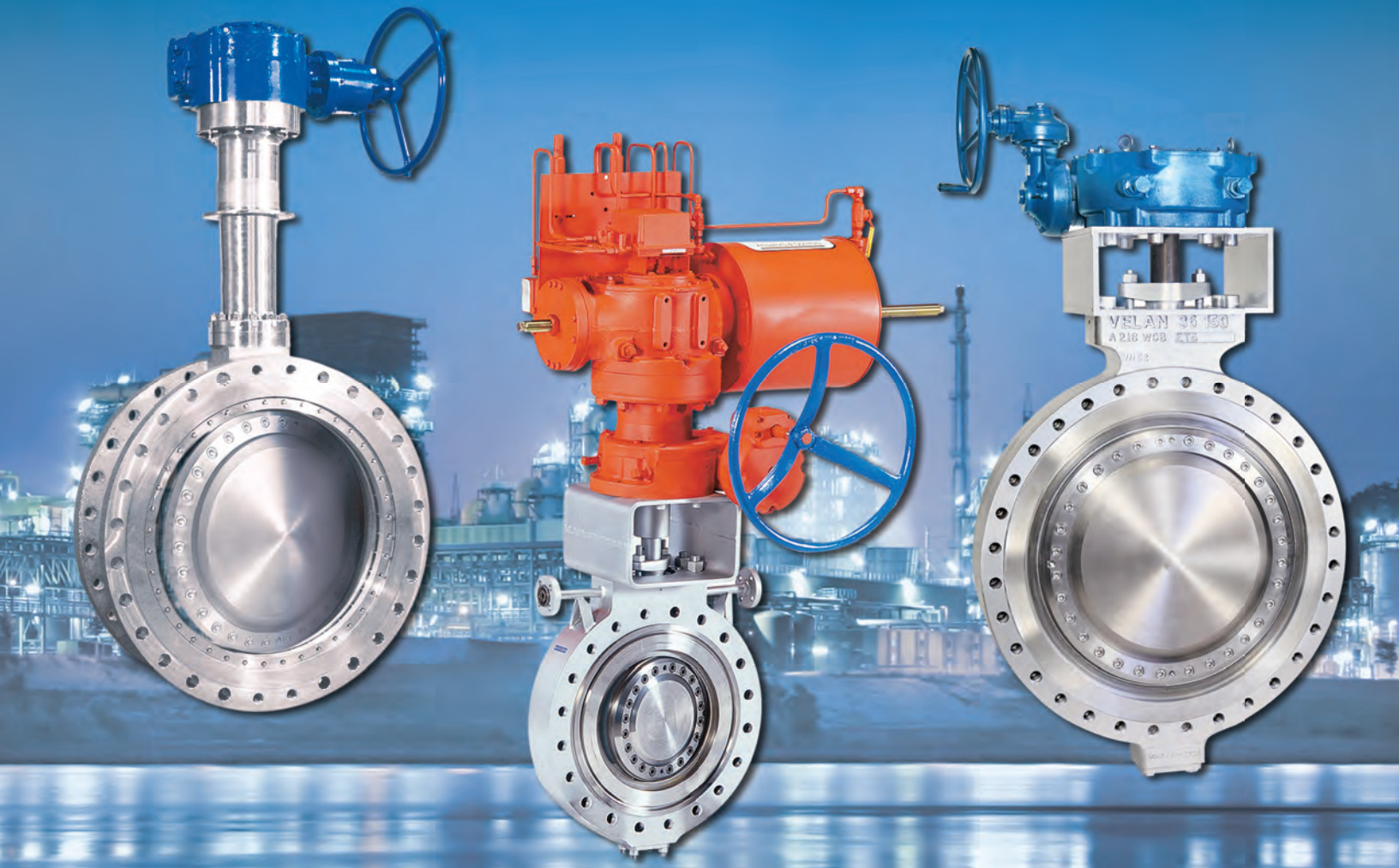
Torqseal®
Triple-offset butterfly valves



ASME classes: 150–900
Sizes: NPS 3–80 (DN 80–2000)

axida • CERTIFIED • IEC 61508 • SIL 3 CAPABLE •

VELAN

VELAN'S PROFILE

VELAN AT A GLANCE

History
- Founded in 1950

Sales
- Over $500 million

People
- Over 2,000 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.

- 17 production facilities
  - 5 plants in North America
  - 6 plants in Europe
  - 6 plants in Asia
- 5 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, U.S.A. (N)
Velan Valve Corp., Plant 3

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

Ansan City, South Korea
Velan Ltd., Plant 3

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

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

Coimbatore, India
Velan Valves India Pvt. Ltd.

Distribution centers

Granby, Canada
Vel*CAN*

Benicia, CA, U.S.A.
Vel*CAL*

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

Houston, TX, U.S.A.
Vel*TEX*

Willich, Germany
Velan GmbH

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

MANUFACTURING PROGRAM

VELAN TRIPLE -OFFSET ZERO LEAKAGE BUTTERFLY VALVE STANDARD PRODUCTION RANGE TO API 609

Carbon and alloy steel, 316 stainless, duplex, monel, hastelloy, inconel, alloy 20 and titanium.
For valve sizes, ASME classes and designs not shown below, please consult Velan Engineering.

Double flanged (short pattern)

NPS 3–48 (DN 80–1200)

ASME classes 150–600

Face-to-Face to ISO 5752

Double flanged (long pattern)

NPS 3–48 (DN 80–1200)

ASME classes 150–600

Face-to-Face to B16.10

Body conforms to API 600 wall thickness

Cryogenic

NPS 3–80 (DN 80–2000)

ASME classes 150–900

Face-to-face to ISO 5752

Butt weld also available

Butt weld type

4–24 (DN 100–600)

ASME classes 150–300

Lug type

NPS 3–48 (DN 80–1200)

ASME classes 150–600

Face-to-face to API 609

Wafer type

NPS 3–48 (DN 80–1200)

ASME classes 150–600

Face-to-face to API 609

Valves fire tested to API 607 *(see page 21).*

Note: *CoCr alloy as used throughout this catalog refers to cobalt chrome hardfacing alloys as supplied by Kennametal Stellite™, and other approved manufacturers.*

APPLICATIONS IN MAJOR INDUSTRIES

All over the world, Velan valves are used by the world's leading industrial companies to help keep their operating facilities running smoothly. In fact, Velan valves have a long history of proving themselves in many of the industrial world's toughest applications.

Fossil & Cogeneration Power

- Pump isolation
- Condenser cooling
- Pump & steam extraction isolation
- Heat exchanger, condenser cooling isolation
- District heating & cooling

Nuclear

- Containment isolation
- Saltwater service
- Core spray systems
- Pump isolation (Velan holds the ASME N-stamp)

Pulp & Paper

- Steam isolation, Boiler water
- Black and white liquors
- Oxygen lines
- Lime and slurries

Refining

- Oil storage isolation
- Hot cracking gas
- Flare gas hydrogen, sour gas isolation
- Product segregation
- Steam supply valves
- Catalytic cracker units
- Desulphurization systems & tail gas treaters

LNG & Cryogenics

- All liquid gases
- Oil field recovery
- Liquid natural gas
- Gasification plants and storage
- LNG ships
- Tank farm isolation

Petrochemicals

- Brine, CO_2 vapor, steam service
- Hydrogen gas, propane gas
- Ethylene plants
- Ethylene crackers
- Propylene plants
- Oxygen service
- Flare inlet & manifold isolation
- PSA & molecular sieves
- Coker plants

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 of Velan

Velan's number-one priority is quality. From order entry to design engineering, the entire company is totally committed to offering top quality 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. The company 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 (TQM) (since 1990)
- Lean manufacturing
- Six-Sigma

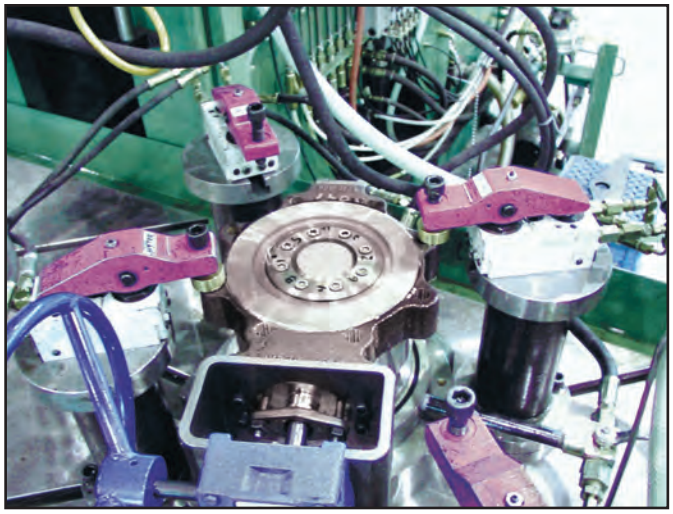
CERTIFICATIONS/APPROVALS

- 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
- SIL 3 capable (per IEC 61508).

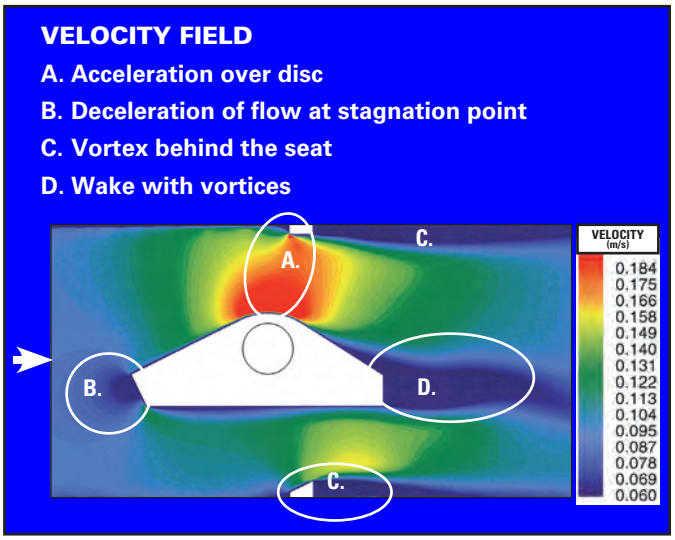
ENGINEERED SOLUTIONS

Velan's Engineering Design and Applications Group is comprised of 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.

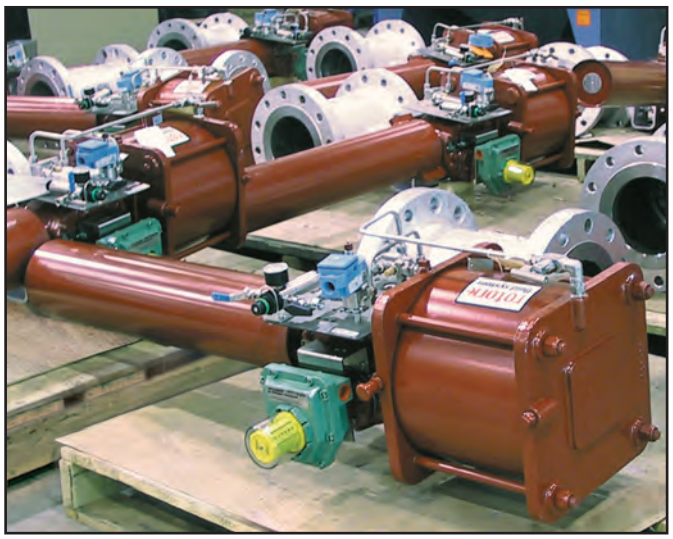
Whether we are refining the design of our standard valves, or engineering valves to meet the demands of a specific application, Velan's vast engineering resources can handle the task. In fact, Velan has a long history of partnering with major architect/engineers, electric utilities and other end users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



Seat bubble test performed on NPS 8 (DN 200) ISO class lug style Torqseal® valve.



A computer simulation of flow through Velan Torqseal® triple-offset valves destined for nuclear containment isolation service.



Automated Torqseal® valves destined for a petrochemical facility.

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.

Automated CoCr alloy (cobalt-chrome alloy) deposit system.

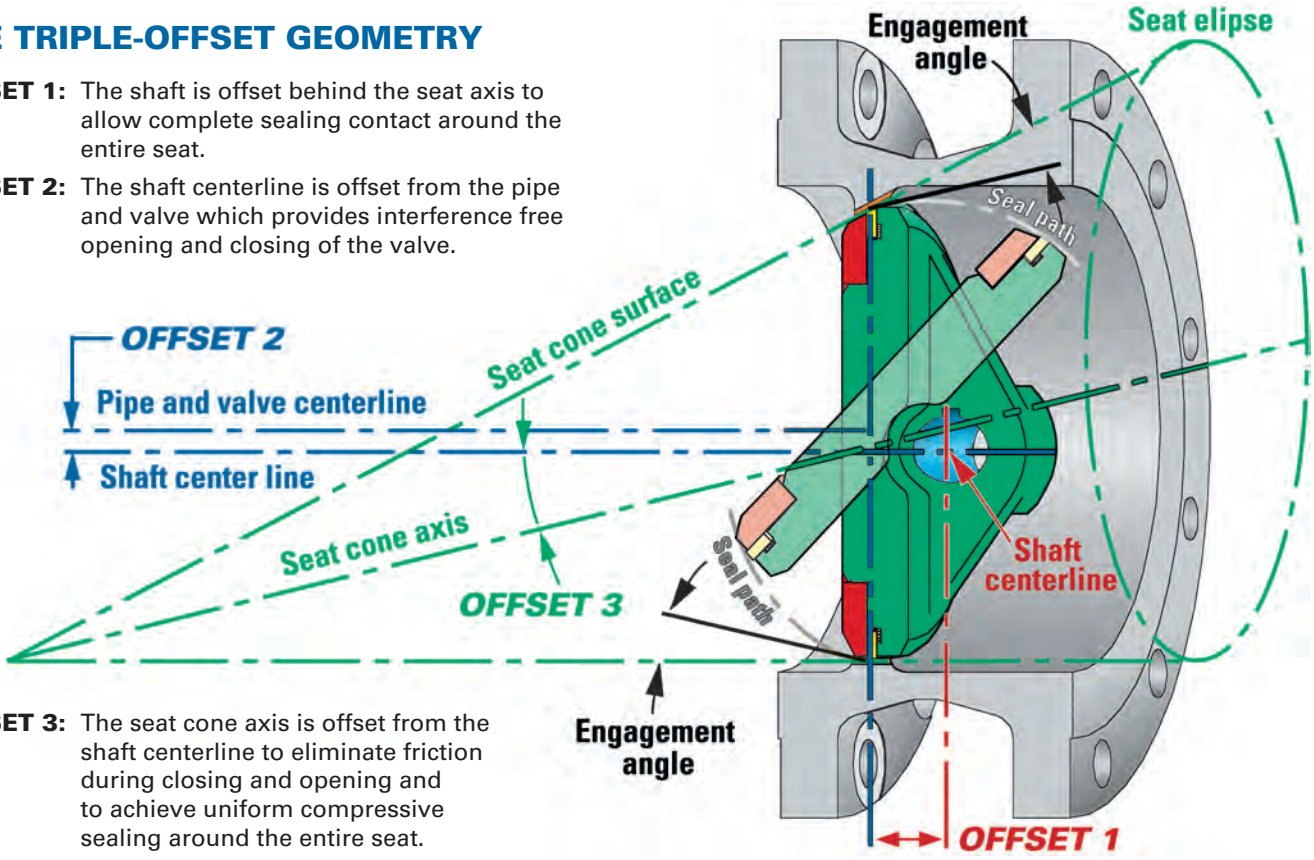
PRINCIPLE OF OPERATION

The Velan triple-offset valve provides a bidirectional bubble tight shut-off to API 598. This geometry ensures that the disc seal contacts the body seat only at the final shut-off position without rubbing or galling, providing a torque generated resilient seal with sufficient "wedging" to ensure a uniform seal contact.

THE TRIPLE-OFFSET GEOMETRY

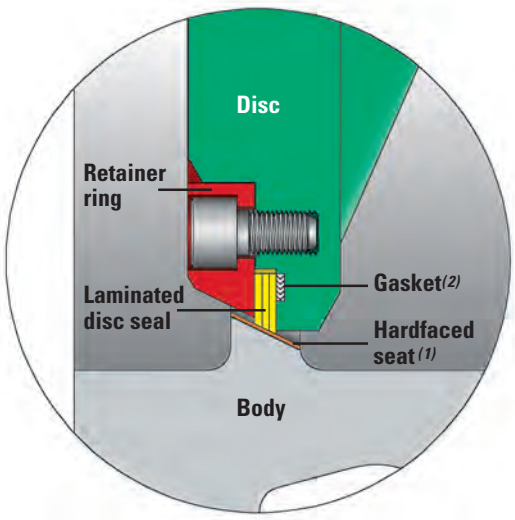
OFFSET 1: The shaft is offset behind the seat axis to allow complete sealing contact around the entire seat.

OFFSET 2: The shaft centerline is offset from the pipe and valve which provides interference free opening and closing of the valve.



OFFSET 3: The seat cone axis is offset from the shaft centerline to eliminate friction during closing and opening and to achieve uniform compressive sealing around the entire seat.

FRICTION FREE SEALING FOR LONG CYCLE LIFE

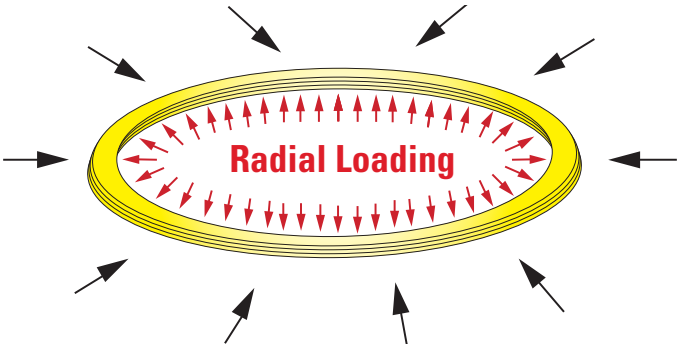


Velan provides an extra rigid retaining ring with bolting, designed in response to ASME stress calculations.

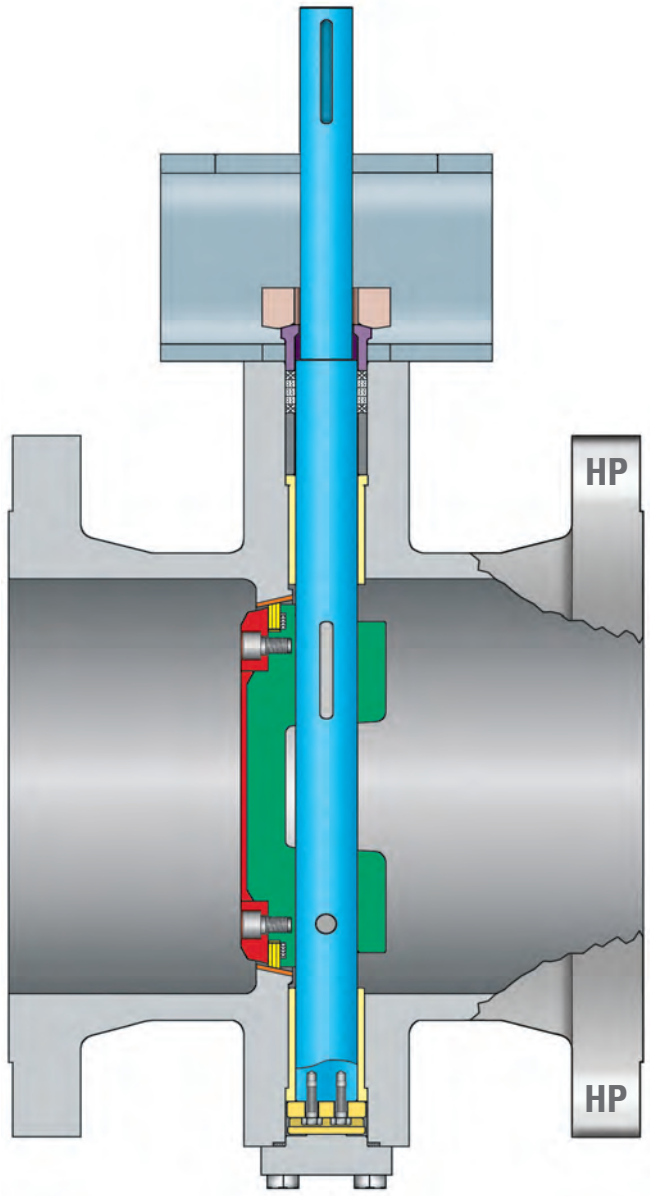
(1) Seat is hardfaced with CoCr alloy as standard.
(2) The gasket is spiral wound SS/Graphite for zero leakage.

THE LAMINATED DISC SEAL

Torque seating during closing of the valve provides uniform forces around the entire circumference of the valve seat. The self-adjusting, resilient seal flexes and energizes, assuming the shape of the seat. The compression forces equally distributed around the perimeter provide a tight bidirectional shut off. The resiliency of the seal allows the valve body and disc to contract or expand, without the risk of jamming due to temperature fluctuations.

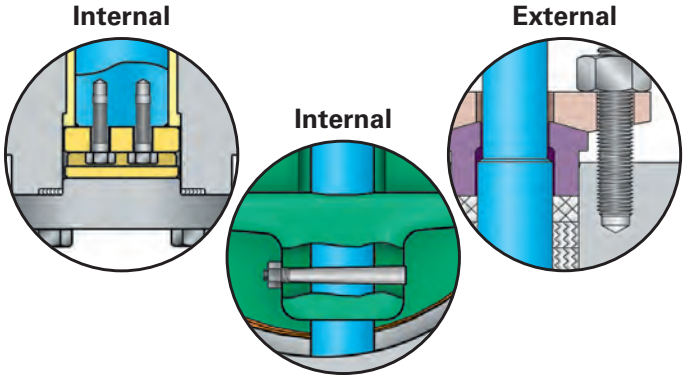


VALVE DESIGN FEATURES



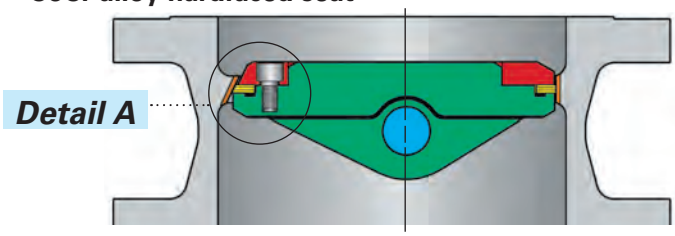
NOTE: *The valve is marked HP for the preferred pressure side when installing the valve (shaft side is the high pressure side for flow assisted sealing). Valve is bi-directional.*

- **Triple shaft blowout protection conforms to API 609**



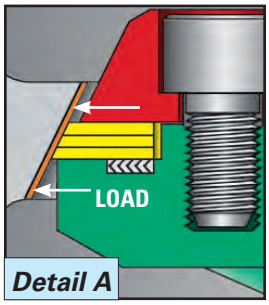
The Torqseal® advanced design features three-way eccentricity and unique elliptical seat geometry ensuring compressive sealing around the entire seat and a tight, bubble free valve.

- **CoCr alloy hardfaced seat**



Raised, conical seat prevents solids build-up from interfering with the seal. Seat is hardfaced with CoCr alloy to meet severe service (in lieu of soft 316SS hardfacing).

- **Standard laminated resilient disc seal to 800°F (427°C)**
  One to four graphite layers are carefully assembled between stainless steel rings and graphite using phenolic resin bond. Solid seal rings are available for abrasive services as well as high temperature applications up to 1112°F (600°C).

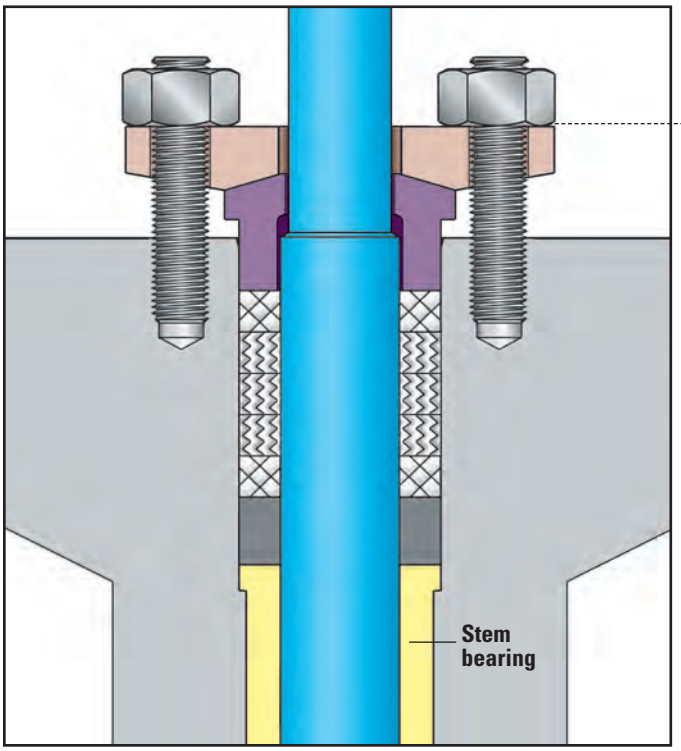


- **Zero leakage seat tightness (API 598 resilient seat standard)**
  The disc seal, evenly compressed around its circumference, produces a wedging effect which flexes the seal ring and reacts like a spring. The resilient seal assures zero leakage of liquids or gases to API 598 - resilient seat standard. Resiliency in the seal allows disc movement during thermal cycles while retaining tight shutoff as shown.
- **No cavity**
  There is no cavity to allow build-up of solids.
- **One-piece shaft**
  Large diameter shaft for safety is connected to the disc close to the bearings to absorb loads with taper pin and/or key to allow for differential expansion due to temperature.
- **Shaft bearings**
  The shaft is centered on two long bearings, chromed, nitrided, or as CoCr alloy (option) protected against the entrance of solids by bearing seals which are optional on Torqseal® valves.
- **Low emission shaft seals to API 622**
  Shaft is burnished to 16 RMS, ID of packing chamber finish 32 RMS. Live-loading available for long maintenance-free service. Easy access for packing adjustment. (See pages 10–11 for details and alternative stem seals.)
- **Certified to API 591, PED & ASME N (upon request)**

NEW STEM SEAL TECHNOLOGY PIONEERED BY VELAN

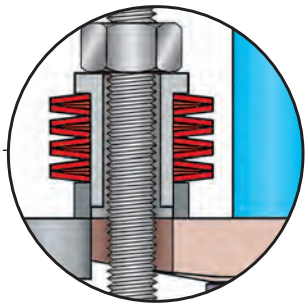
As a result of extensive tests conducted by Velan between 1966 and 1972, a new technology emerged at the time for high performance, leakproof, long life, and low maintenance stem seals for nuclear power, now available for all industries and applications.

Velan is continuing its efforts in updating the low emission technology which, in the case of Torqseal® valves, concerns the stem seal alone (no body-bonnet joint) to newly emerging standards.



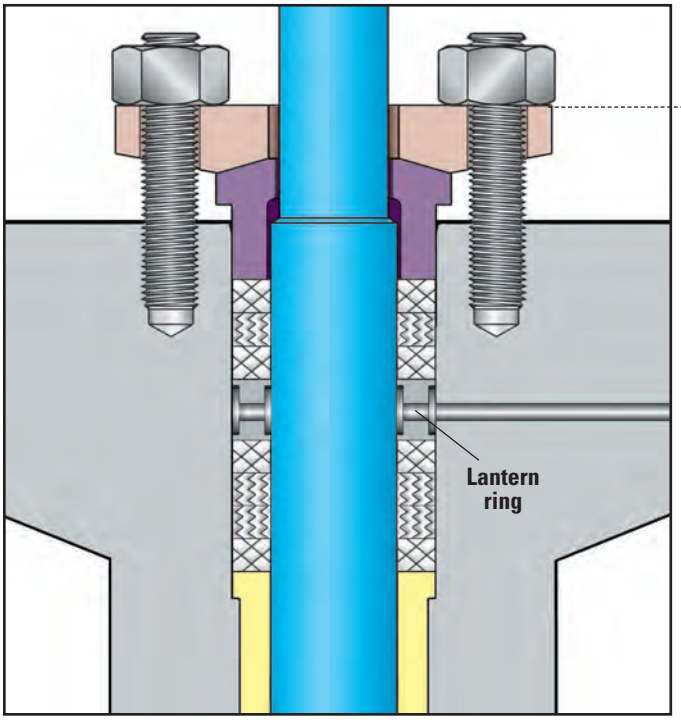
1. STANDARD LOW EMISSION STEM SEAL

- **Short and narrow packing chamber**
  Maximum 5 rings, 1/4" wide.
- **Large compression load required**
  Graphite rings pre-compressed to 4000 psi for effectiveness of all rings. Gland torque must be maintained after installation and in service to levels shown in manuals.
- **Superior finish** (32 RMS) of packing chamber and stem (16 RMS) to assure long cycle life.
- **Stem bearing** to assure concentric stem rotation, allowing stem packing to provide maximum sealing effectiveness.
- **Two-piece gland** with spherical mating surfaces to assure an even packing load over 360°.



OPTIONAL LIVE-LOADING

Provides predictable and constant packing compression for more than 5000 cycles before adjustment or repacking.



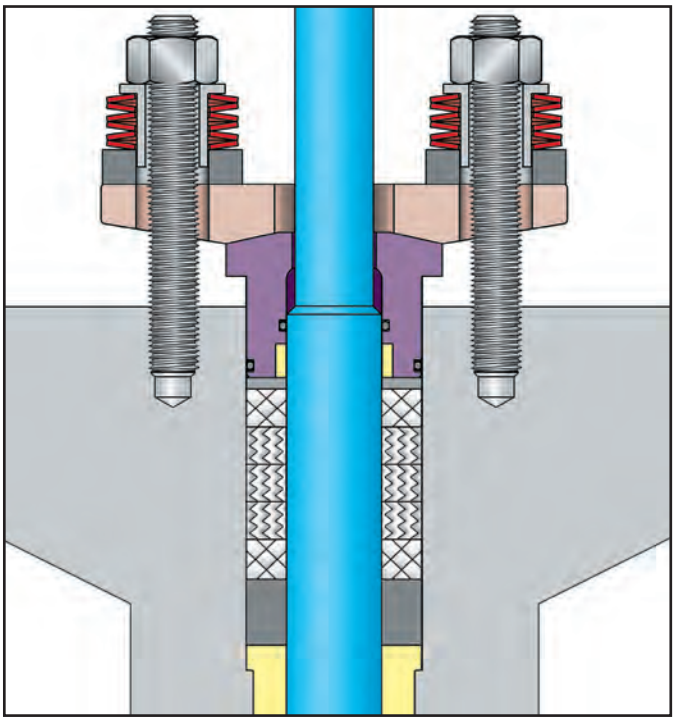
2. DOUBLE PACKED WITH PACKING PORT

- Double packing with leak-off monitoring purge port.
- Two sets of packing rings, precompressed to 4000 psi (graphite).
- A lantern ring and leak-off connection allows removal of leakage, if any, from bottom packing set.

Note: Select option "T" under *Service*, (section J) in the *How To Order* table. See page 26 for more details and options.

ASSURES LOWEST POSSIBLE ENVIRONMENTAL EMISSIONS

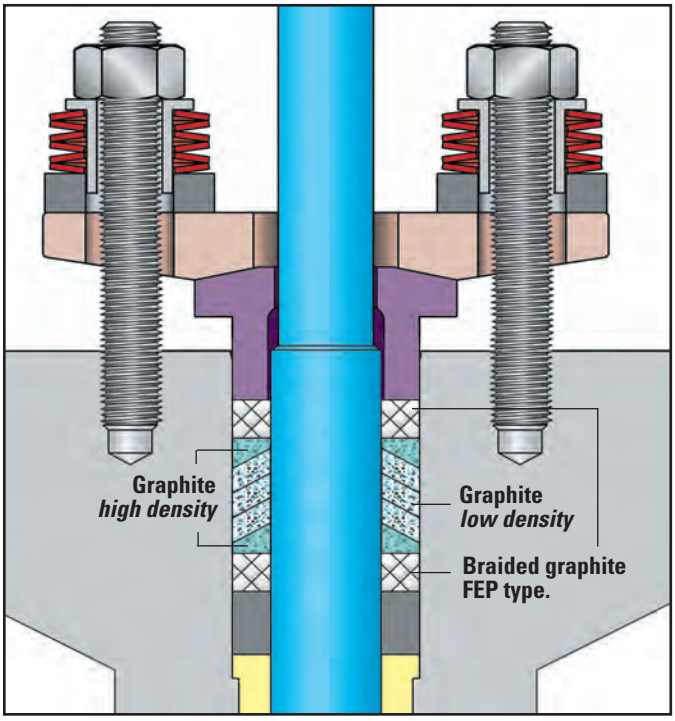
TA-Luft VDI 2440 is a German standard for fugitive emission measurement widely accepted throughout Europe. Packing sealing systems are required to be certified to this standard if they are intended to be used in certain critical applications. The specification requires that testing be witnessed by TUV Germany. Maximum allowable packing leakage is between ISO 15848-1 Class AH and BH and although there is no direct correlation between the ISO 15848-1 global leakage measurement and the leakage concentration measured by Method 21, it can be estimated that the TA-Luft requirement demands packing leakage in the range of only a few ppm. **Velan has qualified two different stem seal designs to the TA-Luft VDI 2440 requirement.**



3. THE TA-LUFT* VDI 2440 STEM SEAL

- **Fully-guided stem**
  Stem bearings in body and gland follower prevent wobbling and packing leakage due to side thrust on stem.
- **Precompressed packing rings to 4000 psi.**
- **Two O-Rings in gland follower**
  provide additional stem seal protection.
- **Live-loading**
  Provides constant packing compression and is essential for this packing arrangement.
- **Two-piece flanged gland.**
- **Superior finish of packing chamber (32 RMS) and stem (16 RMS) to assure long life.**

*Technical instructions to maintain cleanliness of air.



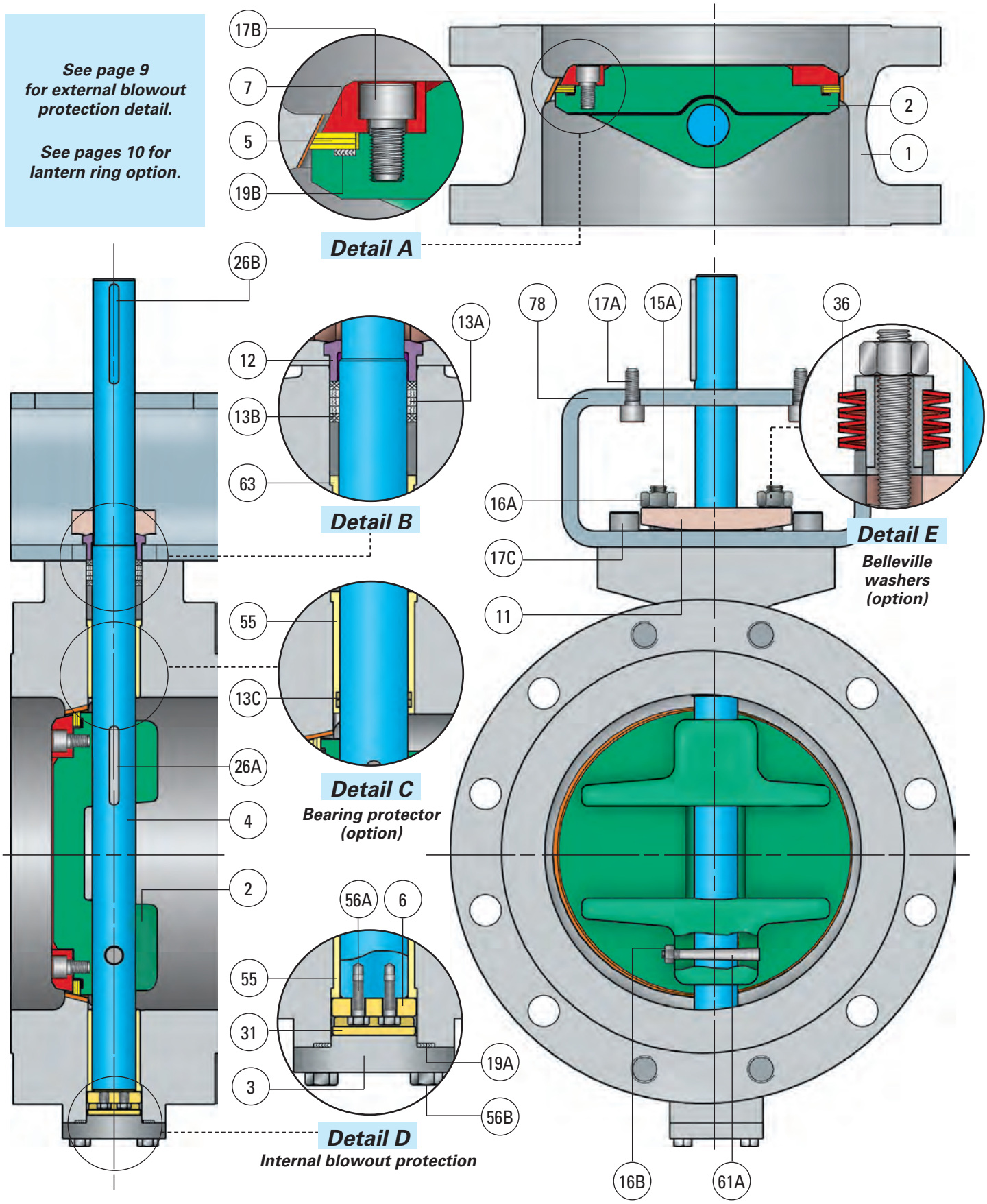
4. STEM SEAL WITH HIGH PERFORMANCE PACKING

- **Special High Performance Packing** is installed and then compressed using gland bolting to approximately 80% of its “free length”.
- The inherent sealing ability due to its cup and cone technology.
- Excellent quality of materials has been proven in standard and very difficult valve applications.
- All backed up by an intensive research program.

VALVE PARTS AND MATERIALS

See page 9 for external blowout protection detail.

See pages 10 for lantern ring option.



TO ASTM STANDARDS

ITEM	QTY	DESCRIPTION	CARBON STEEL	STAINLESS STEEL[1]	
			P02-AAAA	P13-DCDA	P13-DCJA
			Up to 800°F (427°C)	Up to 600°F (316°C)	Up to 800°F (427°C)
1	1	Body	A 216 WCB	A 351 Gr. CF8M	A 351 Gr. CF8M
	1	Seat (hard faced)	CoCr alloy Gr. 21	CoCr alloy Gr. 21	CoCr alloy Gr. 21
2	1	Disc	A 216 Gr. WCB nickel plated[2]	A 351 Gr. CF8M or A182 F316	A 351 Gr. CF8M or A182 F316
3	1	Cover	WCB or A 105	CF8M or F316	CF8M or F316
4	1	Stem	A 479 Gr. 410	Type 630 ASTM 564	A 638 Type 660
5	1	Seal[3]	Duplex + Graphite	Duplex + Graphite	Duplex + Graphite
6	1	Thrust bearing	Stainless steel (Nitrided)	Stainless steel (chrome plated)	Stainless steel (chrome plated)
7	1	Retaining ring	Duplex or SS410	Duplex	Duplex
11	1	Packing flange	Carbon steel	Stainless steel	Stainless steel
12	1	Gland bushing	Stainless steel	Stainless steel	Stainless steel
13A	2	Packing ring (end)	Graphite braided	Graphite braided	Graphite braided
13B	3	Packing ring (internal)	Graphite die formed	Graphite die formed	Graphite die formed
13C	Option	Bearing protector	Graphite	Graphite	Graphite
14[4]	Option	Lantern ring[5]	Stainless steel	Stainless steel	Stainless steel
15A	2	Stud (packing flange)	A 193 Gr. B7	A 193 Gr. B8M	A 193 Gr. B8M
16A	2	Nut (packing flange)	A 194 Gr. 2H	A 194 Gr. 8M	A 194 Gr. 8M
16B	1	Locknut (crimped)[6]	Stainless steel	Stainless steel	Stainless steel
17A	Set	Socket head cap screw (bracket)	Alloy steel	Alloy steel	Alloy steel
17B	Set	Socket head cap screw (disc)	Stainless steel	Stainless steel	Stainless steel
17C	4	Socket head cap screw (actuator)	Alloy steel	Alloy steel	Alloy steel
19A	1	Gasket (cover)	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
19B	1	Gasket (disc)	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
26A	1	Key (disc)	A 479 Type 410	Type 630 ASTM 564	A 638 Type 660
26B	1	Key (actuator)	Alloy steel	Alloy steel	Alloy steel
31	1	Locking plate	Stainless steel	Stainless steel	Stainless steel
36	Option	Belleville washer	Gr. H11/H13	Gr. 6150	Gr. 6150 (Standard)
55	2	Bushing	Stainless steel (Nitrided)	Stainless steel (chrome plated)	Stainless steel (chrome plated)
56A	2	Hex head cap screw (bearing)	A 193 Gr. B8M	A 193 Gr. B8M	A 193 Gr. B8M
56B	4	Hex head cap screw (cover)	A 193 Gr. B8M	A 193 Gr. B8M	A 193 Gr. B8M
61A	1	Taper pin	A 479 Gr. 410	Type 630 ASTM 564	A 638 Type 660
61B[4]	1	Centering pin	Stainless steel	Stainless steel	Stainless steel
63	1	Packing washer	Stainless steel	Stainless steel	Stainless steel
78	1	Bracket	Carbon steel	Carbon steel	Carbon steel

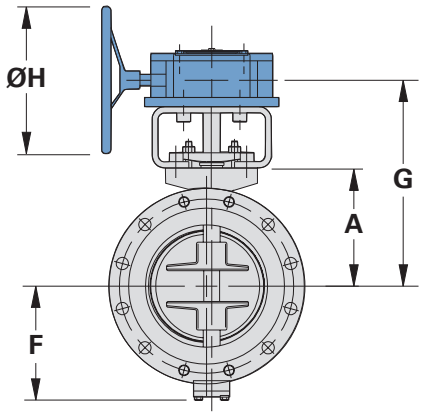
Alternative materials for body, disc and other parts are available to meet specific conditions.

(1) For application above 800°F (427°C) contact Velan.
(2) NPS 3 (DN 80) to NPS 12 (DN 300) = A182 F316.
(3) Other materials are available upon request.
(4) Not shown in illustration.
(5) See page 10, option 2.
(6) Locknut with deformed thread.

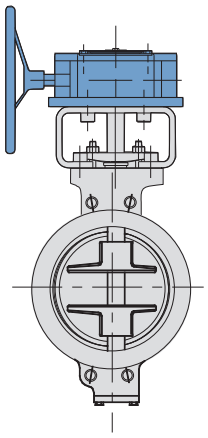
***Note:** CoCr alloy as used throughout this catalog refers to cobalt chrome hardfacing alloys as supplied by Kennametal Stellite™, and other approved manufacturers.*

IMPERIAL DIMENSIONS AND WEIGHTS

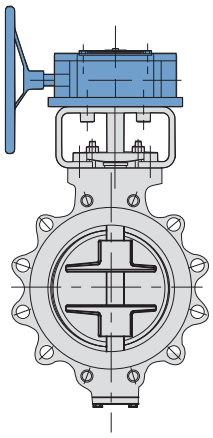
METAL-SEATED TORQSEAL® VALVES B16.5/B16.47



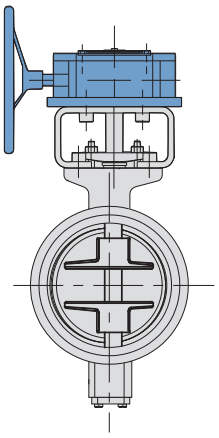
Double flanged short and long pattern



Wafer type



Lug type



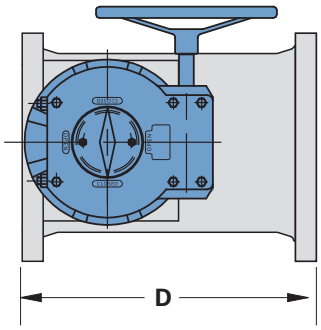
Butt weld type

NPS	Dimensions (inch.)									Weight (lbs)					
	A	D					F	G	ØH	Bare Stem B16.5 / B16.47 Series A					Std. actuator + Top works
		Long	Short	Lug	Wafer	Butt Weld				Long	Short	Lug	Wafer	Butt Weld	
ASME class 150, NPS 3–48															
3	5.36	8.00	4.50	1.88	1.88	–	4.94	9.46	7.87	45	40	32	23	–	15
4	6.21	9.00	5.00	2.12	2.12	7.5	5.78	11.31	7.87	65	60	48	37	53	20
6	5.98	10.50	5.50	2.25	2.25	8.88	6.51	12.09	7.87	101	87	61	56	110	20
8	8.86	11.50	6.00	2.50	2.50	9.94	8.48	14.20	11.81	155	135	90	80	178	30
10	9.75	13.00	6.50	2.81	2.81	12 .00	9.41	15.25	19.69	265	195	145	110	291	35
12	11.44	14.00	7.00	3.19	3.19	13.63	11.16	17.09	19.69	350	300	210	175	378	50
14	12.47	15.00	7.50	3.62	3.62	14.31	11.91	20.36	23.62	445	385	280	230	623	75
16	13.72	16.00	8.50	4.00	4.00	16	13.32	21.89	23.62	570	500	390	306	906	130
18	15.41	17.00	8.75	4.50	4.50	17.19	15.01	23.58	19.69	750	650	580	568	1132	165
20	16.65	18.00	9.00	5.00	5.00	18.69	16.11	24.97	19.69	930	800	720	680	1424	170
24	20.65	20.00	10.50	6.06	6.06	20.75	19.49	28.95	23.62	1525	1350	1145	1060	2402	240
28	24.40	24.00	11.50	6.50	6.50	–	22.55	37.36	23.62	2175	1850	2150	1720	–	570
30	25.01	24.00	12.50	7.50	7.50	–	23.24	37.36	23.62	2500	2195	2015	1950	–	570
36	29.51	28.00	13.00	8.00	8.00	–	27.54	43.41	23.62	3810	3260	3110	2570	–	700
40	30.25	32.00	16.12	9.00	9.00	–	30.00	44.15	24.00	5100	4415	4675	3700	–	750
42	30.50	32.00	16.12	9.69	9.69	–	31.75	44.82	27.56	6250	4610	5025	4020	–	1475
48	32.84	36.00	18.50	10.88	10.88	–	35.02	47.55	27.56	8000	6650	7460	6000	–	1675
ASME class 300, NPS 3–36															
3	5.36	11.12	4.50	1.88	1.88	–	4.94	9.46	7.87	55	45	32	29	–	15
4	6.21	12.00	5.00	2.12	2.12	7.5	5.78	11.31	7.87	90	75	45	35	53	20
6	7.93	15.88	5.50	2.31	2.31	8.88	7.54	13.27	11.81	170	130	78	58	110	30
8	9.56	16.50	6.00	2.88	2.88	9.94	9.29	15.21	19.69	260	200	130	100	178	50
10	10.77	18.00	6.50	3.25	3.25	12 .00	10.29	18.66	23.62	395	295	215	165	291	75
12	12.09	19.75	7.00	3.62	3.62	13.63	11.69	20.26	23.62	530	400	300	265	378	130
14	13.41	30.00	7.50	4.62	4.62	14.31	13.01	21.58	19.69	820	550	460	330	623	165
16	14.78	33.00	8.50	5.25	5.25	16	14.23	23.10	19.69	1095	745	645	430	906	215
18	16.59	36.00	8.75	5.88	5.88	17.19	16.04	24.91	23.62	1400	945	850	750	1132	240
20	18.51	39.00	9.00	6.25	6.25	18.69	17.36	26.83	23.62	1795	1185	1065	820	1424	450
24	21.76	45.00	10.50	7.12	7.12	20.75	20.11	34.11	23.62	2600	1680	1590	1110	2402	570
28	25.82	53.00	11.50	9.00	9.00	–	24.11	39.72	23.62	3700	2618	2900	2100	–	700
30	26.39	55.00	17.75	9.50	9.50	–	24.42	40.29	23.62	4815	3485	3180	2550	–	700
36	29.39	68.00	20.00	9.50	9.50	–	27.92	43.71	23.62	7450	5100	4350	3200	–	800
ASME class 600, NPS 4–24															
4	6.75	17.00	7.5	2.50	2.50	–	6.92	12.09	11.81	163	134	75	60	–	30
6	8.80	22.00	8.25	3.06	3.06	–	8.37	14.46	19.69	307	231	135	95	–	50
8	10.46	26.00	9.06	4.00	4.00	–	10.00	18.63	23.62	554	388	270	203	–	130
10	12.05	31.00	9.81	4.62	4.62	–	11.86	20.21	19.69	913	597	425	289	–	165
12	13.46	33.00	10.63	5.50	5.50	–	13.21	21.78	19.69	1142	742	585	400	–	215
14	14.52	35.00	11.42	6.12	6.12	–	15.32	28.95	23.62	1375	890	700	480	–	450
16	17.55	39.00	12.2	7.00	7.00	–	16.20	34.11	23.62	2175	1350	1250	875	–	570
18	19.01	43.00	12.99	7.88	7.88	–	17.55	33.91	23.62	2675	1650	1525	1067	–	570
20	20.80	47.00	13.78	8.50	8.50	–	19.20	35.70	24.00	3075	1900	1750	1225	–	700
24	24.05	55.00	15.35	9.13	9.13	–	22.20	38.37	27.56	4425	2750	2400	1680	–	850

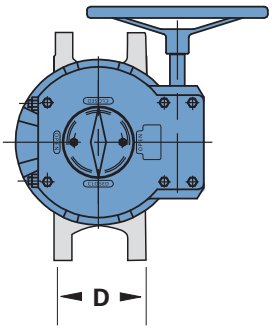
Larger sizes available upon request.

METRIC DIMENSIONS AND WEIGHTS

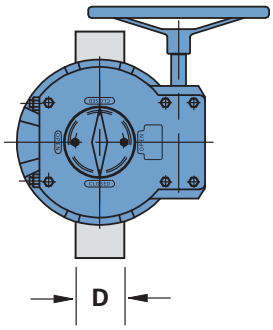
METAL-SEATED TORQSEAL® VALVES B16.5/B16.47



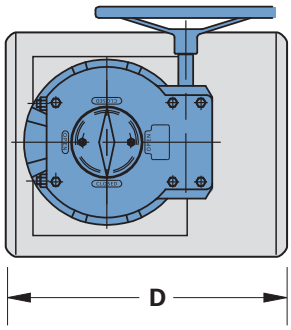
Long pattern



Short pattern



Lug/wafer type

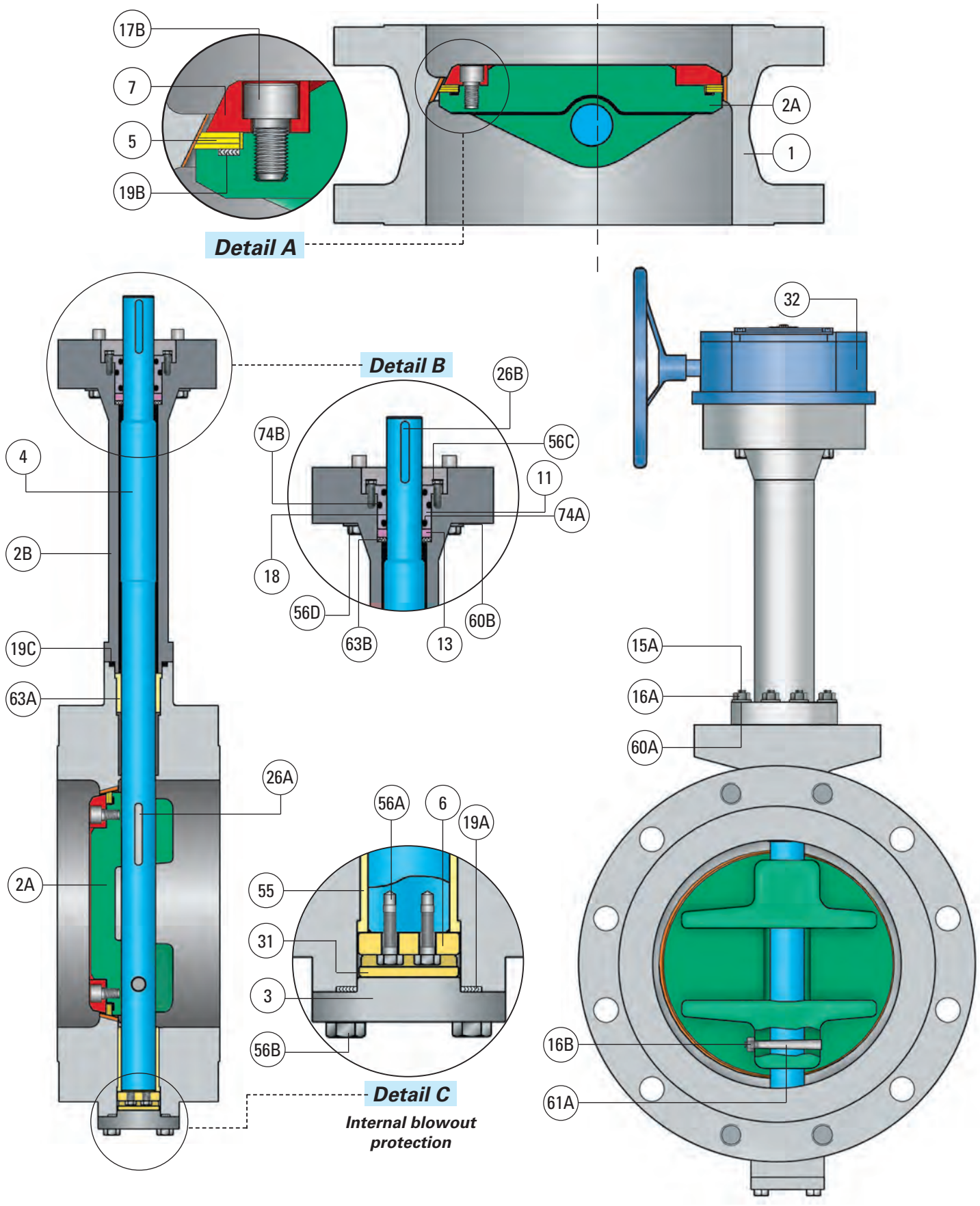


Butt weld type

DN	Dimensions (mm)									Weight (kg)					
	A	D					F	G	ØH	Bare Stem B16.5 / B16.47 Series A					Std. actuator + Top works
		Long	Short	Lug	Wafer	Butt Weld				Long	Short	Lug	Wafer	Butt Weld	
ASME class 150, DN 80–1200															
80	136	203	114	48	48	–	125	240	200	20	18	15	10	–	7
100	158	229	127	54	54	191	147	287	200	30	27	22	17	24	9
150	152	267	140	57	57	225	165	307	200	46	39	28	25	50	9
200	225	292	152	64	64	252	215	361	300	70	61	41	36	81	14
250	248	330	165	71	71	305	239	387	500	120	89	66	50	132	16
300	291	356	178	81	81	346	283	434	500	159	136	95	79	172	23
350	317	381	191	92	92	364	303	517	600	202	175	127	104	283	34
400	348	406	216	102	102	406	338	556	600	259	227	177	139	411	59
450	391	432	222	114	114	437	381	599	500	341	295	263	258	514	75
500	423	457	229	127	127	475	409	634	500	422	363	327	309	646	77
600	525	508	267	154	154	527	495	735	600	692	613	520	481	1091	109
700	620	610	292	165	165	–	573	949	600	987	840	976	781	–	259
750	635	610	318	191	191	–	590	949	600	1135	997	915	885	–	259
900	750	711	330	203	203	–	700	1103	600	1730	1480	1412	1167	–	318
1000	768	813	409	229	229	–	762	1121	610	2315	2004	2122	1680	–	340
1050	775	813	409	246	246	–	806	1138	700	2838	2093	2281	1825	–	669
1200	834	914	470	276	276	–	890	1208	700	3632	3019	3387	2724	–	760
ASME class 300, DN 80–900															
80	136	282	114	48	48	–	125	240	200	25	20	15	13	–	7
100	158	305	127	54	54	191	147	287	200	41	34	20	16	24	9
150	201	403	140	59	59	225	192	337	300	77	59	35	26	50	14
200	243	419	152	73	73	252	236	386	500	118	91	59	45	81	23
250	274	457	165	83	83	305	261	474	600	179	134	98	75	132	34
300	307	502	178	92	92	346	297	514	600	241	182	136	120	172	59
350	341	762	191	117	117	364	330	548	500	372	250	209	150	283	75
400	375	838	216	133	133	406	361	587	500	497	338	293	195	411	98
450	421	914	222	149	149	437	407	633	600	636	429	386	341	514	109
500	470	991	229	159	159	475	441	682	600	815	538	484	372	646	204
600	553	1143	267	181	181	527	511	866	600	1180	763	722	504	1091	259
700	656	1346	292	229	229	–	612	1009	600	1680	1189	1317	953	–	318
750	670	1397	451	241	241	–	620	1023	600	2186	1582	1444	1158	–	318
900	747	1727	508	241	241	–	709	1110	600	3382	2315	1975	1453	–	363
ASME class 600, DN 100–600															
100	171	432	191	64	64	–	176	307	300	74	61	34	27	–	14
150	224	559	210	78	78	–	213	367	500	139	105	61	43	–	23
200	266	660	230	102	102	–	254	473	600	252	176	123	92	–	59
250	306	787	249	117	117	–	301	513	500	415	271	193	131	–	75
300	342	838	270	140	140	–	336	553	500	518	337	266	182	–	98
350	369	889	290	155	155	–	389	735	600	624	404	318	218	–	204
400	446	991	310	178	178	–	411	866	600	987	613	568	397	–	259
450	483	1092	330	200	200	–	446	861	600	1214	749	692	484	–	259
500	528	1194	350	216	216	–	488	907	610	1396	863	795	556	–	318
600	611	1397	390	232	232	–	564	975	700	2009	1249	1090	763	–	386

Larger sizes available upon request.

CRYOGENIC TORQSEAL TRIPLE-OFFSET



VALVE PARTS AND MATERIALS

ITEM	DESCRIPTION	MATERIAL GRADE
1	Body	A351 Gr. CF8M
	Seat (hard faced)	CoCr alloy Gr. 21
2A	Disc	A351 Gr. CF8M or CF3M
2B	Extended bonnet	A351 Gr. CF3M or CF8M
3	Cover	A479-316L
4	Stem	A453 Gr. 660Cl. B Type 2
5	Seal[1]	Nitronic 50
6	Thrust bearing	A479 XM19 Nitrided
7	Retaining ring	Duplex
11	Packing flange	A182F316 / Z6CNd 17-11
13	Graphite ring	Graphite
15A	Stud	A320 Gr. B8M Cl. 2
16A	Nut	A194 Gr. 8M
16B	Nut	A194 Gr. 8M
17	Socket head cap screw	SS 316
18	Bushing	-
19A	Gasket (cover)	SS347 + Graphite
19B	Gasket (disc)	Graphite
19C	Gasket	Graphite
26A	Key (disc)	A182F316
26B	Key (actuator)	X2CrNiMo 17-12-2
31	Locking plate	A479XM19 Nitrided
32	Gearbox	-
55	Bushing	Stainless steel + DFN15
56A	Hex head cap screw	A320 Gr. B8M Cl. 2
56B	Hex head cap screw	A320 Gr. B8M Cl. 2
56C	Hex head cap screw	A320 Gr. B8M Cl. 2
56D	Hex head cap screw	A320 Gr. B8M Cl. 2
60A	Nut lock	A182F316 / X2CrNi 18-9
60B	Nut lock	A182F316 / X2CrNi 18-9
61A	Taper pin	A320 Gr. B8M
61B[2]	Centering pin	A182F316
63A	Packing washer	A182F316 / Z6CNd 17-11
63B	Packing washer	A182F316L
74A	O-ring	Viton
74B	O-ring	Viton

Alternative materials for body, disc, and other parts are available upon request to meet specific requirements.

(1) Other materials are available upon request.
(2) Not shown in illustration.

Note: *CoCr alloy as used throughout this catalog refers to cobalt chrome hardfacing alloys as supplied by Kennametal Stellite™, and other approved manufacturers.*

Design Features

- **Triple-offset disc rotation:** provides bubble tight sealing without rubbing or galling.
- **Cryogenic stem packing** (Detail B): composed of superposed Viton O-rings and expanded graphite rings (fire-safe approved).
- **Low fugitive emission** (Detail B): in accordance with ISO 15848.
- **No cavity** (Detail C): no cavity to prevent build-up of solids.
- **Drainage possibility** (Detail C): the bottom cover can be removed if drainage is required.
- **Internal blow-out protection** (Detail C): prevents the shaft from blowing out under pressure.
- **Inherent fire safe function:** stainless steel construction and metallic seal (item 5) provide inherent fire safe function.
- **Extended bonnet** (item 2B): with a sufficient gas column to keep the stem packing away from cold fluid. Extended bonnet length is qualified for use in LNG application with type approvals from major Classification Societies.
- **Actuator:** manual, pneumatic (single or double acting type), electric or hydraulic according to customer specification. ON/OFF or MODULATING function according to the application. Fast acting actuators for Emergency Shut Down function (ESD) also available.
- **High quality castings:** radiographic control, dye penetrant test, ferrite content control, impact test at -321°F (-196°C) according to customer's requirements.
- **Reinforced stainless steel shaft bearings:** for high cycles and smooth operation at very low temperature (item 55).
- **High reliability:** Safety integrity level requirements according to IEC 61508.

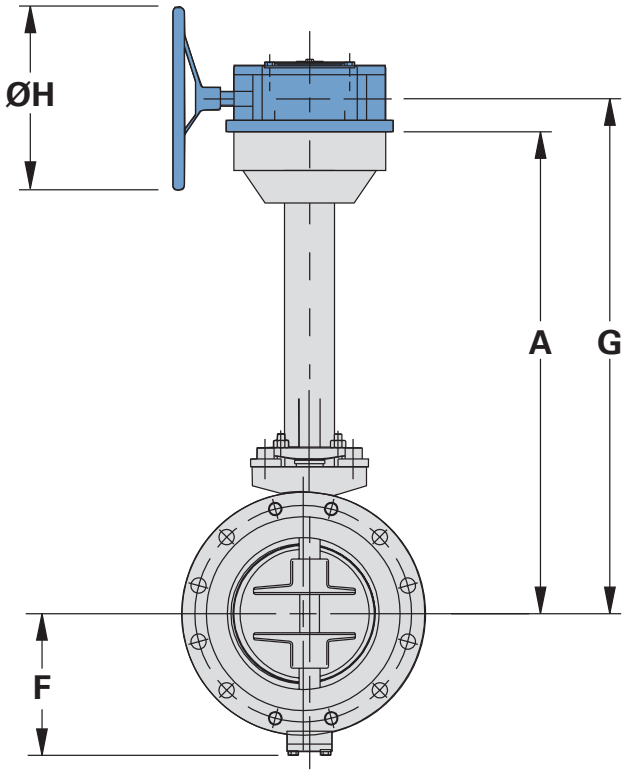
Design Standards

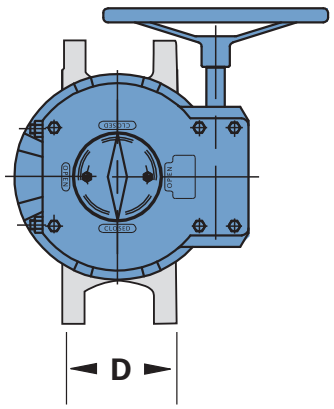
- Design: ASME standard, CE marked (PED), ATEX certified.
- Face-to-face dimensions: ISO 5752 (Short Pattern).
- Ambient temperature testing: API 598 (other type of tests available upon request).
- Alternative Body types (ISO Long pattern, Wafer, LUG or Butt Welded) and sizes available upon request.
- Fire safe according to API 607 and ISO 10497.
- Flanges standard: ANSI B16.5 (sizes from NPS 3 to 24), ANSI B16.47 series A or B (sizes from NPS 26 to 60), ASME VIII div.1 Appendix 2 (sizes > NPS 60). Other flanges standards available upon request.
- Cryogenic temperature testing: BS6364 (other type of tests available upon request).

IMPERIAL DIMENSIONS AND WEIGHTS

METAL-SEATED TORQSEAL® TRIPLE-OFFSET CRYOGENIC VALVES

Short pattern





NPS	Dimensions (inch.)					Weight (lbs)	
	A	D	F	G	ØH	Valve	Valve and gear
ASME class 150, NPS 3–80							
3	21.65	4.49	4.92	23.39	5.91	62	80
4	22.44	5	5.79	24.17	5.91	82	100
6	23.23	5.51	6.54	24.96	7.87	108	127
8	25.28	5.98	7.83	26.97	11.81	152	171
10	26.77	6.5	9.41	28.5	19.69	232	250
12	28.68	7.01	10.06	30.47	19.69	331	362
14	29.92	7.48	11.93	31.89	23.62	456	505
16	31.5	8.5	13.31	33.46	27.56	584	633
18	34.65	8.74	15	37.13	19.69	761	860
20	37.4	9.02	16.1	39.88	19.69	942	1041
24	42.72	10.51	19.49	45.87	23.62	1541	1696
30	48.43	12.52	23.23	52.07	19.69	2485	2820
32	53.23	12.52	24.49	56.56	23.62	2999	3334
36	57.09	12.99	27.56	60.73	27.56	3786	4275
40	61.65	16.14	30.16	65.55	23.62	4902	5541
42	63.07	16.14	31.57	66.97	27.56	5497	6137
48	67.2	18.5	35.71	71.34	31.5	7532	8432
54	75.31	20.87	39.88	80.14	27.56	9958	11215
56	76.69	20.87	41.26	81.52	27.56	10860	12116
60	83.46	23.62	44.09	88.52	27.56	12802	15492
64	86.18	23.62	46.81	91.24	27.56	14943	17633
66	87.64	24.02	48.27	92.7	31.5	16090	18780
72	95.67	26.38	52.36	100.73	31.5	20948	23638
80	106.3	29.92	59.06	111.36	39.37	27563	30870
ASME class 300, NPS 3–36							
3	21.65	4.49	4.92	23.39	5.91	66	85
4	22.52	5	5.79	24.23	11.81	97	116
6	24.29	5.5	7.56	26	11.81	152	171
8	26.77	5.98	9.29	28.54	19.69	225	256
10	27.6	6.5	10.28	29.57	23.62	331	379
12	30.31	7.01	11.69	32.78	15.75	437	536
14	30.98	7.52	12.99	33.44	19.69	622	721
16	32.4	8.5	14.21	35.55	19.69	829	983
18	35.67	8.74	16.02	38.82	23.62	1056	1211
20	38.66	9.02	17.36	41.99	19.69	1327	1663
24	43.35	10.51	20.12	46.99	23.62	2073	2562
30	49.61	12.01	24.41	53.5	19.69	3779	4419
32	54.72	12.52	25.98	58.86	23.62	4406	5305
36	56.5	12.99	27.76	61.32	35.43	5627	6884
ASME class 600, NPS 4–24							
4	22.91	7.52	6.81	24.63	11.81	106	125
6	24.21	8.27	8.39	25.93	19.69	212	230
8	31.65	9.06	10	33.62	23.62	265	313
10	33.5	9.8	11.85	35.96	15.75	573	673
12	40.43	10.63	13.23	43.88	19.69	756	856
14	41.93	11.42	14.37	45.08	19.69	1036	1191
16	43.31	12.2	15.75	46.63	19.69	1544	1879
18	44.69	12.99	17.13	48.01	19.69	1874	2231
20	46.26	13.78	18.7	49.9	27.56	2403	2893
24	48.03	15.35	20.47	51.93	19.69	3098	3737
ASME class 900, NPS 6–24							
6	25.67	8.86	9.84	27.44	19.69	364	395
8	34.06	10.83	12.4	36.52	15.75	478	578
10	36.46	12.8	14.8	38.92	15.75	1025	1125
12	43.74	14.76	16.54	46.89	15.75	1429	1583
14	45.67	16.73	18.11	49	19.69	1921	2256
16	47.28	18.7	19.72	50.61	19.69	2765	3100
18	49.02	19.69	21.46	52.66	27.56	3565	4033
20	50.94	22.64	23.39	54.59	31.5	4507	4974
24	53.15	26.57	25.59	57.28	27.56	5980	6880

METRIC DIMENSIONS AND WEIGHTS

METAL-SEATED TORQSEAL® TRIPLE-OFFSET CRYOGENIC VALVES

DN	Dimensions (mm)					Weight (kg)	
	A	D	F	G	ØH	Valve	Valve and gear
ASME class 150, DN 80–2000							
80	550	114	125	594	150	28	37
100	570	127	147	614	150	37	46
150	590	140	166	634	200	49	58
200	642	152	199	685	300	69	78
250	680	165	239	724	500	105	114
300	729	178	255	774	500	150	164
350	760	190	303	810	600	207	229
400	800	216	338	850	700	265	287
450	880	222	381	943	500	345	390
500	950	229	409	1013	500	427	472
600	1085	267	495	1165	600	699	769
750	1230	318	590	1323	500	1127	1279
800	1352	318	622	1437	600	1360	1512
900	1450	330	700	1543	700	1717	1939
1000	1566	410	766	1665	600	2223	2513
1050	1602	410	802	1701	700	2493	2783
1200	1707	470	907	1812	800	3416	3824
1350	1913	530	1013	2036	700	4516	5086
1400	1948	530	1048	2071	700	4925	5495
1500	2120	600	1120	2249	700	5806	7026
1600	2189	600	1189	2318	700	6777	7997
1650	2226	610	1226	2355	800	7297	8517
1800	2430	670	1330	2559	800	9500	10720
2000	2700	760	1500	2829	1000	12500	14000
ASME class 300, DN 80–900							
80	550	114	125	594	150	30	39
100	572	127	147	616	300	44	53
150	617	140	192	661	300	69	78
200	680	152	236	725	500	102	116
250	701	165	261	751	600	150	172
300	770	178	297	833	400	198	243
350	787	191	330	850	500	282	327
400	823	216	361	903	500	376	446
450	906	222	407	986	600	479	549
500	982	229	441	1067	500	602	754
600	1101	267	511	1194	600	940	1162
750	1260	305	620	1359	500	1714	2004
800	1390	318	660	1495	600	1998	2406
900	1435	330	705	1558	900	2552	3122
ASME class 600, DN 100–600							
100	582	191	173	626	300	48	57
150	615	210	213	659	500	96	105
200	804	230	254	854	600	120	142
250	851	249	301	914	400	260	305
300	1027	270	336	1115	500	343	388
350	1065	290	365	1145	500	470	540
400	1100	310	400	1185	500	700	852
450	1135	330	435	1220	500	850	1012
500	1175	350	475	1268	700	1090	1312
600	1220	390	520	1319	500	1405	1695
ASME class 900, DN 150–600							
150	652	225	250	697	500	165	179
200	865	275	315	928	400	217	262
250	926	325	376	989	400	465	510
300	1111	375	420	1191	400	648	718
350	1160	425	460	1245	500	871	1023
400	1201	475	501	1286	500	1254	1406
450	1245	500	545	1338	700	1617	1829
500	1294	575	594	1387	800	2044	2256
600	1350	675	650	1455	700	2712	3120

From: Satisfied Customer
To: Velan
Subject: Thank you!
RE: Tests reports of valves/balance

Thank you for this data as well as that from your limit switch vendor. You have been quite patient and helpful and I appreciate your efforts. We have accepted your valves and look forward to getting them here at Langley. The cryogenic and ambient performance of Velan's butterfly valves are quite remarkable and I will let my colleagues at Kennedy Space Center and Stennis Space Center know of these results.

Thanks again,
Satisfied Customer

RELIABILITY THROUGH QUALIFICATION TESTS

The development of the Velan Torqseal® triple-offset metal-seated valves required extensive testing and design optimization as many competitive valves showed repeated leaks of seats and laminated disc gaskets. Some highlights of the tests performed in our R&D laboratory are shown here.

Seat Tightness Tests

Forged titanium Torsqseal® NPS 46 (DN 1150), class 150 valve.

- 40,000 cycles.
- Preferred and non-preferred side.

Velan Torqseal® valve with renewable seat ring and TI O_2 plasma sprayed seat surface.

Cold Cycling Test (1000 cycles)

- 820 psi water to test preferred seat side.
- 490 psi water to test non-preferred seat side.

Cold temperature testing to -314°F (-192°C) of the cryogenic Torqseal® valve in our Lyon, France facility.

Ambient Cycling Tests

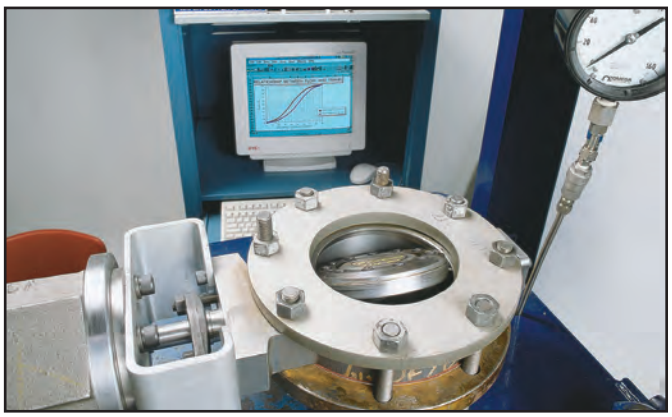
Torqseal® NPS 8 (DN 200), class 150 valve.

- 5000 cycles with preferred flow direction.
- 3000 cycles with non-preferred flow direction.

Torqseal® NPS 8 (DN 200), class 300 valve.

- 30,000 cycles tested with no jamming.

Passed with zero leakage from the seats and gasket.



NPS 8 (DN 200) class 150 valve, ambient cycling.

Hot Cycling Tests

List of requirements:

- 1000 cycles.
- 150–200 psi superheated steam.
- 650–900°F (343–482°C).

The valve tested reached 7250 cycles without seizing or jamming at temperatures between 800–900°F (427–482°C).

Superheated test on NPS 14 (DN 350) class 150 valve.

INCLUDING API 607 & ISO 10497 FIRE TESTS

Fire Tests

1. First the valve was tested to API 598 with zero seat leakage in preferred and non-preferred direction and zero external leakage.
2. During the burning period the valve was exposed to 1400–1800°F (760–980°C) flames for the duration of 30 minutes. Then the test was repeated in the non-preferred direction.
3. Rapid water quenching lowered the valve temperature to below 212°F (100°C). This was performed twice, once in each direction.

Results After 2 Fire Tests

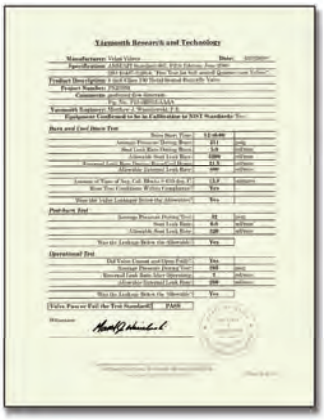
Type of Test	1st Operational Test Preferred	2nd Operational Test Non-Preferred	Allowable Leakage
Seat Leakage	0 ml/min.	0 ml/min.	160 ml/min.
External Leakage	0 ml/min.	0 ml/min.	200 ml/min.

Velan Torqseal® valve being exposed to extreme temperatures of 1800°F (980°C).

NPS 8 (DN 200) class 150 Torqseal valve before the fire test.

After two fire tests, maintains zero seat and stem seal leakage.

Fire Test Reports



CERTIFIED SIL 3

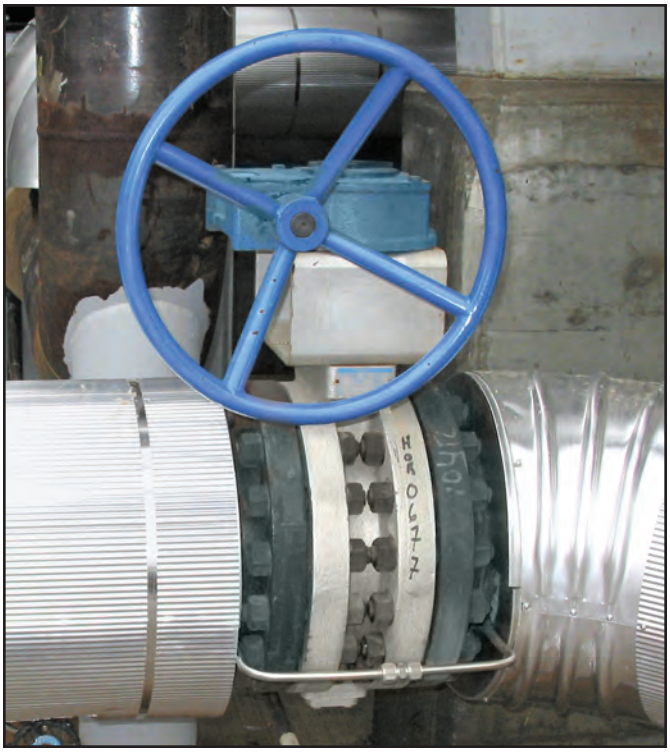
Independent assessment and certification by exida

- IEC 61508: 2010 Part 1–7
- Systematic Integrity: SIL 3 capable (per IEC 61508).

Assessment and FMEDA reports available at www.exida.com

Please note, it is the responsibility of the Safety Instrumented Function (SIF) designer to verify that the selected equipment meets the requirements of the IEC 61508 and IEC 61511 functional safety standards. Verifying a SIF includes reviewing PFDAVG, Architectural Constraints, and SIL Capability. Velan recommends that the SIF designer carefully review all available documentation from the equipment manufacturer and use a commercially available software tools such as exSILentia™ from exida to perform the SIL Verification calculations.

TORQSEAL® TRIPLE-OFFSET VALVES



NPS 12 (DN 300) Torqseal® triple-offset valve for steam isolation.

Motor operated NPS 36 (DN 900) Torqseal® in crude oil.

Torqseal® triple-offset valves, NPS 12 (DN 300) in a tank farm manifold.

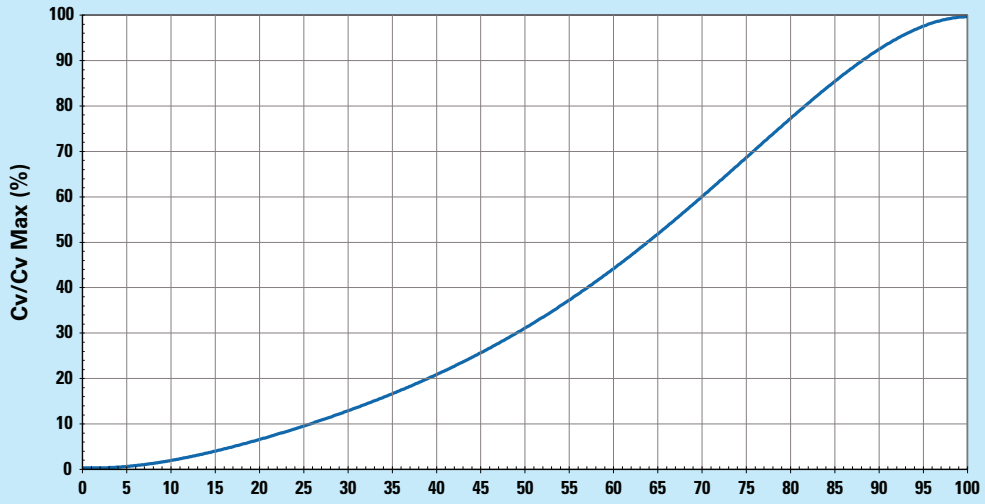
Cv FLOW COEFFICIENT

FLOW DATA

Cv AT 90° - FULLY OPEN VALVE

CLASS	Size (NPS/DN)																
	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600	28 700	30 750	36 900	40 1000	42 1050	48 1200
150	100	219	633	1511	2467	4024	5200	6870	9255	11718	18621	25694	30507	44626	58541	62536	81680
300	100	219	622	1273	2295	3580	4801	6442	8622	11463	16545	24061	29750	43993	–	–	–
600	–	204	591	1090	1686	2559	3421	4719	6112	8366	12737	–	–	–	–	–	–

Cv CURVE



$$Q = C_V \sqrt{\frac{\Delta p}{G_L}}$$

Where:

Q = Flow in gpm (U.S. gallons per minute)

Δp = Pressure drop through the valve (psi)

G_L = Specific gravity (for water at 60°F = 1)

PRESSURE/TEMPERATURE RATINGS (ASME B16.34)

°F psig	Carbon Steel A 216 Gr. WCB				Stainless Steel A 351 Gr. CF8M			
CLASS	**150**	**300**	**600**	**900**	**150**	**300**	**600**	**900**
-20 to 100	285	740	1,480	2,220	275	720	1,440	2,160
200	260	680	1,360	2,035	235	620	1,240	1,860
300	230	655	1,310	1,965	215	560	1,120	1,680
400	200	635	1,265	1,900	195	515	1,025	1,540
500	170	605	1,205	1,810	170	480	955	1,435
600	140	570	1,135	1,705	140	450	900	1,355
650	125	550	1,100	1,650	125	440	885	1,325
700	110	530	1,060	1,590	110	435	870	1,305
750	95	505	1,015	1,520	95	425	855	1,280
800	80	410	825	1,235	80	420	845	1,265

°C BAR	Carbon Steel A 216 Gr. WCB				Stainless Steel A 351 Gr. CF8M			
CLASS	**150**	**300**	**600**	**900**	**150**	**300**	**600**	**900**
–29 to 38	19.6	51.1	102.1	153.2	19.0	49.6	99.3	148.9
50	19.2	50.1	100.2	150.4	18.4	48.1	96.2	144.3
100	17.7	46.6	93.2	139.8	16.2	42.2	84.4	126.6
150	15.8	45.1	90.2	135.2	14.8	38.5	77.0	115.5
200	13.8	43.8	87.6	131.4	13.7	35.7	71.3	107.0
250	12.1	41.9	83.9	125.8	12.1	33.4	66.8	100.1
300	10.2	39.8	79.6	119.5	10.2	31.6	63.2	94.9
325	9.3	38.7	77.4	116.1	9.3	30.9	61.8	92.7
350	8.4	37.6	75.1	112.7	8.4	30.3	60.7	91.0
375	7.4	36.4	72.7	109.1	7.4	29.9	59.8	89.6
400	6.5	34.7	69.4	104.2	6.5	29.4	58.9	88.3
425	5.5	28.8	57.5	86.3	5.5	29.1	58.3	87.4

CLOSING TORQUES — lb•ft

ASME Class 150

NPS	ISO/ MSS	RUN TORQUE[1]	HP SIDE[2]						BI-DIRECTIONAL						MAST[3]		
			6 bar (90 PSI)[4]		10 bar (150 PSI)		20 bar (285 PSI)		6 bar (90 PSI)		10 bar (150 PSI)		20 bar (285 PSI)		lb•ft		
			BTO[5]	ETC[6]	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
3	FA07/10	33	16	18	21	21	31	30	16	24	21	24	31	37	161	144	195
4	FA07/10	36	23	26	32	33	51	49	23	37	32	37	51	59	282	252	341
6	FA10	63	50	56	74	56	128	89	50	80	74	80	128	137	457	409	553
8	FA14	104	91	134	146	134	260	220	91	182	146	182	260	319	699	625	846
10	FA14	158	209	293	330	293	581	467	209	374	330	374	581	639	1007	901	1220
12	FA14	237	356	435	559	435	980	686	356	594	559	594	980	1015	1545	1382	1870
14	FA16	388	381	376	621	376	1120	608	381	659	621	659	1120	1166	2216	1983	2683
16	FA16	714	538	556	804	556	1401	873	538	874	804	874	1401	1511	3627	3245	4390
18	FA25	944	900	1164	1525	1164	2731	1874	900	1626	1525	1626	2731	2818	5575	4988	6748
20	FA25	1712	1109	1095	1947	1095	3504	1759	1109	2032	1947	2032	3504	3564	8060	7211	9756
24	FA30	2487	2060	2078	3568	2078	6474	3372	2060	4743	3568	4743	6474	6647	14104	12620	17074
28	FA35	6284	4028	2764	6726	2764	11931	4135	4028	6360	6726	6360	11931	11172	22567	20192	27318
30	FA35	7255	4054	2634	7189	2634	13235	4169	4054	6935	7189	6935	13235	12497	22567	20192	27318
36	FA40	11977	7364	3630	12450	3630	23008	5721	7364	11393	12450	11393	23008	20687	41978	37559	50815
40	FA40	16581	10948	6662	17443	6662	32056	9747	10948	16400	17443	16400	32056	28821	64142	57390	77645
42	FA48	19264	11056	7627	18657	7627	34448	12753	11056	16803	18657	16803	34448	30518	89597	80166	108460
48	FA48	25945	16141	10058	27101	10058	49872	17412	16141	23945	27101	23945	49872	43425	120963	108230	146429

ASME Class 300

NPS	ISO/ MSS	RUN TORQUE[1]	HP SIDE[2]						BI-DIRECTIONAL						MAST[3]		
			10 bar (150 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		10 bar (150 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		lb•ft		
			BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
3	FA07/10	33	21	30	31	30	66	64	21	24	31	37	66	83	161	144	195
4	FA07/10	36	32	49	51	49	113	108	32	37	51	59	113	138	282	252	341
6	FA14	73	84	103	142	103	333	236	84	89	142	149	333	357	699	625	846
8	FA14	161	182	275	314	275	744	640	182	215	314	362	744	873	1545	1382	1870
10	FA16	235	330	467	581	467	1401	1099	330	374	581	639	1401	1553	2216	1983	2683
12	FA16	376	559	686	980	686	2352	1593	559	594	980	1015	2352	2457	3627	3245	4390
14	FA25	536	765	843	1359	843	3297	1966	765	782	1359	1353	3297	3296	5575	4988	6748
16	FA25	934	1154	1391	2058	1391	5002	3268	1154	1254	2058	2165	5002	5285	8060	7211	9756
18	FA30	1235	1525	1874	2731	1874	6660	4431	1525	1626	2731	2818	6660	6894	10343	9255	12521
20	FA30	2149	2475	2492	4297	2492	10237	5647	2475	2462	4297	4194	10237	10099	14104	12620	17074
24	FA35	3467	3564	3497	6475	3497	15947	8239	3564	3459	6475	6746	15947	16620	22567	20192	27318
28	FA40	8017	7190	5244	13018	5244	32020	12142	7190	6972	13018	12047	32020	29674	41978	37559	50815
30	FA40	8578	8947	6481	15712	6481	37764	14326	8947	8340	15712	14382	37764	34799	41978	37559	50815
36	FA48	13867	12449	5917	23010	5917	57429	13834	12449	11825	23010	20843	57429	52018	73075	65383	88459

ASME Class 600

NPS	ISO/ MSS	RUN TORQUE[1]	HP SIDE[2]						BI-DIRECTIONAL						MAST[3]		
			20 bar (285 PSI)		50 bar (725 PSI)		100 bar (1450 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		100 bar (1450 PSI)		lb•ft		
			BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
4	FA14	32	70	135	151	135	283	253	70	163	151	163	283	310	699	625	846
6	FA14	53	180	406	403	406	771	784	180	208	403	477	771	930	1545	1382	1870
8	FA16	131	434	943	963	943	1835	1813	434	460	963	1042	1835	2023	3627	3245	4390
10	FA25	490	759	1493	1769	1493	3433	2904	759	786	1769	1840	3433	3610	5575	4988	6748
12	FA30	813	1212	2512	2850	2512	5548	4907	1212	1329	2850	3130	5548	6160	8060	7211	9756
14	FA30	1329	1910	3340	4337	3340	8336	6404	1910	1890	4337	4340	8336	8450	14104	12620	17074
16	FA35	2237	2917	4687	6738	4687	12833	9011	2917	2784	6738	6467	12833	12633	22567	20192	27318
18	FA35	3062	3924	6033	9138	6033	17330	11618	3924	3678	9138	8594	17330	16815	32172	28785	38945
20	FA40	4790	5698	9354	13391	9354	26064	18137	5698	5502	13391	12947	26064	25411	41978	37559	50815
24	FA48	7197	10731	9131	25573	14669	50031	28438	10731	13099	25573	23344	50031	45938	89597	80166	108460

NOTES:

(1) Operating torque to open and close the valve between 0-90° for process flows up to 4.5 m/s for liquids and 45 m/s for gases.
For process conditions outside of this range please contact Velan Applications Engineering.

(2) Preferred installation (designated by HP stamp on corresponding valve flange) – Flow direction: Inlet on HP side – Isolation: High pressure on HP side.

CLOSING TORQUES — Nm

ASME Class 150

DN	ISO/ MSS	RUN TORQUE(1)	HP SIDE(2)						BI-DIRECTIONAL						MAST(3)		
			6 bar (90 PSI)(4)		10 bar (150 PSI)		20 bar (285 PSI)		6 bar (90 PSI)		10 bar (150 PSI)		20 bar (285 PSI)		Nm		
			BTO(5)	ETC(6)	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
80	FA07/10	45	22	24	28	28	42	41	22	33	28	33	42	50	219	196	265
100	FA07/10	49	31	35	43	45	69	66	31	50	43	50	69	80	383	342	463
150	FA10	85	68	76	100	76	174	121	68	108	100	108	174	186	619	554	750
200	FA14	141	123	182	198	182	353	298	123	247	198	247	353	433	947	847	1147
250	FA14	215	283	397	447	397	788	633	283	507	447	507	788	866	1366	1222	1654
300	FA14	321	483	590	758	590	1329	930	483	805	758	805	1329	1376	2095	1874	2536
350	FA16	526	517	510	842	510	1519	824	517	894	842	894	1519	1581	3005	2689	3638
400	FA16	969	730	754	1090	754	1900	1184	730	1185	1090	1185	1900	2049	4918	4400	5953
450	FA25	1280	1220	1578	2068	1578	3703	2541	1220	2205	2068	2205	3703	3821	7559	6763	9151
500	FA25	2321	1504	1485	2640	1485	4751	2385	1504	2755	2640	2755	4751	4833	10929	9779	13230
600	FA30	3373	2793	2818	4838	2818	8779	4572	2793	6432	4838	6432	8779	9013	19126	17112	23152
700	FA35	8521	5462	3748	9120	3748	16178	5607	5462	8624	9120	8624	16178	15149	30601	27380	37043
750	FA35	9838	5497	3572	9748	3572	17947	5653	5497	9404	9748	9404	17947	16946	30601	27380	37043
900	FA40	16241	9986	4922	16882	4922	31199	7758	9986	15449	16882	15449	31199	28052	56922	50930	68905
1000	FA40	22484	14845	9034	23653	9034	43468	13217	14845	22238	23653	22238	43468	39081	86976	77821	105287
1050	FA48	26123	14992	10342	25299	10342	46711	17293	14992	22785	25299	22785	46711	41382	121494	108705	147071
1200	FA48	35181	21887	13639	36749	13639	67626	23611	21887	32469	36749	32469	67626	58884	164025	146760	198557

ASME Class 300

DN	ISO/ MSS	RUN TORQUE(1)	HP SIDE(2)						BI-DIRECTIONAL						MAST(3)		
			10 bar (150 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		10 bar (150 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		Nm		
			BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
80	FA07/10	45	28	41	42	41	89	87	28	33	42	50	89	113	219	196	265
100	FA07/10	49	43	66	69	66	153	146	43	50	69	80	153	187	383	342	463
150	FA14	99	114	140	193	140	452	320	114	121	193	202	452	484	947	847	1147
200	FA14	219	247	373	426	373	1009	868	247	292	426	491	1009	1184	2095	1874	2536
250	FA16	319	447	633	788	633	1900	1490	447	507	788	866	1900	2106	3005	2689	3638
300	FA16	510	758	930	1329	930	3189	2160	758	805	1329	1376	3189	3332	4918	4400	5953
350	FA25	727	1037	1143	1843	1143	4471	2666	1037	1060	1843	1835	4471	4469	7559	6763	9151
400	FA25	1267	1565	1886	2791	1886	6783	4431	1565	1700	2791	2936	6783	7166	10929	9779	13230
450	FA30	1675	2068	2541	3703	2541	9031	6008	2068	2205	3703	3821	9031	9348	14025	12549	16978
500	FA30	2913	3356	3379	5827	3379	13881	7657	3356	3338	5827	5687	13881	13694	19126	17112	23152
600	FA35	4701	4833	4742	8780	4742	21624	11172	4833	4690	8780	9148	21624	22537	30601	27380	37043
700	FA40	10872	9750	7111	17652	7111	43419	16465	9750	9454	17652	16336	43419	40238	56922	50930	68905
750	FA40	11632	12132	8788	21305	8788	51208	19426	12132	11309	21305	19502	51208	47187	56922	50930	68905
900	FA48	18803	16881	8023	31202	8023	77874	18759	16881	16035	31202	28263	77874	70536	99089	88659	119950

ASME Class 600

DN	ISO/ MSS	RUN TORQUE(1)	HP SIDE(2)						BI-DIRECTIONAL						MAST(3)		
			20 bar (285 PSI)		50 bar (725 PSI)		100 bar (1450 PSI)		20 bar (285 PSI)		50 bar (725 PSI)		100 bar (1450 PSI)		Nm		
			BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	BTO	ETC	S/S 410	S/S 660	S/S 630
100	FA14	43	95	183	205	183	384	343	95	221	205	221	384	420	947	847	1147
150	FA14	72	244	551	546	551	1045	1063	244	282	546	647	1045	1261	2095	1874	2536
200	FA16	178	589	1279	1306	1279	2488	2458	589	624	1306	1413	2488	2743	4918	4400	5953
250	FA25	665	1029	2025	2399	2025	4655	3938	1029	1066	2399	2495	4655	4895	7559	6763	9151
300	FA30	1102	1643	3406	3865	3406	7523	6654	1643	1802	3865	4244	7523	8353	10929	9779	13230
350	FA30	1803	2590	4529	5881	4529	11304	8684	2590	2563	5881	5885	11304	11458	19126	17112	23152
400	FA35	3033	3955	6356	9137	6356	17402	12219	3955	3775	9137	8769	17402	17130	30601	27380	37043
450	FA35	4153	5321	8181	12391	8181	23499	15754	5321	4987	12391	11653	23499	22801	43625	39033	52809
500	FA40	6495	7726	12684	18158	12684	35343	24594	7726	7461	18158	17556	35343	34457	56922	50930	68905
600	FA48	9760	14551	12382	34677	19891	67842	38562	14551	17762	34677	31654	67842	62292	121494	108705	147071

NOTES:

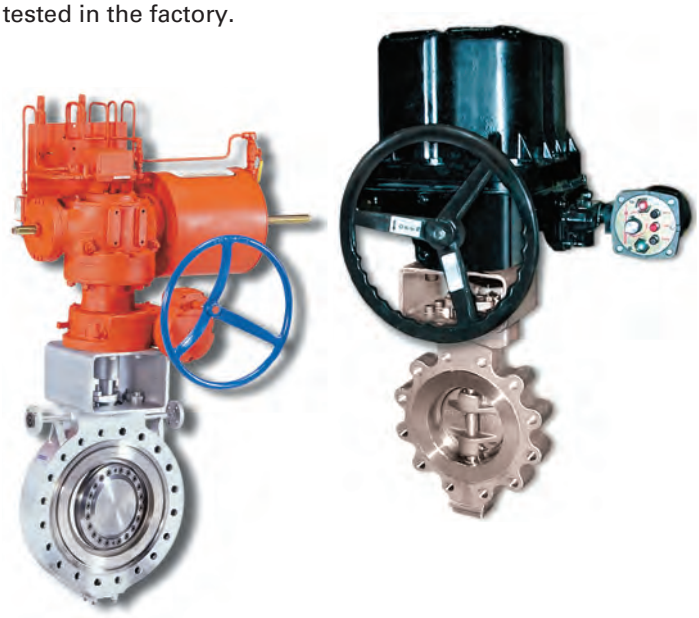
(3) MAST: Maximum allowable stem torque

(4) In high flow applications with differential pressure below 150 psi (10 bar), dynamic running torque may need to be considered, please contact Velan Applications Engineering for assistance.

(5) BTO: Break-to-open *(6) ETC: End-to-close*

AIR AND ELECTRIC ACTUATORS

Velan supplies high quality actuators for pneumatically, electrically and hydraulically operated butterfly valves. All actuators are totally enclosed. 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.

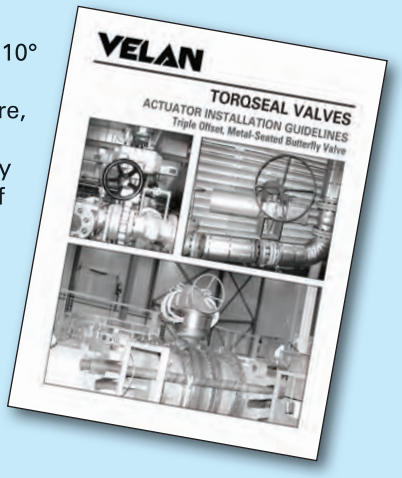


ACTUATION GUIDELINES

A Velan triple-offset butterfly valve is torque-seated and, therefore, there is no mechanical stop in the valves "closed position". Unlike most quarter-turn valves, the valve seat becomes the "mechanical stop" and, therefore, it is vital that care be taken in setting the actuator stops.

Also, the Torqseal® Valve requires 8° to 10° over-travel for tight shutoff and, therefore, couplings must be machined for the key slot with an offset of 8° to 10° to closed position.

For complete details please refer to BF-AIG-08.



OPTIONS

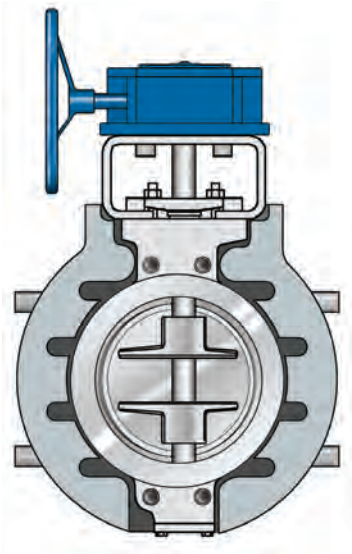
STEM EXTENSIONS

Torqseal® valves are available with stem extension for buried service applications among others.

Chain wheel operators are also available.

STEAM JACKETS

Steam jackets are also available for Torqseal® valves in both the bolt-on and weld on design. Torqseal® valves with steam jackets are an ideal choice for applications where the media tends to crystallize when cooled down, such as sulphur and other applications.



SPECIAL CLEANING

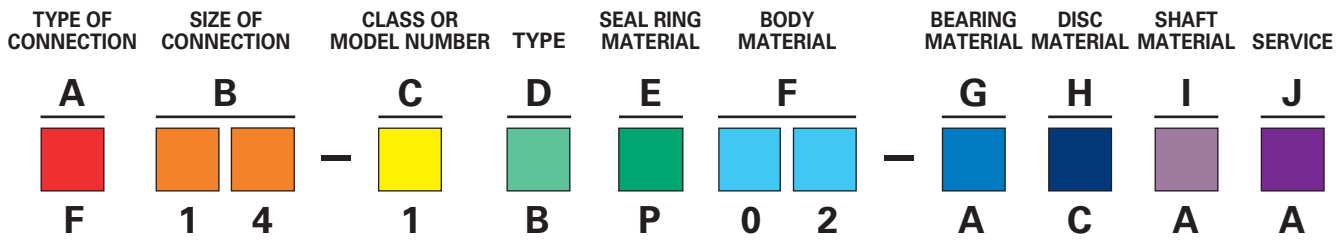
Special cleaning (oxygen, chlorine, etc.) available on all Torqseal® valves.

Please consult the factory for further information.

HOW TO ORDER TORQSEAL® VALVES

GENERAL INFORMATION ON HOW TO ORDER:

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



Example: Flanged B16.5, NPS 6 (DN 150), class 300, short pattern, butterfly valve, with Duplex & Graphite seal ring and a carbon steel body with stainless steel trim for standard service

A TYPE OF CONNECTION

B	Butt weld	**P**	Flanged (B16.47 series B) API 605
D	Din flanges	**R**	Flanged ring joint
F	Flanged B16.5 (B16.47 series A)	**U**	Undrilled flanges
L	Lug	**W**	Wafer
M	Lug (series B)		

B SIZE OF CONNECTION

Customers have the choice of specifying valve size as part of the valve figure number (**B**) using the numbers below, or indicating valve size separately. Sizes shown in NPS (DN)

EXAMPLES:
B**16**-3054P-02TS (valve size is part of figure number)
NPS **10** B-3054P-02TS (valve size is shown separately)

10	3 (80)	**20**	16 (400)	**30**	30 (750)	**54**	54 (1350)
12	4 (100)	**21**	18 (450)	**32**	32 (800)	**56**	56 (1400)
14	6 (150)	**22**	20 (500)	**34**	34 (850)	**60**	60 (1500)
15	8 (200)	**23**	22 (550)	**36**	36 (900)	**64**	64 (1600)
16	10 (250)	**24**	24 (600)	**40**	40 (1000)	**66**	66 (1650)
18	12 (300)	**26**	26 (650)	**42**	42 (1050)	**72**	72 (1800)
19	14 (350)	**28**	28 (700)	**48**	48 (1200)	**80**	80 (2000)

C CLASS/MODEL NUMBER

0	150	**1**	300	**2**	600	**7**	900

D TYPE

A	Long pattern – double flanged (API 609 Table 3), ASME B16.10
B	Short pattern – double flanged (API 609 Table 3), ISO 5752
C	Lug and wafer (API 609 Table 3), MSS SP-68 (Table 2)
D	Velan standard – face to face

E SEAL RING

A	S/S 316 & Graphite	**F**	Hastelloy & Graphite	**P**	Duplex & Graphite
B	S/S 410 & Graphite	**G**	S/S 316 (solid)(1)	**T**	Titanium(1) & Graphite
C	Monel & Graphite	**K**	Inconel (solid)(1)	**Q**	Hastelloy & PTFE
D	Alloy 20 & Graphite	**L**	XM19 Nitronic 50 (solid)(1)		
E	Inconel & Graphite	**M**	Same as shaft (solid)(1)		

Note: *PN is provided for reference purposes only, based on API 600/ISO 10434 2006 edition.*

Class	150	300	600	900
PN	20	50	110	150

F BODY MATERIAL(2)

02	A105, WCB	**14**	S/S F316L, CF3M	**23**	Alloy 20 (CN7M)
04	CHR. MOLY F5, C5	**19**	Monel M35	**31**	LCC
09	CHR, MOLY F9, C12	**20**	Inconel 625	**32**	S/S F51, 4A, CD3MN
13	S/S F316, CF8M(3)	**21**	Hastelloy C	**40**	Titanium Gr.2/3

G BEARING MATERIAL

A	S/S Nitrided	**E**	Monel(4)	**J**	CoCr alloy
B	XM19, (Nitronic 50)	**F**	Inconel(4)	**L**	Nitronic 60
C	CS Nitrided	**G**	Hastelloy	**P**	Duplex Nitrided
D	S/S chrome plated	**H**	Alloy 20	**T**	Titanium(4)

H DISC MATERIAL

A	Same as body - plated	**E**	Monel	**H**	Alloy 20
B	Same as body - not plated	**F**	Inconel(4)	**J**	CoCr alloy
C	S/S 316, CF8M	**G**	Hastelloy		

I SHAFT MATERIAL

A	S/S 410	**F**	Inconel(4)	**P**	Duplex(4)
C	XM19 (Nitronic 50)	**G**	Hastelloy C	**T**	Titanium(4)
D	S/S 630(5)	**H**	Alloy 20		
E	Monel K500	**J**	660		

J SPECIAL SERVICE

A	Standard	**H**	Cryogenic	**T**	Double packed with leak-off
B	Block & bleed	**I**	NACE(6) sour gas	**Q**	API 6D tested
G	Oxygen	**N**	Nuclear		

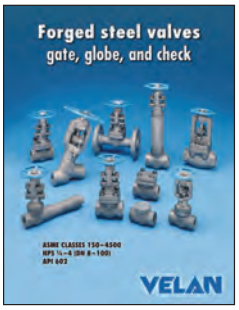
(1) Contact Velan for wear resistant treatment options.
(2) Other materials are available upon request.
(3) Not suitable for temperatures above 1000°F (538°C).
(4) Must specify grade.
(5) Not suitable for temperatures above 600°F (316°C).
(6) NACE service valves are supplied with all materials conforming to NACE MR0103. (Including bolting with maximum hardness of RC22). For compliance to NACE MR0175/ISO 15156 consult Engineering.

Note: *CoCr alloy as used throughout this catalog refers to cobalt chrome hardfacing alloys as supplied by Kennametal Stellite™, and other approved manufacturers.*

Note: *For valves with figure number and/or description indicating* ***NACE*** *Sour Service, the materials conform to the metallurgical requirements of NACE MR0103-2010 and NACE MR0175 / ISO 15156-2009. However, the applicability of materials is dependent on the actual environment. It is the equipment user's responsibility to ensure that the materials are suitable for the intended service.*

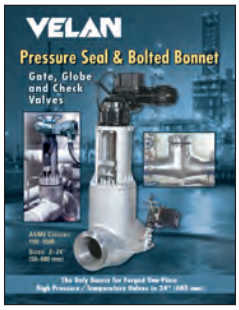
The most comprehensive line of industrial forged and cast steel gate, globe, check, ball, butterfly, and knife gate valves and steam traps.

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

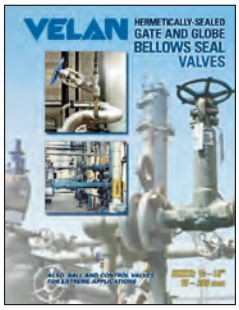


CAT-SFV

CAT-BG

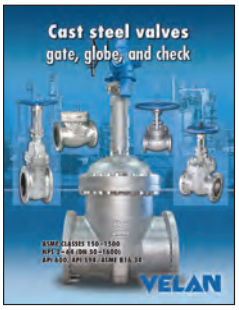


VEL-PS

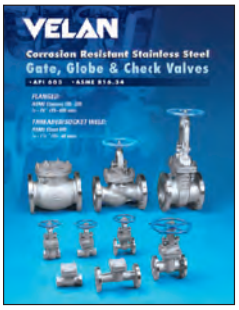


VEL-BS

VEL-CRYO



CAT-CSV

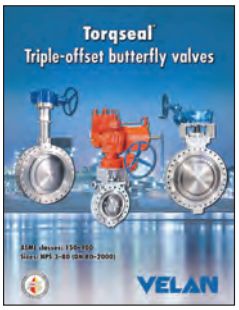


VEL-API-603

CAT-KGV

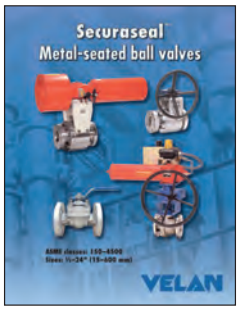
CAT-DPCV

BRO-FLBABV



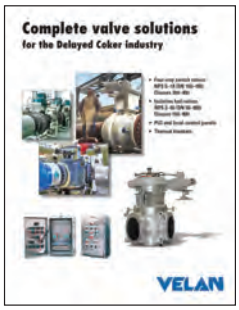
CAT-BF

CAT-SAS-CTORQ

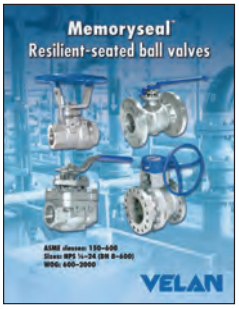


VEL-MS

CAT-PBV

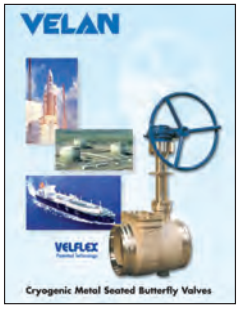


BRO-CBV



CAT-BV

CAT-GPBV



CAT-SAS-CFLEX

CAT-SAS-CCON

CAT-ST

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CAT-BF-12-13

Printed in Canada

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