

# FLOWSEAL

High Performance  
Butterfly Valves

**CRANE**

® Energy Flow Solutions



**Flowseal high performance butterfly valves are available in sizes from 2" - 48" in ASME pressure classes 150, 300, and 600 and are available with a diverse range of actuation options.**

**F**lowseal is a leading provider of soft seat, metal seat and fire-safe high performance butterfly valves. Our products are manufactured under an ISO 9001 Quality Assurance Program that assures each valve we produce meets or exceeds your exacting application requirements.

Additionally, our Design and Manufacturing facility is certified to the Pressure Equipment Directive (PED), and Flowseal valves can be ordered as CE marked (see page 23).

Flowseal high performance butterfly valves are a standard in many industries including heating, ventilating and air conditioning, power generation, hydrocarbon processing, water and waste water treatment, and marine and commercial shipbuilding. Our products are also installed in applications as diverse as food and beverage processing, snowmaking and pulp and paper production. Configurations are available for harsh conditions as well as applications requiring nominal pressure and temperature ratings.

As part of Crane Valve Group, Flowseal high performance butterfly valves are backed by the resources and experience of one of the world's largest valve producers with a delivery and quality track record that is unparalleled in the industries we serve.

NOTE: In keeping with our policy of continuing improvement, we reserve the right to institute changes in design, material, dimensions, or specifications without notice and without incurring any obligation to make such changes and modifications on product previously or subsequently sold.

## **FLOWSEAL**

### **High Performance Butterfly Valves**

- Soft Seat
- Metal Seat
- Fire-Safe Seat
- ISO
- Marine

### **Electric Actuators**

- On/Off
- Modulating

### **Pneumatic Actuators**

- Spring-Return
- Double Acting

### **Vane Actuators**

- Double Acting
- Failsafe

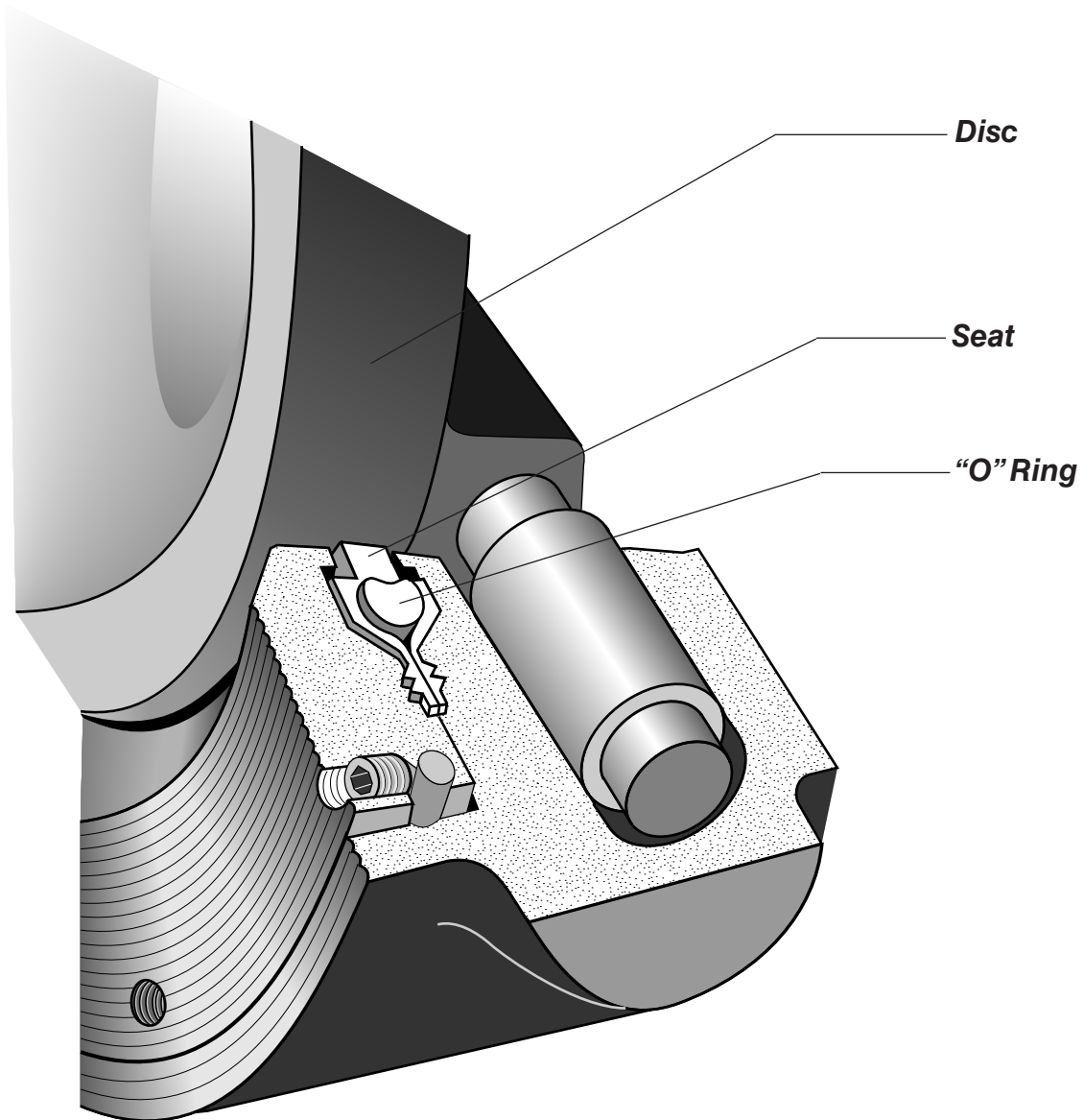
### **Manual Operators**

- Series W Gear Operators\*
- Levers

### **Typical Applications**

- Hydrocarbon Processing
- Chemical/Petrochemical Processing
- Marine and Commercial Shipbuilding
- Power and Utilities
- Pulp and Paper

\* For valves supplied with a chainwheel, the positive restraint option is recommended.



Flowseal is one of the world's leading manufacturers of high performance butterfly valves. Based on many years of research, development and field experience, the Flowseal design is superior to and more versatile than the High Performance Butterfly Valve design offered by other manufacturers.

The Flowseal Soft Seat valve provides a bi-directional bubble tight shutoff (zero leakage) by the use of a patented seat. This unique seat design creates a self-energized seal in vacuum-to-low pressure applications.

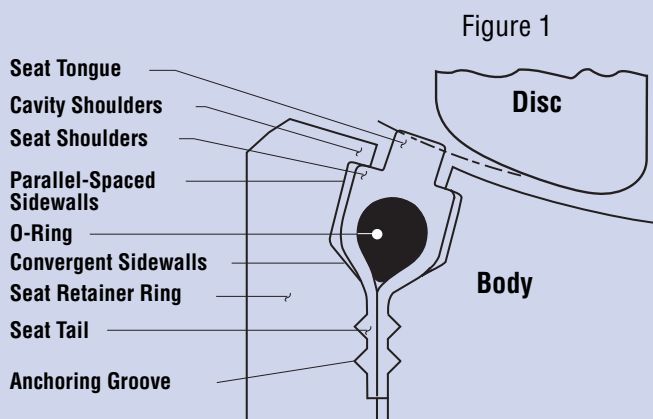
Under higher pressure conditions, the seat is also designed to permit, confine and direct movement of the soft seat against the disc edge, up to the full ASME Class 150, 300 and 600 Cold Working Pressures.

The Soft Seat is designed for high services with minimal wear and low torque. Seat replacement is a simple operation, requiring no special tools.

## DISC OPEN

In Figure 1, the disc and seat are not engaged. In this position, the shoulders of the seat are forced against the cavity shoulders by the compression of the o-ring.

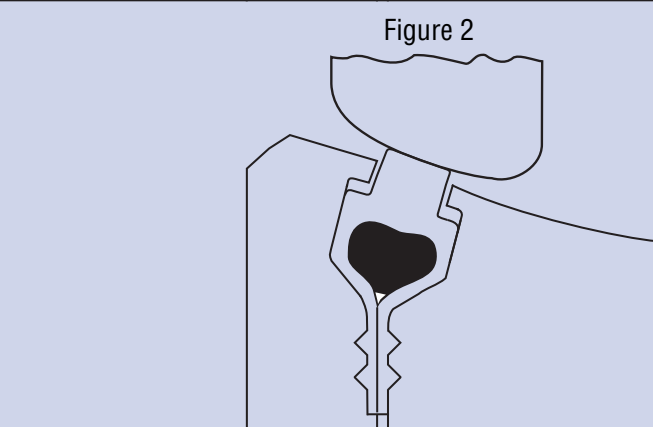
The seat is recessed inside the seat cavity and acts as a gasket in the anchoring groove area. The seat cavity is sealed from exposure from the process fluid and protects the seat from abrasion and wear. The o-ring, which is completely encapsulated by the seat, is also isolated from exposure to the process fluid.



## DISC CLOSED, Self-Energized Seal

In Figure 2, the Flowseal disc and seat are engaged, and the process fluid is under low pressure. The edge of the disc, with a larger diameter than the seat tongue, directs movement of the seat radially outward, causing the seat to compress against the convergent sidewalls of the cavity. The elastomeric o-ring imparts a mechanical pre-load between the disc and seat tongue as it is compressed and flattened by the disc; this is the self-energized mode for sealing at vacuum-to-60 psig.

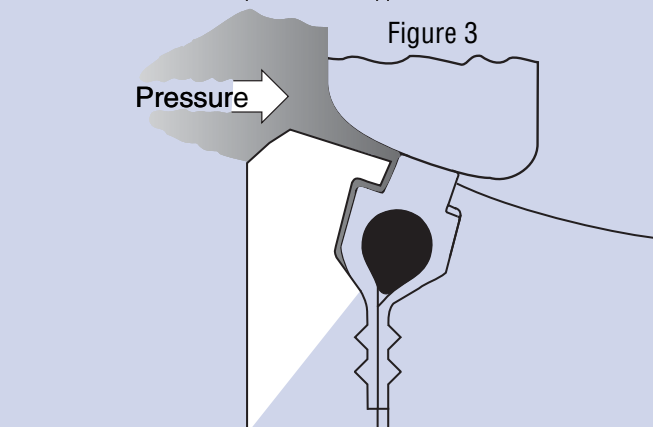
As the seat moves radially outward, the seat shoulders move away from the cavity shoulders and open the cavity to the process media.



## DISC CLOSED, Pressure-Energized Seal (Seat Upstream)

As line pressure increases, the process fluid enters the sidewall area and applies a load against the parallel-spaced sidewall and convergent sidewall of the seat. The seat and cavity design permits the seat to move axially to the downstream sidewall, but confines the movement and directs the movement radially inward towards the disc; the higher the line pressure, the tighter the seal between the disc and seat. Because the o-ring is elastic, it is able to flex and deform under loads and return to original shape after removal of the load; it is the rubber which deforms, not the thermoplastic material.

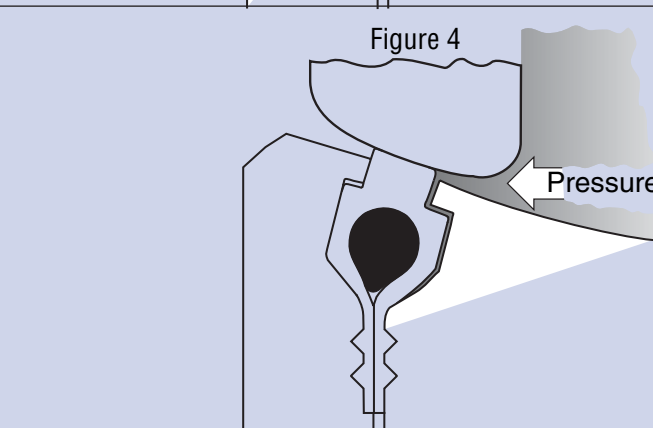
This dynamic seal, patented by Flowseal, is totally unique among high performance butterfly valves.



## DISC CLOSED, Pressure-Energized Seal (Seat Downstream)

The Flowseal valve is bi-directional (in some instances, modifications may be required to operate this arrangement for dead end service). The cavity and seat sidewalls are symmetrically designed to permit, confine and direct movement of the seat to the disc to dynamically seal with line pressure in the reverse direction. The disc edge is the segment of a sphere, and the seat is angled towards the disc edge to seal with pipeline pressure in either direction.

Recommended installation direction is "SUS" (seat upstream), as in Figure 3.





## KEY

Square key valve-to-operator connection provides an externally controlled failure point upon over-torquing.

## GLAND FLANGE

Applies load against packing gland to prevent external leakage. Fully adjustable.

## PACKING

Chevron design TFE prevents external leakage out valve neck to full ASME hydrostatic shell test pressures (150% of C.W.P.).

## WEDGE RING

Stainless steel band wedged between valve body and retainer ring by set screws to lock seat and retainer ring in position on valve sizes 2" through 30". Socket head cap screws are used on valve sizes 36" and larger.

## SET SCREWS

Cone point screws force wedge ring outward to lock seat retainer in position on valve sizes 2" through 30" wafer. Socket head cap screws are used on valve sizes 36" and larger and all DDES lug valves.

## OVERTRAVEL STOP

Prevents disc from rotating into the wrong quadrant.

## SOFT-SEAT

Patented bi-directional seat with encapsulated elastomeric o-ring core for resiliency. Common seat materials include TFE, RTFE and UHMWPE.

## BLOW OUT PROOF SHAFT

Solid shaft provides alignment and rigid support for disc.

## PACKING GLAND

Separate part from gland flange, preventing uneven load distribution against packing.

## BEARINGS

Both above and below the disc, bearings are of composite design: PTFE bonded to epoxy-glass filament wound ring. Used to align shaft, with high capacity, low wear, and low friction coefficient.

## DISC SPACERS

Disc is centered by use of thrust spacers around shaft in sizes 2" to 5". Disc position stops or thrust bolt arrangements are used for larger valve sizes.

## WEDGE PINS

Provide positive mechanical attachment of disc to shaft.

## BODY

ASME B16.34 design in either wafer or lug configuration.

## DISC

360° uninterrupted spherical edge for sealing. Profile is designed for maximum flow and equal percentage control.

## RETAINER RING

Retains seat in valve. Standard surface finish is 125 to 200 AARH and is compatible with both standard gaskets and spiral wound gasket designs. Outside diameter is recessed within gasket sealing surface to prevent external leakage.

## End Seal Variation

The ASME 150 14" through 30" sizes feature a two-piece shaft design. The lower shaft utilizes an end seal in the body to prevent external leakage.

The component parts include an end seal, an end cap and end cap bolts.

END SEAL

END CAP

BOLTS

## Lower Packing Variation

The ASME 150 14" through 48"; ASME 300 14" through 30"; ASME 600 10" through 16" sizes feature a two-piece shaft design which utilizes a lower packing seal in the valve body to prevent external leakage.

The component parts are of the same design used in the packing assembly in the top of the valve body neck.

PACKING

GLAND

GLAND FLANGE

STUDS & NUTS

## PRESSURE/TEMPERATURE RATINGS

As temperature increases, the pressure retaining capability of materials decreases. The graph below illustrates the pressure/temperature ratings of the Flowseal ASME Class 150, Class 300 and Class 600.

The heavy lines define the ratings of the carbon steel and stainless steel valve body (or "shell") in conformance to ASME B16.34. The shaded areas define the ratings of the TFE and RTFE Seat materials.

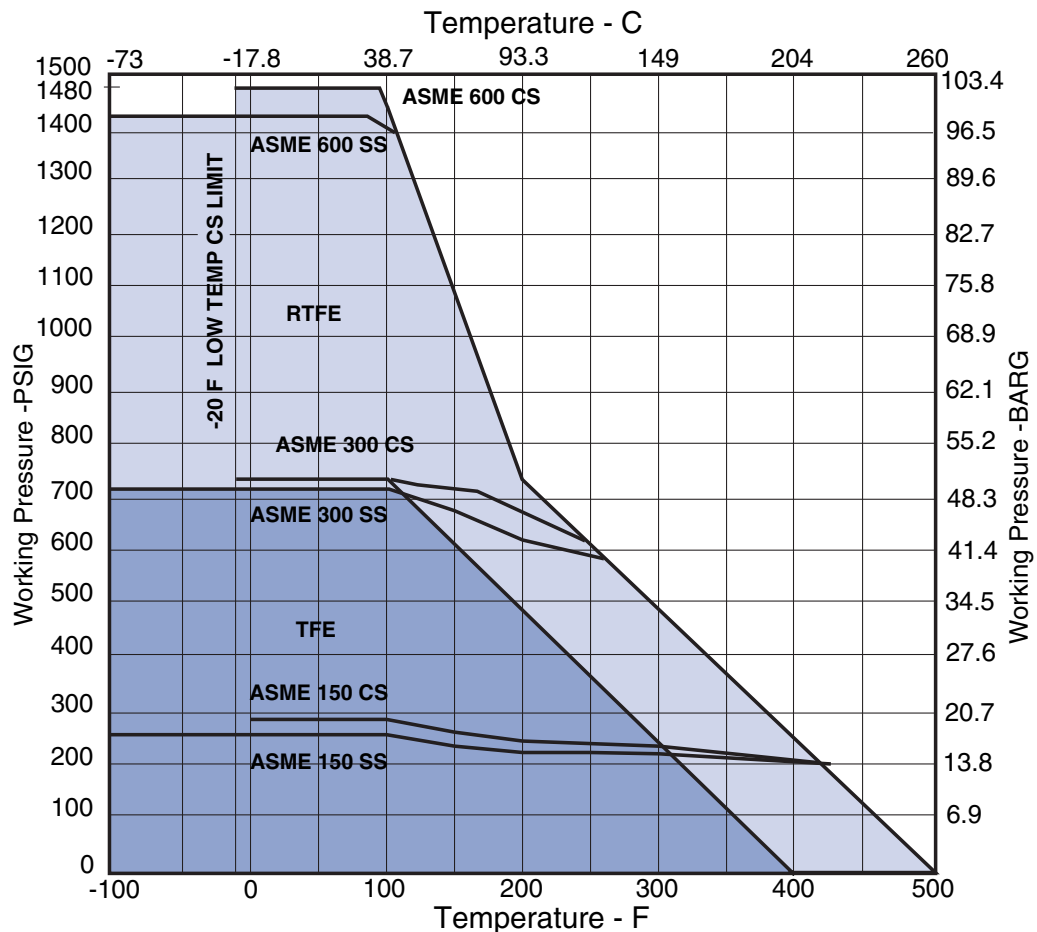
Seat ratings are based on differential pressure with the disc in the fully closed position.\*

### Steam Service

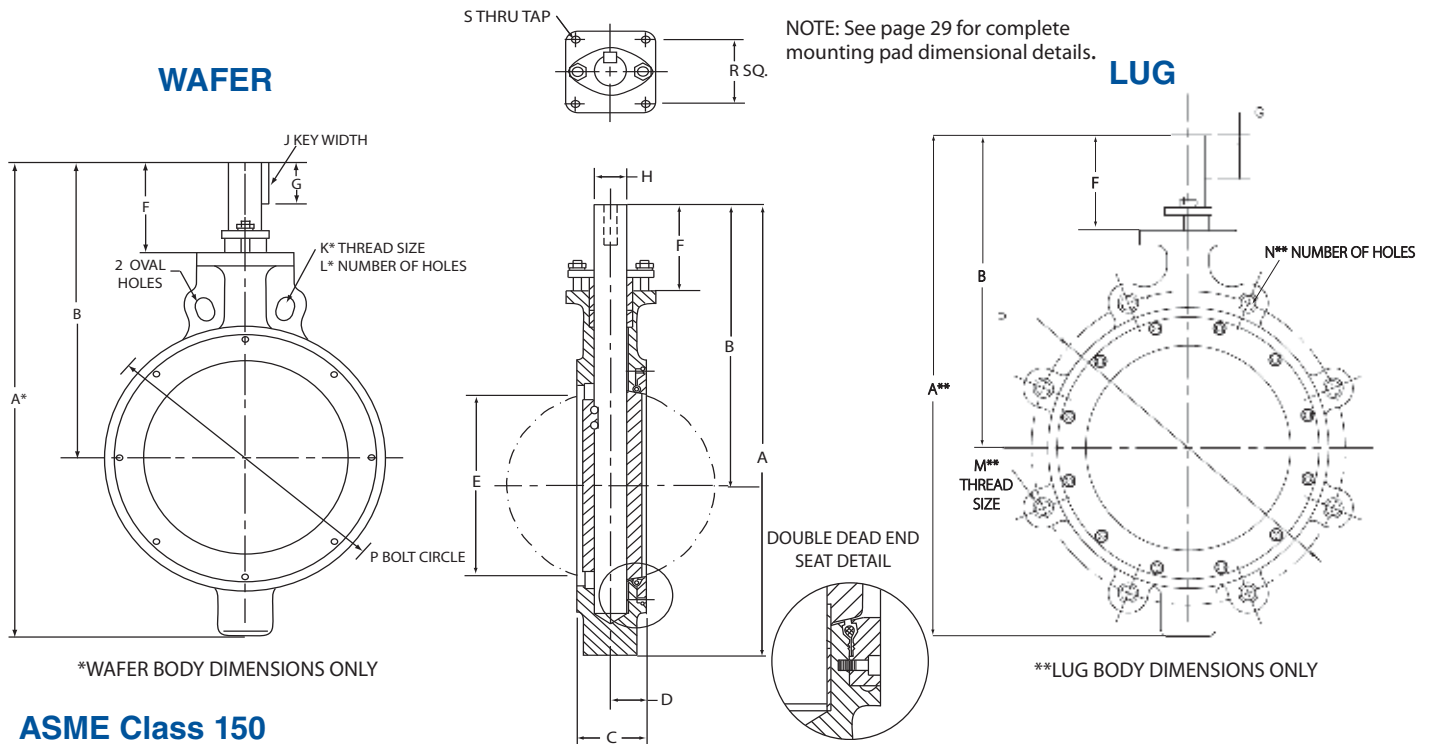
TFE seated valves are rated for 50 psi saturated steam.

Valves with "O" seat configuration (RTFE seat / AFLAS O-ring) are rated to 100 psi steam service.

**ASME B16.34 Body and Flowseal Soft Seat Pressure - Temperature Ratings:**



\*Shaft Materials other than 17-4 PH or Monel will affect working pressure ratings. Please consult factory.



## ASME Class 150

VALVE SIZE	WAFER	LUG																WEIGHT (LBS.)	
	A*	A**	B	C	D	E	F	G	H	J	K*	L*	M**	N**	P	R	S	WAFER	LUG
2"	10.59	10.59	7.59	1.75	1.06	1.72	3.34	.88	.500	3/16	—	—	5/8-11	4	4.750	2.25	3/8-16	8	11
2.5"	10.30	10.30	7.59	1.88	1.09	2.09	3.34	.88	.500	3/16	—	—	5/8-11	4	5.500	2.25	3/8-16	8	11
3"	11.60	11.98	8.60	1.92	1.20	2.75	3.60	1.19	.625	3/16	—	—	5/8-11	4	6.000	2.25	3/8-16	11	13
3.5"	11.97	11.97	8.72	2.05	1.30	3.19	3.60	1.19	.625	3/16	—	—	5/8-11	8	7.000	2.25	3/8-16	14	17
4"	12.92	13.55	9.42	2.13	1.26	3.62	3.67	1.19	.625	3/16	—	—	5/8-11	8	7.500	2.25	3/8-16	17	25
5"	14.53	15.16	10.28	2.25	1.34	4.55	3.81	1.25	.750	1/4	—	—	3/4-10	8	8.500	2.25	3/8-16	20	30
6"	15.69	15.93	10.81	2.29	1.38	5.55	3.81	1.25	.750	1/4	—	—	3/4-10	8	9.500	2.25	3/8-16	30	35
8"	17.81	17.94	11.93	2.50	1.49	7.28	3.80	1.25	1.000	3/8	—	—	3/4-10	8	11.750	2.25	3/8-16	44	48
10"	19.85	20.85	12.97	2.81	1.70	9.20	4.09	1.50	1.250	3/8	—	2	7/8-9	12	14.250	3.25	3/8-16	71	91
12"	24.96	24.96	15.46	3.23	1.86	11.15	4.83	2.25	1.500	3/8	—	2	7/8-9	12	17.000	3.25	3/8-16	110	127
14"	27.14	27.14	16.07	3.62	2.19	12.76	4.82	2.25	1.500	3/8	—	4	1-8	12	18.750	3.25	3/8-16	135	183
16"	31.66	31.66	19.61	4.00	2.31	14.58	6.92	2.50	1.750	1/2	—	4	1-8	16	21.250	4.25	1/2-13	182	250
18"	34.53	34.53	21.35	4.50	2.45	16.38	7.35	3.25	2.000	1/2	—	4	1-1/8-8	16	22.750	4.25	1/2-13	234	305
20"	36.70	36.70	22.76	5.00	2.94	18.38	7.63	3.00	2.250	3/4	1-1/8-8	4	1-1/8-8	20	25.000	5.00	3/4-10	320	414
24"	41.57	41.57	25.13	6.06	3.12	21.88	7.88	3.25	2.500	3/4	1-1/4-8	4	1-1/4-8	20	29.500	5.00	3/4-10	505	702
30"	52.08	52.08	29.35	6.75	3.53	28.00	8.73	4.50	3.000	3/4	1-1/4-8	4	1-1/4-8	28	36.000	5.00	3/4-10	925	1130
36"	64.75	64.75	32.64	8.38	4.34	33.66	8.14	3.50	3.750	1	1-1/2-8	4	1-1/2-8	32	42.750	7.00	1-8	1630	1890
42"	73.24	73.24	37.62	9.25	5.03	40.31	9.62	5.00	4.500	1	1-1/2-8	4	1-1/2-8	36	49.500	7.00	1-8	2475	2700
48"	80.13	80.13	41.88	10.62	5.62	45.25	10.63	6.00	5.000	1-1/4	1-1/2-8	4	1-1/2-8	44	56.000	9.00	1-8	2815	3085

## ASME Class 300

VALVE SIZE	WAFER	LUG	B	C	D	E	F	G	H	J	K*	L*	M**	N**	P	R	S	WEIGHT (LBS.)	
	A*	A**																WAFER	LUG
2"	10.59	10.59	7.59	1.75	1.06	1.72	3.34	.88	.500	3/16	—	—	5/8-11	8	5.000	2.25	3/8-16	8	11
2.5"	10.30	10.30	7.59	1.88	1.09	2.09	3.34	.88	.500	3/16	—	—	3/4-10	8	5.880	2.25	3/8-16	8	11
3"	11.60	11.98	8.60	1.92	1.20	2.75	3.60	1.19	.625	3/16	—	—	3/4-10	8	6.625	2.25	3/8-16	12	17
3.5"	11.97	11.97	8.72	2.05	1.30	3.19	3.60	1.19	.625	3/16	—	—	3/4-10	8	7.250	2.25	3/8-16	14	19
4"	12.92	13.54	9.42	2.13	1.25	3.62	3.67	1.19	.625	3/16	—	—	3/4-10	8	7.875	2.25	3/8-16	17	24
5"	14.53	15.16	10.28	2.25	1.34	4.55	3.81	1.25	.750	1/4	—	—	3/4-10	8	9.250	2.25	3/8-16	20	30
6"	15.93	16.31	10.81	2.29	1.38	5.55	3.81	1.25	1.000	3/8	—	—	3/4-10	12	10.625	2.25	3/8-16	30	49
8"	18.10	19.50	12.22	2.88	1.54	7.06	4.08	1.50	1.250	3/8	—	—	7/8-9	12	13.000	3.25	3/8-16	52	80
10"	21.60	22.10	14.22	3.25	1.70	9.00	4.84	2.25	1.500	3/8	1-8	2	1-8	16	15.250	3.25	3/8-16	88	115
12"	28.40	28.40	17.90	3.62	1.86	10.72	6.90	2.50	1.750	1/2	1-1/8-8	4	1-1/8-8	16	17.750	4.25	1/2-13	153	199
14"	34.31	34.31	19.74	4.62	2.48	12.08	7.36	3.25	2.000	1/2	1-1/8-8	4	1-1/8-8	20	20.250	4.25	1/2-13	285	324
16"	38.14	38.14	21.82	5.25	2.59	13.72	7.82	3.00	2.250	3/4	1-1/4-8	4	1-1/4-8	20	22.500	5.00	3/4-10	336	401
18"	40.26	40.26	23.00	5.88	3.03	15.56	7.87	3.25	2.500	3/4	1-1/4-8	4	1-1/4-8	24	24.750	5.00	3/4-10	393	517
20"	43.62	43.62	25.13	6.31	3.24	17.22	8.74	4.50	3.000	3/4	1-1/4-8	4	1-1/4-8	24	27.000	5.00	3/4-10	510	735
24"	49.94	49.94	28.27	7.19	3.62	20.61	8.89	4.00	3.500	1	1-1/2-8	4	1-1/2-8	24	32.000	7.00	1-8	733	1020
30"	62.40	62.40	31.90	8.88	4.39	27.25	9.02	5.00	4.500	1	1-3/4-8	4	1-3/4-8	28	39.250	7.00	1-8	1745	2145

## ASME Class 600

VALVE SIZE	WAFER	LUG	B	C	D	E	F	G	H	J	K*	L*	M**	N**	P	R	S	WEIGHT (LBS.)	
	A*	A**																WAFER	LUG
2"	10.59	10.59	7.59	1.75	1.06	1.72	3.34	—	.500	—	—	—	5/8-11	8	5.000	2.25	3/8-16	11	13
3"	11.60	12.10	8.60	2.12	1.20	2.50	3.60	1.19	.625	3/16	—	—	3/4-10	8	6.625	2.25	3/8-16	13	18
4"	14.43	14.93	9.81	2.50	1.40	3.43	3.81	1.25	.750	1/4	—	—	7/8-9	8	8.500	2.25	3/8-16	30	52
6"	17.27	18.46	11.71	3.06	1.68	5.18	4.09	1.50	1.250	3/8	1-8	2	1-8	12	11.500	3.25	3/8-16	42	85
8"	21.35	22.00	13.97	4.00	1.85	6.28	4.84	2.25	1.500	3/8	1-1/8-8	—	1-1/8-8	12	13.750	3.25	3/8-16	72	127
10"	31.15	31.15	17.90	4.62	2.00	7.95	6.90	2.50	1.750	1/2	1-1/4-8	4	1-1/4-8	16	17.000	4.25	1/2-13	170	233
12"	34.80	34.80	20.13	5.50	2.53	9.68	7.50	3.00	2.250	3/4	1-1/4-8	4	1-1/4-8	20	19.250	5.00	3/4-10	245	379
14"	39.21	39.21	22.41	6.13	3.14	10.97	7.88	3.50	2.50	3/4	1-3/8-8	4	1-3/8-8	20	20.75	5.00	3/4-10	400	600
16"	—	44.25	25.38	7.00	3.50	12.60	9.38	5.00	3.000	3/4	—	—	1-1/2-8	20	23.750	5.00	3/4-10	—	1170

## NOTES:

## 1. General

- Standard valves tested to MSS SP-61. API 598 testing available on request.
- Dimensions shown are for reference only. Certified drawings available on application.

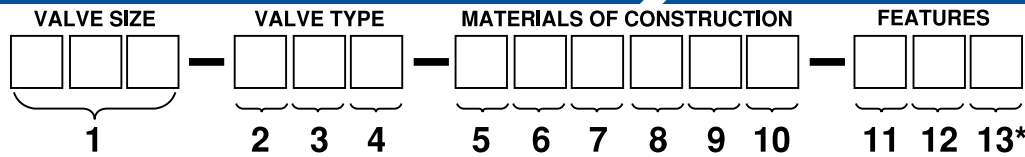
## 2. For 2" through 24" sizes:

- Face-to-face dimensions (C) meet, within specified tolerance, MSS SP-68 and API 609 requirements.
- Valves are designed for installation between ASME B16.5 flanges.

## 3. For 30" through 48" sizes:

- Valves are designed for installation between ASME B16.47 Class A flanges. (Class B on request)





**Example:** 12 - 1WA - 171MTG - 3: 12" Wafer Style Class 150 Carbon body, Straight 17-4 Ph SS Stem, 316 SS Nitrided Disc, Inconel Seat, TFE Pkg, Garfil Bearings, Gear Operated

1. Size	Code
2"	02
2 1/2"	025
3"	03
3 1/2"	035
4"	04
to	
48"	48

2. Body Class	Code
150 PSI Max. Diff. Pressure	0
ASME 150	1
ASME 300	3
ASME 600	6

3. Body Type	Code
Wafer	W
Lugged	L
Lugged DDES <sup>2</sup>	D

4. Shaft Design	Code
Straight	A
Class 150 2" - 12"	
Class 150 36" - 48"	
Class 300 2" - 12" & 30"	
Class 600 2" - 8"	
Balanced	C
Class 150 14" - 30"	
Derated 36" - 48" (150 psig max.)	
Class 300 14" - 24"	
Class 600 10" - 16"	

5. Body Material	Code
Carbon Steel	1
316 SS	2
Monel	3
Alloy 20	4
Annealed AL Br. MIL-B-24480	5
Annealed AL Br. B148 ASTM C958	8
ASTM A744 CN-3MN	A
2205 Duplex ASTM A890 Gr 4A	B
254 SMO	C
Super Duplex ASTM A351 CD4MCu	D
Steel, ASTM A217, Grade C5	E
317 SS	F
Hastelloy C	H
ASTM A352 LCC	L
304 SS (CF8)	N

#### FLOWSEAL ACTUATOR OPTIONS:

**Lever:** Not recommended for Metal Seat  
High Performance Butterfly Valve

#### Gear Five types available:

- High temperature service
- Buried service
- Submersible service
- Marine service
- Standard aluminum handwheel

#### Optional:

- Chain wheel
- Output shaft extension
- Input shaft extension
- Military special operator
- AWWA special operator

#### Hydraulic Actuator:

Customer specified hydraulic actuator

#### Pneumatic Actuators:

Crane Revo® spring return pneumatic actuator  
Crane Revo® double acting pneumatic actuator  
Customer specified pneumatic actuator

#### Electric Actuators:

Series 44000 electric actuator  
Customer specified electric actuator

6. Disc Material	Code
Alum Bronze/ENP B148 C958	0
316 SS	2
Monel	3
Alloy 20	4
Alum Bronze MIL-B-24480	5
316 SS Nitrided	7
Alum Bronze B148 ASTM C958	8
316 SS/ENP	9
ASTM A744 CN-3MN	A
2205 Duplex ASTM A890 Gr 4A	B
254 SMO	C
Super Duplex ASTM A351 CD4MCu	D
317 SS	F
Hastelloy C	H
Hastelloy C/ENP	J
304SS Nitrided (CF8)	L
Monel/ENP	M
304 SS (CF8)	N

7. Shaft Material	Code
17-4PH SS <sup>1</sup>	1
316 SS	2
Monel <sup>1</sup>	3
Alloy 20	4
Inconel 718/750	6
Ferrallium A479	7
Nitronic 50	0
AL-6XN	A
2205 Duplex ASTM A890 Gr 4A	B
254 SMO	C
317 SS	F
Hastelloy C	H

8. Seat Material / O-Ring	Code
TFE / Viton <sup>4</sup>	T
TFE / Neoprene	N
RTFE / Silicone <sup>5</sup>	R
RTFE / Viton <sup>4</sup>	P
RTFE / AFLAS	O
Polyethylene (UHMWPE) / Viton <sup>4</sup>	L
Fire-Flow (TFE & Metal) / Viton <sup>4</sup>	F
Fire-Flow (RTFE & Metal) / Viton <sup>4</sup>	A
Fire-Flow (RTFE & Metal) / Silicone	B
Inconel	M
300 SS	S
Fire-Flow (TFE & Monel) / Viton <sup>4</sup>	C
Fire-Flow (RTFE & Monel) / Silicone	J
Fire-Flow (RTFE & Monel) / Viton <sup>4</sup>	H
Fire-Flow (TFE & Metal) / Silicone	E
Fire-Flow (TFE & Monel) / Silicone	V
Fire-Flow (RTFE & Hastelloy C) / Silicone	K

9. Packing Material	Code
TFE	T
Graphite	G
Fire-Flow	F
Live-Load Packing/TFE	A
Live-Load Packing/Graphite	B
Live-Load Packing/Fire-Flow	C
EF Seal (Viton O-Rings)/TFE	D

10. Bearing Material	Code
Garfil (Glass Backed TFE)	G
316 SS Backed TFE	H
Fire-Flow (Garfil & 316 SS)	F
Stainless Steel Nitrided	S
Bronze	B
Monel	K
Hastelloy C Backed TFE	J

11. Actuator Type	Code
Bare Shaft	B
Worm Gear w/2" Square Nut & Hndwl	D
Ratchet Handle	H
Ratchet Handle w/Lock	L
Throttle	T
Worm Gear	3
Worm Gear (4-way keyed)	9
Pneumatic Double Acting	4
Pneumatic SR Fail Close	5
Pneumatic SR Fail Open	6
Hydraulic	7
Electric	8

12. Special Feature	Code
None	O
Level 2 Commercial Oxygen Cleaning	A
Bi-directional	B
Chlorine Service	C
Dead-end Service (DDES) <sup>2</sup>	D
CE Marked (impact tested) <sup>3</sup>	PI
CE Marked (non-impact tested) <sup>3</sup>	PN
CE Marked (impact tested w/ vacuum service) <sup>3</sup>	VI
CE Marked (non-impact tested w/ vacuum service) <sup>3</sup>	VN
EF Seal (low emissions)	E
EF Seal Vacuum Service (low emissions)/EV	
Flat Face	F
Silicone Free	G
Epoxy Coated Body	H
Chainwheel	J
Stem Extension	K
Lockable Gear	L
Limit Switch w/Stainless Steel Bolting	L1
Limit Switch w/Monel Bolting	L2
Mil-V-24624	M
Gear with Memory Stop	MS
NACE Construction <sup>5</sup>	N
NACE Construction	NI
(w/CE marked impact tested) <sup>3,5</sup>	
NACE Construction	NN
(w/CE marked NON-impact tested) <sup>3,5</sup>	
Buried Service	R
60 to 125 AARH Facing	S
Drill Through Lugs	T
Drill Through Lugs and NACE Constr.	TN
Vacuum Service	V

13. Series	Code
*Factory Assigned	J

**Note<sup>1</sup>** Shaft materials other than 17-4 PH or Monel will affect working pressure ratings. Please consult factory.

**Note<sup>2</sup>** DDES = Double Dead End Service.

**Note<sup>3</sup>** For CE marked valves, see Body Rating chart on page 28, as temp ranges can vary per material.

**Note<sup>4</sup>** Viton O-Ring is recommended for use in Hydrocarbon and NACE service.

**Note<sup>5</sup>** RTFE/Silicone combination is not to be used with "NACE" valves.