Memoryseal® UB-150/300 resilient-seated ball valves

Data sheet

Velan Memoryseal unibody resilient-seated ball valves are designed with unique 3-way packing arrangements for superior stem sealing to handle an extensive range of applications. These rugged, versatile, and high-performance unibody Memoryseal resilient-seated ball valves meet NACE specifications(1).

Memoryseal NPS 3 (DN 80) unibody regular port valve with lever handle.

Features

- Exclusive Memoryseal seats compensate automatically for wear and fluctuations of pressure and temperature.
- Unique 3-way packing arrangements for superior stem sealing.
- Multiple solid cup and cone type PTFE stem seal and graphite packing.
- Fully enclosed PTFE body seal.
- Valve/packing meets ISO and API Fugitive Emissions Standards.
- Long cycle life.
- Low, uniform torques.
- Blowout-proof stem with stem guides prevent side thrust.
- Locking devices standard on lever operated valves.
- Valves are fire safe per API 607 / ISO 10497.
- Certified TA-Luft (optional).

Applications

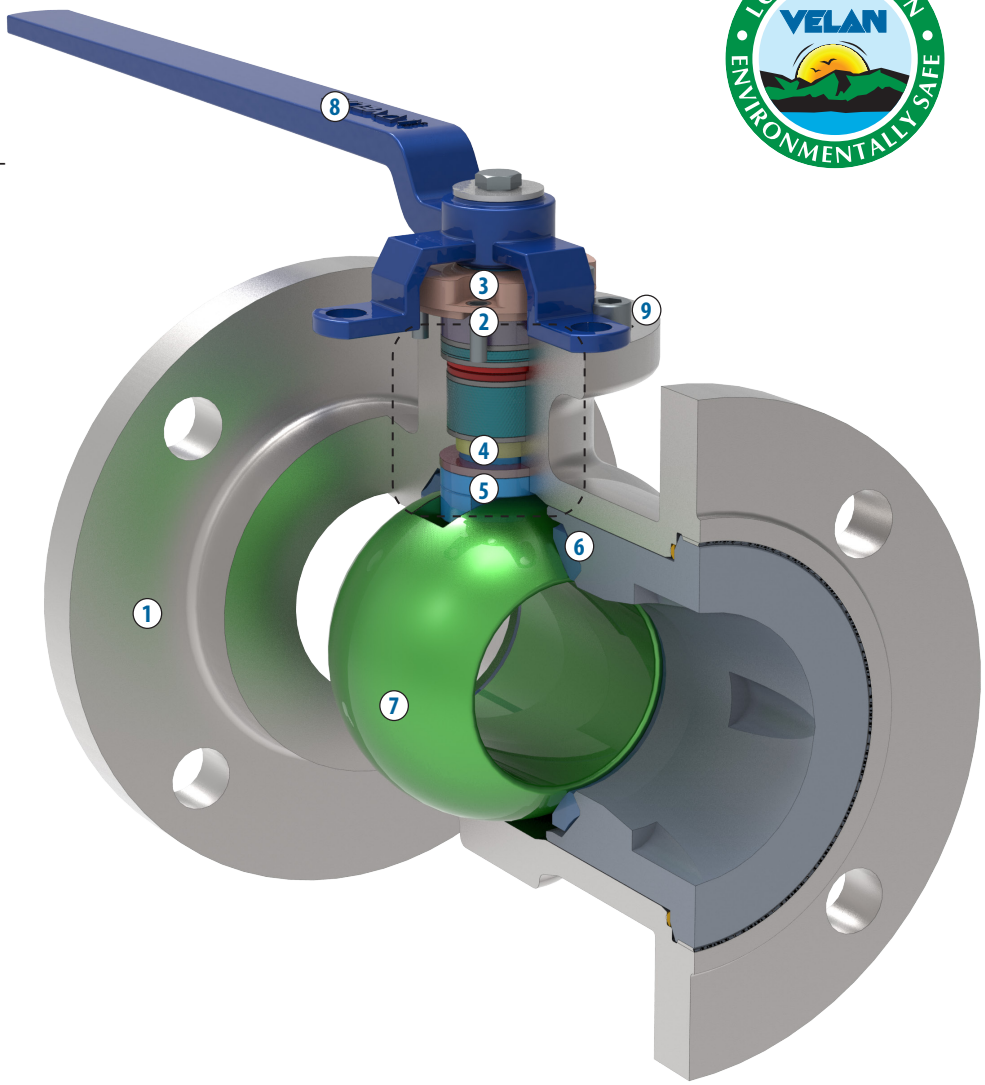
- Fluids
- Slurries
- Semi-solids
- Corrosive services
- Chemical
- Petrochemical
- Oil & gas
- Processing

Specifications

Sizes	NPS ½ – 12 (DN 15 – 300)
Pressure rating	ASME Class 150 and 300
End connections	ASME B16.5
Port	Regular
Valve design	ASME B16.34, API 608
Face-to-face	ASME B16.10 Flanged short pattern

(1) To ensure these valves meet NACE specifications, this requirement must be confirmed prior to placing the purchase order.

Design features



1 Unibody design

One-piece body with seat retainer sleeve eliminates potential leak path. Body with precision machined construction complies to ASME B16.34.

2 Packing chamber

Unique packing chamber design maintains low emissions control for reliable sealing and long lasting high cycle life.

3 Packing flange

Self-aligning packing flange is independent of gland for equal compression of packing rings.

4 Stem guides

Upper and lower bushings prevent side load on packing rings. Eliminates premature wear, therefore enhancing packing life.

5 Stem

Stem shoulder assures blowout-proof protection. A floating stem eliminates thrust washer wear.

6 Memoryseal® seats

Velan concave-convex flexible, in-tension seats with induced sealing memory. (See pages 4-5.)

7 Ball

Contact between the mirror-finished ball and Memoryseal seats with low torque operation.

8 Slide handle(1)

Sliding lock mechanism secures handle in open or closed position. Slide handle can convert to a T-handle by attaching the lever pipe in the center.

9 Actuator mounting

Four mounting holes are provided on top of the valve body to mount the bracket which can receive an ISO 5211 mounting actuator.

Cavity pressure relief

Memoryseal seats are designed to relieve overpressure in the ball/body cavity. (See page 4.)

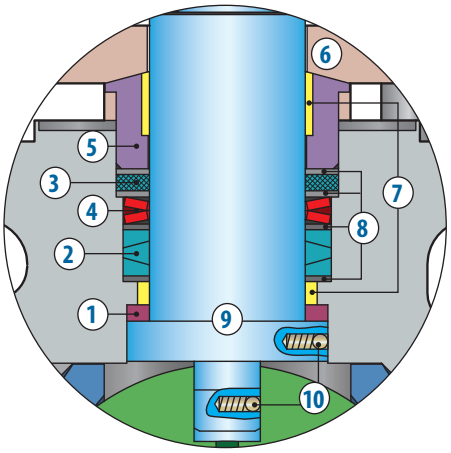
Anti-static design

Eliminates static electrical buildup between stem, ball and body. (See pages 3, 6, and 8.)

(1) NPS 4 (DN 100) 150/300 & NPS 6 (DN 150) 150 only.

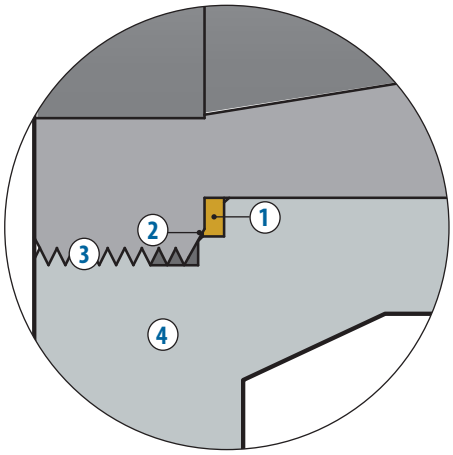
Packing chamber and body seals

3-way seal design dual qualified to API 641 and ISO-15848-1, with optional TA-Luft 4-way seal design for sizes NPS 2–12 (DN 50–300)



The unique E-20 packing chamber design maintains low emissions control for long lasting high cycle life. Valve packing is 100 ppm Low emission (Low-E).
SEAL 4: TA-Luft certified (optional[1]).

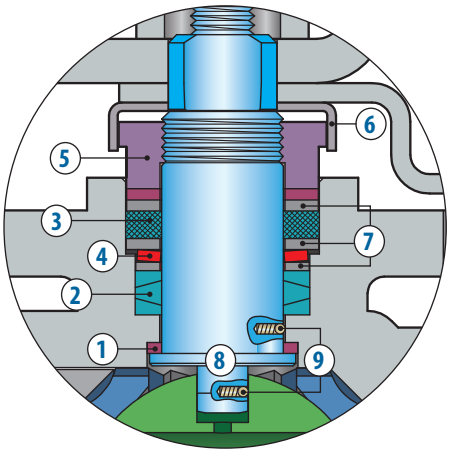
1. **SEAL 1**: Pressurized PTFE thrust washer/stem seal prevents galling.
2. **SEAL 2**: PTFE packed valves are dual qualified to API 641 and ISO-15848-1[2], up to NPS 12 Class 300. Packing rings made in cup and cone type PTFE.
3. **SEAL 3**: Fire safe packing ring made in die-formed flexible graphite.
4. Two live-loaded spring washers create a self-adjusting packing seal.
5. Specially machined gland bushing provides self-alignment to packing flange.
6. Adjustible self-aligning packing flange is independent of gland for equal compression of packing rings.
7. Upper gland bushing sleeve and lower stem bushing prevent side load on packing rings. Eliminates premature wear, enhancing packing life.
8. Four packing washers provide anti-extrusion of the PTFE and graphite packing for enhanced seal performance.
9. Floating stem eliminates thrust washer wear and stem shoulder assures blowout-proof safety.
10. Anti-static design: Ball-to-stem spring device eliminates static electrical build up between stem, ball, and body.



Memoryseal body seal designs incorporate a secondary metal-to-metal contact area in addition to the primary gasket. Threaded seat retainer sleeve and one-piece body eliminates potential leak path.

1. Primary PTFE gasket is fully enclosed.
2. Secondary metal-to-metal contact
3. Threaded seat retainer sleeve
4. One-piece body

3-way seal design dual qualified to API 641 and ISO-15848-1 for sizes NPS ½–1½ (DN 15–40)



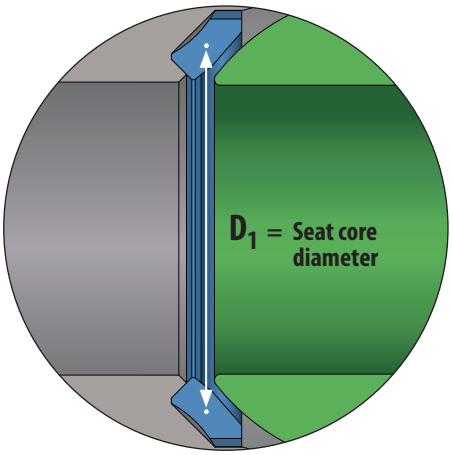
To achieve the required stem packing capability and performance within the limited space in these smaller valves, an impressive and unique 3-way sealing system has been developed.

1. **SEAL 1**: Pressurized thrust washer/ stem seal prevents galling.
2. **SEAL 2**: PTFE packed valves are dual qualified to API 641 and ISO-15848-1[1]. Packing rings made in cup and cone type PTFE.
3. **SEAL 3**: Fire safe packing ring made in die-formed flexible graphite.
4. Live-loaded spring washer creates a self-adjusting packing seal.
5. Adjustible packing nut.
6. Gland locking mechanism (may differ from design shown).
7. Three packing washers provide anti-extrusion of the PTFE and graphite packing for enhanced seal performance.
8. Floating stem eliminates thrust washer wear and stem shoulder assures blowout-proof safety
9. Anti-static design: Ball-to-stem spring device eliminates static electrical build up between stem, ball, and body.

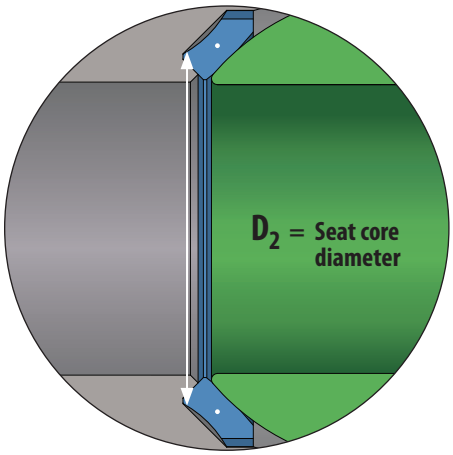
(1) Optional TA-Luft certified design (not shown).
(2) See page 10 for more on qualifications.

Velan Memoryseal® ball valve technology

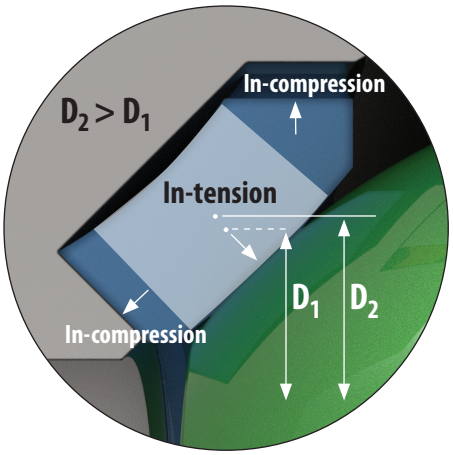
Memoryseal® seat
Before assembly



Memoryseal® seat
After assembly



Memoryseal® seat
Induced sealing memory



Sealing memory

The Velan sealing memory is induced into the seats during the assembly process, when the ball is inserted into the valve body it partially flattens the seat, creating a tensile stress in the center of the seat.

As a result, the seat core increases in diameter from D_1 to D_2 and, like a stretched elastic band, pushes against the ball. This ensures reliable sealing even at vacuum or low pressures.

Seat strength

A seat in-tension is stronger than a seat in compression because the tensile strength of MPTFE in-tension is 3600 psi (25 MPa) versus only 1800 psi (12.5 MPa) for MPTFE in compression. Greater strength means less fatigue, superior sealing ability, and longer cycle life.

The Memoryseal® seat is the only successful seat design in-tension rather than compression and will outlast other extreme seat designs.

Lower torques

Velan in-tension seats produce more uniform torque because the seat deflects into the cavity behind it to accommodate slight differences in machining tolerances or the normal expansion of MPTFE as temperature increases. MPTFE expands approximately seven times as much as metal.

Cavity pressure relief

Memoryseal seats are designed to relieve overpressure in the ball/body cavity. This capability is influenced by many variables including fluid characteristics, variations in pressure, seat materials, seat compression, temperature, and thermal cycles.

Positive release of cavity over-pressure to the upstream side is ensured by bypassing the upstream seat through a drilled hole in the ball. This option is preferred in certain services such as liquid chlorine.

When the valve is in the open position, pressure relief is always through the vent in the top of the ball adjacent to the stem connection. For further information on cavity relief contact our Quarter-turn marketing department.

Concave-convex flexible, in-tension seats with induced sealing memory

Benefits of Memoryseal® seats include:

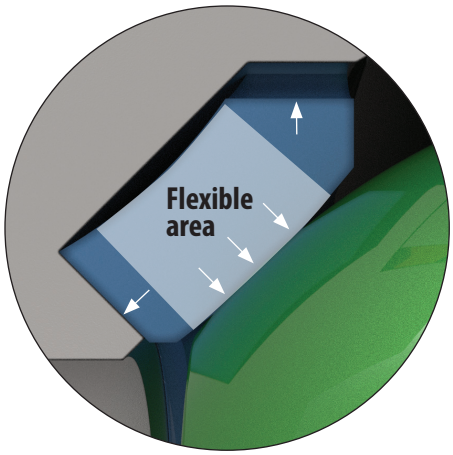
- Greater strength
- Less fatigue
- Positive bi-directional shutoff
- Uniform torque
- Compensate for temperature fluctuations
- Eliminate cold flow effects
- High cycle life

The large flexible area of the Memoryseal® seat offers superior sealing.

Greater flexible strength equals greater performance with Memoryseal® seats

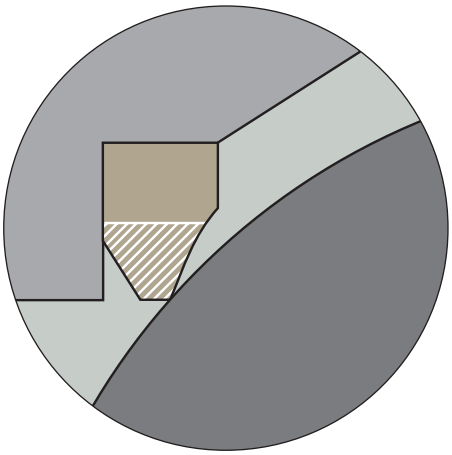
Velan Memoryseal® ball valve technology versus competing designs

Memoryseal® in-tension flexible seat



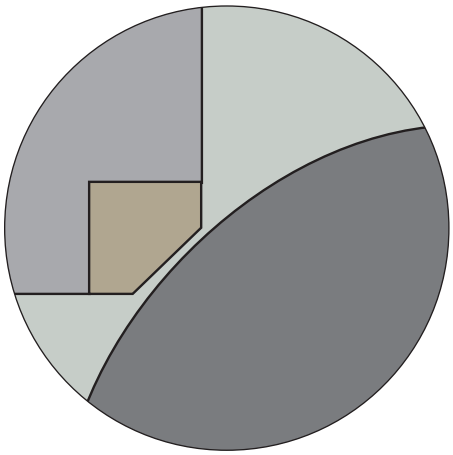
- ☑ Larger seat with smaller seating contact
- ☑ Larger seat with smaller seating contact
- ☑ Seat in-tension, stronger, 3600 psi tensile strength
- ☑ Greater flexible strength = tightness on low-pressure service
- ☑ Greater flexibility = lower torque
- ☑ Greater flexibility = better shock resistance to high DP
- ☑ Greater flexibility = compensation for pressure and temperature fluctuation
- ☑ Greater flexibility = longevity

Competitive flexible seat



- ☒ Smaller, weaker seat
- ☒ Minimal flexible area, susceptible to fatigue
- ☒ Seat in compression, only 1800 psi tensile strength
- ☒ Can leak in low-pressure service due to fatigue
- ☒ Minimal flexibility; conservative torque
- ☒ Minimal flexibility, weak shock resistance to high DP
- ☒ Moderate compensation for pressure and temperature fluctuation
- ☒ Moderate flexibility = premature wear

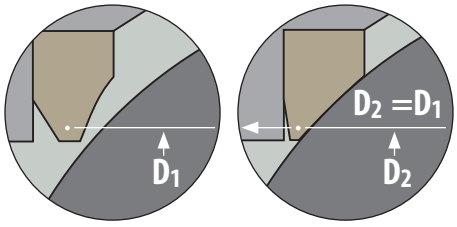
Non-flexible jam seat



- ☒ Much smaller seat
- ☒ No flexibility, high compres-sion: susceptible to cold flow
- ☒ Seat in compression, only 1800 psi tensile strength
- ☒ Can leak in low-pressure service due to fatigue
- ☒ No flexibility, high compression, susceptible to high torque and severe torque variation
- ☒ No flexibility, no shock resistance to high DP
- ☒ No compensation for pressure and temperature fluctuation
- ☒ No flexibility = short cycle life

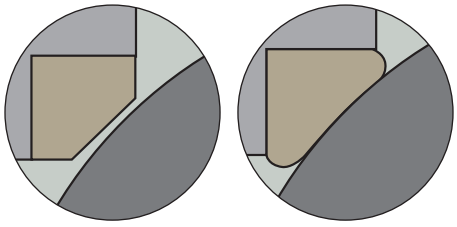
The competing seat design illustrations shown on this page are general in nature and are not intended to show the exact design or performance of any specific manufacturer.

Before assembly **After assembly**



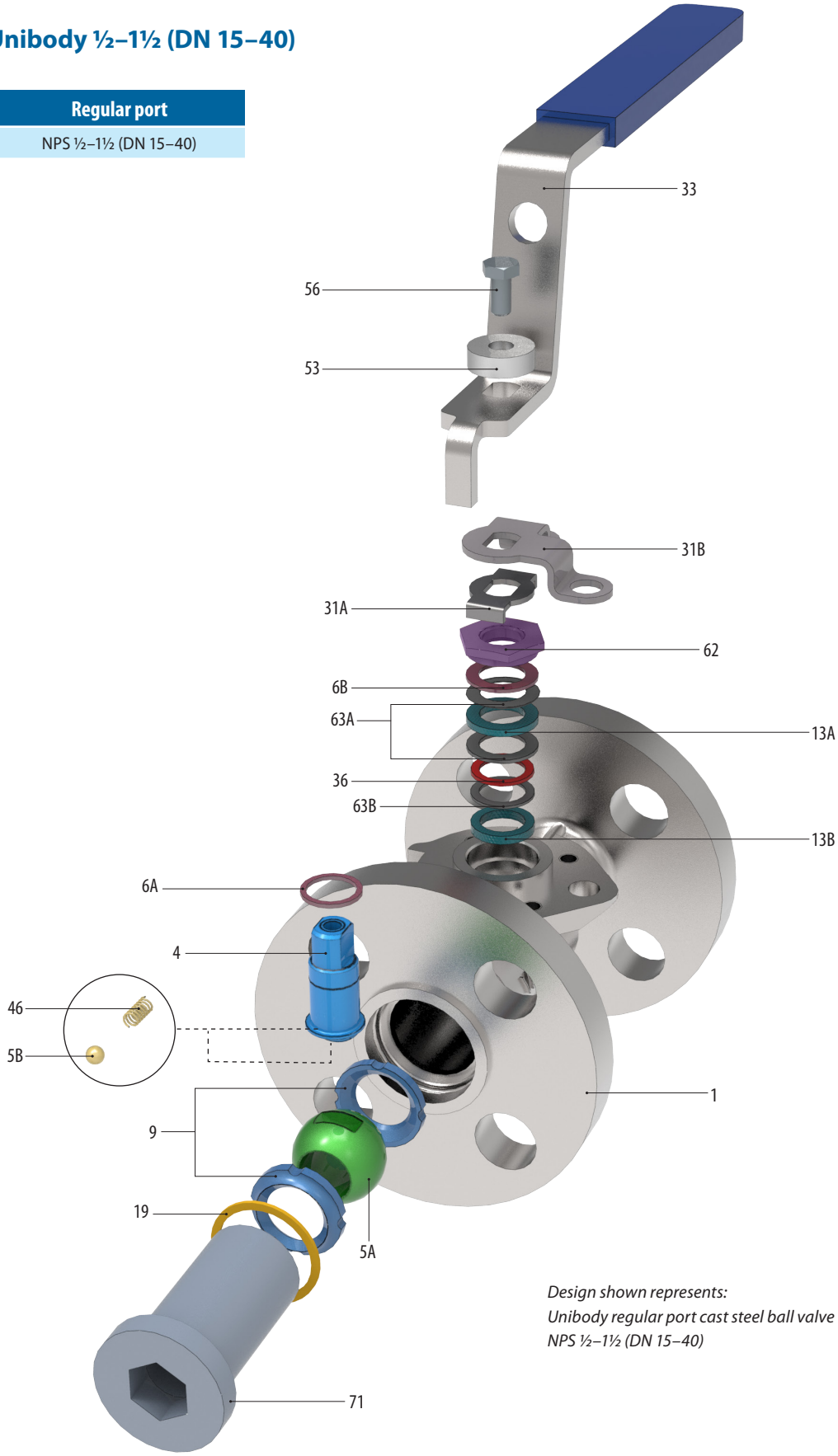
After assembly the seat diameter D_1 does not increase. Seat contact is in compression, not tension.

Before assembly **After assembly**



Exploded view: Unibody ½–1½ (DN 15–40)

ASME Class	Regular port
150/300	NPS ½–1½ (DN 15–40)



Design shown represents:
Unibody regular port cast steel ball valve
NPS ½–1½ (DN 15–40)

Standard materials: Unibody ½–1½ (DN 15–40)

PART		Carbon steel	Stainless steel
1	Body	ASTM A216 WCB	ASTM A351 CF8M
4	Stem	ASTM A276 Gr. 316 SS	
5A	Ball	ASTM A276 Gr. 316 SS	
5B	Grounding ball	ASTM A276 Gr. 316 SS	
6A	Thrust washer	PEEK	
6B	Thrust washer	RPTFE	
9	Seat	MPTFE, RPTFE, PTFE	
13A	Packing ring	Die-formed flexible graphite	
13B	Packing ring	PTFE	
19	Body seal	PTFE	
31A, 31B	Locking device	ASTM A240 Gr. 304 SS	
33	Handle	ASTM A240 Gr. 304 SS	
36	Belleville washer	AMS 5528 / 5529 17-7 PH	
46	Spring	ASTM A313 Gr. 302 SS	
53	Spacer	ASTM A276 Gr. 304 SS	
56	Hexagon head cap screw	ASTM F593 Gr. 304 SS	
62	Packing nut	ASTM A276 Gr. 304 SS	
63A, 63B	Packing washer	ASTM A240 Gr. 316 SS	
71	Seat retainer	ASTM A216 WCB	ASTM A351 CF8M

Notes:

Valves design in accordance with ASME B16.34 & BS 5351.

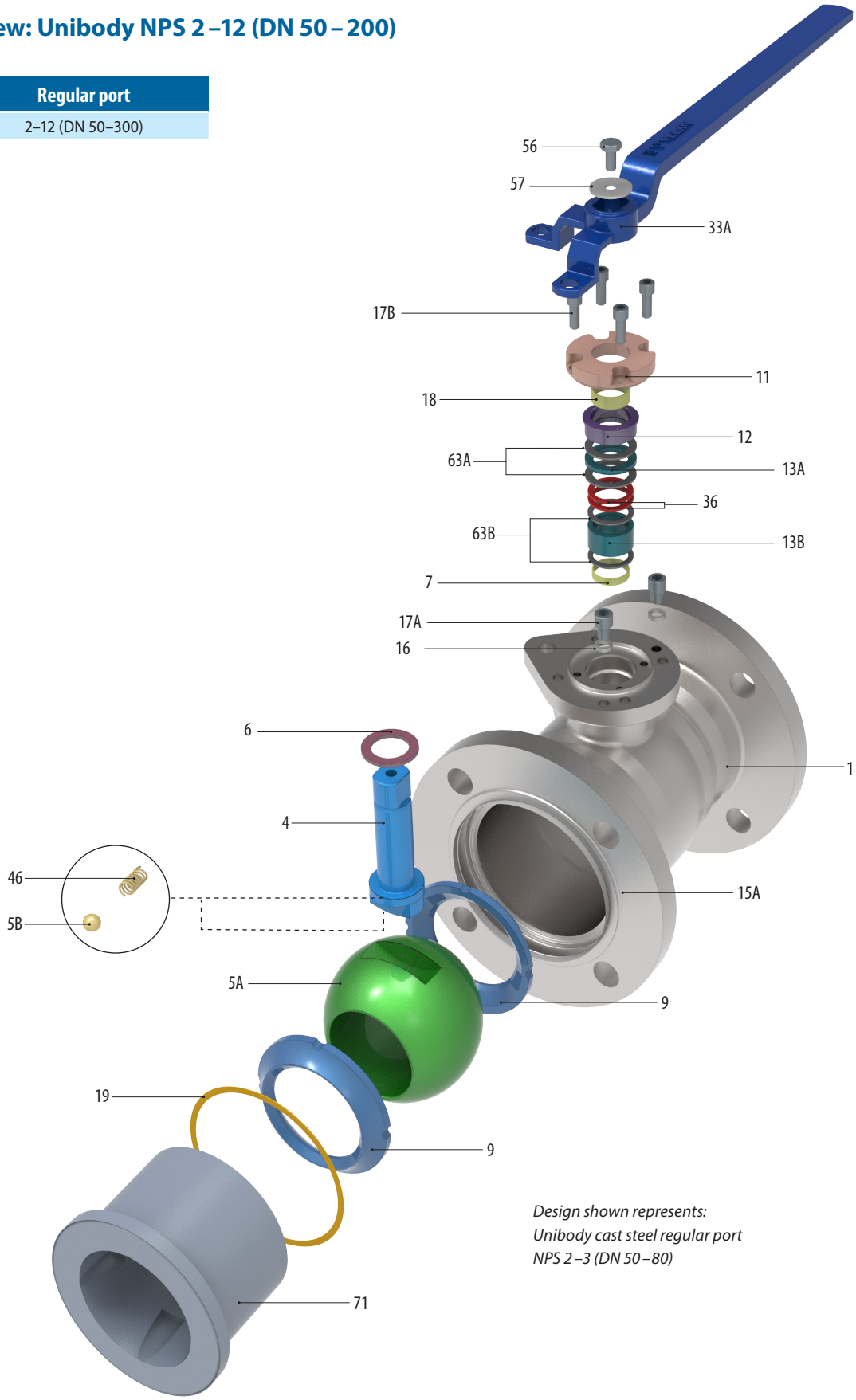
Compatibility to NACE MR0175-2003/ISO 15156 is subject to the client's verification of H2S partial pressure, Chloride content, absence of elemental sulphur, and operating temperature/pressure.

Valves are fire safe per API-607, 5th Edition.

Other materials available.

Exploded view: Unibody NPS 2 –12 (DN 50 – 200)

ASME Class	Regular port
150/300	2–12 (DN 50–300)



Design shown represents:
Unibody cast steel regular port
NPS 2 –3 (DN 50 –80)

Standard materials: Unibody NPS 2 –12 (DN 50 – 200)

PART		Carbon steel	Stainless steel
1	Body	ASTM A216 WCB	ASTM A351 CF8M
4	Stem	ASTM A276 Gr. 316 SS	
5A	Ball	ASTM A351 CF8M	
5B	Grounding ball	ASTM A276 316 SS	
6	Thrust washer	RPTFE	
7	Stem bushing	RPTFE	
9A, 9B	Seat	MPTFE, RPTFE, PTFE	
11	Packing flange	ASTM A351 CF8	
12	Gland bushing	ASTM A276 304 SS	
13A	Packing ring	Die-formed flexible graphite	
13B	Packing ring	PTFE	
16	Nut	CS plated	
17A, 17B	Hex socket head cap screw	ASTM F837 UNS S30433	
18	Gland bushing sleeve	RPTFE	
19	Body seal	PTFE	
33A	Handle	ASTM A216 WCB	
36	Belleville washer	AMS 5528/5529 17-7 PH	
46	Spring	ASTM A313 302 SS	
56	Hexagon head cap screw	ASTM F593 304 SS	
57	Handle washer	CS plated	
63A, 63B	Packing washer	ASTM A240 316 SS	
71	Seat retainer	ASTM A216 WCB	ASTM A351 CF8M

Notes:

Valves design in accordance with ASME B16.34 & BS 5351.

Compatibility to NACE MR0175-2003/ISO 15156 is subject to the client's verification of H2S partial pressure, Chloride content, absence of elemental sulphur, and operating temperature/pressure.

Valves are fire safe per API-607, 5th Edition.

Other materials available.

Technical specifications: design and testing

Pressure-temperature rating	Shell: ASME B16.34
	Valve: see seat materials
Shell wall thickness	ASME B16.34
Face-to-face	ASME B16.10 Flanged short pattern
Flange dimensions	ASME B16.5
Valve testing	ASME 598
Fire safe testing	API 607 rev 5 (5)
Valve design	API 608 and ASME B16.34

Note: Other end connections and actuation available upon request.

Testing and quality assurance

All our valves are tested in our factory to guarantee their performance in the field.

- Shell test performed at 150% max. cold working pressure(1).
- Low pressure closure test preformed at 60 to 100 psig(2).
- RT examination of bonnet/body critical areas as defined in ASME B16.34(3).
- ISO 15848-2 Fugitive emissions production test up to 450 psi Helium(4).
- MT/PT of body entire surface.
- Functional test of all accessories such as actuator and external switches(4).

(1) *Tests performed as per API 598.*

(2) *Test performed with air or nitrogen as per API 598.*

(3) *Extended RT or any other NDE available upon request.*

(4) *Available upon request.*

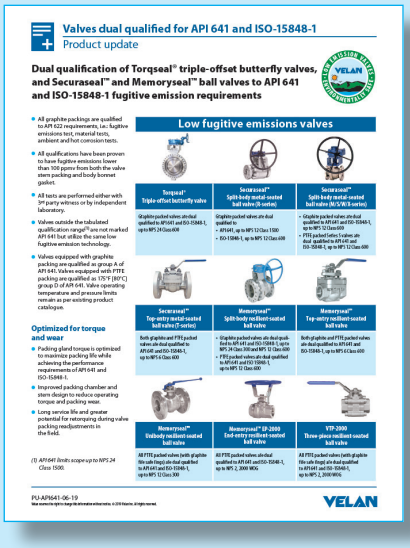
Certifications

Velan offers a wide range of certifications of compliance with regulatory requirements:

- PED
- ATEX
- IEC 61508 SIL 3 Capable
- GOST/EAC

Fugitive Emission Qualifications

- ISO 15848-1 (methane)
- API 641 (methane)
- TA-Luft (helium)
- Velan's FE qualifications have been surveyed and audited by leading organizations around the world such as Bureau Veritas, Lloyds Register and TA-Luft.


Valves dual qualified for API 641 and ISO-15848-1
Product update
Dual qualification of Torqseal® triple-offset butterfly valves, and Securaseal™ and Memoryseal™ ball valves to API 641 and ISO-15848-1 fugitive emission requirements
Low fugitive emissions valves
Optimized for torque and wear
VELAN

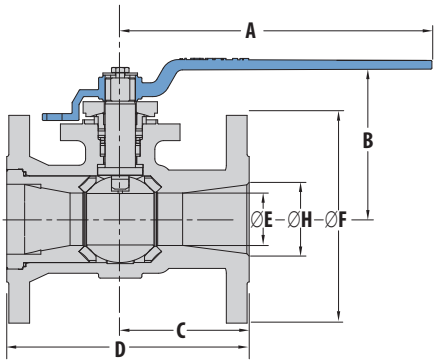
To download the latest information on valves qualified for API 641 and ISO-15848-1 go to velan.com and first log into or create a My Velan member account.

Under the Resources tab at the top of the page, scroll down to Literature, click on the Literature category dropdown menu and select Product updates.

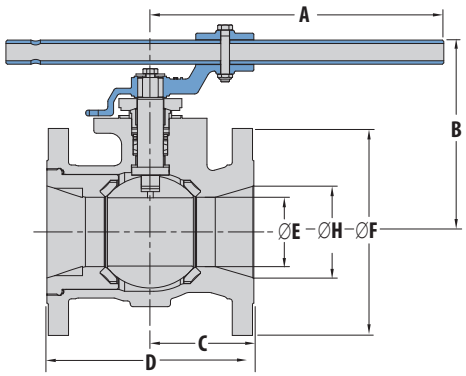
The Document code: PU-API_641-06-19 can be found at this link.

Dimensions, weights, and Cvs: UB-150/300

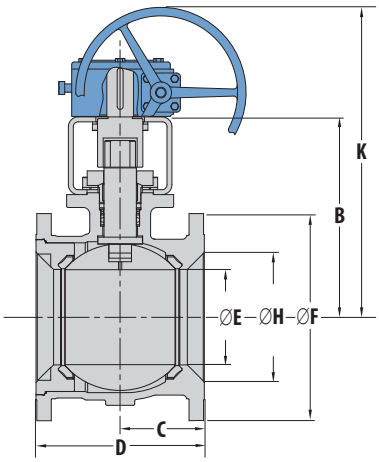
Lever handle



Slide handle



Gear



Size NPS DN	ASME Class 150 regular port									
	A	B	C	D	ØE	ØF	ØH	K	lb / kg	C_V
½ 15	5.9 150	3.47 88	2.13 54	4.25 108	0.5 13	3.5 89	0.5 13	–	3.4 1.5	9
¾ 20	5.9 150	3.78 96	2.31 59	4.63 118	0.62 16	3.88 99	0.74 19	–	4.4 2.0	15
1 25	7.8 198	3.91 99	2.5 64	5 127	0.75 19	4.25 108	1 25	–	7.9 3.6	42
1½ 40	7.8 198	4.89 124	3.25 83	6.5 165	1.18 30	5 127	1.5 38	–	11.7 5.3	125
2 50	9 229	4.59 117	3.72 94	7 178	1.49 38	6 152	2 51	–	19 8.6	165
3 80	11.9 302	5.59 142	4 102	8 203	2.31 59	7.5 191	3 76	–	39 18	350
4 100	21 533	9 229	4.5 114	9 229	2.97 75	9 229	4 102	–	70 32	540
6 150	40 1016	11.71 297	5.25 133	10.5 267	4.38 111	11 279	5.98 152	–	134 61	1,000
8 200	–	–	5.75 146	11.5 292	5.69 145	13.5 343	8 203	19.4 493	206 94	1,770
10 250	–	–	6.5 165	13 330	7.38 187	16 406	10 254	27 686	344 156	2,850
12 300	–	–	7 178	14 356	9 229	19 483	12 305	29.1 739	522 237	4,800

Size NPS DN	ASME Class 300 regular port									
	A	B	C	D	ØE	ØF	ØH	K	lb / kg	C_V
½ 15	5.9 150	3.47 88	3.38 86	5.5 140	0.5 13	3.75 95	0.5 13	–	4.5 2.0	9
¾ 20	5.9 150	3.78 96	3.69 94	6 152	0.62 16	4.63 118	0.74 19	–	7.1 3.2	15
1 25	7.8 198	3.91 99	4 102	6.5 165	0.75 19	4.88 124	1 25	–	11.5 5.2	42
1½ 40	7.81 198	4.89 124	4.25 108	7.5 191	1.18 30	6.13 156	1.5 38	–	18.6 8.4	125
2 50	9 229	4.59 117	4.62 117	8.5 216	1.49 38	6.5 165	2 51	–	26 11.8	165
3 80	11.9 302	5.59 142	6.63 168	11.12 282	2.31 59	8.25 210	3 76	–	60 27	350
4 100	21 533	9 229	6 152	12 305	2.97 75	10 254	4 102	–	103 47	540
6 150	–	–	8.63 219	15.88 403	4.38 111	12.5 318	6 152	17 432	183 83	1,000
8 200	–	–	8.25 210	16.5 419	5.69 145	15 381	8 203	23.4 594	309 140	1,770
10 250	–	–	9 229	18 457	7.38 187	17.5 445	10 254	27.7 704	507 230	2,850
12 300	–	–	9.88 251	19.75 502	9 229	20.5 521	12 305	34.1 866	776 352	4,800

Notes:

Contact velan for bare stem dimensions.

Weight is given without gear operator.

For other sizes and pressure classes, contact your local Velan office.

Flow coefficients (C_V).
Kv is the metric equivalent of C_V.
Kv = C_V x 0.864

Standard actuation compliant to API 608

API 608 standard compliant configurations for the resilient-seated ball valves types shown below are available with the following actuation and handle options (position "J" in the figure number). Other options are available in non-API 608 configurations.

Product	Port	ASME Class	Size NPS	Size DN	Lever handle (W)	Slide[(1)]/ Oval handle (H)	Gear (G)	Bare stem (B)
UB	Regular	150	½	15	• Lever handle	• Oval handle		
			¾	20	• Lever handle	• Oval handle		
			1	25	• Lever handle	• Oval handle		
			1 ½	40	• Lever handle	• Oval handle		
			2	50	• Lever handle			
			3	80	• Lever handle		• Gear G0-2 & Ø12 HD	• Bare stem
			4	100		• Slide handle [(1)]	• Gear G0-2 & Ø12 HD	• Bare stem
			6	150		• Slide handle [(1)]	• Gear G0-2 & Ø12 HD	• Bare stem
			8	200			• Gear G0-3 & Ø12 HD	• Bare stem
			10	250			• Gear G0-3 & Ø20 HD	• Bare stem
			12	300			• Gear G0-4 & Ø20 HD	• Bare stem
		300	½	15	• Lever handle	• Oval handle		
			¾	20	• Lever handle	• Oval handle		
			1	25	• Lever handle	• Oval handle		
			1 ½	40	• Lever handle	• Oval handle		
			2	50	• Lever handle			
			3	80	• Lever handle		• Gear G0-2 & Ø12 HD	• Bare stem
			4	100		• Slide handle [(1)]	• Gear G0-2 & Ø12 HD	• Bare stem
			6	150			• Gear G0-3 & Ø12 HD	• Bare stem
			8	200			• Gear G0-3 & Ø20 HD	• Bare stem
			10	250			• Gear G0-4 & Ø20 HD	• Bare stem
			12	300			• Gear DT36 & Ø30 HW	• Bare stem

• Stocking replenishment program • Available with factory lead times

(1) All slide handles convert to a T-handle by removing the screw holding the pipe while using the second hole to attach the pipe to the pipe holder.

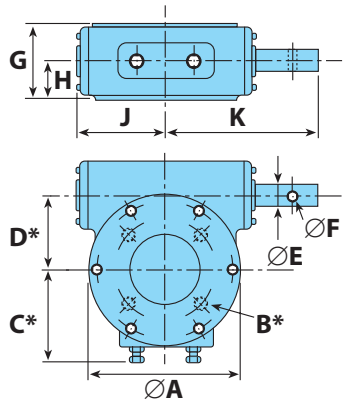
Manual gear operators

Velan recommends manual gear actuators on all NPS 8–12 (DN 200–300) valves that are not equipped with air or electric actuators.

Manual gear actuators are also used on NPS 3–6 (DN 80–150) valves where operating space is too small for lever handles. The actuators are fully enclosed and a pointer indicates the position of the ball. Handle extensions, chain sprockets, and right angle drives are available.

Torque ratings

Unit	Ratio	Max. output torque		Max. shaft diameter		Weight		Efficiency
	Basic	lb-in	Nm	in	mm	lb	kg	Basic
G0-2	30:1	4,800	542	1.437	36	22	10	0.25
G0-3	50:1	9,000	1,017	2.250	57	29	13	0.25
G0-4	80:1	21,000	2,373	3.250	83	70	32	0.25



Type	Dimensions – in/mm ØA	B*	C*	D*	ØE	ØF	G	H	I	J
G0-2	6.37 162	4 x ⅜ - 16 UNC 3 ⅞" (98.4 mm)	4.00 102	2.50 64	0.75 19	0.18 4.57	3.50 89	1.50 38	3.18 81	8.00 203
G0-3	7.12 181	4 x ½ - 13 UNC 5" (127 mm)	4.25 108	3.12 79	0.75 19	0.18 4.57	3.75 95	1.50 38	3.50 89	8.00 203
G0-4	10.00 254	4 x ¾ - 10 UNC 6 ½" (165 mm)	5.75 146	4.50 114	1.00 25	0.25 6.35	4.50 114	2.25 57	5.18 132	9.81 249

** Mounting holes straddle center line.*

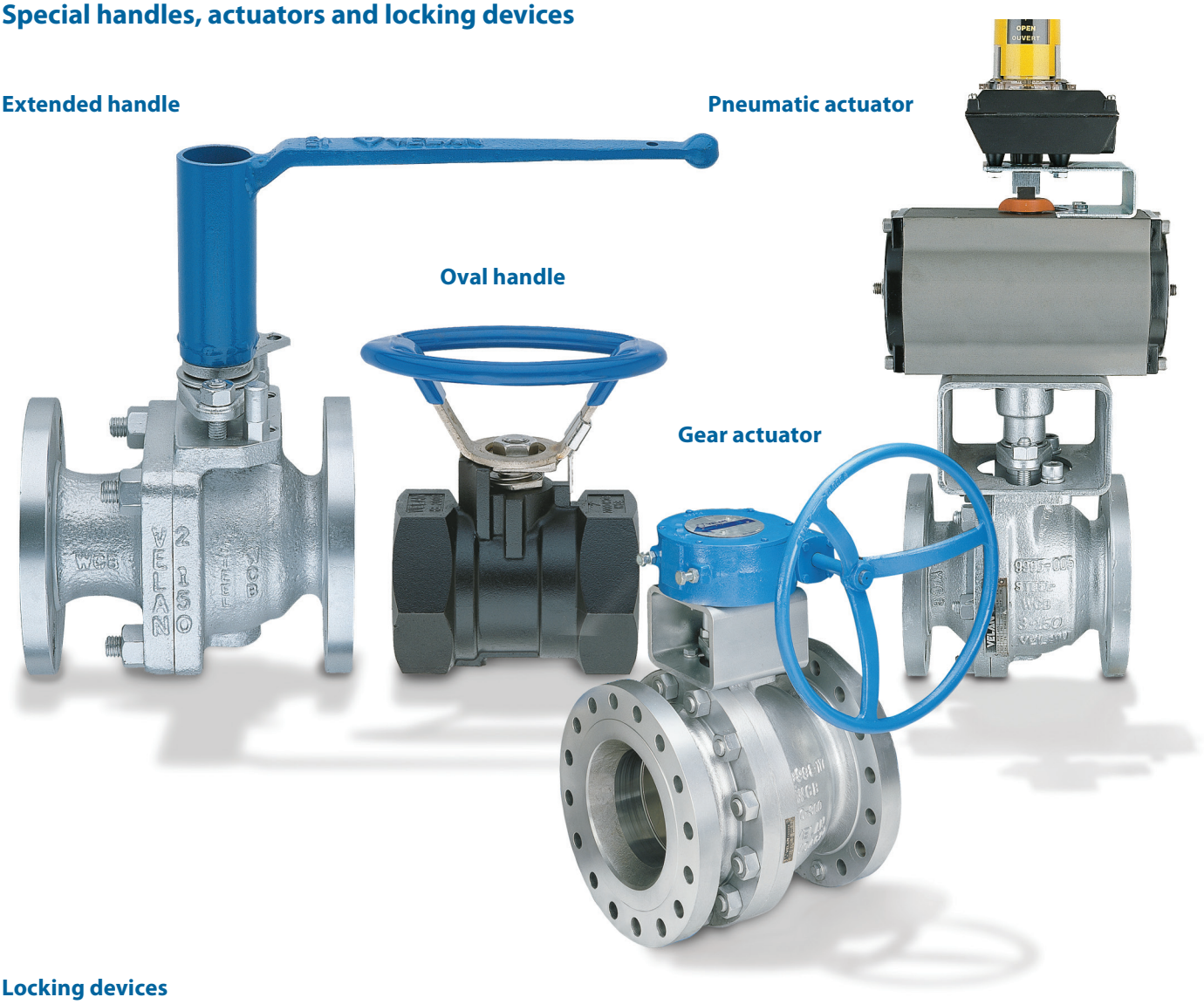
Special handles, actuators and locking devices

Extended handle

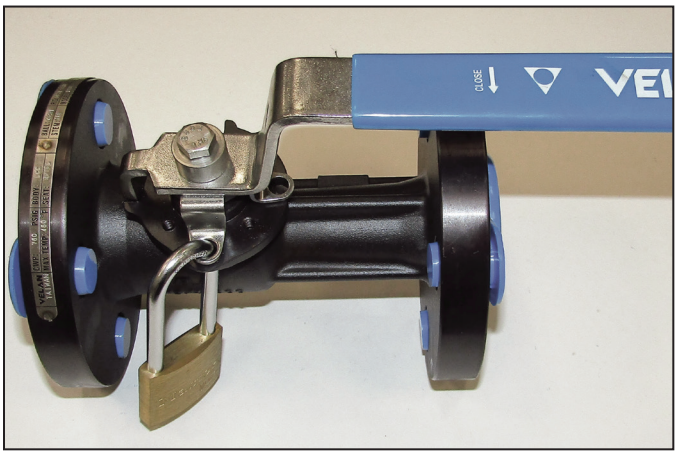
Pneumatic actuator

Oval handle

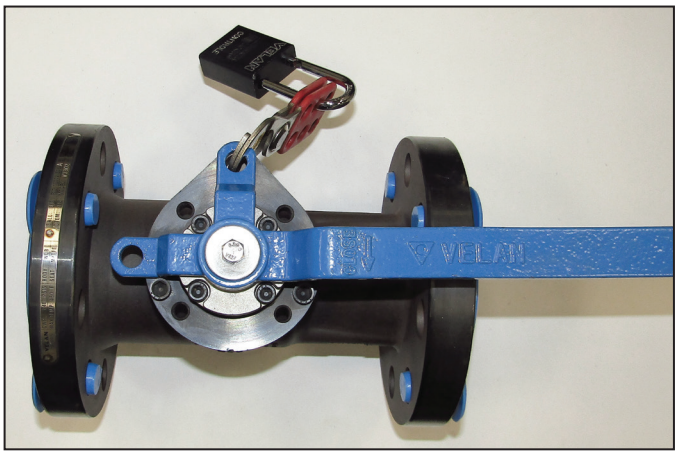
Gear actuator



Locking devices



Standard on:
UB-150/300: NPS ½–1½ (DN 15–40)



Standard on:
UB-150/300: NPS 2–3 (DN 50–80)

Automated valves and control

Velan ball valves are available in a variety of automation packages and include pneumatic, electric, and hydraulic. Velan also supplies automated packages with integral control actuation.

Automation is done either by Velan at its own facilities located around the world or by authorized automation centers. In either case, automation is done in accordance with strict guidelines of quality assurance, engineering standards, and performance.

Thanks to Velan's flexible automation program, we can offer the best actuation package and accessories to meet the customer's needs, whatever their performance and commercial requirements.

Velan maintains *"Specification for Valve Automation"* and *"Quarter Turn Actuation Standards"* documents. Only those automation centers that adhere to these standards and are approved by Velan audits earn the status of "Authorized Velan Automation Center."

This program ensures our ball valves can be automated by a wide range of actuators and accessories, regardless of whether the actuation is done at Velan or at an authorized automation center.

All automated ball valves from Velan or authorized automation centers have a discrete serial number data sheet on permanent file. This permanent record contains the source of supply and data on all components such as actuators, solenoid valves, limit switches, and positioners. All the test data—such as operational and seat leak tests—are recorded as well.

Automated packages with integral control actuation.

Sizing of actuators

Elements affecting valve torque

The torque requirements of soft seated ball valves depend on many factors.

Valve design and material selection

- **Seat design and material selection**

  Velan seats were developed to ensure maximum flexibility and low torque. The friction force depends on the seat material, and the applicable torque multipliers are shown in the seat material selection table on page 16.

- **Ball: free-floating or trunnion-mounted?**

  A free floating ball is forced against the down-stream seat by the fluid pressure and the resulting torque is a product of the friction force and the seat/ball contact radius. The fluid load is carried by the bearings in a trunnion-mounted ball valve, resulting in a lower torque overall.

- **Stem seal**

  The torque resulting from the stem-packing friction depends on the packing chamber depth, the type of materials, and the size of the stem/packing rings – smaller the valve, the greater the importance of the stem seal factor.

Service conditions

- **Differential pressure**

  The breakaway torque increases substantially with the differential pressure on larger ball valves. On small ball valves, up to NPS 1 (DN 25), where the stem packing friction is higher than the ball/seat torque, the overall torque remains approximately the same.

- **Frequency of operation**

  When a valve remains in the closed position for extended periods of time, the breakaway torque increases due to the resilient material filling the voids in the ball caused by machining and other problems.

- **Fluid influence**

  The torque tends to be lower with oils, but higher with gas or other liquids with solids or slurries. Dirt and solid particles can become embedded in the seats, which greatly increases the torque. Note that torque data on the product pages is the result of laboratory tests with clean water at ambient temperature.

- **Influence of temperature**

  Within the operating temperature range, the torque, in most cases, remains constant–except at low cryogenic levels when the seats become more rigid.

- **Limitation to speed of actuation**

  Resilient materials such as virgin MPTFE or reinforced PTFE (RPTFE) can be damaged by a fast turning ball under pressure. The speed limits for closing or opening the ball valves for sizes:

  - NPS ½–2½ (DN 15–65), 0.5 second
  - NPS 3–6 (DN 80–150), 1 second
  - NPS 8–12 (DN 200–300), 5 seconds

Actuator torque requirement calculations

Important:

1. Published factors are to be used as a guide.
2. The actuator selection has to be based also on economic considerations. A valve that has an important function, or one that is out of reach for service, should have a larger actuator than would normally be selected.

Table 1 **Seat factor "MF" and seat material selection**

Seat material	Application and Limitations					Factor "MF" (1)
	Temp. range °F (°C)	Chemical	Radiation	Valve type	Service application	
PTFE (T) Virgin polytetrafluoroethylene	-100 to 400 (-73 to 204)	All except: • Molten alkali metals • Liquid or gaseous fluorine • A few fluorochemicals (i.e., CLF_3 and OF_2)	10^4 RAD	UB-150/300	Chemical and cryogenic service.	1.0
RPTFE (G) 15% Glass reinforced	-100 to 450 (-73 to 232)	All except: • Molten alkali metals • Liquid or gaseous fluorine • A few fluorochemicals (i.e., CLF_3 and OF_2)	10^4 RAD	UB-150/300	Used as standard for low and medium pressure service for steam service up to 150 psig (10.3 bar).	1.0
MPTFE (E) Modified polytetrafluoroethylene	-100 to 450 (-73 to 232)	All except: - Molten alkali metals - Liquid or gaseous fluorine - A few fluorochemicals (i.e., CLF_3 and OF_2)	10^4 RAD	UB-150/300	For low and medium pressure service. Particularly recommended for use on styrene and butadiene.	1.0

Table 2 **Fluid factor "FF"**

Liquid	Factor "FF" (1)
Clean particle-free, non-lubricating (e.g.: water, alcohol or solvents)	1.0
Clean particle-free, lubricating oil	0.5 to 0.8
Slurry (liquids carrying solids) or heavy corroded and contaminated system	1.3 to 2.0
Gas or saturated steam, clean and wet	1.0
Gas or superheated steam, clean and dry	1.3
Gas, dirty (e.g.: natural gas)	1.2 to 1.5

Table 3 **Frequency of operation factor "OF"**

Liquid	Factor "0F" (1)
Once per day or greater	1.0
Once per week or greater	1.3
Once per month or greater	1.4
Once per four-month or greater	1.5

(1) The seat, fluid, and frequency of operation factors should be considered as a guide only and should be adjusted according to experience and judgment. Velan is not responsible directly or indirectly for actuator selection by third parties.

Typical examples for sizing actuators based on actuator torquing equation

To obtain the torque requirements for an actuator:

Step 1
Determine the basic, maximum torque "**TT**" for a particular valve and pressure differential from *Torque tables* on page 19.

Step 2
Determine the seat factor "**MF**", from *Table 1* page 16.
For MPTFE or RPTFE, the factor is 1.0.

Step 3
Determine the fluid factor "**FF**", from *Table 2* page 16.

Step 4
Determine the frequency of operation factor "**OF**", from *Table 3* page 16.

Using the data from **Steps 1–4**, the actuator torque equation "**AT**" can now be established:

AT = TT x MF x FF x OF = lbf•in (Nm)

AT = (Step 1) x (Step 2) x (Step 3) x (Step 4) = lbf•in

Example for a unibody flanged in CF8M, regular port:

Application:	Water
Service:	Clean water. Differential pressure 100 psid (6.8 bar)
Service temp.:	70°F (21°C)
Cycle time:	Every 6 hours
Valve size:	UB-150, NPS 6 (DN 150)
Seat material:	MPTFE
Actuator:	Pneumatic actuator with spring return, fail closed
Air supply:	90 psig (6.2 bar)

Sizing of torque:

TT = 2270 lbf•in (257 Nm), For ΔP = 100 psid (6.8 bar).

MF = 1 (MPTFE) (*Table 1* page 16)

FF = 1.3 (*Table 2* page 16)

OF = 1 (*Table 3* page 16)

Minimum break torque required

AT = 2270 (257 Nm) x 1 x 1.3 x 1 = 2951 lbf•in (334 Nm)

Selection of actuator:

In the example below, 2951 lbf•in (334 Nm) is the minimum required valve break torque or the minimum required actuator output torque.

Since allowances for the fluid type, seat material, and frequency of operation have already been incorporated into the torque calculation, additional safety factors are not required.

However, it is good practice to apply an additional 1.5 multiplier to the break torque when selecting a pneumatic actuator. This will ensure smooth operation and protection from occasional reduction of air pressure.

This is sufficient data when constant torque type actuators such as rack and pinion double acting or electric actuators are used.

However, when scotch-yoke type, spring return–fail closed, or spring return–fail open actuators are used, factor the break torque by 0.70 for run torque and by 0.80 for reseat torque.

Pressure / temperature ratings: Unibody

Carbon steel: ASTM A216-WCB

Temp. °F °C	Psig Bar				
	Class 150		Class 300		
	PTFE [1]	RPTFE & MPTFE	PTFE [1]	RPTFE	MPTFE
-20°F -29°C	285 20	285 20	740 51	740 51	740 51
0°F -18°C	285 20	285 20	740 51	740 51	740 51
100°F 38°C	285 20	285 20	740 51	740 51	740 51
150°F 66°C	272 19	272 19	633 44	649 45	710 49
200°F 93°C	260 18	260 18	527 36	557 38	680 47
250°F 121°C	245 17	245 17	420 29	466 32	588 41
300°F 149°C	230 16	230 16	313 22	374 26	470 32
350°F 177°C	207 14	215 15	207 14	283 20	353 24
400°F 204°C	100 7	192 13	100 7	192 13	235 16
450°F 232°C	N/A	100 7	N/A	100 7	100 7

Stainless steel: ASTM A351-CF8M

Temp. °F °C	Psig Bar				
	Class 150		Class 300		
	PTFE [1]	RPTFE & MPTFE	PTFE [1]	RPTFE	MPTFE
-70°F -57°C	275 19	275 19	720 50	720 50	720 50
0°F -18°C	275 19	275 19	720 50	720 50	720 50
100°F 38°C	275 19	275 19	720 50	720 50	720 50
150°F 66°C	255 18	255 18	617 43	631 44	670 46
200°F 93°C	235 16	235 16	513 35	543 37	620 43
250°F 121°C	225 16	225 16	410 28	454 31	532 37
300°F 149°C	215 15	215 15	307 21	366 25	426 29
350°F 177°C	203 14	205 14	203 14	277 19	319 22
400°F 204°C	100 7	189 13	100 7	189 13	213 15
450°F 232°C	N/A	100 7	N/A	100 7	100 7

(1) Valves with PTFE packing are limited to 400°F (204°C).

Notes:

During the valve selection, please take note that Memoryseal ball valves can be used at the minimum cold temperatures indicated above, except for severe service applications where the media going through the valve is very cold, below -20° F, and the ambient temperature is much warmer and humid. In such extreme applications ice will build up around the valve, especially around the packing area making the valve inoperable.

Pressure rating intermediate to tabulated values are determined by linear interpolation between temperatures.

Torque tables

Seats: MPTFE, PTFE, RPTFE for UB-150/300
Packing: PTFE standard temperature range between -20°F (-29°C) and 400°F (204°C)
Net torque values for clean fluids: lb•in and Nm

UB-150/300 Regular port – lb·in

Size NPS	Maximum Differential Pressure - psi								
	0	100	200	300	400	500	600	700	740
½	40	40	42	43	45	47	48	49	50
¾	70	70	73	75	77	79	83	87	90
1	97	99	102	105	107	110	115	121	126
1½	190	196	202	210	220	235	259	275	284
2	270	280	290	300	315	335	365	385	405
3	400	425	455	495	565	675	765	845	895
4	840	855	925	1060	1270	1440	1595	1725	1850
6	2240	2270	2340	2680	3315	3775	4205	4530	4700
8	3840	3925	4475	5300	5935	6350	6880	7225	7825
10	4850	5350	5675	7700	8100	8700	10050	11200	12200
12	9540	9590	10385	11185	11985	13585	16130	18680	19700

UB-150/300 Regular port – Nm

Size DN	Maximum Differential Pressure - bar								
	0	6.9	13.8	20.7	27.6	34.5	41.4	48.3	51
15	5	5	5	5	5	5	5	6	6
20	8	8	8	8	9	9	9	10	10
25	11	11	12	12	12	12	13	14	14
40	21	22	23	24	25	27	29	31	32
50	31	32	33	34	36	38	41	44	46
80	45	48	51	56	64	76	86	95	101
100	95	97	105	120	144	163	180	195	209
150	253	257	264	303	375	427	475	512	531
200	434	444	506	599	671	718	777	816	884
250	548	605	641	870	915	983	1136	1266	1379
300	1078	1084	1174	1264	1354	1535	1823	2111	2226

Note:
Values in Nm have been calculated by multiplying lb•in values by 0.113.

How to order Memoryseal® UB-150/300 resilient-seated ball valve

Type of connection	Size of connection			Model number/ Class		Port	Type	Body			Trim (ball, stem)		Seat	Standard compliance		Actuation
A	B				C	D	E	F				G	H	I		J
F	0	8	—	—	0	0	3	0	2	—	S	S	G	5	—	B

Example: NPS 2 (DN 50) flanged, unibody, 150 Class, regular port valve in carbon steel with stainless steel trim and glass-reinforced PTFE seat, and with graphite and PTFE packing and bare stem.

A TYPE OF CONNECTION

F	Flanged B16.5 (B16.47 series A)

B SIZE OF CONNECTION

Sizes shown in NPS (DN)

03	½ (15)	**07**	1½ (40)	**12**	4 (100)	**16**	10 (250)
04	¾ (20)	**08**	2 (50)	**14**	6 (150)	**18**	12 (300)
05	1 (25)	**10**	3 (80)	**15**	8 (200)		

C MODEL NUMBER / CLASS(1)

0	150	**1**	300

D PORT

0	Regular port

E TYPE

3	Unibody

F BODY MATERIAL

02	WCB	**13**	CF8M	**25**	LCB
03	WC1	**14**	CF3M	**26**	LCB
04	C5	**19**	Monel (M35-1)	**31**	LCC
05	WC6	**20**	Inconel 625	**32**	4A, CD3MN
06	WC9	**21**	Hastelloy C	**35**	CK3MCuN
09	C12	**22**	Titanium Gr. 5	**38**	LC1
12	CF3	**23**	Alloy 20 (CN7M)	**39**	LC2

G TRIM MATERIAL (ball/stem)

Code	Ball	Stem	Code	Ball	Stem
AY	Alloy 20	Alloy 20	**SN**	316 Cr. plated	Nitronic 50
HC	Hastelloy C	Hastelloy C	**SP**	316 Cr. plated	316
PR	316 Cr. plated	630	**SR**	316	630
SB	304	304	**SS**	316	316

H SEAT MATERIAL

E	MPTFE	**G**	Glass-reinforced PTFE	**T**	PTFE

I STANDARD COMPLIANCE

Standard configurations for unibody (UB-150/300) ball valves are available in the following configuration options:	UB-150/300
	5
API 608(2)	✔
API 641/ISO 15848-1, dual qualified 100 ppm Low-E(3)	✔
API 607, Fire safe(4)	✔
NACE, exposed gland bolting(5)	✔

For all other resilient-seated ball valves, please use the following options(6)

A	PTFE/graphite packing, fire-tested to API 607, no special requirements
C	Chlorine
G	Oxygen, with and without extended bonnet
J	Vacuum

J ACTUATION(2)

A	Air or Hydraulic actuator	**H**	Oval or slide handle(7)
B	Bare stem	**M**	Motor actuator
G	Gear actuator	**W**	Lever

(1) Actual valve pressure temperature ratings depend on choice of materials, consult catalogue/data sheet for details.

(2) Not all actuation options are available in an API 608 compliant configuration (Refer to page 12 for Standard actuation compliant to API 608). In the event the customer prefers a non-compliant actuation option, they should select A or Z (position "I" in figure number).

(3) Refer to fugitive emissions product update document (PU-API641) for qualified size/class range.

(4) Fire-tested to API 607 Rev 5 or later. Fire safe applicable to B16.34 ferritic and austenitic materials. e.g. position "F" body materials: 02, 03, 04, 05, 06, 09, 11, 12, 13, 14, 15, 18, 24, 25, 26, 27, 28, 29, 31, 34, 36, 38, 39, 47. Consult Velan for other materials.

(5) Velan valves for NACE service (as indicated by figure number and/or description) comply with the metallurgical requirements of the current NACE MR0103/ISO 17495 and NACE MR0175/ISO 15156 standards. This compliance is applicable to internal components in contact with the process fluid, as well as Body (body/bonnet and body/body-end) bolting.

NOTE: Material selection is dependent on the actual environment and it is therefore the equipment end user's responsibility to ensure that the selected materials are suitable for the intended service. In this respect, we also refer to NACE MR0103/ISO 17495 for definitions of exposed bolting (bolting that is exposed directly to the sour environment or otherwise denied direct atmospheric exposure) and non-exposed bolting (bolting that is not exposed directly to the sour environment and is directly exposed to the atmosphere at all times). Please contact Velan for any questions regarding the application of our products for NACE service.

(6) Consult Velan for ordering instructions.

(7 All slide handles convert to a T-handle by removing the screw holding the pipe while using the second hole to attach the pipe to the pipe holder.

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