Power Ball valves
One-piece forged metal-seated

U.S. Patent# 6,095,493

ASME classes: 900–4500
Sizes: NPS ½–4 (DN 15–100)

VELAN

VELAN'S PROFILE

VELAN AT A GLANCE

History
- Founded in 1950

Sales
- Over $450 million

People
- Over 1,800 employees

Product line
A world-leading range of valves across all major industrial applications:
- Cast steel gate, globe, check, and ball valves
- Forged steel gate, globe, check, and ball valves
- Triple-offset butterfly valves
- Knife gate valves
- Severe service valves
- Bellows seal valves
- Steam traps

Quality
All major certifications and approvals
- ASME N stamp and NPT for nuclear valves (since 1970)
- ISO 9001 (since 1991)
  Currently certified to ISO 9001:2008
- PED
- GOST (TR and RTN)
- API 6A and API 6D
- TA-Luft
- Quality programs fully compliant with ISO-9001, NCA 4000, ASME NQA-1 and 10 CFR 50 Appendix B, surveyed by ASME and audited by NUPIC, Northrop Grumman Newport News, DCMA, utilities, architect/ engineers, and other organizations from around the world

Headquartered in Montreal, Velan has several international subsidiaries. For general inquiries:

Velan head office:
7007 Côte de Liesse,
Montreal, QC H4T 1G2 Canada

Tel: +1 514 748 7743
Fax: +1 514 748 8635

Check our website for more specific contact information.

www.velan.com

Velan is one of the world's leading manufacturers of industrial steel valves, supplying gate, globe, check, ball, triple-offset butterfly, knife gate, control, and highly engineered severe service valves for critical applications in the chemical, petrochemical, oil and gas, fossil and nuclear power, cogeneration, pulp and paper, mining, marine and cryogenic industries. The company also supplies actuators and integrated control packages.

Founded in 1950, Velan has earned a reputation for product excellence and innovation by bringing to the market superior products with special emphasis on quality, safety, ease of operation, and long service life. Velan valves have an extremely broad installation base and are approved by major companies worldwide.

Velan concentrates on one business—the design, manufacture and marketing of steel valves in a broad range of types and sizes for high performance service in a wide range of applications. The company's talented people are focused on Velan's core values of quality, reliability, innovation, and integrity and mission to be the world's leading valve brand.

TABLE OF CONTENTS

VELAN'S GLOBAL NETWORK

Head office

Montreal, Canada
Velan Inc.

- 15 production facilities
  - 5 plants in North America
  - 6 plants in Europe
  - 4 plants in Asia
- 4 stocking and distribution centers
- Hundreds of distributors worldwide
- Over 60 service shops worldwide

Manufacturing Plants

North America

Montreal, Canada
Velan Inc., Plant 1 (N)

Montreal, Canada
Velan Inc., Plant 2 and 7 (N)

Granby, Canada
Velan Inc., Plant 4 and 6

Montreal, Canada
Velan Inc., Plant 5

Williston, VT, USA
Velan Valve Corp., Plant 3 (N)

Europe

Lyon, France
Velan S.A.S.

Mennecy, France
Segault S.A.

Leicester, UK
Velan Valves Ltd.

Lisbon, Portugal
Velan Válvulas Industriais, Lda.

Lucca, Italy
Velan ABV S.p.A., Plant 1

Lucca, Italy
Velan ABV S.p.A., Plant 2

Asia

Ansan City, South Korea
Velan Ltd., Plant 1

Ansan City, South Korea
Velan Ltd., Plant 2

Taichung, Taiwan
Velan Valvac Mfg. Co., Ltd.

Suzhou, China
Velan Valve (Suzhou) Co., Ltd.

Distribution centers

Granby, Canada
Vel*CAN*

Benicia, CA, USA
Vel*CAL*

Marietta, GA, U.S.A.
Vel*EAST*

Willich, Germany
Velan GmbH

(N) – *ASME N-stamp accredited manufacturer*

TOTAL QUALITY AND PROCESS IMPROVEMENT

VELAN

Total Quality Commitment

Velan Total Quality Program

Our aim is to offer products and services that not only meet but clearly exceed the expectations of our customers.

Through training, teamwork, and performance, our employees strive to achieve continuous improvement of all processes.

Our goal is Total Quality and On-Time Delivery; our method is Total Commitment.

A.K. Velan,
Founder and
Executive Chairman

Velan's number-one priority is quality. From order entry to design engineering to the shop floor, the entire company is totally committed to offering products and services that not only meet but exceed customer expectations. All Velan valves are designed and manufactured with an emphasis on low emissions, safety, simple maintenance, ease of operation, and, above all, long and reliable service life.

TOTAL PROCESS IMPROVEMENT

While Velan has always made quality a priority, in 1990 the company adopted a formal Total Quality Management Program, aimed at improving production processes and was awarded ISO 9001 status the following year.

Today, Velan's Total Process Improvement Program brings together a group of industry best practices, including Lean Manufacturing and Six-Sigma, with the goal of creating a more balanced and efficient production system.

CERTIFICATES/APPROVALS

Velan holds all major applicable approvals, including ISO 9001:2008, PED, ASME N/NPT, TÜV, and TA-Luft. Velan's comprehensive quality program is fully compliant with the most stringent industry standards and has been surveyed and audited by leading organizations, regulatory bodies, utilities, and architect/engineers from around the world.

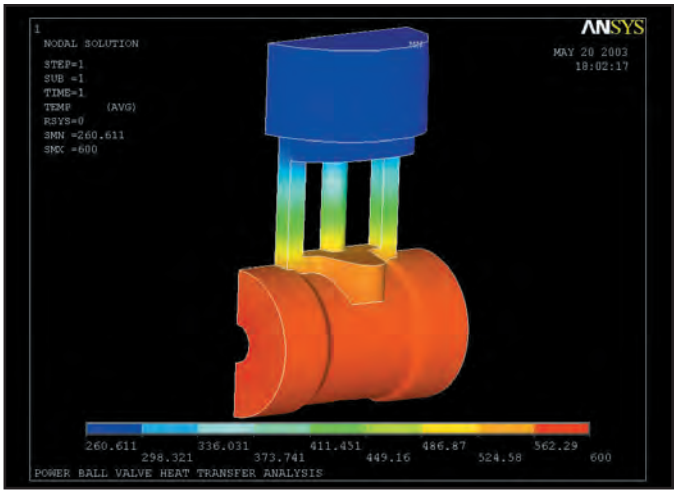
TOTAL PROCESS IMPROVEMENT PROGRAM

- Total Quality Management Program (since 1990)
- Lean Manufacturing
- Six-Sigma

CERTIFICATIONS/APPROVALS

- ISO 9001 (since 1991); Currently certified to ISO 9001:2008
- PED
- ASME N and NPT (since 1970)
- AD2000-Merkblatt HP 0 and A4/TRD 110
- TA-Luft
- Designed and tested to B16.34
- QA Program fully compliant with NCA 4000, ASME NQA-1 and 10 CFR 50 Appendix B
- Quality Programs surveyed by ASME and audited by NUPIC, Northrop Grumman Newport News, DCMA, utilities, architect/engineers, and other organizations from around the world

ENGINEERED SOLUTIONS



Power Ball valve heat transfer analysis.

Velan's Engineering Design and Applications Group comprises approximately 50 professional engineers with extensive experience in critical applications across a broad range of industries. Equipped with advanced software applications, including finite element analysis (FEA), computational fluid dynamics (CFD), and 3D solid modeling, Velan engineers design superior quality valves that meet the most demanding performance requirements. Velan's R&D facilities, equipped with steam boilers and superheaters, flow loops, and cryogenic test stands, provide the company with extensive testing capabilities.

Whether we are refining the design of our standard valves or engineering valves to meet the demands of a specific application, Velan's vast engineering resources can handle the task. In fact, Velan has a long history of partnering with major architect/engineers, electric utilities, and other end users to develop innovative solutions for their valving needs.

Velan's production machinery and equipment are specially engineered to meet the requirements of advanced large valve manufacturing. This includes large CNC horizontal and vertical boring mills with tool changers, CNC lathes, and CNC machining centers. Over 150 CNC machines are in operation in Velan's North American plants.

All welding techniques employed at Velan are in accordance with qualified welding procedures for SMAW, GTAW, GMAW, PTAW, and SAW processes. Production testing equipment is designed to safely and efficiently test high-pressure valves in strict accordance with industry codes and standards, as well as customer-imposed criteria.

In addition, we are engaged in advanced research in metal spray technology, using the services of independent laboratories for abrasion, sliding wear, bond strength testing, scanning electron microscopy, and x-ray diffraction.

Velan's QA system is geared towards continuous improvement, process quality, and stringent compliance to worldwide quality standards (e.g., ASME Section III, PED, TUV, ISO 9001:2008. Automated honing, mate-lapping, and vacuum testing of all metal-seated ball valves is an integral part of Velan's quality process. Advanced tooling design and optimized industrial engineering concepts, combined with state-of-the-art manufacturing plants employing over 165 CNC machining centers, enable us to produce high-quality products at competitive costs for our valued customers.

Flanged Power Ball for special applications.

Stub end welded Power Ball valves in production.

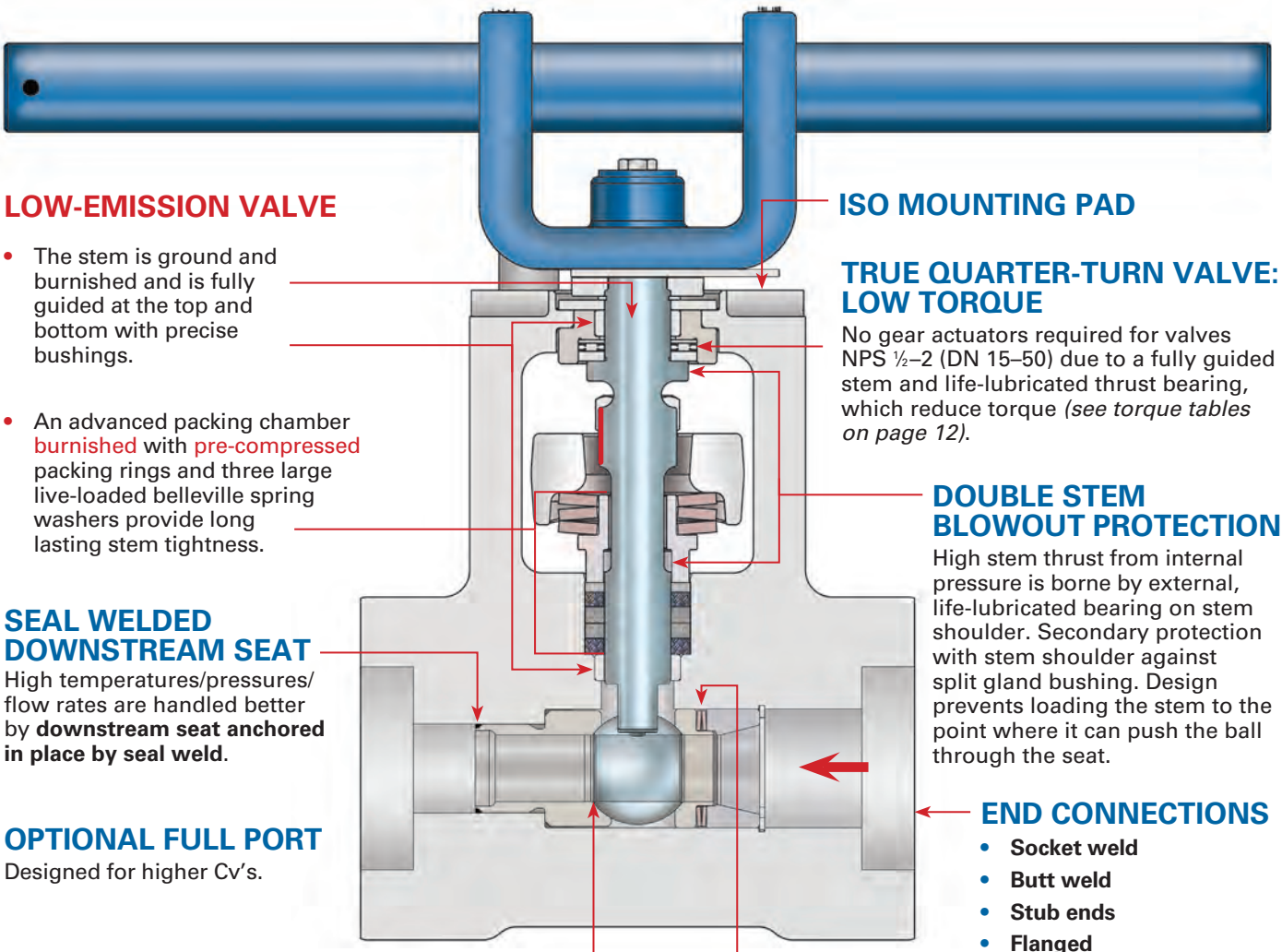
SUPERIOR DESIGN AND UNIQUE CONSTRUCTION

Velan's Power Ball valve is a highly advanced, patented, forged, one-piece metal-seated valve designed for high-pressure/high-temperature applications in the power generation and process industries.

Socket weld
NPS 1/2–2 1/2 (DN 15–65)

VALVE IN OPEN POSITION

Butt weld
NPS 1/2–4 (DN 15–100)



LOW-EMISSION VALVE

- The stem is ground and burnished and is fully guided at the top and bottom with precise bushings.
- An advanced packing chamber burnished with pre-compressed packing rings and three large live-loaded belleville spring washers provide long lasting stem tightness.

SEAL WELDED DOWNSTREAM SEAT

High temperatures/pressures/flow rates are handled better by **downstream seat anchored in place by seal weld**.

OPTIONAL FULL PORT

Designed for higher Cv's.

"0" LEAKAGE SEALING INTEGRITY

- **Improved design features**
  Wider seat faces increase cycle life, reliability, and tightness longevity.
- **Coating**
  New spray and fused technology used for high-temperature applications up to 1250°F (676.67°C) as well as enhanced chrome carbide coating for temperatures not exceeding 1000°F (537.78°C).
- **The ball and seat are mate-lapped** to perfection, ensuring resistance to wear and galling and so providing long service life. Each valve is subjected to **low pressure air seat leakage testing** in accordance with MSS-SP-61 and FCI 70-2. Velan imposes a **zero leakage criterion.**

ISO MOUNTING PAD

TRUE QUARTER-TURN VALVE: LOW TORQUE

No gear actuators required for valves NPS ½–2 (DN 15–50) due to a fully guided stem and life-lubricated thrust bearing, which reduce torque *(see torque tables on page 12)*.

DOUBLE STEM BLOWOUT PROTECTION

High stem thrust from internal pressure is borne by external, life-lubricated bearing on stem shoulder. Secondary protection with stem shoulder against split gland bushing. Design prevents loading the stem to the point where it can push the ball through the seat.

END CONNECTIONS

- **Socket weld**
- **Butt weld**
- **Stub ends**
- **Flanged**
- **NPT**
- **Blank**

INCONEL 718 LOADING RINGS

Maintains tight contact between seats and ball, protecting seats in an open and closed position. Accommodates high-temperature transients, allowing thermal expansion.

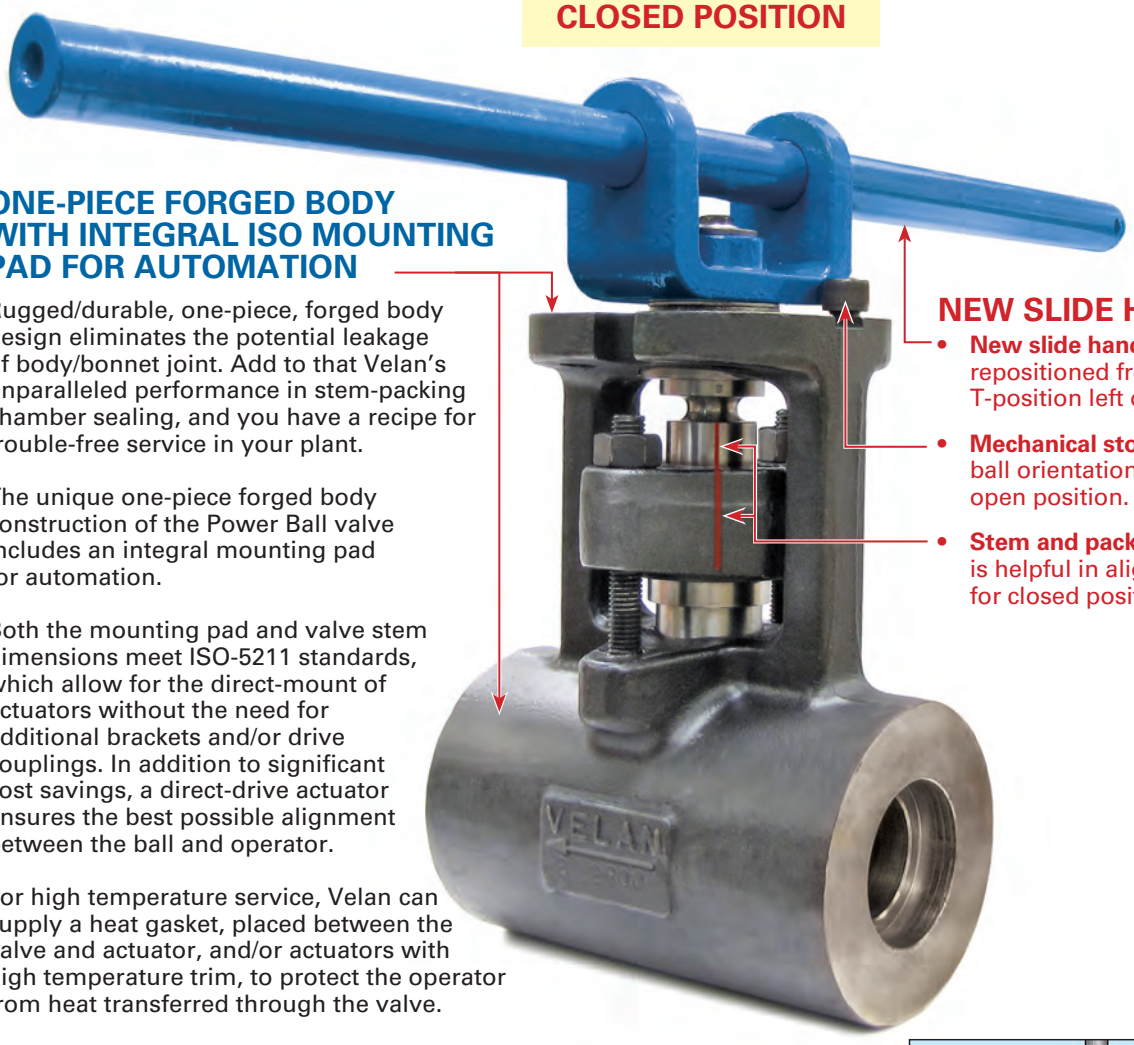
ASSURES RELIABILITY AND LONG SERVICE LIFE

Velan's Power Ball valve joins a long list of proven products for power, including our forged bolted bonnet and pressure seal valves, bonnetless y-pattern globe valves, cast steel valves, small forged valves, large metal-seated ball valves, and bimetallic steam traps.

ASME class 900–4500

U.S. Patent # 6,095,493

VALVE IN CLOSED POSITION



ONE-PIECE FORGED BODY WITH INTEGRAL ISO MOUNTING PAD FOR AUTOMATION

Rugged/durable, one-piece, forged body design eliminates the potential leakage of body/bonnet joint. Add to that Velan's unparalleled performance in stem-packing chamber sealing, and you have a recipe for trouble-free service in your plant.

The unique one-piece forged body construction of the Power Ball valve includes an integral mounting pad for automation.

Both the mounting pad and valve stem dimensions meet ISO-5211 standards, which allow for the direct-mount of actuators without the need for additional brackets and/or drive couplings. In addition to significant cost savings, a direct-drive actuator ensures the best possible alignment between the ball and operator.

For high temperature service, Velan can supply a heat gasket, placed between the valve and actuator, and/or actuators with high temperature trim, to protect the operator from heat transferred through the valve.

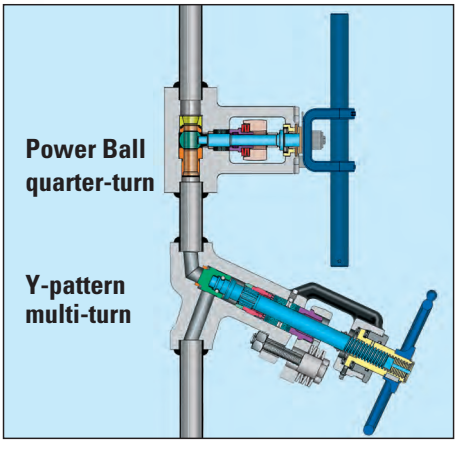
NEW SLIDE HANDLE

- **New slide handle** that can be repositioned from its standard T-position left or right.
- **Mechanical stop** ensures proper ball orientation in closed and open position.
- **Stem and packing gland marking** is helpful in aligning actuators for closed position.

VELAN POWER-COMBO FOR VENTS AND DRAINS

Y-pattern and Power Ball valve combination

Capitalizing on the proven design features and superior performance of our Power Ball and y-pattern globe valves, Velan introduces an innovative POWER-COMBO, matching the forged Power Ball with our forged, one-piece y-pattern (as the flow on/off valve) for vent and drain service in high pressure/temperature systems. This combination provides for a higher measure of system integrity assurance, while extending the service life of the valves in this tough application. It can also be pre-fabricated at the factory or at our authorized repair facilities (simply provide pipe material, schedule, and applicable dimensions at time of request for quotation), or at the site by the end user.



**** Note: All new features in red***

DESIGNED FOR LONG SERVICE

STANDARD MATERIALS

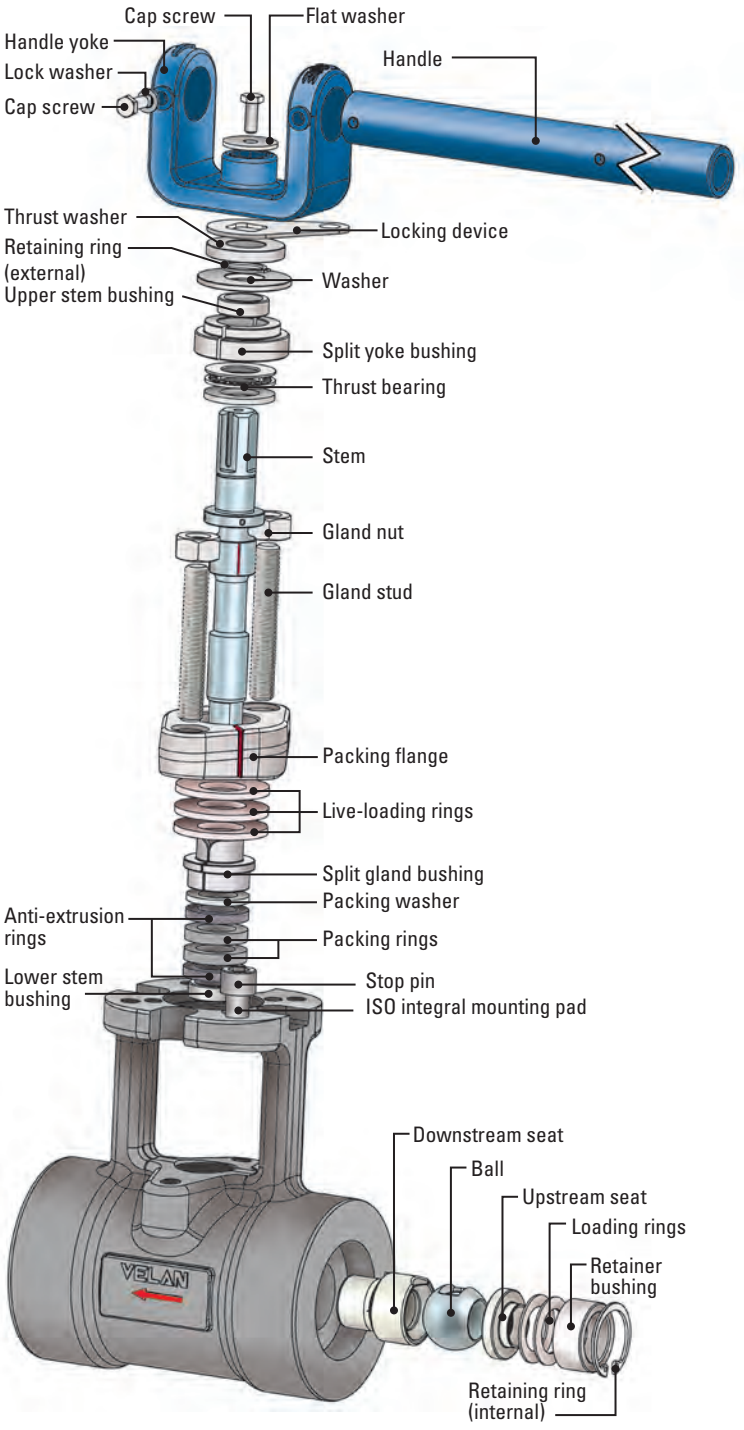
PART	MATERIALS FOR CLASSES 900, 1690, 2680
Body	A105, A182 F22 Cl. 3, A182 F91, A182 F316
Stem	A479 Gr. 410 Cond. 2[(1)]
Ball	A479 Gr. 410 Cond. 2, Chrome Carbide coated[(2)]
Downstream seat	A479 Gr. 410 Cond. 2, Chrome Carbide coated[(2)]
Upstream seat	A479 Gr. 431, Nitrided
Stem bushing (upper)	A479 Gr. 410 Condition 2, Nitrided
Stem bushing (lower)	A479 Gr. 410 Condition 2, Nitrided
Packing flange	A182 F22 Cl. 3
Split gland bushing	ASTM A351 Gr. CF8M
Packing rings	Die formed flexible Graphite
Anti-extrusion rings	Braided Graphite (no Teflon)
Stud (packing flange)	A193 B7 *Option: A193 B16*
Nut (packing flange)	A194 2H *Option: A194 Gr.4*
Lock nut	SS 304 *Option: A194 Gr.8*
Retaining ring (internal)	A564 15-7 P.H.
Thrust bearing	CS SAE 1060-1090
Screws	Alloy steel commercial
Hex head cap screws	Stainless steel
Lock washer	Stainless steel
Flat washer	Stainless steel
Handle	CS A106
Handle yoke	CS A216
Lock device	CS A516 galvanized
Live-loading rings	H11/H13
Loading rings	B 670 Gr.718 P.H. Inconel
Stop pin	A574 Alloy steel
Split yoke bushing	A479 Gr. 410 Condition 2
Thrust washer	Alloy steel commercial
Retainer bushing	A479 Gr. 410 Condition 2
Retaining ring (external)	Alloy steel commercial
Butt weld nipple	A105, A182 F22 Cl. 3, A182 F91, A182 F316

(1) For F91 valves, stem in A638 Gr.660
(2) Also available in B637 Gr.718 spray and fuse. Standard for F91.

PART	MATERIALS FOR CLASS 4500
Body	A105, A182 F22 Cl. 3, A182 F91, A182 F316
Stem	A638 Gr. 660
Ball	B637 Gr. 718 Spray and fuse
Downstream seat	B637 Gr. 718 Spray and fuse
Upstream seat	A479 Gr. 413, Nitrided
Stem bushing (upper)	A479 Gr. 410 Condition 2, Nitrided
Stem bushing (lower)	A479 Gr. 410 Condition 2, Nitrided
Packing flange	A182 F22 Cl. 3
Split gland bushing	ASTM A351 Gr. CF8M
Packing rings	Die formed flexible Graphite
Anti-extrusion rings	Braided Graphite (no Teflon)
Stud (packing flange)	A193 B7 *Option: A193 B16*
Nut (packing flange)	A194 2H *Option: A194 Gr. 4*
Lock nut	SS 304 *Option: A194 Gr. 8*
Retaining ring (internal)	A564 15-7 P.H.
Thrust bearing	CS SAE 1060-1090
Screws	Alloy steel commercial
Hex head cap screws	Stainless steel
Lock washer	Stainless steel
Flat washer	Stainless steel
Handle	CS A106
Handle yoke	CS A216
Lock device	CS A516 galvanized
Live-loading rings	H11/H13
Loading rings	B 670 Gr. 718 P.H.
Stop pin	A574 Alloy steel
Split yoke bushing	A479 Gr. 410 Condition 2
Thrust washer	Alloy steel commercial
Retainer bushing	A479 Gr. 410 Condition 2
Retaining ring (external)	Alloy steel commercial
Butt weld nipple	A182 F22 Cl. 3, A182 F9

REMOVAL OF PARTS

- Valve parts can only be disassembled for service outside the line after removal from pipe. This ensures safety in high-pressure operation.
- The ball in closed position and the upstream seat must be removed first to allow removal of all other parts.
- The gland bushing and yoke bushing are split to facilitate disassembly.
- See Power Ball Valve Maintenance Manual (PBVM).



STANDARD DIMENSIONS

STANDARD DIMENSIONS REGULAR PORT, Cv FLOW COEFFICIENT, AND WEIGHTS

Size NPS (DN)	Class	A			B	C	D	ØE	ØF	G	H	J	L	M	ØN	P	Weight	
		SW	BW	BW_N													Cv Kv	lb kg
1/2 (15)	900–2680	5.00 127	- -	6.50 165	6.74 171	12 305	2.50 64	0.44 11	0.87 22	0.38 10	4.53 115	4.00 102	- -	- -	- -	- -	9 8	12.8(1) 5.8
1/2 (15)	4500	5.00 127	-	6.50 165	6.74 171	12 305	2.50 64	0.44 11	0.87 22	0.38 10	4.53 115	4.00 102	-	-	-	-	9 8	12.8(1) 5.8
3/4 (20)	900–2680	5.00 127	- -	6.50 165	6.74 171	12 305	2.50 64	0.44 11	1.08 27	0.50 13	4.53 115	4.00 102	- -	- -	- -	- -	9 8	12.8(1) 5.8
3/4 (20)	4500	5.00 127	5.00 127	6.50 165	6.74 171	12 305	2.50 64	0.44 11	1.08 27	0.50 13	4.53 115	4.00 102	- -	- -	- -	- -	9 8	12.8(1) 5.8
1 (25)	900–2680	5.00 127	- -	6.50 165	6.74 171	12 305	2.50 64	0.63 16	1.34 34	0.50 13	4.53 115	4.00 102	- -	- -	- -	- -	10 9	12.4(1) 5.6
1 (25)	4500	5.25 133	- -	6.50 165	6.74 171	12 305	2.63 67	0.63 16	1.34 34	0.50 13	4.53 115	3.87 98	- -	- -	- -	- -	10 9	16.6(1) 7.5
1 1/4 (32)	900–2680	5.25 133	5.25 133	6.75 171	6.74 171	12 305	2.63 67	0.63 16	1.69 43	0.50 13	4.53 115	4.12 105	- -	- -	- -	- -	10 9	16.6(1) 7.5
1 1/4 (32)	4500	5.25 133	5.25 133	6.75 171	6.74 171	12 305	2.63 67	0.63 16	1.69 43	0.50 13	4.53 115	4.12 105	- -	- -	- -	- -	10 9	16.6(1) 7.5
1 1/2 (40)	900–2680	5.25 133	5.25 133	6.75 171	6.74 171	12 305	2.63 67	0.63 16	1.93 49	0.50 13	4.53 115	4.12 105	- -	- -	- -	- -	10 9	16.6(1) 7.5
1 1/2 (40)	4500	7.50 191	- -	9.50 241	10.72 272	26.25 667	3.75 95	1.06 27	1.93 49	0.50 13	7.76 197	5.75 146	- -	- -	- -	- -	35 30	55.3(1) 25.1
2 (50)	900–2680	7.50 191	7.50 191	9.50 241	10.72 272	26.25 667	3.75 95	1.06 27	2.42 61	0.62 16	7.76 197	5.75 146	- -	- -	- -	- -	35 30	55.3(1) 25.1
2 (50)	4500	7.50 191	7.50 191	9.50 241	10.72 272	26.25 667	3.75 95	1.06 27	2.42 61	0.62 16	7.76 197	5.75 146	- -	- -	- -	- -	35 30	55.3(1) 25.1
2 1/2 (65)	900–2680	10.00 254	- -	12.50 318	- -	- -	5.00 127	1.50 38	2.92 74	0.62 16	10.00 254	7.50 191	13.43 341	11.50 292	16.00 406	11.75 298	85 72	150.3(2) 68.2
2 1/2 (65)	4500	10.00 254	- -	12.50 318	- -	- -	5.00 127	1.50 38	2.92 74	0.62 16	10.00 254	7.50 191	13.43 341	11.50 292	24.00 610	11.75 298	85 72	154.3(2) 70.0
3 (80)	900–2680	- -	10.00 254	12.50 318	- -	- -	5.00 127	1.50 38	- -	- -	10.00 254	7.50 191	13.43 341	11.50 292	16.00 406	11.75 298	85 72	150.3(2) 68.2
3 (80)	4500	- -	10.00 254	12.50 318	- -	- -	5.00 127	1.50 38	- -	- -	10.00 254	7.50 191	13.43 341	11.50 292	24.00 610	11.75 298	85 72	154.3(2) 70.0
4 (100)	900–2680	- -	10.00 254	- -	- -	- -	5.00 127	1.50 38	- -	- -	10.00 254	- -	13.43 341	11.50 292	16.00 406	11.75 298	85 72	150.3(2) 68.2
4 (100)	4500	- -	10.00 254	- -	- -	- -	5.00 127	1.50 38	- -	- -	10.00 254	- -	13.43 341	11.50 292	24.00 610	11.75 298	85 72	154.3(2) 70.0

BW_N = Butt weld end with nipple. (1) c/w Handle weight. (2) c/w Gear actuator weight

STANDARD DIMENSIONS FULL PORT, Cv FLOW COEFFICIENT, AND WEIGHTS

Size NPS DN	Class	A				B	C	D	ØE	ØF	G	H	J	L	M	ØN	P	Weight	
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3/4 (20)	900–2680	-	6.50 165	-	-	6.74 171	10.60 269	2.50 64	0.63 16	1.08 27	0.50 13	4.53 115	4.00 102	-	-	-	-	10 9	12.8(1) 5.8
3/4 (20)	4500	-	6.75 171	-	-	6.74 171	10.60 269	2.63 67	0.63 16	1.08 27	0.50 13	4.53 115	4.12 105	-	-	-	-	10 9	16.6(1) 7.5
1 (25)	900–2680	-	9.50 241	-	-	10.72 272	24.10 612	3.75 95	1.06 27	1.34 34	0.50 13	7.76 197	5.75 146	-	-	-	-	35 30	55.3(1) 25.1
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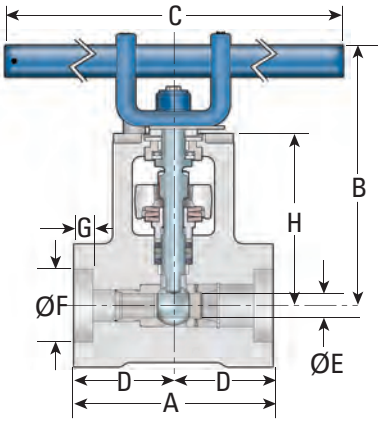
2 (50)	4500	-	12.50 318	-	-	-	-	5.00 127	1.50 38	2.42 61	0.62 16	10.00 254	7.50 191	13.43 341	11.50 292	24.00 610	11.75 298	85 72	154.3(2) 70.0

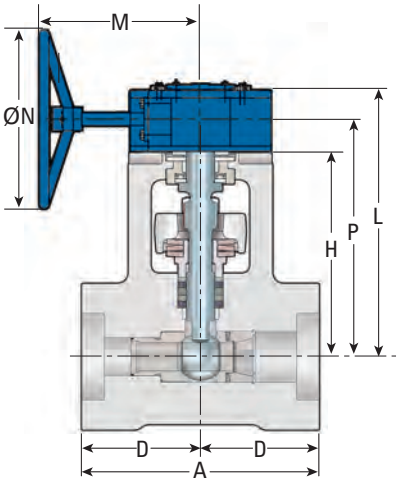
BW_N = Butt weld end with nipple. (1) c/w Handle weight. (2) c/w Gear actuator weight

Valve with handle



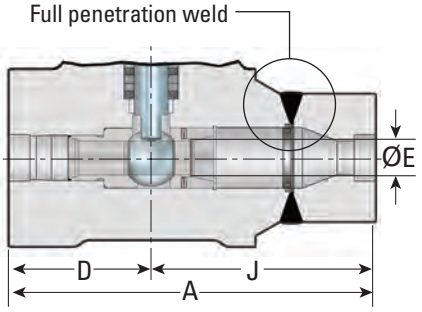
Valve with gear box

for NPS 2½–4 (DN 65–100) valves



Valve with nipple

Full penetration weld



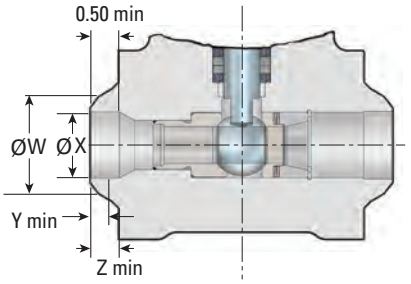
STANDARD DIMENSIONS

DIMENSIONS FOR BUTT WELD END
CONFORMING TO REQUIREMENTS OF ASME B16.25 AND B36.10

NPS (DN)	Pipe Sch. number	BW w/Nipple		in (mm)				
		900-2680	4500	ØW	ØX	Y	Z	Wall Thickness
½ (15)	80	✓	✓	0.840 (21.3)	0.546 (13.87)	0.22 (5.59)	0.29 (7.37)	0.147 (3.73)
	160				0.464 (11.79)	0.28 (7.11)	0.38 (9.65)	0.188 (4.78)
	XXS(1)				0.252 (6.40)	0.44 (11.18)	0.59 (14.99)	0.294 (7.47)
¾ (20)	80	✓	✓	1.050 (26.7)	0.742 (18.85)	0.23 (5.84)	0.31 (7.87)	0.154 (3.91)
	160				0.612 (15.55)	0.33 (8.38)	0.44 (11.18)	0.219 (5.56)
	XXS(1)				0.434 (11.02)	0.46 (11.68)	0.62 (15.75)	0.308 (7.82)
1 (25)	80	✓	✓	1.315 (33.4)	0.957 (24.31)	0.27 (6.86)	0.36 (9.14)	0.179 (4.55)
	160				0.815 (20.70)	0.38 (9.65)	0.50 (12.70)	0.250 (6.35)
	XXS(1)				0.599 (15.22)	0.54 (13.72)	0.72 (18.29)	0.358 (9.09)
1¼ (32)	80	–	–	1.660 (42.2)	1.278 (32.46)	0.29 (7.37)	0.38 (9.65)	0.191 (4.85)
	160				1.160 (29.46)	0.38 (9.65)	0.50 (12.70)	0.250 (6.35)
	XXS(1)	✓	✓		0.896 (22.76)	0.57 (14.48)	0.76 (19.30)	0.382 (9.70)
1½ (40)	80	–	✓	1.900 (48.3)	1.500 (38.10)	0.30 (7.62)	0.40 (10.16)	0.200 (5.08)
	160				1.337 (33.96)	0.42 (10.67)	0.56 (14.22)	0.281 (7.14)
	XXS	✓			1.100 (27.94)	0.60 (15.24)	0.80 (20.32)	0.400 (10.16)
2 (50)	80	–	–	2.375 (60.3)	1.939 (49.25)	0.33 (8.38)	0.44 (11.18)	0.218 (5.54)
	160	✓	✓		1.687 (42.85)	0.52 (13.21)	0.69 (17.53)	0.344 (8.74)
	XXS(1)				1.503 (38.18)	0.65 (16.51)	0.87 (22.10)	0.436 (11.07)
2½ (65)	80	✓	✓	2.875 (73.0)	2.323 (59.00)	0.41 (10.41)	0.55 (13.97)	0.276 (7.01)
	160				2.125 (53.98)	0.56 (14.22)	0.75 (19.05)	0.375 (9.53)
	XXS(1)				1.771 (44.98)	0.83 (21.08)	1.10 (27.94)	0.552 (14.02)
3 (80)	80	–	–	3.500 (88.9)	2.900 (73.66)	0.45 (11.43)	0.60 (15.24)	0.300 (7.62)
	160	✓	✓		2.624 (66.65)	0.66 (16.76)	0.88 (22.35)	0.438 (11.13)
	XXS				2.300 (58.42)	0.90 (22.86)	1.20 (30.48)	0.600 (15.24)
4 (100)	80	–	–	4.500 (114.3)	3.826 (97.18)	0.51 (12.95)	0.67 (17.02)	0.337 (8.56)
	160				3.438 (87.33)	0.80 (20.32)	1.06 (26.92)	0.531 (13.49)
	XXS(1)				3.152 (80.06)	1.01 (25.65)	1.35 (34.29)	0.674 (17.12)

(1) Not available for Class 900. XXS= Double Extra Strong Wall Thickness.

Butt weld end



NOTE: *If specifying a butt weld end valve, please refer to "Dimensions for butt weld end" table (left) to determine if the valve is available with an integral butt weld or a nipple on one end.*

For standard dimension "A" (see tables on page 9) use column "BW" when specifying valves with an integral butt weld, and column "BW_N" when specifying valves with a nipple. For any special requirements, please consult the factory.

VELAN POWER BALL VALVES READY FOR SERVICE

Velan NPS 2 (DN 50) F91 Power Ball valve with declutchable gear box and pneumatic actuator.

Velan NPS 1 to 2 (DN 25 to 50) F22 Power Ball valves ready for shipping to a cogeneration plant.

END CONNECTION TABLE

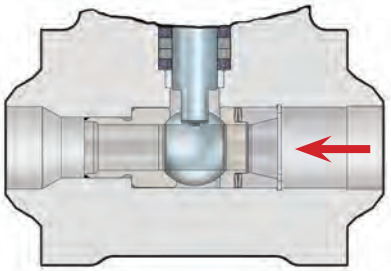
TYPE	Port Size >		0.44				0.63 (A)*			0.63 (B)*				1.06				1.5			
	Max Pressure Class >		900	1690	2680	4500	900	1690	2680	900	1690	2680	4500	900	1690	2680	4500	900	1690	2680	4500
	NPS	Sch.																			
BW	½	80	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		160	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		XXS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	¾	80	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		160	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		XXS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	80	X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
		160	X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
		XXS	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1¼	80	X	X	X	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-
		160	X	X	X	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-
		XXS	X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
	1½	80	X	X	-	-	X	X	-	X	X	X	-	N	N	N	N	-	-	-	-
		160	X	X	X	-	X	X	X	X	X	X	X	N	N	N	N	-	-	-	-
		XXS	X	X	X	-	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
	2	80	X	-	-	-	X	-	-	X	X	-	-	X	X	X	X	-	-	-	-
		160	X	X	-	-	X	X	-	X	X	X	-	N	N	N	N	-	-	-	-
		XXS	X	X	-	-	X	X	-	X	X	X	-	N	N	N	N	-	-	-	-
	2½	80	-	-	-	-	-	-	-	X	X	-	-	X	X	X	-	N	N	N	N
		160	-	-	-	-	-	-	-	X	X	-	-	X	X	X	-	N	N	N	N
		XXS	-	-	-	-	-	-	-	X	X	X	-	N	N	N	N	-	-	-	-
	3	80	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	X	X	X	X
		160	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	N	N	N	N
		XXS	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	N	N	N	N
	4	80	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	X	X	-
		160	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	X	X	-
		XXS	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	X	X	X	-
SW	¼	ALL	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	⅜		N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	½		X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
	¾		X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
	1		X	X	X	-	X	X	X	X	X	X	X	N	N	N	N	-	-	-	-
	1¼		X	X	-	-	X	X	-	X	X	X	X	N	N	N	N	-	-	-	-
	1½		-	-	-	-	-	-	-	X	X	X	-	X	X	X	X	-	-	-	-
	2		-	-	-	-	-	-	-	X	-	-	-	X	X	X	X	N	N	N	N
	2½		-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	X	X	X
NPT	⅜	ALL	N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	½		N	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	¾		X	X	X	X	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-
	1		X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-
	1¼		X	X	X	-	X	X	X	X	X	X	X	N	N	N	N	-	-	-	-
	1½		X	X	-	-	-	-	-	X	X	X	-	N	N	N	N	-	-	-	-
	2		-	-	-	-	-	-	-	X	X	-	-	X	X	X	X	N	N	N	N
	2½		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N	N

* 0.63 (A) is Class 2800# MAX / 0.63 (B) goes up to Class 4500#

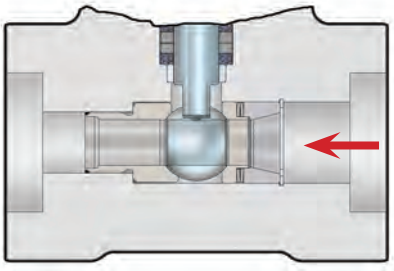
X	INTEGRAL
N	NIPPLE REQUIRED
-	NOT AVAILABLE
-	CONTACT ENGINEERING

OPTIONS ALSO AVAILABLE:
- WITH STUB ENDS
- WITH WELDING NECK FLANGES

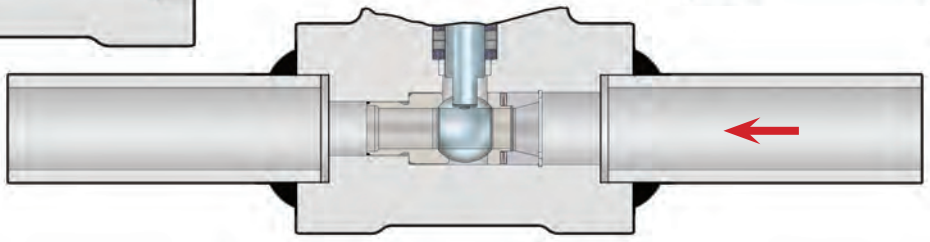
Butt weld end



Socket weld end



Stub ends



PRESSURE/TEMPERATURE RATING

FORGED CARBON STEEL A105

Working Pressure, psig

CLASS	1690			2680			4500		
Shell Test, psig Seat Test, psig	6275 4600	6350 4650		10385 7601	10500 7700		16675 12221	16875 12375	
Temp. °F	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]
-20 to 100	4175	4225	4225	6910	7000	7000	11110	11250	11250
200	3805	4225	4225	6295	7000	7000	10120	11250	11250
300	3695	4225	4225	6125	7000	7000	9845	11250	11250
400	3570	4225	4225	5910	7000	7000	9505	11250	11250
500	3375	4225	4225	5585	7000	7000	8980	11250	11250
600	3080	4015	4015	5105	6650	6650	8210	10690	10690
650	3025	3940	3940	5010	6520	6520	8055	10485	10485
700	3000	3910	3910	4970	6470	6470	7990	10405	10405
750	2840	3550	3550	4700	5880	5880	7560	9450	9450
800	2320	2895	2895	3840	4800	4800	6170	7715	7715
850[1]	1510	1880	1880	2495	3120	3120	4010	5015	5015

FORGED CHROME-MOLY STEEL A182-F22 CL. 3

Working Pressure, psig

CLASS	1690			2680			4500		
Shell Test, psig Seat Test, psig	6275 4600	6350 4650		10500 7700			16875 12375		
Temp. °F	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]
-20 to 100	4225	4225	4225	7000	7000	7000	11250	11250	11250
200	4225	4225	4225	7000	7000	7000	11250	11250	11250
300	4100	4175	4175	6795	6920	6920	10925	11120	11120
400	3975	4075	4075	6585	6760	6760	10585	10865	10865
500	3745	4055	4055	6200	6720	6720	9965	10800	10800
600	3405	4055	4055	5640	6720	6720	9070	10800	10800
650	3310	4030	4030	5490	6680	6680	8825	10735	10735
700	3200	4005	4005	5295	6640	6640	8515	10670	10670
750	2995	3885	3885	4960	6440	6440	7970	10350	10350
800	2860	3790	3790	4735	6275	6275	7610	10095	10095
850	2740	3620	3620	4545	5995	5995	7305	9645	9645
900	2530	3380	3380[4]	4190	5600	5600[4]	6740	9000	9000[4]
950	2125	2655	2720[4]	3520	4400	4580[4]	5665	7070	7555[4]
1000	1470	1835	1975[4]	2430	3040	3455[4]	3910	4885	6050[4]
1050	985	1230	1325	1630	2035	2315	2625	3280	4060
1100	619	772	832	1025	1282	1457	1645	2055	2546

FORGED CHROME-MOLY STEEL A182-F91

Working Pressure, psig

CLASS	1690			2680			4500		
Shell Test, psig Seat Test, psig	6350 4650			10500 7700			16875 12375		
Temp. °F	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]
-20 to 100	4225	4225	4225	7000	7000	7000	11250	11250	11250
200	4225	4225	4225	7000	7000	7000	11250	11250	11250
300	4100	4225	4225	6795	7000	7000	10925	11250	11250
400	3975	4225	4225	6585	7000	7000	10585	11250	11250
500	3745	4225	4225	6200	7000	7000	9965	11250	11250
600	3405	4225	4225	5640	7000	7000	9070	11250	11250
650	3310	4225	4225	5490	7000	7000	8825	11250	11250
700	3195	4120	4120	5295	6840	6840	8515	10995	10995
750	2995	4105	4105	4960	6795	6795	7970	10930	10930
800	2860	4055	4055	4735	6720	6720	7610	10800	10800
850	2740	3810	3810	4545	6320	6320	7305	10160	10160
900	2530	3380	3380	4190	5600	5600	6740	9000	9000
950	2175	2655	2720	3605	4400	4580	5795	7070	7555
1000	2050	2370	2555	3390	3925	4460	5450	6310	7555
1050	2025	2370	2555	3360	3925	4460	5400	6310	7555
1100	1700	2120	2290	2815	3520	4000	4525	5655	7005
1150	1255	1570	1690	2075	2595	2950	3345	4180	5175
1200	810	1010	1090	1340	1680	1905	2160	2700	3345

FORGED STAINLESS STEEL A182 Gr. F316

Working Pressure, psig

CLASS	1690			2680			4500		
Shell Test, psig Seat Test, psig	6100 4475	6350 4650		10080 7392	10500 7700		16200 11900	16875 12375	
Temp. °F	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]	STANDARD	SPECIAL[2]	LIMITED[3]
-20 to 100	4055	4225	4225	6720	7000	7000	10800	11250	11250
200	3485	3885	3885	5780	6440	6440	9290	10350	10350
300	3150	3515	3515	5220	5820	5820	8390	9360	9360
400	2895	3210	3210	4790	5320	5320	7705	8550	8550
500	2690	2990	2990	4455	4960	4960	7165	7970	7970
600	2540	2835	2835	4210	4695	4695	6770	7555	7555
650	2500	2775	2775	4140	4595	4595	6660	7395	7395
700	2445	2725	2725	4050	4520	4520	6515	7265	7265
750	2405	2680	2680	3985	4440	4440	6410	7135	7135
800	2375	2650	2650	3940	4400	4400	6335	7070	7070
850	2350	2625	2625	3895	4350	4350	6265	6990	6990
900	2338	2605	2605	3875	4315	4315	6230	6945	6945
950	2175	2580	2580	3605	4270	4270	5795	6870	6870
1000	1970	2370	2370	3260	3925	3925	5245	6310	6310
1050[5]	1935	2370	2370[4]	3205	3925	3925[4]	5155	6310	6310[4]
1100[5]	1715	2145	2195[4]	2850	3560	3705[4]	4575	5720	6110[4]
1150[5]	1330	1665	1795[4]	2205	2760	3135[4]	3550	4435	5495[4]
1200[5]	1040	1300	1400	1730	2160	2455	2775	3470	4300
1250[5]	825	1035	1115	1375	1720	1950	2210	2765	3425

(1) Permissible but not recommended for prolonged usage above 800°F (425°C).
(2) Special Class: requires additional inspection per ASME B16.34, para. 2.1.2.
(3) Limited Class: only up to and including NPS 2 ½ (DN 65) socket weld all classes. Flanged valves are not allowed.
(4) Do not interpolate between these temperatures. Consult the factory.
(5) At temperatures over 1000°F (538°C) use only when the carbon content is 0.04% or higher (material code 10).

TORQUE VALUES FOR CLASSES 1690, 2680, 4500[6]

SIZE NPS (DN)	CLASS	FIGURE NUMBER	HANDLE LENGTH in (mm)	AT SATURATED STEAM 662°F (350°C)			AT SUPERHEATED STEAM 1000°F (538°C)			C/W 1.5 SAFETY FACTOR AT SUPERHEATED STEAM	
				DESIGN PRESSURE psig (bar)	TORQUE MAX lbf•in (Nm)	HANDLE FORCE lbf (N)	DESIGN PRESSURE psig (bar)	TORQUE MAX lbf•in	HANDLE FORCE lbf (N)	TORQUE MAX lbf•in (Nm)	HANDLE FORCE lbf (N)
½ – ¾ (15–20)	1690	W03-82Ω	10.5 (267)	2611 (180)	227 (26)	22 (98)	1470 (120)	209 (24)	20 (89)	313 (36)	30 (133)
	2680	W03-92Ω					2430 (168)	224 (25)	21 (93)	336 (38)	32 (142)
	4500	W03-52Ω					3910 (270)	249 (28)	24 (107)	374 (42)	36 (160)
1 – 1¼ (25–32)	1690	W05-82Ω	10.5 (267)	2611 (180)	305 (35)	29 (129)	1470 (120)	252 (29)	24 (107)	378 (43)	36 (160)
	2680	W05-92Ω					2430 (168)	297 (34)	28 (125)	446 (50)	42 (187)
	4500	W05-52Ω					3910 (270)	365 (41)	35 (156)	548 (62)	52 (231)
1½ (40)	1690	W07-82Ω	10.5 (267)	2611 (180)	305 (35)	29 (129)	1470 (120)	252 (29)	24 (109)	378 (43)	36 (160)
	2680	W07-92Ω					2430 (168)	297 (34)	28 (125)	446 (50)	42 (187)
	4500	W07-52Ω	24 (610)		1324 (150)	55 (245)	3910 (270)	1587 (179)	66 (294)	2381(269)	99 (441)
2 (50)	1690	W08-82Ω	24 (610)	2611 (180)	1324 (150)	55 (245)	1470 (120)	1092 (123)	46 (205)	1638 (185)	68 (303)
	2680	W08-92Ω					2430 (168)	1287 (145)	54 (240)	1931 (218)	80 (356)
	4500	W08-52Ω					3910 (270)	1587 (179)	66 (294)	2381 (269)	99 (441)
2½ – 4 (65–100)	1690	W09-82Ω	24 (610)	2611 (180)	1324 (150)	55 (245)	1470 (120)	2290 (259)	GEAR	3435 (388)	GEAR
	2680	W09-92Ω					2430 (168)	2862 (323)	GEAR	4293 (485)	GEAR
	4500	W09-52Ω					3910 (270)	3744 (423)	GEAR	5616 (635)	GEAR

(6) For Class 900 torque values contact the factory.

ACTUATORS

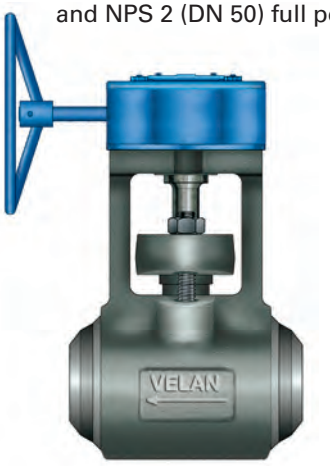
GEAR ACTUATORS

Velan worm gear actuators provide reliable and dependable manual operation for NPS 2½–4 (DN 65–100) regular port and NPS 2 (DN 50) full port Power Ball valves. The gear is designed to operate in the range of 90°, ±5° and is equipped with an angular dial indicator. Worm gear actuators feature a gear segment and a rigid, reversible shaft with integral worm. The gear actuators comply with ISO 5211 and are suitable for high-temperature service.

AIR AND ELECTRIC ACTUATORS

Velan supplies high-quality pneumatic rack and pinion and scotch yoke actuators for NPS ½–4 (DN 15–100) Power Ball valves. All actuators are totally enclosed. External adjustment stops provide accurate adjustment for closing and opening positions. All moving parts are permanently lubricated. Actuators can be installed in the field, although it is preferable that they be installed and tested in the factory.

GEAR ACTUATOR
for NPS 2½–4 (DN 65–100) regular port and NPS 2 (DN 50) full port valves



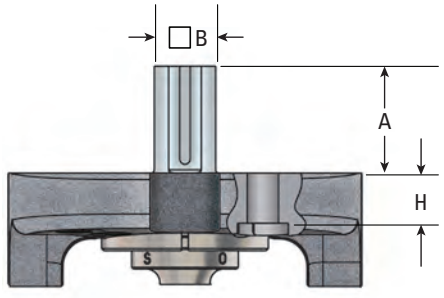
AIR ACTUATOR

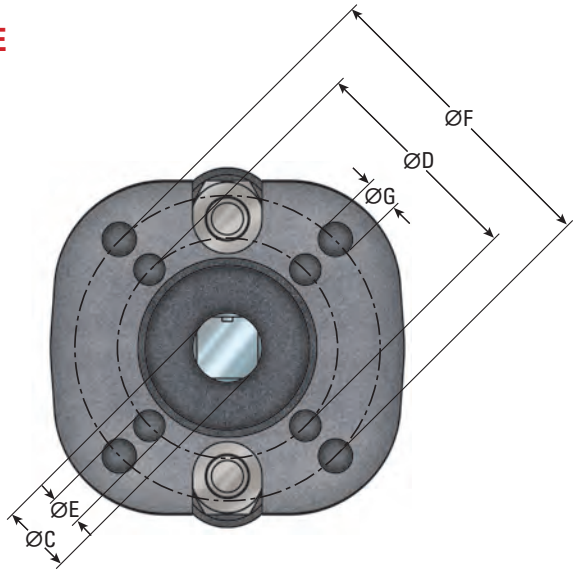
ELECTRIC ACTUATOR

MOUNTING PAD AND STEM HEAD DIMENSIONS

UNIQUE VELAN DIRECT MOUNT ADVANTAGE

Direct mount for all actuators without costly bracket and stem coupling, which results in less angle play.





Regular port	Full port	Stem head			Mounting pad 1		Mounting pad 2		H	ISO STANDARD
NPS	NPS	A	□ B	ØC	ØD	ØE	ØF	ØG		
½ – ¾	½	0.96	0.551	0.625	1.984	9/32	2.750	21/64	0.50	F05/F07
1–1½ (2680 lbs)	¾	0.96	0.551	0.625	1.984	9/32	2.750	21/64	0.50	F05/F07
1½ (4500 lbs) – 2	1–1½	1.07	0.866	1.125	4.000	27/64	-	-	0.72	F10
2½ – 4	2	2	1.063	1.417	4.921	17/32	-	-	0.81	F12

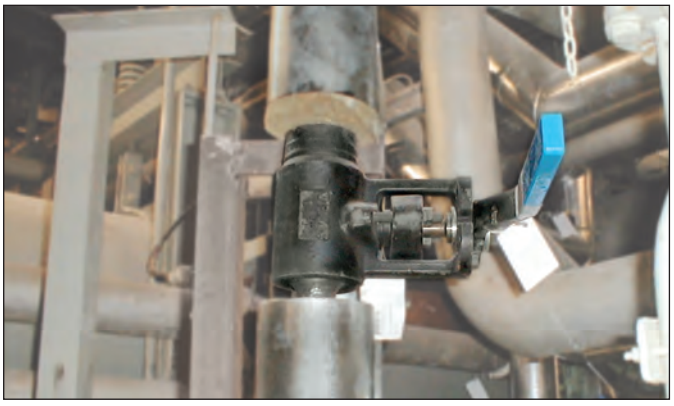
The quarter-turn design on Velan's Power Ball valves makes actuation easy.

VELAN POWER BALL VALVES

With an installed base covering over 385 nuclear power plants and over 4,000 thermal power plants and valves with over forty years of uninterrupted nuclear service, Velan is a market leader in power industry valves.

Velan's Power Ball valve joins a long list of proven products for power, including our forged bolted bonnet and pressure seal valves, bonnetless y-pattern globe valves, cast steel valves, small forged valves, and bimetallic steam traps. As a matter of fact, most of the valves that Velan designs and manufactures (see back cover) have been sold into power plant applications.

POWER BALL VALVES IN POWER GENERATION



NPS 1 1/2 (DN 40) Power Ball valves in steam trap isolation at a major British power plant. Switching to Velan's Power Ball valves offered a low torque, easy to operate solution.

A Velan Power Ball valve in service.

A Velan Power Ball valve in high-pressure steam service.

- **Attemperator isolation valves**
- **Boiler feedwater pump recirculation**
- **Bottom blowdown**
- **Bypass injector isolation**
- **Cogeneration (emergency shutdown system)**
- **Condensate drain lines above/below turbine throttle valves**
- **Feedwater heater isolation**
- **Feedwater heater drain**
- **Feedwater heater loop drain**
- **Isolation turbine drains**
- **Low-pressure turbine drains**
- **Main steam drum vents**
- **Main steam extraction bleed valves**
- **Nuclear**
- **Pressurized fluidized beds (PFB)**
- **Reheat isolation**
- **Steam trap isolation**
- **Seal steam isolation**
- **Steam (saturated/superheated)**
- **High-energy isolation valve**

HOW TO ORDER

The figure numbers shown on this key are designed to cover essential features of Velan valves. Please use figure numbers to ensure prompt and accurate processing of your order. A detailed description must accompany any special orders.

TYPE OF CONNECTION	SIZE OF CONNECTION			CLASS	PORT	TYPE	BODY MATERIAL		TRIM MATERIAL BALL/SEAT	TRIM MATERIAL STEM	COATINGS	SPECIAL SERVICE OR DESIGN
A	B			C	D	E	F		G	H	I	J
W	0	5	—	9	2	Q	0	2	—	F	R	K	A

EXAMPLE: *NPS 1 2680 class socket weld A105 ball valve*

A TYPE OF CONNECTION

B – Butt weld
C – Combination ends
E – Welded stubs butt weld
F – Flange
S – NPT
W – Socket weld
Y – Blank
Z – Welded stubs socket weld

B SIZE OF CONNECTION

Customers have the choice of specifying valve size as part of the valve figure ("B") using the numbers below, or indicating valve size separately. Sizes shown in NPS (DN).
Examples:
NPS1 W-92Q02-FRBA (valve size shown separately)
W05-92Q02-FRBA (valve size in figure number)

03 – ½ (15)
04 – ¾ (20)
05 – 1 (25)
06 – 1¼ (32)
07 – 1½ (40)
08 – 2 (50)
09 – 2½ (65)
10 – 3 (80)
12 – 4 (100)

C PRESSURE RATING

For threaded or socket weld use model number:

3 – 1500
5 – 4500
8 – 1690
7 – 900
9 – 2680

D PORT

1 – Full port
2 – Regular port

E TYPE

Q – One-piece forged metal-seated Power Ball

F BODY MATERIAL

02 – A105
06 – F22
10 – S/S F316H/F316[1]
13 – F316
34 – F91

G BALL AND SEAT MATERIAL

A – 410
F – Inconel 718

H STEM MATERIAL

G – 410
R – A638 Gr. 660 (Gr. 616 may be substituted for 900–2680 pressure classes)

I COATINGS (ball and seats unless noted)

K – Chrome Carbide - spray and fuse
S – Chrome Carbide - HVOF

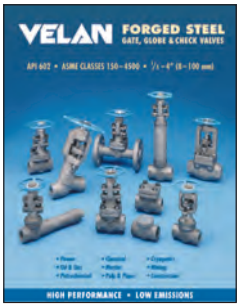
J SPECIAL SERVICE OR DESIGN

A – Standard

(1) Material Code "10" F316H/F316 has a minimum carbon content of 0.04 and is to be used if temperatures are over 1000°F (538°C). Forged F316, Material Code "13", is not suitable for temperatures above 1000°F (538°C) as it is dual certified (F316/F316L).

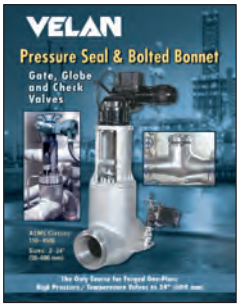
VELAN VALVES FOR THERMAL POWER STATIONS

Small forged valves
Sizes: NPS ½–2 (DN 15–50)
ASME class: 150–4500

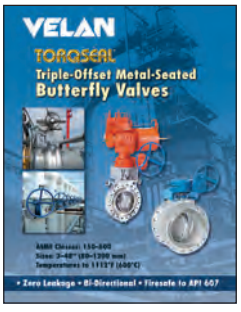


Y-pattern globe valves
Sizes: NPS ½–4 (DN 15–100)
ASME class: 1690–4500

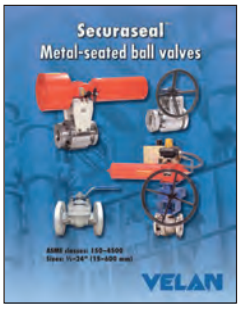
Pressure seal and bolted bonnet gate, globe, and check valves
Sizes: NPS 2–24 (DN 50–600)
ASME class: 150–4500



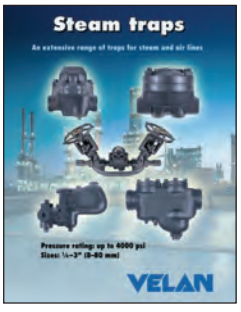
Torqseal butterfly valves
Sizes: NPS 3–48 (DN 80–1200)
ASME class: 150–600



A complete range of large metal-seated ball valves
Sizes: NPS ½–36 (DN 15–900)
ASME class: 150–4500

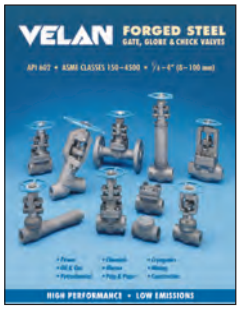


Steam traps
Sizes: NPS ¼–3 (DN 8–80)
Presssure rating: up to 4000 psi



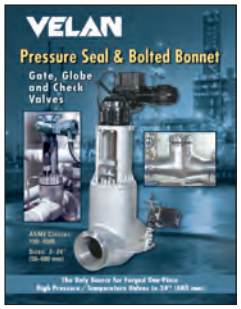
The most comprehensive line of industrial forged and cast steel gate, globe, check, ball, butterfly, and knife gate valves and steam traps.

ASME pressure classes 150–4500 in carbon, alloy, and stainless steel

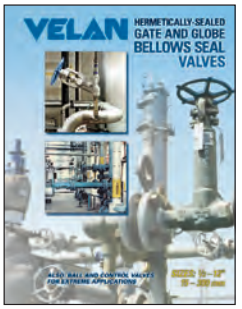


VEL-SFV

VEL-BG



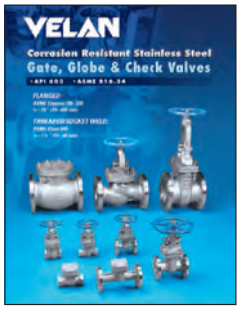
VEL-PS



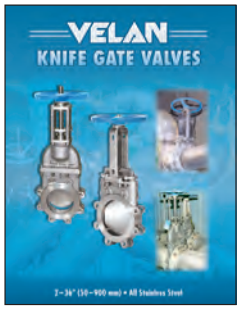
VEL-BS

VEL-CRYO

VEL-CSV



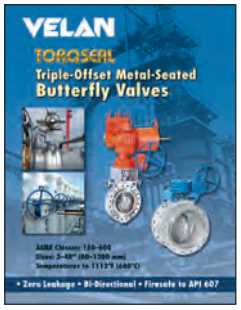
VEL-API-603



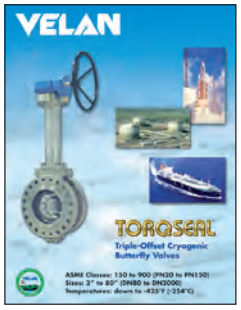
VEL-KGV

VEL-PQCV

BRO-FLBABV



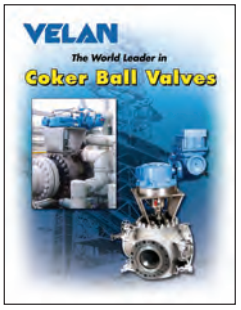
VEL-BF



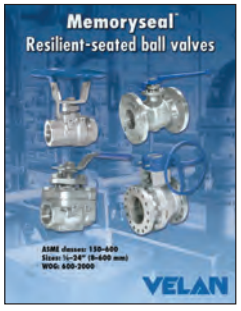
CAT-SAS-CTORQ

VEL-MS

CAT-PBV



VEL-CBV



VEL-BV

CAT-GPBV

CAT-SAS-CFLEX

CAT-SAS-CCON

CAT-ST

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www.velan.com

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