YAMATAKE Specification

Low-Noise Cage Type, Double-Seated Control Valves

Model VDN (ANSI 600 or less)

Introduction

The Low-noise Cage Type Double Seated Control Valves are featured with very low operating noise (aerodynamic noise) when they are used to handle compressible fluids (such as steam, air, natural gas, ethylene gas). These valves operate still more silently than VDC cage type valves.

The cage and valve plug are of a multiple-hole construction. The components for "restriction, divergence" and "expansion" are laid out in a rational manner to accomplish low-noise pressure reducing action.

The valve plug is designed in such configuration that it produces no torque vibration. Further, overall plug is held directly inside the case so that it is resistant against vibration and wear. The valve body can be easily disassembled and reassembled. The trims can be inspected and replaced very rapidly. Components are interchangeable with those of the VDC cage type valves.

Specifications

Body

Type : Single Port, Double seated, straight-through type, Cast glove valve

Rating : JIS 10K, 16K, 20K, 30K, 40K
ANSI 150, 300 , 600

Material : Carbon steel (SCPH2), Low alloy steel (SCPH21, 61), Stainless steel (SCS13, 14) and Other alloy steel

Bonnet : Plain bonnet (0~200℃)
Radiator finned bonnet (Over 200℃)
Extended bonned (0℃ or less)

Nominal size : 1½, 2, 2½, 3, 4, 6, 8, 10, 12inches

End connection : Flanged end (FF, RF and RJ)

Gland type : Bolted gland

Packing : PTFE Shevron, Asbestos and Others
Note) PTFE : Polytetrafluoroethylene

Drain plug : No (optionally available)

Trim

Valve plug : Double-seated low-noise trim
- Cage
- Split cage
- Stack cage

(For application distinction between cage, split cage and stack cage of valves, refer to the Table on the next page.)

Material :
Valve plug and cage; Stainless steel (SCS24, SCS14, SCS14 stellite faced seat, SCS14 hardfacing)
(For combination of materials for valve body, plug, and cage, refer to the Table in the next page.)

Actuator

Type : Spring type pneumatic diaphragm actuator (Model VA5, direct or reverse action) or Springless type pnuematic piston cylinder (Model VP6)

Diaphragm material : Neoprene with fabric reinforced

Spring range : 0.2~1.0, 0.4~1.2kgf/㎠
{20~98, 40~120kPa}
0.4~2.0, 0.8~2.4kgf/㎠
{40~200, 80~240kPa}

Air to diaphragm : 1.2~2.8kgf/㎠{120~270kPa}

Air connection : Rc¼ female
VA4,VA5 type··· Rc½ with Rc¼ adapter, also available Rc⅜ adapter

Ambient temperature : −30~+70℃

Valve action
Air-to-close or air-to-open available by using direct or reverse actuator. Non reversible body.

Accessories
Handwheel (side or top mounted), positioner, limit switch, motion transmitter, volume booster, air lock relay and other available.

Performance

Seat leakage (percentage to rated Cv value) :
Refer to the Table at the next page.

Action : For standard type gland
Hysteresis error
Without positioner ; 3%FS or less
With positioner ; 1%FS or less
Linearity
Without positioner ; ±5%FS or less
With positioner ; ±1%FS or less

Inherent rangeability : 25 : 1

Table 1. Combination of materials for valve body, plug, and cage, and operating temperature limit

Body material	Plug / Cage material	Plug / Cage type	Operating temperature (℃)
Carbon steel (SCPH2)	Stainless steel (SCS24)	Cage (1½~8") / Stack cage (10,12")	−5~+425
Low alloy steel (SCPH21, 61)	Stainless steel (SCS24)	Cage (1½~8") / Stack cage (10,12")	−5~+425
	Stainless steel (SCS 14 hardfacing)	Split cage (3~12")	426~500
Stainless steel (SCS13)	Stainless steel (SCS14)	Cage (1½~8") / Stack cage (10,12")	−195~+200
	Stainless steel (SCS14 hardfacing or stellite faced seat)	Split cage (3~12")	−195~+200 201~600 (500℃ when atomloy)
Stainless steel (SCS14)	Stainless steel (SCS14)	Cage (1½~8") / Stack cage (10,12")	−195~+200
	Stainless steel (SCS14 hardfacing)	Split cage (3~12")	−195~+200 201~600

Table 2. Flow coefficient Cv and stem travel

Nominal size (inch)	1½	2	2½	3	4	6	8	10	12
Port size (inch)	1½	2	2½	3	4	6	8	10	12
Rated Cv value	13	24	37	54	96	210	380	600	860
Stem travel (mm)	25	25	37.5	37.5	37.5	50	75	100	100
Leakage at fully closed	≦0.12	≦0.22	≦0.34	≦0.5	≦0.9	≦2.0	≦3.2	≦5.0	≦7.5

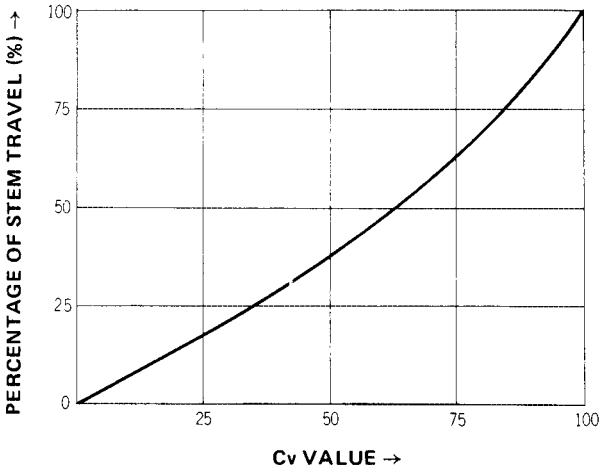


Figure 1. Flow characteristics

(Idealistic flow characteristics is indicated in this graph.)

Table 3. Permissible differential pressure

Table 3-1. Direct action (Air-to-close)

Actuator model no.	Air to diaphragm kgf/cm² { kPa }	Spring range kgf/cm² { kPa }	Positioner	Differential pressure { by nominal size (inch) } kgf/cm²{ kPa }								
				1½	2	2½	3	4	6	8	10	12
VA1D	1.2 {120}	0.2～1.0 {20～98}	×	8.1 {790} 8.1 {790}	6.4 {630} 6.4 {630}							
	1.4 {140}	0.2～1.0 {20～98}	○	13.0 {1270} 20.0 {1960}	7.0 {690} 16.0 {1570}							
	2.8 {270}	0.4～1.2 {40～120}		26.0 {2550} 40.0 {3920}	14.0 {1370} 40.0 {3920}							
		0.6～2.2 {60～220}		35.0 {3430} 35.0 {3430}	22.0 {2160} 27.0 {2650}							
VA2D	1.2 {120}	0.2～1.0 {20～98}	×	11.0 {1080} 11.0 {1080}	9.2 {900} 9.2 {900}	6.8 {670} 7.3 {720}	4.7 {460} 6.3 {620}	2.6 {250} 4.7 {460}				
	1.4 {140}	0.2～1.0 {20～98}	○	19.0 {1860} 29.0 {2840}	10.0 {981} 23.0 {2260}	6.8 {670} 18.0 {1760}	4.7 {460} 16.0 {1570}	2.6 {250} 12.0 {1180}				
	2.8 {270}	0.4～1.2 {40～120}		38.0 {3730} 40.0 {3920}	21.0 {2060} 40.0 {3920}	13.0 {1270} 40.0 {3920}	9.5 {930} 40.0 {3920}	5.3 {520} 40.0 {3920}				
		0.6～2.2 {60～220}		40.0 {3920} 40.0 {3920}	32.0 {3140} 40.0 {3920}	20.0 {1960} 31.0 {3040}	14.0 {1370} 27.0 {2650}	8.0 {780} 20.0 {1960}				
VA3D	1.2 {120}	0.2～1.0 {20～98}	×	19.0 {1860} 19.0 {1860}	15.0 {1470} 15.0 {1470}	11.0 {1080} 12.0 {1180}	7.9 {770} 10.0 {981}	4.4 {430} 7.9 {770}	1.3 {130} 5.3 {520}			
	1.4 {140}	0.2～1.0 {20～98}	○	31.0 {3070} 40.0 {3920}	17.0 {1670} 39.0 {3820}	11.0 {1080} 31.0 {3040}	7.9 {770} 26.0 {2550}	4.4 {430} 20.0 {1960}	1.3 {130} 13.0 1270			
	2.8 {270}	0.4～1.2 {40～120}		40.0 {3920} 40.0 {3920}	35.0 {3430} 40.0 {3920}	22.0 {2160} 40.0 {3920}	15.0 {1470} 40.0 {3920}	8.8 {860} 40.0 {3920}	2.6 {250} 37.0 {3630}			
		0.8～2.4 {80～240}		40.0 {3920} 40.0 {3920}	38.0 {3730} 38.0 {3730}	31.0 {3040} 31.0 {3040}	26.0 {2550} 26.0 {2550}	17.0 {1670} 20.0 {1960}	5.3 {520} 13.0 {1270}			
VA4D	1.2 {120}	0.2～1.0 {20～98}	×			17.0 {1670} 17.0 {1670}	14.0 {1370} 14.0 {1370}	6.2 {610} 11.0 {1080}	1.8 {180} 7.4 {720}	1.5 {150} 5.6 {550}		
	1.4 {140}	0.2～1.0 {20～98}	○			15.0 {1470} 40.0 {3920}	11.0 {1080} 40.0 {3920}	6.2 {610} 33.0 {3240}	1.8 {180} 22.0 {2160}	1.5 {150} 16.0 {1570}		
	2.8 {270}	0.4～1.2 {40～120}				31.0 {3040} 40.0 {3920}	22.0 {2160} 40.0 {3920}	12.0 {1180} 40.0 {3920}	3.7 {360} 40.0 {3920}	3.1 {300} 39.0 {3820}		
		0.8～2.4 {80～240}				40.0 {3920} 40.0 {3920}	40.0 {3920} 40.0 {3920}	24.0 {2350} 33.0 {3240}	7.5 {740} 22.0 {2160}	6.2 {610} 16.0 {1570}		
VA5D	1.2 {120}	0.2～1.0 {20～98}	×						2.5 {240} 10.0 {981}	2.1 {200} 7.6 {740}	1.3 {130} 6.1 {600}	0.9 {90} 5.1 {500}
	1.4 {140}	0.2～1.0 {20～98}	○						2.5 {240} 30.0 {2940}	2.1 {200} 23.0 {2260}	1.3 {130} 15.0 {1470}	0.9 {90} 13.0 {1270}
	2.8 {270}	0.4～1.2 {40～120}							5.1 {500} 40.0 {3920}	4.2 {410} 40.0 {3920}	2.7 {260} 40.0 {3920}	1.8 {180} 40.0 {3920}
		0.8～2.4 {80～240}							10.0 {981} 30.0 {2940}	8.5 {830} 26.0 {2550}	5.4 {530} 15.0 {1470}	3.7 {360} 13.0 {1270}
VP6	5.0 {490}	—	○							40.0 {3920} 40.0 {3920}	30.0 {2940} 40.0 {3920}	21.0 {2060} 40.0 {3920}

Notes : 1) The figures inside bold line are for standard actuator.

2) The top figures are for fully open valves and bottom figures for fully closed valves.

3) Positioner : × ··· Without, ○ ··· With

Table 3-2. Reverse action (Air-to-open)

Actuator model no.	Air to diaphragm kgf/cm² { kPa }	Spring range kgf/cm² { kPa }	Positioner	Differential pressure { by nominal size (inch) } kgf/cm² { kPa }								
				1½	2	2½	3	4	6	8	10	12
VA1R	1.4 {140}	0.2~1.0 {20~98}	× or ○	8.1 {790} 8.1 {790}	6.4 {630} 6.4 {630}							
	2.8 {270}	0.4~1.2 {40~120}	○	24.0 {2350} 24.0 {2350}	19.0 {1860} 19.0 {1860}							
		0.6~2.2 {60~220}		39.0 {3820} 40.0 {3920}	22.0 {2160} 32.0 {3140}							
VA2R	1.4 {140}	0.2~1.0 {20~98}	× or ○	11.0 {1080} 11.0 {1080}	9.2 {900} 9.2 {900}	7.3 {720} 7.3 {720}	6.3 {620} 6.3 {620}	4.7 {460} 4.7 {460}				
	2.8 {270}	0.4~1.2 {40~120}	○	35.0 {3430} 35.0 {3430}	27.0 {2650} 27.0 {2650}	22.0 {2160} 22.0 {2160}	18.0 {1760} 18.0 {1760}	14.0 {1370} 14.0 {1370}				
		0.6~2.2 {60~220}		40.0 {3920} 40.0 {3920}	32.0 {3140} 40.0 {3920}	20.0 {1960} 36.0 {3530}	14.0 {1370} 31.0 {3040}	8.0 {780} 23.0 {2260}				
VA3R	1.4 {140}	0.2~1.0 {20~98}	× or ○	19.0 {1860} 19.0 {1860}	15.0 {1470} 15.0 {1470}	12.0 {1180} 12.0 {1180}	10.0 {981} 10.0 {981}	7.9 {770} 7.9 {770}	2.6 {250} 5.3 {520}			
	2.8 {270}	0.4~1.2 {40~120}	○	40.0 {3920} 40.0 {3920}	40.0 {3920} 40.0 {3920}	36.0 {3530} 36.0 {3530}	31.0 {3040} 31.0 {3040}	23.0 {2260} 23.0 {2260}	10.0 {981} 16.0 {1570}			
		0.6~2.2 {60~220}		40.0 {3920} 40.4 {3920}	40.0 {3920} 40.0 {3920}	34.0 {3330} 40.0 {3920}	23.0 {2260} 40.0 {3920}	13.0 {1270} 39.0 {3820}	4.0 {390} 26.0 {2550}			
VA4R	1.4 {140}	0.2~1.0 {20~98}	× or ○			17.0 {1670} 17.0 {1670}	14.0 {1370} 14.0 {1370}	11.0 {1080} 11.0 {1080}	3.7 {360} 7.4 {720}	3.1 {300} 5.6 {550}		
	2.8 {270}	0.4~1.2 {40~120}	○			40.0 {3920} 40.0 {3920}	40.0 {3920} 40.0 {3920}	33.0 {3240} 33.0 {3240}	15.0 {1470} 22.0 {2160}	12.0 {1180} 16.0 {1570}		
		0.6~2.2 {60~220}				40.0 {3920} 40.0 {3920}	33.0 {3240} 40.0 {3920}	18.0 {1760} 40.0 {3920}	5.6 {550} 33.0 {3240}	4.6 {450} 25.0 {2450}		
VA5R	1.4 {140}	0.2~1.0 {20~98}	× or ○						5.1 {500} 10.0 {981}	4.2 {410} 7.6 {740}	2.7 {260} 6.1 {600}	1.8 {180} 5.1 {500}
	2.8 {270}	0.4~1.2 {40~120}	○						20.0 {1960} 30.0 {2940}	17.0 {1670} 23.0 {2260}	10.0 {981} 18.0 {1760}	7.5 {740} 16.0 {1570}
		0.6~2.2 {60~220}							7.7 {760} 40.0 {3920}	6.3 {620} 38.0 {3730}	4.0 {390} 30.0 {2940}	2.8 {270} 25.0 {2450}
VP6	5.0 {490}	—	○							40.0 {3920} 40.0 {3920}	30.0 {2940} 40.0 {3920}	21.0 {2060} 40.0 {3920}

Notes : 1) The figures inside bold line are for standard actuator.
2) The top figures are for fully open valves and bottom figures for fully closed valves.
3) Positioner : × ··· Without, ○ ··· With

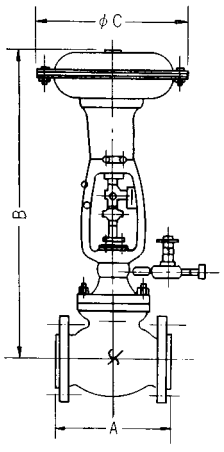
Table 4. Face-to-face dimensions (Unit: mm)

Nominal size (inch)	A					
	JIS 10K FF, RF ANSI 150 RF	JIS 16K, 20K, 30K ANSI 300 RF	JIS 40K RF ANSI 600 RF	ANSI 150 RJ	ANSI 300 RJ	ANSI 600 RJ
1½	222	235	251	235	248	251
2	254	267	286	267	283	289
2½	276	292	311	289	308	314
3	298	318	337	311	333	340
4	352	368	394	365	384	397
6	451	473	508	464	489	511
8	543	568	610	556	584	613
10	673	708	752	686	724	756
12	737	775	819	749	791	822

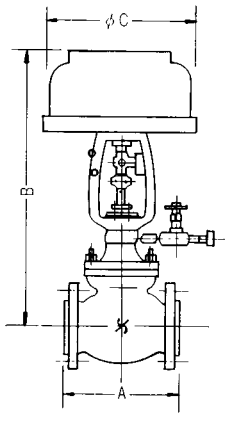
Table 5. External dimensions (Unit: mm)

Nominal size (inch)	Actuator model no.	B				ϕ C
		Direct action (air-to-close)		Reverse action (air-to-open)		
		P	RF	P	RF	
1½	VA1D,R	695	845	695	845	300
	VA2D,R	835	985	835	985	350
	VA3D,R	1000	1150	1000	1150	450
2	VA1D,R	705	855	705	855	300
	VA2D,R	845	995	845	995	350
	VA3D,R	1010	1160	1010	1160	450
2½	VA2D,R	885	1035	885	1035	350
	VA3D,R	1055	1205	1055	1205	450
	VA4D,R	1220	1370	1335	1485	520
3	VA2D,R	900	1050	900	1050	350
	VA3D,R	1060	1210	1060	1210	450
	VA4D,R	1225	1375	1340	1490	520
4	VA2D,R	915	1070	915	1070	350
	VA3D,R	1080	1230	1080	1230	450
	VA4D,R	1245	1395	1360	1510	520
6	VA3D,R	1145	1295	1145	1295	450
	VA4D,R	1310	1460	1425	1575	520
	VA5D,R	1360	1510	1470	1620	620
8	VA4D,R	1430	1575	1540	1690	520
	VA5D,R	1525	1670	1630	1780	620
	VP6	1330	1460	1330	1460	445
10	VA5D,R	1760	2015	1890	2145	620
	VP6	1405	1525	1405	1525	445
12	VA5D, R	1810	2020	1940	2150	620
	VP6	1460	1610	1460	1610	445

Notes : 1) P; Plain bonnet RF; Radiator finned bonnet
2) For actuators with manual handwheels, refer to SS2-8210-0100 (Model VA actuator) and SS2-8210-0300 (Model VP actuator).



With model VA actuator



With model VP6 actuator

Table 6. Weight

(Unit: kg)

Nominal size (inch)	Actuator model no.	Weight					
		JIS 10K ANSI 150		JIS 16K, 20K, 30K ANSI 300		JIS 40K ANSI 600	
		P	RF	P	RF	P	RF
1½	VA1D,R	37	39	42	44	50	52
	VA2D,R	48	50	53	55	61	63
	VA3D,R	76	78	81	83	89	91
2	VA1D,R	43	45	43	46	60	63
	VA2D,R	54	56	54	57	71	74
	VA3D,R	82	84	82	85	91	102
2½	VA2D,R	60	63	65	68	110	113
	VA3D,R	88	91	93	96	138	141
	VA4D	163	166	168	171	213	216
	VA4R	188	191	193	196	238	241
3	VA2D,R	81	86	84	88	121	126
	VA3D,R	109	114	112	117	149	154
	VA4D	184	189	187	192	224	229
	VA4R	209	214	212	217	249	254
4	VA2D,R	97	102	112	117	152	157
	VA3D,R	125	130	140	145	180	185
	VA4D	200	205	215	220	255	260
	VA4R	225	230	240	245	280	285
6	VA3D,R	235	245	245	255	305	315
	VA4D	310	320	320	330	380	390
	VA4R	335	345	345	355	405	415
	VA5D	335	345	345	355	405	415
	VA5R	360	370	370	380	430	440
8	VA4D	402	412	442	452	556	576
	VA4R	427	437	467	477	581	601
	VA5D	432	442	472	482	586	606
	VA5R	457	467	497	507	611	631
	VP6	—	—	475	495	590	620
10	VA5D	600	620	710	730	757	787
	VA5R	625	645	735	755	782	812
	VP6	—	—	650	675	700	720
12	VA5D	836	856	976	996	1058	1158
	VA5R	861	881	1001	1021	1083	1183
	VP6	—	—	820	955	1000	1100

Notes: 1) P : Plain bonnet, RF : Radiator finned bonnet
2) For actuators with manual handwheels, refer to SS2-8210-0900 (model VA actuators) and SS2-8210-0300 (model VP actuators.)

Ordering information

When ordering, please specify;

1) Model number : VDN
2) Nominal size × Port size or Cv required
3) Type and rating of end connections
4) Body and trim material, necessity of hardening
5) Type of valve plug : Low-noise trim
6) Type of bonnet
7) Type of actuator, with or without manual handle, air to actuator
8) Valve action (direct or reverse)
9) Accessories (positioner, handwheel, pressure regulator etc.)
10) Special requirement of degreasing, free from copper and etc.
11) Name of flow medium
12) Normal flow and maximum required flow
13) Pressure of flow medium, upstream and downstream pressure at maximum and minimum required flow
14) Temperature and specific gravity of flow medium
15) Piping specification of downstream side of valve

Specifications are subject to change without notice.

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Shanghai Yamatake Jinshan Control Instruments Co., Ltd.	: China	86-21-6428-8661
Yamatake Korea Co., Ltd.	: Korea	82-2-785-0280~2
Yamatake (Thailand) Co., Ltd.	: Thailand	66-2-210-0900~7
Yamatake Philippines, Inc.	: Philippines	63-2-817-6452
PT. Yamatake Berca Indonesia	: Indonesia	62-21-230-5538
Yamatake Controls Singapore Pte. Ltd.	: Singapore	65-778-5966
YCV Corporation	: U.S.A.	1-602-548-1800

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