

# Metal Body Fluoropolymer Lined Butterfly Valves



Iron

TYPE: CST

SIZES: 1-1/2" to 42"

BODY TYPE: Wafer & Lug

MATERIALS:

BODY: Epoxy-coated Ductile Iron

DISC: PFA covered 316 SS, Conductive PFA  
Stainless Steel, Polished Stainless Steel  
Titanium Grade 2, Hastelloy C22

SEAT & SHAFT SEAL: PFA covered 316 SS, PTFE  
FDA Approved PTFE, UHMPE

SEAT BACK-UPS: FDA Grade FKM (Viton®), Silicone, EPDM

OPERATING TEMPERATURE: -40°C to 200°C (-40°F to 395°F)

Type CST fluoropolymer lined butterfly valves are manufactured by ChemValve-Schmid AG in Switzerland. They feature a fluoropolymer disc covering and seat materials with properties superior to those of standard PTFE. This along with a proven effective stem seal provides these valves with superior performance vs. conventional PTFE lined valves.

## features

- **Exceptional Corrosion Resistance**
- **Zero Leakage** rated for sizes up to 24" at 150 psi up to 105°C (220°F)

### Special TFM Seat and PFA Disc Covering

– The seat is TFM, a high density grade of PTFE. The one piece disc/shaft is 316 SS over-moulded with PFA. Both materials have mechanical properties superior to those of standard PTFE:

- **Low Cold Flow** – More durable and stable when under stress
- **Low Permeability** – The permeability of TFM is 50% less than standard PTFE<sup>1</sup>. Lower permeability means longer valve life on highly corrosive chemicals.
- **Smoother Surface** – Higher abrasion resistance

**Easily Serviceable** – The "split" body can be disassembled and the seat (liner) or disc/shaft part replaced.



<sup>1</sup> Tested with chlorine gas

## Features of TFM Lined Metal Body Butterfly Valves

### Operator Mounting Flange

- Permits direct mounting of electric or pneumatic actuators
- ISO 5211 standard dimensions

### Shaft Bushing

- With inner and outer FKM (Viton®) o-ring seals
- Seals the shaft from the outside and provides vacuum resistance

### Bearing

- PTFE coated permanently lubricated bearing

### Wide Sealing Face on Liner

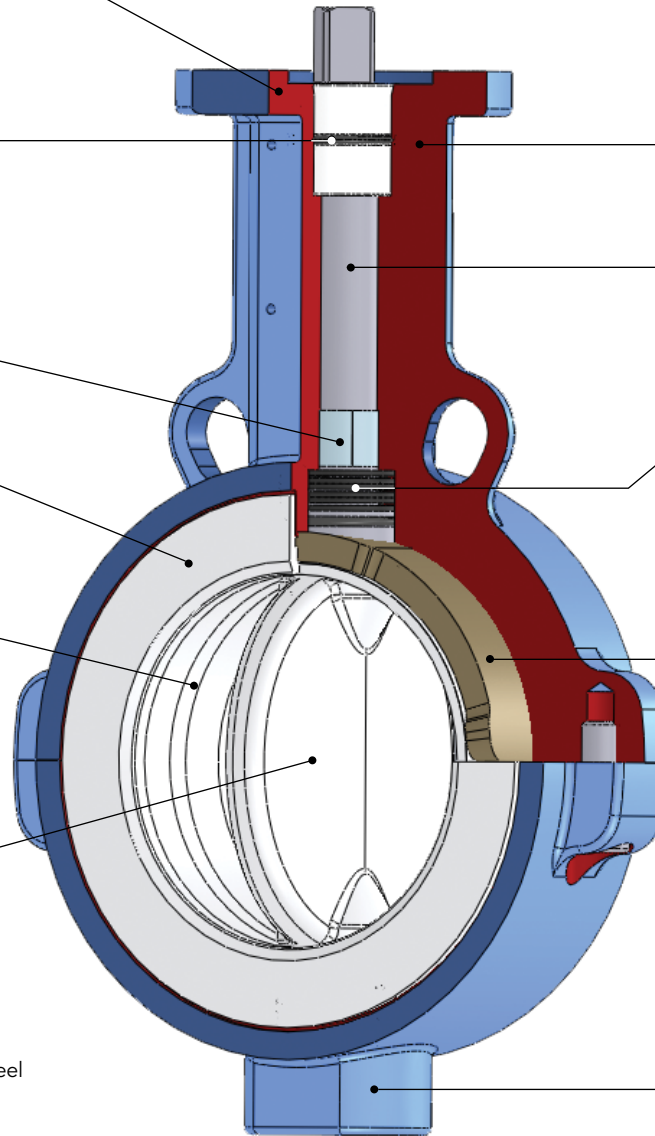
- Guarantees a leak-free seal

### Precision Machined High Density TFM Seat

- Minimum 3.0 mm thickness
- Sealing surface is spherical for optimal sealing and minimal stress. The valve's cycle life is maximized

### One-Piece Disc/Stem

- PFA 3.0 mm thick is precision over-moulded onto the one-piece 316 SS disc/stem
- Permeation problems are eliminated due to the high density PFA permanently bonded to the stainless steel
- Full vacuum resistance at full-range of temperature and pressures



### Split Body Design

- For disassembly. Parts may be replaced.

### One-Piece Disc/Stem

- Allows for a thinner disc for higher  $C_v$  values and better flow control

### Upper Stem Seal Package

- Provides uniform loading onto the compression piece, pressing the TFM seat against the disc-stem
- A leak-free mechanical stem seal – triple seals

### Resilient Elastomer Backup Pads

- Provide uniform pressure onto the circumference of the disc, ensuring bubble-tight shut off under all operating conditions
- Moulded pads have exact dimensional tolerances for precise shaft torques

### Lower Stem Seal Package

- Lower stem seal is the same design as the upper seal (not shown)

## Mechanical Shaft Seal

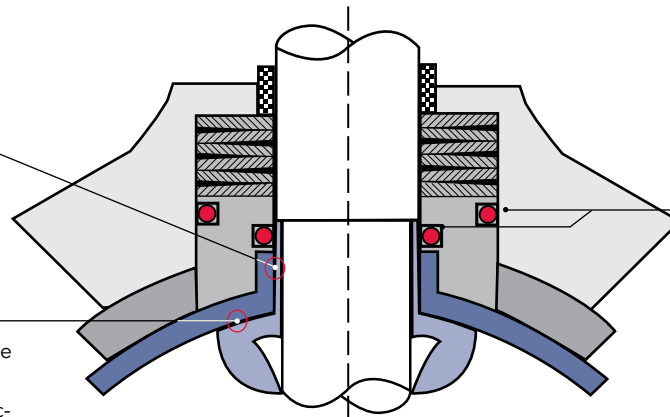
Perfect sealing between the TFM seat and PFA disc is maintained under all pressures and temperatures. Three levels of sealing are provided – primary plus two back-ups.

### 2) Radial (Lip) Sealing

- The compression piece provides a radial seal between the PFA covered shaft and the flared portion of the TFM seat

### 1) Primary Sealing

- Belleville disc springs provide a leak-free mechanical stem seal. The TFM seat is pressed against the shoulder of the disc-stem assembly.



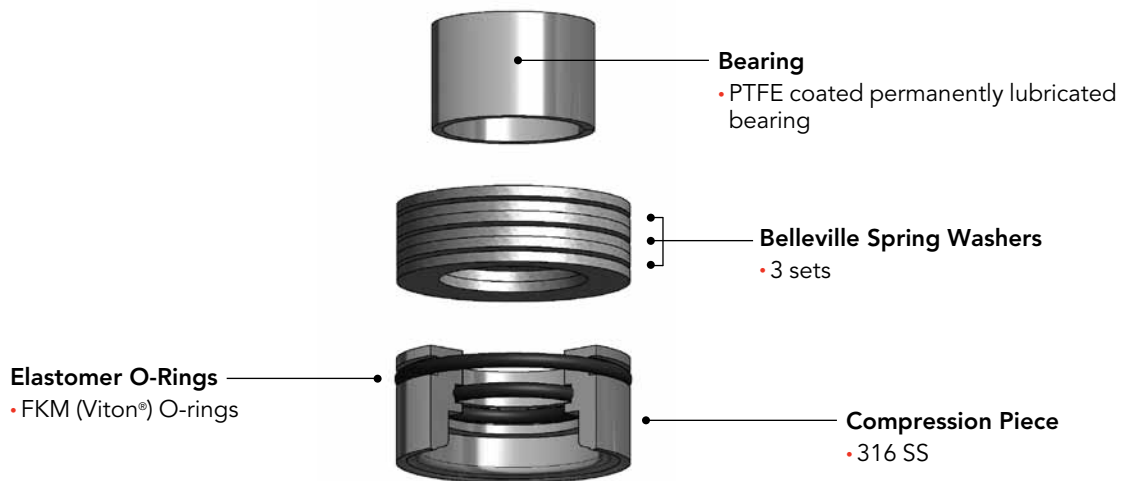
### 3) Back-Up Seals

- FKM (Viton®) o-rings act as a back-up

Three Levels of Sealing

## Spring Pack with Compression Piece

A specially designed spring pack and compression piece provides dynamic loading for the shaft seal.



## TFM – A Superior Grade to PTFE

TFM is made by adding 1% PPVE (Perfluoropropyl Vinyl Ether) to PTFE. The excellent properties of PTFE are retained:

- High chemical resistance
- Wide service temperature range
- Long life – No long term embrittlement

Addition of PPVE creates a higher density molecule structure (Figure 1). This modified PTFE has properties superior of those of standard PTFE

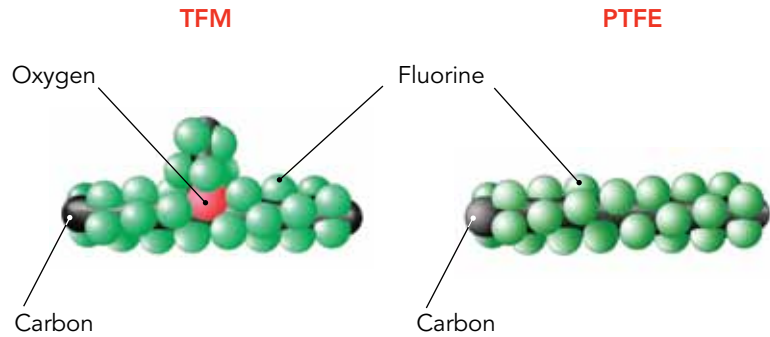
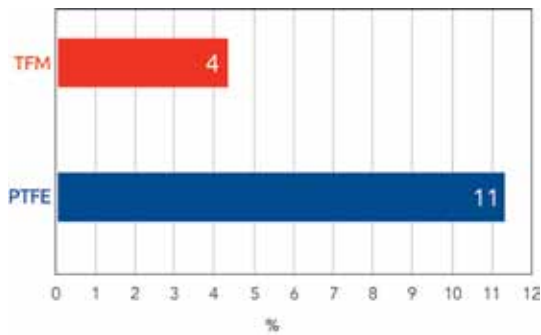


Figure 1: Molecular Structure

### Less “Cold Flow”

- TFM exhibits significantly less “cold flow” or deformation under load compared to PTFE (Figure 2)
- In valve service, a seat of TFM ultimately lasts longer than PTFE

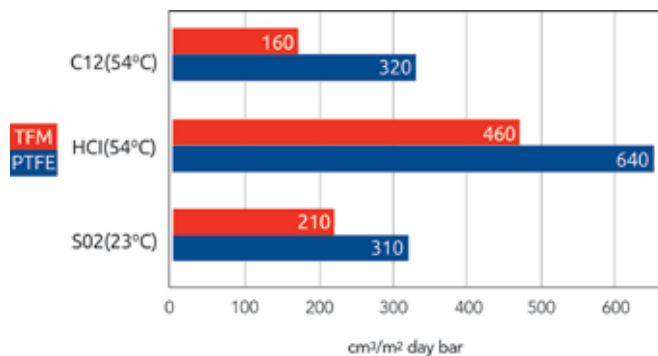


Load: 150 bar 100 hour duration at 23°C (73°F)  
Irreversible deformation after cyclic load, 24 hour after release.

Figure 2: Deformation under load – TFM versus PTFE

### Lower Permeability

- Permeability of TFM is less than PTFE on aggressive services such as chlorine, concentrated acids and other strong oxidizing agents. Valve life is extended (Figure 3).



Permeability of different media for TFM and PTFE  
(test sample thickness = 1 mm)

Figure 3: Permeability of chemicals – TFM versus PTFE

### Smoother Surface

- TFM seat has a smoother surface than that of PTFE which translates to higher abrasion resistance in chemical applications and lower particle generation in high purity applications (Figure 4)

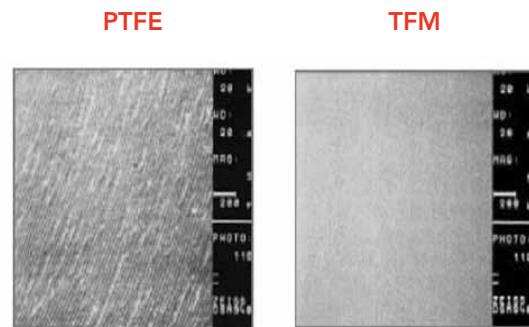
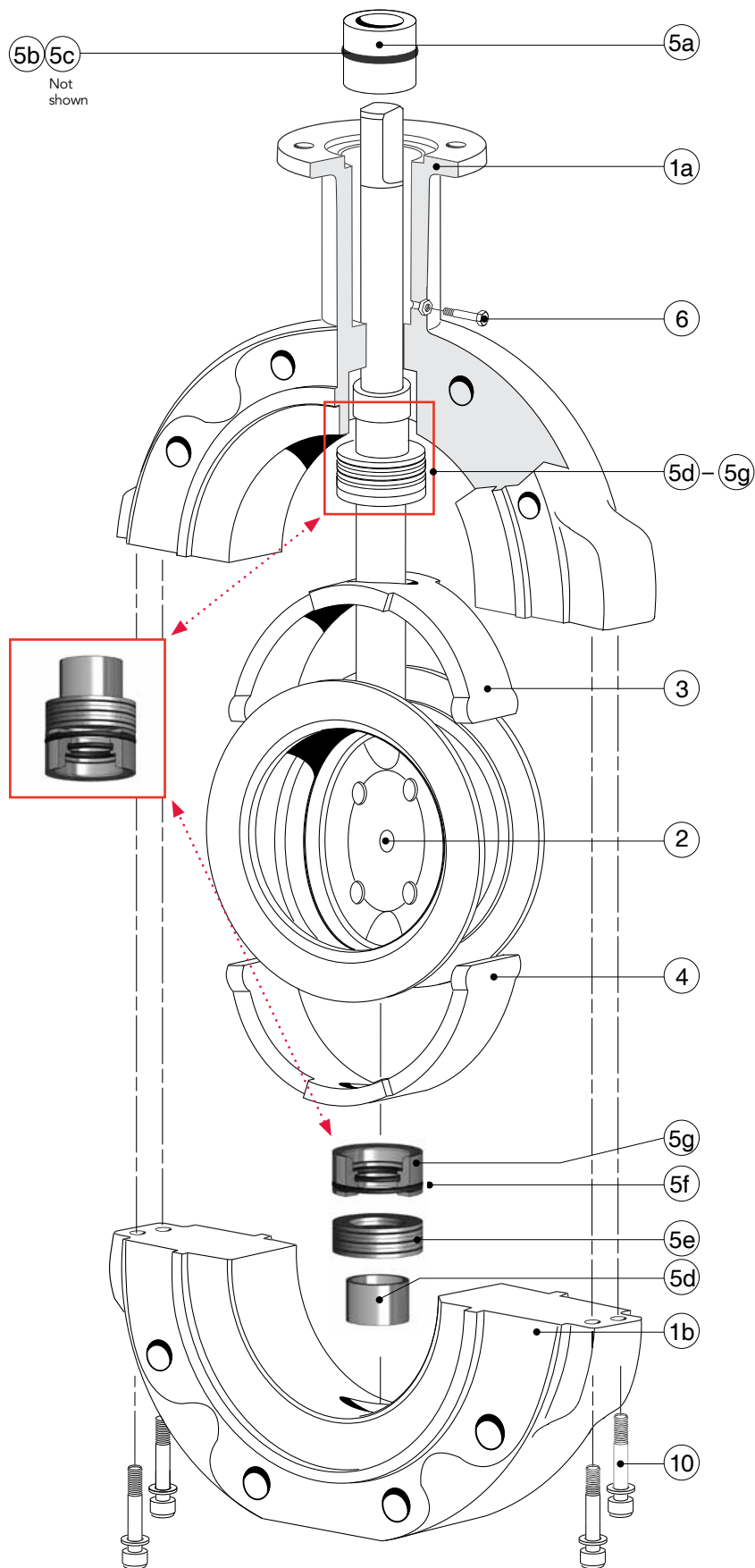


Figure 4: Surfaces magnified 50 times

# Type CST Fluoropolymer Lined Butterfly Valves



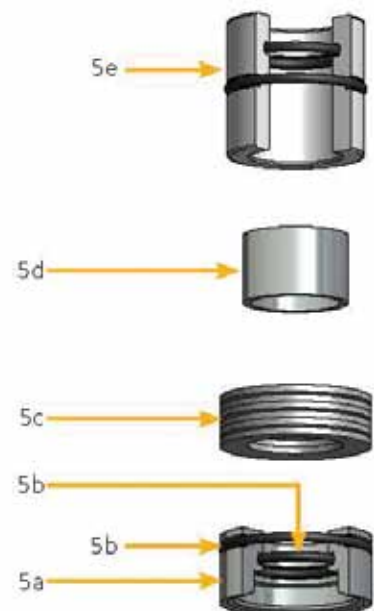
## PARTS

▲ Recommended Spare Parts

No.	Part	Pcs.	Materials
1a	Upper Body	1	Epoxy coated Ductile Iron
1b	Lower Body	1	Epoxy coated Ductile Iron
2▲	Disc/Shaft	1	PFA covered 316 SS
3▲	Seat (Liner)	1	TFM
4▲	Seat Back-up	1	FKM (Viton®)
5a	Shaft Bushing	2	POM Polyacetal
5b	Outer Bushing O-Ring	2	FKM (Viton®)
5c	Inner Bushing O-Ring	2	FKM (Viton®)
5d	Shaft Bearing	2	PTFE Covered
5e	Belleville Spring Washer	3 sets	Spring Steel
5f	Elastomer O-Rings	2	FKM (Viton®)
5g	Compression Piece	1	316SS
6	Atex Sniffer Port <sup>1</sup>	1	SS
7	Hand Lever	1	304 SS
8	Position Lock Plate	1	304 SS
9	Gear Operator	1	Cast Iron, epoxy coated
10	Bolt/Washer	2-4 <sup>2</sup>	316 SS

<sup>1</sup> Optional provision for fugitive emissions monitoring

<sup>2</sup> Quantity dependant on valve size



# Type CST Fluoropolymer Lined Butterfly Valves



## DIMENSIONS INCHES

Size	L	A	B*	C	n	Wafer		D <sub>1</sub>	Wafer		D <sub>3</sub>	E	G <sub>1</sub>	G <sub>2</sub>	Lug	
						e	d		D <sub>2</sub>	D <sub>2</sub>					H <sub>1</sub>	H <sub>1</sub>
1-1/2"	1.30	0.28	1.34	3.87	4	0.63	1.57	2.99	5.43	5.43	4.92	9.06	5.04	1.71	2.09	2.09
2"	1.69	0.24	1.22	4.75	4	0.75	1.97	3.35	6.14	4.88	4.92	9.06	5.04	1.71	2.36	2.36
2-1/2"	1.81	0.43	1.85	5.50	4	0.75	2.56	4.17	5.83	7.99	4.92	9.06	5.04	1.71	2.76	3.19
3"	1.81	0.67	2.48	6.00	4	0.75	3.15	4.80	6.50	8.58	4.92	9.06	5.04	1.71	3.31	3.46
4"	2.05	1.06	3.54	7.50	8	0.75	3.94	5.63	7.56	9.92	4.92	10.63	5.04	1.71	3.94	4.06
5"	2.20	1.50	4.65	8.50	8	0.87	4.92	6.54	8.78	11.26	4.92	10.63	5.04	1.71	4.33	4.61
6"	2.20	1.85	5.39	9.50	8	0.87	5.91	7.60	9.96	12.20	7.87	12.80	8.31	2.07	5.12	5.04
8" lever	2.36	2.80	7.48	11.75	8	0.87	7.87	9.88	12.28	14.80	7.87	13.74	8.31	2.07	6.22	6.30
8" gear	2.36	2.80	7.48	11.75	8	0.87	7.87	9.88	12.28	14.80	7.87	-	8.31	2.07	6.22	6.30
10"	2.68	3.62	9.45	14.25	12	1.02	9.84	11.85	14.72	17.72	7.87	-	8.31	2.07	7.64	7.64
12"	3.07	4.41	11.42	17.00	12	1.02	11.81	13.74	16.69	20.47	9.84	-	10.63	2.71	8.86	8.98
14"	3.62	4.92	12.91	18.75	12	1.14	13.78	16.30	23.07	23.07	9.84	-	10.63	2.71	10.04	10.04
16"	4.02	5.75	14.88	21.25	16	1.14	15.75	18.11	25.59	25.59	9.84	-	10.63	2.71	11.42	11.42
18"	4.49	6.46	16.69	22.75	16	1.26	17.72	20.28	27.56	27.56	11.81	-	11.38	3.31	12.36	12.36
20"	5.00	7.24	18.78	25.00	20	1.26	19.69	22.44	29.33	29.33	11.81	-	11.38	3.31	13.46	13.46
24"	6.06	8.46	22.09	29.50	20	1.38	23.62	26.46	34.25	34.25	15.75	-	15.24	5.41	15.79	15.79
28"	6.06	10.39	26.18	34.00	28	1.38	27.56	30.98	39.37	39.37	15.75	-	15.24	5.41	22.72	22.72
30"	6.06	11.38	28.23	36.00	28	1.38	29.53	33.50	41.34	41.34	19.69	-	16.06	5.41	23.74	23.74
32"	6.06	12.36	30.24	38.50	28	1.65	31.50	35.12	44.49	44.49	23.62	-	16.69	5.41	25.08	25.08
36"	6.06	14.17	33.90	42.75	32	1.65	35.43	40.00	49.02	49.02	23.62	-	16.69	5.41	26.93	26.93
40"	6.06	16.34	38.23	47.25	36	1.65	39.37	43.35	55.51	55.51	15.75	-	17.09	5.41	29.80	29.80
42"	6.06	17.05	39.76	49.50	36	1.65	41.34	46.06	55.51	55.51	15.75	-	17.09	5.41	29.80	29.80

\*B=Minimum inside diameter (I.D.) of mating pipe. If I.D. of pipe is B dimension or less, the inside of pipe and must be chamfered or spacers provided. Consult Chemline.

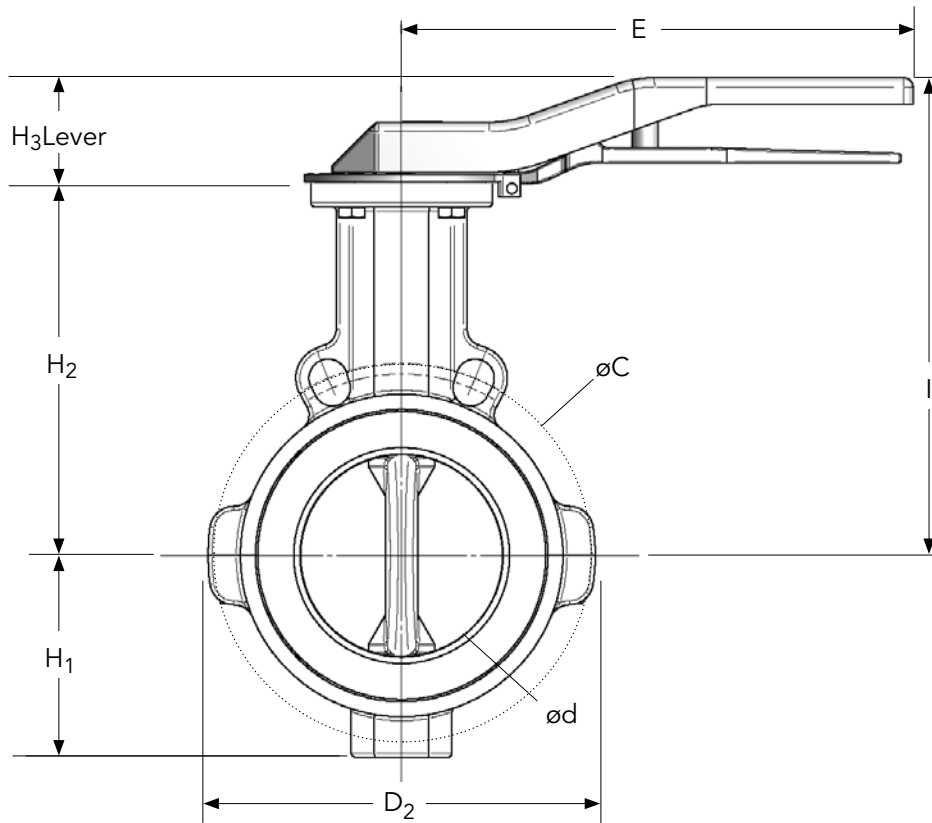
## DIMENSIONS INCHES

Size	Lever		Gear H <sub>3</sub>	Wafer I	Lug I	Lug Threads		K	L x M	P	Q	R	S	T
	H <sub>2</sub>	H <sub>3</sub>				F	J							
1-1/2"	3.70	1.81	2.52	5.81	5.81	1/2" - 13 UNC	1.97	4x 0.28	1.42 0.14	0.35	0.75	2.56	3.31	2.66
2"	5.12	1.81	2.52	6.08	6.08	5/8" - 11 UNC	2.76	4x 0.35	2.20 0.14	0.43	0.75	3.54	3.31	2.66
2-1/2"	5.75	1.81	2.52	6.48	6.91	5/8" - 11 UNC	2.76	4x 0.35	2.20 0.14	0.43	0.75	3.54	3.31	2.66
3"	6.50	1.81	2.52	7.03	7.19	5/8" - 11 UNC	2.76	4x 0.35	2.20 0.14	0.43	0.75	3.54	3.31	2.66
4"	7.28	2.17	2.52	7.66	7.78	5/8" - 11 UNC	2.76	4x 0.35	2.20 0.14	0.55	0.98	3.54	3.31	2.66
5"	7.95	2.17	2.52	8.05	8.33	3/4" - 10 UNC	2.76	4x 0.35	2.20 0.14	0.55	0.98	3.54	3.31	2.66
6"	8.54	2.17	2.95	10.53	10.45	3/4" - 10 UNC	2.76	4x 0.35	2.20 0.14	0.67	1.18	3.54	4.41	3.21
8" lever	9.65	2.17	2.95	11.63	11.71	3/4" - 10 UNC	4.02	4x 0.43	2.80 0.14	0.75	1.02	4.92	4.41	3.21
8" gear	9.65	-	2.95	11.63	11.71	3/4" - 10 UNC	4.02	4x 0.43	2.80 0.14	0.75	1.02	4.92	4.41	3.21
10"	10.63	-	2.95	13.05	13.05	7/8" - 9 UNC	4.02	4x 0.43	2.80 0.14	0.87	1.18	4.92	4.41	3.21
12"	12.13	-	3.58	15.57	15.69	7/8" - 9 UNC	4.02	4x 0.43	2.80 0.14	0.87	1.18	4.92	5.31	4.53
14"	12.99	-	3.58	16.75	16.75	1" - 8 UNC	4.92	4x 0.51	3.43 0.16	1.06	1.46	5.91	5.31	4.53
16"	14.37	-	3.58	18.13	18.13	1" - 8 UNC	4.92	4x 0.51	3.43 0.16	1.06	1.46	5.91	5.31	4.53
18"	15.75	-	3.82	20.18	20.18	1-1/8" - 7 UNC	5.51	4x 0.67	4.02 0.18	1.42	1.97	6.89	6.14	4.84
20"	17.13	-	3.82	21.28	21.28	1-1/8" - 7 UNC	5.51	4x 0.67	4.02 0.18	1.42	1.97	6.89	6.14	4.84
24"	20.08	-	5.04	26.18	26.18	1-1/4" - 7 UNC	6.50	4x 0.83	5.20 0.22	1.81	2.52	8.27	11.10	7.32
28"	22.91	-	5.04	33.11	33.11	1-1/4" - 7 UNC	6.50	4x 0.83	5.20 0.22	1.81	2.52	8.27	11.10	7.32
30"	23.94	-	5.04	36.10	36.10	1-1/4" - 7 UNC	6.50	4x 0.83	5.20 0.22	2.17	3.54	8.27	11.10	7.32
32"	25.08	-	5.04	39.41	39.41	1-1/2" - 6 UNC	10.00	8x 0.67	7.95 0.22	2.17	3.54	11.81	11.10	7.32
36"	26.93	-	5.04	41.26	41.26	1-1/2" - 6 UNC	10.00	8x 0.67	7.95 0.22	2.17	3.54	11.81	11.10	7.32
40"	29.80	-	5.04	40.20	40.20	1-1/2" - 6 UNC	10.00	8x 0.67	7.95 0.22	2.17	3.54	11.81	11.10	7.32
42"	29.80	-	5.04	40.20	40.20	1-1/2" - 6 UNC	10.00	8x 0.67	7.95 0.22	2.17	3.54	11.81	11.10	7.32

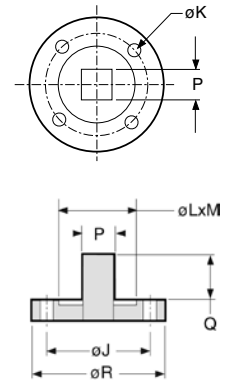
# Type CST Fluoropolymer Lined Butterfly Valves



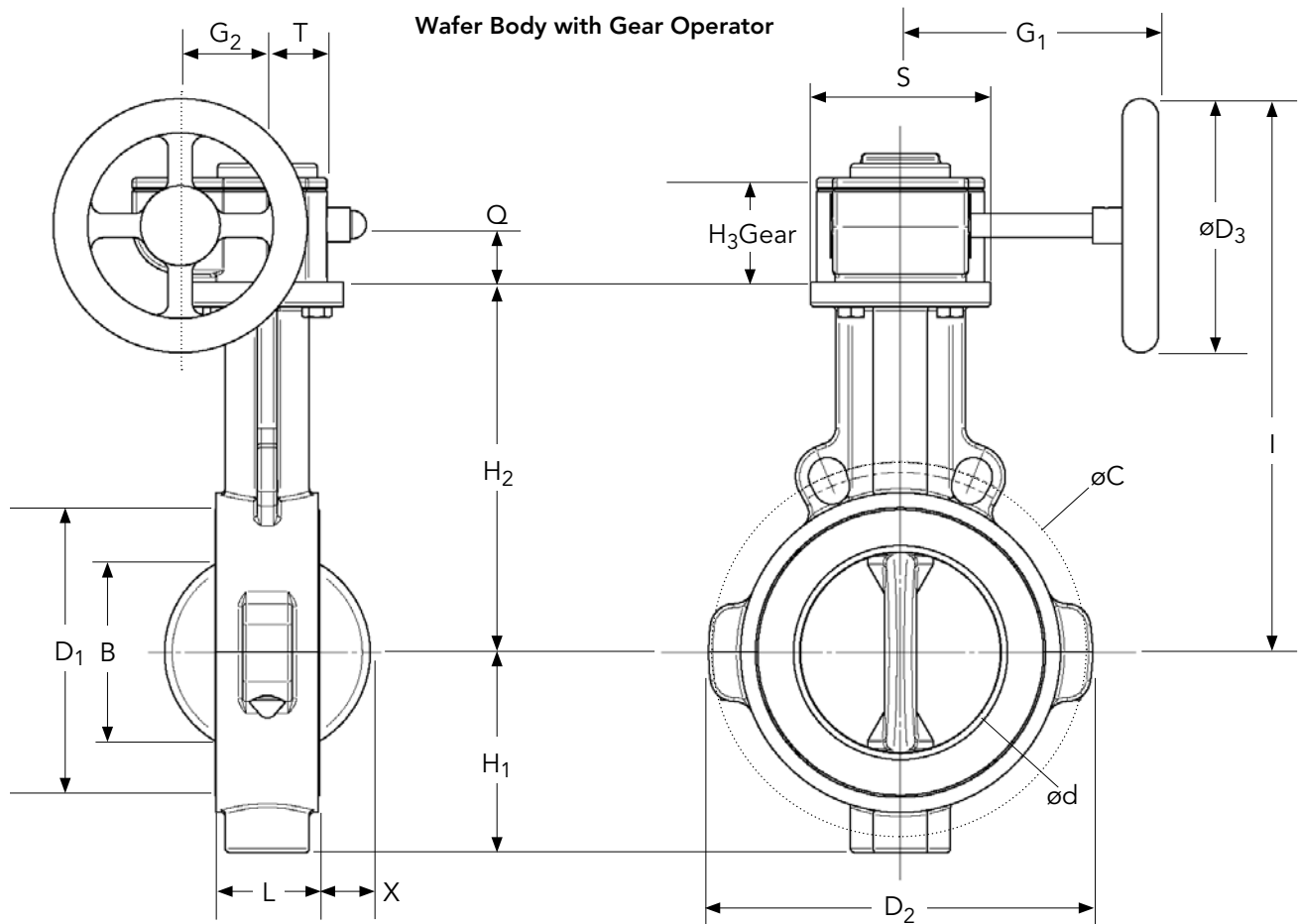
Wafer Body with Lever Operator



Shaft & Top Detail



Wafer Body with Gear Operator

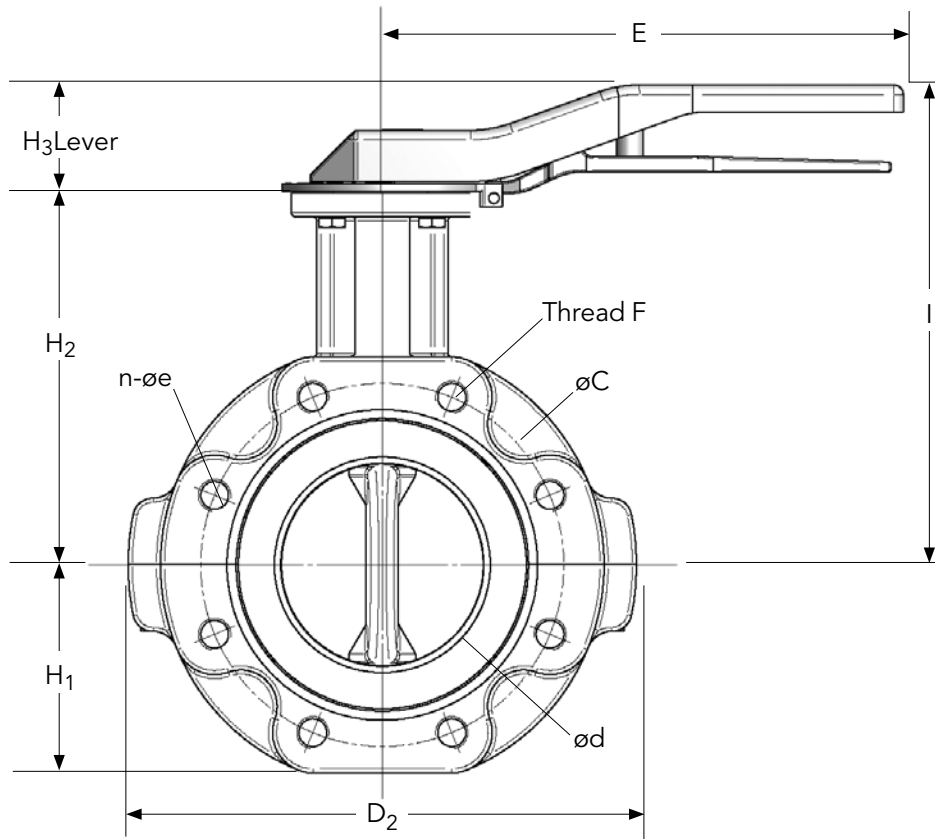




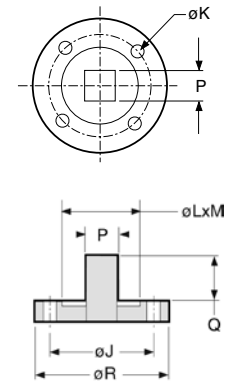
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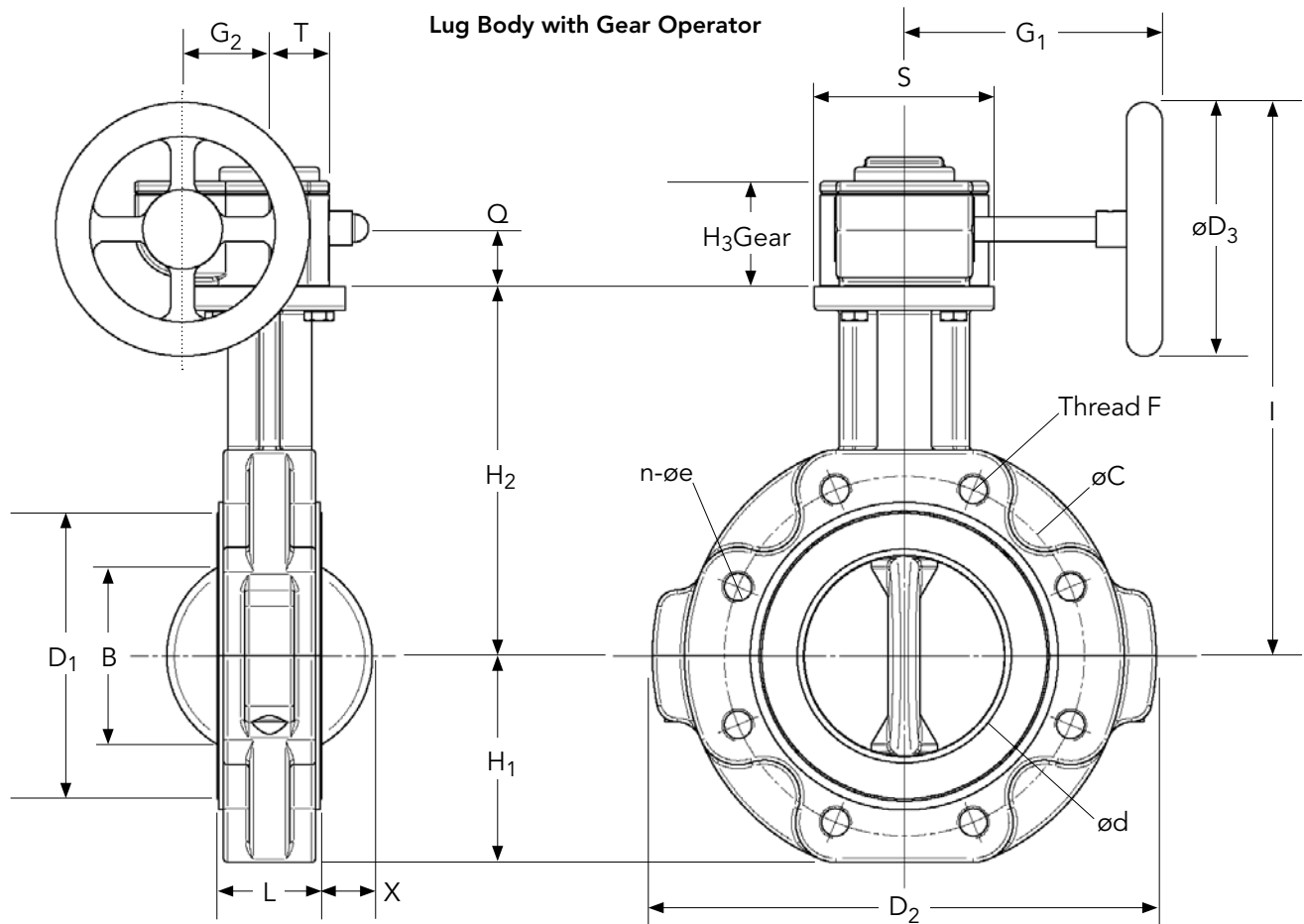
Lug Body with Lever Operator



Shaft & Top Detail



Lug Body with Gear Operator





# Type CST Fluoropolymer Lined Butterfly Valves



Cv VALUES VS. DISC ANGLE							FLANGE BOLT TORQUES	WORKING PRESSURES	PSI		TFM Seat/ PFA Disc
	Size	15°	30°	45°	60°	75°	90°	Max. Recommended Torques Ft.-Lbs.	-25 to 105°C -15 to 221°F	135°C 275°F	200°C 390°F
1-1/2"	4	11	27	60	95	118	18.4	150	150	90	
2"	4	13	33	73	115	144	25.8	150	150	90	
2-1/2"	7	22	56	125	196	245	29.5	150	150	90	
3"	11	33	85	188	295	369	33.2	150	150	90	
4"	23	69	176	390	612	766	36.9	150	150	90	
5"	34	103	263	583	914	1,143	44.3	150	150	90	
6"	43	130	332	736	1,154	1,443	51.6	150	150	90	
8" Lever	88	263	673	1493	2,341	2,927	62.7	150	113	45	
8" Gear	88	263	673	1493	2,341	2,927	62.7	150	113	45	
10"	122	367	938	2079	3,261	4,076	70.1	150	113	45	
12"	185	555	1,418	3144	4,932	6,165	77.4	150	113	45	
14"	283	849	2,170	4812	7,548	9,435	106.9	150	113	45	
16"	403	1,208	3,087	6845	10,738	13,422	121.7	150	113	45	
18"	540	1,620	4,140	9181	14,402	18,002	136.4	150	113	45	
20"	672	2,016	5,151	11423	17,918	22,397	158.6	150	113	45	
24"	863	2,590	6,619	14676	23,021	28,776	169.6	150	113	45	
28"	1,075	3,225	8,241	18273	28,663	35,829	221.3	90	68	30	
30"	1,209	3,627	9,270	20555	32,242	40,303	221.3	90	68	30	
32"	1,385	4,154	10,616	23539	36,924	46,155	339.3	90	68	30	
36"	1,937	5,810	14,848	32924	51,646	64,557	339.3	90	68	30	
40"	2,182	6,545	16,726	37087	58,176	72,720	368.8	90	68	30	
42"	2,454	7,363	18,817	41724	65,450	81,812	368.8	90	68	30	

## WEIGHTS LBS.

Size	Wafer Body Valve		Lug Body Valve	
	with Hand Lever	with Gear Op	with Hand Lever	with Gear Op
1-1/2"	5.1	7.7	7.3	9.9
2"	8.4	11.0	12.8	15.4
2-1/2"	10.6	13.2	17.2	19.8
3"	12.8	15.4	19.6	22.2
4"	16.3	18.3	26.2	28.2
5"	19.4	21.3	34.3	36.3
6"	25.1	30.6	37.8	43.3
8" Lever	40.5	44.9	58.3	62.7
8" Gear	-	44.9	-	62.7
10"	-	62.5	-	81.8
12"	-	98.3	-	142.3
14"	-	208.	-	208.
16"	-	252.	-	252.
18"	-	364.	-	364.
20"	-	436.	-	436.
24"	-	628.	-	628.
28"	-	685.	-	685.
30"	-	729.	-	729.
32"	-	971.	-	971.
36"	-	1,081.	-	1,081.
40"	-	1,138.	-	1,138.
42"	-	1,182.	-	1,182.

## ChemValve as a Control Valve

ChemValve's streamlined disc provides excellent flow control. In general for optimum system control, a valve should operate between 30% and 70% of valve opening (rotation of disc). The flow curve (Figure 5) shows the flow rate versus valve opening to be relatively linear in this range. With a choice of actuators and positions, the CST becomes a cost effective control valve.



Figure 5: Flow Curve

# Type CST Fluoropolymer Lined Butterfly Valves



## VACUUM RATING

- 29.9 inches mercury

## OPTIONS & ACCESSORIES

Consult Chemline for more details

- **Other Metal Body Materials:**  
304 SS, Carbon Steel
- **Alternate Seat Materials:**  
UHMWPE, Conductive TFM, FDA food grade Conductive TFM
- **Alternate Seat Backup "Energizers" Materials:** Silicone, EPDM, FDA grade FKM (Viton®)
- **Alternate Disc/Shaft Materials:**  
Conductive PFA, 316 SS, Polished 316 SS, Grade 2 Titanium, C22 Hastelloy
- **Electrically or Pneumatically Actuated**
- **Chain Wheel Operator**
- **Gear Operator** on 1-1/2" to 6"
- **Locking Capability** on gear operators
- **Shaft Extensions**
- **Limit Switches** for open and/or closed position indication

## SAMPLE SPECIFICATION

**Note:** Specification below is for valves with epoxy-coated ductile iron body, TFM seat, FKM seat backings and PFA covered disc/shaft. The valve is available with other body seat, seat backing and disc materials.

1. All fluoropolymer lined butterfly valves 1-1/2" to 42" will be Type CST from Chemline Plastics, manufactured by ChemValve-Schmid AG.
2. Body material will be epoxy-coated ductile iron.
3. Body will be "split" design, permitting disassembly and replacement of all parts.
4. Wafer style body will have two locating bolt holes, dimensions according to ANSI CL 150.
5. Lug body will have lug threads and bolt pattern dimensions according to ANSI CL 150.
6. Disc/shaft will be one-piece design, 316 stainless steel, over-moulded with minimum 2.5 mm thickness of PFA.
7. Mechanical shaft seals at the top and bottom of the disc/shaft will be a spring pack with 316SS compression piece, each incorporating three pairs of Belleville disc springs, and permanently lubricated bearing.
8. Seat will be TFM, a high density grade of PTFE, minimum 3.0 mm thick. The inside surfaces contacting the disc will be spherically designed for optimal sealing and extended life.
9. Elastomeric seat back-up pads ("energizers") will be precision moulded of FKM (Viton®) to ensure zero leakage and minimal seat wear for long life.
10. Operator mounting flange and shaft dimensions have standard dimensions according to DIN 5211 for exchange of manual operators or actuators. Fasteners used to mount operators will not be pressure retaining.
11. Hand lever operator (lever and position lock plate) will be solid 304 stainless steel.
12. Gear operator will be cast iron epoxy coated for corrosion resistance.

## TECHNICAL STANDARDS

**Flange Connections** – ANSI CL150, PN10-16 (sizes DN 50 to 300) and PN10 (sizes DN200 to 300) are available

**Face-to-Face Dimensions** – Conform to ISO 5752 Basic Range 20

**Operator Mounting Flange** – Conforms to ISO 5211 (standard actuator mounting) dimensions

**Shaft Dimensions** – Double D 1-1/2" to 6", Square shaft 8" to 42". Dimensions are according to ISO 5211.

**Leakage Testing** – Each valve is factory tested before shipment to confirm zero leakage. The test is EN 1226-1/P12, leakage rate A.

**Fugitive Emissions** – Certificate of compliance for TA Luft standard 5.2.6.4. Type CST valves reach this standard by TA Luft ("Technical Instructions on Air Quality Control") after 4,000 cycles with standard production valves while most competitors reach only 2,000 with specially prepared valves.

## ORDERING EXAMPLE

Type CST Butterfly Valves	CST	P	T	V	G	040	W	A1	-L
Disc	P – PFA covered 316SS C – Conductive PFA S – Stainless Steel F – Polished Stainless Steel T – Titanium Grade 2 H – Hastelloy C22								
Seat (Liner)	T – TFM	P – PTFE	C – FDA Approved PTFE	U – UHMPE					
Seat Back-ups	V – FDA grade FKM (Viton®)	S – Silicone	E – EPDM						
Body	G – Epoxy Coated Ductile Iron								
DN Size	015 – 1-1/2"	020 – 2"	025 – 2-1/2"	030 – 3"	040 – 4"	050 – 5"			
	060 – 6"	080 – 8"	100 – 10"	120 – 12"	140 – 14"	160 – 16"			
	180 – 18"	200 – 20"	240 – 24"	280 – 28"	300 – 30"	320 – 32"			
	360 – 36"	400 – 40"	420 – 42"						
Body Type	W – Wafer	E – Lug							
Flange Standard	A1 – ANSI 150	D1 – DIN PN10	D2 – DIN PN16						
Operator	L – Hand Lever	G – Gear Operator							

**Example:** Type CST Butterfly Valve, PFA covered disc/shaft, TFM seat, FKM (Viton®) seat back-ups, epoxy coated ductile iron, 4", wafer body, ANSI 150, lever operator.

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