

**Series 20**  
**Angle Globe Valves**  
**ANSI 150-2500**  
**DIN/BS 4504 PN10-PN420**  
**JIS 10K-63K**

## Series 20 Features

### General

The series 20 angle type control valves are indispensable to control fluid of high differential pressure, slurry, high viscosity or adhesive. They are provided with a number of features such as low resistance of passage, anti-wear quality within the valve, and easy maintenance and inspection.

### Performance:

- High Cv to body size ratio.
- Streamlined flow passages to optimize capacity.
- High Cv to valve weight ratio.
- Excellent flow control rangeability.

### Design Flexibility:

- Modular construction design available with a range of different connections and styles.
- All trim components removable from the top for ease of maintenance.
- Wide range of supplementary noise control options.
- Inherently characterized trim offered in equal percentage, linear, quick opening and modified -parabolic (options).
- Multi trim sizes available.
- Full range of body and trim material options.
- Fully rationalized and interchangeable features.
- Full range of bonnet and packing designs to suit various temperatures and fluids.



Figure 1.  
Series 20 angle type globe valve mounted with  
AO-3600 Pneumatic diaphragm actuator

## Angle Valve Specifications

Valve Type	Diaphragm/Piston Operated Angle Control Valve													
Valve Model	AO-3620													
Trim Type	Balanced, Un-balanced, Anti-cavitation, Low-noise, Optional special trim													
Valve Size (inch)	1/2	3/4	1	1.1/2	2	2.1/2	3	4	5	6	8	10	12	
(mm)	15	20	25	40	50	65	80	100	125	150	200	250	300	
Pressure Rating	ANSI 150# ~ 2500# (JIS 10K ~ 63K, PN 10~ 420)													
End Connection	RF, FF, SW, BW, RTJ													
Body Materials	A216WCB, A351CF8/CF8M, A351CF3/CF3M, H-C, H-B, and so on													
Bonnet Type	Plain(-17°C to 230°C), Extension(-45°C to -17°C, over 230°C), Cryogenic(-196°C to -45°C), Bellows Seal													
Packing	Graphite, PTFE, VOC, etc													
Gasket	Spiral Wound Metal gasket (Teflon, Graphite, Inconel etc)													
Guiding	Top/Cage													
Seat Type	Metal/Soft													

### Design Integrity :

- Heavy duty top guiding with no bottom guide to obstruct seat bore and potentially trap debris.
- Large diameter stems.
- Clamped bonnet and seat ring gaskets are fully retained for easy maintenance.

### Quality manufacturing :

- Rigorously tested to ensure specified performance on site.
- Quality assurance system in accordance with ISO 9001.
- Optional full NACE MR-01-75 certification.

### Scope of Design:

End Connection Sizes: 1/2" to 24" (15mm to 600mm)

### End Connection Styles:

ANSI, DIN and BS flanged RF, FF, RTJ (and other grooved designs).  
Welded profiles including butt weld, socket, etc., clamped designs. Other requirements available on request.

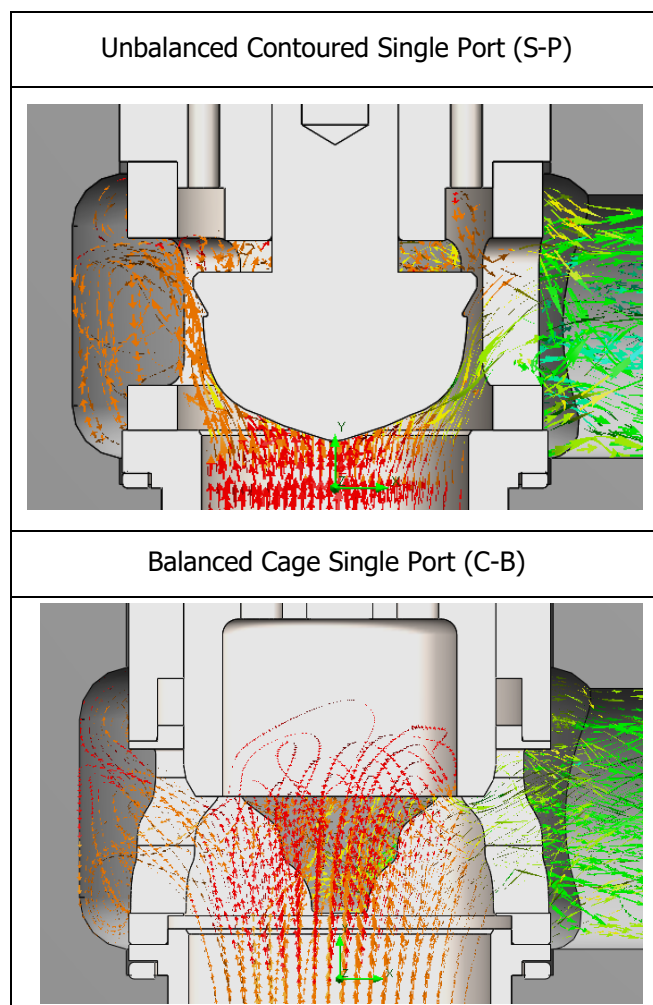


Figure 2. Trim Type

**Valve Body Ratings:**

JIS10K to JIS63K, ANSI 150 to ANSI 2500 and DIN/BS4504 PN10 to PN420 as standard. Other requirements are available on request.

**Design standards:**

ANSI B16.34 and ASME section VIII (for body/bonnet bolting)

**Trim Design Options:**

Full and reduced trim, S-P, C-B and C-D are available as standard. Multi hole cages, attenuator and silencers are available for specific applications.

**Inherent Characteristics:**

Equal percentage, Linear, modified parabolic or Quick open.

**Material Combinations:**

A wide range of body/bonnet and trim materials are available.

**Plug Design Options:**

Unbalanced with metal/metal or resilient seating plus balanced with metal/metal seating and metallic or resilient piston rings.

**Bonnet Options:**

Standard, Extension and Cryogenic bonnet design options available. Refer to Fig 3.

**Actuator:**

Various types of actuators are available including;

AO-3600 spring opposed pneumatic diaphragm. Electric, electro-hydraulic and hydraulic operated versions are available.

**Sizing/Noise prediction**

The procedures for performing valve sizing, velocity and sound pressure level calculations is detailed in the sizing program user's manual.

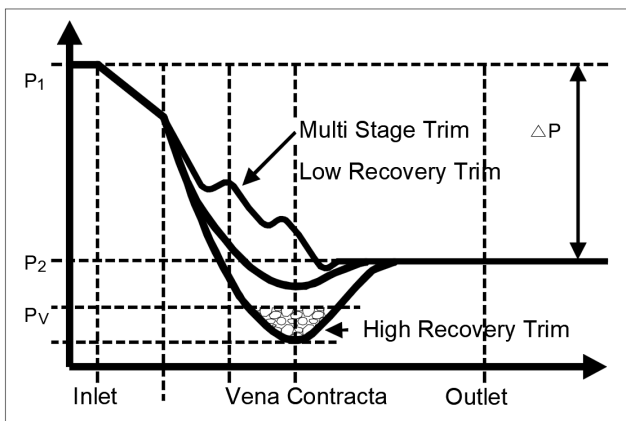
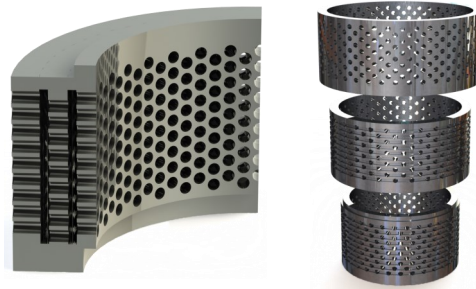


Figure 3. Cavitation Formation

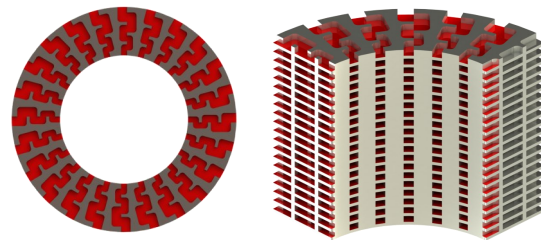
**SEVERE SERVICE TRIMS**

Type	Trim Feature	Application
H Series	Drill hole	Semi-Severe Service/Economical
M Series	Maze	Severe Service/Pure Fluid
T Series	Tooth	Severe Service/Particles
C Series	Cascade	Under 1"/Minimum Flow Control
S Series	Screw	Large Particles

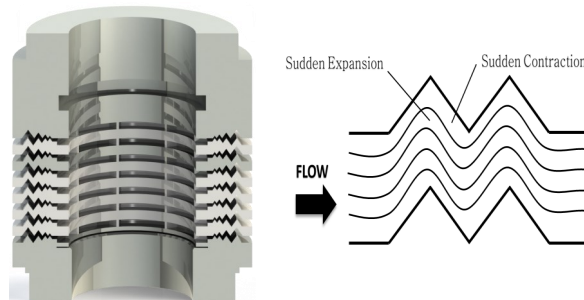
**1) H Series Trim (Anti-Cavitation)**



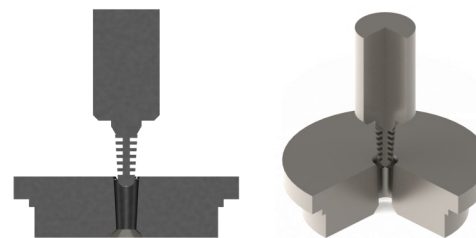
**2) M Series Trim**



**3) T Series Trim**



**4) C Series Trim**



**5) S Series Trim**



**Body Materials (Standard)**

Material	Body material		Service temperature range (deg C)			Main component
	JIS	ASTM	JIS(B8243)	High Pressure gas	ANSI (B16.34)	
Cast steel	SCPH2	A216-WCB	0 ~ 450	-29 ~ 425		
	SCPH6	A216-LCC		-46 ~ 343		
	SCPH11	A216-WC9		-29 ~ 566		
Cast stainless steel	SCS13	A351-CF8	-196 ~ 800	-196 and over	-29 ~ 800	18Cr-9Ni
	SCS14	A351-CF8M	-196 ~ 800	-196 and over	-29 ~ 800	18Cr-12Ni 2.5Mo
	SCS16	A351-CF3M	-196 ~ 450	-196 and over	-29 ~ 455	

**Standard combination of materials available**

Fluid	Condition	Body	Port	Seat	Stem	Guide
NORMAL FLUID	It depends on the fluid type and temperature & pressure	A216WCB	304SS	304SS	304SS	304SS
		A351CF8	316SS	316SS	316SS	316SS
		A351CF8M	316SS	316SS	316SS	316SS
		A351CF3	304LSS	304LSS	316SS	316SS
		A351CF3M	316LSS	316LSS	316LSS	316LSS
		MONEL	MONEL	MONEL	MONEL	MONEL
		ALLOY20	ALLOY20	ALLOY20	ALLOY20	ALLOY20
		HASTELLOY C	HASTELLOY C	HASTELLOY C	HASTELLOY C	HASTELLOY C
STEAM (LP, LT)	LP(<20KG) & LT	A216WCB	410SS	410SS	410SS	410SS
	MP & MT	A216WCB	420J2	420J2	420J2	420J2
	HP & HT(>425°C)	A351CF8	440C	440C	440C	440C

## Note:

1. Please check with your KOMOTO account manager, if needed.
2. Materials may vary depending on service conditions (pressure, temperature or fluid).

## Guide to Trim Options Available

### Modular Design

Series 9110 has been designed around a modular manufacturing concept. Using this philosophy, a center body module selected to most suit the specified flow conditions and operating data, is combined with end connection size/rating, selected to support that module. This design feature allows not only the selection of full size ends, to offer oversize end connections to suit a particular requirement.

### Unbalance Trim

Single Contoured Unbalance Port (S-P) are up to 4". Ports are guided by heavy guide.

### Balance Trim

Pressure balanced cage port is used to reduced the thrust on the port. Balanced Cage Port (C-B) is that over 4" is standard and under 4" are available for specific applications. Balanced Cage Double Port (C-D) for high temperature is also available.

Soft seat is used in application requirement ANSI Class VI 'BUBBLE-TIGHT' shutoff and FIRE SAFE design. Its design consists of an elastomer sandwiched between two metal pieces, retainer (or cage) and metal seat. The installation can be done by inserting soft seat between retainer (or cage) and metal seat. Therefore it can be used for fire safe function.

Table 1. Allowable Temperature

Bonnet Type	Plain Bonnet	Extension Bonnet	Cryogenic Bonnet	Bellows Bonnet
Allowable Temperature	-25°C ~ 230°C	Over 230°C -25°C ~ -45°C	-45°C ~ -196°C	-25°C ~ 350°C

### Globe valve Bonnet type

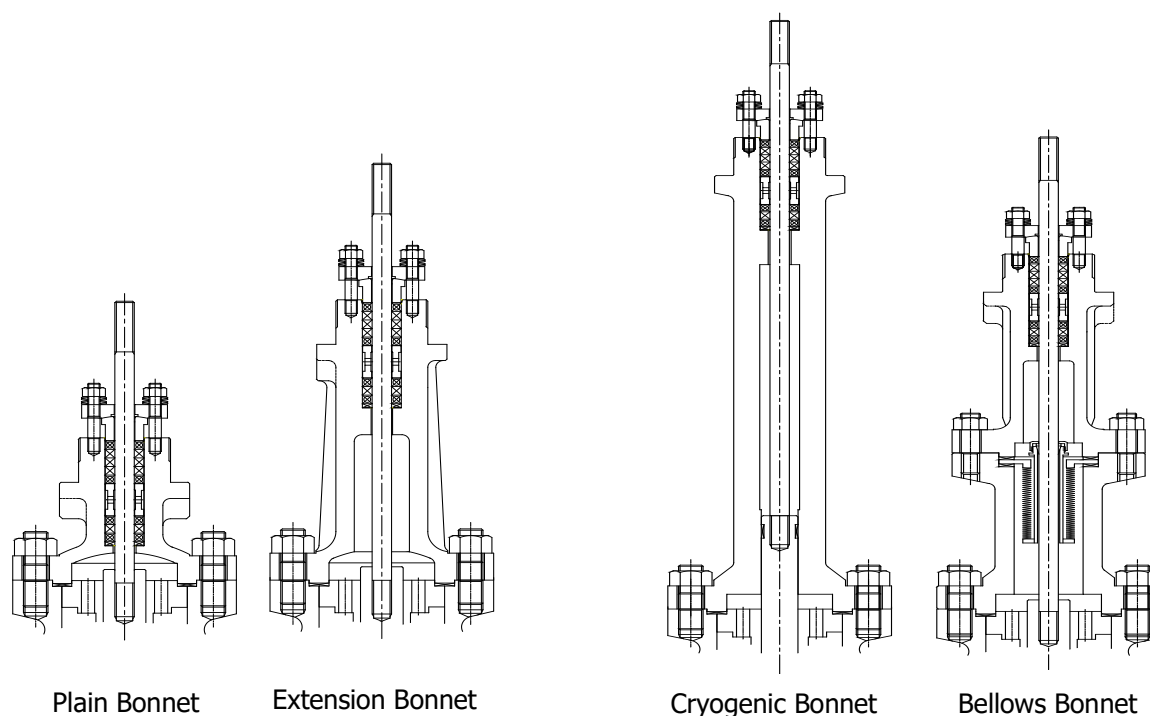


Figure 4. Bonnet Design Option

## AO-3620 Design Cv Values

Table 2. Single Contoured plug Cv value up to 1" valve size

Connection Size		Trim Size	Lift	EQ%	Linear
in	mm				
1/2"	15	3	15	0.09	0.09
		4		0.15	0.15
		6 (1/8)		0.4	0.4
		7 (3/16)		0.8	0.8
		8 (1/4)		1.5	1.5
		10 (3/8)		3.0	3.0
		15 (1/2)		5.2	5.2
3/4"	20	3	15	0.09	0.09
		4		0.15	0.15
		6 (1/8)		0.4	0.4
		7 (3/16)		0.8	0.8
		8 (1/4)		1.5	1.5
		10 (3/8)		3.0	3.0
		15 (1/2)		5.2	5.2
		20 (3/4)		9.0	9.0
1"	25	4	15	0.15	0.15
		6 (1/8)		0.4	0.4
		7 (3/16)		0.8	0.8
		8 (1/4)		1.5	1.5
		10 (3/8)		3.0	3.0
		15 (1/2)		5.2	5.2
		20 (3/4)		9.0	9.0
		25 (1)		14	14

Note : The above Design Cv values apply to valves with body rating ANSI 150 to ANSI 600.

Table 3. Contoured Plug Cv value 1"~4" valve size (unbalanced)

Connection Size	Full ported			
	Trim Size	Lift	EQ%	Linear
1"	1"	15	14	14
1 1/2"	1 1/2"	20	32	36
2"	2"	25	52	58
2 1/2"	2 1/2"	25	78	88
3"	3"	38	116	130
4"	4"	38	195	220

Table 4. Cage guided Cv value 1"~14" valve size (balanced)

Connection Size	Full ported			
	Trim Size	Lift	EQ%	Linear
1"	1"	15	18.5	19
1 1/2"	1 1/2"	20	34	34.2
2"	2"	25	56.2	60.5
2 1/2"	2 1/2"	25	83	84
3"	3"	38	125	135
4"	4"	38	210	211
5"	5"	50	276	294
6"	6"	50	424	438
8"	8"	100	675	690
10"	10"	100	1050	1260
12"	12"	130	1620	2090
14"	14"	130	2030	2620

## Velocity Limitations

In selecting a valve for either a liquid or gas / vapor application one of the major considerations is the effect of fluid velocity. High velocity could lead to operational problems including erosion, excessive vibration and instability. The following tables indicate the maximum recommended velocity values for liquid and gas / vapor services.

Table 5. Recommended Maximum Velocities for Liquid Service

Valve Size				Maximum Velocity			
		Carbon Steel		Alloy Steel		Bronze, Cu / Ni Alloys	
in	mm	ft/s	m/s	ft/s	m/s	ft/s	m/s
0.5 - 2	15 – 50	41	12.5	46	14	25	7.6
3 - 6	80 – 150	34	10.4	34	10.4	20	6.2
8 -12	200 – 300	29	8.9	29	8.9	17	5.2

Table 6. Recommended Maximum Velocities for Gas / Vapor Services

Valve size		Maximum inlet velocity		Maximum outlet velocity		Max. outlet mach number for required noise level		
in	mm	ft/s	m/s	ft/s	m/s	>95 dBA	<95 dBA	<85 dBA
0.5 - 2	15 – 50	340	104	830	253	0.65	0.5	0.3
3 - 6	80 – 150	294	90					
8 - 12	200 – 300	265	81					

## Inherent Rangeability

The inherent rangeability of a control valve is the ratio between maximum and minimum flow within the working characteristic at constant pressure drop.

Table 7. Rangeability Values

Trim Size (in)	Rangeability	
3mm ~ 4mm	30:1	
1/8" ~ 3/16"	50:1	
1/4" - 1/2"	50:1	* Over
3/4" - 16"	50:1	* Over

\* Special option

## Characteristic Curves

The inherent flow characteristic of a control valve is the relationship between the flow and the lift of the plug at constant pressure drop. The characteristics normally available are shown on Figure 4.

### Definitions:

- Linear**  
 Flow is directly proportional to valve lift.
- Equal %**  
 Flow changes by a constant percentage of its instantaneous value for each unit of valve lift.
- Quick Opening**  
 Flow increases rapidly with initial travel reaching near its maximum at a low lift.
- Modified Equal %**  
 Provides fine throttling action at low valve lift and approximately a linear characteristic for upper portions of travel.

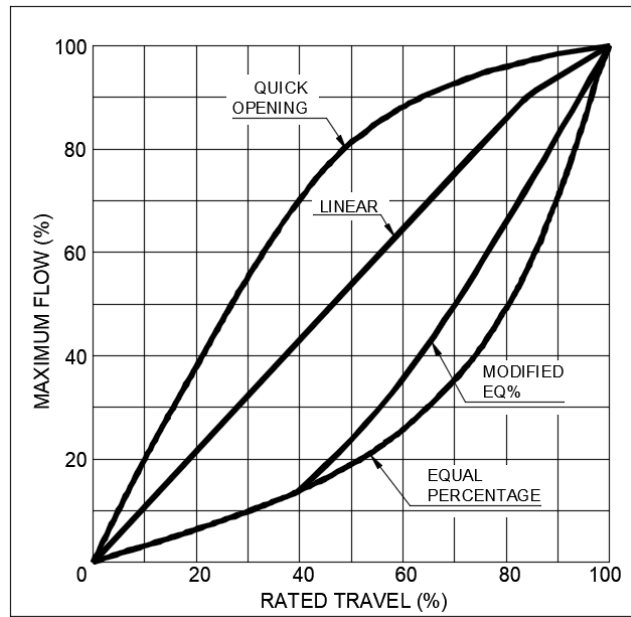


Figure 5. Characteristic curves table

## Maximum Leakage Rates

Leakage rates are normally measured in accordance with the ANSI / FCI 70-2 specification using the class designation. The following Table defines the achievable leakage class for each available plug design.

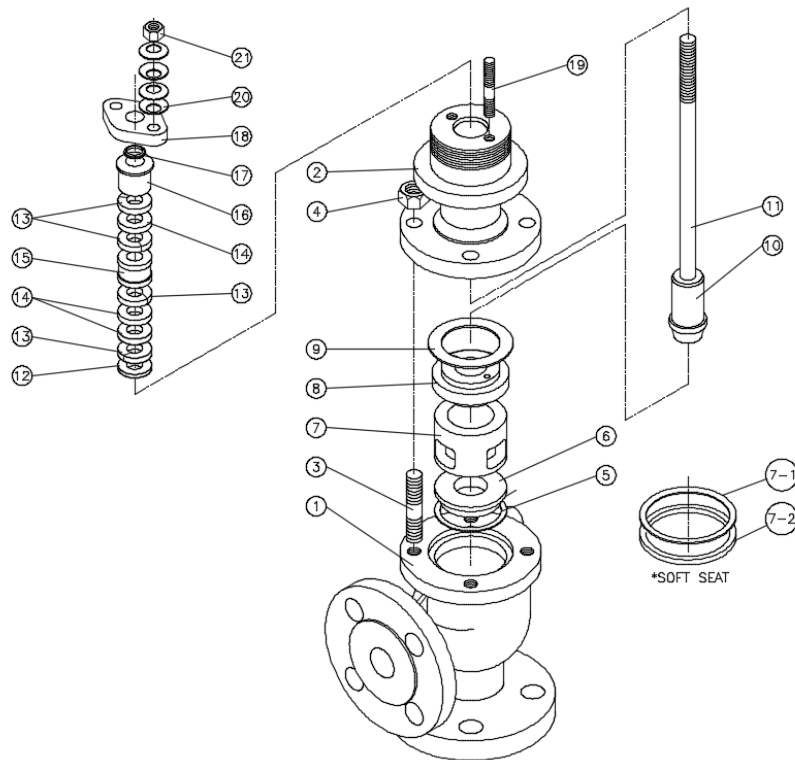
Table 8. Maximum Leakage Rates (FCI 70-2)

Plug Design	Seating Style	Achievable Leakage Class
Unbalanced (S-P)	Metal/Metal (standard)	IV
Unbalanced (S-P)	Metal/Metal (special)	V
Unbalanced (S-P)	Metal/PTFE (standard)	VI
Balanced (C-B)	Metal/Metal (standard)	IV
Balanced (C-B)	Metal/Metal (special)	V
Balanced (C-B)	Metal/PTFE (standard)	VI

Note. (standard) or (special) refer to the amount seat/plug lapping carried out at final assemble.

S-P : Simple contoured plug.  
 C-B : Cage single balance plug.





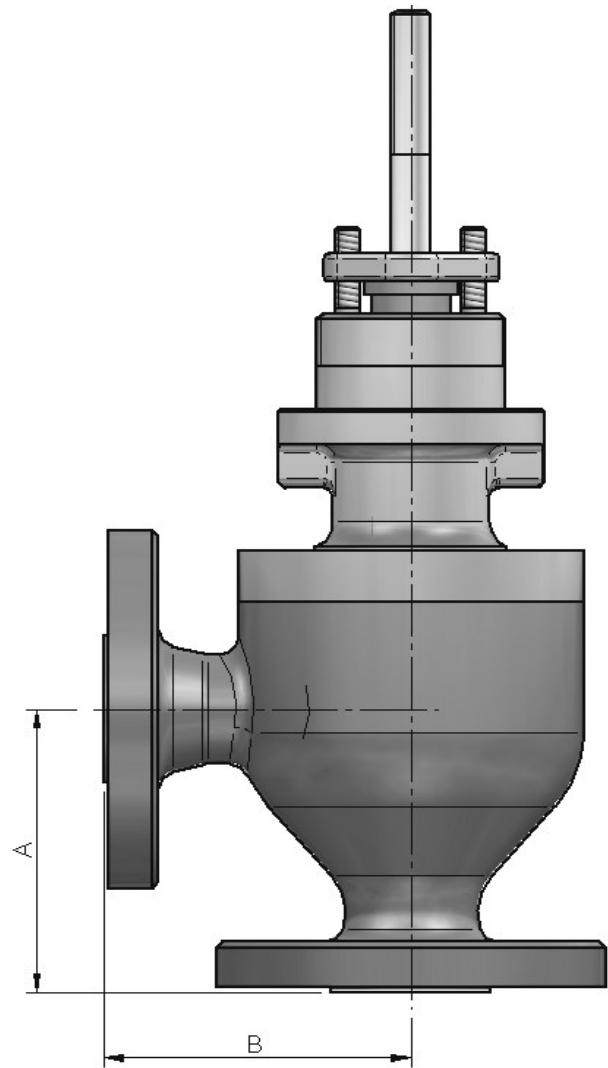
### PARTS LIST

21	HEX. NUT	STAINLESS STEEL	2
20	CONED DISC SPRING	SK5M	8
19	GLAND BOLT	STAINLESS STEEL	2
18	GLAND FLANGE	STAINLESS STEEL	1
17	DUST RING	TEFLON	1
16	GLAND FOLLOWER	STAINLESS STEEL	1
15	LANTURN RING	STAINLESS STEEL	1
14	GLAND PACKING	GRAPHITE	3
13	GLAND PACKING	CARBON FIBER	4
12	PACKING RING	STAINLESS STEEL	1
11	STEM	316L SS, ALLOY STEEL	1
10	INNER VALVE	STAINLESS STEEL, ALLOY STEEL	1
9	BONNET GASKET	SUS+GRAPHITE, SUS+TEFLON	1
8	GUIDE	STAINLESS STEEL, ALLOY STEEL	1
7-2	TEFLON SEAT	TEFLON	1
7-1	SEAT RETAINER (2)	STAINLESS STEEL, ALLOY STEEL	1
7	SEAT RETAINER (1)	STAINLESS STEEL, ALLOY STEEL	1
6	SEAT RING	STAINLESS STEEL, ALLOY STEEL	1
5	SEAT GASKET	SUS+GRAPHITE, SUS+TEFLON	1
4	HEX. NUT	2H, 8, B8M	4
3	STUD BOLT	B7, B8, B8M	4
2	PLAIN BONNET	WCB, CF8, CF8M	1
1	BODY	WCB, CF8, CF8M	1
NO.	NAME OF PARTS	MATERIALS	Q'TY

Figure 6. Body Disassembly and Assembly Diagram

(Unit: mm)

Pressure Rating	A, B				
	JIS 10K ANSI 150RF	JIS 20K ANSI 300RF	JIS 30K ANSI 600RF	JIS 40K,63K ANSI 900RF	JIS 100K ANSI 1500RF
20	92	97	103	146	146
25	92	98.5	105	146	146
40	111	117.5	125.5	166.5	166.5
50	127	133.5	143	187.5	187.5
65	138	146	155.5	205	205
80	149	159	168.5	220.5	230
100	176	184	197	255.5	265
150	225.5	236.5	254	357	384
200	271.5	284	305	457	486
250	336.5	354	376	495.5	533.5
300	368.5	387.5	409.5	565	609.5
350	444.5	463.5	486	628.5	628.5



Tables 9. Outline Dimensions

### Warranty / Remedy

Korea Motoyama Inc. warrants goods of its manufacture as being free of defective materials and faulty workmanship for 12 months from the date of shipment, unless otherwise specified. In this period, all of our products claimed by original defects may be returned to our factory after notice and authorization by us. If warranted goods are returned to Korea Motoyama Inc. during the period of coverage, it will be repaired or replaced without charge for those items it finds defective. Such defects shall be exclusive of the effects of corrosion, erosion, normal wear or improper handling and storage. In case our engineers have field service, the user shall detach and install valves by his cost. Determination of the suitability of the Products for the use contemplated by the buyer or buyer's customer(s) is the sole responsibility of the buyer in connection therewith. The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

**Specifications are subject to change without notices.**



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