

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

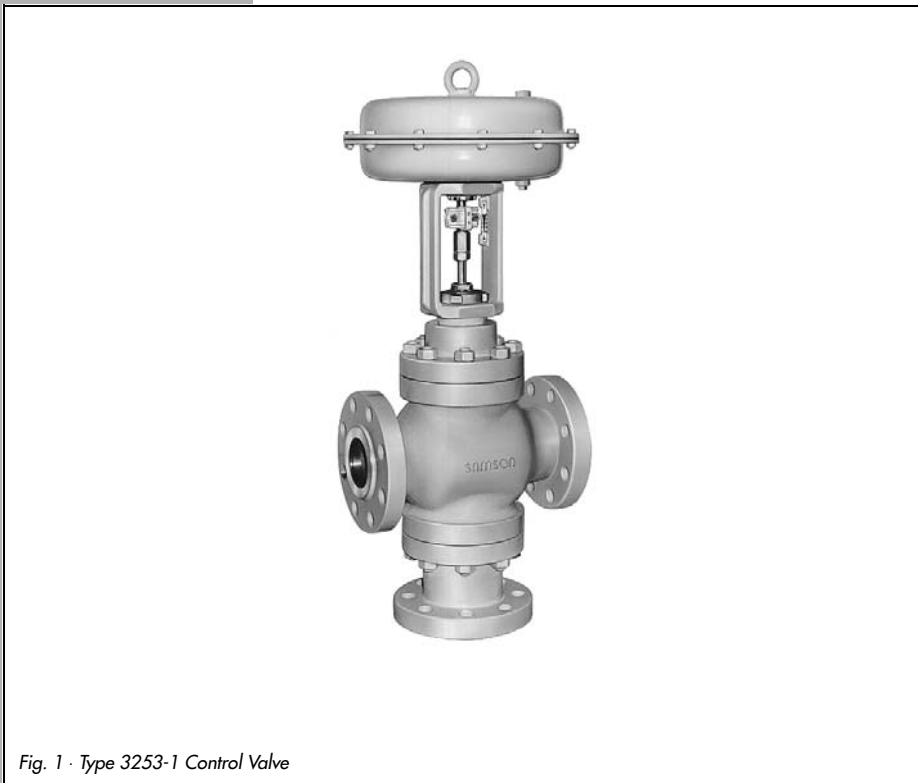


Fig. 1 · Type 3253-1 Control Valve

Mounting and Operating Instructions

EB 8055 EN

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Note!

*Non-electrical control valves which do not have a valve body lined with an **insulating material coating** do not have their own potential ignition source according to the risk assessment in the rare incident of an operating fault, corresponding to EN 13463-1: 2001 paragraph 5.2, and therefore do not fall within the scope of the European Directive 94/9/EC.*

General safety instructions



- ▶ *The control valve may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger. All safety instructions and warnings in these instructions, particularly those concerning installation, start-up and maintenance, must be observed.*
- ▶ *The control valves fulfill 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 can be viewed and downloaded on the Internet at <http://www.samson.de>.*
- ▶ *For appropriate operation, make sure that the control valve is only used in areas where the operating pressure and temperatures do not exceed the operating values based on the valve sizing data submitted in the order. The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence!
Any hazards which could be caused in the control valve by the process medium, operating pressure or by moving parts are to be prevented by means of the appropriate measures.*
- ▶ *Proper shipping and appropriate storage are assumed.*

Caution!

- ▶ *For installation and maintenance work on the control valves, make sure the relevant section of the pipeline is depressurized and, depending on the process medium used, drained as well. If necessary, allow the valve to cool down or warm up to reach ambient temperature prior to starting any work on it.*
- ▶ *Before carrying out any work on the valve, make sure the supply air and control signal are disconnected or interrupted to prevent any hazards from occurring due to moving parts in the control valve.*
- ▶ *Special care is needed when the valve is fitted with an actuator with pre-tensioned springs. These actuators are labeled correspondingly and can also be identified by three long bolts at the bottom of the actuator. Prior to starting any work on the valve, you must relieve the compression from the pre-tensioned springs.*

1 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.

The three-way valve can be used either for mixing or flow-diverting service depending on the plug arrangement.

When used as a mixing valve, the process media to be mixed enter through ports **A** and **B**. The combined flow leaves at port **AB**.

When used as a diverting valve, the process medium enters port **AB** and the divided flows leave at ports **A** and **B**.

The flow rate from ports **A** or **B** to **AB** or vice versa depends on the cross-sectional area of flow between the seats and plugs. The position of the plugs (3.1, 3.2) is changed by the signal pressure acting on 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 by either spring-loaded PTFE-V-ring packings or by adjustable HT packings.

- 1 Valve body
- 1.1 Gasket
- 1.2 Seat body
- 1.3 Body nuts
- 1.4 Gasket
- 2.1 Top seat
- 2.2 Lower seat
- 3.1 Top plug
- 3.2 Lower plug
- 4 Packing

- 5 Valve bonnet
- 5.1 Nuts
- 5.2 Threaded bushing
- 5.3 Yoke
- 5.5 Travel indicator
- 6 Plug stem
- 6.1 Stem connector nut
- 6.2 Lock nut
- 6.4 Nut
- 6.5 Short sleeve

- 6.6 Long sleeve
- 7 Stem connector
- 8 Actuator
- 8.1 Actuator stem
- 8.2 Ring nut
- 8.3 Springs
- 8.4 Diaphragm
- 8.5 Signal pressure connection
- 8.6 Vent

Fail-safe action:

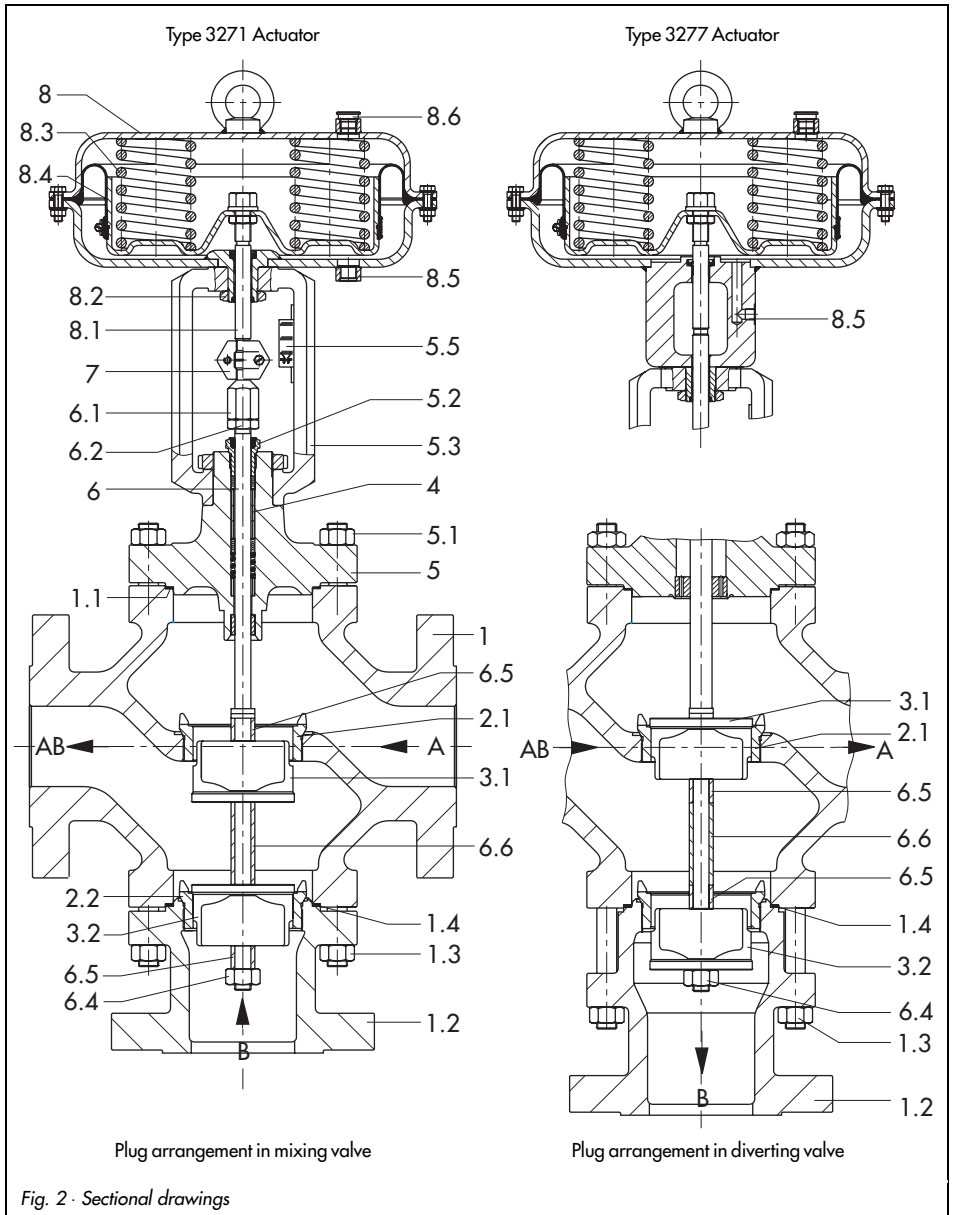
The control valve provides two different fail-safe positions which depend on the arrangement of the compression springs (8.3) in the actuator:

Actuator stem extends:

When the signal pressure is reduced or power supply fails, the compression springs force the actuator stem to move downward, closing the port **B** in the mixing valve, or port **A** in the diverting valve. When the signal pressure increases again, the ports **B** or **A** are opened against the force of the compression springs.

Actuator stem retracts:

When the signal pressure is reduced or power supply fails, the compression springs force the actuator stem to move upward, opening the port **B** in the mixing valve, or port **A** in the diverting valve. When the signal pressure increases again, the ports **B** or **A** are closed against the force of the compression springs.



2 Assembling valve and actuator

The basic pneumatic actuator can be replaced by a pneumatic actuator with additional handwheel or by an electric actuator. All the nominal sizes allow replacing the pneumatic standard actuator with a smaller or larger pneumatic actuator.

If the travel range of the actuator is larger than the travel of the valve, the springs in the actuator are pretensioned 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 another actuator, the necessary mounting parts must be ordered 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. The original parts are then exchanged for the additionally delivered parts.

2.1 Assembly and adjustment

If the valve and actuator have not been assembled by the manufacturer, or the actuator of a control valve is to be exchanged for an actuator of another type or size, proceed as follows:

1. Unthread the lock nut (6.2) and the stem connector nut (6.1) at the valve. Press the plug and plug stem firmly into the seat ring and thread 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 plug stem.

3. Place the actuator on the yoke (5.3) and secure with ring nut (8.2).
4. Read the bench range (or bench range with pretensioned springs) and the actuator's fail-safe action from the actuator's nameplate (e.g. 0.2 bar to 1 bar and "Actuator stem extends"). The lower bench range value (0.2 bar) to be adjusted corresponds to the initial value of the bench range, whereas the upper range value (1 bar) corresponds to the final value of the bench range. The fail-safe action "Actuator stem extends" or "Actuator stem retracts" is marked with FA or FE on the Type 3271 Actuator, and with a symbol on the Type 3277 Actuator.
5. For actuators with **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 **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. Thread down the stem connector nut (6.1) by hand until it contacts the actuator stem (8.1). Then turn it a further 1/4 turn and secure this position with the lock nut (6.2).
7. Position the stem connector clamps (7) and screw tight. Align the travel indicator (5.5) with the tip of the stem connector.

Note concerning removing actuators:

When removing an actuator from a valve, especially an actuator with pretensioned springs, a signal pressure that is slightly higher than the lower bench range value (see nameplate) must be applied to the signal pressure connection before the ring nut (8.2) can be loosened.

2.2 Option of pretensioning for "Actuator stem extends"

To obtain a more powerful 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 bar to 1 bar, the lower bench range value is shifted by 0.1 bar to 0.3 bar (0.1 bar corresponds to a preload of 12.5 %).

On adjusting the valve, the lower bench range value must now be set to 0.3 bar. The newly adjusted bench range of 0.3 to 1.1 bar must be indicated on the nameplate as bench range with preloaded springs.

2.3 Different rated travels of valve and actuator

Valve with actuator "Actuator stem extends"

Note!

Actuators with pretensioned springs must always be used when the valve's rated travel is smaller than the rated travel of the actuator.

Example:

Valve size DN 100 with a rated travel of 30 mm and 1400 cm² actuator with a rated travel of 60 mm, bench range 0.4 to 2 bar.

1. Set the signal pressure required for pretensioning to 1.6 bar which is slightly higher than the signal pressure of 1.2 bar (1.2 to 2 bar) that corresponds to the actuator's mid-travel (30 mm).
2. Thread on the stem connector nut (6.1) until it touches the actuator stem.
3. Secure this position with the lock nut and mount the stem connector as described in section 2.1.
4. Write the bench range of 1.6 to 2.4 bar valid for the mounted valve on the actuator's nameplate.

Valve with actuator "Actuator stem retracts"

The springs of actuators with "Actuator stem retracts" cannot be pretensioned!

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

Example:

Valve DN 100 with a rated travel of 30 mm and a 1400 cm² actuator with a rated travel of 60 mm, bench range 0.2 to 1 bar.

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



Caution!

Actuators which have already been pretensioned by the manufacturer are labeled correspondingly. Additionally, they can also be identified by three long bolts at the bottom actuator case.

3 Installation

3.1 Mounting position

The valve and actuator can be mounted in any position, however, for valves with DN 100 and larger, the valve should be installed horizontally with the actuator pointing upward to make maintenance routines easier.

In cases where the actuator weighs more than 50 kg or the control valves are fitted with an insulating section or bellows seal, the actuator needs to be supported or suspended.

Important!

The valve must be installed free of stress. Flush the pipeline thoroughly prior to installing the valve.

Note!

Control valves with insulating section or bellows seal may only be insulated up to the cover flange of the valve body for medium temperatures below 0 °C as well as temperatures above 220 °C.

*Valves that should meet the requirements of **NACE MR 0175** standard should not be insulated.*

3.2 Point of installation

Depending on whether the valve is to be used for mixing or diverting service, the control valve must be installed as in Fig. 3.

The installation examples refer to standard operation with the actuator "Actuator stem extends" for heating systems and with "Actuator stem retracts" for cooling systems.

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

The plug arrangement, i.e. either mixing or diverting valve, is indicated on a label fixed to the valve body.

With DN 15 to 25, the plug arrangement is the same for both mixing and diverting services.

3.3 Signal pressure line

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

The Type 3277 Actuator has its lower signal pressure connection at the side of the yoke under the lower diaphragm case.

3.4 Strainer, bypass

We recommend that you install a strainer upstream of the valve body, and for mixing valves, upstream of both inlet ports.

We also recommend that you install a shut-off valve both upstream of the strainer and downstream of the valve as well as a bypass so that you need not shut down the plant for maintenance routines.

Mixing service

Temperature control $Q = \text{constant}$

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

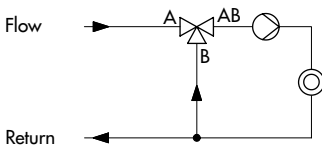
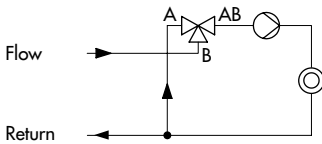
For heating application with FA, the heating medium (flow) is blocked in the fail-safe position
for cooling applications, the cooling is maintained with FE

Diverting service

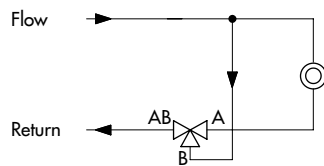
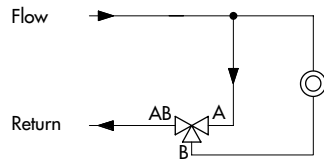
Flow rate control $Q = 0 \text{ to } 100 \%$

Heating with mixing valve FA or cooling with mixing valve FE

Installation in flow pipe

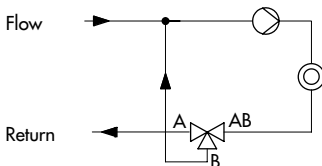
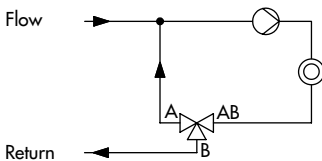


Installation in return pipe



Heating with diverting valve FA or cooling with diverting valve FE

Installation in return pipe



Installation in flow pipe

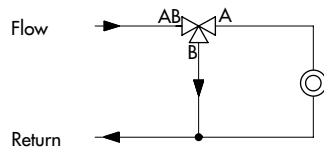
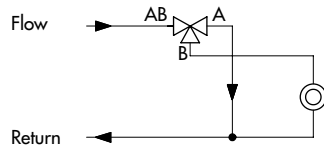


Fig. 3 · Installation examples

3.5 Test connection

Versions with metal bellows seal (Fig. 5) have a test connection (11.1) at the upper flange to check the tightness of the bellows. Especially for liquids and vapors, we recommend the installation of a suitable leakage indicator such as a contact pressure gauge, an outlet to an open vessel or an inspection glass.

4 Operation

(e.g. reversal of operating direction, etc.) Please refer to the Mounting and Operating Instructions for the pneumatic actuators EB 8310 EN for Type 3271 and EB 8311 EN for Type 3277.

Note on SAMSON special tools

Suitable seat wrenches and special tools as well as the appropriate tightening torques can be found in EB 029 EN (formerly WA 29 EN). The instructions can be viewed on the Internet at http://www.samson.de/pdf_en/e00290en.pdf.

5 Maintenance – Replacing parts

The control valve is subject to normal wear, especially at the seat, plug and packing. Depending on the application conditions that prevail, the valve must be inspected at appropriately scheduled intervals to prevent any problems before they occur. If any leakage occurs to the atmosphere, this may be because the packing is leaking. If the valve does not seal properly, this may be because tight shut-off is prevented by dirt between the seat and plug or because the seating surface is damaged. We recommend that you disassemble the parts, thoroughly clean them and replace them, if necessary.



Note!

Before servicing or disassembling the control valve, first relieve the corresponding section of the plant of pressure and, depending on the process medium, drain it as well. Let the plant section cool down to reach ambient temperature, if necessary.

As the process medium cannot drain completely out of the valve, be aware that some of the process medium could still be in the valve. This is particularly the case for valves with insulating sections.

We recommend that you remove the valve from the pipeline.

Important! *On carrying out any work on the valve, first disconnect the signal pressure, remove the signal pressure line and remove the actuator from the valve.*

Disassembling the actuator:

1. Unscrew the ring nut (8.2) and remove the stem connector (7).
For actuators "Actuator stem extends" and especially for actuators with pre-tensioned springs, apply a signal pressure that is higher than the lower bench range value (see nameplate) to the actuator to loosen the ring nut.
Afterwards, disconnect the signal pressure.
2. Lift the actuator off the valve yoke.

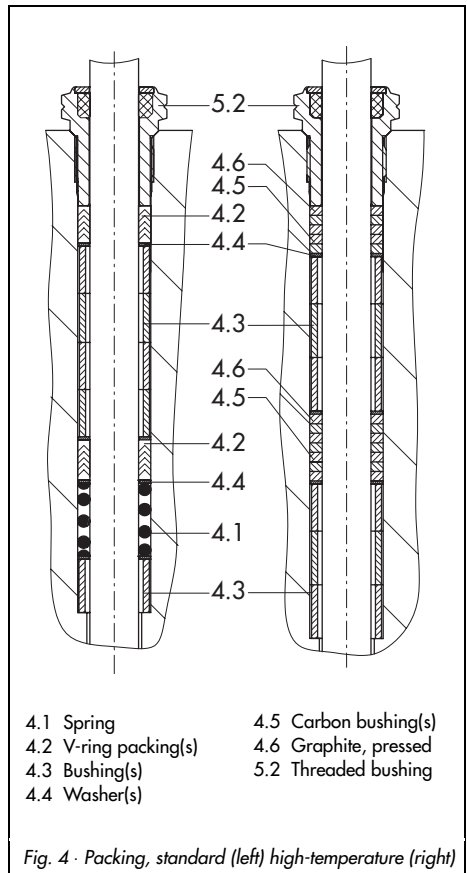
5.1 Replacing parts of standard valves

5.1.1 Packing

When the stuffing box leaks, the packings (4.2) or the sealing parts (4.5 and 4.6) must be replaced.

1. Remove the stem connector nut and the lock nut (6.1 and 6.2) from the plug stem.
Screw the threaded nut (5.2) out of the packing.
2. Remove the body nuts (5.1) and carefully lift the valve bonnet (5) over the plug stem (6).
3. Use an appropriate tool to pull out all the packing parts from the packing chamber. Replace damaged parts.
Thoroughly clean the packing chamber.
4. Apply lubricant (order no. 8150-0111) to all the parts as well as the plug stem (6). Do not use lubricant on the graphite packings.
5. Insert a new gasket (1.1) in the valve body.

6. Carefully slide the valve bonnet over the plug stem onto the valve body and secure with nuts (5.1).
7. Carefully push the packing parts over the plug stem into the packing chamber. Make sure that you keep the proper order. The number of distance bushings (4.3) vary depending on the nominal size.



Screw in the threaded bushing (5.2) and tighten it.

For high-temperature packings, tighten the threaded bushing only slightly. In case of leakage, also tighten 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 2.1 and adjust the lower and upper bench range values.

5.1.2 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 in both the mixing and diverting valve. The sleeves are omitted. When exchanging the seat or plug, you should also replace the packings (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 with a suitable tool.
2. Remove the sleeve (6.5) in the **mixing valve**, and the plug (3.2) and sleeves (6.5 and 6.6) in the **diverting valve**.
3. Unthread the nuts (1.3) and separate the seat body (1.2) from the valve body.
4. For the **mixing valve**, pull the plug (3.2), sleeve (6.6), plug (3.1) and sleeve (6.5) off the plug stem (6).
5. Loosen the nuts (5.1) and lift off the valve bonnet (5) with the yoke and plug stem. For the **diverting valve**, also take out the top plug (3.1).
6. Unscrew the stem connector nut (6.1) and lock nut (6.2) as well as threaded bushing (5.2). Pull the plug stem out of the valve bonnet (5).
7. Replace the plugs (3.1 and 3.2).
8. Use the appropriate seat wrench (see EB 029 EN) to unscrew the seats (2.1 and 2.2).
9. Apply lubricant (order no. 8150-0119) to the thread and the sealing cone of the new seats (it may be possible to use the old plugs after they have been thor-

oroughly cleaned or remachined). Finally, screw them in. The tightening torques for the seats are also listed in EB 029 EN.

Reassembly:

1. Check the packing parts in the bonnet or even better still, replace the packing as described in section 5.1.1.
2. Apply lubricant (order no. 8150-0111) to the plug stem (6). Do not use lubricant on graphite packings!
3. Insert the plug stem in the valve bonnet. Be **careful** if the packing has not been replaced and has to be reinserted! The thread could damage the packing rings. When you use 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, tighten the threaded bushing only slightly, even when leakage occurs, tighten only slightly!
5. Insert a new gasket (1.1) in the valve body.
6. With the **diverting valve**, first insert the top plug (3.1) into the seat (2.1).
7. Place the valve bonnet with the plug stem on the valve body. Screw on the nuts (5.1) and tighten them.
8. Slide the sleeve (6.5), top plug (3.1), sleeve (6.6), lower plug (3.2) and the sleeve (6.5) in this order from below on the plug stem and screw on the nut (6.4) by hand.
9. Insert a new gasket (1.4) in the valve body.
Carefully slide the seat body (1.2) over the lower plug (3.2) and screw tightly to the valve body using the nuts (1.3).

Diverting valve:

8. Insert a new gasket (1.4) and screw the seat body (1.2) tightly to the valve body using the nuts (1.3).
9. Slide the sleeves (6.6, 2x 6.5) and the lower plug (3.2) in this order from below on the plug stem and screw on the nut (6.4) by hand.
10. Screw the lock nut (6.2) and the stem connector nut (6.1) on the plug stem and fix them.
11. Tighten the nut (6.4) while holding the stem connector nut (6.1) in place with an appropriate tool.
Unscrew the stem connector nut and the lock nut.
12. Mount the actuator as described in section 2.1 and adjust the lower and upper bench range values.

Mixing valve:

5.2 Replacing parts of valves with metal bellows seal

5.2.1 Packing

Replace the packing as described for the standard version in section 5.1.1. However, observe the following difference: remove the nuts (11.2) and separate the bonnet (11) from the intermediate piece (9). Insert a new gasket (9.1).

The bonnet must not be separated from the intermediate piece for any other purpose other than when replacing the packing!

5.2.2 Metal bellows

The metal bellows (10) can only be exchanged as a whole together with the plug stem. Proceed as described in section 5.1.2 (Fig. 5).

Caution!

When assembling and disassembling the bellows seal, no torque may be transmitted to the metal bellows!

5.3 Replacing parts of valves with insulating section

Replace the packing as described for the standard version in section 5.1.1.

Replace the seat(s) and plug(s) as described for the standard version in section 5.1.2.

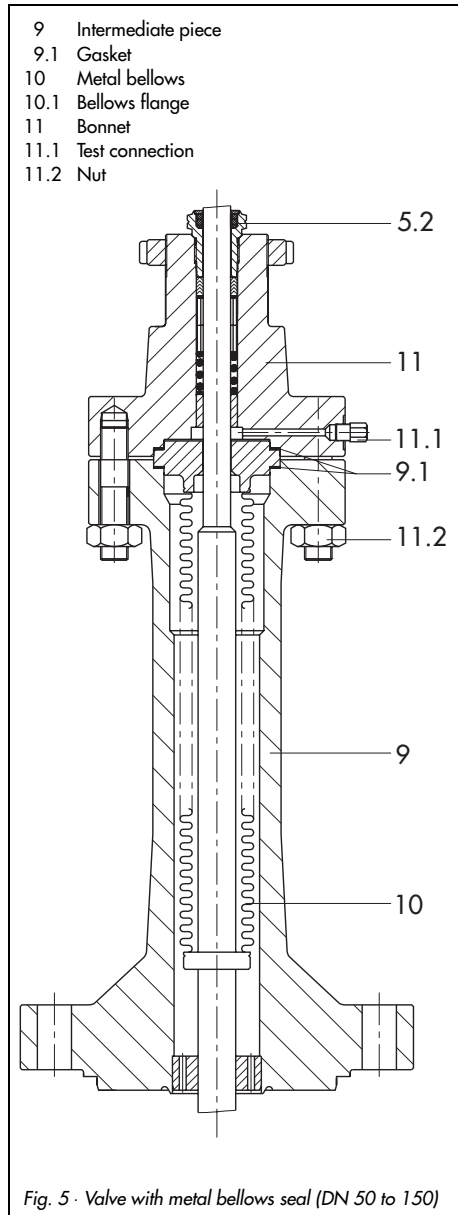
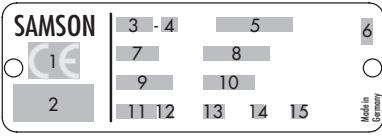
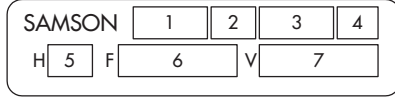


Fig. 5 · Valve with metal bellows seal (DN 50 to 150)

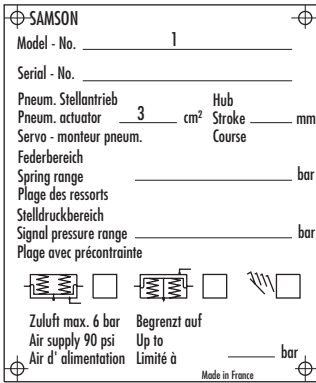
6 Description of nameplates



- 1 CE marking or "Art. 3, Abs. 3" (see article 3, § 3 of PED), where applicable
- 2 Ident. number of notified body, fluid group and category, where applicable
- 3 Type designation
- 4 Modification index of valve
- 5 Material
- 6 Year of manufacture
- 7 Nominal size: DIN: DN, ANSI: Size
- 8 Perm. operating pressure at room temperature DIN: PN, ANSI: CL
- 9 Order number with modification index
- 10 Item position on order
- 11 Flow coefficient:
DIN: Kvs value, ANSI: Cv value
- 12 Characteristic:
% equal percentage, **Lin** linear,
DIN: **A/Z**, ANSI: **O/C** for quick opening
- 13 Sealing:
ME metal, **ST** stellited, **Ni** nickel plated
PT soft sealing with PTFE,
PK soft sealing with PEEK
- 14 Pressure balancing: DIN: **D**, ANSI: **B**
- 15 **I** or **III** flow divider



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



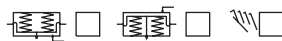
Type 3277

Model - No. _____ 1 _____

Serial - No. _____

Pneum. Stellantrieb _____ Hub _____ mm
Pneum. actuator _____ 3 _____ cm² Stroke _____ mm
Servo - montage pneum. _____ Course _____

Federbereich _____ bar
Spring range _____ bar
Plage des ressorts _____ bar
Stelldruckbereich _____ bar
Signal pressure range _____ bar
Plage avec précontrainte _____ bar



Zuluft max. 6 bar Begrenzt auf _____ bar
Air supply 90 psi Up to _____ bar
Air d'alimentation Limité à _____ bar

Made in France

Fig. 6 · Nameplates on valve (left) and actuators (right)

7 Customer inquiries

Should you have any questions, please submit the following details:

- ▶ Order number
- ▶ Type, model number, nominal size and version of the valve
- ▶ Pressure and temperature of the process medium
- ▶ Flow rate in m³/h

- ▶ Bench range (e.g. 0.2 to 1 bar) of the mounted actuator
- ▶ Has a strainer been installed?
- ▶ Installation drawing

Note!

Dimensions and weights of these valves are listed in Data Sheet T 8055 EN.



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