

KEYSTONE

- 60W – Wafer style resilient seated butterfly valve
- 60L – Lug style resilient seated butterfly valve
- Cartridge Seat Design

Features and Benefits

- Suitable for high pressure and full vacuum service due to the use of a cartridge seat design.
- Triple function cartridge seat isolates the body and stem from the media, provides positive drop-tight shut-off of line media at full rated pressure and provides a flange seal, eliminating the need for flange gaskets.
- Full rated unidirectional dead-end service is achieved by utilizing a unique patented lip in the lug body.
- Strong disc-to-stem connection and elimination of exposed pins or bolts is achieved through a rectangular drive.
- Ability to install the valve with the disc in the closed position eliminates the risk of damage to the valve during installation.
- Maximum flow and rangeability is achieved with the use of a streamlined disc.
- Stems are blowout-proof stems as a standard.
- Longer seat life with low operating torques is ensured by utilizing upper and lower stem bearings.
- Need for costly brackets is eliminated due to the ability to direct mount actuation onto the valve top-plate.



General Application

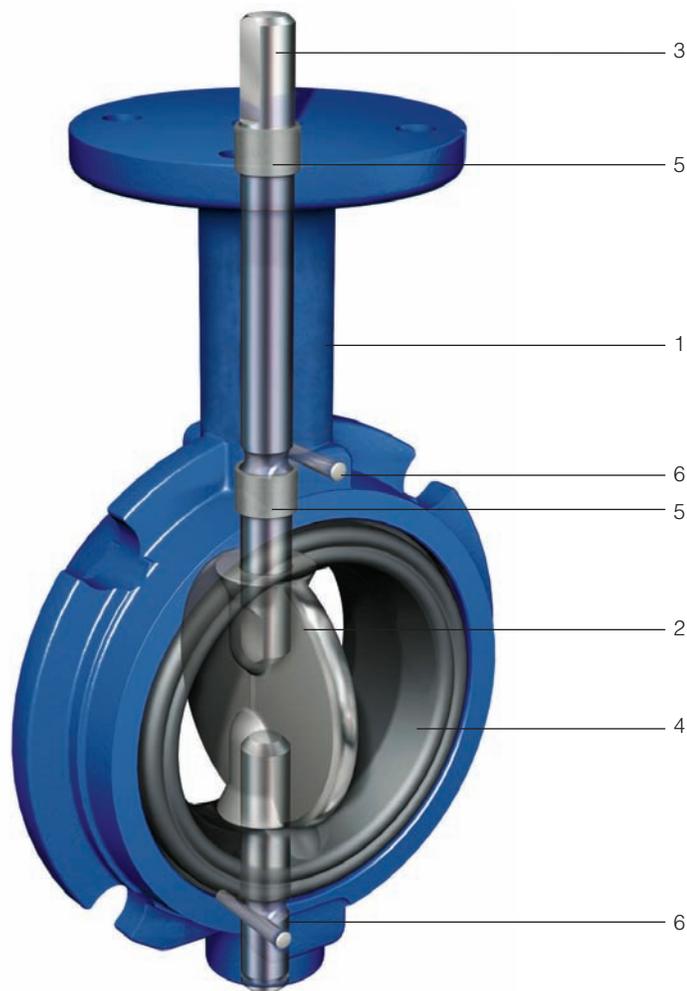
Ideally suited for many industrial applications such as food and beverage, pulp and paper, chemical, mining, water treatment, power, and automotive where a heavy-duty resilient seated butterfly valve is required. Available in a wide variety of body, disc and seat materials to fit a wide variety of media applications.

Technical Data

Size Range:	2" to 24" wafer and lug styles
Pressure Rating:	2" to 12" – 250 psi 14" to 24" – 200 psi
	Teflon® seat or elastomer covered disc 2" to 12" – 150 psi
Dead End Rating:	Full rated in preferred direction of flow
Flange Standard:	ASME Class 125/150

Designed to comply with MSS-SP-67 and API 609 (may be shell tested to spec on request).

Specifications



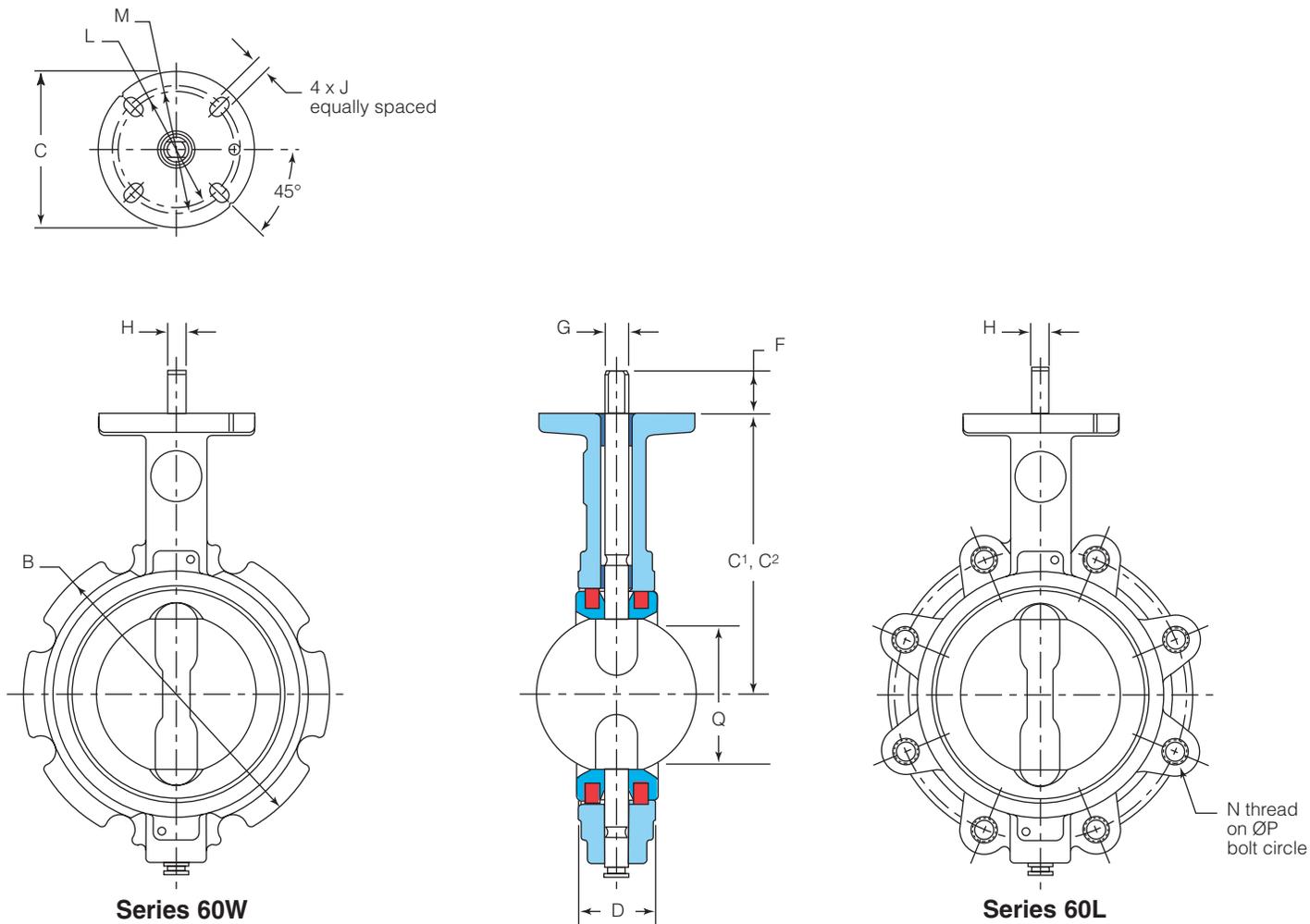
Materials

Part	Standard Material	Material Specifications
1 Body	Cast Iron ¹ Ductile Iron (2" to 12") Ductile Iron ² (14" to 24" Lug style) 316 Stainless Steel ³	ASTM A126 Class B ASTM A395 Grade 60/40/18 ASTM A536 Grade 65/45/12 ASTM A351 CF8M
2 Disc	Ductile Iron/Nickel Plated Aluminum Bronze 316 Stainless Steel EPDM Coated (2" to 12") NBR Coated (2" to 12")	ASTM A536 Grade 65/45/12 ASTM B148 C95400 ASTM A351 CF8M
3 Stem	416 Stainless Steel (standard) 316 Stainless Steel (optional) ⁴	ASTM A582 UNS S41600 Cond. A ASTM A276 UNS S31600 Cond. A
4 Seat	EPDM Food Grade (-20°F – 250°F) NBR (0°F – 180°F) Fluoroelastomer (0°F – 300°F) Teflon® (-20°F – 250°F) (2" to 12")	
5 Bearing ⁵	Teflon® Gar-Fil® (2" to 24")	
6 Pin	Carbon Steel	

Notes:

1. 14" and larger Wafer style available in Cast Iron Body only.
2. 14" and larger Lug style available in Ductile Iron Body only.
3. Offered in 2" to 6" only. These bodies come standard with a vented shaft and food grade seats.
4. 316 Stainless Steel Stem available in 2" to 12" only.
5. Valves with 316 SS bodies are provided with two additional bearings in the lower stem journal.

Specifications



Dimensions (inches)

Size	B	C ¹	C ²	D	E	F	G	H	J	L	M	N	P	Q*	Key	Adapt. Code
2"	5.09	5.75	4.69	1.63	4.00	1.25	0.56	0.37	0.406	3.00	3.25	5/8-11	4.75	1.41	–	BAB
2 1/2"	5.81	6.25	–	1.75	4.00	1.25	0.56	0.37	0.406	3.00	3.25	5/8-11	5.50	1.82	–	BAB
3"	6.25	6.50	4.87	1.75	4.00	1.25	0.56	0.37	0.406	3.00	3.25	5/8-11	6.00	2.62	–	BAB
4"	7.81	7.25	6.00	2.00	4.00	1.25	0.63	0.43	0.406	3.00	3.25	5/8-11	7.50	3.62	–	BAC
5"	8.75	7.75	–	2.13	4.00	1.25	0.75	0.50	0.406	3.00	3.25	3/4-10	8.50	4.67	–	BAD
6"	9.75	8.38	6.50	2.14	4.00	1.25	0.75	0.50	0.406	3.00	3.25	3/4-10	9.50	5.68	–	BAD
8"	12.00	9.62	–	2.35	6.00	1.25	0.87	0.63	0.562	5.00	–	3/4-10	11.75	7.54	–	CAE
10"	14.50	11.00	–	2.63	6.00	2.00	1.12	–	0.562	5.00	–	7/8-9	14.25	9.65	1/4 x 1/4	CAF
12"	17.50	12.50	–	3.00	6.00	2.00	1.37	–	0.562	5.00	–	7/8-9	17.00	11.49	5/16 x 5/16	CAG
14"	19.50	13.25	–	3.06	6.00	3.00	1.37	–	0.531	5.00	–	1-8	18.75	12.97	5/16 x 5/16	CAG
16"	22.06	14.75	–	4.01	6.00	3.00	1.63	–	0.531	5.00	–	1-8	21.25	14.85	3/8 x 3/8	CAH
18"	23.44	15.75	–	4.48	6.75	3.00	1.63	–	0.531	5.00	–	1 1/8-7	22.75	16.76	3/8 x 3/8	CAH
20"	25.68	16.25	–	4.99	6.75	4.25	1.88	–	0.812	6.50	–	1 1/8-7	25.00	18.72	1/2 x 3/8	DAJ
24"	30.06	19.12	–	6.00	8.00	4.25	1.88	–	0.812	6.50	–	1 1/4-7	29.50	22.59	1/2 x 3/8	DAJ

C¹ Dimensions apply to Cast Iron and Ductile Iron bodies ONLY.

C² Dimensions apply to Stainless Steel bodies ONLY.

Q* Dimension is the minimum allowable pipe or flange inside diameter at the centered body face to protect the disc sealing edge against damage when opening the valve.

Keystone Butterfly Valves – Series 60

2" to 24"

Valve Sizing

Rate of flow through a valve depends upon the pressure drop. The most common method of presenting this information is by C_v . The C_v is the valve coefficient of flow and represents the

flow of water in gallons per minute (GPM) with a 1 psi pressure drop through the valve. The higher the C_v , the greater the flow and the better the control characteristics. Throttling

characteristics are shown in the same manner with C_v 's at the various disc openings. Tabulated below are the C_v 's for the Series 60 Butterfly Valve.

C_v Chart (Water @ 70°F, Specific Gravity = 1.00)

Valve Size	Disc position (Degrees Open)							
	25°	30°	40°	50°	60°	70°	80°	90°
2"	3	7	19	36	63	84	115	120
2 1/2"	4	10	24	47	78	113	182	194
3"	14	21	45	84	133	203	382	430
4"	30	52	100	165	270	420	703	830
5"	85	130	210	345	525	825	1,350	1,500
6"	165	225	360	570	820	1,260	1,875	1,980
8"	210	300	480	780	1,320	2,280	3,780	3,870
10"	405	575	850	1,200	1,900	3,300	6,100	6,450
12"	550	750	1,200	1,875	2,850	5,025	9,300	9,800
14"	650	825	1,500	2,300	3,500	6,200	9,700	10,500
16"	800	1,000	1,850	2,900	4,600	7,500	10,600	13,500
18"	1,100	1,400	2,450	3,800	5,000	9,700	13,850	18,000
20"	1,400	1,650	3,050	4,800	7,400	12,500	17,750	23,000
24"	2,000	2,400	4,200	6,600	10,500	17,000	23,000	31,000

Torque Data

Torque is the rotary effort required to operate a valve. This turning force in a butterfly valve is determined by three factors – the friction of the disc and seat due to interference for sealing, bearing friction, and fluid dynamic torque.

Breakaway torque at 70°F

Breakaway torque is the total of the torques resulting from bearing friction and disc/seat interference friction at a given pressure differential. Listed below are torques to open and close the valve at pressures shown in wet services (normal conditions).

Note: These values are valid for water and lubricating fluids only at 70°F. Since torques are greatly increased for dry and nonlubricating fluids and temperature variations, contact your Keystone representative for accurate values in these applications.

Breakaway Torque in Inch Pounds for Wet Service Applications/Standard Disc

Line Pressure	Size													
	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
50	85	126	180	355	562	918	1,440	2,466	3,510	5,200	6,900	9,000	11,000	16,000
100	108	153	207	414	652	1,035	1,692	3,010	4,140	6,000	8,000	10,500	14,000	21,000
150	126	175	256	472	715	1,152	1,922	3,550	5,616	7,500	9,500	12,000	15,200	28,000
200	144	198	297	531	787	1,269	2,205	4,095	7,686	8,550	10,750	13,500	17,600	33,700
250	162	221	339	590	869	1,386	2,476	4,660	10,556	–	–	–	–	–

Materials Description

Seats

Food Grade EPDM – Rated for temperatures -20°F to 250°F. Service conditions are equivalent to those recommended for regular EPDM including applications where Food Grade is required.

NBR – Rated for temperatures 0°F to 180°F. NBR is also commonly identified as BUNA-N, Nitrile, or Hycar®. It is an excellent general purpose elastomer suitable for use with air, water as well as most petroleum oils and greases, automotive gasolines (except those which have additives), alcohols and glycols, L-P gases, propane and butane, fuel oils and many other fluids. It also exhibits good abrasion resistance, and excellent resistance to compression set.

Viton® – Rated for temperatures 0°F to 300°F. Viton® is a DuPont Dow Elastomers trademark. Fluorel® is Dyneon's trademark for the equivalent fluorocarbon elastomer. This material offers higher temperature resistance and outstanding chemical resistance. It is resistant to hydrocarbon products and mineral acids, both diluted and concentrated solutions. However, it is never to be used in steam applications and is relatively poor in water service.

Teflon® – Rated for temperatures -20°F to 250°F. The Teflon® liner overlays silicone which is bonded to a rigid phenolic ring on the outside seat perimeter. Teflon® extends over the seat faces and outside flange seal diameter, completely covering the EPDM layer of the seat which provides the resilience for sealing valve stems and the closed disc.

Special Valve Seats

EPDM – Rated for temperatures -20°F to 250°F. EPDM is an abbreviation of a compound called Ethylene Propylene Diene Monomer. It is also commonly called EPT, Nordel, and EPR. EPDM is used extensively in the HVAC (Heating, Ventilation, Air Conditioning) industry due to its resistance to polar compounds such as water, phosphate esters, ketones, alcohols, and glycols. The EPDM material is also applicable for handling concentrated sulfuric acid, 20% sodium hypochlorite (bleach), chlorinated water for swimming pools, and other alkaline solutions. EPDM is not resistant to hydrocarbon solvents and oils, chlorinated hydrocarbons, turpentine, or any other petroleum based oils.

White Neoprene – Rated for temperatures 0°F to 180°F. Neoprene has excellent resistance to alcohols, glycols, dilute mineral acids, concentrated caustics, and aqueous salt solutions. White Neoprene is generally used in sanitary applications, and although it is slightly inferior to BUNA-N in oil resistance, it is markedly better than most elastomers in these applications.

Black Neoprene – Rated for temperatures 0°F to 180°F. Neoprene offers excellent physical properties where resistance to alcohols, glycols, dilute mineral acids, concentrated caustics, aqueous salt solutions, and mild abrasion resistance is required. The black grade provides better abrasion and oil resistance than the white grade Neoprene, and although it is slightly inferior to BUNA-N in oil resistance, it provides excellent service in water/oil, air/oil services.

Disc Coatings

PVDF Coated Disc – Rated for temperatures -20°F to 275°F. Polyvinylidene fluoride also known as Kynar® is a strong, tough fluoroplastic material that is particularly suited to corrosion resistant applications in severe environments. The coating has a high degree of mechanical strength, and is chemically resistant to most acids and bases over a broad temperature range. (min. thickness 20 mils).

EPDM Coated Disc – Rated for temperatures -20°F to 250°F. EPDM coated disc provides excellent wear and abrasion characteristics for use in highly abrasive environments. The EPDM elastomer also provides the disc with chemical resistance for handling certain acids, esters, ketones and all types of water service where normal metal discs cannot be used due to chemical and/or abrasive conditions. The EPDM coated discs are not recommended for use in hydrocarbon solvents and oils, chlorinated hydrocarbons, turpentine, or any other petroleum based oils. Other rubber materials available upon request.

Notes:

- A. Phenolic reinforced seats standard on 2" to 24"
- B. Letter identification of phenolic reinforced liners on I.D. of liner is:
 - NB = NBR
 - EM = Food-Grade EPDM
 - CF = White Neoprene
 - EP = EPDM
 - FK = Viton®
 - CR = Black Neoprene
 - CS = Hypalon®

Valve Weights

Wafer Body (lbs)

Valve Size:	2	2.5	3	4	5	6	8	10	12	14	16	18	20	24
Bare Stem	5	6	7	17	19	29	36	58	87	140	177	222	347	465
Lever OP	10	11	12	22	24	34	41	63	92	–	–	–	–	–
Gear OP	14	15	19	24	30	32	62	84	130	164	201	246	371	535

Lug Body (lbs)

Valve Size:	2	2.5	3	4	5	6	8	10	12	14	16	18	20	24
Bare Stem	8	10	11	15	27	31	44	64	120	156	226	266	412	495
Lever OP	13	15	16	20	32	36	49	69	125	–	–	–	–	–
Gear OP	17	19	20	27	40	44	79	115	163	180	250	290	436	565

Material Specifications – ASTM References

Part	Material	Specs
Body	Cast Iron	A126 Class B
	Ductile Iron (2" to 12")	A395 Grade 60/40/18
	Ductile Iron (14" to 24" Lug)	A536 Grade 65/45/12
	Stainless Steel	A351 Grade CF8M
Disc	Ductile Iron	A236 Grade 65/45/12
	Stainless Steel	A351 Grade CF8M
	Aluminum Bronze	B148 UNS C945000
Stem	416 SS	A582 Type 416
	316 SS	A276 Type 316 Cond. A
Bearings	Teflon®	Gar-Fil®

Series 60 Ordering Information

Example:

a 4" lug style with cast iron body, aluminum bronze U/C disc, 416 SS shaft and NBR seat with handle – **040 60L CAS2 U 1**

040 60 L C A S 2 U 1

Size

020 – 2"	100 – 10"
025 – 2 1/2"	120 – 12"
030 – 3"	140 – 14"
040 – 4"	160 – 16"
050 – 5"	180 – 18"
060 – 6"	200 – 20"
080 – 8"	240 – 24"

Series

60

Body Style

- W – Wafer
- L – Lug

Body Material

- C – Cast Iron (14" and larger wafer style available only in Cast Iron)
- D – Ductile Iron (14" and larger lug style available only in Ductile Iron)
- S – Stainless Steel (available only in 2" to 6" sizes)
- X – Other

Disc Material

- S – 316 Stainless Steel (2" to 12" valves with 316 SS Disc are available only with 316 SS Stem)
- A – Aluminum Bronze
- D – Ductile Iron – ENP
- E – EPDM coated
- N – NBR coated
- X – Other

Stem Material

- S – 416 Stainless Steel (standard)
- P – 316 Stainless Steel (optional; available only in 2" to 12" sizes)
- X – Other

Seat Material

1 – EPDM (Food Grade)	6 – Black Neoprene
2 – NBR	7 – Teflon®
3 – Viton®	8 – EPDM
4 – Black Hypalon®	X – Other
5 – White Neoprene	

Special

- U – U/C
- S – Silicone-free
- C – Sanitary Service (available only with Stainless Steel Body)
- X – Other

Actuation

0 – None	4 – Pneumatic Direct Acting
1 – 10 Position Handles	5 – Pneumatic Spring Return
2 – Gear	6 – Electric
3 – Chain Wheel	X – Other

Additional Keystone Products



Keystone K-LOK® ANSI rated high performance valves are available in ASME 150 and ASME 300 pressure classes. They are available in a variety of trims to meet your higher pressure higher temperature requirements.



Keystone Figure 106 large diameter butterfly valves are offered in sizes 24" to 48" for your larger diameter valve requirements.

Tyco Flow Control offers a complete line of actuation and controls to meet all your automation needs. This allows us to supply a complete package for single source responsibility.



**Keystone
MRP Pneumatic Rack and
Pinion Actuators**



**Keystone
EPI₂ Electric Actuator**

Tyco Flow Control (TFC) provides the information herein in good faith but makes no representation as to its comprehensiveness or accuracy. This data sheet is intended only as a guide to TFC products and services. Individuals using this data sheet must exercise their independent judgment in evaluating product selection and determining product appropriateness for their particular purpose and system requirements. TFC MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT(S) TO WHICH THE INFORMATION REFERS. ACCORDINGLY, TFC WILL NOT BE RESPONSIBLE FOR DAMAGES (OF ANY KIND OR NATURE, INCLUDING INCIDENTAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES) RESULTING FROM THE USE OF OR RELIANCE UPON THIS INFORMATION. All Patents and Patents Pending in the U.S. and foreign countries are property of their respective owners. Tyco reserves the right to change product designs and specifications without notice. All registered trademarks are the property of their respective owners. Printed in the USA.