Type 3310/31a and Type 3310/3278 Pneumatic Segmented Ball Valves

ANSI version

SAMSON

Application

Control valve for process engineering and industrial applications

Valve size	NPS 1 to 12 (DN 25 to 300)
Pressure rating	Class 150/300 (PN 40)
Temperatures	−51 to +842 °F (−46 to +450 °C)

Type 3310 Segmented Ball Valve with

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

Valve body made of

- Cast steel
- Cast stainless steel

Segmented ball valve

- Soft seal
- Metal seal

The control valves can be equipped with various accessories: Positioners, solenoid valves and other accessories according to VDI/VDE 3845 on Type SRP or DAP and Type 3278 Rotary Actuators. Direct attachment of SAMSON valve accessories to Type 3278 Rotary Actuator.

Versions

Standard version for temperatures ranging from −20 to 428 °F (−29 to 220 °C), NPS 1 to 12 (DN 25 to 300)

- **Type 3310-SRP** · With single-acting Type 31a-SRP Pneumatic Rotary Actuator (see Data Sheet ▶ T 9929 EN)
- **Type 3310/3278** · With single-acting Type 3278 Pneumatic Rotary Actuator (see Data Sheet ▶ T 8321 EN)

Further versions

- **Type 3310** · With double packing with or without leak monitoring
- **Type 3310** · Without insulating section for medium temperatures from −10 to +220 °C, with cast steel or cast stainless steel according to DIN
- **Type 3310** · With insulating section for medium temperatures from −10 to +400 °C, with cast steel according to DIN
- **Type 3310** · With insulating section for medium temperatures from −46 to +450 °C, with cast stainless steel according to DIN
- **Type 3310** · With reduced C_V (K_{VS}) coefficients by installing upstream or downstream reducers
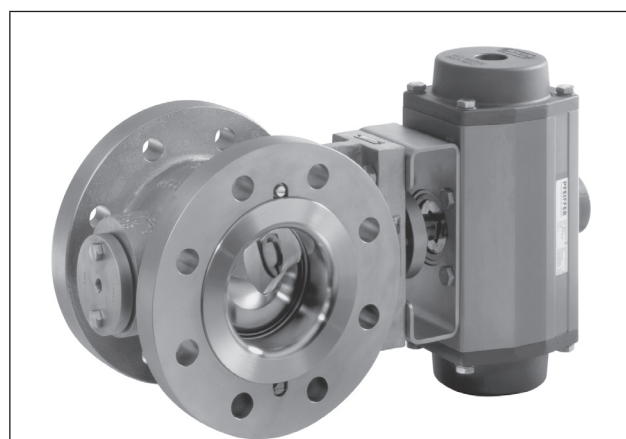
Fig. 1: *Type 3310 Segmented Ball Valve with Type 31a Pneumatic Rotary Actuator*
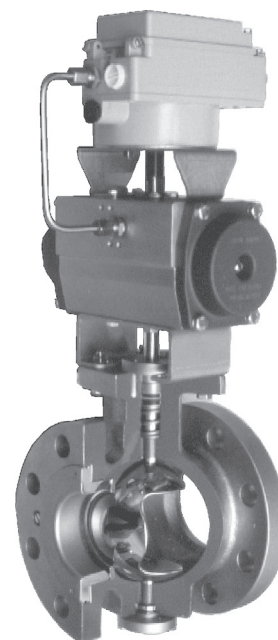
Fig. 2: *Cutaway view of Type 3310 Segmented Ball Valve with Type 31a Pneumatic Rotary Actuator and positioner*

- **Type 3310** · With form-fit flanges
- **Type 3310** · With DIN flanges
- **Type 3310-DAP** · With double-acting Type 31a-DAP Pneumatic Rotary Actuator
- **Type 3310** · With pneumatic rotary actuator and additional handwheel
- **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 controlling 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:

- **Fail-close valve:** The segmented ball valve is closed when the supply air fails.
- **Fail-open valve:** 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 toward the valve.
- **Linear:** The converted actuator turns counterclockwise (left turning) to close the valve, looking from the actuator toward the valve.
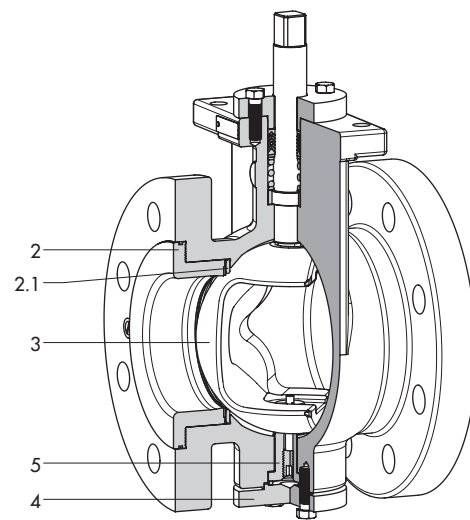
2	Retainer
2.1	Gasket
3	Segmented ball valve
4	Bottom flange
5	Counter bearing

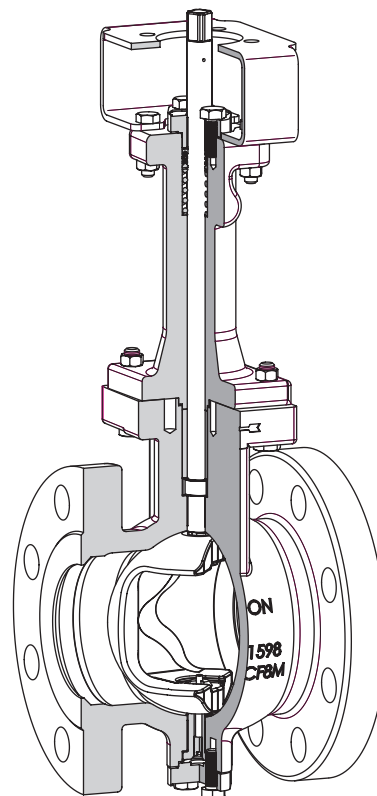**Fig. 3:** *Type 3310 Segmented Ball Valve*

Fig. 4: *Insulating section for Type 3310 Segmented Ball Valve*

Table 1: *Technical data*

Valve size		NPS 1 to 12 (DN 25 to 300)
Pressure rating		Class 150/300 (PN 40)
Type of end connections	Flanges	ANSI B16.5 · DIN (ISO on request)
Seat ring	Soft seal	PTFE with reinforced stainless steel (max. 430 °F/220 °C)
	Metal seal	ARCAP AP1C
Characteristic		Linear or equal percentage
Max. opening angle		90° · 70° with reverse direction of flow in throttling service
Rangeability		≥ 100:1
Overall length		DIN EN 558-2 Series 36
Temperature range	Standard version	−20 to +428 °F (−29 to +220 °C) · DIN: 14 to 752 °F (−10 to +220 °C)
	Version with insulating section	A216 WCC: −20 to +797 °F (−29 to +425 °C) · DIN: 14 to 752 °F (−10 to +400 °C)
		A351 CF8M: −51 to +842 °F (−46 to +450 °C) · DIN: −50 to +842 °F (−46 to +450 °C)
Leakage class according to ANSI/FCI 70-2		
Soft seal		VI
Metal seal		IV

Table 2: *Materials for standard version*

Body	A216 WCC	A351 CF8M
Segmented ball valve	316L, hardened	
Shaft	NPS 1, 1½, 2, 3, 4, 8, 10, 12: 316L · NPS 6: AISI 630	
Plain bearing	304 + PTFE · High-temperature versions: ARCAP AP1C	
Packing	V-ring packing: PTFE with carbon · Spring: Stainless steel	
Bottom flange	Up to NPS 3: 316L · NPS 4 and larger: A105	316L

Table 3: *Opening angle and associated C_V and K_{VS} coefficients*

Table 3.1: *C_V coefficients for modified linear characteristic*

Valve size		Opening angle										
NPS	DN	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
1	25	0.35	1	3.4	7	11.5	17.3	20	24.5	32.3	38	40
1½	40	1	3	10	21	35	52	60	74	97	114	120
2	50	1.4	4	13.6	28	46	69	80	98	129	152	160
3	80	3.6	10	34	70	115	173	200	245	323	381	400
4	100	6.3	18	60	123	201	302	350	429	565	666	700
6	150	13	35	119	245	402	605	700	858	1130	1333	1400
8	200	18	50	170	350	574	864	1000	1226	1614	1904	2000
10	250	28	78	264	543	890	1339	1550	1900	2502	2951	3100
12	300	28	78	264	543	890	1339	1550	1900	2502	2951	3100

[1] The C_V coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 3.2: *K_{VS} coefficients for modified linear characteristic*

Valve size		Opening angle										
NPS	DN	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
1	25	0.3	0.85	3	6	10	14.7	17	20.8	27.4	32.3	34
1½	40	0.85	2.5	8.5	18	30	44	51	63	82.4	97	102
2	50	1.2	3.4	11.68	24	40	59	68	84	110	130	140
3	80	3	8.5	29	60	98	148	170	210	276	325	340
4	100	5.4	15	51	105	172	260	298	367	482	570	600
6	150	11	30	102	210	344	517	595	733	965	1140	1200
8	200	15.4	43	145	300	490	738	850	1048	1380	1630	1700
10	250	24	66	225	464	760	1145	1317	1624	2140	2520	2650
12	300	24	66	225	464	760	1145	1317	1624	2140	2520	2650

[1] The K_{VS} coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 3.3: C_V coefficients for modified equal percentage characteristic (standard)

Valve size		Opening angle										
NPS	DN	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
1	25	0.08	0.16	1.3	3.3	6.3	10.7	14	16.3	23	32	40
1½	40	0.25	0.5	4	10	19	32	42	49	69	95	120
2	50	0.3	0.6	5	13	25	42	56	65	92	126	160
3	80	0.8	1.6	12	32	62	106	140	162	231	316	400
4	100	1.4	2.8	22	56	109	186	245	284	405	553	700
6	150	2.8	5.6	43	112	218	371	490	567	809	1106	1400
8	200	4.0	8	62	160	312	530	700	810	1156	1580	2000
10	250	6.2	12	96	248	484	822	1085	1256	1792	2449	3100
12	300	6.2	12	96	248	484	822	1085	1256	1792	2449	3100

[1] The C_V coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 3.4: K_{VS} coefficients for modified equal percentage characteristic (standard)

Valve size		Opening angle										
NPS	DN	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
1	25	0.07	0.13	1.1	2.8	5.3	9	12	14	20	27	34
1½	40	0.21	0.4	3.4	8.5	16	27	36	42	59	81	102
2	50	0.25	0.5	4	11	21	36	48	56	79	108	140
3	80	0.7	1.4	10	27	53	91	120	138	197	270	340
4	100	1.2	2.4	19	48	93	159	208	243	346	473	600
6	150	2.4	4.8	37	96	186	317	416	485	691	945	1200
8	200	3.4	6.8	53	137	267	453	688	692	990	1350	1700
10	250	5.3	10	82	212	414	702	922	1074	1531	2093	2650
12	300	5.3	10	82	212	414	702	922	1074	1531	2093	2650

[1] The K_{VS} coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 4: Terms for control valve sizing and noise level calculation

Table 4.1: Modified linear characteristic

	Opening angle										
	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
F_L	0.95	0.95	0.95	0.94	0.87	0.81	0.77	0.73	0.65	0.59	0.57
X_T	0.78	0.78	0.78	0.76	0.65	0.56	0.51	0.46	0.36	0.30	0.27
C	0.39	0.35	0.28	0.23	0.2	0.17	0.16	0.14	0.12	0.10	0.09

[1] The C_V coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 4.2: Modified equal percentage characteristic

	Opening angle										
	5°	10°	20°	30°	40°	50°	55° [1]	60°	70°	80°	90°
F_L	0.95	0.95	0.95	0.95	0.95	0.90	0.86	0.82	0.75	0.66	0.57
X_T	0.78	0.78	0.78	0.78	0.78	0.69	0.62	0.58	0.49	0.38	0.27
C	0.44	0.39	0.33	0.29	0.24	0.21	0.19	0.18	0.15	0.12	0.09

[1] The C_V coefficient can be lowered by reducing the opening angle to 55° only in conjunction with a positioner (cam disk)

Table 5: *Permissible differential pressures for Type 3310 Segmented Ball Valve · All pressures stated in bar*

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

Table 5.1: *Permissible differential pressures for valve CLOSED · For both fail-safe positions · With Type 31a-SRP Rotary Actuator*

| Valve size | | C_V coefficient | Shaft Ø in mm | Type SRP ... Actuator | No. of springs | Required supply pressure | Max. supply pressure at | | | Δp with PTFE or metal seal | |
NPS	DN						20 °C (71 °F)	220 °C (428 °F)	450 °C [1] (842 °F)	With standard direction of flow	With reverse direction of flow [2]
1	25	40	16	60	2/3	2.5	6.9	5.5	4	15	10
				60	4	4	7.5	6.1	4.5	20	20
				30	5/6	5.5	8	8	8	17	12
1½	40	120	16	100	2/3	2.5	4.8	3.9	2.9	20	17
				60	4	4	7.5	6.1	4.5	20	19
				60	5/6	5.5	8	6.7	–	20	20
2	50	160	16	150	2/3	2.5	5.6	5	4.4	20	20
				100	4	4	8	7.6	6.6	20	20
				60	5/6	5.5	8	8	8	20	20
3	80	400	16	220	2/3	2.5	3.8	3.5	3.1	20	20
				150	4	4	6.2	5.6	5	20	20
				100	5/6	5.5	8	8	7.2	20	18
4	100	700	25	450	2/3	2.5	6.6	6	5.2	18	15
				300	4	4	8	8	8	18	16
				220	5/6	5.5	8	8	8	20	19
6	150	1400	25	600	3	3	5.5	5	4.4	11	8
				600	4	4	5.9	5.4	4.8	20	20
				450	5/6	5.5	7.8	7.1	6.3	20	20
				300	5/6	5.5	8	8	8	6	3
8	200	2000	36	1200	2/3	2.5	5	4.5	3.9	9	6
				1200	4	4	5.6	5.1	4.5	20	20
				900	5/6	5.5	7.8	7.1	6.3	20	20
10	250	3100	36	1200	4	4	5.6	5.1	4.5	9	6
				1200	5/6	5.5	6.2	5.7	–	19	16
				900	5/6	5.5	7.8	7.1	6.3	7	5
12	300	3100	36	1200	4	4	5.6	5.1	4.5	9	6
				1200	5/6	5.5	6.2	5.7	–	19	16
				900	5/6	5.5	7.8	7.1	6.3	7	5

[1] Version with insulating section
[2] The permissible opening angle is reduced to 70° with reverse direction of flow in throttling service.

Table 5.2: *Permissible differential pressures for valve CLOSED · For both fail-safe positions · With Type 3278 Rotary Actuator*

| Valve size | | C_V coefficient | Shaft Ø in mm | Actuator area in cm² | Bench range [1] | Required supply pressure | Max. supply pressure at | | Δp with PTFE or metal seal | |
NPS	DN						20 °C (71 °F)	220 °C (428 °F)	With standard direction of flow	With reverse direction of flow [2]
1	25	40	16	160	0.5 to 1.0	1.5	2.5	2	17	12
					0.8 to 1.6	2.4	3	2.6	20	20
1½	40	120	16	160	0.5 to 1.0	1.5	2.5	2	10	–
					0.8 to 1.6	2.4	3	2.6	20	20
2	50	160	16	160	0.8 to 1.6	2.5	4.5	4.1	20	20
3	80	400	16	160	1.2 to 2.4	3.7	5.2	4.7	7	–
					1.7 to 3.4	5.1	5.8	5.4	20	20
4	100	700	25	320	0.8 to 1.6	2.4	4.8	4.4	9	4
					1.2 to 2.4	3.6	5.4	5	20	20
6	150	1400	25	320	1.7 to 3.4	5.1	6	5.6	12	10

[1] Only applies to standard direction of flow
[2] The permissible opening angle is reduced to 70° with reverse direction of flow in throttling service.

Table 6: *Permissible shaft and opening torques*

Table 6.1: *Shaft with square drive (e.g. Type 31a-SRP/DAP Actuator)*

| Valve size | | Perm. shaft torque [Nm] at | | Opening torque [Nm] for PTFE or metal seal with | | | | | | | |
| | | | | Standard direction of flow at Δp | | | | Reverse direction of flow [1] at Δp | | | |
NPS	DN	20 °C (71 °F)	220 °C (428 °F)	5 bar	10 bar	15 bar	20 bar	5 bar	10 bar	15 bar	20 bar
1	25	70	54	9	9	11	13	10	11	13	15
1½	40	70	54	12	12	14	16	13	14	16	18
2	50	125	110	14	14	16	18	15	16	18	20
3	80	125	110	29	31	33	35	32	34	36	38
4	100	500	440	60	65	76	87	65	70	81	92
6	150	500	440	115	125	145	165	125	135	155	175
8	200	860	750	190	210	255	300	210	230	275	320
10	250	860	750	300	340	410	480	330	370	440	510
12	300	860	750	300	340	410	480	330	370	440	510

[1] The permissible opening angle is reduced to 70° with reverse direction of flow in throttling service.

Table 6.2: *Shaft with key drive end (e.g. Type 3278 Actuator)*

| Valve size | | Perm. shaft torque [Nm] at | | Opening torque [Nm] for PTFE or metal seal with | | | | | | | |
| | | | | Standard direction of flow at Δp | | | | Reverse direction of flow [1] at Δp | | | |
NPS	DN	20 °C (71 °F)	220 °C (428 °F)	5 bar	10 bar	15 bar	20 bar	5 bar	10 bar	15 bar	20 bar
1	25	70	54	9	9	11	13	10	11	13	15
1½	40	70	54	12	12	14	16	13	14	16	18
2	50	125	110	14	14	16	18	15	16	18	20
3	80	125	110	29	31	33	35	32	34	36	38
4	100	500	440	60	65	76	87	65	70	81	92
6	150	500	440	115	125	145	165	125	135	155	175

[1] The permissible opening angle is reduced to 70° with reverse direction of flow in throttling service.

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

Valve	NPS	1	1½	2	3	4	6	8	10	12
	DN	25	40	50	80	100	150	200	250	300
L - FTF according to ISA S75.04	mm	102	114	124	165	194	229	243	297	338
d - Shaft Ø	mm	16	16	16	16	25	25	36	36	36
A	mm	107	117	126	145	170	206	254	281	281
B	mm	72	82	100	120	140	175	205	230	230
F - Optional insulating section		170				255				
Flange connecting yoke		See actuators								
SW (standard shaft)	mm	12	12	12	12	19	19	27	27	27
Shaft with key drive for Type 3278 Actuator	mm	16	16	16	16	25	25	–	–	–
Weight	kg	5	7	16	28	42	70	110	155	180

| Type 31a-SRP/DAP Rotary Actuator [1]		30	60	100	150	220	300	450	600	900	1200
Mounted on valve			NPS 1½ DN 40	NPS 2 DN 50		NPS 4 DN 100				NPS 10/12 DN 250/300	
		NPS 1 DN 25			NPS 3 DN 80		NPS 6 DN 150			NPS 8 DN 200	
C	mm	50	50	50	50	50 [2]	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
AF	mm	14	14	17	17	22	22	27	27	36	36
Weight [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 cm²		320 cm²	
E	mm	118		162	
C	mm	50		55 [2]	80
H1	mm	260		421	
H2	mm	72		95	
D	mm	225		295	
Connecting flange ISO 5211		F07		F12	
Weight	kg	16		50	

[1] Single-acting Type 31a-SRP/SC (right turning) and Type 31a-SRP/SO (left turning) Actuators.
Double-acting Type 31a-DAP/DR (right turning) and Type 31a-DAP/DC (left turning) Actuators.

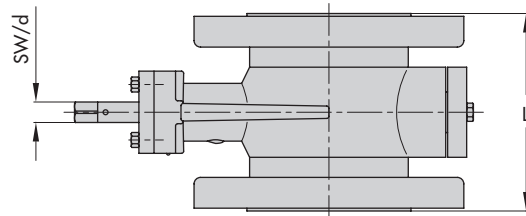[2] C = 55 mm with valve in NPS 4

Dimensional drawings
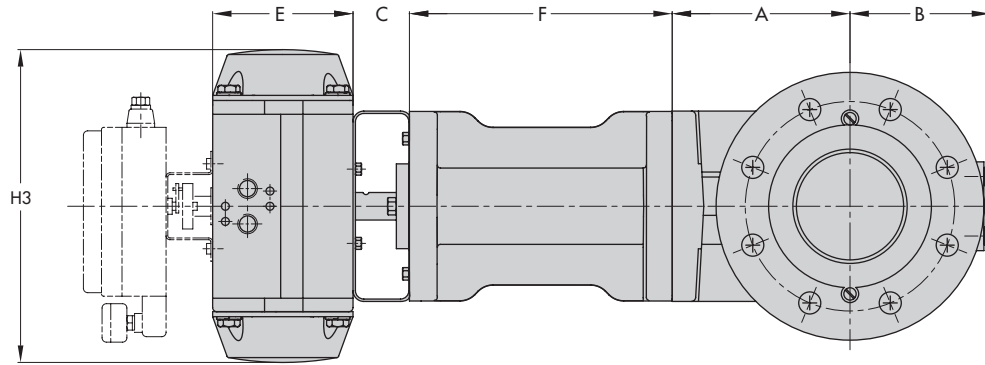
Type 3310/31a Segmented Ball
Valve with short insulating section
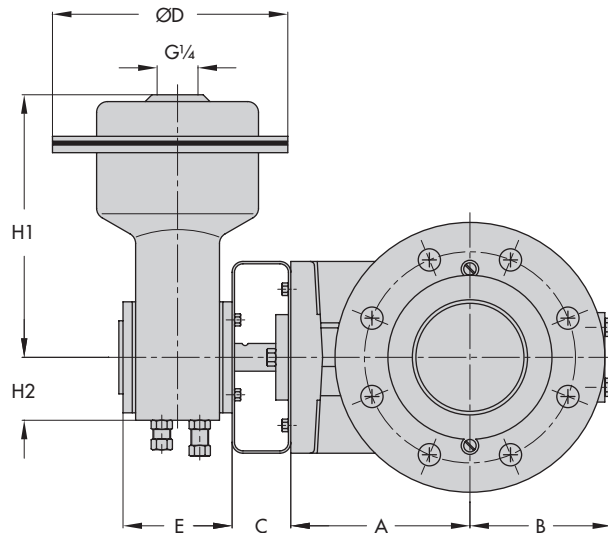
Type 3310 Segmented Ball
Valve with Type 3278 Actuator

Ordering text

Valve size	NPS …	Rotary actuator	Type 31a-SRP, Type 31a-DAP or Type 3278
Pressure rating	Class …	Fail-safe position	Fail-close or fail-open
Body material	According to Table 2	Supply air	… bar
Gasket	Metal or soft seal	Operating range	Number of springs or bench range
Characteristic	Equal percentage or linear	Valve accessories	Positioner and/or limit switch
Direction of flow	Standard or reverse		

Specifications subject to change without notice

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