

TBV Series 3300 Secured, Metal-Seated Ball Valves

Metal-seated ball valves for oil sands, metallurgical and oil refining, and chemical process applications. Also suited for abrasive applications such as catalysts, fines, and slurries.

TECHNOLOGY



Table of Contents

TBV SERIES 3300 SECURED, METAL-SEATED BALL VALVES

Introduction	2
Product Applications	3
Key Features and Benefits of the TBV Severe Service Design	4
Secured Seat Design	5
Product Dimensions	9
How to Order	11
Services for Valves and Actuation	12
Trademark Information	13

TBV Series 3300 Secured, Metal-Seated Ball Valves



Millbury, Mass., USA

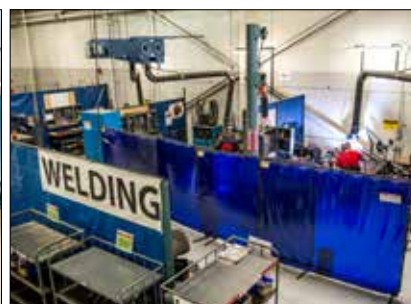
Cameron is a leading provider of valves, valve automation, and measurement systems to the oil and gas industry. Our products are used primarily to control, direct, and measure the flow of oil and gas as it is moved from individual wellheads through flowlines, gathering lines, and transmission systems to refineries, petrochemical plants, and industrial centers for processing.

We provide critical service valves for refinery, chemical, and petrochemical processing businesses, and for associated storage terminal applications, particularly through our ORBIT® and GENERAL VALVE® product lines. These brands are complemented by our WKM® and TBV™ valve products, and considerably expand the scope of our product offerings.

TBV valve products are manufactured and assembled at Cameron's facility in Millbury, Mass. This facility offers 68,600 sq ft of space, of which, 52,160 sq ft are dedicated to manufacturing, assembling, testing, shipping, and quality assurance. The manufacturing space allows us to expand our product offerings and size range. Our TBV valves are competitive in the LNG, mining, and petrochemical markets, with the added ability to offer larger size ranges within this product line.

Facility Features

- Clean room for oxygen, chlorine, and phosgene assembly and testing
- Paint booth
- Dedicated cryogenic testing area
- State-of-the-art CNC machining
- In-house NDE capabilities – PMI, ferrite testing, fugitive emissions testing, high-pressure gas testing, and LP examination
- Welding performed to provide a wide variety of configurations
- ASME-qualified welders



PRODUCT APPLICATIONS

Mining Autoclave Applications

- Oxygen Injection
- Autoclave Vent
- Autoclave Vent Isolation
- Autoclave Slurry (discharge)
- Autoclave Raffinate Feed
- Pump Isolation
- Inlet Valves
- Acid Injection
- Steam System

Refining/Petrochemical

- Fly Ash
- Oil Sands
- Coal Slurries
- Catalyst Slurries
- Hydrocarbons

Pulp and Paper

- White and Black Liquid Slurries

Other Applications

- Polycarbonate Flake
- Ammonium Chloride
- Molten Materials
- Methyl Chloride



TBV Series 3300 14" Valve



KEY FEATURES AND BENEFITS OF THE TBV SEVERE SERVICE DESIGN

All of the individual design elements incorporated into Cameron's TBV Series 3300 valves have been field proven in the precious metals (mining) industry – one of the most demanding applications for any valve.

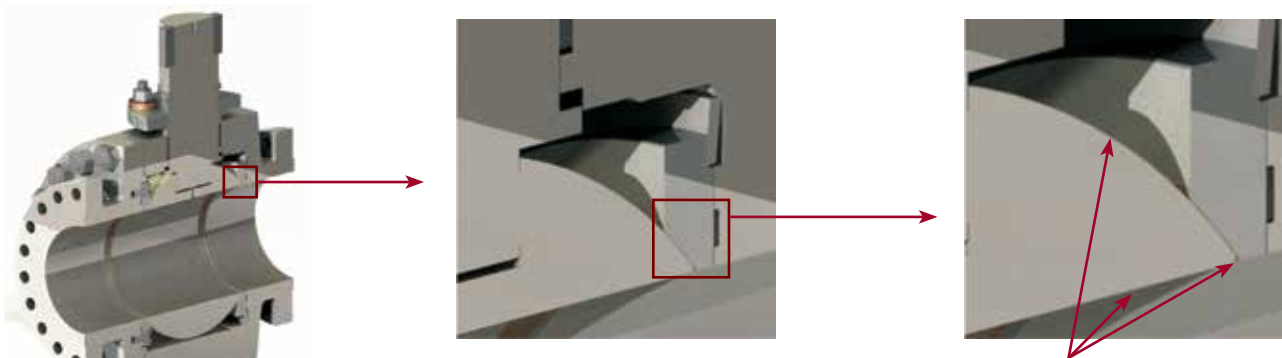
The valve is preferable by design, overcoming issues with historically unsuccessful design elements by incorporating field proven evolutionary designs and higher quality components.



Ball and Seat Coatings

TBV Series 3300 valves can be supplied with a range of ball and seat coatings. However, our recommended coating is a vacuum plasma-sprayed (VPS) titanium dioxide coating for the titanium ball and seats. Tungsten carbide used for carbon and stainless steel valves.

The VPS process deposits an extremely hard, wear-resistant coating to the ball and seats, which, with the addition of the inert bond layer, has a very high adhesion strength to the substrate metal. For a number of years, this coating system has been used successfully in leaching out precious metals. This coating system, in addition to others, have proven to work well for heavy oils, gas entrained particles, and chemical slurries and sludges.



Titanium Dioxide-Coated Surfaces on the Ball and Seats

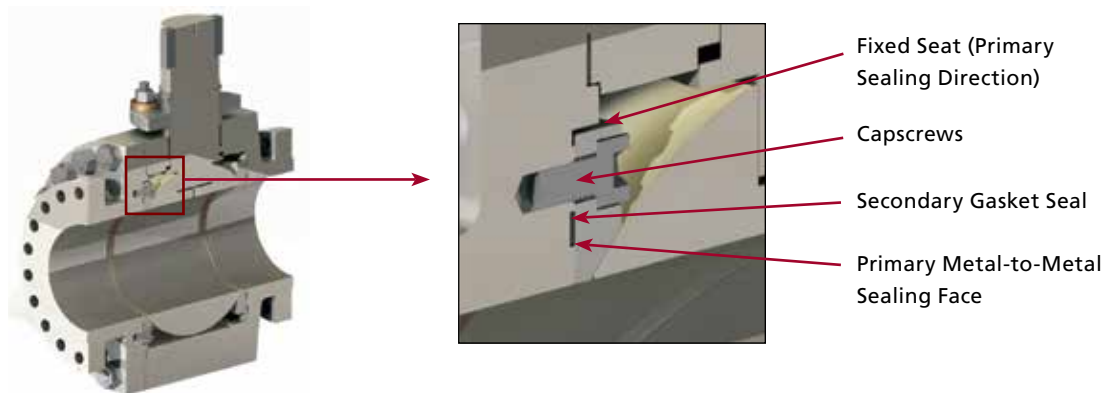
SECURED SEAT DESIGN

Fixed Seat/Floating Seat Arrangement

In the past, many severe service valves have failed due to poor seat sealing designs, which allow leakage to occur around the back face of the seats. This leakage often results in very heavy erosion damage to the valve internals, which can be expensive and time consuming to repair.

Our TBV Series 3300 valve's design reduces the potential for a behind-seat leak path in the primary sealing direction by utilizing a fixed-seat sealing arrangement. The seat back face and mating face on the body are lapped surfaces that provide a metal-to-metal seal, preventing leakage around the back of the seat. In addition, a gasket also is in place on the seat back face to help ensure a secondary seal.

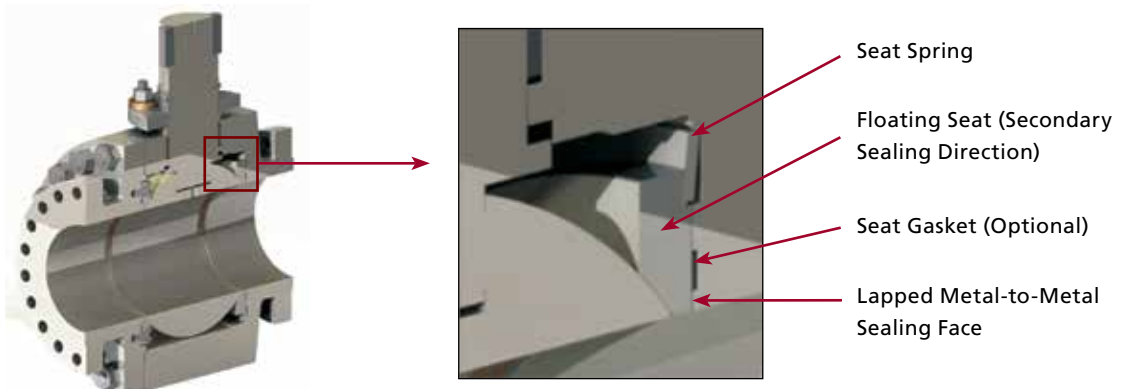
The seat is held in place by a number of socket head capscrews that allow for easy removal and reassembly.



The seat for the secondary sealing direction is a spring-loaded floating seat arrangement. A disc spring applies a load to the seat to keep the seat permanently in contact with the ball. When the valve is required to seal in the secondary sealing direction, the seat spring will compress, allowing the back face of the seat to make a seal with the valve body. This seat sealing area is a lapped metal-to-metal sealing surface.

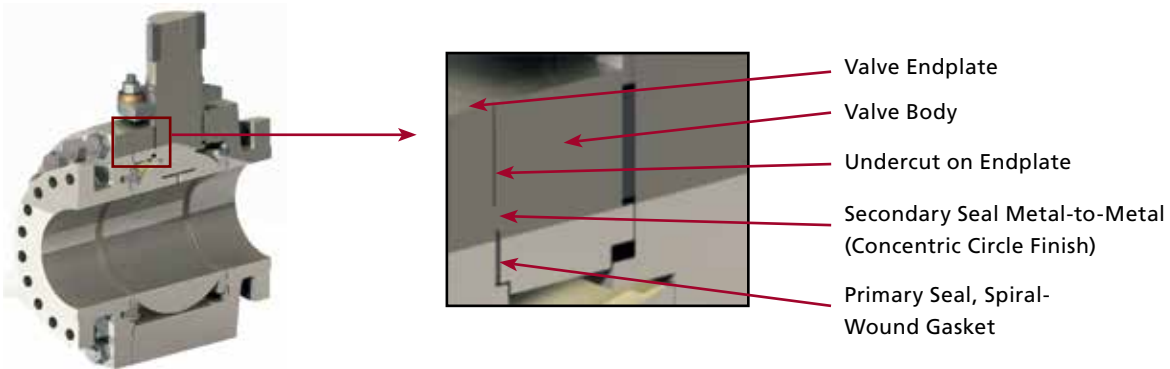
When the valve is operating at high temperatures, thermal expansion can cause the ball and seats to expand at a slightly different rate than the valve body. Therefore, a small gap must be left between the back of the seat and the valve body to prevent the valve from seizing.

In slurry applications, this small gap between the seat and body will entrap particulate, which can prevent the valve from sealing in the secondary direction and may lead to erosion damage over time. For this reason, if the valve is to be placed into an unclean service, where bi-directional sealing is required, the valve has an optional seat gasket that can be installed on the floating seat sealing face (as shown below).



Body Seal Arrangement

The primary body seal on the TBV Series 3300 valve is a spiral-wound gasket. As a secondary sealing mechanism, the valves also have a metal-to-metal sealing surface. This surface is flat on the body side, with a concentric circle finish machined on the endplate side. When the body and endplate are bolted together, these two surfaces form a seal. In addition, to ensure that maximum loading is applied to the metal-to-metal sealing surfaces, an undercut is machined onto the endplate so that all bolt load is transferred to the desired sealing area.

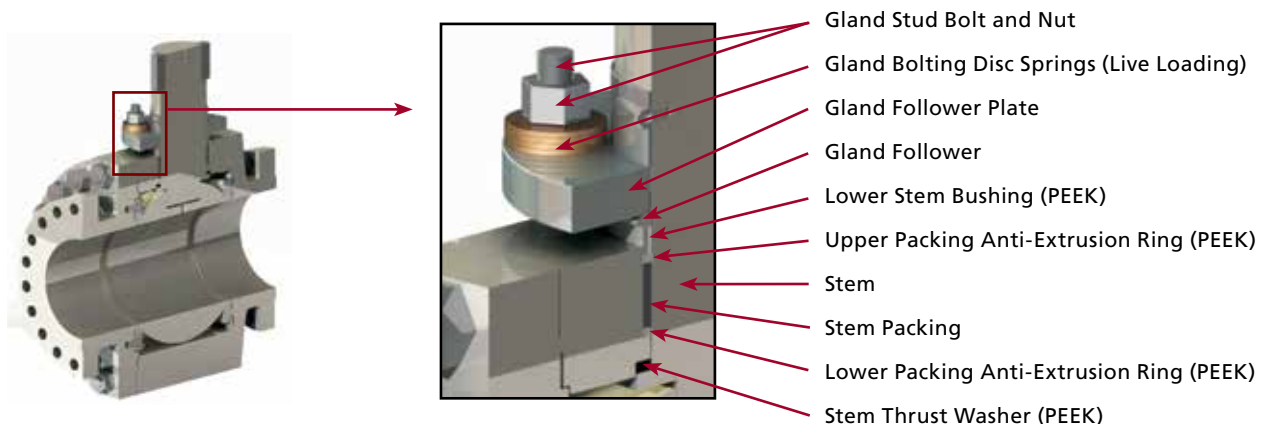


Stem Sealing Arrangement

The stem sealing arrangement on the TBV Series 3300 valve is a dual live-loaded arrangement. This is because it incorporates a live-loaded gland bolting design, where a stack of disc springs acting in parallel maintain the desired gland packing compression during thermal and pressure cycling. In addition, the gland packing itself is a braided graphite material, interwoven with helical INCONEL[®] 625 coils; this gives the packing a certain degree of recovery from compression, which plain graphite packing does not.

Fitted above and below the packing are PEEK anti-extrusion rings. These rings allow the packing to be evenly compressed, while preventing the packing from extruding through the small gaps between the valve stem and body bores.

The gland follower also is fitted with a PEEK bushing to provide the stem with additional stability and to reduce the chance of packing damage due to side loading on the stem. Finally, the stem is fitted with a PEEK thrust washer to prevent galling damage between the stem and body. PEEK has proven to be an ideal material for thrust washers due to its high-temperature and abrasion resistance. In addition, it does not suffer from coating failure and resultant galling damage, which can lead to stem seizure, as occurs with some coated titanium ring thrust washer designs.



Material Availability

Cameron's TBV Series 3300 valves can be supplied in all commercially available materials. Regardless of the material, the design of the valve remains unchanged.

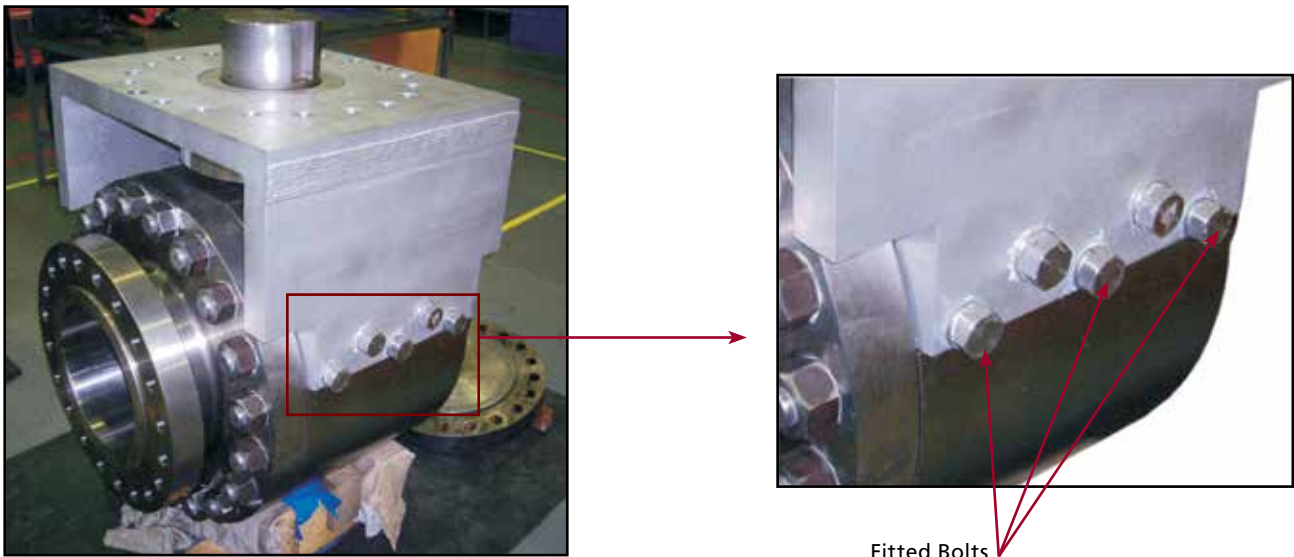
Testing

All valves undergo a standard series of tests. These tests include hydrostatic pressure testing of the valve shell and seats and low air pressure testing in accordance with the requirements of MSS SP61. All valves will also be function tested with their associated actuator as a part of the factory acceptance test. Additional testing also can be performed on each valve from each size range at an extra cost. This testing can include high-pressure gas shell testing, valve torque testing (break torque at full differential pressure and free-running torque), or any client-specific testing requirements (e.g., additional function tests, etc.).

Mounting Brackets

As our valve design does not require the mounting bracket to retain the stem, and is therefore not part of the integral design, we are able to provide mounting brackets to match any brand of actuator.

The actuator mounting brackets on all valve sizes are pinned to the valve body using fitted bolts. These bolts have a tight tolerance on the shank to bracket through-hole, preventing actuator bracket slippage from occurring.



Typical Fitted Bolting Arrangement

Coating Requirements

The TBV Series 3300 valve must resist extremely severe conditions resulting from the abrasion and erosion of slurries, as well as chemical attack. The most important group of components to the valve is the ceramic-coated stack height (ball and seats).

Both the valve design and the highly effective VPS coatings combine to:

- Help resist acid attack
- Create a seal with the opposing surface when the valve is in the closed position (isolation)
- Be compatible with the process environment
- Resist wear of mating surfaces during valve actuation
- Have shear bonding strength to substrate greater friction stresses during actuation
- Have compressive strength to withstand combined loads on sealing surfaces
- Have bending strength to withstand stresses during actuation
- Withstand the repeated thermal cycling associated with valve actuation

Because there is no known metal or alloy that meets all requirements, thermally sprayed coatings emerge as a solution. The combination of a substrate material and single or multilayer coatings offers the ability to combine the most advantageous properties of a number of materials to attain the required characteristics.

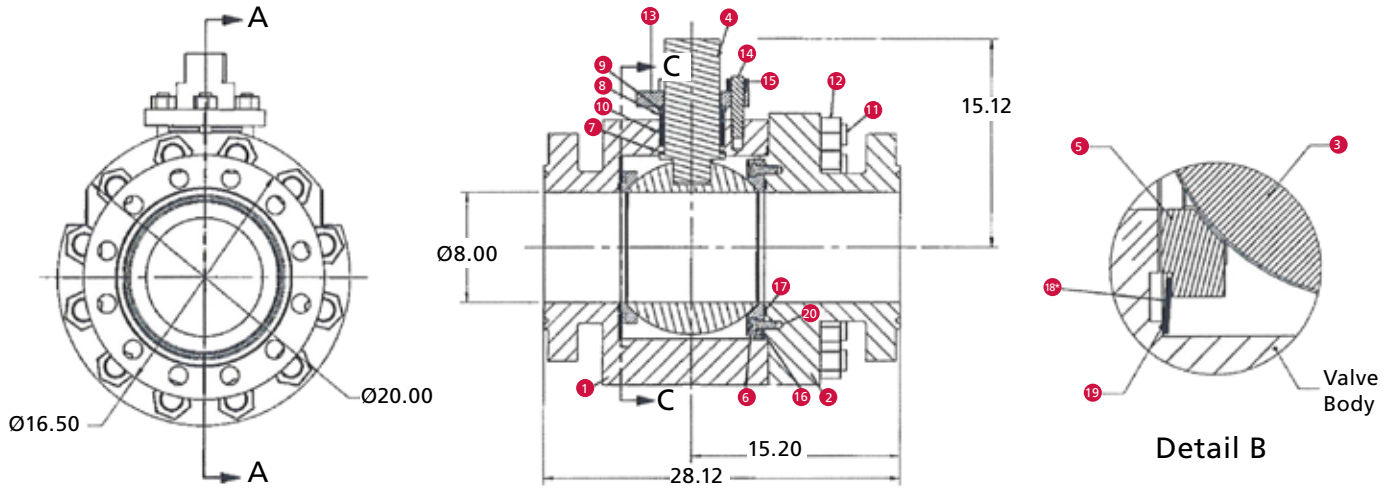
Thermal spray-coated ball valve components have been used successfully in process applications that involve severe operating conditions such as nickel/gold mining, chemical, petrochemical, and power generation.

VPS Titanium Dioxide Coating

Cameron's TBV facility supplies VPS-applied coatings to the industry with significant performance benefits. This is achieved by utilizing both the tantalum bond coat and the titanium dioxide (TiO₂) top coat to the application for autoclave applications. These coatings replaced older chromic coatings and have become the standard protective coating for severe service ball valves.

PRODUCT DIMENSIONS

8" ASME Class 600 Flanged Two-Piece Dimensions

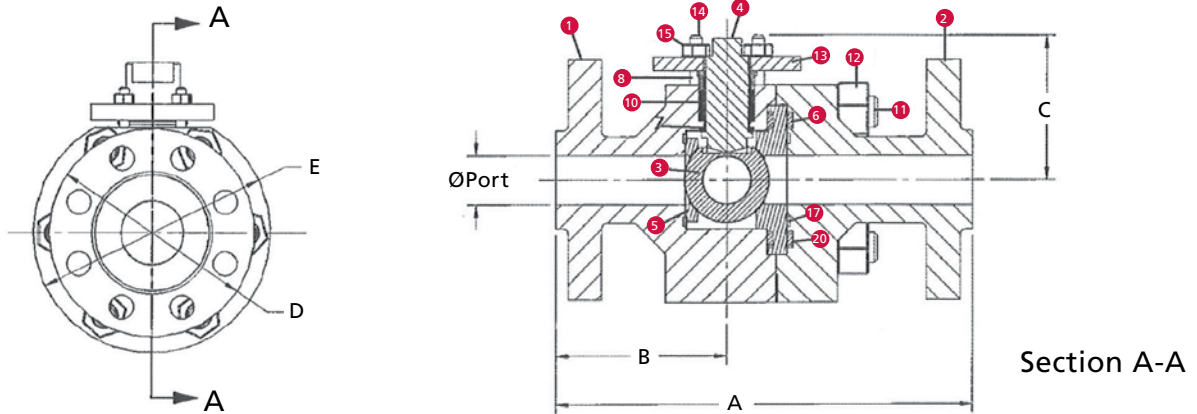


Item No.	Part	Qty.
1	Body	1
2	Endplate	1
3	Ball	1
4	Stem	1
5	Body Seat	1
6	Endplate Seat	1
7	Thrust Bearing	1
8	Follower	1
9	Stem Bearing	1
10	Stem Packing	6
11	Body Stud	12
12	Body Stud Nut	12
13	Gland Plate	1
14	Gland Plate Stud	3
15	Gland Plate Stud Nut	3
16	Body Seal	1
17	Endplate Seat Seal	1
18*	Body Seat Seal	1
19	Body Seat Spring	1
20	Seat Socket Head Capscrew	16

* Optional for bi-directional

SERIES 3300 SECURED, METAL-SEATED BALL VALVE

2" through 6" ASME Class 600 Flanged Two-Piece Dimensions

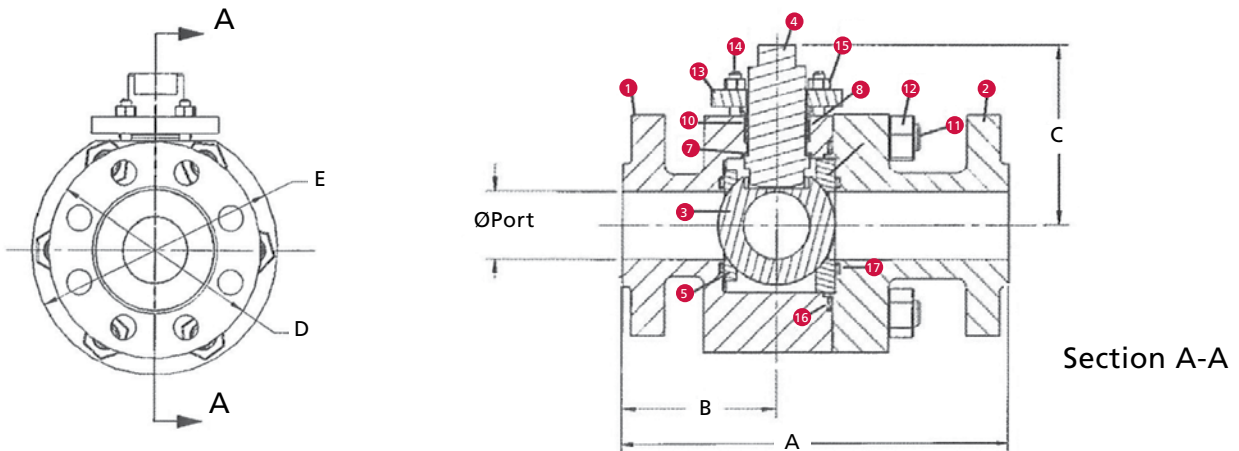


Major Dimensions

Size (in.)	Port	A	B	C	D	E
2	Ø2.00	11.50	4.60	5.28	Ø6.50	Ø7.50
3	Ø3.00	14.00	5.53	6.67	Ø8.25	Ø9.50
4	Ø4.00	17.00	7.02	9.19	Ø10.75	Ø12.00
6	Ø6.00	22.00	12.84	11.68	Ø14.00	Ø16.00

Note: All dimensions are in inches unless otherwise specified.

1" ASME Class 600 Flanged Two-Piece Dimensions

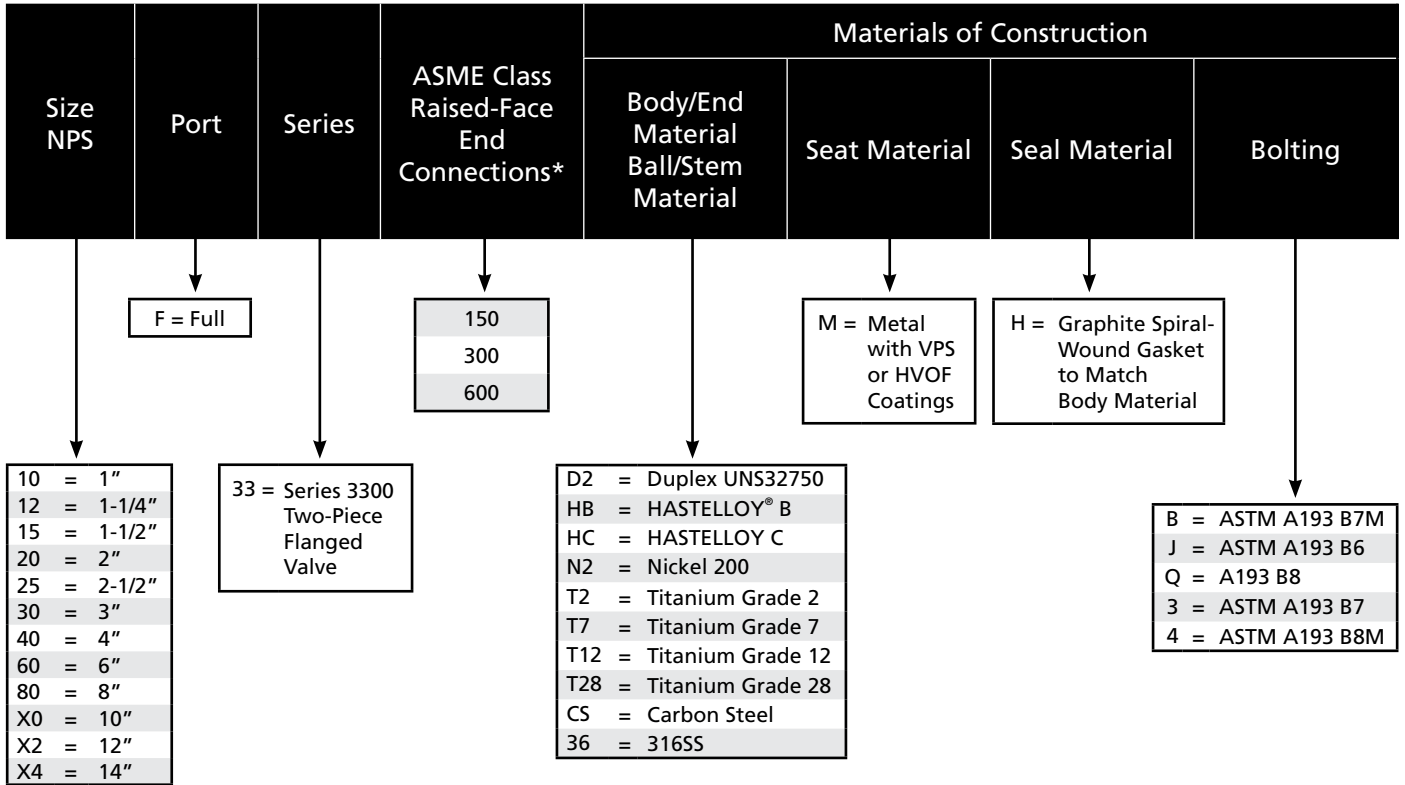


Major Dimensions

Size (in.)	Port	A	B	C	D	E
1	Ø1.00	8.50	3.50	7.92	Ø4.88	Ø5.00

Note: All dimensions are in inches unless otherwise specified.

HOW TO ORDER



* Consult Cameron for Class 900 and 1500 dimensions.

Services for Valves and Actuation

WE BUILD IT. WE BACK IT.

Global Network and Local Support

Cameron is well-positioned to deliver total aftermarket support, quickly and efficiently, with unmatched OEM expertise. Our highly skilled engineers and technicians are available around the clock, seven days a week, to respond to customer queries, troubleshoot problems, and offer reliable solutions.

Easily Accessible Parts and Spare Valves

- OEM spare valves, actuators, and parts (including non-Cameron brands)
- Handling, storage, packaging, and delivery
- Dedicated stocking program

Comprehensive Services Portfolio

- Parts and spare valves
- Repair
- Field services
- Preventative maintenance
- Equipment testing and diagnostics
- Remanufacturing
- Asset preservation
- Customer property management
- Training and recertification services
- Warranty

Customized Total Valve CareSM (TVC) Programs

Customized asset management plans that optimize uptime, availability, and dedicated services.

- Engineering consultancy
- Site management
- Flange management
- Startup and commissioning
- Spare parts and asset management
- Operational support



Trademark Information

TBV is a trademark of Cameron.

This document contains references to registered trademarks or product designations that are not owned by Cameron.

Trademark	Owner
HASTELLOY	Haynes International, Inc.
INCONEL	INCO Nickel Sales, Inc.
PEEK	Vitrex PLC Corp United Kingdom

CERTIFICATIONS



3250 Briarpark Drive, Suite 300
Houston, TX 77042
USA
Tel 1 281 499 8511

Learn more about TBV solutions at:
www.c-a-m.com/TBV
TBV@c-a-m.com



HSE Policy Statement

At Cameron, we are committed ethically, financially and personally to a working environment where no one gets hurt and nothing gets harmed.