

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

Micro-flow Valve Type 3510



Application

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

| | |
|-------------------------|--|
| Nominal sizes | G ¼ · G ⅜ · G ½ |
| | ¼ NPT · ⅜ NPT · ½ NPT |
| | DN 10 · DN 15 · DN 25 |
| Nominal pressure | PN 40 to PN 400 |
| Temperatures | –200 to +450 °C |

The pneumatic control valve essentially consists of:

- Type 3510 Micro-flow Control Valve and
- Type 3271-5 Actuator or optionally Type 3277-5 Actuator.

The Type 3510 Micro-flow Control Valves are available either as:

- Globe valves or
- Angle valves.

Their valve bodies have either:

- G or NPT screwed connections,
- 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.

Versions

Standard version

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

Type 3510-1 (Fig. 3) · With Type 3271-5 Pneumatic Actuator, 120 cm² effective area or Type 3271-52 with 60 cm² effective area (see Data Sheet T 8310-1 EN)

Type 3510-7 (Figs. 1 and 2) · With Type 3277-5 Pneumatic Actuator, 120 cm² effective area designed for integral positioner attachment (see Data Sheet T 8310-1 EN).

Other versions with

- **Insulating section** for temperatures from –200 to +450 °C, made of special material up to +650 °C
- **Metal bellows seal** up to PN 100 with a with an external sealing ability of $\leq 10^{-5} \frac{\text{mbar l}}{\text{s}}$, higher pressure ratings on request
- **Handwheel**
- **Body connections with threaded flanges** and lens ring gaskets in nominal sizes DN 6 and DN 10, nominal pressure PN 325 acc. to IG standard ($K_{VS_{max}} = 0.4$)

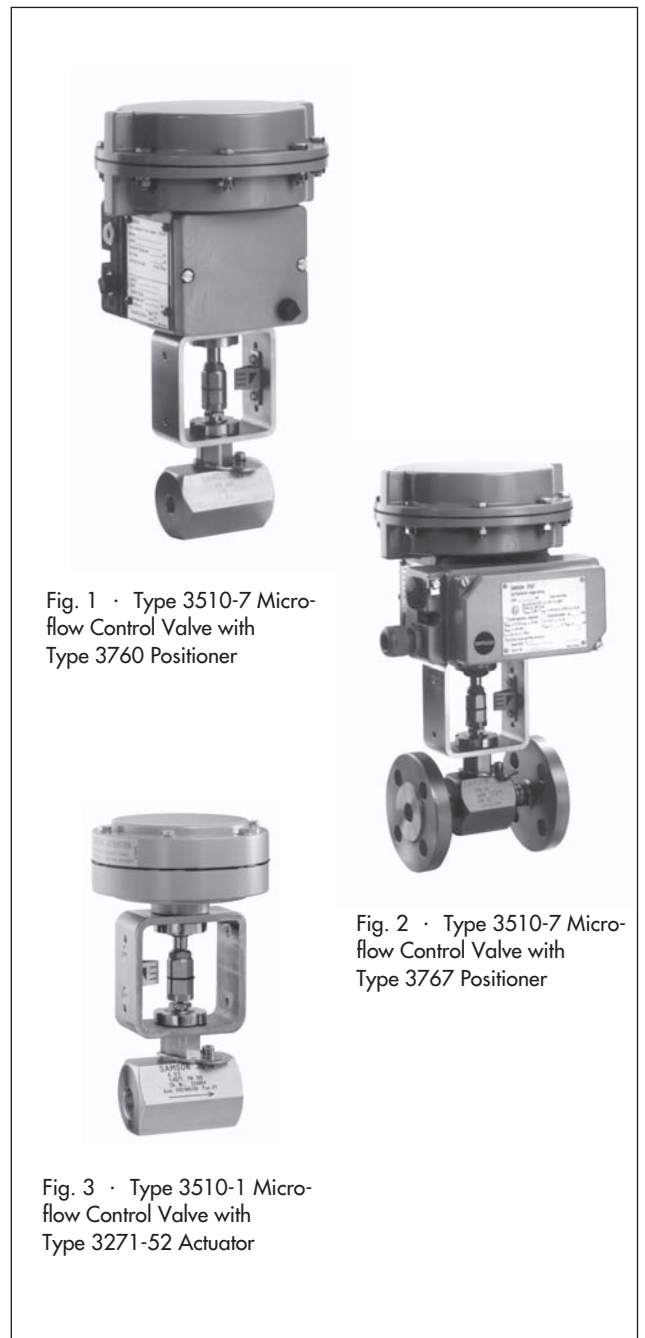


Fig. 1 · Type 3510-7 Micro-flow Control Valve with Type 3760 Positioner

Fig. 2 · Type 3510-7 Micro-flow Control Valve with Type 3767 Positioner

Fig. 3 · Type 3510-1 Micro-flow Control Valve with Type 3271-52 Actuator

Principle of operation

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

The plug stem (6) is connected to the actuator stem (8.1) via the stem connector (7) and sealed with an adjustable packing (4).

If high requirements regarding external sealing ability are to be met, the valve can be equipped with a double-walled metal bellows (10).

The anti-rotation device (13) prevents loosening of the screw connection between the valve body (1) and the bonnet (5) or the intermediate piece (9).

Fail-safe position

Depending on how the springs are arranged in the actuator (8) (see Data Sheet T 8310-1 EN for details), the control valve has two different fail-safe actions:

Actuator stem "extends" (FA)

The valve is closed upon air supply failure.

Actuator stem "retracts" (FE)

The valve is opened upon air supply failure.

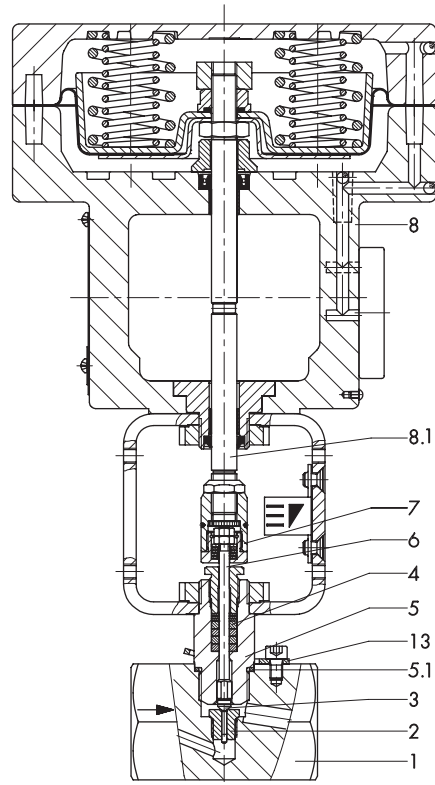


Fig. 4 · Type 3510-7 Micro-flow Control Valve

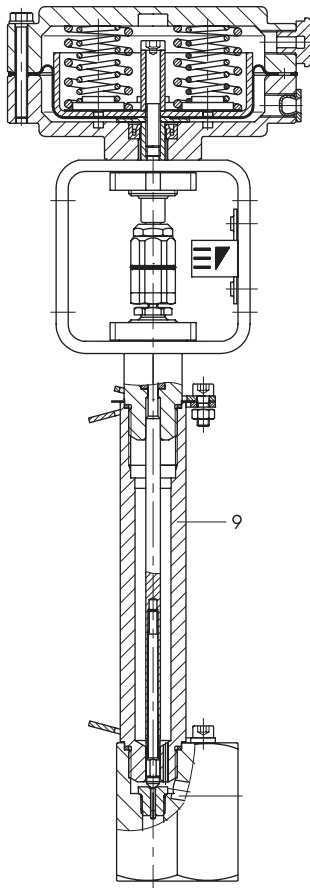


Fig. 5 · Type 3510 Valve, angle valve with insulating section and Type 3271-52 Actuator (60 cm²)

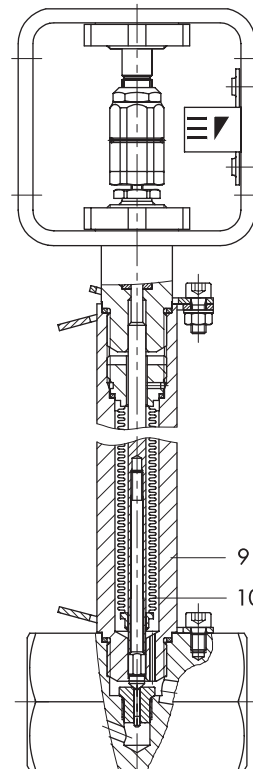


Fig. 6 · Type 3510 Valve, globe valve with metal bellows seal

Table 1 · Technical data for Type 3510

| Connection | Female thread | Welding ends | Flanges |
|-------------------------------------|--|-----------------------|--------------------------|
| Nominal size | G ¼ · G ⅜ · G ½ ¼ NPT · ⅜ NPT · ½ NPT | DN 10 · DN 15 · DN 25 | DN 10 · DN 15 · DN 25 |
| Nominal pressure | PN 40 to PN 400 | | |
| Seat-plug seal | Metal sealing | | |
| Characteristic | Equal percentage with $K_{VS} \geq 0.01$ · Linear · Quick opening | | |
| Rangeability | 50 : 1 · Smaller than 50 : 1 for $K_{VS} < 0.1$ | | |
| Temperature range | -10 to 200 °C · -200 to 450 °C with insulating section | | |
| Leakage rate acc. to DIN EN 1349 | Metal sealing Lapped-in metal For $K_{VS} < 0.01$: Metal sealing Lapped-in metal | | IV IV-S2 III IV |

Table 2 · Materials

| | | |
|---|---|-----------------|
| Valve body ¹⁾ and bonnet ²⁾ | 1.4571 / A 316 Ti | 2.4610 |
| Seat and plug | 1.4571 / 1.4571 1.4122 / 1.4112 1.4122 / Stellite | 2.4610 / 2.4610 |
| Packing | PTFE compound | |
| Body gasket | 1.4571 | 2.4610 |
| Insulating section | 1.4571 | 2.4610 |
| Metal bellows seal | | |
| Intermediate piece | 1.4571 | 2.4610 |
| Metal bellows for PN 100 ³⁾ | 1.4571 | 2.4819 |

¹⁾ Other materials on request

²⁾ Wetted parts

³⁾ For higher nominal pressures on request

Legends for Figs. 4 to 6

- 1 Valve body
- 2 Seat
- 3 Plug
- 4 Packing
- 5 Valve bonnet
- 5.1 Body gasket
- 6 Plug stem
- 7 Stem connector
- 8 Actuator
- 8.1 Actuator stem
- 9 Intermediate piece for insulating section or bellows seal
- 10 Metal bellows
- 13 Anti-rotation device

Table 3 · Available K_{V5} values
Table 3a · Overview

| | | | | | |
|-----------------|----|--------------------------------|------------------|--------|---------------------------|
| K _{V5} | | 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 | |
| Seat Ø | mm | 2 | 3 | 4 | 10 |
| Plug stem Ø | mm | 4 | | | 4 |
| Travel | mm | 7.5 | | | 7.5 |

1) Seat and plug made only of 1.4122/Stellite

2) Only up to PN 100.

Table 3b · K_{V5} values and associated nominal sizes

| End connections | | | Female thread | | | Welding ends | | | Flanges | | |
|------------------------------|------------------|--------|---------------|--------------|--------------|--------------|-------|-------|---------|-------|-------|
| Flow rate K _{V5} | Characteristic | | G ¼ ¼ NPT | G ⅜ ⅜ NPT | G ½ ½ NPT | DN 10 | DN 15 | DN 25 | DN 10 | DN 15 | DN 25 |
| | 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 up to max. PN 100 can be used.

Table 4 · Permissible differential pressures · Pressures in bar (gauge)

Table 4a · Standard version without bellows seal · Fail-safe position "Valve CLOSED"

| Bench range for actuator size | | 60 cm ² | 0.2 ... 1.0 | 0.4 ... 2.0 | 1.4 ... 2.3 | 2.1 ... 3.3 |
|---|---------------------|---------------------|--------------------------------|-------------|-------------|-------------|
| | | 120 cm ² | 0.4 ... 0.8 | 0.8 ... 1.6 | 1.7 ... 2.1 | 2.4 ... 3.1 |
| Nominal size | K _{V5} | Actuator | Δp when p ₂ = 0 bar | | | |
| G ¼ · G ⅜ · G ½ ¼ NPT · ⅜ NPT · ½ NPT DN 10 · DN 15 · DN 25 | 0.0001 to 0.4 | 60 cm ² | 25 | 100 | 400 | – |
| | | 120 cm ² | 250 | 400 | – | – |
| G ½ ½ NPT DN 15 · DN 25 | 0.63 to 1.6 | 60 cm ² | – | 11 | 72 | 100 |
| | | 120 cm ² | 35 | 84 | 100 | – |

Table 4b · Standard version with bellows seal · Fail-safe position "Valve CLOSED"

| Bench range for actuator size | | 60 cm ² | 0.2 ... 1.0 | 0.4 ... 2.0 | 1.4 ... 2.3 | 2.1 ... 3.3 |
|---|---------------------|---------------------|--------------------------------|-------------|-------------|-------------|
| | | 120 cm ² | 0.4 ... 0.8 | 0.8 ... 1.6 | 1.7 ... 2.1 | 2.4 ... 3.1 |
| Nominal size | K _{V5} | Actuator | Δp when p ₂ = 0 bar | | | |
| G ¼ · G ⅜ · G ½ ¼ NPT · ⅜ NPT · ½ NPT DN 10 · DN 15 · DN 25 | 0.0001 to 0.4 | 60 cm ² | – | 10 | 61 | 95 |
| | | 120 cm ² | 30 | 72 | 100 | – |
| G ½ ½ NPT DN 15 · DN 25 | 0.63 to 1.6 | 60 cm ² | – | 5 | 55 | 90 |
| | | 120 cm ² | 25 | 68 | 100 | – |

Table 4c · Standard version without bellows seal · Fail-safe position "Valve OPEN"

| Bench range for actuator size | | 60 cm ² | 0.2 ... 1.0 | | |
|---|---------------------|---------------------|--------------------------------|-----|-----|
| | | 120 cm ² | 0.4 ... 0.8 | | |
| | | Supply pressure | 1.2 | 2.5 | 3.5 |
| Nominal size | K _{V5} | Actuator | Δp when p ₂ = 0 bar | | |
| G ¼ · G ⅜ · G ½ ¼ NPT · ⅜ NPT · ½ NPT DN 10 · DN 15 · DN 25 | 0.0001 to 0.4 | 60 cm ² | 24 | 400 | – |
| | | 120 cm ² | 254 | 400 | – |
| G ½ ½ NPT DN 15 · DN 25 | 0.63 to 1.6 | 60 cm ² | – | 79 | 100 |
| | | 120 cm ² | 36 | 100 | – |

Table 4d · Standard version with bellows seal · Fail-safe position "Valve OPEN"

| Bench range for actuator size | | 60 cm ² | 0.2 ... 1.0 | | |
|---|---------------------|---------------------|--------------------------------|-----|-----|
| | | 120 cm ² | 0.4 ... 0.8 | | |
| | | Supply pressure | 1.2 | 2.5 | 3.5 |
| Nominal size | K _{V5} | Actuator | Δp when p ₂ = 0 bar | | |
| G ¼ · G ⅜ · G ½ ¼ NPT · ⅜ NPT · ½ NPT DN 10 · DN 15 · DN 25 | 0.0001 to 0.4 | 60 cm ² | – | 63 | 100 |
| | | 120 cm ² | 27 | 100 | – |
| G ½ ½ NPT DN 15 · DN 25 | 0.63 to 1.6 | 60 cm ² | – | 63 | 100 |
| | | 120 cm ² | 27 | 100 | – |

Table 5 · Dimensions in mm

| End connections | | Female thread | Welding ends | Flanges | | |
|----------------------|------------------------|---------------|---------------|---------|-------|-------|
| Valve | | G/NPT | DN 10, 15, 25 | DN 10 | DN 15 | DN 25 |
| L | PN 40 | 74 | 80 | 130 | 130 | 160 |
| | PN 63 to 160 | | | 210 | 210 | 230 |
| | PN 250 to 320 | | | 230 | 230 | 260 |
| | PN 400 | | | 230 | 230 | 308 |
| H1 | 60/120 cm ² | | | 122 | | |
| H4 with ins. section | PN 40 to 400 | | | 263 | | |
| H4 with bellows seal | PN 40 to 100 | | | 263 | | |
| | PN 160 to 250 | | | 365 | | |
| H2 or flange Ø D1 | PN 40 | 23 | 23 | 90 | 95 | 115 |
| | PN 63 to 160 | | | 100 | 105 | 140 |
| | PN 250 to 320 | | | 125 | 130 | 160 |
| | PN 400 | | | 125 | 145 | 180 |
| H3 | 60/120 cm ² | | | 150 | | |
| L1 | PN 40 | 34 | 40 | 85 | 90 | 100 |
| | PN 63 to 160 | | | 105 | 105 | 115 |
| | PN 250 to 320 | | | 115 | 115 | 130 |
| | PN 400 | | | 115 | 115 | 154 |

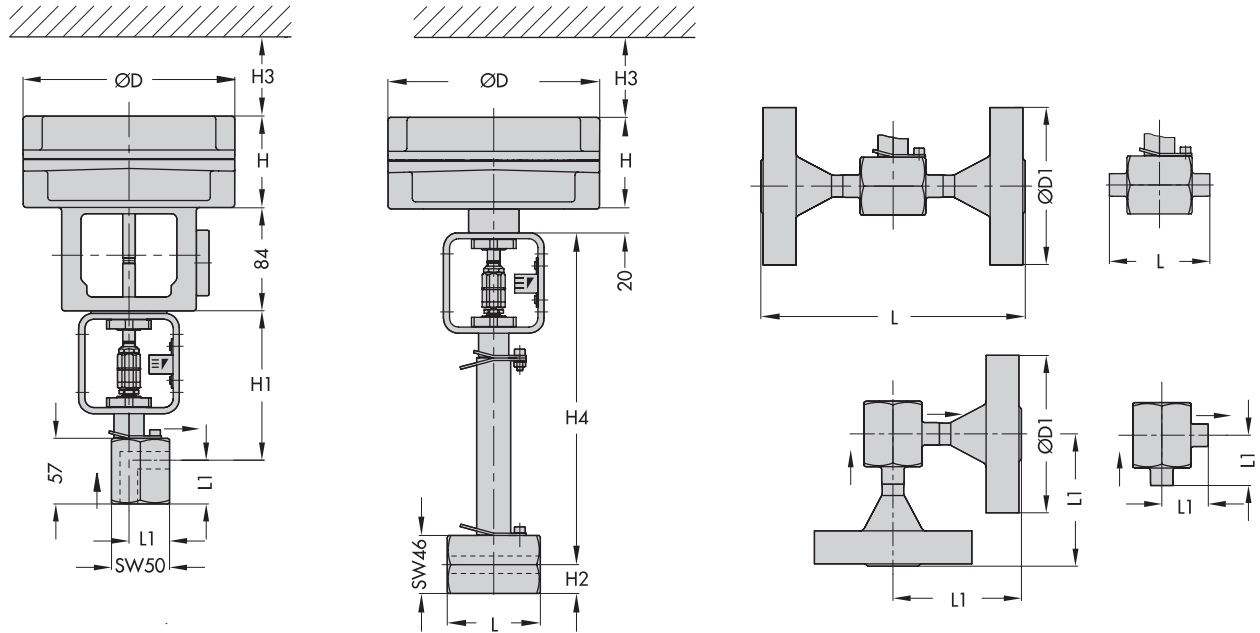
| Actuator | 60 cm ² | 120 cm ² |
|----------------------------|--------------------|---------------------|
| Diaphragm Ø D | 120 | 168 |
| H | 63 | 69 |
| H3 | 150 | 150 |
| Thread | M20 x 1.5 | M20 x 1.5 |
| Supply pressure connection | G 1/8 or 1/8 NPT | G 1/8 or 1/8 NPT |

Table 6 · Weights in kg

| End connections | | 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 | 1.6 | 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 |
| Optional | Insulating section | | | 0.5 | | |
| | Bellows seal | | | 0.6 | | |

| Actuator | 60 cm ² | 120 cm ² |
|------------|--------------------|---------------------|
| Approx. kg | 1.3 | 3.5 |

Dimensions in mm



Type 3510-7 - angle valve with female thread

Type 3510-1 - globe valve with female thread - with bellows seal/insulating section

Type 3510 - valve versions with flanges and welding ends

Ordering text

| | |
|----------------------------|--|
| Micro-flow Valve Type 3510 | Globe or angle valve |
| Nominal size | DN ... |
| Nominal pressure | PN ... |
| Valve body material | Acc. to Table 2 |
| End connections | Female thread G, NPT flanges or welding ends |
| Direction of flow | FTO or FTC |
| Characteristic | Equal percentage, linear, or quick-opening |
| Pneumatic actuator | Type 3271-5/Type 3277-5 60 or 120 cm ² |
| Fail-safe position | Valve CLOSED or OPEN |
| Process medium | ... |
| Density | ... kg/m ³ |
| Maximum flow rate | ... kg/h or m ³ /h in standard or operating condition |
| Pressure | p ₁ and p ₂ in bar (absolute pressure) |
| Process medium temperature | °C or K |
| Accessories | Positioner and/or limit switches |

Specifications subject to change without notice.



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