Series 250

Pneumatic Control Valve Type 3251-1 and Type 3251-7
Globe Valve Type 3251

Application
Control valve for processing engineering applications with high industrial requirements

Nominal size	**DN 15 to 200**
Nominal pressure	**PN 16 to 400**
Temperature	**–200 to +500 °C**

Type 3251 Globe Valve operated with:
- Type 3271 Pneumatic Actuator (Type 3251-1 Control Valve)
- Type 3277 Pneumatic Actuator (Type 3251-7 Control Valve) for integral positioner attachment

Valve body optionally made of:
- Cast steel or
- Stainless cast steel
- High-temperature or cold-resisting cast steel

Low-noise valve plug
- With metal sealing
- With soft sealing or
- Lapped-in metal
- Balanced for handling high differential pressures.

The control valves have a modular-assembly design and can be equipped with various accessories as follows:

Positioners, limit switches, solenoid valves and further accessories according to IEC 60534-6 and NAMUR recommendations. Refer to Information Sheet T 8350 EN for more details.

Versions

Standard version with PTFE packing suitable for temperature ranges from –10 to 220 °C, or with adjustable high-temperature packing suitable for –10 to 350 °C, nominal size DN 15 to DN 200, nominal pressure PN 16 to 160

Type 3251-1 (Fig. 1) · Type 3251 Valve and Type 3271 Actuator with an effective area of 350 to 2800 cm² (see Data Sheets T 8310-1/-2 EN)

Type 3251-7 · Type 3251 Valve and Type 3277 Actuator with an effective area of 350 or 700 cm² (see T 8310-1 EN)

Additional versions with
- **Nominal pressures PN >160 to 400** · On request
- **Welding ends or welding-neck ends** acc. DIN EN 12 627
- **Flow divider** · For noise level reduction, see T 8081 EN
- **AC-Trim** · See Data Sheets T 8082 EN and T 8082 EN
- **Extension bonnet or bellows seal** · See Technical data
- **Heating jacket** · Details on request
- **Additional handwheel** · See T 8310-1/-2 EN
- **ANSI version** · NPS ½ to 8, ANSI Class 300 to 2500 (see Data Sheet T 8052 EN)

Fig. 1 · Type 3251-1 Pneumatic Control Valve with Type 3271 Actuator

- **Type 2351-3 Hand-operated Valve** · With Type 3273 Hand-operated Actuator, for valves with max. 30 mm rated travel (see Data Sheet T 8312 EN)
- **Type 3251-2 Electric Control Valve** · Details on request

Associated Information Sheets	**T 8000-1/-2/-3 EN**
Associated Data Sheets for Pneumatic Actuators	**T 8310-1/-2 EN**

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Data Sheet **T 8051 EN**

Principle of operation

The process medium flows in the direction indicated by the arrow. The valve plug determines the cross-sectional area of flow. Versions with metal bellows seal (Fig. 4) have a test connection which allows the stainless steel bellows to be monitored.

A pressure-balanced plug (Fig. 3) can be used when high pressures or differential pressures act on the valve plug and the force produced by the actuator is insufficient.

The control valves may be supplied with Flow Dividers St I or St III (refer to Data Sheet T 8081 EN for details).

Fail-safe positions

Depending on how the compression springs are arranged in the actuator (see Data Sheet T 8310-1 EN and T 8310-2 EN for details), the control valve has two different fail-safe positions which are activated upon air supply failure.

"Actuator stem extends" (fail-close):
Upon air supply failure the force of the compression springs causes the valve to be closed.

"Actuator stem retracts" (fail-open):
Upon air supply failure the force of the compression springs causes the valve to be opened.

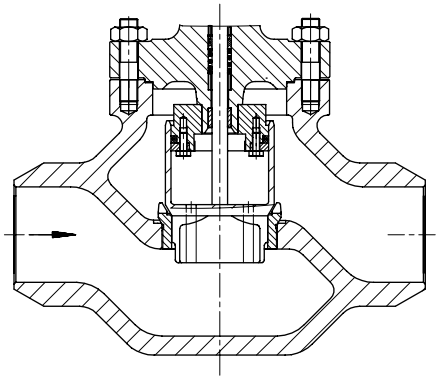


Fig. 3 · Type 3251 Valve with welding ends and balanced valve plug

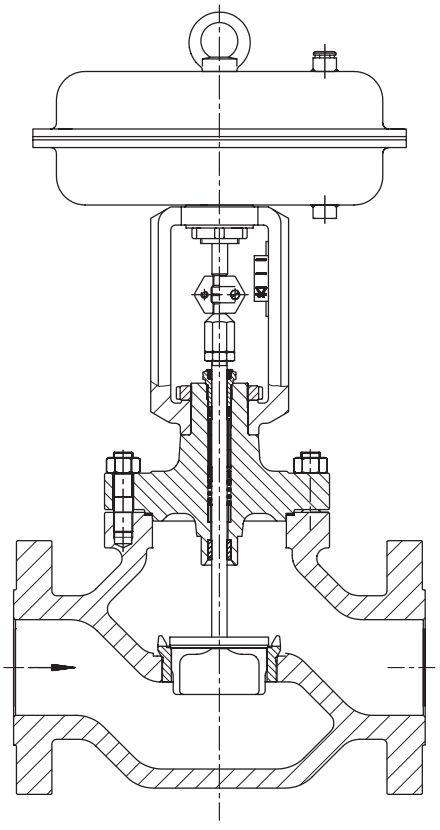


Fig. 2 · Type 3251-1 Pneumatic Control Valve with Type 3271 Actuator

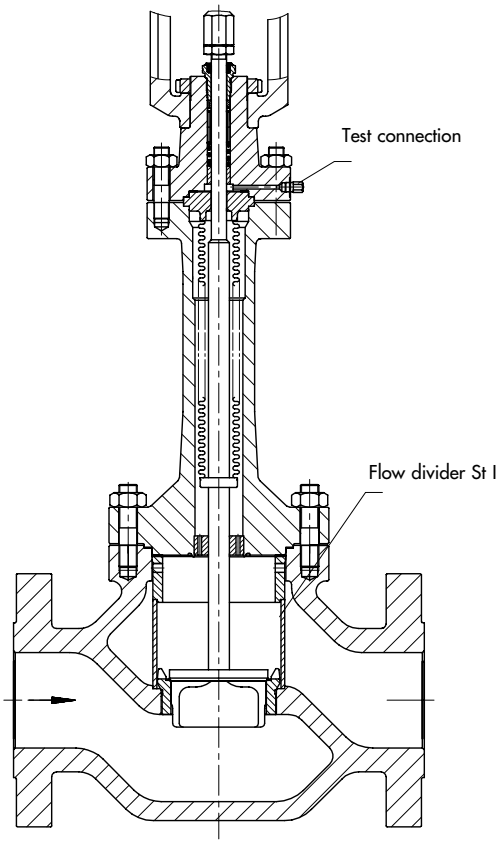


Fig. 4 · Type 3251 Valve with Flow Divider St I and additional metal bellows seal with test connection

Table 1 · Technical Data for Type 3251 Globe Valve

Material			Cast steel · 1.0619	Cast steel · 1.7357	Stainless cast steel 1.4581	
Nominal size [1]		DN	15 ... 200 [1]		15 ... 100	150 ... 200
Nominal pressure		PN	16 ... 160 [2]	16 ... 160 [2]	16 ... 160	16 ... 100 [2]
End connection		Flanges	All DIN EN versions			
		Welding ends	DIN EN 12 627			
Plug sealing			Metal sealing, soft sealing or lapped-in metal			
Characteristic			Equal percentage or linear			
Rangeability			50 : 1			
Temperature ranges in °C · Permissible operating pressures according to pressure-temperature diagrams (see Information Sheet T 8000-2 EN)						
Valve body without extension bonnet			–10 ... 220 · Up to 350 °C with high-temperature packing			
Valve body with		Extension bonnet	–10 ... 400	–10 ... 500	–10 ... 450	
		Bellows seal	–10 ... 400	–10 ... 500	–10 ... 450	
Valve plug[3]	Standard	With metal sealing	–200 ... 500			
		With soft sealing	–200 ... 220			
	Balanced	PTFE ring	–200 ... 220			
		Graphite ring	220 ... 500			
Leakage class acc. to DIN EN 1349: 2000						
Valve plug	Standard	With metal sealing	IV			
		With soft sealing	VI			
		Lapped-in metal	IV-S2 · DN 100 and larger: IV-S1			
	Balanced	With metal sealing	With PTFE ring: IV · With graphite ring: III			

[1] Nominal size DN 200 in PN 63 to 100
[2] Up to PN 400 on request
[3] Only in combination with a suitable body material

Table 2 · Materials

Standard version Valve body and flanges [1]		Cast steel · 1.0619	Cast steel · 1.7357	Stainless cast steel 1.4581
Seat and plug [2]	With metal sealing	1.4006/1.4008		1.4571/1.4581
Seal ring with	Soft sealing	PTFE with 15 % glass fiber		
	Balanced	PTFE with carbon · Graphite		
Guide bushings		1.4112		2.4610
Stuffing box packing		V-ring packing PTFE with carbon, spring of 1.4310 or high-temperature packing		
Body gasket		Metal		
Extension bonnet		1.7335		1.4571
Metal bellows seal				
Intermediate piece		1.7335		1.4571
Metal bellows		1.4571		
Heating jacket		1.4541		

[1] See also Pressure-Temperature Diagrams (T 8000-2 EN).
Materials suitable for temperatures over 500 °C: 1.7380;
suitable for cryogenic applications: 1.6220 or 1.4308.
[2] Seats and plugs with metal sealing are also available either stellited or plug made of solid Stellite.

Table 3 · K_{VS} coefficients available · Versions in shaded areas also available with balanced plug

Table 3a · Overview with Flow Dividers St I ($K_{VS}I$) and St III ($K_{VS}III$)

K_{VS}	0.1 · 0.16 0.25 · 0.4	0.63	1.0	1.6	2.5	4	6.3	10	16	25	40	63	100	160	250	360	630
$K_{VS}I$	–			1.45	2.2	3.6	5.7	9	14.5	22	36	57	90	144	225	320	560
$K_{VS}III$	–					3	4.8	7.5	12	20	30	47	75	120	190	270	–
Seat Ø in mm	6			12		24			31	38	50	63	80	100	125	150	200
Rated travel	15 mm										30 mm				60 mm		

Table 3b · Versions without flow divider

K_{VS}	0.1 . 0.16 0.25 · 0.4	0.63	1.0	1.6	2.5	4	6.3	10	16	25	40	63	100	160	250	360	630
DN																	
15	•	•	•	•	•	•											
25	•	•	•	•	•	•	•	•									
40	•	•	•	•	•	•	•	•	•	•							
50						•	•	•	•	•	•						
80						•	•	•	•	•	•	•	•				
100										•	•	•	•	•			
150												•	•	•	•	•	
200														•	•	•	•

Tabelle 3c · Versions with Flow Divider St I

$K_{VS}I$	–			1.45	2.2	3.6	5.7	9	14.5	22	36	57	90	144	225	320	560
DN																	
15				•	•	•											
25				•	•	•	•	•									
40				•	•	•	•	•	•	•							
50						•	•	•	•	•	•						
80						•	•	•	•	•	•	•	•				
100										•	•	•	•	•			
150												•	•	•	•	•	
200														•	•	•	•

Table 3d · Versions with Flow Divider St III

$K_{VS}III$	–					3.0	4.8	7.5	12	20	30	47	75	120	190	270	–
DN																	
50*						•	•	•									
80						•	•	•	•	•	•						
100										•	•	•					
150												•	•	•	•		
200														•	•	•	

* Version DN 50 and St III not available with bellows seal

Table 4a · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing and without metal bellows seal; fail-safe position "Valve CLOSED"

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to the maximum · Values in parentheses apply to half rated travel

Table 4a · Fail-safe position "Valve CLOSED" (fail-close)												
Bench range (bar) for actuator (cm^2)		350	0.2...1.0	0.4...1.2	0.4...2.0	0.8...2.4	0.6...3.0	1.2...3.6	1.4...2.3	2.1...3.3	–	–
		700		0.4...1.2 (0.8...1.2)		0.8...2.4 (1.6...2.4)		1.2...3.6 (2.4...3.6)	1.4...2.3 (1.85...2.3)	2.1...3.3 (2.7...3.3)	2.35...3.8 (3.05...3.8)	2.6...4.3 (3.45...4.3)
		1400					0.5...2.5	1.0...3.0 (2.0...3.0)	1.1...2.4	1.4...2.7 (2.05...2.7)	1.3...2.8	1.7...3.2 (2.45...3.2)
		2800	0.4...1.2 (0.8...1.2)	0.8...2.4 (1.6...2.4)	1.0...3.0 (2.0...3.0)	1.2...3.6 (2.4...3.6)	0.9...1.6	1.1...1.8 (1.25...1.6)	1.0...2.1	1.25...2.35 (1.55...2.1)	1.1...2.6	1.5...3.0 (1.85...2.6)
		2x2800										
Required supply pressure			Upper spring range value + 0.2 bar									
DN	K_{vs}	Actuator cm^2	Δp when $p_2 = 0$									
15 to 40	0.1 to 1.0	350	46.1	102	102	213	158	325	380	400	–	–
	1.6 to 2.5	350	46.1	102	102	213	158	325	380	400	–	–
	4 to 10	350	8.7	22.4	22.4	50.5	36.6	78.4	92.3	141	–	–
		700	–	(106)	–	(217)	–	(329)	(252)	(370)	(400)	–
50		350	8.1	22	22	49.9	35.9	77.7	91.7	140	–	–
		700	–	(105)	–	(217)	–	(328)	(252)	(370)	(400)	–
40 to 80	16	350	4.3	12.7	12.7	29.4	21	45.1	54.4	83.6	–	–
		700	–	(62.7)	–	(129)	–	(196)	(150)	(221)	(250)	(284)
40 to 100	25	350	–	8.1	8.1	19.2	13.6	30.3	35.8	55.3	–	–
		700	–	(41.4)	–	(85.8)	–	(130)	(99.7)	(147)	(166)	(188)
50 to 100	40	700	4.3	10.7	10.7	23.6	17.1	36.4	42.8	65.3	73.3	81.3
		1400	–	(49.2)	–	(100)	–	(126)	–	(129)	–	(155)
80 to 150	63	700	–	6.3	6.3	14.4	10.4	22.5	26.5	40.7	45.7	50.8
		1400	–	(30.6)	–	(62.9)	–	(79.1)	–	(81.1)	–	(97.3)
80 to 150	100	700	–	–	–	8.7	6.2	13.7	16.3	25	28.2	31.3
		1400	–	(18.8)	–	(38.8)	–	(48.8)	–	(50.1)	–	(60.1)
100 to 150	160	700	–	–	–	5.4	–	8.7	10.3	15.9	17.9	19.9
		1400	–	(11.9)	–	(24.7)	–	(31.1)	–	(31.9)	–	(38.3)
200	160	700	–	–	–	5.4	–	8.6	10.2	15.8	17.8	19.8
		1400	–	(11.8)	–	(24.6)	–	(31)	–	(31.8)	–	(38.2)
100 to 150	250	1400	–	–	–	7.5	4.4	9.5	10.5	13.6	12.6	16.7
		2800	(15.7)	(32.1)	(40.3)	(48.5)	–	(24.9)	–	(31.1)	–	(37.2)
200	250	1400	–	–	–	7.4	4.3	9.5	10.5	13.6	12.5	16.6
		2800	(15.6)	(32)	(40.3)	(48.5)	–	(24.9)	–	(31)	–	(37.2)
		2x2800	(31.2)	(64)	(80.6)	(97)	–	(49.8)	–	(62)	–	(74.4)
150	360	1400	–	–	–	5.1	–	6.5	7.2	9.4	8.7	11.5
		2800	(10.8)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.8)
200	360	1400	–	–	–	5.1	–	6.5	7.2	9.3	8.6	11.5
		2800	(10.7)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.7)
		2x2800	(21.4)	(44.4)	(55.8)	(67.2)	–	(34.4)	–	43	–	(51.4)
200	630	1400	–	–	–	–	–	–	4	5.2	4.7	6.4
		2800	(6)	(12.4)	(15.6)	(18.8)	–	(9.6)	–	(12)	–	(14.4)
		2x2800	(12)	(24.8)	(31.2)	(37.6)	–	(19.2)	–	(24)	–	(28.8)

Table 4b · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing and without metal bellows seal; fail-safe position "Valve OPEN" (fail-open)

Table 4b · Fail-safe position "Valve OPEN" (fail-open)						
Bench range (bar) for actuator (cm^2)		350	0.2 ... 1.0 (0.2 ... 0.6)			
		700				
		1400				
		2800				
		2x2800				
Required supply pressure			1.4	2.4	4.0	6.0
DN	K_{vs}	Actuator cm^2	Δp at p_2 = 0			
15 to 40	0.1 to 1.0	350	102	380	400	–
	1.6 to 2.5	350	101	380	400	–
	4 to 10	350	22.4	92.1	203	343
		700	(106)	(245)	(400)	–
50		350	21.6	91.3	203	342
		700	(105)	(244)	(400)	–
40 to 80	16	350	12.4	54.2	121	204
		700	(62.5)	(146)	(280)	–
40 to 100	25	350	7.9	35.7	80.1	136
		700	(41)	(97)	(185)	–
50 to 100	40	700	10.6	42.7	94.1	158
		1400	(49)	(113)	(216)	–
80 to 150	63	700	6.2	26.4	58.7	99.2
		1400	(30.4)	(71)	(135)	–
80 to 150	100	700	–	16.2	36.2	61.3
		1400	(18.7)	(43.7)	(84)	(134)
100 to 150	160	700	–	10.2	23	39.1
		1400	(11.8)	(27.8)	(53.5)	(85)
200	160	700	–	10.0	22.9	38.9
		1400	(11.6)	(27.7)	(53.3)	(85)
150	250	1400	–	13.6	30	50.6
		2800	(15.6)	(36.2)	(69)	–
200	250	1400	–	13.5	29.9	50.4
		2800	(15.5)	(36.1)	(69)	–
		2x2800	(31)	(72)	(138)	–
150	360	1400	–	9.4	20.8	35
		2800	(10.8)	(25)	(47.8)	–
200	360	1400	–	9.3	20.7	34.9
		2800	(10.7)	(25)	(47.8)	–
		2x2800	(21.4)	(50)	(95.6)	–
200	630	1400	–	5.1	11.5	19.5
		2800	(5.9)	(13.9)	(26.8)	(42.8)
		2x2800	(11.8)	(27.8)	(53.6)	–

Notes regarding the differential pressure tables

The differential pressure tables were prepared under the following conditions:

- Direction of flow: FTO
- Version including valve plug with metal sealing
- Version including PTFE packing
- Table 4a and 4b apply to unbalanced valve plugs with a downstream pressure of $p_2 = 0$
- For the maximum differential pressure listed and the previously mentioned conditions, the leakage rate specified in Table 1 is not exceeded
- All pressures in bar (gauge pressure)
- The differential pressures specified in Tables 4a and 4b can be restricted by the pressure-temperature diagram.

Note regarding the fail-safe position "Valve CLOSED": Always use pre-tensioned spring ranges for actuators with reduced travels.

Note: Permissible differential pressures for special versions with soft-sealing plugs or lapped-in metals plugs, with metal bellows seal or balanced plug including a graphite ring are available on request.

Table 5 · Permissible differential pressures Δp for valves with balanced plug with metal sealing and PTFE ring, without metal bellows seal

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to the maximum · Values in parentheses apply to half rated travel

Table 5a · Fail-safe position "Valve CLOSED" (fail-close)									**5b · "Valve OPEN" (fail-open)**		
Bench range (bar) for actuator (cm^2)		700	0.4...2.0	0.8...2.4 (1.6...2.4)	–	–	0.6...3.0	1.2...3.6	0.4 ... 2.0 (0.4 ... 1.2)		
		1400			0.5...2.5	1.0...3.0 (2.0...3.0)	–	–			
		2800					0.6...3.0	1.2...3.6 (2.4...3.6)			
		2x2800									
Required supply pressure			Upper spring range value + 0.2 bar						2.4	4.0	6.0
DN	K_{vs}	Actuator cm^2	Δp at p_2 = 0								
80 100	63	700	57.4	155	–	–	106	252	57.4	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
150	63	700	22.2	62.1	–	–	42.2	102	22.2	182	382
		1400	–	(302)	–	(381)	–	–	(221)	(400)	–
80 100	100	700	48.1	146	–	–	96.8	243	48.1	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
150	100	700	18.4	58.3	–	–	38.4	98.3	18.4	178	378
		1400	–	(298)	–	(378)	–	–	(218)	(400)	–
100	160	700	37.2	135	–	–	85.9	232	37.2	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
150	160	700	13.9	53.8	–	–	33.9	93.8	13.9	174	373
		1400	–	(293)	–	(373)	–	–	(213)	(400)	–
200	160	700	4.6	20.2	–	–	12.4	35.8	4.6	67	145
		1400	–	(114)	–	(145)	–	–	(82.6)	(207)	(363)
150	250	1400	48.3	128	68.2	168	–	–	48.3	368	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
200	250	1400	18	49.2	25.8	64.8	–	–	18	143	299
		2800	–	(236)	–	(298)	–	(361)	(174)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(348)	(400)	–
150	360	1400	42.6	123	62.6	162	–	–	42.7	362	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
200	360	1400	15.8	47	23.6	62.6	–	–	15.3	109	265
		2800	–	(234)	–	(296)	–	(359)	(172)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(344)	(400)	–
200	630	1400	11.4	42.6	19.2	58.2	–	–	11.4	136	292
		2800	–	(230)	–	(292)	–	(354)	(167)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(334)	(400)	–

Table 6 · Dimensions in mm for Type 3251-1 and Type 3251-7 in standard version

Valve	DN	15	25	40	50	80	100	150	200
Length L	PN 10... 40	130	160	200	230	310	350	480	600
	PN 63...160	210	230	260	300	380	430	550	650
Height H1 for actuator area	350 cm²	392	392	404	457	462	482	–	
	700 cm²	392	392	404	457	462	482	732	805
	1400 cm²	–			512	517	537	732	805
	2800 cm²	–					722	817	890
Height H2 (with foot for DN 100 or larger)	PN 10... 40	50	60	80	90	100	160	220	250
	PN 63...160	60	70	90	100	120	180	235	270

Actuator	cm²	350	700	1400	2800	2 x 2800
Diaphragm ∅ D		280	390	530	770	
Height H [1]		82	196	287	617	1134
Height H3 [2]		110	190	610	650	
Thread		M 30 x 1.5		M 60 x 1.5	M 100 x 2	
a (for Type 3271 Actuator)		G ⅜ (NPT ⅜)		G ¾ (NPT ¾)	G 1 (NPT 1)	
a2 (for Type 3277 Actuator)		G ⅜ (NPT ⅜)		–		

[1] Actuator area 350 cm² without lifting ring

[2] Minimum clearance for actuator disassembly

Table 7 · Weights for Type 3251-1 and Type 3251-7 in standard version

Valve	DN	15	25	40	50	80	100	150	200
Valve w/o actuator (approx. kg)	PN 16... 40	15.5	17.5	21.5	38	59	78	201	427
	PN 63...160	20	25	30.5	54	89	116	334	642

Actuator	cm²	350	700	1400	2800	2 x 2800
Type 3271 (approx. kg) [1]	w/o handwheel	8	22	70	450	950
	w. handwheel	13	27	Only with side-mounted handwheel, see T 8310-2 EN		
Type 3277 (approx. kg) [1]	w/o handwheel	12	26	–		
	w. handwheel	17	31			

[1] Top row without handwheel, bottom row with handwheel

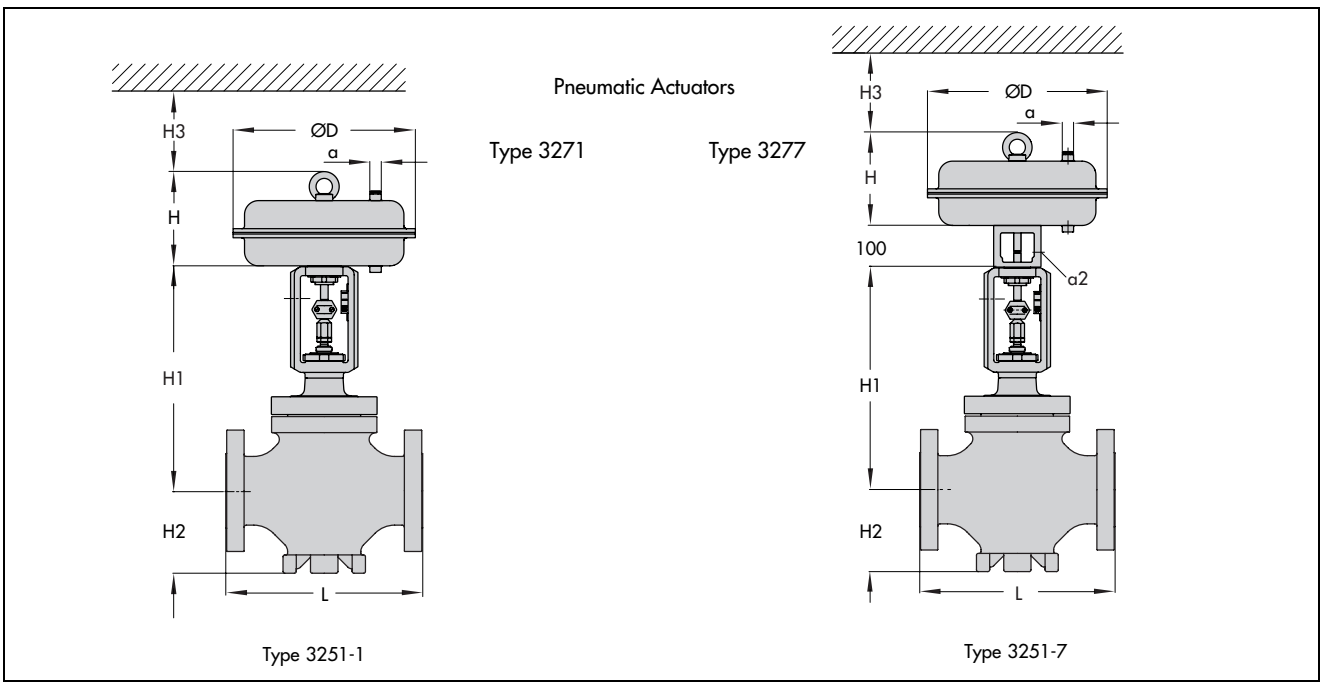
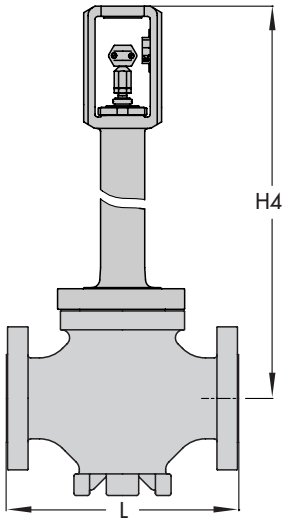


Table 8 · Dimensions and weights for Type 3251 Globe Valve in standard version with extension bonnet · Without actuator

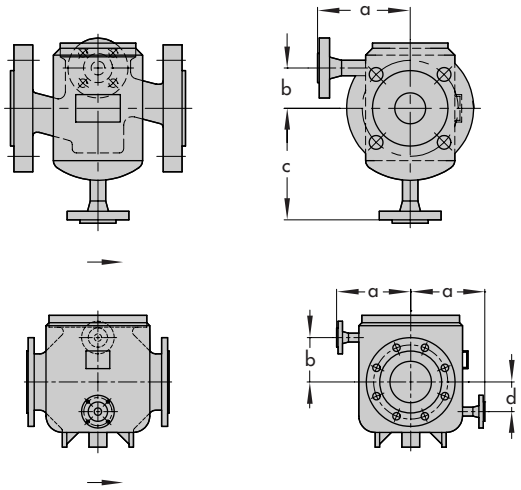
Nominal size	DN	15	25	40	50	80	100	150	200
Height H4 for actuator area	350 cm²	593	593	605	727	732	752	–	
	700 cm²	593	593	605	727	732	752	1083	1365
	1400 cm²	–			782	787	807	1083	1365
	2800 cm²	–					992	1168	1450
Weight (kg) w/o actuator for	PN 16 ... 40	19.5	21.5	24	44	65	84	237	492
	PN 63 ...160	24	29	33	60	95	122	370	707

Table 9 · Dimensions and weights for Type 3251 Globe Valve in standard version with bellows seal · Without actuator

Nominal size	DN	15	25	40	50	80	100	150	200
Height H4 for PN 16 ... 40 for actuator area	350 cm²	590	590	602	836	841	841	–	–
	700 cm²	590	590	602	836	841	841	1139	1455
	1400 cm²	–			891	896	896	1139	1455
	2800 cm²	–					1081	1224	1540
Height H4 for PN 63 ... 160 for actuator area	350 cm²	590	590	602	836	841	841	–	–
	700 cm²	590	590	602	836	841	841	1271	1855
	1400 cm²	–			891	896	896	1271	1855
	2800 cm²	–					1081	1356	1940
Weight (kg) w/o actuator for	PN 16 ... 40	20	22	24	45	66	85	242	532
	PN 63 ...160	25	30	34	61	96	123	375	768



Type 3251 with bellows seal or extension bonnet



Type 3251 with heating jacket · Dimensions on request

Selection and sizing of the control valve

1. Calculate the K_v coefficient according to IEC 60534.
2. Select the nominal size DN and the K_{vs} coefficient from Tables 3 to 5.
3. Determine the permissible differential pressure Δp from Tables 4 and 5.
4. Select the body material from Tables 1 and 2 as well as from the pressure-temperature diagrams in the Information Sheet T 8000-2 EN.
5. Select additional equipment from Tables 1 and 2.

Please submit the following details when ordering

Nominal size	DN
Nominal pressure	PN
Body material	According to Table 2
Type of connection	Flanges/Welding ends
Plug	Standard/balanced lapped-in metal, with soft sealing or with metal sealing
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 (see T 8310-1 EN or T 8310-2 EN)
Fail-safe position	Valve CLOSED or valve OPEN
Process medium	Density in kg/m^3 and temperature in °C
Flow rate	kg/h or m^3/h under normal or operating conditions
Pressure	p_1 and p_2 in bar (absolute pressure p_{abs}), for minimum, normal and maximum flow rate
Accessories	Positioner and/or limit switch

Specifications subject to change without notice.

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