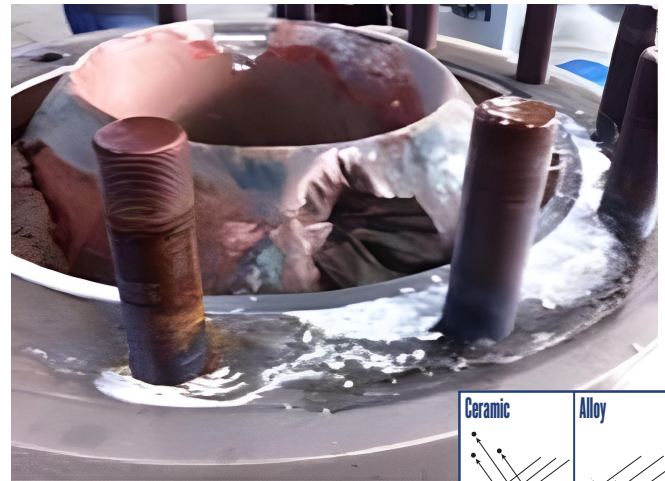




## InfiniFlo Ceramic Series

# Why Ceramic Valves?

- Ceramic materials are 6-8 times harder than stainless steels.
- The thickness of Flo-Tite's ceramic material is often measured in inches, typically 1/4" and thicker. Most hard coatings are measured in microns. For example, Hard Chrome coatings are typically less than one-thousandth (0.001") of an inch thick.
- Extreme hardness and high temperature capabilities give ceramics exceptional resistance to cavitation, even continuous, aggressive cavitation does not affect the material.
- With special ball and seat processing, bubble-tight shut-off can be achieved.

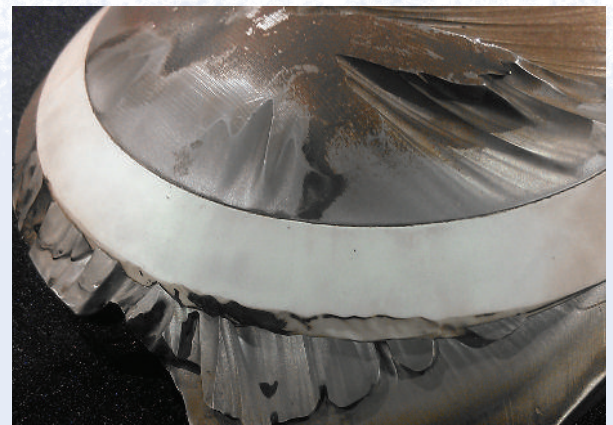


*A valve severely corroded by an abrasive chemical must be repaired or replaced often.*

### About Us

Flo-Tite wants to provide the process industry with special valves it has never seen before. Employing the brightest engineers and machinists that are able to combine metal and ceramics effectively, we are able to manufacture valves to **API, ANSI, CE and ISO 9001 standards**. We have committed ourselves to R&D and engineering expertise in the ceramic valve industry, utilizing the latest CAD/CAM software and manufacturing methods. Our extensive product offering means that Flo-Tite is the world leader in ceramic valve technology. When you have an opportunity to use one of our valves in your severe plant application, you'll understand why we are the best at producing Ceramic Valves – For the Toughest Process Applications.

**Actuator failure. Severely worn steel, ceramic untouched.**





# About Ceramic Materials

| Infiniflo® Ceramic Series Material Properties |                       |                                |                  |                                |                 |                 |
|---|-----------------------|--------------------------------|------------------|--------------------------------|-----------------|-----------------|
|   |                       | Alumina                        | Zirconia         | Silicon Nitride                | Silicon Carbide | Stainless Steel |
|   |                       | Al <sub>2</sub> O <sub>3</sub> | ZrO <sub>2</sub> | Si <sub>3</sub> N <sub>4</sub> | SiC             | SS              |
|   |                       | 99.5%                          | Y-PSZ            |                                | SSiC            | 316             |
| Density                                       | g/cm <sup>3</sup>     | 3.90                           | 6.02             | 3.20                           | 3.15            | 8.0             |
| Hardness                                      | Vickers               | 1820                           | 1200             | 1400                           | 2800            | 169             |
| Flexural/Tensile Strength                     | MPa                   | 379                            | 1150             | 800                            | 380             | 550             |
| Max Working Temp                              | °C/°F                 | 1500/2732                      | 500/932          | 1000/1832                      | 1500/2732       | 925/1697        |
| Coeff of Thermal Expansion (CTE)              | x10 <sup>-6</sup> /°C | 8.4                            | 10.3             | 3.3                            | 4.0             | 16.0            |
| Compressive Strength                          | MPa                   | 2200                           | 2500             | 2800                           | 3500            | 240             |
| Modulus of Elasticity                         | GPa                   | 350                            | 210              | 320                            | 410             | 193             |
| Thermal Conductivity                          | W/mk (20C)            | 25                             | 2.2              | 29                             | 125             | 16              |
| Relative Cost                                 |                       | 3                              | 3                | 10                             | 7               | 1               |
| Relative thermal shock capability             |                       | 1                              | 2                | 4                              | 3               | 5               |

Relative thermal shock capability: 1 – poor, 2 – moderate, 3 – good, 4 – excellent, 5 – best

| Infiniflo® Series Corrosion Resistance Comparison |      |      |               |          |                 |                 |      |        |
|---|------|------|---------------|----------|-----------------|-----------------|------|--------|
|   | Temp | PTFE | 99.5% Alumina | Zirconia | Silicon Nitride | Silicon Carbide | C276 | 316 SS |
| 20% HCL   | 60C  | A    | A             | A        | B               | A               | B    | C      |
| 20% HCl   | 95C  | A    | A             | A        | C               | A               | C    | X      |
| 90% H <sub>2</sub> SO <sub>4</sub>                | 95C  | A    | A             | A        | B               | A               | C    | C      |
| 60% H <sub>3</sub> PO <sub>4</sub>                | 95C  | A    | A             | A        | C               | A               | A    | C      |
| 10% HF  | 60C  | A    | B             | C        | A               | A               | B    | C      |
| 46% HF  | 95C  | A    | C             | C        | C               | A               | C    | X      |
| 60% HNO <sub>3</sub>                              | 95C  | A    | B             | A        | C               | A               | C    | B      |
| 30% NaOH  | 60C  | A    | B             | A        | B               | A               | A    | A      |
| 30% NaOH  | 95C  | A    | B             | B        | C               | A               | A    | B      |

A – Negligible corrosion  
 B – Moderate corrosion, annual inspection recommended  
 C – Significant, not recommended  
 X – Aggressive corrosion, failure very quickly



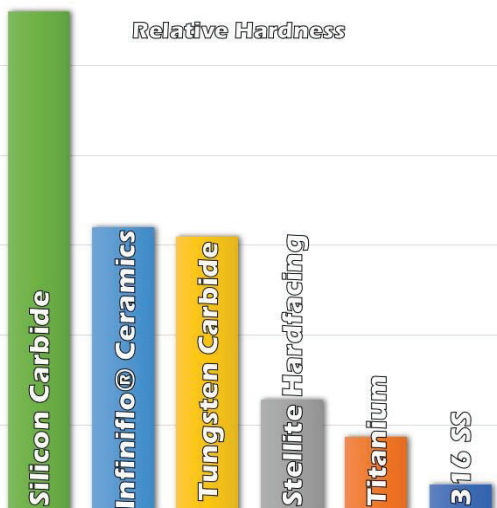
Zirconia - Zirconium Oxide (ZrO<sub>2</sub>)  
 Alumina - Aluminum Oxide (Al<sub>2</sub>O<sub>3</sub>)  
 Silicon Carbide (SiC)  
 Silicon Nitride (Si<sub>3</sub>N<sub>4</sub>)



From your experience, you might guess that all ceramic materials are white, but Silicon Carbide is a charcoal color and Silicon Nitride is a shade of grey. Alumina has varying shades of white and cream and zirconia is typically a white color. The most commonly used ceramics in our valves are Zirconia and Alumina. Zirconia is the strongest of the two but is slightly less hard. Typically Alumina is used in seats for hardness and Zirconia in balls because of the need to withstand being torqued while opening and closing. Silicon Carbide is the hardest of all the common ceramic materials but is very expensive. Silicon Nitride is used occasionally when thermal shock may be an issue.

## Infiniflo® Ceramic Series Wear Resistance

“Material hardness” or just “hardness” is the property that is most useful in determining ability to resist erosive wear. High hardness materials will resist attack by particulate that has the potential to damage softer materials. Generally, the material of the wear surface must be harder than the media to resist erosion. The graph below shows where Flo-Tite's ceramic Series falls in the hardness spectrum. Silicon carbide is often used in extremely high abrasive applications and is also a ceramic material.



Heavy, thick ceramic materials will continuously “renew” themselves in operation. When ceramic does become damaged in service due to an extraordinary circumstance such as a chip or particularly aggressive wear, the surface remains the same. There is no change in the material that is exposed to the flow and removal just exposes new ceramic material with the same excellent hardness properties as the original surface.

Coatings such as HVOF, Stellite or Tungsten Carbide are typically applied in very thin cross sections (often 0.001” thick) and when damaged, will expose the softer base material to abrasive wear that is not intended. Once that happens, the coating will be quickly undermined and eventually disappear in the region of damage, leading to eventual failure of the valve body.

It is common to see ceramic show no discernable wear YEARS after installation in abrasive service.



**CRD**

**Ceramic Rotating Disc Valve**

Self cleaning  
 Isolation of dry media  
 Fly Ash  
 Hopper Bottom valve  
 Sizes 2" to 12"  
 Pressure to 40 bar/588 psi



**CBF**

**Ceramic Butterfly Valve**

Narrow take out  
 Isolation of slurries  
 Sizes 2" to 24"  
 Pressure to 10 bar/147 psi



**CPT**

**Ceramic Pneumatic Transport Valve**

Allows space for particles  
 Isolation of dry media  
 Aluminum manufacture  
 Fly Ash  
 Sizes 2" to 24"  
 Pressure to 16 bar/235 psi



**CSB**

**Ceramic Segmented Ball Valve**

Allows space for particles  
 Isolation of dry media  
 Sizes: 2" to 8"  
 Pressure to 16 bar/235 psi

**CBV**  
**Ceramic Ball Valve**

Aggressive wear and corrosion  
 Isolation and Control of:  
 Slurries  
 Light dry particulate  
 Sizes: 1/2" to 8"  
 Pressure to 40 bar/588 PSI (2")  
 20 bar/294 psi (2.5"+)



**Multi Choice Series  
 Ceramic Ball/Seat**



**CSK**

**Ceramic Slurry Knife Gate**

Self cleaning  
 Isolation of slurries  
 Bottom ash  
 FGD media  
 Mining tailings  
 Sizes: 2" to 24"  
 Pressure to 10 bar/147 psi



Aggressive Abrasion Valve  
 Isolation Service  
 Threaded and SW ends available  
 Sizes: 1/2" to 4"  
 Pressure to 40 bar/588 PSI (2")  
 20 bar/294 psi (2.5"+)

# Principles of Ceramic Valve Design

1.



The durability of the valve seat is crucial to the integrity of the entire valve.

3.



Retain the media in the pipeline system.

2.



Minimize possible leak points by minimizing the size of irregular valve packings.

## Advantages of Flo-Tite's Ceramic Valves

| Valve Types | Pricing Advantages | Corrosion Resistance | Wear Resistance | Sealing Performance | Light Torque | Service Life | Temperature Tolerance |
|-------------|--------------------|----------------------|-----------------|---------------------|--------------|--------------|-----------------------|
| Ceramic     | ✓                  | ✓✓                   | ✓✓              | ✓✓                  | ✓✓           | ✓✓           | ✓                     |
| Plastic     | ✓✓                 | ✓✓                   | •               | •                   | •            | •            | •                     |
| Metal       | ✓✓                 | •                    | •               | ✓                   | ✓            | •            | ✓✓                    |
| Alloy       | •                  | •                    | ✓               | ✓                   | ✓            | ✓            | ✓✓                    |

\*The above chart presents the characteristics of ceramic valves compared to other types of valves.

### Corrosion resistance

Flo-Tite's advanced ceramics have very stable chemical properties for most acid-base media, performing excellent corrosion resistance.

### High strength

Flo-Tite adopts high-performance advanced ceramics as valve ball and lining materials — flange connection, three-stage structure design, forged steel shell, ensuring easy maintenance and high strength.

### High hardness

Flo-Tite's zirconia ceramics balls have hardness up to HRA88, second only to the diamond.

### Wear resistance

Advanced ceramics' ultra-high hardness allows Flo-Tite's ceramic valves to operate against the erosion of solid particles in fluid flow. Also, the conveying medium will not be contaminated by the peeling material caused by scouring.

### Zero leakage

Flo-Tite's ceramic ball valves adopt a surface contact sealing structure between ball bodies and valve seats. The sealing surface is well polished with high roundness and accuracy. ANSI VI sealing level is possible.

### Self-lubrication

With precise ground surface between ball bodies and valve seats, Flo-Tite's ceramic ball valves are self-lubricated in the On/Off process with slight resistance and smooth On/Off switch.

### Low torque value

Since Flo-Tite's ceramic ball valves are self-lubricated, they have low torque values and are easy to maintain.

### Long service life

Because of the above mentioned properties, Flo-Tite's ceramic ball valves significantly extend service life and reduce maintenance rates.

*Due to continuous development & improvement of our product range, we reserve the right to alter the dimensions and technical data included in this brochure.*

## Ceramic Valves for the Toughest Process Applications



# Model CBV

## Ceramic Ball Valve

### Ceramic Ball Valve Advantages

- Exceptional Corrosion Resistance
- Ceramics are 8 times harder than Stainless Steel
- Customizable for Flanges, Materials, V-port and Seat Configurations
- Metal Body is NON-Wetted part
- Zero Leakage capability

### Typical Usage

- Slurry Flow Control
- Highly Corrosive Chemicals (Oil Industry, Chemical plants, corrosive applications)
- Powder Pneumatic transport

### Also Available:

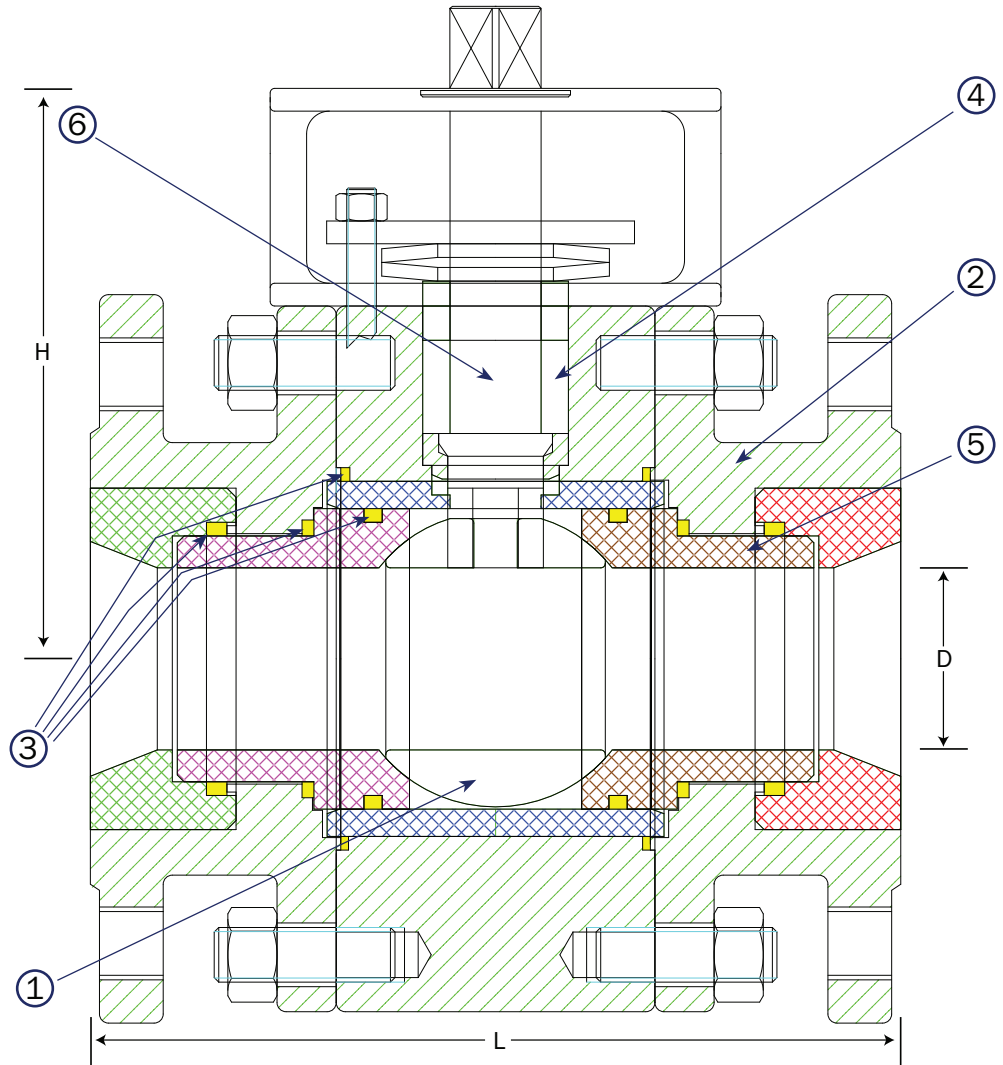
Ceramic Seated Knife Gates to 24"  
Ceramic Segmented Ball to 16"  
Ceramic Seated Butterflies

#### Standard Valve

|   |                   |
|---|-------------------|
| Pressure Rating:                                | See Back of Sheet |
| Temperature Rating:                             | 350° F (177°C)    |
| Maximum Size:                                   | 12 x 8"           |
| Extended range units available on custom basis. |                   |



| Typical Materials |               |                  |
|-------------------|---------------|------------------|
| 1                 | Ball          | Zirconia Ceramic |
| 2                 | Body          | WCB/CF8          |
| 3                 | O-Ring        | FKM / Viton      |
| 4                 | Packing       | Graphite / PTFE  |
| 5                 | Seat / Lining | Alumina Ceramic  |
| 6                 | Stem          | Hastelloy C276   |



| Dimensions (in) ANSI 150 |     |      |      |      |        |      |        |      |      |                   |                    |                    |
|--------------------------|-----|------|------|------|--------|------|--------|------|------|-------------------|--------------------|--------------------|
| Size                     |     | 1/2" | 3/4" | 1"   | 1 1/2" | 2"   | 2 1/2" | 3"   | 4"   | 5"                | 6"                 | 8"                 |
| Face-to-Face             | L   | 4.25 | 4.62 | 5.00 | 6.50   | 7.00 | 7.50   | 8.00 | 9.00 | 9.65 <sup>A</sup> | 10.50 <sup>B</sup> | 11.50 <sup>B</sup> |
| Bore                     | D   | 0.50 | 0.50 | 0.75 | 1.00   | 1.50 | 2.00   | 2.50 | 3.00 | 4.00              | 5.00               | 6.00               |
| Height                   | H   | 2.20 | 2.50 | 3.10 | 3.50   | 3.80 | 4.20   | 4.60 | 5.50 | 6.70              | 8.00               | 9.10               |
| Weight                   | lb  | 10   | 14   | 15   | 26     | 40   | 53     | 73   | 128  | 209               | 308                | 462                |
| Full Port CV             |     | 8    | 14   | 24   | 55     | 90   | 130    | 195  | 340  | 495               | 750                | 1100               |
| Pressure Limit           | psi | 588  | 588  | 588  | 588    | 588  | 294    | 294  | 294  | 294               | 294                | 294                |
| ISO 5211 Mount           |     | F05  | F05  | F07  | F07    | F10  | F12    | F12  | F14  | F14               | F14                | F16                |

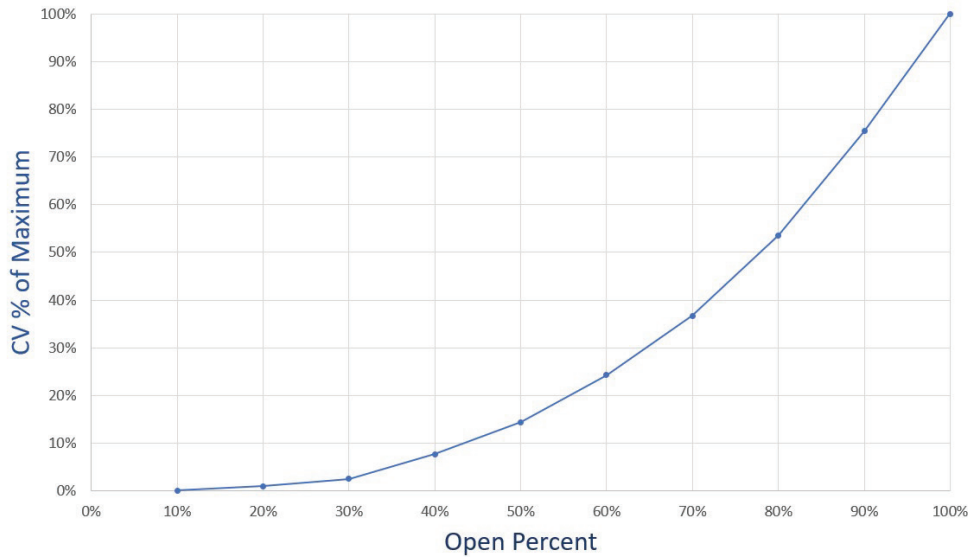
Note: Higher pressure ratings available upon request and engineering review  
 1/2" - 4" - ANSI Full Port F-F      A = 5" Nonstandard      B = 6" - 8" REDUCED PORT

Flo-Tite • 4815 West 5th St, Lumberton, NC 28358 • Phone: (910)738-8904 • [www.flotite.com](http://www.flotite.com)

Due to continuous development & improvement of our product range, we reserve the right to alter the dimensions and technical data included in this brochure.

# CBV Technical Data

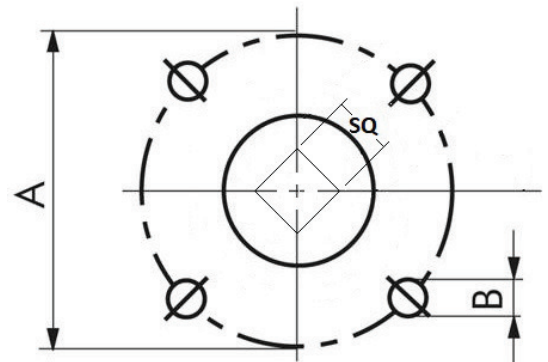
**INFINIFLO** SERIES



| FULLY OPEN CV VALUES |      |      |    |        |     |        |     |     |       |     |      |
|----------------------|------|------|----|--------|-----|--------|-----|-----|-------|-----|------|
|                      | 1/2" | 3/4" | 1" | 1 1/2" | 2"  | 2 1/2" | 3"  | 4"  | 5"    | 6"  | 8"   |
| <b>0</b>             | 10   | 18   | 30 | 69     | 113 | 163    | 244 | 425 | 619   | 938 | 1375 |
| <b>V90</b>           | 5    | 11   | 21 | 45     | 63  | 100    | 150 | 250 | 412.5 | 625 | 938  |
| <b>V60</b>           | 3    | 6    | 14 | 31     | 43  | 68     | 100 | 163 | 306   | 438 | 625  |
| <b>V30</b>           | 2    | 3    | 9  | 19     | 31  | 44     | 73  | 106 | 195   | 313 | 438  |

## CBV Top Dimensions

| ISO 5211 F Pattern Dimensions |               |             |             |
|-------------------------------|---------------|-------------|-------------|
| F Pattern                     | Hole Diameter | Bolt Circle | Bolt $\phi$ |
| F04                           | 5.5           | 42          | M5          |
|                               | 7/32          | 1.654       | 10 - 24     |
| F05                           | 6.5           | 50          | M6          |
|                               | 5/16          | 1.969       | 1/4 - 20    |
| F07                           | 8.5           | 70          | M8          |
|                               | 3/8           | 2.756       | 5/16 - 18   |
| F10                           | 10.5          | 102         | M10         |
|                               | 7/16          | 4.016       | 3/8 - 16    |
| F12                           | 12.5          | 125         | M12         |
|                               | 9/16          | 4.921       | 1/2 - 13    |
| F14                           | 17            | 140         | M16         |
|                               | 3/4           | 5.512       | 5/8 - 11    |
| F16                           | 21            | 165         | M20         |
|                               | 7/8           | 6.496       | 3/4 - 10    |



| Valve Dimensions |           |                   |                    |
|------------------|-----------|-------------------|--------------------|
| Valve Size       | F Pattern | Square Drive (mm) | Square Height (in) |
| 1/2"             | F04/F05   | 11                | 0.67               |
| 3/4"             | F04/F05   | 11                | 0.67               |
| 1"               | F04/F05   | 11                | 0.67               |
| 1 1/2"           | F05/F07   | 14                | 0.79               |
| 2"               | F05/F07   | 17                | 1.00               |
| 2 1/2"           | F07/F10   | 17                | 1.00               |
| 3"               | F07/F10   | 22                | 1.00               |
| 4"               | F07/F10   | 22                | 1.18               |
| 5"               | F07/F10   | 27                | 1.18               |
| 6"               | F10/F14   | 27                | 1.38               |
| 8"               | F10/F14   | 33                | 1.57               |

## Ceramic Valves for the Toughest Process Applications



# Model CPT

## Ceramic Pneumatic Transport

### Ceramic Valve Advantages

- Designed for use with high abrasion media, including dust, catalysts, and other small particles.
- Gate seat is spring loaded to enhance sealing effect for ultra-fine powders.
- Expansive gate cavity allows flowable product to "flow" into open areas, allowing gate to close
- Ceramics are 8 times harder than Stainless Steel

### Typical Usage

- Transport of Ultra-Fine Particulate
- Power Plant Fly Ash Handling
- Bauxite transport for aluminum manufacture
- Cement transport in concrete plants

| Standard Valve                                  |                 |
|---|-----------------|
| Pressure Rating:                                | 150 PSI typical |
| Temperature Rating:                             | 650° F (343°C)  |
| Maximum Size:                                   | 12"             |
| Extended range units available on custom basis. |                 |



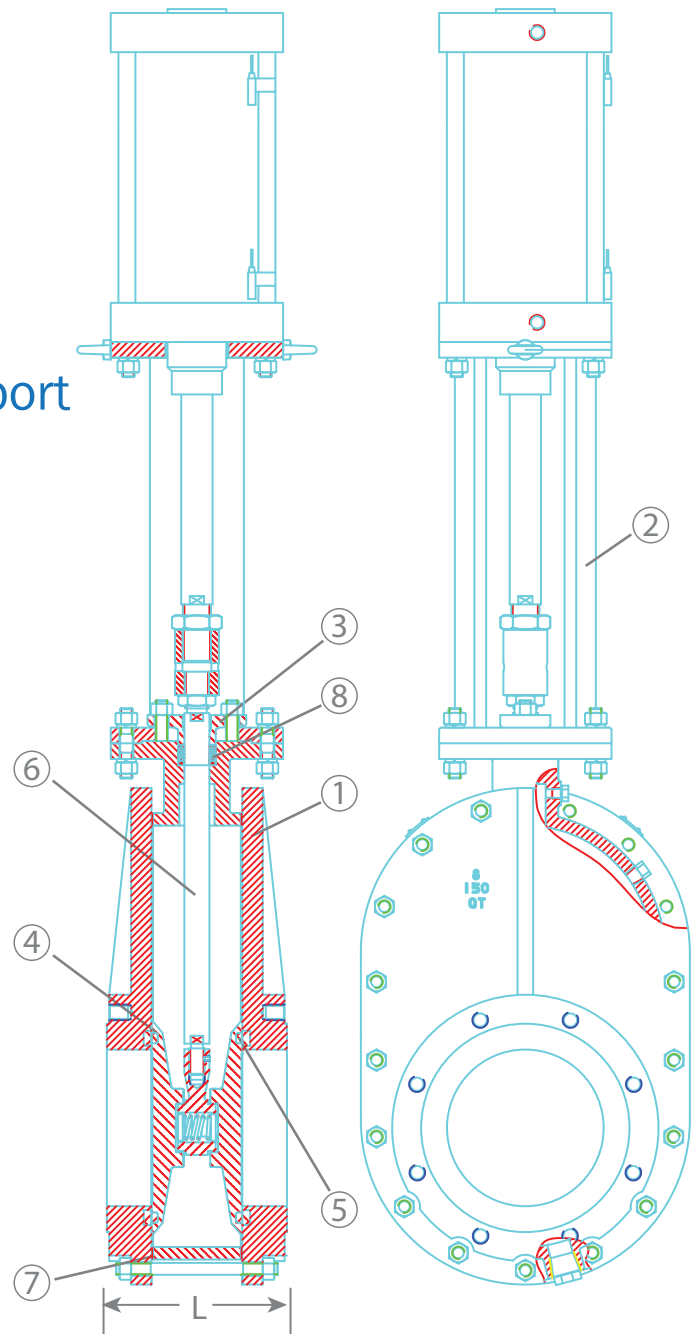
# CPT Style

Ceramic Pneumatic Transport

*Ultra Fine Powder and Fly Ash Service*

## Product Specifications

| Typical Materials |               |          |
|-------------------|---------------|----------|
| 1                 | Body          | WCB      |
| 2                 | Actuator Yoke | WCB      |
| 3                 | Packing Gland | WCB      |
| 4                 | Seat          | Ceramic  |
| 5                 | Disc          | Ceramic  |
| 6                 | Stem          | AISI 420 |
| 7                 | Gaskets       | PTFE     |
| 8                 | Packing       | PTFE     |



| Typical Dimensions (Inches, Class 150) |   |       |       |        |        |        |        |        |
|--|---|-------|-------|--------|--------|--------|--------|--------|
| Size                                   |   | 2"    | 3"    | 4"     | 6"     | 8"     | 10"    | 12"    |
| F-F (Long)                             | L | 7.87" | 9.45" | 11.02" | 12.60" | 13.78" | 15.75" | 17.72" |
| F-F (Short)                            | L | 4.72" | 4.72" | 4.72"  | 6.30"  | 6.30"  | 7.87"  | 7.87"  |

Note: Higher pressure ratings available upon request and engineering review

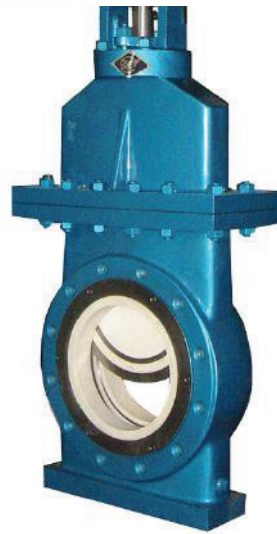
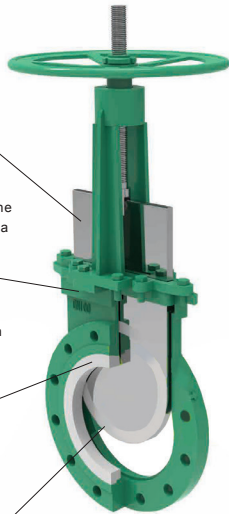
## Design Features

Optional enclosed bonnet design allows more aggressive slurries to be handled with ease.

Ceramic Materials can be selected for the application. Including Zirconia, Alumina and Silicon Carbide.

Hard ceramic materials in the seat mean sealing capability stays consistent for years with no degradation.

Ceramic material seat inserts insure long life even under severe service.



Enclosed Bonnet

1- Chemical Plant



2- Power Plant



3- Cement Plant



4- Petrochemical Plant



5- Water Treatment



6- Papermaking



7- Mining Plant

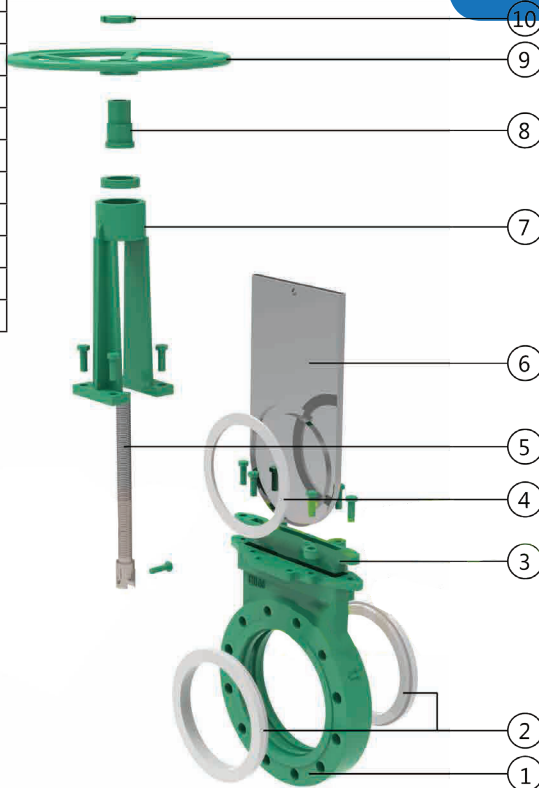


8- Steel Smelt



## Available Material List

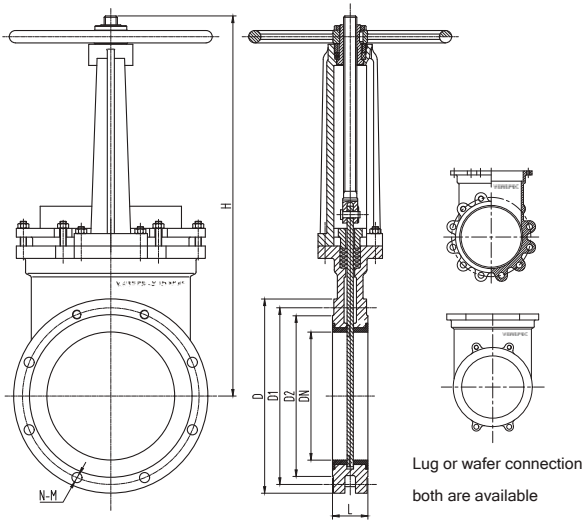
| Item | Part Name     | Material   |
|------|---------------|--|
| 1    | Body          | WCB, CF8, CF8M, Duplex SS                              |
| 2    | Seat          | Al <sub>2</sub> O <sub>3</sub> , SiC, ZrO <sub>2</sub> |
| 3    | Packing Gland | WCB, CF8, CF8M, Duplex SS                              |
| 4    | Disc Insert   | Al <sub>2</sub> O <sub>3</sub> , SiC, ZrO <sub>2</sub> |
| 5    | Stem          | 2Cr13, 17-4Ph  |
| 6    | Knife Gate    | CS, SS   |
| 7    | Yoke          | WCB, CF8, CF8M, Duplex SS                              |
| 8    | Stem Nut      | Copper   |
| 9    | Hand Wheel    | Cl, DI, CS   |
| 10   | Locking Nut   | CS, SS   |



## Ceramic Slurry Gate Valve

Fig Number: C SK

**Heavy Duty Knife Gate Valve with Ceramic Sealing**



**Specification:**

- Design Standard: MS-SSP-81
- Face to face dimension: VerSpec factory standard or customize
- End Flange: GB/T 9113-2010
- Inspection and Test: JB/T 9092; Sealing Class See Below:
- Ceramic Sealing Class: II, Polyurethane Sealing Class: VI
- Max Temperature of Ceramic Seat: 200°C, Polyurethane seat: 90°C
- Worm gear or Pneumatic or Electrical actuator operating

**Dimensions**

Unit: mm

| DN  | L   | D   | D1  | D2  | H (FYI) | N-M    |
|-----|-----|-----|-----|-----|---------|--------|
| 50  | 43  | 165 | 125 | 100 | 285     | 4-M16  |
| 65  | 46  | 185 | 145 | 120 | 295     | 4-M16  |
| 80  | 46  | 200 | 160 | 135 | 315     | 4-M16  |
| 100 | 52  | 220 | 180 | 155 | 365     | 8-M16  |
| 125 | 56  | 250 | 210 | 185 | 400     | 8-M20  |
| 150 | 56  | 285 | 240 | 210 | 475     | 8-M20  |
| 200 | 60  | 340 | 295 | 265 | 540     | 8-M20  |
| 250 | 68  | 405 | 355 | 320 | 630     | 12-M22 |
| 300 | 78  | 460 | 410 | 375 | 780     | 12-M22 |
| 350 | 78  | 520 | 470 | 435 | 885     | 12-M27 |
| 400 | 102 | 580 | 525 | 485 | 990     | 16-M27 |
| 450 | 114 | 640 | 585 | 545 | 1100    | 16-M30 |
| 500 | 127 | 715 | 650 | 608 | 1200    | 20-M30 |
| 600 | 154 | 840 | 770 | 718 | 1450    | 20-M33 |

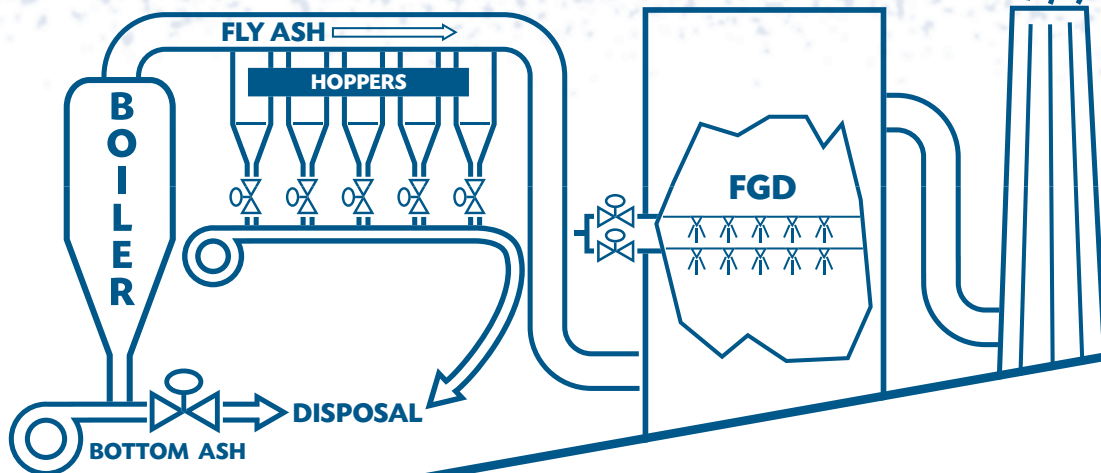
All dimension also can be customized, please contact VerSpec representative to get confirmed general drawing, and we reserve the right to make changes within the context of technical development



**Al2O3 Ceramic Sealing Knife Gate Valves for Mining Plants Slurry Medium**

# Typical Applications / Industries

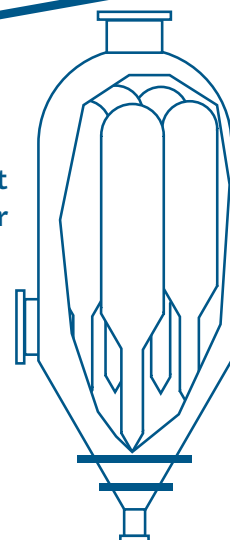
## Power Plants



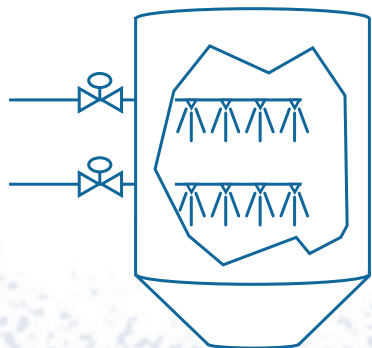
## Refinery Applications



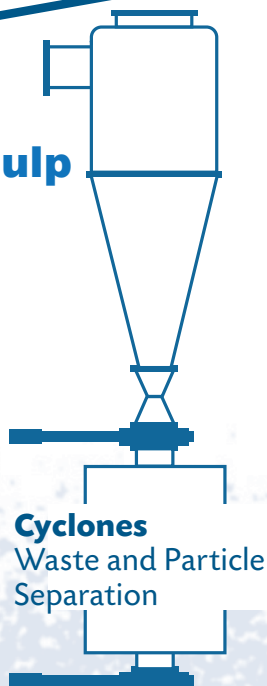
Catalyst Regenerator



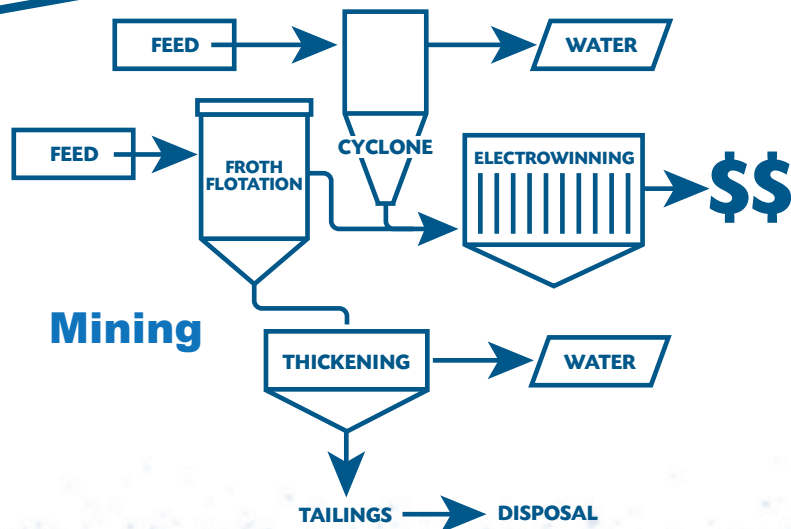
## Chemical - Paper / Pulp



Scrubbers with Abrasive Media



Cyclones Waste and Particle Separation



## Mining