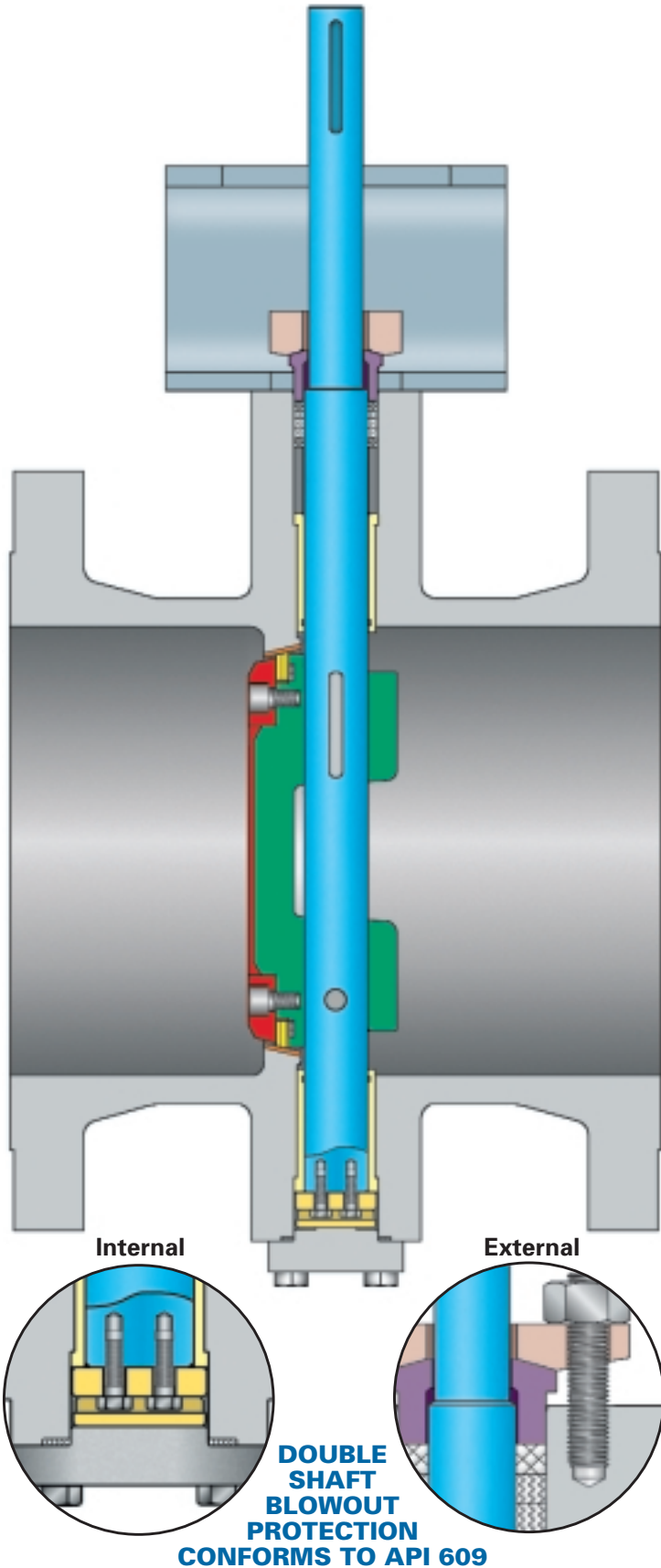
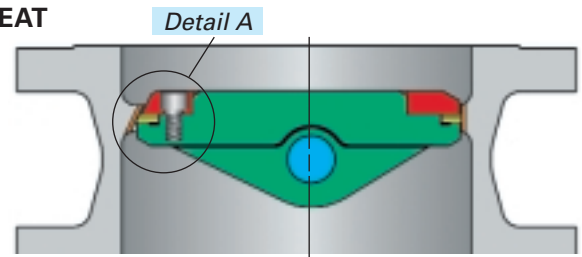


VALVE DESIGN FEATURES

This advanced design features three-way eccentricity and unique elliptical seat geometry ensuring compressive sealing around entire seat and a "tight" bubble free valve.



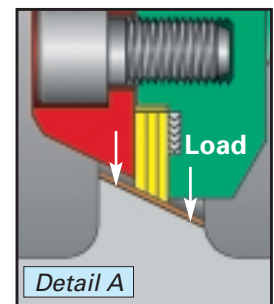
SEAT



Raised, conical seat prevents solids build-up from interfering with seal. Seat is hardfaced with Stellite to meet severe service. Alternative space age alloys are also used.

LAMINATED RESILIENT DISC SEAL to 1000°F (538°C)

One to four graphite layers are carefully assembled between stainless steel rings using Phenolic Resin. Flexible seal rings without glue are available for higher temperatures.



"ZERO LEAKAGE" - SEAT TIGHTNESS

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 (contrary to Gate Valves) 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 key to allow for differential expansion due to temperature.

SHAFT BEARINGS

The shaft is centered on two long bearings, chromed, nitrided, or as stellite (option) protected against the entrance of solids by O-rings (Bearing flush taps available as an option).

LOW EMISSION SHAFT SEALS 0-20 ppm

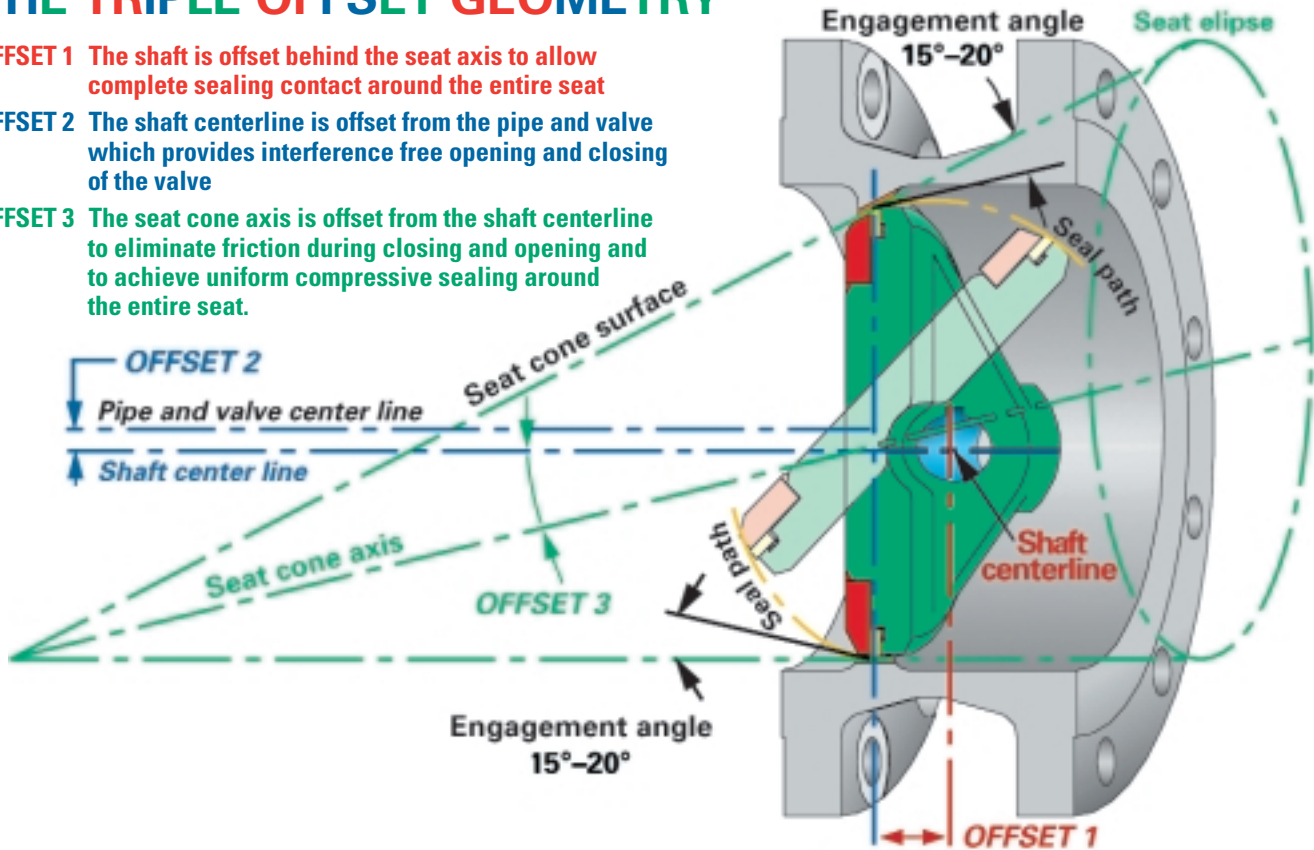
Shaft is burnished to 8 RMS, ID of packing chamber finish 32 RMS. Live-loading available for long maintenance free service. Easy access for packing adjustment. (See page 8 for details and alternative stem seals.)

PRINCIPLE OF OPERATION

The Velan Triple Offset Butterfly Valve provides a bi-directional bubble tight shut-off. 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

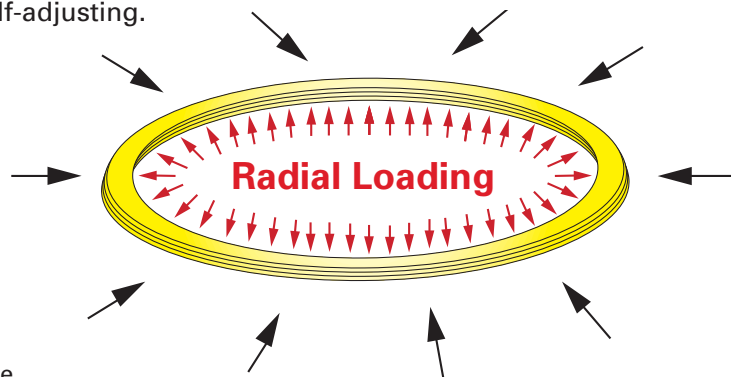
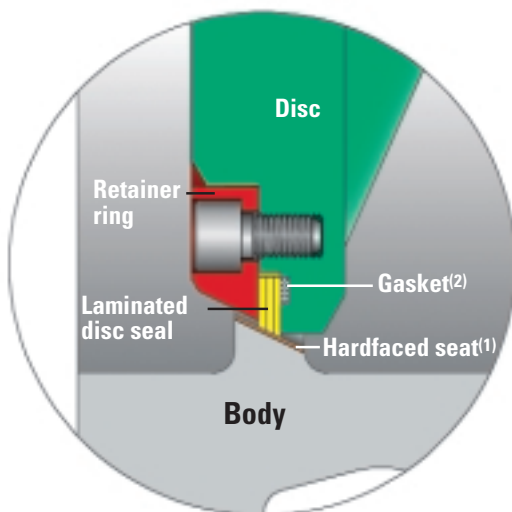
- OFFSET 1** The shaft is offset behind the seat axis to allow complete sealing contact around the entire seat
- OFFSET 2** The shaft centerline is offset from the pipe and valve which provides interference free opening and closing of the valve
- OFFSET 3** The seat cone axis is offset from the shaft centerline to eliminate friction during closing and opening and to achieve uniform compressive sealing around the entire seat.



FRICION FREE SEALING FOR LONG CYCLE LIFE

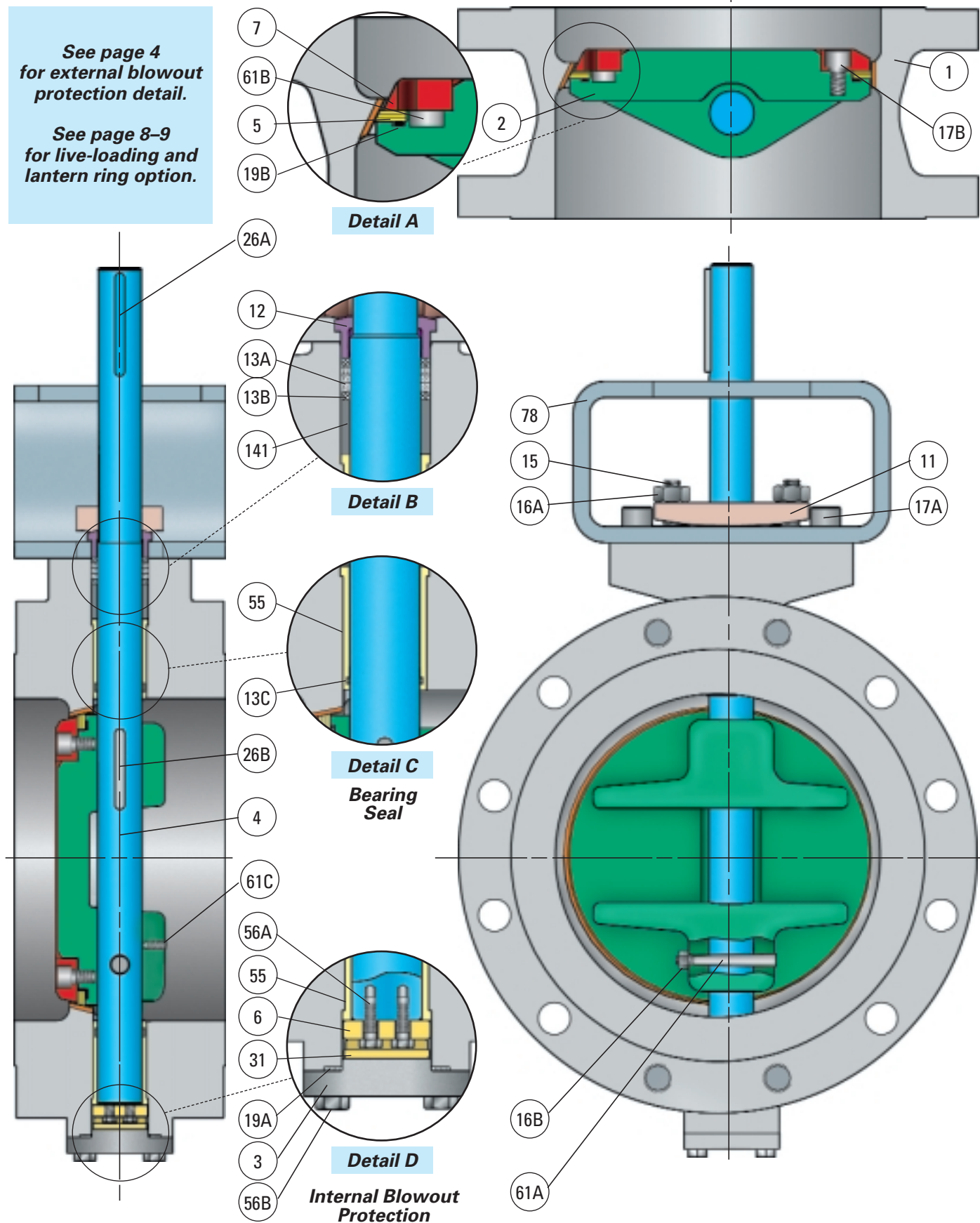
THE LAMINATED DISC SEAL

Seating forces are generated by the torque during closing uniformly around the entire circumference. The resilient seal flexes and energizes, assuming the shape of the seat. The compression forces equally distributed around the perimeter provide a tight bi-directional 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. It is self-adjusting.



Velan provides an extra rigid retaining ring with bolting, resulting from ASME stress calculations.
 (1) Seat is hardfaced with Stellite as standard.
 (2) The gasket is spiral wound SS/Graphite for zero leakage

VALVE PARTS AND MATERIALS TO ASTM STANDARDS

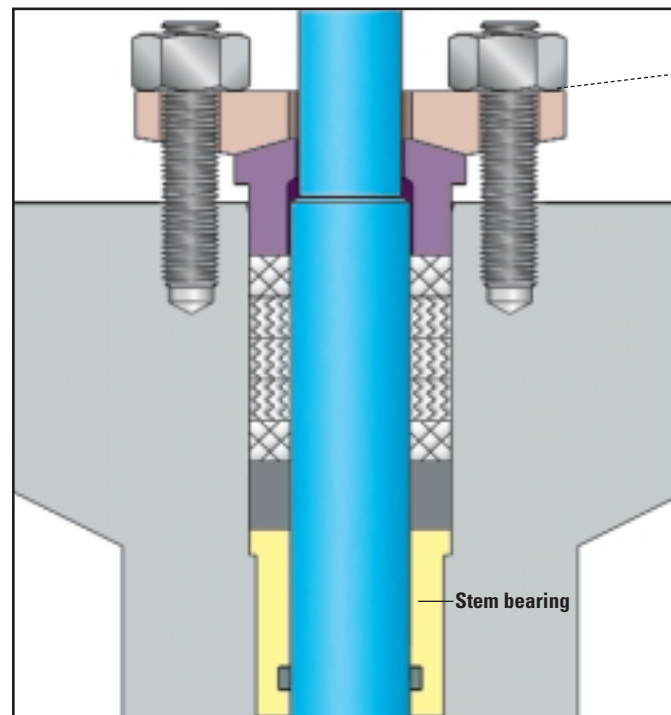


ITEM	QTY	DESCRIPTION	UP TO 750°F (400°C)	UP TO 800°F (427°C)	UP TO 1000°F (538°C)
			CARBON STEEL, NACE	STAINLESS STEEL, NACE	WC6, C5, OR C12
1	1	Valve body	A 216 WCB	A 351 Gr. CF8M	WC6, C5 or C12
		Seat	Stellite	Stellite	Stellite
2	1	Disc	A 216 Gr. WCB nickel plated	A 351 Gr. CF8M	WC6, C5 or C12 nickel plated ⁽¹⁾
3	1	Bottom cover	A 105 CS	A 182 F 316	WC6, C5 or C12
4	1	Shaft	A 479 Gr. 410 2xH1150	A 564 Type 630 2xH1150	B 637 Inconel 718 nitrided
5	1	Laminated seal	Duplex + Graphite	Duplex + Graphite	Duplex + Graphite
6	1	Thrust bearing	A 479 Type 316 nitrided	A 479 Type 316 chrome plated	UNS 21800 Nitronic 60 nitrided
7	1	Retaining ring	Duplex	Duplex	Duplex
11	1	Packing flange	A 105 CS	F309	A 105 CS
12	1	Gland bushing	Type 304	Type 304	Type 304
13A	3	Packing ring	Graphite ribbon	Graphite ribbon	Graphite ribbon
13B	2	Packing ring	Graphite braided	Graphite braided	Graphite braided
13C	2	Bearing protector o-ring	Graphite braided	Graphite braided	Graphite braided
14	Opt.	Lantern ring	Stainless steel	Stainless steel	Stainless steel
15	2	Gland stud	A 193 Gr. B7	A 193 Gr. B8M	A 193 Gr. B16
16A	2	Gland heavy hex nut	A 194 Gr. 2H	A 194 Gr. 8M	A 193 Gr. B16
16B	1	Taper pin hex nut (crimped)	SS 316	SS 316	SS 316
17A	4	Actuator bracket hex. socket cap screw	Alloy steel	Alloy steel	Alloy steel
17B	set	Retainer hex. socket cap screw	SS 316	SS 316	A 193 Gr. B6
19A	1	Bottom cover spiral wound gasket	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
19B	1	Disc spiral wound gasket	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
26A, B	1	Key	A 479 Type 410 2xH1150	A 564 Type 630 2xH1150	A 479 Type 410 Cond. 2
31	1	Locking plate	A 479 Type 316	A 479 Type 316	UNS 21800 Nitronic 60 nitrided
55	2	Stem bearing	A 479 Type 316 nitrided	A 479 Type 316 chrome plated	UNS 21800 Nitronic 60 nitrided
56A	2	Thrust bearing hex. head cap screw	SS 316	SS 316	SS 316
56B	4	Cover heavy hex. headcap screw	A 193 Gr. B8M	A 193 Gr. B8M	A 193 Gr. B16
61A	1	Taper pin	A 479 Gr. 410 2xH1150	A 564 Type 630 2xH1150	B 637 Inconel 718 nitrided
61B	1	Centering pin	Stainless steel	Stainless steel	Stainless steel
61C	1	Assembly set screw	Alloy steel	Stainless steel	Alloy steel
78	1	Actuator bracket	Carbon steel	Carbon steel	Stainless steel
141	1	Packing spacer	Stainless steel	Stainless steel	Stainless steel

All NACE materials to be supplied in condition respective MR01.75-99.
Alternative materials for body, disc and other parts are available to meet specific conditions.

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 butterfly valves, concerns the stem seal alone (no body-bonnet joint) to newly emerging standards.

1. STANDARD LOW EMISSION STEM SEAL WITH 0-20 PPM

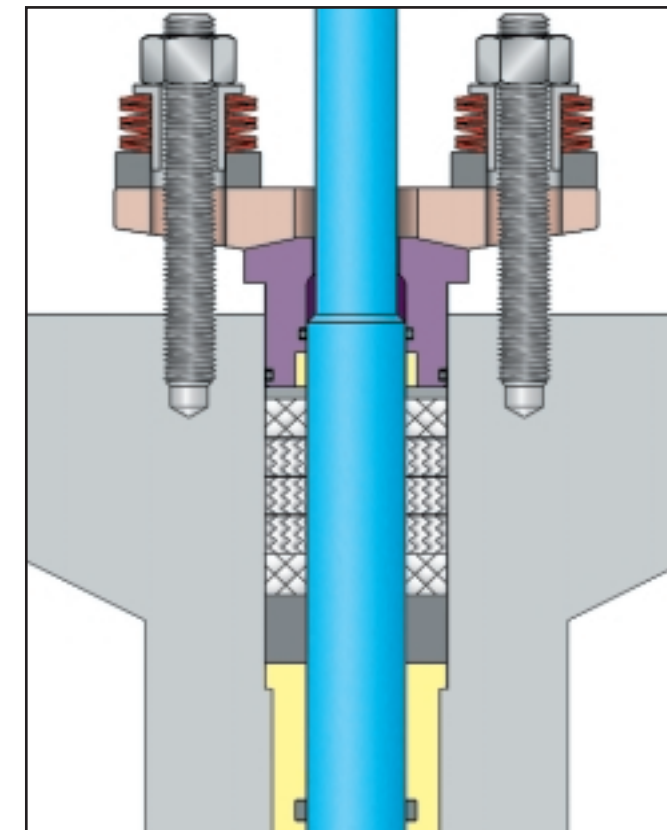


- OPTIONAL LIVE-LOADING** provides predictable and constant packing compression for more than 5000 cycles before adjustment or re-packing.
- Short and narrow packing chamber**
Maximum 5 rings, 1/4" wide.
 - Large compression load required**
Graphite rings precompressed to 4000 psi for effectiveness of 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 (8 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%.

The new European specification, called TA-LUFT which is controlled by a section of the German TUV agency (Technischer Überwachungs-Verein), demands for critical valves a maximum leakage of less than 1 ppm (0.0014 ppm). Certification issued after extensive pressure and cycling tests with H.P. helium, witnessed by TA-Luft inspectors, assures the design and performance of a given stem seal to be equivalent to a bellows seal design. Velan has qualified two different stem seal designs to the TA-LUFT regulations.

3. THE TA-LUFT* SEAL WITH LESS THAN 1 PPM (0.0014 PPM)

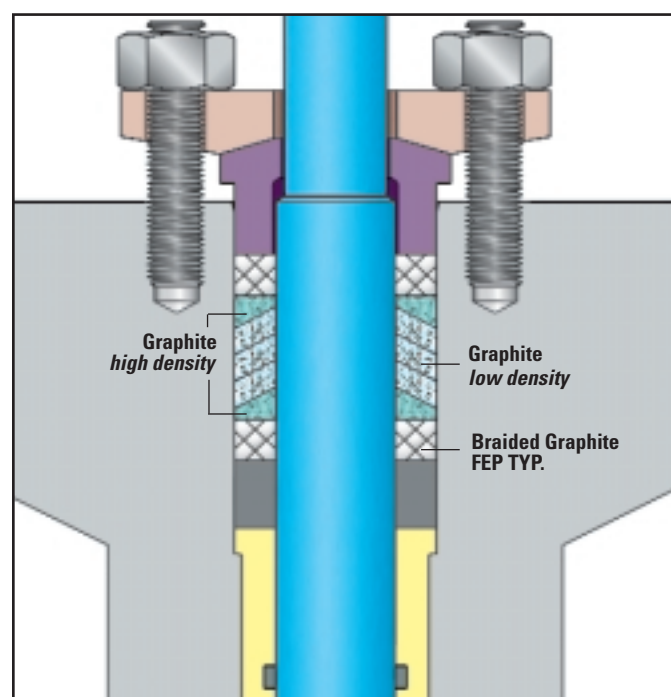
** Technical instructions to maintain cleanliness of air.*



- 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 to assure tightness of less than 1 ppm.
- 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 (8 RMS) to assure long life.**

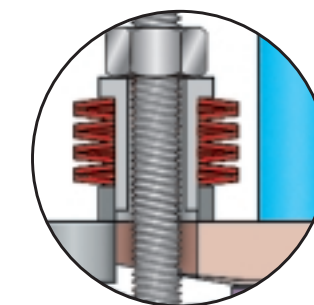
2. EFV* STEM SEAL WITH "0" HELIUM BUBBLES

** Environmentally Friendly Valve*



- The Garlock EVSP 9000 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 and excellent quality of materials has been proven in standard and very difficult valve applications, all backed up by an intensive research program carried out by BP-Amoco, calling it the Environmentally Friendly Valve Technology.
- 10% of valves are tested for compliance or zero helium bubbles with helium leak detectors, at the highest, cold operating pressure for a given pressure class (150 & 300).

4. LANTERN RING OPTION DOUBLE PACKED WITH LEAK-OFF MONITORING PURGE PORT



OPTIONAL LIVE-LOADING provides predictable and constant packing compression for more than 5000 cycles before adjustment or re-packing.

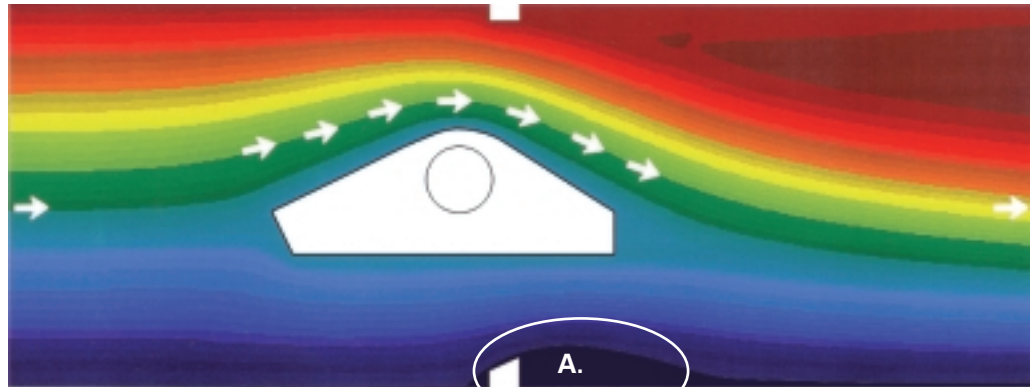
Double packing with leak-off monitoring purge port. Two sets of packing rings, precompressed to 4000 psi (graphite). A lantern ring and leak-off connection allows removal of leakage, if any, from bottom packing set.

COMPUTER FLOW SIMULATION

FLOW IN FULLY OPEN VALVE

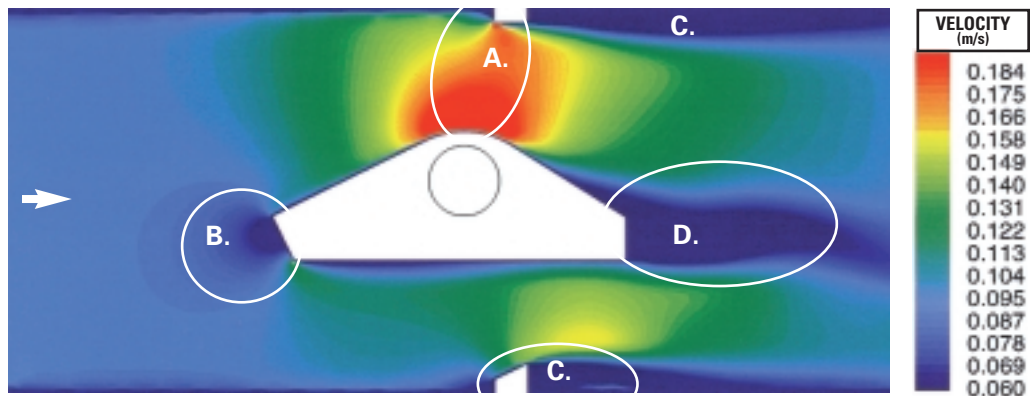
FLOW AROUND THE DISC

- A. Vortex behind the seat



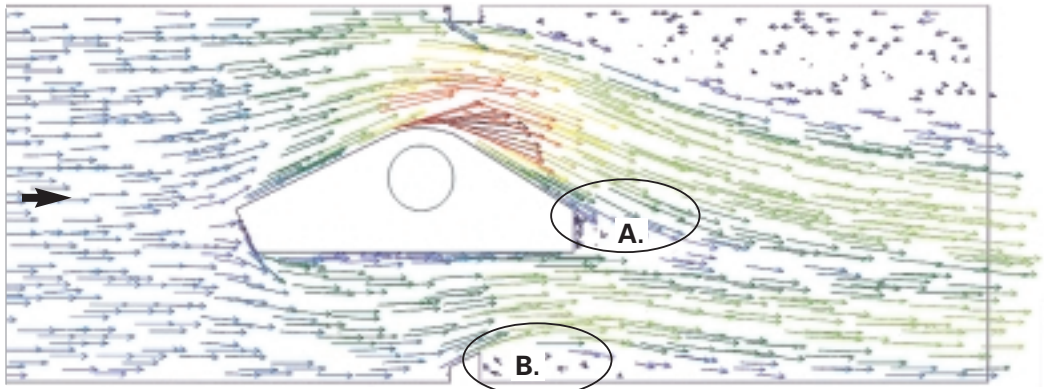
VELOCITY FIELD

- A. Acceleration over disc
- B. Deceleration of flow at stagnation point
- C. Vortex behind the seat
- D. Wake with vortices



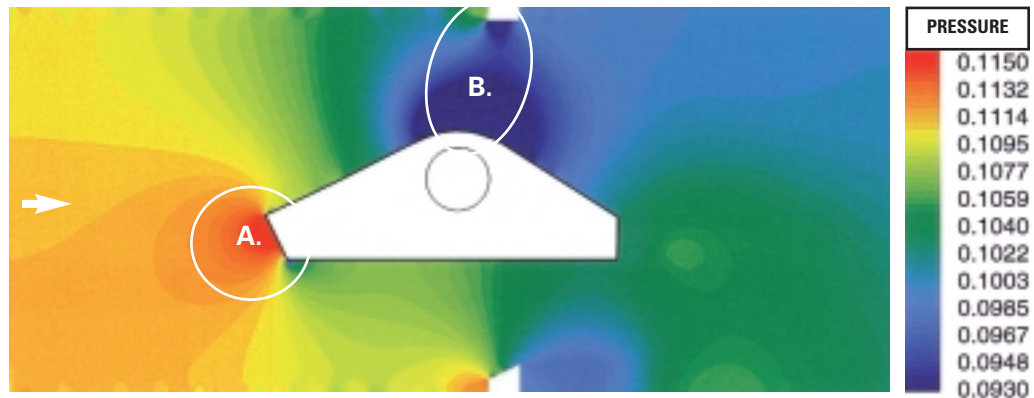
VELOCITY VECTOR FIELD

- A. Vortex behind the disc
- B. Vortex behind the seat



RELATIVE PRESSURE FIELD

- A. High pressure at stagnation point
- B. Low pressure over the disc (accelerated flow)



Cv FLOW COEFFICIENT

FLOW DATA

Cv AT 90° – FULLY OPEN VALVE

Size in mm	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600	30 750	36 900
Class 150	150	280	760	1360	2220	3600	5200	7200	9600	12550	18900	31400	44900
Class 300	150	280	760	1260	2030	3050	4660	6450	8640	11420	17200	29600	44000

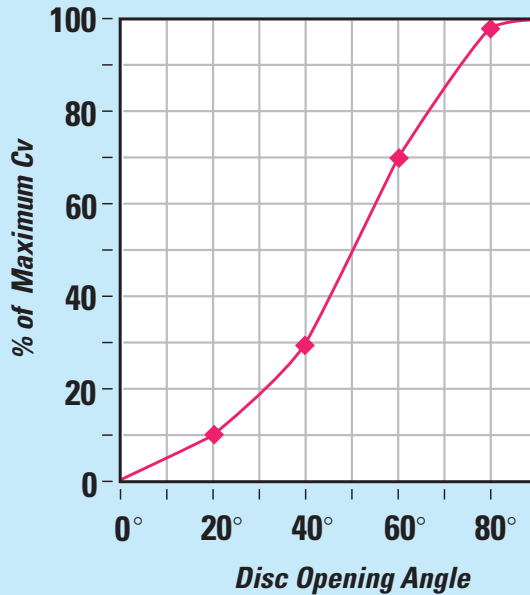
$$Q = C_v \sqrt{\frac{\Delta p}{G_L}}$$

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)



Cv for partially open valve

Cv for open
at 80° = 99%
at 60° = 70%
at 40° = 30%
at 20° = 10%

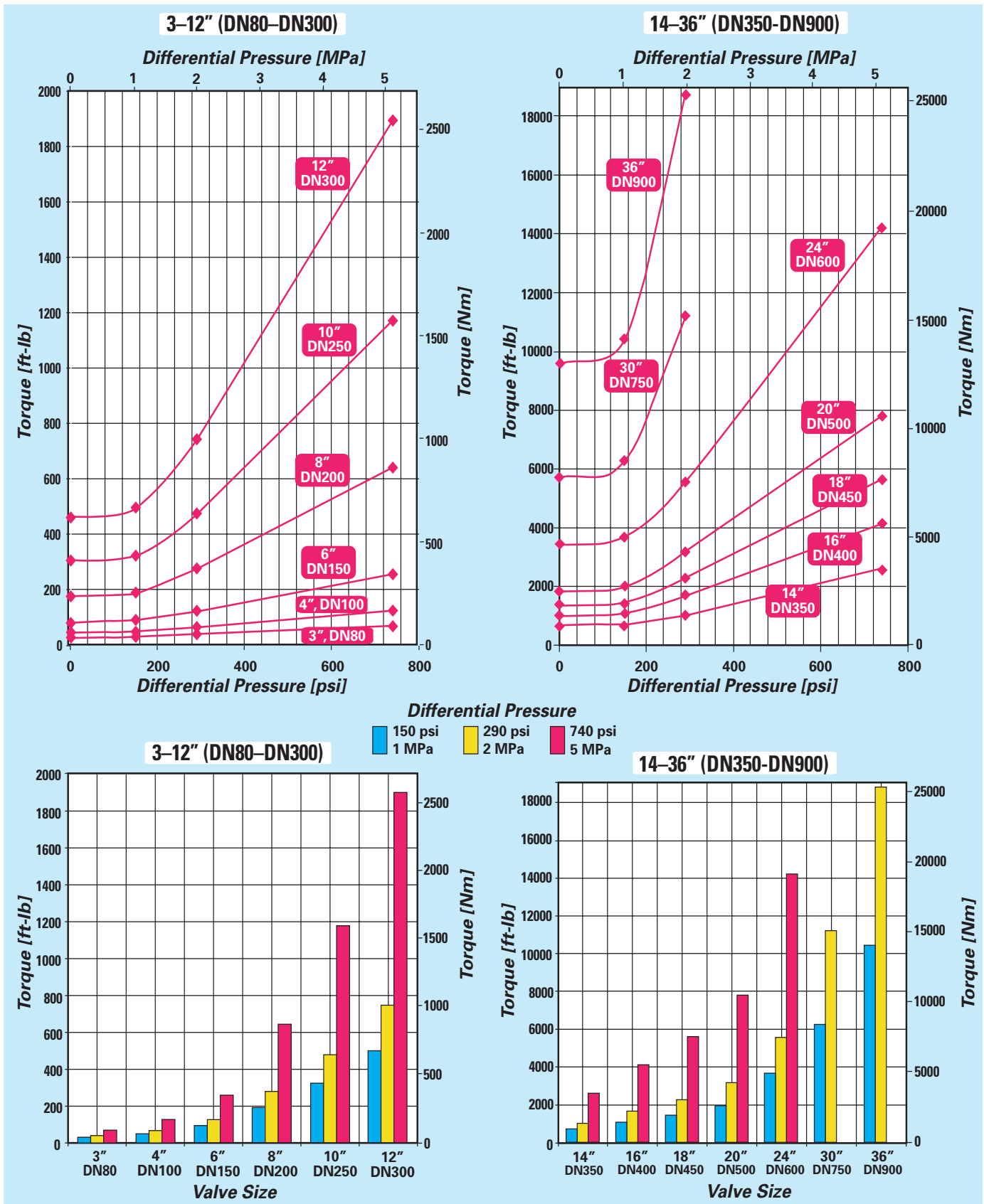
PRESSURE TEMPERATURE RATINGS

PRESSURE/TEMPERATURE RATINGS (ASME B16.34)

TEMP. °F	CLASS 150				CLASS 300				TEMP. °C
	Carbon Steel A 216 Gr. WCB		Stainless Steel A 351 Gr. CF8M		Carbon Steel A 216 Gr. WCB		Stainless Steel A 351 Gr. CF8M		
	PSIG	BAR	PSIG	BAR	PSIG	BAR	PSIG	BAR	
-20 to 100	285	19.65	275	18.96	740	51.02	720	49.64	-29 to 38
200	260	17.93	235	16.20	675	46.54	620	42.75	93
300	230	15.86	215	14.82	655	45.16	560	38.61	149
400	200	13.79	195	13.44	635	43.78	515	35.51	204
500	170	11.72	170	11.72	600	41.37	480	33.09	260
600	140	9.65	140	9.65	550	37.92	450	31.03	316
650	125	8.62	125	8.62	535	36.89	445	30.68	343
700	110	7.58	110	7.58	535	36.89	430	29.65	371
750	95	6.55	95	6.55	505	34.82	425	29.30	399
800	80	5.52	80	5.52	410	26.27	415	28.61	427

CLOSING TORQUES VS. DIFFERENTIAL PRESSURE FOR "0" LEAKAGE

The top two graphs show closing torques arranged by valve size. The same curves are valid for both pressure classes. The bottom two diagrams indicate torques related to 150, 290 and 750 psi (1,2 and 5 MPa) differential pressure.

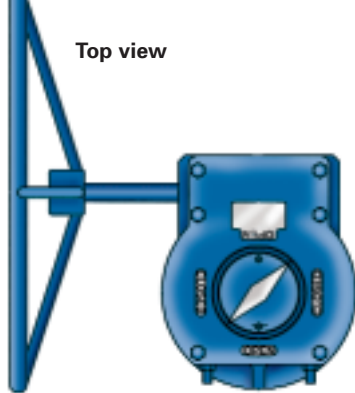


GEAR ACTUATORS

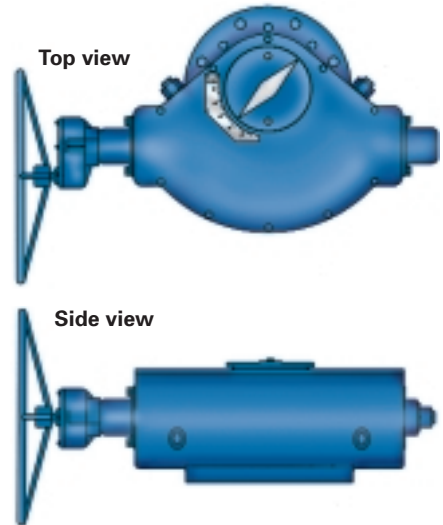
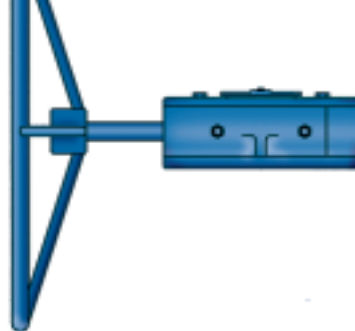
Velan worm gear and scotch yoke actuators provide reliable and dependable manual operation for butterfly valves. Both series are designed to operate in the range of $90^\circ \pm 5^\circ$ and are equipped with angular dial indicator (see pg. 14). VW worm gear actuators are featuring a gear segment and a rigid, reversible shaft with integral worm. For larger valves, heavy duty VS series scotch yoke type

actuators provide nonlinear torque characteristic with the highest possible mechanical advantage for seating and unseating the valve. Both series comply with the ISO 5211 standard and are suitable for high temperature service.

VW-SERIES



VS-SERIES



AIR AND ELECTRIC ACTUATORS

Velan supplies high quality actuators for pneumatically-operated butterfly 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.

PNEUMATIC RACK & PINION AND SCOTCH YOE ACTUATORS

- Quarter turn, double acting and spring return type with a totally enclosed design and no external moving linkages.
- 95.5° rotation, including external travel stops with a minimum of 10° adjustment.
- Rated for continuous operation using a dry or lubricated noncorrosive gas and suitable for mounting in any position.
- Ambient temperature range of -40° to $+180^\circ\text{F}$ (-40° to $+82^\circ\text{C}$) or, for high temperature service 0° to $+350^\circ\text{F}$ (-18° to $+177^\circ\text{C}$).

Also available with electric actuators.

