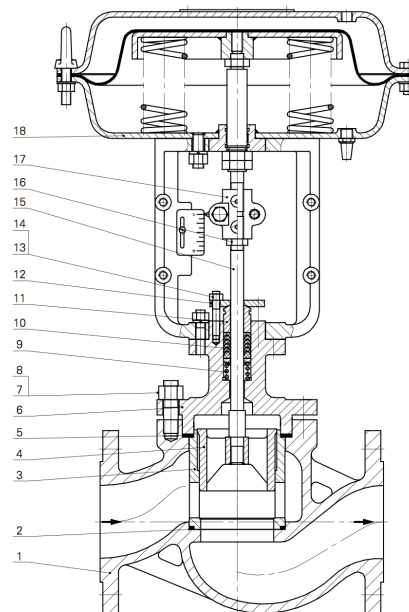


HCB Pneumatic Pressure-Balanced Cage Type Control Valve

OVERVIEW

Model HCB Pressure Balanced Cage Type Control Valves are designed for heavy duty services. The compact valve body, having a S-shape flow passage that features low pressure loss and a stabilizer that regulates turbulent flow around the cage, allows a large flow capacity, rangeability and high accuracy flow characteristics.

The valve plug is structured in a pressure-balanced type that permits flow control of a high differential pressure with a small actuating force. The actuator integrated with simplest mechanisms utilizes a compact yet powerful diaphragm actuator loaded with multiple springs. The model HCB valves are widely applicable for reliable control of high or low temperature, high pressure or high differential pressure process lines where dynamic stability, low noise, and cavitation/flashing resistance are required.



HCB Standard Type

1. Body 2. Seat Gasket 3. Cage 4. Plug 5. Sealing 6. Bonnet 7. Double-screw Bolt 8. Hexagon Nut 9. Packing Spring 10. Packing 11. Packing Screw 12. Packing Plate 13&14. Nuts&Bolts 15. Stem 16. Locknut 17. Stem Connector 18. Actuator

SPECIFICATIONS

Body

Type

Straight-through, cast globe valve

Nominal size

3/4", 1", 1-1/4", 1-1/2", 2", 2-1/2", 3", 4", 5", 6", 8", 10", 12", 14", 16"

Pressure rating

- ANSI Class 125, 150, 300, 600
- JIS 10K, 16K, 20K, 30K, 40K
- PN1.6, 4.0, 6.4, 10.0 Mpa

End connection

- Flanged End: FF, RF, RJ, LG
According to ANSI B16.5, JIS B2201, JB/T79.1
PN1.6MPa, JB/T79.2
- Welded End: SW, BW
- Threaded End: Rc

Material

A216 WCB, A216WC6, A352 LCB, A351 CF8, A351 CF8M, A351 CF3M, A351 CF3(see table3-1,3-2)

Bonnet

- Plain bonnet (-17 to 230°C)
- Extension bonnet Type1(-45 to -17°C and 230 to 566°C)
- Extension bonnet Type 2 Cryogenic
Integral cast type (-100 to -45°C)
Welded type (-196 to -100°C)
- Bellows type
(See Figure 2-1, 2-2, 2-3)

Gland type

Bolted Gland

Packing

V shaped PTFE, PTFE, Flexible graphite

Gasket material

Stainless steel(SUS304, SUS316, SUS316L), copper, aluminum

Trim

Valve plug

Pressure balanced type

Actuator

Type

Single-acting diaphragm actuator, Spring type piston actuator, Double acting piston actuator

Diaphragm material

Cloth embedded nylon and ethylene propylene rubber

Spring range

- 20 to 100 kPa(0.2 to 1.0 kgf/cm²)
- 40 to 200 kPa(0.4 to 2.0 kgf/cm²)
- 80 to 240 kPa(0.8 to 2.4 kgf/cm²)

Supply pressure

0.14, 0.16, 0.28, 0.4, 0.5 Mpa

Air connection

Rc1/4 or 1/4NPT internal thread

Ambient temperature

-20 to 70°C

Valve action

- FO: Air to close(Direct action actuator is combined.)
- FC: Air to open(Reverse action actuator is combined.)

Optional accessories

- P/P or I/P Positioner
- Air filter regulator
- Top-mounted or Side-mounted Handwheel
- Limit switch
- Solenoid valve
- Motion transmitter
- Booster relay
- Lock-up valve
- Air lock relay
- Others

Performance

Rated Cv value

Refer to table 1.

Flow characteristics (Refer to table 2)

- Equal percentage
- Linear

Leakage

- Metal Seat
According to ANSI B16.104 Class II, leakage less than 0.5% of maximum valve capacity.
- Soft Seat
According to ANSI B16.104 Class VI, leakage less than 0.00001% of maximum valve capacity.

Inherent rangeability

- 50:1 (Optional 75:1 for full port size)

Hysteresis error

- Without positioner: Within 3% F.S.
- With positioner: Within 1% F.S.

Linearity

Without positioner: Within $\pm 5\%$ F.S.
With positioner: Within $\pm 1\%$ F.S.

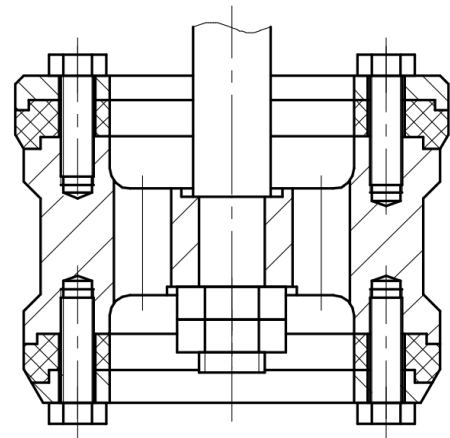


Figure a-a. Plug
(Sealing surface RPTFE)

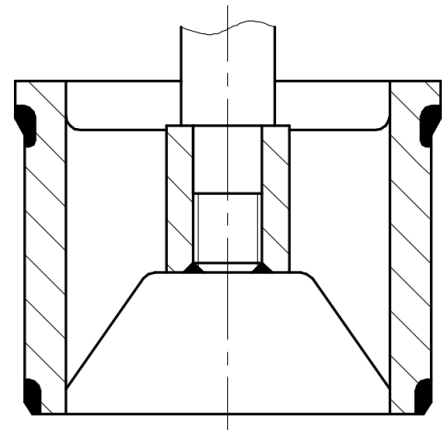


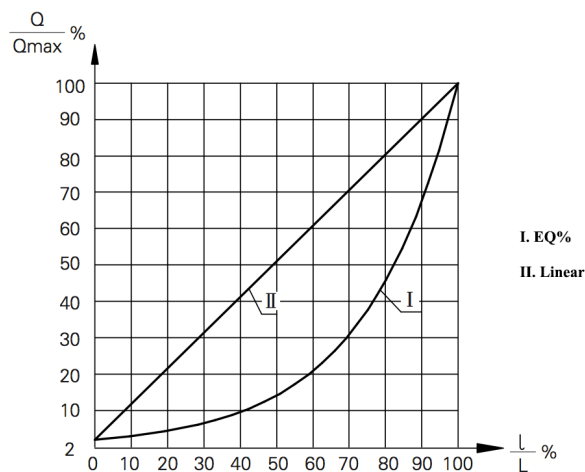
Figure a-b. Plug
(Sealing surface welding Stellite)

Table 1. Rated Kv Value and Travel

Nominal Diameter DN(mm)	Port Size	Rated Kv Value		Travel (mm)
		EQ%	Linear	
20	20	6.3	6.9	16
25	20	6.3	6.9	16
	25	10	11	16
32	20	6.3	6.9	16
	25	10	11	16
	32	16	17.6	25
40	25	10	11	16
	32	16	17.6	25
	40	25	27.5	25
50	32	16	17.6	25
	40	25	27.5	25
	50	40	44	25
65	40	25	27.5	25
	50	40	44	25
	65	63	69	40
80	50	40	44	25
	65	63	69	40
	80	100	110	40
100	65	63	69	40
	80	100	110	40
	100	160	176	40

Nominal Diameter DN(mm)	Port Size	Rated Kv Value		Travel (mm)
		EQ%	Linear	
125	80	100	110	40
	100	160	176	40
	125	250	275	60
150	100	160	176	40
	125	250	275	60
	150	400	440	60
200	125	250	275	60
	150	400	440	60
	200	630	690	60
250	150	400	440	60
	200	630	690	60
	250	1000	1100	100
300	200	630	690	60
	250	1000	1100	100
	300	1600	1760	100
350	250	1000	1100	100
	300	1600	1760	100
	350	2160	2375	100
400	300	1600	1760	100
	350	2160	2375	100
	400	4000	4400	100

Table 2. Flow characteristics



R50

Unit: %

Q/Qmax I/L Characteristics	0	10	20	30	40	50	60	70	80	90	100
EQ%	2	11.8	21.6	31.4	41.2	51	60.8	70.6	80.4	90.2	100
Linear	2	3	4.37	6.5	9.6	14.1	20.9	30.9	45.7	67.6	100

Allowable Differential Pressure For Metal Seat(Diaphragm Actuator)

Air to Close(Direct action)

Unit: Mpa

Actuator	Spring Range(Kpa)	Air Supply (Mpa)	Positioner Y/N	Seat Diameter dg (mm)															
				20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	
PZMA-4	20~100	0.14	No	1.27	1.06														
			Yes	3.81	3.18														
	40~200	0.25	Yes	5.41	4.50														
	80~240	0.40	Yes	10.0	9.81														
PZMA-5	20~100	0.14	No			1.13	0.93	0.76											
			Yes			3.40	2.80	2.29											
	40~200	0.25	Yes			4.82	3.96	3.24											
	80~240	0.40	Yes			10.0	8.63	7.06											
PZMA-6	20~100	0.14	No						0.92	0.76	0.61								
			Yes						2.78	2.29	1.85								
	40~200	0.25	Yes						3.94	3.24	2.62								
	80~240	0.40	Yes						8.58	7.06	5.72								
PZMA-7	20~100	0.14	No									0.86	0.72	0.54					
			Yes									2.58	2.16	1.63					
	40~200	0.25	Yes									3.66	3.07	2.32					
	80~240	0.40	Yes									7.97	6.68	5.05					
PZMA-8	20~100	0.14	No												0.70	0.30	0.25	0.22	
			Yes												2.09	1.77	1.52	1.33	
	40~200	0.25	Yes											2.96	2.51	2.15	1.88		
	80~240	0.40	Yes												6.44	5.46	4.68	4.10	

Air to Open(Reverse action)

Unit: Mpa

Actuator	Spring Range(Kpa)	Air Supply (Mpa)	Positioner Y/N	Seat Diameter dg (mm)															
				20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	
PZMB-4	20~100	0.14	Yes/No	1.27	1.06														
	40~200	0.25	Yes	3.81	3.18														
	80~240	0.40	Yes	10.0	8.48														
PZMB-5	20~100	0.14	Yes/No			1.13	0.93	0.76											
	40~200	0.25	Yes			3.40	2.80	2.29											
	80~240	0.40	Yes			9.08	7.46	6.11											
PZMB-6	20~100	0.14	Yes/No						0.92	0.76	0.61								
	40~200	0.25	Yes						2.78	2.29	1.85								
	80~240	0.40	Yes						7.40	6.11	4.94								
PZMB-7	20~100	0.14	Yes/No									0.86	0.72	0.54					
	40~200	0.25	Yes									2.58	2.16	1.63					
	80~240	0.40	Yes									6.89	5.78	4.37					
PZMB-8	20~100	0.14	Yes/No												0.70	0.30	0.25	0.22	
	40~200	0.25	Yes												2.09	1.77	0.52	1.33	
	80~240	0.40	Yes												5.57	4.72	4.05	3.55	

Allowable Differential Pressure For Soft Seat (Diaphragm Actuator)

Air to Close(Direct action)

Unit: Mpa

Actuator	Spring Range(Kpa)	Air Supply (Mpa)	Positioner Y/N	Seat Diameter dg (mm)															
				20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	
PZMA-4	20~100	0.14	No	1.98	1.65														
			Yes	3.00	3.00														
	40~200	0.25	Yes	3.00	3.00														
	80~240	0.40	Yes	3.00	3.00														
PZMA-5	20~100	0.14	No			1.77	1.45	1.19											
			Yes			3.00	3.00	2.86											
	40~200	0.25	Yes			3.00	3.00	3.00											
	80~240	0.40	Yes			3.00	3.00	3.00											
PZMA-6	20~100	0.14	No						1.44	1.19	0.96								
			Yes						3.00	2.86	2.31								
	40~200	0.25	Yes						3.00	3.00	3.00								
	80~240	0.40	Yes						3.00	3.00	3.00								
PZMA-7	20~100	0.14	No									1.34	1.12	0.85					
			Yes									3.00	2.71	2.04					
	40~200	0.25	Yes									3.00	3.00	2.73					
	80~240	0.40	Yes									3.00	3.00	3.00					
PZMA-8	20~100	0.14	No													1.09	0.74	0.63	0.55
			Yes													2.61	2.21	1.89	1.66
	40~200	0.25	Yes												3.00	2.95	2.53	2.22	
	80~240	0.40	Yes												3.00	3.00	3.00	3.00	

Air to Open(Reverse action)

Unit: Mpa

Actuator	Spring Range(Kpa)	Air Supply (Mpa)	Positioner Y/N	Seat Diameter dg (mm)															
				20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	
PZMB-4	20~100	0.14	Yes/No	1.98	1.65														
	40~200	0.25	Yes	3.00	3.00														
	80~240	0.40	Yes	3.00	3.00														
PZMB-5	20~100	0.14	Yes/No			1.77	1.45	1.19											
	40~200	0.25	Yes			3.00	3.00	2.86											
	80~240	0.40	Yes			3.00	3.00	3.00											
PZMB-6	20~100	0.14	Yes/No						1.44	1.19	0.96								
	40~200	0.25	Yes						3.00	2.86	2.31								
	80~240	0.40	Yes						3.00	3.00	3.00								
PZMB-7	20~100	0.14	Yes/No									1.34	1.12	0.85					
	40~200	0.25	Yes									3.00	2.71	2.04					
	80~240	0.40	Yes									3.00	3.00	3.00					
PZMB-8	20~100	0.14	Yes/No												1.09	0.74	0.63	0.55	
	40~200	0.25	Yes												2.61	2.21	1.90	1.66	
	80~240	0.40	Yes												3.00	3.00	3.00	3.00	

Allowable Differential Pressure (Piston Actuator)

Unit: Mpa

Actuator Size	Spring Range (Kpa)	Air Supply (Mpa)	Sealing Type	Seat Diameter dg(mm)									
				65	80	100	125	150	200	250	300	350	400
150	125~375	0.5	Metal Seat	4.37	3.61								
			Soft Seat	3.00	3.00								
200	125~375	0.5	Metal Seat	7.79	6.41	5.19	4.19	3.52					
			Soft Seat	3.00	3.00	3.00	3.00	3.00					
250	125~375	0.5	Metal Seat	10.0	9.93	8.11	6.55	5.49	4.15				
			Soft Seat	3.00	3.00	3.00	3.00	3.00	3.00				
280	125~375	0.5	Metal Seat					6.84	5.21				
			Soft Seat					3.00	3.00				
300	125~375	0.5	Metal Seat						5.98	4.79	4.06		
			Soft Seat						3.00	3.00	3.00		
350	125~375	0.5	Metal Seat						8.14	6.51	5.53		
			Soft Seat						3.00	3.00	3.00		
400	125~375	0.5	Metal Seat							8.52	7.22	6.19	5.42
			Soft Seat							3.00	3.00	3.00	3.00

Working Temperature Range and Seat Leakage

Table 3-1 Valve Body Material: Carbon Steel

Valve Body Material		WCB, WCC, WC6, WC9, LCB			
Trim	Material	304/316	304/316	304/316	304/316
	Treatment	RPTFE(Figure a-a)	—	ST(Figure a-b)	SS
Seat	Material	304/316	304/316	304/316	304/316
	Treatment	—	—	ST	SS
Allowable Leakage	Class	V/VI	IV	IV	IV
	Standard	GB/T4213, FCI70.2, ANSI B16.104			
Working Temperature(°C)	WCB, WCC	-45~+160°C	-5 ~ +230°C	-5 ~ +425°C	-5 ~ +425°C
	WC6, WC9	-45~+160°C	-5 ~ +230°C	-5 ~ +538°C	-5 ~ +538°C
	LCB	-45~+160°C	-45 ~ +230°C	-45 ~ +350°C	-45 ~ +350°C

Table 3-2 Valve Body Material: Stainless Steel

Valve Body Material		CF3, CF8, CF3M, CF8M			
Trim	Material	304/316	304/316	304/316	304/316
	Treatment	RPTFE(Figure a-a)	—	ST(Figure a-b)	SS
Seat	Material	304/316	304/316	304/316	304/316
	Treatment	—	—	ST	SS
Allowable Leakage	Class	V/VI	IV	IV/V	IV/V
	Standard	GB/T4213, FCI70.2, ANSI B16.104			
Working Temperature(°C)		-45~+160°C	-196 ~ +538°C	-196 ~ +538°C	-196 ~ +538°C

Figure 1. Valve Trim Material · Treatment

Figure1-1 Metal Seated

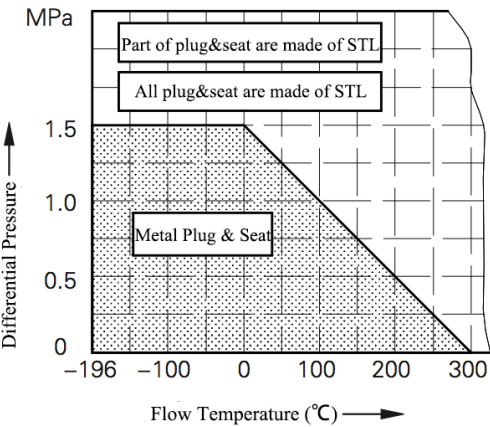


Figure 1-2 Soft Seated(RPTFE)

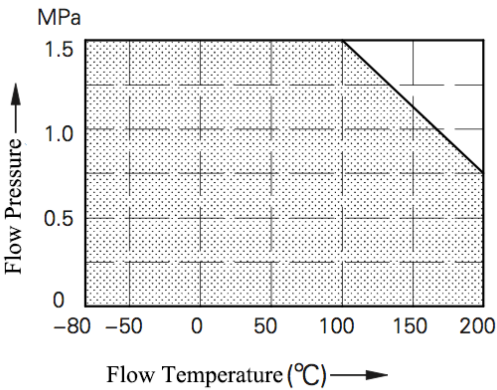


Figure 2. Working Temperature of Packing Material · Pressure Ranges

Figure 2-1 V-Type RPTFE

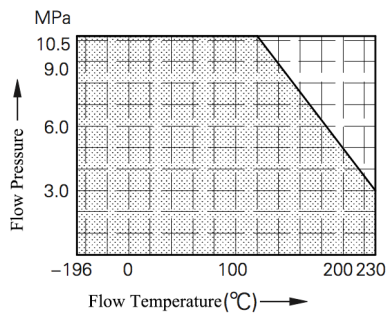


Figure 2-2 PTFE+Carbon Fiber/PTFE+Asbestos

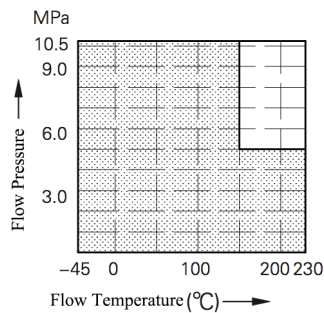
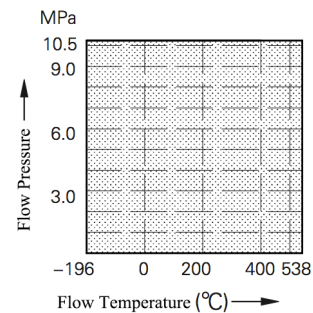


Figure 2-3 Flexible Graphite



Bonnet Type

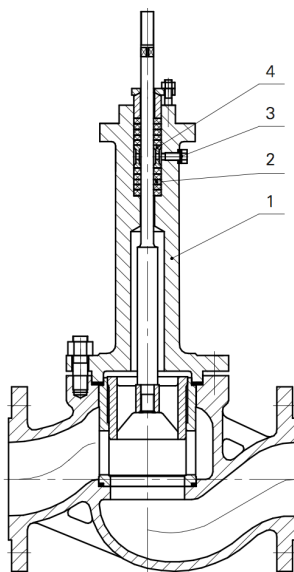


Figure 2-1 Extension Bonnet 1
1. Extension Bonnet 2. Packing 3. Bushing 4. Stem

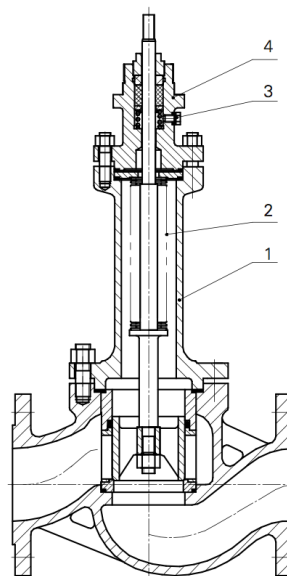


Figure 2-2 Bellows Seal Bonnet
1. Lower Bonnet 2. Bellows 3. Inspection Hole 4. Upper Bonnet

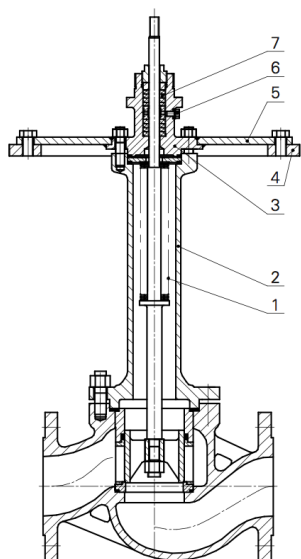


Figure 2-3 Extension Bonnet 2
1. Bellows 2. Lower Bonnet 3. Upper Bonnet 4. Welding Flange 5. Connect Flange 6. Inspection Hole 7. Packing

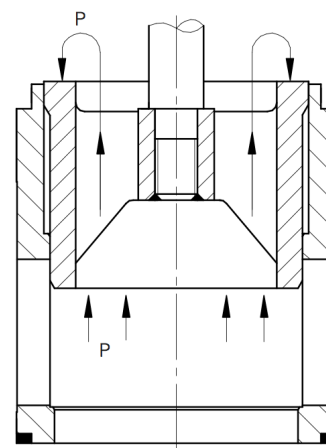
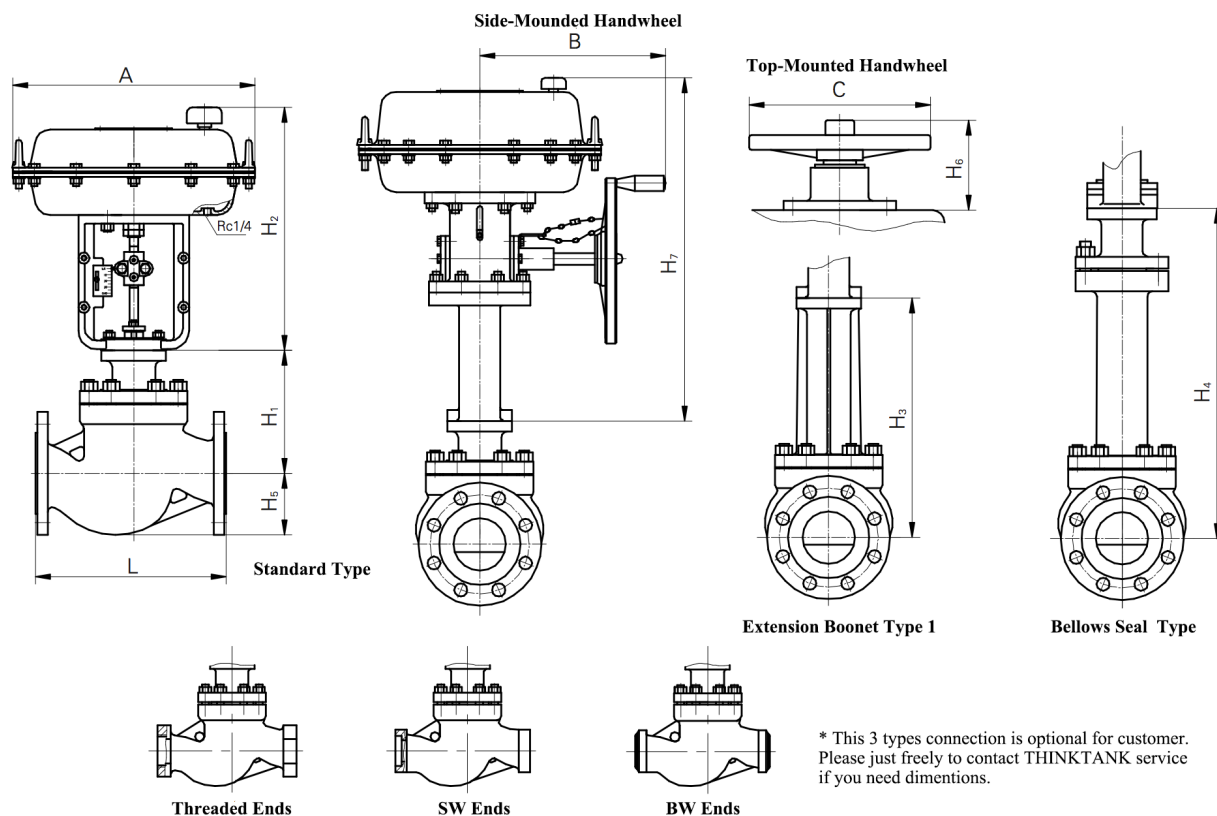


Figure 2-4 The Principle of E Equilibrium

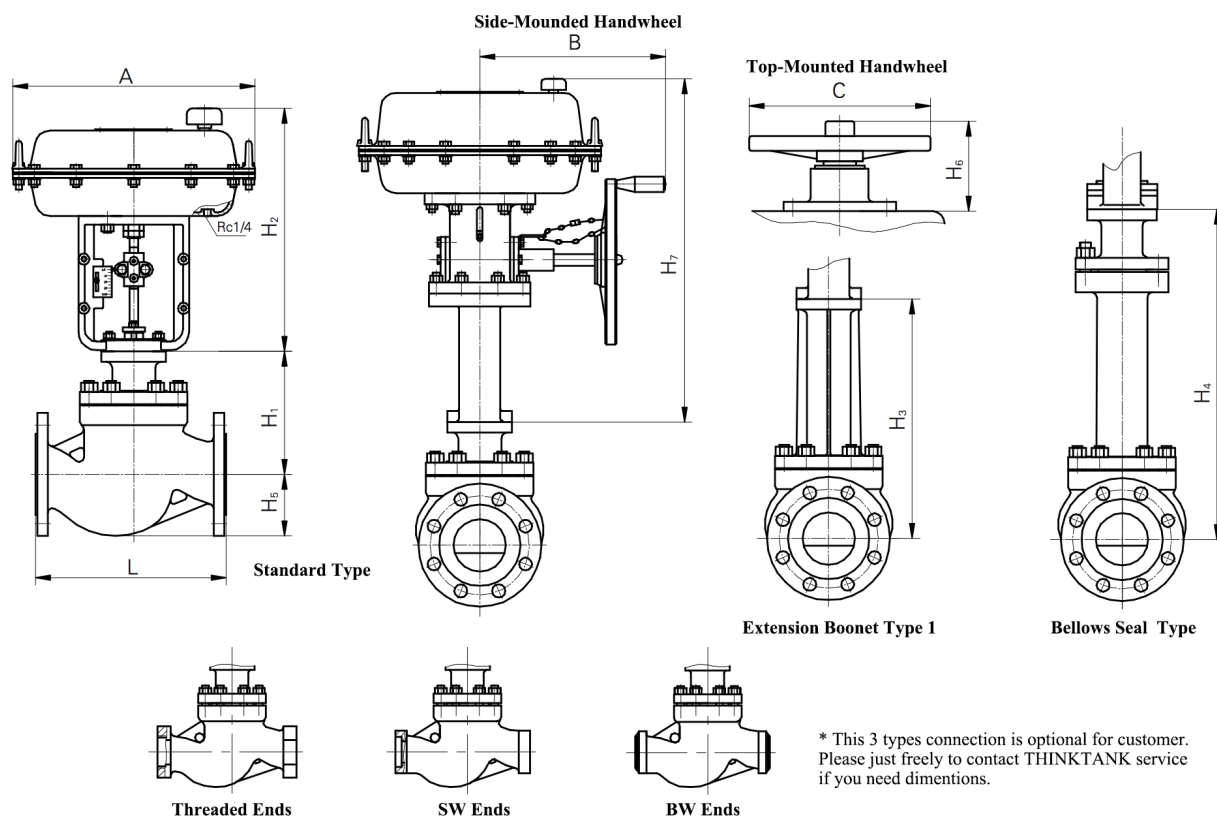
DN20 ~ DN50 External Dimensions for Standard, Bellows and Extension



Unit: mm

Nominal Diameter DN(mm)	L			H1	H3	H4	H5	Actuator					
	PN16/ 25/40, 150LB	PN64, 300LB	PN100, 600LB					A	B	C	H2	H6	H7
20(3/4")	184	194	206	130	254	337	44	282	260	220	258	180	465
25(1")	184	197	210	130	254	337	48	282	260	220	258	180	465
32(1-1/4")	222	235	251	152	320	386	56	282	260	220	258	180	465
								308	260	220	280	180	465
40(1-1/2")	222	235	251	152	320	402	65	282	260	220	258	180	465
								308	260	220	280	180	465
50(2")	254	267	286	159	320	402	76	308	260	220	280	180	465

DN65 ~ DN400 External Dimensions for Standard, Bellows and Extension

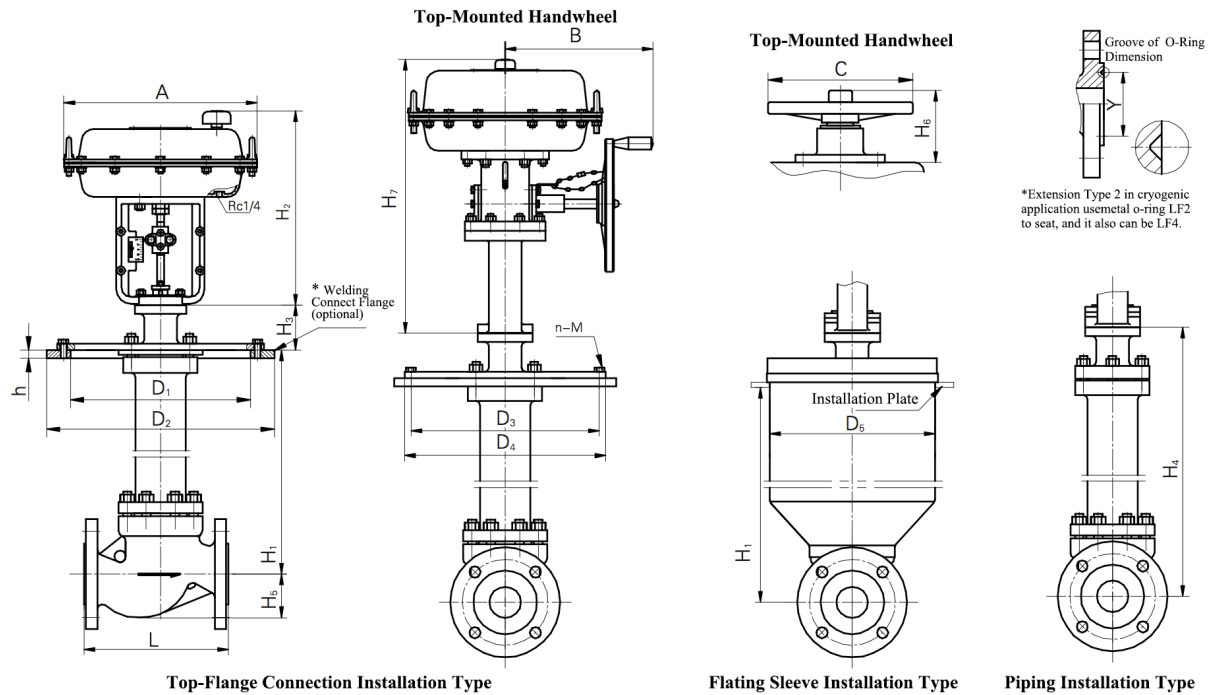


Unit: mm

Nominal Diameter DN(mm)	L			H1	H3	H4	H5	Actuator					
	PN16/ 25/40, 150LB	PN64, 300LB	PN100, 600LB					A	C	H2	H6	H7	B
65(2-1/2")	276	292	311	205	365	630	100	308	220	280	180	305	260
								394	270	360	236	580	305
80(3")	298	317	337	205	365	630	100	308	220	280	180	305	260
								394	270	360	236	580	305
100(4")	352	368	394	208	373	635	110	394	270	360	236	580	305
125(5")	400	500	500	274	484	698	126	394	270	360	236	580	305
								498	320	435	310	675	330
150(6")	451	473	508	333	529	705	149	394	270	360	236	580	305
								498	320	435	310	675	330
200(8")	543	568	610	370	561	730	198	498	320	435	310	675	330
250(10")	-①	-	-	493	750	892	220	618	500	621	394	959	374
300(12")	-	-	-	545	771	892	326	618	500	621	394	959	374
350(14")	-	-	-	610	812	945	350	618	500	621	394	959	374
400(16")	-	-	-	681	830	978	372	618	500	621	394	959	374

Note: ① The distance of two flange or Valve Length could be custom by customer's requirements.

External Dimensions for Extension Type 2

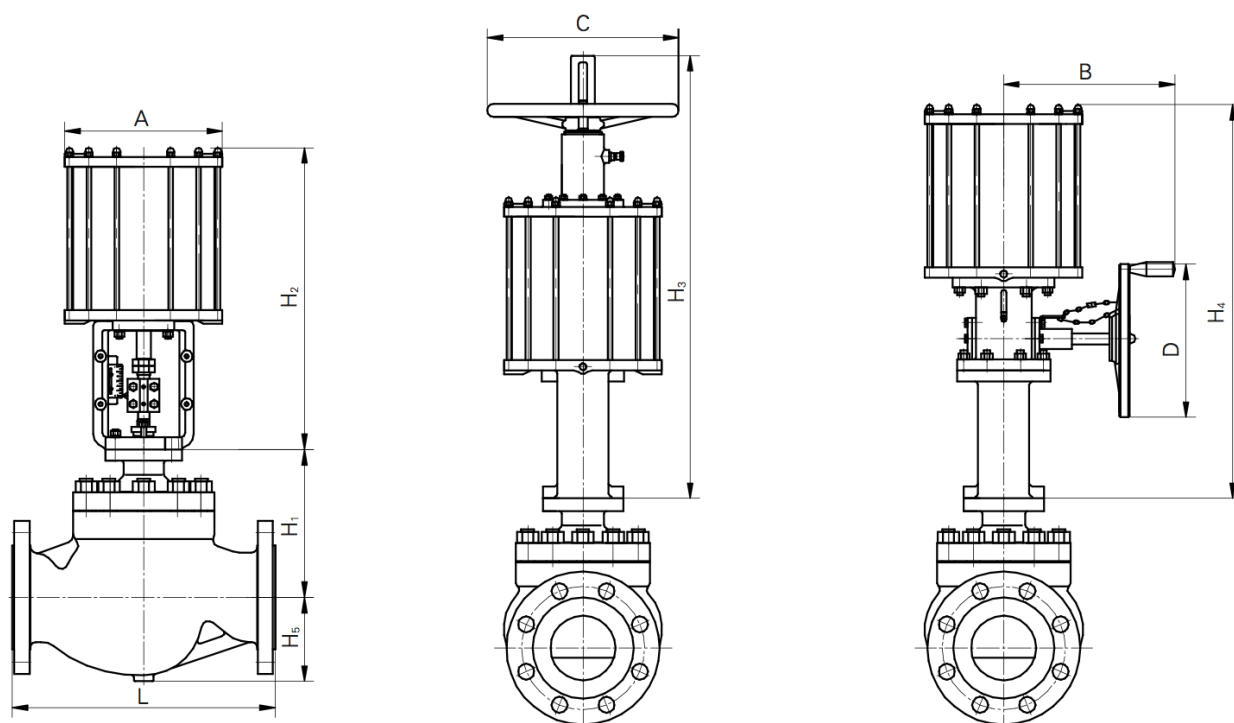


Unit: mm

Nominal Diameter DN(mm)	L			D1	D2	D3	D4	D5	Y	H1	H3	H4	H5	Actuator					
	PN16/25/40, 150LB	PN64,30 0LB	PN100, 600LB											A	C	H2	H6	H7	B
20(3/4")	184	194	206	270	335	305	335	285	45	700	88	590	44	282	220	258	180	465	260
25(1")	184	197	210	270	335	305	335	285	45	700	88	590	48	282	220	258	180	465	260
32(1-1/4")	222	235	251	305	390	340	370	285	60	700	88	587	56	282	220	258	180	465	260
														308	220	280	180	465	260
40(1-1/2")	222	235	251	342	430	370	400	285	65	700	88	587	65	282	220	258	180	465	260
														308	220	280	180	465	260
50(2")	254	267	286	375	465	405	435	285	75	700	88	587	76	308	220	280	180	400	260
65(2-1/2")	276	292	311	430	520	460	490	470	90	700	95	695	100	308	220	280	180	465	260
														394	270	280	236	580	305
80(3")	298	317	337	490	585	525	555	470	104	700	95	695	100	308	220	280	180	305	260
														394	270	360	236	580	305
100(4")	352	368	394	556	660	590	630	470	135	700	95	695	110	394	270	360	236	580	305
125(5")	400	500	500	665	770	700	740	—	165	800	170	870	126	394	270	360	236	580	305
														498	320	435	310	675	330
150(6")	451	473	508	665	700	700	740	—	195	800	170	872	149	394	270	360	236	580	305
														498	320	435	310	675	330
200(8")	543	568	610	765	890	805	845	—	245	800	170	970	198	498	320	435	310	675	330
250(10")	①	-	-	980	1120	1030	1080	—	305	900	110	909	220	618	500	621	394	959	374
300(12")	-	-	-	1080	1220	1130	1180	—	350	900	110	892	326	618	500	621	394	959	374
350(14")	-	-	-	1180	1320	1230	1280	—	400	900	110	945	350	618	500	621	394	959	374
400(16")	-	-	-	1380	1440	1500	1540	—	455	900	110	978	372	618	500	621	394	959	374

Note: ① The distance of two flange or Valve Length could be custom by customer's requirements.

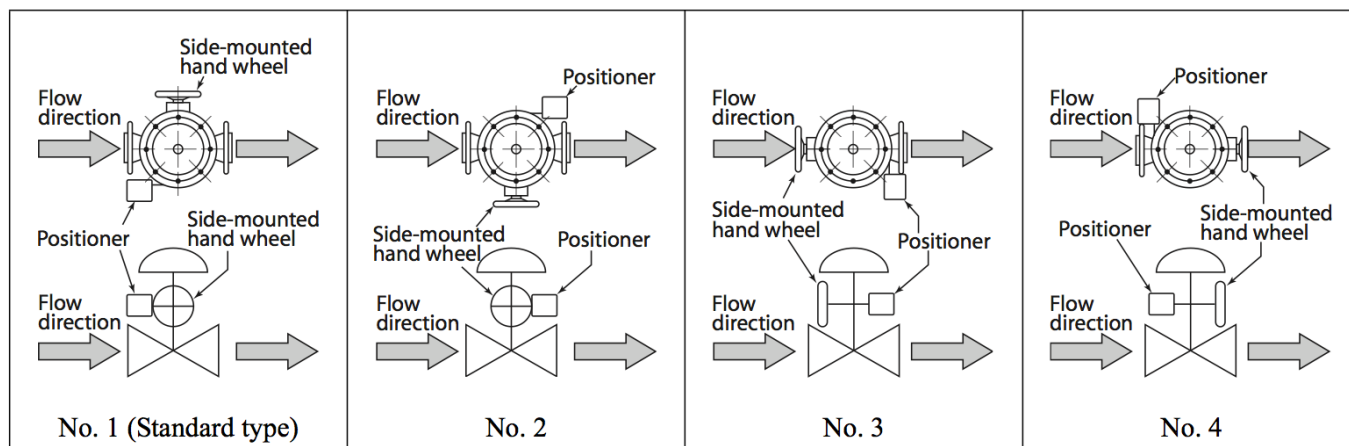
External Dimensions for Piston Type Actuator



Unit: mm

Nominal Diameter DN(mm)	L			H1	H5	Actuator						
	PN16/25/40, 150LB	PN64, 300LB	PN100, 600LB			A	B	C	D	H2	H3	H4
65(2-1/2")	276	292	311	205	100	215	305	270	270	447	683	612
						275	305	270	270	495	731	660
80(3")	298	317	337	200	100	215	305	270	270	447	683	612
						275	305	270	270	495	731	660
100(4")	352	368	394	208	110	215	305	270	270	447	683	612
						275	305	270	270	495	731	660
125(5")	400	500	500	274	126	325	330	320	270	600	911	795
						340	330	320	270	727	1038	922
150(6")	451	473	508	333	149	325	330	320	270	600	911	795
200(8")	543	568	610	370	198	325	330	320	270	600	911	795
250(10")	-①	-	-	493	220	340	330	500	270	727	1121	1035
300(12")	-	-	-	545	326	385	374	500	320	710	1104	1018
350(14")	-	-	-	610	350	412	374	500	320	775	1169	1083
400(16")	-	-	-	680	372	485	374	500	320	775	1169	1083

Note: ① The distance of two flange or Valve Length could be custom by customer's requirements.



Actuator orientation

Note) Indicate by position number when installation other than the standard type is required.

Ordering Information

When ordering, please specify;

- | | |
|--|---|
| 1) Model Number: HCB | 9) Accessories (pressure regulator and etc.) |
| 2) Nominal size × Cv required | 10) Special requirement of degreasing, copper free and etc. |
| 3) Type and rating of end connections | 11) Name of flow medium |
| 4) Body and trim material, necessity of hardening | 12) Normal flow and maximum required flow |
| 5) Type of bonnet | 13) Pressure of flow medium, upstream and downstream pressure at maximum and minimum, required flow |
| 6) Valve and plug characteristics | 14) Temperature and specific gravity of flow medium |
| 7) Type of actuator, necessity of hand wheel, and air to diaphragm | 15) Viscosity of flow medium, inclusive or exclusive of slurry |
| 8) Valve action (direct or reverse) | |

**Specifications are subject to change without notice.*

THINKTANK®

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