

### Application

Control valves for use in process engineering where valve trim and valve body are subjected to erosive and abrasive wear

<b>Nominal size</b>	<b>DN 25 to DN 150</b>
<b>Nominal pressure</b>	<b>PN 16 to PN 400</b>
<b>Temperatures</b>	<b>Up to 500 °C</b>

In industrial plants, pneumatic and electric control valves control different media, often under unfavorable flow conditions. In flashing service and with aggressive fluids containing solid matter, the valve trim, i.e. seat and plug, as well as the valve body are subject to erosive and abrasive wear.

In some applications, valve trims made of cast iron or PTFE are worn out within only a few days and valve trims of stellited or forged titanium within a few weeks. Valve trims made of low-wear ceramic, however, shows almost no signs of wear after one year in service.

Depending on the valve design and the particular properties of the ceramic material used, the following advantages can be attained:

- Seat and plug made of hot-pressed silicon nitride (HPSN)
- Constant high flexural strength and resistance to abrasive wear
- Corrosion resistance
- Service life 200 times longer compared to valve trims made of austenitic steel used under highly erosive and abrasive conditions
- Longer service life of angle valve bodies thanks to the flow-to-close direction of flow and an additional anti-wear sleeve of silicon carbide (SiC)

The control valves have a modular design and can be equipped with various accessories, such as positioners, solenoid valves and other accessories according to IEC 60534-6 and NAMUR recommendation. See Information Sheet T 8350 EN for details.

### Versions

The pneumatic control valves illustrated in Figs. 1 and 2 can be equipped with ceramic valve trims. They are equipped with the Type 3271 Pneumatic Actuator.

- **Type 3251-1** · Type 3251 Globe Valve
- **Type 3256-1** · Type 3256 Angle Valve

### Additional versions with

- **Electric actuator** · On request



Fig. 1  
Type 3251-1 Pneumatic  
Control Valve with  
Type 3271 Actuator



Fig. 2 · Type 3256-1 Pneumatic Control Valve  
with Type 3271 Actuator

### Fail-safe position

Depending on the arrangement of the compression springs in the actuator (for details, see Data Sheets T 8310-1 EN and T 8310-2 EN), the control valve has two different fail-safe positions which become effective when the supply air fails:

**"Actuator stem extends",**

The valve is closed when the air supply fails.

**"Actuator stem retracts",**

The valve is opened when the air supply fails.

### Materials

The data sheets listed in Table 1 contain exact details on the materials used.

The valve bodies are available in standard or stainless cast steel as well as in cold-resisting or high-temperature cast steel.

The ceramic valve trim, i.e. plug and seat or seat ring, consists of silicon nitride ( $\text{Si}_3\text{N}_4$ ), which is hot-pressed at 1700 to 1800 °C. The anti-wear sleeve is made of hot-pressed silicon carbide ( $\text{SiC}$ ).

The data in Table 2 indicate the favorable properties of these materials.

### Permissible differential pressures $\Delta p$

The permissible differential pressures for versions with  $K_{vs}$  values of 1.6 to 160 are specified in the data sheets listed in Table 1. Here, only the combination of nominal sizes and seat diameters shown in Tables 3 can be applied.

Permissible differential pressures for versions with  $K_{vs} \leq 1$  and  $K_{vs} > 160$  are available on request.

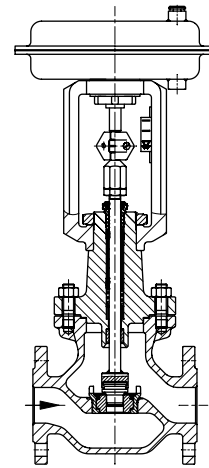


Fig. 3 · Type 3251-1 with ceramic trim

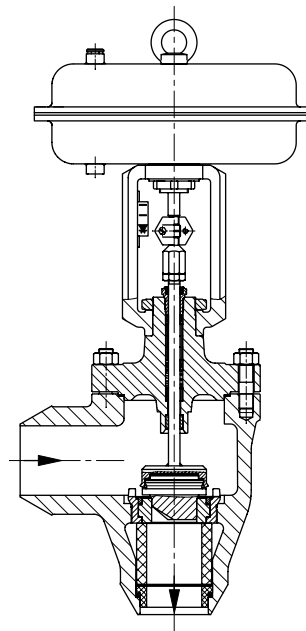


Fig. 4 · Type 3256-1 with ceramic trim and ceramic anti-wear sleeve

**Table 1 · Technical data**

Valve	Type	3251	3256
Actuator <sup>1)</sup>	Type	Type 3271 or Type 3277 (up to 700 cm <sup>2</sup> )	
Body style	Globe valve	•	–
	Angle valve	–	•
Nominal sizes	DN	25 · 50 · 80 · 100 · 150	
Nominal pressure	PN	16 ... 400	
<b>Reinforcement</b>			
Ceramic valve trim		HPSN (Si <sub>3</sub> N <sub>4</sub> )	
Ceramic anti-wear sleeve		–	SiC
<b>Temperature ranges</b> (see associated data sheet) · Permissible operating pressures acc. to pressure-temperature diagrams (see T 8000-2 EN)			
Temperature limits	°C	–250 ... 500	
<b>Leakage class</b> according to DIN EN 1349: 2000			
Valve plug		IV-S2	
For details, see Data Sheet		T 8051 EN	T 8065 EN

<sup>1)</sup> Type 3251-2 and Type 3256-2 Electric Control Valves on request

**Table 2 · Properties of ceramic materials**

Material		HPSN	SiC
Flexural strength (4-point)	N/mm <sup>2</sup>	600 ... 800	>350
Tensile strength	N/mm <sup>2</sup>	300 ... 500	>180
Compressive strength	N/mm <sup>2</sup>	2500	>1200
Young's Modulus	kN/mm <sup>2</sup>	310 ... 320	>330
Hardness HV 10	N/mm <sup>2</sup>	>16 000	>21 000
Thermal expansion (α)	10 <sup>-6</sup> /°C	3.2	4.3
Corrosion resistance		Better than all metal valve materials	

### Selection and sizing

Control valves with ceramic valve trim require especially careful sizing. Therefore, final sizing is carried out by SAMSON.

1. Calculate the appropriate K<sub>v</sub> coefficient according to IEC 60534.
2. Select the nominal size and K<sub>vs</sub> coefficient according to Table 3.
3. Determine the permissible differential pressure Δp and select the appropriate actuator according to the data sheets listed in Table 1.
4. Select materials and accessories according to the pressure-temperature diagram and the corresponding data sheets.

### The following details are required on ordering

Valve type	DN ... PN ...
Body material	Acc. to associated data sheet
End connection	Flanges/welding ends
Plug	Ceramic/balanced
Characteristic	Equal percentage or linear
Anti-wear sleeve	For Type 3256
Actuator	Versions according to T 8310-1 EN and T 8310-2 EN
Fail-safe action	Valve OPEN/CLOSED
Process medium	Density in kg/m <sup>3</sup> and temperature in °C or K
Max. flow rate	kg/h or m <sup>3</sup> /h under standard or operating conditions
Pressure	p <sub>1</sub> in bar (absolute pressure p <sub>abs</sub> ) p <sub>2</sub> in bar (absolute pressure p <sub>abs</sub> )
Accessories	Positioner and/or limit switch

**Table 3 · K<sub>vs</sub> and z values · Overview**

K <sub>vs</sub>	0.1 · 0.16 · 0.25 0.4 · 0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	40	63	100	160
Seat Ø mm	8	12			24			31	38	50	63	80	100
Rated travel mm	15									30			

**Table 3a · Type 3251 Globe Valve with ceramic valve trim**

Flow-to-open · Versions in fields highlighted in gray also available with balanced plug

K <sub>vs</sub>	0.1 · 0.16 · 0.25 0.4 · 0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	40	63	100	160
DN	z values												
25	0.75	0.65	0.65	0.55	0.55								
50						0.5	0.45	0.5					
80								0.5	0.45	0.35			
100										0.35	0.35		
150											0.35	0.25	0.25

Terms for control valve sizing according to DIN EN 60534, Parts 2-1 and 2-2:  $F_L = 0.95$ ,  $x_T = 0.75$

**Table 3b · Type 3256 Angle Valve with ceramic valve trim and ceramic anti-wear sleeve**

Flow-to-close · Versions in fields highlighted in gray also available with balanced plug

K <sub>vs</sub>	0.1 · 0.16 · 0.25 0.4 · 0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	40	63	100	160
DN	z values												
25	0.15	0.15	0.15	0.15	0.15								
50						0.15	0.15	0.15					
80								0.15	0.15	0.15			
100										0.15	0.15		
150											0.15	0.15	0.15

Terms for control valve sizing according to DIN EN 60534, Parts 2-1 and 2-2:  $F_L = 0.85$ ,  $x_T = 0.6$

Specifications subject to change without notice.

