DATA SHEET

T 8257 EN

Series 280 · Type 3286 Steam Conditioning Valve

Type 3286-1 and Type 3286-7 Pneumatic Steam Conditioning Valves

ANSI version

Application

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

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

Fig. 1: *Type 3286-1 Pneumatic Steam Conditioning Valve*

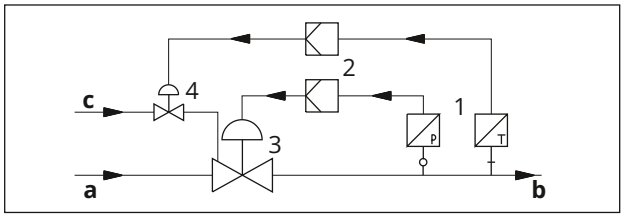

Fig. 2: *Steam pressure/temperature control with steam conditioning valve*

a Superheated steam
b Throttled and cooled steam
c Water
1 Transmitter
2 Controller
3 Steam conditioning valve
4 Control valve for cooling water

Special features

Steam conditioning valves 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 3286 Steam Conditioning Valve together with a Type 3271 Pneumatic Actuator (Type 3286-1 Steam Conditioning Valve) or with a Type 3277 Pneumatic Actuator (Type 3286-7 Steam Conditioning Valve).

The steam conditioning valve largely corresponds to a Type 3256 Angle Valve fitted with a flow divider ST 3 (see Data Sheet ▶ T 8066).

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

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Optional with RFID tags with unique identification according to DIN SPEC 91406.

The control valves with their modular design can be equipped with various accessories, such as positioners, limit switches, solenoid valves and other devices according to DIN EN 60534-6-1[1)] and NAMUR Recommendation (see Information Sheet ▶ T 8350).

[1)] Accessories required. See associated actuator documentation.

Versions

Operating temperature (medium temperature) with PTFE packing for temperatures up to 428 °F (+220 °C) or with adjustable high-temperature packing up to 662 °F (+350 °C), nominal sizes NPS 2 to 12, Class 150 to 900

- **Type 3286-1** (Fig. 1) • Type 3286 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 3286-7** • Type 3286 Steam Conditioning Valve and Type 3277 Actuator with 350 to 750v2 cm² actuator area for integral positioner attachment (see Data Sheet ▶ T 8310-1)

Further versions

- **Welding ends** · According to ASME B16.25
- **Perforated plug**
- **Version with insulating section** · For temperatures up to 932 °F (500 °C)
- **Additional handwheel** · See Data Sheet ▶ T 8310-1
- **DIN version** · Nominal sizes DN 50 to 300, pressure rating PN 16 to 160 · See Data Sheet ▶ T 8256

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. A rise in signal pressure causes the force acting on the diaphragm in the actuator to increase. The springs are compressed. Depending on the selected direction of action, the actuator stem retracts or extends. As a result, the position of the plug in the seat changes and determines the flow rate through the valve and the pressure p_2 with it.

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.

The following diagrams show configuration examples.

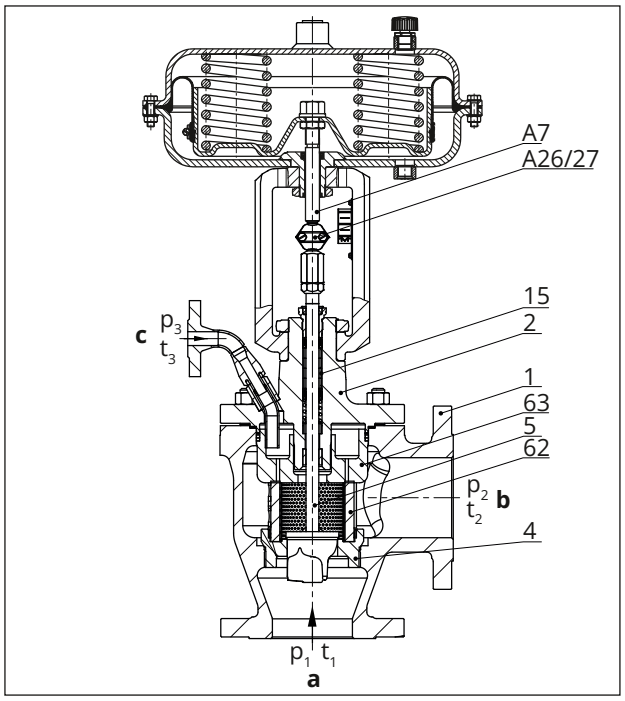

Fig. 3: *Type 3286-1 Pneumatic Steam Conditioning Valve with flanged connections and Type 3271 Actuator*

a	Superheated steam	5	Plug with plug stem
b	Throttled and cooled steam	15	Packing set
		62	Flow divider ST 3
c	Water	63	Clamping element
1	Body	A7	Actuator stem
2	Bonnet with connecting pipe	A26/27	Stem connector clamps
4	Seat		

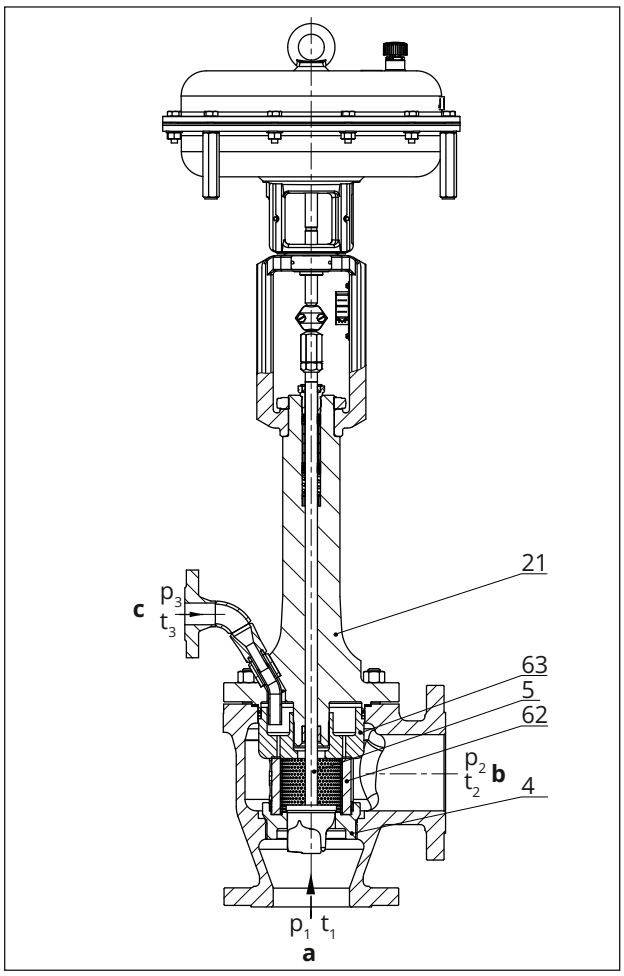

Fig. 4: *Type 3286-7 Pneumatic Steam Conditioning Valve with insulating section, welding ends and Type 3277 Actuator*

a	Superheated steam	5	Plug with plug stem
b	Throttled and cooled steam	21	Insulating section
		62	Flow divider ST 3
c	Water	63	Clamping element
4	Seat		

Differential pressures

See Information Sheet ▶ T 8000-4 for permissible differential pressures.

Fail-safe positions

Depending on how the springs are arranged in the Type 3271 or Type 3277 Pneumatic Actuator (see Data Sheets ▶ T 8310-1, ▶ T 8310-2 and ▶ T 8310-3), the valve has two different fail-safe positions that become effective when the supply air fails:

- **Actuator stem extends (fail-close):**
  The valve is closed upon air supply failure.
- **Actuator stem retracts (fail-open):**
  The valve is opened upon air supply failure.

Table 1: *Technical data for Type 3286 · ANSI version*

Material			**Cast steel A216 WCC**	**Cast steel A217 WC6**
Nominal size		NPS	2 to 12	2 to 12
Pressure rating		Class	150 to 900	150 to 900
Type of end connections		Flanges	According to ASME B16.5	
		Welding ends	According to ASME B16.25	
Seat-plug seal			Metal seal or high-performance metal seal	
Characteristic			Equal percentage or linear	
Rangeability			50:1	
Conformity			CE	
Optional RFID tag			Application range according to the technical specifications and the explosion protection certificates. These documents are available on our website: ▶ www.samsongroup.com > Products > Electronic nameplate The permissible range for temperatures at the RFID tag is between -40 and +185 °F (-40 and +85 °C).	
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 (-10 to +220) · Up to +660 (+350) with high-temperature packing	
Body with insulating section			-20 to +800 (-29 to +425)	-20 to +932 (-29 to +500)
Valve plug	Standard	Metal seal	-20 to +932 (-29 to +500)	
	Balanced with PTFE ring		-20 to +428 (-29 to +220)	
	Balanced with graphite ring		-20 to +932 (-29 to +500)	
Leakage class according to ANSI FCI 70-2				
Valve plug	Metal seal		Standard: IV · High-performance metal seal: V	
	Balanced, metal seal		With PTFE ring (standard): IV · High-performance metal seal: V · With graphite ring: IV	

Table 2: *Materials for Type 3286 · ANSI version*

Standard version 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 plug also with Stellite® facing or plug made of solid Stellite® available

Table 3: *Available C_V and K_{VS} coefficients*

	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
Rated 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							•	•	•[1]				
8	200								•	•	•[1)2)]	•[1)]		
10	250								•	•	•[1)2)]	•[1)]	•[1)]	
12	300									•	•[1)2)]	•[1)]	•[1)]	•[1)]

1) Versions also with pressure balancing

2) 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.

Dimensions

Specifications in inches and mm

Table 4: *Type 3286 Valve · ANSI version · Face-to face dimensions according to ANSI/ISA 75.08.01 up to* **≤***Class 600 and according to ASME B16.10 for* **≥***Class 900*

Valve		NPS	2	3	4	6	8	10	12
		DN	50	80	100	150	200	250	300
Length L2	Class 150	in	5.00	5.88	6.94	8.88	10.69	*)	*)
		mm	127	149	176	226	272	*)	*)
	Class 300	in	5.25	6.25	7.25	9.31	11.19	*)	*)
		mm	133	159	184	236	284	*)	*)
	Class 600	in	5.62	6.62	7.75	10.00	12.00	*)	*)
		mm	143	168	197	254	305	*)	*)
	Class 900	in	7.25	7.50	9.00	12.00	14.50	*)	*)
		mm	184	190	229	305	368	*)	*)
H8 for actuator	350 cm²	in	9.45	9.45	9.45	–	–	–	–
		mm	240	240	240	–	–	–	–
	350v2 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	–	–	–
	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	–	–
		mm	295	295	295	418	418	–	–
	1400-60 cm²	in	11.61	11.61	11.61	16.46	16.46	19.81	19.81
		mm	295	295	295	418	418	503	503
	1400-120 cm²	in	18.90	18.90	18.90	19.81	19.81	25.60	25.60
		mm	480	480	480	503	503	650	650
	2800 cm²	in	18.90	18.90	18.90	19.81	19.81	25.60	25.60
		mm	480	480	480	503	503	650	650
	2 x 2800 cm²	in	18.90	18.90	18.90	19.81	19.81	19.81[1)]	25.60
		mm	480	480	480	503	503	503[1)]	650

Valve		NPS	2	3	4	6	8	10	12
		DN	50	80	100	150	200	250	300
With standard bonnet									
H4	Class 150 to 600	in	6.89	6.30	6.69	9.13	*)	*)	*)
		mm	217	222	242	314	*)	*)	*)
	Class 900	in	9.88	8.74	9.53	12.36	*)	*)	*)
		mm	251	222	242	314	*)	*)	*)
With insulating section									
H4	Class 150 to 600	in	17.52	16.93	17.32	22.05	*)	*)	*)
		mm	445	430	440	560	*)	*)	*)
	Class 900	in	19.13	16.93	17.32	22.05	*)	*)	*)
		mm	586	430	440	560	*)	*)	*)

*) On request

1) H8 = 25.60" (650 mm) with seat bore 9.84" (250 mm)

Table 5: *Further dimensions[1] in combination with Type 3271 Pneumatic Actuator or Type 3277 Pneumatic Actuator*

Actuator area		cm²	350	350v2	355v2	750v2	1000	1400-60	1400-120	2800	2x 2800
Diaphragm ØD		in	11.02	11.02	11.02	15.51	18.19	20.87	21.02	30.32	30.32
Diaphragm ØD		mm	280	280	280	394	462	530	534	770	770
H[2]	Type 3271	in	3.23	3.62	5.16	9.29	15.87	13.27	23.54	28.07	47.76
H[2]	Type 3271	mm	82	92	131	236	403	337	598	713	1213
H[2]	Type 3277	in	3.23	3.23	4.76	9.29	–	–	–	–	–
H[2]	Type 3277	mm	82	82	121	236	–	–	–	–	–
H3[3]		in	4.33	4.33	4.33	7.48	24.02	24.02	25.59	25.59	25.59
H3[3]		mm	110	110	110	190	610	610	650	650	650
H5	Type 3277	in	3.98	3.98	3.98	3.98	–	–	–	–	–
H5	Type 3277	mm	101	101	101	101	–	–	–	–	–
Thread	Type 3271		M30x1.5	M30x1.5	M30x1.5	M30x1.5	M60x1.5	M60x1.5	M100x2	M100x2	M100x2
Thread	Type 3277		M30x1.5	M30x1.5	M30x1.5	M30x1.5	–	–	–	–	–
a	Type 3271		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[4]	G ⅜[4]	G ⅜[4]	G ⅜[4]	–	–	–	–	–

1) The specified dimensions are theoretical maximum design values for a specific standard device configuration. They do not reflect every possible case of use. The actual values for individual devices may differ depending on the device configuration and the specific application.

2) 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.

3) Minimum clearance required to remove the actuator

4) An adapter G ⅜ to ⅜ NPT is available for the a2 connection. It can be ordered separately using the following article number: 100160362

Dimensional drawings

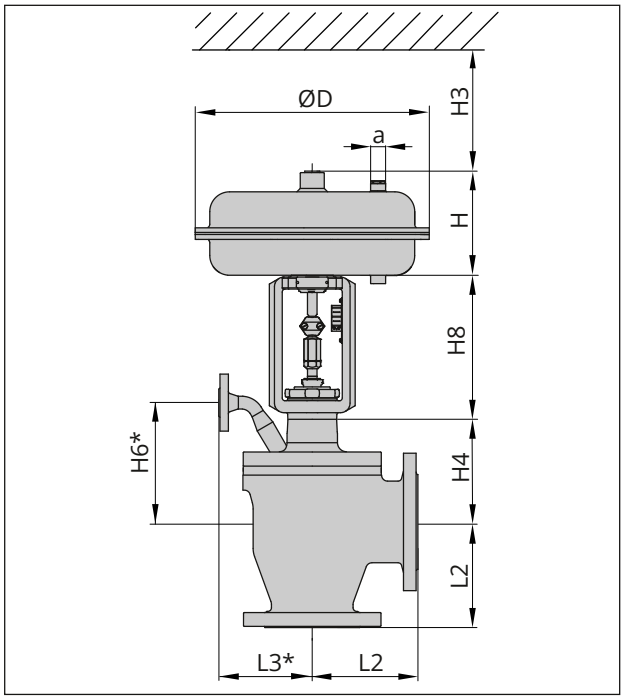

Fig. 5: *Type 3286-1 with flanges*

* Dimensions H6 and L3 for cooling water connection on request

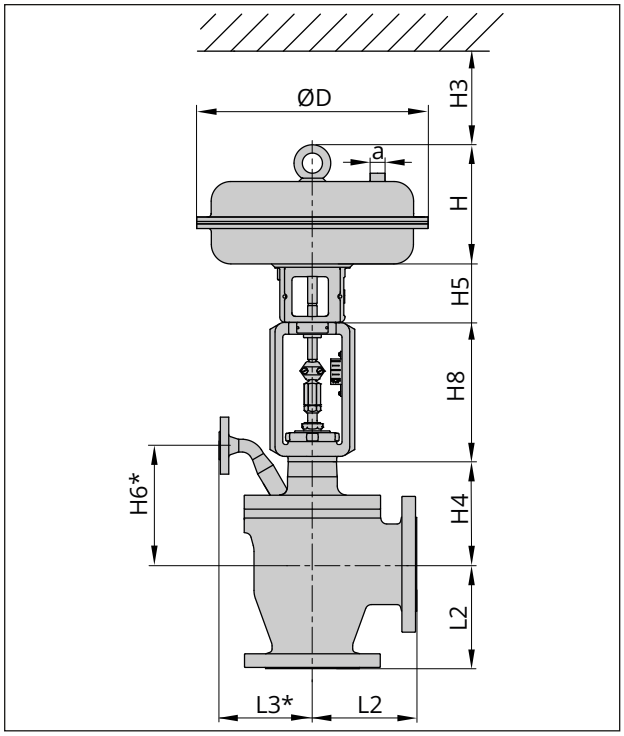

Fig. 6: *Type 3286-7 with flanges*

* Dimensions H6 and L3 for cooling water connection on request

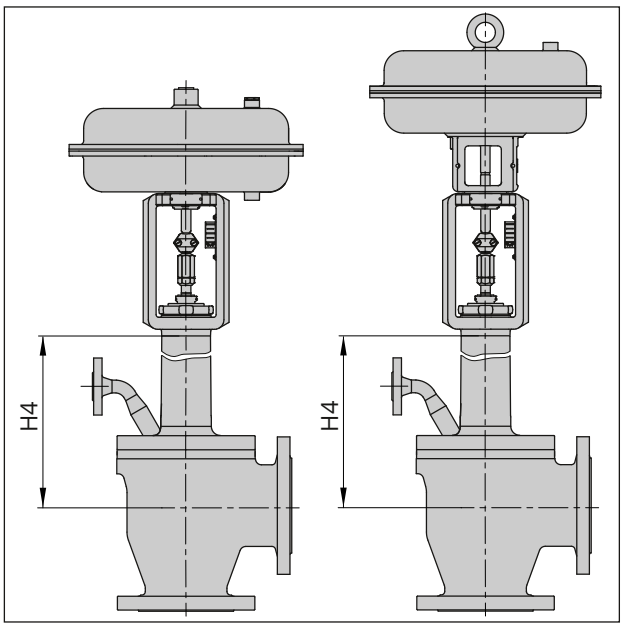

Fig. 7: *Left: Type 3286-1 with insulating section*
Right: Type 3286-7 with insulating section

Weights

Specifications in lbs and kg

Table 6: *Type 3286 Valve · ANSI version*

Valve		NPS	2	3	4	6	8	10	12
		DN	50	80	100	150	200	250	300
With standard bonnet									
Weight[1], approx. 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	3363
		kg	43	77	112	315	525	1290	1480
With insulating section									
Weight[1], approx. without actuator	Class 150 to 300	lbs	111	172	232	552	1048	*)	*)
		kg	50	78	105	250	475	*)	*)
	Class 600 to 900	lbs	166	254	353	838	1510	*)	*)
		kg	75	115	160	380	685	*)	*)

*) On request

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

Table 7: *Weights[1] for Type 3271 and Type 3277 Pneumatic Actuators*

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

*) On request

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

2) Side-mounted handwheel up to 80 mm travel

3) Side-mounted handwheel with travel higher than 80 mm travel

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 C_V coefficient according to DIN EN 60534-1.
2. Select nominal size NPS and C_V coefficient from Table 3.
3. Select materials, pressure and temperature from Table 1 and Table 2 as well as from the pressure-temperature diagram (see Information Sheet ▶ T 8000-2).
4. Select accessories from Table 1 and Table 2.
5. Check the installation conditions as described in the TV-SK 9778-1 document.
6. Check the limits of application (more details on request).

Associated Information Sheet	▶ T 8000-X
Associated Data Sheets for pneumatic actuators	▶ T 8310-1 to ▶ T 8310-3
Associated Mounting and Operating Instructions	▶ EB 8257

Ordering text

The following specifications are required on ordering:

Steam conditioning valve	Type 3286 Angle Valve
Nominal size	NPS ...
Pressure rating	Class ...
Body material	See Table 2
Bonnet	Standard or insulating section
Type of end connections	Flanges or welding ends
Plug	Standard or balanced Metal seal or high-performance metal seal
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 (see Data Sheets ▶ T 8310-1, ▶ T 8310-2 and ▶ T 8310-3)
Fail-safe position	Actuator stem extends/retracts
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 in psi or bar
Steam temperature upstream and downstream of the valve	T_1 and T_2 in °F or °C
Cooling water pressure and temperature upstream of the valve	p_3 in psi or bar and T_3 in °F or °C
RFID tag	Yes/No
Valve accessories	Positioner and/or limit switch