

Pneumatic Control Butterfly Valve Type 3331/BR 31a

Application

Control butterfly valve for use in process engineering and industrial applications to meet high demands

Suitable for liquids, vapors and gases

Nominal size DN 100 to 400 · NPS 4 to 16

Nominal pressure PN 10 to 40 · ISO PN 20 and 50
Class 150 and 300

Medium temperature -10 to +400 °C · 14 to 752 °F

Type 3331 Butterfly Valve with

- Type BR 31a Pneumatic Rotary Piston Actuator (see T 9929 EN)

Or as special version with

- Type 3278 Pneumatic Rotary Actuator (see T 8321 EN)

Valve body made of

- Cast steel or stainless cast steel

Type of butterfly disc

- Swing-through or
- Angle-seated (low-noise)

Additional features

- Butterfly valve can be clamped between DIN or ANSI flanges
- DN 100 (NPS 4) or smaller with a wafer-style body
- DN 150 (NPS 6) and higher with centering lugs to simplify installation in the pipeline

Attachment of control valve accessories such as pneumatic or electropneumatic positioners, electric or pneumatic limit switches or solenoid valves according to VDI/VDE 3845.

Versions

Standard version

Type 3331 Butterfly Valve with swing-through or angle-seated (low-noise) disc for medium temperatures between -10 and +220 °C (14 to 428 °F), spring-loaded PTFE packing

- **Type 3331/BR 31a** (Fig. 1) · Butterfly valve and single-acting Type SRP Pneumatic Rotary Piston Actuator

Special version

- **Type 3331/3278** (Fig. 2) · Butterfly valve and single-acting Type 3278 Pneumatic Rotary Diaphragm Actuator

Further versions with

- **Graphite packing** · Medium temperature between -10 and +400 °C (14 to 725 °F)
- **DN 50 and 80, angle-seated disc** · Without noise reduction, made of solid steel or 1.4404
- **Double packing**
- **Form-fit flanges** · On request
- **Handwheel**
- **Extension for low temperature applications**
- **Manual or electric actuator** · On request

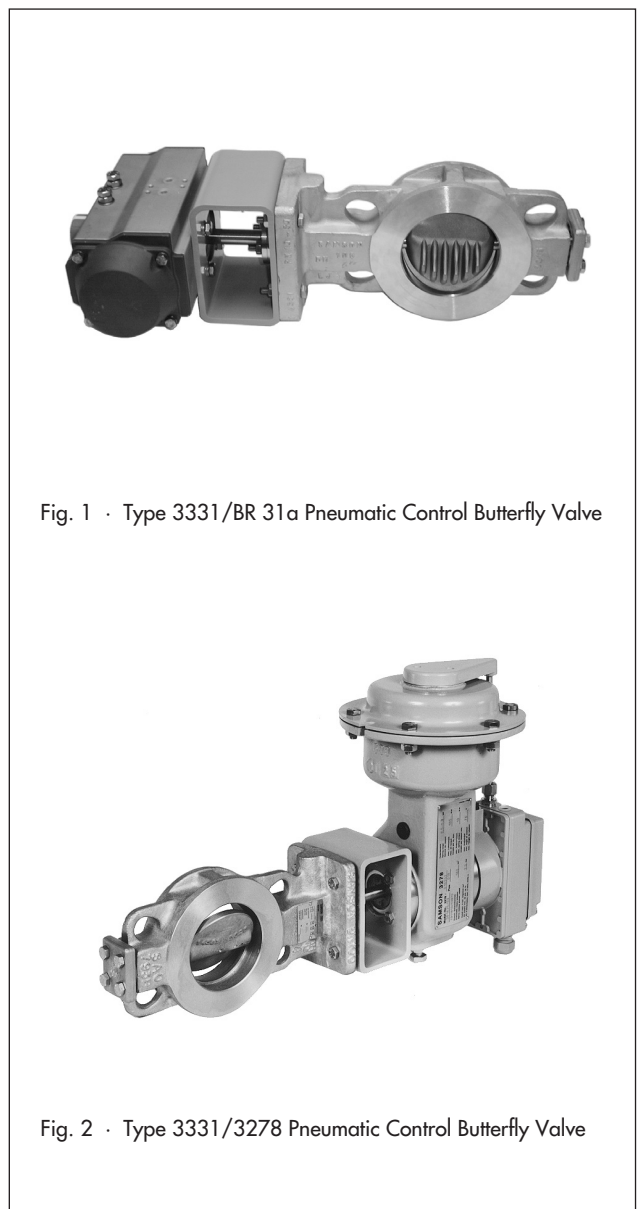


Fig. 1 · Type 3331/BR 31a Pneumatic Control Butterfly Valve

Fig. 2 · Type 3331/3278 Pneumatic Control Butterfly Valve

- **Double-acting rotary actuator** · On request
- **Step-seated butterfly disc** · On request

Principle of operation

The process medium flows through the butterfly valve. The flow coefficient is determined by the opening angle of the disc.

In Type 3331/BR 31a, the actuator motion is transmitted using a square drive. In Type 3331/3278, a single key drive is used to transmit the motion from the actuator to the shaft. The shaft is sealed by a packing.

Fail-safe position

Depending on how the actuator is mounted (see Data Sheets T 9929 EN and T 8321 EN), the valve provides two different fail-safe positions:

Valve CLOSED without supply air

The butterfly valve is closed when the supply air fails.

Valve OPEN without supply air

The butterfly valve is opened when the supply air fails.

Note: The butterfly valve in DN 100/NPS 4 and smaller is delivered with a wafer-style body and in DN 150/NPS 6 and larger with lugs

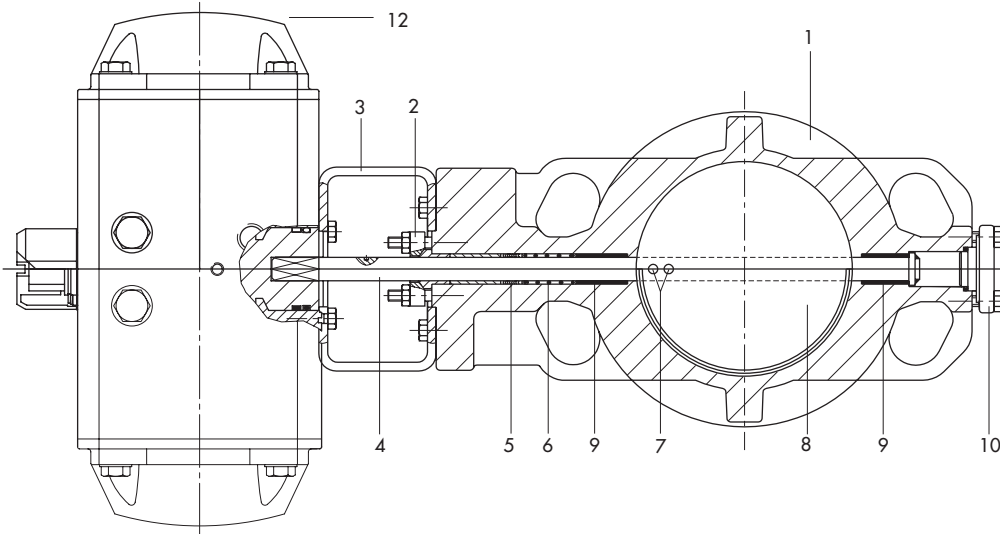


Fig. 3 · Type 3331/BR 31a Pneumatic Control Butterfly Valve

- 1 Body
- 2 Gland flange
- 3 Yoke
- 4 Shaft
- 5 Packing
- 6 Spring
- 7 Tapered pins
- 8 Butterfly disc
- 9 Internal bearing
- 10 Stopper
- 11 Single key
- 12 Actuator

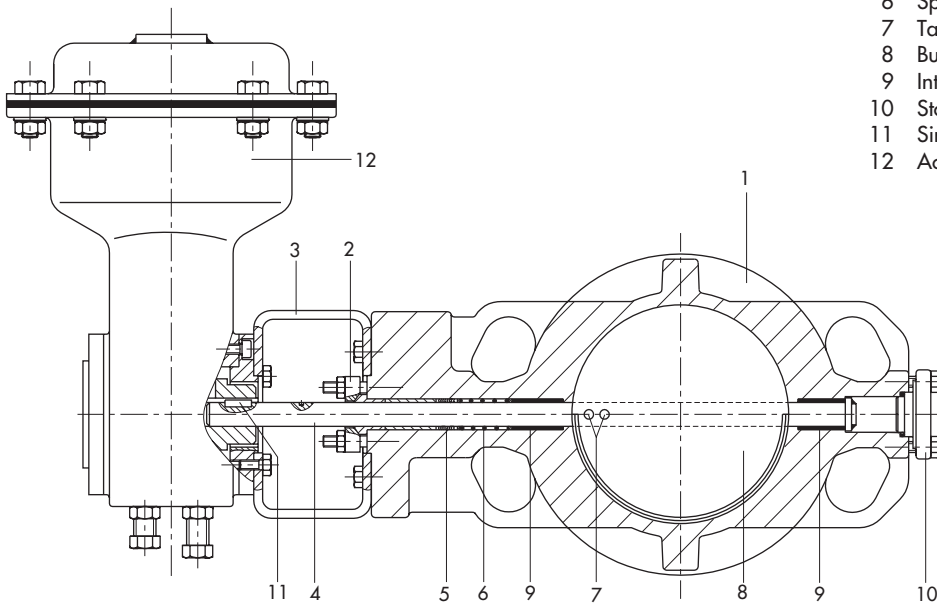


Fig. 4 · Type 3331/3278 Pneumatic Control Butterfly Valve

Table 1 · Technical data of Type 3331 Control Butterfly Valve

Nominal size	DN 100 to 150 · NPS 4 to 6	DN 200 to 400 · NPS 8 to 16
Nominal pressure	PN 10 to 40 (DIN) · PN 20 and 50 (ISO) · Class 150 and 300 (ANSI)	
Temperature range		
Normal version	-10 to 220 °C · 14 to 428 °F	
with graphite packing and insulating section ¹⁾	-10 to 400 °C · 14 to 752 °F	
Opening angle		
On-off service	90° · 70° with angle-seated (low-noise) disc	
Throttling service	70°	
Leakage rate, in relation to K _V value at the opening angle		
Swing-through	≤ 1 % (K _V 90°)	≤ 0.5 % (K _V 90°)
Angle-seated/low-noise	≤ 1 % (K _V 70°)	≤ 0.5 % (K _V 70°)
Rangeability with φ ₁₀₀ = 70°	50 : 1	

¹⁾ Taking into account the material-specific temperature limits down to -50 °C (-58 °F) · Refer to T 8000-2 EN

Table 2 · Materials

Body	DN 100/NPS 4	Cast steel 1.0425 (H II) · A414 Gr D	Cast stainless steel 1.4404/316L
	≥ DN 150/NPS 6	1.0619 (GP240GH) · A 216 WCB (216 WCC)	1.4581 (1.4408)
Butterfly disc	1.4581		
Shaft	CrNiMo steel 1.4021 with 36 mm Ø shaft		CrNiMo steel
Tapered pins	Heat-treated stainless steel		
Internal bearing	Carbon		
Packing	PTFE V-ring packing with carbon for 16 and 25 mm Ø shaft PTFE silk cord and compound for -10 to 220 °C (14 to 428 °F) for 36 mm Ø shaft or graphite carbon for -10 to 400 °C (14 to 752 °C)		
Gland flange	1.4305	1.4571	
Spring	1.4310		
Yoke	St 37-2		
Stopper	1.0460 (C 22.8) · A 105		1.4571 · A 182 F 316

Table 3 · Terms for control valve sizing and noise level calculation**Table 3a · Swing-through disc**

Op. angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
F _L	0.95	0.95	0.92	0.83	0.73	0.65	0.58	0.53	0.50
x _T	0.75	0.75	0.73	0.58	0.46	0.36	0.29	0.24	0.21
x _{Fz}	0.35	0.30	0.25	0.20	0.17	0.14	0.12	0.11	0.10

Table 3b · Angle-seated (low-noise) disc

Op. angle	10°	20°	30°	40°	50°	60°	70°
F _L	0.79	0.78	0.77	0.75	0.73	0.70	0.66
x _T	0.54	0.53	0.51	0.48	0.45	0.42	0.37
x _{Fz}	0.32	0.26	0.22	0.19	0.17	0.15	0.13

Table 4 · K_V coefficients**Table 4a · Swing-through disc**

DN	Opening angle								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
100	8	25	40	80	140	220	320	420	440
150	10	35	80	160	290	450	700	1000	1200
200	40	120	260	460	720	1100	1500	1800	2000
250	50	190	410	730	1200	1700	2400	2900	3200
300	70	230	590	990	1600	2400	3400	4100	4500
400	125	450	1000	1700	2800	4200	5900	7200	7800

Table 4b · Angle-seated (low-noise) disc

DN	Opening angle						
	10°	20°	30°	40°	50°	60°	70°
100	20	45	85	120	180	240	330
150	50	100	180	275	375	500	600
200	60	150	300	530	870	1080	1200
250	80	210	390	615	970	1250	2150
300	140	350	650	1025	1480	2100	3090
400	180	470	870	1380	1990	2830	4830

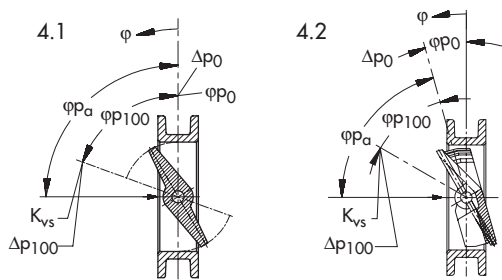
Table 5 · C_V coefficients**Table 5a · Swing-through disc**

DN	Opening angle								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
100	9	30	45	90	160	255	370	485	510
150	12	40	90	185	335	520	810	1160	1390
200	45	140	300	530	830	1270	1740	2080	2310
250	55	220	470	845	1390	1970	2780	3350	3700
300	80	265	680	1150	1850	2780	3930	4740	5200
400	145	520	1160	1970	3240	4860	6820	8320	9020

Table 5b · Angle-seated (low-noise) disc

DN	Opening angle						
	10°	20°	30°	40°	50°	60°	70°
100	23	50	100	140	210	275	380
150	58	115	210	320	435	580	700
200	70	175	350	615	1005	1250	1400
250	93	245	450	710	1120	1445	2490
300	160	405	750	1185	1710	2430	3570
400	210	540	1005	1600	2300	3270	5505

Functional diagrams, opening angle and flow coefficients



4.1 Swing-through disc
4.2 Angle-seated (low-noise) disc

Fig. 4 · Disc types for nominal size DN 100

Notes on the differential pressure tables

The specified K_V coefficients apply to a nominal opening angle of $\varphi_{100} = 70^\circ$.

In addition, the following applies:

Δp_0 Permissible differential pressure with disc in closed position (valve CLOSED)

Δp_{100} Permissible differential pressure with a nominal opening angle of φ_{100} (valve OPEN 70°)

The permissible differential pressures are limited by the nominal pressure ratings (also see T 8000-2 EN).

Only on-off butterfly valves can be used without positioners. In all other cases, positioners are required.

Table 6 · Permissible differential pressures

Table 6a · Type SRP Actuator with fail-safe position CLOSED or OPEN · All pressures in bar

Values for supply pressure in parentheses only apply to body material 1.0619 and shaft material 1.4021.

A graphite-carbon packing must be used for temperatures above 220 °C.

Nominal size	Shaft \varnothing in mm	Type SRP Actuator	Springs n =	Signal pressure required to keep disc open	Max. perm. supply pressure at			Differential pressure with packing			
					20 °C (68 °F)	220 °C (428 °F)	400 °C (752 °F)	PTFE		Graphite	
								Δp_0	Δp_{100}	Δp_0	Δp_{100}
DN 100 NPS 4	16	100	2/3	2.5	6	6	6	7.7	1.20	3.7	0.50
		100	4	4	6	6	6	12.7	2.10	8.7	1.40
		100	5/6	5.5	6	6	6	17.8	2.9	13.8	2.20
DN 150 NPS 6	16	150	2/3	2.5	6	5.9	5.1	5.9	0.60	3.9	0.45
		100	4	4	6	6	6	6.3	0.60	4.3	0.45
		100	5/6	5.5	6	6	6	8.9	0.90	6.9	0.75
	25	450	2/3	2.5	6	6	5.7	11.3	1.90	9.2	1.53
		450	4	4	6	6	6	18.4	3.1	16.3	2.73
		450	5/6	5.5	6	6	6	25.4	4.30	23.3	3.93
DN 200 NPS 8	16	150	2/3	2.5	6	5.9	5.1	3.4	0.25	2.3	0.19
		150	4	4	6	6	5.7	5.5	0.40	4.4	0.34
		100	5/6	5.5	6	6	6	5.0	0.35	3.9	0.29
	25	450	2/3	2.5	6	6	5.8	7.2	0.85	5.8	0.69
		450	4	4	6	6	6	11.7	1.40	10.3	1.24
		450	5/6	5.5	6	6	6	16.1	1.90	14.7	1.74
DN 250 NPS 10	25	600	2/3	2.5	6	5.4	4.7	6.4	0.60	5.5	0.50
		450	4	4	6	6	6	7.6	0.70	6.7	0.60
		450	5/6	5.5	6	6	6	10.5	1.00	9.6	0.90
DN 300 NPS 12	25	600	2/3	2.5	6	5.4	4.7	4.3	0.35	3.7	0.30
		600	4	4	6	6	5.3	7.0	0.60	6.4	0.55
		600	5/6	5.5	6	6	5.9	9.7	0.80	9.1	0.75
	36	1200	2/3	2.5	5.8 (6)	4.5 (6)	3.9 (6)	5.7	0.65	4.9	0.55
		1200	4	4	6	5.1 (6)	4.5 (6)	9.2	1.00	8.4	0.90
		1200	5/6	5.5	6	5.7 (6)	– (6)	12.8	1.50	12.0	1.40
DN 400 NPS 16	25	600	2/3	2.5	6	5.4	4.7	2.6	0.15	2.3	0.13
		600	4	4	6	6	5.3	4.2	0.25	3.9	0.23
		600	5/6	5.5	6	6	5.9	5.8	0.35	5.5	0.33
	36	1200	2/3	2.5	5.8 (6)	4.5 (6)	3.9 (6)	3.4	0.30	2.9	0.25
		1200	4	4	6	5.1 (6)	4.5 (6)	5.4	0.50	4.9	0.45
		1200	5/6	5.5	6	5.7 (6)	– (6)	7.5	0.65	7.0	0.60

Table 6b · Actuators with fail-safe position CLOSED · All pressures in bar

Nominal size	Shaft Ø in mm	Diaphragm area in cm ²	Signal pressure range 90°	Operating range 70°	Signal pressure required to keep disc open	Max. perm. supply pressure at			Differential pressure with packing			
						20 °C (68 °F)	220 °C (428 °F)	400 °C (752 °F)	PTFE		Graphite	
									Δp ₀	Δp ₁₀₀	Δp ₀	Δp ₁₀₀
DN 100 NPS 4	16	160	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	9.0	2.4	5	1.70
			1.2...2.4	1.2...2.2	3.5	6.0	5.2	4.7	14	3.0	10	2.30
			1.7...3.4	1.7...3.1	5.5	6.0	5.9	–	20	5.7	16	5.00
DN 150 NPS 6	16	160	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	4.5	0.7	2.5	0.55
			1.2...2.4	1.2...2.2	3.5	6.0	5.2	4.7	7.0	0.9	5	0.75
			1.7...3.4	1.7...3.1	5.5	6.0	5.9	–	10	1.7	8	1.55
	25 ¹⁾	320	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	8.5	2.5	6.4	2.12
			1.2...2.4	1.2...2.2	3.5	6.0	5.3	4.8	13	3.2	10.9	2.82
			1.7...3.4	1.7...3.1	5.5	6.0	6.0	–	19	5.8	16.9	5.42
DN 200 NPS 8	16	160	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	2.5	0.3	1.4	0.24
			1.2...2.4	1.2...2.2	3.5	6.0	5.2	4.7	4.0	0.4	2.9	0.34
			1.7...3.4	1.7...3.1	5.5	6.0	5.9	–	5.5	0.7	4.4	0.64
	25 ¹⁾	320	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	5.5	1.1	4.1	0.94
			1.2...2.4	1.2...2.2	3.5	6.0	5.3	4.8	8.5	1.4	7.1	1.24
			1.7...3.4	1.7...3.1	5.5	6.0	6.0	–	12	2.6	10.6	2.44
DN 250 NPS 10	25	320	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	3.5	0.6	2.6	0.50
			1.2...2.4	1.2...2.2	3.5	6.0	5.3	4.8	5.5	0.7	4.6	0.60
			1.7...3.4	1.7...3.1	5.5	6.0	6.0	–	7.5	1.3	6.6	1.20
DN 300 NPS 12	25	320	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	2.4	0.3	1.8	0.25
			1.2...2.4	1.2...2.2	3.5	6.0	5.3	4.8	3.5	0.4	2.9	0.35
			1.7...3.4	1.7...3.1	5.5	6.0	6.0	–	5.3	0.8	4.7	0.75
DN 400 NPS 16	25	320	0.8...1.6	0.8...1.5	2.5	6.0	4.7	4.0	1.5	0.15	1.15	0.12
			1.2...2.4	1.2...2.2	3.5	6.0	5.3	4.8	2.2	0.2	1.85	0.17
			1.7...3.4	1.7...3.1	5.5	6.0	6.0	–	3.2	0.3	2.85	0.27

¹⁾ Only with swing-through disc

Table 6c · Type 3278 Actuator with fail-safe action OPEN · All pressures in bar

Nominal size	Shaft \varnothing in mm	Diaphragm area in cm ²	Signal pressure range 90°	Operating range 70°	Signal pressure required to close disc	Max. perm. supply pressure at			Differential pressure with packing			
						20 °C (68 °F)	220 °C (428 °F)	400 °C (752 °F)	PTFE		Graphite	
									Δp_0	Δp_{100}	Δp_0	Δp_{100}
DN 100 NPS 4	16	160	0.5...1.0	0.6...1.0	2.5	5.5	4.1	3.5	10.0	1.4	6	0.70
			0.8...1.6	0.9...1.6	3.5	6.0	4.6	4.1	20	2.4	16	1.70
			1.2...2.4	1.4...2.4	5.0	6.0	5.3	–	30	3.6	26	2.90
DN 150 NPS 6	16	160	0.5...1.0	0.6...1.0	2.5	5.5	4.1	3.5	5.5	0.4	3.5	0.25
			0.8...1.6	0.9...1.6	3.5	6.0	4.6	4.1	10	0.7	8	0.55
			1.2...2.4	1.4...2.4	5.0	6.0	5.3	–	15	1.1	13	0.95
	25 ¹⁾	320	0.5...1.0	0.6...1.0	2.5	5.8	4.4	3.8	11.5	1.4	9.4	1.02
			0.8...1.6	0.9...1.6	3.5	6.0	4.9	4.3	18	2.3	15.9	1.92
			1.2...2.4	1.4...2.4	5.0	6.0	5.4	–	28	3.5	25.9	3.12
DN 200 NPS 8	16	160	0.5...1.0	0.6...1.0	2.5	5.5	4.1	3.5	3.0	0.2	1.9	0.14
			0.8...1.6	0.9...1.6	3.5	6.0	4.6	4.1	5.5	0.3	4.4	0.24
			1.2...2.4	1.4...2.4	5.0	6.0	5.3	–	8.5	0.4	7.4	0.34
	25 ¹⁾	320	0.5...1.0	0.6...1.0	2.5	5.8	4.4	3.8	7.5	0.6	6.1	0.44
			0.8...1.6	0.9...1.6	3.5	6.0	4.9	4.3	11.5	1	10.1	0.84
			1.2...2.4	1.4...2.4	5.0	6.0	5.4	–	17.5	1.5	16.1	1.34
DN 250 NPS 10	25	320	0.5...1.0	0.6...1.0	2.5	5.8	4.4	3.8	4.8	0.3	3.9	0.20
			0.8...1.6	0.9...1.6	3.5	6.0	4.9	4.3	7.5	0.5	6.6	0.40
			1.2...2.4	1.4...2.4	5.0	6.0	5.4	–	11.5	0.8	10.6	0.70
DN 300 NPS 12	25	320	0.5...1.0	0.6...1.0	2.5	5.8	4.4	3.8	3.3	0.2	2.7	0.15
			0.8...1.6	0.9...1.6	3.5	6.0	4.9	4.3	5	0.3	4.4	0.25
			1.2...2.4	1.4...2.4	5.0	6.0	5.4	–	7.5	0.45	6.9	0.40
DN 400 NPS 16	25	320	0.5...1.0	0.6...1.0	2.5	5.8	4.4	3.8	2.0	0.1	1.65	0.07
			0.8...1.6	0.9...1.6	3.5	6.0	4.9	4.3	3.1	0.13	2.75	0.10
			1.2...2.4	1.4...2.4	5.0	6.0	5.4	–	4.7	0.2	4.35	0.17

1) Only with swing-through disc

Table 7 · Permissible shaft, opening and dynamic torques in Nm

Nominal size	Shaft \varnothing in mm	Perm. shaft torque at			Opening torque at a differential pressure Δp_0 (in bar) ^{2) 3)}				Dynamic torque at a diff. pressure Δp_{100} (in bar) ^{2) 4)}		
		20 °C (68 °F)	220 °C (428 °F)	400 °C (752 °F)	3.5	5	10	20	0.5	1	2
DN 100 NPS 4	16	180	130	110	8	12	22	42	8	14	26
DN 150 NPS 6	16	180	130	110	15	22	42	–	22	42	82
	25 ¹⁾	690	500	420	27	38	73	143	24	44	85
DN 200 NPS 8	16	180	130	110	26	37	–	–	48	95	–
	25 ¹⁾	690	500	420	40	58	113	223	50	96	189
DN 250 NPS 10	25	690	500	420	60	88	173	–	92	181	359
DN 300 NPS 12	25	690	500	420	90	128	–	–	153	303	–
	36 ¹⁾	1030	750	630	130	186	366	–	162	318	–
		2060*	1500*	1260*							
DN 400 NPS 16	25	690	500	420	150	213	–	–	348	–	–
	36 ¹⁾	1030	750	630	220	311	–	–	352	698	–
		2060*	1500 *	1260*							

1) Only with swing-through disc

* Valid for shaft material 1.4021 with body material 1.0619

2) Values for PTFE packing

With graphite packing, the values sum up: 8 Nm with \varnothing 16 mm shaft; 15 Nm with \varnothing 25 mm shaft; 30 Nm with \varnothing 36 mm shaft.

3) Permissible differential pressure in bar when the disc is closed

4) Permissible differential pressure in bar when the disc is open (70°)

Table 8 · Dimensions in mm and weights for Type 3331/BR 31a and Type 3331/3278

Type 3331 Butterfly Valve											
Nominal size	DN/NPS	100/4	150/6		200/8		250/10	300/12		400/16	
L		52	56		60		68	78		102	
A		168	209		234		267	343		388	
B		136	175		202		241	267		338	
C		80	80	90	80	90	90	90	100	90	100
\varnothing W - Shaft with single key		16	16	25	16	25	25	25	36	25	36
SW - Shaft with square drive/adaptor for actuator		12/17	12/17	19/27	12/17	19/27	19/27	19/27	27/36	19/27	27/36
Flange connecting yoke		F07	F07	F12	F07	F12	F12	F12	F14	F12	F14
\varnothing D _i		97	146		194		242	290		380	
\varnothing D _e		158	216		270		320	376		486	
Weight	approx. kg	13	19		25		35	55		98	

Type SRP ... Rotary Actuator		100	150	450	600	900	1200
F	mm	248	269	409	438	487	543
G	mm	135	147	207	226	271	295
H	mm	107	123	172	187	204	222
Conn. flange DIN 3337		F07		F12		F14	
SW	mm	17		27		36	
Weight							
Type SRP	approx. kg	4.5	6.5	18.5	24	32	46

Type 3278 Rotary Actuator		160 cm ²	320 cm ²
E	mm	120.5	165.5
H1	mm	260	421
H2	mm	72	95
D	mm	225	295
Conn. flange ISO 5211		F07	F12
Weight		16	50

Table 9 · Mounting dimensions $\varnothing K$ and $\varnothing M$ in mm

Nominal size	DN	100 ... 250	300		400		
Nominal pressure	PN	PN 10 ... 50	25	40 ... 50	25	40	50
	ANSI Class	150 and 300	-	300	-	-	300
$\varnothing W=25$	$\varnothing K$	Dimensions according to PN 10 to 40 ISO PN 20 and 50 ANSI Class 150 and 300 DN 100/NPS 4 without lugs (dimensions M)	-		-		
	$\varnothing M$		-		-		
$\varnothing W=36$	$\varnothing K$		430	450.8	550	585	571.5
	$\varnothing M$		M 27 ¹⁾	M 30 ¹⁾ 1 1/8"	36	39	M 33 ¹⁾ 1 1/4"

1) Versions without threaded holes

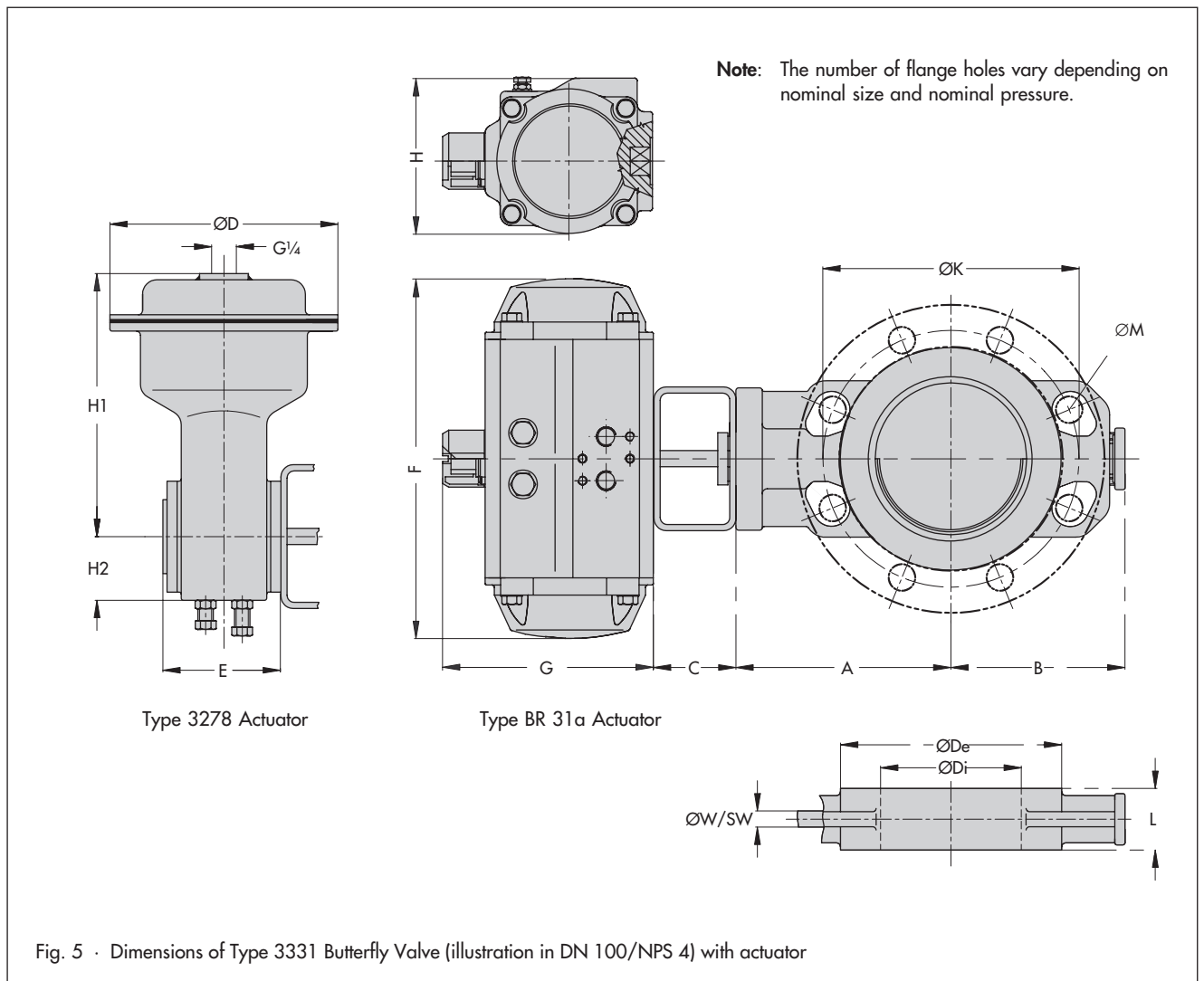


Fig. 5 · Dimensions of Type 3331 Butterfly Valve (illustration in DN 100/NPS 4) with actuator

Ordering text

Nominal size DN ... / NPS ...

Nominal pressure PN ... / Class ...

Butterfly valve with Swing-through or angle-seated (low-noise) disc

Body material According to Table 2

Fail-safe position Valve CLOSED or valve OPEN

Process medium and its density in kg/m³

Maximum flow rate kg/h or m³ /h in relation to the standard or operating conditions

Available supply pressure

Δp_0 and Δp_{100}

Temperature of the process medium

Control valve accessories

Specifications subject to change without notice.



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