



# *Control Valve Product Guide*



*Experience In Motion*



## Flowserve - Corporate Overview

### *The World's Premier Provider of Industrial Flow Management Services*

*Flowserve is the world's premier provider of industrial flow management services. The company produces engineered pumps, precision mechanical seals, automated and manual quarter-turn valves, control valves and actuators, and provides a range of related flow management services, primarily for the process industries. With 2007 sales of almost \$3.8 billion, Flowserve has around 14,000 employees and operates in 56 countries.*

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### *Flowserve's Products and Services*

Flowserve Corporation is the world's premier single-source provider of flow management products and related repair and replacement services. Flowserve is composed of three divisions:

- **Flow Control** is a leading global manufacturer of flow control products including control valves, quarter-turn valves, actuators, and complete valve automation systems.
- **Flowserve Pumps** is one of the world's largest suppliers of industrial, engineered, and special purpose pumps and systems.
- **Flow Solutions** is a world leading designer and manufacturer of mechanical seals and other engineered fluid sealing systems.

Flowserve's products can be found in various process industries including: petroleum refining, oil and gas production, pipeline, chemical, power generation, pulp and paper, mineral and ore processing, water resources, pharmaceuticals and general industrial applications.

### *Flowserve Flow Control*

Flowserve Flow Control is the foremost valve and controls manufacturing organization in the world. Flowserve's broad offering of flow control products includes many of the most widely known and trusted brand names in the marketplace.

Strong brand recognition results primarily from the extraordinary success of Flowserve valve and automation products with thousands of applications in all major industries.

Flowserve supplies contractors, OEMs, distributors and end users with a product range of unparalleled breadth to meet modern industry's flow control needs in various markets.

Quality, safety, availability and in-depth technical support are combined in a world class product offering. Engineered and manufactured through Flowserve Flow Control, our range of complementary products is designed to provide a flexible approach to solving your operational requirements. Solutions for today should also spell secure investments for times to come. Each user-specific development is based on a vision of the future.

Flowserve Flow Control has the manufacturing capability to handle any flow control requirement anywhere in the world - from custom-engineered products to large projects. Major manufacturing operations are located in North America (USA), Europe (Austria, France, Germany, Sweden, Switzerland, UK), Pacific and Asia (Australia, India, China).

### **Leading Brands:**

*Accord, Anchor Darling, Argus, Atomac, Automax, Durco, Edward, Gestra, Kämmer, Limitorque, McCANNA, NAF, Naval, Noble Alloy, Norbro, Nordstrom, Polyvalves, PMV, Serck Audco, Valtek, Vogt, Worcester Controls*



## Flow Control Sectors

### Controls

From off the shelf options to custom engineered designs that meet specific requirements, Flowserve provides top of the line solutions to meet the diverse demands included by this broad control valve sector.

Brands include: *Kämmer, NAF, Valtek, and Logix.*

All of the brands under this sector have established themselves as suppliers of high-performance, innovative and dependable control valve products. Products cover pressure classes as high as Class 42500 with valve sizes ranging from ½" to 60". When coupled with the many innovative trims, a large range of flow capacity and severe service solutions are provided. State of the art control is provided through the Logix line of digital positioners with Quick Cal calibration and intelligent control.

Products include: Globe, angle, Y-body, and check valves. Butterfly, eccentric plug, segmented ball and full port ball valves. High and low temperature configurations. High and low flow configurations. Desuperheater solutions and pressure reducing valves. Pressure balanced and pilot operated trims. Environmental packing systems and bellow seals. Sound attenuation and anti-cavitation trims for severe service applications. Soft-seated, and metal-seated options with high shutoff capability. General purpose and high performance custom engineered valves. High performance pneumatic actuators for linear and rotary applications including ultra high cycle designs coupled with industry leading positioners ranging from pneumatic to analog, to digital to PID controllers to fully integrated intelligent control systems.

### Process and Oil & Gas

The leading brands outline an outstanding portfolio of value-engineered isolation valves and associated actuation products from some of the leading manufacturers in the world

Brands include: *Argus, Atomac, Automax, Durco, McCanna, Norbro, Nordstrom, Serck Audco, PMV, and Worcester.*

Products include: Soft-seated, metal-seated or lined ball valves, general purpose or high performance butterfly valves, gate, globe and check valves, lined plug valves, pressure balanced plug valves and polyethylene valves. High performance pneumatic actuators (rack and pinion or Scotch yoke), electric actuators, valve automation accessories, analog & digital positioners, switches, and quarter-turn valve automation packages.

### Power

Power solutions include a wide range of engineered solutions to this vital industry, covering sectors as diverse as nuclear, fossil fuel, district heating, steam equipment and systems for boiler houses.

Brands include: *Anchor Darling, Edward Valves, Gestra, Limitorque, and Naval.*

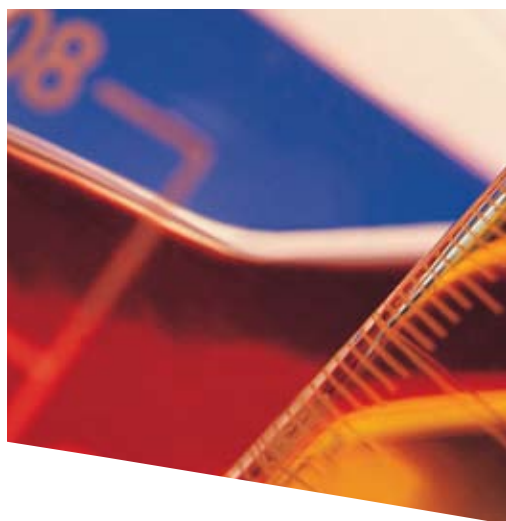
Products include: Gate, globe and check valves, electric actuators, welded ball valves, steam traps, non-return check valves, control valves, vessels, boiler house equipment, and heat recovery systems.



## Application Category

### Page

- |              |  |  |
|--------------|--|--|
| <b>6-7</b>   | <b>General Service</b>                 | The majority of control valve applications fall into the general service category. The typical pressure rating for these (linear and rotary) valves does not exceed ANSI Class 300 (PN40). General service valves do not require special engineering so standard options will cover most applications.   |
| <b>8-9</b>   | <b>Low Temperature &amp; Cryogenic</b> | By using an extended bonnet, the packing, gaskets and seals are protected from cryogenic temperatures, thus ensuring their sealing properties. Optional special gaskets and packings can be used to operate at temperatures as low as -457°F (-272°C). Depending on the application, Flowserve cryogenic valves are available with a top entry design for the easy maintenance of valves located in a cold box or with a simple extended bonnet attached to the valve body.  |
| <b>10-11</b> | <b>Medium - High Pressure</b>          | Valves with pressure classes above ANSI Class 300 (PN40) are considered by Flowserve as “high pressure” designs. Based on decades of proven experience and expertise, Flowserve can supply the best high-pressure control valves on the market in pressure classes to ANSI Class 4500 (PN4000) and beyond.   |
| <b>12</b>    | <b>Low Flow &amp; Micro Flow</b>       | For Flowserve, a Low Flow valve is a valve with a range of Cv values between 0.01 and 4.7. Flowserve also manufactures Micro Flow valves capable of Cv ranges from 0.01 down to 0.0000012. In the Flowserve control valve portfolio a wide range of valves are designed to offer both ranges of Cv values. These products are widely used for applications in laboratories and industrial research departments as well as in industrial processes requiring high degrees of control accuracy.                                  |
| <b>13</b>    | <b>Corrosive</b>                       | Corrosive fluids, including both gases and liquids, require special attention when it comes to the materials used to build the valve and Flowserve offers a wide range of choices for these applications. The company has experience in building valves from Carbon Steel, Stainless Steel, Titanium, Hastelloy, Alloy 6, Inconel, Monel, and many, many other alloys. For fluids that require even greater chemical resistance, Flowserve offers a variety of solid plastic and plastic lined valves.                         |
| <b>14</b>    | <b>Sanitary &amp; Aseptic</b>          | In the food and beverage industry as well as in biotechnology, pharmacy and other areas where perfect cleanliness and sterile valves are required, Flowserve has the solution. Our products meet the USDA and 3A requirements and can be supplied for Clean In Place (CIP) and Steam In Place (SIP).   |
| <b>14</b>    | <b>Special / Other</b>                 | In certain control applications the use of standard globe valves is not possible. This is why Flowserve has developed other control valves such as split body or ball sector valve. Flowserve has also developed special products used for process control as a complementary product for the control valve. Often, these products use fundamental control valve principles such as the self-acting regulator or in upstream or equipment upstream or downstream of a control valve as in a desuperheater system, for example. |










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- 15**                    **Custom Engineered Products**      Flowserve is the foremost specialist valve and controls manufacturing organization in the world. Flowserve engineering has many years of successful experience developing custom solutions for difficult applications. Flowserve supplies a rugged and reliable product range of unparalleled breadth to meet the needs of almost any flow control process.
- 16-19**                **Severe Services**                      Flowserve is the foremost specialist valve and controls manufacturing organization. Severe service is defined as applications which have excessive noise, cavitation, erosion, or high pressure drops. Most valves in these categories require special design work, resulting in the use of special materials or trim designs. Flowserve offers the most comprehensive range of solutions to minimize or eliminate cavitation, erosion and noise.
- 20-22**                **Actuators**                                The function of the actuator is to adjust the opening of the valve according to the instrument signal in order to ensure correct control of the process fluid. Depending on the actuator selected, the valve position may be open or closed, as in the case of isolating valves, or continuously modulating, in the case of the control valves. Flowserve offers different types of actuators according to the thrust or torque required (pneumatic, electric, or hydraulic) to operate rotary or linear control valve designs.
- 23**                     **Accessories**                              Flowserve manufactures a range of limit switch boxes, position transmitters and flow boosters.
- 24-25**                **Positioners**                              Flowserve has a complete range of analog and pneumatic positioners available with hazardous area classifications to serve the different market needs.
- From analog/pneumatic to Digital to intelligent control system**      Flowserve offers one of the widest ranges of digital positioners available on the market. Ranging from digital positioners without any communications protocols to HART and FOUNDATION Fieldbus positioners and advanced diagnostics, Flowserve positioners provide state of the art performance and reliability to meet the needs of even the most critical processes.
- Flowserve introduced the first intelligent control system into the market. This unique system combines a control valve, pressure and temperature sensor, and PID control loop in an efficient, compact package.



# General Application




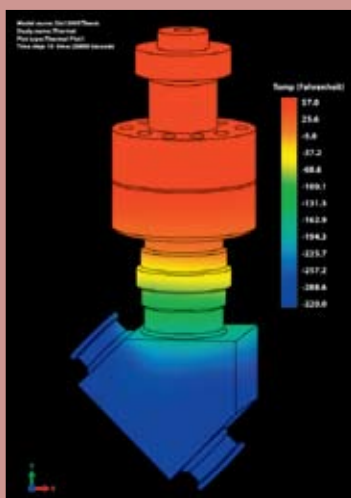
# Rotary

Design	Butterfly	Butterfly	Butterfly	Eccentric Rotary Plug
Product				
Type	<i>Torex</i>	<i>Valdisk BX</i>	<i>Valdisk</i>	<i>MaxFlo 3</i>
Size Range	3 to 24" (DN80 to DN600)	2 to 30" (DN50 to DN760)	2 to 30" (50 to 760 mm)	1 to 12" (DN25 to DN300)
Pressure Rating	Class 150 to 300 (PN10 to 40)	Class 150 to 300 (PN10 to 40)	Class 150 to 2500	Class 150 to 300 (PN10 to 40)
End Connections	Wafer Lugged	Wafer Lugged	Wafer Lugged	Flanged (size 1"-12") Flangeless (size 1"-8")
Body Materials	Stainless steel	Carbon steel Stainless steel	Carbon steel Stainless steel	Carbon steel Stainless steel
Temp. Range	-30 to +660°F (-34 to +350°C)	-100 to +800°F (-73 to +427°C)	-400 to +1200°F (-240 to +650°C)	-150 to +750°F (-101 to +399°C)
Shutoff Class	IV, V, VI SS-ISO 5208-2 Rate A DIN 3230 BN Leakrate 1	IV and VI	IV, V, VI	IV and VI
Cv Range	245 to 24267	62 to 31000	50 to 20200	7 to 3600
Main Features	<ul style="list-style-type: none"> <li>• Triple offset design</li> <li>• Low operating torque</li> </ul>	<ul style="list-style-type: none"> <li>• Double offset design</li> <li>• Excellent high cycle tightness</li> </ul>	<ul style="list-style-type: none"> <li>• Double offset design</li> <li>• NACE</li> </ul>	<ul style="list-style-type: none"> <li>• Non-crossover shaft</li> <li>• Anti blow-out system</li> <li>• High Cv capacity</li> <li>• Rangeability 160:1</li> <li>• NACE</li> </ul>
Options	<ul style="list-style-type: none"> <li>• Alloy body material available</li> <li>• Fire safe design</li> <li>• Internally polished body and disk</li> <li>• Stem sealing for vacuum</li> <li>• CE mark</li> </ul>	<ul style="list-style-type: none"> <li>• Alloy body material available</li> <li>• Four seat designs</li> </ul>	<ul style="list-style-type: none"> <li>• Alloy body material available</li> <li>• Cryogenic design available</li> <li>• Fire-safe design</li> </ul>	<ul style="list-style-type: none"> <li>• Other body material on request</li> <li>• Noise attenuator available</li> <li>• Low emission packing</li> <li>• Seat reductions available</li> <li>• Brewery application</li> </ul>



			Linear
Ball Sector	Ball Sector	Full Bore Ball	Linear Globe
			
<b>Shearstream SB</b>	<b>Shearstream HP</b>	<b>Duball</b>	<b>FlowTop</b>
1 to 16" (DN25 to DN400)	1 to 16" (25 to 400 mm)	1 to 20" (DN25 to DN500)	½ to 4" (DN15 to DN100)
Class 150 to 300 (PN10 to 40)	Class 150 to 600	Class 150 to 300 (PN10 to 40)	Class 150 to 300 (PN10 to 40)
Flanged Wafer	Flanged Wafer	Flanged	Flanged
Carbon steel Stainless steel	Carbon steel Stainless steel	Carbon steel Stainless steel	Carbon steel Stainless steel
-30 to +435°F (-34 to +224°C)	-50 to +600°F (-45 to +315°C)	-30 to +350°F (-34 to +177°C)	-50 to +800°F (-45 to +427°C)
IV SS-ISO 5208-2 Rate A DIN 3230 BN Leakrate 1	IV and VI	IV, V, VI SS-ISO 5208-2 Rate A DIN 3230 BN Leakrate 2	IV to VI
1.75 to 13900	24 to 7150	73 to 29000	0.19 to 231
<ul style="list-style-type: none"> <li>• V-shaped sector</li> <li>• High rangeability</li> </ul>	<ul style="list-style-type: none"> <li>• One-piece body</li> <li>• V-notch ball</li> <li>• 300:1 rangeability</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy-duty 2-piece ball valve</li> <li>• Excellent tightness in both flow directions</li> </ul>	<ul style="list-style-type: none"> <li>• Direct mounted accessory</li> <li>• High flow coefficient, Cv</li> <li>• Modular design</li> <li>• Meets the requirements for SIL 3/4 according to IEC 61508</li> </ul>
<ul style="list-style-type: none"> <li>• Z-Trim 2 to 16" (DN50 to 400) for cavitation and noise reduction</li> <li>• Alloy body material available</li> </ul>	<ul style="list-style-type: none"> <li>• Alloy body material available</li> <li>• Bi-directional seats available</li> </ul>	<ul style="list-style-type: none"> <li>• Ceramic version</li> <li>• Fire safe</li> <li>• Anti-static</li> <li>• Pocket ball valve</li> <li>• A-trim or Z-trim 2 to 16" (DN50 to 250) for cavitation and noise reduction</li> <li>• Alloy body material available</li> </ul>	<ul style="list-style-type: none"> <li>• Low noise and anti-cavitation: Silentpack</li> <li>• DVGW certification up to 6" (DN150)</li> <li>• Bellows</li> <li>• Post guiding</li> <li>• Stellite plug and seat</li> </ul>

## Low Temperature & Cryogenic


Design	Linear Angle Top Entry	Linear Angle Top Entry
<b>Product</b>		
<b>Type</b>	<i>ColdFlow™ - 041000</i>	<i>ColdFlow™ - 241000</i>
<b>Size Range</b>	1 to 16" (DN25 to DN400)	1/6 to 6" (DN4 to DN150)
<b>Pressure Rating</b>	Class 150 to 400 (PN10 to 63)	Class 150 to 300 (PN10 to 40)
<b>End Connections</b>	Butt weld Socket weld	Butt weld Socket weld
<b>Body Materials</b>	Aluminum	Stainless steel
<b>Temp. Range</b>	Down to -321°F (-196°C)	Down to -454°F (-270°C)
<b>Shutoff Class</b>	Up to VI	Up to VI
<b>Cv Range</b>	0.12 to 730	0.0012 to 647
<b>Main Features</b>	<ul style="list-style-type: none"> <li>• Top entry up to 4" (DN100)</li> <li>• Stainless steel extension bolted</li> </ul>	<ul style="list-style-type: none"> <li>• Top entry</li> <li>• Cryogenic extension welded on body</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• Bellows seals</li> <li>• Stainless steel body material</li> <li>• Soft seat</li> <li>• Cover plate for vacuum sealing</li> </ul>	<ul style="list-style-type: none"> <li>• Bellows seal</li> <li>• Soft seat</li> <li>• Cover plate for vacuum sealing</li> </ul>

Linear Globe Top Entry		Special Features	
			
Mark Six		Cryogenic Valve Testing	
<p>1/2 to 12" (15 to 300 mm)</p> <p>Class 150 to 4500</p> <p>Screwed Butt weld or Socket weld Flanged</p> <p>Stainless steel Nickel alloys Bronze</p> <p>Down to -360°F (-218°C)</p>			
<p>Up to VI</p> <p>0.012 to 400</p> <ul style="list-style-type: none"> <li>Streamlined, light weight body for reduced heat transfer</li> <li>Top entry for easy service without breaking down the cold box</li> </ul>		<p><b>Product / Specialist Knowledge:</b></p> <p>FlowsERVE top entry cryogenic valves are the answer for gas liquefaction and air separation applications. FlowsERVE top entry cryogenic valves are designed so that all of the internal valve trim components can be accessed and disassembled from the top. This simplifies maintenance for valves installed in a cold box or welded in line.</p>	
<ul style="list-style-type: none"> <li>“Y” type body</li> <li>Rubber boot</li> <li>Seal boot</li> <li>Metallurgical development with gold vacuum brazing</li> <li>Monel and copper</li> </ul>			





## Medium Pressure



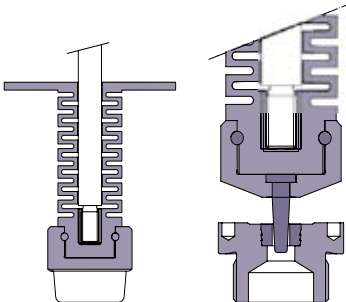

Design	Linear Globe Plug Head Guiding	Linear Globe Double Top Stem Guiding
<b>Product</b>		
<b>Type</b>	<i>TotalFlow™ - 035000</i>	<i>Mark One</i>
<b>Size Range</b>	1 to 6" (25 to 150 mm)	½ to 36" (15 to 915 mm)
<b>Pressure Rating</b>	Class 150 to 2500	Class 150 to 2500
<b>End Connections</b>	Flanged Butt weld Socket weld	Flanged Butt weld Socket weld Screwed
<b>Body Materials</b>	Carbon steel Stainless steel Special alloys	Carbon steel Stainless steel Most alloys
<b>Temp. Range</b>	-321 to +1022°F (-196 to +550°C)	-320 to +1500°F (-196 to +815°C)
<b>Shutoff Class</b>	IV to VI	IV to VI
<b>Cv Range</b>	0.012 to 460	0.46 to 11000
<b>Main Features</b>	<ul style="list-style-type: none"> <li>• Compact and lightweight</li> <li>• Wide variety of alloy material</li> </ul>	<ul style="list-style-type: none"> <li>• Versatile body</li> <li>• High pressure drops</li> <li>• Low noise and anti-cavitation trims</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• Angle, 3-way</li> <li>• Bellows seal</li> <li>• Cryogenic bonnet</li> <li>• Steam jacket</li> <li>• Various trim options</li> <li>• TA-Luft packing</li> </ul>	<ul style="list-style-type: none"> <li>• Angle, 3-way</li> <li>• Bellows seal</li> <li>• Cryogenic bonnet</li> <li>• Steam jacket</li> <li>• CavControl trim</li> <li>• ChannelStream trim</li> <li>• MegaStream trim</li> <li>• TigerTooth trim</li> <li>• Stealth trim</li> </ul>





## High Pressure

Linear “Y” Style Globe Double Top Stem Guiding	Linear Globe Plug Double Top Stem Guiding	Linear Angle Body Plug Head Guiding
		
Mark Eight	Mark 100	HpFlow™ - 011000 / 015000 / 017000 Series*
1 to 18" (25 to 450 mm)	6 to 30" (150 to 750 mm)	1/8 to 3 1/2" (DN3 to DN90)
Class 150 to 2500	Class 150, 300 and 600	Up to 60,000 psi (414 MPa) Up to PN4000
Flanged Butt weld Socket weld Screwed	Flanged Butt weld	Threaded Screwed flange according to IG standard DIN and ANSI flanges
Stainless steel Carbon steel Most alloys	Stainless steel Carbon steel	Stainless steel Special alloys
-320 to +1500°F (-196 to +815°C)	-321 to +1500°F (-196 to +815°C)	-22 to +1022°F (-30 to +550°C)
IV and VI	IV to VI	IV to VI
10 to 3060	429 to 10925	0.0000012 to 46
<ul style="list-style-type: none"> <li>• “Y” type body</li> </ul>	<ul style="list-style-type: none"> <li>• High capacity</li> <li>• Versatile body</li> <li>• Low noise and anti-cavitation trims</li> </ul>	<ul style="list-style-type: none"> <li>• Split body</li> <li>• High pressure drops</li> </ul>
<ul style="list-style-type: none"> <li>• CavControl trim</li> <li>• ChannelStream trim</li> <li>• MegaStream trim</li> <li>• TigerTooth trim</li> <li>• Stealth trim</li> </ul>	<ul style="list-style-type: none"> <li>• CavControl trim</li> <li>• ChannelStream trim</li> <li>• MegaStream trim</li> <li>• TigerTooth trim</li> <li>• Stealth trim</li> </ul>	<ul style="list-style-type: none"> <li>• Bellows seal</li> <li>• Cryogenic bonnet</li> <li>• Seat and plug in ceramic or tungsten carbide</li> <li>• PTFE soft seat</li> <li>• TA-Luft packing</li> <li>• ANSI or DIN flanges</li> </ul> <p>*Note: For size-specific features and options, contact Flowserve.</p>




## Low Flow & Micro Flow

Design	Linear Globe Split Body	Linear Globe Casting Body	Linear Globe	Linear Globe
Product				
Type	<i>020000</i>	<i>030000</i>	<i>SmallFlow™ - 030000</i>	<i>185000 / 285000</i>
Size Range	1/2 to 1" (DN10 to DN25)	1/2 to 1" (DN10 to DN25)	1/4" (DN6)	1/2 to 1" (DN15 to DN25)
Pressure Rating	Class 150 to 2500 (PN10 to 400)	Class 150 to 300 (PN10 to 40)	Class 150 to 2500 (PN10 to 400)	Class 150 to 2500 (PN10 to 400)
End Connections	Flanged Screwed	Flanged Screwed NPT, G	Screwed NPT, G	Screwed NPT, G Flanged
Body Materials	Stainless steel	Stainless steel	Stainless steel Special alloys	Stainless steel Special alloys
Temp. Range	-321 to +1022°F (-196 to +550°C)	-22 to +752°F (-30 to +400°C)	-22 to +1022°F (-30 to +550°C)	-321 to +1022°F (-196 to +550°C)
Shutoff Class	IV to VI	IV to VI	IV to VI	IV to VI
Cv Range	0.0000012 to 2.9	0.0012 to 2.9	0.0000012 to 2.9	0.0000012 to 2.9
Main Features	<ul style="list-style-type: none"> <li>• Split body design</li> </ul>	<ul style="list-style-type: none"> <li>• Casting design</li> <li>• Compact control valve</li> </ul>	<ul style="list-style-type: none"> <li>• Compact valve with the actuator</li> </ul>	<ul style="list-style-type: none"> <li>• Compact valve with the actuator</li> </ul>
Options	<ul style="list-style-type: none"> <li>• Angle</li> <li>• 3-way valve</li> <li>• Cryogenic extension</li> <li>• Soft seat</li> <li>• TA-Luft packing</li> <li>• Bellows</li> </ul>	<ul style="list-style-type: none"> <li>• Bellows seal</li> </ul>	<ul style="list-style-type: none"> <li>• Angle</li> <li>• Bellows seal</li> </ul>	<ul style="list-style-type: none"> <li>• Angle</li> <li>• 3-way valve</li> <li>• Cryogenic extension</li> <li>• Bellow seal</li> </ul>






	<h1>Corrosive</h1>	
<b>Special Features</b>	<b>Linear Globe Lined Body</b>	<b>Special Features</b>
		
<b>Low Flow Experience</b>	<b>LinedFlow™ - 132000</b>	<b>Lining &amp; Bellows Detail</b>
<ul style="list-style-type: none"> <li>• Low Flow valves from 1/4" to 1/2" valve sizes and pressure classes up to ANSI class 2500 (PN400).</li> <li>• The large Cv range from 0.0000012 up to 2.9 with reproducible characteristics and Cv values are unique in the market.</li> <li>• Wide range of body materials and end connection designs meet almost all applications and customer specifications.</li> <li>• Extremely low Cv values are hand made with permanent control through the manufacturing. Each custom designed plug can be duplicated to obtain the identical Cv and flow characteristic using a manufacturing reference model.</li> <li>• Laboratory and research facilities as well as carbonating equipment or large production plants with exact and precise control requirements are the main application fields for low flow valves.</li> </ul> 	<p>1/2 to 4" (DN15 to DN100)</p> <p>Class 150 (PN16)</p> <p>Flanged</p> <p>Lined ductile iron 0.7043</p> <p>-40 to +392°F (-40 to +200°C)</p> <p>IV to VI</p> <p>0.012 to 210</p> <ul style="list-style-type: none"> <li>• Lined body</li> <li>• TFM internal parts</li> <li>• Bellows seal</li> </ul> <ul style="list-style-type: none"> <li>• Different liner materials are available upon request</li> <li>• Hastelloy C plug and seat inserts for small Cv values</li> </ul>	<ul style="list-style-type: none"> <li>• The Series 132000 control valve completes the range of lined valves within the FLOWSERVE corporation. Many years of experience in the manufacture of lined ball and plug valves and the sophisticated experience of manufacturing excellent reproducible trims for linear valves are combined in this new product.</li> <li>• High quality lining materials such as PFA (standard), PVDF, PP, ETFE and FEP as well as PFA antistatic cover most mediums and applications. The revolutionary PTFE bellows design allows a standard pressure rating of PN16.</li> <li>• T-grooves provide an extremely positive connection between the liner and the metal valve body, especially important in vacuum applications.</li> </ul>





	<b>Sanitary &amp; Aseptic</b>	<b>Special/Other</b>		
<b>Design</b>	<b>Linear Angle CIP/SIP</b>	<b>Desuperheater Injection Nozzle Valve</b>	<b>Linear Angle Injection Nozzle Valve</b>	<b>Ball Sector Valve</b>
<b>Product</b>				
<b>Type</b>	<b>CleanFlow™ - 191000</b>	<b>VariCool</b>	<b>VaporCool</b>	<b>V-Flow</b>
<b>Size Range</b>	½ to 4" (DN10 to DN100)	For steampipe: 6 to 40" (DN150 to 1000) (152 to 1016 mm) Water connection: 1, 1 ½" (DN25, 40) (25, 38 mm) Steam connection: 3, 4, 6" (DN80, 100, 150) (76, 102, 152 mm)	1 and 1 ½" (DN25 and DN40) (25 and 38 mm) Water connection for steampipe 6 to 40" (DN 150 to 1000) (152 to 1016 mm)	½ to 6" (DN15 to DN150)
<b>Pressure Rating</b>	Class 150 (PN10 to 16)	Class 300 to 2500 (PN40 to 160)	Class 300 to 2500 (PN40 to 160)	Class 150 to 300 (PN10 to 40)
<b>End Connections</b>	Clamped Butt weld Threaded Flanged	Flanged	Flanged	Flanged Butt weld Socket weld Screwed
<b>Body Materials</b>	Stainless steel	Stainless steel: 1.4571, A182 F304 Carbon steel: 1.7335, A182 F12	Carbon steel Stainless steel	Carbon steel Stainless steel Nickel alloys
<b>Temp. Range</b>	-13 to +356°F (-25 to +180°C)	+14 to +986°F (-10 to +530°C)	+14 to +986°F (-10 to +530°C)	-22 to +572°F (-30 to +300°C)
<b>Shutoff Class</b>	IV	IV and V	IV	VI
<b>Cv Range</b>	0.012 to 190	0.15 to 7.3	0.02 to 20	8 to 1880
<b>Main Features</b>	<ul style="list-style-type: none"> <li>• 3A approval</li> <li>• Conforms to FDA and USDA standards</li> </ul>	<ul style="list-style-type: none"> <li>• No cooling valve necessary</li> <li>• Patented nozzle design</li> <li>• Easy changeable nozzle design</li> <li>• Differential pressure up to 1305 psi (90 bar)</li> <li>• Modular design</li> </ul>	<ul style="list-style-type: none"> <li>• Complete atomization</li> <li>• Lowest Dp atomisation available</li> <li>• No moving parts</li> <li>• Quick change multi-nozzle spray head</li> </ul>	<ul style="list-style-type: none"> <li>• Characterized control seat</li> <li>• Ball plug</li> <li>• Modular design</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• Test port connection</li> <li>• Aseptic diaphragm and bonnet</li> <li>• Class VI shutoff (with soft seat)</li> </ul>	<ul style="list-style-type: none"> <li>• Installation set</li> <li>• Strainer</li> </ul>	<ul style="list-style-type: none"> <li>• Installation set</li> <li>• Strainer</li> <li>• Electric actuator</li> </ul>	

## Custom Engineered Products


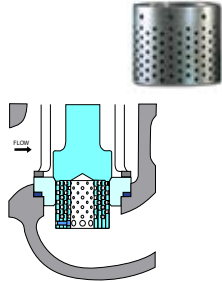
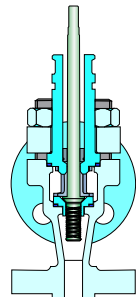
Linear Globe Y-Design Tank Flush	Sweep Angle Severe Application	Multi-Stage Trim Type Large Solids Capability
		
<i>DrainFlow™ - 051000</i>	<i>Survivor</i>	<i>Multi-Z</i>
1 x 1/2 to 10 x 8" (25 x 15 to 250 x 200 mm)	1 to 14" (DN25 to DN350)	1 to 8" (DN 25 to 200)
Class 150 to 2500 (PN10 to 160)	Class 300 to 2500 (PN 40 to 160)	Class 300 to 2500 (PN40 to 400)
Flanged Butt weld	Flanged	Weld ends Flanged Screwed NPT
Stainless steel Most special alloys	Stainless steel Carbon steel	Carbon steel Stainless steel CrMo steel
-4 to +752°F (-20 to +400°C)	+14 to +752°F (-10 to +400°C)	+14 to +752°F (-10 to +400°C)
IV to VI	IV	Individually to service conditions
4.6 to 645	8 to 2604	0.03 to 137
<ul style="list-style-type: none"> <li>• Tank flush valve - outlet angle 45° or 60°</li> </ul>	<ul style="list-style-type: none"> <li>• Specially designed for severe service slurry</li> <li>• Wiper rings</li> <li>• Extended venturi seat design</li> <li>• Specially designed for severe flashing in erosive services</li> </ul>	<ul style="list-style-type: none"> <li>• Linear Multi Stage design (3, 4 or 5 stages)</li> <li>• Venturi outlet nozzle</li> <li>• Balanced or unbalanced plug design</li> <li>• Solids up to 0.5"</li> <li>• High rangeability</li> </ul>
<ul style="list-style-type: none"> <li>• Bellows</li> </ul>	<ul style="list-style-type: none"> <li>• Different body and trim material available including ceramic and titanium</li> </ul>	<ul style="list-style-type: none"> <li>• Plug and seat material in accordance to application</li> <li>• Cv value to be designed to actual conditions</li> </ul>

## Severe Services

Design	Cavitation Control, Liquid Services	Cavitation Control, Liquid Services	Cavitation Control and Noise Reduction	Cavitation Control and Noise Reduction	Cavitation Control and Noise Reduction
Product					
Type	<i>Multi-Z</i>	<i>ZK Trim</i>	<i>MultiStream</i>	<i>Silentpack</i>	<i>Z-Trim</i>
Base Valve	Multi-Z Valves	Gestra ZK	Flowtop	Flowtop	NAF-Setball
Size Range	1 to 8" (DN 25 to 200) (25.4 to 203 mm)	1 to 3" (DN25 to 150) (25.4 to 76 mm)	½ to 4" (DN15 to 100) (12.7 to 102 mm)	½ to 4" (DN15 to 100) (12.7 to 102 mm)	2 to 20" (DN50 to 500) (51 to 508 mm)
Cv Range	0.03 to 137	2.7 to 20	0.19 to 231	0.19 to 231	90-7400
Flow Direction	Flow Under	Flow Over	Flow over for cavitation, flow under for noise	Flow over for cavitation, flow under for noise	Bi-directional
Dirty Service	Low clogging potential	High clogging potential	Moderate clogging potential	Moderate clogging potential	Allows impurities
Main Features	<ul style="list-style-type: none"> <li>• Unique venturi outlet nozzle</li> <li>• Linear multistage plug</li> <li>• Eliminates cavitation</li> <li>• Forgiving of solids in the process</li> <li>• High rangeability</li> <li>• Custom characteristics</li> <li>• Protected seat from high velocity</li> <li>• Unbalanced or balanced trim design</li> <li>• The only valve certified and tested by a boiler feed-pump manufacturer</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent sealing and control characteristics</li> <li>• Extremely wear resistant</li> <li>• Valve designed on modular assembly principle</li> <li>• Low sound level</li> <li>• Easy assembly and inspection of nozzle insert</li> <li>• Leakage-free pressure balanced design</li> </ul>	<ul style="list-style-type: none"> <li>• Attenuation: up to 20 dBA</li> <li>• Efficient, modular design with standardized combinations for noise reduction and cavitation control</li> <li>• Easy upgrade of standard control valves to MultiStream design (no change of the trim set)</li> </ul>	<ul style="list-style-type: none"> <li>• Attenuation: up to 18 dBA</li> <li>• Efficient, modular design with standardized combinations for noise reduction</li> <li>• For gas and steam service to reduce noise: wire wrapping package within a frame in combination with all parabolic plug designs</li> <li>• Easy upgrade of standard control valves to Silentpack design (no change of the trim set)</li> </ul>	<ul style="list-style-type: none"> <li>• Attenuation &lt;= 15 dBA</li> <li>• Tight shutoff</li> <li>• The unique patented Z-trim design reduces noise and cavitation by taking the pressure drop in several steps. The design is based on a ball sector valve with trim which splits the flow into many smaller flows and the pressure drops into 3 steps which offers major control benefits.</li> <li>• A V-shaped sector provides accurate control over a wide range, even at low flow rates.</li> <li>• A combined function makes it possible to manage high pressure drops at low flow and small opening angles and high capacity (Cv) at large opening angles.</li> <li>• The shaping of Z-trim makes it possible to use the valve for media with some solid parts, e.g. pulp, without risk to plug the valve.</li> </ul>






Cavitation Control and Noise Reduction			
Cavitation Control and Noise Reduction	Cavitation Control and Noise Reduction	Cavitation Control Liquid Services	Cavitation Control Liquid Services
			
<i>Z-Trim</i>	<i>A-Trim</i>	<i>CavControl</i>	<i>CavStream</i>
NAF-Duball	NAF-Duball	Mark One, Mark One-X, Mark Two, Mark Eight & Mark 100	Mark One, Mark One-X, Mark Two & Mark Six
2 to 20" (DN50 to 500) (51 to 508 mm)	2 to 10" (DN50 to 250) (51 to 508 mm)	1 to 24" (25 to 610 mm)	0.5 to 3" (12.7 to 77 mm)
140-9500	30-650	1.5 to 1000	0.4 to 88
Bi-directional	Bi-directional	Flow over the plug	Flow over the plug
Allows impurities	Clean media	Low clogging potential	Low clogging potential
<ul style="list-style-type: none"> <li>• Attenuation &lt; = 25 dBA</li> <li>• Tight shutoff</li> <li>• The unique patented Z-trim design reduces noise and cavitation by taking the pressure drop in several steps. The design is based on a NAF-Duball valve with trim which splits the flow into many smaller flows and the pressure drops into 3 steps which offers major control benefits.</li> <li>• A combined function makes it possible to manage high pressure drops at low flow and small opening angles and high capacity (Cv) at large opening angles.</li> <li>• The shaping of Z-trim makes it possible to use the valve for media with some solid parts, e.g. pulp, without risk to plug the valve.</li> </ul>	<ul style="list-style-type: none"> <li>• Attenuation &lt; = 25 dBA</li> <li>• Tight shutoff</li> <li>• The patented A-trim design gives the highest noise reduction for clean medias.</li> <li>• The ball has a large number of small zigzag channels to take the pressure drop in several steps. When the valve is opening the channels will be opened one by one and up to 45° the flow is forced to pass the channels twice.</li> <li>• After the ball valve has been opened through an angle of 45°, the channel will be gradually exposed and the media will flow through the channels only once.</li> <li>• Every channel comprises a large number of deflections, which enables the pressure drop to take place in many small steps.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.2</li> <li>• CavControl controls cavitation damage by relocating the cavitation bubbles away from metal surfaces. It utilizes a number of diametrically opposed holes to isolate cavitation by impinging a cavitating jet of fluid on a similar jet created on the opposite side of the retainer. Impinging jets create a column of cavitation in the center of the retainer.</li> <li>• Small, stepped holes are used to relocate the vena contracta away from metal surfaces, further reducing cavitation damage.</li> <li>• CavControl uses a drilled hole seat retainer.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.2</li> <li>• CavStream uses the same technology as CavControl to control cavitation damage, except the controlling holes are drilled into the plug head rather than the seat retainer.</li> </ul>





## Severe Services

Design	Cavitation Control, Liquid Services	Cavitation Control, Liquid Services	Cavitation Control, Liquid Services
<b>Product</b>			
<b>Type</b>	<i>ChannelStream</i>	<i>Low Cv ChannelStream</i>	<i>MicroCav</i>
<b>Base Valve</b>	Mark One, Mark One-X, Mark Two, Mark Eight & Mark 100	Mark One, Mark One-X, Mark Two & Mark Six	Mark One, Mark One-X & Mark Two
<b>Size Range</b>	1.5 to 36" (38 to 914 mm)	1 to 3" (25 to 76 mm)	1, 1.5 and 2" (25, 38, and 51 mm)
<b>Cv Range</b>	6 to 720	0.25 to 50	0.007 to 1.25
<b>Flow Direction</b>	Flow over the plug	Flow over the plug	Flow over the plug
<b>Dirty Service</b>	High clogging potential	High clogging potential	High clogging potential
<b>Main Features</b>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.002</li> <li>• Works best in mild to moderate cavitation and dirty services</li> <li>• ChannelStream eliminates cavitation by using a series of holes and channels to reduce the pressure in stages. Pressure reduction mechanisms include impingement, expansion and contraction, and small passages. More stages can be added as required by the design pressure drop.</li> <li>• ChannelStream uses a set of nested cylinders in place of the seat retainer. Each cylinder has a set of holes and intersecting channels around the outside diameter. In the channels, flow is accelerated and the pressure recovers in each hole. One contraction and expansion comprises a stage, leading to one stage for each cylinder.</li> <li>• ChannelStream eliminates cavitation and the damage caused by the effects of cavitation.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.002</li> <li>• Same great performance as the CavControl, but lower capacities</li> <li>• Low Cv ChannelStream uses the same technology as ChannelStream to eliminate cavitation, except the stages are built into the plug head rather than the seat retainer.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.006</li> <li>• Exceptionally low flow capabilities</li> <li>• The unique MicroCav design utilizes a special plug that is closely guided within the seat ring. The plug head is designed with a series of special-engineered grooves that continually expand as they progress diagonally along the length and around the circumference of the plug head, allowing the grooves to continually intersect with each other. The fluid passes through the grooves, experiencing a continual increase in flow area while allowing for staged pressure reduction. Staged pressure reduction takes place as the fluid impinges upon itself when the grooves intersect.</li> </ul>






Noise Reduction Gas Services		
Noise Reduction Gas Services	Cavitation Control and Noise Reduction	Noise Reduction Gas Services
		
<i>MegaStream</i>	<i>TigerTooth</i>	<i>Stealth</i>
Mark One, Mark One-X, Mark Two, Mark Eight & Mark 100	Mark One, Mark Two, Mark Eight & Mark 100	Mark One & Mark 100
1 to 36" (25 to 914 mm)	1.5 to 36" (38 to 914 mm)	6 to 36" (152 to 914 mm)
5 to 10100	4 to 4000	to 4000
Flow under the plug	Flow under the plug	Flow under the plug
Low clogging potential	Low clogging potential	High clogging potential
<ul style="list-style-type: none"> <li>• Attenuation of up to 20 dBa</li> <li>• MegaStream eliminates valve noise by controlling pressure reduction and gaseous turbulence. Pressure drops are taken in multiple stages with attenuation taking place at each stage.</li> <li>• MegaStream uses nested cylinders in place of the seat retainer. Each drilled cylinder represents a stage of pressure reduction.</li> <li>• MegaStream uses three or more stages. MegaStream II utilizes one or two stages while using standard Mark I parts for lower cost.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates Sigma as low as 1.002</li> <li>• Tolerates P1/P2 ratios of up to 40</li> <li>• Attenuation of up to 30 dBa</li> <li>• TigerTooth uses stacked disc sets with grooves or teeth to take multiple stage pressure drops. Sudden expansions and contractions occur over each tooth to create staged pressure drops.</li> <li>• TigerTooth stacks are used in place of the valve seat retainer.</li> <li>• Used in both gas and liquid applications TigerTooth can be used to eliminate cavitation or attenuate noise.</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerates P1/P2 ratios of up to 40</li> <li>• Attenuation of up to 40 dBa</li> <li>• Stealth uses laser-cut discs to stacked disc retainers. The cuts in the discs form channels for the fluid to pass through.</li> <li>• Stealth is the most efficient high pressure drop noise attenuation trim ever developed.</li> <li>• Stealth uses all known pressure drop and noise attenuation methods known, including:                             <ul style="list-style-type: none"> <li>• Multiple sharp turns</li> <li>• Frictional losses</li> <li>• Sudden expansions and contractions</li> <li>• Multiple stage pressure reduction</li> <li>• Pressure drop control</li> <li>• Tortuous path</li> <li>• Frequency shift</li> <li>• Jet isolation</li> <li>• Multiple stage acoustic impedance</li> <li>• Acoustic impedance chamber</li> <li>• Velocity &amp; expansion control</li> </ul> </li> </ul>




## Actuators *Linear*

Design	Diaphragm With Spring Return	Diaphragm With Spring Return	Diaphragm With Spring Return	Diaphragm With Spring Return	Diaphragm With Spring Return
<b>Product</b>					
<b>Type</b>	<i>FlowAct</i>	<i>Series 1</i>	<i>Series 2</i>	<i>Series 3</i>	<i>Series 4</i>
<b>Supply</b>	Up to 90 psi (6 bar)	Up to 65 psi (4.5 bar)	Up to 87 psi (6 bar)	Up to 87 psi (6 bar)	Up to 60 psi (4 bar)
<b>Number of Sizes</b>	6	2	4	2	4
<b>Diaphragm/ Piston Area</b>	19.4 to 465 in <sup>2</sup> (125 to 3000 cm <sup>2</sup> )	4 to 12.4 in <sup>2</sup> (26 to 80 cm <sup>2</sup> )	18.6 to 186 in <sup>2</sup> (120 to 1200 cm <sup>2</sup> )	263.5 to 496 in <sup>2</sup> (1700 to 3200 cm <sup>2</sup> )	12.4 to 155 in <sup>2</sup> (80 to 1000 cm <sup>2</sup> )
<b>Force or Torque</b>	Up to 20, 200 lb. (90 kN)	135 to 360 lb. (0.6 to 1.6 kN)	135 to 7,640 lb. (0.6 to 34 kN)	Up to 22,480 lb. (100 kN)	90 to 4,496 lb. (0.4 to 20 kN)
<b>Stroke or Angle</b>	Up to 4" (100 mm)	0.4" (10 mm)	Up to 3.15" (80 mm)	Up to 3.15" (80 mm)	Up to 1.6" (40 mm)
<b>Temp. Range</b>	-40 to +176°F (-40 to +80°C)	-40 to +176°F (-40 to +80°C)	-40 to +176°F (-40 to +80°C)	-40 to +176°F (-40 to +80°C)	-22 to +176°F (-30 to +80°C)
<b>Handwheel</b>	Top mounting up to size 700 Side mounting 1500 to 3000	N/A	Top mounted	Top mounted	Top mounted
<b>Options</b>	<ul style="list-style-type: none"> <li>• Travel stop</li> <li>• Top handwheel in "light" and "heavy" design</li> </ul>		<ul style="list-style-type: none"> <li>• Travel stop</li> </ul>	<ul style="list-style-type: none"> <li>• Travel stop</li> </ul>	<ul style="list-style-type: none"> <li>• Travel stop</li> <li>• Integrated positioner</li> <li>• Integrated limit switches</li> </ul>
<b>Remarks</b>	<ul style="list-style-type: none"> <li>• Universal yoke designed in response to VDI/ VDE and Namur standard mounting for positioners and accessories also available for the semi-integrated Flowserve positioner Logix 500si</li> <li>• Field reversible</li> </ul>	<ul style="list-style-type: none"> <li>• Very compact actuator developed for low flow valve that requires small bulk</li> <li>• First diaphragm actuator in aluminium designed for chemical industry and suitable on all Kämmer valves</li> </ul>	<ul style="list-style-type: none"> <li>• Complete stainless steel actuator designed for corrosive atmosphere and suitable for all Flowserve valves</li> </ul>	<ul style="list-style-type: none"> <li>• Field reversible</li> <li>• Heavy duty actuator to develop high thrust for large valves</li> </ul>	<ul style="list-style-type: none"> <li>• First diaphragm actuator in aluminium developed for chemical industry and suitable on all Kämmer valves</li> </ul>




Piston With Spring Return	Piston With Spring Return	Piston With Spring Return	Piston With External Spring Return
			
<i>Series VL</i>	<i>Series VL-C</i>	<i>Series VL-UHC</i>	<i>Series VL-ES</i>
Up to 150 psi (10 bar)	Up to 150 psi (10 bar)	Up to 150 psi (10 bar)	Up to 150 psi (10 bar)
8	5	4	5
25 to 600 in <sup>2</sup> (161 to 3,871 cm <sup>2</sup> )	25 to 200 in <sup>2</sup> (161 to 1,290 cm <sup>2</sup> )	25 to 200 in <sup>2</sup> (161 to 1,290 cm <sup>2</sup> )	100 to 400 in <sup>2</sup> (645 to 2,581 cm <sup>2</sup> )
3,700 to 60,000 lb. (16,500 to 266,904 N)	3,700 to 30,000 lb. (16,500 to 133,450 N)	3,700 to 30,000 lb. (16,500 to 133,450 N)	15,000 to 40,000 lb. (66,725 to 177,940 N)
Up to 24" (600 mm)	Up to 24" (600 mm)	Up to 4" (102 mm)	Up to 24" (600 mm)
-20 to +250°F (-29 to +121°C) ambient temperature -40 to +350°F (-40 to +177°C) using optional soft goods	-20 to +250°F (-29 to +121°C) ambient	-20 to +250°F (-29 to +121°C) ambient	-20 to +250°F (-29 to +121°C) ambient
Side mounted Top mounted	Side mounted Top mounted	Side mounted Top mounted	Side mounted Top mounted
Travel stop Lever actuator Field reversible	Travel stop Field reversible	Travel stop	Travel stop Field reversible
<ul style="list-style-type: none"> <li>• Highest thrust in a compact lightweight package</li> <li>• Simple, easy maintenance</li> <li>• Rugged design for long life</li> </ul>	<ul style="list-style-type: none"> <li>• Same as the VL actuator, but with carbon steel construction</li> </ul>	<ul style="list-style-type: none"> <li>• Same as the VL actuator, but with even higher cycle life</li> <li>• Up to 2 million life cycles</li> </ul>	<ul style="list-style-type: none"> <li>• Same as the VL actuator, but with external springs for longer strokes and higher spring thrusts</li> <li>• Maximum thrust</li> <li>• Long Strokes</li> <li>• Simple, easy maintenance</li> <li>• Rugged design for long life</li> </ul>





# Actuators *Rotary*

Design	Diaphragm With Spring Return	Piston With Spring Return	Link Coupling	Rack & Pinion	Scotch Yoke
<b>Product</b>					
<b>Type</b>	<b>NR</b>	<b>VR Cylinder</b>	<b>Turnex</b>	<b>SuperNova</b>	<b>Heavy Duty</b>
<b>Supply</b>	Up to 58 psi (4 bar)	Up to 150 psi (10 bar)	Up to 116 psi (8 bar)	Up to 145 psi (10 bar)	Up to 100 psi (6.9 bar)
<b>Number of Sizes</b>	3	4	11	11	19
<b>Diaphragm / Piston Area</b>	17 - 54 - 116 in <sup>2</sup> (110 - 350 - 750 cm <sup>2</sup> )	23.7 to 188 in <sup>2</sup> (153 to 1212 cm <sup>2</sup> )	3.1 to 124.6 in <sup>2</sup> (20 to 804 cm <sup>2</sup> )	12 to 438 in <sup>2</sup> (79 to 2827 cm <sup>2</sup> )	20 to 450 in <sup>2</sup> (129 to 2,903 cm <sup>2</sup> )
<b>Force or Torque</b>	76 to 25,487 in-lb. (8.6 to 2880 Nm)	1150 to 26,195 in-lb. (130 to 2960 Nm)	885 to 176,991 in-lb. (100 to 20000 Nm)	71 to 44,292 in-lb. (8 to 5005 Nm)	1,000 to 500,000 in-lb. (113 to 56,500 Nm)
<b>Stroke or Angle</b>	Up to 80°	Up to 90°	Up to 96°	Up to 100° as standard Extended travel options	Up to 90°
<b>Temperature Range</b>	-40 to +176°F (-40 to +80°C)	-40 to +351°F (-40 to +177°C)	-22 to +176°F (-30 to +80°C) Standard -40 to +176°F (-40 to +80°C) Low temperature	-22 to +176°F (-30 to +80°C) Standard -58 to +176°F (-50 to +80°C) Low temperature -22 to +302°F (-30 to +150°C) High temperature	-55 to +300°F (-48 to 149°C)
<b>Handwheel</b>	Side mounted	End shaft mounting	Extra long screw	Base mounting	End shaft mounting
<b>Options</b>	<ul style="list-style-type: none"> <li>• Travel stop</li> </ul>	<ul style="list-style-type: none"> <li>• Travel stop</li> <li>• Field reversible</li> </ul>	<ul style="list-style-type: none"> <li>• Locking device</li> <li>• -40°F (-40°C)</li> </ul>	<ul style="list-style-type: none"> <li>• 180° option</li> <li>• Stainless steel pinion</li> <li>• Star shaped pinion drive</li> </ul>	<ul style="list-style-type: none"> <li>• Travel stop</li> </ul>
<b>Remarks</b>	<ul style="list-style-type: none"> <li>• Designed especially to fit on the MaxFlo 3 rotary valves to offer high accuracy and control</li> <li>• Available for both 60 and 80° rotation</li> </ul>			<ul style="list-style-type: none"> <li>• Field reversible</li> <li>• ISO 5211 or DIN 3337 for valve connection</li> <li>• NAMUR for solenoid valve connection</li> <li>• NAMUR for limit switch, positioner and other accessories</li> </ul>	

<h1>Accessories</h1>			
Design	Position Transmitter	Flow Amplifier	Limit Switch
<b>Product</b>			
Type	<i>Position Pac</i>	<i>Flow Booster</i>	<i>UltraSwitch</i>
<b>Supply Pressure</b>	N/A	Up to 10 bar	N/A
<b>Air Consumption</b>	N/A	N/A	N/A
<b>Air Delivery</b>	N/A	Cv = 5.0 for supply and 3.0 for exhaust	N/A
<b>Input Signal</b>	N/A	Output signal from actuator	N/A
<b>Output Signal</b>	4 to 20 mA	Output signal from actuator, one-to-one amplified	4 to 20 mA
<b>Stroke or Angle</b>	0 to 90°	N/A	0 to 180
<b>Temp. Range</b>	-40 to +185°F (-40 to +85°C)	-40 to +167°F (-40 to +75°C)	-40 to 176°F (-40 to 80°C)
<b>Enclosure Rating</b>	IP66/NEMA 4X	N/A	NEMA 4,4X
<b>Hazardous Area Classifications</b>	Meet applicable NEMA standard: 1, 3, 4, 7, 9 and 13; explosionproof rating: Class 1 - Group B (H2TS Only), C and D; and Class II - Groups E, F and G	N/A	UL/CSA Class 1, Div. 1 & 2, Groups C,D / Class 1, Div.2 Groups A,B,C,D / Class 2, Div. 1 & 2. Groups E,F,G / ATEX II 2 G Eexd IIB T5
<b>Communication</b>	N/A	N/A	AS-I (option)
<b>Limit Switches</b>	Up to 4 SPDT UL/CSA rating (L23)	N/A	Up to 4 SPDT
<b>Position Transmitter</b>	Analog 4 to 20 mA or 0 to 20 mA	N/A	4 to 20 mA
<b>Mounting</b>	<ul style="list-style-type: none"> <li>• Direct rotary mounting</li> <li>• Side mounting on the valve</li> </ul>	<ul style="list-style-type: none"> <li>• On casing actuator</li> <li>• On panel</li> </ul>	NAMUR, Double D
<b>Particularity</b>	<ul style="list-style-type: none"> <li>• Ability to combine up to 4 SPDT or 2 SPDT with analog transmitter</li> </ul>	<ul style="list-style-type: none"> <li>• The flow booster is a one-to-one pressure regulator that amplifies flow to increase the stroking speed of actuators.</li> </ul>	Standard High-Visibility (Dome) Bolt on position indicator or flat top for a lower profile. Many switch options can be installed to meet each application's needs. Quick-Set tool free cams.

## Positioners - From Pneumatic to Intelligent Control System

Design	Analog	Analog	Analog
Product			
Type	<b>Beta/NT3000</b>	<b>XL/NT3000</b>	<b>XL90/NT3000</b>
Supply Pressure	Up to 145 psi (10 bar)	Up to 145 psi (10 bar)	Up to 145 psi (10 bar)
Air Consumption	4.37 lbf-ft <sup>3</sup> /h at 58 psi (0.55 Nm <sup>3</sup> /h at 4 bar)	4.37 lbf-ft <sup>3</sup> /h at 58 psi (0.55 Nm <sup>3</sup> /h at 4 bar)	4.37 lbf-ft <sup>3</sup> /h at 58 psi (0.55 Nm <sup>3</sup> /h at 4 bar)
Air Delivery	210.38 lbf-ft <sup>3</sup> /h at 58 psi (26.5 Nm <sup>3</sup> /h at 4 bar)	210.38 lbf-ft <sup>3</sup> /h at 58 psi (26.5 Nm <sup>3</sup> /h at 4 bar)	210.38 lbf-ft <sup>3</sup> /h at 58 psi (26.5 Nm <sup>3</sup> /h at 4 bar)
Input Signal	4 to 20 mA 3 - 15 or 6 - 30 with split range available	4 to 20 mA 3 - 15 or 6 - 30 with split range available	4 to 20 mA 3 - 15 or 6 - 30 with split range available
Output Signal	0 to 100% of supply	0 to 100% of supply	0 to 100% of supply
Stroke or Angle	45° rotation 0.5 to 8" (12.7 to 203 mm)	45° rotation 0.5 to 8" (12.7 to 203 mm)	90° rotation
Temp. Range	-20 to +176°F (-40°F in option) (-29 to +80°C) (-40°C in option)	-20 to 176°F (-40°F in option) (-29 to +80°C) (-40°C in option)	-20 to +176°F (40°F) (-29 to +80°C) (-40°C in option)
Enclosure Rating	IP66/ NEMA 4X	IP66/ NEMA 4X	IP66/ NEMA 4X
Hazardous Area Classifications	Cl.1, Div.1, Grp B, C, D FM/CSA Cl.1, II, III, Div.1 Grp A-E FM/CSA II 2G, EExdIIB+H2T6 II 1G, EExialICT4 (Ta=80°C)	Cl.1, Div.1, Grp B, C, D FM/CSA Cl.1, II, III, Div.1 Grp A-E FM/CSA II 2G, EExdIIB+H2T6 II 1G, EExialICT4 (Ta=80°C)	Cl.1, Div.1, Grp B, C, D FM/CSA Cl.1, II, III, Div.1 Grp A-E FM/CSA II 2G, EExdIIB+H2T6 II 1G, EExialICT4 (Ta=80°C)
Communication	N/A	N/A	N/A
Limit Switches	No	No	Two proximity switches Two mechanical switches
Position Transmitter	No	No	Analog 4 to 20mA
Mounting			• Direct rotary mounting
Particularity	<ul style="list-style-type: none"> <li>• P/P configuration available</li> <li>• Independent zero and span setting</li> <li>• Oxygen service model</li> <li>• Single or double acting</li> </ul>	<ul style="list-style-type: none"> <li>• P/P configuration available</li> <li>• Independent zero and span setting</li> <li>• Single or double acting</li> </ul>	<ul style="list-style-type: none"> <li>• P/P configuration available</li> <li>• Position indicator "dome"</li> <li>• Optional Ultraswitch</li> <li>• Oxygen service model</li> <li>• Single or double acting</li> <li>• Independent zero and span setting</li> </ul>

Digital	Digital	PID Controller	Intelligent Control System
			
<b>Logix 500si</b>	<b>Logix 3000IQ</b>	<b>Logix 2000</b>	<b>StarPac</b>
30 to 150 psi (10 bar)	30 to 150 psi (10 bar)	35 to 145 psi (2.4 to 10 bar)	
4.26 lbf-ft <sup>3</sup> /h at 87 psi (0.120 Nm <sup>3</sup> /h at 6 bar)	4.35 lbf-ft <sup>3</sup> /h at 60 psi (0.5 Nm <sup>3</sup> /h at 4 bar)	3.8 lbf-ft <sup>3</sup> /h at 58 psi (0.48 Nm <sup>3</sup> /h at 4 bar)	3.8 lbf-ft <sup>3</sup> /h at 58 psi (0.48 Nm <sup>3</sup> /h at 4 bar)
247.20 lbf-ft <sup>3</sup> /h at 87 psi (7.0 Nm <sup>3</sup> /h at 6 bar)	247.20 lbf-ft <sup>3</sup> /h at 87 psi (7.0 Nm <sup>3</sup> /h at 6 bar)	159.6 lbf-ft <sup>3</sup> /h (20.1 Nm <sup>3</sup> /h)	159.6 lbf-ft <sup>3</sup> /h (20.1 Nm <sup>3</sup> /h)
4 to 20 mA HART (520si)	4 to 20 mA and HART (3200IQ) Foundation Fieldbus (3400IQ)	Modbus	Modbus
0 to 100% of supply	0 to 100% of supply	0 to 100% of supply	1 to 100% of supply
90° rotation Full Stroke	90° rotation Full Stroke		
-40 to +176°F (-40 to +80°C)	-40 to +176°F (-40 to +80°C)	-40 to +167°F (-40 to +76°C)	-40 to +167°F (-40 to +76°C)
IP65/ NEMA 4X	IP65/ NEMA 4X		IP66 (Starpac I)
ATEX Intrinsically Safe FM/CSA Intrinsically Safe GOST R GOST K GOST GGTN K	ATEX, FM/CSA, IECEx Intrinsically Safe INMETRO Intrinsically Safe ATEX, FM/CSA, IECEx Explosion Proof ATEX Non-incendive GOST R, K, GGTN K	Non incendive Class 1, Div 2, Group A to G FM/CSA	Non incendive Class 1, Div 2, Group B, C, D FM/CSA Cenelec EExdIIB+H2 (Starpac I)
HART (520si)	HART or Foundation Fieldbus	Modbus	Modbus
Options available			
Analog 4 to 20mA	Analog 4 to 20mA	Analog 4 to 20mA	Analog 4 to 20mA
		<ul style="list-style-type: none"> <li>• Pipe-stand</li> <li>• Side mounting on the valve</li> </ul>	<ul style="list-style-type: none"> <li>• Mounted on the valve</li> </ul>
<ul style="list-style-type: none"> <li>• Single button Quick Calibration</li> <li>• Position indicator “dome”</li> <li>• Single or double acting</li> </ul>	<ul style="list-style-type: none"> <li>• Single button Quick Calibration</li> <li>• Remote Mounting option</li> <li>• Stainless Steel housing option</li> <li>• Vented configuration for Natural Gas</li> <li>• Single or double acting</li> </ul>	<ul style="list-style-type: none"> <li>• 2 Analog outputs</li> <li>• Discrete inputs (2 channels)</li> <li>• Discrete outputs -alarm relay</li> <li>• Discrete outputs -pulse relay</li> </ul>	<ul style="list-style-type: none"> <li>• 2 Analog outputs</li> <li>• Discrete inputs (2 channels)</li> <li>• Discrete outputs -alarm relay</li> <li>• Discrete outputs -pulse relay</li> <li>• Measurement signal: inlet and outlet pressure from body and temperature</li> <li>• Based on Logix 2000 technology</li> </ul>



## North American Service Centers

*The choice any maintenance professional must make is: Who should repair my valves? The best answer is to find a repair facility that meets the toughest deadlines, restores the valve as close to its original quality as possible, repairs a wide range of valve styles, and is cost competitive.*

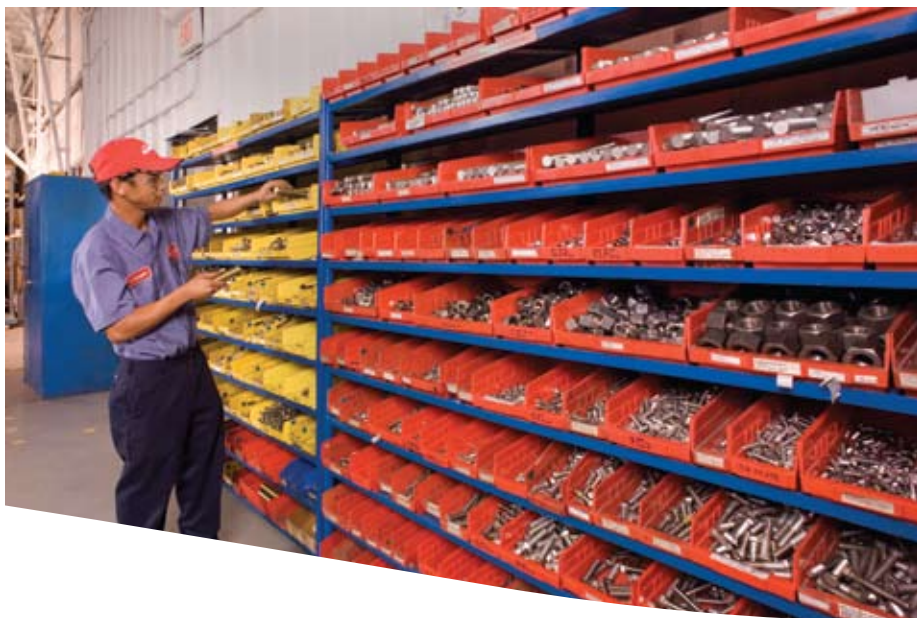
*That answer is Flowserve.*

The factory-trained service technicians at Flowserve restore the original quality to all types of control, manual-operated or pressure relief valves, including Valtek®, Durco®, Kammer®, Fisher®, Masoneilan®, Hammel-Dahl®, etc. To ensure this quality, each Flowserve service center is equipped with thousands of commonly required parts, produced by the OEM or built by skilled valve machinists in-house.

Since Flowserve is an established valve manufacturer, it has the equipment and capacity to turn around any repair project quickly—large or small—including plant shutdowns.

Veteran application engineers stand ready at each location to recommend how to extend the life of the valve or to improve its performance. These engineers also, specialize in upgrading valves to spring cylinder actuators and four-way positioners, or automating quarter-turn valves, which dramatically increases the performance of the valve.





Flowserve's wide experience with building custom engineered valves provides the critical expertise necessary to repair special service valves. If any valve — standard or nonstandard — proves unrepairable, Flowserve is capable of replacing the valve with a new valve, usually within the same time frame.

As with all Flowserve products, strict quality control is maintained at all stages of manufacturing, assembly and testing. In addition to several in-process inspections, all manufactured parts and valve assemblies are 100 percent inspected prior to delivery. These rigid controls ensure longer valve life, thus minimizing future extended plant shutdowns.

Finally, Flowserve backs up this quality with a high level of service, including 24-hour emergency repair, free pick-up and delivery within the facility's service area, and on-site repair with mobile repair units. In emergencies, Flowserve service technicians can be on-site in any North American plant within 24 hours—48 hours for any plant outside of North America.



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