,487	0,345	0,286	0,286	0,286	0,286	0,281
Cv	4	7,69	15,3	22,7	42,6	75	98	99,5	100	102
Kv		6,65	13,2	19,6	36,8	64,9	84,8	86,1	86,5	88,2
Fd(1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,83	0,82	0,81	0,77	0,6	0,59	0,58	0,58	0,58
XT		0,504	0,548	0,555	0,529	0,375	0,322	0,336	0,334	0,319
Cv	6	5,1	20,6	34,6	71,9	123	170	230	231	232
Kv		4,41	17,8	29,9	62,2	106	147	199	200	201
Fd(1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,97	0,95	0,9	0,82	0,73	0,65	0,57	0,55	0,55
XT		0,99	0,551	0,566	0,533	0,432	0,397	0,263	0,26	0,258
Cv	8	27,1	74,3	140	232	342	457	552	614	646
Kv		23,4	64,3	121	201	296	395	477	531	559
Fd(2)		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,92	0,91	0,88	0,76	0,69	0,66	0,62	0,6	0,58
XT		0,636	0,494	0,494	0,49	0,442	0,388	0,369	0,339	0,311

1. These values are measured with valve rotation of 60 degree.

2. These values are measured with valve rotation of 60 degree.

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 16. FPG 400 series rotary plug valve, trim level T4, full port trim, Forward flow

Flow Coefficient	Valve size NPS	Valve rotation (degree)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	0,3	1,91	4,68	7,3	9,17	10,3	11	11,5	11,6
Kv		0,26	1,65	4,05	6,31	7,93	8,91	9,52	9,95	10
Fd		0,49	0,64	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		---	0,98	0,87	0,87	0,85	0,86	0,85	0,86	0,84
XT		0,668	0,574	0,529	0,566	0,616	0,668	0,685	0,628	0,616
Cv	1-1/2	1,46	3,79	8,13	13,4	17,9	20,7	22,4	24	25
Kv		1,26	3,28	7,03	11,6	15,5	17,9	19,4	20,8	21,6
Fd		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,86	0,86	0,82	0,84	0,8	0,8	0,79	0,79	0,79
XT		0,566	0,605	0,55	0,544	0,551	0,574	0,589	0,585	0,597
Cv	2	1,76	6	13,8	22,6	29,5	35,2	38,4	38,4	38,4
Kv		1,52	5,19	11,9	19,5	25,5	30,4	33,2	33,2	33,2
Fd		0,49	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,95	0,96	0,94	0,83	0,81	0,8	0,77	0,77	0,78
XT		0,819	0,555	0,501	0,48	0,533	0,566	0,57	0,585	0,585
Cv	3	7,6	23,2	44	62,6	82,5	102	115	119	124
Kv		6,57	20,1	38,1	54,1	71,4	88,2	99,5	103	107
Fd		0,46	0,62	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,88	0,87	0,85	0,84	0,83	0,82	0,8	0,8	0,8
XT		0,578	0,484	0,511	0,54	0,529	0,515	0,518	0,533	0,526
Cv	4	9,31	37	73,5	111	144	171	192	208	221
Kv		8,05	32	63,6	96	125	148	166	180	191
Fd		0,45	0,61	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,96	0,9	0,85	0,84	0,82	0,8	0,77	0,77	0,77
XT		0,526	0,476	0,449	0,452	0,48	0,504	0,511	0,501	0,487
Cv	6	9,71	64,3	141	222	299	368	426	469	499
Kv		8,4	55,6	122	192	259	318	368	406	432
Fd		0,44	0,6	0,72	0,81	0,87	0,92	0,96	0,99	1
FL		0,95	0,88	0,82	0,8	0,78	0,78	0,77	0,77	0,76
XT		0,504	0,459	0,432	0,422	0,429	0,436	0,432	0,422	0,413
Cv	8	34,6	142	290	447	592	716	822	911	958
Kv		29,9	123	251	387	512	619	711	788	829
Fd		0,43	0,59	0,72	0,8	0,87	0,92	0,96	0,99	1
FL		0,92	0,76	0,78	0,79	0,77	0,76	0,73	0,71	0,73
XT		0,544	0,446	0,426	0,429	0,429	0,46	0,419	0,41	0,429

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 17. FPG 400 series rotary plug valve, trim level T4, full port trim, Reverse flow

Flow Coefficient	Valve size NPS	Valve rotation (degree)				Modified linear flow characteristic				
		10	20	30	40	50	60	70	80	90
C _v	1	0.107	1.85	5.09	8.8	11.9	13.6	14.0	14.0	15.3
K _v		0.093	1.60	4.40	7.61	10.3	11.8	12.1	12.1	13.2
F _D		0.49	0.64	0.73	0.81	0.87	0.92	0.96	0.99	1.00
F			0.88	0.65	0.60	0.54	0.54	0.60	0.62	0.61
X		0.334	0.526	0.426	0.360	0.334	0.345	0.372	0.384	0.334
C _v	1-1/2	0.988	3.37	7.66	13.5	19.3	23.5	25.3	25.3	26.1
K _v		0.854	2.92	6.63	11.7	16.7	20.3	21.9	21.9	22.6
F _D		0.48	0.63	0.73	0.81	0.87	0.92	0.96	0.99	1.00
F		0.98	0.92	0.75	0.73	0.62	0.58	0.59	0.61	0.61
X		0.473	0.585	0.563	0.487	0.432	0.403	0.400	0.426	0.429
C _v	2	1.42	4.92	11.8	20.9	29.8	36.7	40.9	42.7	43.0
K _v		1.23	4.26	10.2	18.1	25.8	31.7	35.4	36.9	37.2
F _D		0.49	0.63	0.73	0.81	0.87	0.92	0.96	0.99	1.00
F		0.97	0.93	0.86	0.77	0.72	0.62	0.64	0.63	0.66
X		0.403	0.718	0.616	0.518	0.472	0.452	0.452	0.446	0.439
C _v	3	7.64	20.6	41.3	62.4	80.5	94.8	105	109	111
K _v		6.61	17.8	34.9	54.0	69.6	82.0	90.8	94.3	96.0
F _D		0.46	0.62	0.73	0.81	0.87	0.92	0.96	0.99	1.00
F		0.93	0.91	0.89	0.81	0.73	0.72	0.71	0.74	0.76
X		0.616	0.656	0.537	0.497	0.501	0.508	0.504	0.515	0.511
C _v	4	8.07	31.3	67.1	102	129	153	174	189	192
K _v		6.98	27.1	58.0	88.2	112	132	151	163	166
F _D		0.45	0.61	0.72	0.81	0.87	0.92	0.96	0.99	1.00
F		0.86	0.85	0.84	0.80	0.75	0.75	0.75	0.75	0.74
X		0.456	0.664	0.533	0.490	0.515	0.526	0.522	0.504	0.515
C _v	6	10.5	58.6	134	218	294	356	406	445	461
K _v		9.08	50.7	116	189	254	308	351	385	399
F _D		0.44	0.60	0.72	0.81	0.87	0.92	0.96	0.99	1.00
F		0.80	0.76	0.72	0.70	0.68	0.69	0.69	0.69	0.69
X		0.511	0.551	0.459	0.406	0.391	0.397	0.401	0.416	0.429
C _v	8	25.4	136	266	413	554	686	818	895	897
K _v		22.0	118	230	357	479	593	708	774	776
F _D		0.43	0.59	0.72	0.80	0.87	0.92	0.96	0.99	1.00
F		0.75	0.77	0.75	0.72	0.73	0.69	0.70	0.70	0.72
X		0.731	0.439	0.483	0.469	0.439	0.397	0.360	0.375	0.426

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 18. FPG 400 series rotary plug valve, trim level T4, flow-restricted trims, Forward flow

Flow Coefficient	Valve size NPS	Valve rotation (degree)						Modified linear flow characteristic		
		10	20	30	40	50	60	70	80	90
Cv	1	2,14	3,7	4,65	5,25	5,5	5,57	5,66	5,66	5,66
Kv		1,84	3,18	4	4,52	4,73	4,79	4,87	4,87	4,87
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,64	0,75	0,75	0,79	0,75	0,74	0,73	0,73	0,73
XT		0,286	0,388	0,464	0,483	0,471	0,459	0,444	0,444	0,444
Cv	1-1/2	2,1	4,55	6,16	8	10,4	11,3	11,3	11,3	11,3
Kv		1,81	3,91	5,3	6,88	8,94	9,72	9,72	9,72	9,72
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,82	0,79	≥ 0,79	0,79	0,79	0,72	0,72	0,72	0,72
XT		0,469	0,379	0,454	0,5	0,502	0,482	0,482	0,482	0,482
Cv	2	2,75	5,15	6,7	9,65	13,7	16,9	18,8	18,8	17,9
Kv		2,37	4,43	5,76	8,3	11,8	14,5	16,2	16,2	15,4
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,75	0,76	0,83	≥ 0,86	0,87	0,85	0,77	0,77	0,81
XT		0,467	0,448	0,519	0,624	0,612	0,543	0,444	0,439	0,484
Cv	3	4,12	9,5	13,1	19,8	29,6	39	45,3	48	48
Kv		3,56	8,22	11,3	17,1	25,6	33,7	39,2	41,5	41,5
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,8	0,8	0,88	0,86	0,84	0,82	0,81	0,79	0,77
XT		0,469	0,551	0,605	0,522	0,518	0,551	0,515	0,466	0,466
Cv	4	2,26	11,2	20,1	33,3	50,8	69,1	83	89,3	90,1
Kv		1,95	9,69	17,4	28,8	43,9	59,8	71,8	77,2	77,9
Fd		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,96	0,95	0,85	0,86	0,86	0,83	0,8	0,77	0,74
XT		0,779	0,779	0,632	0,62	0,612	0,589	0,537	0,466	0,452
Cv	6	13,6	37,9	49,8	82,9	122	159	184	194	196
Kv		11,6	32,8	43,1	71,7	106	138	159	168	170
Fd(1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,97	0,69	0,72	0,74	0,77	0,81	0,81	0,77	0,77
XT		0,518	0,28	0,381	0,357	0,397	0,452	0,476	0,452	0,442
Cv	8	19,7	63,6	134	228	334	438	526	587	605
Kv		19	55	116	197	289	379	455	508	523
Fd(2)		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,93	0,83	0,76	0,77	0,77	0,77	0,75	0,75	0,72
XT		0,597	0,473	0,422	0,394	0,378	0,381	0,4	0,429	0,436

1. These values are measured with valve rotation of 60 degree.

2. These values are measured with valve rotation of 60 degree.

Series FPG 400

Rotary Plug Control Valves

Flow Coefficient

Table 19. FPG 400 series rotary plug valve, trim level T4, flow-restricted trims, Reverse flow

Flow Coefficient	Valve size	Valve rotation (degree)						Modified linear flow characteristic		
	NPS	10	20	30	40	50	60	70	80	90
Cv	1	1,9	3,8	4,85	5,82	5,9	5,9	5,9	5,9	5,9
Kv		1,63	3,27	4,17	5,01	5,07	5,07	5,07	5,07	5,07
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,56	0,67	0,68	0,69	0,73	0,75	0,750.	0,75	0,75
XT		0,312	0,386	0,427	0,409	0,448	0,448	0,448	0,448	0,448
Cv	1-1/2	1,95	4,45	5,75	7,75	11,4	11,8	11,8	11,8	11,8
Kv		1,68	3,83	4,96	6,67	9,8	10,2	10,2	10,2	10,2
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,83	0,77	0,78	0,76	0,68	0,72	0,73	0,73	0,73
XT		0,395	0,415	0,527	0,519	0,421	0,459	0,459	0,459	0,459
Cv	2	2,7	4,65	6,3	11,1	18,3	19,8	20,2	20,4	21
Kv		2,32	4	5,42	9,55	15,7	17	17,4	17,5	18,1
Fd(1)		0,54	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,91	0,89	0,84	0,71	0,58	0,61	0,62	0,62	0,6
XT		0,459	0,464	0,594	0,453	0,307	0,358	0,366	0,337	0,328
Cv	3	4,41	9,6	13,7	19,5	37,3	53,3	56,7	57,9	57,9
Kv		3,38	8,3	11,9	16,9	32,3	46,1	49	50,1	50,1
Fd(1)		0,53	0,66	0,75	0,82	0,88	0,92	0,96	0,99	1
FL		0,96	0,93	0,93	0,87	0,73	0,64	0,62	0,62	0,63
XT		0,469	0,578	0,578	0,537	0,319	0,258	0,265	0,268	0,268
Cv	4	9,78	11,1	19,4	32,1	49,7	67,8	80,5	84,6	86,6
Kv		8,46	9,6	16,8	27,8	43	58,6	69,6	73,2	74,9
Fd(1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,93	0,93	0,89	0,84	0,79	0,72	0,64	0,65	0,65
XT		0,62	0,62	0,593	0,605	0,57	0,522	0,476	0,459	0,436
Cv	6	10,6	30	43,4	77,1	122	168	198	223	226
Kv		9,17	26,6	37,5	66,7	106	145	171	193	195
Fd(1)		0,52	0,65	0,74	0,82	0,88	0,92	0,96	0,99	1
FL		0,77	0,79	0,77	0,75	0,69	0,64	0,63	0,58	0,58
XT		0,64	0,369	0,476	0,41	0,381	0,357	0,336	0,284	0,278
Cv	8	19,8	55,8	125	222	323	413	488	549	569
Kv		17,1	48,3	108	192	279	357	422	475	492
Fd(2)		0,48	0,63	0,73	0,81	0,87	0,92	0,96	0,99	1
FL		0,75	0,77	0,78	0,75	0,7	0,68	0,7	0,68	0,7
XT		0,459	0,581	0,462	0,394	0,375	0,381	0,391	0,391	0,391

1. These values are measured with valve rotation of 60 degree.

2. These values are measured with valve rotation of 60 degree.

Series FPG 400

Rotary Plug Control Valves

Ordering Information

Table 20. FPG 400 Series Eccentric Rotary Plug Valve Ordering Table

FPG 400 Series Eccentric Rotary Plug Valve Ordering Table							Actuator
FPG 400	Body Size	Body Material	Process connection & Pressure Rating	Bonnet Style	Packing System	Special	

ORDERING CODE

FPG 400	1	T	RF1	B0	1	
---------	---	---	-----	----	---	--

Body size

Body Size (inch)	Code
1	1
1-1/2	1-1/2
2	2
3	3
4	4
6	6
8	8

Body material

Body Material	Code
WCC Steel	T
CF8M SST	M
Others	Y

Packing system

Packing system	Code
Single PTFE	1
Double PTFE	2
Single Graphite	3
Double Graphite	4
Other designs	Y

Bonnet style

Bonnet style	Code
Standard	B0
Extension I	B1
Extension II	B2

Process connection & pressure rating

Body material	Available Valve Size (Inch)	Pressure Connection	Pressure Rating	Code
WCC steel & Stainless Steel	1-2 inch	RF Flange	Class150	RF1
			Class300	RF3
			Class600	RF6
		RTJ Flange	Class150	RJ1
			Class300	RJ3
			Class600	RJ6
	3-8 inch	RF Flange	Class150	RF1
			Class300	RF3
			Class600	RF6
		RTJ Flange	Class150	RJ1
			Class300	RJ3
			Class600	RJ6
		Wafer	Class150	RT1
			Class300	RT3
			Class600	RT6

Note :

1. Please fill the control valve design worksheet for valve design and selection.
2. Please attach the Actuator design worksheet when assembled with actuator.
3. Control valve parts can be ordered separately, please specify.
4. Please contact Flapcon™ technical support for special requirements.

Please attach actuator ordering table if valve is assembled with actuator

FRAD Spring Diaphragm Actuator
FRAT Piston Cylinder Actuator

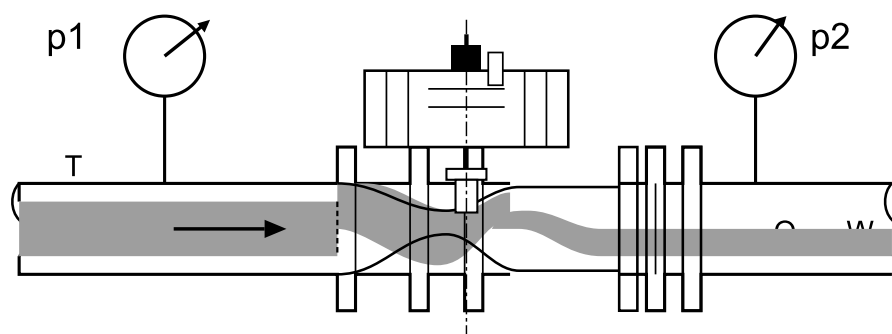


Figure 11. Sectional drawing for FPG 400 series eccentric rotary plug valve

Series FPG 400

Rotary Plug Control Valves

Control Valve Design Worksheet



P1: Upstream pressure
P2: Downstream pressure
Q: Flow rate
W: Mass flow rate
*: Density
T1: Temperature

Figure 12. Control Valve Mounting Diagram

Control Valve Design Worksheet (■ - must fill this cell when select a control valve)

1	OPERATING CONDITION	Control Location				
2		Test and Control Task				
3		Pipe Size	DN___ PN___ Classification___			
4		Process fluid name	☐ Liquid ☐ Stream ☐ Gas			
5		Process fluid status				
6			Min	Regular	Max	Unit
7		Flow				
8		Upstream pressure P1				
9		Downstream pressure P2				
10		Shut-off diff. pressure				
11		Temperature T				
12		Density *				
13		Stream Pressure Pv				
14		Critical pressure Pc				
15		Dynamic viscosity V				
16	Valve Body	Rated Pressure				
17		Connecting type	☐ Flange ☐ Wafer ☐ ANSI			
18	Actua- tor & Acces- sories	Action	☐ Direct ☐ Reverse			
19		Accessories	☐ Positioner ☐ Regulator ☐ Solenoid valve ☐ Limit Switch ☐ Hand Wheel			
20		Other				

• Remark: dark zone must be finished

Series FPG 400

Rotary Plug Control Valves

Assembly Part List



Figure 13. FPG 400 Series rotary valve assembly with FRAD actuator

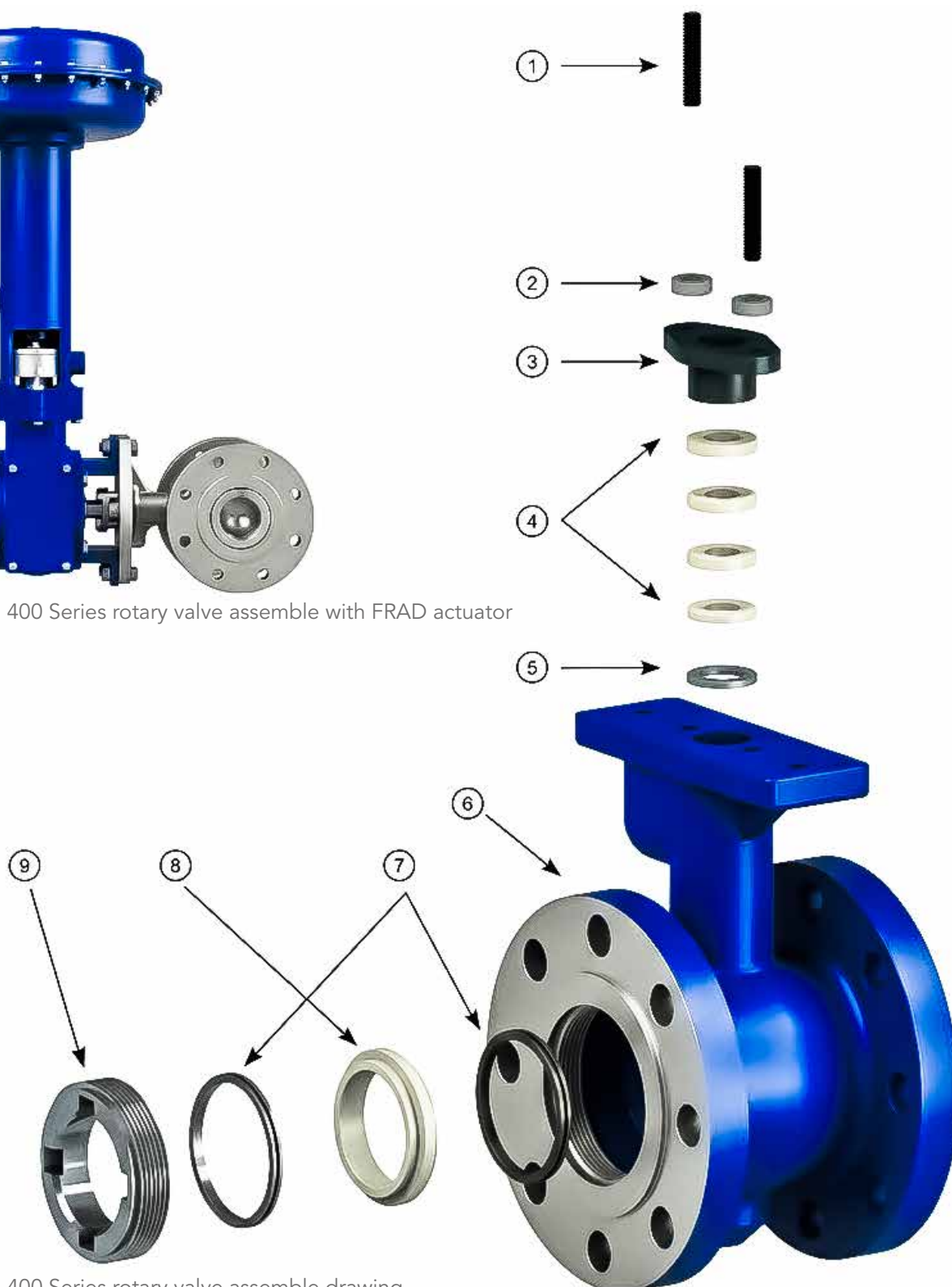


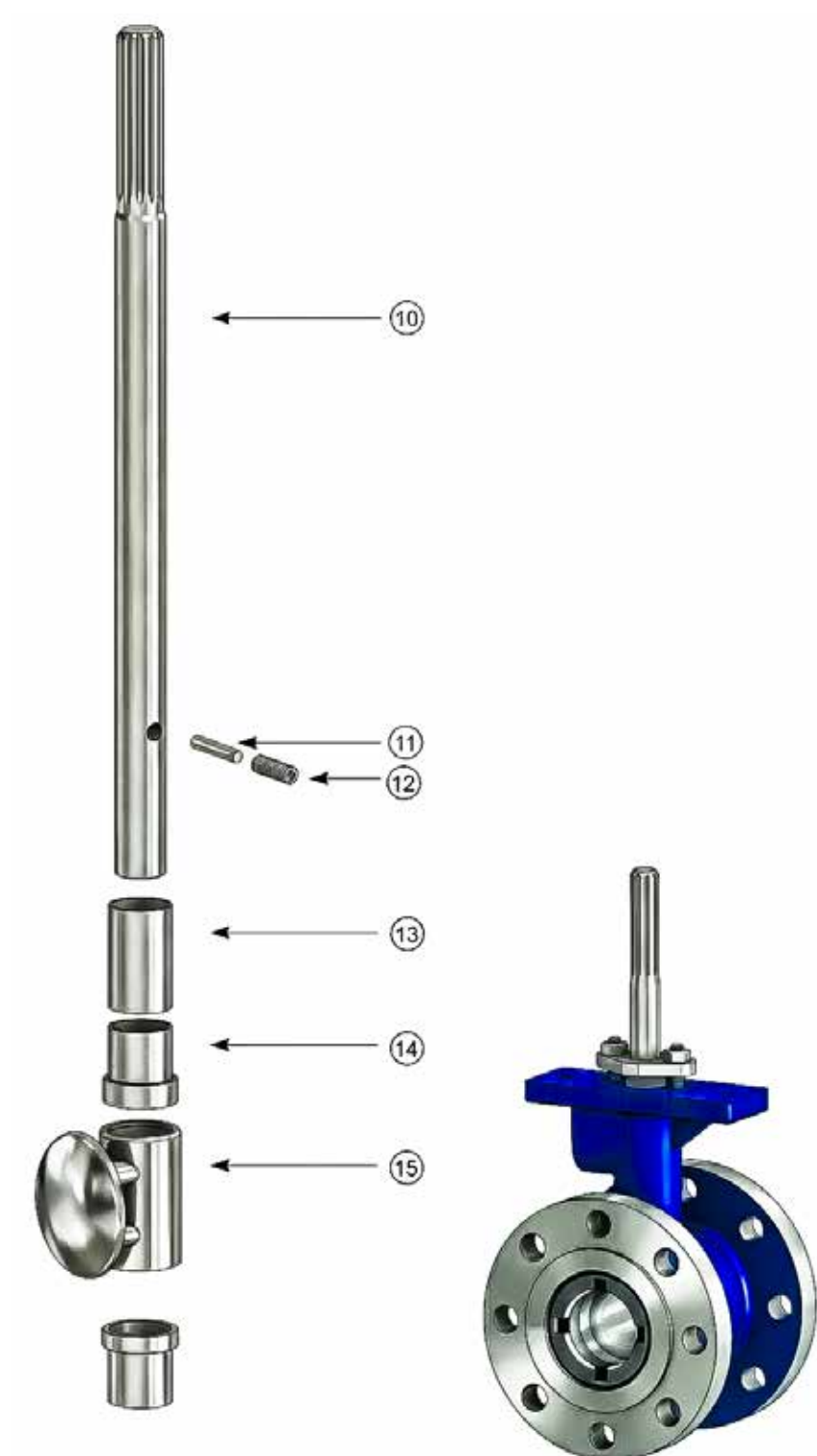
Figure 14. FPG 400 Series rotary valve assembly drawing

Series FPG 400

Rotary Plug Control Valves

Assembly Part List

Table 22. FPG 400 Series rotary valve assembly parts list



Item	Name
1	Packing box stud
2	Packing box nut
3	Packing follower
4	Packing box
5	Gasket
6	Valve body
7	Seat ring seals
8	Seat ring
9	Retainer
10	Valve shaft
11	Taper pin
12	Extension pin
13	Bearing stop
14	Bearing
15	Valve plug

Please consult Flapcon™ technical support for part numbers.

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