DATA SHEET

T 8091 EN

Type 3510-1 and Type 3510-7 Pneumatic Control Valves

Type 3510 Micro-flow Valve

DIN version

Application

Control valve especially designed for controlling low flow rates in pilot plants and technical research facilities

Nominal size	**G ⅛ · G ¼ · G ⅜ · G ½ · G ¾** **⅛ NPT · ¼ NPT · ⅜ NPT · ½ NPT · ¾ NPT** **DN 10 · DN 15 · DN 25**
Pressure rating	**PN 40 to 400**
Temperatures	**-196 to +450 °C**



Fig. 1: *Type 3510-7 Control Valve with Type 3725 Positioner*

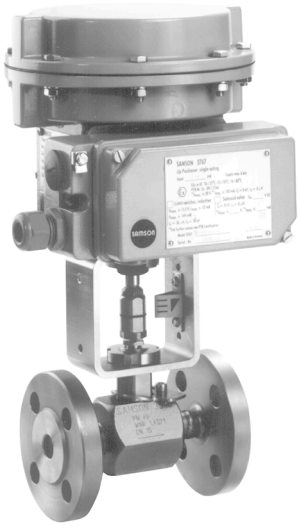


Fig. 2: *Type 3510-7 Control Valve with Type 3767 Positioner*

Special features

Type 3510 Micro-flow Valve with

- Type 3271-5 Pneumatic Actuator (Type 3510-1 Control Valve)
- Type 3277-5 Pneumatic Actuator (Type 3510-7 Control Valve) for integral positioner attachment

Available as

- Globe valve
- Angle valve

Valve body with

- G or NPT female thread
- Welding ends or flanges

Stainless steel is used as the standard body material. However, a wide variety of special materials can also be used on customer request.

A mounting kit (1400-9031) provides the valve with an interface according to DIN EN 60534-6-1 (NAMUR) for attachment of positioners, limit switches, solenoid valves and other valve accessories. We recommend using an insulating section or bellows seal for flanged valves to provide more space to mount valve accessories.

A safety manual containing the safety-related data is optionally available for use in safety-instrumented systems (SIL requirements).

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Versions

Standard version

- For temperatures from -10 to +220 °C
- PN 40 to 400
- Globe or angle valve
- Female thread G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ or ⅛ NPT · ¼ NPT · ⅜ NPT · ½ NPT · ¾ NPT
- Flanges DN 10, 15 or 25
- Welding ends DN 10, 15 or 25

Type 3510-1 · With Type 3271-5 Pneumatic Actuator, 120 cm² actuator area (see Data Sheet ▶ T 8310-1)

Type 3510-7 (Fig. 1 and Fig. 2) · With Type 3277#5 Pneumatic Actuator with 120 cm² actuator area, for integral positioner attachment (see Data Sheet ▶ T 8310-1)

Further versions

- **Insulating section** for temperatures from -196 to +450 °C, with special material up to +650 °C
- **Metal bellows seal** up to PN 250 or PN 325 with external tightness of ≤10^{-5} mbar*l/s
- **Manual override**
- **Electric actuator** · On request
- **Stainless steel actuator** for ambient temperatures down to -60 °C · On request
- **Body connections with threaded flanges** and lens ring gaskets in nominal sizes DN 6 and 10, pressure rating PN 325, dimensions acc. to IG standard ($K_{VS\ max}$ = 0.4)

Principle of operation

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

The plug stem is connected to the actuator stem by the stem connector and sealed with an adjustable packing.

To comply with stricter fugitive emissions requirements, the valve can be equipped with a double-walled metal bellows.

The anti-rotation fixture prevents a loosening of the screw connection between the valve body and the bonnet or the intermediate piece.

Fail-safe positions

Depending on how the compression springs are arranged in the pneumatic actuator, the valve has two fail-safe positions that become effective when the supply air fails:

- **Actuator stem extends:**
  The valve is closed upon air supply failure.
- **Actuator stem retracts:**
  The valve is opened upon air supply failure.

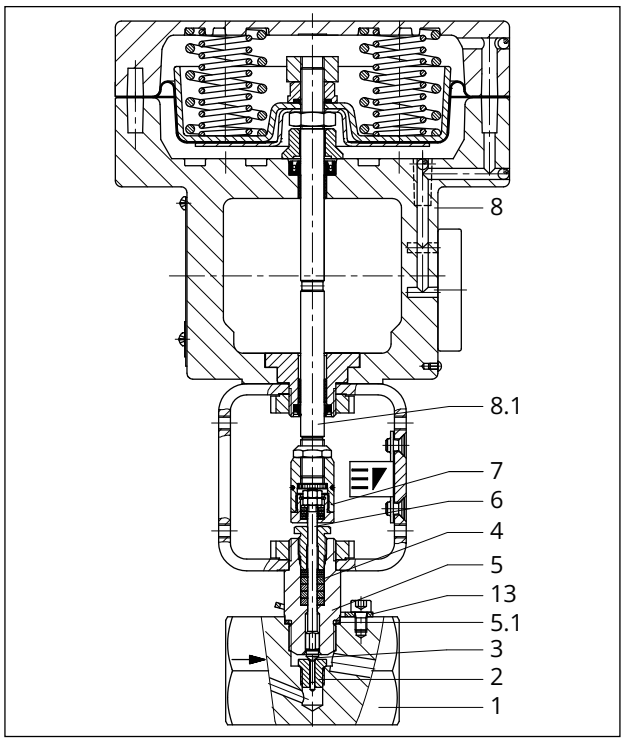


Fig. 3: *Type 3510-7 Control Valve*

1	Valve body	6	Plug stem
2	Seat	7	Stem connector
3	Plug	8	Actuator
4	Packing	8.1	Actuator stem
5	Valve bonnet	13	Anti-rotation fixture
5.1	Body gasket		

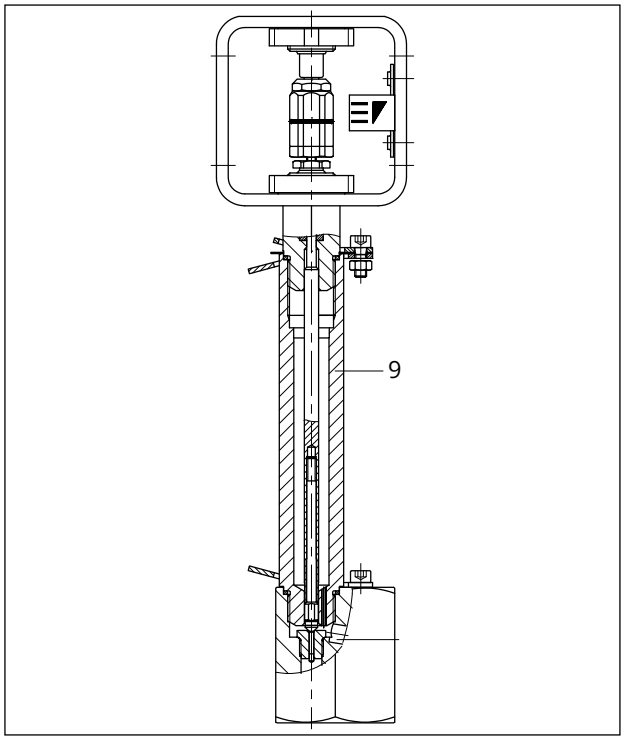


Fig. 4: *Type 3510 Valve, angle valve with insulating section*

9 Intermediate piece for insulating section or bellows seal

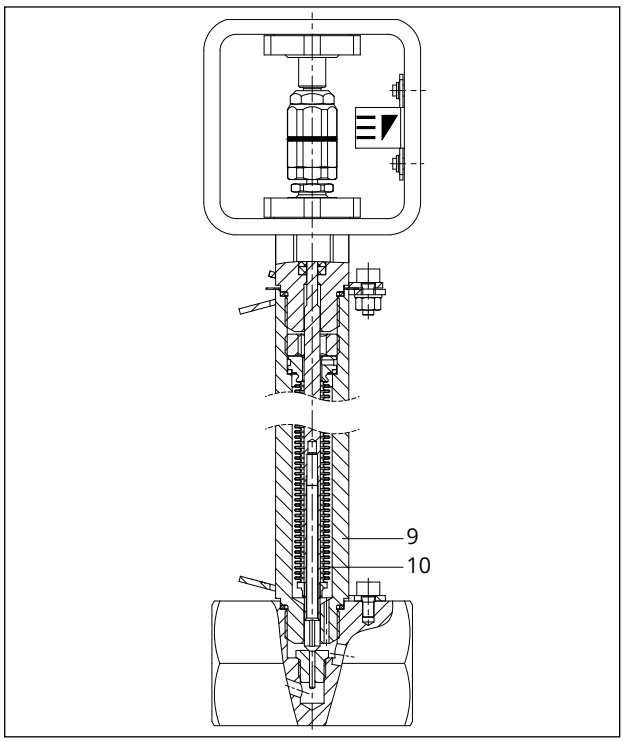


Fig. 5: *Type 3510 Valve, globe valve with metal bellows seal*

9 Intermediate piece for insulating section or bellows seal
10 Metal bellows

Table 1: *Technical data for Type 3510 · DIN version*

Connection	Female thread	Welding ends	Flanges
Nominal size	G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ ⅛ NPT, ¼ NPT, ⅜ NPT, ½ NPT, ¾ NPT	DN 10 · DN 15 · DN 25	DN 10 · DN 15 · DN 25
Pressure rating	PN 40 to 400		
Seat-plug seal	Metal seal		
Characteristic	Equal percentage with K_{VS} ≥0.01 · Linear · On/off		
Rangeability	50:1 · <50:1 with K_{VS} <0.1		
Temperature range[1)]	-10 to +220 °C · With insulating section: -196 to +450 °C		
Leakage class according to DIN EN 60534-4	Metal seal: IV · High-performance metal seal: V		
Conformity	CE EAC		

1) Higher temperatures on request

Table 2: *Materials for Type 3510 · DIN version*

Valve body[1)] and valve bonnet[2)]	1.4401/1.4404[4)]	2.4610
Seat	1.4401/1.4404[3)4)] 1.4122 Stellite®	2.4610[3)]
Plug	1.4401/1.4404[3)4)] 1.4112 Stellite®	2.4610[3)]
Packing	PTFE compound	
Body gasket	1.4401/1.4404[4)]	2.4610
Insulating section	1.4401/1.4404[4)]	2.4610
Bellows seal		
Intermediate piece	1.4401/1.4404[4)]	2.4610
Metal bellows up to PN 250	1.4571	2.4819
Metal bellows up to PN 325	2.4819	2.4819

1) Other materials on request

2) Wetted parts

3) Only with K_{VS} 0.001 to 1.6

4) Material double stamping

Available K_{VS} coefficients

Table 3: *Overview · DIN version*

K_{VS} coefficient	0.0001 to 0.0063[1)]	0.01 to 0.25	0.4	0.63 to 1.6[2)]
Rangeability	<15:1	15:1 to 50:1	50:1	50:1
Seat Ø in mm	2	3	4	10
Seat thread[3)]	M10x1	M10x1	M10x1	M16x1
Plug stem Ø in mm	4	4	4	4
Travel in mm	7.5	7.5	7.5	7.5

1) Seat and plug made only of 1.4122/1.4112, 1.4122/Stellite® or Stellite®/Stellite®

2) Only up to PN 100

3) Trims are only interchangeable within the K_{VS} coefficient ranges 0.0001 to 0.4 (M10x1) and 0.63 to 1.6 (M16 x 1) due to the different seat threads.

Table 4: *K_{VS} coefficients with associated nominal sizes · DIN version*

Connection			Female thread			Welding ends			Flanges		
Flow rate	Characteristic		G ⅛, G ¼ · ⅛ NPT, ¼ NPT	G ⅜ · ⅜ NPT	G ½, G ¾ · ½ NPT, ¾ NPT	DN 10	DN 15	DN 25	DN 10	DN 15	DN 25
K_{VS}	Equal percentage	Linear									
0.00010	–	•	•	•	•	•	•	•	•	•	•
0.00016	–	•	•	•	•	•	•	•	•	•	•
0.00025	–	•	•	•	•	•	•	•	•	•	•
0.00040	–	•	•	•	•	•	•	•	•	•	•
0.00063	–	•	•	•	•	•	•	•	•	•	•
0.0010	–	•	•	•	•	•	•	•	•	•	•
0.0016	–	•	•	•	•	•	•	•	•	•	•
0.0025	–	•	•	•	•	•	•	•	•	•	•
0.0040	–	•	•	•	•	•	•	•	•	•	•
0.0063	–	•	•	•	•	•	•	•	•	•	•
0.010	•	•	•	•	•	•	•	•	•	•	•
0.016	•	•	•	•	•	•	•	•	•	•	•
0.025	•	•	•	•	•	•	•	•	•	•	•
0.040	•	•	•	•	•	•	•	•	•	•	•
0.063	•	•	•	•	•	•	•	•	•	•	•
0.10	•	•	•	•	•	•	•	•	•	•	•
0.16	•	•	•	•	•	•	•	•	•	•	•
0.25	•	•	•	•	•	•	•	•	•	•	•
0.40	•	•	•	•	•	•	•	•	•	•	•
0.63[1)]	•	•	–	–	•	–	•	•	–	•	•
1.0[1)]	•	•	–	–	•	–	•	•	–	•	•
1.6[1)]	•	•	–	–	•	–	•	•	–	•	•

1) Versions can be used up to PN 100 at the maximum

Table 5: *Valve selection guide*

PN	16 to 40			63 to 100			160 to 250			325			400		
Metal bellows	**Optional**			**Optional**			**Optional**			**Optional**			**–**	**Optional**	
K_{VS}															
0.0001	**Type 3510**			**Type 3510**			**Type 3510**			**Type 3510**			**Type 3510**		
0.00016															
0.00025															
0.0004															
0.00063															
0.001															
0.0016															
0.0025															
0.004															
0.0063															
0.01															
0.016															
0.025															
0.04															
0.063															
0.1		**Type 3252**	**Type 3241**		**Type 3252**	**Type 3251**		**Type 3252**	**Type 3251**		**Type 3252**	**Type 3211**		**Type 3252**	**Type 3241**
0.16															
0.25															
0.4															
0.63															
1															
1.6															
2.5															
4															
6.3															
10															

Detailed information on each valve version can be found in the following data sheets:

- Type 3241: ▶ T 8015 (DIN) and ▶ T 8012 (ANSI)
- Type 3251: ▶ T 8051 (DIN) and ▶ T 8052 (ANSI)
- Type 3252: ▶ T 8053

Permissible differential pressures · DIN version · Pressures stated in bar (gauge)

Table 6: *Standard version without bellows seal · Fail-close · Maximum permissible supply pressure: 4 bar*

Bench range with actuator area		**120 cm²**	**0.8 to 1.6**	**1.7 to 2.1**	**2.4 to 3.0**
Nominal size	K_{VS} coefficient	Actuator	Δp when p_2 = 0 bar		
G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ ⅛ NPT, ¼ NPT, ⅜ NPT, ½ NPT, ¾ NPT DN 10 · DN 15 · DN 25	0.0001 to 0.4	120 cm²	400	–	–
G ½ · G ¾ ½ NPT · ¾ NPT DN 15 · DN 25	0.63 to 1.6	120 cm²	84	100	–

Table 7: *Standard version with bellows seal · Fail-close · Maximum permissible supply pressure: 4 bar*

Bench range with actuator area		**120 cm²**	**0.8 to 1.6**	**1.7 to 2.1**	**2.4 to 3.0**	**2.4 to 3.0**
Nominal size	K_{VS} coefficient	Actuator	Δp when p_2 = 0 bar			
G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ ⅛ NPT, ¼ NPT, ⅜ NPT, ½ NPT, ¾ NPT DN 10 · DN 15 · DN 25	0.0001 to 0.4	120 cm²	72	160	250	325
G ½ · G ¾ ½ NPT · ¾ NPT DN 15 · DN 25	0.63 to 1.6	120 cm²	68	100	–	–

Table 8: *Standard version without bellows seal · Fail-open · Maximum permissible supply pressure: see Table 10*

Bench range with actuator area		**120 cm²**	**0.8 to 1.6**		
		Supply pressure	2.0	3.3	4.3
Nominal size	K_{VS} coefficient	Actuator	Δp when p_2 = 0 bar		
G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ ⅛ NPT, ¼ NPT, ⅜ NPT, ½ NPT, ¾ NPT DN 10 · DN 15 · DN 25	0.0001 to 0.4	120 cm²	254	400	–
G ½ · G ¾ ½ NPT · ¾ NPT DN 15 · DN 25	0.63 to 1.6	120 cm²	36	100	–

Table 9: *Standard version with bellows seal · Fail-open · Maximum permissible supply pressure: see Table 10*

Bench range with actuator area		**120 cm²**	**0.8 to 1.6**			
		Supply pressure	2.0	3.3	4.3	4.3
Nominal size	K_{VS} coefficient	Actuator	Δp when p_2 = 0 bar			
G ⅛ · G ¼ · G ⅜ · G ½ · G ¾ ⅛ NPT, ¼ NPT, ⅜ NPT, ½ NPT, ¾ NPT DN 10 · DN 15 · DN 25	0.0001 to 0.4	120 cm²	27	160	250	325
G ½ · G ¾ ½ NPT · ¾ NPT DN 15 · DN 25	0.63 to 1.6	120 cm²	27	100	–	–

Table 10: *Maximum permissible supply pressure in bar for fail-open version*

Bench range	**Adjusted to**	**Max. permissible supply pressure**
0.4 to 2.0	0.8 to 1.6	3.3
1.4 to 2.3	1.7 to 2.1	3.8
2.1 to 3.3	2.4 to 3.0	4.7

Dimensions

Table 11: *Dimensions in mm for Type 3510 Valve · DIN version*

	Connection	Female thread	Welding ends	Flanges		
Valve		**G/NPT**	**DN 10, 15, 25**	**DN 10**	**DN 15**	**DN 25**
Length L[1]	PN 40	74	80	130	130	160
	PN 63 to 160			210	210	230
	PN 250 to 320			230	230	260
	PN 400			–	264	308
Length L1[1]	PN 40	34	40	90	90	100
	PN 63 to 160			105	105	115
	PN 250 to 320			115	115	130
	PN 400			–	132	154
Standard bonnet						
H1 for actuator	120 cm²	122				
With insulating section						
H4	PN 40 to 400	263				
With bellows seal						
H4	PN 40 to 100	263				
	PN 160 to 325	365				
H2 or flange ØD1	PN 40	23[2]	23[2]	90	95	115
	PN 63 to 160			100	105	140
	PN 250 to 320			125	130	160
	PN 400			125	145	180

1) Face-to-face dimensions of flanges according to DIN EN 558

2) H2 = 28 mm with body material 2.4610

Table 12: *Further dimensions[1] in combination with Type 3271 Pneumatic Actuator or Type 3277 Pneumatic Actuator*

Actuator area		**cm²**	**120**
Diaphragm ØD		mm	168
H[2]	Type 3271	mm	69
H[2]	Type 3277	mm	69
H3[3]		mm	110
H5	Type 3277	mm	88
Thread	Type 3271		M30x1.5 (M20x1.5)[5]
Thread	Type 3277		M30x1.5 (M20x1.5)[5]
a	Type 3271		G ⅛ (⅛ NPT)
a2	Type 3277		–

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

5) Version with connections for micro-flow valve

Dimensional drawings

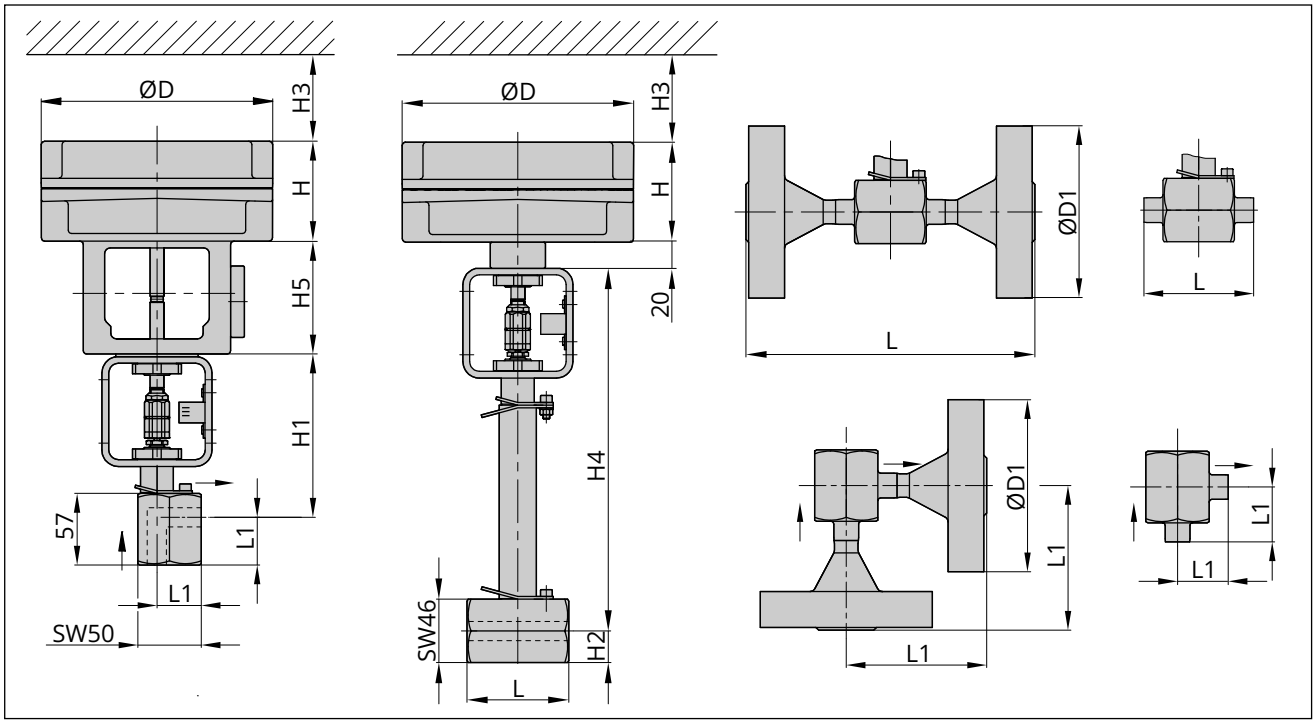


Fig. 6: *From left to right: Type 3510-7 Angle Valve with female thread connections, Type 3510-1 Globe Valve with female thread connections and bellows seal/insulating section, Type 3510 body with flanges, Type 3510 body with welding ends*

Weights

Table 13: *Weights (approx.) in kg for Type 3510 Valve · DIN version*

	Connection	Female thread	Welding ends	Flanges		
Valve		**G/NPT**	**DN 10, 15, 25**	**DN 10**	**DN 15**	**DN 25**
Valve without actuator	PN 40	1.7	1.5	2.9	3.1	4.2
	PN 63 to 160			3.9	4.2	7.3
	PN 250 to 320			5.6	6.0	8.7
	PN 400			7.1	9.1	9.8
With insulating section						
Additional weight		0.5				
With bellows seal						
Additional weight	PN 40 to 100	0.6				
	PN 160 to 325	0.9				

Table 14: *Weights[1] for Type 3271 and Type 3277 Pneumatic Actuators*

Type ... Actuator	Actuator area in cm²		120
3271	Without handwheel	kg	2.5
3271	With handwheel	kg	4
3277	Without handwheel	kg	3.2
3277	With handwheel	kg	4.5

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.).

Ordering text

The following specifications are required on ordering:

Type 3510 Microflow Valve	Globe or angle valve
Nominal size	DN …
Pressure rating	DN …
Body material	See Table 2
Type of end connections	G, NPT female thread Flanges or welding ends
Direction of flow	Flow-to-open or flow-to-close design
Characteristic	Equal percentage, linear or on/off
Bonnet	Standard bonnet, insulating section or bellows seal
Actuator	Type 3271-5 or Type 3277-5 (see Data Sheet ▶ T 8310-1)
Fail-safe action	Actuator stem extends/retracts
Process medium	Density in kg/m³ and temperature in °C
Flow rate	in kg/h or m³/h in standard or operating state
Pressure	p_1 and p_2 in bar (absolute pressure p_{abs}), with minimum, normal and maximum flow rate
Valve accessories[1)]	Positioner and/or limit switch

1) Mounting kit (1400-9031) required

Associated Data Sheet for pneumatic actuators	▶ T 8310-1
Associated Mounting and Operating Instructions	▶ EB 8091 (DIN version) ▶ EB 8091-1 (ANSI version)