

# Ball Valve Product Overview

KEYSTONE



# Dual Pak Core Technology



Vari-V Control Valve



FM Approved Valve



Cryogenic Valve



Metal Seated Valve



3-way Diverter Valve

At the heart of every Keystone Ball Valve lies our Dual Pak core technology. Each configuration starts with a Keystone Dual Pak Ball Valve, and by adding or removing optional components, several applications can be achieved with minimal setup time, delivering extraordinary results.



Block and Bleed Valve

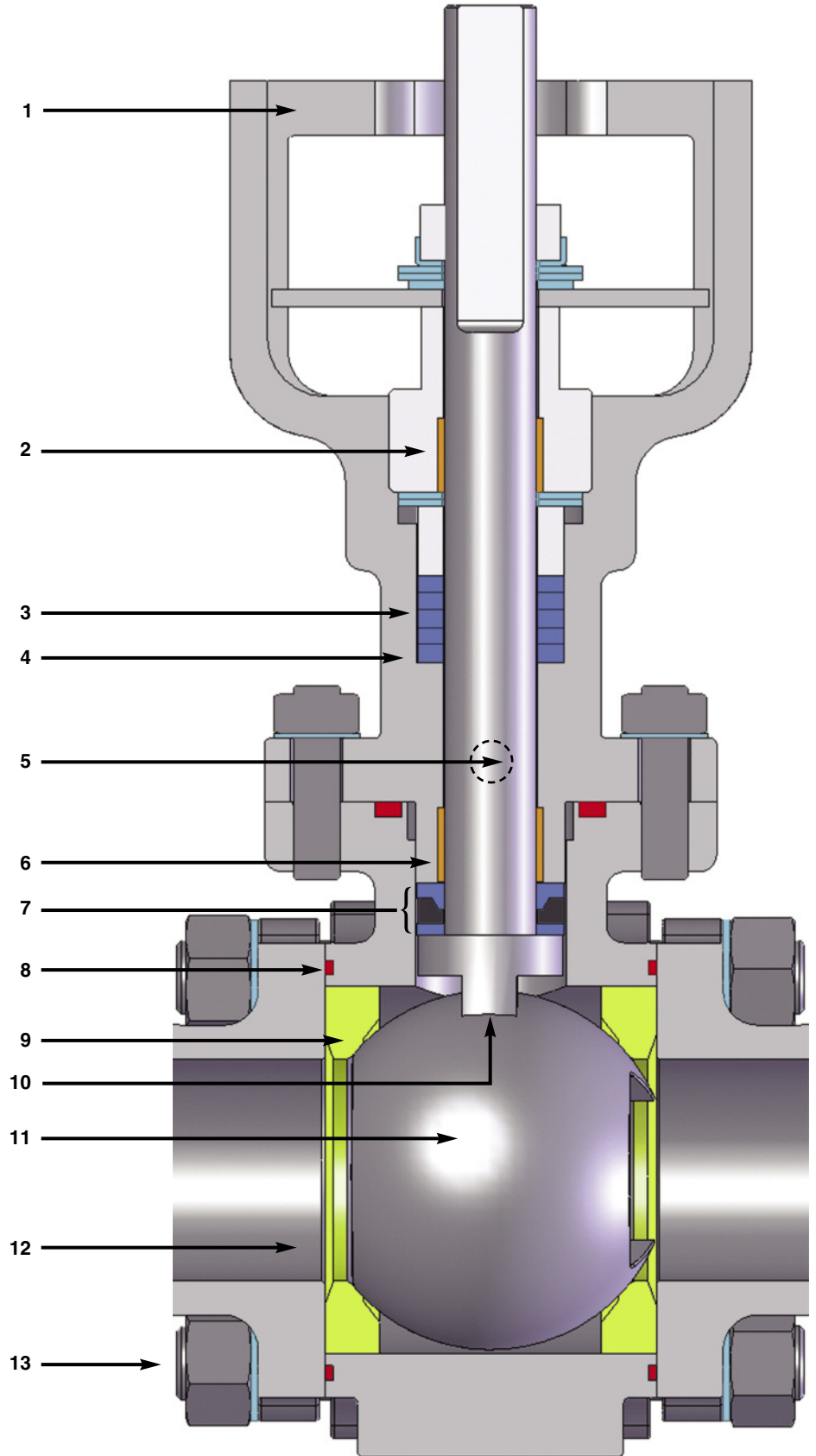


Keystone Dual Pak Ball Valve

# Dual Pak Core System Features

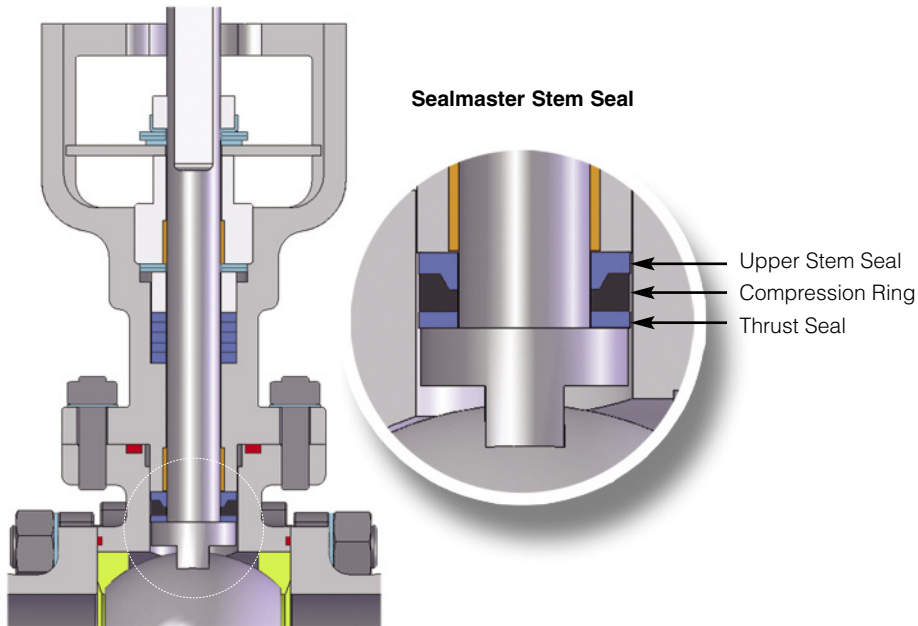
## Dual Pak System Cutaway

1. Clearview Mounting Pad.
2. Upper stem guide.
3. Independently live loaded upper packing.
4. Extended bonnet for insulation.
5. Optional fugitive emission port (not visible).
6. Lower stem guide.
7. Independently live loaded lower packing (Sealmaster thrust seal).
8. Fully encapsulated end cap seals.
9. Wide variety of "soft" seats.
10. Fully grounded stem, ball and body.
11. Complete range of body and trim materials (including high alloys).
12. Multiple end connections (including flanged, welded, threaded, sanitary or customer specified).
13. Live loaded body bolts.



# Dual Pak Core System Features

## Stem Sealing System



The Dual Pak valve has the most advanced stem sealing system on the market, and is designed to eliminate stem leaks. It has two sets of packing: Graphoil® or Chevron Teflon® at the top, and the patented Sealmaster on the bottom. Both sets are “live loaded” for longer life, and are independently adjustable. The Dual Pak also has a pair of stem guides which hold the stem concentric to the ball and prevent side loading on the packing.

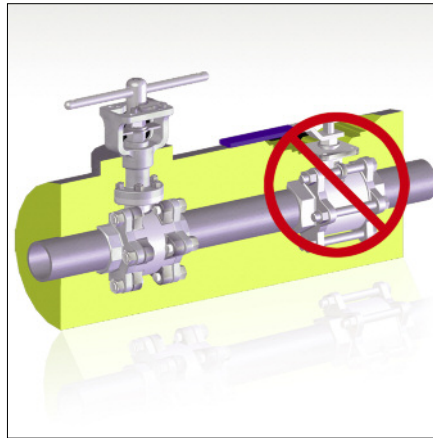
The Sealmaster stem seal is a patented stem seal. It is comprised of three parts; an upper stem seal, compression ring and a thrust seal. When the Sealmaster is tightened, the compression ring forces the upper stem seal into the stem and creates a seal between the stem and body. The Sealmaster stem seal can be retightened to recommended torques.

## Clearview Mounting Pad



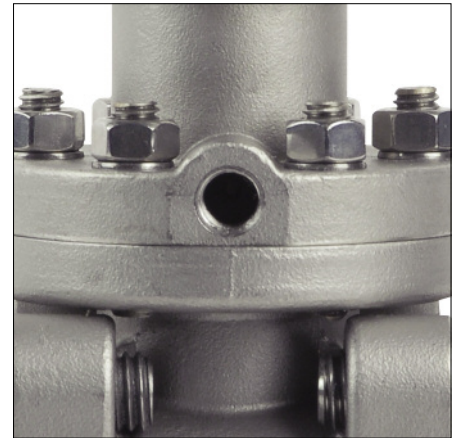
The clearview mounting pad is a patented design that combines a cast bracket with an ISO 5211 mounting pad. The pad is raised and open, keeping the stem flats visible, and the packing adjustments accessible without removing the actuator or insulation. This design also keeps the actuator away from elevated process conditions and protects it from excessive heat or cold.

## Extended Bonnet



The extended bonnet is ideal for insulated lines. There is a minimum of 2" between the top of the flange and bottom of the clearview mounting pad. Even with insulation in place, the stem flats are visible, packing adjustments are accessible, and the actuator is raised away from elevated process temperatures, preventing damage to the actuator seals.

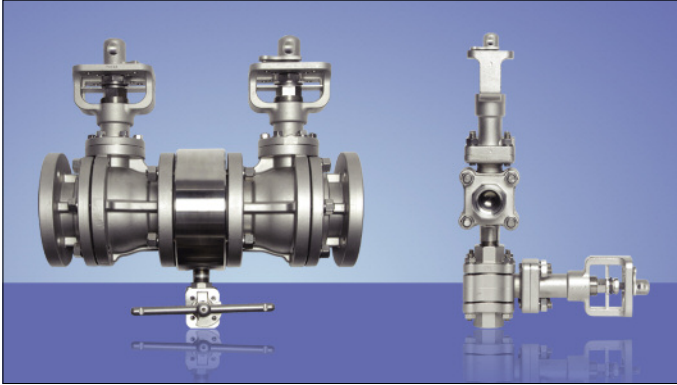
## Lethal Services



The fugitive emissions port is located between the Sealmaster and the upper packing. If leakage occurs past the Sealmaster, the upper packing is designed to still contain the leak. For lethal applications, the fugitive emissions port can be purged with an inert gas. It is very important that the purge pressure is higher than the process pressure because this will prevent the process media from escaping.



## Block and Bleed Valve



We offer three styles of block and bleed valves:

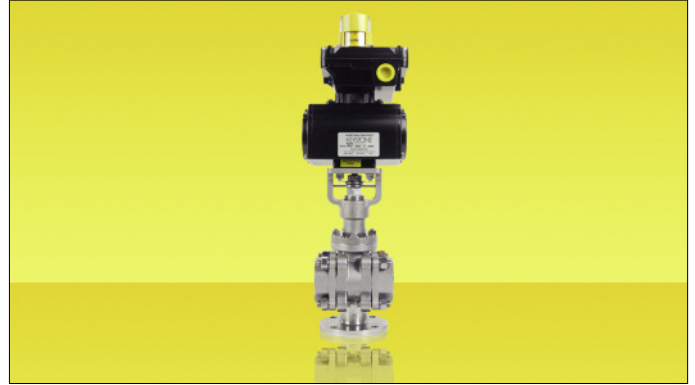
- Single block and bleed with live loaded seats (one valve, two seats, and a bleed valve).
- Double block and bleed (two valves with a spacer between them and a bleed valve).
- Double block and bleed in a single body.

## FM Approved Valves



The Keystone ball valve line is FM approved and is available with a wide selection of FM approved actuators, limit switches and solenoids, including Kinetrol, Asco, TopWorx®, and Gosco. FM configurations range from 1/2" to 8", provide bubble tight shut-off, and are available in soft or metal seats.

## 3-Way Diverter Valves



Our quarter turn 3-way diverter valves are bottom entry with flow to the left or right ports. We offer a "Single L Port" ball for 180° applications where there is no mix of the media between the two ports, and a "Double-L Port" ball for 90° applications where there will be a mix between the ports. The seats are live loaded so that they seal in both directions.

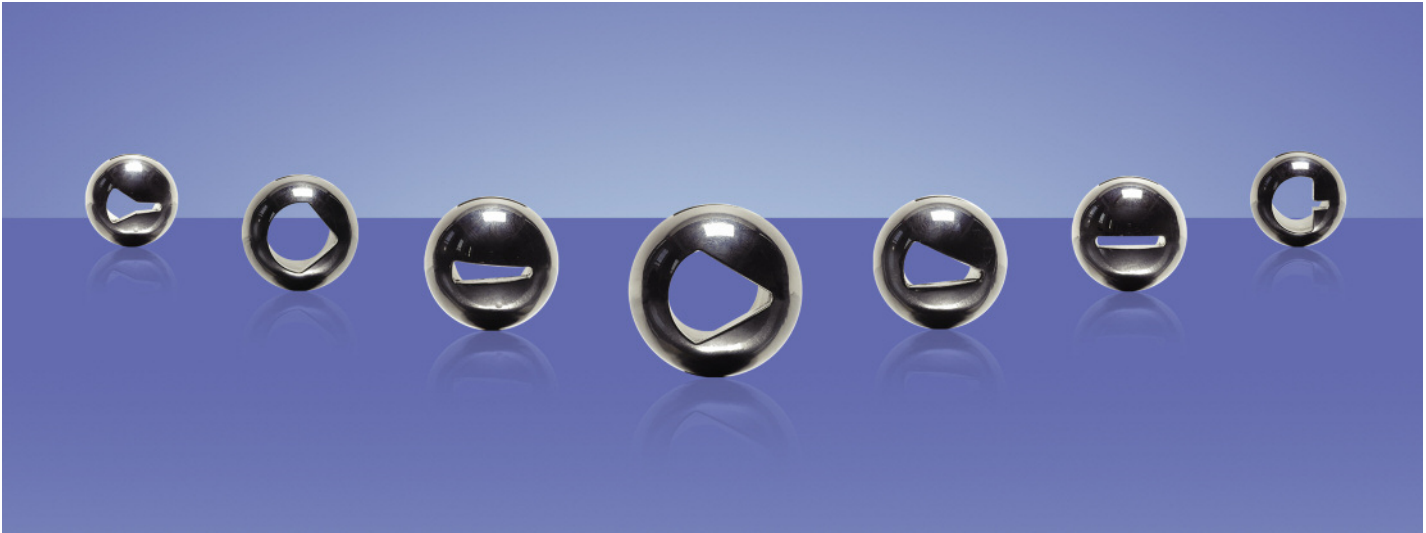
## Cryogenic Valves



Our cryogenic valves have a minimum 12" extension to protect the actuator/handle from ice ball build up. A retrofit kit consisting of a replacement stem, bonnet and packing, pre-torqued and tested in the factory is available for hassle free maintenance. We offer oxygen cleaning and trim options for -270°F [-450°C].

# Vari-V Control Valves

## Vari-V Balls



At the heart of every Keystone control valve is the Vari-V ball. The profile of the V ball determines the flow characteristic of the valve and can be changed to suit the application. The most common V balls are 10°, 30°, 60° and 90°, but

other profiles are readily available. The Linear V is a slot in the ball that can be machined for precise flow requirements. The Filler V is used when you need maximum flow for filling and then precise flow to accurately control

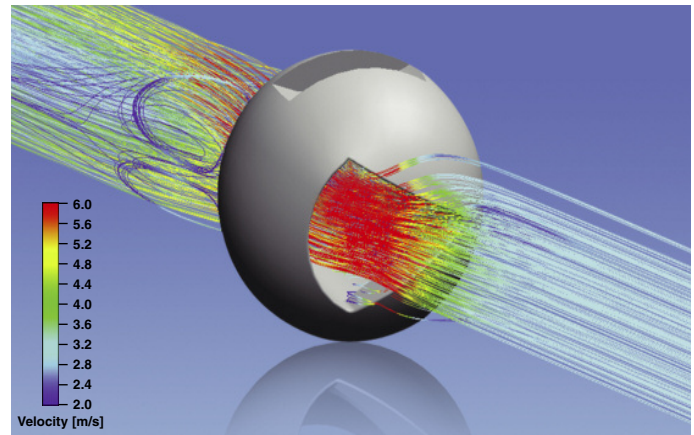
the levels. The High Turndown V maximizes flow in the open position with fine control when the valve is partially closed. The transition between high flow and fine control with the Vari-V is very smooth.

## Custom Vari-V Balls

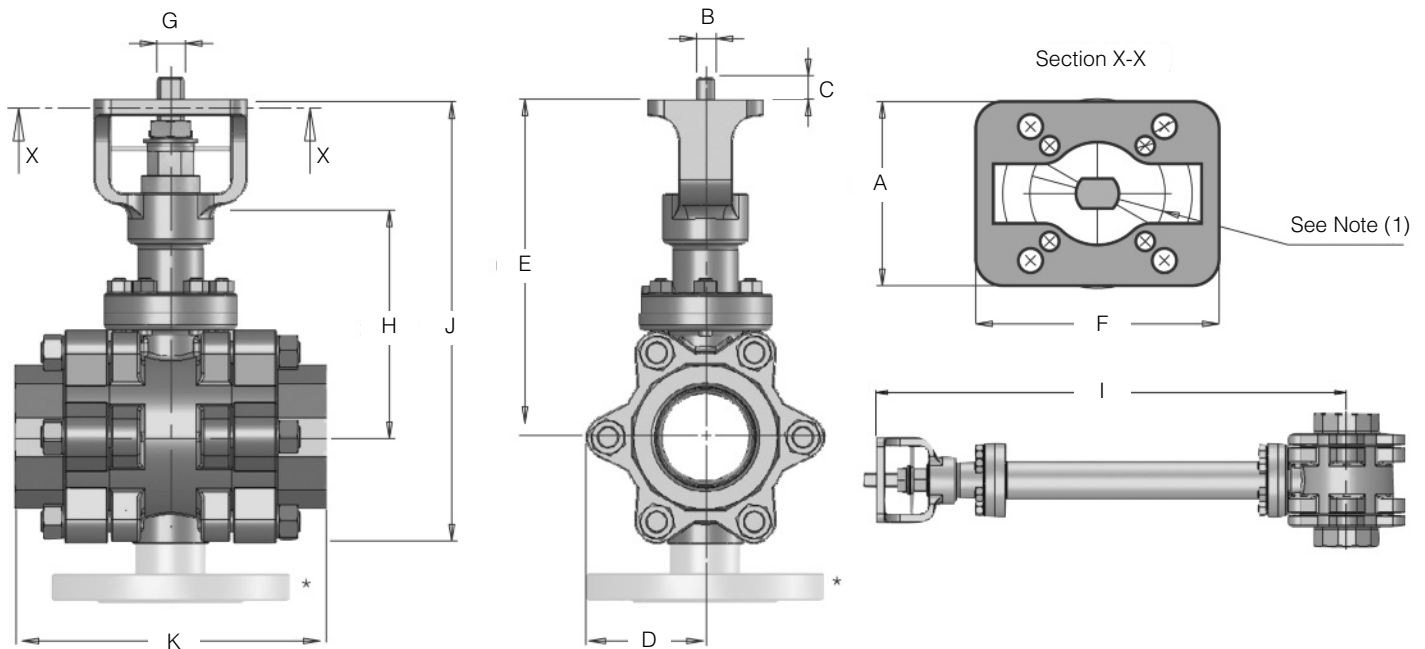


Custom V balls are available for applications that need specific flow requirements that can not be met with the standard V balls. Using Computational Fluid Dynamics (CFD), we can create a V ball with a specific profile to fit any application. Anti-cavitation trim is also available.

## CFD Analysis



Computational Fluid Dynamics (CFD) is used to calculate the flow through the trim of a valve. It determines locations of high velocity and high flow, and assists in trim engineering for specific applications where velocities need to be controlled. CFD is also used to determine the flow coefficient ( $C_v$ ) of Keystone Vari-V balls and aids in designing them to custom specifications.



\* Please contact your sales representative for up-to-date 3-way diverter valve and split body dimensions.

## 3-Piece Overall Dimensions (inches)

| Valve Size  | A    | B    | C    | D    | E     | F    | G    | H     | I     | J     | NPT  | ISO 5211 |       | Valve Weight |             |
|-------------|------|------|------|------|-------|------|------|-------|-------|-------|------|----------|-------|--------------|-------------|
|             |      |      |      |      |       |      |      |       |       |       |      | K 150#   | 300#  |              | MTG Pattern |
| 1/2"        | 1.88 | 0.26 | 0.39 | 1.75 | 5.77  | 2.36 | 0.38 | 3.88  | 17.58 | 7.52  | 3.27 | 4.25     | 5.50  | F04          | 3.7         |
| 3/4" S.P.   | 1.88 | 0.26 | 0.39 | 1.94 | 5.77  | 2.36 | 0.38 | 3.88  | 17.58 | 7.71  | 3.79 | 4.61     | 6.00  | F04          | 4.3         |
| 3/4"        | 1.88 | 0.26 | 0.39 | 1.94 | 5.90  | 2.36 | 0.38 | 4.00  | 17.71 | 7.84  | 3.79 | 4.61     | 6.00  | F04          | 5.6         |
| 1" S.P.     | 1.88 | 0.26 | 0.39 | 2.13 | 5.90  | 2.36 | 0.38 | 4.00  | 17.71 | 8.03  | 4.31 | 5.00     | 6.50  | F04          | 5.8         |
| 1"          | 2.20 | 0.34 | 0.45 | 2.13 | 6.26  | 3.22 | 0.50 | 4.17  | 18.07 | 8.39  | 4.31 | 5.00     | 6.50  | F05          | 7.5         |
| 1 1/4" S.P. | 2.20 | 0.34 | 0.45 | 2.31 | 6.26  | 3.22 | 0.50 | 4.17  | 18.07 | 8.57  | 4.60 | 5.50     | 7.00  | F05          | 7.5         |
| 1 1/4"      | 2.20 | 0.34 | 0.45 | 2.31 | 6.44  | 3.22 | 0.50 | 4.35  | 18.25 | 8.75  | 4.60 | 5.50     | 7.00  | F05          | 7.5         |
| 1 1/2" S.P. | 2.20 | 0.34 | 0.45 | 2.50 | 6.44  | 3.22 | 0.50 | 4.35  | 18.25 | 8.94  | 5.07 | 6.50     | 7.50  | F05          | 7.5         |
| 1 1/2"      | 2.68 | 0.44 | 0.51 | 2.50 | 7.40  | 3.54 | 0.62 | 5.00  | 19.21 | 9.90  | 5.07 | 6.50     | 7.50  | F05/F07      | 13.9        |
| 2" S.P.     | 2.68 | 0.44 | 0.51 | 3.00 | 7.40  | 3.54 | 0.62 | 5.00  | 19.21 | 10.40 | 5.59 | 7.00     | 8.50  | F05/F07      | 14.0        |
| 2"          | 2.68 | 0.44 | 0.51 | 3.00 | 7.76  | 3.54 | 0.62 | 5.34  | 19.57 | 10.76 | 5.59 | 7.00     | 8.50  | F05/F07      | 17.5        |
| 2 1/2" S.P. | 2.68 | 0.44 | 0.51 | 3.50 | 7.76  | 3.54 | 0.62 | 5.34  | 19.57 | 11.26 | 6.84 | 7.50     | 9.50  | F05/F07      | 17.8        |
| 2 1/2"      | 3.86 | 0.59 | 0.63 | 3.50 | 8.56  | 4.92 | 0.88 | 5.93  | 20.37 | 12.06 | 6.84 | 7.50     | 9.50  | F07/F10      | 28.8        |
| 3" S.P.     | 3.86 | 0.59 | 0.63 | 3.75 | 8.56  | 4.92 | 0.88 | 5.93  | 20.37 | 12.31 | 7.59 | 8.00     | 11.13 | F07/F10      | 29.0        |
| 3"          | 3.86 | 0.59 | 0.63 | 3.75 | 9.07  | 4.92 | 0.88 | 6.44  | 20.88 | 12.82 | 7.59 | 8.00     | 11.13 | F07/F10      | 39.6        |
| 4" S.P.     | 3.86 | 0.59 | 0.63 | 4.50 | 9.07  | 4.92 | 0.88 | 6.44  | 20.88 | 13.57 | N/A  | 9.00     | 12.00 | F07/F10      | 64.6        |
| 4"          | 4.72 | 0.71 | 0.61 | 4.50 | 10.67 | 5.63 | 1.00 | 7.29  | 22.48 | 15.17 | N/A  | 9.00     | 12.00 | F10/F12      | 93.0        |
| 6" S.P.     | 4.72 | 0.71 | 0.61 | 5.50 | 10.67 | 5.63 | 1.00 | 7.29  | 22.48 | 16.17 | N/A  | 10.50    | 15.88 | F10/F12      | 103.0       |
| 6"          | 7.00 | 1.13 | 1.08 | 7.85 | 15.25 | 8.25 | 1.50 | 11.00 | 27.06 | 23.10 | N/A  | 15.50    | 15.88 | F12/F16      | 357.0       |
| 8" S.P.     | 7.00 | 1.13 | 1.08 | 7.85 | 15.25 | 8.25 | 1.50 | 11.00 | 27.06 | 23.10 | N/A  | 18.00    | 19.75 | F12/F16      | 396.0       |

### Notes:

1. For coupling manufacture, all "B" dimensions are  $\pm 0.003$ .
2. Please contact your sales representative for valve weights.

# Operating Information

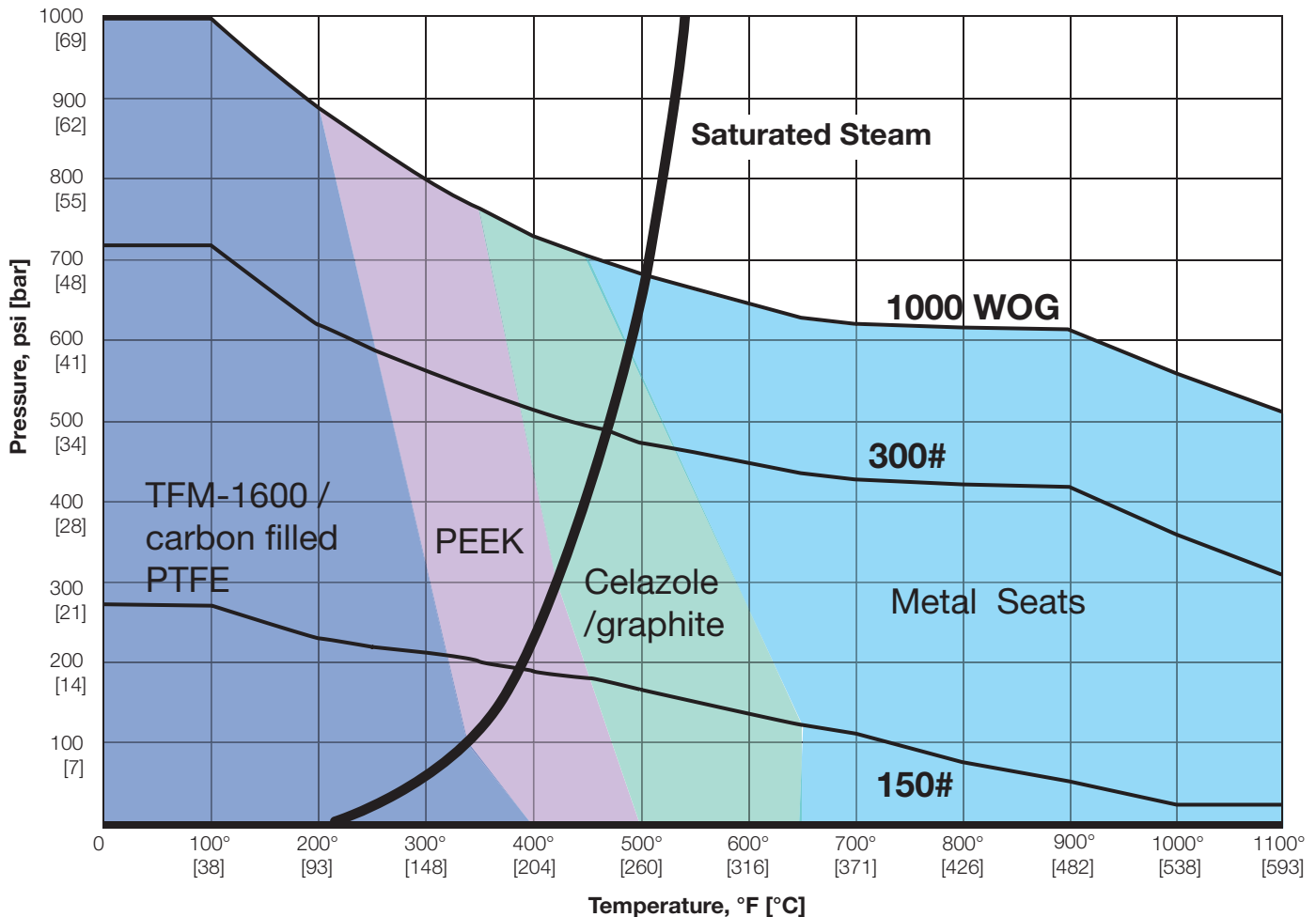
## Keystone Vari-V and Dual Pak Ball Valve Torques\* (in/lbs)

| Valve Size | TFM-1600      |           | Carbon-filled PTFE |           | PEEK/Celazole/Graphite |           |
|------------|---------------|-----------|--------------------|-----------|------------------------|-----------|
|            | Standard Port | Full Port | Standard Port      | Full Port | Standard Port          | Full Port |
| 1/2"       | N/A           | 110       | N/A                | 120       | N/A                    | 150       |
| 3/4"       | 110           | 140       | 120                | 150       | 150                    | 200       |
| 1"         | 140           | 200       | 150                | 200       | 200                    | 300       |
| 1 1/4"     | 200           | 260       | 200                | 260       | 300                    | 400       |
| 1 1/2"     | 260           | 300       | 260                | 330       | 400                    | 520       |
| 2"         | 300           | 450       | 330                | 450       | 520                    | 650       |
| 2 1/2"     | 450           | 850       | 450                | 900       | 650                    | 1450      |
| 3"         | 850           | 1700      | 900                | 1800      | 1450                   | 2750      |
| 4"         | 1700          | 3000      | 1800               | 3300      | 2750                   | 4500      |
| 6"         | 3000          | 3800      | 3300               | 4200      | 4500                   | 5700      |
| 8"         | 3800          | 8200      | 4200               | 9000      | 5700                   | 12200     |

\*Torque values are based on a shutoff pressure of 300 psi.  
Values will increase linearly by 50% between 300 psi and 1000 psi shutoff.

## Pressure/Temperature Chart

For temperatures over 1100°F [538°C] and/or pressures over 1000 psi [69 bar], please refer to Keystone M-Class Valves.





# Vari-V Control C<sub>v</sub> Chart

| Valve Size  | Vari-V | 100%    | 90%    | 80%    | 70%    | 60%    | 50%    | 40%   | 30%   | 20%   | 10%  | Non Vari-V ball C <sub>v</sub> 's |
|-------------|--------|---------|--------|--------|--------|--------|--------|-------|-------|-------|------|-----------------------------------|
| 1/2"        | 10°    | 2.95    | 2.36   | 1.94   | 1.53   | 1.19   | 0.84   | 0.51  | 0.36  | 0.00  | 0.00 | 38                                |
|             | 30°    | 5.76    | 3.99   | 3.15   | 2.22   | 1.46   | 0.89   | 0.51  | 0.32  | 0.02  | 0.00 |                                   |
|             | 60°    | 10.13   | 6.93   | 4.56   | 3.18   | 2.02   | 1.32   | 0.73  | 0.33  | 0.03  | 0.00 |                                   |
|             | 90°    | 15.28   | 9.83   | 6.29   | 4.10   | 2.57   | 1.58   | 0.84  | 0.34  | 0.03  | 0.00 |                                   |
| 3/4"        | 10°    | 4.27    | 3.55   | 2.70   | 2.13   | 1.55   | 1.19   | 0.66  | 0.37  | 0.03  | 0.00 | 70                                |
|             | 30°    | 8.43    | 6.45   | 4.88   | 3.51   | 2.18   | 1.49   | 0.79  | 0.38  | 0.03  | 0.00 |                                   |
|             | 60°    | 16.84   | 11.09  | 7.59   | 5.12   | 3.17   | 2.09   | 0.95  | 0.41  | 0.03  | 0.00 |                                   |
|             | 90°    | 27.63   | 17.52  | 11.28  | 6.70   | 4.14   | 2.47   | 1.29  | 0.46  | 0.03  | 0.00 |                                   |
| 3/4" S.P.   | 10°    | 3.01    | 2.22   | 1.84   | 1.31   | 1.01   | 0.71   | 0.49  | 0.27  | 0.00  | 0.00 | 15                                |
|             | 30°    | 4.96    | 3.62   | 2.89   | 2.13   | 1.45   | 0.83   | 0.53  | 0.27  | 0.04  | 0.00 |                                   |
|             | 60°    | 8.16    | 5.84   | 4.54   | 3.00   | 1.82   | 1.18   | 0.67  | 0.26  | 0.04  | 0.00 |                                   |
|             | 90°    | 11.18   | 7.73   | 5.57   | 3.87   | 2.39   | 1.36   | 0.83  | 0.27  | 0.04  | 0.00 |                                   |
| 1" S.P.     | 10°    | 4.03    | 3.29   | 2.48   | 2.02   | 1.50   | 0.98   | 0.58  | 0.34  | 0.01  | 0.00 | 30                                |
|             | 30°    | 7.63    | 5.93   | 4.59   | 3.30   | 2.38   | 1.33   | 0.72  | 0.35  | 0.01  | 0.00 |                                   |
|             | 60°    | 15.82   | 10.80  | 7.47   | 4.74   | 3.18   | 1.96   | 0.95  | 0.36  | 0.01  | 0.00 |                                   |
|             | 90°    | 19.37   | 13.37  | 9.17   | 6.28   | 4.07   | 2.47   | 1.44  | 0.60  | 0.02  | 0.00 |                                   |
| 1"          | 10°    | 5.88    | 4.97   | 4.25   | 3.28   | 2.14   | 1.74   | 1.06  | 0.84  | 0.34  | 0.00 | 110                               |
|             | 30°    | 12.34   | 9.86   | 7.50   | 5.36   | 3.89   | 2.41   | 1.63  | 0.95  | 0.36  | 0.00 |                                   |
|             | 60°    | 26.91   | 17.37  | 12.47  | 8.19   | 5.45   | 3.45   | 2.16  | 1.14  | 0.30  | 0.00 |                                   |
|             | 90°    | 40.62   | 26.78  | 17.96  | 11.74  | 7.48   | 4.49   | 2.55  | 1.05  | 0.20  | 0.00 |                                   |
| 1 1/4" S.P. | 10°    | 5.74    | 5.09   | 4.10   | 3.13   | 2.32   | 1.59   | 1.09  | 0.66  | 0.38  | 0.00 | 46                                |
|             | 30°    | 10.75   | 9.40   | 6.63   | 5.04   | 3.55   | 2.30   | 1.54  | 0.68  | 0.35  | 0.00 |                                   |
|             | 60°    | 23.30   | 15.59  | 11.03  | 8.11   | 5.04   | 3.20   | 1.96  | 0.95  | 0.24  | 0.00 |                                   |
|             | 90°    | 37.20   | 26.09  | 17.26  | 10.44  | 6.91   | 4.37   | 2.38  | 1.04  | 0.22  | 0.00 |                                   |
| 1 1/4"      | 10°    | 10.24   | 6.87   | 6.86   | 5.22   | 3.73   | 2.86   | 2.23  | 1.19  | 0.52  | 0.00 | 230                               |
|             | 30°    | 20.10   | 16.09  | 12.17  | 8.66   | 6.09   | 4.22   | 2.55  | 1.67  | 0.56  | 0.00 |                                   |
|             | 60°    | 39.26   | 27.25  | 19.36  | 13.11  | 8.82   | 5.60   | 3.25  | 1.75  | 0.56  | 0.00 |                                   |
|             | 90°    | 70.96   | 44.32  | 29.44  | 18.79  | 11.83  | 7.44   | 4.51  | 2.32  | 0.75  | 0.00 |                                   |
| 1 1/2" S.P. | 10°    | 9.90    | 8.02   | 6.72   | 5.03   | 4.42   | 3.22   | 1.90  | 0.78  | 0.36  | 0.00 | 82                                |
|             | 30°    | 20.13   | 15.89  | 12.12  | 8.88   | 6.58   | 4.50   | 2.38  | 1.00  | 0.26  | 0.00 |                                   |
|             | 60°    | 37.09   | 27.38  | 19.01  | 13.56  | 9.17   | 6.10   | 3.45  | 1.24  | 0.28  | 0.00 |                                   |
|             | 90°    | 66.22   | 43.48  | 28.48  | 18.44  | 12.28  | 8.08   | 4.51  | 1.68  | 0.35  | 0.00 |                                   |
| 1 1/2"      | 10°    | 12.76   | 11.06  | 7.65   | 5.94   | 5.21   | 3.50   | 2.41  | 0.89  | 0.00  | 0.00 | 350                               |
|             | 30°    | 28.60   | 22.35  | 15.23  | 11.38  | 8.30   | 5.48   | 2.46  | 1.37  | 0.46  | 0.00 |                                   |
|             | 60°    | 55.73   | 40.16  | 26.54  | 17.53  | 11.87  | 7.31   | 3.07  | 1.59  | 0.34  | 0.00 |                                   |
|             | 90°    | 96.99   | 62.87  | 38.90  | 24.95  | 15.69  | 9.73   | 5.46  | 2.37  | 0.62  | 0.00 |                                   |
| 2" S.P.     | 10°    | 13.41   | 10.22  | 8.12   | 5.98   | 4.74   | 3.88   | 2.43  | 1.28  | 0.00  | 0.00 | 120                               |
|             | 30°    | 27.15   | 20.92  | 15.36  | 11.54  | 7.25   | 4.90   | 3.43  | 1.37  | 0.41  | 0.00 |                                   |
|             | 60°    | 49.56   | 35.81  | 24.77  | 17.20  | 10.88  | 7.21   | 4.10  | 1.71  | 0.37  | 0.00 |                                   |
|             | 90°    | 80.14   | 52.63  | 35.60  | 23.75  | 14.43  | 9.03   | 5.42  | 2.07  | 0.00  | 0.00 |                                   |
| 2"          | 10°    | 21.53   | 16.98  | 16.01  | 12.47  | 10.07  | 5.26   | 4.43  | 2.37  | 0.79  | 0.00 | 600                               |
|             | 30°    | 47.47   | 37.46  | 27.32  | 20.75  | 14.12  | 9.65   | 6.53  | 3.05  | 1.15  | 0.00 |                                   |
|             | 60°    | 92.06   | 69.69  | 49.08  | 31.92  | 21.36  | 13.98  | 8.52  | 4.21  | 1.31  | 0.00 |                                   |
|             | 90°    | 173.40  | 110.49 | 73.44  | 48.50  | 29.56  | 18.56  | 11.54 | 5.13  | 1.44  | 0.00 |                                   |
| 2 1/2" S.P. | 10°    | 18.63   | 14.82  | 12.28  | 8.98   | 7.00   | 5.01   | 3.09  | 1.97  | 0.49  | 0.00 | 240                               |
|             | 30°    | 41.74   | 33.58  | 26.16  | 18.52  | 13.60  | 8.59   | 4.71  | 2.56  | 0.53  | 0.00 |                                   |
|             | 60°    | 83.22   | 60.04  | 44.35  | 29.98  | 20.41  | 12.56  | 7.33  | 3.71  | 0.65  | 0.00 |                                   |
|             | 90°    | 139.40  | 89.84  | 61.63  | 41.32  | 27.57  | 17.68  | 9.76  | 5.27  | 0.99  | 0.00 |                                   |
| 2 1/2"      | 10°    | 35.16   | 29.35  | 24.60  | 19.68  | 14.70  | 10.63  | 7.63  | 3.85  | 1.32  | 0.00 | 780                               |
|             | 30°    | 79.21   | 63.94  | 49.22  | 34.32  | 25.24  | 15.90  | 9.98  | 4.98  | 2.16  | 0.00 |                                   |
|             | 60°    | 150.59  | 107.54 | 80.65  | 52.93  | 34.89  | 22.72  | 14.87 | 6.44  | 2.02  | 0.00 |                                   |
|             | 90°    | 253.06  | 180.69 | 119.78 | 84.32  | 50.76  | 32.69  | 21.11 | 11.67 | 1.79  | 0.00 |                                   |
| 3" S.P.     | 10°    | 34.93   | 23.88  | 19.89  | 16.25  | 13.56  | 10.52  | 7.60  | 3.99  | 2.18  | 0.00 | 350                               |
|             | 30°    | 73.79   | 56.60  | 43.67  | 33.42  | 22.87  | 15.24  | 10.22 | 6.82  | 2.47  | 0.00 |                                   |
|             | 60°    | 138.23  | 101.69 | 74.53  | 51.94  | 34.94  | 21.55  | 13.98 | 7.69  | 2.14  | 0.00 |                                   |
|             | 90°    | 240.46  | 154.55 | 114.28 | 73.22  | 47.24  | 31.57  | 17.96 | 10.50 | 4.49  | 0.00 |                                   |
| 3"          | 10°    | 47.02   | 32.65  | 26.34  | 19.84  | 15.89  | 12.27  | 7.97  | 3.98  | 1.81  | 0.00 | 1330                              |
|             | 30°    | 105.15  | 80.57  | 58.10  | 42.90  | 29.96  | 19.58  | 12.14 | 5.04  | 1.96  | 0.00 |                                   |
|             | 60°    | 190.26  | 136.08 | 112.14 | 82.22  | 54.10  | 40.01  | 23.23 | 13.54 | 1.43  | 0.00 |                                   |
|             | 90°    | 388.90  | 235.03 | 157.48 | 99.49  | 64.78  | 40.42  | 23.16 | 11.64 | 2.10  | 0.00 |                                   |
| 4" S.P.     | 10°    | 44.07   | 33.64  | 27.16  | 21.85  | 16.37  | 11.61  | 8.46  | 4.82  | 1.66  | 0.00 | 720                               |
|             | 30°    | 95.43   | 77.54  | 57.24  | 42.34  | 28.95  | 19.77  | 13.05 | 6.04  | 2.06  | 0.00 |                                   |
|             | 60°    | 171.46  | 139.82 | 103.63 | 68.86  | 47.12  | 27.80  | 16.79 | 7.85  | 2.07  | 0.00 |                                   |
|             | 90°    | 283.27  | 208.78 | 147.71 | 98.21  | 62.96  | 41.66  | 25.34 | 10.82 | 3.15  | 0.00 |                                   |
| 4"          | 10°    | 58.97   | 52.74  | 43.58  | 33.52  | 25.93  | 18.16  | 11.12 | 7.42  | 3.66  | 0.00 | 2420                              |
|             | 30°    | 160.29  | 131.67 | 100.78 | 72.91  | 53.71  | 35.10  | 19.49 | 10.73 | 3.90  | 0.00 |                                   |
|             | 60°    | 332.17  | 243.98 | 174.60 | 118.86 | 81.15  | 51.80  | 24.79 | 15.34 | 6.48  | 0.00 |                                   |
|             | 90°    | 652.17  | 401.89 | 262.88 | 170.63 | 111.42 | 73.39  | 43.49 | 24.32 | 7.20  | 0.00 |                                   |
| 6" S.P.     | 10°    | 71.00   | 58.00  | 45.00  | 35.00  | 26.00  | 20.00  | 13.00 | 7.00  | 3.10  | 0.00 | 625                               |
|             | 30°    | 164.00  | 129.00 | 95.00  | 70.00  | 51.00  | 36.00  | 22.00 | 11.00 | 4.10  | 0.00 |                                   |
|             | 60°    | 270.00  | 213.00 | 163.00 | 115.00 | 76.00  | 51.00  | 31.00 | 15.00 | 4.80  | 0.00 |                                   |
|             | 90°    | 409.00  | 329.00 | 244.00 | 166.00 | 110.00 | 72.00  | 44.00 | 22.00 | 7.40  | 0.00 |                                   |
| 6"          | 10°    | 148.00  | 112.00 | 91.00  | 76.00  | 55.00  | 40.00  | 30.00 | 19.00 | 7.40  | 0.00 | 3340                              |
|             | 30°    | 367.00  | 286.00 | 205.00 | 146.00 | 104.00 | 70.00  | 47.00 | 25.00 | 9.00  | 0.00 |                                   |
|             | 60°    | 816.00  | 568.00 | 414.00 | 272.00 | 177.00 | 110.00 | 67.00 | 34.00 | 10.00 | 0.00 |                                   |
|             | 90°    | 1292.00 | 890.00 | 581.00 | 382.00 | 234.00 | 145.00 | 88.00 | 45.00 | 14.40 | 0.00 |                                   |
| 8" S.P.     | 10°    | 134.00  | 112.00 | 92.00  | 86.00  | 54.50  | 35.50  | 28.00 | 17.00 | 6.80  | 0.00 | 2060                              |
|             | 30°    | 338.00  | 270.00 | 209.00 | 159.00 | 109.00 | 75.00  | 46.00 | 24.00 | 8.70  | 0.00 |                                   |
|             | 60°    | 648.00  | 513.00 | 378.00 | 260.00 | 175.00 | 112.00 | 65.00 | 32.00 | 10.00 | 0.00 |                                   |
|             | 90°    | 1106.00 | 768.00 | 538.00 | 360.00 | 242.00 | 148.00 | 82.00 | 42.00 | 13.00 | 0.00 |                                   |

# Ordering Instructions

|                       |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
|-----------------------|----------|---------------------------------------|----------|------------|--------------------------|-----------|-----------|--------------------|------------|------------|-------------|------------|----------|-----------|
|                       | <b>K</b> | <b>02</b>                             | <b>F</b> | <b>150</b> | <b>-</b>                 | <b>A2</b> | <b>A2</b> | <b>-</b>           | <b>TFE</b> | <b>CHV</b> | <b>-</b>    | <b>10V</b> | <b>B</b> | <b>FE</b> |
| <b>Keystone Valve</b> |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| <b>Size</b>           |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| 01                    | -        | 1/2"                                  | 06       | -          | 2"                       | 11        | -         | 8"                 |            |            |             |            |          |           |
| 02                    | -        | 3/4"                                  | 07       | -          | 2 1/2"                   | 12        | -         | 10"                |            |            |             |            |          |           |
| 03                    | -        | 1"                                    | 08       | -          | 3"                       | OT        | -         | Other              |            |            |             |            |          |           |
| 04                    | -        | 1 1/4"                                | 09       | -          | 4"                       |           |           |                    |            |            |             |            |          |           |
| 05                    | -        | 1 1/2"                                | 10       | -          | 6"                       |           |           |                    |            |            |             |            |          |           |
| <b>Port</b>           |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| S                     | -        | Standard port                         | F        | -          | Full port                |           |           |                    |            |            |             |            |          |           |
| <b>Connection</b>     |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| NPT                   | -        | National Pipe Thread                  | 150      | -          | 150# flanged             |           |           |                    |            |            |             |            |          |           |
| SWE                   | -        | Socket weld end                       | 300      | -          | 300# flanged             |           |           |                    |            |            |             |            |          |           |
| BWE                   | -        | Butt weld end                         | S15      | -          | Split body, 150# flanged |           |           |                    |            |            |             |            |          |           |
|                       |          |                                       | OTH      | -          | Other                    |           |           |                    |            |            |             |            |          |           |
| <b>Body</b>           |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| SS                    | -        | 316 Stainless steel (CF3M)            | I6       | -          | Inconel® 625             |           |           |                    |            |            |             |            |          |           |
| A2                    | -        | Alloy 20 (CN7M)                       | I7       | -          | Inconel® 718             |           |           |                    |            |            |             |            |          |           |
| HC                    | -        | Hastelloy C®                          | OT       | -          | Other                    |           |           |                    |            |            |             |            |          |           |
| <b>Trim</b>           |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| SS                    | -        | 316 Stainless steel (CF3M)            | I7       | -          | Inconel® 718             |           |           |                    |            |            |             |            |          |           |
| S7                    | -        | 17-4Ph stem, 316 Stainless steel ball | KM       | -          | K Monel®                 |           |           |                    |            |            |             |            |          |           |
| A2                    | -        | Alloy 20 (CN7M)                       | SD       | -          | Super Duplex             |           |           |                    |            |            |             |            |          |           |
| HC                    | -        | Hastelloy C®                          | HB       | -          | Hastelloy B®             |           |           |                    |            |            |             |            |          |           |
| I6                    | -        | Inconel® 625                          | OT       | -          | Other                    |           |           |                    |            |            |             |            |          |           |
| <b>Seat</b>           |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| TFE                   | -        | TFM-1600, 2nd generation PTFE         | CLZ      | -          | Celazole®                |           |           |                    |            |            |             |            |          |           |
| TCF                   | -        | 25% carbon filled PTFE                | DEV      | -          | Devlon®                  |           |           |                    |            |            |             |            |          |           |
| BI7                   | -        | Borided Inconel® 718                  | VPK      | -          | FDA approved virgin PEEK |           |           |                    |            |            |             |            |          |           |
| UMP                   | -        | UHMWPE                                | Note 3   | -          | Cavity Filler            |           |           |                    |            |            |             |            |          |           |
| PEK                   | -        | Carbon filled PEEK                    | PTF      | -          | PTFE                     |           |           |                    |            |            |             |            |          |           |
|                       |          |                                       | OTH      | -          | Other                    |           |           |                    |            |            |             |            |          |           |
| <b>Packing</b>        |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| CHV                   | -        | PTFE chevron                          |          |            |                          |           |           |                    |            |            |             |            |          |           |
| GRA                   | -        | Standard GRAFOIL®                     |          |            |                          |           |           |                    |            |            |             |            |          |           |
| CRY                   | -        | Cryogenic valve <sup>2</sup>          |          |            |                          |           |           |                    |            |            |             |            |          |           |
| <b>Vari-V</b>         |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| 10V                   | -        | 10° Vari-V                            | LNV      | -          | Linear Vari-V            | OTH       | -         | Other              |            |            |             |            |          |           |
| 30V                   | -        | 30° Vari-V                            | HTV      | -          | High turndown Vari-V     | NON       | -         | Regular ball       |            |            |             |            |          |           |
| 60V                   | -        | 60° Vari-V                            | FLV      | -          | Filler Vari-V            |           |           |                    |            |            |             |            |          |           |
| 90V                   | -        | 90° Vari-V                            | ARC      | -          | Arcuate cut ball         |           |           |                    |            |            |             |            |          |           |
| <b>Handle</b>         |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| T                     | -        | Tee handle                            | L        | -          | Lock-out bracket         |           |           |                    |            |            |             |            |          |           |
| B                     | -        | Bare shaft for actuation              | OTH      | -          | Other                    |           |           |                    |            |            |             |            |          |           |
| G                     | -        | Gear box                              |          |            |                          |           |           |                    |            |            |             |            |          |           |
| <b>Special</b>        |          |                                       |          |            |                          |           |           |                    |            |            |             |            |          |           |
| FE                    | -        | Drilled fugitive emission port        | HT       | -          | High temperature         | O2        | -         | Oxygen cleaned     | FM         | -          | FM approved |            |          |           |
| DB                    | -        | Drilled ball (upstream side)          | XT       | -          | Extended ends            | 41        | -         | 410 Stainless ball | SP         | -          | Special     |            |          |           |
|                       |          |                                       | K3       | -          | Kolsterised ball         | 3W        | -         | 3-way diverter     | NS         | -          | No special  |            |          |           |

- Notes**
1. Block and bleed valves have different part numbers. Please contact Keystone for further information.
  2. Specific to the Keystone Cryogenic Valve part number. Includes standard cryogenic extension, PTFE chevron packing, and a drilled ball for pressure relief.
  3. CVT=cavity filler TFM-1600, CVU=cavity filler UHMWPE, CVD=cavity filler Devlon, CVC=cavity filler 25% carbon-filled PTFE.
  4. Only available on full port valves.

The M-Class Valve is an elite, made-to-order custom ball valve, unparalleled in quality and performance. It can be designed for any combination of abrasive, corrosive, high temperature, high pressure, and high cycle applications, with a variety of custom options, including exotic alloys. M-Class valves provide optimum performance and bubble-tight shutoff for the most extreme applications.



## Features

- Ball and seats have the most advanced coating/surface technology options available to provide the best solution for your critical applications.
- Metal ball and seats are lap matched to provide bubble-tight shutoff.
- Optional arcuate cut ball for abrasive or high velocity applications.
- Optional scalloped seat to prevent build-up of material between the upstream seat and the end caps.
- Dual live loaded packing sets eliminate stem leaks.
- Available in all commercially available materials (Hastelloy®, Alloy 20, Titanium, Duplex, Monel®, Tantalum, etc.).
- Live loaded body and bonnet bolts compensate for thermal expansion, pressure fluctuations and vibration.
- Extended bonnet for insulation.
- Tripod mounting bracket with ISO 5211 option for simple actuator mounting.
- Oversized stem to prevent twisting.
- Pressures up to 4500# class.

## Tripod Mount



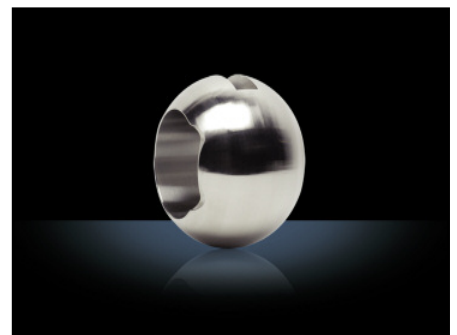
The M-Class tripod mount is designed to eliminate the problems associated with traditional brackets. The bends in a traditional bracket introduce inconsistencies that can lead to alignment problems and other issues.

## Metal Trim



Certain applications such as corrosive, abrasive, high temperature and high pressure applications require seats that can last in the most extreme conditions. Metal seats are the definite choice and are available in exotic alloys.

## Arcuate Cut Ball



An arcuate cut is a profile in the ball that reduces velocity both when the valve opens and as it closes. In an arcuate cut ball, the opening of the ball is greatly increased in the first ten degrees of opening. This reduces the velocity by spreading out the flow, reducing wear.

# Design Specifications

ANSI/ASME B1.3M screw thread gauging system for dimensional acceptability

ANSI/ASME B16.10 face-to-face and end-to-end dimensions of valves

ANSI/ASME B16.34 valves-flanged, threaded and welding ends

ANSI/ASME B16.5 pipe flanges and pipe fittings

ASTM A193/A 194M-96b standard specifications for alloy steel and stainless steel bolting materials for high temperature service

ASTM A194/A 194M-96 standard specifications for carbon and alloy steel nuts and bolts for high pressure and high temperature service

MSS SP-25 standard marking system for marking valves, fittings, flanges and unions

CSA B51-95 boiler, pressure vessel and pressure piping code

API 598 valve inspection and testing

CRN Canadian Registration Number (0911851.5)

ISO 9001:2000

API 607 5th Edition

TÜV section 3.1.8.4

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