

Series 280

Type 3281-1 and Type 3281-7 Pneumatic Steam Converters Type 3281 Steam-converting Valve



ANSI version

Application

Final control element (globe valve) for process engineering applications and thermal plants

Valve size	NPS 2 to 20
Pressure rating	Class 150 to 900
Temperatures	Up to 932 °F (500 °C)



Steam converters reduce the pressure and the temperature to the set points adjusted at the pressure controller and the temperature controller (Fig. 2). They consist of a Type 3281 Steam-converting Valve together with a Type 3271 Pneumatic Actuator (Type 3281-1 Steam Converter) or with a Type 3277 Pneumatic Actuator (Type 3281-7 Steam Converter).

The steam-converting valve largely corresponds to a Type 3251 Globe Valve (► T 8051) fitted with a flow divider St III.

Valve body made of

- Cast steel
- High-temperature cast steel

Low-noise valve plug

- Metal seal
- High-performance metal seal
- Balanced to handle high differential pressures

Water supplied through the flow divider St III ensures:

- Full utilization of the steam's kinetic energy to mix and split up the cooling water
- Fast evaporation independent of the steam flow rate
- Homogenous condition of the throttled and superheated steam
- Prevention of thermal shock or erosion caused by the cooling water entering the valve as the water does not have any contact with the valve body
- Low-vibration and low-noise operation

The steam converters, 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 and NAMUR recommendation (see Information Sheet ► T 8350).

Versions

Standard version with PTFE packing for temperatures up to 428 °F (220 °C) or with adjustable high-temperature packing up to 662 °F (350 °C), valve size NPS 2 to 20, pressure rating Class 150 to 900



Fig. 1: Type 3281-1 Pneumatic Steam Converter

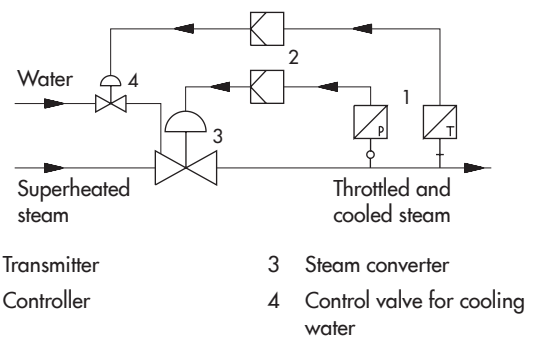


Fig. 2: Steam pressure/temperature control with steam converter

- **Type 3281-1** (Fig. 1) · Type 3281 Steam-converting Valve and Type 3271 Actuator with 350 to 2800 cm² actuator area (see Data Sheets ► T 8310-1, ► T 8310-2, and ► T 8310-3)
- **Type 3281-7** · Type 3281 Steam-converting Valve and Type 3277 Actuator with 350 to 750 cm² actuator area (see Data Sheet ► T 8310-1)

Further versions

- **Welding ends** according to ASME B16.25
- **Insulating section** for temperatures up to 932 °F (500 °C)
- **Additional handwheel** · See Data Sheets ▶ T 8310-1, ▶ T 8310-2, and ▶ T 8310-3
- **DIN version** · DN 50 to 500, PN 16 to 160 · See Data Sheet ▶ T 8251
- **Perforated plug**

Principle of operation

The medium flows through the valve in the direction indicated by the arrow. The valve plug position determines the cross-sectional area between the seat (2) and plug (3).

The cooling water does not have any contact with the valve body. It is fed to the flow divider St III (13) through the connecting pipe (5.5) and the annular chamber formed by the clamping element (13.1).

After flowing through the cross-sectional area between seat and plug, the steam flow reaches its maximum velocity and comes into contact with the cooling water at the inner wall of the flow divider (13). The steam flow and water carried with it are split up and mixed in the fine-mesh wire fabric of the flow divider. At the same time, the steam velocity is reduced, releasing some of its heat to the water across the large surface of the wire mesh coil, which causes it to evaporate quickly. The steam/water mixture leaves the flow divider as a fine mist with a high steam content. Evaporation is completed a short distance downstream of the steam-converting valve. The water atomization described is ensured over the whole load range since the steam velocity at the throttling point is independent of the flow rate.

Fail-safe position

Depending on how the springs are arranged in the pneumatic actuator, the valve has two different fail-safe positions effective upon air supply failure or when the air supply pressure drops.

- **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.

Differential pressures

The permissible differential pressures can be found in the Information Sheet ▶ T 8000-4.

Note: Fig. 3 and Fig. 4 show configuration examples.

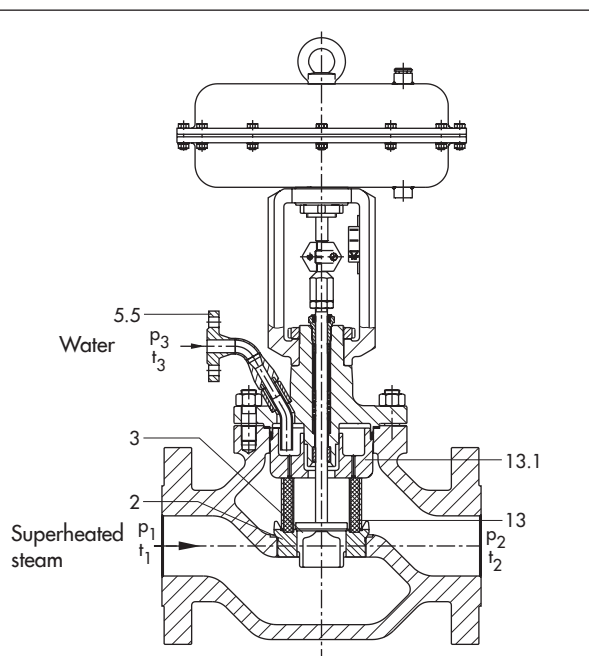


Fig. 3: Type 3281-1 Pneumatic Steam Converter with flanged connections and Type 3271 Actuator

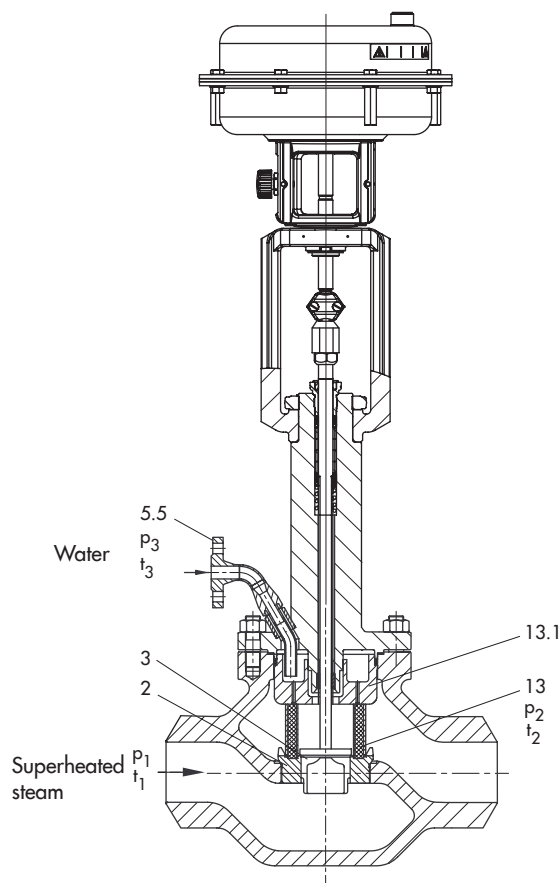


Fig. 4: Type 3281-7 Pneumatic Steam Converter with insulating section, welding ends and Type 3277 Actuator

2	Seat
3	Plug
5.5	Water connection
13	Flow divider St III
13.1	Clamping element

Table 1: Technical data for Type 3281 Steam-converting Valve


Material		Cast steel · A216 WCC	Cast steel · A217 WC6
Valve size	NPS	2 to 20	
Pressure rating	Class	150 to 900	
Type of connection	Flanges	ASME B16.5	
	Welding ends	ASME B16.25	
Seat-plug seal		Metal seal or high-performance metal seal	
Characteristic		Equal percentage or linear	
Rangeability		50:1	
Compliance			
Temperature ranges · Permissible operating pressures acc. 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 (up to 350 °C) with high-temperature packing	
Body with	Insulating section	-20 to +800 °F (-29 to +427 °C)	-20 to +932 °F (-29 to +500 °C)
Valve plug	Standard	Metal seal	-20 to +932 °F (-29 to +500 °C)
	Balanced with PTFE		-20 to +428 °F (-29 to +220 °C)
	Balanced with graphite ring		-20 to +932 °F (-29 to +500 °C)
Leakage class according to ANSI/FCI 70-2			
Valve plug	Standard	Metal seal	IV
		High-performance metal seal	V
	Balanced with PTFE		Standard: IV · High-performance metal seal: V
	Balanced with graphite ring		IV

Table 2: Materials

Standard version with body and flanges ¹⁾		Cast steel · A216 WCC	Cast steel · A217 WC6
Seat and plug ²⁾	Metal seal	410-2/1.4008	
	Seal ring for balanced plug	PTFE/graphite	
Guide bushings		1.4112	
Packing		V-ring packing: PTFE with carbon, spring: 302 or high-temperature packing	
Body gasket		Graphite seal on metal core	
Insulating section		A216 WCC/A105	A217 WC6/A 182 F12 Cl.2

¹⁾ See also pressure-temperature diagrams (► T 8000-2)

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

Table 3: Available C_V and K_{VS} coefficients · Versions highlighted in gray also available with balanced plug

C_V	3.5	5.6	9	14	23	35	55	90	140	220	315	560	880	1280	1730	2200	
K_{VS}	3.0	4.8	7.5	12	20	30	47	75	120	190	270	480	750	1100	1500	1900	
Seat Ø	in	0.945			1.22	1.5	1.97	2.48	3.15	3.94	4.92	5.91	7.87	9.84	11.81	13.78	15.75
	mm	24			31	38	50	63	80	100	125	150	200	250	300	350	400
Travel	in	0.59				1.18				2.36			4.72				
	mm	15				30				60			120				
NPS	DN																
2	50	•	•	•													
3	80	•	•	•	•	•	•										
4	100				•	•	•	•									
6	150							•	•	•							
8	200							•	•	•	•						
10	250							•	•	•	•	•					
12	300								•	•	•	•	•				
14	–										•	•	•	•			
16	400										•	•	•	•	•		
20	500												•	•	•	•	

Table 4: Dimensions for standard versions of Type 3281-1 and Type 3281-7 Pneumatic Steam Converters

Table 4.1: Type 3281 Steam-converting Valve · Face-to face dimensions according to ANSI/ISA-75.08.01 for Class 600 and lower and according to ASME B16.10 for Class 900 and higher

Valve	NPS		2	3	4	6	8	10	12	14	16	20
	DN		50	80	100	150	200	250	300	–	400	500
Length L (flanges RF and welding ends)	Class 150	in	10.00	11.75	13.88	17.75	21.38	26.50	29.00	35.00	40.00	On request
		mm	254	298	352	451	543	673	737	889	1016	
	Class 300	in	10.50	12.55	14.50	18.62	22.38	27.88	30.50	36.50	41.62	On request
		mm	267	318	368	473	568	708	775	927	1057	
	Class 600	in	11.25	13.25	15.50	20.00	24.00	29.62	32.25	38.25	43.62	On request
		mm	286	337	394	508	610	752	819	972	1108	
	Class 900	in	14.50	15.00	18.00	24.00	29.00	33.00	38.00	40.50	On request	
		mm	368	381	457	610	737	838	965	1029		
Height H4	Class 150 to 600	in	8.54	8.74	9.53	12.36	15.24	17.40 ¹⁾	25.79	25.20	25.20	On request
		mm	217	222	242	314	387	442 ¹⁾	655	640	640	
	Class 900	in	9.88	8.74	9.53	12.36	15.24	20.43 ²⁾	25.79	On request		
		mm	251	222	242	314	387	519 ²⁾	655			
H8 for actuator	350 cm ²	in	9.45	9.45	9.45	–						
		mm	240	240	240							
	355 cm ²	in	9.45	9.45	9.45	16.46	–					
		mm	240	240	240	418						
	700 cm ²	in	9.45	9.45	9.45	16.46	16.46	16.46	–			
		mm	240	240	240	418	418	418				
	750 cm ²	in	9.45	9.45	9.45	16.46	16.46	16.46	–			
		mm	240	240	240	418	418	418				
	1000 cm ²	in	11.61	11.61	11.61	16.46	16.46	On request				
		mm	295	295	295	418	418					
	1400-60 cm ²	in	11.61	11.61	11.61	16.46	16.46	On request				
		mm	295	295	295	418	418					
1400-120 cm ²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59	25.59	25.59	25.59	
	mm	480	480	480	503	503	503	650	650	650	650	

Valve	NPS		2	3	4	6	8	10	12	14	16	20
	DN		50	80	100	150	200	250	300	-	400	500
H8 for actuator	2800 cm ²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59	25.59	25.59	25.59
		mm	480	480	480	503	503	503	650	650	650	650
	2x2800 cm ²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59	25.59	25.59	25.59
		mm	480	480	480	503	503	503	650	650	650	650
H2 (NPS 4 and larger with foot)	Class 150	in	3.54	3.94	6.3	8.66	9.84	12.21	14.57	On request	16.34	On request
		mm	90	100	160	220	250	310	370		415	
	Class 300 to 600	in	3.94	4.72	7.09	9.25	10.63	11.82	15.35	On request		
		mm	100	120	180	235	270	300	390			
	Class 900	in	4.33	4.72	7.09	9.25	On request					
		mm	110	120	180	235						

1) NPS 10, Class 150 to 300: 442 mm or 17.40"

2) NPS 10, Class 600 to 900: 519 mm or 20.43"

Table 4.2: Types 3271 and 3277 Pneumatic Actuators

Actuator area	cm ²	350	355	700	750	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	11.3	19.29 ³⁾ / 22.83 ⁴⁾	24.80 ³⁾ / 27.36 ⁴⁾	44.49 ³⁾ / 47.05 ⁴⁾	
	mm	82	121	199	236	403	287	490 ³⁾ / 580 ⁴⁾	630 ³⁾ / 695 ⁴⁾	1130 ³⁾ / 1195 ⁴⁾	
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 355 cm² without lifting eyelet

2) Minimum clearance required to remove the actuator

3) Height for version with welded-on lifting eyelet (material EN-JS1030)

4) Height for version with female thread (material 1.5638/A352 LC3)

Table 5: Weights (approx.) for standard version of Type 3281-1 and Type 3281-7 Pneumatic Steam Converters

Table 5.1: Type 3281 Steam-converting Valve

Valve	NPS		2	3	4	6	8	10	12	14	16	20
	DN		50	80	100	150	200	250	300	-	400	500
Valve without actuator	Class 150	lbs	66	110	152	342	948	1892	2028	On request	3197	3638
		kg	30	50	69	155	460	858	920		1450	1650
	Class 300	lbs	95	170	247	694	948	1892	2028	On request	3197	3638
		kg	43	77	112	315	430	858	920		1450	1650
	Class 600	lbs	95	170	247	694	1096	2509	2535	On request		
		kg	43	77	112	315	497	1138	1150			
	Class 900	lbs	95	170	247	694	1157	2844	3263	On request	5732	On request
		kg	43	77	112	315	525	1290	1480		2600	

Table 5.2: Types 3271 and 3277 Pneumatic Actuators

Actuator	cm ²	350	355	700	750	1000	1400-60	1400-120	2800	2 x 2800
Type 3271 without handwheel	lbs	18	33	49	80	187	154	386	992	2094
	kg	8	15	22	36	85	70	175	450	950
Type 3271 with handwheel	lbs	29	44	60	91	419	386	661 ¹⁾ / 937 ²⁾	1268 ¹⁾ / 1543 ²⁾	On request
	kg	13	20	27	41	190	175	300 ¹⁾ / 425 ²⁾	575 ¹⁾ / 700 ²⁾	
Type 3277 without handwheel	lbs	26	42	57	88	-				
	kg	12	19	26	40					
Type 3277 with handwheel	lbs	37	53	68	100					
	kg	17	24	31	45					

- 1) Side-mounted handwheel up to 80 mm travel
- 2) Side-mounted handwheel above 80 mm travel

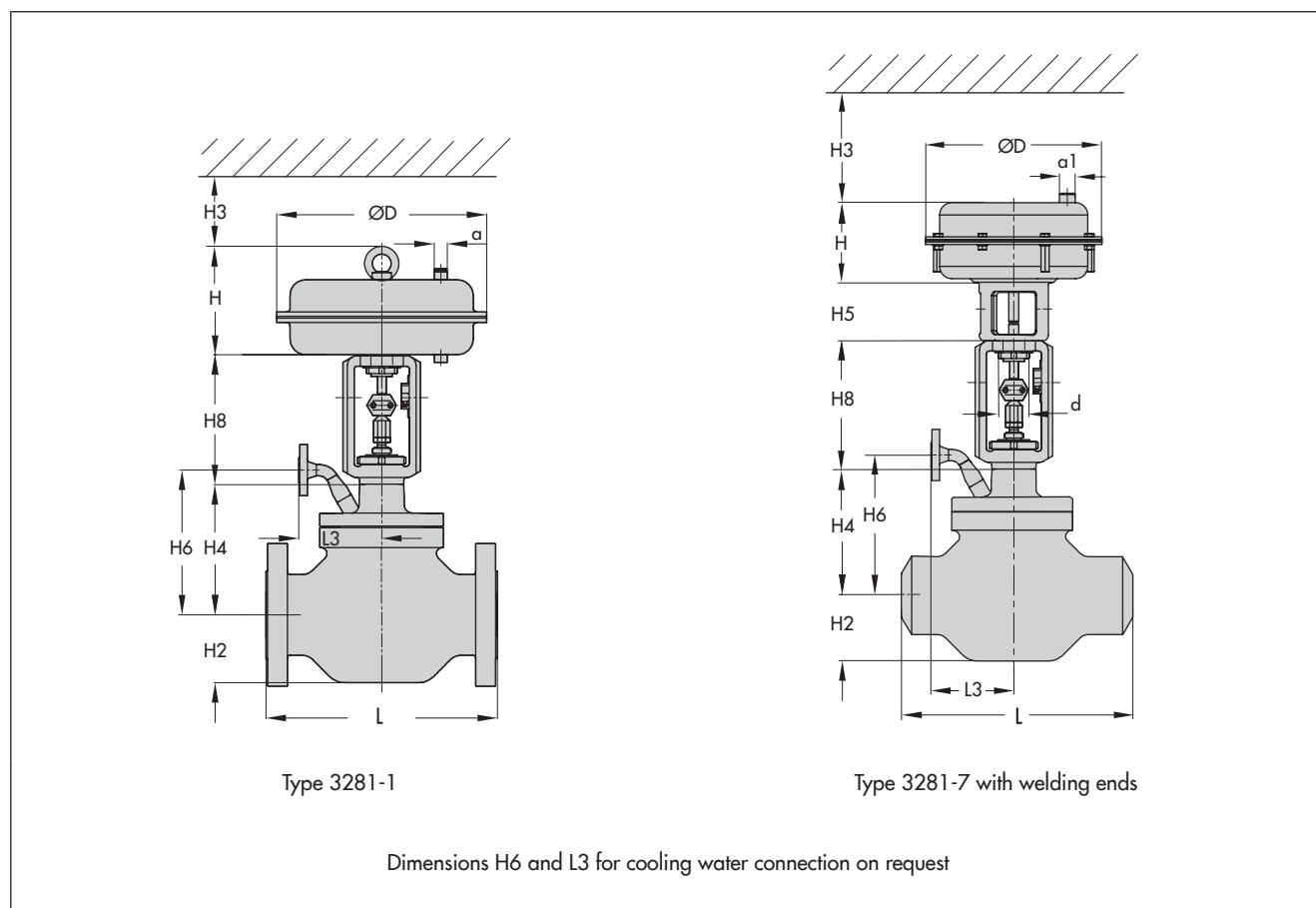
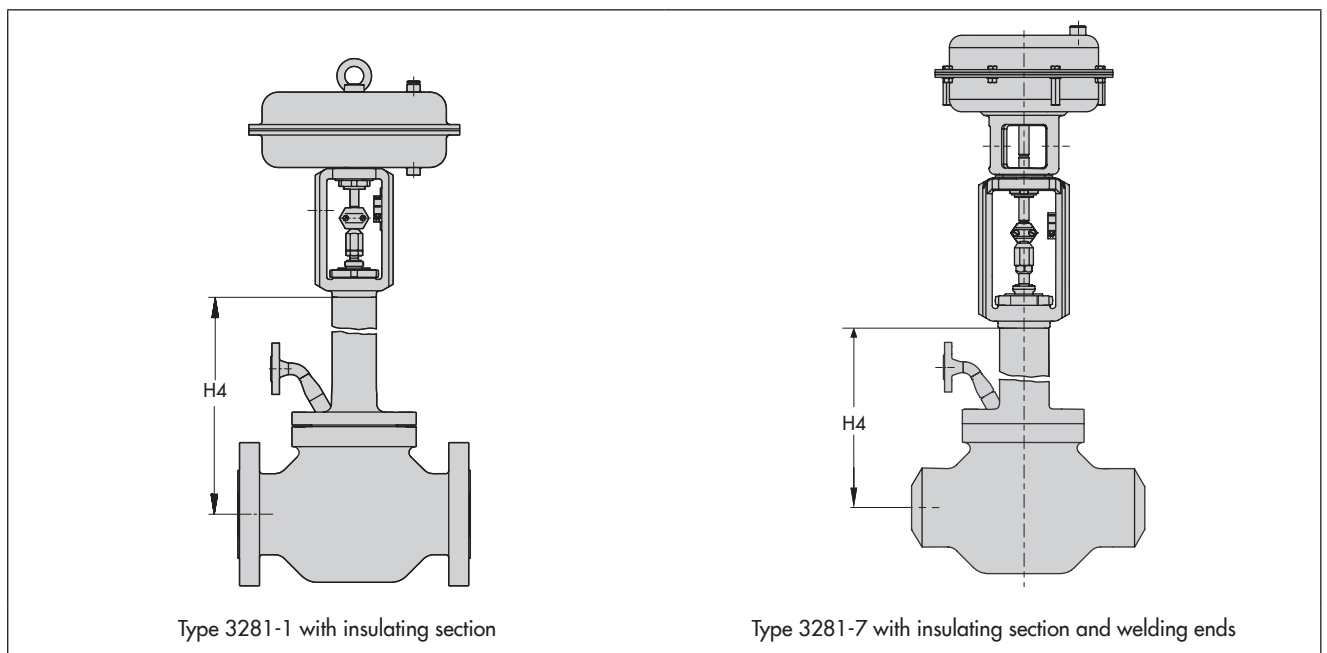


Table 6: Dimensions for Type 3281 Steam-converting Valve with insulating section

Valve		NPS	2	3	4	6	8	10	12	16	20	
		DN	50	80	100	150	200	250	300	400	500	
Height H4	Class 150 to 600	in	19.17	19.37	20.16	26.18	37.28	42.01	45.32	44.76	On request	
		mm	487	492	512	665	947	1067	1151	1137		
	Class 900	in	20.32	19.37	20.16	26.18	37.28	42.01	On request			
		mm	516	492	512	665	947	1067				

Table 7: Weights (approx.) for Type 3281 Steam-converting Valve with insulating section

Valve		NPS	2	3	4	6	8	10	12	16	20	
		DN	50	80	100	150	200	250	300	400	500	
Valve without actuator	Class 150 to 300	lbs	111	172	232	552	1048	On request				
		kg	50	78	105	250	475					
	Class 600 to 900	lbs	166	254	353	838	1510					
		kg	75	115	160	380	685					



Selection and sizing of the steam converter

The steam converters require particularly careful sizing. Therefore, SAMSON performs the final sizing of the valves.

1. Calculate the suitable C_v coefficient according to IEC 60534.
2. Select valve size and C_v coefficient from Table 3.
3. Select materials, pressure, and temperature from Table 1 and Table 2 and from the pressure-temperature diagram (► T 8000-2).
4. Select accessories from Table 1 and Table 2.
5. Check the installation conditions as described in TV-SK 9778-1.
6. Check the limits of application (more details on request).

The following specifications are required on ordering:

Steam converter	Type 3281 Globe Valve
Valve size	NPS ...
Pressure rating	Class ...
Body material	According to Table 2
Type of connection	Flanges or welding ends
Plug	Standard or balanced
Characteristic	Equal percentage or linear
Max. and min. flow rate of the superheated steam or cooled steam	in lbs/h or kg/h
Steam pressure upstream and downstream of the valve	p_1 and p_2
Steam temperature upstream and downstream of the valve	T_1 and T_2
Cooling water pressure and temperature upstream of the valve	p_3 and T_3
Actuator	Type 3271 or Type 3277
Actuator area	... cm ²
Fail-safe action	Fail-close or fail-open
Valve accessories	Positioner and/or limit switch

Specifications subject to change without notice



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