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HF DOUBLE-ECCENTRIC BUTTEFLY VALVE

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Content

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HF DOUBLE-ECCENTRIC BUTTERFLY VALVE

Overview

High-frequency double eccentric butterfly valves are widely implemented in working conditions that requires frequent cycles such as PSA and VPSA units. The key for prolonging the service lives of these valves lies in how to suppress ”cold flows” of soft materials. Meanwhile, the most effective solution against cold flow is to reduce the sealing torque as much as possible without harming the sealing quality. Following this train of thoughts, ATW has put a lot of effort into solving this problem by developing simulation models, trying innovational designs, comparing sealing materials, improving processing technique and so on. As a result, the products we provide have significantly less sealing stress and operating torque during operations, thereby delaying the deformations of soft seal materials. Therefore, these valves can truly meet the requirements of “Long Life, zero Leakage.”

Features

- Low Torque, Long Life: Adopts flexible seat seal design to reduce extrusion stress and operating torque; able to endure 200m+ cycles.
- Bi-directional Seal: sealing in bi-direction to fulfill special needs.
- Zero Leakage: Tight shutoffs on flexible seat design; zero leakage under low or high pressure.
- Easy Maintenance: Interchangable valve seats, easy to repair at site without de-assembling valve plate and stem parts.

ATW HF double eccentric butterfly valve

Design features

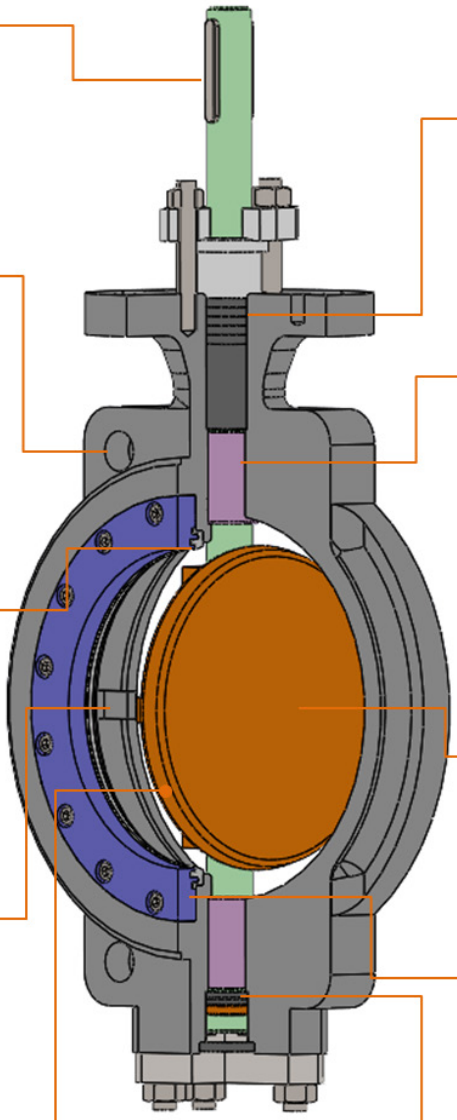
Actuators
- Can be operated by manual, pneumatic, electric and other actuators.

Locator for installation
- The location hole on the valve body helps with the positioning between the valve and the flange.

Modularized sealing pair
- Zero leakage sealing
- Soft-seated easily dismounted and re-mounted
- Reduces the maintenance difficulty

'Limit Stop Design'
- One piece casting plate with position limit, not welded stop design, prevent over-closed position.

"Ball" type sealing face
- Can be used under few particles fluid condition, dramatically improves the service life and reduce maintenance times.



Multi-layer packing seal
- Fugitive leakage complies with TA-Luft and EPA.
- No maintenance for packing even after 1m on/off cycles.

Extended Stem Housing
- Extended stem housing to improve stability.
- Hardened stem and housing to prolong service life in high-frequency usage.

Intensified plate parts
- Big Cv value.
- Option as regulating and shutoff function.

Seat guard plate
- Easily dismounted and mounted.
- Zero leakage with seat.

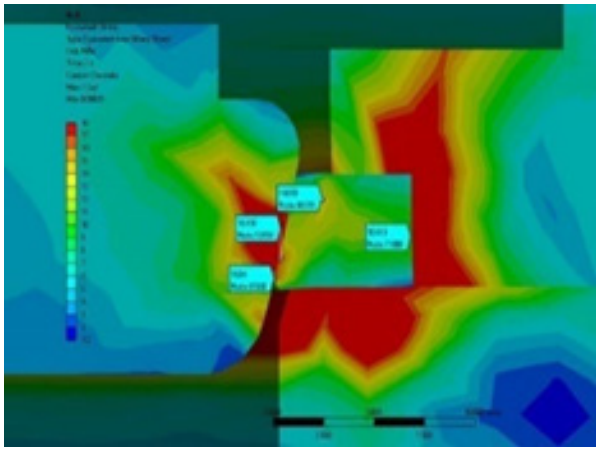
One piece anti-blowout stem design
- Safety

Note: Image shows WAFER type. There are also flange type or LUG type. For more, please consult ATW.

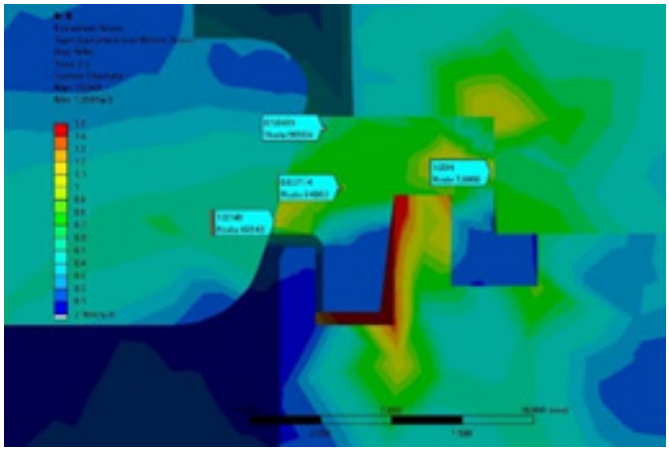
Core design concept：slow down the cold flow

The phenomenon of thermoplastic materials flowing under the surrounding pressure at ambient temperature is called cold flow, which will cause internal leakage, external leakage and other conditions in the valve. The speed of cold flow is mainly related to the bearing load, ambient temperature and medium, and the ambient temperature and medium belong to the working conditions and cannot be changed. Therefore, the best way to slow down the cold current is to reduce the load, that is, the stress. How to reduce the internal stress of thermoplastic materials is the key to extending the life of a soft seal valve. For soft seal valves, it can be said that "low stress means long service life".

ATW believes that the internal stress of thermoplastic materials such as PFA should not exceed the allowable stress (17MPa), otherwise it will accelerate the cold flow to produce plastic damage and shorten the service life. Under the guidance of the concept of "slowing down the cold flow", ATW has developed a targeted structure and design. The following figure shows the general structure and Antway's patent. Stress distribution of the valve seat structure.



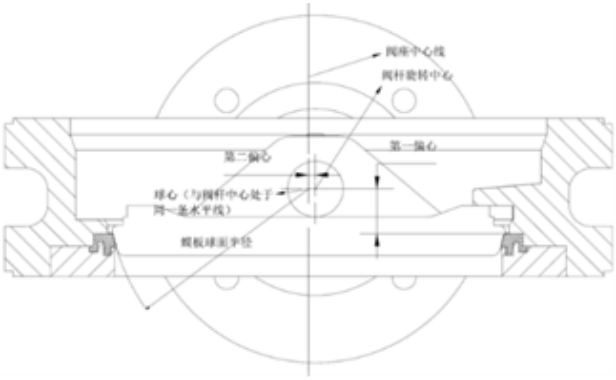
Over-stressed distribution of normal design



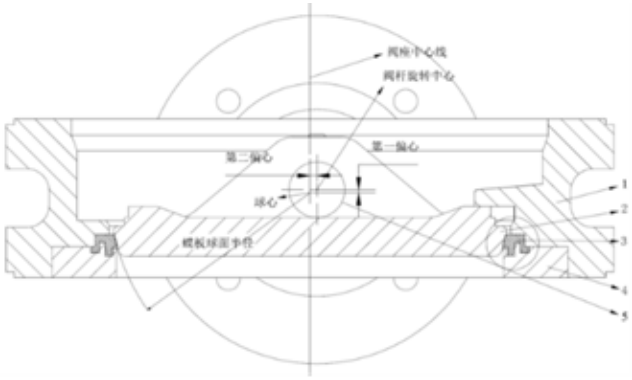
Stress distribution of ATW patented design

Solution to concentration of sealing face stress

New Eccentric Design

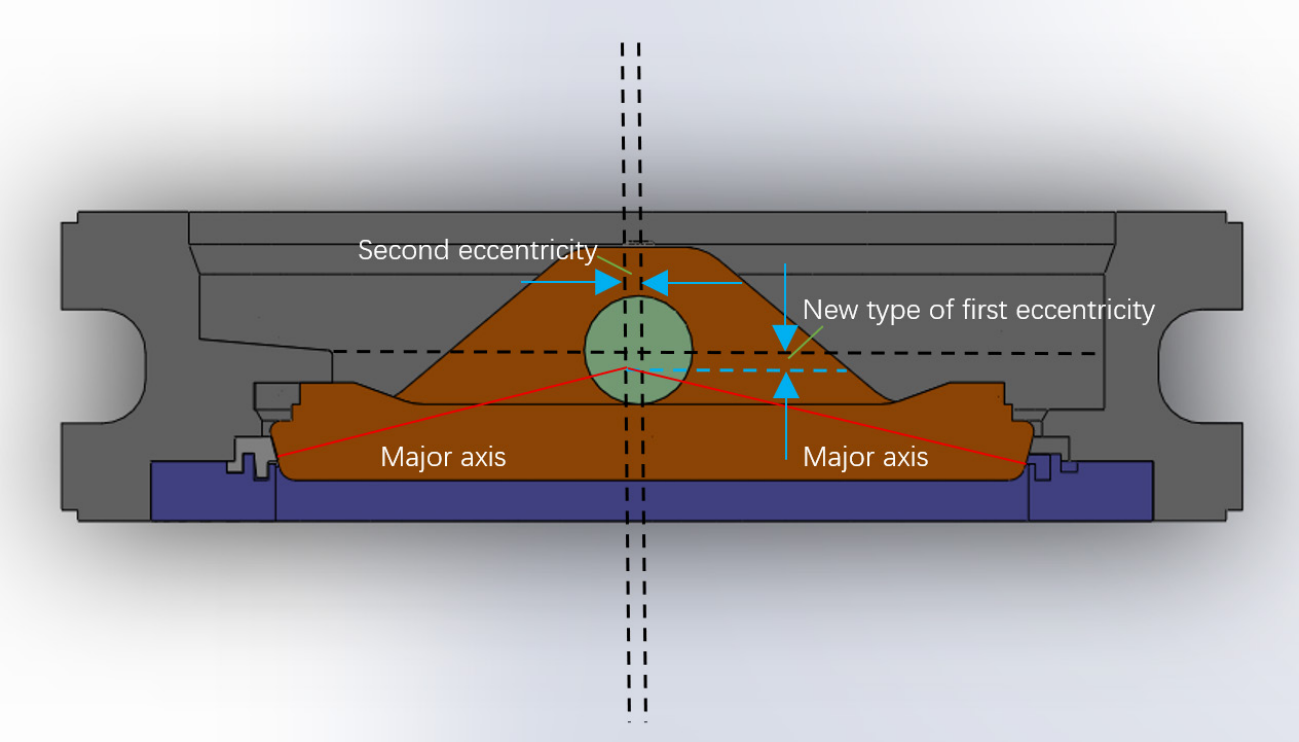


General Design



High Frequency Design

In ordinary designs, whenever the butterfly plate is rotating and entering the valve seat, the deformation of the long axe does not equate that of the short axe, which may cause the stress to concentrate at one location and increase the possibilities of internal leakage; Meanwhile, the new type of eccentric design resolves this problem by shifting the first ‘off-center’ so that the deformation of the two axes match each other. This helps to even out the stress and ultimately lengthens the service life of the valve.



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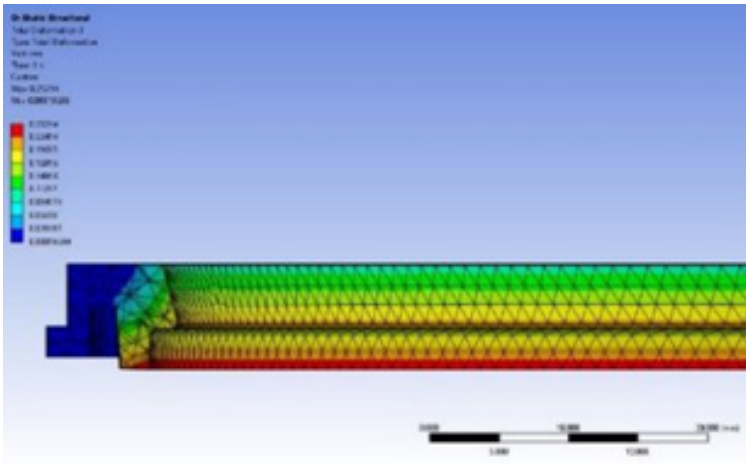
HF DOUBLE-ECCENTRIC BUTTERFLY VALVE

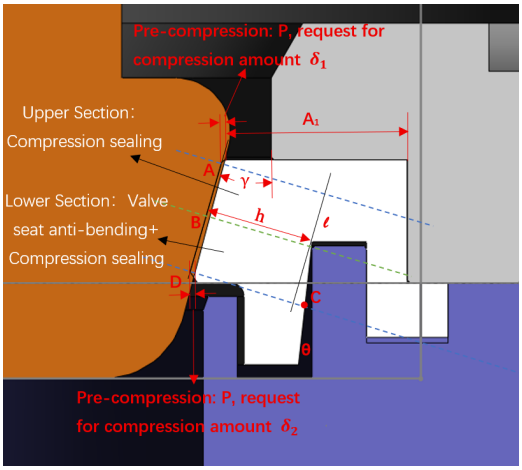
Bi-directional tight shutoff, Zero Leakage

Strictly Controlled Compression

Inferring from the underlying technical models, we are able to calculate the precise amount of compression of the butterfly plate and the valve seat as well as the most appropriate width for the sealing face. These models enable us to not only reduce the extrusion stress of the seat, but also guarantee the sealing strength and operating life.



Numerical simulated calculation of compression amount



Mathematical model for the compression amount

Long-life sealing pair, enhanced continuous operating time

Cantilever-type flexible valve seat

This design adopts the unique cantilever-type seat structure and uses PTFE, RPTFE as material. Under this design, the resilience force of the seat is generated by the cantilever as the combination of its buckling stress and extrusion stress. This design effectively lowers the rate of cold flows and improves the operating life.

DF-GC01 structure (High-frequency Type)

Applicable for environments with temperature < 200℃, pressure level≤CLASS300 requiring 1m+ cycles, it has the following features

- Prevents cold flow
- Wide sealing face
- Self-compensated valve seat
- Low torque
- Strong cantilever
- Fatigue-resistant

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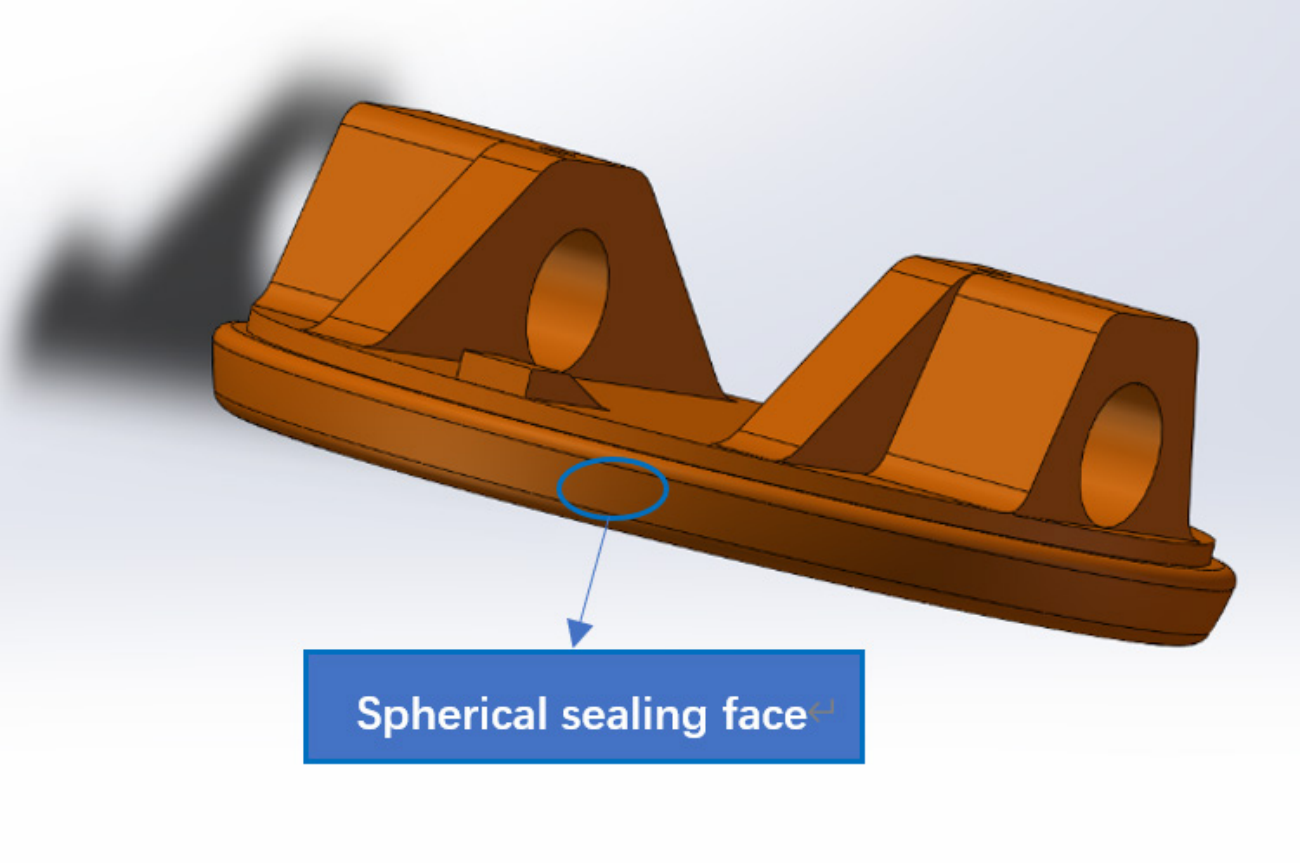
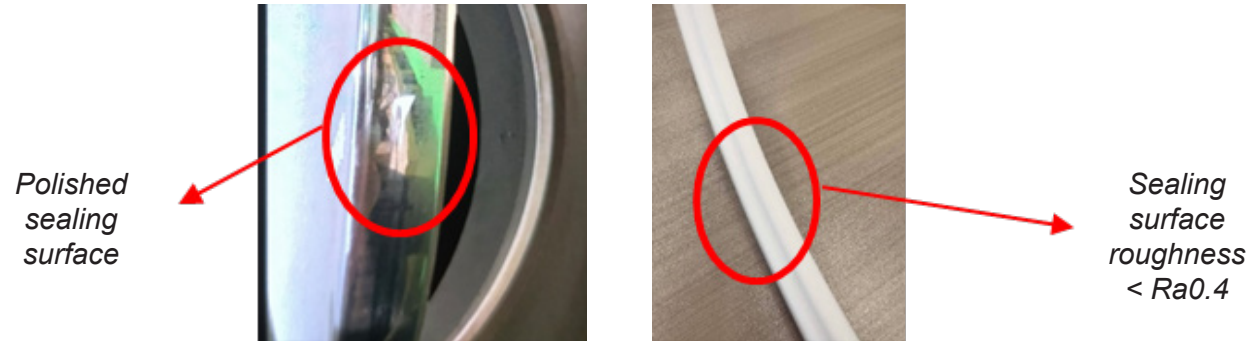
Spherical sealing face design

Whenever the sealing face of the butterfly plate comes into contact with the valve seat, this 'spherical face' design helps to even out the stress put onto the sealing face, thereby reducing the wear rate. Moreover, due to this design and the duplex eccentric structure, the butterfly plate and the valve seat would be pulled even closer to each other after contact, hence strengthening the sealing quality.



Treatments for the sealing faces

The butterfly plate is composed of castings with polished spherical sealing face of roughness < Ra 0.4; reducing the amount of wear between the seat and the butterfly plate.



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Quicker and cheaper repair

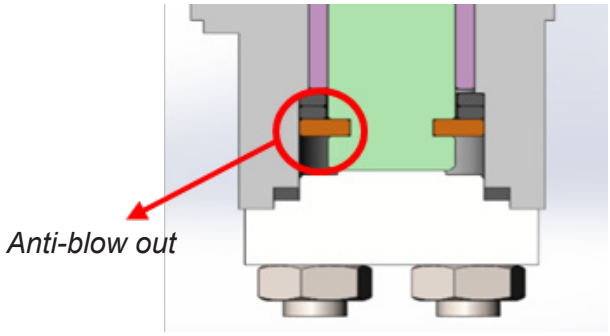
Easily Exchanged Soft Seal Valve Seat

Based on reliable engineering, ATW guarantees that the valve seats are unified configured and interchangable with one another by implementing high-precision devices as well as improving the processing technology and processing equipment. If the sealing face of the butterfly was found to be harmed, the plate could be maintained quickly to provide reliable seal with the back-up valve seat. On the other hand, if the sealing face of the valve seat got harmed, the junk ring could be easily demounted to replace the seat with a new one. This effectively reduces the maintenance cost and improves repairing efficiency.

Other features

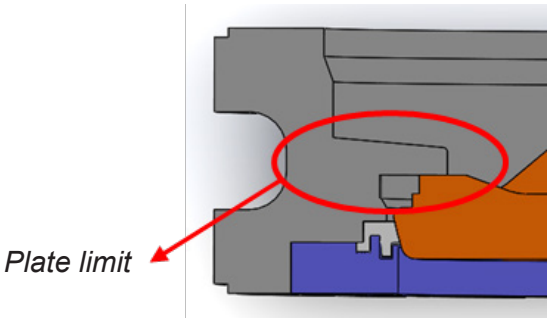
Anti-blowout Structure

The lower part of the stem is equipped with a pair of split ring. It is designed to function as a stop plate as it is connected to the valve stem and in position against the ‘stairs’ on the valve body. When the medium pressure rises, this pair of split ring stops the stem from shifting upwards, thus preventing blowouts.



Position Controlling Structure

Conventional stop plates are usually welded or tightly nailed into position. In our design the position controlling unit is an installation onto one piece valve and would not dysfunction due to fatigue damages nor influence the dimensions of the valve that may occur from welding.
The machined valve body and butterfly plate will be able to manage the position of the plate to guarantee that it is in position or slightly under-shut. This is because being slightly under-shut could lengthen the service life of the soft seal valve seat but over-shutting will do severe damages to the sealing face in the form of decreasing the resilience value of the face.



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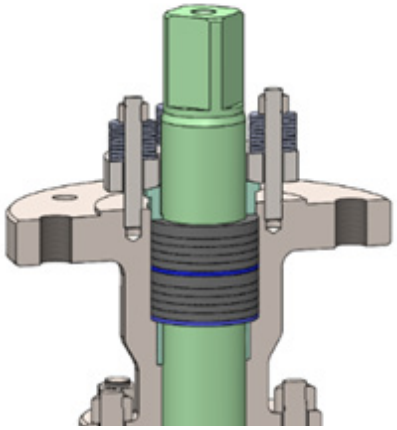
Compensated Belleville-spring Packing Structure

● The packing pressing plate is equipped with a pre-tightening module, which continuously supplies pre-tightening force to the packing and effectively compensates the packing wear.

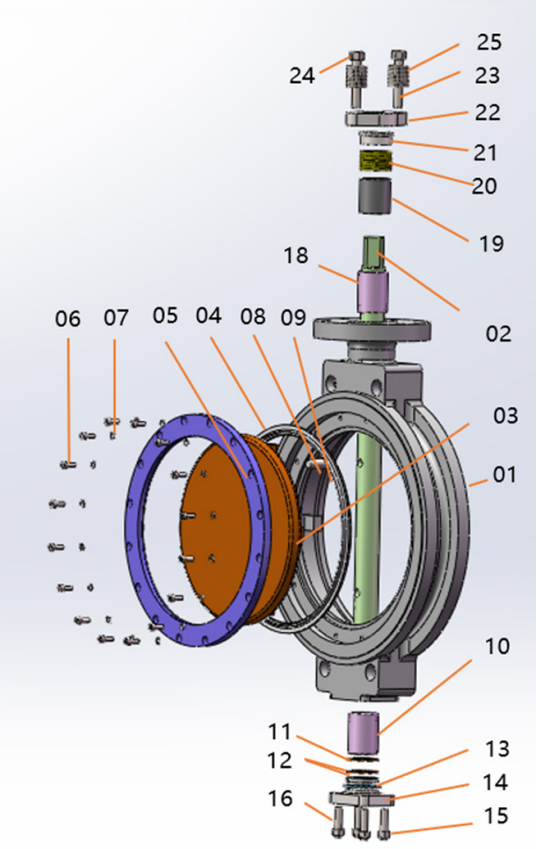
● Design is based on the ‘Packing Wear Model’ developed by analyzing the coupling influence between factors affecting packing’s life and the packing structure.

● No maintenance needed even after 1m+ cycles.



Material Composition

Double eccentric butterfly valve



Item	Name	Material 1	Material 2	Material 3
01	Body	ASTM A216 WCB	ASTM A351 CF8	ASTM A351 CF3M
02	Stem	17-4PH+HF	17-4PH+HF	17-4PH+HF
03	Plate	ASTM A351 CF8/ ASTM A351 CF3M	ASTM A351 CF8/ ASTM A351 CF3M	ASTM A351 CF3M
04	Seat	RPTFE	RPTFE	RPTFE
05	Ring	ASTSM A182 F304	ASTSM A182 F304	ASTSM A182 F316
06	Gasket	A2	A2	A2
07	Screw	A4-70	A4-70	A4-70
08	Tighten screw	A2-70	A2-70	A2-70
09	Pin	17-4PH	17-4PH	17-4PH
10	Bearing	316L+HF	316L+HF	316L+HF
11	Split ring	316L+QPQ	316L+QPQ	316L+QPQ
12	Trust bearing	316L+HF	316L+HF	316L+HF
13	Sealing ring	Graphite	Graphite	Graphite
14	Lower cover	ASTM A105	ASTM A182 F304	ASTSM A182 F316
15	Nut	ASTM A194 2H	ASTM A194-8	ASTM A194-8
16	Bolt	ASTM A193 B7	ASTM A193 B8-2	ASTM A193 B8-2
17	Key	17-4PH	17-4PH	17-4PH
18	Bearing	316L+HF	316L+HF	316L+HF
19	Packing spacer ring	316L	316L	316L
20	Packing	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite
21	Press fit sleeve	304	304	304
22	Press fit plate	A105	304	304
23	Bolt	ASTM A193 B7	ASTM A193 B8-2	ASTM A193 B8-2
24	Nut	ASTM A194 2H	ASTM A194-8	ASTM A194-8
25	Belleville spring	631	631	631

Note: For more materials, please consult ATW

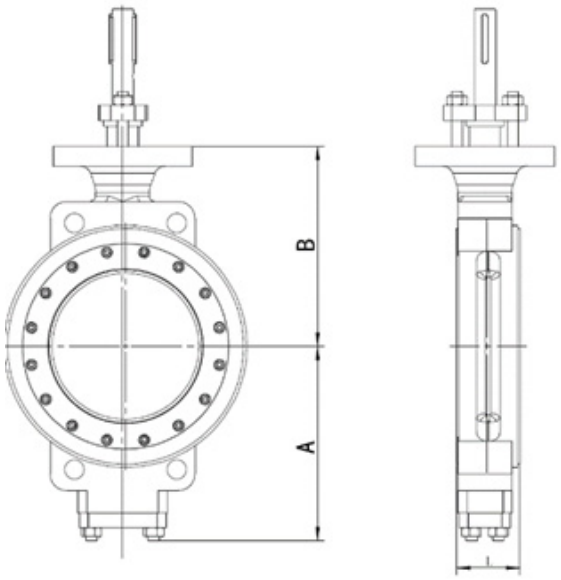
Technical Specification

Performance Indicators

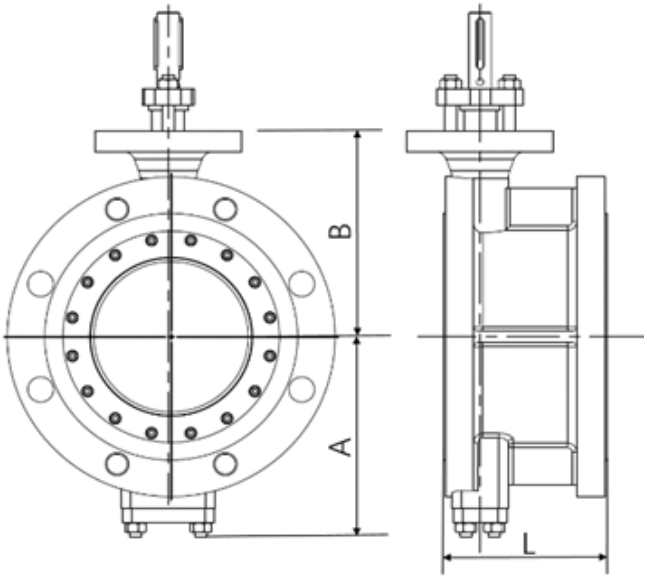
Size	• DN80~DN1200 • NPS3~NPS48
Flange Standard	• ASME B16.5 • ASME B16.47B • EN 1092
Pressure Rate	• PN16~PN40 • Class150~Class300
Design Temperature	• -29℃~180℃
Structure length standard	• API609(S) • ISO 5752
Design Standard	• API 609 • ASME B16.34
Inspection and test Std.	• API 598 (Uni/bi-direction) • ISO5208 (Uni/bi-direction) • FCI70-2VI(Uni/bi-direction)
Low fugitive emission Std.	•ISO 15848-1 • API 609

HF DOUBLE-ECCENTRIC BUTTERFLY VALVE

Dimensions



LUG/WAFER



RF

Class 150 PN20							
Size		L(mm)		Dimension		Weight (kg)	
NPS	DN	LUG/WAFER	RF	A	B	LUG/WAFER	RF
3"	80	48	114	151	130	8	15
4"	100	54	127	177	180	11	22
6"	150	57	140	208	180	17	32
8"	200	63.5	152	220	213	25	47
10"	250	71	165	252	247	34	66
12"	300	81	178	294	281	52	100
14"	350	92	190	325	314	71	136
16"	400	102	216	355	347	92	177
18"	450	114	222	380	374	110	211
20"	500	127	228	415	412	138	265
24"	600	154	268	474	483	207	3995
30"	750	190	318	590	572	320	6172
36"	900	203	330	690	668.5	473	912
42"	1050	251	410	795	740	482	930
48"	1200	276	470	850	880	1020	1978

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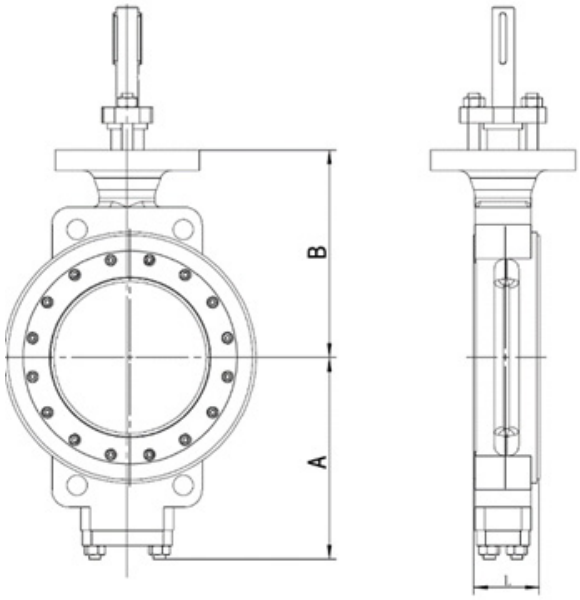
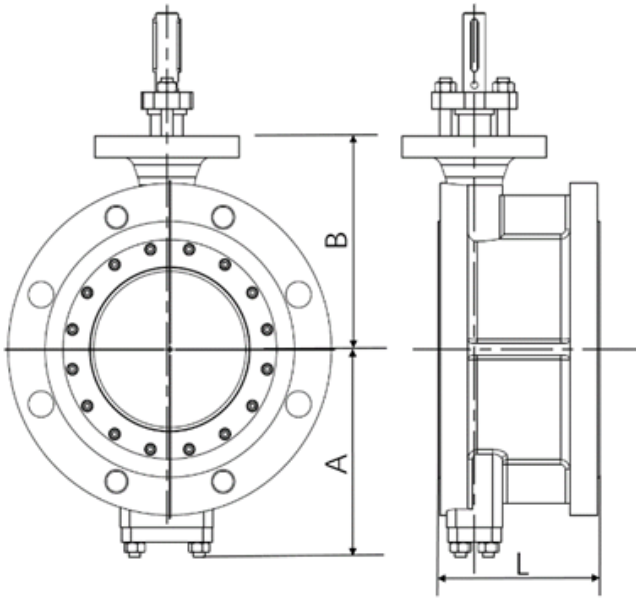


LUG/WAFER



RF

Class 300 PN50							
Size		L(mm)		Dimension		Weight (kg)	
NPS	DN	LUG/WAFER	RF	A	B	LUG/WAFER	RF
3"	80	48	114	138	190	14	36
4"	100	54	127	166	211	19	36
6"	150	60	140	200	235	27	51
8"	200	73	152	240	247	37	71
10"	250	83	165	280	265	56	107
12"	300	92	178	315	301	78	150
14"	350	117	191	350	336	109	211
16"	400	133	216	388	371	147	283
18"	450	149	222	415	405	180	347
20"	500	159	229	446	440	222	428
24"	600	181	267	525	516	347	669
30"	750	215	318	620	609	521	1005
36"	900	252	330	720	703.5	795	1534
42"	1050	290	410	827	864	1011	1951
48"	1200	320	470	940	960	1225	2363

Note: For other pressure levels or sizes, please consult ATW.

Order Instruction

Model compilation

1	2	3	4	5	6
DEB	DC	150	8	WA	NN

1.Product Code

DEB	Double eccentric butterfly valve

2. Series

SC	Uni-directional seal; Replaceable seat	DC	Bi-directional seal; Replaceable seat

3. Pressure Rate

Class 150	Class 300	Class 600	Class900
150	300	600	900

PN6	PN10	PN16	PN20	PN25	PN40	PN63	PN100	PN160
006	010	016	020	025	040	063	100	160

4. Nominal size

NPS	3	4	6	8	10	12	14	16	18
DN	80	100	150	200	250	300	350	400	450
NPS	20	24	28	30	32	36	40	42	48
DN	500	600	700	750	800	900	1000	1050	1200

5. Connections

Flange					WAFER	Butt-welded
RF	RJ	FF	FM/M	T/G	WA	BW

6. Special Options

EN	NN
Extended stem	/

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