



ENGINEERING MANUAL

GLIMPSE ON ENGINEERING DETAILS

INTRODUCTION

STAFFORD Butterfly valves has been developed with extensive application, design and manufacturing expertise. These products are produced by employing modern manufacturing practices under a robust quality assurance system. These practices ensure consistent product quality and dependable performance

In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. STAFFORD reserves the right to decline responsibility for any premature failure or damage to the valves due non-adherence to the instructions given in the manual.

CONFORMITY TO CODES AND STANDARDS

Design & Face to Face Dim : API 609 / EN 593 / IS 13095
 Valve Testing : API 598 / BS EN 12266 PART 1
 Flange Standard Conformity : ANSI / EN / JIS / AWWA / AS / ***

GIST ON PRODUCT RANGE

S NO	SERIES	TYPE	VALVE SIZE	PRESSURE RATING	CONSTRUCTION
1	50	WAFER	2" TO 20"	PN3.5 PN10 PN 16 #150	WAFER,1PIECE STEM
2	52	LUG	2" TO 20"	PN3.5 PN10 PN 16 #150	LUG,1PIECE STEM
3	51	WAFER	22" TO 48"	PN3.5 PN10 PN 16	WAFER,2PIECE STEM
4	53	DOUBLE FLANGE (Short Pattern)	22" TO 48"	PN3.5 PN10 PN 16	DOUBLE FLANGE,2PIECE STEM
5	60	DOUBLE FLANGE (Short Pattern)	2" to 48"	PN3.5 PN10 PN 16 #150	DOUBLE OFFSET FLANGED, 2PIECE STEM (SOFT SEAT)
6	61	DOUBLE FLANGE (Short Pattern)	2" to 48"	PN3.5 PN10 PN 16 #150	DOUBLE OFFSET FLANGED, 2PIECE STEM (METAL SEAT)

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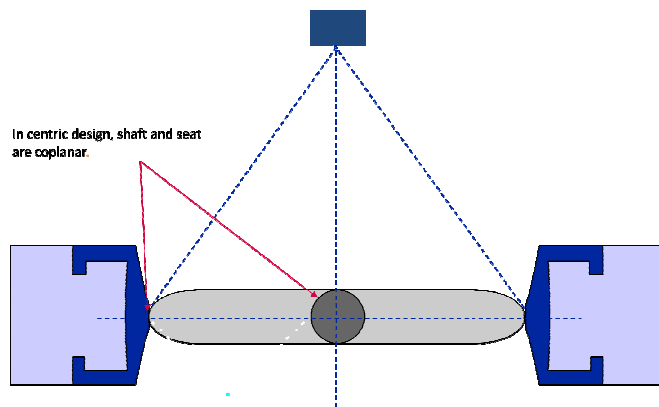
GENERAL DESIGN TYPES

STAFFORD Butterfly valves are offered in the following types

1. CONCENTRIC VALVE OR CENTRIC DISC DESIGN BUTTERFLY VALVE
2. DOUBLE OFFSET DISC DESIGN BUTTERFLY VALVE

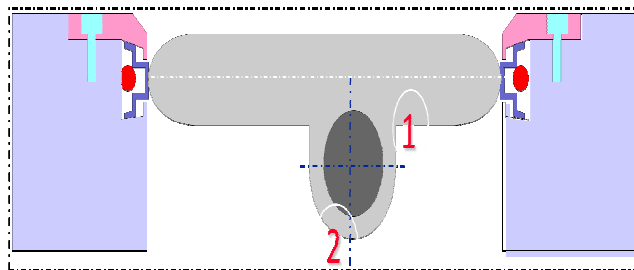
CONCENTRIC VALVE OR CENTRIC DISC DESIGN BUTTERFLY VALVE

The disc-sealing plane coincides with the vertical plane of the body and seat in this design and the shaft axis is located at the geometric center of the disc & body. The disc shoulder's are always in contact with the seat / body. Such design generally employs an elastomeric liner type seat and the sealing is achieved by the interface between the seat & disc.



DOUBLE OFFSET DISC DESIGN BUTTERFLY VALVE

The disc is mounted eccentrically to both the seating plane and disc diameter. The axis of rotation of the disc is shifted from the seat as well as the body's geometric centerline. The body's seat and the seal ring are machined according to cone having an axis aligned with the pipe bore axis. In this case a low interference is noticed, therefore this design is for soft lined valves as well as metal seated valves.



Offset 1

First offset is between shaft axis plane and seat plane which allows complete sealing contact around the entire seat

Offset 2

Second offset is between flow line axis and shaft axis, which gives camming effect & reduced rubbing rotation while opening and closing

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OPERATION

Butterfly valves OPEN and CLOSE through a 90 (quarter turn) rotation of the disc. Conventionally the valve CLOSE by clockwise rotation of the hand lever / hand wheel and OPEN by counter-clock-wise rotation which is adopted as the standard for Intervolve make Butterfly Valves also.

TYPES OF OPERATOR

Stafford Butterfly valves are fitted with any one of the following operators

- Manual handlever
- Manual worm gear box
- Pneumatic actuators with or without manual override
- Electrical actuators with or without manual override

MANUAL HAND LEVER OPERATED

- Valves up to 200 NB sizes are normally provided with manual hand levers. The hand levers are provided with mechanical stoppers at the fully CLOSE and OPEN positions with provision to lock the handle in 5 or 8 intermediate position depending on the model of the handle. The OPEN/CLOSE directions are marked on the hand lever and OPEN / CLOSE positions are marked on the notch disc.
- The hand levers have been designed to OPEN and CLOSE the valve with a max. pull of 40 kg on the lever. No extension levers or crowbars must be used as these may damage the handles.

MANUAL GEAR OPERATED

- Manual gear operators provided on the butterfly valves are essentially quarter turn worm and worm wheel type gear boxes. These gearboxes are grease filled and lubricated for life.
- The gear boxes are provided with an indicating pointer that shows the angular movement of the disc as well as OPEN and CLOSE positions. The self-locking feature ensures precise disc positioning anywhere between 0 deg C to 90 deg C .
- The gear boxes are provided with an adjustable OPEN & CLOSE end stops which are factory preset. These shall not be disturbed unless really warranted. By adjusting the stopper bolts the rotation of the gear box can be adjusted anywhere between ± 5 at the either end.

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- The hand wheel provided on the gear boxes is capable of generating the required output torque with a pull of 36kg (356 N) on the hand wheels. No extra lever or crowbars shall be used with the hand wheels, which may result in damage to the hand wheels.
- The gear boxes are designed to provide a clockwise output to CLOSE the valve with a clockwise rotation of the hand wheels. Counter-clockwise rotation of the hand wheel will OPEN the valve.

PNEUMATICALLY OPERATED

The pneumatic operated valves are designed to control the flow in all positions from fully open to fully closed and from fully closed to fully open with control in any intermediate position.

The pneumatic operated valves are provided with following accessories

- A. Pneumatic Actuator
- B. Air filter regulator
- C. Limit Switches
- D. Air lock relay
- E. Solenoid Valve
- F. Manual Over Ride
- G. Mountings & Tubings

ELECTRICALLY OPERATED

Electrically operated valves are designed to open and close the valve at the rated speed against the design differential pressure, at 90% of the nominal voltage.

Electric Actuators comprises of the following

- A. Electric Motors
- B. Limit Switches
- C. Hand Wheel and gear train
- D. Mechanical position indicator
- E. Internal wiring and terminal block.

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SEAT MATERIAL

S No	Seat Material	Temperature Range (Oper)	Self Life (Yrs)	General Chemical Resistance	
				Recommended for	Not Recommended for
1	NITRILE	-30 Deg C to +90 Deg C	4	Oils, fuels, water, sea water, air, powders, pellets, slurries, hydrocarbons	Oxidizing media, acids & Alkalies, chlorinated hydrocarbons, steam, hot water
2	NEOPRENE	-30 Deg C to +100 Deg C	6	Oils, fuels, water, sea water, air, powders, pellets, slurries, hydrocarbons	Oxidizing media, acids & Alkalies, chlorinated hydrocarbons, steam, hot water
3	EPDM	-40 Deg C to +130 Deg C	6	Dilute to medium acids & Alkalies, water, hot water & LP steam, ammonia. Hydrocarbon.	Petroleum products, mineral oils, grease
4	HYPALON	-25 Deg C to +130 Deg C	6	Dilute acids & Alkalies, chemicals in general except solvents.	Concentrated and oxidizing acids, chlorinated hydrocarbons
5	SILICON	-60 Deg C to +200 Deg C	8	Hot air, hot gases, vegetable oils, food & pharmaceuticals	Solvents, concentrated acids & Alkalies, steam and hot water, slurries, powders
6	VITON	-30 Deg C to +180 Deg C	6	Chemicals, mineral oils & fats, halogenated hydrocarbons.	Steam, ketons, caustic solutions, hydrogen sulfide & ammonia.

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**PRODUCT SPECIFICATION FOR SERIES 50 / 52 MODEL
BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)**

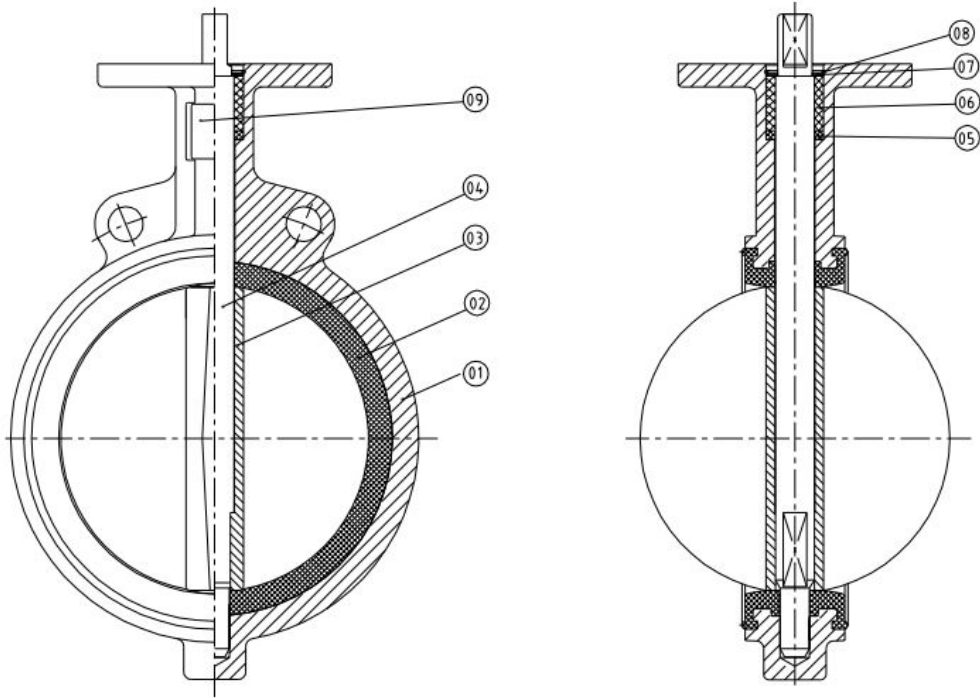
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GENERAL FEATURES	Valve Type	Centric Disc Butterfly	
	Valve Model	Series 50 / 52 (Replaceable Seat)	
	Description	Butterfly Valve with Replaceable Liner (Seat)	
	Design, Mfg. Std.	API 609 / EN 593 (BS 5155) / IS 13095	
	Face To Face Dimension	ISO 5752 Tab 5 / API 609 (Category - A)	
	Testing Standard	API 598 / EN 12266 Part 1 (BS 6755 Part 1)	
	Top Flange	ISO 5211.2	
PRODUCT SPECS.	Size Range	50 NB to 500 NB	
	Operating Temperature	- 25° C ~ +200° C. (Depending on MOC)	
	Pressure Rating	PN 3.5 / PN 7 / PN 10 / PN 16	
	Body Type	Wafer (Series 50)	Wafer Lugged (Series 52)
	Flange Standards	ANSI 150; EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10 Tab D & E; AS 2129	ANSI 150, EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10; AS 2129
	Disc Type	Centric With Double D Locking type	
	Seat Type	Replaceable Liner Type	
	Seat Leakage	Zero Leak, Tight Shut Off	
	Flow Direction	Bi-directional	
	Painting & Finish	Blue Epoxy Powder Coated / Painted (Except St. Steel)	
MATL. OF CONSTRUCTION	Body Matl.	CI / SGI / WCB / CF8 / CF8M / Special	
	Disc Matl.	SGI / CF8 / CF8M / WCB / Special	
	Seat Matl.	NITRILE, EPDM, NEOPRENE, HYPALON, VITON, SILICON #	
	Shaft Matl.	AISI 410 or SS 316 or Special	
	Bearing Matl.	Self Lubricated	
	Shaft Sealing	O-rings	
OPERATION	Hand Lever	For Sizes up to 150 NB	
	Gear Boxes	For Sizes above 200 NB	
	Actuator (Elect./ Pneumatic)	Available	

1. Specifications subject to change due to continuous improvement.
2. Contact factory for any other material options or non-standard requirements.

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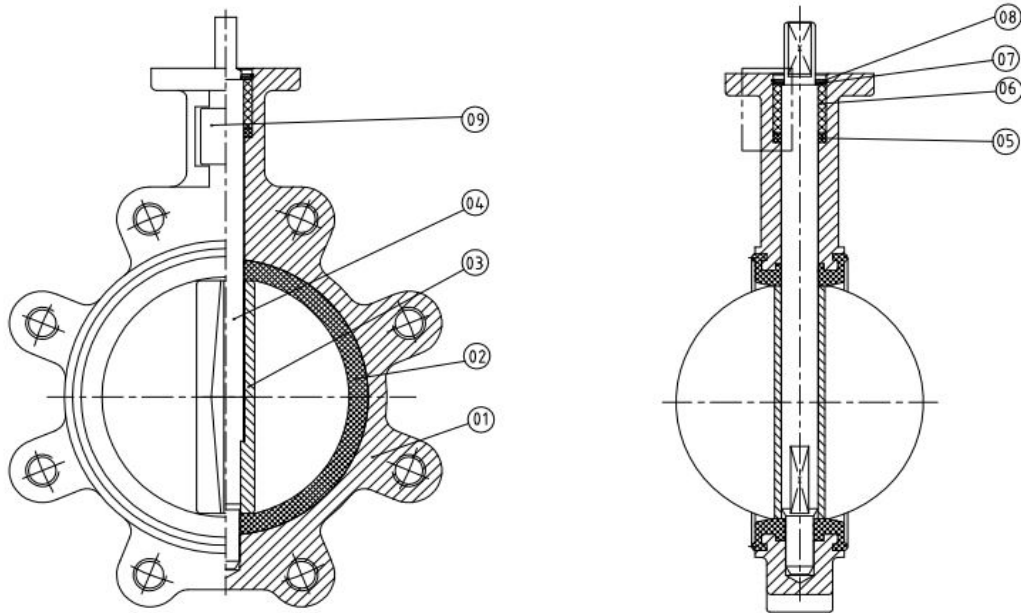
CROSS SECTIONAL VIEW OF SERIES 50 MODEL BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)



NO	DESCRIPTION	QTY
1	BODY	1
2	SEAT	1
3	DISC	1
4	STEM	1
5	U' CUP SEAL	1
6	BEARING	1
7	RETAINER RING	1
8	INTERNAL CIRCLIP	1
9	NAME PLATE	1

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CROSS SECTIONAL VIEW OF SERIES 52 MODEL BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)



NO	DESCRIPTION	QTY
1	BODY	1
2	SEAT	1
3	DISC	1
4	STEM	1
5	U' CUP SEAL	1
6	BEARING	1
7	RETAINER RING	1
8	INTERNAL CIRCLIP	1
9	NAME PLATE	1

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**PRODUCT SPECIFICATION FOR SERIES 51 / 53 MODEL
BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)**

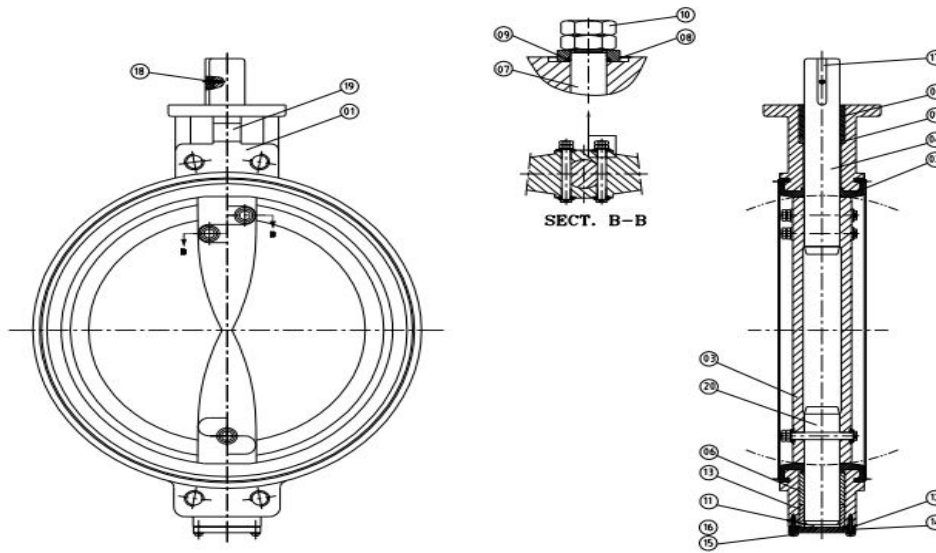
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GENERAL FEATURES	Valve Type	Centric Disc Butterfly	
	Valve Model	Series 51 / 53 (Replaceable Seat)	
	Description	Butterfly Valve with Replaceable Liner (Seat)	
	Design, Mfg. Std.	API 609 / EN 593 (BS 5155) / IS 13095	
	Face To Face Dimension	ISO 5752 Tab 5 / API 609 (Category - A)	
	Testing Standard	API 598 / EN 12266 Part 1 (BS 6755 Part 1)	
	Top Flange	ISO 5211.2	
PRODUCT SPECS.	Size Range	550 NB to 1200 NB ****	
	Operating Temperature	- 25° C ~ +200° C. (Depending on MOC)	
	Pressure Rating	PN 3.5 / PN 7 / PN 10 / PN 16	
	Body Type	Wafer (Series 51)	Double Flanged Short Pattern (Series 53)
	Flange Standards	ANSI 150; EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10 Tab D & E; AS 2129	ANSI 150, EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10; AS 2129
	Disc Type	Centric With Locking Pin Arrangement	
	Seat Type	Replaceable Liner Type	
	Seat Leakage	Zero Leak, Tight Shut Off	
	Flow Direction	Bi-directional	
	Painting & Finish	Blue Epoxy Powder Coated / Painted (Except St. Steel)	
MATL. OF CONSTRUCTION	Body Matl.	CI / SGI / WCB / CF8 / CF8M / Special	
	Disc Matl.	SGI / CF8 / CF8M / WCB / Special	
	Seat Matl.	NITRILE, EPDM, NEOPRENE, HYPALON, VITON, SILICON #	
	Shaft Matl.	AISI 410 or SS 316 or Special	
	Bearing Matl.	Self Lubricated	
	Shaft Sealing	O-rings	
OPERATION	Operator	Gear Box	
	Actuator (Elect./ Pneumatic)	Available	

1. Specifications subject to change due to continuous improvement.
 2. Contact factory for any other material options or non-standard requirements.
- **** Size above 1200 also available on request

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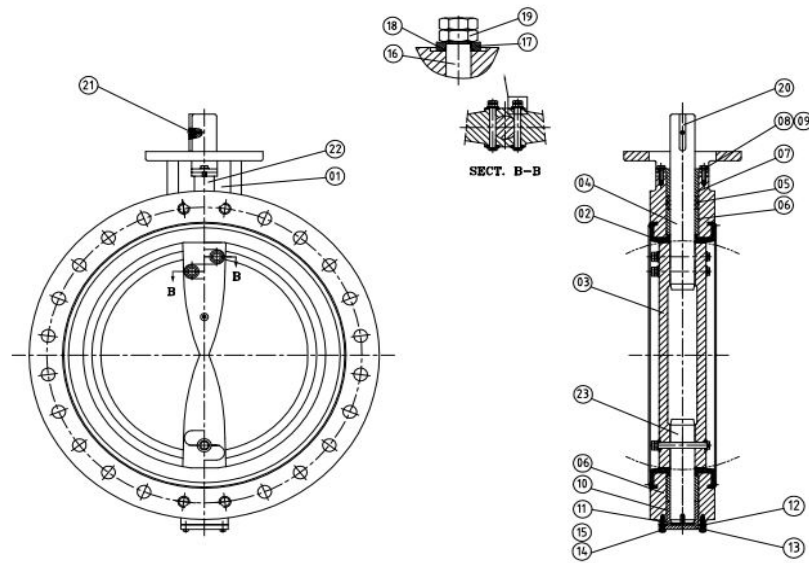
CROSS SECTIONAL VIEW OF SERIES 51 MODEL BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)



NO	DESCRIPTION	QTY
1	BODY	1
2	SEAT	1
3	DISC	1
4	UPPER STEM	1
5	U' CUP SEAL	1
6	BEARING	1
7	PIN	3
8	WASHER	6
9	O-RING	6
10	HEX NUT	6
11	THRUST BEARING	1
12	GASKET	1
13	SPACER	1
14	BOTTOM PLATE	1
15	HEX.HD SCREW	1
16	PLAIN WASHER	4
17	PRALLEL KEY	1
18	SOC.HD.SCREW	1
19	NAME PLATE	1
20	LOWER STEM	1

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CROSS SECTIONAL VIEW OF SERIES 53 MODEL BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)



NO	DESCRIPTION	QTY
1	BODY	1
2	SEAT	1
3	DISC	1
4	UPPER STEM	1
5	U' CUP SEAL	3
6	BEARING	2
7	PACKING GLAND	1
8	HEX.BOLT	2
9	PLAIN WASHER	2
10	SPACER	1
11	THRUST BEARING	1
12	GASKET	1
13	BOTTOM PLATE	1
14	PLAIN WASHER	4
15	HEX.HD.SCREW	4
16	PIN	3
17	WASHER	6
18	O-RING	6
19	HEX NUT	6
20	PARALLEL KEY	1
21	SOC.HD.CAPSCREW	1
22	NAME PLATE	1
23	LOWER STEM	1

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**PRODUCT SPECIFICATION FOR SERIES 60 MODEL BUTTERFLY
VALVE (REPLACEABLE SEAT TYPE)**

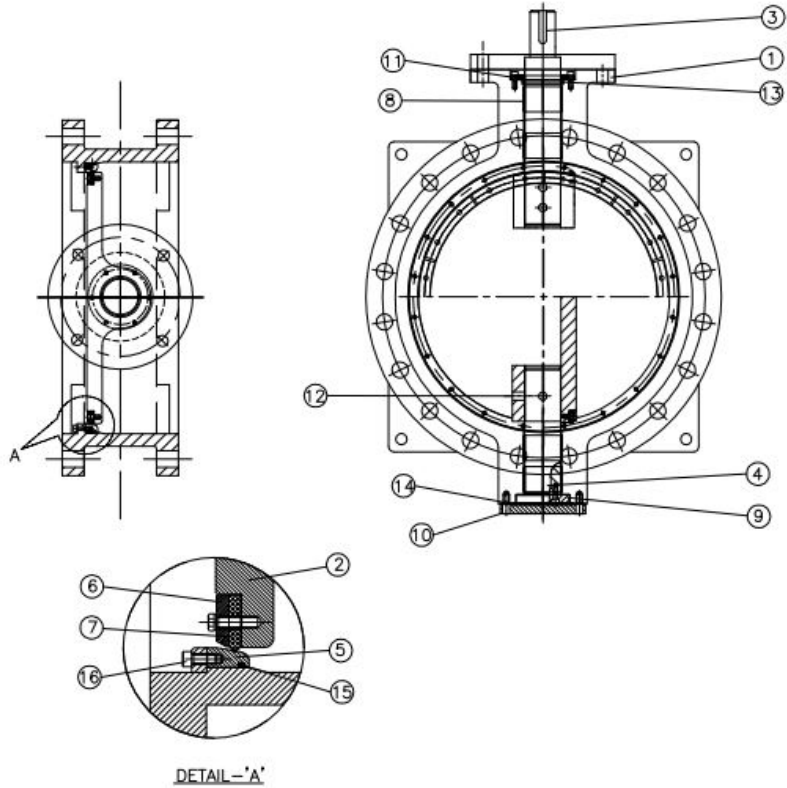
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GENERAL FEATURES	Valve Type	Double Eccentric Butterfly Valve
	Valve Model	Series 60 (Replaceable Seat)
	Description	Butterfly Valve with Replaceable Liner (Seat)
	Design, Mfg. Std.	API 609 / EN 593 (BS 5155) / IS 13095
	Face To Face Dimension	API 609 (Category – A & B) / EN 558
	Testing Standard	API 598 / EN 12266 Part 1 (BS 6755 Part 1)
	Top Flange	ISO 5211.2
PRODUCT SPECS.	Size Range	50 NB to 1200 NB ****
	Operating Temperature	- 25° C ~ +200° C. (Depending on MOC)
	Pressure Rating	PN 3.5 / PN 7 / PN 10 / PN 16 / PN 20 / # 150
	Body Type	Double Flanged Long Pattern (Series 60)
	Flange Standards	ANSI 150; EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10 Tab D & E; AS 2129
	Disc Type	Centric With Locking Pin Arrangement
	Seat Type	Replaceable Seal Type
	Seat Leakage	Zero Leak, Tight Shut Off
	Flow Direction	Uni-directional
	Painting & Finish	Blue Epoxy Powder Coated / Painted (Except St. Steel)
MATL. OF CONSTRUCTION	Body Matl.	CI / SGI / WCB / CF8 / CF8M / Special
	Disc Matl.	SGI / CF8 / CF8M / WCB / Special
	Seat Matl.	NITRILE, EPDM, NEOPRENE, HYPALON, VITON, SILICON #
	Shaft Matl.	AISI 410 or SS 316 or Special
	Bearing Matl.	Self Lubricated
	Shaft Sealing	O-rings
OPERATION	Operator	Gear Box
	Actuator (Elect./ Pneumatic)	Available

1. Specifications subject to change due to continuous improvement.
 2. Contact factory for any other material options or non-standard requirements.
- **** Size above 1200 also available on request

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CROSS SECTIONAL VIEW OF SERIES 60 MODEL BUTTERFLY VALVE (REPLACEABLE SEAT TYPE)



NO.	DESCRIPTION	QTY
1	BODY	1
2	DISC	1
3	DRIVE SHAFT	1
4	STUB SHAFT	1
5	BODY SEAT RING	1
6	CLAMPING SEGMENT	10
7	VALVE SEAL	1
8	BEARING BUSH	4
9	THRUST PAD	1
10	END COVER PLATE	1
11	GLAND PLATE	1
12	SHAFT PIN	3
13	GLAND O-RING	1
14	END COVER O-RING	1
15	BODY-O-RING	1
16	HARDWARES	-

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PRODUCT SPECIFICATION FOR SERIES 61 MODEL BUTTERFLY VALVE (METAL SEATED TYPE)

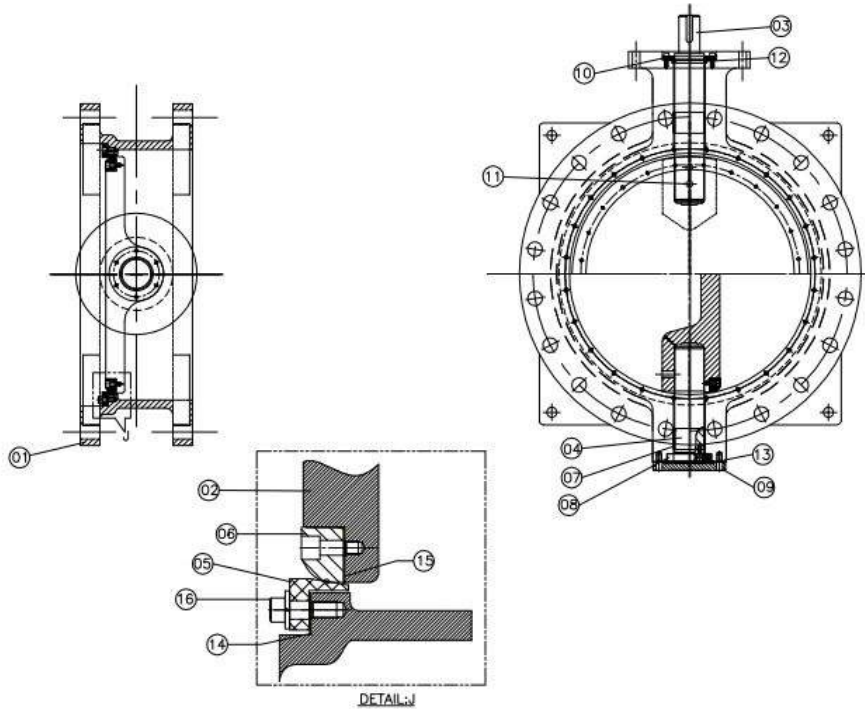
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GENERAL FEATURES	Valve Type	Double Eccentric Butterfly Valve
	Valve Model	Series 61 (Metal Seat)
	Description	Metal Seated Butterfly Valve
	Design, Mfg. Std.	API 609 / EN 593 (BS 5155) / IS 13095
	Face To Face Dimension	API 609 (Category – A & B) / EN 558
	Testing Standard	API 598 / EN 12266 Part 1 (BS 6755 Part 1)
	Top Flange	ISO 5211.2
PRODUCT SPECS.	Size Range	50 NB to 1200 NB ****
	Operating Temperature	- 25° C ~ +200° C. (Depending on MOC)
	Pressure Rating	PN 3.5 / PN 7 / PN 10 / PN 16 / PN 20 / # 150
	Body Type	Double Flanged Long Pattern (Series 61)
	Flange Standards	ANSI 150; EN PN 10/16; IS:6392; JIS 5K/ 10K/16K; BS 10 Tab D & E; AS 2129
	Disc Type	Centric With Locking Pin Arrangement
	Seat Type	Replaceable Ring / Integral Type
	Seat Leakage	ANSI Class IV Leakage
	Flow Direction	Uni-directional
	Painting & Finish	Blue Epoxy Powder Coated / Painted (Except St. Steel)
MATL. OF CONSTRUCTION	Body Matl.	Cl / SGI / WCB / CF8 / CF8M / Special
	Disc Matl.	SGI / CF8 / CF8M / WCB / Special
	Seat Matl.	SS 410 or SS 316 or Special
	Shaft Matl.	AISI 410 or SS 316 or Special
	Bearing Matl.	Self Lubricated
	Shaft Sealing	O-rings
OPERATION	Operator	Gear Box
	Actuator (Elect./ Pneumatic)	Available

1. Specifications subject to change due to continuous improvement.
 2. Contact factory for any other material options or non-standard requirements.
- **** Size above 1200 also available on request

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CROSS SECTIONAL VIEW OF SERIES 61 MODEL BUTTERFLY VALVE (METAL SEATED TYPE)



NO.	DESCRIPTION	QTY
1	BODY	1
2	DISC	1
3	DRIVE SHAFT	1
4	STUB SHAFT	1
5	BODY SEAT RING	1
6	DISC TRIM	1
7	BEARING BUSH	4
8	THRUST PAD	1
9	END COVER PLATE	1
10	GLAND PLATE	1
11	SHAFT PIN	3
12	GLAND O-RING	1
13	END COVER O-RING	1
14	BODY SEAT RING GASKET	1
15	DISC TRIM GASKET	1
16	HARDWARES	-

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