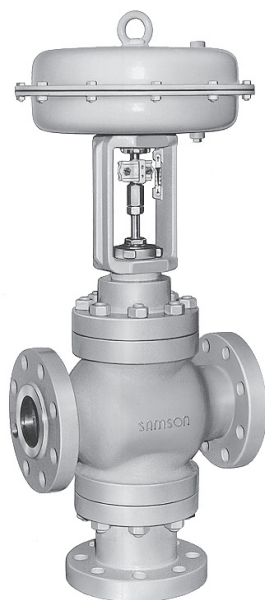


Type 3253-1 and Type 3253-7 Pneumatic Control Valves



Mounting and Operating Instructions

EB 8055 EN

Edition October 2003

Definition of signal words



DANGER!

Hazardous situations which, if not avoided, will result in death or serious injury



WARNING!

Hazardous situations which, if not avoided, could result in death or serious injury



NOTICE

Property damage message or malfunction



Note:

Additional information



Tip:

Recommended action

1	General safety instructions	5
2	Design and principle of operation	6
3	Assembling valve and actuator	8
3.1	Assembly and adjustment	8
3.2	Option of preloading springs for "Actuator stem extends"	9
3.3	Different rated travels of valve and actuator	9
4	Installation	10
4.1	Mounting position	10
4.2	Point of installation	10
4.3	Signal pressure line	12
4.4	Strainer, bypass	12
4.5	Test connection	12
5	Operation	12
6	Maintenance – Replacing parts	12
6.1	Replacing parts in standard valves	14
6.1.1	Packing	14
6.1.2	Seats and/or plugs	15
6.2	Replacing parts in valves with bellows seal.....	17
6.2.1	Packing	17
6.2.2	Metal bellows	17
6.3	Replacing parts in valves with insulating section	17
7	Description of nameplates	18
8	Customer inquiries	19



Note:

*Non-electric control valve versions whose bodies are not lined with an **insulating material coating** do not have their own potential ignition source according to the risk assessment stipulated in EN 13463-1:2001, section 5.2, even in the rare incident of an operating fault. Therefore, such valve versions **do not** fall within the scope of Directive 94/9/EC.*

1 General safety instructions



- The control valve must be mounted, started up or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third persons are not exposed to any danger.

All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be strictly observed.

- The control valves comply with the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity, which includes information about the applied conformity assessment procedure. The declaration of conformity can be viewed and downloaded at <http://www.samson.de>.
- To ensure appropriate use, only use the control valve in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the valve at the ordering stage. The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
Any hazards that could be caused in the valve by the process medium, the operating pressure, the signal pressure or by moving parts are to be prevented by taking appropriate precautions.
- Proper shipping and storage are assumed.

WARNING!

- For installation and maintenance, make sure the relevant section of the pipeline is depressurized and, depending on the process medium, drained as well. Depending on the field of application, allow the valve to cool down or heat up to reach ambient temperature before starting any work on it.
- When working on the valve, make sure that the pneumatic air supply as well as the control signal are disconnected to prevent any hazards caused by moving parts.
- Be particularly careful if the actuator springs are preloaded. Such actuators are labeled correspondingly and can also be identified by three long bolts protruding from the bottom of the actuator. Before starting any work on the valve, relieve the compression from the preloaded springs.

2 Design and principle of operation

The Type 3253-1 and Type 3253-7 Pneumatic Control Valves consist of the Type 3253 Three-way Valve and either a Type 3271 or Type 3277 Pneumatic Actuator. Depending on the plug arrangement, the three-way valve can be used for either mixing or diverting service.

In mixing valves, the process media to be mixed enter at valve ports A and B. The combined flow exits the valve at port AB. In diverting valves, in contrast, the process medium enters at the valve port AB and the partial flows exit at valve ports A and B. The flow rate from ports A or B to AB and vice versa depends on the cross-sectional area of flow between the seats and plugs. The plugs (3.1, 3.2) are moved by changing the control signal applied to the diaphragm of the actuator (8). The plug stem (6) and the plugs are connected with the actuator stem (8.1) via the stem connector (7) and sealed at the packing (4)

by either spring-loaded PTFE V-ring packings or by adjustable HT packings.

Fail-safe action:

Depending on how the compression springs (8.3) are arranged in the actuator, the valve has two different fail-safe positions.

Actuator stem extends:

When the signal pressure is reduced or the power supply fails, the compression springs force the actuator stem to move downward, closing port B in the mixing valve or port A in the diverting valve.

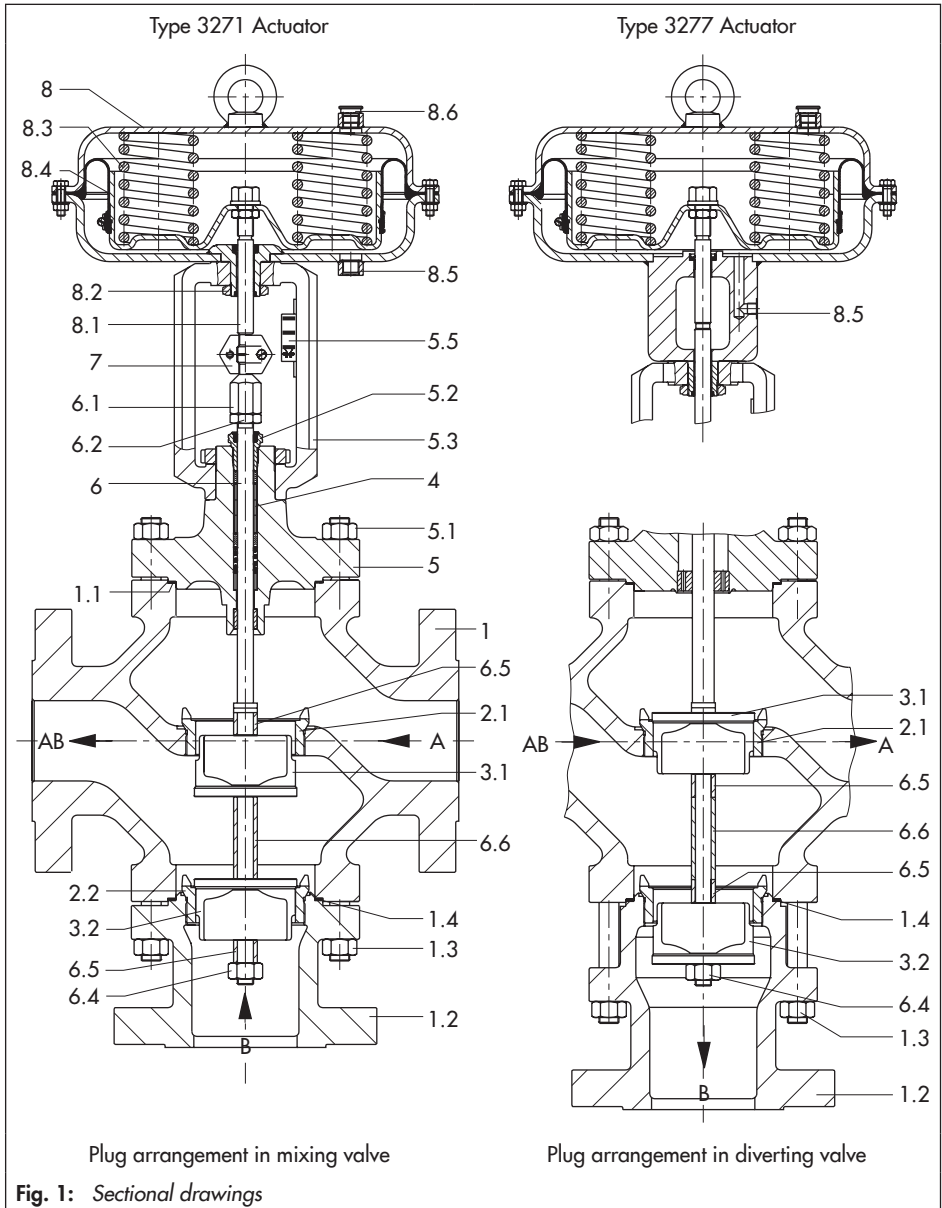
The valve ports B or A are opened against the force of the compression springs when the signal pressure increases.

Actuator stem retracts:

When the signal pressure is reduced or the power supply fails, the compression springs force the actuator stem to move upward, opening port B in the mixing valve or port A in the diverting valve.

The valve ports B or A are closed against the force of the compression springs when the signal pressure increases.

1	Valve body	5	Valve bonnet	6.6	Long sleeve
1.1	Gasket	5.1	Nuts	7	Stem connector
1.2	Seat body	5.2	Threaded bushing	8	Actuator
1.3	Body nuts	5.3	Yoke	8.1	Actuator stem
1.4	Gasket	5.5	Travel indicator	8.2	Ring nut
2.1	Upper seat	6	Plug stem	8.3	Springs
2.2	Lower seat	6.1	Stem connector nut	8.4	Diaphragm
3.1	Upper plug	6.2	Lock nut	8.5	Signal pressure connection
3.2	Lower plug	6.4	Nut	8.6	Vent
4	Packing	6.5	Short sleeve		



3 Assembling valve and actuator

The basic pneumatic actuator can be replaced by a pneumatic actuator with additional handwheel or by an electric actuator. The standard pneumatic actuator can be replaced by a smaller or larger actuator for all nominal valve sizes.

If the travel range of the actuator is larger than the travel of the valve, the springs in the actuator are preloaded by the manufacturer so that the travel ranges match.

Each valve is supplied with the parts required for its standard actuator. If you intend to use a different actuator, order the required mounting parts together with the actuator.

The required parts and their order numbers can be found in the overview 1600-0501 to 0550, which is available on request. In this case, the original parts are exchanged for the additionally delivered parts.

3.1 Assembly and adjustment

Proceed as follows if the valve and actuator have not been assembled by the manufacturer or if the actuator is to be replaced by an actuator of another type or size:

1. Unscrew the lock nut (6.2) and stem connector nut (6.1) on the valve.
Firmly press the plug and plug stem into the seat ring and screw the lock nut and stem connector nut downward.
2. Remove the stem connector clamps (7) and the ring nut (8.2) from the actuator. Slide the ring nut over the valve's plug stem.

3. Place the actuator onto the yoke (5.3) and secure it with the ring nut (8.2).
4. Read the bench range (or bench range with preloaded springs) and the actuator's fail-safe action from the actuator's nameplate (e.g. 0.2 to 1 bar and "Actuator stem extends").

The lower value (0.2 bar) corresponds to the lower bench range value to be adjusted, whereas the upper value (1 bar) corresponds to the upper bench range value.

The fail-safe action "Actuator stem extends" (FA) or "Actuator stem retracts" (FE) is marked by FA or FE on the Type 3271 Actuator, and by a symbol on the nameplate of the Type 3277 Actuator.

5. For actuators with fail-safe action "**Actuator stem extends**", apply a signal pressure that corresponds to the lower bench range value (e.g. 0.2 bar) to the lower diaphragm chamber connection.

For actuators with fail-safe action "**Actuator stem retracts**", apply a signal pressure that corresponds to the upper bench range value (e.g. 1 bar) to the upper diaphragm chamber connection.

6. Screw on the stem connector nut (6.1) by hand until it touches the actuator stem (8.1); then turn it a further ¼ turn and secure this position with the lock nut (6.2)
7. Position the stem connector clamps (7) and screw them tight.
Align the travel indicator (5.5) with the tip of the stem connector.

**Note on removing an actuator:**

When removing an actuator from a valve, especially an actuator with preloaded springs, apply a signal pressure that is slightly higher than the lower bench range value (see actuator nameplate) to the signal pressure connection so that the ring nut (8.2) can be unscrewed.

3.2 Option of preloading springs for "Actuator stem extends"

To achieve a greater positioning force, the springs of these actuators can be preloaded by up to 25 % of their travel or their bench range.

When a preload of, e.g. 0.1 bar, is desired for a bench range of 0.2 to 1 bar, the lower bench range value is shifted by 0.1 bar to 0.3 bar (0.1 bar correspond to a preload of 12.5 %).

When adjusting the valve, the lower bench range value must now be set to 0.3 bar.

Make sure to indicate the new bench range with preloaded springs of 0.3 to 1.1 bar on the nameplate.

3.3 Different rated travels of valve and actuator

Valve with "Actuator stem extends" actuator

**NOTICE!**

Always use actuators with preloaded springs when the valve's rated travel is smaller than the rated travel of the actuator.

Example:

DN 100 valve with 30 mm rated travel and 1400 cm² actuator with 60 mm rated travel, bench range 0.4 to 2 bar:

8. Set the signal pressure required for preloading from 1.2 bar (1.2 to 2 bar), which corresponds to half the actuator's travel (30 mm), to 1.6 bar.
9. Screw on the stem connector nut (6.1) until it touches the actuator stem.
10. Secure this position with the lock nut and mount the stem connector as described in section 3.1.
11. Write the bench range of 1.6 to 2.4 bar valid for the assembled control valve on the actuator's nameplate.

Valve with "Actuator stem retracts" actuator

The springs of actuators with "Actuator stem retracts" cannot be preloaded.

When a valve is combined with an oversized actuator (rated actuator travel larger than rated valve travel), only the first half of the actuator's bench range can be used.

Example:

DN 100 valve with 30 mm rated travel and 1400 cm² actuator with 60 mm rated travel, bench range 0.2 to 1 bar:

At half the valve travel, the usable bench range is between 0.2 and 0.6 bar.



Note:

Actuators that have already been preloaded by the manufacturer without mounting the valve are labeled correspondingly. Additionally, they can be identified by three longer bolts with nuts protruding from lower diaphragm case.

4 Installation

4.1 Mounting position

The valve can be mounted in any desired position. However, we recommend installing valves in sizes larger than DN 100 in a vertical pipeline with the actuator pointing up. Otherwise, it will be difficult to perform maintenance routines on the valve. For valves fitted with an insulating section or bellows seal and for actuators weighing more than 50 kg, the actuator needs to be supported or suspended.



NOTICE!

Install the valve free of stress.

Pipeline routing

To ensure that the control valve functions properly, the pipeline upstream and downstream of the valve must

be straight and without any manifolds or disturbances for a distance of at least six times the valve size (DN). Contact SAMSON if this distance cannot be observed. Flush the pipeline thoroughly before installing the valve.



Note:

Only insulate control valves with insulating section or bellows seal up to the cover flange of the valve body for medium temperatures below 0 °C and above 220 °C. Do not insulate valves mounted to comply with **NACE MR0175** requirements.

4.2 Point of installation

Install the valve as shown in Fig. 2 depending on whether it is to be used for mixing or diverting service.

The installation examples apply to standard operation with fail-safe action "Actuator stem extends" for heating applications and "Actuator stem retracts" for cooling applications.

Fail-safe action: the valve shuts off the flow of the heating or cooling medium.

The plug arrangement (i.e. either mixing or diverting valve) is indicated on a label attached to the valve body.

In DN 15 to 25, the plug arrangement is the same for mixing and diverting service.

Mixing service

Temperature control $Q = \text{constant}$

Fail-safe action: FA = "Actuator stem extends", FE = "Actuator stem retracts"

In heating applications with FA, the heating medium (flow) is shut off in the fail-safe position.

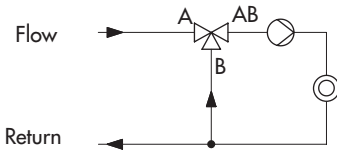
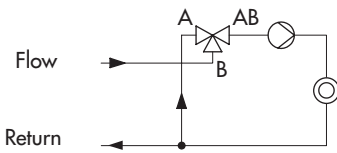
In cooling applications with FE, cooling is maintained in the fail-safe position.

Diverting service

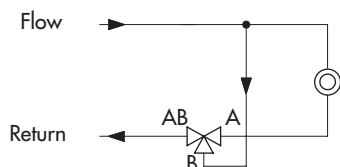
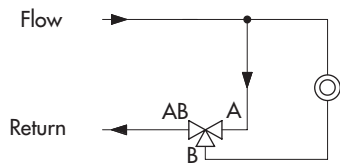
Flow control $Q = 0 \text{ to } 100 \%$

Heating with mixing valve FA or cooling with mixing valve FE

Installation in flow pipe

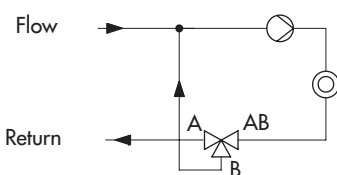
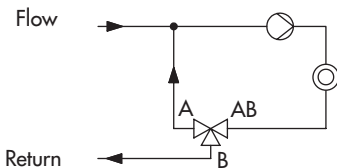


Installation in return flow pipe



Heating with diverting valve FA or cooling with diverting valve FE

Installation in return flow pipe



Installation in flow pipe

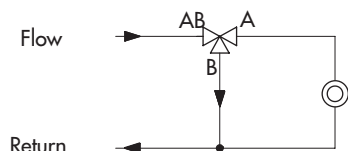
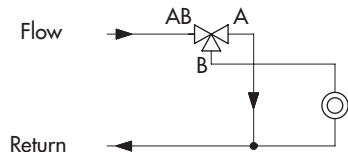


Fig. 2: Typical installations

4.3 Signal pressure line

Connect the signal pressure line for valves with "Actuator stem extends" actuator to the lower diaphragm case, and for valves with "Actuator stem retracts" actuator to the upper diaphragm case.

In the Type 3277 Actuator, the lower signal pressure connection is located at the side of the yoke under the lower diaphragm case.

4.4 Strainer, bypass

We recommend to install a strainer upstream of the valve, and upstream of both inlet ports in mixing valves.

We recommend installing a shut-off valve both upstream of the strainer and downstream of the valve to ensure that the plant does not need to be shut down for maintenance. In addition, install a bypass line.

4.5 Test connection

Versions with bellows seal (Fig. 4) are fitted with a leak-off connection (11.1) at the upper flange to monitor the tightness of the bellows.

Particularly for liquids and vapors, we recommend installing a suitable leakage indicator, such as a contact pressure gauge, an outlet to an open vessel or an inspection glass.

5 Operation

(e.g. reversing the operating direction etc.)

Refer to the mounting and operating instructions of the pneumatic actuators:

- ▶ EB 8310 EN for Type 3271 and
- ▶ EB 8311 EN for Type 3277.



Note on special SAMSON tools:

Suitable seat wrenches and special tools as well as the associated tightening torques are listed in EB 029 (previously WA 029).

The document is available at

- ▶ http://www.samson.de/pdf_en/e00290en.pdf.

6 Maintenance – Replacing parts

The control valve is subject to normal wear, especially at the seat, plug and packing. Depending on the operating conditions, check the valve at regular intervals to prevent possible failure before it can occur.

External leakage can indicate that the packing's tightness is impaired.

If the valve does not close tightly, tight shut-off may be impaired by dirt stuck between the seat and plug or by damaged facings.

We recommend removing the parts, cleaning them, and, if necessary, replacing them with new ones.

**WARNING!****Working on the control valve**

Before performing any work on the control valve, make sure the relevant plant section has been depressurized and, depending on the process medium, drained as well.

When used at high temperatures, allow the plant section to cool down to ambient temperature.

As valves are not free of cavities, remember that residual process medium might still be contained in the valve. This applies to valve versions with bellows seal or insulating section in particular.

We recommend removing the valve from the pipeline.

Working on the valve body

Before starting any work on the valve body, disconnect the signal pressure and remove the signal pressure line as well as the actuator.

a signal pressure that is higher than the lower bench range value (see nameplate) to the actuator so that the ring nut can be unscrewed.

Disconnect the signal pressure again.

2. Lift the actuator off the valve yoke.

**Note:**

Contact your nearest SAMSON subsidiary or the SAMSON After-sales Service department for information on suitable lubricants.

Removing the actuator from the valve:

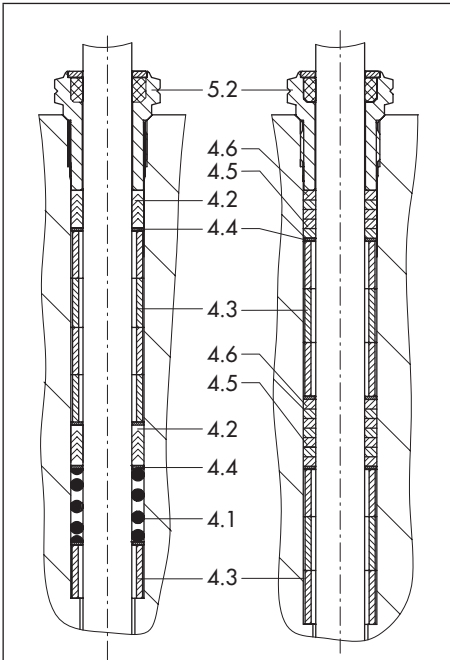
1. Unscrew the ring nut (8.2) and remove the stem connector (7).

For actuators with fail-safe action "Actuator stem extends" and particularly for actuators with preloaded springs, apply

6.1 Replacing parts in standard valves

6.1.1 Packing

If there is leakage at the stuffing box, replace the packings (4.2) or the sealing parts (4.5 and 4.6).



- | | |
|-----------------------|-----------------------|
| 4.1 Spring | 4.5 Carbon bushing(s) |
| 4.2 V-ring packing(s) | 4.6 Pressed graphite |
| 4.3 Bushing(s) | 5.2 Threaded bushing |
| 4.4 Washer(s) | |

Fig. 3: Packing: standard (left), high temperature (right)

1. Unscrew the lock and stem connector nuts (6.1 and 6.2) from the plug stem. Unscrew the threaded bushing (5.2) of the packing.
2. Remove the nuts (5.1) and carefully lift off the valve bonnet (5) over the plug stem (6).
3. Pull the entire packing out of the packing chamber using a suitable tool and replace damaged parts. Clean the packing chamber thoroughly.
4. Apply a suitable lubricant to all parts as well as the plug stem (6); do not use lubricant on graphite packings.
5. Insert a new gasket (1.1) into the valve body.
6. Carefully slide the valve bonnet over the plug stem onto the valve body and secure it with nuts (5.1).
7. Carefully slide the packing parts over the plug stem into the packing chamber. Make sure to observe the proper order. The number of distance bushings (4.3) may vary depending on the nominal valve size. Screw in the threaded bushing (5.2) and tighten it.
For high-temperature packings, only tighten the threaded bushing slightly; in case of leakage, also retighten it only slightly.
8. Loosely screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem.
9. Mount the actuator as described in section 3.1 and adjust the upper and lower bench range values.

6.1.2 Seats and/or plugs

Mixing and diverting valves differ in the arrangement of their plugs and sleeves.

Valves in sizes DN 15 to 25 have a one-piece double plug, therefore the plug arrangement is the same for mixing and diverting service; no sleeves are needed.

When replacing the seat or plug, we also recommend replacing the packing parts (4.2 or 4.5 and 4.6).

1. Unscrew the nut (6.4) at the end of the plug stem while holding the stem connector nut (6.1) in place.
2. In the **mixing valve**, remove the sleeve (6.5); in the **diverting valve**, remove the plug (3.2) and sleeves (6.5 and 6.6).
3. Unscrew the nuts (1.3) and separate the seat body (1.2) from the valve body.
4. In the **mixing valve**, pull the plug (3.2), sleeve (6.6), plug (3.1) and sleeve (6.5) off the plug stem (6).
5. Unscrew the nuts (5.1) and lift off the valve bonnet (5) with the yoke and plug stem. In the **diverting valve**, also remove the upper plug (3.1).
6. Unscrew the lock and stem connector nuts (6.1 and 6.2) as well as the threaded bushing (5.2). Pull the plug stem out of the valve bonnet (5).
7. Replace the plug (3.1 and 3.2).
8. Unscrew the seats (2.1 and 2.2) with a suitable wrench (refer to EB 029 EN).
9. Apply a suitable lubricant to the thread and the sealing cone of the new seats and screw in the seats (it may be possible to use the old plugs again after they have been thoroughly cleaned or remachined). For the tightening torques, refer to EB 029 EN.

Reassembly:

1. Check the packing parts in the bonnet, or even better, replace the packing as described in section 6.1.1.
2. Apply a suitable lubricant to the plug stem (6); do not use lubricant on graphite packings.
3. Slide the plug stem into the valve bonnet. Slide in the stem carefully if the packing has not been replaced. The thread could damage the packing rings. When using new packings, carefully slide the packing parts over the plug stem into the packing chamber.
4. Screw in the threaded bushing (5.2) and tighten it.
For high-temperature packings, only tighten the threaded bushing slightly; in case of leakage, also retighten it only slightly.
5. Insert a new gasket (1.1) into the valve body.
6. In the **diverting valve**, slide the upper plug (3.1) into the seat (2.1) first.
7. Place the valve bonnet with the plug stem onto the valve body. Screw on the nuts (5.1) and tighten them.

Mixing valve:

8. Slide the sleeve (6.5), upper plug (3.1), sleeve (6.6), lower plug (3.2) and the sleeve (6.5) onto the plug stem in this order from below and screw on the nut (6.4) by hand.
9. Insert a new gasket (1.4) into the valve body. Carefully slide the seat body (1.2) over the lower plug (3.2) and firmly tighten it to the valve body using the nuts (1.3).

Diverting valve:

8. Insert a new gasket (1.4) and firmly tighten the seat body (1.2) to the valve body using the nuts (1.3).
9. Slide the sleeves (6.6, 2x 6.5) and the lower plug (3.2) onto the plug stem in this order from below and screw on the nut (6.4) by hand.
10. Screw the lock nut (6.2) and stem connector nut (6.1) onto the plug stem and counter them against each other.
10. Firmly tighten the nut (6.4) while holding the stem connector nut (6.1) in place. Unscrew the stem connector and lock nuts again.
11. Mount the actuator as described in section 3.1 and adjust the upper and lower bench range values.

6.2 Replacing parts in valves with bellows seal

6.2.1 Packing

Replace the packing as described for the standard version in section 6.1.1, however, remove the nuts (11.2) and separate the bonnet (11) from the intermediate piece (9). Replace the gasket (9.1). Do not separate the bonnet from the intermediate piece unless to replace the packings.

6.2.2 Metal bellows

The metal bellows (10) can only be replaced as a unit together with the plug stem. Proceed as described in section 6.1.2 (Fig. 4).



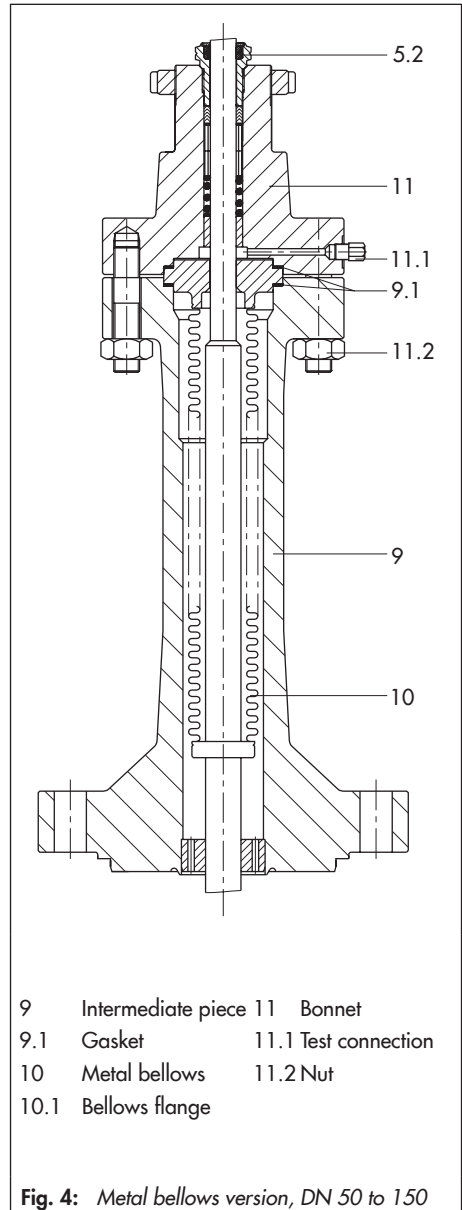
NOTICE!

Do not transmit any torque to the metal bellows during assembly or disassembly of the bellows seal.

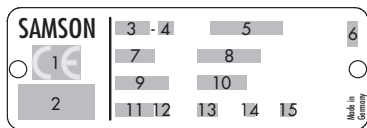
6.3 Replacing parts in valves with insulating section

Replace the packing as described for the standard version in section 6.1.1.

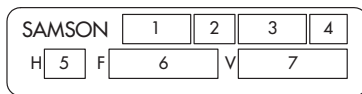
Replace the seat and plug as described for the standard version in section 6.1.2



7 Description of nameplates

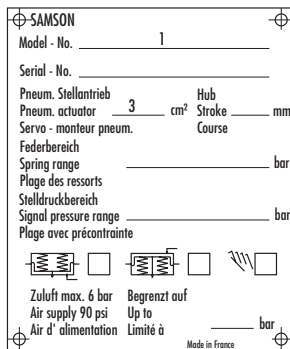


- 1 CE marking or "Art. 3, Abs. 3", where applicable
- 2 ID of the notified body, fluid group and category, where applicable
- 3 Type designation
- 4 Modification index
- 5 Material
- 6 Year of manufacture
- 7 Valve size: DIN: DN, ANSI: Size
- 8 Perm. operating gauge pressure at room temperature, DIN: PN, ANSI: CL
- 9 Order no. with modification index
- 10 Order item
- 11 Flow coefficient:
DIN: K_{vs} , ANSI: C_v
- 12 Characteristic:
% equal percentage, **Lin** linear,
DIN: **A/Z**, ANSI: **O/C** for on/off
- 13 Seal:
ME metal, **ST** Stellite coated,
Ni nickel plated,
PT soft PTFE seal,
PK soft PEEK seal
- 14 Version: **M** mixing valve, **V** diverting valve
- 15 Flow divider I or III



Type 3271

- 1 Type designation
- 2 Modification index
- 3 Effective diaphragm area
- 4 Fail-safe action:
Actuator stem extends (FA)
Actuator stem retracts (FE)
- 5 Travel
- 6 Bench range (spring range)
- 7 Bench range with preloaded springs



Type 3277

Fig. 5: Nameplates: valve (left) and actuator (right)

8 Customer inquiries

Submit the following details when making inquiries:

- Order number
- Type, model number, nominal size and valve version
- Pressure and temperature of the process medium
- Flow rate in m³/h
- Bench range of the mounted actuator (e.g. 0.2 to 1 bar)
- Is a strainer installed?
- Installation drawing



Note:

For dimensions and weights of the valves refer to Data Sheet T 8055.



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