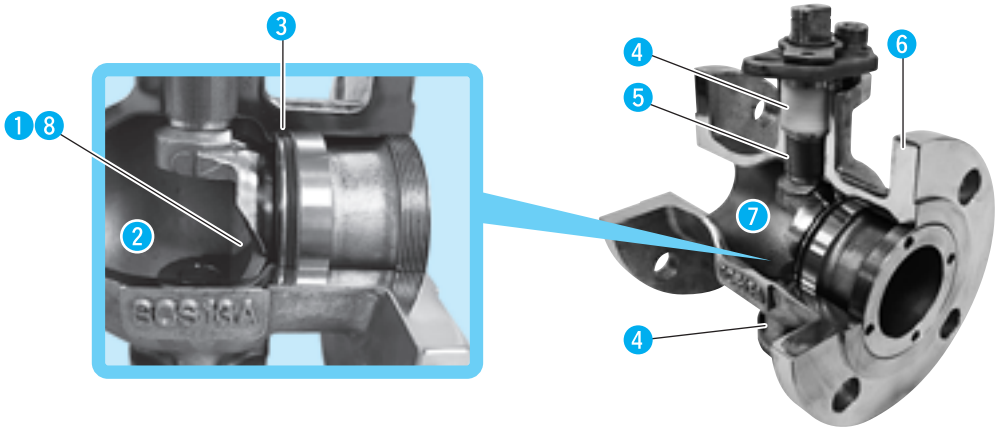
Structure and Feature of V-Port Valve

Structure and Features

V-Port Valve is the most suitable for resin pellet (nylon etc.), powder (fly ash etc.), paper mill (pulp fluid), slurry (steel mill, muddy water, lime milk etc.) and any other high viscous fluid.
The valve has high performance for heat resistance, abrasion resistance and flow control.




Ball

❶ V-Cut Ball

The valve is effective to cut cellulose or solid matter by V shaped opening of the half-sphere ball.
The valve is superior for abrasion resistance by stelite applied to seat side and lapping applied surface of ball. (note; For soft seta , hard chrome plated.)

❷ Pocketless Structure

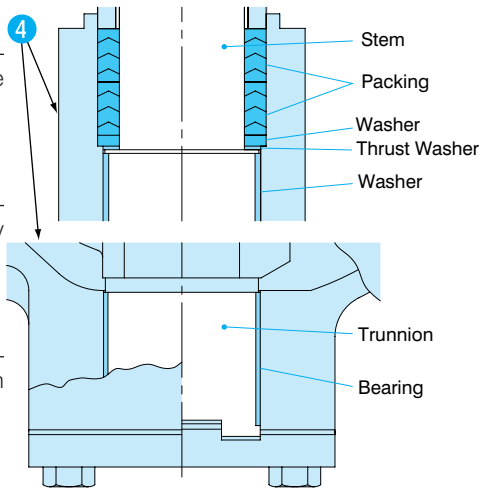
Since seat is located at inlet side only, congestion of fluid or clogging between ball and body will not occur. By this seal configuration, abnormal pressure rise will not occur too.

❸ Seat with Heat Resistance and Abrasion Resistance

The seat has both rigidity and flexibility, therefore, it can seal from vacuum to high pressure without an influence by temperature and/or pressure difference. The valve is usable in high temperature if metal seat is applied. The seat has high abrasion resistance against abrasive fluid such as slurry and powder. (The details about the seat are described in the next page.)

❹ Stable Bearing Configuration

Reinforced PTFE is applied to bearings for stem and trunnion and therefore, the operation torque is low and the frequent operation is possible.



❺ Gland Packing with Superior Sealing

Perfect sealing is possible from vacuum condition to high pressure condition by applying V-Packing. (V100ND)

❻ Integrated Body

The valve body is an all integrated body. Therefore, there are no fluctuations in torque by piping stress, no deterioration of sealing or no external leakage.

❼ Full Flow

When the valve is fully opened, the flow passage is almost straight, minimizing pressure loss and ensuring a full capacity flow. Slurry or high viscous fluids can flow the passage smoothly without congestion or cavitation.

❽ Flow Control

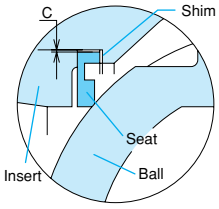
The V-shaped cut ball increases rangeability and enhance flow rate control ability. The flow characteristics are almost equal percentage.

Reference for Seat Selection

Seat Specification and Features (V100ND)

- Solid (thick) Seat, Thin Seat and Soft (Reinforced PTFE) Seat are available for wide range purposes.
- The above three kinds of seats are compatible.
- Outer diameter has a clearance C. By placing the seat on the spherical surface of the ball, seal surface of the seat becomes centripetal and equal contact can be obtained.

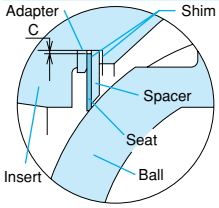
Solid (thick) Seat (Code: ST)



SUS316 (Stellite at seal surface). When the insert is tightened, a notch at the backside of the seat makes cantilever action and seal surface of the seat adheres to the surface of the ball.

Application: resin pellet, powder, slurry, high viscous fluid

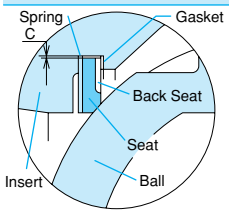
Thin Seat (Code: M)



Thin spring plate of SUS316H. The principle of the seal is cantilever as same as the solid seat.
However, since the flexibility is better, the leakage tolerance and the torque of the valve can be minimized than the solid seat.

Application: cellulose fluid, viscous fluid, sludge

Soft Seat (Code: CF)



Carbonfiber reinforced PTFE. Since the seat spring acts as cantilever, more stable sealing than thin seat can be obtainable.

Application: water, oil, air, for on-off control of clean fluid

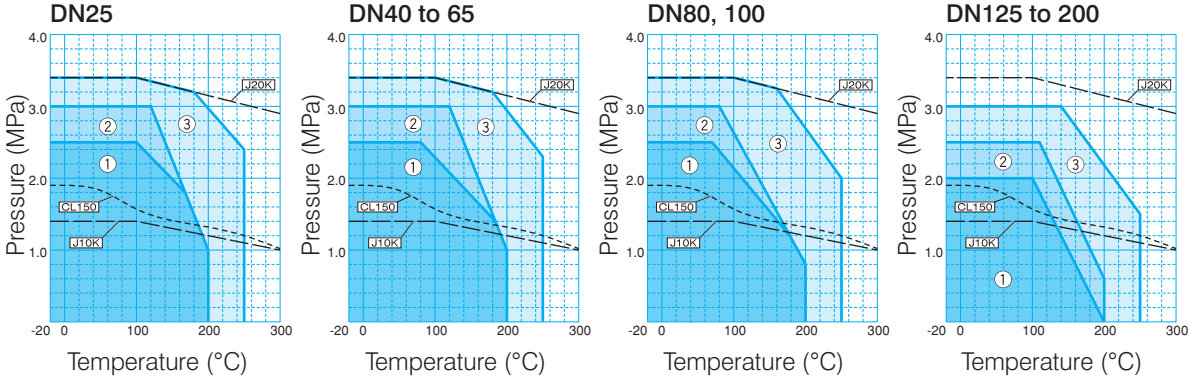
Allowable Seat Leakage

Kind of Seat	Allowable Leakage	Applicable Code
Solid Seat (ST)	0.5% of rated Cv	ANSI B16.104 Class II and IEC534-4 Class II
Thin Seat (M)	0.0005% of rated Cv	ANSI B16.104 Class IV 1/20 and IEC534-4 Class IV-S1
Soft Seat (CF)	Zero leakage	—

Remark: Solid seat with allowable leakage of 0.002% is also available.

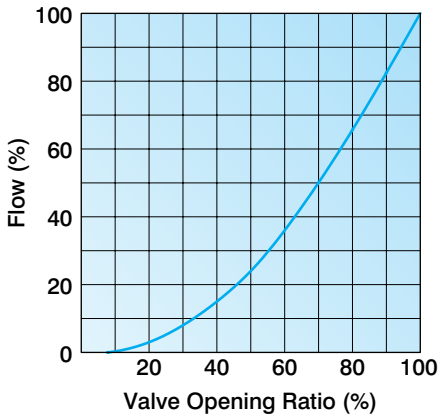
Working Pressure and Temperature Range

CF: ①
M : ②
ST: ③



✻ DN125 to 200 is V100NC.

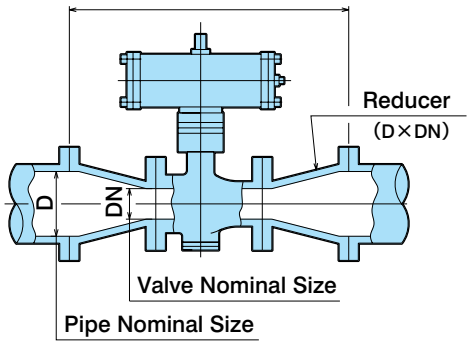
Flow Characteristics



Flow Coefficient Cv Value (Adjusted Cv value considering rated Cv and effects by reducer)

DN	Rated Cv	D×DN	Adjusted Cv	D×DN	Adjusted Cv	D×DN	Adjusted Cv
25	28	40×25	23	50×25	21	65×25	20
40	75	50×40	68	65×40	60	80×40	55
50	153	65×50	127	80×50	110	100×50	95
65	250	80×65	218	100×65	185	125×65	165
80	350	100×80	312	125×80	270	150×80	245
100	540	125×100	480	150×100	430	200×100	360
125	930	150×125	835	200×125	675	250×125	575
150	1320	200×150	1110	250×150	950	300×150	830
200	2000	250×200	1800	300×200	1620	350×200	1500

Adjusted Cv based on the reducer type



Cv value Calculation

Fluid		Formula
Liquid	General	$C_V=11.56V\sqrt{\frac{G}{(P_1-P_2)}}$
	Viscous Fluid	$C_V=11.56V\cdot R\cdot\sqrt{\frac{G}{(P_1-P_2)}}$
Gas	$\Delta P<\frac{P_1}{2}$	$C_V=\frac{Q}{2.93}\sqrt{\frac{G(273+t)}{\Delta P(P_1+P_2)}}$
	$\Delta P\geq\frac{P_1}{2}$	$C_V=\frac{Q\sqrt{G(273+t)}}{2.538P_1}$
Steam	$\Delta P<\frac{P_1}{2}$	$C_V=\frac{WK}{0.1391\sqrt{\Delta P(P_1+P_2)}}$
	$\Delta P\geq\frac{P_1}{2}$	$C_V=\frac{WK}{0.1205P_1}$

V: Maximum Flow (m³/hr)
G: Gravity (water: 1, air: 1)
P1: Valve inlet pressure (kPa·A)
P2: Valve outlet pressure (kPa·A)
ΔP: P1-P2 (kPa)
R: Viscosity correction factor
t: Temperature(°C)
Q: Maximum Flow (15.6°C, 101.3 kPa)
W: Maximum Flow (kg/hr)
K: 1+(0.0013 x Superheated value°C)

Superheated value:
Temperature difference (t-t1) between saturate temperature (t) in absolute pressure at valve inlet and temperature at valve inlet (t1).
For saturated steam, superheated value is assumed to be zero.

Pulp Density Correction Value

Density (%)	Correction Factor (K1)
1	1
2	1.1
3	1.2
4	1.4
5	1.9

Remarks:
1. Viscosity correction factor R will be applied when the fluid is more than 20cSt.
2. Pulp density correction will be calculated by multiplying Cv value with K1 (Viscous fluid formula to be used.)

3 V-Port Valve: V100ND

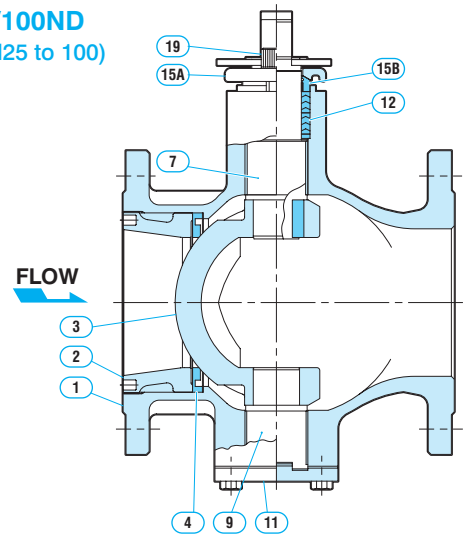
Specification

Type	V100ND	V100NC
Nominal Size (*1)	DN25 to 100	DN125 to 200
Face to Face Dimension	According to ISO5752	
Connection type	Flange type: JIS10K, 20K • Class (ASME, JPI) 150, 300	
Body Material (*2)	SCS13A (CF8) SCS14A (CF8M)	SCS13 SCS14
Ball Material / Seat Material	According to the combination of Ball and Seat	
Operation type	Lever, Gear, Pneumatical, Electrical	

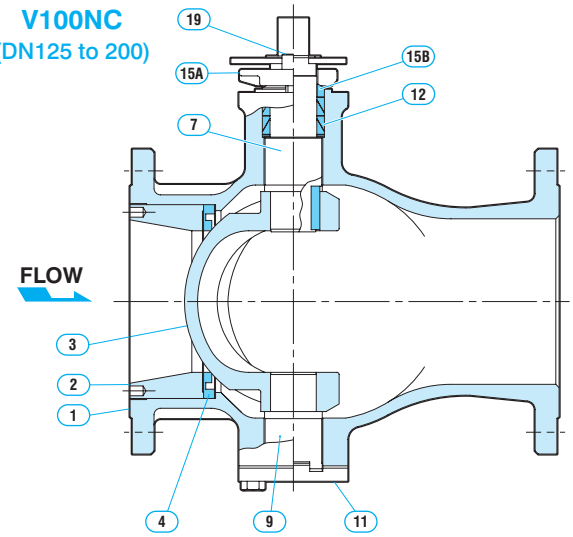
*1: DN20 and over 250 are also available.
*2: FCD is also available.

Parts and Materials

V100ND
(DN25 to 100)



V100NC
(DN125 to 200)



Parts		Material			
		V107ND	V107NC	V112ND	V112NC
1	Body	SCS13A	SCS13	SCS14A	SCS14
2	Insert	SCS13A	SUS304	SCS14A	SUS316
3	Ball	SCS11 (ST) SCS11 (Hcr.P)		SCS11 (ST) SCS11 (Hcr.P)	
4	Seat	SUS316 (ST) SUS316H (M) Reinforced PTFE (CF)		SUS316 (ST) SUS316H (M) Reinforced PTFE (CF)	
7	Stem	SUS316		SUS316	
9	Trunnion	SUS316		SUS316	
11	Trunnion Cover	SUS316		SUS316	
12	Packing	New-PTFE	PTFE	New-PTFE	PTFE
15A	Gland Flange	SCS13A	SCS13	SCS13A	SCS13
15B	Gland	SUS304		SUS304	
19	Cap Screw	SUS304		SUS304	

Combination of Ball and Seat

Type	V100ND, V100NC	
	Ball	Seat
Solid Seat (thick)	SCS11+ST	SUS316 + ST
Thin Seat	SCS11+Hcr.P	SUS316H
Soft Seat (Reinforced PTFE)		Reinforced PTFE(CF)

•ST: Stellite •Hcr.P: Hard chrome plating

Valve Codes

Valve Code for V100ND

V 1 0 7 N D - C F - 0 5 0 - J 1 0 K R F

① ✻ ② ③ ④

V100ND (NC) (V-Port Valve)

① Body Material

07	SCS13A
12	SCS14A

② Seat Material (Refer to P 29)

ST	Solid Seat
M	Thin Seat
CF	Soft Seat

③ Nominal Size (DN or A)

Conforming to ISO6708 and JIS B2001

④ Connection

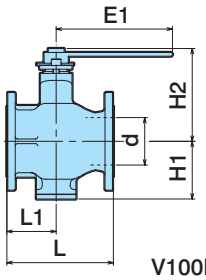
J10KRF	JIS 10KRF
J20KRF	JIS 20KRF
A150RF	ASME CL150

✻ Improvement Identification Code

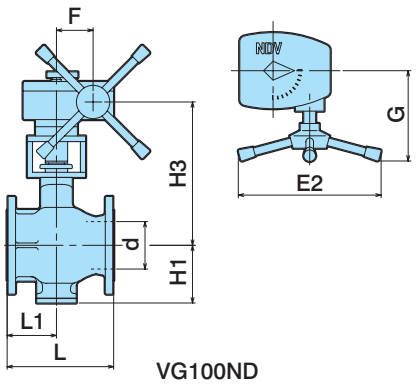
None	Original Design
N	First Improvement
NB	Second Improvement
NC	Third Improvement
ND	Fourth Improvement

Dimension

V100ND (NC) · VG100ND (NC)



V100ND



VG100ND

Unit: mm

Nominal size DN	d	L		L1	H1	H2	Lever Operated Valve E1		Gear Operated Valve H3								Mass (Approx. kg) Lever Operated		Gear Operated	
		10K CL150	20K				10K CL150	20K	10K CL150	20K	G 10K CL150	G 20K	F 10K CL150	F 20K	E2 10K CL150	E2 20K	10K CL150	20K	10K CL150	20K
25	25	127	165	55	48	108	160	160	—	—	—	—	—	—	—	—	3.8	5.0	—	—
40	38	165	190	70	71	135	230	230	—	—	—	—	—	—	—	—	6.8	8.5	—	—
50	51	178	216	75	77	140			—	—	—	—	—	—	—	—	8.1	10.5	—	—
65	64	190	241	80	96	163	350	350	—	—	—	—	—	—	—	—	13.0	15.5	—	—
80	76	203	283	90	101	168			—	—	—	—	—	—	—	—	14.0	17.0	—	—
100	102	229	305	106	131	209	450	450	311	316	165	190	62.5	77	240	300	21.0	26.5	38.0	49.0
125	127	356	381	145	163	295	650	800	378	378	190	230	77.0	90.5	300	460	44.0	50.0	77.0	81.0
150	152	394	403	150	173	307			388	388							55.0	64.0	90.0	95.0
200	203	457	502	200	211	368	800	1000	446	464	230	260	90.5	121	460		86.0	98.0	135.0	150.0