



RESILIENT SEATED BUTTERFLY VALVES

TECHNICAL BULLETIN

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detailed drawings



APPLICATIONS

The Tri-Seal Resilient Seated Butterfly Valves are designed to handle a wide variety of applications such as water treatment, pulp and paper, power, automotive, mining, ethanol, oil, gas and other general service applications where a resilient seated butterfly valve is required.

TOP FLANGE

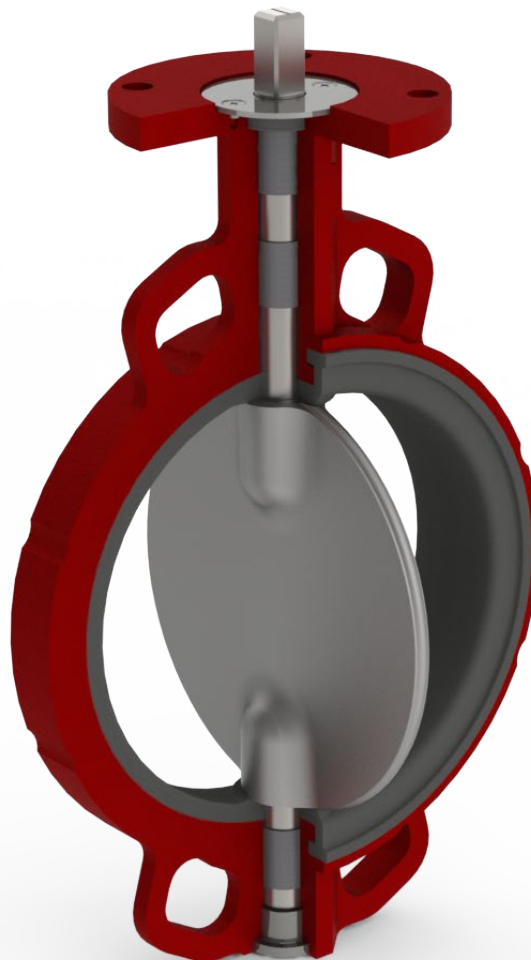
Conforms to industry standard ISO 5211, which allows the flexibility to mount most actuators in the market.

BLOWOUT PROOF STEM

Tri-Seal offers a reliable shaft retention system that meets the blowout proof shaft requirements of API 609.

SLIM DISC DESIGN

The inclusion of dual upper and lower shafts in the design of the valve has resulted in a slim profile disk. This slim disk profile maximizes the valve's CVs (coefficients of flow capacity), which enables more fluid to pass through the valve and eliminates the need for external disc-to-shaft pin connections. This feature is particularly beneficial in applications where high flow rates are required.



TONGUE & GROOVE SEAT

Utilizes 3 tongue and groove connection points to provide a stable, secure connection even under high pressure dead-end or full vacuum service. Aside from locking the seat in place, the center tongue also allows rubber to flex into the center body groove when shutting the valve, which reduces the operating torque.

GENERAL

Lug valves shall be designed for installation between ANSI 125/150 flanges. Wafer valves shall be designed for installation between ANSI 125/150, PN 10, and PN 16 flanges. All valves shall be capable of bi-directional, end of line, bubble tight service to rated pressure. Valves are also rated to full vacuum service. Design Standards: API 609 category A.

PRESSURE/TEMPERATURE RATING

2" - 36" - 230psi to fit between ANSI 125/150 flanges. -20°F - +400°F

BODY

Valve body shall be a 1 piece ductile iron ASTM A-536 (65-45-12) construction with a laying length conforming to the latest revision of ISO 5752 and a flange connection B16.1/B16.5.

DISC

Valve disc shall be CF8M stainless steel. Disc shall be designed to accommodate an upper and lower shaft with a thin center profile giving higher CV values combined with strength.

SHAFT

Valve shaft shall be constructed of heat treated 431 stainless steel. Valve shall be designed to accommodate (2) shafts (1 upper and 1 lower). The upper shaft shall have a positive engagement in the disc utilizing an internal square drive and shall be retained by the body top cap and end cap.

SEAT

Seat shall be EPDM, Buna-N or Viton™. Seat design shall consist of 3 tongues (2 located on the side walls and 1 located in the center bore) that engage into 3 grooves in the body. These 3 tongue and groove connection points prevent seat movement in a radial and axial direction. Seats shall be field replaceable.



SHAFT SEALS

Upper shaft seal shall be self-adjusting X-ring type and shall be suitable for pressure or vacuum service. Packing shall be located above the bushing and shall create a positive seal against the top cap. Bottom end cap contains a captive O-ring creating a positive seal against external leakage.

BUSHINGS

Valve shall consist of (2) full length 316 SS/PTFE lined bushings (upper and lower) offering superior protection against friction, corrosion, and impacts providing protection against shaft side loading.

TESTING

All valves shall be leak tested in the factory at their rated pressure per API 598.

FLOW COEFFICIENT CV

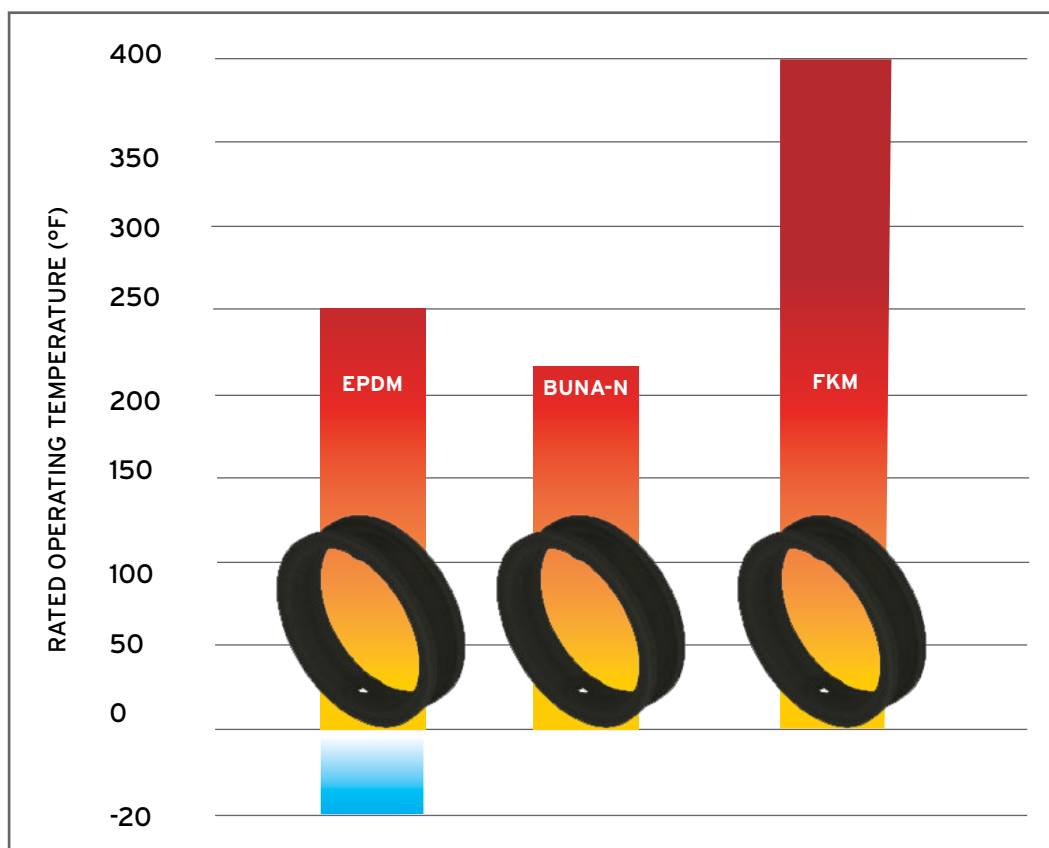
OPENING ANGLE									
SIZE	10°	20°	30°	40°	50°	60°	70°	80°	90°
2	0.1	5	12	24	45	64	90	125	135
2.5	0.2	8	20	37	65	98	144	204	220
3	0.3	12	22	39	70	116	183	275	302
4	0.5	17	36	78	139	230	364	546	600
5	0.8	29	61	133	237	392	620	930	1022
6	2	45	95	205	366	605	958	1437	1579
8	3	89	188	408	727	1202	1903	2854	3136
10	4	151	320	694	1237	2047	3240	4859	5340
12	5	234	495	1072	1911	3162	5005	7507	8250
14	6	338	715	1549	2761	4568	7230	10844	11917
16	8	464	983	2130	3797	6282	9942	14913	16388
18	11	615	1302	2822	5028	8320	13168	19752	21705
20	14	791	1674	3628	6465	10698	16931	25396	27908
24	22	1222	2587	5605	9989	16528	26157	39236	43116
28	36	1813	3639	6636	10000	14949	22769	34898	49500
30	41	2052	4118	7508	11850	17739	27018	41409	58736
32	45	2387	4791	8736	13788	20613	31395	48117	68250
36	60	3021	6063	11055	17449	26086	39731	60895	86375

CV = Flow (gpm) of water at 1psi pressure drop

OPERATING TORQUE

API 609 Resilient Seat Concentric Class 150 Butterfly Valve Torque Table						
SIZE	Tongue and Groove Soft Seat (ibf.in)					
	EPDM		NBR		FKM	
	145	230	145	230	145	230
2	80	89	89	98	107	116
2.5	133	151	151	169	178	195
3	186	231	204	257	239	301
4	328	381	363	416	425	496
5	505	576	558	638	655	753
6	832	912	912	1001	1080	1187
8	1514	1824	1664	2010	1965	2373
10	2337	2647	2567	2912	3036	3444
12	3559	3691	3913	4063	4630	4798
14	4594	6922	5054	7612	5975	9002
16	6701	10834	7373	11914	8710	14082
18	9329	13392	10259	14729	12126	17410
20	12569	16632	13826	18296	16339	21623
24	19260	29943	21190	32935	25040	38927
28	27987	37015	30784	40715	36387	48123
30	35210	47999	38732	52797	45778	62400
32	42432	58984	46672	64878	55160	76677
36	57559	73428	63312	80775	74827	95459

NOTE: 1. Torque above are measured with water media under above-listed pressure.
2. Torque excluding 30% safety factor

**EPDM -20°F to 250°F (-29°C to 121°C)**

EPDM is the abbreviation for Ethylene Propylene Diene Monomer. This material can sometimes be referred to as ECD, EPT or EPR, and are all the same material. EPDM has excellent resistance to abrasion, good resistance to tearing and higher temperature capabilities than Buna-N seats.

EPDM is an economical seat material that is generally recommended for a wide array of applications such as alcohols, salts, alkaline solutions, beverages, bleach, inorganic acids (diluted), and water (cooling, brackish, brine). EPDM is not suitable for hydrocarbons, petroleum based oils and turpentine. Tri-Seal seats can be certified to NSF-61.

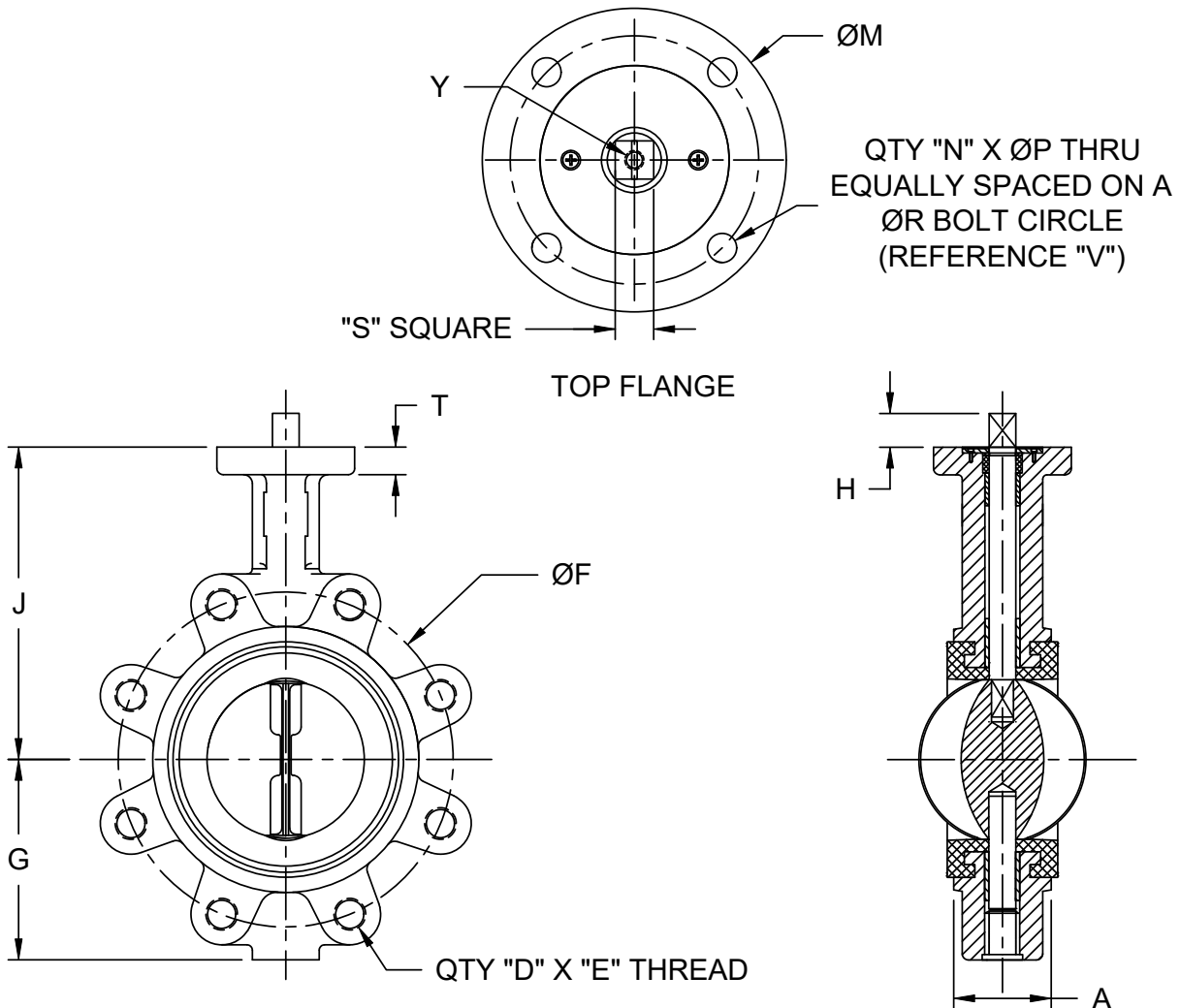
BUNA-N (Black or White) 0°F to 212°F (-18°C to 100°C)

BUNA-N is the commonly used name for nitrile synthetic rubber, and is sometimes referred to as

NBR or Nitrile. BUNA-N has good abrasion resistance and fair tear resistance. Particularly suited for hydrocarbon service, but generally can handle medias such as alcohols, alkaline salets, butane, fuel oil, L-P gases, petroleum oils and greases and propane.

FKM 0°F to 400°F (-18°C to 204°C)

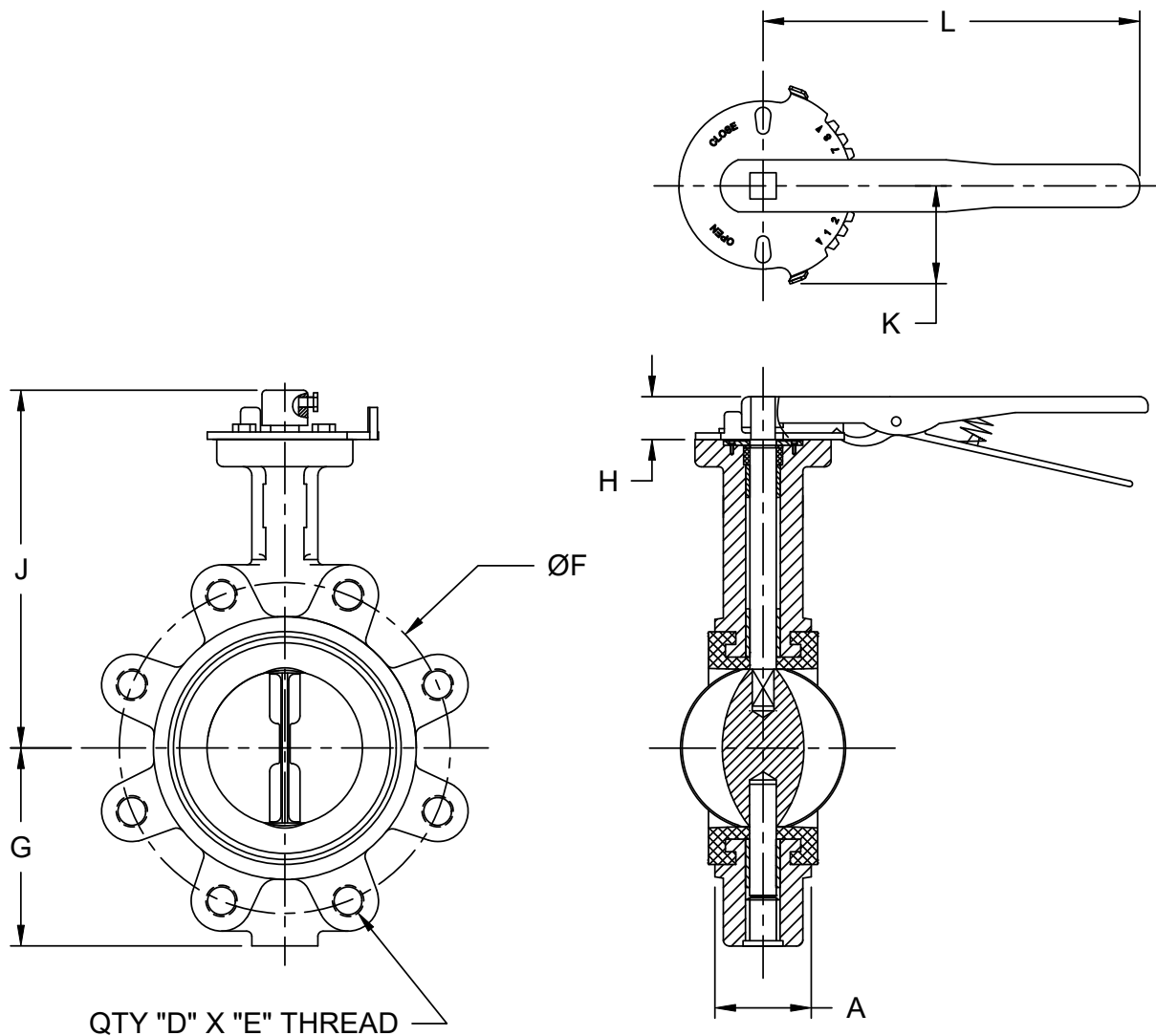
FKM is a Fluorinated Hydrocarbon Elastomers (Fluoroelastomers) similar to Viton™ (DuPont™). FKM has fair abrasion and tearing resistance, but improved acid, oil, and temperature resistance over other seat materials. Generally FKM is recommended for alcohols, some hydrocarbons, mineral acids and phosphoric acid. FKM is not suitable for hot water applications.



DIMENSIONS (Inches)															
SIZE	A	D	E	F	G	H	J	M	N	P	R	S	T	V	WT (lbs.)
2	1.70	4	5/8"-11	4.75	3.15	1.10	5.51	3.54	4	0.40	2.76	0.433	0.55	F07 M5	7
2.5	1.81	4	5/8"-11	5.50	3.50	1.10	5.90	3.54	4	0.40	2.76	0.433	0.55	F07 M5	8
3	1.81	4	5/8"-11	6.00	3.74	1.10	6.22	3.54	4	0.40	2.76	0.433	0.55	F07 M5	10
4	2.05	8	5/8"-11	7.50	4.49	1.10	6.93	3.54	4	0.40	2.76	0.433	0.60	F07 M5	16
5	2.20	8	3/4"-10	8.50	5.00	1.10	7.48	3.54	4	0.40	2.76	0.551	0.60	F07 M5	21
6	2.20	8	3/4"-10	9.50	5.47	1.10	8.35	3.54	4	0.40	2.76	0.551	0.60	F07 M5	24
8	2.36	8	3/4"-10	11.75	6.89	1.38	9.25	5.90	4	0.55	4.92	0.669	0.63	F12 M8	43
10	2.68	12	7/8"-9	14.25	7.99	1.38	10.43	5.90	4	0.55	4.92	0.866	0.63	F12 -	68
12	3.07	12	7/8"-9	17.00	9.53	1.38	12.00	5.90	4	0.55	4.92	0.866	0.70	F12 -	97
14	3.07	12	1"-8	18.75	10.51	1.38	14.49	5.10	4	0.55	4.92	0.866	0.55	F12 -	120
16	4.02	16	1"-8	21.25	12.16	1.42	15.75	6.89	4	0.70	5.51	1.063	0.55	F14 -	185
18	4.49	16	1-1/8"-8	22.75	13.39	1.42	16.61	6.89	4	0.70	5.51	1.063	0.55	F14 -	234
20	5.00	20	1-1/8"-8	25.00	14.37	1.42	17.91	8.27	4	0.87	6.50	1.417	0.60	F16 -	268
24	6.06	20	1-1/4"-8	29.50	17.80	1.81	22.24	8.27	4	0.87	6.50	1.417	0.60	F16 -	520

DESCRIPTION:
2"-24" API 609, 150# Lug Body, Bare Shaft
Resilient Seated BFV

DATE: 08/13/2024
DRAWING: TS-DD0001-B



DIMENSIONS (Inches)										
SIZE	A	D	E	F	G	H	J	K	L	WT (lbs)
2	1.70	4	5/8"-11	4.75	3.15	1.10	6.61	2.46	10.24	9
2.5	1.81	4	5/8"-11	5.50	3.50	1.10	7.00	2.46	10.24	10
3	1.81	4	5/8"-11	6.00	3.74	1.10	7.32	2.46	10.24	12
4	2.05	8	5/8"-11	7.50	4.49	1.10	8.03	2.46	10.24	18
5	2.20	8	3/4"-10	8.50	5.00	1.10	8.58	2.46	10.24	23
6	2.20	8	3/4"-10	9.50	5.47	1.10	9.45	2.46	10.24	26
8	2.36	8	3/4"-10	11.75	6.89	1.38	10.63	3.47	14.17	48
10	2.68	12	7/8"-9	14.25	7.99	1.38	11.81	3.47	14.17	73

DESCRIPTION:

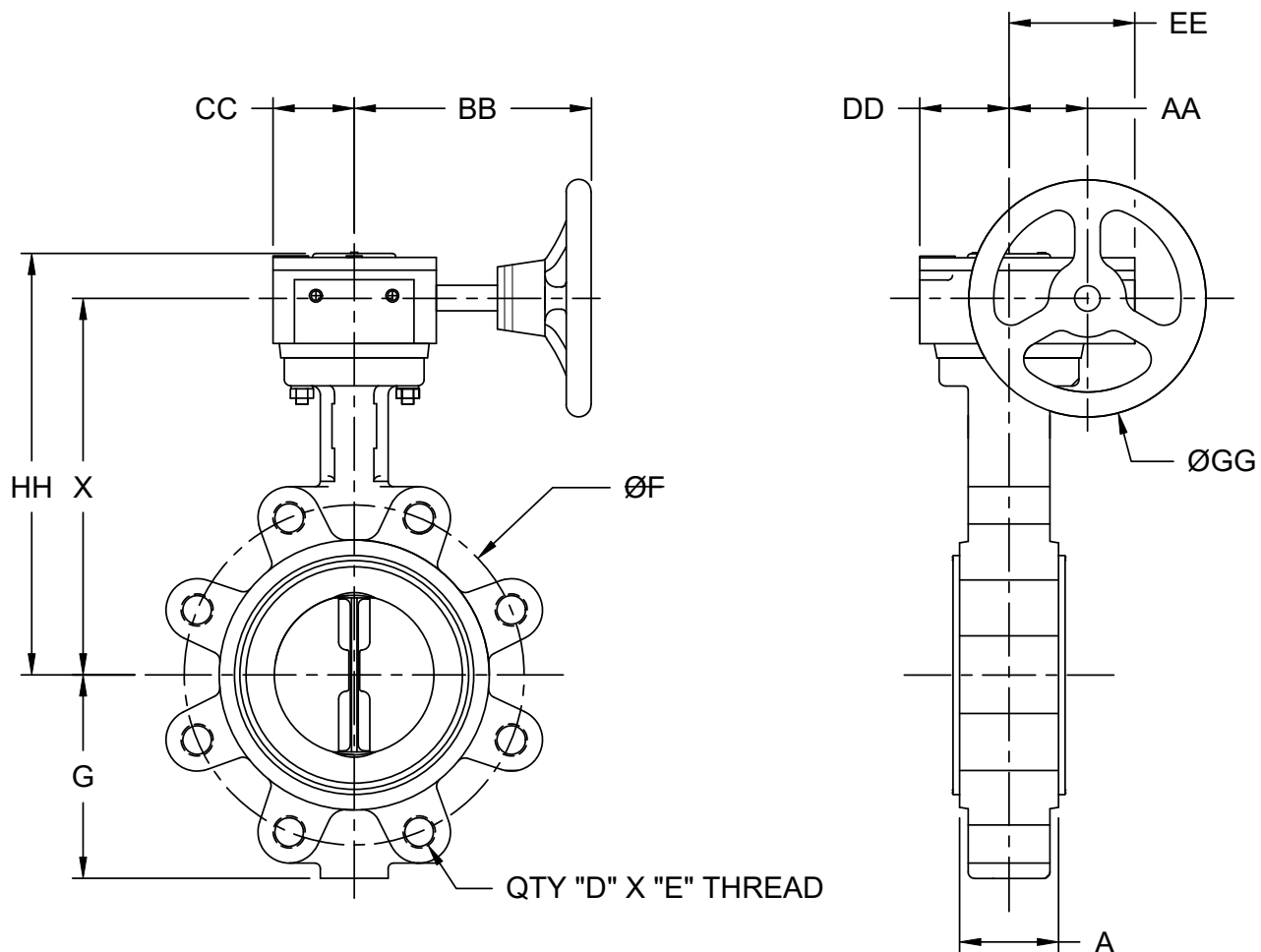
2"-10" API 609, 150# Lug Body Resilient Seated
BFV w/ Lever Operator

DATE:

08/13/2024

DRAWING:

TS-DD0002-B



DIMENSIONS (Inches)

SIZE	A	D	E	F	G	X	AA	BB	CC	DD	EE	GG	HH	WT (lbs.)	ACT MODEL
2	1.70	4	5/8"-11	4.75	3.15	6.77	1.81	6.08	2.07	2.07	3.10	5.75	7.99	16	RS-2410-01
2.5	1.81	4	5/8"-11	5.50	3.50	7.17	1.81	6.08	2.07	2.07	3.10	5.75	8.40	17	RS-2410-01
3	1.81	4	5/8"-11	6.00	3.74	7.48	1.81	6.08	2.07	2.07	3.10	5.75	8.70	19	RS-2410-01
4	2.05	8	5/8"-11	7.50	4.49	8.19	1.81	6.08	2.07	2.07	3.10	5.75	9.40	25	RS-2410-01
5	2.20	8	3/4"-10	8.50	5.00	8.75	1.81	6.08	2.07	2.07	3.10	5.75	9.97	30	RS-2410-01
6	2.20	8	3/4"-10	9.50	5.47	9.60	1.81	6.08	2.07	2.07	3.10	5.75	10.83	33	RS-2410-01
8	2.36	8	3/4"-10	11.75	6.89	10.75	2.42	8.86	2.80	2.80	3.78	11.60	12.34	62	RS-3010-02
10	2.68	12	7/8"-9	14.25	7.99	11.93	2.42	8.86	2.80	2.80	3.78	11.60	13.52	86	RS-3010-02
12	3.07	12	7/8"-9	17.00	9.53	13.51	3.37	8.90	3.07	3.07	4.10	11.60	15.16	119	RS-5010-01
14	3.07	12	1"-8	18.75	10.51	15.99	3.37	8.90	3.07	3.07	4.10	11.60	17.64	142	RS-5010-01

DESCRIPTION:

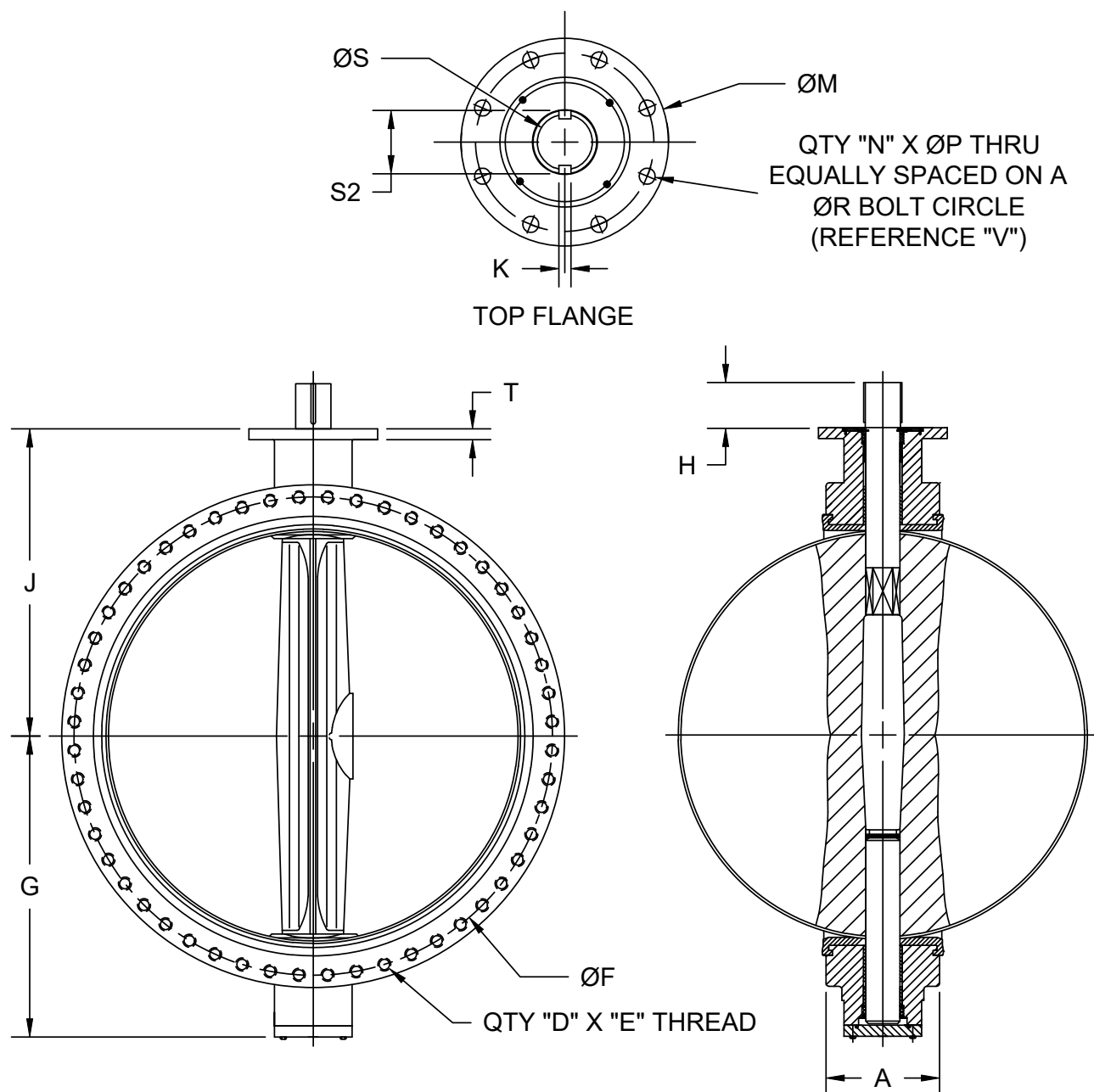
2"-14" API 609 - 150# Lug Body Resilient Seated
BFV with Gear and Handwheel

DATE:

08/13/2024

DRAWING:

TS-DD0004-A



DIMENSIONS (Inches)

SIZE	A	D	E	F	G	H	J	K	M	N	P	R	S	S2	T	V	WT (lbs)
28	6.50	28	1-1/4"-8	34.00	20.47	4.33	24.57	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	726
30	6.50	28	1-1/4"-8	36.00	20.08	4.33	25.60	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	794
32	7.48	28	1-1/2"-8	38.50	22.84	4.33	26.46	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	871
36	7.87	32	1-1/2"-8	42.75	25.04	5.12	28.35	0.787	13.78	8	0.87	11.73	2.952	3.338	1.77	F30	1,173

DESCRIPTION:

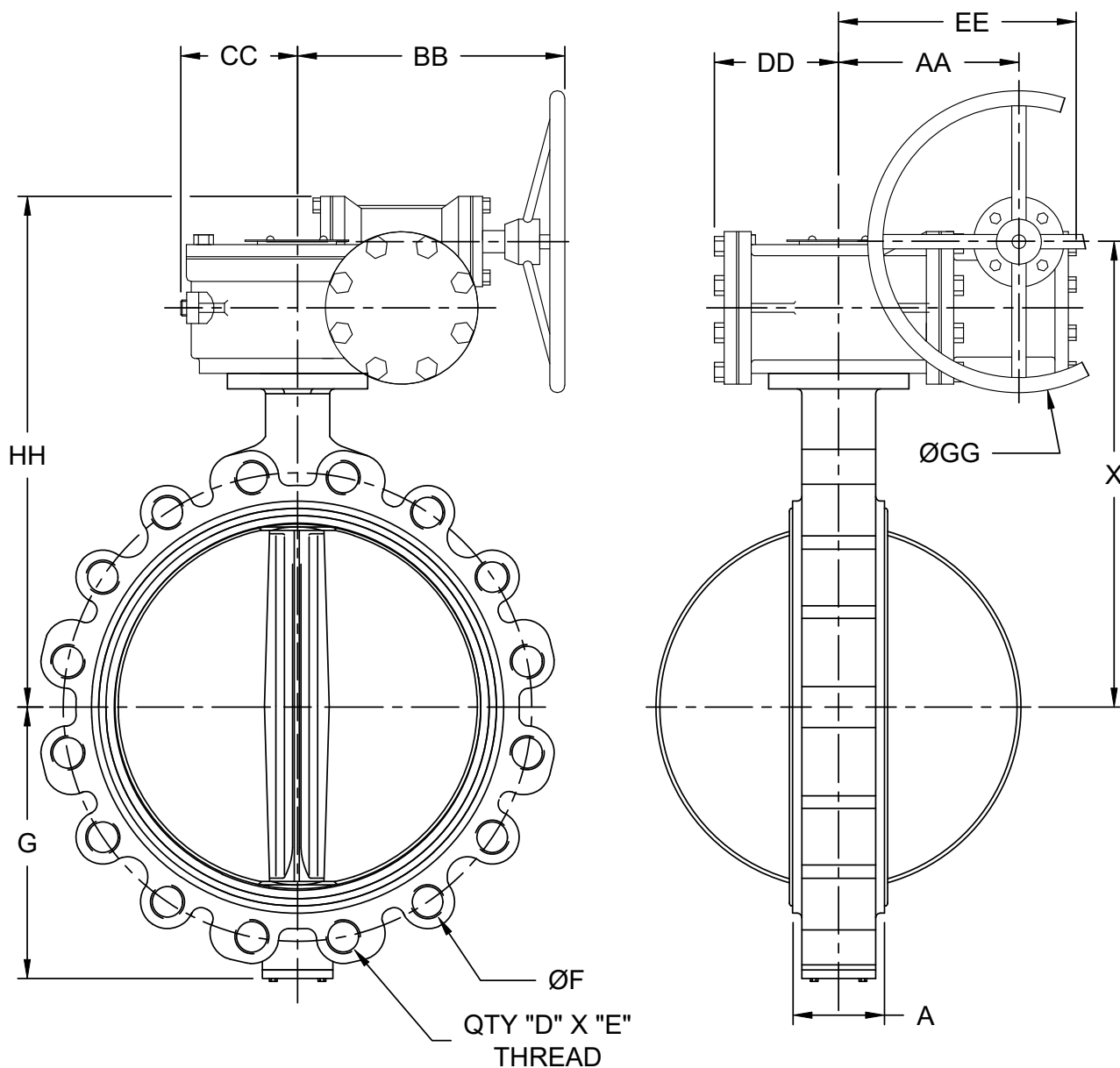
28"-36" API 609, 150# Lug Body, Bare Shaft
Resilient Seated BFV

DATE:

08/13/2024

DRAWING:

TS-DD0005-B



DIMENSIONS (Inches)															
SIZE	A	D	E	F	G	X	AA	BB	CC	DD	EE	GG	HH	WT (lbs.)	ACT MODEL
16	4.02	16	1"-8	21.25	12.16	20.08	6.50	9.72	4.92	4.56	8.51	11.80	21.80	246	RS-5321-01
18	4.49	16	1-1/8"-8	22.75	13.40	20.94	6.50	9.72	4.92	4.56	8.51	11.80	22.67	294	RS-5321-01
20	5.00	20	1-1/8"-8	25.00	14.37	22.24	6.50	9.72	4.92	4.56	8.51	11.80	23.97	356	RS-5321-03
24	6.06	20	1-1/4"-8	29.50	17.80	27.28	7.64	11.81	5.75	5.47	9.92	11.80	29.09	623	RS-6401-01
28	6.50	28	1-1/4"-8	34.00	20.47	30.59	8.78	13.78	6.34	6.73	2.52	17.72	33.00	890	RS-7041-01
30	6.50	28	1-1/4"-8	36.00	20.08	31.62	8.78	13.78	6.34	6.73	2.52	17.72	34.03	957	RS-7041-01
32	7.48	28	1-1/2"-8	38.50	22.84	32.48	8.78	13.78	6.34	6.73	2.52	17.72	34.90	1,035	RS-7041-01
36	7.87	32	1-1/2"-8	42.75	25.04	35.24	9.37	14.67	6.85	7.20	2.52	17.72	37.40	1,373	RS-8321-01

DESCRIPTION:

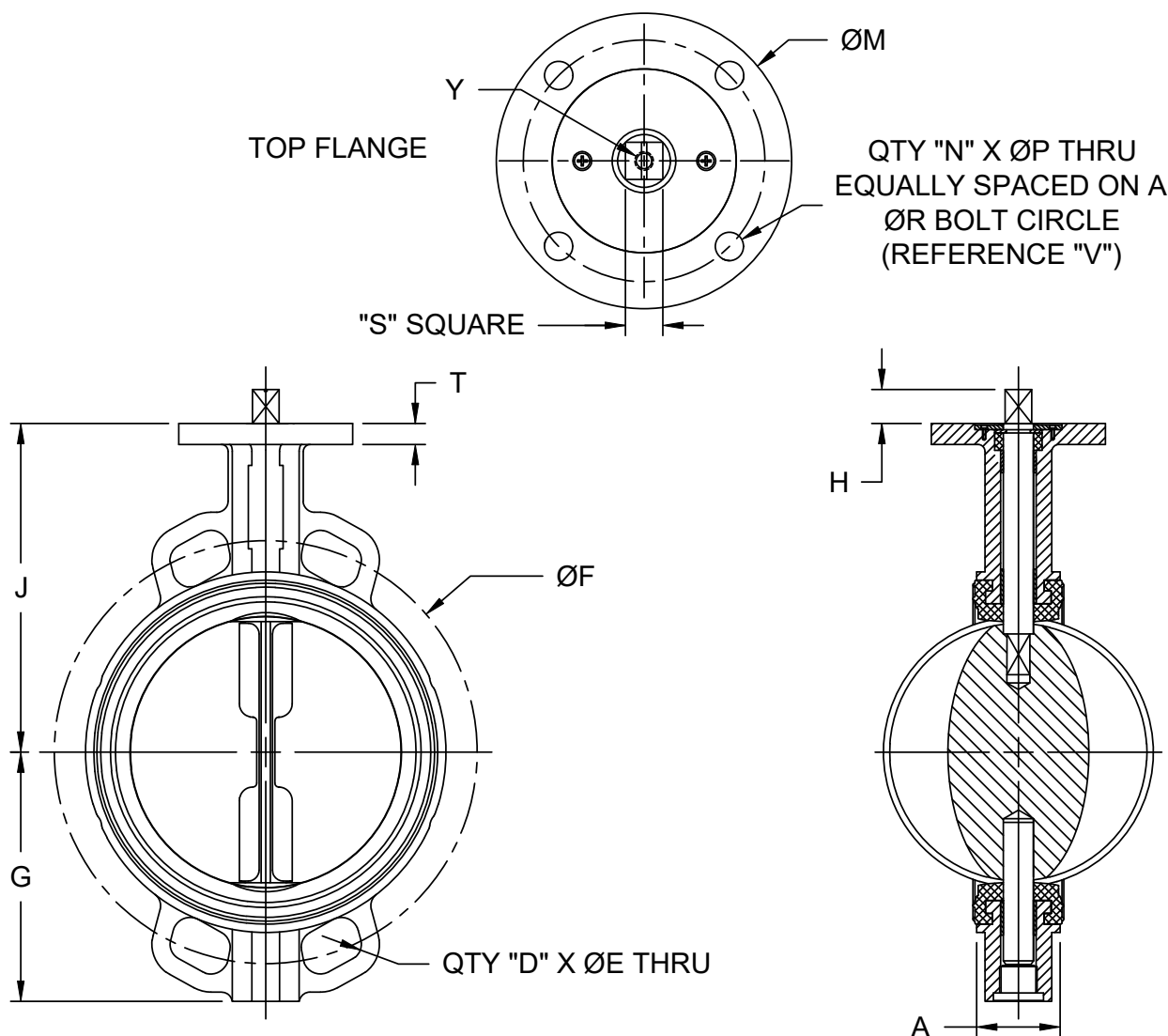
16"-36" API 609, 150# Lug Body, Resilient Seated BFV with Gear and Handwheel

DATE:

08/13/2024

DRAWING:

TS-DD0006-A



DIMENSIONS (Inches)															
SIZE	A	D	E	F	G	H	J	M	N	P	R	S	T	V	WT (lbs)
2	1.70	4	0.75	4.75	3.15	1.10	5.51	3.54	4	0.40	2.76	0.433	0.55	F07	M5 6
2.5	1.81	4	0.75	5.50	3.50	1.10	5.90	3.54	4	0.40	2.76	0.433	0.55	F07	M5 7
3	1.81	4	0.75	6.00	3.74	1.10	6.22	3.54	4	0.40	2.76	0.433	0.55	F07	M5 7
4	2.05	4	0.75	7.50	4.49	1.10	6.93	3.54	4	0.40	2.76	0.433	0.60	F07	M5 11
5	2.20	4	0.87	8.50	5.00	1.10	7.48	3.54	4	0.40	2.76	0.551	0.60	F07	M5 15
6	2.20	4	0.87	9.50	5.47	1.10	8.35	3.54	4	0.40	2.76	0.551	0.60	F07	M5 18
8	2.36	4	0.87	11.75	6.89	1.38	9.30	5.90	4	0.55	4.92	0.669	0.63	F12	M8 33
10	2.68	4	1.02	14.25	7.000	1.38	10.43	5.90	4	0.55	4.92	0.866	0.63	F12	- 50
12	3.07	4	1.02	17.00	9.53	1.38	12.00	5.90	4	0.55	4.92	0.866	0.70	F12	- 69
14	3.07	4	1.14	18.75	10.63	1.38	14.49	5.10	4	0.55	4.92	0.866	0.75	F12	- 84
16	4.02	4	1.14	21.25	12.20	1.42	15.75	6.89	4	0.70	5.51	1.063	0.98	F14	- 137
18	4.49	4	1.26	22.75	13.39	1.42	16.61	6.89	4	0.70	5.51	1.063	0.98	F14	- 168
20	5.00	4	1.26	25.00	14.37	1.42	17.40	8.27	4	0.87	6.50	1.417	1.06	F16	- 212
24	6.06	4	1.38	29.50	17.80	1.81	22.24	8.27	4	0.87	6.50	1.417	1.26	F16	- 371

DESCRIPTION:

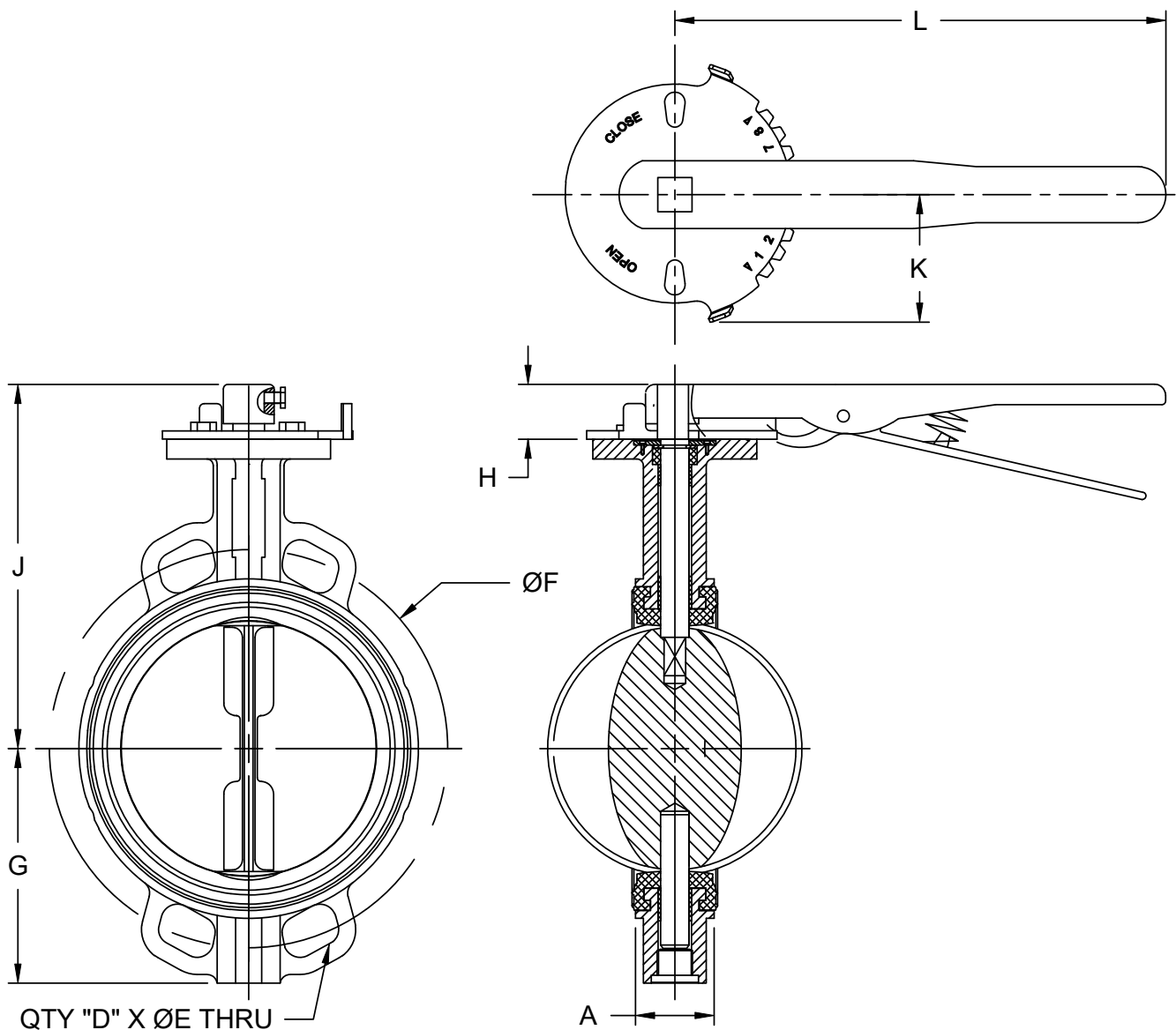
2"-24" API 609, 150# Wafer Body, Bare Shaft
Resilient Seated BFV

DATE:

08/13/2024

DRAWING:

TS-DD0007-B



DIMENSIONS (Inches)										
SIZE	A	D	E	F	G	H	J	K	L	WT (lbs)
2	1.70	4	0.75	4.75	3.15	1.10	6.61	2.46	10.24	8
2.5	1.81	4	0.75	5.50	3.50	1.10	7.00	2.46	10.24	9
3	1.81	4	0.75	6.00	3.74	1.10	7.32	2.46	10.24	9
4	2.05	4	0.75	7.50	4.49	1.10	8.03	2.46	10.24	13
5	2.20	4	0.87	8.50	5.00	1.10	8.58	2.46	10.24	17
6	2.20	4	0.87	9.50	5.47	1.10	9.45	2.46	10.24	20
8	2.36	4	0.87	11.75	6.89	1.38	10.67	3.47	14.17	38
10	2.68	4	1.02	14.25	7.00	1.38	11.81	3.47	14.17	55

DESCRIPTION:

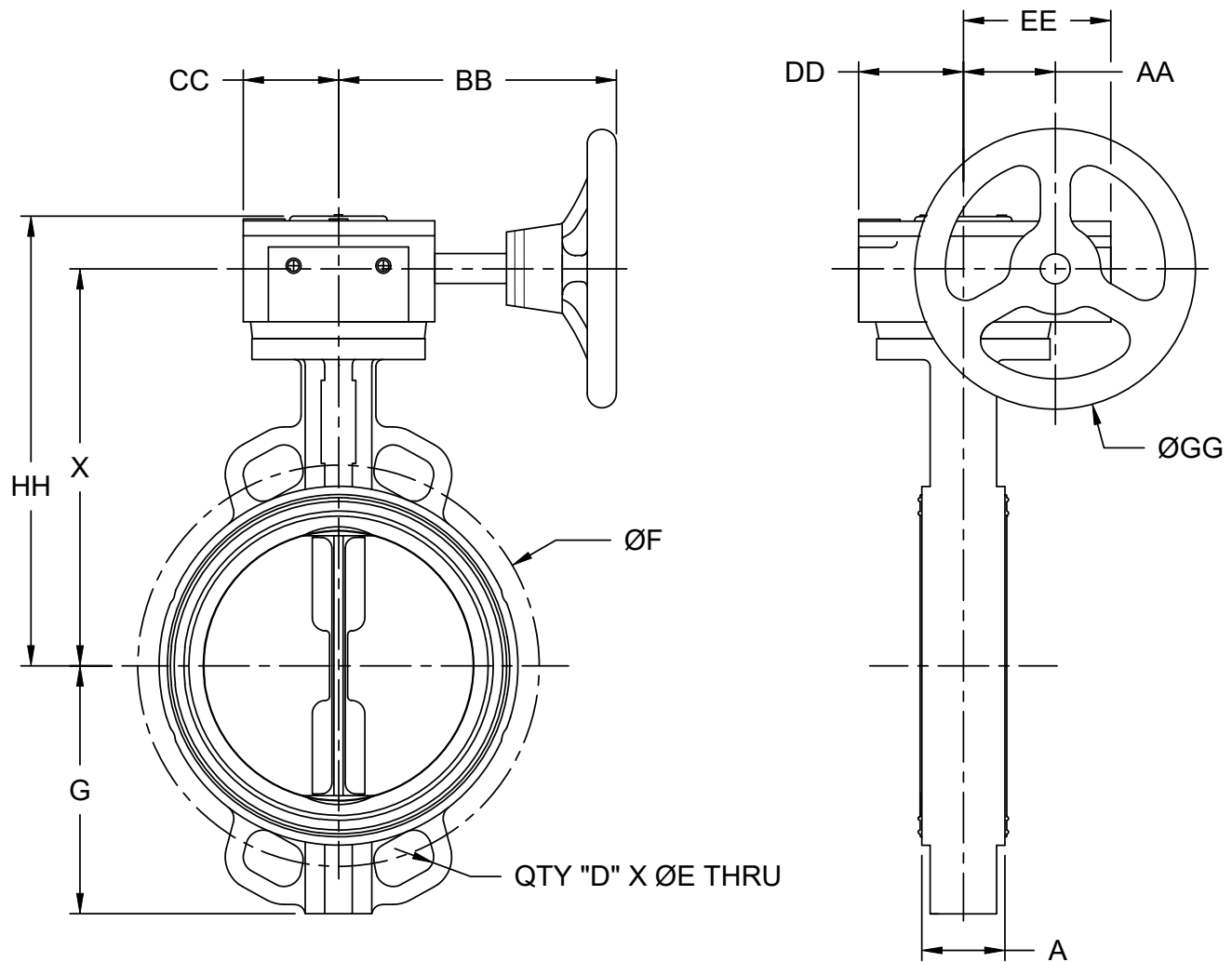
2"-10" API 609, 150# Wafer Body Resilient Seated
BFV w/ Lever Operator

DATE:

08/13/2024

DRAWING:

TS-DD0008-B



DIMENSIONS (Inches)

SIZE	A	D	E	F	G	X	AA	BB	CC	DD	EE	GG	HH	WT (lbs.)	ACT MODEL
2	1.70	4	0.75	4.75	3.15	6.77	1.81	6.08	2.07	2.07	3.10	5.75	7.99	14	RS-2410-01
2.5	1.81	4	0.75	5.50	3.50	7.17	1.81	6.08	2.07	2.07	3.10	5.75	8.40	15	RS-2410-01
3	1.81	4	0.75	6.00	3.74	7.48	1.81	6.08	2.07	2.07	3.10	5.75	8.70	16	RS-2410-01
4	2.05	4	0.75	7.50	4.49	8.19	1.81	6.08	2.07	2.07	3.10	5.75	9.40	20	RS-2410-01
5	2.20	4	0.87	8.50	5.00	8.75	1.81	6.08	2.07	2.07	3.10	5.75	9.97	24	RS-2410-01
6	2.20	4	0.87	9.50	5.47	9.60	1.81	6.08	2.07	2.07	3.10	5.75	10.83	27	RS-2410-01
8	2.36	4	0.87	11.75	6.89	10.75	2.42	8.86	2.80	2.80	3.78	11.60	12.34	52	RS-3010-02
10	2.68	4	1.02	14.25	7.00	11.93	2.42	8.86	2.80	2.80	3.78	11.60	13.52	69	RS-3010-02
12	3.07	4	1.02	17.00	9.53	13.51	3.37	8.90	3.07	3.07	4.10	11.60	15.16	91	RS-5010-01
14	3.07	4	1.14	18.75	10.63	15.99	3.37	8.90	3.07	3.07	4.10	11.60	17.64	105	RS-5010-01

DESCRIPTION:

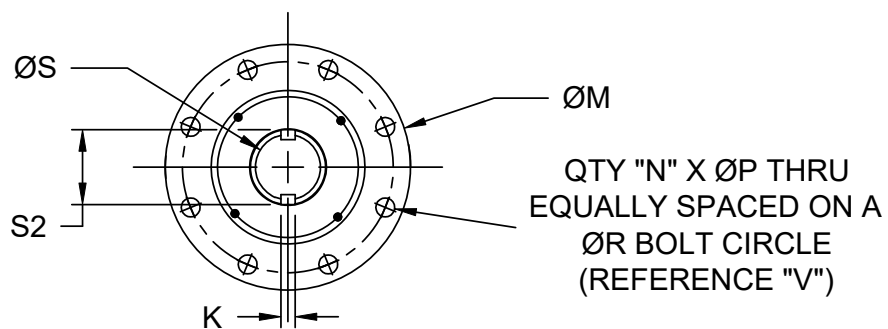
2"-14" API 609 - 150# Wafer Body Resilient Seated BFV with Gear & Handwheel

DATE:

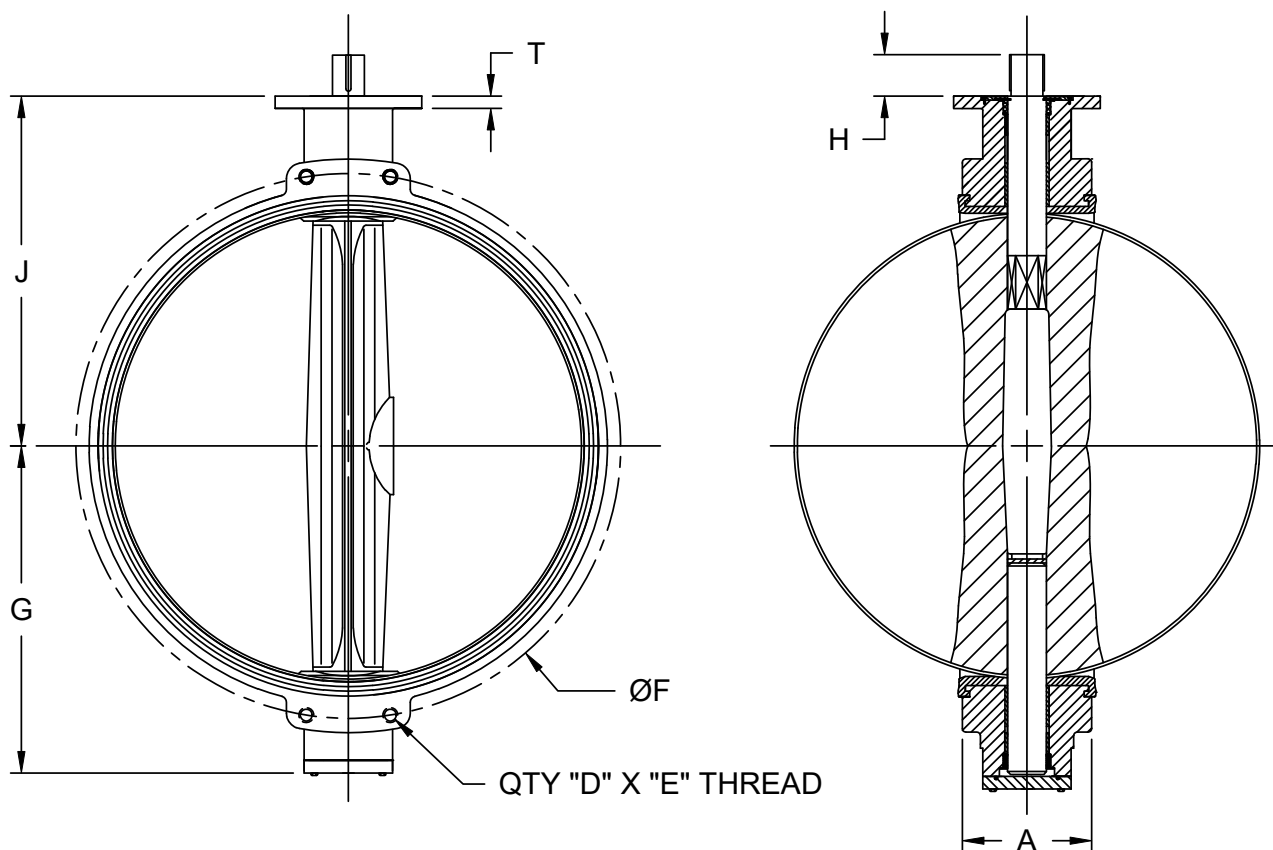
08/12/2024

DRAWING:

TS-DD0010-A



TOP FLANGE



DIMENSIONS (Inches)

SIZE	A	D	E	F	G	H	J	K	M	N	P	R	S	S2	T	V	WT (lbs)
28	6.50	4	1-1/4"-8	34.00	20.08	4.33	24.57	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	598
30	6.50	4	1-1/4"-8	36.00	20.08	4.33	25.60	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	684
32	7.48	4	1-1/2"-8	38.50	22.84	4.33	26.46	0.709	11.81	8	0.70	10.00	2.559	2.905	1.38	F25	823
36	7.87	4	1-1/2"-8	42.75	25.04	5.12	28.35	0.787	13.78	8	0.87	11.73	2.952	3.338	1.77	F30	1,026

DESCRIPTION:

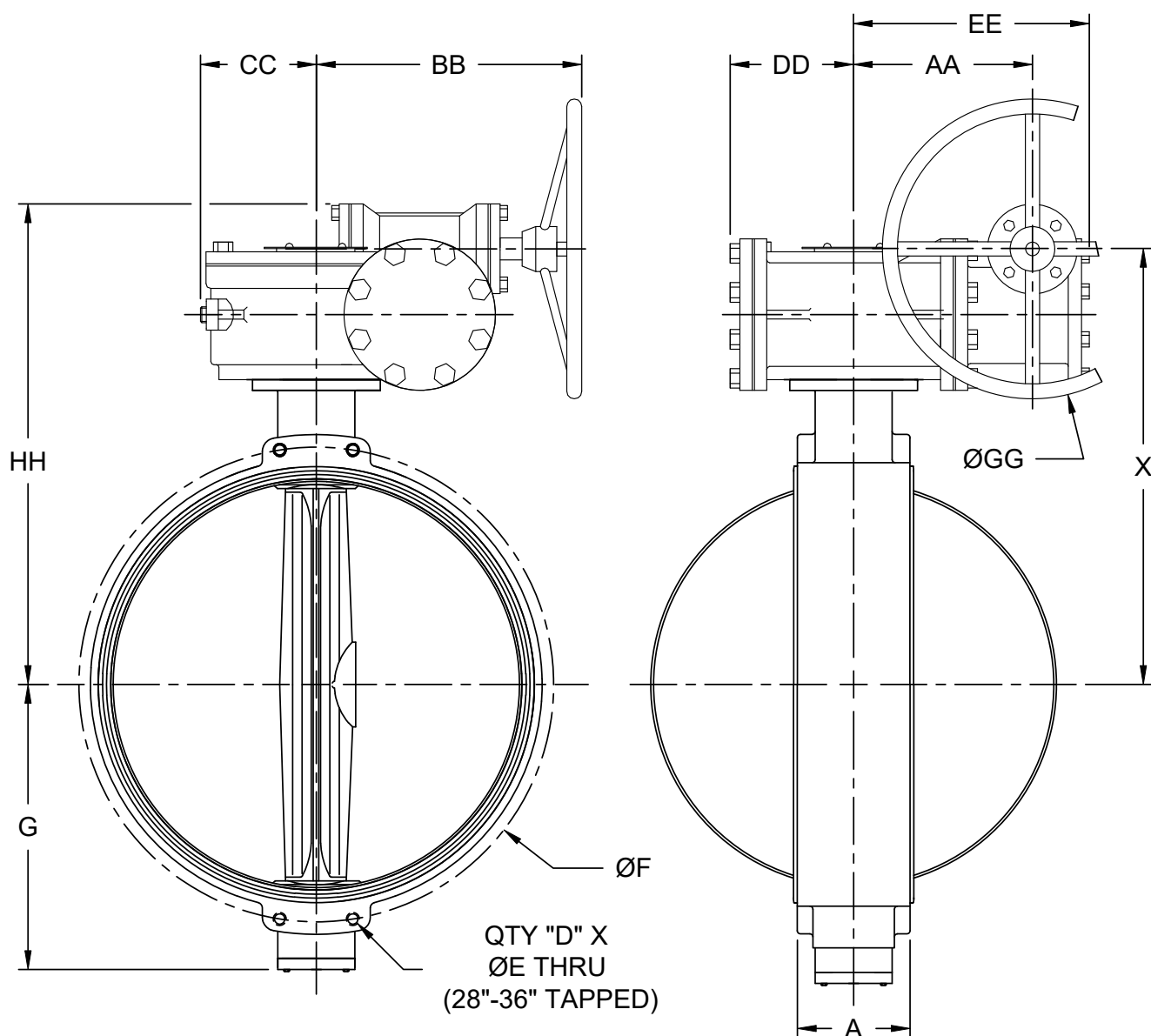
28"-36" API 609, 150# Wafer Body, Bare Shaft
Resilient Seated BFV

DATE:

08/13/2024

DRAWING:

TS-DD0011-B



DIMENSIONS (Inches)

SIZE	A	D	E	F	G	X	AA	BB	CC	DD	EE	GG	HH	WT (lbs.)	ACT MODEL
16	4.02	4	1.14	21.25	12.20	20.08	6.50	9.72	4.92	4.56	8.51	11.80	21.80	197	RS-5321-01
18	4.49	4	1.26	22.75	13.40	20.94	6.50	9.72	4.92	4.56	8.51	11.80	22.67	228	RS-5321-01
20	5.00	4	1.26	25.00	14.37	21.73	6.50	9.72	4.92	4.56	8.51	11.80	23.46	272	RS-5321-03
24	6.06	4	1.38	29.50	17.80	27.28	7.64	11.81	5.75	5.47	9.92	11.80	29.09	473	RS-6401-01
28	6.50	4	1-1/4"-8	34.00	20.08	30.59	8.78	13.78	6.34	6.73	2.52	17.72	33.00	761	RS-7041-01
30	6.50	4	1-1/4"-8	36.00	20.08	31.62	8.78	13.78	6.34	6.73	2.52	17.72	34.03	847	RS-7041-01
32	7.48	4	1-1/2"-8	38.50	22.84	32.48	8.78	13.78	6.34	6.73	2.52	17.72	34.90	986	RS-7041-01
36	7.87	4	1-1/2"-8	42.75	25.04	35.24	9.37	14.67	6.85	7.20	2.52	17.72	37.40	1,225	RS-8321-01

DESCRIPTION:

16"-36" API 609, 150# Wafer Body, Resilient
Seated BFV with Gear and Handwheel

DATE:

08/13/2024

DRAWING:

TS-DD0012-A

EXAMPLE:

1	2	3	4	5	6	7	8
GSTL	1	080	9	9	9	9	7

The above example is for a General Service Resilient Seated BFV - Lug pattern (GSTL), ASME Class 150 (1), 8" size (080), Ductile Iron Body (9), CF8M Disc (9), 431 SS Shaft (9), EPDM Seat (9) and a gear operator with hand wheel (7)

Sign 1	Model
GSTL	Lug
GSTW	Wafer

Sign 2	Class
1	Class 150

Sign 3	Size
020	2"
025	2.5"
030	3"
040	4"
050	5"
060	6"
080	8"
100	10"
120	12"
140	14"
160	16"
180	18"
200	20"
240	24"
300	30"
360	36"

Sign 4	Body
9	Ductile Iron

Sign 5	Disc
9	CF8M

Sign 6	Shaft
9	SS 431

Sign 7	Seat
9	EPDM
8	NBR
7	VITON

Sign 8	Operator
9	Bare Stem
8	Lever Kit
7	Gear w/ Handwheel
6	IP68 Gear (Buried Service)

