



## Metal Seated Ball Valves

**Engineered Valves for Severe Service  
Reliability with Innovative Process Solutions**

**Severe Series  
Extreme Series  
Shut-Off Class IV, V & VI**



**Automated Metal Seated  
Valves of All Types Shown  
with High Temperature Extension**

Flo-Tite works with customers to design valves tailored to their specific needs. Knowledge of applications, materials and design allows our engineers to find solutions to problems quickly and effectively.

### **Extreme Temperatures, Extreme Pressures and Your Toughest Application Challenges**

- Flanged Ends - ANSI Class  
150, 300, 600, 900, 1500, 2500
- Size 1/2" thru 24 inch
- Floating & Trunnion Types
- On-Off & Modulating Options
- Threaded Ends
- Socket and Butt Weld Ends
- 2250 / 3000 / 6000 PSI Ratings
- Two & Three PC Designs
- 3 & 4 Way Multiport Designs

## Severe Series

Demanding services requiring resistance to abrasion, erosion, corrosion, solids and high temperatures beyond the capabilities of polymer seated ball valves, temperatures up to 800 °F

## Extreme Series

Applications where temperatures exceed 800 °F & up to temperatures as high as 1200 °F. Media build-up, cycling with solids in the line & erosive attack of materials & coatings. Flo-Tite extreme series valves are designed & developed for the most severe services heavy industry has to offer.

## Titan Series

High pressure 3pc body design ball valve  
This series is manufactured to your exact specifications  
Available in ANSI pressure classes 900 and 1500 and 5000 WOG in SW & NPT  
Consult factory for more information on this series



### Corrosion / Erosion Resistance

- Extend the life of metals with a wide selection of surface coatings, available for valve internal / externals. These coatings include Teflon, chrome, electroless nickel, zinc phosphate, tungsten carbide galvanizing & many more options.

### In-line Repairability

- Three-piece valve assembly
- Valve body can be easily removed while end connections remain in-line
- Allows valve body to be tested after repair, prior to insertion back in the pipe line

### Ball & Seats

- Mate-lapped for 100% sealing contact
- Ensures absolute shutoff per ANSI classification
- Corrosion resistant
- Seats are protected from flow in open / closed position
- Seats are available as field replaceable sets

### Body Gaskets

- Encapsulated spiral wound body seals guarantee zero leaks to the surrounding area.
- Lowers contact stresses

### Seat Spring

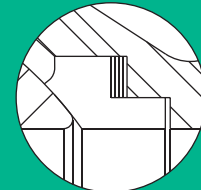
- Assisted by line pressure, provides a constant mechanical force on ball against seat to maintain a tight seal

### Quarter-turn, Non-rising Stem

- Live loaded expanded graphite stem seals guarantees zero leaks and low emissions
- Quick open / close operation, compact design

## Scraper Seat Design

Flo-Tite's scraper seat is ideal for most difficult applications where build-up of damaging fluid deposit may occur on the ball face. Overtime, this occurrence to the critical smooth ball surface will cause the ball to become rough and dull rendering the valve inoperative. This problem is most common in pulp making recovery in white, black & green liquors.



## Standards and Specifications

Valves covered in this bulletin are available to conform to the following industry standards and specifications

All valves are manufactured to ISO 9001 quality standards.

|                    |  |
|--------------------|--|
| WW-V-35C           | Federal Specification: Valve, Ball   |
| ANSI/ASME B16.10   | Face-to-Face / End-to-End Dimensions of Ferrous Valves                                 |
| ANSI/ASME B16.5    | Steel Pipe Flanges and Flange Fittings   |
| ANSI/ASME B16.34   | Steel Valves - Flanged and Buttwelded End  |
| ANSI/ASME B31.1    | Power Piping   |
| ANSI/ASME B31.3    | Chemical Plant & Petroleum Refinery Piping   |
| ANSI/FCI 70-2-1976 | For Control Valve Leakage  |
| BS 6755, Part 2    | Testing of Valves - Specification for Fire Type Testing                                |
| ISO 5752:1982      | Metal Valves for use in Flanged Piping Systems   |
| ISA 75.02          | Valve Sizing Coefficient Cv, Piping Geometry Factor Fp and Pressure Drop Limitation XT |
| ISA 575.19         | Hydrostatic Testing of Control Valves  |
| ISO 5211           | Dimensions for Attachment of Actuators/Gear Boxes to Valves (ISO Mounting)             |
| MSS-SP-25          | Standard Marking Systems for Valves  |
| MSS SP-55          | Quality Standards for Steel Castings   |

|              |  |
|--------------|--|
| MSS-SP-6     | Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings    |
| MSS-SP-44    | Steel Pipe Line Flanges  |
| MSS-SP-61    | Pressure Testing of Steel Valves   |
| MSS-SP-72    | Flanged or Butt and Weld End Ball Valves Having Full or Reduced Bores for General Liquid and Gas Service |
| MSS-SP-96    | Terminology for Valves and Fittings  |
| NACE MR01-75 | Sulfide Stress Cracking Resistant Materials for Oilfield Equipment.                                      |

## Optional Standards & Specification

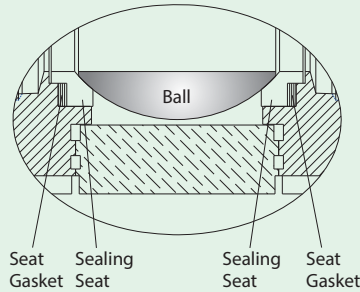
|             |   |
|-------------|---|
| API 608     | Metal Ball valves Used in On-Off Service that have Buttwelded or Flanged Ends for Size 1/2"NPS - 12" NPS                            |
| API 6D      | Specifications for Pipeline Valves  |
| API 598     | Valve Inspection and Testing  |
| MSS-SP-93   | Quality Standard for Steel Casting and Forging for Valves, Flanges and Fittings and Other Piping Components-Liquid Penetrant Method |
| ISO 15848-1 | Industrial valves - Measurement, test and qualification procedures for fugitive emissions   |

## G Seat - Graphite Sealed Seat (B1)

A series of Graphite seal rings behind the metal seat, coupled with a Graphite outer diameter seat seal, prevent media from building up behind the seat. The rings also allow for expansion of the internal valve components in high temperature applications.

**Application:** Steam, Abrasion, High Temperatures, Fine Solids  
**Shut-Off:** Class V, VI

*Bi-Directional Flow*

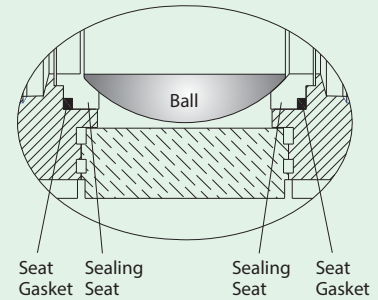


## O Seat - O-Ring Sealed Seat (B2)

A double seal design providing both spring loading and excellent sealing capabilities. There is no area for media to build up behind the seat, which prevents the valve from locking up.

**Temperature Range:** -150 to 500 deg F  
**Application:** Steam, Abrasion, Low Pressure Differentials, Fine Solids, Emulsions  
**Shut-Off:** Class IV, Class V, Class VI

*Bi-Directional Flow*

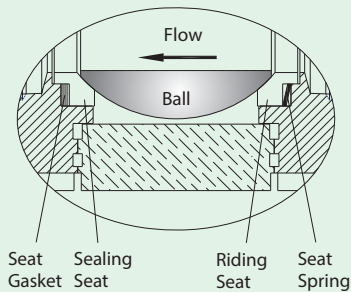


## P Seat - Spring Loaded (B3)

For unidirectional applications. The sealing seat is available as a separate seat ring for repairability, or integral with the tailpiece for high temperature applications. The spring seat OD seal prevents media from building up between the spring and the back of the seat.

**Application:** Steam, Low Pressure Differentials, High Temperatures  
**Shut-Off:** Class V, Class VI  
 Preferred automated design

*Uni-Directional Flow*



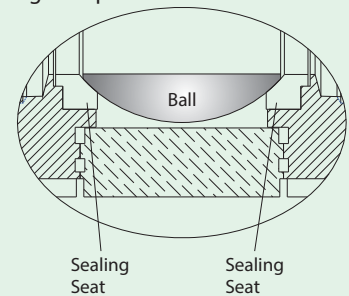
## R Seat - Replaceable Seat Design (B4)

This seat design is an ideal choice for that application that exceeds the requirements for the high temperature soft seated ball valves.

All valve balls are upgraded to assure a precise spherical finish. If needed, this valve is considered as drop-in replacement of the valve seat and can be rebuilt in the field. No special machining is required.

**Temperature Range:** 400 to 650 deg F  
**Application:** Steam, Low Pressure Differentials, High Temperatures  
**Shut-Off:** Class IV

*Bi-Directional Flow*

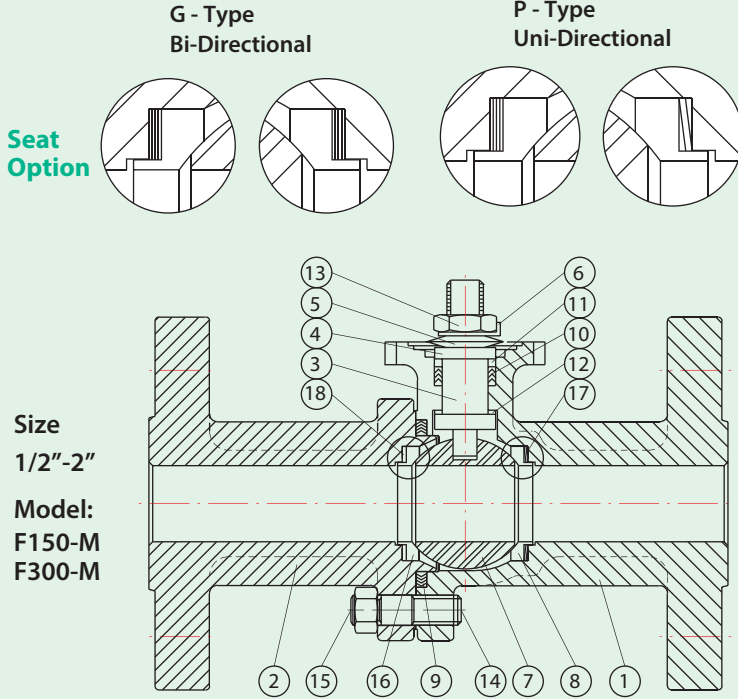


**High-Temperature Metal-Seated Ball Valves are well suited for a variety of demanding services where high-temperature and abrasive solids are present**

## Features:

- The spring seat design provides freedom for thermal expansion of the ball without jamming, even at extreme temperatures. Proven in qualification tests and field operation to be excellent, even for the toughest applications on slurry service with solids.
- 17-4PH internal entry stem provides extra strength and durability in severe services.
- A solid, 316 stainless steel ball with hard chrome plating provides durability in severe applications while maintaining smooth, low turbulence flow.
- Flo-Tite's non-magnetic cobalt based superalloy maintains good strength up to 2150°F. AMS 5759 provides minimum yield strength of 45,000 psi at room temperature. This material maintains good oxidation resistance up to 1900°F. Unique ability to resist corrosion in very severe environments. Highly resistant to hydrochloric acid, nitric acid and wet chlorine (user to exercise care in its selection at certain concentrations and temperatures)

# Metal Seated Flanged End Connection Severe Series / Full Port Technical Submittal

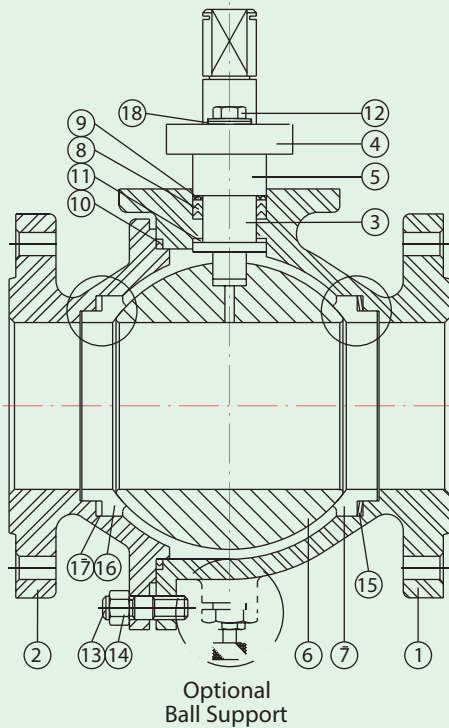


## Standard Bill of Materials

| NO. | Name              | Materials                          |               |
|-----|-------------------|------------------------------------|---------------|
|     |                   | Stainless Steel                    | Carbon Steel  |
| 1   | Body              | ASTM A351 CF8M                     | ASTM A216 WCB |
| 2   | Cap               | ASTM A351 CF8M                     | ASTM A216 WCB |
| 3   | Stem              | SS316 / 17-4PH / A286              |               |
| 4   | Packing Follower  | SS304                              |               |
| 5   | Belleville Washer | SS301                              |               |
| 6   | Lock Washer       | SS304                              |               |
| 7   | Ball              | SS316 Chrome Plated                |               |
| 8   | Riding Seat       | SS316 w / Stellite / 17-4 PH       |               |
| 9   | Gasket            | Spiral Wound Wire SS316 / Graphite |               |
| 10  | Stem Packing      | TFM / Graphite                     |               |
| 11  | Packing Protector | 50%PTFE+SS316                      |               |
| 12  | Thrust Washer     | Nitronic 60                        |               |
| 13  | Thin Nut          | SS304                              |               |
| 14  | Body Stud         | ASTM A193 B8                       | ASTM A193 B7  |
| 15  | Body Nut          | ASTM A194 Gr.8                     | ASTM A194 2H  |
| 16  | Sealing Seat      | SS316 w / Stellite / 17-4 PH       |               |
| 17  | Spring            | 17-4PH / Inconel / A286            |               |
| 18  | Seat Gasket       | TFM / Graphite                     |               |

**Size**  
2 1/2"-12"

**Model:**  
F150-M  
F300-M

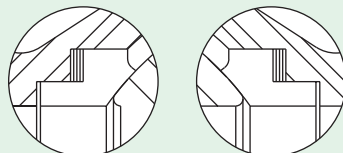


## Standard Bill of Materials

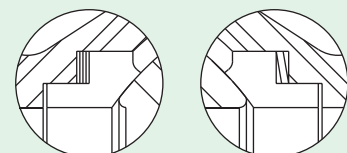
| NO. | Name              | Materials                          |               |
|-----|-------------------|------------------------------------|---------------|
|     |                   | Stainless Steel                    | Carbon Steel  |
| 1   | Body              | ASTM A351 CF8M                     | ASTM A216 WCB |
| 2   | Cap               | ASTM A351 CF8M                     | ASTM A216 WCB |
| 3   | Stem              | SS316 / 17-4PH / A286              |               |
| 4   | Packing Gland     | ASTM A351 CF8                      |               |
| 5   | Packing Follower  | SS304                              |               |
| 6   | Ball              | SS316 Chrome Plated                |               |
| 7   | Riding Seat       | SS316 w / Stellite / 17-4 PH       |               |
| 8   | Stem Packing      | TFM / Graphite                     |               |
| 9   | Packing Protector | 50%PTFE+SS316                      |               |
| 10  | Gasket            | Spiral Wound Wire SS316 / Graphite |               |
| 11  | Thrust Washer     | Nitronic 60                        |               |
| 12  | Gland Bolt        | SS304                              | Steel         |
| 13  | Body Stud         | ASTM A193 B8                       | ASTM A193 B7  |
| 14  | Body Nut          | ASTM A194 Gr.8                     | ASTM A194 2H  |
| 15  | Spring            | 17-4PH / Inconel / A286            |               |
| 16  | Sealing Seat      | SS316 w / Stellite / 17-4 PH       |               |
| 17  | Seat Gasket       | TFM / Graphite                     |               |
| 18  | Belleville Washer | SS301                              |               |

**Seat Option**

**G - Type  
Bi-Directional**



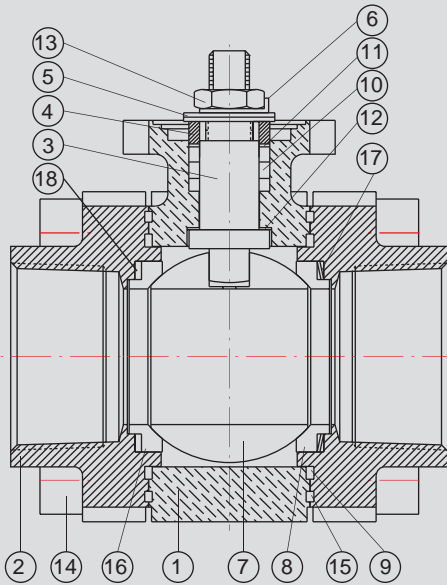
**P - Type  
Uni-Directional**



# Metal Seated Threaded & Welded Connections

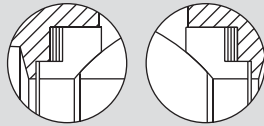
## Technical Submittal for Tri-pro Serise Valves

Model  
 Size 1/2"-2" HPF51/52/53-M  
 HPF41/42/43-M

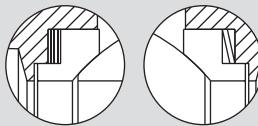


### Seat Option

G - Type  
 Bi-Directional



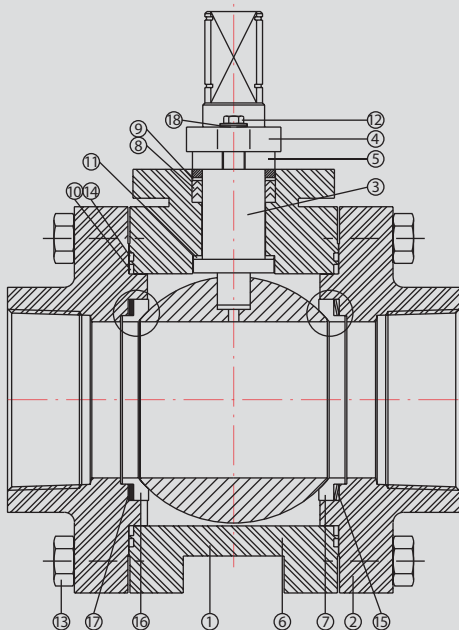
P - Type  
 Uni-Directional



### Standard Bill of Materials

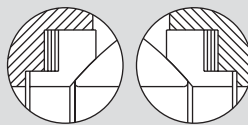
| NO. | Name              | Materials                   |               |
|-----|-------------------|-----------------------------|---------------|
|     |                   | Stainless Steel             | Carbon Steel  |
| 1   | Body              | ASTM A351 CF8M              | ASTM A216 WCB |
| 2   | Cap               | ASTM A351 CF8M              | ASTM A216 WCB |
| 3   | Stem              | SS316 / 17-4PH / A286       |               |
| 4   | Packing Follower  | SS304                       |               |
| 5   | Belleville Washer | SS301                       |               |
| 6   | Lock Washer       | SS304                       |               |
| 7   | Ball              | SS316 Chrome Plated         |               |
| 8   | Riding Seat       | SS316 w/ Stellite/17-4 PH   |               |
| 9   | Gasket, Inner     | Graphite                    |               |
| 10  | Stem Packing      | TFM / Graphite              |               |
| 11  | Packing Protector | 50%PTFE+SS316               |               |
| 12  | Thrust Washer     | Nitronic 60                 |               |
| 13  | Thin Nut          | SS304                       |               |
| 14  | Body Bolt         | ASTM A193 B8                | ASTM A193 B7  |
| 15  | Gasket, Outer     | Graphite                    |               |
| 16  | Sealing Seat      | SS316 w/ Stellite / 17-4 PH |               |
| 17  | Spring            | 17-4PH / Inconel / A286     |               |
| 18  | Seat Gasket       | TFM / Graphite              |               |

Model:  
 Size 2 1/2"-4" HPF51/52/53-M  
 HPF41/42/43-M

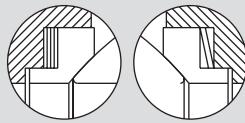


### Seat Option

G - Type  
 Bi-Directional



P - Type  
 Uni-Directional



### Standard Bill of Materials

| NO. | Name              | Materials                   |               |
|-----|-------------------|-----------------------------|---------------|
|     |                   | Stainless Steel             | Carbon Steel  |
| 1   | Body              | ASTM A351 CF8M              | ASTM A216 WCB |
| 2   | Cap               | ASTM A351 CF8M              | ASTM A216 WCB |
| 3   | Stem              | SS316 / 17-4PH / A286       |               |
| 4   | Packing Gland     | ASTM A351 CF8               |               |
| 5   | Packing Follower  | SS304                       |               |
| 6   | Ball              | SS316 Chrome Plated         |               |
| 7   | Riding Seat       | SS316 w/ Stellite / 17-4 PH |               |
| 8   | Stem Packing      | TFM / Graphite              |               |
| 9   | Packing Protector | 50%PTFE+SS316               |               |
| 10  | Gasket, Inner     | Graphite                    |               |
| 11  | Thrust Washer     | Nitronic 60                 |               |
| 12  | Gland Bolt        | SS304                       | Steel         |
| 13  | Body Stud         | ASTM A193 B8                | ASTM A193 B7  |
| 14  | Gasket, Outer     | Graphite                    |               |
| 15  | Spring            | 17-4PH / Inconel / A286     |               |
| 16  | Sealing Seat      | SS316 w/ Stellite / 17-4 PH |               |
| 17  | Seat Gasket       | TFM / Graphite              |               |
| 18  | Belleville Washer | SS301                       |               |

## Flo-Tite's Unique Design Options

Unique problem solving ball designs eliminate most common problems found in the typical ball valve.

### Class VI Shut - Off



Flo-Tite's unique escaping ball design relieves ball-seat contact during the 90-degree rotation. Full ball seat contact is made at the beginning and at the end of the 90-degree stroke. This reduced contact results in longer life for the class VI shut-off with lower operating torques and improved overall performance.

The escaping ball design is an exceptional design for metal seated valves when class VI shut-off is required.

Flo-Tite's Media Cap unit provides an added safety feature with the addition of a secondary set of graphite stem packing with a live loaded design using Belleville washers that automatically compensate for temperature and pressure fluctuation, maintaining a leak proof seal for an extended cycle life. This unit's focus is on safety with duplicate stem seals and added height which helps distance and protect the valve operator from dangerous high temperature heat.



**Redundant Seals  
Assuring Added  
Safety**



Control ball or slotted V-ports 15, 30, 60, 90 deg and custom designed balls.

### Accurate Flow Control

Flo-Tite offers modulating V-port control valves. The V-ball is characterized to meet all custom flow requirements.

From simple on-off to modulating control applications See tech bulletin page 120.

## Ball Surface Treatments and Coatings

Choosing the right hard surface technique for ball coatings is key in overcoming a wide variety of application problems. These surfaces must resist high temperature wear, galling and corrosion, in addition to maintaining total sealability.

**Hard Chrome Plating** is very hard electroplate exceeding Rockwell C-67. Together with its low coefficient of friction and its self-lubricating properties. Hard Chrome is an ideal material for any wear surfaces. It can be used in applications up to 2000 °F with no ill effects.

**Nitriding** is a surface treatment technique that significantly increases the hardness and wear resistance of austenitic 300 series stainless steel, by thermochemical diffusion.

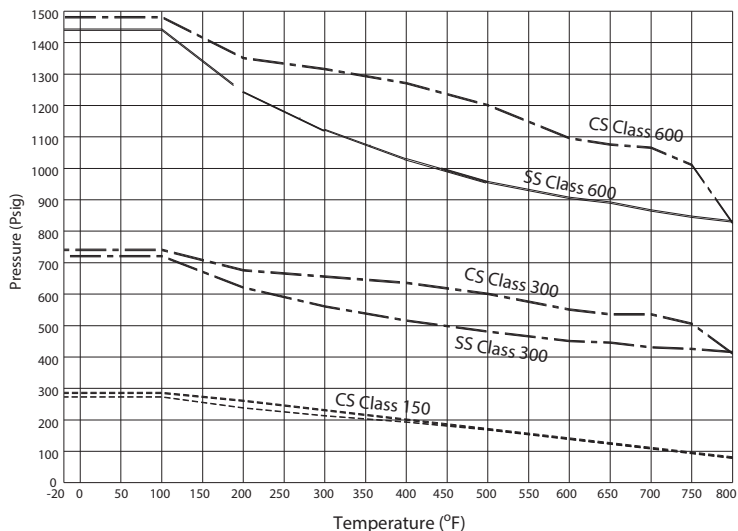
**Tungsten Carbide** with a cobalt binder coating applied by HVOF techniques similar to Cr3C2. WC-Co coating applied mainly to 400 series martensitic stainless steel results with micro-hardness as high as 72 Rc. This coating resists cryogenic temperature down to -320 °F (-196 °C) and high temperatures up to 1000 °F (538 °C). WC-Co is a wear resistance and dense coating with chemical resistance to sulphur environment on Nickel based alloy.

**Stellite**, A cobalt-based stellite coating provides excellent mechanical wear resistance, with good corrosion resistance at temperatures up to 1000 °F (538 °C).

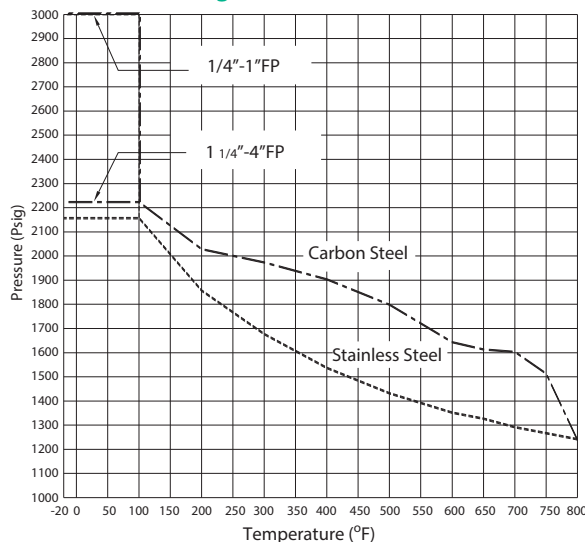
# Design & Technical Data

## Pressure Temperature Chart

### Flanged End Designs



### Three Piece Designs



### Hydrostatic Testing - psi [bar]

| Class | Material        | Shell      | Seat       |
|-------|-----------------|------------|------------|
| 150   | Carbon Steel    | 450 [31]   | 320 [22]   |
|       | Stainless Steel | 425 [29]   | 315 [22]   |
| 300   | Carbon Steel    | 1125 [78]  | 820 [57]   |
|       | Stainless Steel | 1100 [76]  | 800 [55]   |
| 600   | Carbon Steel    | 2225 [153] | 1630 [112] |
|       | Stainless Steel | 2175 [150] | 1590 [110] |

### Hydrostatic Testing - psi [bar]

| Class       | Material        | Shell      | Seat       |
|-------------|-----------------|------------|------------|
| 1/4\"-1\"   | Carbon Steel    | 4500 [310] | 3300 [228] |
|             | Stainless Steel | 4500 [310] | 3300 [228] |
| 1 1/4\"-4\" | Carbon Steel    | 3350 [231] | 2450 [167] |
|             | Stainless Steel | 3250 [224] | 2380 [164] |

For 6000psi valve shell and seat test pressure, consult factory

Note: WCB carbon steel valves limited to -20°F [-29°C]; Higher Pressures/Temperatures available with optional seat design

### Unconditional Firesafe Provision & Inherent electrical continuity

While metal seats are extremely heat resistant, other sealing components such as packing and gaskets are made of heat resistant flexible graphite. No part of the valve will be affected by extraordinary heated environments.

The provision of an anti-static device is not required because of inter-component electric conductivity.

### Allowable Industry Leakage Standard

Flo-Tite valves are designed to meet ANSI/FCI requirements, meeting a shut-off class of IV, V or VI

| CODE               | Class or Seat Type | Test Fluid      | Test Pressure                                     | Allowed Pressure                     | Notes   |
|--------------------|--------------------|-----------------|---|--------------------------------------|---|
| ANSI/FCI 70-2-1976 | I                  |                 |   |                                      | No Tests performed by agreement between user & Mfg. |
|                    | II                 | Water or air    | Lesser of 45-60 psig or max. Pressured difference | 0.5% of full rated valve capacity    | Pressure and flow measured within - 10%             |
|                    | III                | Water or air    | Lesser of 45-60 psig or max. Pressured difference | 0.1% of full rated valve capacity    | Pressure and flow measured within - 10%             |
|                    | IV                 | Water or air    | Lesser of 45-60 psig or max. Pressured difference | 0.01% of full rated valve capacity   | Pressure and flow measured within - 10%             |
|                    | V                  | Water           | Max. difference Pressure or by agreement          | 5x10 ml per min per in. dia. Per psi | Pressure and flow measured within - 10%             |
|                    | VI                 | Air or nitrogen | Lesser of 45-60 psig or max. Pressured difference | Per B16,104 table to 3\" nom. dia    | Approx. 6 or less bubbles per min. per in of dia.   |

**Class V:** The most frequently specified leakage class is class V, and the Flo-Tite standard.

**Class VI:** is frequently misinterpreted as "bubble-tight". Actually, a certain amount of leakage is allowed. Coincidentally, this leakage often is measured by the number of bubbles of air that escapes per minute within the established test guidelines.

The bubble-tight term is normally associated with resilient seated valves.

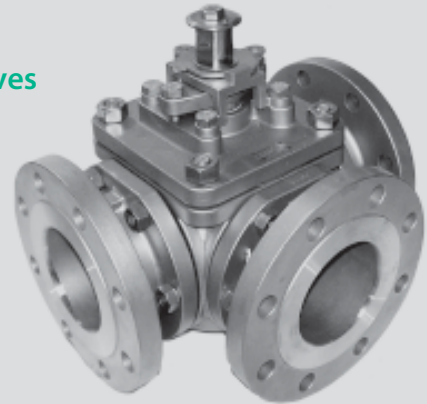
## Valve Automation

Flo-Tite is a specialist in valve automation systems offering all types of pneumatic and electric actuators



## Multiported - Valves

Flo-Tite offers a wide selection of metal seated 3 & 4 way valve designs to simplify piping systems.



## Trunnion Design Valves

Flo-Tite also offers its metal seated options in our TM - Series  
Size range up to 48"  
All ANSI pressure classes  
Wide selection of body materials and designs



## Quotation Information

When quoting metal seated valves, it is very important that we have the following information:

- Valve Type
- Pressure Class
- Materials
- Line Pressure
- Temperature
- Media
- Flow Direction
- Class Shut-Off Required
- Tag Required
- Flow Arrow Required
- Cycle frequency

## Applications

### Power Generation

- Control Valve Isolation
- Bottom Ash Isolation
- Superheater Spray
- Boiler Feed Pump
- Main Steam Supply
- Main Boiler Drain

### Refining

- Coal Slurry Handling
- Heavy Oil Units
- Hydrogen Isolation
- Coker - Isolation
- Catalyst Slurry
- Hydrotreating Units

Metal seated valves are ideal for applications with high velocity and high pressure drops.

**Technical information such as dimensions, weights, Cv and assembly exploded views Can be found in our standard catalog brochure for all valve series**

*Flanged End Tech Bulletin Page 58*

*3PC Tri-Pro Tech Bulletin Page 51*

*3 Way Multiport Bulletin Page 90*



**Flo-Tite, Inc.**  
4815 W 5th St.  
Lumberton, NC 28358

P.O. Box 1293  
Lumberton, NC 28359  
Website: [www.flotite.com](http://www.flotite.com)

Tel: (910) 738-8904  
Fax: (910) 738-9112  
E-mail: [flotite@flotite.com](mailto:flotite@flotite.com)