

# High Pressure Service, Low-Noise Cage, Double-Seated Control Valves Model VDN (ANSI 900-2500)

## Introduction

The High Pressure Service, Low-Noise Cage, Double-Seated Control Valves (VDN) realize reduction in aerodynamic noise in handling of compressible fluids (steam, air, natural gas, ethylene gas, etc.). The VDNs operate more silently than high pressure service VDC cage valves.

The cage and plug are of a multiple-hole structure, and serial three-stage combination with "restriction, divergence and expansion" allows rational low-noise pressure reducing.

The valve plug provides such shape as cause no torque vibration, and overall plug is held inside the case, resulting in great resistance against vibration and wear. The valve body can be easily disassembled and reassembled to allow rapid inspection and replacement of trim section. The components are interchangeable with those of the VDC cage valves.

## Standard specifications

### Body

**Type** : Single port, double-seated, straight-through, cast globe valve

**Material** : SCPH2, SCPH21, SCPH61, SCS13, and other alloy steel

**Size** : 1½, 2, 2½, 3, 4, 6, 8, 10, 12 inches

### End connection :

Flanged-end (RF, RJ)

Welded ( Socket-welded; 2 inches or less )  
( Butt-welded; 2½ or more )

**Rating** : JIS 63K, ANSI 900, 1500, 2500

**Gland type** : Bolted gland

**Bonnet** : Plain bonnet (0 to 200°C)  
Radiator finned bonnet (200°C or over)

**Packing** : Asbestos yarn and others

**Drain plug** : No (optionally available)

### Trim

**Valve plug** : Double-seated, low-noise structure  
Cage (10 and 13 inches : stack cage)  
Linear split cage

**Material** : Atomloy treatment, and others.

### Actuator

**Type** : Spring type pneumatic diaphragm actuator (VA, direct or reverse action) or Springless type pneumatic piston cylinder (VP)

**Diaphragm material** : Chloroprene rubber reinforced with fabric (Diaphragm motor only)

### Spring range (Diaphragm motor only) :

0.4 to 2.0, 0.2 to 1.8, 0.8 to 2.4kgf/cm<sup>2</sup>  
(40 to 200, 20 to 180, 80 to 240kPa)

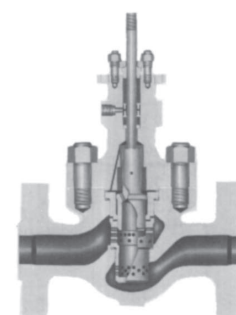
**Air to diaphragm** : Diaphragm motor; 2.6 or 2.8kgf/cm<sup>2</sup>  
(250 or 270kPa)

Piston cylinder; 5kgf/cm<sup>2</sup>(490kPa)

**Pneumatic connection** : Rc ¼ internal thread  
(For VA4D, VA4R, VA5D, and VA5R, Rc ½ internal thread with Rc ¼ adapter or with Rc 1/8 available)



2½ inch or over



2 inch or under

**Ambient temperature** : -30 to +70°C

**Valve action** : Direct action (Direct action actuator) or  
Reverse action (Reverse action actuator)

### Optional accessories (Provided upon request) :

With positioner  
Handwheel, limit switch, motion transmitter, volume booster, air-lock relay, and others available

### Performance :

**Seat leakage rate (percentage to rated Cv value) :**  
0.75% or less

**Action** : (For standard gland)  
Hysteresis error; 1%FS or less (with positioner)  
Linearity; ±1%FS or less (with positioner)

**Rangeability** : 30 : 1

**Table 1. Flow coefficient Cv**

Valve size (inch)	1½	2	2½	3	4	5	6	8	10	12	
Port size (inch)	1½	2	2½	3	4	5	6	8	10	12	
Rated Cv value	JIS 63 <sup>K</sup> ANSI 900,1500	14	25	39	56	91	144	210	365	580	820
	ANSI 2500	10	14	25	39	56	91	144	210	365	580

**Table 2. Stem travel**

Valve size (inch)	1½	2	2½	3	4	5	6	8	10	12	
Stem travel (mm)	JIS 63 <sup>K</sup> ANSI 900, 1500	25	25	37.5	37.5	37.5	50	50	75	100	100
	ANSI 2500	25	25	37.5	37.5	37.5	50	50	50	75	75

**Table 3. Maximum pressure differential**

**Table 3-1. Model VA, Spring type pneumatic diaphragm actuator (with positioner)**

**Table 3-1-1. Direct action (air-to-close)**

Rating	Actuator Model No.	Air to diaphragm kgf/cm <sup>2</sup> (kPa)	Spring range kgf/cm <sup>2</sup> (kPa)	Pressure differential kgf/cm <sup>2</sup> (MPa)										
				Valve size (inch)										
				1½	2	2½	3	4	5	6	8	10	12	
JIS 63 <sup>K</sup> ANSI 900	VA3D	2.6 (250)	0.4~2.0 (40~200)	150 (14.7)	150 (14.7)	150 (14.7)	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>150</sup> <sub>(14.7)</sub> )	( <sup>75.0</sup> <sub>(7.35)</sub> ) ( <sup>130</sup> <sub>(12.7)</sub> )						
	VA4D	2.6 (250)	0.4~2.0 (40~200)					150 (14.7)	( <sup>95.0</sup> <sub>(9.32)</sub> ) ( <sup>145</sup> <sub>(14.2)</sub> )	( <sup>70.0</sup> <sub>(6.86)</sub> ) ( <sup>120</sup> <sub>(11.8)</sub> )	( <sup>25.0</sup> <sub>(2.45)</sub> ) ( <sup>60.0</sup> <sub>(5.88)</sub> )			
	VA5D	2.6 (250) 2.8 (270)	0.4~2.0 (40~200) 0.2~1.8 (20~180)						150 (14.7)	( <sup>45.0</sup> <sub>(4.41)</sub> ) ( <sup>145</sup> <sub>(14.2)</sub> )	( <sup>30.0</sup> <sub>(2.94)</sub> ) ( <sup>65.0</sup> <sub>(6.37)</sub> )	( <sup>25.0</sup> <sub>(2.45)</sub> ) ( <sup>55.0</sup> <sub>(5.39)</sub> )		
ANSI 1500	VA3D	2.6 (250)	0.4~2.0 (40~200)	170 (16.7)	170 (16.7)	( <sup>165</sup> <sub>(16.2)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )	( <sup>75.0</sup> <sub>(7.35)</sub> ) ( <sup>130</sup> <sub>(12.7)</sub> )						
		2.8 (270)		235 (23.0)	235 (23.0)	( <sup>165</sup> <sub>(16.2)</sub> ) ( <sup>200</sup> <sub>(19.6)</sub> )	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )							
		2.8 (270)	0.2~1.8 (20~180)	250 (24.5)	( <sup>155</sup> <sub>(15.2)</sub> ) ( <sup>250</sup> <sub>(24.5)</sub> )									
	VA4D	2.6 (250)	0.4~2.0 (40~200)					150 (14.7)	( <sup>95.0</sup> <sub>(9.32)</sub> ) ( <sup>145</sup> <sub>(14.2)</sub> )	( <sup>70.0</sup> <sub>(6.86)</sub> ) ( <sup>120</sup> <sub>(11.8)</sub> )	( <sup>25.0</sup> <sub>(2.45)</sub> ) ( <sup>60.0</sup> <sub>(5.88)</sub> )			
		2.8 (270)			210 (20.6)	210 (20.6)	( <sup>150</sup> <sub>(14.7)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )							
		2.8 (270)	0.2~1.8 (20~180)		250 (24.5)	( <sup>170</sup> <sub>(16.7)</sub> ) ( <sup>240</sup> <sub>(23.5)</sub> )								
	VA5D	2.6 (250)	0.4~2.0 (40~200)						130 (12.7)	( <sup>45.0</sup> <sub>(4.41)</sub> ) ( <sup>85.0</sup> <sub>(8.34)</sub> )	( <sup>30.0</sup> <sub>(2.94)</sub> ) ( <sup>65.0</sup> <sub>(6.37)</sub> )	( <sup>25.0</sup> <sub>(2.45)</sub> ) ( <sup>55.0</sup> <sub>(5.39)</sub> )		
		2.8 (270)						185 (18.1)	185 (18.1)	( <sup>145</sup> <sub>(14.2)</sub> ) ( <sup>165</sup> <sub>(16.2)</sub> )				
		2.8 (270)	0.2~1.8 (20~180)					240 (23.5)	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>200</sup> <sub>(19.6)</sub> )					
ANSI 2500	VA3D	2.6 (250)	0.4~2.0 (40~200)	170 (16.7)	170 (16.7)	( <sup>165</sup> <sub>(16.2)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )	( <sup>75.0</sup> <sub>(7.35)</sub> ) ( <sup>130</sup> <sub>(12.7)</sub> )						
		2.8 (270)		235 (23.0)	235 (23.0)	( <sup>165</sup> <sub>(16.2)</sub> ) ( <sup>200</sup> <sub>(19.6)</sub> )	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>170</sup> <sub>(16.7)</sub> )							
		2.8 (270)	0.2~1.8 (20~180)	305 (29.9)	( <sup>155</sup> <sub>(15.2)</sub> ) ( <sup>255</sup> <sub>(25.0)</sub> )									
	VA4D	2.6 (250)	0.4~2.0 (40~200)					150 (14.7)	( <sup>135</sup> <sub>(13.2)</sub> ) ( <sup>150</sup> <sub>(14.7)</sub> )	( <sup>95.0</sup> <sub>(9.32)</sub> ) ( <sup>145</sup> <sub>(14.2)</sub> )	( <sup>35.0</sup> <sub>(3.43)</sub> ) ( <sup>110</sup> <sub>(10.8)</sub> )			
		2.8 (270)			210 (20.6)	210 (20.6)	( <sup>150</sup> <sub>(14.7)</sub> ) ( <sup>180</sup> <sub>(17.6)</sub> )	( <sup>135</sup> <sub>(13.2)</sub> ) ( <sup>175</sup> <sub>(17.2)</sub> )						
		2.8 (270)	0.2~1.8 (20~180)		270 (26.5)	( <sup>170</sup> <sub>(16.7)</sub> ) ( <sup>240</sup> <sub>(23.5)</sub> )								
	VA5D	2.6 (250)	0.4~2.0 (40~200)							( <sup>55.0</sup> <sub>(5.39)</sub> ) ( <sup>130</sup> <sub>(12.7)</sub> )	( <sup>40.0</sup> <sub>(3.92)</sub> ) ( <sup>80.0</sup> <sub>(7.74)</sub> )	( <sup>30.0</sup> <sub>(2.94)</sub> ) ( <sup>65.0</sup> <sub>(6.37)</sub> )		
		2.8 (270)						185 (18.1)	185 (18.1)	185 (18.1)	( <sup>55.0</sup> <sub>(5.39)</sub> ) ( <sup>150</sup> <sub>(14.7)</sub> )			
		2.8 (270)	0.2~1.8 (20~180)					240 (23.5)	235 (23.0)	( <sup>120</sup> <sub>(11.8)</sub> ) ( <sup>200</sup> <sub>(19.6)</sub> )				

- Notes: 1) Bold line is for standard actuator.  
 2) The figures inside ( ) indicate fully open position. No ( ) represents the cases when the figures are the same for fully open and fully closed positions.  
 3) When primary pressure is larger than pressure differential with a valve fully closed, use the primary pressure for actuator sizing.

**Table 3-1-2. Reverse action (air-to-open)**

Rating	Actuator Model No.	Air to diaphragm kgf/cm <sup>2</sup> (kPa)	Spring range kgf/cm <sup>2</sup> (kPa)	Pressure differential kgf/cm <sup>2</sup> (MPa)										
				Valve size (inch)										
				1½	2	2½	3	4	5	6	8	10	12	
JIS 63 <sup>K</sup> ANSI 900	VA3R	2.6 (250)	0.4~2.0 (40~200)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)						
		2.8 (270)	0.8~2.4 (80~240)	150 (14.7)	150 (14.7)	150 (14.7)	(120) (11.8)	(75.0) (7.35)						
	VA4R	2.6 (250)	0.4~2.0 (40~200)							90.0 (8.82)	(40.0) (3.92)			
		2.8 (270)	0.8~2.4 (80~240)					150 (14.7)	(100) (9.81)	(70.0) (6.86)				
	VA5R	2.6 (250)	0.4~2.0 (40~200)									(65.0) (6.37)	(50.0) (5.39)	(40.0) (3.92)
		2.8 (270)	0.8~2.4 (80~240)							150 (14.7)	150 (14.7)	(45.0) (4.41)		
ANSI 1500	VA3R	2.6 (250)	0.4~2.0 (40~200)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)						
		2.8 (270)	0.8~2.4 (80~240)	235 (23.0)	235 (23.0)	(165) (16.2)	(120) (11.8)	(75.0) (7.35)						
	VA4R	2.6 (250)	0.4~2.0 (40~200)							90.0 (8.82)	(40.0) (3.92)			
		2.8 (270)	0.8~2.4 (80~240)				210 (20.6)	(150) (14.7)	(100) (9.81)	(70.0) (6.86)				
	VA5R	2.6 (250)	0.4~2.0 (40~200)									(65.0) (6.37)	(50.0) (4.90)	(40.0) (3.92)
		2.8 (270)	0.8~2.4 (80~240)							185 (18.1)	185 (18.1)	(150) (14.7)	(45.0) (4.41)	
ANSI 2500	VA3R	2.6 (250)	0.4~2.0 (40~200)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)	100 (9.81)						
		2.8 (270)	0.8~2.4 (80~240)	235 (23.0)	235 (23.0)	(165) (16.2)	(120) (11.8)	(75.0) (7.35)						
	VA4R	2.6 (250)	0.4~2.0 (40~200)									(50.0) (4.90)		
		2.8 (270)	0.8~2.4 (80~240)				210 (20.6)	(150) (14.7)	(135) (13.2)	(95.0) (9.32)	(35.0) (3.43)			
	VA5R	2.6 (250)	0.4~2.0 (40~200)										(60.0) (5.88)	(50.0) (4.90)
		2.8 (270)	0.8~2.4 (80~240)							185 (18.1)	185 (18.1)	(55.0) (5.39)		

Notes : 1) Bold line is for standard actuator.

2) The figures inside ( ) indicate full open position. No ( ) represents the cases when the figures are the same for fully open and fully closed positions.

3) When primary pressure is larger than pressure differential with a valve fully closed, use the primary pressure for actuator sizing.

**Table 3-2. Model VP, Springless type piston cylinder actuator (with positioner)**

**Table 3-2-1. Direct action (air-to-close) and Reverse action (air-to-open)**

Rating	Actuator Model No.	Air to diaphragm kgf/cm <sup>2</sup> (kPa)	Pressure differential kgf/cm <sup>2</sup> (MPa)		
			Valve size (inch)		
			8	10	12
JIS 63 <sup>K</sup> , ANSI 900	VP6	5.0 (490)	145 (14.2)	115 (11.3)	96.0 (9.41)
ANSI 1500	VP6	5.0 (490)	145 (14.2)	115 (11.3)	96.0 (9.41)
ANSI 2500	VP6	5.0 (490)	260 (25.5)	140 (13.7)	115 (11.3)

Notes : 1) Bold line is for standard actuator.

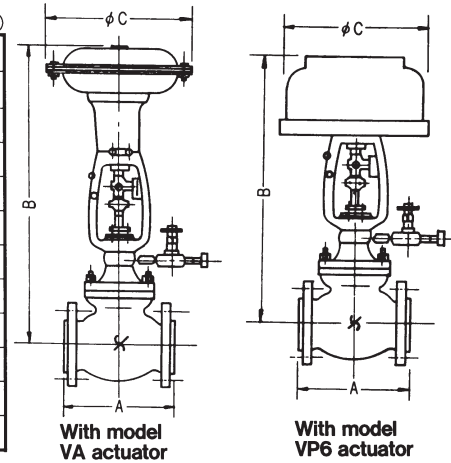
2) The figures are the same for fully open and fully closed position.

3) When primary pressure is larger than pressure differential with a valve fully closed, use the primary pressure for actuator sizing.

**Table 4. Face to face dimensions**

(Unit : mm)

Valve size (inch)	JIS63 <sup>K</sup> RF	ANSI 900		ANSI 1500		ANSI 2500	
		RF, SW, BW	RJ	RF, SW, BW	RJ	RF, SW, BW	RJ
1½	325	335	335	335	335	380	383
2	355	375	378	375	378	440	443
2½	390	410	413	410	413	500	506
3	435	440	443	460	463	540	546
4	495	510	513	530	533	615	625
5	620	635	638	680	683	680	693
6	700	715	718	770	776	770	783
8	880	900	903	900	910	950	966
10	1085	1100	1103	1100	1110	1200	1222
12	1285	1300	1303	1300	1316	1400	1422



**Table 5. Approximate dimensions**

(Unit : mm)

Valve size (inch)	Actuator Model No.	B												C
		JIS 63 <sup>K</sup> , ANSI 900				ANSI 1500				ANSI 2500				
		Direct action (Air-to-Close)		Reverse action (Air-to-Open)		Direct action (Air-to-Close)		Reverse action (Air-to-Open)		Direct action (Air-to-Close)		Reverse action (Air-to-Open)		
		P	RF	P	RF	P	RF	P	RF	P	RF	P	RF	
1½	VA3D, R	1055	1260	1055	1260	1055	1260	1055	1260	1055	1260	1055	1260	450
2	VA3D, R	1060	1265	1060	1265	1060	1265	1060	1265	1060	1265	1060	1265	450
2½	VA3D, R	1100	1305	1100	1305	1100	1305	1100	1305	1100	1305	1100	1305	450
3	VA3D, R	1105	1310	1105	1310	1105	1310	1105	1310	1110	1315	1110	1315	450
4	VA3D, R	1115	1315	1115	1315	1115	1315	1115	1315	1155	1325	1155	1325	450
	VA4D, R	1275	1455	1390	1570	1275	1455	1390	1570	1300	1480	1415	1595	520
5	VA4D, R	1310	1490	1425	1600	1310	1490	1425	1600	1310	1490	1425	1600	520
	VA5D, R	1355	1535	1470	1645	1355	1535	1470	1645	1355	1535	1470	1645	620
6	VA4D, R	1375	1575	1490	1690	1375	1575	1490	1690	1375	1580	1490	1695	520
	VA5D, R	1420	1620	1530	1730	1420	1620	1530	1730	1420	1625	1530	1735	620
8	VA5D, R	1470	1770	1580	1880	1520	1820	1630	1930	1570	1870	1680	1980	620
	VP6	1320	1620	1320	1620	1370	1670	1370	1670	1420	1720	1420	1720	445
10	VA5D, R	1620	1920	1730	2030	1630	1930	1740	2040	1700	2000	1810	2110	620
	VP6	1470	1770	1470	1770	1480	1780	1480	1780	1550	1850	1550	1850	445
12	VA5D, R	1660	1960	1770	2070	1730	2030	1840	2140	1820	2120	1930	2230	620
	VP6	1510	1810	1510	1810	1580	1880	1580	1880	1670	1970	1670	1970	445

Notes : 1) P : Plain bonnet, RF : Radiator finned bonnet  
 2) As for model VP6 actuator with manual handle, add 220mm to B (mm) above.

**Ordering Information**  
 When ordering, please specify;

1) Model Number : VDN	9) Accessories (positioner, pressure regulator etc.)
2) Valve size x Port size or Cv required	10) Necessity of special spec. such as oil-free, free from copper, etc.
3) Body rating and type 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 valve plug : Low -noise trim	13) Pressure of flow medium, upstream and downstream pressure at fully closed and fully opened
6) Type of bonnet	14) Temperature and specific gravity of flow medium
7) Type of actuator; With or without manual handle, Air to diaphragm	15) Piping Specification of downstream side of valve.
8) Valve action (direct or reverse)	

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Specifications are subject to change without notice.

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