



# TBV Valves

Unique range of products for gas processing  
and the downstream chemical market

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## Introduction

Cameron is a leading provider of valves and measurement systems to the oil and gas industry. Our products are primarily used 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 a wide range of valves for use in natural gas, LNG, crude oil, and refined products transmission lines. The traditional CAMERON T30 Series\* fully welded ball valve product line has been combined with the GROVE\* valve, RING-O\* subsea valve, TOM WHEATLEY\* check valve, ENTECH\* nozzle check valve, and TK\* trunnion-mounted ball valve product lines. This broad offering has strengthened Cameron's ability to serve as a single source for a wide scope of customer requirements. We also provide critical service valves for refinery, chemical, and petrochemical processing businesses and for associated storage terminal applications, particularly through our ORBIT\* rising stem ball valve and GENERAL\* valve brands. These brands are complemented by WKM\* valves, TBV\* valves, and TEXSTEAM\* plug valves and considerably expand the scope of our product offerings.

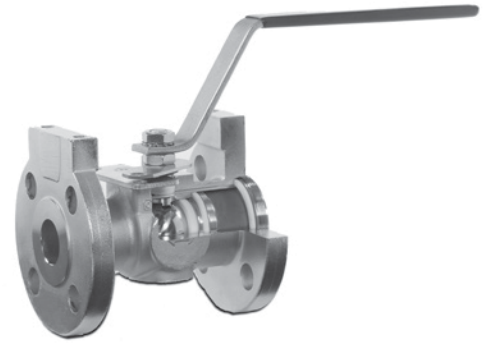
TBV valves have much to offer the marketplace. Since 1978, we have come a long way from simply supplying small titanium valves manufactured from bar stock. Today, Cameron offers a large portfolio of valves manufactured from a wide range of commercially available materials. This increased manufacturing capability has enabled Cameron to expand its product offerings and size ranges. TBV valves feature high alloys, advanced instrumentation, and cryogenic and severe service capabilities, including for LNG, high-pressure acid leaching (HPAL), petrochemical, and refining applications.

# Flanged Ball Valves

## Series 2000

The TBV Series 2000 valve is a unibody, cast, standard-port flanged ball valve offering versatility of materials and modifiers to satisfy today's sophisticated process valve requirements. With no breaks in the body design, the Series 2000 valve is advantageous in applications in which external leakage is a concern. The valve body is designed to facilitate ease of automation by including both ISO and flange-boss mounting capabilities as standard. The TBV Series 2000 valve is available in ½ in to 8 in (diameter nominal [DN] 15 to DN 200) size bonnets with ASME Class 150 to 600 flanges.

Valve safety also is addressed with the standard blowout-proof stem design in conjunction with optional features, such as oval safety handles for sizes up to 1 in (DN 25), lockout devices, and FE bonnets. They are designed to comply with the fire-safe standards of API 607.



*Series 2000  
flanged ball valve.*

## Series 1800 valve

The TBV Series 1800 flanged valve is manufactured from bar stock or forgings. It is available in standard- or full-port design and features a high-integrity, two-piece body. A welded FE bonnet is also offered. It is available in sizes from ½ in to 10 in (DN 15 to DN 250) in a variety of body and seat materials with ASME Class 150 to 1500 flanges.



*Series 1800  
flanged ball valve.*

## Series 2800 valve

The TBV Series 2800 two-piece, cast, full-port flanged ball valve is specifically designed to overcome the challenges of severe service applications. This design includes a live-loaded dual stem seal (primary and secondary seal) as standard. The body and bonnet are cast as a single piece with no welds. The TBV Series 2800 valve is available in sizes from ½ in to 8 in (DN 15 to DN 200) with ASME Class 150 to 600 flanges.



*Series 2800  
flanged ball valve.*

## Series 3300 valve

An enhanced version of the Series 1800 valve, the TBV Series 3300 valve is suited for erosive applications. The design includes a secured downstream seat, spring-loaded upstream seat, and enhanced ball and stem engagement. This valve is manufactured from bar stock or forgings from any commercially available material. It is offered in sizes from 1 to 14 in (DN 25 to DN 350) with ASME Class 150 to 1500 flanges.



*Series 3300  
flanged ball valve.*

# Three-Piece Ball Valves

For threaded and welded end connections

## Series 1100 valve

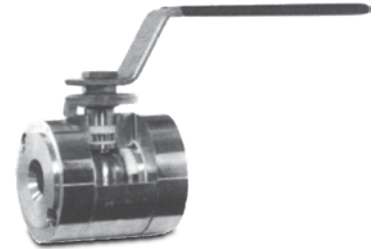
Along with all of the features and versatility of a three-piece valve, the TBV Series 1100 valve incorporates a raised face on the seat-bearing side of the endplate, which ensures positive alignment of the components and positive preset. The body seal is 100% enclosed. Its rugged construction features a heavy-duty handle and stop plate and body bolts with a variety of material options. The TBV Series 1100 valve is ASME Class 600-rated and is available in a wide variety of materials with NPT, socket-weld, and butt-weld end connections in ¼ in to 3 in (DN 8 to DN 80) sizes. Other special end connections are available upon request.



*Series 1100  
three-piece ball valve.*

## Series 3100 valve

The TBV Series 3100 wafer three-piece valve combines the benefits of a standard three-piece valve with additional wafer features. The three-piece design uses raised-face endplates to ensure correct alignment with the body, totally encapsulated body seals, and a bottom-entry blowout-proof stem. The wafer configuration provides additional benefits, including reduction of the material mass of the valve and lower cost. The TBV Series 3100 valve can be used between ASME Class 150 to 600 flanges with a 1,500-psi pressure rating and is available in sizes from ½ in to 8 in (DN 15 to DN 200) in a wide variety of alloys.



*Series 3100  
three-piece ball valve.*

# Diverter Valves

For blending and mixing applications

Diverter valves' 90° operation enables diverting from the bottom or side port to either of the other two ports with a 90° turn of the handle, but the flow can never be shut off. The 180° operation enables diverting with a 180° turn of the handle, and flow can be shut off at the 90° position.

## Series 5100 valve (fabricated from Series 1100 valve)

Cameron's TBV brand offers the Series 5100 diverter valve to accomplish what would otherwise require two or more two-way valves. The diverter valve uses all of the benefits of the two-way, three-piece TBV valve, including a blowout-proof stem, raised-face endplates to reduce radial piping stresses that could cause body seal leakage, a wide variety of seals, and a large selection of end connections. The TBV Series 5100 is available in either a diverter or a three-way format with bottom or side porting. It also is available for 90° or 180° operations in sizes from ¼ in to 6 in (DN 8 to DN 150), making it beneficial for a variety of applications.



Series 5100 diverter valve.

## Four-way diverter

The TBV four-way diverter valve is used in applications in which several two-way valves would otherwise be needed. It is available in a wide array of flow patterns utilizing an L port, a T port, or a double-L ball. Four seats ensure leak-tight sealing. The four-way diverter can be produced in a large variety of body and seat materials in sizes from ½ in to 6 in (DN 15 to DN 150), and is available with screwed, socket-weld, butt-weld, or flanged end connections.



Four-way diverter valve.

## Series 51/20 valve (fabricated from Series 2000 valve)

The TBV Series 2000 flanged, unibody valve has a welded bottom port flange connection for use in applications that normally would require two or more two-way valves. It is available with bottom or side porting in 90° or 180° operations. The TBV Series 51/20 is available in sizes from ½ in to 8 in (DN 15 to DN 200) with ASME Class 150 to 600 flanges in a variety of alloys.



Series 51/20 diverter valve.



# Cryogenic Ball Valves

## Series 2100 valve (fabricated from Series 1100 valve)

The unique design of the TBV Series 2100 three-piece cryogenic valve incorporates features that provide long life, safety, and low torque. The high-strength, blowout-proof stem is used in conjunction with a welded, extended bonnet and a five-chevron V-ring packing set to provide leak-proof stem seal integrity as well as live-loaded self-adjustment. The TBV Series 2100 valve has a temperature rating down to  $-452 \text{ degF}$  [ $-269 \text{ degC}$ ]. It comes in 316 stainless steel, brass, and other commercially available materials with NPT, socket-weld, and butt-weld end connections in  $\frac{1}{4}$  in to 8 in (DN 8 to DN 200) sizes. For applications such as vent and bleed lines or intermittent cryogenic services, nonextended stems are available.



*Series 2100  
cryogenic ball valve.*

## Series 21/18, 21/20, and 21/28 flanged cryogenic valves

TBV flanged cryogenic valves provide operation down to  $-452 \text{ degF}$  [ $-269 \text{ degC}$ ]. The integrity of the valve is further enhanced by the welded bonnet design. The stem is blowout proof and self adjusting to wear and pressure due to live loading. The standard body material is 316 stainless steel and is available with ASME Class 150 to 1500 flanges (model dependent) in  $\frac{1}{2}$  in to 8 in (DN 15 to DN 200) sizes. A wide variety of seating options are available. A nonextended bonnet option also is available.



*Series 21/18 valve  
(fabricated from Series 1800 valve).*



*Series 21/20 valve  
(fabricated from Series 2000 valve).*



*Series 21/28 valve  
(fabricated from Series 2800 valve).*

## Series 21/80 valve

The TBV Series 21/80 valve is a large-bore, 10 in to 18 in (DN 250 to DN 450) cryogenic valve available with ASME Class 150 to 600 flanges. This series of valve is full port, trunnion-supported, and split body.



*Series 21/80  
cryogenic ball valve.*

### **Series 21/51 valve (fabricated from a Series 5100 valve)**

The TBV Series 21/51 cryogenic diverter valve incorporates all features found in the TBV Series 2100 valve and provides diverting capabilities for use where two or more two-way valves normally would be necessary. The TBV Series 21/51 valve is available in two porting arrangements, 90° and 180° operations, and operates like TBV standard diverter valves. It is offered as full port or standard port in sizes from ½ in to 8 in (DN 15 to DN 200), in 316 stainless steel or brass, and with or without an extended stem. NPT, socket-weld, and butt-weld end connections are available.



*Series 21/51  
cryogenic ball valve.*

### **Series 21/51A valve**

The TBV Series 21/51A high-flow cryogenic diverter valve assembly for dual safety relief systems is designed to meet the high flow requirements of stationary cryogenic containers. This valve features a 180° operation, provides positive porting with consistently high  $C_v$  during transfer, and is suitable for tank pressures up to 600 psi. The installation of cryogenic relief valves like the TBV Series 21/51A are vital for reducing the possibility of costly field repair fabrication because of the overpressurization of cryogenic piping systems.



*Series 21/51A  
cryogenic ball valve.*

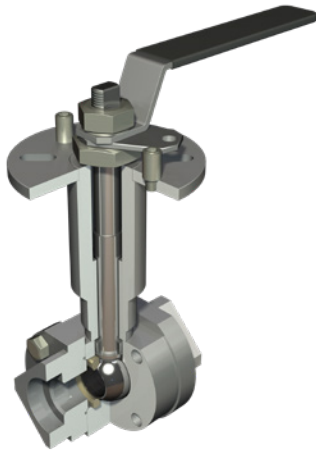


# Severe Service

## Fugitive emissions (FE) valves

### FE bonnet for high performance

For critical applications involving toxic or volatile organic compounds, the TBV valve brand provides the FE bonnet. The FE bonnet uses a unique design in which the stem packing is live loaded between the threads on the top of the stem and a shoulder on the stem rather than a shoulder in the packing box. Through this floating stem design, Cameron has eliminated the effect of temperature cycles on the packing arrangement. The packing consists of chevron V-rings sandwiched between the top and bottom adapter rings (wedge-style packing) and can be modified to accept a leak-off with a lantern ring. This unique design has been proven in thousands of installations in services including phosgene and chlorine. A fire-safe version is available.



*FE 1100  
severe service valve.*



*FE 1800  
severe service valve.*



*FE 2000  
severe service valve.*

# Check Valves

### Series 7100 valve

The TBV Series 7100 swing check valve uses a toggle arm and disc arrangement. This valve is available with integral metal seats. The TBV Series 7300 wafer swing check valve can be supplied for use with all ASME Class flanges up to 600, as standard. Both the TBV Series 7100 swing check and the TBV Series 7300 wafer swing check valves are available in sizes ranging from 2 in to 8 in (DN 50 to DN 200).



*Series 7100  
check valve.*

### Series 9100 valve

The TBV Series 9100 ball check valve is available in sizes ranging from 1/2 in to 2 in (DN 15 to DN 200) in a wide variety of material choices, such as stainless steel, Monel®, Hastelloy®, and titanium. Cameron can provide the TBV Series 9100 valve with all available end connections, including socket-weld, butt-weld, screw-end, or ASME Class 150 to 900 flanged ends. The TBV Series 9100 valve is controlled by backpressure and can be supplied with a spring set calibrated from 5 to 25 psi [0.34 to 1.72 bar].



*Series 9100  
check valve.*

# Special Service

## Chlorine service

Cameron has developed special designs for the handling of chlorine compounds. TBV chlorine valves feature Inconel® Belleville-loaded stem seals for automatic compensation of temperature and pressure fluctuations, an upstream pressure-relief hole in the ball or a slotted upstream endplate to enable expanding chlorine to escape harmlessly upstream, and a wide variety of available materials to suit each individual application. TBV chlorine valves are cleaned, assembled, and bagged following the recommendations of the Chlorine Institute Pamphlet 6. The chlorine service option is available for all TBV ball valves.

## Oxygen service

TBV valves are commonly applied on oxygen service in either the liquid (cryogenic) or gaseous phase. Because of the danger of oxygen explosively reacting with any grease, oil, or combustible material left in the piping system, TBV valves provided for oxygen service are

- inspected for chips, burrs, foreign matter, and any other defects in workmanship
- cleaned and degreased before assembly (including tools and handling apparatus)
- purged and dried with filtered, nonlubricated air
- lubricated with oxygen-compatible Fluorolube® lubricant on gaseous oxygen valves; cryogenic valves are not lubricated
- black-light inspected before assembly
- assembled, tested, and air dried in a clean room
- capped on each end
- tagged "Cleaned for Oxygen Service"
- polybagged and sealed closed
- engineered in compliance with Praxair® Standard GS-38.

# Control Seats

The TBV V-seated control valve greatly expands the ability of a ball valve to provide accurate control over a wide range of flow conditions.

The metal V-seat can be installed upstream or downstream. For lower pressure drops, installing the V-seat upstream will ensure bubble-tight shutoff from the resilient downstream seat. For higher pressure drops with cavitation or erosion potential, installing the V-seat downstream will extend valve life.

Bubble-tight shutoff is attained by installing a soft seat downstream. Typically, a reinforced PTFE seat is used for tight shutoff. This seat is protected from high-velocity damage since the upstream V-seat already has significantly reduced the flow rate through the valve. For higher flow rates or for abrasive media, a metal seat can be used downstream, providing Class 5 shutoff.



*15° control seat.*



*30° control seat.*



*60° control seat.*

# Advanced Wear and Corrosion-Resistant Coatings

Today's process requirements demand metal seat performance at an ever-increasing rate because metal seat technology has drastically improved over the years, which has resulted in elevated performance and usage.

TBV valves offer metal seats and coatings for some of the toughest applications. All TBV valves—from the smallest instrumentation valve to our largest cryogenic valve—employ our coating expertise, which was developed as the TBV valve entered the high-pressure acid leaching (HPAL) niche for metal extraction several years ago. Cameron continually reviews its coating technology for better performance.

Thermal spraying is a technology that uses a hot, fast-moving jet to partially melt and accelerate entrained particles toward a substrate. Three technologies are widely used for the deposition of materials onto the surface of a component:

- **atmospheric plasma spraying (APS)**, which uses an extremely hot 9,032- to 27,032-degF [5,000- to 15,000-degC], relatively slow-moving (subsonic) plasma jet in an open environment
- **vacuum plasma spraying (VPS)**, which uses a cooler (5,432–18,032 degF [3,000–10,000 degC]) but much faster (supersonic) plasma jet inside a controlled, reduced-pressure reactor
- **high-velocity oxygen fuel (HVOF)**, which uses a lower-temperature, higher-velocity flame compared with APS or VPS technologies.

## Salient features of VPS coatings

- Strong metallurgical bonding between the coating and the component
- Extremely dense coatings
- Oxide-free metallic coatings
- ASME Class VI shutoff at factory upon request (otherwise, Class V)

# Instrumentation Valves

TBV instrumentation valves were developed in response to concerns expressed by plant engineers. A center-to-center spacing problem arises in competitive designs because the bonnet must be removed from the body to screw the valve into the orifice flange next to another valve. With TBV instrumentation valves, common problems such as center-to-center spacing in differential pressure installations, visual position indication, plugging of impulse lines, and tamper proofing have all been reduced.

TBV instrumentation valves can be installed on 2 $\frac{1}{8}$ -in [54-mm] centers<sup>†</sup> by removing the mating valve handle, leaving the valve's factory integrity intact. Visual position indication is achieved through the use of an oval safety handle. This handle enables easy position identification while maintaining safety. These tamper-proof valves incorporate additional safety through a full-penetration, all-welded design, which practically ensures that the body components cannot be separated. Standard valves have been subjected to bending loads exceeding 27,000 ft.lbf [36,607 N.m] without weld failure.

To avoid plugging of impulse lines, all TBV instrumentation valves are fully roddable. The bore through the ball and seats is larger than the body bore. This feature prevents accidental damage to the ball or seats during the rodding operation. TBV instrumentation valves are available in any commercially available material. TBV valves also can accommodate the entire spectrum of end connections on our instrumentation product line. All products are available with threaded, socket-weld, butt-weld, or flanged end connections, and all can be ordered as fire safe.

<sup>†</sup>With the exception of the TBV Series 6800 and 6900 valves.



### Series 4100 valve

The TBV Series 4100 valve is an all-welded, fully roddable, double-female valve. Standard sizes range from ¼ in to 1 in (DN 8 to DN 25). Material options include all commercially available alloys. The valve also meets API 607 fire-safe requirements.



Series 4100 instrumentation valve.

### Series 41/61 valve

The TBV Series 41/61 valve is an all-welded, fully roddable design with one female NPT end and one male end. The male end is available with screwed, butt-weld, socket-weld, and flanged connections. Male and female ends may be different sizes upon request. Standard sizes range from ¼ in to 1 in (DN 8 to DN 25). Material options include all commercially available alloys.



Series 41/61 instrumentation valve.

### Series 5500 valve

The TBV Series 5500 valve is a double-isolation valve. There are two closure members on each side of the bleed valve. For the bleed, a standard TBV instrumentation ball valve is recommended, although non-TBV brands can be used, such as needle or outside stem and yoke (OS&Y) depending on customer preference. The Series 5500 valve is offered in sizes up through 3 in (DN 80) and ASME Class 1500 in any commercially available material. The valve also meets API 607 fire-safe requirements.



Series 5500 instrumentation valve.

### Series 6100 valve

The TBV Series 6100 valve is fully roddable and provides three ½-in (DN-15) female ports with one male end for attachment to an orifice flange. The TBV Series 6100 valve accommodates different-sized male ends up to 1 in (DN 25) and is available in a variety of materials. The valve can be installed in pairs on 2½-in [54-mm] centers for transmitter hookups.



Series 6100 instrumentation valve.

### Series 61/41/61 valve

The double-male-end TBV Series 61/41/61 valve reduces the need for extensions to be used with female end valves. The all-welded design also reduces the number of leak paths, and extended male ends are available upon request.



Series 61/41/61 instrumentation valve.

# Instrumentation valves (can be used as process valves)

### Series 6400 valve

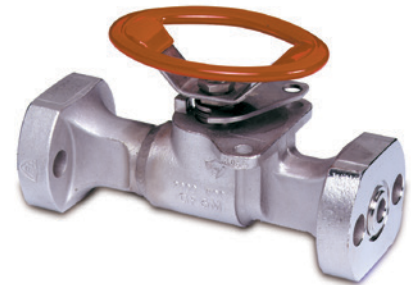
The TBV Series 6400 valve includes all of the advanced TBV ball valve features in a fire-safe design that meets API 607 requirements. The TBV Series 6400 valve is available with a variety of seat materials in a carbon steel or stainless steel forged body from ½ in to 1 in (DN 15 to DN 25). Other materials are available upon request. The TBV Series 6400 valve is furnished with one NPT end and enables a choice of NPT, socket-weld, or integrally reinforced external body (IREB) end connections for the other end. This quarter-turn ball valve replaces leaky, extended body gate valves in process, block, bleed, and drain applications.



Series 6400 instrumentation valve.

### Series 6500 valve

The TBV Series 6500 valve cast body process transmitter valve replaces gate valves with advanced TBV ball valve features in a fire-safe design, meeting stringent refinery and chemical plant requirements. The TBV Series 6500 valve features all-welded, tamper-proof construction, an internal blowout-proof stem, and an oval safety handle to prevent accidental operation. The unique design of the TBV Series 6500 incorporates backup metal fire lips to provide sealing should the soft seals sublimate in the event of fire, and optional graphoil stem seals that ensure fire-safe protection. The TBV Series 6500 valve offers reliability, safety, visibility, unique mounting capability, quality, and unsurpassed leakage protection.



Series 6500 instrumentation valve.

### Series 6800 valve

The TBV Series 6800 valve is an instrumentation valve with a cast body that incorporates an integral lockout pad and a high-performance stem packing. The valve comes equipped with a locking oval handle as a standard feature. It is seal-welded to prevent tampering or accidental unthreading when removing from the line. The TBV Series 6800 is fire-safe when ordered with appropriate seals, and is fully roddable. Because of the cast lockout pad, it cannot be turned on 2½-in [54-mm] centers for transmitter hookups.



Series 6800 instrumentation valve.

### Series 6900 valve

Similar to the TBV Series 6100 valve, the TBV Series 6900 valve uses a cast body that incorporates an integral lockout pad and high-performance stem packing. In addition, like the TBV Series 6100 valve, the TBV Series 6900 is intended as a gauge isolation valve with tapped NPT side ports for flush and drain functions. It incorporates all of the other features of the TBV Series 6100 valve—roddability, fire safety, and seal welding. The valve comes equipped with a locking oval handle as a standard feature. Because of the cast lockout pad, it cannot be turned on 2½-in [54-mm] centers for transmitter hookups.



Series 6900 instrumentation valve.

# Instrumentation Connection Systems

Cameron's TBV valve instrumentation connection systems (ICSs) combine optimal measurement technology, proved mounting practices (close coupling), and hardware integration to produce not only accuracy and zero stability but a low installed cost unequalled in performance and constructability. This system can reduce installation costs by modularizing, preengineering, prefabricating, and locking in the optimal transmitter installation in a tamper-proof system that guarantees the rated performance of the transmitter while lowering the installed cost per instrument loop by 30% to 80%. TBV valves feature more than 325 manifold detail types for almost every conceivable installation situation.



*Series 3411-00  
flow applications.*



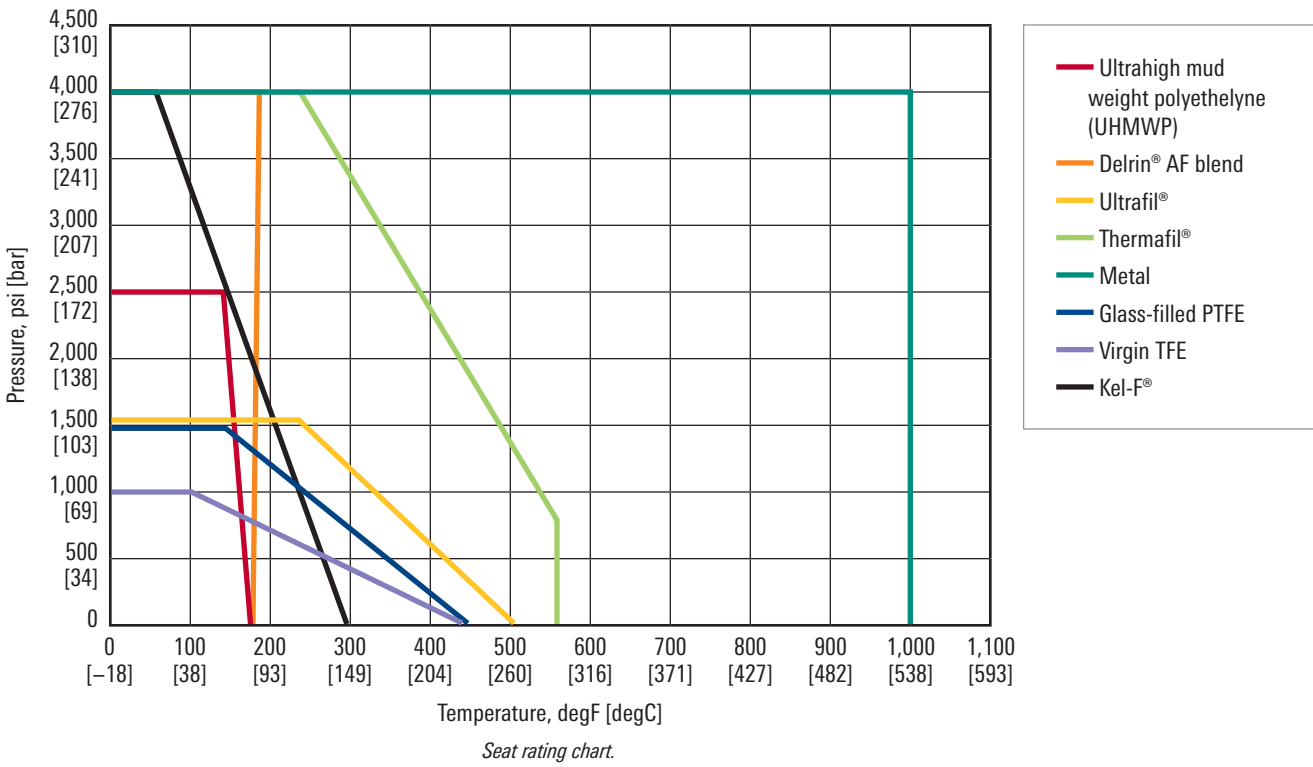
*Series 5571-00  
pressure applications.*



*Series 5576-42  
level applications.*

# Seat Rating Chart

Graphite and metal seats are available for services up to 1,200 degF [649 degC] at varying pressures, dependent on media and service conditions.



Seat Material Identification Code		
Code	Material	Color
T	Virgin PTFE	White
G	Reinforced PTFE	White with red speckles
U	Ultrafil	Black
F	Thermafil (carbon-filled PEEK)	Black
P	UHMWP	Translucent white
D	Delrin	Dark brown
K	Chlorotrifluoroethylene (CTFE)	Translucent
M	Metal	Silver
H	Graphite	Black

Extended pressures and temperatures can be achieved by altering the design for specific applications. Consult Cameron with service conditions.



# Ordering Guide

## Basic rules for ordering TBV valves

Please use the charts on the next two pages for part numbers and item descriptions when giving our customer service department information on quoting a job.

- TBV valve model numbers can be as long as 30 characters, including spaces.
- TBV valve model numbers contain spaces or dashes to separate major valve features.

The following list is in accordance with Cameron's TBV valve ordering charts on the next two pages:

1. Start with the valve size. The size will be two digits.
2. Follow the size with the designation for full (F) or standard (S) port.
3. A space will always follow the full or standard port designator.
4. Fill in the two character codes for the desired valve series.
5. A space is next.
6. Pick the three-character code to designate end connections. If a combination is required, use the single codes as needed. An "x" is used to separate these combination codes. For example, an MNPT connection by an FNPT connection is designated as 1x3.
7. A space is next.
8. Pick the desired two-character code for body and endplate material.
9. Pick the desired two-character code for ball material. Do not skip a space between the body or endplate and ball material code. Pick the desired two-digit code for stem material. If the ball and stem are the same material, you can skip a space and go to the seat code. If differing ball and stem codes are required, use a third material to designate the stem, as required. Do not leave a space between material designation codes. For example, titanium Grade 2 body, end, and ball with titanium Grade 5 stem would be designated as T2T2T5.
10. A space is next.
11. Pick a seat code. This is a one-character code.
12. Pick a seal or packing code. This is a one-character code and follows the seat code. Pick body seal then stem seal, if different.
13. A space is next.
14. Pick a bolting code.
15. Pick option codes, as required. These are two-character codes. List the required two-character codes in numerical and alphabetical order. Do not put spaces between the option codes.

### Example

#### **10S 20 300 LCHC UT OCLVB**

1-in, standard port, TBV 2000 Series valve (cast standard-port flanged) with ASME Class 300 flanges raised face (RF), low carbon steel body and endplate, Hastelloy C ball and stem, Ultrafil 25 seats, virgin TFE seals and packing. Bolting—none. Modifiers: cleaned for chlorine service, vented ball.

The number of options may exceed the 30-character limit, or the required valve may not be described by standard nomenclature. In this case, we will assign a Z number to designate a special valve.

Please list any unspecified special features.

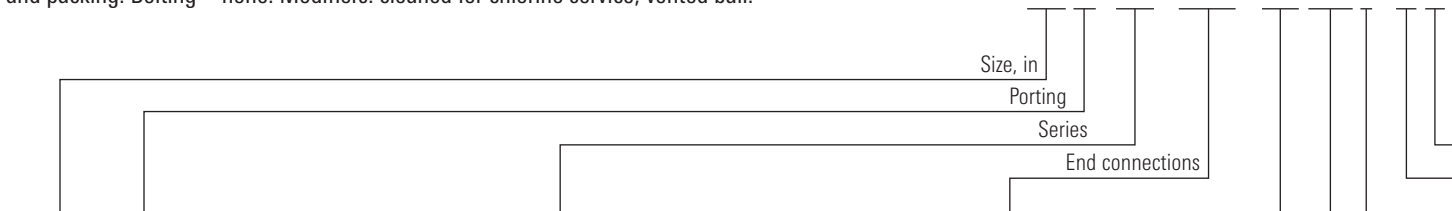
# How to Order

## 10S 20 300 LCHC UT OCLVB

1-in, standard port, TBV 2000 Series valve (cast standard-port flanged) with ASME Class 300 flanges RF, low carbon steel body and endplate, Hastelloy C ball and stem, Ultrafil 25 seats, virgin TFE seals and packing. Bolting—none. Modifiers: cleaned for chlorine service, vented ball.

### Example

**10S 20 300 LCHC<sup>‡</sup> UT**



Size, in	
01	1/8
02	1/4
03	3/8
05	1/2
07	3/4
10	1
12	1 1/4
15	1 1/2
17	1 3/4
20	2
21	2 x 1
23	1/4 x 3/8
25	2 1/2
30	3
32	3/8 x 1/4
35	3 1/2
40	4
51	1/2 x 1
52	1/2 x 1/4
57	1/2 x 3/4
60	6
71	3/4 x 1
75	3/4 x 1/2
80	8
X0	10
X2	12
X4	14
X6	16
X8	18
1A	1 x 1/2
2A	1/4 x 1/2

Series	
11	1100—Three-piece
16	1600—Tank bottom
18	1800—Bar stock split-body flanged
20	2000—Cast unibody flanged
21	2100—Cryogenic three piece
28	2800—Cast split-body flanged
2A	Switching diverter extended stem bottom port
2B	21/20—Cryogenic unibody flanged
2C	21/31—Cryogenic wafer
2D	21/51—Cryogenic diverter three piece
2F	21/51/20—Cryogenic unibody flanged diverter
2G	21/18—Cryogenic split-body bar stock flanged
2H	21/61—Cryogenic multiported instrumentation valve
2K	21/65—Cryogenic instrumentation valve with I-flange
2L	21/64—Cryogenic forged instrumentation valve
2P	21/51/18—Split-body bar stock flanged cryogenic diverter
2R	Switching diverter non-extended stem bottom port
2S	Switching diverter extended stem side port
2T	Switching diverter non-extended stem side port
2V	21/28—Cryogenic cast split-body flanged
2W	21/80—Large-bore cryogenic cast split-body flanged (trunnion)
31	3100—Wafer three piece
33	3300—metal seated with secured (bolted in) downstream seat
3L	3100L—Lugged wafer
41	4100—Instrumentation valve with female ends
43	4300—Welded with downstream relief
46	4600—Instrumentation valve with one male and one female connection
50	51/20—Diverter cast flanged unibody
51	5100—Diverter three piece
53	51/18—Diverter bar stock flanged split body
61	6100—Instrumentation valve, multiported
64	6400—Instrumentation valve, forged
65	6500—Instrumentation valve with I-flange
66	6600—Instrumentation valve with double make ends
68	6800—Instrumentation valve with integral lockout, forged
69	6900—Instrumentation valve with integral lockout, cast
71	7100—Swing check, flanged
73	71/31—Swing check, wafer
91	9100—Ball check

End Connections	
BWT	Butt-weld ext. and tube ends <sup>†</sup>
B__	Butt-weld + schedule (B40—Schedule 40)
CPE	Clamped pipe ends
FSE	NPT female thread
FSW	Female socket weld
GRE	Grayloc® ends
MFD	Manifold connection
MLS	Metal seal
MSE	NPT male thread
MST	Straight thread with O-ring
MSW	Male socket weld
MWE	Male weld end
SOE	OD tube end socket weld
SPL	Special
TCE	Triclamp end
TE_	Tube end (K, L, M) socket weld
UNE	Union end
150	ASME 150# flanged RF
15L	150 lap joint flange
15R	Class 150 RTJ
300	ASME 300 flanged RF
30L	300-lbm lap joint flange
30R	Class 300 RTJ
600	ASME 600 flanged RF
60R	Class 600 RTJ
900	ASME 900 flanged RF
005	ASME 1500 flanged RF
05R	Class 1500 RTJ
025	Class 2500

For Mixed Combination of Connections	
0	IREB
1	MSE
2	MSW
3	FSE
4	FSW
5	I-flange
6	BW80
7	BW40
8	BW160
9	I-flange neutral

Example	
1 x 3	MSE x FSE

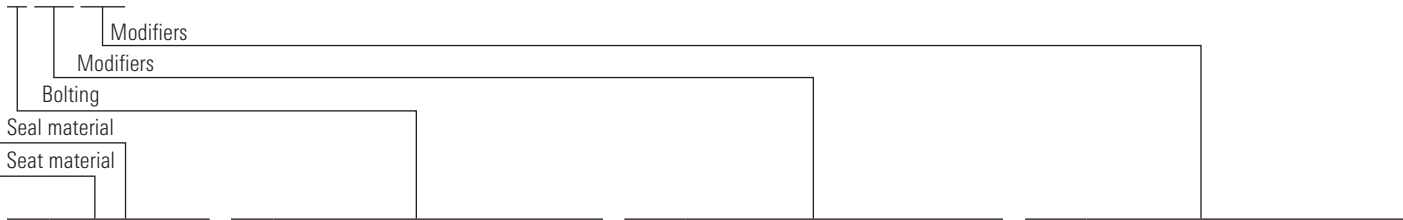
Body and End Material; Ball and Stem <sup>‡</sup> Material	
A2	Alloy 20
AL	Aluminum
BR	Brass
CS	Carbon steel
C5	A105 Carbon steel
D1	Super duplex UNS-32205
D2	Super duplex stainless UNS-32750
DS	Duplex stainless AL6XN
HB	Hastelloy B
HC	Hastelloy C
H3	Hastelloy B-3
H2	Hastelloy C-22
IN	Inconel
IY	Incoloy®
LC	LCB carbon steel
M4	Monel 400
M5	Monel K500
N2	Nickel 200
T2	Titanium Grade 2
T5	Titanium Grade 5
T7	Titanium Grade 7
T12	Titanium Grade 12
TN	Tantalum
ZR	Zirconium
17	17-4 pH stainless steel (SS)
34	304 SS
36	316 SS
37	317 SS
39	Nitronic® 50
42	410 SS
4L	304L SS
6L	316L SS

<sup>‡</sup>Stem blocks are optional if the ball and stem are made from the same material.

<sup>†</sup>Specify OD wall thickness and length.

## Bolting and Modifiers<sup>§</sup>

### OCLVB



Seat and Seal Material	Bolting	Modifiers	Modifiers
A Arlon® 1555 PEEK	B ASTM A193 B7M × A194 7M	O1 90° operation (diverter valve)	MB Boronized surface treatment
B Buna	C ASTM A193 B8 CL2 × A194 Grade 8	O2 180° operation (diverter valve)	MC Chrome-carbide coating
C Cryofil	D Alloy 20	O4 Four seated (diverter valve)	MD Titanium dioxide ceramic coating and tantalum bond layer
D Delrin AF	E ASTM A193 B8 CL1 × A194 Grade 8F	AH Actuator prep. with standard handle	MN Tungsten carbide coating
E EPR	F ASTM A540 B21 × A194 Grade 2H	AI Actuator installed	MT Chromium oxide ceramic coating/ tantalum bond layer
F Thermafil PEEK	G ASTM A320 L7 × A194 Grade 4	AP Prepared for actuation	NE Nonextended
G 15% GF TFE	H Inconel 718	CA Cutaway sample	OH Oval handle
H Graphoil/Graphite	J 410 SS A193 Grade B6	CB Enclosed bolting	OS Stainless steel oval handle
J TFM	K 304L SS	CS Crusher seats	OX Oxygen-cleaned
K CTFE	L Hastelloy B2	CF Cavity filler	PC Phosgene-cleaned
L Vespel®	M Monel 400	CL Chlorine service	PM Panel-mounted
M Metal	N ASTM A320 Grade B8P	EB Extended bonnet	RS Self-relieving seats
N Nylon	Q A193 Grade B8 × ASTM A194 Grade 8	EC Corrosion evaluation	SC Split collar stem
P UHMWPP	W All welded	EE Extended ends	SJ Steam jacket
Q EPDM	0 None	EP Electropolish	SL Spring-loaded 9100
S Stellite®	1 Carbon steel	ES Extended stem	SP Side port 5100
T Virgin TFE	2 300 SS	FD FE bonnet (TFE × graphite)	SR Spring-return handle
U Ultrafil 25	3 ASTM A193 B7 × A194 2H	FE Fugitive emissions bonnet	TR Trunnion
V Viton	4 ASTM A193 B8M × A194 8M	FL Fire lip	VB Vented ball
1 Tefzel®	5 Monel K-500	FS Fire safe	VS Vacuum service
2 Kalrex®	6 Hastelloy C	GO Gear operator	W1 Spiral-wound metal body seal — 316 SS with TFE filler
3 PFA	7 316 SS	GS Grounding spring	W2 Spiral-wound metal body seal — 316 SS with Grafoil filler
4 FEP	8 Titanium Grade 5	HF Hydrofluoric service	W3 Spiral-wound metal body seal — titanium Grade 2 with TFE filler
	9 Hastelloy C-276	HP High pressure	W4 Spiral-wound metal body seal — titanium Grade 2 with Grafoil filler
	Y3 ASTM A320 B8M	LH Locking gear operator	W5 Spiral-wound metal body seal — Hastelloy C with Grafoil filler
		LG Locking handle	
		LO Locking oval handle	
		LR Lantern ring	
		LS Locking stainless steel oval handle	
		LV Lever handle	
		M1 15° control seat	
		M3 30° control seat	
		M4 45° control seat	
		M6 60° control seat	
		M9 90° control seat	
		MZ 120° control seat	

For valves with a mixed combination of end connections, indicate upstream (first) and downstream (second).

All flanged valves, if not to ASME B16.10 face to face, must state face-to-face length; in all cases, all flanged diverter valves must state face-to-face and centerline-to-bottom face dimensions as no ASME specification exists; example: 9 × 4½.

<sup>§</sup> Bolting and modifiers: may have up to 10 characters. If modifier section has more than 10 characters, please contact Cameron.

# TBV Valves



[cameron.slb.com/valves](http://cameron.slb.com/valves)

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