

# Pneumatic Segmented Ball Valve

## Type 3310/BR 31a and Type 3310/3278



### Application

Control valve for process engineering and plants with industrial requirements

**Valve sizes** 1" to 10"  
**Pressure rating** ANSI Class 150 and 300  
**Temperatures** -46 °C to 427 °C (-51 °F to +800 °F)

Type 3310 Segmented Ball Valve with

- Single-acting Type BR 31a-SRP Pneumatic Rotary Actuator
- Double-acting Type BR 31a-DAP Pneumatic Rotary Actuator
- Single-acting Type 3278 Pneumatic Rotary Actuator

Valve body material

- Carbon steel
- Stainless carbon steel

Segmented ball with

- Soft sealing or
- Metal sealing.

The control valves can be optionally equipped with various accessories:

Positioners, solenoid valves and other accessories according to VDI/VDE 3845 to Type SRP/DAP and Type 3278 Rotary Actuators.

Direct attachment of SAMSON control valve accessories to Type 3278 Rotary Actuator.

### Versions

**Standard version** for temperatures from -29 to 220 °C (-20 to 430 °F), valve sizes 1" to 10"

- **Type 3310-SRP** with single-acting Type BR 31a-SRP Pneumatic Rotary Actuator,
- **Type 3310/3278** with single-acting Type 3278 Pneumatic Rotary Actuator (see Data Sheet T 8321 EN).

### Further versions

- **Type 3310** · With DIN flanges
- **Type 3310** · With double packing, with or without leak-off connection
- **Type 3310** · With insulating section for medium temperatures -46 to 220 °C (-51 to 428 °F) with stainless carbon steel
- **Type 3310** · With insulating section and graphite packing for medium temperatures -29 to 427 °C (-20 to 800 °F), max. 400 °C for carbon steel version acc. to DIN
- **Type 3310** · With reduced Kvs value using upstream or downstream reducers
- **Type 3310** · With adapter flanges
- **Type 3310-DAP** · Valve sizes 1" to 10" with double-acting Type BR 31a-DAP Pneumatic Rotary Actuator



Fig. 1 · Type 3310 Segmented Ball Valve with Type BR 31a Pneumatic Rotary Actuator

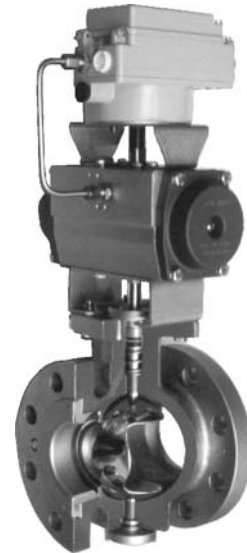


Fig. 2 · Cutaway view of Type 3310 Segmented Ball Valve with Type BR 31a Pneumatic Rotary Actuator and positioner

- **Type 3310** · With pneumatic rotary actuator and additional manual override
- **Type 3310** · With handwheel
- **Type 3310** · With heating jacket

### Principle of operation

In the segmented ball valve the medium flows into the convex face of the ball. When the valve is closed, the pressure acts on the convex side of the ball. The flow coefficient is determined by the opening angle of the ball.

To reduce the wear on the body on using abrasive media, the direction of flow can be reversed.

### Fail-safe position

With the Type SRP and Type 3278 Rotary Actuator the control valve has two fail-safe positions which become effective when the pressure acting on the piston or diaphragm is reduced as well as when the supply air fails:

#### Control valve CLOSED without supply air

The segmented ball valve is closed when the supply air fails.

#### Control valve OPEN without supply air

The segmented ball valve is opened when the supply air fails.

The Type DAP Rotary Actuator has no springs. A defined final position is not reached when the supply air fails.

### Selection of the flow characteristic

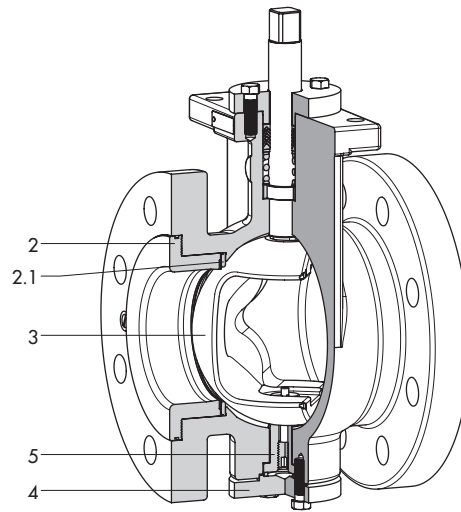
The design of the segmented ball allows the same valve to be used with two different types of flow characteristic:

#### Equal percentage (standard)

The actuator turns clockwise (right turning) to close the valve, looking from the actuator towards the valve.

#### Linear

The converted actuator turns counterclockwise (left turning) to close the valve, looking from the actuator towards the valve.



- 2 Retainer
- 2.1 Gasket
- 3 Segmented ball
- 4 Bottom flange
- 5 Support

Fig. 2 · Type 3310 Segmented Ball Valve

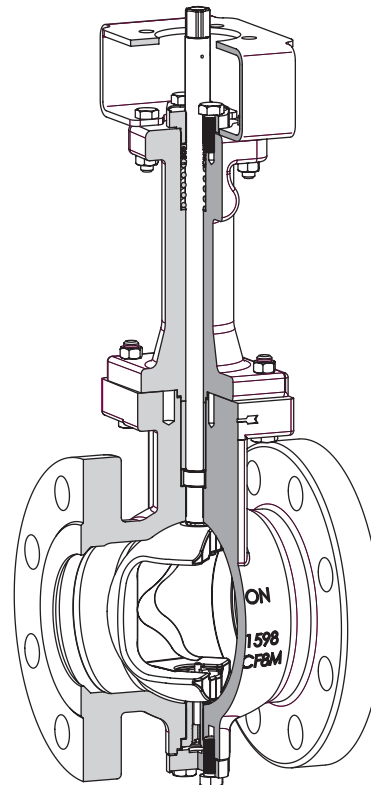


Fig. 4 · Insulating section for Type 3310 Segmented Ball Valve

**Table 1 · Technical data**

Valve size	1" to 10"	
Pressure rating	Class 150/300	
Type of connection	Flanges in accordance with ANSI B 16.5 · DIN/ISO version on request	
Seat ring	Soft sealing: PTFE, reinforced Metal sealing: Stainless steel, hardened	
Flow characteristic	Linear or equal percentage	
Max. opening angle	90° · 70° for reverse flow in throttling service	
Rangeability	≥ 100 : 1	
Overall length	DIN EN 558-2 Series 36	
Temperature range	Standard version	-29 to 220 °C (-20 to 428 °F)
	Version with insulating section	Down to -46 °C (-51 °F) with stainless carbon steel
	Insulating section and HT packing	Up to 427 °C (800 °F), max. 400 °C for carbon steel version with DIN flanges
<b>Leakage rate according to DIN EN 1349</b>		
Soft sealing	VI	
Metal sealing	IV	

**Table 2 · Materials for standard version**

Body	A 216 WCB · A 216 WCC	A 351 CF8M
Segmented ball	316 L, hardened	
Shaft	316 Ti	
Plain bearing	304 / PTFE	
Packing	1" to 6":	V-ring packing PTFE with carbon · Spring: 301
	8" to 10":	PTFE-compound silk cord · Spring: 301
Bottom flange	1" to 3":	316L
	4" to 10":	A 105

**Opening angles and associated flow coefficients**
**Table 3a · C<sub>v</sub> values for modified linear characteristic**

Size	Opening angle										
	5°	10°	20°	30°	40°	50°	55° <sup>1)</sup>	60°	70°	80°	90°
1"	0.35	1	3.4	7	11.5	17.3	20	24.5	32.3	38	40
1½"	1	3	10	21	35	52	60	74	97	114	120
2"	1.4	4	13.6	28	46	69	80	98	129	152	160
3"	3.6	10	34	70	115	173	200	245	323	381	400
4"	6.3	18	60	123	201	302	350	429	565	666	700
6"	13	35	119	245	402	605	700	858	1130	1333	1400
8"	18	50	170	350	574	864	1000	1226	1614	1904	2000
10"	28	78	264	543	890	1339	1550	1900	2502	2951	3100

**Table 3b · C<sub>v</sub> values for modified equal percentage characteristic (standard)**

Size	Opening angle										
	5°	10°	20°	30°	40°	50°	55° <sup>1)</sup>	60°	70°	80°	90°
1"	0.08	0.16	1.3	3.3	6.3	10.7	14	16.3	23	32	40
1½"	0.25	0.5	4	10	19	32	42	49	69	95	120
2"	0.3	0.6	5	13	25	42	56	65	92	126	160
3"	0.8	1.6	12	32	62	106	140	162	231	316	400
4"	1.4	2.8	22	56	109	186	245	284	405	553	700
6"	2.8	5.6	43	112	218	371	490	567	809	1106	1400
8"	4.0	8.0	62	160	312	530	700	810	1156	1580	2000
10"	6.2	12	96	248	484	822	1085	1256	1792	2449	3100

<sup>1)</sup> C<sub>v</sub> value can only be lowered by reducing the opening angle to 55° in conjunction with a positioner (cam disc).

## Terms for control valve sizing and noise level calculation

Table 4a · Modified linear characteristic

	Opening angle										
	5°	10°	20°	30°	40°	50°	55° <sup>1)</sup>	60°	70°	80°	90°
<b>F<sub>L</sub></b>	0.95	0.95	0.95	0.94	0.87	0.81	0.77	0.73	0.65	0.59	0.57
<b>x<sub>T</sub></b>	0.78	0.78	0.78	0.76	0.65	0.56	0.51	0.46	0.36	0.30	0.27
<b>x<sub>Fz</sub></b>	0.39	0.35	0.28	0.23	0.20	0.17	0.16	0.14	0.12	0.10	0.09

Table 4b · Modified equal percentage characteristic

	Opening angle										
	5°	10°	20°	30°	40°	50°	55° <sup>1)</sup>	60°	70°	80°	90°
<b>F<sub>L</sub></b>	0.95	0.95	0.95	0.95	0.95	0.90	0.86	0.82	0.75	0.66	0.57
<b>x<sub>T</sub></b>	0.78	0.78	0.78	0.78	0.78	0.69	0.62	0.58	0.49	0.38	0.27
<b>x<sub>Fz</sub></b>	0.44	0.39	0.33	0.29	0.24	0.21	0.19	0.18	0.15	0.12	0.09

<sup>1)</sup> C<sub>v</sub> value can only be lowered by reducing the opening angle to 55° in conjunction with a positioner (cam disc).

### Permissible differential pressures for Type 3310 Segmented Ball Valve with valve position CLOSED · All pressures in bar

- Depending on the valve sizing (cavitation, flashing, gas development), the differential pressure for the open position must be limited.
- Maximum exit velocity for liquids is 4 m/s. If cavitation exists, the maximum exit velocity must not exceed 2 m/s in the individual operating points.
- Maximum exit velocity for gases is 0.3 Mach.

Table 5a · Permissible differential pressures in CLOSED position for both fail-safe actions with Type BR 31a-SRP Rotary Actuator

Size	C <sub>v</sub>	Shaft Ø in mm	Actuator Type SRP ...	Number of springs	Required supply pressure	Max. supply pressure at		Δp with PTFE or metal sealing	
						20 °C (71 °F)	220 °C (430 °F)	For standard flow	For reverse flow <sup>1)</sup>
1"	40	16	60	2/3	2.5	6	5.5	15	10
				4	4		6	20	20
				30	5/6		5.5	6	17
1½"	120	16	100	2/3	2.5	4.5	4	20	17
			60	4	4	6	6	20	19
				5/6	5.5			20	20
2"	160	16	150	2/3	2.5	5.5	5	20	20
			100	4	4	6	6	20	20
				60	5/6			5.5	20
3"	400	16	220	2/3	2.5	3.8	3.5	20	20
			150	4	4	6	5.5	20	20
				100	5/6			5.5	6
4"	700	25	450	2/3	2.5	6	6	17	15
			300	4	4			18	16
				220	5/6			5.5	20
6"	1400	25	600	3	3	5.5	5	12	10
			450	4	4	6	5.5	20	20
				300	5/6			5.5	6
8"	2000	36	1200	2/3	2.5	5	4.5	10	5
			900	4	4	5.5	5	20	20
				5/6	5.5	6	6	20	20
10"	3100	36	1200	4	4	5.5	5	10	6
			900	5/6	5.5	6	5.5	19	16
				6	6			7	5

<sup>1)</sup> The permissible opening angle in throttling service is reduced to 70° with a reverse flow.

**Table 5b · Permissible differential pressures in CLOSED position for both fail-safe actions with Type 3278 Rotary Actuator**

Size	C <sub>v</sub>	Shaft Ø in mm	Diaphragm area in cm <sup>2</sup>	Bench range <sup>2)</sup>	Required supply pressure	Max. supply pressure at		Δp with PTFE or metal sealing	
						20 °C (71 °F)	220 °C (430 °F)	For standard flow	For reverse flow <sup>1)</sup>
1"	40	16	160	0.5 ... 1.0	1.5	2.5	2	17	12
				0.8 ... 1.6	2.4	3	2.6	20	20
1½"	120	16	160	0.5 ... 1.0	1.5	2.5	2	10	–
				0.8 ... 1.6	2.4	3	2.6	20	20
2"	160	16	160	0.8 ... 1.6	2.5	4.5	4.1	20	20
3"	400	16	160	1.2 ... 2.4	3.7	5.2	4.7	7	–
				1.7 ... 3.4	5.1	5.8	5.4	20	20
4"	700	25	320	0.8 ... 1.6	2.4	4.8	4.4	9	4
				1.2 ... 2.4	3.6	5.4	5	20	20
6"	1400	25	320	1.7 ... 3.4	5.1	6	5.6	12	10

<sup>1)</sup> The permissible opening angle in throttling service is reduced to 70° with a reverse flow.

<sup>2)</sup> Only applies to standard flow.

**Permissible shaft torques and opening torques**
**Table 6a · Square-ended shaft (e.g. Type BR 31a-SAP/DAP Actuator)**

Size	Perm. shaft torque in Nm at		Opening torques in Nm for PTFE or metal sealing for							
			Standard flow at Δp				Reverse flow <sup>1)</sup> at Δp			
			20 °C (71 °F)	220 °C (430 °F)	5 bar	10 bar	15 bar	20 bar	5 bar	10 bar
1"	70	54	9	9	11	13	10	11	13	15
1½"	70	54	12	12	14	16	13	14	16	18
2"	125	110	14	14	16	18	15	16	18	20
3"	125	110	29	31	33	35	32	34	36	38
4"	500	440	60	65	76	87	65	70	81	92
6"	500	440	115	125	145	165	125	135	155	175
8"	860	750	190	210	255	300	210	230	275	320
10"	860	750	300	340	410	480	330	370	440	510

**Table 6b · Shaft with feather key end (e.g. Type 3278 Actuator)**

Size	Perm. shaft torque in Nm at		Opening torques in Nm for PTFE or metal sealing for							
			Standard flow at Δp				Reverse flow <sup>1)</sup> at Δp			
			20 °C (71 °F)	220 °C (430 °F)	5 bar	10 bar	15 bar	20 bar	5 bar	10 bar
1"	70	54	9	9	11	13	10	11	13	15
1½"	70	54	12	12	14	16	13	14	16	18
2"	125	110	14	14	16	18	15	16	18	20
3"	125	110	29	31	33	35	32	34	36	38
4"	500	440	60	65	76	87	65	70	81	92
6"	500	440	115	125	145	165	125	135	155	175

<sup>1)</sup> The permissible opening angle in throttling service is reduced to 70° with a reverse flow.

**Table 7 · Dimensions in mm and weights in kg**

Valve	Size	1"	1½"	2"	3"	4"	6"	8"	10"
L - Installation length acc. to ISA S75.04	mm	102	114	124	165	194	229	243	297
d - Shaft Ø	mm	16	16	16	16	25	25	36	36
A	mm	107	117	126	145	170	206	254	281
B	mm	72	82	100	120	140	175	205	230
Flange connecting yoke		See actuators							
SW (standard shaft)	mm	12	12	12	12	19	19	27	27
Shaft with feather key for Type 3278 Actuator	Ø in mm	16	16	16	16	25	25	-	-
Weight	kg	5	7	16	28	42	70	110	150

Type BR 31α-SRP/DAP <sup>1)</sup> Rotary Actuators		30	60	100	150	220	300	450	600	900	1200
Attached to valve		1½"									
		2"			4"			10"			
		1"		3"			6"			8"	
C	mm	50	50	50	50	50 <sup>2)</sup>	55	55	55	80	80
H3	mm	159	211	248	269	315	345	409	438	487	543
E	mm	85	102	115	127	145	157	177	196	221	245
Connecting flange	DIN 3337	F05	F05	F07	F07	F10	F10	F12	F12	F14	F14
SW	mm	14	14	17	17	22	22	27	27	36	36
Weight in kg	Type SRP	1.7	3.2	4.4	6.6	9.5	12.6	18.1	24	31.6	45.1
	Type DAP	1.5	2.7	3.9	5.4	8.4	10.2	14.5	19.8	25	35.5

Type 3278 Rotary Actuator		160 cm <sup>2</sup>	320 cm <sup>2</sup>
E	mm	118	162
C	mm	50	55 <sup>2)</sup>   80
H1	mm	260	421
H2	mm	72	95
D	mm	225	295
Connecting flange	ISO 5211	F07	F12
Weight	kg	16	50

<sup>1)</sup> Single-acting Type BR 31α-SRP/SC (right turning) and Type BR 31α-SRP/SO (left turning) Actuators; double-acting Type BR 31α-DAP/DR (right turning) and Type BR 31α-DAP/DC (left turning) Actuators.

<sup>2)</sup> C = 55 with valve size 4"

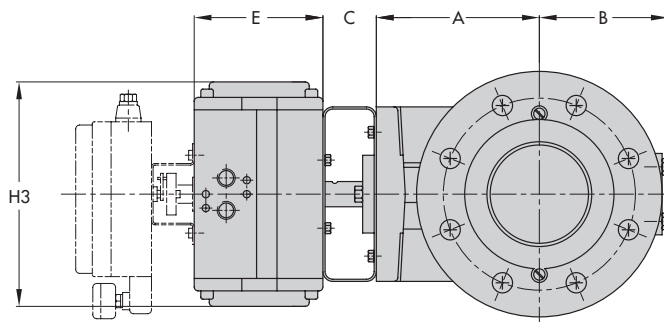


Fig. 4 · Dimension diagram of Type 3310/BR 31a

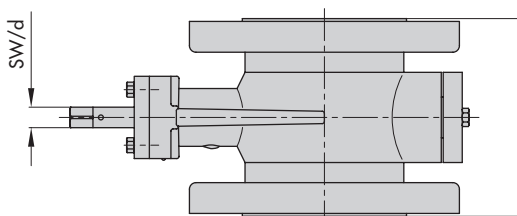
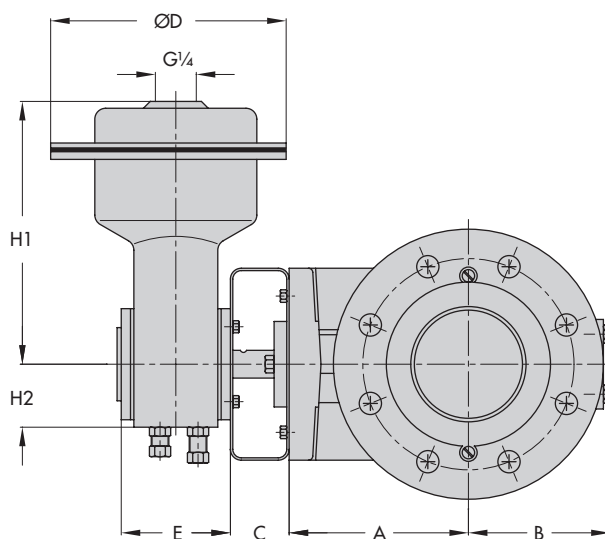


Fig. 5 · Dimension diagram of Type 3310/3278

**The following details are required on ordering**

Valve size	.... "	Operating range	Number of springs or bench range
Pressure rating	Class ....	Accessories	Positioner and/or limit switches
Body material	According to Table 2		
Seal	Soft sealing, metal sealing		
Characteristic	Equal percentage or linear		
Flow direction	Standard or reverse		
Rotary actuator	Type BR 31a-SRP or BR 31a-DAP Type 3278		
Fail-safe action	Valve CLOSED or valve OPEN		
Supply pressure	.... bar		

Specifications subject to change without notice.