DATA SHEET

T 8252 EN

Series 280 • Type 3281 Steam Conditioning Valve
Type 3281-1 and Type 3281-7 Pneumatic Steam Conditioning Valves

ANSI version

Application

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

Valve size	**NPS 2 to 12**
Pressure rating	**Class 150 to 900**
Temperatures	**Up to 932 °F (500 °C)**

Special features

Steam conditioners 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 Conditioning Valve together with a Type 3271 Pneumatic Actuator (Type 3281-1 Steam Conditioning Valve) or with a Type 3277 Pneumatic Actuator (Type 3281-7 Steam Conditioning Valve).

The steam conditioning valve largely corresponds to a Type 3251 Globe Valve (▶ T 8052) fitted with a flow divider ST 3.

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 3 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 conditioning valves with their modular design can be equipped with various accessories:
Positioners, limit switches, solenoid valves and other valve accessories according to IEC 60534 [1] and NAMUR recommendation (see Information Sheet ▶ T 8350).

[1] Accessories required. See associated actuator documentation.

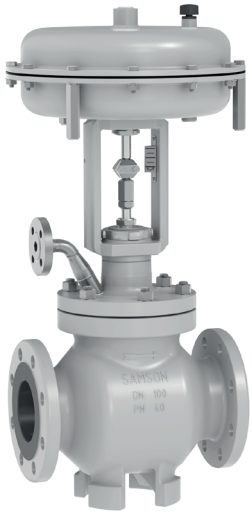
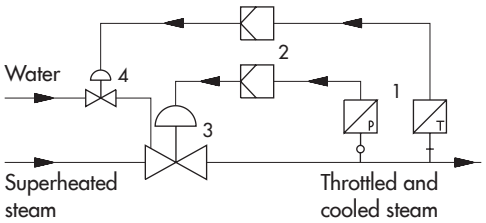


Fig. 1: *Type 3281-1 Pneumatic Steam Conditioning Valve*



1	Transmitter	3	Steam conditioner
2	Controller	4	Control valve for cooling water

Fig. 2: *Steam pressure/temperature control with steam conditioner*

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 12, pressure rating Class 150 to 900

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– **Type 3281-1** (Fig. 1) · Type 3281 Steam Conditioning 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 Conditioning Valve and Type 3277 Actuator with 350 to 750v2 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 Sheet ▶ T 8310-1
– **DIN version** · DN 50 to 300, PN 16 to 160 · See Data Sheet ▶ T 8251
– **Perforated plug**

Principle of operation

The seat (4), plug with plug stem (5) and flow divider (62) are installed in the body (1). The plug stem is connected to the actuator stem (A7) by the stem connector clamps (A26/27) and is sealed by a spring-loaded V-ring packing (15). Alternatively, an adjustable high-temperature packing can be used.

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

The cooling water is fed to the flow divider (62) through the connecting pipe on the bonnet (2) and holes in the clamping element (63). 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. The steam flow and the entrained water are mixed in the narrow wire mesh 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 conditioning 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 that become effective when the supply air fails 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.

Fig. 3 and Fig. 4 show configuration examples.

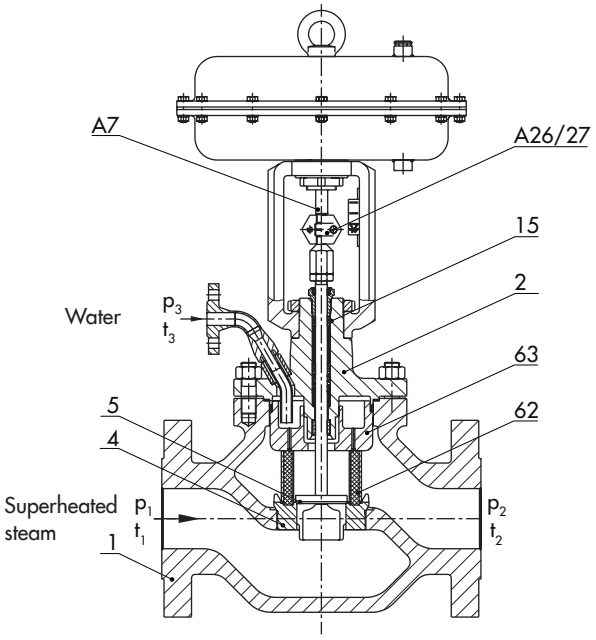


Fig. 3: *Type 3281-1 Pneumatic Steam Conditioning Valve with flanged connections and Type 3271 Actuator*

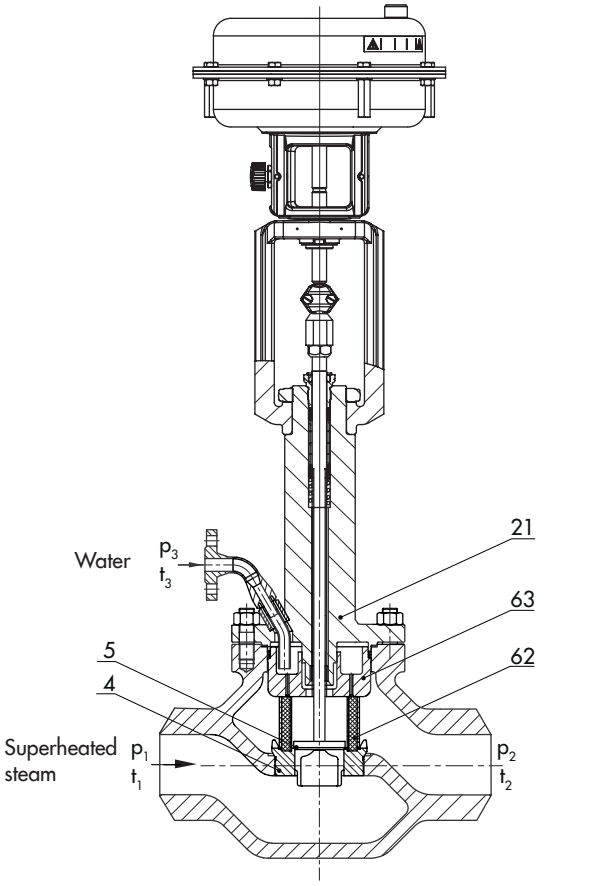


Fig. 4: *Type 3281-7 Pneumatic Steam Conditioning Valve with insulating section, welding ends and Type 3277 Actuator*

Legend for Fig. 3 and Fig. 4

1	Body	21	Insulating section
2	Bonnet with connecting pipe	62	Flow divider ST 3
		63	Clamping element
4	Seat	A7	Actuator stem
5	Plug with plug stem	A26/27	Stem connector clamps
15	Packing		

Table 1: *Technical data of Type 3281 Steam Conditioning Valve*

Material			**Cast steel · A216 WCC**	**Cast steel · A217 WC6**
Valve size		NPS	2 to 12	
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	
Conformity			CE · EAC	
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 +425 °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/A182 F12 Cl.2

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

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
K_{VS}		3.0	4.8	7.5	12	20	30	47	75	120	190	270	480	750
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
	mm	24			31	38	50	63	80	100	125	150	200	250
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								•	•	• [1]	•		
10	250								•	•	• [1]	•	•	
12	300									•	• [1]	•	•	•

[1] Version with balanced plug: seat bore 125 is only possible for Class 600 and 900. A special machined plug and seat bore 150 (special version) are required for Class 150 and 300.

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

Table 4.1: *Type 3281 Steam Conditioning 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**
	DN		**50**	**80**	**100**	**150**	**200**	**250**	**300**
Length L (flanges RF and welding ends)	Class 150	in	10.00	11.75	13.88	17.75	21.38	26.50	29.00
		mm	254	298	352	451	543	673	737
	Class 300	in	10.50	12.55	14.50	18.62	22.38	27.88	30.50
		mm	267	318	368	473	568	708	775
	Class 600	in	11.25	13.25	15.50	20.00	24.00	29.62	32.25
		mm	286	337	394	508	610	752	819
	Class 900	in	14.50	15.00	18.00	24.00	29.00	33.00	38.00
		mm	368	381	457	610	737	838	965
Height H4	Class 150 to 600	in	8.54	8.74	9.53	12.36	15.24	17.40 [1]	25.79
		mm	217	222	242	314	387	442 [1]	655
	Class 900	in	9.88	8.74	9.53	12.36	15.24	20.43 [2]	25.79
		mm	251	222	242	314	387	519 [2]	655
H8 for actuator	350 cm²	in	9.45	9.45	9.45	–			
		mm	240	240	240				
	355v2 cm²	in	9.45	9.45	9.45	16.46	–		
		mm	240	240	240	418			
	700 cm²	in	9.45	9.45	9.45	16.46	16.46	16.46	–
		mm	240	240	240	418	418	418	
	750v2 cm²	in	9.45	9.45	9.45	16.46	16.46	16.46	–
		mm	240	240	240	418	418	418	
	1000 cm²	in	11.61	11.61	11.61	16.46	16.46	On request	
		mm	295	295	295	418	418		
	1400-60 cm²	in	11.61	11.61	11.61	16.46	16.46	On request	
		mm	295	295	295	418	418		
	1400-120 cm²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59
		mm	480	480	480	503	503	503	650

Valve	NPS		2	3	4	6	8	10	12
	DN		50	80	100	150	200	250	300
H8 for actuator	2800 cm²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59
		mm	480	480	480	503	503	503	650
	2 x 2800 cm²	in	18.90	18.90	18.90	19.80	19.80	19.80	25.59
		mm	480	480	480	503	503	503	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
		mm	90	100	160	220	250	310	370
	Class 300 to 600	in	3.94	4.72	7.09	9.25	10.63	11.82	15.35
		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: *Type 3271 and Type 3277 Pneumatic Actuators*

Actuator area		cm²	350	350v2	355v2	700	750v2	1000	1400-60	1400-120	2800	2 x 2800
Diaphragm ØD		in	11.02	11.02	11.02	15.35	15.51	18.19	20.87	21.02	30.32	30.32
		mm	280	280	280	390	394	462	530	534	770	770
H 1)	Type 3271	in	3.23	3.62	5.16	7.83	9.29	15.87	13.27	23.54	28.07	47.76
		mm	82	92	131	199	236	403	337	598	713	1213
	Type 3277	in	3.23	3.23	4.76	7.83	9.29	–	–	–	–	–
		mm	82	82	121	199	236	–	–	–	–	–
H3 2)		in	4.33	4.33	4.33	7.48	7.48	24.02	24.02	25.59	25.59	25.59
		mm	110	110	110	190	190	610	610	650	650	650
H5	Type 3277	in	3.98	3.98	3.98	3.98	3.98	–	–	–	–	–
		mm	101	101	101	101	101	–	–	–	–	–
Thread	Type 3271		M30x1.5					M60x1.5		M100x2		
	Type 3277		M30x1.5					–	–	–	–	–
a	Type 3271		G ⅜ (⅜ NPT)	G ⅜ (⅜ NPT)	G ⅜ (⅜ NPT)	G ⅜ (⅜ NPT)	G ⅜ (⅜ NPT)	G ¾ (¾ NPT)	G ¾ (¾ NPT)	G 1 (1 NPT)	G 1 (1 NPT)	G 1 (1 NPT)
a2	Type 3277		G ⅜	G ⅜	G ⅜	G ⅜	G ⅜	–	–	–	–	–

1) Height including lifting eyelet or female thread and eyebolt according to DIN 580. Height of the swivel hoist may differ. Actuators up to 355v2 cm² without lifting eyelet or female thread
2) Minimum clearance required to remove the actuator

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

The weights specified apply to a specific standard device configuration. Weights of other device configurations may differ depending on the version (material, trim or number of actuator springs etc.).

Table 5.1: *Type 3281 Steam Conditioning Valve*

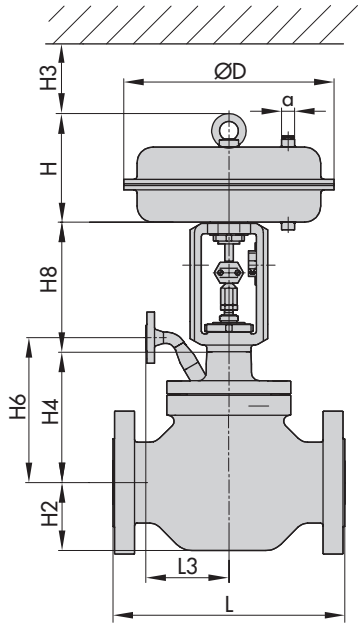
Valve		NPS	2	3	4	6	8	10	12
		DN	50	80	100	150	200	250	300
Valve without actuator	Class 150	lbs	66	110	152	342	948	1892	2028
		kg	30	50	69	155	460	858	920
	Class 300	lbs	95	170	247	694	948	1892	2028
		kg	43	77	112	315	430	858	920
	Class 600	lbs	95	170	247	694	1096	2509	2535
		kg	43	77	112	315	497	1138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

Table 5.2: *Type 3271 and Type 3277 Pneumatic Actuators*

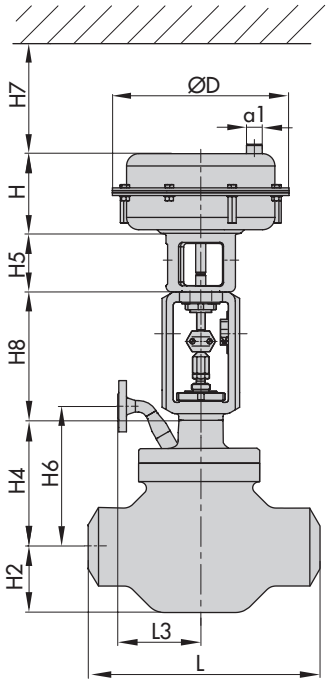
Actuator area			cm²	350	350v2	355v2	700	750v2	1000	1400-60	1400-120	2800	2 x 2800
Weight	Type 3271	Without handwheel	lbs (approx.)	18	26	33	49	79	176	154	386	992	2095
			kg (approx.)	8	11.5	15	22	36	80	70	175	450	950
		With handwheel	lbs (approx.)	29	37	44	60	90	397	386	661 [1]/ 937 [2]	1268 [2]/ 1544 [3]	On request
			kg (approx.)	13	16.5	20	27	41	180	175	300 [1]/ 425 [2]	575 [2]/ 700 [3]	On request
	Type 3277	Without handwheel	lbs (approx.)	27	33	42	58	89	–	–	–	–	–
			kg (approx.)	12	15	19	26	40	–	–	–	–	–
		With handwheel	lbs (approx.)	38	44	53	69	100	–	–	–	–	–
			kg (approx.)	17	20	24	31	45	–	–	–	–	–

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

Dimensional drawings



Type 3281-1 with flanges



Type 3281-7 with welding ends

Dimensions H6 and L3 for cooling water connection on request

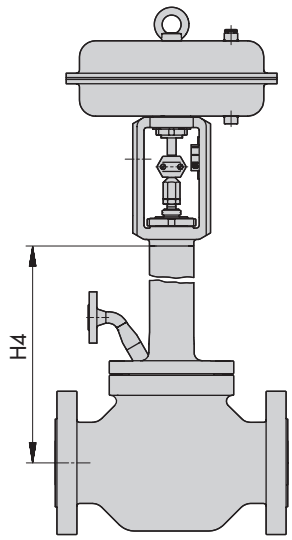
Table 6: *Dimensions for Type 3281 Steam Conditioning Valve with insulating section*

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

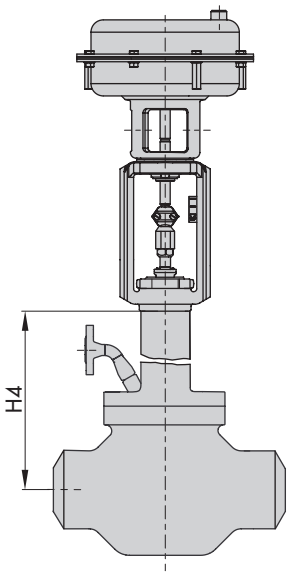
Table 7: *Weights (approx.) for Type 3281 Steam Conditioning Valve with insulating section*

Valve		NPS	2	3	4	6	8	10	12
		DN	50	80	100	150	200	250	300
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		

Dimensional drawings



Type 3281-1 with insulating section and flanges



Type 3281-7 with insulating section and welding ends

Selection and sizing of the steam conditioning valve

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

1. Calculate the suitable K_V coefficient according to IEC 60534.
2. Select valve size DN and K_{VS} 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).

Ordering data

Steam conditioner	Type 3281 Globe Valve
Valve size	NPS ...
Pressure rating	Class ...
Body material	Refer 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	... cm²
Fail-safe position	Fail-close or fail-open
Valve accessories	Positioner and/or limit switch

Associated Information Sheet ▶ T 8000-X

Associated Data Sheets for pneumatic actuators
▶ T 8310-1
▶ T 8310-2
▶ T 8310-3

Associated Mounting and Operating Instructions
▶ EB 8252