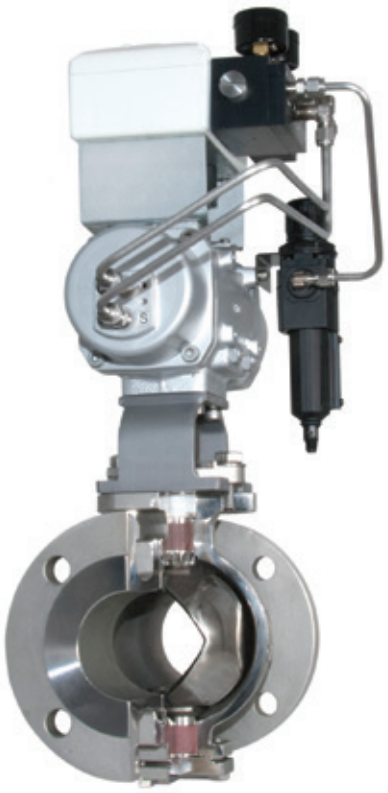
KTM V-PORT CONTROL BALL VALVE

FULL BORE AND REDUCED BORE

A rugged, long-life V-port control ball valve with excellent flow characteristics for various fluids including slurries and fibers



GENERAL APPLICATION

Steam, liquids, gas or critical services in pulp and paper industry, fibrous materials, pellet slurry, high viscous solutions and other fluids having special characteristics.

TECHNICAL DATA

Full bore:	VA11 / VA12 DN 25 - DN 200 (NPS 1 - 8) W0601 / W0602 DN 250 - DN 300 (NPS 10 - 12)
Reduced bore:	VA21 / VA22 DN 40 - DN 250 (NPS 1½ - 10) W0401 / W0402 DN 300 - DN 500 (NPS 12 - 20)
Temperature:	-29°C to 350°C
Pressure rating:	ASME Class 150, 300 JIS 10K, 20K
Face to face:	ASME B16.10 Long pattern (full bore) ASME B16.10 Short pattern (reduced bore)

FEATURES

- Rotary-valve design provides shearing action between the V-notch ball and the seat, promoting a smooth, non-clogging operation.
- Straight-through flow design provides high capacity for fluids.
- With a single-seat design, torque is lower than typical trunnion design valves, for ease of operation and reduced actuator cost.
- Two seat designs:
  - Laminated seat provides ASME/FCI 70-2 class IV shut-off and withstands tough operating conditions.
  - Thick (solid) seat for high-velocity and abrasive or erosive service.
- Segmented, V-notched ball features high rangeability and smooth throttling action.
- Choice of full and reduced port, providing the right flow capacity for every application at low cost.
- Machined ISO 5211 top mounting flange (VA series only).
- Heavy-duty, stainless steel shaft for high strength and rigidity.
- Multiple, adjustable ring packing allows easy adjustment without valve disassembly or actuator removal.
- Shaft bearings assure a durability, smooth and easy valve operation.
- Positive alignment of split body.
- The spline connection minimises the backlash of shaft and disk. It results excellent control performance.

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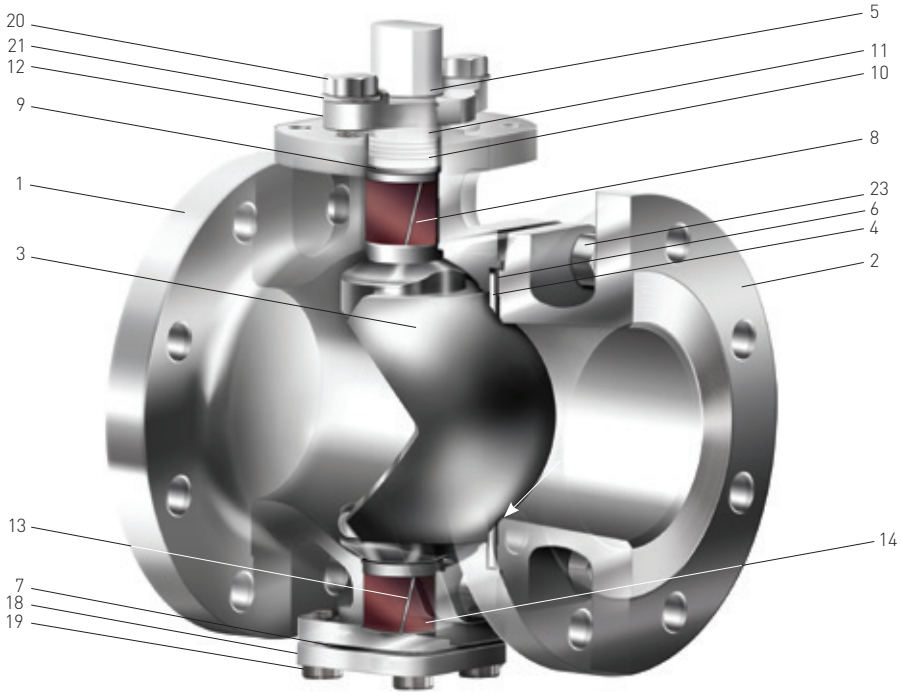

NOTE: The illustration shows body construction of V-port ball valve, Model VA11 in DN 100.

PARTS LIST

No.	Description	Material
1	Body	CF8M, CF8 or WCB
2	Body cap	CF8M, CF8 or WCB
3	Disc	CF8M HCr or CF8M stellited
4	Seat	Laminated 316S/S or thick (solid) 316S/S stellited
5	Shaft	316S/S
6	Gasket	Non asbestos joint sheet (standard) or R-PTFE (option)
7	Gasket	Non asbestos joint sheet (standard) or R-PTFE (option)
8	Shaft bearing	R-PTFE
9	Thrust washer	316S/S
10	Gland packing	PTFE V-ring (standard) or expanded graphite (optional)
11	Packing washer	316S/S
12	Gland flange	CF8
13	Lower shaft	316S/S
14	Shaft bearing	R-PTFE
15	Thrust bearing	R-PTFE (Not shown on illustration)
16	Shim	316S/S (Not shown on illustration)
17	Pivot	316S/S (Not shown on illustration)
18	Lower cover	316S/S
19	Bolt	304S/S
20	Gland bolt	A193 (G) B8
21	Live loading spring	304S/S
22	Stud	A193 (G) B8 (Not shown on illustration)
23	Nut	A194 (G) 8

OPTIONS

Special tests
- X-ray (RT)
- Liquid penetrant (PT)
- Positive material identification (PMI)

NOTES:

1. Shaft and disc are connected by spline in Model VA11, VA12, W0601, and W0602 size up to DN 250 and in Model VA21, VA22, W0401, and W0402 size up to DN 300. For larger sizes, connections are by key.
2. Throttle lever or gear operator, not shown here, is required for manual operation.
3. For details of the trim, please refer to trim table on page 7.

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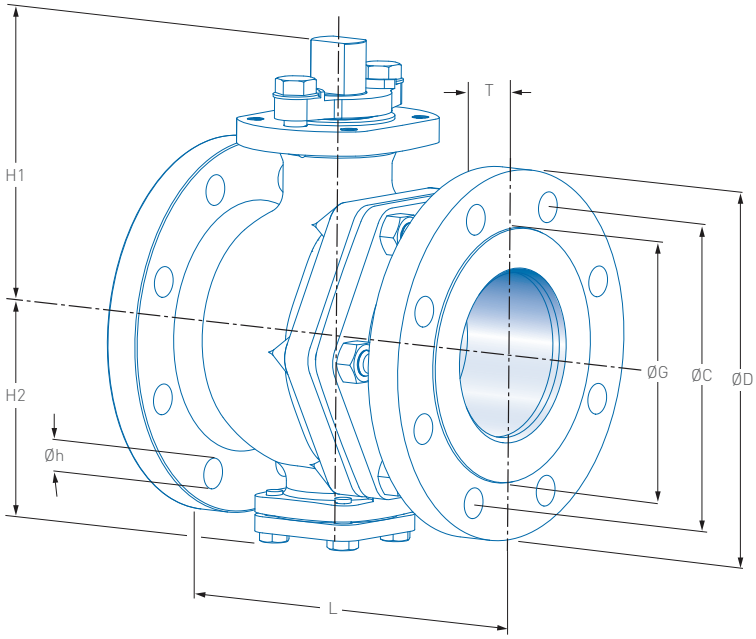
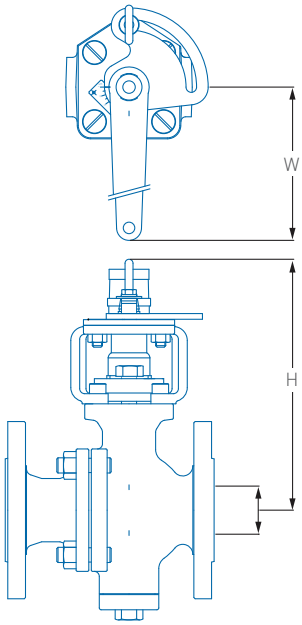
FULL BORE AND REDUCED BORE





ASME CLASS 150 / JIS 10K DIMENSIONS (mm)

	Full bore					Reduced bore					ASME flange dimensions						JIS flange dimensions					
DN	**L**	**H1**	**H2**	**H**	**W**	**L**	**H1**	**H2**	**H**	**W**	**ØD**	**ØC**	**ØG**	**T**	**N**	**Øh**	**ØD**	**ØC**	**ØG**	**T**	**N**	**Øh**
VA *																						
25	127.0	88	62	167.5	160	-	-	-	-	-	108	79.5	51	11.2	4	16	125	90	67	14	4	19
40	165.0	119	87	205.5	230	165	88	62	167.5	160	127	98.5	73	14.3	4	16	140	105	81	16	4	19
50	178.0	124	92	210.5	230	178	119	87	205.5	230	152	120.5	92	15.9	4	19	155	120	96	16	4	19
65	190.0	157	105	272.5	400	190	124	92	210.5	230	178	139.5	105	17.5	4	19	175	140	116	18	4	19
80	203.0	163	111	278.5	400	203	157	105	272.5	400	190	152.2	127	19.1	4	19	185	150	126	18	8	19
100	229.0	186	131	304.0	400	229	163	111	278.5	400	229	190.5	157	23.9	8	19	210	175	151	18	8	19
125	356.0	256	167	419.0	1055	254	186	131	304.0	400	254	216.0	186	23.9	8	22	250	210	182	20	8	23
150	394.0	269	180	431.0	1055	267	256	167	419.0	1055	279	241.5	216	25.4	8	22	280	240	212	22	8	23
200	457.0	351	246	-	-	292	269	180	431.0	1055	343	298.5	270	28.6	8	22	330	290	262	22	12	23
250	-	-	-	-	-	457	351	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W0 **																						
250	533	361	271	-	-	-	-	-	-	-	406	362.0	324	30.2	12	25	400	355	324	24	12	25
300	610	453	333	-	-	502	361	271	-	-	483	432.0	381	31.8	12	25	445	400	368	24	16	25
350	-	-	-	-	-	572	453	333	-	-	533	476.0	413	35.0	12	29	490	445	413	26	16	25
400	-	-	-	-	-	610	478	358	-	-	597	539.5	470	36.6	16	29	560	510	475	28	16	27
450	-	-	-	-	-	660	538	412	-	-	635	578.0	533	39.7	16	32	620	565	530	30	20	27
500	-	-	-	-	-	711	580	433	-	-	698	635.0	584	42.9	20	32	675	620	585	30	20	27

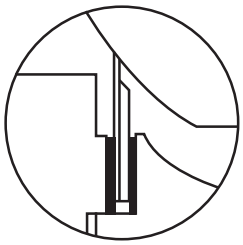
ASME CLASS 300 / JIS 20K DIMENSIONS (mm)

	Full bore					Reduced bore					ASME flange dimensions						JIS flange dimensions					
DN	**L**	**H1**	**H2**	**H**	**W**	**L**	**H1**	**H2**	**H**	**W**	**ØD**	**ØC**	**ØG**	**T**	**N**	**Øh**	**ØD**	**ØC**	**ØG**	**T**	**N**	**Øh**
VA *																						
25	165	88	67	167.5	160	-	-	-	-	-	124	89.0	51	17.5	4	19	125	90	67	16	4	19
40	190	119	94	205.5	230	190	88	67	167.5	160	156	114.5	73	20.7	4	22	140	105	81	18	4	19
50	216	124	99	210.5	230	216	119	94	205.5	230	165	127.0	92	22.3	8	19	155	120	96	18	8	19
65	241	157	110	272.5	400	241	124	99	210.5	230	190	149.0	105	25.4	8	22	175	140	116	20	8	19
80	283	163	116	278.5	400	283	157	110	272.5	400	210	168.0	127	28.6	8	22	200	160	132	22	8	23
100	305	186	136	304.0	400	305	163	116	278.5	400	254	200.0	157	31.8	8	22	225	185	160	24	8	23
125	381	256	175	419.0	1055	381	186	136	304.0	400	279	235.0	186	35.0	8	22	270	225	195	26	8	25
150	403	269	187	431.0	1055	403	256	175	419.0	1055	318	270.0	216	36.6	12	22	305	260	230	28	12	25
200	502	351	255	-	-	419	269	187	431.0	1055	381	330.0	270	41.3	12	25	350	305	275	30	12	25
250	-	-	-	-	-	457	351	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W0 **																						
250	568	361	270	-	-	-	-	-	-	-	444	387.5	324	47.7	16	29	430	380	345	34	12	27
300	-	-	-	-	-	502	361	280	-	-	521	451.0	381	50.8	16	32	480	430	395	36	16	27

NOTES: N = Number of bolts * = VA series ** = W0 series

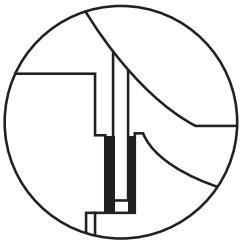
SEAT SELECTION

The KTM V-port valve is a single-seat design. Torque is lower than typical trunnion design valves resulting in easier operation and reduced actuator cost.
Choose from two unique seat designs:



LAMINATED SEAT

Provides ASME/FCI 70-2 Class IV shut-off and withstands tough operating conditions.



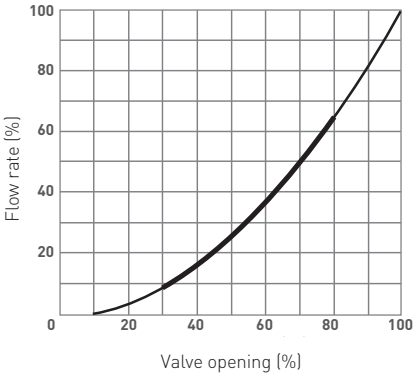
THICK (SOLID) SEAT

For high-velocity, abrasive and erosive service. ASME/FCI 70-2 Class II shut-off.

Seat leakage for Laminated seat is equivalent to Class IV, however the actual test pressure seat leakage is 1.5 ml/inch* and smaller (Hydro).
** inch is nominal port size*

INHERENT FLOW CHARACTERISTICS

V-port valves maintain an inherent flow characteristic, which is approximately midway between linear and equal percent.



NOTE:
Bolded line shows a range of control

MATERIALS SELECTION

Temperature*	Gland packing	Thrust bearing	Shaft bearing	Seat
Up to 200°C	PTFE	R-PTFE	R-PTFE	Laminated /Thick seat
200°C to 250°C	R-PTFE	R-PTFE	R-PTFE	Laminated /Thick seat
Over 250°C**	Graphite	Graphite	Stellite	Laminated /Thick seat

* Laminated seat (Max. temp 300°C), Thick seat (Max. temp 350°C)
** Please consult us for the details of temperature range above 250°C

TEST PRESSURE

	Shell (MPa)		
Rating	Carbon steel	Stainless steel	Seat (MPa)
ASME Class 150	3.10	2.93	Thick seat: 0.3 MPa
ASME Class 300	7.76	7.58	Laminated seat: Lower value out of comparison between A (Fluid pressure x 1.1) and B (MASP* for V-port valve). (0.3 MPa unless otherwise stated.)
JIS 10K	2.10	2.10	
JIS 20K	5.10	5.10	

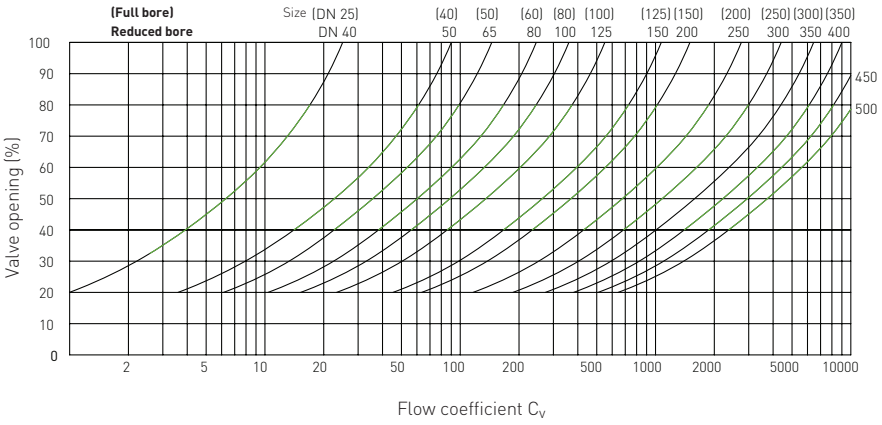
* Maximum Allowable Shut off Pressure (Please refer to page 5 for the details)

MAX SHUT-OFF PRESSURE

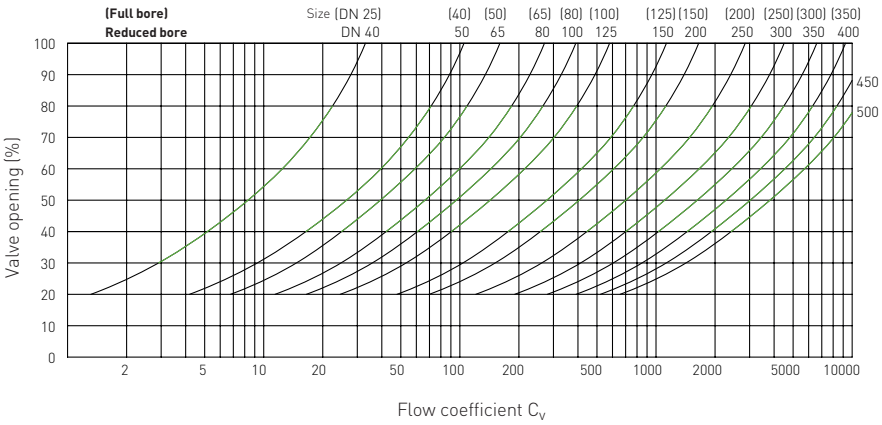
Valve size (DN)		Max. shut-off pressure (MPa)	
Full bore	**Reduced bore**	**Laminated seat**	**Thick seat**
25	40	2.2	5
40	50	2.2	5
50	65	2.2	5
65	80	2.2	5
80	100	2.1	5
100	125	2.0	5
125	150	1.9	5
150	200	1.7	5
200	250	1.5	2
250	300	1.3	2
300	350	1.2	2
-	400	1.0	2
-	450	0.8	2
-	500	0.6	2

VALVE OPENING VS. FLOW COEFFICIENT C_v (PIPE SIZE IS SAME AS VALVE SIZE)

LAMINATED SEAT



THICK SEAT



NOTE:
Please choose the valve in the range of green lines when you select the valve size.

KTM V-PORT CONTROL BALL VALVE
FULL BORE AND REDUCED BORE

EFFECTIVE FLOW COEFFICIENT C_V (FULL BORE: MODEL VA11, VA12, W0601, W0602)

	Valve size	Pipe size = Valve size		Pipe size = 1.5 x Valve size		Pipe size = 2 x Valve size	
Model	(DN)	Thick seat	Laminated seat	Thick seat	Laminated seat	Thick seat	Laminated seat
VA11/VA12	25	33	25	26	22	23	20
VA11/VA12	40	105	90	72	66	60	57
VA11/VA12	50	160	145	118	112	101	97
VA11/VA12	65	270	245	190	180	160	155
VA11/VA12	8	390	360	280	270	235	230
VA11/VA12	100	580	550	450	430	387	378
VA11/VA12	125	1,130	1,070	790	770	660	650
VA11/VA12	150	1,650	1,500	1,140	1,090	950	920
VA11/VA12	200	2,850	2,750	2,000	1,960	1,680	1,660
W0601/WO602	250	4,500	4,400	3,140	3,110	2,630	2,610
W0601	300	6,600	6,450	4,560	4,510	3,820	3,790

EFFECTIVE FLOW COEFFICIENT C_V (REDUCED BORE: MODEL VA21, VA22, W0401, W0402)

	Valve size	Pipe size = Valve size		Pipe size = 1.5 x Valve size		Pipe size = 2 x Valve size	
Model	(DN)	Thick seat	Laminated seat	Thick seat	Laminated seat	Thick seat	Laminated seat
VA21/VA22	40	33	25	31	24	30	24
VA21/VA22	50	105	90	90	80	82	74
VA21/VA22	65	160	145	140	130	130	120
VA21/VA22	80	270	245	220	210	200	190
VA21/VA22	100	390	360	340	320	310	300
VA21/VA22	125	580	550	510	490	470	460
VA21/VA22	150	1,130	1,070	920	890	810	790
VA21/VA22	200	1,650	1,500	1,420	1,320	1,290	1,220
VA21/VA22	250	2,850	2,750	2,390	2,330	2,140	2,100
W0401/WO402	300	4,500	4,400	3,660	3,610	3,240	3,210
W0401	350	6,600	6,450	5,230	5,140	4,580	4,530
W0401	400	9,250	9,000	7,140	7,020	6,180	6,110
W0401	450	12,300	12,000	9,300	9,170	8,000	7,910
W0401	500	15,500	15,200	11,610	11,490	9,960	9,880

SIZING EQUATION

Fluid	Remarks	Equation
Liquid	$\Delta P < F_L^2 \cdot (P_1 - P_V)$	$C_V = \frac{Q_L}{0.0865} \sqrt{\frac{G_L}{\Delta P}}$
	$\Delta P \geq F_L^2 \cdot (P_1 - P_V)$	$C_V = \frac{Q_L}{0.0865 \cdot F_L} \sqrt{\frac{G_L}{P_1 - P_V}}$
Gas	$X < F_k \cdot X_T$	$C_V = \frac{Q_g}{4.17 \cdot P_1 \cdot Y} \sqrt{\frac{G_g \cdot T_1 \cdot Z}{X}}$ $C_V = \frac{W}{0.948 \cdot P_1 \cdot Y} \sqrt{\frac{T_1 \cdot Z}{X \cdot M}}$ $C_V = \frac{W}{2.73 \cdot Y \cdot \sqrt{X \cdot P_1 \cdot \Upsilon_1}}$
	$X \geq F_k \cdot X_T$	$C_V = \frac{Q_g}{2.78 \cdot P_1} \sqrt{\frac{G_g \cdot T_1 \cdot Z}{F_k \cdot X_T}}$ $C_V = \frac{W}{0.632 \cdot P_1} \sqrt{\frac{T_1 \cdot Z}{F_k \cdot X_T \cdot M}}$ $C_V = \frac{W}{1.82 \sqrt{F_k \cdot X_T \cdot P_1 \cdot \Upsilon_1}}$
Saturated steam	$X < F_k \cdot X_T$	$C_V = \frac{W}{0.138 \sqrt{\Delta P \cdot (P_1 + P_2)}}$
	$X \geq F_k \cdot X_T$	$C_V = \frac{W}{0.119 \cdot F_L \cdot P_1}$
Superheated steam	$X < F_k \cdot X_T$	$C_V = \frac{W \cdot (1 + 0.00126 \cdot T_{sh})}{0.138 \cdot \sqrt{\Delta P \cdot (P_1 + P_2)}}$
	$X \geq F_k \cdot X_T$	$C_V = \frac{W \cdot (1 + 0.00126 \cdot T_{sh})}{0.119 \cdot F_L \cdot P_1}$

NOTES:

C_V: Flow coefficient
F_K: Specific heat ratio factor
F_L: Liquid pressure recovery factor of a control valve without attached fittings (V-ball: 0.6)
G_L: Liquid specific gravity at upstream condition
G_g: Gas specific gravity
M: Molecular mass of flowing fluid
P_1: Inlet absolute static pressure (KPaA)
P_2: Outlet absolute static pressure (KPaA)
ΔP: Differential pressure (P_1-P_2) (KPaA)
P_V: Absolute vapour pressure of liquid at inlet temperature (KPaA)
Q_g: Gas volumetric flow rate (m^3/h)
Q_L: Liquid volumetric flow rate (m^3/h)
T_1: Inlet absolute temperature (°k) (273+°C)
T_{sh}: Degree of superheat (°C)
W : Mass flow rate (kg/h)
X: Ratio of pressure differential to inlet absolute pressure ($\Delta P/P_1$)
X_T: Pressure differential ratio factor of a control valve without attached fittings at choked flow (V-ball: 0.3)
Y: Expansion factor

$$Y = 1 - \frac{X}{3 \cdot F_K \cdot X_T}$$

Z: Compressibility factor
Υ_1: Density of fluid at P_1 & T_1 (kg/m^3)

PULP CONSISTENCY CORRECTION

Pulp consistency	Consistency correction factor K_s	
	Chemical stock	Mechanical stock
1	1.00	1.00
2	1.03	1.01
3	1.11	1.05
4	1.20	1.09
5	1.25	1.11

NOTE:
Qp = K_sQ where 'K_s' is correction factor and 'Q' is actual flow rate. Required C_v is determined by substituting this Q_p for Q_L in the sizing equations on page 6.

TRIM TABLE

Bore type / Full bore	Trim code*	Valve code	Size	Disc	Shaft	Seat
	3L	VA11, VA12	DN 25 - DN 200	CF8M HCr	316S/S	316S/S Laminated
		W0601, W0602	DN 250	CF8M HCr	316S/S	316S/S Laminated
		W0601	DN 300	CF8 HCr	304S/S	316S/S Laminated
	3S	VA11, VA12	DN 25 - DN 200	CF8M + Stellite	316S/S	316S/S + Stellite
		W0601, W0602	DN 250	CF8M + Stellite	316S/S	316S/S + Stellite
		W0601	DN 300	CF8 + Stellite	304S/S	304S/S + Stellite
	4L	VA11, VA12	DN 25 - DN 200	CF8M HCr	316S/S + Stellite	316S/S Laminated
		W0601, W0602	DN 250	CF8M HCr	316S/S + Stellite	316S/S Laminated
		W0601	DN 300	CF8 HCr	304S/S + Stellite	316S/S Laminated
	4S	VA11, VA12	DN 25 - DN 200	CF8M + Stellite	316S/S + Stellite	316S/S + Stellite
		W0601, W0602	DN 250	CF8M + Stellite	316S/S + Stellite	316S/S + Stellite
		W0601	DN 300	CF8 + Stellite	304S/S + Stellite	304S/S + Stellite
Reduced bore						
	3L	VA21, VA22	DN 40 - DN 250	CF8M HCr	316S/S	Laminate**
		W0401, W0402	DN 300	CF8M HCr	316S/S	Laminate**
		W0401	DN 350 - DN 500	CF8 HCr	304S/S	Laminate**
	3S	VA21, VA22	DN 40 - DN 250	CF8M + Stellite	316S/S	316S/S + Stellite
		W0401, W0402	DN 300	CF8M + Stellite	316S/S	316S/S + Stellite
		W0401	DN 350 - DN 500	CF8 + Stellite	304S/S	304S/S + Stellite
	4L	VA21, VA22	DN 40 - DN 250	CF8M HCr	316S/S + Stellite	Laminate**
		W0401, W0402	DN 300	CF8M HCr	316S/S + Stellite	Laminate**
		W0401	DN 350 - DN 500	CF8 HCr	304S/S + Stellite	Laminate**
	4S	VA21, VA22	DN 40 - DN 250	CF8M + Stellite	316S/S + Stellite	316S/S + Stellite
		W0401, W0402	DN 300	CF8M + Stellite	316S/S + Stellite	316S/S + Stellite
		W0401	DN 350 - DN 500	CF8 + Stellite	304S/S + Stellite	304S/S + Stellite

NOTES:
* Code 3L and 4L for Laminated seat and 3S and 4S for Thick seat
** The base materials are 316SS for DN 350 and smaller sizes, and 304SS for DN 400 and larger sizes
Size DN 40 or larger for WCB body
For ASME Class 300, full bore size up to DN 250 and reduced bore size up to DN 300 only
HCr: Hard chromium plating

KTM V-PORT CONTROL BALL VALVE
FULL BORE AND REDUCED BORE

SELECTION GUIDE

Example									**VA11**	**-**	**-**	**32**	**3L**	**A15**	**RF**	**25**	**-**
Valve code																	
Code	**ASME**	**JIS**	**Description**														
VA11	150	10K	Full bore, DN 25 - DN 200														
VA12	300	20K	Full bore, DN 25 - DN 200														
VA21	150	10K	Reduced bore, DN 40 - DN 250														
VA22	300	20K	Reduced bore, DN 40 - DN 250														
W0601	150	10K	Full bore, DN 250 - DN 300														
W0602	300	20K	Full bore, DN 250														
W0401	150	10K	Reduced bore, DN 300 - DN 500														
W0402	300	20K	Reduced bore, DN 300														
Sub code																	
Code	**Description**																
Blank	Metal seat																
Special feature																	
Code	**Description**																
Blank	Not applicable																
K	Powder service (please consult for details)																
Body code																	
Code	**JIS**		**ASTM**														
31	SCS13A (304S/S)		CF8 (304S/S)														
32	SCS14A (316S/S)		CF8M (316S/S)														
62	SCPH2 or S25C		WCB														
Trim code*																	
Code	**Disc**		**Seat**		**Packing**		**Shaft**										
3L	S/S with HCr		S/S laminate		PTFE		S/S										
3S	S/S with stellite		S/S with stellite		PTFE		S/S										
4L	S/S with HCr		S/S laminate		PTFE		S/S with stellite										
4S	S/S with stellite		S/S with stellite		PTFE		S/S with stellite										
Flange code																	
ASME	**Description**		**JIS**		**Description**												
A15	ASME Class 150		J10		JIS 10K												
A30	ASME Class 300		J20		JIS 20K												
Connection code																	
Code	**Description**																
RF	Raised face (125 to 250 AARH)																
Size code																	
Code	**25**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**		
DN	25	40	50	65	80	100	125	150	200	250	300	350	400	450	500		
NPS	1	1½	2	2½	3	4	5	6	8	10	12	14	16	18	20		
Option code																	
Code	**Description**																
Blank	No additional option																

NOTES:

* For details of the trim, please refer to the trim table on page 7

HCr: Hard chromium plating

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