

Type 3271 Pneumatic Actuator

1000 cm² actuator area

SAMSON



Mounting and Operating Instructions

EB 8310-2 EN

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CE

Definition of signal words



DANGER!

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



NOTICE

Property damage message or malfunction



WARNING!

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



Note:

Additional information



Tip:

Recommended action

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1 General safety instructions

For your own safety, follow these instructions concerning the mounting, start-up and operation of the actuator:

- The actuator is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.
- According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- Any hazards that could be caused by the signal pressure or moving parts of the actuator are to be prevented by taking appropriate precautions.

To avoid damage to any equipment, the following also applies:

- Proper shipping and storage are assumed.



WARNING!

Risk of injury and property damage due to incorrect lifting of the actuator!

Do not use the lifting ring to lift the entire valve assembly. Only use this ring for assembling and dismantling the pneumatic actuator.

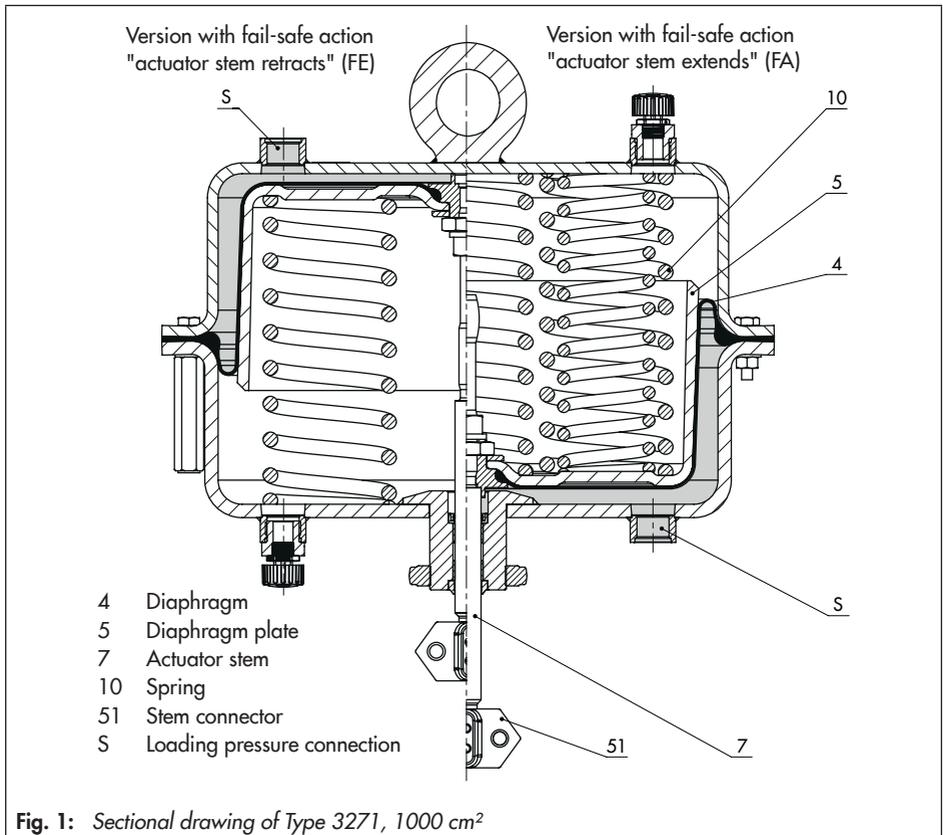
2 Design and principle of operation

The Type 3271 Pneumatic Actuator with 1000 cm² diaphragm area contains a rolling diaphragm and internal springs. It is mounted on SAMSON Series 240, 250, 280 and 290 Valves.

The signal pressure p_{st} creates the force $F = p_{st} \cdot A$ at the diaphragm surface A , which is opposed by the springs (10) in the actuator.

The bench range is determined by the number of springs used and their compression, taking into account the rated travel. The travel is proportional to the signal pressure p_{st} . The operating direction of the actuator stem (7) depends on how the springs are installed in the actuator.

The stem connector (51) connects the actuator stem (7) with the plug stem of the valve.



2.1 Operating direction

The operating direction is determined by how the springs and diaphragm plate are arranged in the actuator. With operating direction "actuator stem retracts", the compressed air is applied to the loading pressure connection on the top diaphragm case. With operating direction "actuator stem extends", the compressed air is applied to the loading pressure connection on the bottom diaphragm case.

The operating direction of the actuator is reversible. Remove the actuator from the valve before reversing the operating direction (see section 6).

2.2 Signal pressure routing

In the "actuator stem extends" version of Type 3271 Actuator (1000 cm²) (Fig. 1, right), the signal pressure is routed through the bottom loading pressure connection (S) to the bottom diaphragm chamber and moves the actuator stem (7) upward opposing the spring force.

In the "actuator stem retracts" version (Fig. 1, left), the signal pressure is routed through the top loading pressure connection (S) to the top diaphragm chamber and moves the actuator stem (7) downward opposing the spring force.

2.3 Fail-safe action

When the signal pressure fails, the fail-safe action of the actuator depends on whether the springs are installed in the top or bottom diaphragm chamber.

2.3.1 Version with fail-safe action "actuator stem extends" (FA)

When the signal pressure is reduced or the air supply fails, the springs move the actuator stem downward and close a mounted globe valve. The valve opens when the signal pressure is increased enough to overcome the force exerted by the springs.

2.3.2 Version with fail-safe action "actuator stem retracts" (FE)

When the signal pressure is reduced or the air supply fails, the springs move the actuator stem upward and open a mounted globe valve.

The valve closes when the signal pressure is increased enough to overcome the force exerted by the springs.

3 Application

- To mount the actuator on the valve or to remove it from the valve, follow the instructions written in the mounting and operating instructions of the corresponding valve.

3.1 Throttling service

The Type 3271 Pneumatic Actuator (1000 cm²) is designed for a maximum supply pressure of 6 bar when used for throttling service.

3.2 Versions

- **Standard version**
Type 3271 Pneumatic Actuator (1000 cm²) with diaphragm cases made of plastic-coated sheet steel or stainless sheet steel
- **Travel stop**
The actuator as a special version can be fitted with a mechanically adjustable travel stop. The actuator travel can be limited by the stop (see section 4.1).
- Versions for other control media (e.g. water) available on request.

4 Operation



WARNING!

Risk of injury and property damage due to incorrect lifting of the actuator! Do not use the lifting ring to lift the entire valve assembly. Only use this ring for assembling and dismantling the pneumatic actuator.

The applicable bench or operating range which the actuator can move through is written on the nameplate.

Additional points that apply concerning operation:

- Only apply the signal pressure to the loading pressure connection (S) on the diaphragm chamber of the actuator which does not contain any springs.
 - Only use vent plugs that let air through them (16 in Fig. 5).
-



Note:

Actuators with preloaded springs are labeled correspondingly and can also be identified by the long nuts and bolts used to fasten the diaphragm cases together.

4.1 Travel stop

In a special version of Type 3271 (1000 cm²), the actuator travel can be limited as follows:

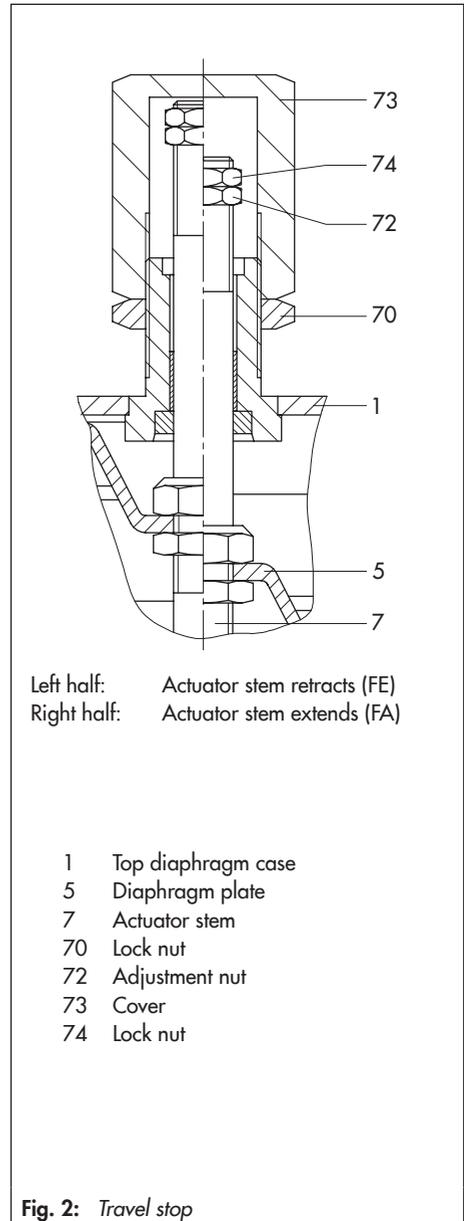
Operating direction	Min. stop	Max. stop
Stem extends	0 to 125 %	33 to 125 %
Stem retracts	0 to 100 %	33 to 100 %

4.1.1 Bottom travel stop (minimum travel)

1. Undo lock nut (70) and remove cover (73).
2. Unscrew lock nut (74) and turn the adjustment nut (72) to adjust the travel stop.
3. Tighten lock nut (74).
4. Attach the cover (73) and retighten the lock nut (70).

4.1.2 Top travel stop (maximum travel)

1. Undo the lock nut (70).
2. Adjust the cover (73) to the required travel stop.
3. Retighten lock nut (70).



5 Maintenance

The diaphragm must be renewed if it does not work reliably. We recommend renewing the plain bearing and seals as well.



WARNING!

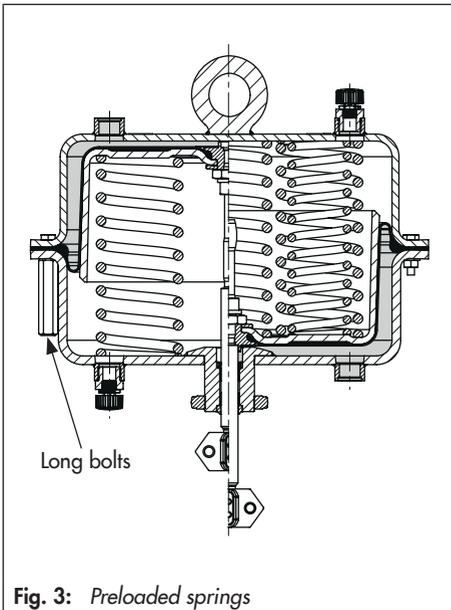
Risk of personal injury by preloaded spring!

Before removing the actuator from the valve, relieve the spring compression!



Note:

Actuators with preloaded springs are labeled correspondingly and can also be identified by the long bolts on the bottom diaphragm case.



5.1 Removing an actuator with preloaded springs from the valve

1. Unscrew the stem connector (51) between valve and actuator.
2. **For actuators with fail-safe action "stem extends" (FA):**
Apply compressed air to the loading pressure connection (S) on the bottom diaphragm case until the actuator stem (7) moves away from the stem connector nut on the valve.



Note:

Relieve spring compression as described in section 5.2 when the actuator is defective or no compressed air is available.

3. **For actuators with fail-safe action "stem retracts" (FE):**
Disconnect the signal pressure from the actuator.
4. Separate the actuator from the valve by undoing the ring nut (8).

5.2 Relieving the spring compression

1. Unscrew and remove the nuts (21) on the short bolts (20) on the diaphragm casing.
2. Unthread the nuts (23) on the long bolts a few turns, alternating between them to gradually relieve the spring compression.

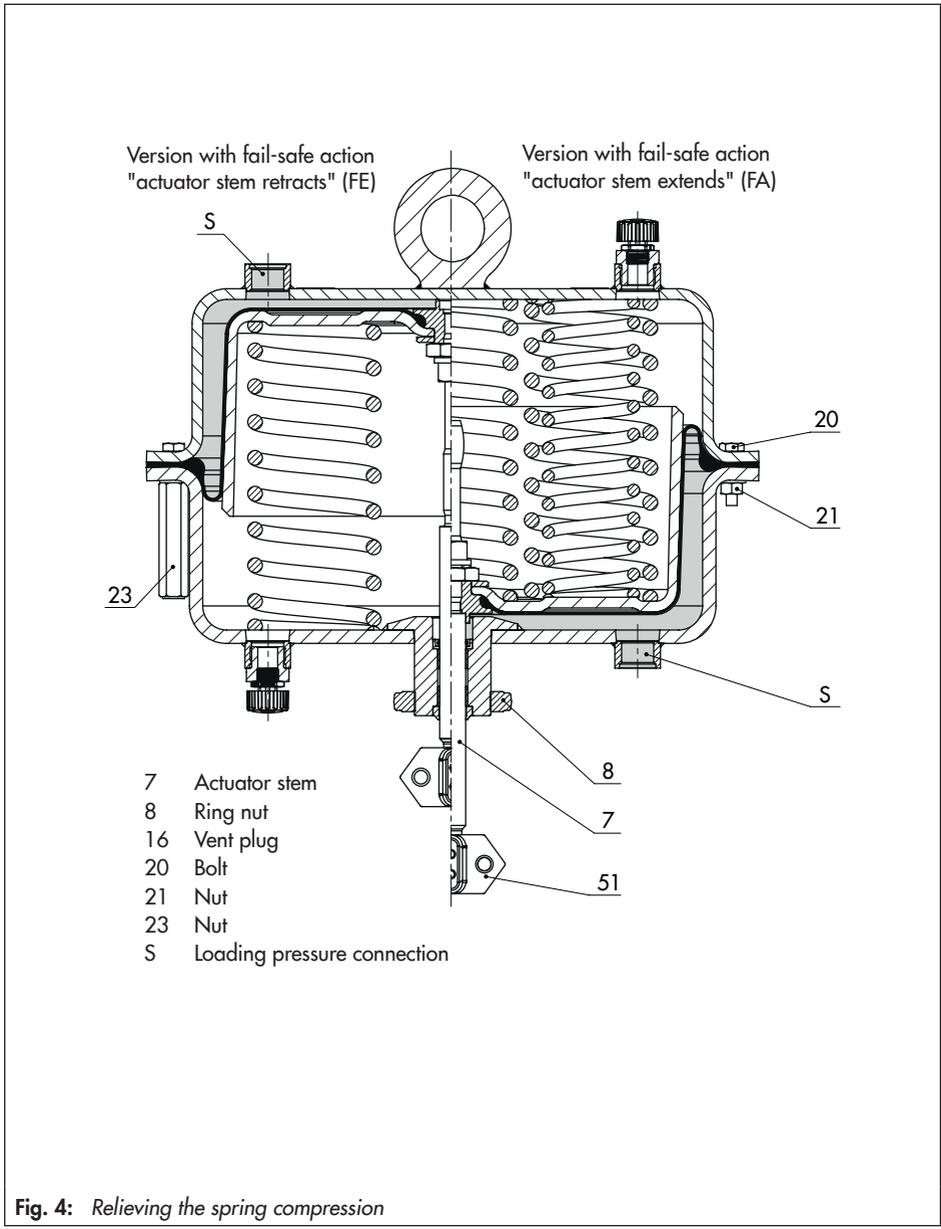


Fig. 4: Relieving the spring compression

5.3 Replacing the diaphragm

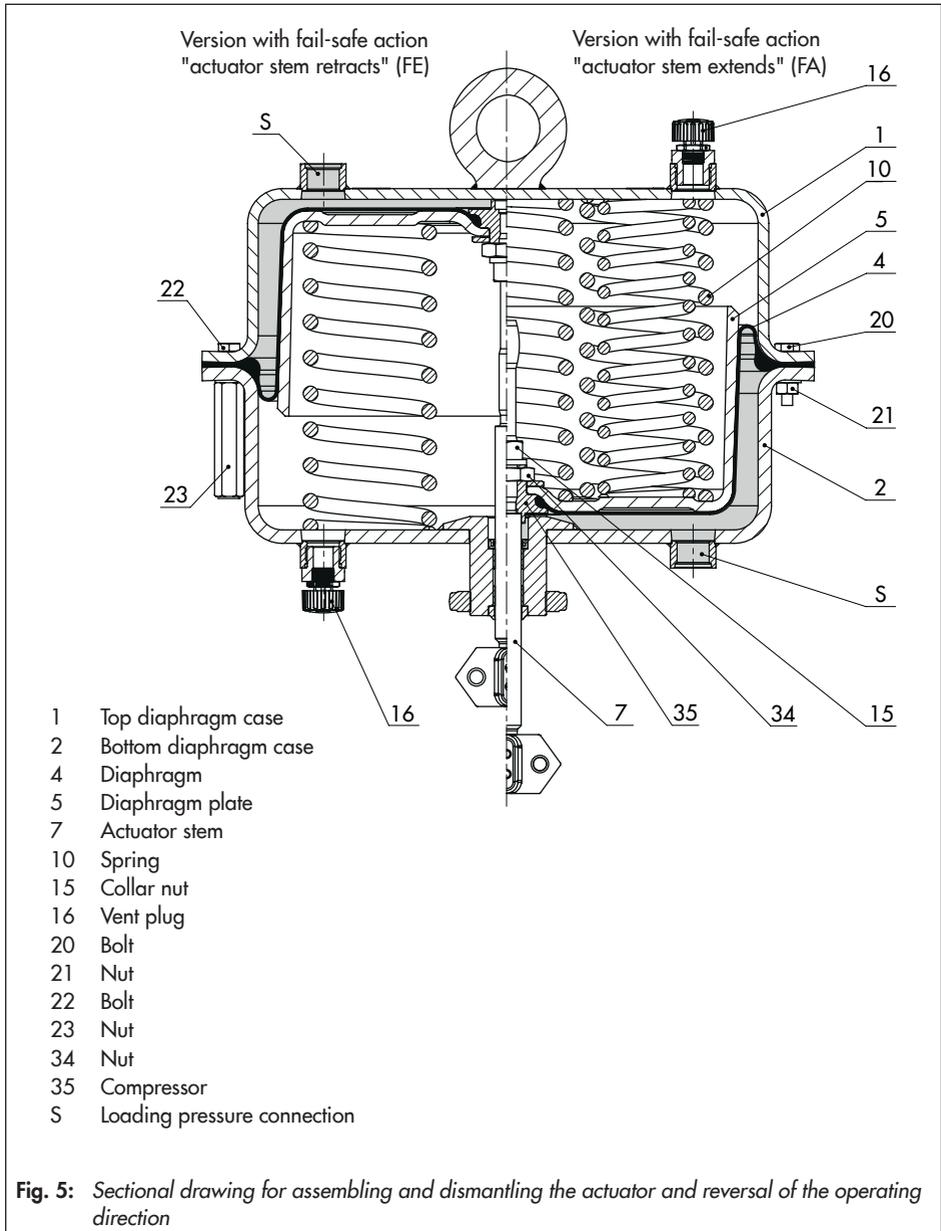
For actuators with fail-safe action "stem extends" (FA):

1. Undo the nuts (21) and bolts (20) on both cases.
2. Lift off the top diaphragm case (1) and remove springs (10).
3. Take the diaphragm plate (5) together with the diaphragm (4) and actuator stem (7) out of the bottom diaphragm case.
4. Unscrew the collar nut (15), while holding the compressor (35) stationary with a wrench (width across flats 28).
5. Unscrew the nut (34) including washer from the compressor (35), while holding the compressor (35) stationary with a wrench (width across flats 28).
6. Remove diaphragm plate (5) and diaphragm (4).
7. Insert new diaphragm and diaphragm plate (5). Make sure that the diaphragm is inserted correctly between compressor (35) and diaphragm plate (5).
8. Check the sealing element on the collar nut (15). If necessary, renew it (order no.: 8353-0539).
9. Screw the nut (34) with washer onto the compressor (35) and tighten it with 200 Nm torque.
10. Screw the collar nut (15) onto the actuator stem (7) and tighten it with 160 Nm torque.

11. Apply sealant and lubricant to the actuator stem:
NBR diaphragm: 8152-0043
PVMQ diaphragm: 8150-4009
12. Insert the diaphragm plate assembly into the bottom diaphragm case.
13. Insert springs (10) and place on the top diaphragm case (1).
14. Fasten the top and bottom diaphragm cases together with the nuts and bolts. Tighten the nuts in an even pattern with 30 Nm torque.
15. Mount the actuator onto the valve following the instructions in the mounting and operating instructions of the valve.

For actuators with fail-safe action "actuator stem retracts" (FE):

1. Undo the nuts (21) and bolts (20) on both cases.
2. Lift off the top diaphragm case (1).
3. Take the diaphragm plate (5) together with the diaphragm (4) and actuator stem (7) out of the bottom diaphragm case.
4. Unscrew the collar nut (15), while holding the compressor (35) stationary with a wrench (width across flats 28).
5. Unscrew the nut (34) including washer from the compressor (35), while holding the compressor (35) stationary with a wrench (width across flats 28).
6. Remove diaphragm plate (5) and diaphragm (4).



7. Insert new diaphragm and diaphragm plate (5). Make sure that the diaphragm is inserted correctly between compressor (35) and diaphragm plate (5).
8. Check the sealing element on the collar nut (15). If necessary, renew it (order no.: 8353-0539).
9. Screw the nut (34) with washer onto the compressor (35) and tighten it with 200 Nm torque.
10. Screw the collar nut (15) onto the actuator stem (7) and tighten it with 160 Nm torque.
11. Check whether the springs (10) rest correctly in the bottom diaphragm case.
12. Apply sealant and lubricant to the actuator stem:
NBR diaphragm: 8152-0043
PVMQ diaphragm: 8150-4009
13. Insert the diaphragm plate assembly into the bottom diaphragm case.
14. Place on the top diaphragm case (1).
15. Fasten the top and bottom diaphragm cases together with the nuts and bolts. Tighten the nuts in an even pattern with 30 Nm torque.
16. Mount the actuator onto the valve following the instructions in the mounting and operating instructions of the valve.

5.4 Replacing the actuator stem seals

1. Take the diaphragm plate (5) together with the actuator stem (7) out of the bottom diaphragm case (2) as described in section 5.3.
2. Apply sealant and lubricant to the new radial shaft seal (40):
NBR diaphragm: 8152-0043
PVMQ diaphragm: 8150-4009
3. Mount the radial shaft seal with suitable mandrel.
4. Replace the plain bearing (42) and wiper ring (41) as well, if necessary.
5. Reassemble actuator as described in section 5.3.

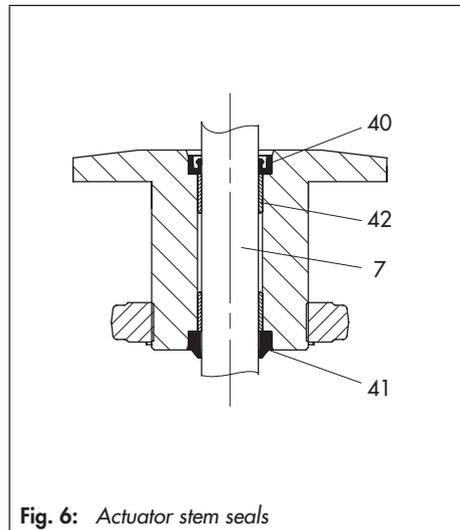
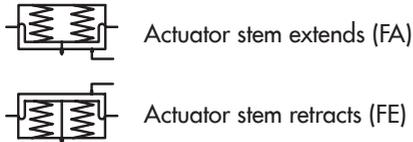


Fig. 6: Actuator stem seals

6 Reversing the operating direction

The operating direction and fail-safe action of pneumatic actuators can be changed. The fail-safe action is indicated on the nameplate by a symbol:



NOTICE!
 The configuration ID and actuator symbol on the nameplate are no longer correct after the reversal of the operating direction!
 Request a new nameplate from SAMSON after-sales service after reversing operating direction!



WARNING!

Risk of personal injury by preloaded spring!

Before removing the actuator from the valve, relieve the spring compression evenly!



Note:

Actuators with preloaded springs are labeled correspondingly and can also be identified by the long bolts on the bottom diaphragm case.

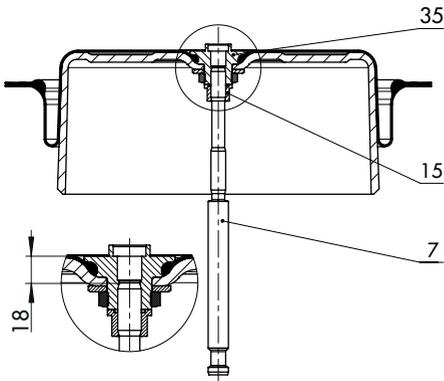
→ **Before continuing, relieve the spring compression as described in section 5.1 or 5.2.**

6.1 Reversal of the operating direction from stem extends to stem retracts

→ See Fig. 5 on page 13

1. Relieve the spring compression as described in section 5.1/5.2.
2. Lift off the top diaphragm case (1) and remove springs (10).
3. Pull the actuator stem (7) together with the diaphragm plate (5) and diaphragm (4) out of the bottom diaphragm case (2).
4. Clamp the actuator stem (7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.
5. Unscrew collar nut (15).

6. Unscrew the compressor (35) together with the diaphragm plate (5) and diaphragm (4) on the actuator stem (7).
7. Clamp the actuator stem (7) with the thread pointing upward into a vice using protective jaws.
8. Screw the collar nut (15) with the collar facing upward at least 20 mm onto the actuator stem. Screw the compressor (35) in the ready-assembled diaphragm plate (5) onto the actuator stem. Adjust it to achieve the dimension of 18 mm:



9. Screw the collar nut (15) against the compressor (35) and tighten with 160 Nm.
10. Apply sealant and lubricant (order no. 8152-0043) to the actuator stem.
11. Place the diaphragm plate (5) together with the diaphragm into the top diaphragm case (1). Insert springs (10) and slide the bottom diaphragm case over the actuator stem (7).

12. Fasten the top and bottom diaphragm cases together with the nuts (21 and 23) and bolts (20 and 22).

13. Remove the vent plug (16) from the top loading pressure connection (S) and screw it onto the bottom connection.

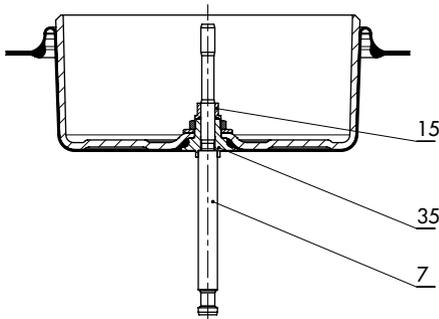
→ The actuator springs, which now push against the diaphragm plate from below, cause the actuator stem to retract. The signal pressure is connected to the connection (S) on the top diaphragm case. As a result, the actuator stem extends against the spring force as the signal pressure increases.

14. Affix new nameplate with revised actuator symbol and new configuration ID to the actuator.

6.2 Reversal of the operating direction from stem retracts to stem extends

→ See Fig. 5 on page 13

1. Relieve the spring compression as described in section 5.1/5.2.
2. Remove the top diaphragm case (1).
3. Take the actuator stem (7) together with the diaphragm plate (5) and diaphragm (4) out of the bottom diaphragm case (2). Remove the springs (10).
4. Undo the collar nut (15).
5. Unscrew the compressor (35) together with the diaphragm plate (5) and diaphragm (4) on the actuator stem (7).
6. Screw the actuator stem (7) completely into the compressor (35) in the ready-mounted diaphragm plate (5):



7. Clamp the actuator stem (7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.
8. Mount the collar nut (15), making sure that the actuator stem does not become unscrewed out of the compressor again.

9. Tighten collar nut (15) with 160 Nm.
10. Apply sealant and lubricant (order no. 8152-0043) to the actuator stem. Insert it together with the diaphragm plate and diaphragm into the bottom diaphragm case (2).
11. Insert springs (10) and place on the top diaphragm case (1).
12. Fasten the top and bottom diaphragm cases together with the nuts (21 and 23) and bolts (20 and 22).
13. Remove the vent plug (16) from the bottom loading pressure connection (S) and screw it onto the top connection.

→ The actuator springs, which now push against the diaphragm plate from above, cause the actuator stem to extend. The signal pressure is connected to the connection (S) on the bottom diaphragm case. As a result, the actuator stem retracts against the spring force as the signal pressure increases.

14. Affix new nameplate with revised actuator symbol and new configuration ID to the actuator.

7 Appendix

7.1 Nameplate

The plastic nameplate for the Type 3271 Pneumatic Actuator (1000 cm²) is stuck on the diaphragm casing. It includes all details required to identify the actuator:

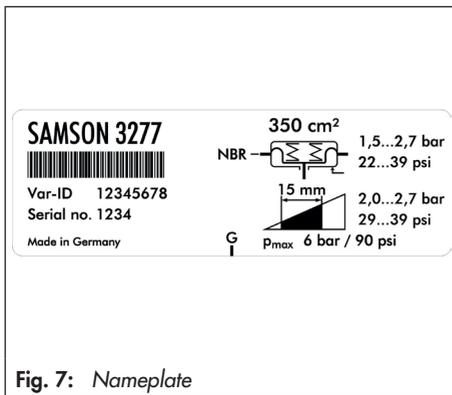


Fig. 7: Nameplate

- Manufacturer and type number
- Configuration ID (Var.-ID) as bar code and plain text
- Serial no.
- Country of origin
- Diaphragm area in cm²
- Diaphragm material: NBR or EPDM
- Symbol indicating fail-safe action: stem extends or retracts, (stem extends in this example)
- Bench range in bar or psi
- Symbol for operating travel in mm
- Bench range with preloaded springs
- Thread for pneumatic connection in G, NPT or Rc
- Permissible supply pressure p_{max}

7.2 Dimensions and weights

Refer to Data Sheet ► T 8310-2 EN for details on dimensions and weights of the actuator versions.

7.3 Customer inquiries

Please submit the following details:

- Type designation and model number
- Effective area
- Bench range (spring range) in bar
- Actuator version and fail-safe action



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