API 6A Side-entry trunnion ball valves

Data sheet

Velan ABV has been an API 6A licensee since 2001, implementing a quality management system in compliance with API Q1 and offers a complete range of valves that comply with the latest edition of API requirements.

Velan ABV's API 6A Side-entry trunnion ball valves are designed and manufactured for wellhead and Christmas tree equipment that operate in aggressive environments with various fluids and gases such as a petroleum mixture of oil and sand and extreme sour gas service.

Our forged valves are configured in two or three bolted pieces to ensure the highest level of reliability in varying combinations of high-temperature and high-pressure applications. Forged materials are used to provide the rigidity and strength required in critical high-pressure operations and to meet customer project specifications.

Specifications

Sizes	NPS 1 13/16–21¼ (DN 46–540)
Pressure rating	API 5000 to API 20000
Temperature range	-150 to 428°F (-101 to 220°C)
Face-to-face	As per API 6A standard
End connections	Flanged 6B, 6BX, or Hub connection

Features

- Full or reduce bore
- Double block & bleed design
- Design for pressure-containing equipment in accordance with API 6X
- Fire safe design and fire tested as per API 6FA/607/ ISO 10497
- Materials for pressure-containing and pressure-controlling components in accordance with API 6A material classes
- Different product specification levels available (PSL 1, 2, 3, 3G, and 4)
- Different performance requirement levels available (PR 1, PR 2)
- Compliance with NACE MR0175 for H2S environments
- SIL 3 certification by independent third party as per IEC 61508
- Fugitive emission stem seal packing certified as per ISO 15848 (available on request)
- Manually operated gear or coupled with actuator
- Design validation as per PR2F (available on request)

Applications

- Boarding shutdown
- Surface safety valve (SSV) systems
- Riser
- Blowdown
- Shutdown
- High-integrity pressure protection systems (HIPPS)
- Wellhead production
- Water/gas injection process

Design features

① Trunnion mounted design

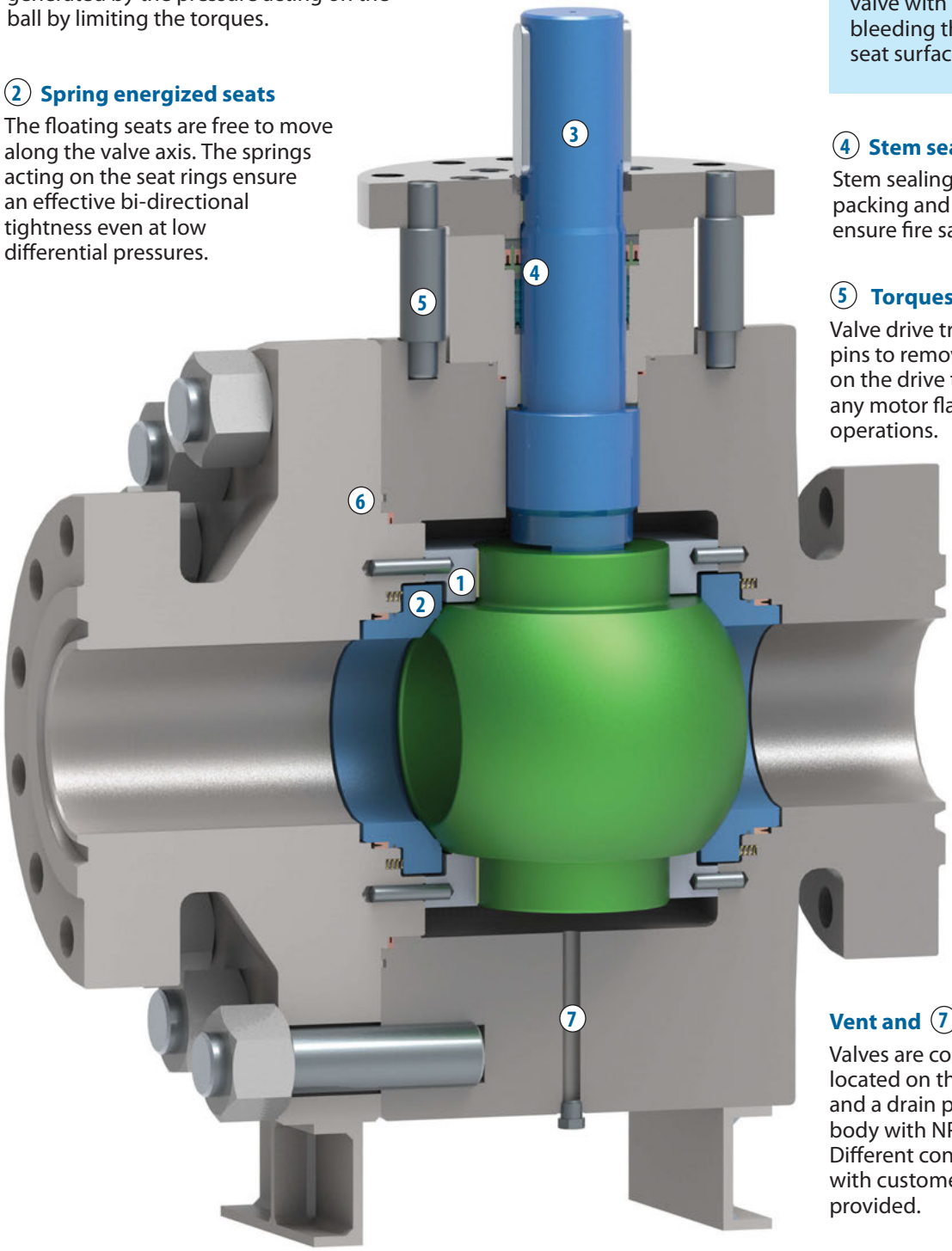
Two available configurations to fix the ball's rotational axis: a double trunnion for small sizes and trunnion plates for bigger sizes. Both are available with bearings to absorb the side load effect generated by the pressure acting on the ball by limiting the torques.

② Spring energized seats

The floating seats are free to move along the valve axis. The springs acting on the seat rings ensure an effective bi-directional tightness even at low differential pressures.

③ Anti-blowout stem

The stem is designed with an intrinsic retention feature to avoid stem ejection caused by internal pressure.



Double block & bleed

Trunnion ball valves have a double block and bleed design feature. With the ball in the closed position, the two seats provide a seal against pressure from both ends of the valve with a means of venting/ bleeding the cavity between the seat surfaces.

④ Stem sealing packing

Stem sealing is composed of lip seals packing and one graphite gasket to ensure fire safe protection.

⑤ Torques pins

Valve drive train design includes torque pins to remove any shear and twisting on the drive train bolting and to avoid any motor flange rotation during fast operations.

⑥ Body sealing

The double sealing action of the lip seal rings and graphite gaskets in all static joints of the body components ensures zero leakage.

Vent and ⑦ drain

Valves are completed with a vent valve located on the upper part of the body and a drain plug in the lower part of the body with NPT standard connection. Different connections, in accordance with customer specifications, can be provided.

Available seat designs

Self-relieving seats

Both seats are designed with the Single Piston Effect (SPE), capable of automatically releasing pressure from the body cavity by venting into the main line. This configuration is suitable for the cavity relief feature.

Double piston seats

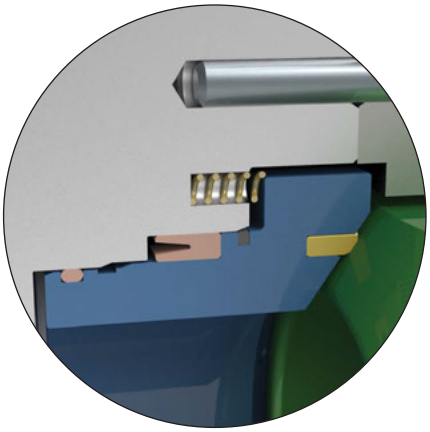
Both seats are designed to ensure Double Isolation and Bleed (DIB), allowing both the pressure in the line and in the body cavity to energize the seat by pressing them towards the ball. This provides a double barrier in both directions.

This configuration is suitable for the DIB-1 feature.

Combination seats

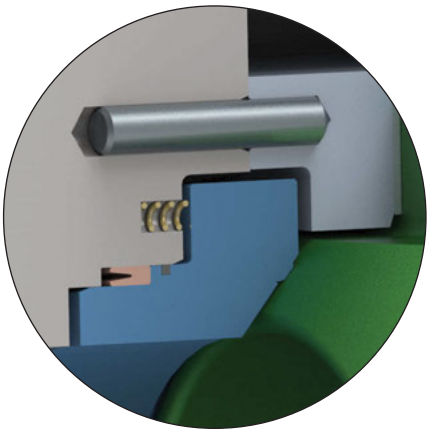
Double positive isolation in one direction is possible with this combination design of a self-relieving seat on the upstream side and a double sealing seat on the downstream side. This design also offers the capability of releasing excess body pressure via the upstream seat. This configuration is suitable for the DIB-2 feature.

Available seat contact types



Soft-seated

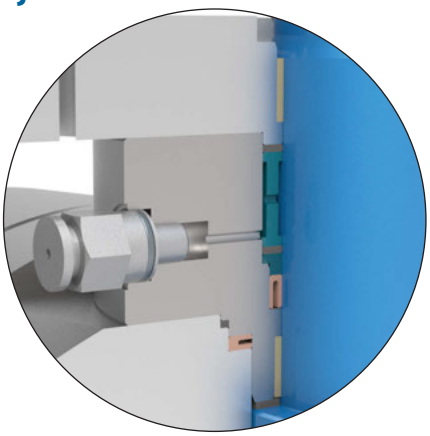
For general service, the seat is designed to hold an insert in resilient material for a soft sealing action on the ball. Different materials are available based on the media and the pressure/temperature range required. Zero leakage always ensured.



Metal-seated

For high temperatures, abrasive services or highly corrosive fluids, the sealing surfaces of the ball and seats are coated with hard materials such as Tungsten carbide, Chrome Carbide or CoCr Alloy. This provides a sealing action by metal-to-metal contact between the ball and the seat rings. Leakage is in compliance with API 6A requirements.

Available emergency sealant injection



Stem sealant injection

Valves NPS 4 and larger can be equipped, on request, with an emergency stem sealant injection fitting located between the lip seal packing and the graphite gasket.

Seat sealant injection

Valves from NPS 6 and above can be manufactured with two emergency sealant injections in the seat's sealing area. As standard for isolation purposes, each injection point incorporates a primary and a secondary check valve.

During maintenance, the seat injection ports can also be used for flushing clean deposited impurities from the seating surfaces.

API 6A design considerations

API6A monogrammed products

Velan has an API Q1 compliant quality management system for the manufacturing of API6A products, which are monogrammed only if all the API-specified requirements of the applicable API specifications are met.

Special customer requirements for a dedicated project, which could be in contrast with API specifications, can be met with the production of non-monogrammed products.

Velan identification Numbers

- API 6D-0289
- API 6A-0568
- API 6DSS-0048

API Standard 6X

Following the latest API 6A edition, the design calculations for pressure-containing and pressure-controlling components of all our valves follow the design methodology of API 6X.

Temperature ratings

Velan ABV valves are fully customizable in order to satisfy any design temperatures required by customers. However, our way of manufacturing products focuses on supporting customers in the choice of one or more temperature classes identified by the standard.

Temperature classification	Operating range °F/°C	
	min.	max.
K	-75 -60	180 82
L	-50 -46	180 82
N	-50 -46	140 60
P	-20 -29	180 82
S	0 -18	140 60
T	0 -18	180 82
U	0 -18	250 121
V	35 2	250 121
X	0 -18	350 180

Our extensive experience in manufacturing valves for wellhead and Christmas tree equipment, allows us to satisfy all combinations of temperature classes, including special Class X, that makes the product suitable for a maximum temperature range of 180°F (82°C).

Product specification levels (PSL)

Velan covers all 4 levels of PSL defined in the API specification. Every level provides the quality control, material and testing requirements.

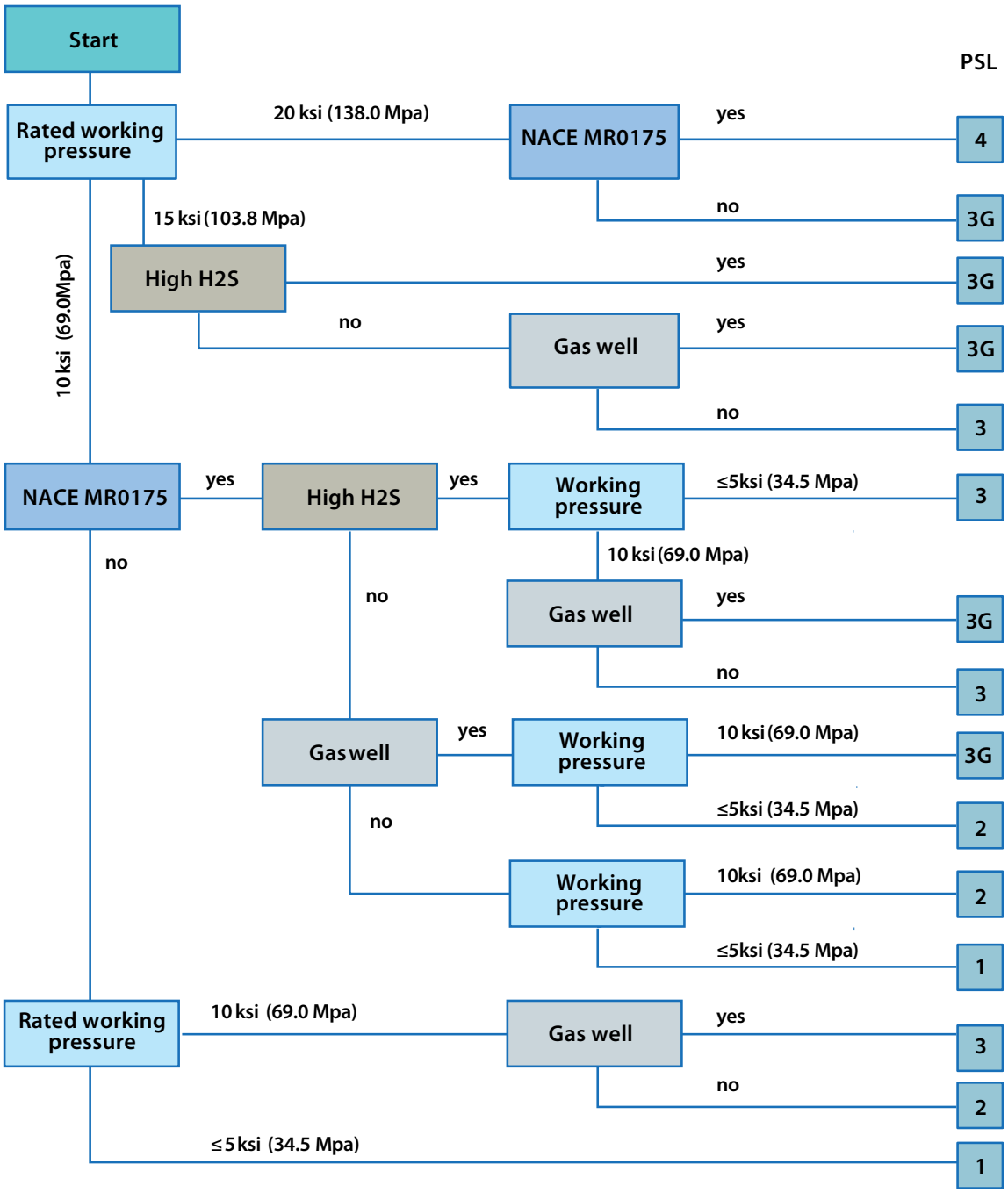
- **PSL 1** represents the set of basic requirements for quality, material and testing.
- **PSL 2** contains all the quality and testing requirements of PSL1 but with additional requirements such as Charpy testing, volumetric inspection of welds, and magnetic particle inspection of accessible well wetted surfaces.
- **PSL 3** contains all the quality and testing requirements of PSL2 but with additional requirements such as volumetric inspection of all material in body, bonnets, flanges, stems and extended hydrostatic test times.
- **PSL 3G** is a specific testing requirement level that includes all the requirements of PSL 3 plus an additional gas-testing requirement for assembled equipment.
- **PSL 4** contains the highest level of quality and testing requirements for any product within this specification. PSL 4 equipment meets all the requirements of PSL 3 and would apply to high-pressure equipment used in sour service.

The minimum level of PSL depends on both the selected material class and relative pressure class.

Material class	API 5000	API 10000	API 15000
AA, BB, CC	PSL 1	PSL 2	PSL 2
DD, EE, FF	PSL 1	PSL 2	PSL 3
HH	PSL 3	PSL 3	PSL 3

PSL flow chart selection guide

For all services, especially those where sour gas is present, Velan suggests following the flow chart defined by the API6A standard, in order to identify the right product specification level.



For special services such as Surface safety (SSV), Blowdown (BDV) or Shutdown systems, Velan suggests a minimum level of PSL 2, while for Boarding shutdown (BSDV) and High-integrity pressure protection system (HIPPS) the minimum level should be increased to PSL 3.

Valve design configuration

Summary of available features

Features	Side-entry design
Fire safe design as per API 6FA - API 607 - BS 6755 part 2	Included
Face-to-face as per API6A	Included
Flange dimensions as per API6A	Included
Hub connections	On request
Trunnion mounted with two independent floating seats	Included
Double block and bleed design	Included
Independent ball and stem	Included
Anti-blowout stem	Included
Antistatic	Included
Spring energized seats	Included
Self-relieving seats (SPE)	Included
Both seats with Double Piston Effect (DPE) for DIB-1 Test	On request
Combination (SPE / DPE) seats for DIB-2 Test	On request
Soft seats	Included
Metal-to-metal seats	On request
Statics seals: Lip seal and one graphite gasket	Included
Stem seals: Lip seal packing and one graphite gasket	Included
Low fugitive emission stem packing	On request
Overlay on all dynamic sealing areas	On request
Overlay on all wetted parts	On request
Drain plug	Included
Vent valve (on NPS 6 and larger)	Included
Emergency sealant injection on stem	On request
Emergency sealant injection on seats (on NPS 6 and larger)	On request
Lifting lugs (over 250 kg)	Included
Supporting feet (on NPS 6 and larger)	On request
Manually operated by gear or lever	On request
Locking device	On request
Bare stem	On request
Operated by quarter-turn actuator	On request

Actuation

Manually operated valves are provided either with a lockable wrench or gear operator.

The use of levers is limited to small valves for which the required force remains below the maximum allowable value of 360N, as per API standard.

Actuated valves can be supplied with the following quarter-turn actuators:

- Electric
- Pneumatic
- Hydraulic

Velan ABV cable drive pneumatic/ hydraulic actuator

Velan ABV continuously seeks new technical solutions to meet our customer's needs by designing and manufacturing actuators that operate quarter-turn valves for extreme services.

Our innovative, patent-protected cable drive actuator maintains the robustness and the reliability of traditional scotch yoke actuators, while offering a revolutionary transmission system. This smart and simplified design has less components, less friction and therefore, less maintenance, while cutting costs and improving performance.

Talk to us to see why our latest developments in quarter-turn valves and actuation set us apart.

Inspection and testing

100% Velan valves are inspected and tested before shipment.

NDT certified personnel

Internal personnel, qualified as per ASNT SNT-TC-1A or ISO 9712, perform nondestructive testing (NDT) on valve components in compliance with all the major international standards.

- Visual and dimensional inspections
- Positive material identification
- Penetrant testing
- Magnetic particle testing
- Ultrasonic testing
- Leak testing

Tested as per API 6A

All manufactured valves are tested following all the API6A requirements in accordance with the table below.

Test	PSL 1	PSL 2	PSL 3	PSL 3G	PSL 4
Hydrostatic shell	✔	✔	✔	✔	✔
Hydrostatic seat	✔	✔	✔	✔	✔
Hydrostatic function		✔	✔	✔	✔
Gas body				✔	✔
Gas seat				✔	✔
Drift	✔	✔	✔	✔	✔

Velan follows the tests acceptance criteria defined in API specification. For both hydrostatic and gas tests, the valves shall not show any release of test fluid during the pressure hold period. Visible leakage is observed directly by video equipment.

Performance Requirement (PR)

During production, the API specification requires to test valve performances in accordance with two levels: PR 1 or PR 2. Velan provides valves in accordance with both.

Performance requirement level	Operating cycles
PR 1	3 cycles
PR 2	200 cycles

PR 2F design validation

Velan's new designs are certified following the PR 2F design validation method described in Annex F of the standard, introduced in the API6A 2018 edition. Following the specification, Velan ensures that all previous design validation in accordance with PR 2 requirements, are still in conformance with the requirements of PR 2F.

This specification provides design validation procedures for qualification of equipment. The design validation procedures are applied to new product designs including design changes. All substantive changes that affect the performance of the product will be considered as a new design that requires the design validation.

Design validation is performed on a prototype or production model of equipment made in accordance with this specification to confirm that the performance requirements specified for pressure, temperature, load, mechanical cycles and standard test fluids are met in the design of product.

The tested prototype is disassembled and inspected. The final examination includes a written statement that neither the final product nor part design contains defects to the extent that any performance requirement is not met.

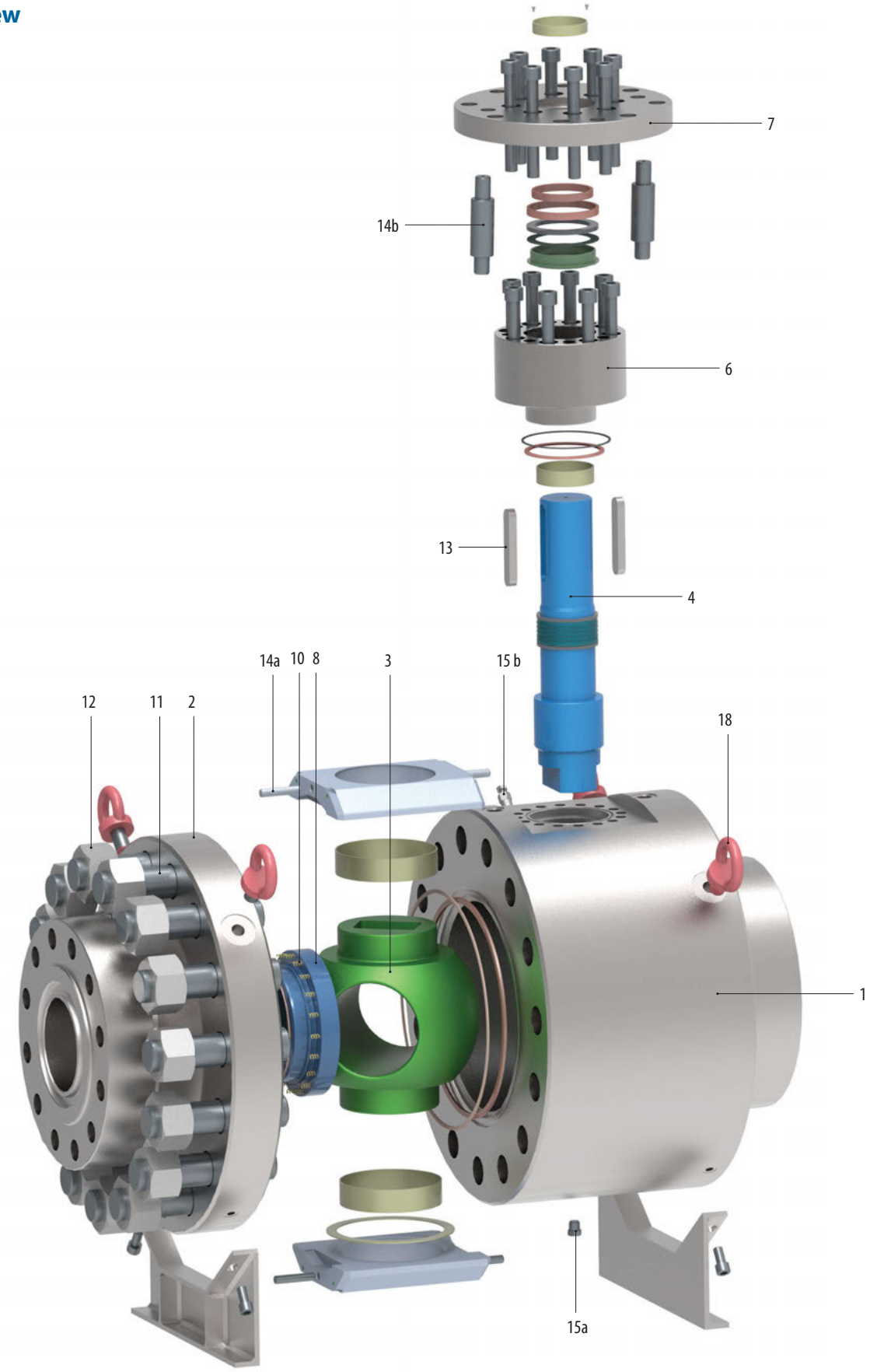
Scaling may be used to validate other similar products if they are similar in accordance with the configuration and the design stress levels. The same PR 2F validation design qualifies products of the same family having equal or lower-pressure ratings, and products that have one nominal size larger and one nominal size smaller than the tested size.

Drift testing

Velan follows the API specification for conducting a drift test. for all the full bore valves and PSL levels, a drift mandrel conforming to the specification is passed completely through the valve bore, to avoid any type of occlusions into the valve, ensuring reliability and safety of the system.

Applicable international standards
API6A
API6X
ASME B16.34
ASME VIII Div. I & II
API 6FA/607/ISO 10497
NACE MR0 175
EN 10204
ATEX DIR 2014-34-EU
PED DIR 2014-68-EU
ISO 15848
IEC61508

Exploded view



Standard materials

	PART	Standard service	Offshore service	Sour service
1	Body	ASTM A694 F65	ASTM A182 F51	ASTM A694 F65 + CRA overlay
2	Closures	ASTM A694 F65	ASTM A182 F51	ASTM A694 F65 + CRA overlay
3	Ball	ASTM A182 F51	ASTM A182 F51	Inconel 625
4	Stem	ASTM A564 630 Cond. H1150D	ASTM A182 F55	Inconel 718
5	Trunnion plate	ASTM A694 F65+ENP	ASTM A182 F51	Inconel 625
6	Gland flange	ASTM A694 F65	ASTM A182 F51	Inconel 625
7	Adapter flange	ASTM A694 F65	ASTM A182 F51	Inconel 625
8	Seat ring	ASTM A182 F51	ASTM A182 F51	Inconel 625
9	Seat insert	PEEK	PEEK	PEEK
10	Seat spring	Inconel X750	Inconel X750	Inconel 718
11	Body stud	ASTM A320 L7M	ASTM A320 L7M (Xylan 1070)	ASTM A320 L7M (Xylan 1070)
12	Body nuts	ASTM A194 Gr.7M	ASTM A194 Gr.7M (Xylan 1070)	ASTM A194 Gr.7M (Xylan 1070)
13	Stem key	Alloy steel	Alloy steel	Alloy steel
14a/14b	Body / trunnion pins	ASTM A564 630 Cond. H1150D	UNS 31803	Inconel 718
15a/15b	Drain / bleeder	AISI 316	Inconel 625	Inconel 625
16	Stem sealing injector	AISI 316	Inconel 625	Inconel 625
17	Seat sealing injector	AISI 316	Inconel 625	Inconel 625
18	Eye bolt	AISI 1012	AISI 1012+ENP	AISI 1012+ENP
	Sealing	Lip seals	Lip seals	Lip seals
	Gaskets	Graphite	Graphite	Graphite
	Bushings	CS+PTFE	Inconel 625+PTFE	Inconel 625+PTFE

The API6A standard defines different classes of materials for the pressure containing and pressure controlling components in relation with the type of sour service of the product.

Velan ABV recommends to always specify the material class in order to provide the most appropriate material of each component of the class.

For all valves with a pressure class up to API 10000, Velan selects materials for pressure-containing parts with a minimum yield stress of 60K, and 75K for pressure classes API 15000 and above.

Material Class	Minimum material requirements	
	Pressure-containing parts	Pressure-controlling parts, stems, and mandrel hangers
AA - General service	Carbon or low-alloy steel, or CRA	Carbon or low-alloy steel, or CRA
BB - General service	Carbon or low-alloy steel, or CRA	Stainless steel or CRA
CC - General service	Stainless steel or CRA	Stainless steel or CRA
DD - Sour service	Carbon or low-alloy steel, or CRA	Carbon or low-alloy steel, or CRA
EE - Sour service	Carbon or low-alloy steel, or CRA	Stainless steel or CRA
FF - Sour service	Stainless steel or CRA	Stainless steel or CRA
HH - Sour service	CRA	CRA

Materials for sour service

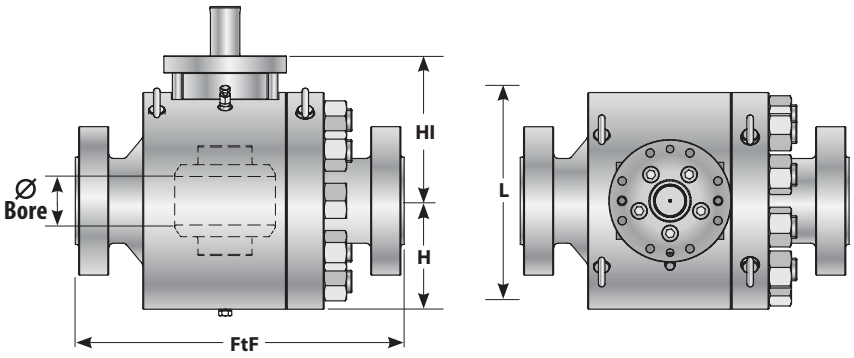
All the DD/EE/FF/HH material classes, including bolting, studs and nuts are selected with anti-corrosion properties in accordance with NACE MR0175/ ISO 15156.

Velan also identifies ZZ Material Class for specific sour service applications in which the use of materials in fluid conditions exceeding the limits defined in NACE MR0175/ISO 15156.

In addition, when it is required to improve the corrosion resistance of the base material and/or mechanical performance of a component, a weld overlay of corrosion resistance alloy (CRA) material (stainless steel or Inconel 635) can be placed on the sealing areas only for all the wetted parts.

The parts undergo a pre-machining process, followed by the welding, and final machining. The welding is carried out by qualified welders and it is controlled by NDE personnel. At the end of the process, Velan ensures as a standard, a minimum of 3 mm of CRA material over the base material.

Dimensions and weight: Full bore



Size NPS DN	API 5000 Ø Bore	FtF	L	Hi	H	Weight lb / kg
2 1/16	2.05	14.61	8.58	6.22	4.72	176
52	52	371	218	158	120	80
2 9/16	2.56	18.62	9.57	6.85	5.24	262
65	65	473	243	174	133	119
3 1/8	3.11	18.62	10.63	7.56	6.06	331
79	79	473	270	192	154	150
4 1/16	4.06	21.61	13.7	8.86	7.72	584
103	103	549	348	225	196	265
5 1/8	5.12	22.64	18.94	10.47	9.8	935
130	130	575	481	266	249	424
7 1/16	7.05	32.05	20.79	13.5	12.6	1852
179	179	814	528	343	320	840
9	9.02	40.16	26.77	16.61	17.32	3638
229	229	1020	680	422	440	1650

Size NPS DN	API 10000 Ø Bore	FtF	L	Hi	H	Weight lb / kg
1 13/16	1.81	18.27	11.02	7.17	6.3	309
46	46	464	280	182	160	140
2 1/16	2.05	20.51	11.02	7.17	6.3	335
52	52	521	280	182	160	152
2 9/16	2.56	22.24	11.97	8.43	6.89	485
65	65	565	304	214	175	220
3 1/16	3.07	24.37	14.37	9.09	8.11	789
78	78	619	365	231	206	358
4 1/16	4.06	26.38	18.11	12.2	11.81	1301
103	103	670	460	310	300	590
5 1/8	5.12	29.02	24.02	15.75	14.96	2425
130	130	737	610	400	380	1100
7 1/16	7.05	35	29.92	20.94	19.69	4806
179	179	889	760	532	500	2180

Notes:
For larger sizes and for API 15000 dimensions and weight, please contact our sales department
Dimensions shown in inches/mm.

How to order API 6A Side-entry trunnion ball valves

Type	Size	Pressure rating	Connection	Main materials	Standard execution	Sealing material	Operator
A	B	C	D	E	F	G	H
B T 2	Z 8	P 7	H H	1 4 2	K K T T M M	F	S G B

Example:

- **A** Forged trunnion ball valve, two-piece bolted body
- **B** NPS 7 1⁄16 (DN 179)
- **C** API Class 1000
- **D** Hub end connection
- **E** Body and closures: ASTM A182 F55, Ball: ASTM A182 F55, Stem: ASTM A182 F55, Bolting: ASTM A320 L7M-ASTM A194 Gr. 7M (Xylan coated 1070)
- **F** Lip seals, soft self-relieving seats with emergency sealant injection on seats and stem.
- **G** Lip seals and seat inserts: PEEK
- **H** Standard gear box with padlocking

A TYPE

BT2	Forged trunnion ball valve, two-piece bolted body

B SIZE shown in NPS/inch (DN/mm)

Full bore

Z1	1 13⁄16	(46)	**Z4**	3 1⁄16	(78)	**Z7**	5 1⁄8	(130)
Z2	2 1⁄16	(52)	**Z5**	3 1⁄8	(79)	**Z8**	7 1⁄16	(179)
Z3	2 9⁄16	(65)	**Z6**	4 1⁄16	(103)	**Z9**	9	(229)

C PRESSURE RATING (API CLASS)

P5	5000	**P7**	100000	**P8**	15000

D END CONNECTION

HH	Hub (HUB)	**1E**	Compact flange (CF)	**XX**	Ring-type joint flanged (RTJ) API 6A-6BX

E MAIN MATERIALS

Code	Body & closures	Ball	Stem	Bolting
0LX	ASTM A694 F65	ASTM A182 F51	ASTM A564 630 Cond. H1150D	ASTM A320 L7M - ASTM A194 Gr. 7M
837	ASTM A694 F65	ASTM A182 F51	UNS N07718 API 6A	ASTM A320 L7M - ASTM A194 Gr. 7M
0H1	ASTM A182 F51	ASTM A182 F51	ASTM A182 F51	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
0ZM	ASTM A182 F51	ASTM A182 F51	ASTM B637 N07718	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
142	ASTM A182 F55	ASTM A182 F55	ASTM A182 F55	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
122	ASTM A182 F55	ASTM A182 F55	UNS N07718 API 6A	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
9A0	ASTM A694 F65+CRA	ASTM A182 F51	ASTM A182 F55	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
Z78	ASTM A694 F65+CRA	ASTM A182 F51	ASTM B637 N07718	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
X20	ASTM A694 F65+CRA	ASTM B564 N06625	UNS N07718 API 6A	ASTM A320 L7M - ASTM A194 Gr. 7M
105	UNS N07718 API 6A	UNS N07718 API 6A	UNS N07718 API 6A	ASTM A320 L7M - ASTM A194 Gr. 7M (Xylan coated 1070)
14F	AISI 4140	ASTM A564 630 Cond. H1150D	ASTM A564 630 Cond. H1150D	ASTM A320 L7M - ASTM A194 Gr. 7M

Note: For additional features or different materials combination please contact our sales department

F STANDARD EXECUTION

Code	Primary seals	Emergency sealant injection - seats	Emergency sealant injection - stem	Seat contact type	Seat design
KKTTMM	Lip seal	Yes	Yes	Soft seat	Self-relieving
A5DDTT	Lip seal	Yes	Yes	Metal seat	Self-relieving
APDDTT	Lip seal	Yes	Yes	Soft seat	Double piston
AFDDTT	Lip seal	Yes	Yes	Soft seat	Combination
A5ACTT	Lip seal	Yes	Yes	Metal seat	Double piston
ARLLTT	Lip seal	Yes	Yes	Metal seat	Combination
KK00MM	Lip seal	No	No	Soft seat	Self-relieving
KKLLMM	Lip seal	No	No	Metal seat	Self-relieving
APDD00	Lip seal	No	No	Soft seat	Double piston
AFDD00	Lip seal	No	No	Soft seat	Combination
AFDDNN	Lip seal	No	No	Metal seat	Combination
APDDNN	Lip seal	No	No	Metal seat	Double piston

G SEALING MATERIALS

Code	Seals	Seat inserts
F	Lip seal	PEEK
W	Lip seal	Metal
K	Lip seal	PCTFE

H OPERATOR

Code	Description
0FM	Bare system
FML	Wrench flange with padlocking
FLL	Wrench flange
SGL	Standard gear box
SGB	Standard gear box with padlocking

For more specific product information contact our sales department:

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