

T 8227 EN

Type 3331 Butterfly Valve

Application

Butterfly valves for increased industrial requirements in process engineering and in industrial applications
Liquids, vapors and gases

Valve size DN 100 to 400 · NPS 4 to 16
Pressure rating PN 10 to 40 · Class 150 and 300
Medium temperature -10 to +400 °C · 14 to 752 °F

Type 3331 Butterfly Valve optionally with

- Type 31a Pneumatic Piston Actuator (see Data Sheet ▶ T 9929) or
- Type 3278 Pneumatic Diaphragm Actuator (see Data Sheet ▶ T 8321)

Body made of

- Cast steel
- Cast stainless steel

Butterfly disk

- Swing-through design
- Angle-seated design with low-noise features

Special features

- Butterfly valve can be clamped between DIN or ANSI flanges
- Wafer-type body in various versions depending on the valve size and pressure rating (see Fig. 3 and Table 9)

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 for medium temperatures from -10 to +220 °C (14 or 428 °F), with spring-loaded PTFE packing
- **Type 3331/31a** (Fig. 1) · Butterfly valve with single-acting Type SRP or DAP Pneumatic Piston Actuator
 - **Type 3331/3278** (Fig. 2) · Butterfly valve and single-acting Type 3278 Pneumatic Diaphragm Actuator

Further versions

- **Graphite packing** · For medium temperatures from -10 to +400 °C (14 to 752 °F)
- **DN 50 and 80 in angle-seated design** · On request
- **Double packing**
- **Other flange versions** · On request
- **Handwheel**
- **Extension for low and high temperatures**
- **Hand-operated or electric actuator** · On request

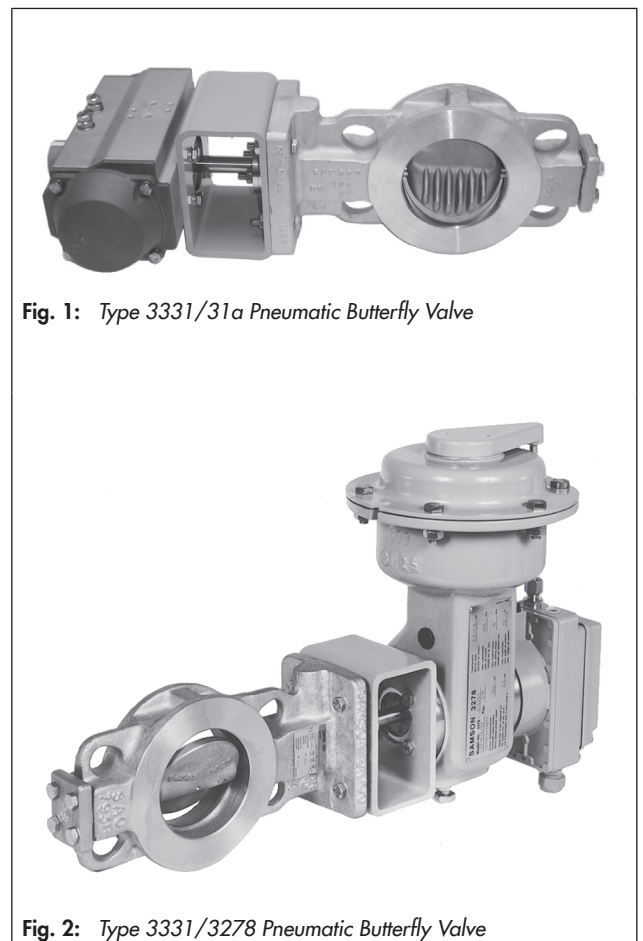


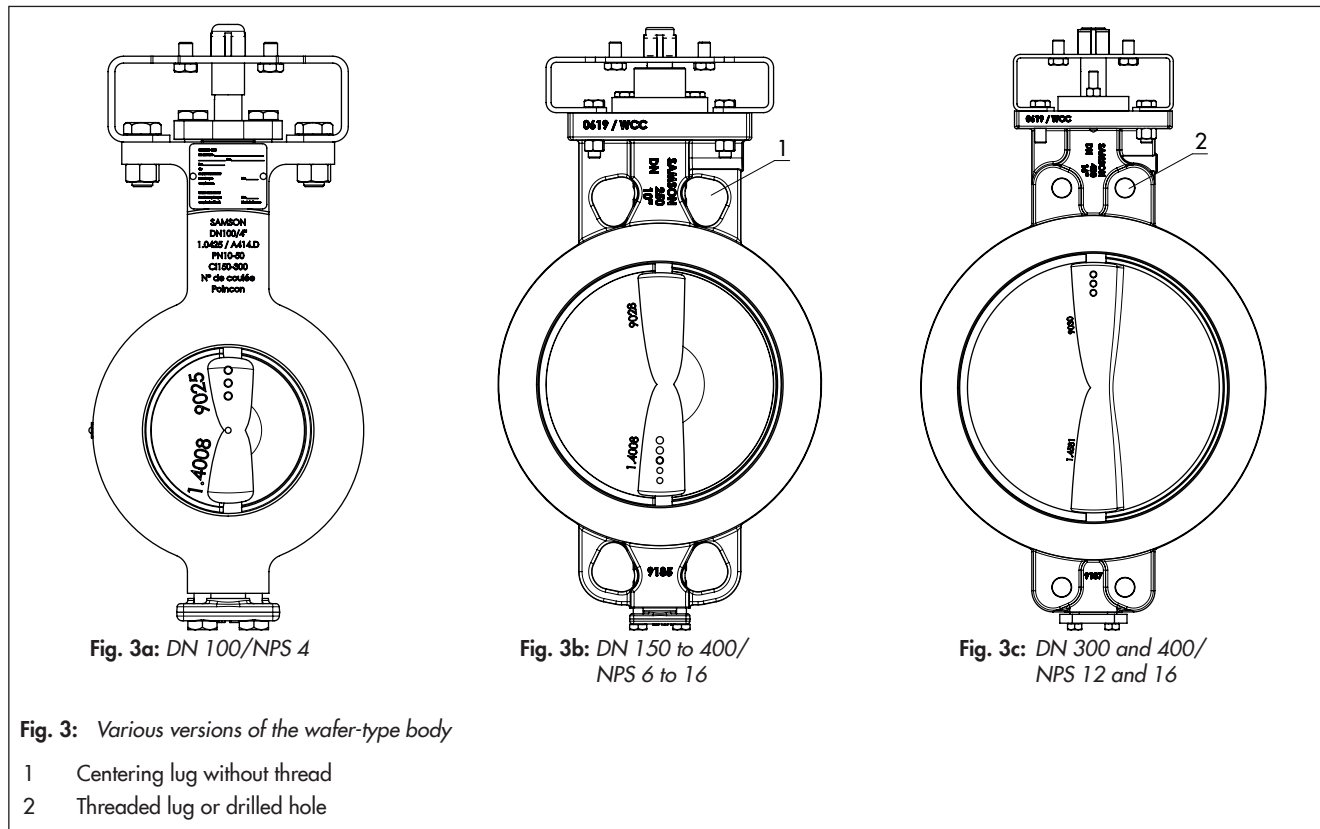
Fig. 1: Type 3331/31a Pneumatic Butterfly Valve

Fig. 2: Type 3331/3278 Pneumatic Butterfly Valve

Note on various versions available

The butterfly valve is mounted between flanges according to DIN EN 1092-1/ASME B16.5 and available in the following versions (see Fig. 3 and Table 9):

- Fig. 3a: DN 100/NPS 4 as wafer-type body
- Fig. 3b: DN 150 to 400/NPS 6 to 16 as wafer-type body with eyelets
- Fig. 3c: DN 300 and 400/NPS 12 and 16 (depending on pressure rating) as wafer-type body with threaded lugs or drilled holes



Principle of operation

The medium flows through the butterfly valve. The flow coefficient depends on the opening angle of the butterfly disk.

With the Type 31a Piston Actuator, the actuator motion is transmitted using a square drive. With the Type 3278 Diaphragm Actuator, 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 action

The closing direction corresponds to the shaft being rotated in clockwise direction. Depending on how the actuator (see Data Sheets ▶ T 9929 and) is mounted on the valve, the butterfly valve has two different fail-safe actions:

- **Fail-close:** The butterfly valve is closed when the supply air fails.
- **Fail-open:** The butterfly valve is opened when the supply air fails.

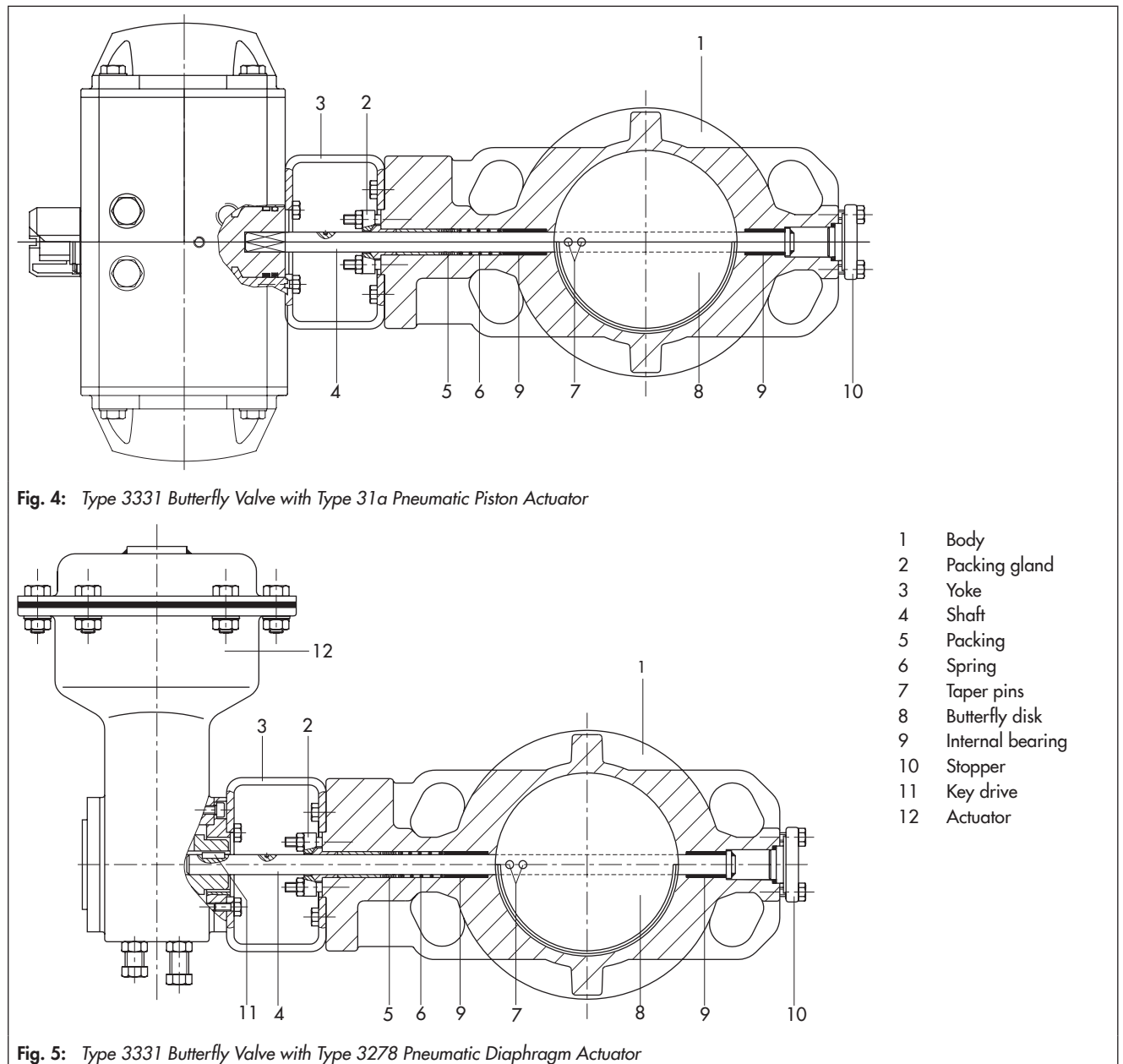


Table 1: Technical data for Type 3331 Butterfly Valve

Valve size	DN 100 to 150 · NPS 4 to 6	DN 200 to 400 · NPS 8 to 16
Pressure rating	PN 10 to 40 (DIN) · Class 150 and 300 (ANSI)	
Temperature range		
Standard 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° with swing-through butterfly disk · 70° with angle-seated butterfly disk with low-noise features	
Throttling service	70°	
Leakage rate, in relation to K_V coefficient at the opening angle		
Swing-through design	≤1 % (K_V 90°)	≤0.5 % (K_V 90°)
Angle-seated design/with low-noise features	≤1 % (K_V 70°)	≤0.5 % (K_V 70°)
Rangeability with $\varphi_{100} = 70^\circ$	50 : 1	

¹⁾ Taking into account material-specific temperature limits down to -50 °C (-58 °F) · See Information Sheet ► T 8000-2

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 and larger	1.0619/A216 WCC	1.4408/A351 CF8M
Butterfly disk	1.4581		
Shaft	1.4404/316L 1.4021 with $\varnothing = 36$ mm		1.4404/316L
Taper pins	Heat-treated stainless steel		
Internal bearing	Carbon		
Packing	PTFE V-ring packing with carbon with 16 and 25 mm shaft diameter PTFE/silk cord and compound for -10 to +220 °C (14 to 428 °F) with 36 mm shaft diameter Graphite/carbon for -10 to +400 °C (14 to 752 °C)		
Packing gland	1.4305	1.4571	
Spring	1.4310		
Yoke	St 37-2		
Stopper	1.0460 (C 22.8) · A105	1.4571 · A182 F316	

Table 3: Parameters for control valve sizing and noise level calculation**Table 3.1: Swing-through butterfly disk**

Opening 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 3.2: Angle-seated butterfly disk with low-noise features

Opening 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_{VS} coefficients

Table 4.1: Swing-through butterfly disk

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 4.2: Angle-seated butterfly disk with low-noise features

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

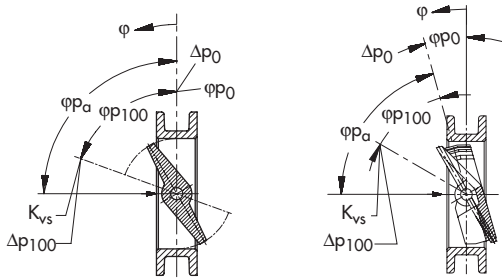
Table 5.1: Swing-through butterfly disk

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 5.2: Angle-seated butterfly disk with low-noise features

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

Schematic drawings, opening angles and flow coefficients



Left: Swing-through butterfly disk
Right: Angle-seated butterfly disk (low noise)

Fig. 6: Disk versions for DN 100

Notes on the differential pressure tables

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

The following also applies:

Δp_0 : Permissible differential pressure with closed butterfly valve

Δp_{100} : Permissible differential pressure at nominal opening angle φ_{100} (open position 70°)

The permissible differential pressures are restricted by the pressure rating (see Information Sheet ▶ T 8000-2).

250	93	245	450	710	1120	1445	2490
300	160	405	750	1185	1710	2430	3570
400	210	540	1005	1600	2300	3270	5505

Table 6: Permissible differential pressures · All pressures stated in bar

Table 6.1: Type SRP Actuator (fail-open or fail-close)

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

Valve size	Shaft Ø in mm	Type SRP Actuator	Springs n =	Signal press. req. to keep valve 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_{100}	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 6.2: Type 3278 Actuator (fail-close)

Valve size	Shaft Ø in mm	Actuator area in cm ²	Signal pressure range 90°	Operating range 70°	Signal press. req. to keep valve 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 butterfly disk

Table 6.3: Type 3278 Actuator (fail-open)

Valve size	Shaft Ø in mm	Actuator area in cm ²	Signal pressure range 90°	Operating range 70°	Signal press. req. to close valve	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 butterfly disk

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

Valve size	Shaft Ø in mm	Perm. shaft torque at			Opening torques at differential pressure Δp_0 (in bar) ^{2) 3)}				Dynamic torques at differential 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 ⁵⁾	1500 ⁵⁾	1260 ⁵⁾							
DN 400 NPS 16	25	690	500	420	150	213	–	–	348	–	–
	36 ¹⁾	1030	750	630	220	311	–	–	352	698	–
		2060 ⁵⁾	1500 ⁵⁾	1260 ⁵⁾							

¹⁾ Only with swing-through butterfly disk

²⁾ Values apply to PTFE packing. Add the following values when a graphite packing is used: 8 Nm for 16 mm shaft Ø; 15 Nm for 25 mm shaft Ø; 30 Nm for 36 mm shaft Ø

³⁾ Permissible differential pressure [bar] with closed butterfly valve

⁴⁾ Permissible differential pressure [bar] with open butterfly valve (70°)

⁵⁾ Applies to shaft material 1.4021 with body of 1.0619

Table 8: Dimensions and weights for Type 3331/31a and Type 3331/3278

Type 3331 Butterfly Valve											
Valve size	DN/NPS	100/4	150/6		200/8		250/10	300/12		400/16	
L	mm	52	56		60		68	78		102	
A	mm	168	209		234		267	343		388	
B	mm	136	175		202		241	267		338	
C	mm	80	80	90	80	90	90	90	100	90	100
ØW – Shaft with key drive	mm	16	16	25	16	25	25	25	36	25	36
SW – Shaft with square drive/adapter for actuator	mm	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
ØD _i	mm	97	146		194		242	290		380	
ØD _e	mm	158	216		270		320	376		486	
Weight	kg	13	19		25		35	55		98	

Type SRP Piston 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
Connecting flange DIN 3337		F07		F12		F14	
AF	mm	17		27		36	
Weight							
Type SRP	kg (approx.)	4.5	6.5	18.5	24	32	46

Type 3278 Diaphragm 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
Connecting flange ISO 5211		F07	F12
Weight	kg	16	50

Table 9: Installation dimensions $\varnothing K$ and $\varnothing M$ in mm · See Fig. 3c (DN 300 and 400 $\varnothing W$ 36)

DN	300			-		400			-	
NPS	-			12		-			16	
PN	10...16	25	40	-		10...16	25	40	-	
Class	-			150	300	-			150	300
K	Eyelets (see Fig. 3b)	430	450.8	418	450.8	Eyelets (see Fig. 3b)			150	300
$\varnothing M$ (boreholes)		-	-	40	-				-	-
$\varnothing M$ (thread)		M27	M30	-	1 1/8", 7 UNC				1 1/4" 7 UNC	

Dimensional drawings

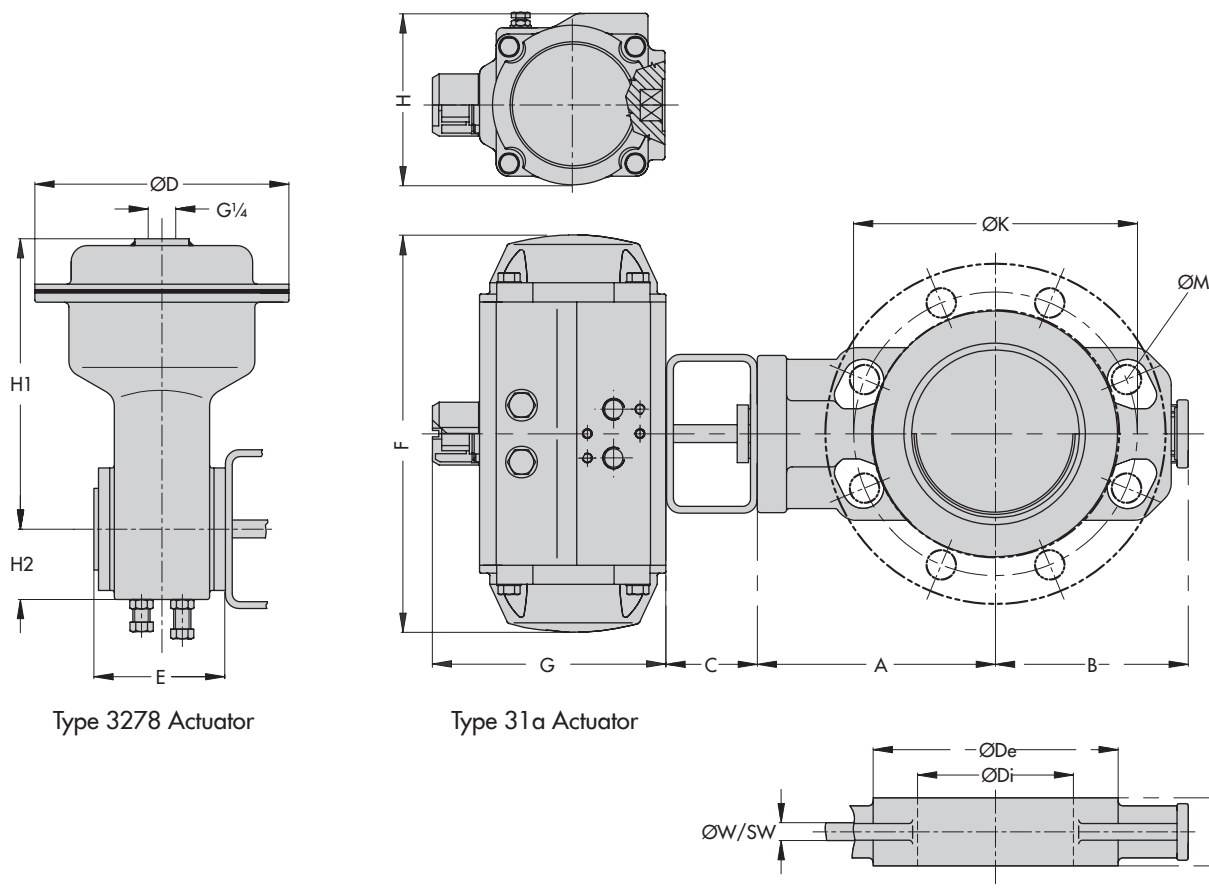


Fig. 7: Dimensions of Type 3331 Butterfly Valve (example in DN 100/NPS 4) with actuator

Note: The number of flange bores varies depending on the valve size and pressure rating.

Ordering text

Butterfly valve	Type 3331
Valve size	DN .../NPS ...
Pressure rating	PN .../Class ...
Butterfly disk	Swing-through or angle-seated design (with low-noise features)
Body material	According to Table 2
Fail-safe action	Fail-close or fail-open
Process medium and its density in kg/m ³	
Max. flow rate	kg/h or m ³ /h in standard or operating state
Supply pressure available	
Δp_0 and Δp_{100}	
Medium temperature	
Valve accessories	