PNEUMATIC ACTUATED INDUSTRIAL VALVES

E-BALL ROTARY CONTROL VALVES

PRODUCT SPECIFICATION

SERIES

3800

SIZES: 1 TO 8 INCHES

High performance, reduced wear, eccentric plug rotary control valves. Available with superior erosion resistant TTZ ceramic trim. Bodies available custom cast in a vast array of specialized alloys to meet your requirements: Hastelloy, Zirconium, Titanium, Alloy 20, CD4MCu….

3800_PS_RevPa_0422

3800 PRODUCT SPEC

WARREN CONTROLS

2600 EMRICK BLVD • BETHLEHEM, PA 18020 • USA •800-922-0085 • WWW.WARRENCONTROLS.COM

DEPENDABLE, RUGGED, PRECISION CONTROL VALVES AND ACCESSORIES

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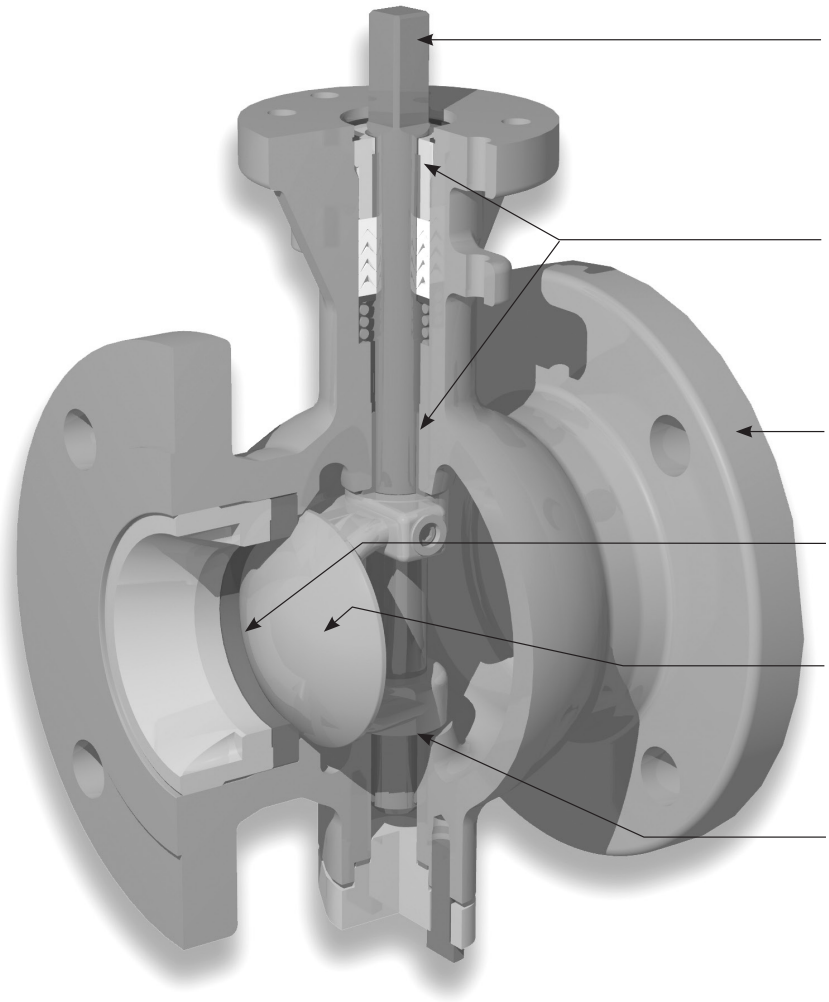
QAS INTERNATIONAL
ISO 9001:2015
REGISTERED FIRM

WARREN CONTROLS INC.
A VETERAN OWNED, PRIVATELY HELD, SMALL BUSINESS
WARREN CONTROLS INC.

SERIES: 3800
E-Ball Rotary Valve



Parallel Square ISO-5211 Actuator Interface
offers broadest range of application to 3rd party actuator preferences.

Standard Triple Point PEEK Shaft Bearings
provide added stability and low friction, resulting in lowest hysteresis and precision control.

Rugged Body
with a selection of port reductions.

Standard Trim Choices
of 316SS, Alloy 6, TTZ Ceramic, PTFE or PEEK seated 316SS.

Classic Eccentric Plug Design
cams away from seating surface avoiding plug and seat wear common with "wiping" concentric designs.

Standard Triple Point
PEEK Shaft Bearings

Description
The 3800 Series Rotary Globe Control Valve incorporates the time-tested and proven Segmented Ball—Eccentric Geometry design (E-Ball), combining exceptionally tight control and rangeability (100:1), with superior trim wear characteristics inherent with the eccentric design.

Available as completely automated valve assemblies with the highest quality actuators and accessories or as bare stem product ready for your automation needs, the 3800 Series comes in a wide variety of standard options for body/trim materials and construction builds, from Class IV to Class VI shut off.

The ever-popular TTZ Ceramic Trim is an off-the-shelf choice for erosive or corrosive fluids and a vast array of custom alloys can be selected for custom construction, engineered to your specific application needs.

The 3800 can flow in the forward direction, flow-to-open; or reverse direction, flow-to-close. The 3800 is available in a thru-shaft or split-shaft configuration. These features allow for maximum flexibility in matching benefits to your application.

FEATURES AND ADVANTAGES

RUGGEDNESS & HIGH PERFORMANCE

Features	Advantages
Eccentric E-ball plug	Provides exceptional modulating control with 100:1 rangeability.
One-piece straight thru body	Compact package with streamlined flow passage yields high Cv's handling greater flow capacities.
Body materials	Standard body materials are WCB steel and CF8M stainless steel. Bodies available custom cast in other specialized alloys: Hastelloy B & C, Zirconium, Titanium, Alloy 20, CD4MCu…
Trim components	Durable rugged plug and seat construction shuts off tightly without deforming plug arms or employing thin ball seals.
Trim materials	TTZ ceramic and Alloy 6 trim promote long dependable service life in applications controlling erosive and hard to handle fluids. 316 stainless steel trim, PEEK & TFE soft seat trim available for non-erosive service.
Forward or reverse flow direction	Choice of forward flow (flow-to-open) or reverse flow (flow-to-close) directions maximizes flexibility in meeting application requirements.
Reduced ports	1, 2, & 3 sizes reduced trim available. Provides flexibility in matching valve size to flow requirements.
ISO 5211 parallel square shaft	ISO standard interface. Allows for broad range of actuators.
Thru- or split-shaft	Choice of one-piece thru-shaft or two-piece split-shaft maximizes flexibility in meeting application requirements.
Shaft, drive pin, plug connection	Eliminates backlash. Assures minimum dead band and hysteresis.
Oversized bearings and shafts	Ideal for high pressure drops.
Extension bonnet	Allows for wide range of temperature applications

INCREASED SERVICEABILITY & REDUCED MAINTENANCE

Features	Advantages
Integral valve body flanges	Promote secure valve installations and piping integrity. Easy installation. Eliminate exposed line flange bolting. Shorten alignment and installation time. Many different classes of pipe flanges.
Eccentric plug rotation	Minimizes contact with seat ring until plug is fully seated reducing friction and wear.
Segmented ball design	In control range reduces risk of cavitation as compared to a full bore ball valve.
90 degree shaft rotation	Removes valve plug from flow stream reducing plug wear.
Rotary shaft with TFE v-ring or graphite packing	Reduces packing wear. Minimizes potential for packing leaks.

ESTABLISHED FEATURES & QUALITY

Features	Advantages
Rotary Control Valve	Rotary design is rugged and compact providing higher Cv's than linear globe designs. Matched with rotary actuators to produce heavy duty automatic throttling control valve which dependably controls both clean and dirty fluids in many process industries.
Pneumatic rack & pinion actuators	Powerful, low profile, high torque actuators with large, highly visible, valve position indicator. Supply pressures to 120 psig. Declutchable gear operator available for manual override. Combine actuators with pneumatic accessories to allow for wide variety of control actions.
Wide variety of accessories	Pneumatic and electro-pneumatic positioners for intrinsically safe, explosion proof, or fail freeze operation. Digital positioners and communications, intelligent keypad, Hart, and foundation fieldbus inputs available. 3-way and 4-way solenoids also available.

TRIM MATERIAL:

316 STAINLESS STEEL
316 stainless steel is our most common and lowest cost trim material choice. 316 stainless steel trim is suitable for flowing differential pressures up to 300 PSIG, is capable of tight Class IV shut-off, is corrosion resistant to many fluids, but is less erosion resistant than other trim materials.

TTZ CERAMIC
TTZ Ceramic is our most durable trim material choice. TTZ Ceramic trim is suitable for flowing differential pressures up to 550 PSIG, is capable of tighter Class IV+ shut-off, is corrosion resistant to many fluids, and is more erosion resistant than other trim materials.

TFE SOFT SEAT
TFE is our most common choice for a resilient trim material. TFE soft seat trim is suitable for flowing differential pressures up to 100 PSIG and temperatures to 340F, is capable of our tightest Class VI shut-off, is corrosion resistant to many fluids, but is much less erosion resistant than other trim materials. **TFE soft seat trim requires the flow direction to be Flow-to-Close.**

PEEK SOFT SEAT
PEEK is our most durable choice for a resilient trim material. PEEK soft seat trim is suitable for flowing differential pressures up to 200 PSIG and temperatures to 450F, is capable of our tightest Class VI shut-off, is corrosion resistant to many fluids, but is less erosion resistant than other trim materials. **PEEK soft seat trim requires the flow direction to be Flow-to-Close.**

ALLOY 6
Alloy 6 is an extremely durable choice for trim material. Alloy 6 trim is suitable for flowing differential pressures up to 450 PSIG, is capable of tight Class IV shut-off. While somewhat corrosion resistant, Alloy 6 is particularly well suited to wear longer in a cavitation prone environment.

SHAFT DESIGN:

THROUGH VS SPLIT
The through shaft design has one piece and passes continuously through the center of the valve. The through shaft is our most common and lowest cost shaft design choice. The split shaft design has two pieces and does not pass continuously through the center of the valve. Seen through the end of the valve, the split shaft provides a flow path with little obstruction. An advantage of this design is a valve with a higher Cv or flow capacity compared to the same valve with a through shaft. Disadvantages are, since the split shaft and plug is a matched set, it is harder and more costly to manufacture or repair. A split shaft is generally only chosen when the higher Cv it offers is absolutely required or there is very thick, sticky or dense slurry.

DIRECT VS INDIRECT
This feature describes the part of the shaft that extends above the valve and connects to the actuator. The direct design has a short shaft and the actuator mounts directly to the valve. The indirect design has a long shaft and the actuator mounts on a bracket indirectly to the valve. While the direct design is more compact and lower in cost than the indirect design, there are applications where an indirect shaft is desired. The indirect design is commonly selected for higher temperature applications where it is necessary to have space between the actuator and valve. Also, if the process fluid is corrosive, CL2 for example, users may want to inspect the packing for leaks. The indirect design provides access to the packing for inspection and adjustment, while the direct design does not.

SHAFT MATERIAL:

17-4 HARD VS INCONEL
17-4 Hard is our most common and lowest cost shaft material choice. Of the two standard choices we offer it is the strongest and can handle the highest torques. It has mild corrosion resistance and due to its hardness performs well on erosive service. Inconel is more commonly chosen for corrosive service applications but is a more expensive nickel alloy and is somewhat softer than 17-4 offering a bit lower actuator torque capability.

BEARING & SEALS TYPE:

PEEK VS ALLOY 6
PEEK is our most common and lowest cost bearing material choice. PEEK bearings are good to 450F and for flowing differential pressures up to 300 PSIG. Alloy 6 is more durable than PEEK and is available as a bearing material for more severe service. Alloy 6 bearings are good to 800F.

FLUORAZ SEALS
Fluoraz seals protect the valve's bearings and shaft from entrained particles in the fluid. If no seals are present, fluid pressure may force foreign particles between the bearings and shaft where damage can occur to the guiding surfaces. Fluoraz seals are good to 500F and are compatible with a significant number of process fluids.

PACKING TYPE:

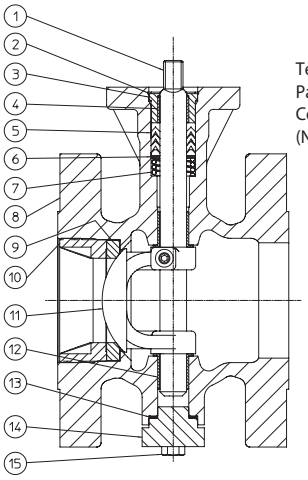
TEFLON V-RING VS GRAPHITE
Teflon v-ring packing is our most common and lowest cost packing material choice. Available self-adjusting or adjustable, teflon v-ring packing is used with PEEK bearings and good to 450F. Graphite packing is available for more severe service. Adjustable, graphite packing used with PEEK bearings is good to 450F, and used with Alloy 6 bearings is good to 800F. Adjustable teflon v-ring or graphite packing requires an indirect shaft.

FLOW DIRECTION:

FLOW-TO-OPEN VS FLOW-TO-CLOSE
When flow enters the valve through the end containing the seat ring the flow direction is flow-to-open. Flow through the valve in this direction tends to move the plug away from the seat ring and opens the valve. When flow enters the valve through the end opposite the seat ring the flow direction is flow-to-close. Flow through the valve in this direction tends to move the plug toward the seat ring and closes the valve. The flow-to-open direction is commonly chosen for its smoother transition from valve closed to open with large pressure differentials and large valves. This flow direction also allows for larger pressure drops prior to the onset of cavitation. The flow-to-close direction provides greater erosion resistance and higher Cv's although flow to open Cv's can be maximized with a split-shaft. Valves with TTZ Ceramic trim in the flow-to-close direction are capable Class IV+ shut-off. **The flow-to-close flow direction is required for TFE soft seat trim and PEEK soft seat trim.**

MATERIALS OF CONSTRUCTION

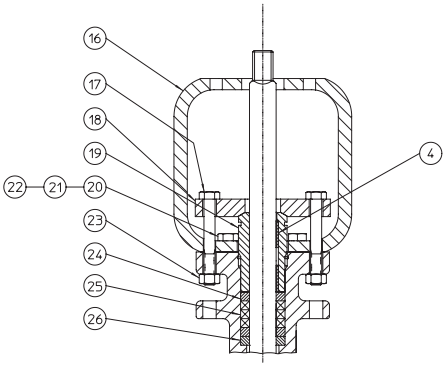
Direct Shaft



Teflon V-Ring
Packing
Code T
(Non-adjustable)

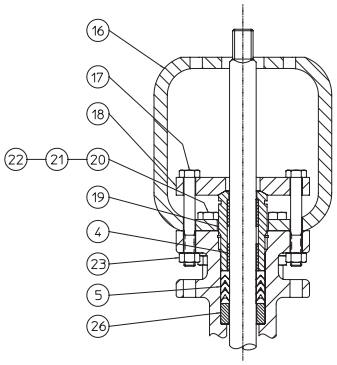
Full Cross-Section

Indirect Shaft

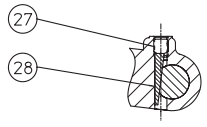


Graphite
Packing
Code G
(Adjustable)

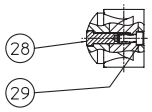
Graphite
Packing
Code J
(Adjustable)



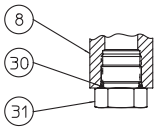
Teflon V-Ring
Packing
Code A
(Adjustable)



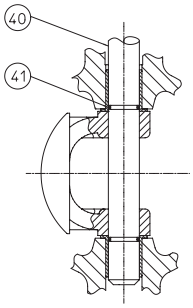
Plug & Shaft
Construction
1.5 - 8
Inch Valves



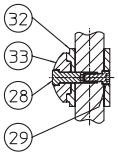
Plug & Shaft
Construction
1 Inch Valves



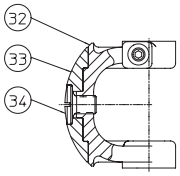
Bottom Plug
Construction
1 - 2 Inch
Valves



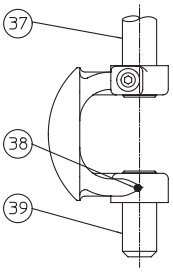
Bearing Seal
Construction



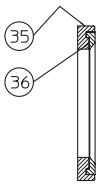
Ceramic or Alloy 6
Plug Construction
1 Inch Valves



Ceramic or Alloy 6
Plug Construction
1.5 - 8 Inch Valves
Inseparable Assembly



Split Shaft Construction
1.5 - 8 Inch Valves
Plug & Shafts are matched sets



Soft Seat Construction
Inseparable Assembly

BODY MATERIALS

Item	Part Nomenclature	Materials
	Code: W WCB Body	
8	Valve Body	Steel A216 WCB
13	Gasket	Nonasbestos
14	Bottom Cover	Steel A216 WCB
15	Hex Head Capscrew	Alloy Steel GR B7
30	O-ring	Fluoraz 797
31	Bottom Plug	STEEL
	Code: F CF8M Body	
8	Valve Body	SST A351 CF8M
13	Gasket	Nonasbestos
14	Bottom Cover	SST A351 CF8M
15	Hex Head Capscrew	SST GR B8M Class 2
30	O-ring	Fluoraz 797
31	Bottom Plug	316 SST

TRIM MATERIALS

Item	Part Nomenclature	Materials
	Code: S316 Stainless Steel Trim	
9	Fixed Adjustable Seat Ring	316 SST
10	Seat Retainer	316 SST
11	Plug	316 SST
27	Set Screw	316 SST
29	Socket Head Capscrew	316 SST
	Code: Z TTZ Ceramic Trim	
9	Fixed Adjustable Seat Ring	TTZ Zirconia Ceramic
10	Seat Retainer	316 SST
27	Set Screw	316 SST
29	Socket Head Capscrew	316 SST
32	Blank Plug	316 SST
33	Plug Face	TTZ Zirconia Ceramic
34	Retaining Screw	Inconel 625
	Code: T TFE Soft Seats	
10	Seat Retainer	316 SST
11	Plug	316 SST
27	Set Screw	316 SST
29	Socket Head Capscrew	316 SST
35	Soft Seat Retainer	316 SST
36	Soft Seat	Fluorosint 207
	Code: P PEEK Soft Seats	
10	Seat Retainer	316 SST
11	Plug	316 SST
27	Set Screw	316 SST
29	Socket Head Capscrew	316 SST
35	Soft Seat Retainer	316 SST
36	Soft Seat	PEEK
	Code: 6 Alloy 6 Trim	
9	Fixed Adjustable Seat Ring	Alloy 6B or 316 SST/ Alloy 6B Inlay
10	Seat Retainer	316 SST
27	Set Screw	316 SST
29	Socket Head Capscrew	316 SST
32	Blank Plug	316 SST
33	Plug Face	Alloy 6B
34	Retaining Screw	Inconel 625

SHAFT DESIGN

Item	Part Nomenclature	Materials
	Code: D or E Indirect Shaft	
16	Actuator Adapter	Steel
20	Hex Head Bolt	Alloy Steel GR B7
21	Regular Lockwasher	Steel
22	Hex Nut	Alloy Steel GR 2
	Code: E or F Split Shaft	
37	Upper Shaft	As Specified
38	Groove Pin	SST
39	Lower Shaft	As Specified

SHAFT MATERIALS

Item	Part Nomenclature	Materials
	Code: S 17-4 Hard Shaft	
1	Valve Shaft	17-4 PH SST
28	Drive Pin	17-4 PH SST
	Code: I Inconel Shaft	
1	Valve Shaft	Inconel 718
28	Drive Pin	Inconel 718

BEARINGS AND SEALS

Item	Part Nomenclature	Materials
	Code: S PEEK Bearings	
12	Bearing	PEEK
	Code: T PEEK Bearings w/Fluoraz 797 Seals	
12	Bearing	PEEK
40	Shaft for Bearing Seals	As Specified
41	O-ring	Fluoraz 797
	Code: 6 Alloy 6B Bearings	
12	Bearing	Alloy 6B
	Code: Y Alloy 6B Bearings w/Fluoraz 797 Seals	
12	Bearing	Alloy 6B
40	Shaft for Bearing Seals	As Specified
41	O-ring	Fluoraz 797

PACKING MATERIALS

Item	Part Nomenclature	Materials
	Code: T Teflon V-Ring Packing	
2	Retaining Ring	316 SST
3	Packing Retainer	316 SST
4	Packing Bearing	PEEK
5	V-Ring Packing Set	PTFE
6	Packing Spacer	316 SST
7	Packing Spring	316 SST
	Code: G Graphite Packing (Requires Indirect Shaft)	
17	Hex Head Capscrew	SST
18	Packing Flange	316 SST
19	Adjustable Packing Retainer	Alloy 6B
23	Hex Nut	316 SST
24	Yarn Packing	Graphite
25	Ring Packing	Graphite
26	Packing Spacer	Alloy 6B
	Code: J Graphite Packing (Requires Indirect Shaft)	
4	Packing Bearing	PEEK
17	Hex Head Capscrew	SST
18	Packing Flange	316 SST
19	Adjustable Packing Retainer	316 SST
23	Hex Nut	316 SST
24	Yarn Packing	GRAPHITE
25	Ring Packing	GRAPHITE
26	Packing Spacer	316 SST
	Code: A Teflon V-Ring Packing (Requires Indirect Shaft)	
4	Packing Bearing	PEEK
5	V-ring Packing Set	PTFE
17	Hex Head Capscrew	SST
18	Packing Flange	316 SST
19	Adjustable Packing Retainer	316 SST
23	Hex Nut	316 SST
26	Packing Spacer	316 SST

PERFORMANCE CHARACTERISTICS

Body Pressure-Temperature Ratings

Body Pressure: Temperature Rating conform to ANSI based on body/flange rating and body material. As the fluid temperature increases, the maximum allowable internal pressure decreases. Verify maximum pressures and temperatures prior to selecting body material and body/flange rating.

BODY PRESSURE-TEMPERATURE RATINGS:				
Temperature (F)	**150 FLG WCB**	**300 FLG WCB**	**150 FLG CF8M**	**300 FLG CF8M**
+32° To 100°	285	740	275	720
150°	272	710	255	670
175°	266	695	245	645
200°	260	680	235	620
225°	252	673	230	605
250°	245	667	225	590
275°	237	661	220	575
300°	230	655	215	560
325°	222	650	210	548
350°	215	645	205	535
375°	207	640	200	526

BODY PRESSURE-TEMPERATURE RATINGS:				
Temperature (F)	**150 FLG WCB**	**300 FLG WCB**	**150 FLG CF8M**	**300 FLG CF8M**
400°	200	635	195	515
450°	185	620	182	497
500°	170	605	170	480
550°	155	587	155	465
600°	140	570	140	450
650°	125	550	125	440
700°	110	530	110	435
750°	95	505	95	425
800°	80	410	80	420

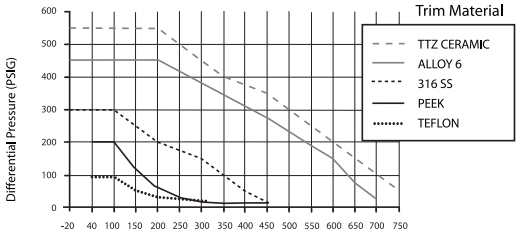
Pressure ratings are PSIG
For applications below 32º consult factory.

Flowing Differential Pressure

NOTE: Approaching limits for continuous use will reduce trim life. For continuous use, stay within half of rated maximum.

NOTE ON BEARINGS: PEEK Bearings should not be used for temperatures above 450ºF or flowing differential pressure above 300 PSIG.

MAXIMUM FLOWING DIFFERENTIAL PRESSURE LIMITS



ANSI Seat Leakage Classes

ALLOWABLE SEAT LEAKAGE CLASSES				
Leakage Class	**Maximum Seat Leakage**	**Test Fluid**	**Test Pressure**	**Relative Seat Tightness**
Class II	0.5% of rated CV	Water	45 to 60 PSI	1
Class III	0.1% of rated CV	Water	45 to 60 PSI	5
Class IV	0.01% of rated CV	Water	45 to 60 PSI	50
Class IV+	0.005 ml/min/inch of trim size/ΔP(PSI)	Water	Max Operating ΔP	30,000
Class V	0.0005 ml/min/inch of trim size/ΔP(PSI)	Water	Max Operating ΔP	300,000
Class VI	Class VI about 0.9 ml/min*	Air	50 PSI	600,000

3800 with Metal Seats or TTZ Ceramic Seats, in any flow direction, ANSI Class IV, Standard.

3800 with TTZ Ceramic Seats in the Flow-To-Close direction can allow for the available Class IV+

Class IV+ is a proprietary designation of Warren Controls and is not an ANSI/FCI classification.

Class IV+ requires special factory set up and as such there is an up charge. Contact Warren Controls Sales Department for pricing and ordering instructions.

3800 with PEEK or TFE Soft Seats **(Requires Flow-to-Close flow direction)** ANSI Class VI

*Leakage rate varies by nominal port diameter, refer to the Standard ANSI/FCI 70.2.

Internal Configurations vs Max Temp

Trim Material	Shaft Design	Bearing & Seals	Packing	Max Temp [1]
S 316 Stainless Steel **Z** TTZ Ceramic **T** TFE Soft Seats **P** PEEK Soft Seats **6** Alloy 6	**C** Thru Direct **D** Thru Indirect **E** Split Direct **F** Split Indirect	**S** PEEK **T** PEEK w/ Fluoraz 797 Seal	**T** Teflon V-ring **J** Graphite **A** Teflon V-ring	450°F
S 316 Stainless Steel **Z** TTZ Ceramic **6** Alloy 6	**D** Thru Indirect **F** Split Indirect	**Y** Alloy 6B w/ Fluoraz 797 Seal	**G** Graphite	500°F
S 316 Stainless Steel **Z** TTZ Ceramic **6** Alloy 6	**D** Thru Indirect **F** Split Indirect	**6** Alloy 6B	**G** Graphite	800°F

[1]For Maximum Temperatures see also Valve Body Pressure-Temperature Ratings and Actuator Temperature Ratings

STEAM TABLE					
Steam Pressure PSIG	**Temp. °F**	**Temp. °C**	**Sensible Heat BTU/Lb.**	**Latent Heat BTU/Lb.**	**Total Heat BTU/ Lb.**
0	212	100	180	971	1151
10	239	115	207	952	1159
25	266	130	236	934	1170
50	297	147	267	912	1179
75	320	160	290	896	1186
100	338	170	309	881	1190
125	353	178	325	868	1193
150	365	185	339	858	1197
200	387	197	362	838	1200
250	406	208	381	821	1202
300	422	217	399	805	1204
400	448	231	438	778	1216
500	470	243	453	752	1205
600	489	254	475	729	1204

Rectangular Tank Capacity in Gallons

$$\text{Gallons} = \frac{\text{Height x Width x Length (inches)}}{230}$$

or

Gallons = H x W x L (Ft.) x 7.5

Circular Tank Storage Capacity in Gallons

Storage = $6D^2$ x L (Gallons)

Where:
D = Tank Diameter in Feet
L = Length in Feet

LOAD SIZING CALCULATIONS

Glossary of Terms
t = Time in Hours
Cp = Specific Heat of Liquid
S = Specific Gravity of Fluid
W = Weight in Lbs.
ΔT = Temperature Rise or Fall in °F
h_{fg} = Latent Heat of Steam

Conversion Factors

1 Lb. Steam / Hr. =	1000 BTU / Hr.
1 Cubic Meter =	264 U.S. Gallons
1 Cubic Foot Water =	62.4 Lbs.
1 PSI =	2.04 Inches of Mercury
1 PSI =	2.3 Feet of Water
1 PSI =	27.7 Inches of Water
1 U.S. Gallon Water =	231 Cubic Inches
1 U.S. Gallon Water =	8.33 Lbs.

Heating Water with Steam

Quick Method

$$\text{Lbs./Hr.} = \frac{\text{GPM}}{2} \times \Delta T$$

Accurate Method

$$\text{Lbs./Hr.} = \frac{\text{GPM} \times 500 \times \Delta T}{h_{fg}}$$

Heating or Cooling Water with Water

$$\text{GPM}_1 = \text{GPM}_2 \times \frac{\text{°F water}_2 \text{ temp. rise or drop}}{\text{°F water}_1 \text{ temp. rise or drop}}$$

Heating or Cooling Water

$$\text{GPM} = \frac{\text{BTU / Hr.}}{(\text{°F water temp. rise or drop}) \times 500}$$

Heating Oil with Steam

$$\text{Lbs./Hr.} = \frac{\text{GPM}}{4} \times (\text{°F oil temp. rise})$$

Heating Air with Water

$$\text{GPM} = 2.16 \times \frac{\text{CFM x (°F air temp. rise)}}{1000 \times (\text{°F water temp. drop})}$$

Heating Liquids with Steam

$$\text{Lbs./Hr.} = \frac{\text{GPM} \times 60 \times \text{Cp} \times \text{W}}{h_{fg}} \times \Delta T$$

Heating Liquids in Steam Jacketed Kettles

$$\text{Lbs./Hr.} = \frac{\text{Gallons} \times \text{Cp} \times \text{S} \times 8.33}{h_{fg} \times t} \times \Delta T$$

General Liquid Heating

$$\text{Lbs./Hr.} = \frac{\text{W} \times \text{Cp}}{h_{fg} \times t} \times \Delta T$$

Heating Air with Steam

$$\text{Lbs./Hr.} = \frac{\text{CFM}}{900} \times \Delta T$$

FLOW COEFFICIENTS (Cv) VERSUS TRAVEL — FLOW TO OPEN

Shaft Style	VALVE		3800 FLOW COEFFICIENTS (Cv) FLOW TO OPEN									
	Valve Size (IN)	Port Size	% Stroke 10	20	30	40	50	60	70	80	90	100
Thru Shaft	1	Full	0.90	1.70	3.00	4.50	6.20	8.00	10.0	12.4	14.7	17.3
		Reduced 1SR	0.60	1.20	2.00	3.00	4.20	5.40	6.70	8.20	9.80	11.5
		Reduced 2SR	0.40	0.80	1.30	2.00	2.80	3.60	4.50	5.50	6.50	7.70
		Reduced 3SR	0.30	0.50	0.90	1.30	1.80	2.40	3.00	3.70	4.40	5.10
Thru Shaft	1.5	Full	3.00	6.00	10.0	15.0	20.0	26.0	32.0	40.0	48.0	56.0
		Reduced 1SR	1.90	3.70	6.50	9.70	13.0	17.0	22.0	27.0	32.0	37.0
		Reduced 2SR	1.20	2.50	4.30	6.50	9.00	12.0	14.0	18.0	21.0	25.0
		Reduced 3SR	0.80	1.70	2.90	4.30	6.00	7.70	9.60	12.0	14.0	17.0
Split Shaft		Full	5.00	11.0	19.0	29.0	40.0	51.0	64.0	79.0	94.0	110
		Reduced 1SR	3.70	7.30	13.0	19.0	26.0	34.0	43.0	52.0	62.0	73.0
		Reduced 2SR	2.40	4.90	8.50	13.0	18.0	23.0	28.0	35.0	42.0	49.0
		Reduced 3SR	1.60	3.30	5.60	8.50	12.0	15.0	19.0	23.0	28.0	33.0
Thru Shaft	2	Full	4.00	8.00	15.0	22.0	30.0	39.0	49.0	60.0	71.0	84.0
		Reduced 1SR	2.80	5.60	9.70	15.0	20.0	26.0	32.0	40.0	48.0	56.0
		Reduced 2SR	1.90	3.70	6.50	9.70	13.0	17.0	22.0	27.0	32.0	37.0
		Reduced 3SR	1.20	2.50	4.30	6.50	9.00	12.0	14.0	18.0	21.0	25.0
Split Shaft		Full	7.00	14.0	24.0	35.0	49.0	63.0	79.0	97.0	116	136
		Reduced 1SR	4.50	9.10	16.0	24.0	33.0	42.0	53.0	65.0	77.0	91.0
		Reduced 2SR	3.00	6.00	10.5	16.0	22.0	28.0	35.0	43.0	51.0	60.0
		Reduced 3SR	2.00	4.00	7.00	10.5	15.0	19.0	23.0	29.0	34.0	40.0
Thru Shaft	3	Full	9.00	18.0	31.0	47.0	65.0	84.0	104	129	153	180
		Reduced 1SR	6.00	12.0	21.0	31.0	43.0	56.0	70.0	86.0	102	120
		Reduced 2SR	4.00	8.00	14.0	21.0	29.0	37.0	46.0	57.0	68.0	80.0
		Reduced 3SR	2.70	5.30	9.20	14.0	19.0	25.0	31.0	38.0	45.0	53.0
Split Shaft		Full	13.0	27.0	47.0	70.0	97.0	126	157	193	230	270
		Reduced 1SR	9.00	18.0	31.0	47.0	65.0	84.0	104	129	153	180
		Reduced 2SR	6.00	12.0	21.0	31.0	43.0	56.0	70.0	86.0	102	120
		Reduced 3SR	4.00	8.00	13.8	21.0	29.0	37.0	46.0	57.0	68.0	80.0
Thru Shaft	4	Full	17.0	35.0	61.0	91.0	126	163	203	250	298	350
		Reduced 1SR	11.7	23.0	40.0	61.0	84.0	108	135	167	198	233
		Reduced 2SR	7.80	16.0	27.0	40.0	56.0	72.0	90.0	111	132	156
		Reduced 3SR	5.20	10.0	18.0	27.0	37.0	48.0	60.0	74.0	88.0	104
Split Shaft		Full	26.0	51.0	89.0	133	185	239	298	367	436	513
		Reduced 1SR	17.1	34.0	59.0	89.0	123	159	198	245	291	342
		Reduced 2SR	11.4	23.0	39.0	59.0	82.0	106	132	163	194	228
		Reduced 3SR	7.60	15.0	26.0	40.0	55.0	71.0	88.0	109	129	152
Thru Shaft	6	Full	40.0	80.0	138	208	288	372	464	572	680	800
		Reduced 1SR	27.0	53.0	92.0	139	192	248	309	381	453	533
		Reduced 2SR	17.8	36.0	62.0	92.0	128	165	206	254	302	356
		Reduced 3SR	11.9	24.0	41.0	62.0	85.0	110	137	169	201	237
Split Shaft		Full	58.0	116	200	301	416	538	670	827	983	1156
		Reduced 1SR	39.0	77.0	133	200	277	358	447	551	655	771
		Reduced 2SR	26.0	51.0	89.0	134	185	239	298	367	437	514
		Reduced 3SR	17.1	34.0	59.0	89.0	123	159	199	245	291	343
Thru Shaft	8	Full	65.0	130	225	338	468	604	754	929	1105	1300
Split Shaft		Full	86.0	173	299	450	623	804	1003	1237	1471	1730

Flow-To-Open:
Most general service applications will benefit from the flow to open direction. Smoother transitions from close to open and greater ability to accommodate larger pressure drops prior to the onset of cavitation are prime benefits as compared to flow to close operation. **The flow-to-open flow direction is not suitable for TFE soft seat and PEEK soft seat trim.**

FLOW COEFFICIENTS (CV) VERSUS TRAVEL — FLOW TO CLOSE

Flow-To-Close:
Flow to close operation is generally reserved for erosive service applications. While tighter shut off can be an additional benefit, this is not quantified for levels of tightness above Class IV or Class VI. Further, the tradeoff can be lack of a smooth transition from close to open when pressure differentials are significant especially on larger sizes. **The flow-to-close flow direction is required for TFE soft seat and PEEK soft seat trim.**

Shaft Style	VALVE		3800 FLOW COEFFICIENTS (Cv) FLOW TO CLOSE									
	Valve Size (IN)	Port Size	% Stroke									
			10	20	30	40	50	60	70	80	90	100
Thru Shaft	1	Full	0.90	1.90	3.20	4.90	6.70	8.70	10.8	13.4	15.9	18.7
		Reduced 1SR	0.60	1.20	2.20	3.20	4.50	5.80	7.20	8.90	10.6	12.5
		Reduced 2SR	0.40	0.80	1.40	2.20	3.00	3.90	4.80	5.90	7.10	8.30
		Reduced 3SR	0.30	0.60	1.00	1.40	2.00	2.60	3.20	4.00	4.70	5.50
Thru Shaft	1.5	Full	3.00	6.00	11.0	16.0	22.0	29.0	36.0	44.0	53.0	62.0
		Reduced 1SR	2.10	4.10	7.20	10.7	15.0	19.0	24.0	30.0	35.0	41.0
		Reduced 2SR	1.40	2.80	4.80	7.20	9.90	13.0	16.0	20.0	23.0	28.0
		Reduced 3SR	0.90	1.80	3.20	4.80	6.60	8.50	10.7	13.0	16.0	18.0
Split Shaft		Full	6.00	12.0	21.0	32.0	44.0	57.0	71.0	87.0	104	122
		Reduced 1SR	4.10	8.10	14.0	21.0	29.0	38.0	47.0	58.0	69.0	81.0
		Reduced 2SR	2.70	5.40	9.40	14.0	20.0	25.0	31.0	39.0	46.0	54.0
		Reduced 3SR	1.80	3.60	6.30	9.40	13.0	17.0	21.0	26.0	31.0	36.0
Thru Shaft	2	Full	5.00	9.00	16.0	24.0	33.0	43.0	53.0	66.0	78.0	92.0
		Reduced 1SR	3.10	6.10	10.6	16.0	22.0	29.0	36.0	44.0	52.0	61.0
		Reduced 2SR	2.00	4.10	7.10	10.6	15.0	19.0	24.0	29.0	35.0	41.0
		Reduced 3SR	1.40	2.70	4.70	7.10	9.80	13.0	16.0	19.0	23.0	27.0
Split Shaft		Full	7.00	15.0	26.0	39.0	54.0	69.0	86.0	107	127	149
		Reduced 1SR	5.00	9.90	17.0	26.0	36.0	46.0	58.0	71.0	84.0	99.0
		Reduced 2SR	3.30	6.60	11.5	17.0	24.0	31.0	38.0	47.0	56.0	66.0
		Reduced 3SR	2.20	4.40	7.60	11.5	16.0	21.0	26.0	32.0	38.0	44.0
Thru Shaft	3	Full	10.0	20.0	34.0	51.0	71.0	92.0	114	141	167	197
		Reduced 1SR	6.60	13.0	23.0	34.0	47.0	61.0	76.0	94.0	112	131
		Reduced 2SR	4.40	8.80	15.0	23.0	32.0	41.0	51.0	63.0	74.0	88.0
		Reduced 3SR	2.90	5.80	10.0	15.0	21.0	27.0	34.0	42.0	50.0	58.0
Split Shaft		Full	15.0	29.0	51.0	77.0	106	137	171	211	251	295
		Reduced 1SR	9.80	20.0	34.0	51.0	71.0	91.0	114	141	167	197
		Reduced 2SR	6.60	13.1	23.0	34.0	47.0	61.0	76.0	94.0	111	131
		Reduced 3SR	4.40	8.70	15.0	23.0	31.0	41.0	51.0	62.0	74.0	87.0
Thru Shaft	4	Full	19.0	38.0	66.0	100	138	179	223	275	326	384
		Reduced 1SR	12.8	26.0	44.0	67.0	92.0	119	148	183	218	256
		Reduced 2SR	8.50	17.0	30.0	44.0	61.0	79.0	99.0	122	145	171
		Reduced 3SR	5.70	11.0	20.0	30.0	41.0	53.0	66.0	81.0	97.0	114
Split Shaft		Full	28.0	56.0	97.0	146	203	262	327	403	479	563
		Reduced 1SR	18.8	38.0	65.0	98.0	135	175	218	268	319	375
		Reduced 2SR	12.5	25.0	43.0	65.0	90.0	116	145	179	213	250
		Reduced 3SR	8.30	17.0	29.0	43.0	60.0	78.0	97.0	119	142	167
Thru Shaft	6	Full	44.0	87.0	151	227	315	407	507	626	744	875
		Reduced 1SR	29.0	58.0	101	152	210	271	338	417	496	583
		Reduced 2SR	19.4	39.0	67.0	101	140	181	226	278	331	389
		Reduced 3SR	13.0	26.0	45.0	67.0	93.0	121	150	185	220	259
Split Shaft		Full	63.0	126	219	329	455	588	734	904	1075	1265
		Reduced 1SR	42.0	84.0	146	219	304	392	489	603	717	843
		Reduced 2SR	28.0	56.0	97.0	146	202	261	326	402	478	562
		Reduced 3SR	18.7	37.0	65.0	97.0	135	174	217	268	319	375
Thru Shaft	8	Full	71.0	142	246	369	511	660	824	1015	1207	1420
Split Shaft		Full	94.0	189	327	491	680	879	1096	1351	1607	1890

ADDITIONAL COEFFICIENTS

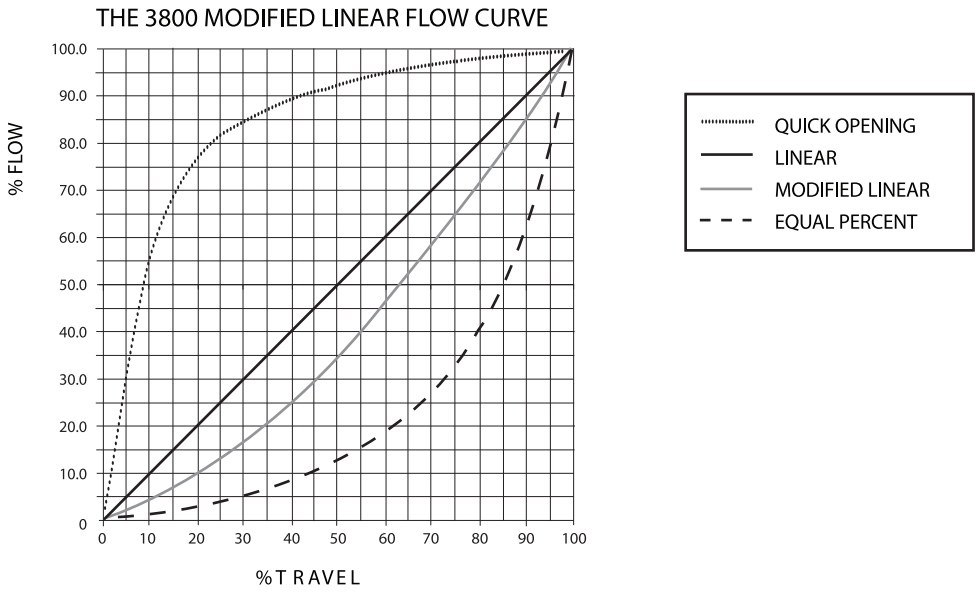
VALVE		FLOW-TO-OPEN									
Coefficients	**Valve Size (IN)**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
F_L	1 - 2 All Ports	0.89	0.89	0.88	0.88	0.87	0.87	0.86	0.86	0.85	0.85
F_L^2		0.79	0.79	0.77	0.77	0.76	0.76	0.74	0.74	0.72	0.72
K_C		0.60	0.61	0.61	0.62	0.62	0.63	0.64	0.63	0.62	0.59
X_T		0.48	0.50	0.51	0.54	0.57	0.61	0.63	0.62	0.60	0.59
F_L	3 - 4 All Ports	0.87	0.85	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.76
F_L^2		0.76	0.72	0.69	0.67	0.66	0.64	0.62	0.61	0.59	0.58
K_C		0.60	0.61	0.61	0.62	0.62	0.63	0.61	0.60	0.58	0.57
X_T		0.48	0.53	0.57	0.54	0.52	0.51	0.49	0.48	0.46	0.45
F_L	6 - 8 All Ports	0.94	0.92	0.90	0.87	0.84	0.81	0.78	0.75	0.72	0.69
F_L^2		0.88	0.85	0.81	0.76	0.71	0.66	0.61	0.56	0.52	0.48
K_C		0.60	0.61	0.61	0.62	0.62	0.63	0.60	0.55	0.51	0.47
X_T		0.60	0.57	0.54	0.51	0.48	0.45	0.45	0.43	0.42	0.41

VALVE		FLOW-TO-CLOSE									
Coefficients	**Valve Size (IN)**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
F_L	1 - 2 All Ports	0.96	0.87	0.77	0.74	0.68	0.62	0.62	0.62	0.62	0.62
F_L^2		0.92	0.76	0.59	0.55	0.46	0.38	0.38	0.38	0.38	0.38
K_C		0.88	0.72	0.55	0.52	0.44	0.35	0.35	0.35	0.35	0.35
X_T		0.52	0.54	0.56	0.49	0.42	0.36	0.36	0.36	0.35	0.35
F_L	3 - 4 All Ports	0.83	0.82	0.81	0.75	0.65	0.58	0.58	0.58	0.58	0.58
F_L^2		0.69	0.67	0.66	0.56	0.42	0.34	0.34	0.34	0.34	0.34
K_C		0.61	0.57	0.53	0.52	0.40	0.32	0.32	0.32	0.32	0.32
X_T		0.52	0.54	0.56	0.49	0.42	0.36	0.36	0.36	0.35	0.35
F_L	6 - 8 All Ports	0.92	0.90	0.88	0.81	0.74	0.66	0.63	0.60	0.59	0.58
F_L^2		0.85	0.81	0.77	0.66	0.55	0.44	0.40	0.36	0.35	0.34
K_C		0.77	0.73	0.69	0.62	0.53	0.41	0.39	0.34	0.33	0.33
X_T		0.64	0.55	0.49	0.45	0.42	0.39	0.37	0.35	0.33	0.31

F_L = Recovery coefficient for all fluids
K_C = Incipient cavitation index for liquids
X_T = Terminal pressure drop for gaseous state

Flow Curve

The 3800 design inherently has a modified linear flow curve suitable for a wide range of precision control applications.



3800 Actuator Torque Requirements - Flow to OPEN

VALVE	MAX TORQUE		RATED TORQUES (LBS - IN) HOLDING TORQUE IN LB - IN TO MAINTAIN CLASS IV SHUT OFF															
Valve Size (IN)	17-4 Shaft	In-conel Shaft	Control Valve Inlet Pressure (PSI)															
			Seat Surface: Hard						Bearing Material: PEEK									Packing Material: PTFE
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	44	46	49	52	55	57	61	68	75	82	89	95	109	123	150	177	204
1-1/2	1080	950	78	85	92	99	106	113	124	142	159	177	195	212	248	283	353	424	495
2	1080	950	100	111	123	134	146	157	174	203	232	261	289	318	376	433	548	664	779
3	1800	1590	203	235	268	301	334	366	415	497	579	661	742	824	988	1151	1478	*1805*	*2132*
4	3160	2860	369	448	526	605	683	762	879	1075	1271	1467	1664	1860	2252	2644	*3428*	*4213*	*4997*
6	7020	6190	759	974	1188	1403	1618	1833	2155	2692	3229	3766	4303	4840	5914	*6987*	*9135*	*11283*	*13431*
8	8460	7460	1229	1646	2063	2479	2896	3313	3938	4981	6023	7065	8107	*9149*	*11234*	*13318*	*17486*	*21655*	
			Seat Surface: Hard						Bearing Material: Alloy 6									Packing Material: PTFE
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	49	52	55	59	62	65	70	78	85	93	101	109	125	141	172	204	235
1-1/2	1080	950	87	95	103	111	119	127	138	158	178	198	218	238	277	317	396	476	555
2	1080	950	111	124	137	150	163	176	195	228	260	293	325	357	422	487	617	747	876
3	1800	1590	223	260	296	333	369	405	460	551	642	733	824	915	1097	1278	1642	*2006*	*2370*
4	3160	2860	407	493	580	666	753	839	969	1186	1402	1618	1835	2051	2484	2917	*3782*	*4648*	*5513*
6	7020	6190	846	1086	1327	1567	1808	2048	2409	3011	3612	4213	4815	5416	6619	*7822*	*10227*	*12633*	*15039*
8	8460	7460	1346	1805	2263	2721	3180	3638	4326	5471	6617	7763	*8909*	*10055*	*12347*	*14638*	*19222*	*23805*	
			Seat Surface: Hard						Bearing Material: Alloy 6									Packing Material: Graphite
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	129	132	136	139	142	145	150	158	166	174	182	190	206	222	254	287	319
1-1/2	1080	950	167	175	183	191	199	207	219	239	259	279	299	319	359	399	479	559	638
2	1080	950	191	204	217	230	243	256	276	308	341	373	406	439	504	569	699	830	960
3	1800	1590	374	410	447	483	520	556	611	702	793	885	976	1067	1250	1432	1797	*2162*	*2527*
4	3160	2860	617	704	791	877	964	1051	1181	1399	1616	1833	2050	2267	2701	3136	*4004*	*4873*	*5741*
6	7020	6190	1302	1544	1785	2027	2269	2511	2873	3478	4082	4686	5291	5895	*7104*	*8313*	*10730*	*13148*	*15566*
8	8460	7460	1803	2262	2722	3181	3641	4100	4790	5938	7087	8236	*9385*	*10534*	*12832*	*15129*	*19725*	*24320*	

Rules for Use:

1) Select torque requirement table based on flow direction, seat surface, bearing material, and packing material of valve.

2) Read across row for valve size to columns for MAX torque. Read maximum shaft torque in column for shaft material of valve.

3) Read across row for valve size to column for control valve inlet pressure that is equal to or greater than inlet pressure to valve. Read rated torque value in that column. For rated torque values in *italics* consult factory for an engineering-application review, and for possible consideration of stronger custom shaft and plug materials, as these choices exceed the MAX torque for standard shafts.

3800 Actuator Torque Requirements - Flow to CLOSE

VALVE	MAX TORQUE		RATED TORQUES (LBS - IN) MINIMUM REQUIRED HOLDING TORQUE IN LB - IN TO MAINTAIN CLASS IV SHUT OFF (CLASS IV+ WITH TTZ CERAMIC SEAT)	***TO RE-OPEN:** TORQUE MUST BE 1.5 TIMES GREATER THAN APPLIED CLOSING TORQUE															
Valve Size (IN)	17-4 Shaft	Inconel Shaft	Control Valve Inlet Pressure (PSI)																
			Seat Surface: Hard						Bearing Material: PEEK								Packing Material: PTFE		
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	12	13	15	16	18	19	22	26	30	34	38	42	50	57	73	89	105
1-1/2	1080	950	14	18	22	25	29	33	39	49	58	68	78	87	107	126	165	204	242
2	1080	950	18	26	34	42	50	58	70	90	110	130	150	170	210	250	330	410	489
3	1800	1590	39	63	87	111	135	159	195	255	316	376	436	496	616	736	977	*1217*	*1457*
4	3160	2860	82	143	205	267	328	390	482	637	791	945	1099	1253	1562	1870	*2486*	*3103*	*3720*
6	7020	6190	220	395	569	744	919	1094	1356	1793	2230	2667	3104	3541	4415	*5289*	*7037*	*8786*	*10534*
8	8460	7460	398	750	1103	1455	1808	2160	2689	3571	4452	5334	*6215*	*7096*	*8859*	*10622*	*14148*	*17674*	
			Seat Surface: Hard						Bearing Material: Alloy 6								Packing Material: PTFE		
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	12	13	15	17	19	20	23	27	31	36	40	44	53	61	78	96	113
1-1/2	1080	950	14	18	22	27	31	35	41	51	62	72	82	93	113	134	175	217	258
2	1080	950	18	27	35	43	52	60	73	93	114	135	156	177	219	260	344	427	510
3	1800	1590	40	65	90	116	141	166	204	267	329	392	455	518	644	770	1021	*1273*	*1524*
4	3160	2860	84	148	212	276	341	405	501	661	821	982	1142	1302	1623	1943	*2584*	*3225*	*3866*
6	7020	6190	228	410	593	775	958	1140	1414	1870	2327	2783	3239	3696	4609	*5521*	*7347*	*9172*	*10997*
8	8460	7460	410	775	1140	1505	1870	2235	2783	3695	4608	5520	*6433*	*7345*	*9170*	*10995*	*14645*	*18296*	
			Seat Surface: Hard						Bearing Material: Alloy 6								Packing Material: Graphite		
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	92	94	95	97	99	101	103	108	112	117	121	125	134	143	161	179	196
1-1/2	1080	950	94	98	103	107	111	115	121	132	142	153	163	174	195	216	258	300	341
2	1080	950	98	107	115	124	132	141	154	175	196	217	239	260	302	345	430	515	599
3	1800	1590	190	216	241	266	291	317	355	418	481	544	607	670	797	923	1176	*1429*	*1681*
4	3160	2860	294	359	423	488	552	616	713	874	1035	1196	1357	1518	1840	*2162*	*2806*	*3450*	*4094*
6	7020	6190	684	867	1051	1235	1419	1602	1878	2337	2797	3256	3715	4175	*5094*	*6012*	*7850*	*9687*	*11524*
8	8460	7460	866	1232	1599	1965	2331	2697	3247	4162	5078	*5993*	*6909*	*7824*	*9655*	*11486*	*15148*	*18811*	

VALVE	MAX TORQUE		RATED TORQUES (LBS - IN) MINIMUM REQUIRED HOLDING TORQUE IN LB - IN TO MAINTAIN CLASS VI SHUT OFF	***TO RE-OPEN:** TORQUE MUST BE 1.5 TIMES GREATER THAN APPLIED CLOSING TORQUE															
Valve Size (IN)	17-4 Shaft	Inconel Shaft	Control Valve Inlet Pressure (PSI)																
			Seat Surface: Soft						Bearing Material: PEEK								Packing Material: PTFE		
			10	20	30	40	50	60	75	100	125	150	175	200	250	300	400	500	600
1	480	424	11	12	13	15	16	17	19	22	24	27	30	33	39	45	56	68	79
1-1/2	1080	950	13	15	18	21	23	26	30	37	44	50	57	64	77	90	117	144	171
2	1080	950	15	21	26	32	37	43	51	64	78	91	105	119	146	173	227	282	336
3	1800	1590	31	47	64	80	96	112	137	177	218	258	299	339	420	501	663	825	987
4	3160	2860	61	103	144	185	227	268	330	433	537	640	743	847	1053	1260	1673	*2087*	*2500*
6	7020	6190	162	279	396	513	630	747	923	1215	1508	1801	2093	2386	2971	3556	*4727*	*5897*	*7067*
8	8460	7460	281	516	752	987	1223	1458	1812	2401	2989	3578	4167	4756	*5934*	*7112*	*9467*	*11823*	

Rules for Use:

**** These valves require more torque to reopen than was used to close them. Typically up to 50% more. This is inherent in the design and needs to be considered when specifying an actuator.***

1) Select torque requirement table based on flow direction, seat surface, bearing material, and packing material of valve.

2) Read across row for valve size to columns for MAX torque. Read maximum shaft torque in column for shaft material of valve.

3) Read across row for valve size to column for control valve inlet pressure that is equal to or greater than inlet pressure to valve. Read rated torque value in that column. For rated torque values in *italics* consult factory for an engineering-application review, and for possible consideration of stronger custom shaft and plug materials, as these choices exceed the MAX torque for standard shafts when 1.5 times torque is applied.

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	-	-	-	-	2	-	3	-	4	-	-	-	-	-	2	-	3	-	-	-
		Close-Off PSIG	575	-	720	-	720	-	-	-	-	-	247	-	560	-	720	-	-	-	-	-	415	-	720	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	-	-	-	-	2	2	3	3	4	4	-	-	-	-	2	2	3	3	-
		Close-Off PSIG	-	720	720	720	720	720	720	-	-	-	-	425	425	675	675	720	720	-	-	-	-	660	660	720	720	-
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	-	-	-	-	-	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5
		Close-Off PSIG	-	-	395	-	720	-	-	-	-	-	-	-	167	-	367	-	567	-	-	-	72	-	369	-	-	660
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	-	-	-	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4
		Close-Off PSIG	-	211	211	561	561	720	720	-	-	-	-	89	89	238	238	388	388	540	540	693	-	236	236	462	462	690
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5
		Close-Off PSIG	420	-	720	-	-	-	-	-	-	-	120	-	387	-	605	-	720	-	-	-	280	-	610	-	-	720
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4
		Close-Off PSIG	-	720	720	-	-	-	-	-	-	-	-	296	296	467	467	620	620	720	720	-	-	450	450	700	700	720
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	5	-	-	-	-	-	-	-	4	-	5	-	-	-	-	-	3	-	-	5
		Close-Off PSIG	-	-	104	-	366	-	625	-	-	-	-	-	-	-	106	-	212	-	-	-	-	-	108	-	-	262
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4
		Close-Off PSIG	-	-	-	200	200	397	397	593	593	700	-	-	-	39	39	116	116	197	197	275	-	38	38	158	158	275
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	-	-	-	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5
		Close-Off PSIG	125	-	425	-	650	-	700	-	-	-	-	-	125	-	240	-	360	-	-	-	70	-	246	-	-	415
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4
		Close-Off PSIG	-	300	300	550	550	600	600	650	650	700	-	75	75	170	170	250	250	340	340	430	-	165	165	300	300	425
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80
		Actuator	RP73										RP73										RP103					
		Interface	385										385															
		Valve Size	1″										1.5″															

RACK & PINION ACTUATOR CLOSE OFF

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5	-	6	-	-
		Close-Off PSIG	-	-	-	-	122	-	275	-	433	-	580	-	-	-	201	-	433	-	-	660	-	720	-	-
	SPRING FAIL CLOSED	Springs / Side	-	-	-	-	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	-
		Close-Off PSIG	-	-	-	-	-	215	215	330	330	445	445	560	560	700	-	330	330	404	404	680	680	720	720	-
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	-	-	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5	-	6	-	-
		Close-Off PSIG	-	720	-	-	-	-	82	-	181	-	281	-	-	-	36	-	182	-	-	325	-	471	-	-
	SPRING FAIL CLOSED	Springs / Side	4	5	5	-	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	690	720	720	-	-	43	43	118	118	191	191	268	268	341	-	116	116	228	228	340	340	451	451	562
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5	-	6	-	-
		Close-Off PSIG	-	-	-	-	83	-	187	-	292	-	395	-	-	-	137	-	294	-	-	445	-	600	-	-
	SPRING FAIL CLOSED	Springs / Side	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	720	-	-	-	-	145	145	225	225	302	302	380	380	467	-	225	225	272	272	465	465	578	578	720
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	-	-	-	-	-	4	-	5	-	-	-	-	-	3	-	-	5	-	6	-	-
		Close-Off PSIG	-	412	-	-	-	-	-	-	50	-	115	-	-	-	-	-	51	-	-	141	-	240	-	-
	SPRING FAIL CLOSED	Springs / Side	4	5	5	6	-	-	-	-	-	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6
		Close-Off PSIG	275	391	391	515	-	-	-	-	-	57	57	107	107	155	-	-	-	81	81	155	155	234	234	299
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	-	-	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5	-	6	-	-
		Close-Off PSIG	-	595	-	-	-	-	62	-	133	-	208	-	-	-	28	-	131	-	-	240	-	350	-	-
	SPRING FAIL CLOSED	Springs / Side	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	425	550	550	650	-	30	30	85	85	140	140	199	199	250	-	85	85	170	170	250	250	350	350	415
SINGLE ACTING		Air Signal PSIG	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP103				RP73										RP103									
		Interface	385				385																			
		Valve Size	1.5″				2″																			

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	-	-	-	-	2	-	3	-	-	5	-	6	-	-	2	-	3	-
		Close-Off PSIG	253	-	559	-	720	-	-	-	-	-	65	-	137	-	-	217	-	293	-	-	82	-	184	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	-	-	-	-	2	2	3	3	4	4	5	5	6	-	2	2	3
		Close-Off PSIG	-	460	460	700	700	720	720	-	-	-	-	107	107	165	165	225	225	283	283	341	-	151	151	232
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	-	-	3	-	-	5	-	6	-	-	-	-	3	-
		Close-Off PSIG	132	-	264	-	459	-	656	-	720	-	-	-	31	-	-	79	-	128	-	-	-	-	59	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6	-	2	2	3
		Close-Off PSIG	-	200	200	354	354	507	507	661	661	720	-	-	-	47	47	84	84	122	122	159	-	37	37	89
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	-	-	2	-	3	-	-	5	-	6	-	-	2	-	3	-
		Close-Off PSIG	172	-	377	-	587	-	720	-	-	-	44	-	94	-	-	146	-	195	-	-	56	-	124	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	-	-	2	2	3	3	4	4	5	5	6	-	2	2	3
		Close-Off PSIG	-	312	312	480	480	620	620	720	720	-	-	71	71	113	113	151	151	190	190	230	-	102	102	161
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	5	-	6	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-
		Close-Off PSIG	-	-	105	-	237	-	367	-	475	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	-	-	-	-	4	4	5	5	6	-	-	-	3
		Close-Off PSIG	-	61	61	163	163	267	267	367	367	467	-	-	-	-	-	11	11	38	38	63	-	-	-	14
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	-	-	3	-	-	5	-	6	-	-	-	-	3	-
		Close-Off PSIG	52	-	195	-	340	-	475	-	620	-	-	-	22	-	-	60	-	99	-	-	-	-	43	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6	-	2	2	3
		Close-Off PSIG	-	149	149	270	270	375	375	485	485	600	-	-	-	35	35	65	65	90	90	120	-	28	28	68
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60
		Actuator	RP148										RP103										RP148			
		Interface	385										386													
		Valve Size	2"										3"													

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5	-	-	-
		Close-Off PSIG	287	-	390	-	493	-	164	-	-	338	-	510	-	-	-	-	172	-	378	-	583	-	720	-	-	-
	SPRING FAIL CLOSED	Springs / Side	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	-
		Close-Off PSIG	232	312	312	393	393	473	-	238	238	361	361	485	485	608	608	720	-	309	309	469	469	628	628	720	720	-
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5	-	6	-
		Close-Off PSIG	125	-	191	-	256	-	46	-	-	157	-	267	-	-	-	-	51	-	183	-	314	-	446	-	577	-
	SPRING FAIL CLOSED	Springs / Side	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	89	141	141	192	192	244	-	93	93	172	172	251	251	330	330	409	-	139	139	241	241	343	343	445	445	547
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5	-	6	-
		Close-Off PSIG	194	-	262	-	345	-	110	-	-	225	-	346	-	-	-	-	116	-	256	-	395	-	530	-	675	-
	SPRING FAIL CLOSED	Springs / Side	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	161	210	210	267	267	318	-	160	160	247	247	330	330	410	410	492	-	207	207	311	311	418	418	530	530	645
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	4	-	5	-	6	-	-	-	-	4	-	5	-	-	-	-	-	-	3	-	4	-	5	-	6	-
		Close-Off PSIG	39	-	83	-	129	-	-	-	-	62	-	137	-	-	-	-	-	-	78	-	172	-	255	-	333	-
	SPRING FAIL CLOSED	Springs / Side	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	14	50	50	76	76	120	-	17	17	72	72	127	127	183	183	237	-	49	49	120	120	198	198	255	255	322
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5	-	6	-
		Close-Off PSIG	93	-	145	-	193	-	33	-	-	120	-	205	-	-	-	-	38	-	137	-	243	-	347	-	460	-
	SPRING FAIL CLOSED	Springs / Side	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	68	107	107	140	140	182	-	70	70	132	132	190	190	250	250	315	-	105	105	185	185	260	260	350	350	425
SINGLE ACTING		Air Signal PSIG	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP148						RP222										RP295									
		Interface	386																									
		Valve Size	3"																									

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5
		Close-Off PSIG	31	-	71	-	111	-	152	-	192	-	63	-	-	131	-	199	-	-	-	-	67	-	147	-	227	-	308
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4
		Close-Off PSIG	-	58	58	90	90	123	123	153	153	184	-	92	92	140	140	189	189	237	237	286	-	120	120	183	183	245	245
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	5	-	6	-	-	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5
		Close-Off PSIG	-	-	13	-	39	-	65	-	90	-	-	-	-	52	-	95	-	-	-	-	10	-	62	-	113	-	165
	SPRING FAIL CLOSED	Springs / Side	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4
		Close-Off PSIG	-	-	-	25	25	45	45	65	65	85	-	26	26	57	57	88	88	119	119	150	-	44	44	84	84	124	124
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	2	-	-	4	-	5	-	-	-	-	2	-	3	-	4	-	5
		Close-Off PSIG	20	-	48	-	75	-	102	-	127	-	42	-	-	88	-	133	-	-	-	-	44	-	98	-	154	-	207
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4
		Close-Off PSIG	-	38	38	60	60	90	90	103	103	124	-	62	62	95	95	126	126	159	159	191	-	90	90	122	122	164	164
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	-	-	5	-	6	-	-	-	-	-	-	5	-	-	-	-	-	-	3	-	4	-	5
		Close-Off PSIG	-	-	-	-	-	-	13	-	32	-	-	-	-	-	-	36	-	-	-	-	-	-	11	-	49	-	87
	SPRING FAIL CLOSED	Springs / Side	-	-	-	-	-	-	-	5	5	6	-	-	-	-	-	4	4	5	5	6	-	-	-	3	3	4	4
		Close-Off PSIG	-	-	-	-	-	-	-	13	13	29	-	-	-	-	-	31	31	54	54	77	-	-	-	27	27	58	58
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	4	-	5	-	6	-	-	-	-	4	-	5	-	-	-	-	-	-	3	-	4	-	5
		Close-Off PSIG	-	-	-	-	25	-	46	-	65	-	-	-	-	35	-	70	-	-	-	-	-	-	42	-	86	-	127
	SPRING FAIL CLOSED	Springs / Side	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4
		Close-Off PSIG	-	-	-	12	12	28	28	47	47	62	-	14	14	39	39	65	65	90	90	115	-	28	28	62	62	87	87
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90
		Actuator	RP148										RP222										RP295						
		Interface	387																										
		Valve Size	4"																										

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6	-	-
		Close-Off PSIG	-	388	-	97	-	210	-	324	-	437	-	-	-	74	-	192	-	311	-	-	437	-	-
	SPRING FAIL CLOSED	Springs / Side	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	308	308	370	-	160	160	242	242	325	325	407	407	490	-	142	142	234	234	320	320	411	411	502
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6	-	-
		Close-Off PSIG	-	216	-	29	-	102	-	175	-	248	-	-	-	66	-	174	-	282	-	-	384	-	-
	SPRING FAIL CLOSED	Springs / Side	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	164	164	205	-	70	70	123	123	176	176	229	229	281	-	127	127	209	209	291	291	372	372	454
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6	-	-
		Close-Off PSIG	-	260	-	65	-	141	-	218	-	293	-	-	-	103	-	216	-	330	-	-	437	-	-
	SPRING FAIL CLOSED	Springs / Side	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	207	207	248	-	107	107	162	162	218	218	273	273	329	-	167	167	252	252	339	339	424	424	508
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	-	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6	-	-
		Close-Off PSIG	-	126	-	-	-	41	-	93	-	149	-	-	-	14	-	94	-	174	-	-	250	-	-
	SPRING FAIL CLOSED	Springs / Side	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	87	87	118	-	17	17	56	56	93	93	136	136	174	-	60	60	120	120	181	181	242	242	302
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6	-	-
		Close-Off PSIG	-	170	-	17	-	78	-	137	-	193	-	-	-	47	-	137	-	225	-	-	308	-	-
	SPRING FAIL CLOSED	Springs / Side	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	127	127	162	-	49	49	92	92	137	137	182	182	220	-	95	95	162	162	225	225	290	290	360
SINGLE ACTING		Air Signal PSIG	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP295			RP470										RP586									
		Interface	387																						
		Valve Size	4"																						

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6
		Close-Off PSIG	21	-	50	-	78	-	107	-	135	-	32	-	72	-	112	-	152	-	-	-	52	-	112	-	171	-	-	227
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5
		Close-Off PSIG	-	40	40	62	62	84	84	106	106	128	-	54	54	83	83	113	113	142	142	171	-	86	86	131	131	176	176	221
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	4	-	5	-	6	-	-	-	3	-	4	-	5	-	-	-	-	-	3	-	4	-	-	6
		Close-Off PSIG	-	-	-	-	25	-	43	-	61	-	-	-	21	-	46	-	72	-	-	-	-	-	46	-	84	-	-	120
	SPRING FAIL CLOSED	Springs / Side	-	-	-	3	3	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5
		Close-Off PSIG	-	-	-	15	15	29	29	43	43	57	-	-	-	28	28	47	47	65	65	84	-	30	30	58	58	87	87	116
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	5	-	6	-	2	-	3	-	4	-	5	-	-	-	2	-	3	-	4	-	-	6
		Close-Off PSIG	14	-	33	-	52	-	71	-	90	-	21	-	48	-	75	-	102	-	-	-	35	-	75	-	115	-	-	152
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5
		Close-Off PSIG	-	27	27	41	41	56	56	71	71	86	-	36	36	56	56	75	75	95	95	114	-	57	57	88	88	118	118	148
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	-	-	-	-	6	-	-	-	-	-	4	-	5	-	-	-	-	-	3	-	4	-	-	6
		Close-Off PSIG	-	-	-	-	-	-	-	-	23	-	-	-	-	-	12	-	31	-	-	-	-	-	12	-	41	-	-	68
	SPRING FAIL CLOSED	Springs / Side	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	4	4	5	5	6	-	-	-	3	3	4	4	5
		Close-Off PSIG	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	12	12	27	27	40	-	-	-	21	21	43	43	65
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	4	-	5	-	6	-	-	-	3	-	4	-	5	-	-	-	-	-	3	-	4	-	-	6
		Close-Off PSIG	-	-	-	-	19	-	34	-	50	-	-	-	17	-	37	-	59	-	-	-	-	-	37	-	70	-	-	102
	SPRING FAIL CLOSED	Springs / Side	-	-	-	3	3	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5
		Close-Off PSIG	-	-	-	11	11	22	22	33	33	44	-	-	-	22	22	38	38	54	54	69	-	23	23	48	48	72	72	98
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100
		Actuator	RP295										RP470										RP586							
		Interface	388																											
		Valve Size	6"																											

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	2	-	-	4	-	5	-	-	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	95	-	-	195	-	293	-	-	-	-	128	-	-	261	-	391	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	221	266	-	134	134	204	204	273	273	342	342	411	-	181	181	273	273	363	363	457	457	549
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	2	-	-	4	-	5	-	-	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	36	-	-	99	-	162	-	-	-	-	57	-	-	141	-	225	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	116	144	-	61	61	105	105	149	149	193	193	237	-	90	90	149	149	208	208	266	266	325
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	2	-	-	4	-	5	-	-	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	64	-	-	130	-	196	-	-	-	-	86	-	-	175	-	262	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	-
		Close-Off PSIG	148	172	-	90	90	136	136	183	183	229	229	275	-	121	121	183	183	245	245	306	306	368
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	-	4	-	5	-	-	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	-	-	-	52	-	99	-	-	-	-	20	-	-	83	-	147	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	-
		Close-Off PSIG	65	83	-	23	23	57	57	88	88	123	123	159	-	46	46	89	89	135	135	179	179	225
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	2	-	-	4	-	5	-	-	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	28	-	-	82	-	135	-	-	-	-	47	-	-	120	-	188	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	5	6	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	98	121	-	50	50	92	92	126	126	161	161	200	-	75	75	125	125	175	175	225	225	275
SINGLE ACTING		Air Signal PSIG	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP586		RP900										RP1213									
		Interface	388		389																			
		Valve Size	6"																					

Rack & Pinion Actuator Close-Off's

FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	-	6	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	26	-	56	-	85	-	-	113	-	-	47	-	-	97	-	146	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	43	43	65	65	87	87	110	110	132	-	67	67	101	101	136	136	170	170	204
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	-	6	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	23	-	42	-	-	60	-	-	18	-	-	50	-	81	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	15	15	29	29	44	44	58	58	72	-	30	30	52	52	75	75	97	97	119
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	3	-	4	-	-	6	-	-	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	17	-	37	-	57	-	-	75	-	-	32	-	-	65	-	97	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	29	29	43	43	58	58	73	73	88	-	45	45	67	67	91	91	114	114	136
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	-	4	-	-	6	-	-	-	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	-	-	15	-	-	29	-	-	-	-	-	21	-	46	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	-	-	-	-	4	4	5	5	6	-	-	-	3	3	4	4	5	5	6
		Close-Off PSIG	-	-	-	-	-	16	16	28	28	39	-	-	-	23	23	41	41	59	59	76
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	3	-	4	-	-	6	-	-	-	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	12	-	29	-	-	46	-	-	-	-	-	37	-	64	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	-	-	3	3	4	4	5	5	6	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	-	-	18	18	31	31	45	45	57	-	19	19	38	38	57	57	77	77	97
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP586										RP900									
		Interface	388										389									
		Valve Size	8"																			

Rack & Pinion Actuator Close-Off's

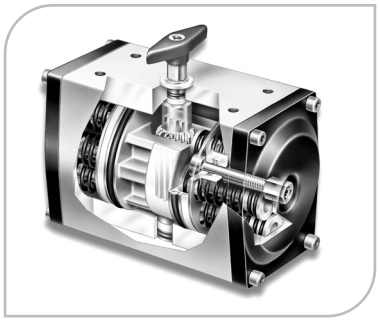
FLOW-TO-CLOSE, SOFT SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	64	-	-	130	-	195	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	90	90	136	136	181	181	227	227	273
FLOW-TO-CLOSE, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	28	-	-	71	-	113	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	45	45	75	75	104	104	134	134	163
FLOW-TO-CLOSE, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	43	-	-	87	-	130	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	-
		Close-Off PSIG	-	60	60	90	90	121	121	148	148	182
FLOW-TO-OPEN, HARD SEAT, ALLOY 6 BEARING, GRAPHITE PACKING	SPRING FAIL OPEN	Springs / Side	-	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	-	-	-	38	-	71	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	18	18	41	41	64	64	89	89	110
FLOW-TO-OPEN, HARD SEAT, PEEK BEARING, PTFE PACKING	SPRING FAIL OPEN	Springs / Side	2	-	-	4	-	5	-	-	-	-
		Close-Off PSIG	17	-	-	55	-	90	-	-	-	-
	SPRING FAIL CLOSED	Springs / Side	-	2	2	3	3	4	4	5	5	6
		Close-Off PSIG	-	32	32	57	57	80	80	110	110	135
SINGLE ACTING		Air Signal PSIG	0-30	0-40	0-50	0-60	0-70	0-80	0-90	0-100	0-110	0-120
		Actuator	RP1213									
		Interface	389									
		Valve Size	8"									

SIZE	AIR CONSUMPTION CU. IN/CYCLE
RP73	52.5
RP103	67.1
RP148	112.9
RP222	152.6
RP295	218.5
RP470	335.6
RP586	416.2
RP900	762.8
RP1213	872.6

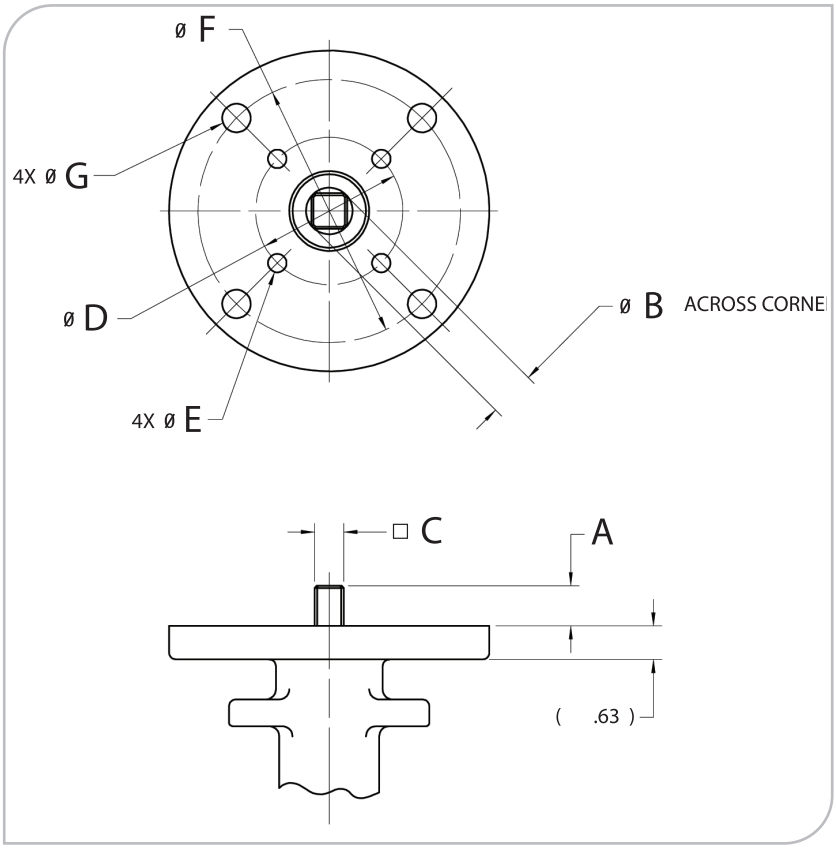
ACTUATOR INTERFACE		
Size	**Flange Type**	**Star Drive**
P73	F05/F07	17 mm
RP103	F05/F07	17 mm
RP148	F07/F10	22 mm
RP222	F07/F10	22 mm
RP295	F07/F10	22 mm
RP470	F10/F12	27 mm
RP586	F10/F12	27 mm
RP900	F12/F16	36 mm
RP1213	F12/F14	36 mm

Body: Extruded Aluminum, Hard Anodized
End Caps: Die Cast Aluminum, with One Part Dry Powder Epoxy Polyester Paint
Fasteners: 304 Stainless Steel
Racks: Dual, Die Cast Aluminum, Racks with Integral Pistons
Pinion: One Piece Electroless Plated Steel Pinion
Pinion Bearings: Upper and Lower, Delrin 500 Encapsulated
Piston Guides: Delrin 500
Seals: Buna-N
Travel Stops: 304 Stainless Steel Dual Adjustable
Springs Cartridges: Fully Encapsulated Epoxy Coated Steel, Delrin/Brass
Action: Double Acting or Spring Return
Accessory Mounting: Namur
Ambient Temperature: 5 to 320ºF (Standard Seals)
Options: Low Temperature Seals (-58 to 158ºF)
Accessories: Declutchable Gear Operators
•UL & approved
•Safety Integreity Level (SIL) certified under IEC Standards 61508 and 61511
•ISO 9001:2008
•ATEX certified under Directive 94/9/CE

Pneumatic Rack and Pinion Actuators require a positioner for modulating control.



INTERFACES		
Model	**ISO 5211-2001 Designation**	**Actuator Interface**
385 1" - 2" Bodies	EN ISO 5211-F07-N-L-11	F07 flange w/ parallel square drive
386 3" Bodies	EN ISO 5211-F07-N-L-14	F07 flange w/ parallel square drive
387 4" Bodies	EN ISO 5211-F07/F10-N-L-17	F07 & F10 flange w/ parallel square drive
388 6"or 8" Bodies	EN ISO 5211-F10-N-L-22	F10 flange w/ parallel square drive
389 6"or 8" Bodies	EN ISO 5211-F12-N-L-22	F12 flange w/ parallel square drive



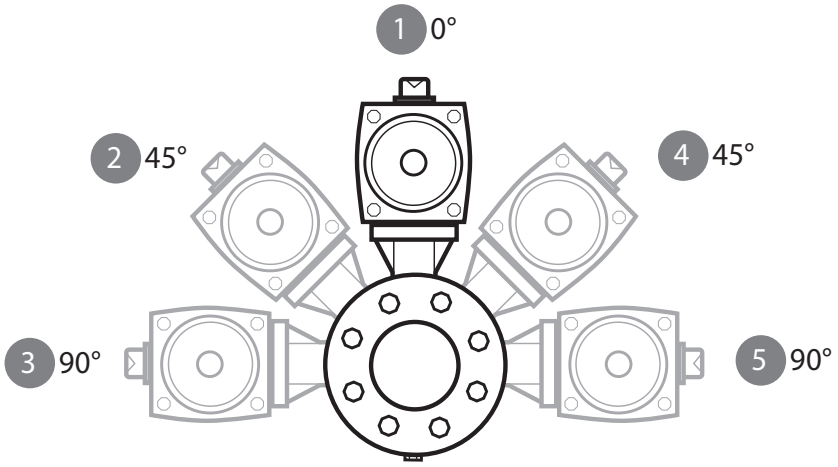
INTERFACE DIMENSIONS							
Valve Size (IN)	**A**	**B**	**C**	**D**	**E**	**F***	**G***
1	.75	.551 .547	.4318 .4291	2.756	.352 .341	--	--
1-1/2	.75	.551 .547	.4318 .4291	2.756	.352 .341	--	--
2	.75	.551 .547	.4318 .4291	2.756	.352 .341	--	--
3	.75	.708 .704	.5499 .5472	2.756	.352 .341	--	--
4	.75	.866 .861	.6680 .6653	2.756	.352 .341	4.016	.430 .419
6	.94	1.102 1.097	.8646 .8613	4.016	.430 .419	4.921	.540 .528
8	.94	1.102 1.097	.8646 .8613	4.016	.430 .419	4.921	.540 .528

* F10 flange 4" valve size 387 Models.
F12 flange 6" & 8" valve sizes 389 Models.

A wide array of acceptable piping orientations allow for maximum flexibility of piping design layout.

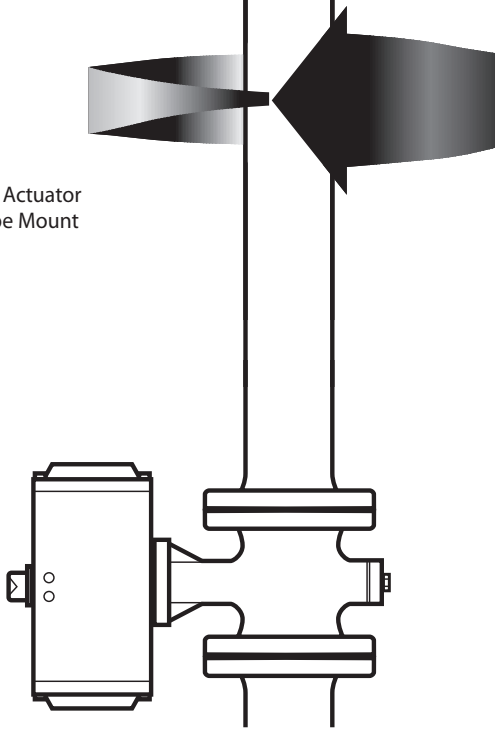
Positions 1 , 2 , and 3 are preferred. Positons 4 and 5 are **NOT** preferred (plug opens into any material that may have settled in bottom of valve.)

Pneumatic Actuator Horizontal Pipe
0-45-90 Piping Orientations



Seat End

360º
Orientation



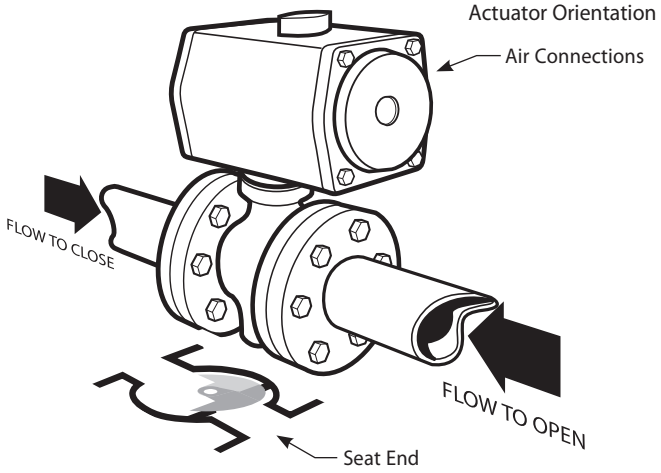
Pneumatic Actuator
Vertical Pipe Mount

High temperature applications require indirect actuator mount and actuator orientation that is not directly above the valve.

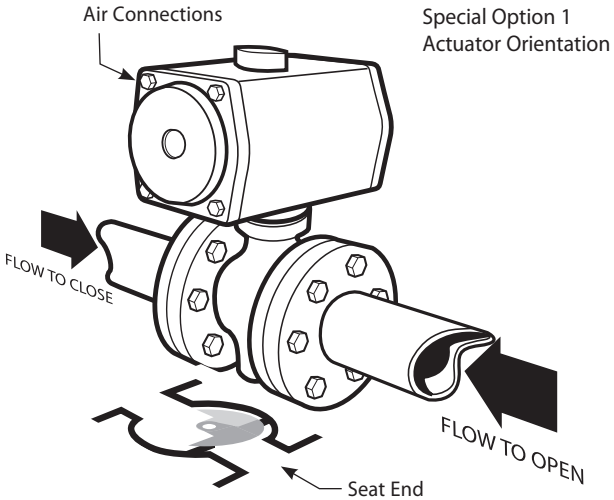
ACTUATOR ORIENTATION & FLOW DIRECTION

Pneumatic Rack & Pinion Actuator

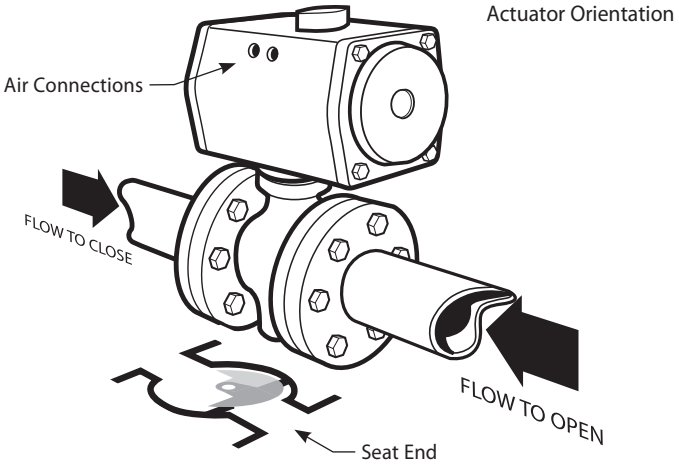
Factory Default
Actuator Orientation



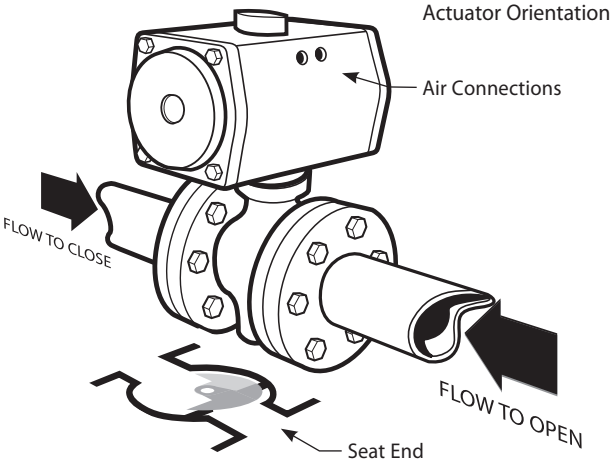
Special Option 1
Actuator Orientation



Special Option 2
Actuator Orientation



Special Option 3
Actuator Orientation



POSITIONERS

Split Ranging with Positioners
Positioners are sometimes used to "Split-Range" two control valves in a parallel configuration within a piping scheme. This technique is used to obtain higher rangeability than could otherwise be achieved with a single control valve. Typically one smaller valve supplying 15% to 35% of total flow is mated with a larger valve supplying 65% to 85% of total flow.

The best-matched pair will each be providing similar rangeability for each respective flow contribution to the manifold. Calculated as maximum flow /minimum controllable flow, the smaller valve should not be attempting to control flow below 5% of strok e. Estimate Cv from Cv tables vs. stroke to calculate this.

The chosen positioners would then have a Low Range signal for the smaller valve and a High Range Signal for the larger valve. With this, a single control signal can be applied to both valves. At mid-signal range, the little valve is completely open while the larger valve is just starting to open. Controlability for wide process set point ranges is dramatically improved.

VAC Models:

V200 Pneumatic

Models:	2FP_: Full Range Signal (3-15 PSIG)
	2LP_: Low Range Signal (3-9 PSIG)
	2HP_: High Range Signal (9-15 PSIG)
Options:	2SPDT Limit Switches, 4-20 mA Feedback
Ingress & Corrosion Protection:	NEMA, 4X, IP66
Supply Pressure:	20 to145 PSIG Max **Not to Exceed Actuator Rating**
Linearity error:	<0.7% f.s.
Hysteresis:	<0.4% f.s.
Repeatability:	<0.3% f.s.
Weight:	5.5 lbs

V200 Electro-Pneumatic

Models:	2FE_: Full Range Signal (4-20 mA)
	2LE_: Low Range Signal (4-12 mA)
	2HE_: High Range Signal (12-20 mA)
Options:	2SPDT Limit Switches, 4-20 mA Feedback
Ingress & Corrosion Protection:	NEMA, 4X, IP66
Supply Pressure:	20 to 145 PSIG **Not to Exceed Actuator Rating**
Linearity error:	<1.0% f.s.
Hysteresis:	<0.6% f.s.
Repeatability:	<0.5% f.s.
Weight:	6 lbs

V200 Electro-Pneumatic Intrinsically Safe

Models:	2FI_: Full Range Signal (4-20 mA)
	2LI_: Low Range Signal (4-12 mA)
	2HI_: High Range Signal (12-20 mA)
Ingress & Corrosion Protection:	NEMA, 4X, IP66
Supply Pressure:	20 to 145 PSIG **Not to Exceed Actuator Rating**
Linearity error:	<1.0% f.s.
Hysteresis:	<0.6% f.s.
Repeatability:	<0.5% f.s.
Weight:	6 lbs

V200 Electro-Pneumatic Explosion Proof

Models:	2FX_: Full Range Signal (4-20 mA)
	2LX_: Low Range Signal (4-12 mA)
	2HX_: High Range Signal (12-20 mA)
Ingress & Corrosion Protection:	NEMA, 4X, IP66
Supply Pressure:	20 to 145 PSIG **Not to Exceed Actuator Rating**
Linearity error:	<0.8% f.s.
Hysteresis:	<0.5% f.s.
Repeatability:	<0.4% f.s.
Weight:	7.5 lbs

V200 Electro-Pneumatic Fail Freeze *

Models:	2FF_: Full Range Signal (4-20 mA)
	2LF_: Low Range Signal (4-12 mA)
	2HF_: High Range Signal (12-20 mA)
Options:	2SPDT Limit Switches, 4-20 mA Feedback
Ingress & Corrosion Protection:	NEMA, 4X, IP66
Supply Pressure:	20 to 100 PSIG **Not to Exceed Actuator Rating**
Linearity error:	<1.2% f.s.
Hysteresis:	<0.9% f.s.
Repeatability:	<0.8% f.s.
Weight:	7.5 lbs

VAC All Models:

Construction:	Aluminum Housing with Polyester Coating
Action:	Direct or Reverse
Media:	Clean Dry Oil Free Air Filtered to 5 micron
Air Connections:	1/4 NPT
Electrical Connection:	1/2 NPT
Gauges:	Input 0-30 PSIG, Output 0-100 PSIG, Supply 0-100PSIG Housing Black Steel Case with Chrome Ring
Ambient Temperature:	-40 to 185°F (Except Fail Freeze - 20 to 158°F)
Mounting:	Yoke Mounted

Limit Switches and Feedback Options are NEMA 4X, IP66 only, and are not suitable for hazardous locations.

** For positioner code 2xF_, the VAC V200 Positioner with the Fail Freeze module, check first with the factory for approval due to the space considerations on certain valve assembly combinations.*

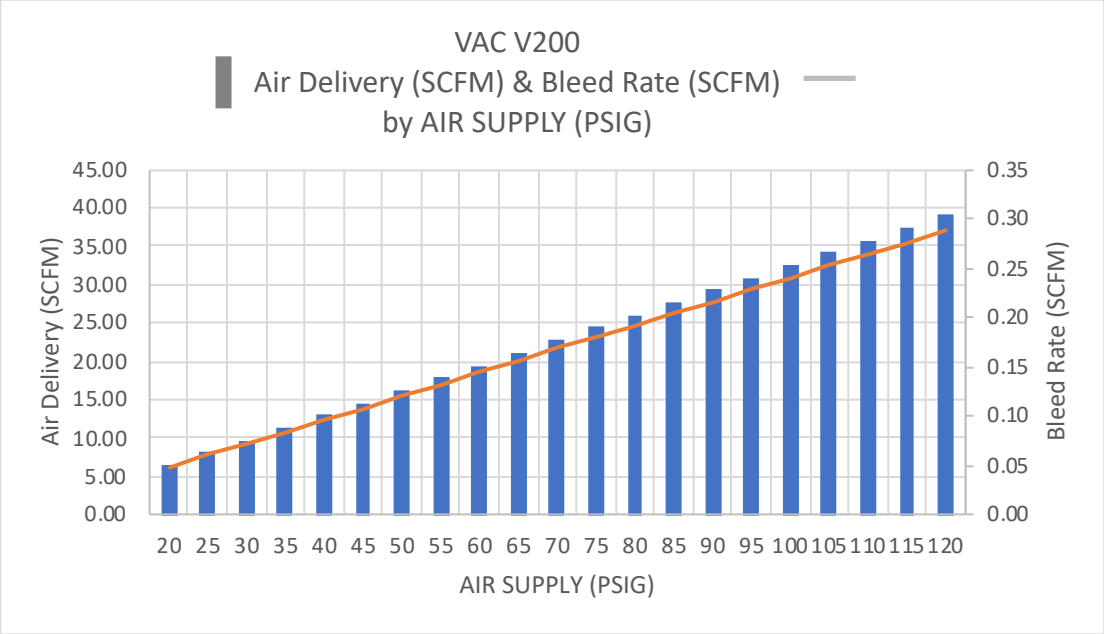
VAC Models (Continued):

V200 Pneumatic

VAC V200		
AIR SUPPLY (PSIG)	**Bleed Rate (SCFM)**	**Air Delivery (SCFM)**
20	0.05	6.50
25	0.06	8.13
30	0.07	9.75
35	0.08	11.38
40	0.10	13.00
45	0.11	14.63
50	0.12	16.25
55	0.13	17.88
60	0.14	19.50
65	0.16	21.13
70	0.17	22.75
75	0.18	24.38
80	0.19	26.00
85	0.20	27.63
90	0.22	29.25
95	0.23	30.88
100	0.24	32.50
105	0.25	34.13
110	0.26	35.75
115	0.28	37.38
120	0.29	39.00

Bleed: 0.0024 scfm per psig
Delivery: 0.325 scfm per psig

APPROVALS - VAC V200 POSITIONERS ONLY		
Ratings for hazardous locations:		**V200-EX** - Explosion Proof
		ATEX - Explosion Protection 1487X, instrinsically safe EEx ia IIC T4/T5/T6
FM and CSA: Explosions Proof		CL I, II Div 1 Grp B-G
Intrinsically Safe: FM, CSA		CL I-II-III Div 1 Grp A-G; CL II Div 1&2 Grp E-G; CL III
Non Incendive: FM		CL 1 Div2 Grp A-C
Temperature Class		
Short Circut	Current-max	Ambient Temp max
T6	50 mA	140 F (60 C)
T5	60 mA	158 F (70 C)
T4	60 mA	185 F (85 C)
Intrinsically Safe		
V200-IS • ATEX: EEX ia IIcT4/T6		
FM: CL1 Div1 Grp A B C D		
CSA: EX is CL1 Grp A B C D EX is CL 1 Div2 Grp A B C D		



VAC D400 Models:

4-20mA

Models: T0Z0:	Full Range Signal (2-Wire, 4-20 mA), Explosion Protection: None
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	None

4-20mA w/HART

Models: THN_:	Full Range Signal (2-Wire, 4-20 mA), HART Protocol 5.1
Explosion Protection:	Intrinsically Safe & Non-Incendive
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	4-20 mA Feedback Module, Digital Position Feedback Module, Proximity Switches NC.
Models: THX_:	Full Range Signal (2-Wire, 4-20 mA), HART Protocol 5.1
Explosion Protection:	Explosion Proof
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	4-20 mA Feedback Module, Digital Position Feedback Module, 24VDC/AC Micro-switches, Proximity Switches NC.

PROFIBUS PA

Models: TPN_:	Communication PROFIBUS PA Profile for Process Devices, Electro-Pneumatic Actuators, V3.0, In Compliance with IEC 61158-2
Explosion Protection:	Intrinsically Safe & Non-Incendive
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	Proximity Switches NC.
Models: TPX_:	Communication PROFIBUS PA Profile for Process Devices, Electro-Pneumatic Actuators, V3.0, In Compliance with IEC 61158-2
Explosion Protection:	Explosion Proof
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	24VDC/AC Microswitches, Proximity Switches NC.

FOUNDATION FIELDBUS ™

Models: TFN_:	Communication Foundation Fieldbus ™ Version 1.4, In Compliance with IEC 61158-2
Explosion Protection:	Intrinsically Safe & Non-Incendive.
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	Proximity Switches NC.
Models: TFX_:	Communication Foundation Fieldbus™ Version 1.4, In Compliance with IEC 61158-2
Explosion Protection:	Explosion Proof
Calibration:	Single-Button Auto-adjust Commissioning or Customized Auto-adjust
Operator Panel:	4 Push-Buttons and Two-Line LCD
Position Indicator:	Mechanical
Options:	24VDC/AC Micro-switches, Proximity Switches NC.

APPROVALS & RATINGS: D400 Intrinsically Safe & Non-Incendive Models

FM

Intrinsically Safe:	Class I, II, III, Div. 1, Grp. A-B-C-D-E-F-G T6, T5, T4, Ta = 40 °C, 55 °C, 85 °C 901265 Entity, FISCO
Non-Incendive:	Class I, Div. 2, Grp. A-B-C-D T6, T5, T4, Ta = 40 °C, 55 °C, 85 °C
Suitable:	Class II, III, Div. 2, Grp. E-F-G T6, T5, T4, Ta = 40 °C, 55 °C, 85 °C

CSA

Intrinsically Safe:	Class I, Div. 1 Grp. A-B-C-D Class II, Div. 1 Grp. E-F-G Class III, Div. 1

APPROVALS & RATINGS: D400 Explosion Proof Models

FM

Explosion Proof:	Class I; Div 1; Grp. C-D T5, max. 82 °C
Dust Ignition-Proof:	Class II, III, Div 1 Grp. E-F-G T5; max. 82 °C

CSA

Explosion Proof:	Class I; Div 1; Grp. C-D Class II; Div 1; Grp. E-F-G Class III
Temperature range:	-40 … 85 °C T5, max. 85 °C ; T6, max. 70 °C

ALL MODELS:

Construction:	Aluminum Case with Electrostatic Dipping Varnish with Epoxy Resin Stove Hardened.
Ingress & Corrosion Protection:	IP65 / NEMA 4X
Action:	Direct or Reverse
Supply Pressure:	20 to 90PSIG **Not to Exceed Actuator Rating**

ALL MODELS: (Continued)

Media:	Clean Dry Oil Free Air acc.to DIN / ISO 8573-1 Pollution and Oil Content According to Class 3 (Purity:Max. Particle Size: 5 µm, Max. Particle Density: 5 mg / m^3; Oil Content: Max. Concentration: 1mg / m^3; Pressure Dew Point: 10, K Below Operating Temperature
Air Delivery:	2.3 SCFM at 20 PSIG, 6.0 SCFM at 90 PSIG
Bleed Rate:	<0.015 SCFM (Independent of Supply Pressure)
Air Connections:	1/4-18 NPT
Electrical Connections:	1/2-14 NPT
Gauges:	Supply, Output
Ambient Temperature:	-40 to 185°F
Mounting:	Yoke Mounted

Available as Specials (Contact Factory for Details and Available Models)

Fail Freeze Function
Safety Integrity Level SIL2
ATEX, GOST, IECEx Approvals
Shutdown Module

OPTIONS:

F) 4-20 mA Feedback Module
Range 4-20mA (Configurable) Two-Wire circuitry, Power Supply 24VDC
NOTE: For 4-20mA w/HART Models ONLY

K) Digital Position Feedback Module
Two Switches For Digital Position Feedback (Position Adjustable Within The Range Of 0 ... 100%, Ranges Cannot Overlap)
NOTE: For 4-20mA w/HART Models ONLY

L) 24VDC/AC Micro-switches
Two Micro-switches For Independent Position Signaling. Switching Points Adjustable Between 0 ... 10%
NOTE: For Explosion Proof Models ONLY

P) Proximity Switches NC
Two Proximity Switches For Indepentent Position Signaling. Switching Points Adjustable Between 0 ... 100%
Switch Type SJ2-SN (NC)

ACCEPTABLE OPTION COMBINATIONS

w/	F*	K*	L‡	P
F*		Yes	Yes	Yes
K*	Yes		Yes	Yes
L‡	Yes	Yes		No
P	Yes	Yes	No	

* For 4-20mA w/ HART Models ONLY

‡ For Explosion Proof Models ONLY

ACCESSORIES

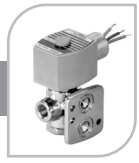
Limit Switches

PX21 Proximity Brand, Mark 4 Series, Top-Mounted Switch Box. Two Limit Switches, SPDT, 11 AMP @ 125/250 VAC, with Indication

Air Filter Regulators

Models:	Type 300, Type 350SS
Output Ranges:	Type 300, 0-60, or 0-120 PSIG Type 350SS, 0-100 PSIG
Supply Pressure:	Type 300, 250 PSIG Maximum Type 350SS, 290 PSIG Maximum
Construction:	Type 300, Die-Cast Aluminum with Irridite and Baked Epoxy Paint Type 350SS, 316 Stainless Steel
Gauge:	Type 300, Output, Housing Steel Painted Type 350SS,Output, Housing Stainless Steel
Air Connections:	1/4 NPT
Filter:	Type 300, 40 micron. Type 350SS, 25 micron
Mounting:	Remote Mounted

Solenoids



3-Way solenoids are commonly used to evacuate pneumatic single-acting spring return actuators and block the supply. Several combinations are available, when choosing a solenoid please provide diagram or set-up

Models:	8320G704, EF8320G704, 8320G714, EF8320G714
Construction:	(EF)8320G704, 3-Way Brass, Single Solenoid (EF)8320G714, 3-Way Stainless Steel, Single Solenoid
Locations:	8320G704, 8320G714 Watertight Types 1, 2, 3, 3S, 4, and 4X EF8320G704, EF8320G714 Explosion proof and Watertight, Types 3, 3S, 4, 4X 6, 6P, 7 & 9
Supply:	120VAC
Ambient Temperature:	+32 to 125°F
Air Connections:	1/4 NPT
Electrical Connection:	1/2 NPT, Pigtail Leads
Approvals:	CSA, UL, CE
Mounting:	Direct Mounted

Manual (Worm) Gear Operators

Models:	G30 Fits 1 Thru 4 Inch Valves G50 Fits 6 Inch Valves G51 Fits 8 Inch Valves
Body:	Cast Iron
Cover:	Cast Iron
Gear Cover:	Cast Iron
Handwheel:	Ductile Iron (DG30 & 50), Steel (DG51)
Handwheel Shaft:	1045Steel
Housings:	Epoxy Coated
External Lube Fitting:	Standard
Limit Stops:	Standard
Position Indicator:	Standard
Sealed Weathertight Housing:	Standard

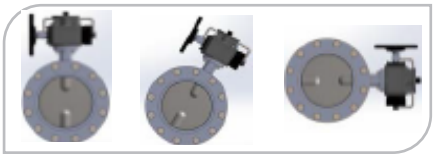
Factory Default Mounting Position: Handwheel parallel to pipe away from Seat End

Declutchable (Worm) Gear Operators

For Use With RP Pneumatic Rack & Pinion Actuators
Features an easy declutch mechanism, integrated block and bleed capabiity and lockout/tagout holes. Body is Triple Epoxy Coated.

Models:	G0W02 Fits 1 Thru 3 Inch Valves G0W06 Fits 3 Thru 8 Inch Valves G0W09 Fits 4 Inch Valves, G0W12 & G0W16 Fits 6 & 8 Inch Valves *See KEY
Enclosure:	IP67 Weatherproof
Interface:	ISO 5211 Mounting Top & Bottom
Body:	WCB, Phosphated, Epoxy & Polyester Coating
Worm Shaft:	#45 Carbon Steel, Nickel Plated, Salt Spray Tested 48 Hrs.
Worm Gear:	#45 Carbon Steel, Painted
Handwheel:	Ductile Iron, Painted
Lockout Device:	#20 Carbon Steel, Painted
Bolting:	18-8 Stainless Steel
Seats:	Standard (BUNA-N) -4°F (-20°C) to 176°F (80°C) Low Temp. (BUNA-N) -40°F (-40°C) to 176°F (80°C) High Temp. (FKM) 5°F (-15°C) to +248°F (120°C)
Integrated Block and Bleed Device:	During manual operation with the declutchable gear operator, the integrated block & bleed valve may be used to relieve air pressure from the actuator. The air pressure will be relieved when the gear operator clutch is engaged if the block and bleed valve is piped to the actuator or is piped to the positioner or solenoid when present. The maximum allowable air pressure to the block and bleed valve is 116 PSIG [8 Bar]. The factory default configuration is the block and bleed valve is piped to relieve air pressure when the gear operator clutch is engaged.
Factory Default Mounting Position:	Handwheel parallel to pipe on side opposite actuator air connections. Hand wheel must be above centerline of horizontal pipe. Gear operator may be used in horizontal or 45° off vertical positions.

* KEY FOR DECLUTCHABLE GEAR OPERATORS		
Valve Size	with Actuator	Model
1, 1-1/2 & 2 inch	RP73, 103, 148, 222 & 295	GOW02
3 inch	RP73 & 103	GOW02
	RP148 , 222 & 295	GOW06
4 inch	RP148, 222 & 295	GOW06
	RP470 & 586	GOW09
6 & 8 inch	RP148, 222 & 295	GOW06
	RP470 & 586	GOW12
	RP900 & 1213	GOW16



Special Options and Set-ups

Air Tubing:	Copper Standard, Stainless Steel Optional
Tagging:	Stainless Steel Tagging Optional (Two lines, 24 characters/ line)
Actuator Orientation:	Optional positions 1, 2, or 3

For additional special option and set-up requirements consult factory.

DIMENSIONS & WEIGHTS

With Pneumatic Rack & Pinion Actuators

DIMENSION (IN)		VALVE SIZE (IN))						
		1	1-1/2	2	3	4	6	8
A	150FLG	4	4-1/2	4-7/8	6-1/2	7-5/8	9	9-9/16
	300FLG	4	4-1/2	4-7/8	6-1/2	7-5/8	9	9-9/16
B		2-7/8	3-1/4	3-5/8	4-1/2	5-3/8	6-5/8	7-3/4
C VBA DIRECT MOUNT		4-5/8	4-7/8	5	6	7	8-1/2	10
C VBA INDIRECT MOUNT		9-1/2	9-3/4	9-7/8	10-7/8	13-7/8	15-3/8	16-7/8
WITH RP RACK AND PINION ACTUATOR WITHOUT POSITIONER								
DIMENSION (IN)	ACTUATOR	1	1-1/2	2	3	4	6	8
C TOTAL (STANDARD DIRECT ACTUATOR MOUNTING)	RP73	10	10-1/4	10-3/8	11-3/8	N/A	N/A	N/A
	RP103	11-1/4	11-1/2	11-5/8	12-5/8	N/A	N/A	N/A
	RP148	11-3/8	11-5/8	11-3/4	12-3/4	13-3/4	15-1/4	16-3/4
	RP222	11-5/8	11-7/8	12	13	14	15-1/2	17
	RP295	12-3/8	12-5/8	12-3/4	13-3/4	14-3/4	16-1/4	17-3/4
	RP470	N/A	N/A	N/A	N/A	16-1/4	17-3/4	19-1/4
	RP586	N/A	N/A	N/A	N/A	16-7/8	18-3/8	19-7/8
	RP900	N/A	N/A	N/A	N/A	N/A	20-3/8	21-7/8
	RP1213	N/A	N/A	N/A	N/A	N/A	20-3/8	21-7/8
C TOTAL (WITH HI-TEMP INDIRECT ACTUATOR MOUNTING)	RP73	14-7/8	15-1/8	15-1/4	16-1/4	N/A	N/A	N/A
	RP103	16-1/8	16-3/8	16-1/2	17-1/2	N/A	N/A	N/A
	RP148	16-1/4	16-1/2	16-5/8	17-5/8	20-5/8	22-1/8	23-5/8
	RP222	16-1/2	16-3/4	16-7/8	17-7/8	20-7/8	22-3/8	23-7/8
	RP295	17-1/4	17-1/2	17-5/8	18-5/8	21-5/8	23-1/8	24-5/8
	RP470	N/A	N/A	N/A	N/A	23-1/8	24-5/8	26-1/8
	RP586	N/A	N/A	N/A	N/A	23-3/4	25-1/4	26-3/4
	RP900	N/A	N/A	N/A	N/A	N/A	27-1/4	28-3/4
	RP1213	N/A	N/A	N/A	N/A	N/A	27-1/4	28-3/4
WITH RP RACK AND PINION ACTUATOR WITH V200 POSITIONER								
DIMENSION (IN)	ACTUATOR	1	1-1/2	2	3	4	6	8
C TOTAL (STANDARD DIRECT ACTUATOR MOUNTING)	RP73	15-3/4	16	16-1/8	17-1/8	N/A	N/A	N/A
	RP103	16-1/8	16-3/8	16-1/2	17-1/2	N/A	N/A	N/A
	RP148	17	17-1/4	17-3/8	18-3/8	19-3/8	20-7/8	22-3/8
	RP222	17	17-1/4	17-3/8	18-3/8	19-3/8	20-7/8	22-3/8
	RP295	17-7/8	18-1/8	18-1/4	19-1/4	20-1/4	21-3/4	23-1/4
	RP470	N/A	N/A	N/A	N/A	22-1/8	23-5/8	25-1/8
	RP586	N/A	N/A	N/A	N/A	22-1/8	23-5/8	25-1/8
	RP900	N/A	N/A	N/A	N/A	N/A	25-7/8	27-3/8
	RP1213	N/A	N/A	N/A	N/A	N/A	25-7/8	27-3/8
C TOTAL (WITH HI-TEMP INDIRECT ACTUATOR MOUNTING)	RP73	20-5/8	20-7/8	21	22	N/A	N/A	N/A
	RP103	21	21-1/4	21-3/8	22-3/8	N/A	N/A	N/A
	RP148	21-7/8	22-1/8	22-1/4	23-1/4	26-1/4	27-3/4	29-1/4
	RP222	21-7/8	22-1/8	22-1/4	23-1/4	26-1/4	27-3/4	29-1/4
	RP295	22-3/4	23	23-1/8	24-1/8	27-1/8	28-5/8	30-1/8
	RP470	N/A	N/A	N/A	N/A	29	30-1/2	32
	RP586	N/A	N/A	N/A	N/A	29	30-1/2	32
	RP900	N/A	N/A	N/A	N/A	N/A	32-3/4	34-1/4
	RP1213	N/A	N/A	N/A	N/A	N/A	32-3/4	34-1/4

NOTES:

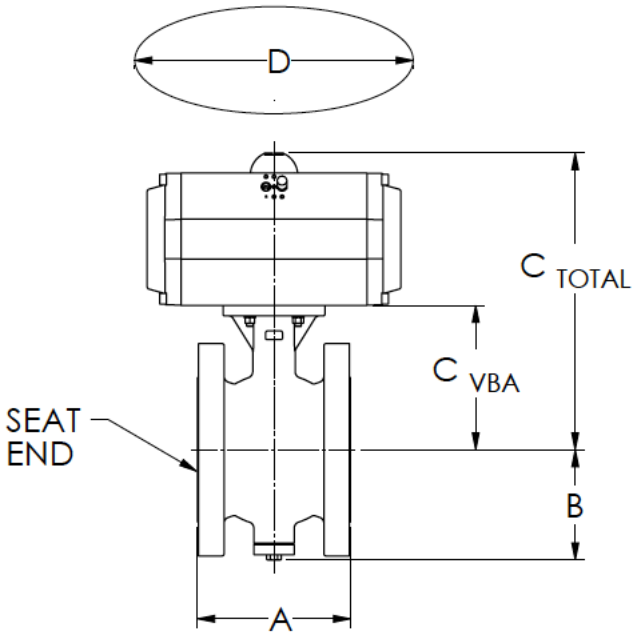
- N/A = NOT APPLICABLE
- FACE TO FACE DIMENSIONS CONFORM TO ANSI/ISA S75.04

ACTUATOR REMOVAL CLEARANCE:

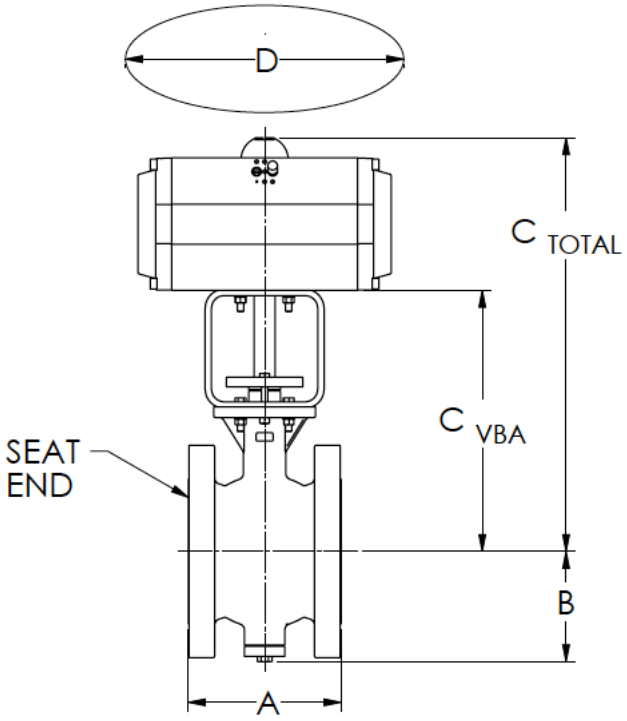
- ABOVE 1" THRU 4" VALVES- ALLOW 3/4".
- ABOVE 6" AND 8" VALVES- ALLOW 1".

D DIMENSION (IN) RP ACTUATOR AND POSITIONER ONLY. DOES NOT INCLUDE HANDWHEEL						
ACTUATOR	**WITHOUT POSITIONER**	**WITH V200 POSITIONER**				
		PNEUMATIC	ELECTRO PNEUMATIC	INTRINSICALLY SAFE	EXPLOSION PROOF	FAIL FREEZE
RP73	7-7/8	13-3/4	13-3/4	13-3/4	14-1/8	15-1/8
RP103	9	13-3/4	13-3/4	13-3/4	14-1/8	15-1/8
RP148	9-3/4	13-3/4	13-3/4	13-3/4	14-1/8	15-1/8
RP222	12-1/4	13-3/4	13-3/4	13-3/4	14-1/8	15-1/8
RP295	12-3/4	13-3/4	13-3/4	13-3/4	14-1/8	15-1/8
RP470	15	15	15	15	15	15-1/8
RP586	16	16	16	16	16	16
RP900	18-7/8	18-7/8	18-7/8	18-7/8	18-7/8	18-7/8
RP1213	19-7/8	19-7/8	19-7/8	19-7/8	19-7/8	19-7/8

WITH RP RACK AND PINION ACTUATOR WITHOUT POSITIONER

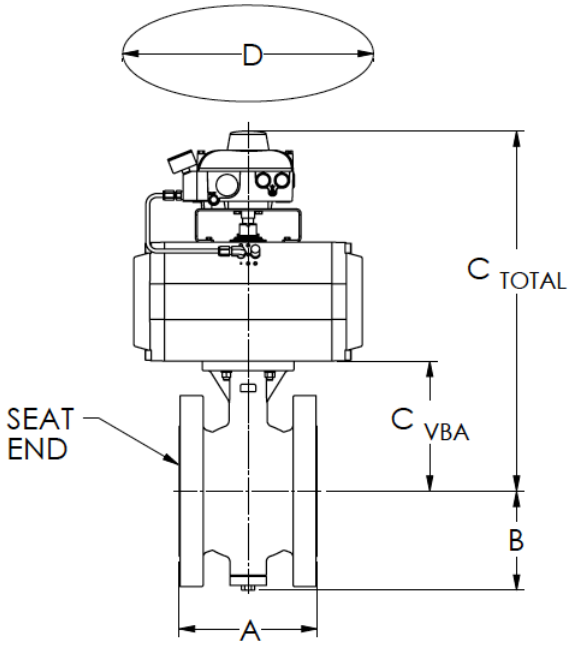


DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

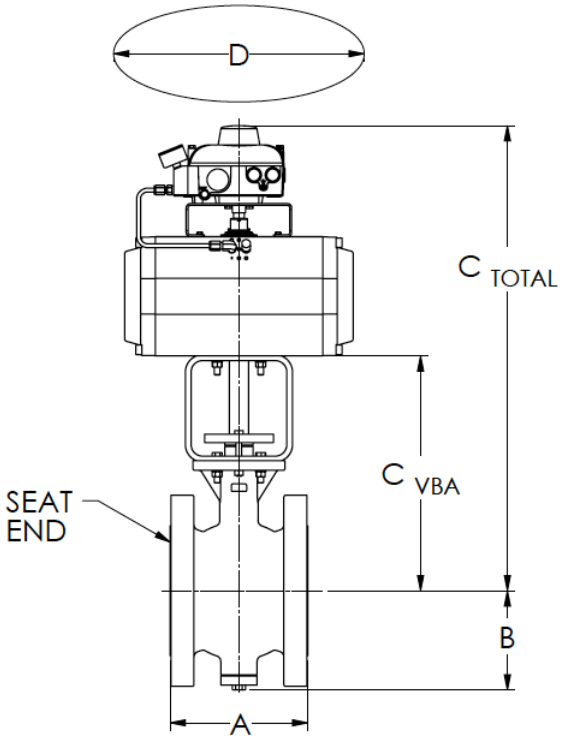


INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

WITH RP RACK AND PINION ACTUATOR WITH V200 POSITIONER



DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION



INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

DIMENSIONS & WEIGHTS

With Pneumatic Rack & Pinion Actuators & Declutchable Handwheel

WITH RP RACK AND PINION ACTUATOR WITH V200 POSITIONER AND DECLUTCHABLE HANDWHEEL								
DIMENSION (IN)	ACTUATOR	VALVE SIZE						
		1	1-1/2	2	3	4	6	8
C TOTAL (STANDARD) DIRECT ACTUATOR MOUNTING)	RP73	19-7/8	20-1/8	20-1/4	21-1/4	N/A	N/A	N/A
	RP103	20-1/4	20-1/2	20-5/8	21-5/8	N/A	N/A	N/A
	RP148	21-1/8	21-3/8	21-1/2	24-1/4	25-1/4	26-3/4	28-1/4
	RP222	21-1/8	21-3/8	21-1/2	24-1/4	25-1/4	26-3/4	28-1/4
	RP295	21-7/8	22-1/8	22-1/4	25	26	27-1/2	29
	RP470	N/A	N/A	N/A	N/A	27-7/8	29-3/8	30-7/8
	RP586	N/A	N/A	N/A	N/A	27-7/8	29-3/8	30-7/8
	RP900	N/A	N/A	N/A	N/A	N/A	33-3/8	34-7/8
	RP1213	N/A	N/A	N/A	N/A	N/A	CF	CF
C TOTAL (WITH HI-TEMP INDIRECT ACTUATOR MOUNTING)	RP73	24-3/4	25	25-1/8	26-1/8	N/A	N/A	N/A
	RP103	25-1/8	25-3/8	25-1/2	26-1/2	N/A	N/A	N/A
	RP148	26	26-1/4	26-3/8	29-1/8	32-1/8	33-5/8	35-1/8
	RP222	26	26-1/4	26-3/8	29-1/8	32-1/8	33-5/8	35-1/8
	RP295	26-3/4	27	27-1/8	29-7/8	32-7/8	34-3/8	35-7/8
	RP470	N/A	N/A	N/A	N/A	34-3/4	36-1/4	37-3/4
	RP586	N/A	N/A	N/A	N/A	34-3/4	36-1/4	37-3/4
	RP900	N/A	N/A	N/A	N/A	N/A	40-1/4	41-3/4
	RP1213	N/A	N/A	N/A	N/A	N/A	CF	CF
E HW (STANDARD) DIRECT ACTUATOR MOUNTING)	RP73	6-7/8	7-1/8	7-1/4	8-1/4	N/A	N/A	N/A
	RP103	6-7/8	7-1/8	7-1/4	8-1/4	N/A	N/A	N/A
	RP148	6-7/8	7-1/8	7-1/4	8-3/16	9-3/16	10-11/16	12-3/16
	RP222	6-7/8	7-1/8	7-1/4	8-3/16	9-3/16	10-11/16	12-3/16
	RP295	6-7/8	7-1/8	7-1/4	8-3/16	9-3/16	10-11/16	12-3/16
	RP470	N/A	N/A	N/A	N/A	9-3/16	10-11/16	12-3/16
	RP586	N/A	N/A	N/A	N/A	9-3/16	10-11/16	12-3/16
	RP900	N/A	N/A	N/A	N/A	N/A	10-15/16	12-7/16
	RP1213	N/A	N/A	N/A	N/A	N/A	CF	CF
E HW (WITH HI-TEMP INDIRECT ACTUATOR MOUNTING)	RP73	11-3/4	12	12-1/8	13-1/8	N/A	N/A	N/A
	RP103	11-3/4	12	12-1/8	13-1/8	N/A	N/A	N/A
	RP148	11-3/4	12	12-1/8	13-1/16	16-1/16	17-9/16	19-1/16
	RP222	11-3/4	12	12-1/8	13-1/16	16-1/16	17-9/16	19-1/16
	RP295	11-3/4	12	12-1/8	13-1/16	16-1/16	17-9/16	19-1/16
	RP470	N/A	N/A	N/A	N/A	16-1/16	17-9/16	19-1/16
	RP586	N/A	N/A	N/A	N/A	16-1/16	17-9/16	19-1/16
	RP900	N/A	N/A	N/A	N/A	N/A	17-13/16	19-13/16
	RP1213	N/A	N/A	N/A	N/A	N/A	CF	CF

NOTES:

- N/A = NOT APPLICABLE
- FACE TO FACE DIMENSIONS CONFORM TO ANSI/ISA S75.04
- CF = CONSULT FACTORY FOR DRAWINGS WEIGHTS, AND DIMENSIONS OF CONFIGURATIONS NOT SHOWN

ACTUATOR REMOVAL CLEARANCE:

- ABOVE 1" THRU 4" VALVES- ALLOW 3/4".
- ABOVE 6" AND 8" VALVES- ALLOW 1".

DECLUTCHABLE HANDWHEEL	DIMENSION (IN)					
	A HW	B HW	C HW	D HW	F HW	WEIGHT (LB)
GOW02	4-3/4	4-3/8	4-1/8	8-1/4	1-13/16	12-1/4
GOW06	6-3/4	5-1/2	5-13/16	8-1/8	2-15/16	33-1/4
G0W09	6-5/8	5-3/8	5-3/4	9-7/8	2-7/8	36-3/4
GOW12	6-3/4	5-1/2	5-3/4	9-7/8	2-7/16	39
GOW16	10-1/2	6-3/4	7-5/8	15-1/4	4-1/4	73-1/2

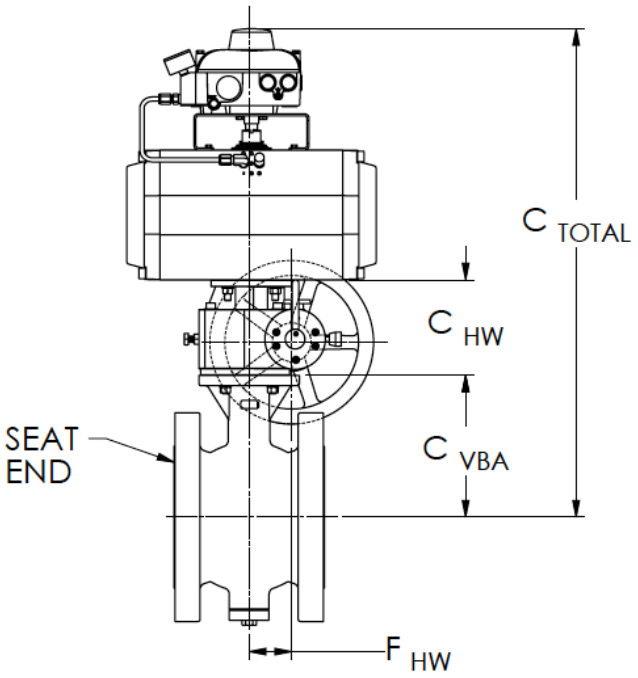
MAX AIR DECLUTCHABLE GEAR OPERATOR (SEE KEY TO RIGHT)

KEY FOR DECLUTCHABLE GEAR OPERATORS		
Valve Size	with Actuator	Model
1, 1-1/2 & 2 inch	RP73, 103, 148, 222 & 295	GOW02
3 inch	RP73 & 103	GOW02
	RP148 , 222 & 295	GOW06
4 inch	RP148, 222 & 295	GOW06
	RP470 & 586	GOW09
6 & 8 inch	RP148, 222 & 295	GOW06
	RP470 & 586	GOW12
	RP900 & 1213	GOW16

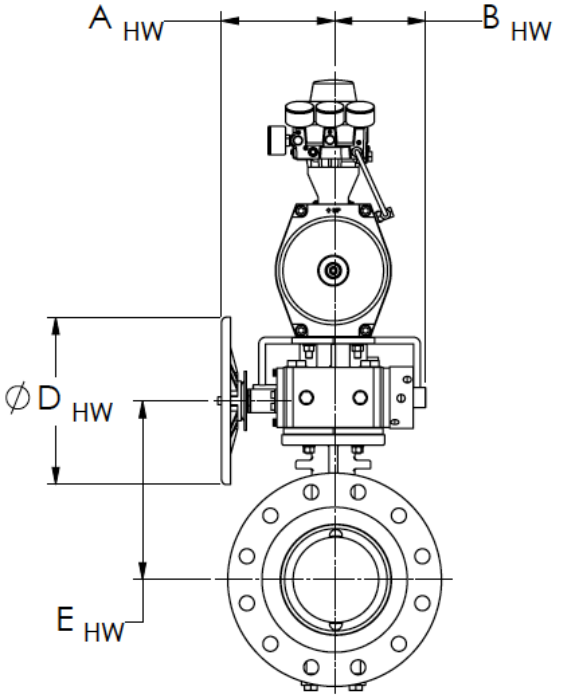
With Pneumatic Rack & Pinion Actuators & Declutchable Handwheel, Continued

For A, B, CVBA & D Dimensions, see corresponding views without declutchable handwheel - p. 34 & 35

WITH RP RACK AND PINION ACTUATOR WITH V200 POSITIONER AND DECLUTCHABLE HANDWHEEL

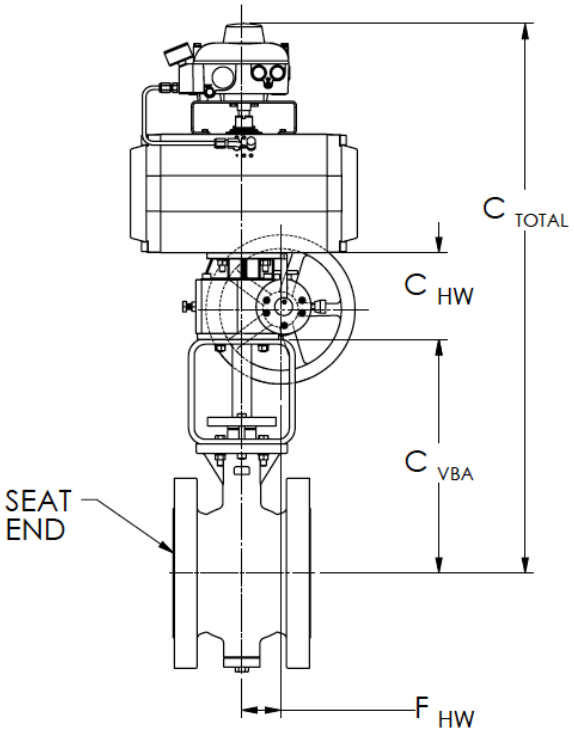


DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

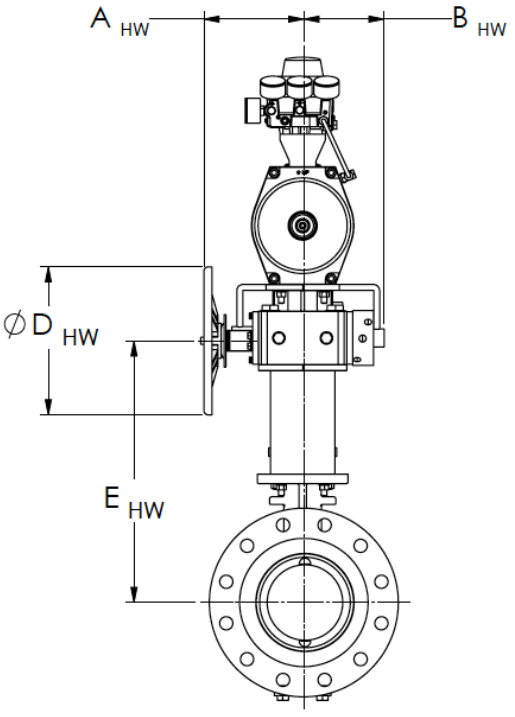


DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

WITH RP RACK AND PINION ACTUATOR WITH V200 POSITIONER AND DECLUTCHABLE HANDWHEEL



INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

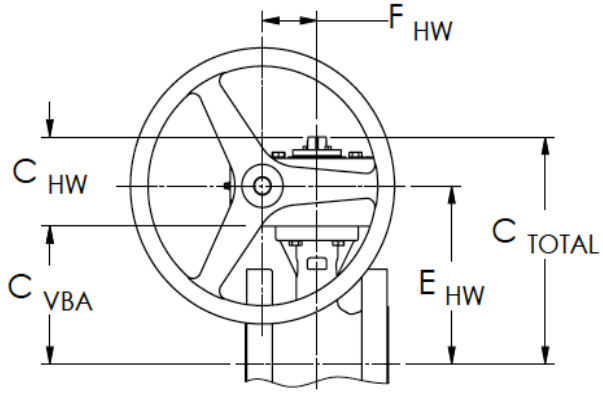


INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

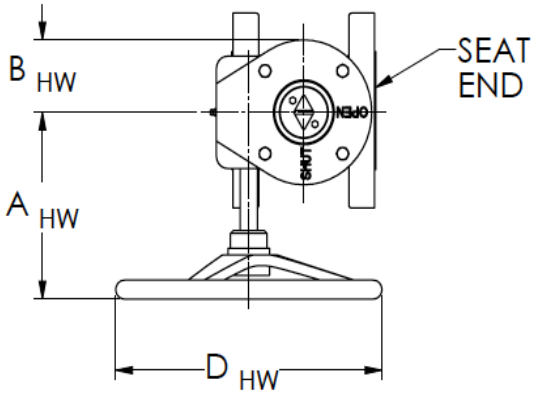
DIMENSIONS & WEIGHTS

With Manual Gear Operator

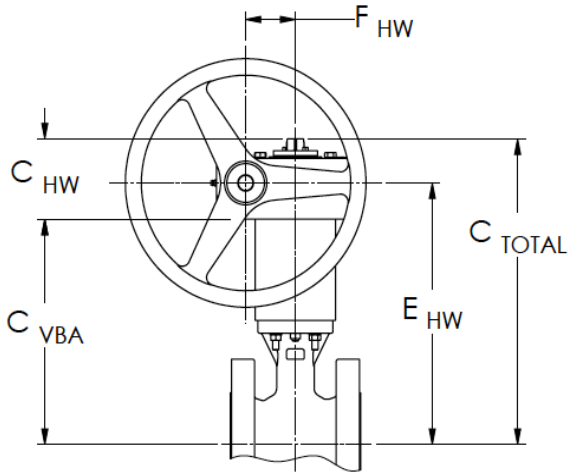
For CVBA Dimension, see p. 34



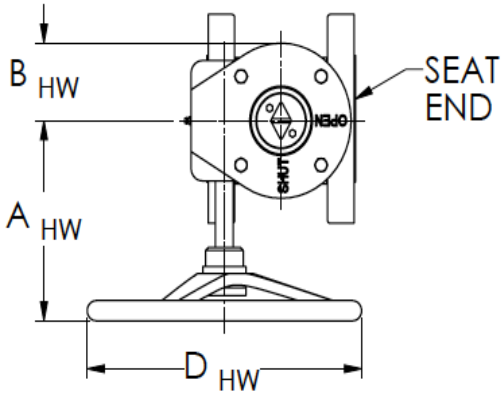
DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION



DIRECT SHAFT DEFAULT ACTUATOR ORIENTATION



INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION



INDIRECT SHAFT DEFAULT ACTUATOR ORIENTATION

DIMENSION (IN)		VALVE SIZE (IN)						
		1	1-1/2	2	3	4	6	8
C HW DIRECT MOUNTING	G30	8-5/8	8-7/8	9	10	11	N/A	N/A
	G50	N/A	N/A	N/A	N/A	N/A	12-1/2	N/A
	G51	N/A	N/A	N/A	N/A	N/A	N/A	14
E HW DIRECT MOUNTING	G30	6-7/16	6-11/16	6-13/16	7-13/16	8-13/16	N/A	N/A
	G50	N/A	N/A	N/A	N/A	N/A	10-5/16	N/A
	G51	N/A	N/A	N/A	N/A	N/A	N/A	11-13/16
C HW INDIRECT MOUNTING	G30	13-1/2	13-1/4	13-7/8	14-7/8	17-7/8	N/A	N/A
	G50	N/A	N/A	N/A	N/A	N/A	19-3/8	N/A
	G51	N/A	N/A	N/A	N/A	N/A	N/A	20-7/8
E HW INDIRECT MOUNTING	G30	11-3/16	11-9/16	11-11/16	12-11/16	15-11/16	N/A	N/A
	G50	N/A	N/A	N/A	N/A	N/A	17-3/16	N/A
	G51	N/A	N/A	N/A	N/A	N/A	N/A	18-11/16

MANUAL GEAR OPERATOR	WEIGHT (LB)
G30	25-1/2
G50	26
G51	26-1/2

MANUAL GEAR OPERATOR	DIMENSION (IN)			
	A HW	B HW	D HW	F HW
G30	8	3-1/8	12	2-1/2
G50	8-3/8	3-1/4	12	3-1/8
G51	11-1/4	3-1/4	18	3-1/8

ACTUATORS

Actuator	Weight (LB)
RP73	6
RP103	8
RP148	11
RP222	15
RP295	19
RP470	31
RP586	35
RP900	62
RP1213	69

POSITIONERS

V200 Positioner	Weight (LB)
Pneumatic	5-1/2
Electro Pneumatic	6
Intrinsically Safe	6
Explosion Proof	7-1/2
Fail Freeze	7-1/2

VALVE BODIES

Valve Size (IN)	Weight (LB)			
	Standard		With Hi-Temp Actuator MTG	
	150 FLG	300 FLG	150 FLG	300 FLG
1	20	22	29	31
1-1/2	23	30	32	39
2	20	25	29	34
3	35	50	44	59
4	55	80	76	101
6	100	140	121	161
8	145	200	166	221

Fluid Temperature Limit Thresholds

The engineering data within our product specification will share information about MAX fluid temperature limits as if it is an absolute for any configurable valve assembly. It is not. The MAX fluid temperatures listed, sometimes as high as 800 Deg. F depending on the valve is only an absolute one for the valve body itself. It does not take into consideration the actuation or accessories. Actuators and accessories each have their own MAX ambient temperature limits that may be anywhere from 122 °F to 250°F depending on the items for the electronics or softs goods these items contain. ***It is nearly impossible to correlate JUST fluid temperature to determine when any of these actuators or accessories will have their ambient exceeded.***

THERE ARE SEVERAL FACTORS THAT INCLUDE BUT ARE NOT LIMITED TO:

- valve size
- actuator orientation
- room ambient temperature
- distance from the valve body to the components of interest
- bonnet style/size
- conducted heat versus radiated heat
- ventilation

With all of these variables it is a challenge to come up with some guidelines.

However, we have attempted to do that in the tables that follow on page 31. Realize these are only guidelines.

Actuator Mounting VS. *Insulating Blankets*

When working with higher fluid temperatures thermal insulating blankets can ***dramatically reduce surface temperatures on pipes, valves and other fixtures*** in a fluid control system such that the ambient room temperatures in these environments are dramatically reduced as well. This is often required in for valve actuators and accessories to reliably survive when fluid temperatures rise well above the safe ambient temperatures of the devices. Radiant heat and convected heat are the major sources for damage to these actuators and accessories. When a valve actuator is mounted to the side of a valve there is still radiant heat but convected heat is mostly eliminated. ***For globe control valves, having the actuator mounted vertically above the valve is best for optimum valve packing life but will then suffer the most with both radiant and convected heat to deal with.*** Alternatives to blankets and the mounting orientation listed include longer yoke actuators and extension bonnets on valves. These put distance between the heat sources and the components you are trying to protect from heat.

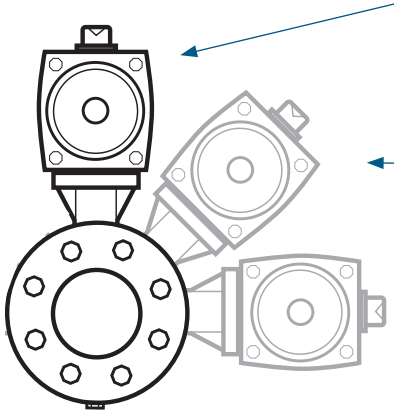
Choose the right blanket

ACOUSTIGUARD™ VS. THERMIGUARD™

At Warren Controls our ***AcoustiGuard™ & ThermiGuard™*** blankets are nearly identical. In fact they have identical thermal properties. The ***AcoustiGuard™*** has an additional layer of high density barium sulfate vinyl reflector for sound reflection. Each blanket is specifically designed in a one or two piece design that is made to be easily removable for valve servicing. When used in conjunction with high temperature fluids, significant energy savings, lower surface & ambient temperatures and a ***safer environment for employees are just some of the benefits***.

Predicting Safe Fluid Temperatures for Actuators & Accessories

Pneumatic Actuator Horizontal Pipe
0-45-90 Piping Orientations



Seat End

VERTICAL ABOVE PIPING

This is the recommended position for mounting as it is the best position to ensure the service life of the equipment; however this is where it will encounter the most heat and sound vibrations.

45º FROM VERTICAL ABOVE PIPING ON EITHER SIDE

You may mount in this position to try to reduce the heat in high temperature applications; however this will reduce the life of the packing.

Actuators mounted in any position other than vertical MUST be supported independent of the valve.

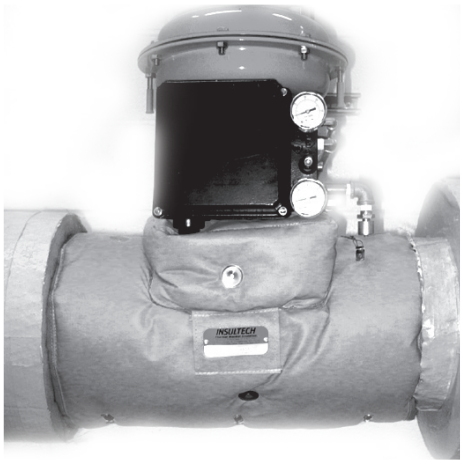
90º TO PIPING HORIZONTAL ON EITHER SIDE

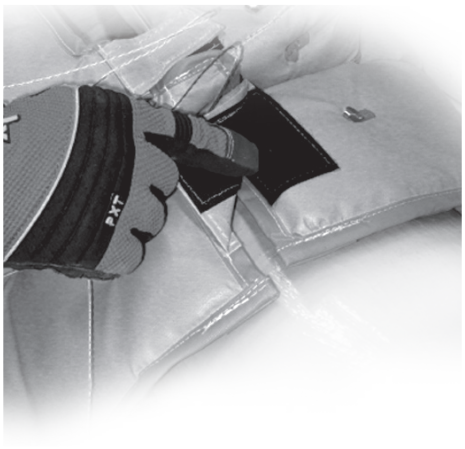
This is the worst possible position and creates great strain and limits the life of the internal components of the valve.

Actuators mounted in any position other than vertical MUST be supported independent of the valve.

The tables that follow on page 31 will identify temperature ranges, valve size ranges, actuator orientation and use of thermal blankets to determine what is required to get longevity out of your actuators and accessories.

HEAT/SOUND PRESSURE LEVELS GUIDELINES





Whether you need to lower your mechanical room temperature, avoid getting burned, reduce harmful noise or save energy our blanket wraps are your solution!

AcoustiGuard™ & ThermiGuard™ are custom fit high quality insulation blanket systems pre-engineered to either reduce harmful noise, or save energy by retaining radiant heat. Both are designed to improve the surrounding work environment. While ***AcoustiGuard™*** is designed to act as a "sound attenuation" and thermal barrier, ***ThermiGuard™*** is capable of withstanding weather conditions and chemical environments. Both are capable of withstanding maximum service temperatures of 450°F (***AcoustiGuard™ & ThermiGuard™***) or up to 800°F with the High Temperature option. Any piece will not exceed 40 pounds. ***AcoustiGuard™*** comes with 2 fastening options: Lacing Pins & Metal "D" Ring Strap with Velcro Tab. In addition to these fastening options, ***ThermiGuard™*** comes with 2 additional fastening options: Velcro Flaps & Side Release Buckles. The ***AcoustiGuard™ & ThermiGuard™*** products are designed to be flexible and easier to install, easy to remove and reinstall, allowing quick access and easy equipment serviceability.

- ***EASY TO INSTALL & REINSTALL***
- ***CAN WITHSTAND UP TO 450°F OR 800°F***
- ***MULTIPLE FASTENING OPTIONS***

Sound Pressure Levels

107 dBA Source	A-Weighted Measurements	Linear Weighted Measurements
Test Frequency (In Hz)	1 1/2" Noise Reduction (In dBA)	1 1/2" Insertion Loss (In dBA)
100	13	13
125	14	13
160	13	13
200	13	13
250	13	12
315	15	15
400	19	19
500	25	25
630	26	33
800	39	39
1000	38	39
1250	42	42
1600	43	43
2000	43	43
2500	44	44
3150	45	44
4000	44	45
5000	46	45

Fluid Temperature Limit Guidelines

3800 RACK & PINION

Ensures reliable, long-term performance of seals and any included insrtrumentation

Direct Mounted Shaft

ACTUATOR ORIENTATION	Valve Size 1" - 2"	Valve Size 3" - 4"	Valve Size 6" - 8"
	FLUID TEMPERATURE LIMIT		
Above the Valve	325°F	300°F	275°F
To the Side of the Valve	375°F	350°F	325°F
Above the valve w/ ThermiGuard*	450°F	413°F	375°F
Side of the valve w/ ThermiGuard*	550°F	500°F	450°F

InDirect Mounted Shaft

ACTUATOR ORIENTATION	Valve Size 1" - 2"	Valve Size 3" - 4"	Valve Size 6" - 8"
	FLUID TEMPERATURE LIMIT		
Above the Valve	400°F	350°F	300°F
To the Side of the Valve	650°F	575°F	500°F
Above the valve w/ ThermiGuard*	750°F	700°F	650°F
Side of the valve w/ ThermiGuard*	800°F	800°F	800°F

** Custom Fit Insulating Blankets, assumes pipes are insulated and blanket is chosen for correct temperature limit.*

3800 ELECTRIC

Ensures reliable, long-term performance of seals and any included insrtrumentation

Direct Mounted Shaft

ACTUATOR ORIENTATION	Valve Size 1" - 2"	Valve Size 3" - 4"	Valve Size 6" - 8"
	FLUID TEMPERATURE LIMIT		
Above the Valve	225°F	200°F	175°F
To the Side of the Valve	350°F	300°F	250°F
Above the valve w/ ThermiGuard*	350°F	325°F	300°F
Side of the valve w/ ThermiGuard*	500°F	450°F	400°F

InDirect Mounted Shaft

ACTUATOR ORIENTATION	Valve Size 1" - 2"	Valve Size 3" - 4"	Valve Size 6" - 8"
	FLUID TEMPERATURE LIMIT		
Above the Valve	350°F	300°F	250°F
To the Side of the Valve	450°F	400°F	350°F
Above the valve w/ ThermiGuard*	650°F	600°F	550°F
Side of the valve w/ ThermiGuard*	800°F	750°F	700°F

** Custom Fit Insulating Blankets, assumes pipes are insulated and blanket is chosen for correct temperature limit.*

These are simply rough guidelines and not absolute thresholds.

FLANGE SIZES AND PATTERNS

STEEL FLANGE DIMENSIONS AND DRILLING TEMPLATES
150 PSI (GAGE) PRIMARY SERVICE PRESSURE RATING

	A	B	C	D	E			F	G
Nominal Pipe Size (IN)	Flange Diameter	Minimum Flange Thickness	Diameter of Raised Face	Diameter of Bolt Circle	Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	Length of Stud Bolts w/2 Nuts	Length of Machine Bolts
1	4-1/4	9/16	2	3-1/8	1/2 - 13*	4	1/2	2-1/2	2
1-1/2	5	0.61	2-7/8	3-7/8	1/2 - 13*	4	1/2	2-3/4	2-1/4
2	6	5/8	3-5/8	4-3/4	3/4	4	5/8	3	2-3/4
3	7-1/2	3/4	5	6	3/4	4	5/8	3-1/2	3
4	9	15/16	6-3/16	7-1/2	3/4	8	5/8	3-1/2	3
6	11	1	8-1/2	9-1/2	7/8	8	3/4	3-3/4	3-1/4
8	13-1/2	1-1/8	10-5/8	11-3/4	7/8	8	3/4	4	3-1/2

Dimensions in inches

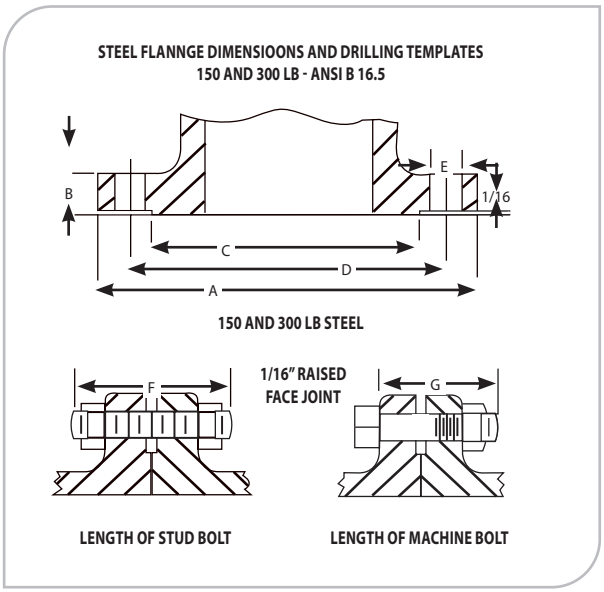
* Flanges tapped, not enough room for heavy hex nuts.

STEEL FLANGE DIMENSIONS AND DRILLING TEMPLATES
300 PSI (GAGE) PRIMARY SERVICE PRESSURE RATING

	A	B	C	D	E			F	G
Nominal Pipe Size (IN)	Flange Diameter	Minimum Flange Thickness	Diameter of Raised Face	Diameter of Bolt Circle	Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	Length of Stud Bolts w/2 Nuts	Length of Machine Bolts
1	4-7/8	11/16	2	3-1/2	5/8 - 11*	4	5/8	3	2-1/2
1-1/2	6-1/8	13/16	2-7/8	4-1/2	7/8	4	3/4	3-1/2	3
2	6-1/2	7/8	3-5/8	5	3/4	8	5/8	3-1/4	3
3	8-1/4	1-1/8	5	6-5/8	7/8	8	3/4	4	3-1/2
4	10	1-1/4	6-3/16	7-7/8	7/8	8	3/4	4-1/4	3-3/4
6	12-1/2	1-7/16	8-1/2	10-5/8	7/8	12	3/4	4-3/4	4-1/4
8	15	1-5/8	10-5/8	13	1	12	7/8	5-1/4	4-3/4

Dimensions in inches

* Flanges tapped, not enough room for heavy hex nuts.



POSITIONERS									
		Input Signal					Failure Modes		
Valve Type	Actuator Action	Pneumatic	Electro-Pneumatic	PROFIBUS PA	Foundation Fieldbus	Increasing Signal	Loss of Signal Valve Fails…[1]	Loss of Power Valve Fails…[2]	Loss of Air Supply Valve Fails…
3800	Spring Fail Open	3-15 PSI	4-20 mA	PROFIBUS Protocol	Fieldbus Protocol	Closes Valve	Open	Open	Open
	Spring Fail Closed	3-15 PSI	4-20 mA	PROFIBUS Protocoll	Fieldbus Protocol	Opens Valve	Closed	Closed	Closed

[1] Valves with Fail Freeze Positioners Fail in Last Position on Loss of Signal.
[2] D400 with PROFIBUS PA or Foundation Fieldbus ONLY

SOLENOIDS (3-WAY SINGLE SOLENOID)			
			Failure Modes
Valve Type	Actuator Action	Solenoid Energized	Solenoid De-energized, Loss of Signal, or Loss of Air Supply, Valve Fails...
3800	Spring Fail Open	Closes Valve	Open
	Spring Fail Closed	Opens Valve	Closed

If the Solenoid is used with a Positioner or an I/P, refer to the Positioner or I/P listings for factory default settings and failure modes with the solenoid not failed.

POSITIONER FEEDBACK			
Valve Type	Actuator Action	Feedback Signal	Signal Increases as
3800	Spring Fail Open	4-20 mA	Valve Closes
	Spring Fail Closed	4-20 mA	Valve Opens

POSITIONER LIMIT SWITCHES			
		Settings	
Valve Type	Position	Switch 1	Switch 2
3800	Valve Closed	Closed	Open
	Valve Open	Open	Closed

AIR FILTER REGULATORS
Output Pressure
As customer specified to max rating of regulator. End user must supply 100 (or 120) psig minimum to the AFR. For air supply above 100 psig special user supplied gage required.

1. SELECTIONS Please make a selection from each table of OPTIONS below to make a complete model number string.

38 □ - □□□ □ □ □ □ □ □ □ □ □ □

VALVE BODY

Model	Size	Body Material	End Conn.	Trim Material	Trim Cv	Shaft Design	Shaft Mat'l.	Bearing & Seals	Packing	Flow Dir.
385 1"-2" Bodies (EN ISO 5211-F07-N-L-11*)	**100** 1 inch	**W** WCB	**F** 150 lb. Flanged	**S** 316 SS	**F** Full Port	**C** Thru, Direct	**S** 17-4 Hard	**S** PEEK	**T** Teflon V-ring Self Adjusting	**0** None
386 3" Bodies (EN ISO 5211-F07-N-L-14*)	**150** 1-1/2 inch	**F** CF8M	**G** 300 lb. Flanged	**T** TFE Soft Seats*	**1** 1st Port Reduction	**D** Thru, Indir.	**I** Inconel	**6** Alloy 6	**G** Adjustable Graphite Indir Mtg & Alloy 6 Brngs	**1** Flow to Close
387 4" Bodies (EN ISO 5211-F07/F10-N-L-17*)	**200** 2 inch			**P** PEEK Soft Seats*	**2** 2nd Port Reduction	**E** Split, Direct		**T** PEEK w/ Fluoraz Seal	**J** Adjustable Graphite Indir Mtg & PEEK Brngs	**2** Flow to Open
388 6" or 8" Bodies (EN ISO 5211-F10-N-L-22*)	**300** 3 inch			**6** Alloy 6 w/ 316 SS Seat Retainer	**3** 3rd Port Reduction	**F** Split, Indir.		**Y** Alloy 6 w/ Fluoraz Seal	**A** Adjustable Teflon V-Ring Indir Mtg	***NOTE:*** *"O" Not allowed on Actuated Valve*
389 6" or 8" Bodies (EN ISO 5211-F12-N-L-22*)	**400** 4 inch			**H** Alloy 6 w/17-4 Seat Retainer				**ST** PEEK Brngs; Self-Adj Teflon Pkg to 450F		
*ISO 5211-2001 Designations	**600** 6 inch			**Z** TTZ Ceramic w/ 316 SS Seat Retainer				**SJ** PEEK Brngs; Adj Graphite Pkg (Requires Indir Shaft) to 450F		
	800 8 inch			**R** TTZ Ceramic w/17-4PH Seat Retainer				**SA** PEEK Brngs; Adj Teflon Pkg (Requires Indir Shaft) to 450F		
				Y Y-TZP Ceramic (Ceramic Seat, Sleeve & Plug)				**6G** Alloy 6 Brngs: Adj Graphite Pkg (Requires Indir Shaft) to 800F		
				**TFE & PEEK Soft Seats require Flow-to-Close flow direction*				**TT** PEEK Brngs w/ Fluoraz Seal; Self-Adj Teflon Pkg to 450F		
								TJ PEEK Brngs w/ Fluoraz Seal; Adjustable Graphite Packing (Requires Indirect Shaft) to 450F		
								TA PEEK Brngs w/ Fluoraz Seal; Adj Teflon Pkg (Requires Indirect Shaft) to 450F		
								YG Alloy 6 Brngs w/ Fluoraz Seal; Adj Graphite Pkg (Requires Indir Shaft) to 500F		
								SG, 6J, 6T, 6A, TG, YT, YJ, YA Not Available		

Actuator / Valve Compatibility:

PNEUMATIC RACK & PINION	VALVE MODEL	VALVE SIZE
073 Size RP73	385	1" - 2"
	386	3"
103 Size RP103	385	1" - 2"
	386	3"
148 Size RP148	385	1" - 2"
	386	3"
	387	4"
	388	6" & 8"
222 Size RP222	385	1" - 2"
	386	3"
	387	4"
	388	6" & 8"
295 Size RP295	385	1" - 2"
	386	3"
	387	4"
	388	6" & 8"
470 Size RP470	387	4"
	388	6" & 8"
586 Size RP586	387	4"
	388	6" & 8"
900 Size RP900	389	6" & 8"
999 Size RP1213	389	6" & 8"

ELECTRIC 120VAC	VALVE MODEL	VALVE SIZE
EA3 Size P2	385	1" - 2"
	386	3"
	387	4"
EB3 Size P3	386	3"
	387	4"
E04 Size P4	388	6" & 8"
E05 Size P5	388	6" & 8"
E06 Size P6	388	6" & 8"

ACTUATOR

Actuator Series

000	None
PNEU. RACK & PINION	
073	Size RP73
103	Size RP103
148	Size RP148
222	Size RP222
295	Size RP295
470	Size RP470
586	Size RP586
900	Size RP900
999	Size RP1213
MANUAL GEAR OP:	
G30	Size G0-30 w. 12" HW (1" - 4")
G50	Size G0-50 w. 12" HW (6")
G51	Size G0-50 w. 18" H (8")
ELECTRIC 120VAC:	
EA3	Size P2
EB3	Size P3
E04	Size P4
E05	Size P5
E06	Size P6

Action

0	None, or Gear Op.
SINGLE ACTING W/ SPRING RETURN	
2	4 Springs
3	6 Springs
4	8 Springs
5	10 Springs
6	12 Springs
ELECTRIC	
M	Modulating
T	On-Off

Fail Mode

0	None or Gear Op.
PNEUMATIC	
S	Single Act. Fail Open
T	Single Act. Fail Closed
ELECTRIC	
1	20 mA to Close, Signal Loss Open
2	20mA to Open, Signal Loss Closed
3	20mA to Close, Signal Loss As Is
4	20mA to Open, Signal Loss As Is

Declutch. Gear Op.

0	None
1	G0W02
2	G0W06
3	G0W09
4	G0W12
5	G0W16

NOTE: Only for use as Accessory to Pneumatic R&P Actuator.

See Key Below

ACCESSORIES

Positioners & Limit Switches

0000	None
	POSITIONERS:
2xP_	VAC V200 Pneumatic
2xE_	VAC V200 ElectroPneumatic
2xI_	VAC V200 ElectroPneu. Intrn. Safe
2xX_	VAC V200 ElectroPneu. Exp. Proof
2xF_	VAC V200 ElectroPneu. Fail Freeze
TOZO	VAC D400 4-20mA *
THN_	VAC D400 4-20mA w/HART Intrn. Safe & Non-Incend *
TPN_	VAC D400 PROFIBUS PA Intrn. Safe & Non-Incend.
TFN_	VAC D400 FOUNDATION Field-bus Intrn. Safe & Non-Incend.
THX_	VAC D400 4-20mA w/HART Exp. Proof *
TPX_	VAC D400 PROFIBUS PA Exp. Proof
TFX_	VAC D400 FOUNDATION Fieldbus Exp. Proof
	LIMIT SWITCHES:
PX21	Mark 4 Series- 2 ea. SPDT w/Indication

* Available with split ranges, select "S" in Special Options.

x digit spec.

F	Full Range Signal, 3-15 PSI or 4-20mA (Factory Default)
L	Low of Split Range, 3-9 PSI or 4-12mA
H	High of Split Range, 9-15 PSI or -20mA

VAC 4th digit spec.

0	No Additions
L	w/Mech. Lmt Swtch's
F	w/4-20 Feedback
B	w/Swtch's & Feedbck

NOTE : L,F,B not available for 2xI , 2xX.

D400 4th digit spec.

Individual Options

0	No Additions
F	w/4-20 Feedback Module (4-20mA w/HART Models ONLY)
K	w/Digital Position Feedback Module (4-20mA w/HART Models ONLY)
L	w/ 24VDC/AC Micro-Switch's (Exp. Proof Models ONLY)
P	w/Proximity Switch's NC

Option Combinations (For 4-20mA w/HART Models ONLY)

A	= **F** & **K**
B	= **F** & **L** (Exp. Proof Mod. ONLY)
C	= **F** & **P**
E	= **K** & **L** (Exp. Proof Mod. ONLY)
G	= **K** & **P**
J	= **F** & **K** & **L** (Exp. Proof Mod. ONLY)
M	= **F** & **K** & **P**

See Actuators, Positioners, & Accessories • Section of Product Specification for details.

Air Filter Regulators

0	None
B	Type 300 0-60 PSI
C	Type 300 0-120 PSI
D	Type 300SS 0-100 PSI

ASCO Solenoids

0	None
120 VAC Coils:	
C	8320G704 3-Way Brass
D	8320G714 3-Way SS
N	EF8320G704 3-Way EXP Br.
P	EF8320G714 3-Way EXP SS
24 Vdc Coils:	
2	EF8320G704 3-Way EXP Br.

**Fail Last Position*

Note: *All solenoids are direct mounted.*

Special Options

0	None
S	Special Opts or Set-Up
T	SS Tubing
G	SS Tagging
B	SS Tubing and Tagging

NOTE:

- Standard pneumatic tubing is copper. SS tubing **"T"** is optional.
- SS tagging **"G"** (Two lines, 24 characters/line) is optional.
- SS tubing and tagging together **"B"** is optional.
- Actuator Orientation **"1"**, **"2"** or **"3"** is optional.
- Special Options or Set-Up **"S"**- Use this code to identify custom bodies, trim, non-default set ups, etc. not identified by another code. The description of the special option or set-up and complete process conditions must be present on the purchase order.
- If your application requires a special option or set-up contact factory for details.

Codes & Descriptions **(Codes shown in bold)**		
Valve Model *ISO 5211-2001Designations	Actuator Series	Max Air Declutchable Gear Operator
385 1"- 2" Bodies (EN ISO 5211-F07-N-L-11*)	**073** RP73, **103** RP103, **148** RP148 , **222** RP222 & **295** RP295	**1** G0W02
386 3" Bodies (EN ISO 5211-F07-N-L-14*)	**073** RP73 & **103** RP103	**1** G0W02
	148 RP148 , **222** RP222 & **295** RP295	**2** G0W06
387 4" Bodies (EN ISO 5211-F07/F10- N-L-17*)	**148** RP148 , **222** RP222 & **295** RP295	**2** G0W06
	470 RP470 & **586** RP586	**3** G0W09
388 6" or 8" Bodies (EN ISO 5211-F10-N-L-22*)	**148** RP148 , **222** RP222 & **295** RP295	**2** G0W06
	470 RP470 & **586** RP586	**4** G0W12
389 6" or 8" Bodies (EN ISO 5211-F12-N-L-22*)	**900** RP900 & **999** RP1213	**5** G0W16

Note:
Yellow & Black raised beacons are standard.
Red & Black is a special order option for VAC.

Warren Controls does not assume responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any Warren Controls product remains solely with the purchaser and end-user.

3800 PRODUCT SPECIFICATION

1800 SERIES	2800 SERIES	2900 SERIES	3800 SERIES	5800 SERIES
Heavy Globe Control Valves	Precision Globe Control Valves	High Capacity General Purpose Globe Control Valves	E-Ball Rotary Control Valves	Compact Globe Control Valves
styles:	**styles:**	**styles:**	**styles:**	**styles:**
• 2-way balanced • 2-way unbalanced • 3-way mixing • 3-way diverting	• 2-way unbalanced • 2-way low flow • 3-way mixing • 3-way diverting	• 2-way balanced • 2-way unbalanced • 3-way mixing • 3-way diverting	• 2-way rotary - flow to open - flow to close	• 2-way unbalanced cage retained seat • 2-way low flow unbalanced cage retained seat • 2-way cage balanced cage retained seat
sizes 1/2 to 12 in.	**sizes** 1/2 to 2 in.	**sizes** 2-1/2 to 10 in.	**sizes** 1 to 8 in.	**sizes** 1/2 to 4 in.
class 250 & 300	**class** 250 & 300	**class** 125 & 250	**class** 300	**class** 300
ends 125 FF, 150, 250, 300 RF flg	**ends** Buttweld, NPT	**ends** 125 FF, 250 RF flg	**ends** 150,300 RF flg	**ends** 150,300 RF flg, Socketweld, NPT
body Cast Iron, WCB,CF8M, Bronze (ASTM B61)	**body** Bronze, CF8M	**body** Cast Iron	**body** WCB, CF8M, Custom Alloys	**body** WCB, CF8M, Bronze (ASTM B61)
trim 316 SST, Alloy 6	**trim** Bronze, 316 ST 17-4pH, Alloy 6, TFE, PEEK	**trim** Bronze, 300 SS, 17-4pH, Alloy 6	**trim** 316 SST, Alloy 6, Ceramic, TFE, PEEK	**trim** 316 SST, 400 SST, Alloy 6, TFE, PEEK
Cv up to 1649	**Cv** up to 40	**Cv** up to 960	**Cv** up to 1420	**Cv** up to 170
temp. -20° to 800°F	**temp.** -20° to 500°F	**temp.** -20° to 400°F	**temp.** -20° to 800°F	**temp.** -20° to 800°F
body limit to 740 psi	**body limit** to 720 psi	**body limit** to 400 psi	**body limit** to 740 psi	**body limit** to 740 psi
leakage rates class III, IV, IV+	**leakage rates** class III,IV, VI	**leakage rates** class II, III, IV	**leakage rates** class IV, IV+, VI	**leakage rates** class IV, IV+, VI
rangeability 50:1	**rangeability** 50:1	**rangeability** 50:1	**rangeability** 100:1	**rangeability** 50:1
• Heavy Duty • Severe Service • High Pressure Differentials • Corrosive Materials, Liquids, Gases & Steam • Modulating or On/Off Control	• Economical • Precision Control • Suited for Gases, Steam, or Liquids that are Not Viscous or Solids Bearing	• High Capacity • General Purpose • Moderate Pressure Drops • Compatible Liquids and Gas, Steam & Water • Modulating or On/Off Control	• Eccentric, Segmented Ball • Well Suited for Erosive Service • Various Trim Options Include Ceramic for Slurries or Gritty Materials & Teflon® for Class VI Shutoff	• Highly Efficient, Compact Design • High Pressure Drops • Typically Suited for High Force Piston Actuators for Steam, Chemicals & Dirty Fluids