Double-Offset Butterfly Valve

Technical Product Information

The world's preferred partner, delivering expert, corrosion-resistant, valve solutions.

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Headlines

Your Comprehensive Double-Offset Butterfly Valve Technical Manual

Shipham Valves has developed a high-quality Double-Offset Butterfly Valve range that reflects our technical expertise in valve design, product engineering and market knowledge. This range possesses multiple design features which reflect the wide range of applications these valves support.

Technical Information At Your Fingertips

This technical manual provides a comprehensive overview of our range, illustrated by detailed 3D models and cutaway imagery combined with in-depth product descriptions and technical information such as:

- Unique design features
- User benefits
- Technical specifications
- Valve components and construction
- Varied applications supported by the double-offset range
- Reference standards and certifications

This range also delivers a robust and effective through-life isolation valve, provides weight and space savings and is an alternative solution to gate and ball valves.

User Requirements

This high-quality double-offset range has benefited from our valve design and materials expertise, unparalleled understanding of user needs and design feature requirements plus extensive market knowledge. This has resulted in a range that delivers proven performance and supports various severe-service applications.

By choosing to work with Shipham Valves, we remove any concerns and provide total confidence that you have selected the right partner. This will help you navigate your way through the complex world of valve selection and project execution.

1 Introduction

Double-Offset Butterfly Valves (DOBV) are a high-performance and cost-effective butterfly valve solution. The double-offset butterfly valve is suitable for high pressure and moderate temperatures while handling gas, oil, steam or water amongst other fluids and matter. This type of butterfly valve uses two offsets to achieve a uniform seal around the entire 360° of the seat component. The offsets combined with the seat design produce a high-performance butterfly valve.

See image 1 for further details.

The valve shaft is offset from the centre line in both the X and Y axis, which makes up the two offsets.

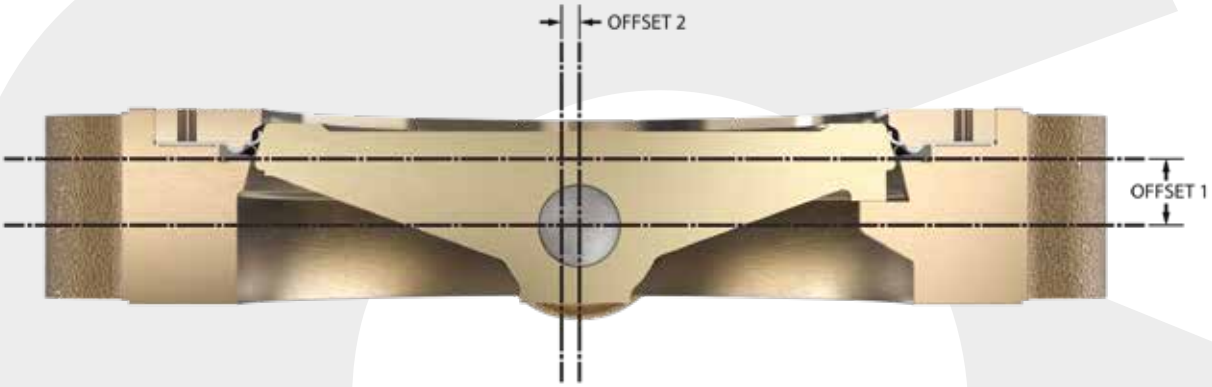

Image 1. Offset locations

1.1 Valve Design Series

- BU01 – Wafer-Type Raised Face and Flat Face availability
- BU02 – Lug-Type Raised Face and Flat Face availability
- BU03 – Double-Flanged Raised Face and Flat Face availability

BU01 - Wafer-Type

BU02 - Lug-Type

BU03 - Double-Flanged

1.2 Reference Standards

Valve Design
API 609 Cat. B - Butterfly Valves: Double-Flanged, Lug and Wafer-Type, and Buttweld
ASME B16.34 - Valves — Flanged, Threaded and Buttweld

Face to Face
API 609 - Lug and Wafer-Type and Double-Flanged Short Pattern
ASME B16.10 - Valves — Flanged, Threaded and Buttweld

Pressure Testing
API 598 – Valve Inspection and Testing

Shut Off Class
API 598 (Zero Leakage) – Valve Inspection and Testing
ISO 5208 Rate A - Industrial valves — Pressure Testing of Metallic Valves

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Fire Testing
API 607 - Industrial valves — Pressure Testing of Metallic Valves
BS EN ISO 10497 - Testing of Valves — Fire Type Testing Requirements

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Fugitive Emissions
API 641

Accreditations
PED 2014 / 68 / EU
PE(S)R

2 Applications

As the market standard for high-performance butterfly valves increases, factors such as advancements in technology, an increasing number of applications and consumer demand are major drivers of growth for this valve type.

Diverse Industry-Specific Applications

The primary double-offset applications are isolation and regulating flow. They provide an effective isolation valve solution for industry-specific applications such as:

- Chemical and processing industries
- Energy and power generation
- Fertilisation
- LNG storage and transportation
- Marine
- Mining
- Oil and gas
- Petrochemical
- Petroleum and refining
- Pharmaceutical
- Pulp and paper
- Steel production
- Water industry and wastewater treatment

Supporting applications such as:

- Cooling water systems and control
- Cryogenic LNG isolation
- Fire main bypass control
- Flare gas control
- Flow balancing
- Isolation
- LNG circulation control
- LNG tank flow control
- Loading and unloading flow control
- Pipeline isolation
- Pump discharge
- Regulator level control and isolation valves
- Seawater control, injection, isolation and recirculation
- Water storage tank isolation

Butterfly valve solutions are required to provide tight shutoff capabilities, lightweight solutions, lower installation costs, and the ability to operate at higher pressures. These end-user requirements are addressed by Shipham Valves' Double-Offset Butterfly Valve range.

High pressure
If your operations involve high pressures and specific fluids, this valve type can be an ideal solution.

Speciality materials and alloy steel with increased strength and corrosion resistance characteristics are contributing to increased demand for Double-Offset Butterfly Valves.

3 Design Features

3.1 Graphite Seals

Graphite is chemically inert and may be used in a wide range of temperatures. This makes it a suitable sealing material for a wide range of applications, including where specified firesafe performance is required.

Graphite packing rings, as well as supporting a wide range of temperatures, are chemically compatible with almost all fluid types. This makes them the ideal solution for a wide range of applications.

The Double-Offset Butterfly Valves range uses graphite gaskets and packing rings as standard. This design has successfully been tested to both API 607 and ISO 10497 standards in a variety of materials.

Image 2 below illustrates the fitted graphite packing rings.

General Material	Component	Min. Temp	Max. Temp
Graphite	Gasket	-250°C	+600°C
	Packing Ring	-196°C	+400°C
		-200°C	+450°C

**On firesafe specific designs, graphite packing rings must be used alongside graphite gaskets and seals.*

Table 1. Graphite gasket and packing ring materials

Image 2. Graphite packing arrangement

3.2 Seating Geometry

Shipham Valves' double-offset design employs a spherical seating face. To ensure uniform engagement of the seat/sealing components with this face around the entirety of the sealing face on the disc creating a leak-tight seal.

The two offsets in the double-offset design create a cam action which pulls the disc out of the seat within the first few degrees of the valve opening. This reduces seat wear which prolongs the lifespan of this component.

3.2.1 Soft Seat

The design utilises an industry-proven reinforced-PTFE (RPTFE) soft seat design. The soft seat design comprises an RPTFE 'jacket' with an elastomer (typically Viton®) energiser. The seal is compressed by the disc when the valve is closed; this compression creates a sealing stress which allows the valve to seal against both low-pressure gases and high-pressure liquids.

A compression-based seal design ensures a consistent bi-directional seal regardless of application.

The RPTFE 'jacket' provides a considerably lower coefficient of friction and better chemical compatibility when compared to the use of an elastomer on its own. This combination typically improves performance and extends the seal service life.

Image 3. Soft seat design, RPTFE jacket and elastomer energiser

3.2.2 Secondary Metal Seal

The secondary metal seat, supplied in Inconel® 625 as standard, provides a fire-safe seal when the soft seat melts in the event of a fire. This seat's performance has been evaluated and qualified in accordance with API 607 and BS EN ISO 10497.

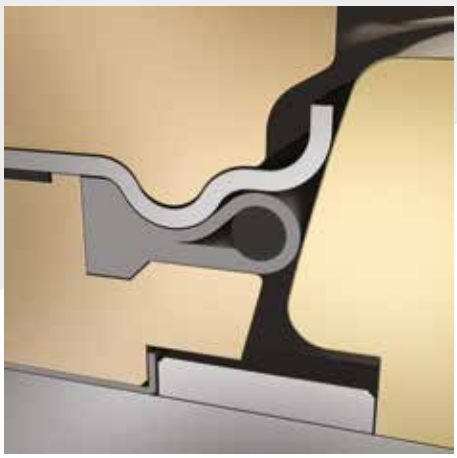


Image 4. Soft seat and secondary metal seat

3.3 Anti-Blowout Device

The Double-Offset Butterfly Valve range is designed with an anti-blowout device as standard. The anti-blowout device prevents the stem from being ejected from the valve in the event of failure when the valve is under pressure.

The anti-blowout ring is split into two equal pieces which reform as a ring around the stem in a groove located in the valve gland.

The ring is located in the shaft and retained by the gland to prevent the stem from being blown out of the top of the valve.

Anti-blowout ring dimensions and gland bolting size are calculated to counter-react the stem ejection force.

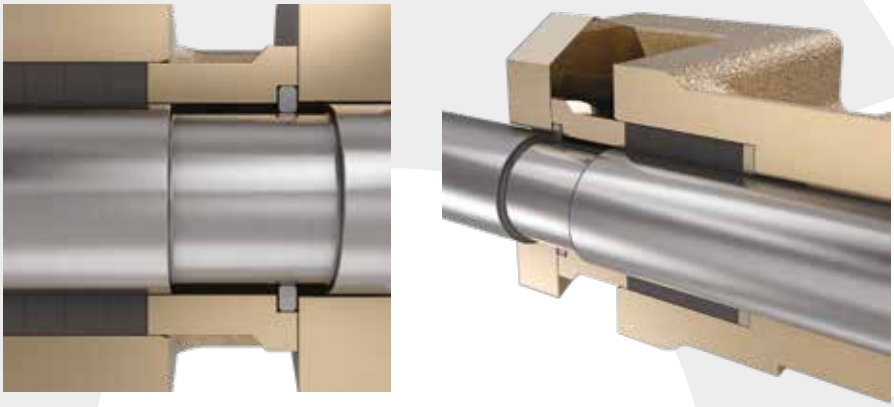


Image 5. Double-Offset stem and anti-blowout detail

3.4 Operation

The Double-Offset Butterfly Valve is lever operated in sizes up to and including 4” on ASME Class 150 valves; sizes 6” and above are operated by a gearbox.

Levers supplied are latch-lock levers in accordance with API 609 and gearboxes are supplied with locking facilities as standard.

These valves may need to be activated, so are supplied with the thrust boxes as stated in ISO 5211.

Image 6. Double-Offset butterfly valve lug-type C/W gearbox and handwheel

4 Part Identification

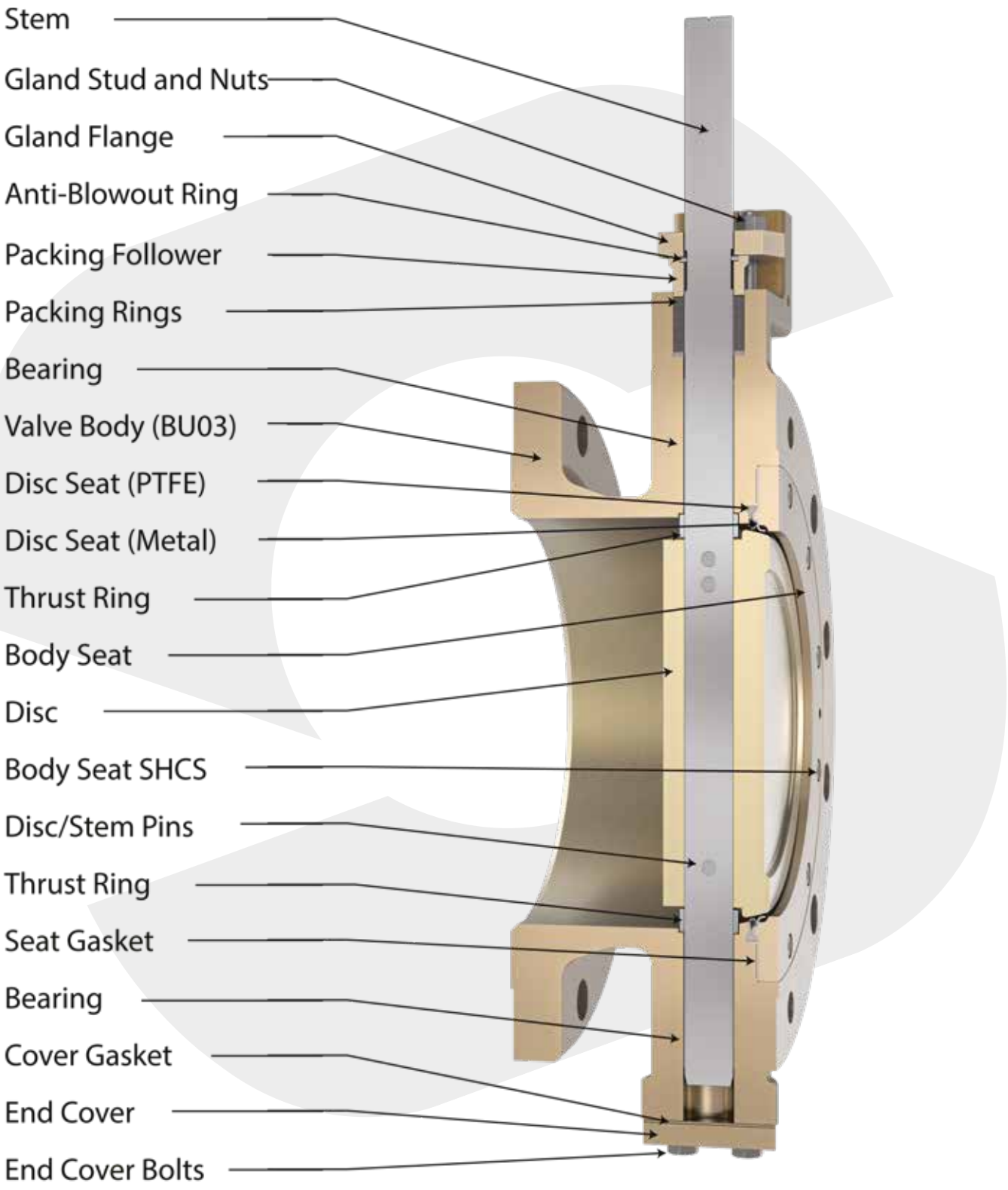


Image 7. Sectional view of double-offset double-flanged flat-face (BU03)

5 Benefits

The standard design of our Double-Offset Butterfly Valve range is compatible with various off-the-shelf actuation solutions and designed to meet a wide range of user requirements.

Benefits
The Double-Offset Butterfly Valve range is available in three main body configurations and with extensive design features.

This range delivers various user benefits including:

Performance
- High performance across a diverse range of applications with large volumes of fluid
- Prolonged valve service longevity with double-offset design cam action reduces seat wear
- Has a lower operating torque than some other valve types, making them easier to open and close
- The disc can quickly leave the seat once the valve is opened, reducing friction

Design
- Designed fully in accordance with API 609 Cat B
- Certified Firesafe design
- Compact design – compared to other metal seated isolation valves such as Gate Valves
- Significant weight savings compared to Gate and Ball Valves
- Peace of mind - multiple anti-blowout devices integrated into the product to ensure stem retention under all future conditions
- Cost-effective and lightweight design

Certification and Accreditation
- Firesafe certification in accordance with API 607

Actuation
- Standard mounting interfaces enable easy actuation

Sizes and specialist materials of construction
Our range can be manufactured in a variety of specialist materials including Nickel Aluminium Bronze, Bronze, Duplex Stainless Steel, Super Duplex Stainless Steel, Hastelloy®, Monel®, Titanium, Inconel® and Zirconium in sizes ranging from 2” – 24”, with additional sizes available upon customer request.

6 Product Range

6.1 BU01

Double-Offset Butterfly Valve, Wafer-Type Body,
Designed in accordance with API 609 Cat. B.

6.2 BU02

Double-Offset Butterfly Valve, Lug-Type Body,
Designed in accordance with API 609 Cat. B.

6.3 BU03

Double-Offset Butterfly Valve, Double-Flanged Body,
Designed in accordance with API 609 Cat. B.

6.4 Body Configurations - Flanges

The double-offset design is available in the three main body configurations shown previously in section (1.1 Valve Design Series). Each valve can be offered with either flat-face or raised-face flanges.

Flat-face flange – Gasket face is flat and on the same face as the bolting face (see image 7 below).
Raised-face flange – Gasket surface is raised above the bolting face (see image 8 below).

Image 8. Lug-type body with flat-face flanges

Image 9. Lug-type body with raised-face flanges

6.5 Series Availability

- This range is available in sizes from 2” up to 24” with further size options.

These tables below show the product range for the Shipham Valves’ Double-Offset. Further sizes are available upon customer request.

Size	2”		3”		4”		6”		8”		10”	
Class	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300
Wafer-Type (BU01)	●	●	●	●	●	●	●	●	●	●	●	●
Lug-Type (BU02)	●	●	●	●	●	●	●	●	●	●	●	●
Double-Flanged (BU03)	●	●	●	●	●	●	●	●	●	●	●	●

Table 2. Double-Offset range options 2” - 10

Size	12”		14”		16”		18”		20”		24”	
Class	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300	Cl 150	Cl 300
Wafer-Type (BU01)	●	●	●	●	●	●	●	●	●	●	●	●
Lug-Type (BU02)	●	●	●	●	●	●	●	●	●	●	●	●
Double-Flanged (BU03)	●	●	●	●	●	●	●	●	●	●	●	●

Table 3. Double-Offset range options 12” - 24

7 Valve Dimensions

7.1 Envelope Dimensions

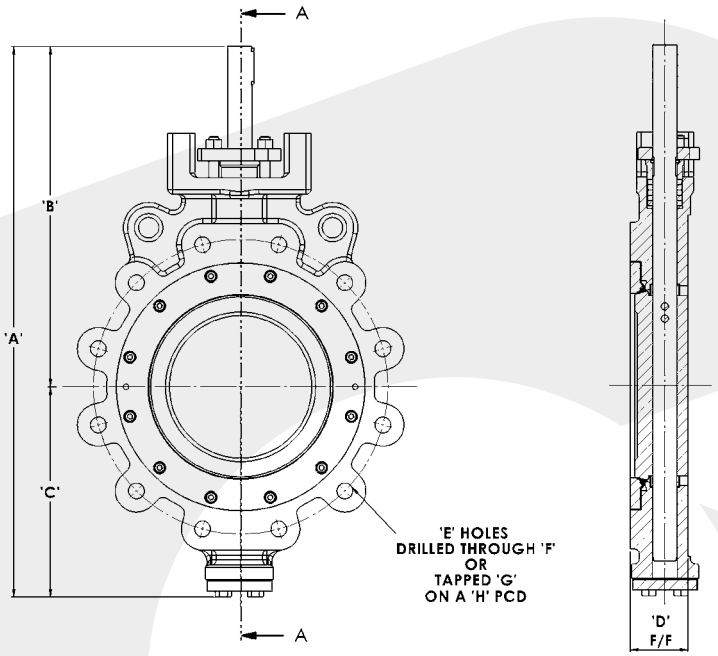


Image 10. Bare stemmed GA drawing, double-offset lug-type flat face (BU02)

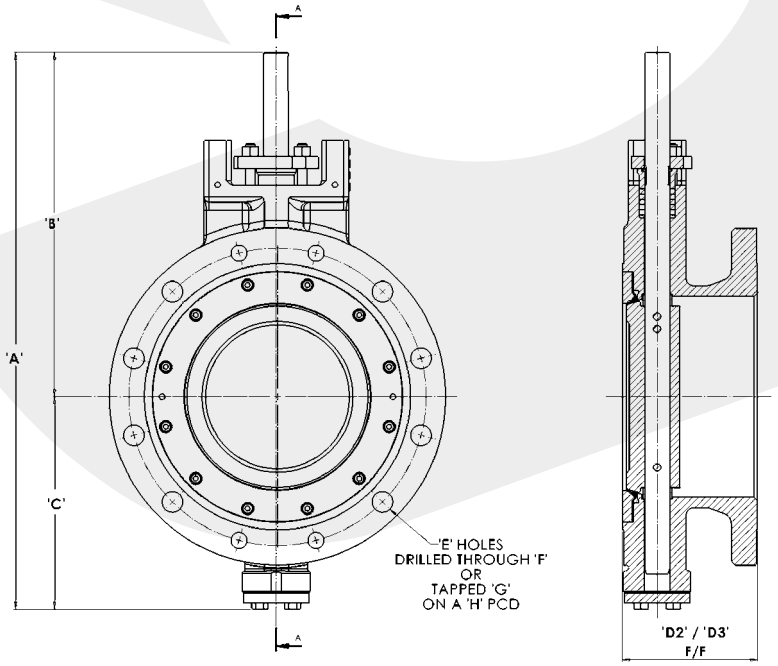


Image 11. Bare stemmed GA drawing, double-offset double-flanged flat face (BU03)

Class 150														
Valve size (inch)		A (mm)	B (mm)	C (mm)	D (mm)	D2 (DFSP)	D3 (DFLP)	E No. of Holes	F	G	H (mm)	Wafer (Kg)	Lugged (Kg)	Double Flanged (Kg)
DN	NPS													
50	2	TBC	TBC	TBC	TBC	TBC	TBC	4	3/4"	5/8"	120.6	8	10	13
80	3	330	217	113	48	114	203	4	3/4"	5/8"	152.4	11.5	13	16
100	4	417	257	160	54	127	229	8	3/4"	5/8"	190.5	13	16	23
150	6	476	289	187	57	140	267	8	7/8"	3/4"	241.3	23.5	26	33
200	8	596	365	231	64	152	292	8	7/8"	3/4"	298.4	42	45	54
250	10	678	419	259	71	165	330	12	1"	7/8"	362	52	56	76
300	12	753	453	300	81	178	356	12	1"	7/8"	431.8	84	88	109
350	14	836	503	333	92	190	381	12	1 1/8"	1"	476.2	105	111	142
400	16	923	556	367	102	216	406	16	1 1/8"	1"	539.8	158	165	201
450	18	1008	614	394	114	222	432	16	1 1/4"	1 1/8"	577.8	198	209	244
500	20	1132	698	434	127	229	457	20	1 1/4"	1 1/8"	635	272	295	335
600	24	1249	755	494	154	267	508	20	1 3/8"	1 1/4"	749.3	380	422	502

Table 4 – Class 150 valve envelope dimensions and approximate series weights

Class 300											
Valve size (inch)		A (mm)	B (mm)	C (mm)	D (mm)	E No. of Holes	F	G	H (mm)	Wafer (Kg)	Lugged (Kg)	Double Flanged (Kg)
DN	NPS											
80	3	363.8	234.2	129.6	50	8	7/8"	3/4"	168.3	*	12.5	*
100	4	443.1	271.5	171.6	56	8	7/8"	3/4"	168.3	*	19	*
150	6	584.9	367.3	217.6	62	12	7/8"	3/4"	168.3	*	32	*
200	8	612.1	375.5	237	75	12	1"	7/8"	330.2	*	47	*
250	10	739.6	450	289.6	83	16	1"	1"	387.4	*	85	*
300	12	862.6	525	337.6	88	16	1 1/4"	1 1/8"	450.8	*	160	*
350	14	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	*	TBC	*
400	16	1040.5	608.5	432	129.8	20	1 1/4"	1 1/4"	571.5	*	293	*

** Consult factory*

Table 5 – Class 300 valve envelope dimensions and approximate series weights

7.2 Topworks Dimensions (Class 150)

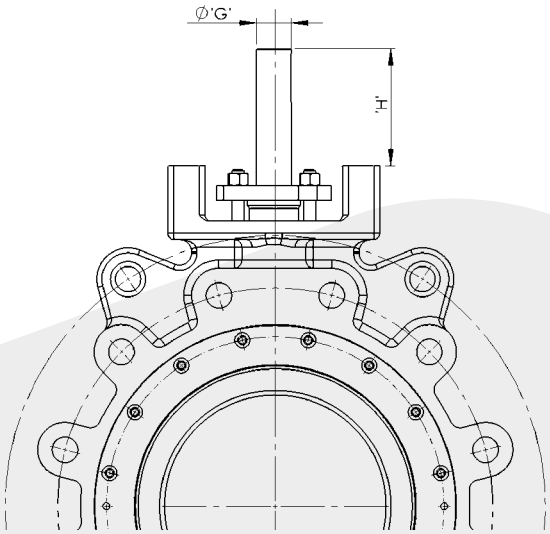


Image 12. Topwork details - double-offset mounting bracket detail (BU02)

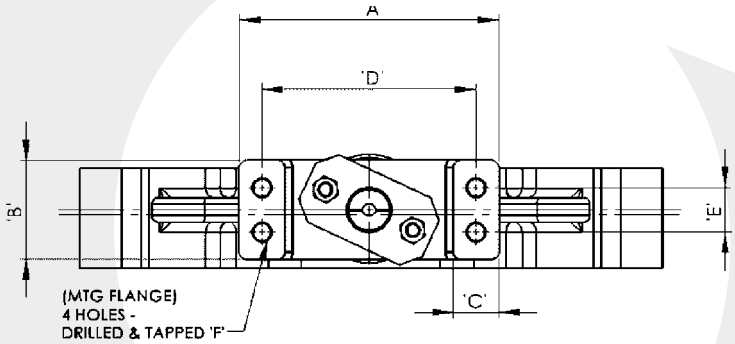


Image 13. - Topworks details – mounting bracket and gland mounting detail - Double-Offset (BU02)

Valve size		A	B	C	D	E	F	G (Ø)	H
DN	NPS	mm	mm	mm	mm	mm	Thread	mm	mm
50	2	128	48	26	100	24	M10	12	60
80	3	128	48	26	100	24	M10	16	62
100	4	128	50	26	100	24	M10	20	70
150	6	128	50	26	100	24	M10	22	74
200	8	176	70	33	140	34	M12	25	91
250	10	176	70	33	140	34	M12	30	108
300	12	210	80	37	173	36	M16	35	116
350	14	210	80	37	173	36	M16	40	123
400	16	250	120	43	208	70	M20	45	148
450	18	250	120	43	208	70	M20	50	161
500	20	295	120	60	223	70	M20	60	188
600	24	295	130	60	234	70	M24	70	198

Table 6. Double-Offset topworks dimensions (Class 150)

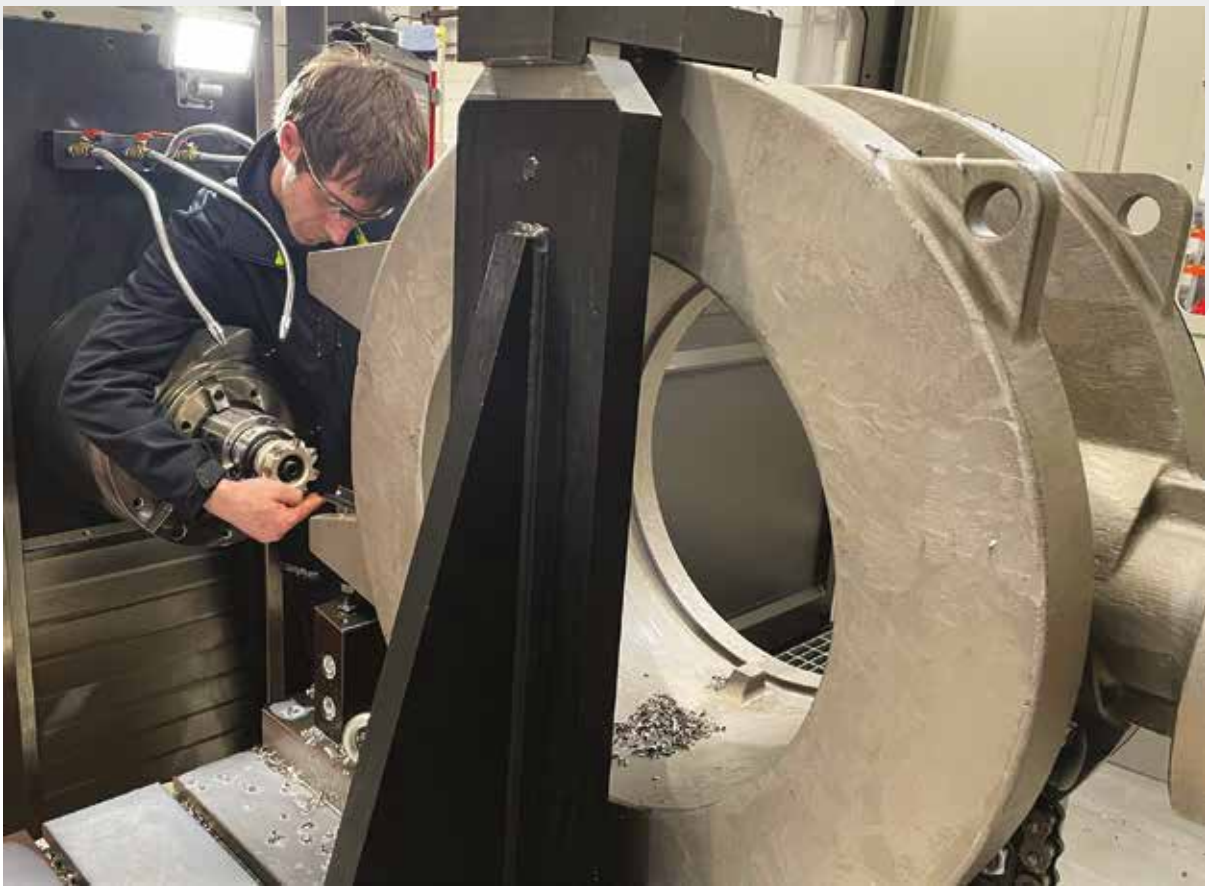
7.3 Operating Torques and MAST (Class 150)

The Double-Offset range has a normal operating torque and maximum allowable stem torques (MAST) on various stem materials which are highlighted in the table below.

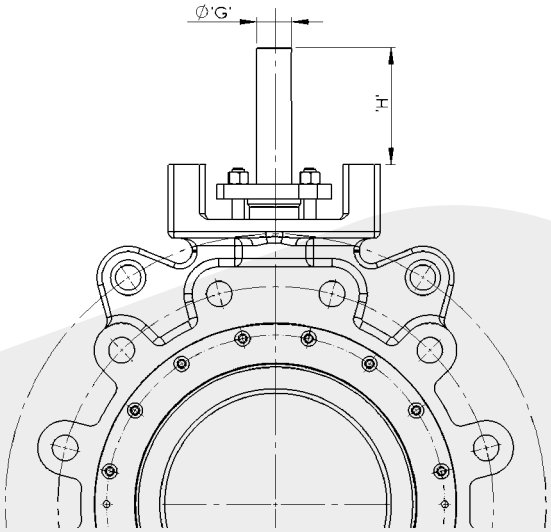
Valve size		Operating Torque	MAST (Nm)						
DN	NPS	(Nm)	K-500	Inc. 718	17- 4pH	Ti Gr5	S.Dup 6A	Inc. 625	Hast
50	2”	30	73	87	76	87	58	36	30
80	3”	70	155	186	163	186	123	77	63
100	4”	130	322	386	339	387	257	161	132
150	6”	240	425	509	446	510	339	212	174
200	8”	380	781	936	821	938	623	391	320
250	10”	640	1387	1662	1457	1664	1105	693	569
300	12”	1100	1846	2212	1939	2215	1471	923	757
350	14”	1800	2918	3498	3066	3502	2326	1459	1197
400	16”	2400	4342	5204	4562	5210	3461	2171	1781
450	18”	3450	5601	6713	5885	6722	4465	2801	2297
500	20”	4600	9623	11533	10111	11547	7670	4811	3947
600	24”	6800	15756	18884	16555	18907	12559	7878	6462

*Operating Torque = Torque required to close the valve.

Table 7. Operating torques and MAST values (ASME Class 150)



7.4 Topworks Dimensions (Class 300)



14. Topwork details - double-offset mounting bracket detail (BU02)

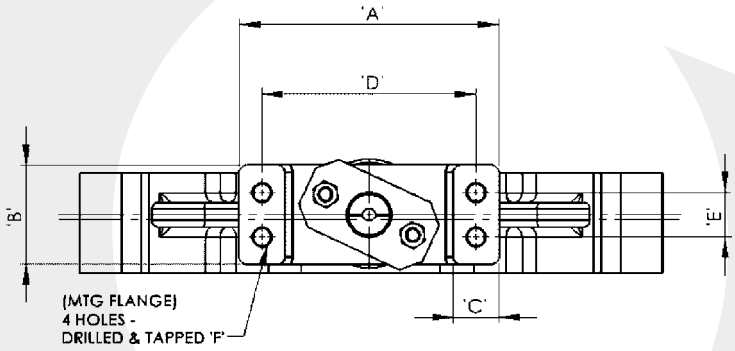


Image 15. - Topworks details – mounting bracket and gland mounting detail - Double-Offset (BU02)

Class 300														
Valve size		A (A/F)		B		C		D		E		F (Ø)	G	
DN	NPS	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Thread	mm	inch
80	3	128	5”	48	1 7/8"	26	1“	100	3 9/10"	24	9/10"	M10 x 1.5	15.97	2/3"
100	4	128	5”	50	2”	26	1”	100	3 9/10"	24	9/10"	M10 x 1.5	20	4/5"
150	6	176	6 7/8"	64	2 1/2"	33	1 1/3"	140	5 1/2"	34	1 1/3"	M12 x 1.75	25	1“
200	8	176	6 7/8"	70	2 3/4"	34.85	1 1/3"	140	5 1/2"	34	1 1/3"	M12 x 1.75	30	1 1/5"
250	10	210	8 1/4"	80	3 1/5"	37	1 1/2"	173	6 4/5"	36	1 2/5"	M16	35	1 1/3"
300	12	250	9 3.4"	120	4 3/4"	42.5	1 2/3"	208	8 1/5"	70	2 3/4"	M20 x 2.5	45	1 3/4"
350	14	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
400	16	ø302	11 7/8"	ø302	11 7/8"	N/A	N/A	127 PC.D	5”	97.2	3 4/5"	M16 x 2.0	65	2 1/2"
450	18	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
500	20	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
600	24	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

Table 8. Double-Offset topworks dimensions (Class 300)

Class 300															
Valve size		H		J	K	L		M		N	O	P		Q	
DN	NPS	mm	inch	Mtg holes (No.)	Thread	mm	inch	mm	inch	No. of Holes	Thread	mm	inch	mm	inch
80	3	64.2	2 1/2"	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
100	4	72.5	2 7/8"	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
150	6	102.3	4”	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
200	8	105.5	4 1/5"	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
250	10	120	4 3/4"	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
300	12	150	5 9/10"	4	TBC	TBC	TBC	TBC	TBC	2	TBC	TBC	TBC	TBC	TBC
350	14	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
400	16	208.5	8 1/5"	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
450	18	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
500	20	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
600	24	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

Table 9. Double-Offset topworks dimensions (Class 300)

7.5 Operating Torques and MAST (Class 300)

The Double-Offset range has a normal operating torque and maximum allowable stem torques (MAST) on various stem materials which are highlighted in the table below.

Valve size		Operating Torque	MAST (Nm)						
DN	NPS	(Nm)	K-500	Inc. 718	17- 4pH	Ti Gr5	S.Dup 6A	Inc. 625	Hast
50	2”	30	73	87	76	87	58	36	30
80	3”	70	155	186	163	186	123	77	63
100	4”	130	322	386	339	387	257	161	132
150	6”	240	425	509	446	510	339	212	174
200	8”	380	781	936	821	938	623	391	320
250	10”	640	1387	1662	1457	1664	1105	693	569
300	12”	1100	1846	2212	1939	2215	1471	923	757
350	14”	1800	2918	3498	3066	3502	2326	1459	1197
400	16”	2400	4342	5204	4562	5210	3461	2171	1781
450	18”	3450	5601	6713	5885	6722	4465	2801	2297
500	20”	4600	9623	11533	10111	11547	7670	4811	3947
600	24”	6800	15756	18884	16555	18907	12559	7878	6462

Operating Torque = Torque required to close the valve.

Table 10. Operating Torques and MAST Values (ASME Class 300)

Shipham Valves' Double-Offset Butterfly Valve with Double-Flanged Body (BU03) - Exploded View

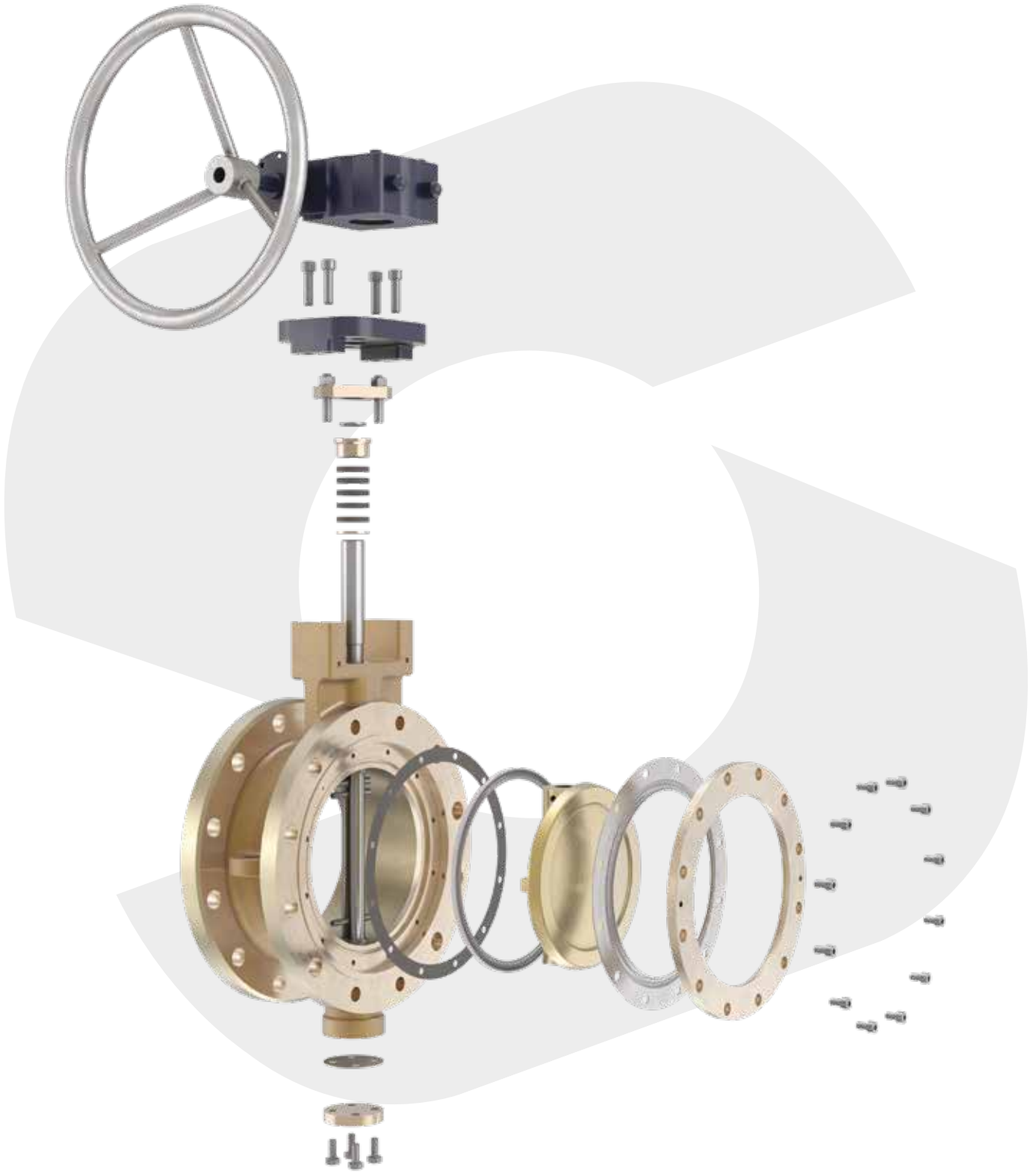


Image 16. Double-Offset Butterfly Valve with Double-Flanged body - exploded view

8 Valve Flow Coefficient

The Double-Offset range theoretical flow capabilities shown below are based on assumption that the valve is in the fully open position and pressure drop will be negligible.

Valve Size		Class 150		Class 300	
DN	NPS (In)	*Cv	*Kv	*Cv	*Kv
50	2	120	103	120	103
80	3	280	242	280	242
100	4	512	442	512	442
150	6	1196	1033	196	1033
200	8	2181	1885	2181	1885
250	10	4146	3582	4146	3582
300	12	6065	5240	6065	5240
350	14	7460	6445	7460	6445
400	16	10996	9500	10996	9500
450	18	14214	12281	13785	11910
500	20	17861	15432	17378	15015
600	24	26459	22860	25865	22348

*Cv - Valve flow coefficient (imperial unit) - The number of US gallons per minute (gpm) of water at 60°F that can flow through a valve with a pressure drop across it of 1psi

*Kv - Valve flow coefficient (metric unit) - The number of cubic metres per hour (m3/h) of water at 16°C that can flow through a valve with a pressure drop across it of 1bar

Table 11 – Theoretical Cv and Kv valves for Double-Offset (Class 150-300)

9 Materials of Construction

Component	Body	Seat Retainer	Disc	Stem	Stem Pins	Bearings	Packing
Nickel Aluminium Bronze	Nickel Aluminium Bronze ASTM B148 C95800	Nickel Aluminium Bronze ASTM B271 C95800	Nickel Aluminium Bronze ASTM B148 C95800	Monel® K500 ASTM B865 N05500	Monel® K500 ASTM B865 N05500	PTFE/ Bronze	Graphite
Monel®	Monel® ASTM A494 M 35-1	Monel® ASTM A494 M 35-1	Monel® ASTM A494 M 35-1	Monel® K500 ASTM B865 N05500	Monel® K500 ASTM B865 N05500	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Duplex	Duplex ASTM A995 CD3MN	Duplex ASTM A995 CD3MN	Duplex ASM A995 CD3MN	Super Duplex ASTM A479 S32760	Super Duplex ASTM A479 S32760	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Super Duplex	Super Duplex ASTM A995 CD3MWCuN	Super Duplex ASTM A995 CD3MWCuN	Super Duplex ASM A995 CD3MWCuN	Super Duplex ASTM A479 S32760	Super Duplex ASTM A479 S32760	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Titanium	Titanium ASTM B367 Gr. C-2	Titanium ASTM B367 Gr. C-2	Titanium ASTM B367 Gr. C-2	Titanium ASTM B381 F-5	Titanium ASTM B381 F-5	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Inconel® 625	Inconel® 625 ASTM A494 CW6MC	Inconel® 625 ASTM A494 CW6MC	Inconel® 625 ASTM A494 CW6MC	Inconel® 718 ASTM B637 Gr. 718	Inconel® 718 ASTM B637 Gr. 718	PTFE and Stainless Steel / PTFE and Bronze	Graphite
6Mo	6Mo ASTM A351 CK3MCuN	6Mo ASTM A351 CK3MCuN	6Mo ASTM A351 CK3MCuN	Inconel® 718 ASTM B637 Gr. 718	Inconel® 718 ASTM B637 Gr. 718	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Stainless Steel	Stainless Steel ASTM A351 CF8M	Stainless Steel ASTM A351 CF8M	Stainless Steel ASTM A351 CF8M	17-4pH ASTM A564 630 1150D	17-4pH ASTM A564 630 1150D	PTFE and Stainless Steel / PTFE and Bronze	Graphite
Hastelloy®	Hastelloy® ASTM A494 CW12MW	Hastelloy® ASTM A494 CW12MW	Hastelloy® ASTM A494 CW12MW	Inconel® 718 ASTM B637 Gr. 718	Inconel® 718 ASTM B637 Gr. 718	PTFE and Stainless Steel / PTFE and Bronze	Graphite

Table 12. Available materials of construction

Component	Packing Follower	Gland Flange	Gaskets	Cover	Seat	Firesafe Seat	Bolting	Alt. Stem Materials
Nickel Aluminium Bronze	Nickel Aluminium Bronze ASTM B150 C63200	Nickel Aluminium Bronze ASTM B150 C63200	Graphite	Nickel Aluminium Bronze ASTM B150 C63200	RPTFE and Viton®	Inconel® 625	Nickel Aluminium Bronze ASTM B150 C63000 HR50	Monel® K500 ASTM B865 N05500 Inconel® 718 ASTM B637 Gr. 718
Monel®	Monel® ASTM B164 N04400	Monel® ASTM B164 N04400	Graphite	Monel® ASTM B164 N04400	RPTFE and Viton®	Inconel® 625	Monel® ASTM B164 N04400	Inconel® 718 ASTM B637 Gr. 718
Duplex	Super Duplex ASTM A479 S32760	Super Duplex ASTM A479 S32760	Graphite	Duplex ASTM A182 S3XXXX	RPTFE and Viton®	Inconel® 625	Super Duplex ASTM A276 Cond. S	Inconel® 718 ASTM B637 Gr. 718
Super Duplex	Super Duplex ASTM A479 S32760	Super Duplex ASTM A479 S32760	Graphite	Super Duplex ASTM A182 S32760	RPTFE and Viton®	Inconel® 625	Super Duplex ASTM A276 Cond. S	Inconel® 718 ASTM B637 Gr. 718
Titanium	Titanium ASTM B348 Gr. 2	Titanium ASTM B348 Gr. 2	Graphite	Titanium ASTM B381 F-2	RPTFE and Viton®	Inconel® 625	ASTM A193 B8 Cl.2/ ASTM A194 Gr. 8	-
Inconel® 625	Inconel® 625 ASTM A564 N06625	Inconel® 625 ASTM A564 N06625	Graphite	Inconel® 625 ASTM A564 N06625	RPTFE and Viton®	Inconel® 625	TBC	-
6Mo	Super Duplex ASTM A479 S32760	Super Duplex ASTM A479 S32760	Graphite	Bar	RPTFE and Viton®	Inconel® 625	TBC	-
Stainless Steel	Stainless Steel ASTM A479 S31600	Super Duplex ASTM A479 S31600	Graphite	Stainless Steel ASTM A182 S31600	RPTFE and Viton®	Inconel® 625	ASTM A193 B8M Cl2 / ASTM A194 Gr. 8M	Inconel® 718 ASTM B637 Gr. 718
Hastelloy®	Hastelloy® ASTM A564 N10276	Hastelloy® ASTM A564 N10276	Graphite	Hastelloy® ASTM A564 N10276	RPTFE and Viton®	Inconel® 625	Hastelloy® ASTM F - HSP	-

Table 12. Available materials of construction continued

10 Pressure Temperature Ratings

The Double-Offset Butterfly Valve series is available in pressure classes ASME Class 150 and ASME Class 300.

The lower pressure-temperature rating of the body material and the seat (shown in the following table) is applicable to the valve.

Temperature °C (°F)	Class 150				Class 300			
	PTFE or modified PTFE		RPTFE or modified RPTFE		PTFE or modified PTFE		RPTFE or modified RPTFE	
	bar	psig	bar	psig	bar	psig	bar	psig
-29 to +38 (-20 to +100)	19.7	285	19.7	285	51	740	51	740
66 (150)	18.8	273	18.8	273	48.8	708	48.8	708
93 (200)	17.9	260	17.9	260	37.9	550	46.5	675
121 (250)	16.9	245	16.9	245	29.3	425	36.5	530
149 (300)	15.9	230	15.9	230	20.7	300	26.9	390
177 (350)	9.7	140	14.8	215	12.1	175	17.2	250
204 (400)	3.4	50	6.9	100	3.4	50	6.9	100

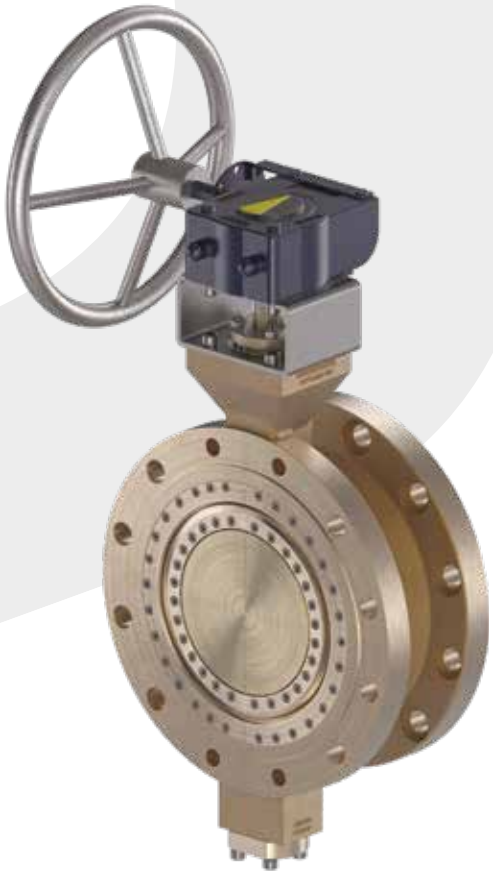
**PTFE = PolyTetraFluoroEthylene. RPTFE = Reinforced PolyTetraFluoroEthylene*

Table 13. API609 Table 1, Pressure temperature ratings for RPTFE

The Pressure Temperature Ratings of the body materials are in accordance with the SPT Curves available as per the list below:

Body Material	Pressure Temperature Rating (SPT)
Nickel Aluminium Bronze ASTM B148 C95800	SPT01
Monel® 400 ASTM A494 M 35-1	SPT08
Duplex ASTM A995 Gr. CD3MN	SPT10
Super Duplex ASTM A995 CD3MNWCuN	SPT10
Titanium ASTM B367 Gr. C-2	SPT02
Inconel® 625 ASTM A494 CW6MC	TBC
6Mo (Super Austenitic) ASTM A351 CK3MCuN	TBC
Stainless Steel ASTM A351 CF8M	TBC
Hastelloy® ASTM A494 CW-12MW	SPT09

Table 14 - Body Material Pressure Temperature Rating(s)



As the world's preferred partner, delivering expert corrosion resistant valve solutions, we manufacture valves in a wide range of materials. These materials may or may not have pressure-temperature ratings available for them. Materials such as ASTM B148 C95800 do not have pressure-temperature ratings listed in ASME B16.34. These materials have had their bespoke pressure-temperature ratings developed and refined over the years and are in line with standard developments.

Shipham Valves have developed a range of Shipham Pressure Temperature (SPT) ratings. These pressure-temperature ratings have been developed in line with industry best practices incorporating the requirements and limitations of the chemical and mechanical restrictions imposed by standards such as NACE and NORSOK which standard pressure-temperature ratings from ASME B16.34 do not account for.

11 Fire Testing Approval

ISO 10497 – Butterfly Valves
This section shows the butterfly valves which have been successfully tested and approved to the ISO 10497 standard.

The table below shows the Fire tested Nickel-Aluminium Bronze, butterfly valves.

Model	BU02		
Size (NPS)	2"	3"	8"
Rated Pressure	19.0	19.0	19.0
Class Rating	Cl 150	Cl 150	Cl 150
Body Material	B148 C95800	B148 C95800	B148 C95800
Seat Material	PTFE	PTFE	PTFE
Firesafe Seat	Alloy 625	Alloy 625	Alloy 625
Stem Material	K-500	K-500	K-500
Bolting Material	B7/2H	B7/2H	B7/2H
Gasket Material	Graphite	Graphite	Graphite
Packing Material	Graphite	Graphite	Graphite
Drawing	022A044W	022A044W	022A044W
Certificate No.	COV0917246/5A1	COV/0917246/02	COV0917246/1A1

Table 15 - ISO 10497 Double-Offset Butterfly Valves

Valve Feature	Qualification Extension
Size	2", 3" and 8" provides full extension to cover all sizes available
Rated Pressure	Cl 150 valve qualifies Cl 150 and Cl 300 valves
Body Material	All Duplex/Super Duplex materials are covered by these valves
Seat Material	PTFE seats qualify both PTFE and Filled PTFE Seats
Firesafe Seat	Firesafe seats are always Alloy 625
Stem Material	Stems are not considered part of the qualification; any stem can be supplied
Bolting Material	B8M /8M only covers austenitic bolting (B8/8 and B8M/8M)
Gasket Material	Graphite, gaskets supplied must be Graphite
Packing Material	Graphite, packing supplied must be Graphite

Table 16 - Qualification extension table Double-Offset Butterfly Valves

The table below shows the Fire tested Super Duplex Butterfly Valves.

The extension of these qualifications is shown by the table below.

Model	BU02		
Size (NPS)	2"	3"	8"
Rated Pressure	20.0	20.0	20.0
Class Rating	Cl 150	Cl 150	Cl 150
Body Material	A995 6A	A995 6A	A995 6A
Seat Material	PTFE	PTFE	PTFE
Firesafe Seat	Alloy 625	Alloy 625	Alloy 625
Stem Material	Super Duplex	Super Duplex	Super Duplex
Bolting Material	B8M / 8M	B8M / 8M	B8M / 8M
Gasket Material	Graphite	Graphite	Graphite
Packing Material	Graphite	Graphite	Graphite
Drawing	025A006W	025A007W	025A008W
Certificate No.	COV1430045/14	COV1430045/13	COV1430045/12

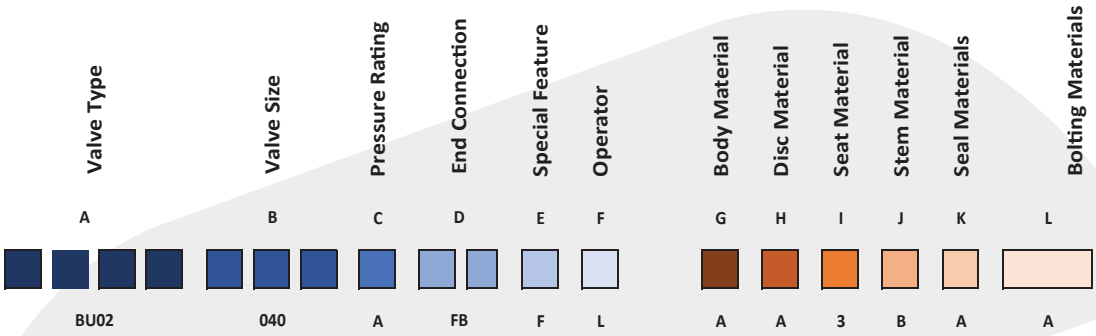
Table 17 - ISO 10497 Super Duplex Butterfly Valves

Valve Feature	Qualification Extension
Size	2", 3" and 8" provides full extension to cover all sizes available
Rated Pressure	Cl 150 valve qualifies Cl 150 and Cl 300 valves
Body Material	All Duplex/Super Duplex materials are covered by these valves
Seat Material	PTFE seats qualify both PTFE and Filled PTFE Seats
Firesafe Seat	Firesafe seats are always Alloy 625
Stem Material	Stems are not considered part of the qualification; any stem can be supplied
Bolting Material	B8M /8M only covers austenitic bolting (B8/8 and B8M/8M)
Gasket Material	Graphite, gaskets supplied must be Graphite
Packing Material	Graphite, packing supplied must be Graphite

Table 18 - Qualification extension table Super Duplex Butterfly Valves

12 Product Coding

Double-Offset Butterfly Valve Product Information



A - Valve Type	
BU01	- Wafer-Type
BU02	- Lug-Type
BU03	- Double Flanged

B - Valve Size			
020	- 2"	120	- 12"
030	- 3"	140	- 14"
040	- 4"	160	- 16"
060	- 6"	180	- 18"
080	- 8"	200	- 20"
100	- 10"	240	- 24"

C - Pressure Class	
A	- ASME Cl 150
B	- ASME Cl 300
Q	- PN16
S	- PN32
T	- PN40

D - End Connection	
FA	- ASME B16.5 Cl 150 RF
FB	- ASME B16.5 Cl 150 FF
FD	- ASME B16.5 Cl 300 RF
FE	- ASME B16.5 Cl 300 FF

E - Special Feature	
A	- None
F	- Firesafe Seat

F - Operator	
W	- Gearbox (Worm)
L	- Lever
B	- Bareshaft

In the case of a component being manufactured from bar in place of the casting e.g. a ball; the bar equivalent material specification is supplied.

Notes
[1] - Firesafe seat shall always be manufactured from Inconel 625.

G - Body Material	
A	- ASTM B148 C95800 (NI AL BRZ)
B	- ASTM A494 M 35-1 (MONEL® 400)
C	- ASTM B61 C92200 (BRONZE)
D	- ASTM B62 C83600 (BRONZE)
E	- ASTM A995 CD3MN (DUPLEX)
F	- ASTM A995 CD3MWCuN (SUPER DUPLEX)
H	- ASTM B367 Gr. C-2 (TITANIUM)
K	- ASTM A494 CW6MC (INCONEL® 625)
L	- ASTM A351 CK3MCuN (6Mo)
M	- ASTM A494 N12MV (HASTELLOY®B)
N	- ASTM A494 CW12MW (HASTELLOY®C)

H -Disc Material	
A	- ASTM B148 C95800 (NI AL BRZ)
B	- ASTM A494 M 35-1 (MONEL® 400)
C	- ASTM B61 C92200 (BRONZE)
D	- ASTM B62 C83600 (BRONZE)
E	- ASTM A995 CD3MN (DUPLEX)
G	- ASTM A995 CD3MWCuN (SUPER DUPLEX)
K	- ASTM B367 Gr. C-2 (TITANIUM)
N	- ASTM A494 CW6MC (INCONEL® 625)
O	- ASTM A351 CK3MCuN (6Mo)
Q	- ASTM A494 N12MV (HASTELLOY®B)
R	- ASTM A494 CW12MW (HASTELLOY®C)

I - Seat Insert Material	
3	- Carbon/Graphite-Filled PTFE

J - Stem Material	
A	- ASTM B150 C63200 TQ 50 (NI AL BRZ)
B	- ASTM B865 N05500 (MONEL® K-500)
C	- API 6A CRA N07718 (INCONEL® 718)
D	- ASTM B381 Gr. F-5 (TITANIUM)
F	- ASTM B564 N06625 (INCONEL® 625)
J	- ASTM B564 N10276 (HASTELLOY®)
L	- ASTM A276 S32760 (S.DUPLEX)

K- Seal Material	
A	- Graphite / No Elastomer
B	- Graphite / Nitrile Elastomer
C	- Graphite / Type 3 FKM Elastomer
D	- Graphite / Type 2 FKM Elastomer
E	- Graphite / 25/90 FKM Elastomer
P	- PTFE / No Elastomer
Q	- PTFE / Nitrile Elastomer
R	- PTFE / Type 3 FKM Elastomer
S	- PTFE / Type 2 FKM Elastomer
T	- PTFE / 25/90 FKM Elastomer

L- Bolting Material	
A	- ASTM B150 C63000 HR50 (NI AL BRZ)
B	- ASTM B164 N04400 (MONEL® 400)
E	- ASTM A193 B7/ A194 2H SCF2 (C.STEEL)
F	- ASTM A193 B7M/ A194 2HM SCF2(C.STEEL)
G	- ASTM A193 B8 CL.2 / A194 8 (S.STEEL)
H	- ASTM A193 B8 CL.2 / A194 8 SCF2 (S.STEEL)
K	- ASTM A193 B8M CL.2 / A194 8M (S.STEEL)
L	- ASTM A193 B8M CL.2 / A194 8M SCF2 (S.STEEL)
M	- ASTM A320 L7 / A194 Gr. 7 SCF2 (C.STEEL)
N	- ASTM A320 L7M / A194 Gr. 7M SCF2 (C.STEEL)
P	- ASTM A276 S32760 Cond. S (S.DUPLEX)

Finish Identifier	Extent	Code	Colour	Quality Identifier	Level Number	Percentage Modifier	Level Modifier
M	N	O	P	Q	R	S	T
F				Q			
F	A	N	N	Q	0	S	S

N - Extent	
A	ACTUATOR
N	NOT APPLICABLE
O	OPERATOR ONLY
V	VALVE ASSEMBLY

O -Code	
B	BS 4800
C	CUSTOM
F	FED STD
N	NOT APPLICABLE
R	RAL

P- Colour	
BS4800	
A	14-E-53 - Green (SC011)
B	04-D-45 - Russet
C	04-E-53 - Poppy Red SC010)
D	06-C-39 - Saddle Brown
E	06-E-51 - Mandarin Orange
F	08-C-35 - Butterscotch
G	22-D-45 - Deep Purple
H	20-E-51 - Cornflower Blue
I	00-E-53 - Black
J	08-E-55 - Orange & 04-D-45 Russet
K	10-E-53 - Canary Yellow
L	18-E-53 - Cobalt Blue
CUSTOM	
A	TBC
FED STD	
A	TBC
RAL	
A	RAL 3000 - Flame Red (SC002)
B	RAL 3001 - Signal Red (SC005)
C	RAL 3002 - Carmine Red
D	RAL 9003 - Signal White (SC006)
E	RAL 1028 - Melon Yellow
F	RAL 7042 - Traffic Grey
G	RAL 6002 - Leaf Green
H	RAL 9017 - Traffic Black (SC004)
I	RAL 7022 - Umbra Grey
J	RAL 7035 - Light Grey
K	RAL 2011 - Deep Orange
L	RAL 5011 - Steel Blue
M	RAL 5013 - Cobalt Blue (SC001)
O	RAL 7038 - Exxon Mobil Grey
P	RAL 9002 - Grey White
N- NOT APPLICABLE	

R - Level Number	
0	QSL 0
A	SQL 1
B	SQL 2
C	SQL 3
See 4-07-15 for details of QSL's	

S -Percentage Modifier	
S	STD 10% MIN OF 2
A	25% PER LINE ITEM
B	50% PER LINE ITEM
C	100% PER LINE ITEM

T - Level Modifier	
B	3.2 CERT (BV BODY)
C	IMPACT TESTED (-196°C)
D	3.2 CERT (DNV BODY)
L	3.2 CERT (LLOYDS BODY)
S	STANDARD NO REQ
Z	SPECIAL

13 Technical Optional Extras

Our added-valve services include a wide range of technical options and cover everything your organisation needs, from optional design features that meet various bespoke applications to comprehensive testing services and coating options.

We provide effective technical solutions for valves installed in challenging environments, hard-to-reach locations or areas with limited access.

Technical Optional Extras

Design features:
- Extended stem – ideal for pits and buried applications
- Actuation – hydraulic, pneumatic and electric
- Extended gearbox input shaft
- Gearbox orientation (through 90°)

Testing:
- Extended test durations
- Fugitive emissions testing
- Disc strength test
- Torque testing
- Functional testing

External coating
- Painting

For further details on the complete range of Shipham Valves' technical optional extra solutions, please contact the team today at valvesales@shiphamvalves.com or +44 (0)1482 323163.

14 Commercial Optional Extras

Tailored Valve Solutions That Meet Your Requirements

We also offer a selection of added-value services to complement the high-quality valves we manufacture.

These optional commercial extras cover everything your organisation needs from comprehensive testing to witness inspection services, documentation and tagging. This ensures we deliver a tailored valve solution that meets your requirements.

Commercial Optional Extras

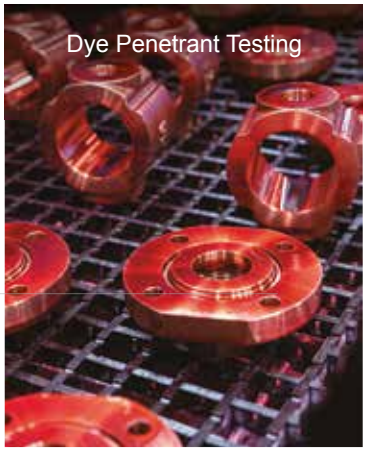
Items	Cost
Certificate of Origin and Invoice Attested by Local Chamber of Commerce	TBC
EX1 Export Documentation	TBC
Project Documentation Pack (English language only) This contains GA Drawings, maintenance and operating instructions along with relevant procedures in PDF file format only (ITP and relevant procedures) One copy supplied six weeks after order placement Any other documentation required will be subject to additional costs	Costs will be provided as part of the overall costed proposal
Witness Inspection (Charged at a day rate to P.O quantity)	Costs will be provided as part of the overall costed proposal
Tagging (Optional) If tagging is required, please provide full details in-order for us to process the order	TBC

For further details on the complete range of Shipham Valves' commercial optional extra solutions, please contact the team today at valvesales@shiphamvalves.com or +44 (0)1482 323163.

Testing and Quality Verification

Verifies product quality by performing dimensional inspections

Verification of metal and alloy chemical composition



Testing exterior/interior surfaces for defects, cracks and conformity to ASME VIII