

Application

Maintenance-friendly control valve for the petrochemical industry and process engineering

Valve size	NPS ½ to 8
Pressure rating	Class 150 to 900
Temperatures	-325 to +842 °F (-196 to +450 °C)



Type 3291 Globe Valve operated with

- Type 3271 Pneumatic Actuator (Type 3291-1 Control Valve)
- Type 3277 Pneumatic Actuator (Type 3291-7 Control Valve) for integral positioner attachment

Valve body made of

- Cast steel
- Cast stainless steel
- High-temperature cast steel
- Cold-resisting cast steel

Low-noise valve plug

- Metal seal
- Soft seal
- High-performance metal seal
- Balanced to handle high differential pressures
- Quick and easy maintenance
- Clamped-in seat for quick maintenance

The control valves, designed according to the modular assembly principle, can be equipped with various accessories: Positioners, limit switches, solenoid valves, and other accessories according to IEC 60534-6 and NAMUR recommendation (see Information Sheet ▶ T 8350 for more details).

Versions

Standard version (Fig. 1) · Globe valve for temperatures from 15 to 430 °F (-10 to +220 °C) · NPS ½ to 8

- **Type 3291-1** (Fig. 1) · Type 3291 Valve and Type 3271 Pneumatic Actuator (see Data Sheets ▶ T 8310-1 and ▶ T 8310-2)
- **Type 3291-7** · Type 3291 Valve and Type 3277 Pneumatic Actuator for integral positioner attachment (see Data Sheet ▶ T 8310-1)

Further versions

- **Welding ends** or **welding-neck ends** according to ANSI B16.25
- **Flow divider** · For noise reduction · See Table 3 and Table 4
- **Perforated plug trim** · See Data Sheet ▶ T 8086
- **Insulating section or bellows seal** · See Technical data
- **Heating jacket** · Details on request



Fig. 1: Type 3291-1 Pneumatic Control Valve with Type 3271 Pneumatic Actuator

- **Additional handwheel** (see Data Sheets ▶ T 8310-1 and ▶ T 8310-2)
- **Type 3291-3 Hand-operated Valve** · With Type 3273 Hand-operated Actuator for valves with max. 30 mm rated travel · See Data Sheet ▶ T 8312
- **Type 3291-2 Electric Control Valve** · Details on request
- **NACE version for sour gas applications** · On request

Principle of operation

The process medium flows through the valve in the direction indicated by the arrow in the flow-to-open direction. The valve plug position determines the cross-sectional area between the seat and plug.

The version with bellows seal (Fig. 4) features a test connection to allow the stainless steel bellows to be monitored for leakage, e.g. when the valve is used to control explosive or toxic media.

Pressure balancing must be used when high pressures or differential pressures act on the plug (Fig. 3).

The valves can be equipped with a flow divider (Fig. 4, see Table 3 and Table 4 for details) to reduce noise levels.

Fail-safe action

Depending on how the springs are arranged in the pneumatic actuator (see Data Sheets ► T 8310-1 and ► T 8310-2), the valve has two different fail-safe positions effective upon air supply failure.

- **Actuator stem extends (fail-close)**
The valve closes when the supply air fails.
- **Actuator stem retracts (fail-open)**
The valve opens when the supply air fails.

Fig. 2 to Fig. 4 show configuration examples.

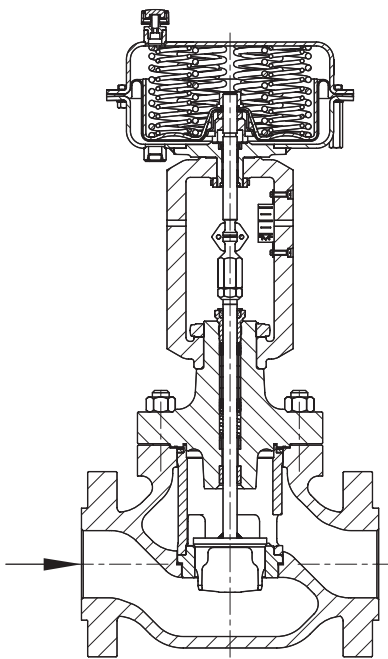


Fig. 2: Type 3291-1 Control Valve with flanges and Type 3271 Pneumatic Actuator

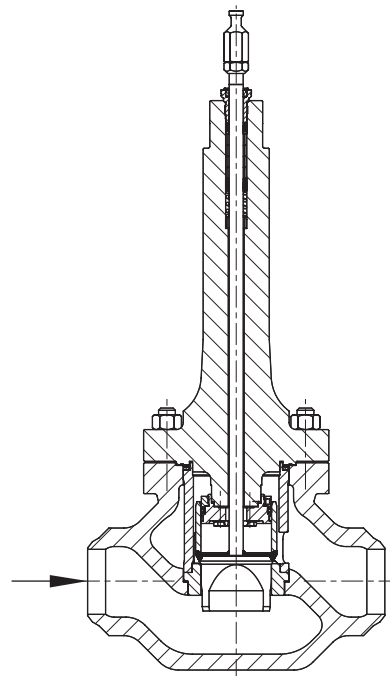


Fig. 3: Type 3291 Valve with welding ends and insulating section

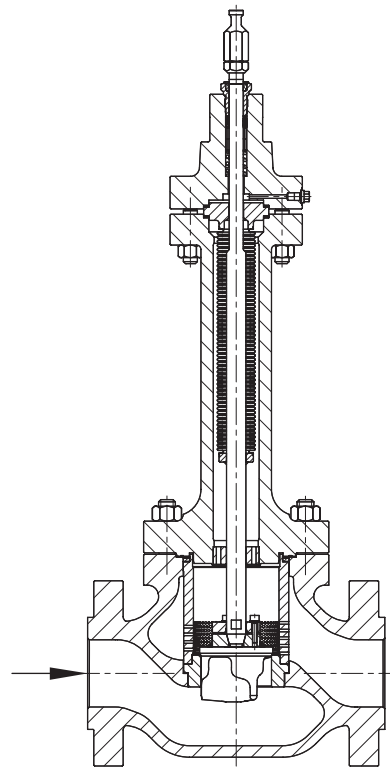


Fig. 4: Type 3291 Valve with flanges, flow divider and bellows seal with test connection

Table 1: Technical data for Type 3291

Material		Cast steel	Cast steel	Cast steel	Cast stainless steel	
		A352 LCC	A216 WCC	A217 WC6	A351 CF3M	A351 CF8M
Valve size		NPS ½ to 8				
Pressure rating		Class 150 to 900				
Type of connection	Flanges	All ANSI versions				
	Welding ends	According to ANSI B16.25				
Seat-plug seal		Metal seal · Soft seal · High-performance metal seal				
Characteristic		Equal percentage · Linear · Quick opening				
Rangeability		50:1				
Compliance		CE · EAC				
Temperature ranges in °F (°C) · Permissible operating pressures according to pressure-temperature diagrams (see Information Sheet ► T 8000-2)						
Body without insulating section		14 to 428 °F (-10 to +220 °C) · Up to 660 °F (350 °C) with high-temperature packing depending on material				
Body with	Insulating section	-51 to +649 °F (-46 to +343 °C)	-20 to +800 °F (-29 to +427 °C)	-20 to +842 °F (-29 to +450 °C)	-325 to +842 °F (-196 to +450 °C)	-325 to +842 °F (-196 to +450 °C)
	Bellows seal	-51 to +649 °F (-46 to +343 °C)	-20 to +800 °F (-29 to +427 °C)	-20 to +842 °F (-29 to +450 °C)	-325 to +842 °F (-196 to +450 °C)	-325 to +842 °F (-196 to +450 °C)
Valve plug ¹⁾	Standard	Metal seal	-325 to +842 °F (-196 to +450 °C)			
		Soft seal	-325 to +428 °F (-196 to +220 °C)			
	Balanced with PTFE ring		-40 to +428 °F (-40 to +220 °C) · Lower temperatures on request			
	Balanced with graphite ring		-40 to +842 °F (-40 to +450 °C)			
Leakage class according to ANSI/FCI 70-2 (2006)						
Valve plug	Standard	Metal seal	IV · High-performance metal seal: V			
		Soft seal ²⁾	VI			
	Balanced, metal seal		Standard: IV (with PTFE or graphite ring) · High-performance metal seal: V (only with PTFE ring)			

¹⁾ Only in combination with suitable body material

²⁾ On request

Table 2: Materials (EN material number)

Standard version	Body and flanges ¹⁾	Cast steel	Cast steel	Cast steel	Cast stainless steel	
		A352 LCC	A216 WCC	A217 WC6	A351 CF3M	A351 CF8M
Seat and plug ²⁾	Metal seal	1.4006/1.4404	1.4006/1.4404	1.4006/1.4404	1.4404	1.4404
Seal ring for	Soft seal	PTFE with 15 % glass fiber				
	Pressure balancing	PTFE with carbon · Graphite				
Guide bushings		1.4112		1.4112	2.4610	
Packing		V-ring packing: PTFE with carbon; spring: 1.4310 · High-temperature packing				
Body gasket		Graphite seal on metal core				
Insulating section ³⁾		A352 LCC/ A350 LF2	A216 WCC/ A182 F12 Cl. 2/ A105	A217 WC6/ A182 F12 Cl. 2	A351 CF3M/ A182 F316L	A351 CF8M/ A182 F316
Metal bellows seal						
Intermediate piece ³⁾		A352 LCC/ A350 LF2	A216 WCC/ A182 F12 Cl. 2/ A105	A217 WC6/ A182 F12 Cl. 2	A351 CF3M/ A182 F316L	A351 CF8M/ A182 F316
Metal bellows		1.4571				
Heating jacket		1.4404/A240 316L				

¹⁾ See the pressure-temperature diagram in Information Sheet ► T 8000-2

²⁾ Seats and metal-seated plug also with Stellite® facing or plug made of solid Stellite® available

³⁾ Depending on valve bonnet material

Table 3: C_v and K_{vs} coefficients · Class 150 to 600

Versions highlighted in gray also available with balanced plug

Table 3.1: Overview with flow divider ST 1 ($C_v1/K_{vs}1$)

C_v	0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	10.5	12	20	23	30	42	47	75	105	120	170	190	290	375	420	650
K_{vs}	0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4	6.3	9	10	16	20	25	36	40	63	90	100	144	160	250	320	360	560
C_v1	-								4.2	7	9.5	-	17	21	26	37	42	67	95	105	145	170	265	325	375	570
$K_{vs}1$	-								3.6	5.7	8	-	14.5	18	22	32	36	57	80	90	125	144	225	280	320	490
Seat Ø mm	6/8						12	24				31	38	50	63	80	100	125	150	200						
Rated travel	in	0.5															1.18					2.36				
	mm	15															30					60				

Table 3.2: Versions without flow divider

C_v	0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	10.5	12	20	23	30	42	47	75	105	120	170	190	290	375	420	650		
NPS																												
½	•	•	•	•	•	•	•	•	•																			
1	•	•	•	•	•	•	•	•	•	•	•																	
1½	•	•	•	•	•	•	•	•	•	•		•	•	•														
2									•	•		•	•		•	•												
3									•	•		•	•		•		•	•	•									
4															•		•	•		•	•							
6																		•		•		•	•	•				
8																						•	•			•	•	

Table 3.3: Versions with flow divider ST 1

C_v1	-								4.2	7	9.5	-	17	21	26	37	-	67	95	105	150	170	265	325	375	570		
NPS																												
½																												
1									•	•	•																	
1½													•	•														
2															•	•												
3																	•	•										
4																			•	•								
6																					•	•	•					
8																										•	•	

Table 4: C_V and K_{VS} coefficients · Class 900

Versions highlighted in gray also available with balanced plug

Table 4.1: Overview with flow divider ST 1 ($C_V1/K_{VS}1$)

C_V	0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	9.5	12	20	21	30	37	47	75	95	120	145	190	290	325	420	570					
K_{VS}	0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4	6.3	8	10	16	18	25	32	40	63	80	100	125	160	250	280	360	490					
C_V1	-								4.2	7	9.5	-	17	21	26	37	42	67	95	105	145	170	265	325	375	570					
$K_{VS}1$	-								3.6	5.7	8	-	14.5	18	22	32	36	57	80	90	125	144	225	280	320	490					
Seat Ø	mm						6/8		12		24			31		38		50		63		80		100		125		150		200	
Rated travel	in		0.5												1.18						2.36										
	mm		15												30						60										

Table 4.2: Versions without flow divider

C_V	0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	9.5	12	20	21	30	37	47	75	95	120	145	190	290	325	420	490		
NPS																												
1/2	•	•	•	•	•	•	•	•	•																			
1	•	•	•	•	•	•	•	•	•	•	•																	
1 1/2	•	•	•	•	•	•	•	•	•	•		•	•	•														
2									•	•		•	•		•	•												
3									•	•		•	•		•		•	•	•									
4															•		•	•	•	•	•	•						
6																		•		•			•	•	•			
8																							•	•		•	•	

Table 4.3: Versions with flow divider ST 1

C_V1	-								4.2	7	9.5	-	17	21	26	37	-	67	95	145	145	170	265	325	375	490		
NPS																												
1/2																												
1									•	•	•																	
1 1/2												•	•															
2															•	•												
3																	•	•	•									
4																			•	•	•	•						
6																					•		•	•				
8																										•	•	

Table 5: Dimensions for Type 3291-1 and Type 3291-7 in standard version

Table 5.1: Dimensions for Type 3291 Valve

Valve		NPS	½	1	1½	2	3	4	6	8	
Length L Class 150	Flanges RF/welding ends (schedule 80)	in	7.25	7.25	8.75	10.00	11.75	13.88	17.75	21.38	
		mm	184	184	222	254	298	352	451	543	
	Flanges RTJ	in	-	7.76	9.25	10.51	12.24	14.37	18.27	21.89	
		mm	-	197	235	267	311	365	464	556	
Length L Class 300	Flanges RF/welding ends (schedule 80)	in	7.50	7.75	9.25	10.50	12.50	14.50	18.62	22.38	
		mm	190	197	235	267	318	368	473	568	
	Flanges RTJ	in	7.95	8.27	9.76	11.14	13.15	15.12	19.25	22.87	
		mm	203	210	248	283	334	384	489	584	
Length L Class 600	Flanges RF/welding ends (schedule 80)	in	8.00	8.25	9.88	11.25	13.25	15.50	20.00	24.00	
		mm	203	210	251	286	337	394	508	610	
	Flanges RTJ	in	7.91	8.27	9.88	11.38	13.39	15.63	20.12	24.13	
		mm	201	210	251	289	340	397	511	613	
Length L Class 900	Flanges RF/welding ends (schedule 80)	in	8.50	10.00	12.00	14.50	15.00	18.00	24.00	29.00	
		mm	216	254	305	368	381	457	610	737	
	Flanges RTJ	in	8.5	10	12.01	14.61	15.12	18.11	24.09	29.13	
		mm	216	254	305	371	384	460	613	740	
H4	Class 150 to 600	in	5.98	5.98	6.46	8.54	8.74	9.53	13.57	16.14	
		mm	152	152	164	217	222	242	337	410	
	Class 900	in	7.32	7.32	7.68	9.88	8.74	9.53	13.27	16.14	
		mm	186	186	195	251	222	242	337	410	
H8 Yoke height for actuator	350 cm ²	in	9.45	9.45	9.45	9.45	9.45	9.45	-		
		mm	240	240	240	240	240	240	-		
	355v2 cm ²	in	9.45	9.45	9.45	9.45	9.45	9.45	15.55	-	
		mm	240	240	240	240	240	240	395	-	
	700/750v2 cm ²	in	9.45	9.45	9.45	9.45	9.45	9.45	15.55	15.55	
		mm	240	240	240	240	240	240	395	395	
	1000 cm ²	in	-				11.61	11.61	11.61	15.55	15.55
		mm	-				295	295	295	395	395
	1400-60 cm ²	in	-				11.61	11.61	11.61	15.55	15.55
		mm	-				295	295	295	395	395
	1400-120 cm ²	in	-						18.90	18.90	18.90
		mm	-						480	480	480
	2800 cm ²	in	-						18.90	18.90	18.90
		mm	-						480	480	480
H2 NPS 4 and larger including foot	Class 150	in	1.97	2.36	3.15	3.54	3.94	6.30	8.66	9.84	
		mm	50	60	80	90	100	160	220	250	
	Class 300 to 600	in	2.34	2.76	3.54	3.94	4.72	7.09	9.25	10.63	
		mm	60	70	90	100	120	180	235	270	
	Class 900	in	2.76	3.15	3.94	4.33	4.72	7.09	9.25	10.63	
		mm	70	80	100	110	120	180	235	270	

Table 5.2: Dimensions for Types 3271 and 3277 Pneumatic Actuators

Actuator area	cm ²	350	355v2	700	750v2	1000	1400-60	1400-120	2800	2 x 2800
Diaphragm ØD	in	11.02	11.02	15.35	15.51	18.19	20.87	21.02	30.32	30.32
	mm	280	280	390	394	462	530	534	770	770
H ¹⁾	in	3.23	4.76	7.83	9.29	15.87	13.27	23.54	28.07	47.76
	mm	82	121	199	236	403	337	598	713	1213
H3 ²⁾	in	4.33	4.33	7.48	7.48	24.02	24.02	25.59	25.59	25.59
	mm	110	110	190	190	610	610	650	650	650
H5	Type 3277 in	3.98	3.98	3.98	3.98	-	-	-	-	-
	Type 3277 mm	101	101	101	101	-	-	-	-	-
Thread	Type 3271	M30 x 1.5				M60 x 1.5		M100 x 2		
	Type 3277	M30 x 1.5				-	-	-	-	-
α	Type 3271	G 3/8 (3/8 NPT)	G 3/8 (3/8 NPT)	G 3/8 (3/8 NPT)	G 3/8 (3/8 NPT)	G 3/4 (3/4 NPT)	G 3/4 (3/4 NPT)	G 1 (1 NPT)	G 1 (1 NPT)	G 1 (1 NPT)
α2	Type 3277	G 3/8	G 3/8	G 3/8	G 3/8	-	-	-	-	-

1) Height with welded-on lifting eyelet or height of eyebolt according to DIN 580. Height of the swivel lifting hook may differ. Actuators up to 355v2 cm² without lifting eyelet

2) Minimum clearance required to remove the actuator

Table 6: Weights for standard version of Type 3291-1 and Type 3291-7 Control Valves

Valve	NPS	1/2	1	1 1/2	2	3	4	6	8	
Valve without actuator (approx.)	Class 150/300	lbs	34	39	50	88	137	181	465	1003
		kg	15.5	17.5	22.5	40	62	82	211	455
	Class 600	lbs	49	62	82	146	231	311	772	1224
		kg	22	28	37	66	105	141	350	555
	Class 900	lbs	77	90	134.5	218	271	362	860	1456
		kg	35	41	61	99	123	164	390	665

Actuator	cm ²	350	355v2	700	750v2	1000	1400-60	1400-120	2800	2 x 2800	
Type 3271 (approx.)	Without handwheel	lbs	18	33	49	80	187	154	386	992	2094
		kg	8	15	22	36	85	70	175	450	950
	With handwheel	lbs	29	44	60	91	Only with side-mounted handwheel, see ▶ T 8310-2		On request		
		kg	13	20	27	41					
Type 3277 (approx.)	Without handwheel	lbs	26	42	57	88	-				
		kg	12	19	26	40					
	With handwheel	lbs	37	53	68	98					
		kg	17	24	31	45					

Dimensional drawings for Type 3291-7 and Type 3291-1

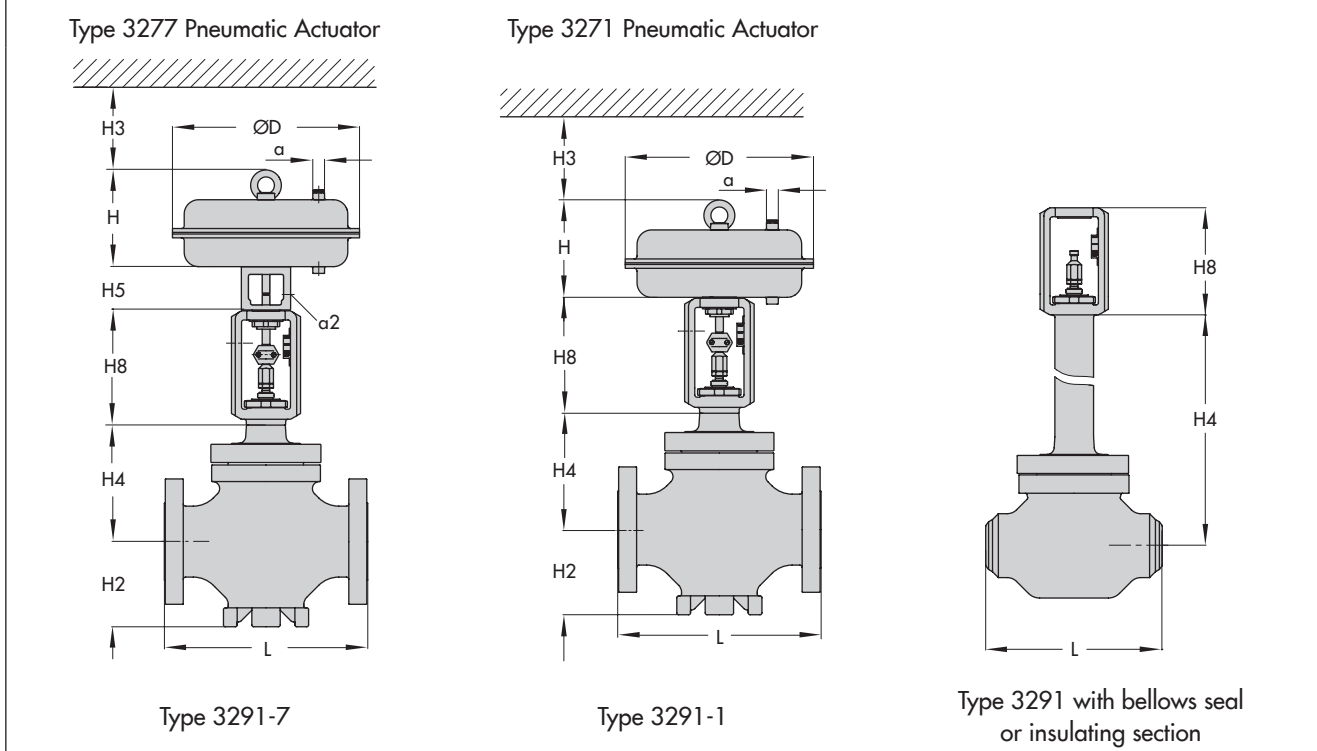


Table 7: Dimensions and weights for the standard version of Type 3291 with insulating section · Without actuator

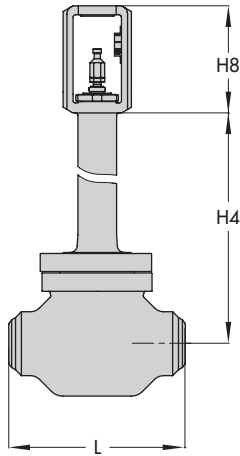
Valve size		NPS	½	1	1½	2	3	4	6	8
H4	Class 150 to 600	in	13.90	13.90	14.37	19.17	19.37	20.16	27.09	38.19
		mm	353	353	365	487	492	512	688	970
	Class 900	in	15.04	15.04	15.39	20.32	19.37	20.16	27.09	38.19
		mm	382	382	391	516	492	512	688	970
Weight without actuator	Class 150/300	lbs	On request							
		kg	On request							
	Class 600	lbs	66	79	99	163	249	353	816	1444
		kg	30	36	45	74	113	160	370	655
Class 900	lbs	95	108	152	236	293	406	904	1642	
	kg	43	49	69	107	133	184	410	745	

Table 8: Dimensions and weights for the standard version of Type 3291 with bellows seal · Without actuator

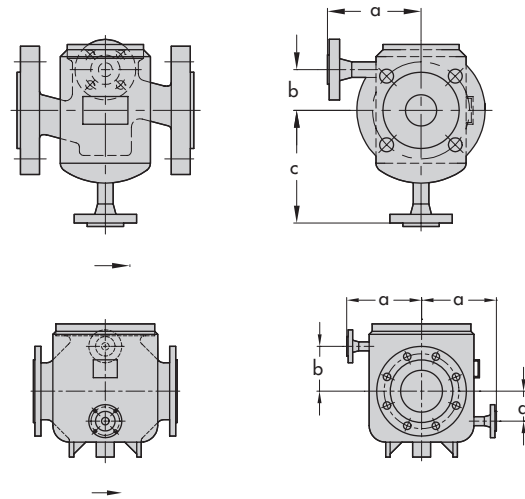
Valve size	NPS	½	1	1½	2	3	4	6	8
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H4	Class 150	in	13.78	13.78	14.25	23.46	23.66	23.66	29.29	41.73
		mm	350	350	362	596	601	601	744	1060
	Class 300 to 600	in	13.78	13.78	14.25	23.46	23.66	23.66	34.49	57.48
		mm	350	350	362	596	601	601	876	1460
	Class 900	in	13.46	13.46	13.86	23.03	23.66	23.66	34.49	62.80
		mm	342	342	352	585	601	601	876	1595

Dimensional drawings



Type 3291 with insulating section or bellows seal



Type 3291 with heating jacket (dimensions on request)

Selection and sizing of the control valve

1. Calculate the C_v (K_v) coefficient according to IEC 60534-6.
2. Select valve size NPS and C_v (K_{vs}) coefficient from Table 3 or Table 4.
3. Select the actuator and determine the permissible differential pressure Δp from the Information Sheet ► T 8000-4.
4. Select the valve body material from Table 1 and Table 2 as well as from the pressure-temperature diagrams (see Information Sheet ► T 8000-2).

Order specifications:

Valve size	NPS
Pressure rating	Class
Body material	According to Table 2
Bonnet	Bonnet, insulating section or bellows seal
Type of connection	Flanges/welding ends
Plug	Standard or balanced
Facing	Soft seal, metal seal or high-performance metal seal
Characteristic	Equal percentage, linear or quick opening
Actuator	Type 3271 or Type 3277 (see Data Sheets ► T 8310-1 and ► T 8310-2)
Fail-safe position	Fail-close or fail-open
Process medium	Density in lb/cu.ft or kg/m ³ and temperature in °F (°C)
Flow rate	lbs/h or kg/h or cu.ft/min or m ³ /h in standard or operating state
Pressure	Upstream pressure p_1 and downstream pressure p_2 or differential pressure Δp in psi (bar) (absolute pressure p_{obs}) (with minimum, normal and maximum flow rate)
Valve accessories	Positioner, limit switch, solenoid valve etc. (see Information Sheet ► T 8350)

Note: The temperature limits for DIN and ANSI versions are not directly converted temperatures.

Specifications subject to change without notice



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