

Type 3271 Pneumatic Actuator

Actuator area: 1000 cm²



Translation of original instructions

Type 3271 Pneumatic Actuator

Mounting and Operating Instructions

EB 8310-2 EN

Edition September 2016

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

- For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- If you have any questions about these instructions, contact SAMSON's After-sales Service Department (aftersaleservice@samson.de).



The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website (www.samson.de) > Product documentation. You can enter the document number or type number in the [Find:] field to look for a document.

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	Safety instructions and measures	5
1.1	Notes on possible severe personal injury	7
1.2	Notes on possible personal injury	7
1.3	Notes on possible property damage	8
2	Markings on the device	9
2.1	Actuator nameplate	9
3	Design and principle of operation	10
3.1	Direction of action	11
3.2	Signal pressure routing	11
3.3	Fail-safe action	11
3.3.1	Version with direction of action "actuator stem extends" (FA)	11
3.3.2	Version with direction of action "actuator stem retracts" (FE)	11
3.4	Versions	12
3.5	Technical data	12
4	Measures for preparation	14
4.1	Unpacking	14
4.2	Transporting and lifting	14
4.2.1	Transporting	15
4.2.2	Lifting	15
4.3	Storage	17
4.4	Preparation for installation	18
5	Mounting and start-up	19
5.1	Mounting the actuator onto the valve	19
5.2	Preloading the springs	21
5.2.1	Tensioning the springs	21
5.2.2	Increasing the actuator thrust	22
5.2.3	Adapting the travel range	22
6	Operation	24
6.1	Throttling service	24
6.2	On/off service	24
6.3	Reversal of the direction of action	25
6.3.1	Reversal of the direction of action from stem extends to stem retracts	25

6.3.2	Reversal of the direction of action from stem retracts to stem extends	26
6.4	Adjusting the travel stop	28
6.4.1	Bottom travel stop (minimum travel)	28
6.4.2	Top travel stop (maximum travel)	28
7	Servicing	29
7.1	Replacing the diaphragm	30
7.2	Replacing the actuator stem seals	32
7.3	Preparation for return shipment.....	34
7.4	Ordering spare parts and operating supplies	34
8	Malfunctions	35
9	Decommissioning and disassembly	36
9.1	Decommissioning.....	36
9.2	Removing the actuator from the valve	36
9.3	Relieving the spring compression in the actuator.....	36
9.4	Disposal.....	36
10	Annex	38
10.1	After-sales service	38
10.2	Spare parts	38

1 Safety instructions and measures

Intended use

The SAMSON Type 3271 Actuator is designed for operating a mounted globe valve. In combination with the valve, the actuator is used to shut off the flow of liquids, gases or vapors in the pipeline. Depending on the version, the actuator is suitable for throttling or on/off service. The actuator can be used in processing and industrial plants.

The actuator is designed to operate under exactly defined conditions (e.g. thrust, travel). Therefore, operators must ensure that the actuator is only used in applications that meet the specifications used for sizing the actuator at the ordering stage. In case operators intend to use the actuator in other applications or conditions than specified, contact SAMSON.

SAMSON does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

→ Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse

The actuator is not suitable for the following applications:

- Use outside the limits defined during sizing and in the technical data
- Use outside the limits defined by the accessories mounted on the actuator

Furthermore, the following activities do not comply with the intended use:

- Use of non-original spare parts
- Performing service and repair work not described in these instructions

Qualifications of operating personnel

The actuator must be mounted, started up, serviced, and repaired by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. 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 hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Personal protective equipment

We recommend wearing the following personal protective equipment when handling the Type 3271 Pneumatic Actuator:

- Protective gloves when mounting or removing the actuator
- ➔ Check with the plant operator for details on further protective equipment.

Revisions and other modifications

Revisions, conversions or other modifications to the product are not authorized by SAMSON. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Safety devices

The Type 3271 Actuator does not have any special safety equipment.

Warning against residual hazards

To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the actuator by the process medium, the operating pressure, the signal pressure or by moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions, especially for installation, start-up, and service work.

Responsibilities of the operator

The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions as well as the referenced documents to the operating personnel and to instruct them in proper operation. Furthermore, the operator must ensure that operating personnel or third persons are not exposed to any danger.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the referenced documents and observe the hazard statements, warning and caution notes specified in them. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Referenced standards and regulations

According to the ignition risk assessment performed in accordance with EN 13463-1:2009, section 5.2, the non-electrical actuators do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 2014/34/EU.

- For connection to the equipotential bonding system, observe the requirements specified in section 6.4 of EN 60079-14 (VDE 0165 Part 1).

Referenced documentation

The following documents apply in addition to these mounting and operating instructions:

- Mounting and operating instructions for the mounted valve
- Mounting and operating instructions for mounted valve accessories (positioner, solenoid valve etc.)
- Safety Manual ► SH 8310 for use in safety-instrumented systems
- ► AB 0100 for tools, tightening torques, and lubricant

1.1 Notes on possible severe personal injury

DANGER

Risk of bursting in the actuator.

Actuators are pressurized. Improper opening can lead to actuator components bursting.

- Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

1.2 Notes on possible personal injury

WARNING

Crush hazard arising from moving parts.

The actuator contains moving parts (actuator stem), which can injure hands or fingers if inserted into the actuator.

- Do not insert hands or fingers into the yoke while the valve is in operation.
- While working on the actuator, disconnect and lock the pneumatic air supply as well as the control signal.

WARNING

Risk of personal injury when the actuator vents.

While the valve is operating, the actuator may vent during closed-loop control or when the valve opens or closes.

- Install the control valve in such a way that the actuator does not vent at eye level.
- Use suitable silencers and vent plugs.
- Wear eye protection when working in close proximity to the control valve.

Risk of personal injury due to preloaded springs.

Actuators with preloaded springs are under tension. They can be identified by the long bolts protruding from the bottom of the actuator.

- Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

1.3 Notes on possible property damage

NOTICE

Risk of actuator damage due to incorrectly attached slings.

- Do not attach load-bearing slings to the handwheel or travel stop.

Risk of actuator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are not tightened far enough may loosen.

- Observe the specified tightening torques (▶ AB 0100).

Risk of actuator damage due to the use of unsuitable tools.

Certain tools are required to work on the actuator.

- Only use tools approved by SAMSON (▶ AB 0100).

Risk of actuator damage due to the use of unsuitable lubricants.




The lubricants to be used depend on the actuator material. Unsuitable lubricants may corrode and damage the valve surface.

- Only use lubricants approved by SAMSON (▶ AB 0100).

2 Markings on the device

2.1 Actuator nameplate

The nameplate is stuck on the diaphragm casing. It includes all details required to identify the device:

- 2 Configuration ID
- 3 Serial number
- 4 Actuator area
- 5 Bench range in bar
- 6 Bench range in psi
- 7 Operating travel in mm
- 8 Operating range in bar
- 9 Operating range in psi
- 10 Permissible supply pressure p_{max} in bar
- 11 Permissible supply pressure p_{max} in psi
- 12 Symbol indicating fail-safe action
 -  Actuator stem extends (FA)
 -  Actuator stem retracts (FE)
 -  Manual override
- 14 Connecting thread
- 15 Diaphragm material
- 16 Date of manufacture

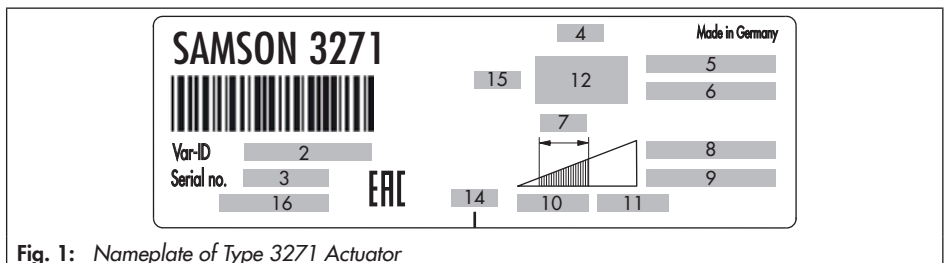


Fig. 1: Nameplate of Type 3271 Actuator

3 Design and principle of operation

The SAMSON Type 3271 Actuator with 1000 cm² actuator area is mounted to Series 240, 250, 280, and 290 Valves (globe valves).

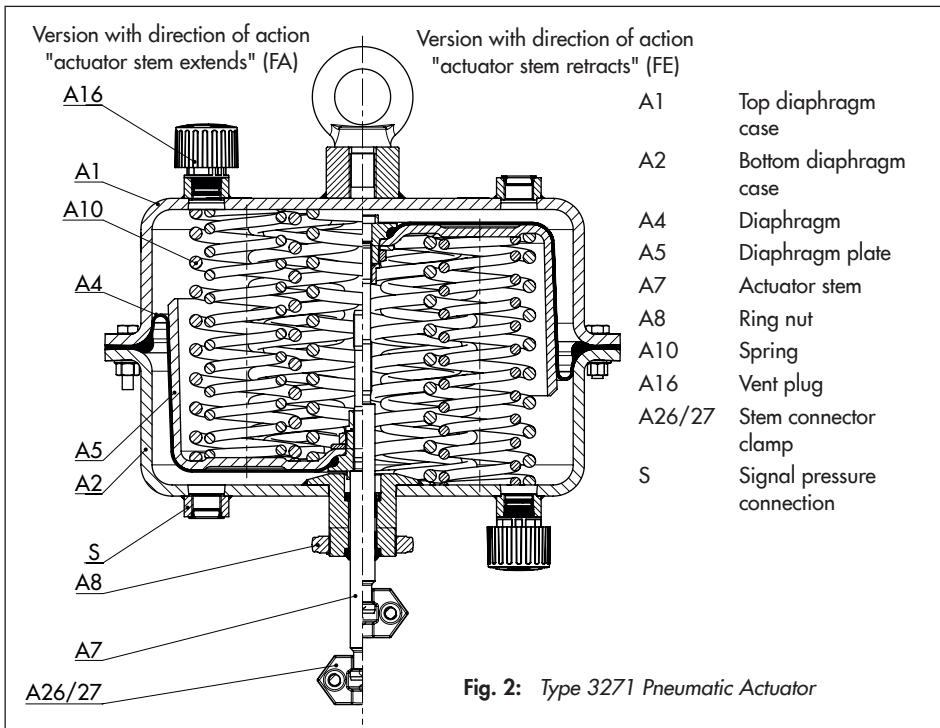
The actuator mainly consists of two diaphragm cases (A1, A2), the diaphragm (A4) with diaphragm plate (A5), and springs (A10) (see Fig. 2).

The signal pressure p_{st} creates the force $F = p_{st} \cdot A$ at the diaphragm surface A which is opposed by the springs (A10) 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 direction of action of the actuator stem (A7) depends on how the springs are installed in the actuator.

A maximum of 13 springs, partly fitted into one another, can be installed in the actuator.

The stem connector clamps (A26/27) connect the actuator stem (A7) with the plug stem of the globe valve.



3.1 Direction of action

The direction of action is determined by how the springs (A10) and diaphragm plate (A5) are arranged in the actuator.

With direction of action "actuator stem extends", the compressed air is applied to the signal pressure connection on the bottom diaphragm case.

With direction of action "actuator stem retracts", the compressed air is applied to the signal pressure connection on the top diaphragm case.

The actuator's direction of action can be reversed (see section 6.3).

3.2 Signal pressure routing

In the "actuator stem extends" version, the signal pressure is routed through the bottom signal pressure connection (S) to the bottom diaphragm chamber and moves the actuator stem (A7) upward opposing the spring force (see Fig. 2, left).

In the "actuator stem retracts" version, the signal pressure is routed through the top signal pressure connection (S) to the top diaphragm chamber and moves the actuator stem (A7) downward opposing the spring force (see Fig. 2, right).

3.3 Fail-safe action

When the signal pressure is reduced or the control signal fails, the fail-safe position of the control valve depends on whether the springs are installed in the top or bottom diaphragm chamber.

i Note

The listed fail-safe actions apply to SAMSON Series 240, 250, 280 and 290 Valves (globe valves).

3.3.1 Version with direction of action "actuator stem extends" (FA)

When the signal pressure is reduced or the control signal fails, the springs move the actuator stem downward and close the globe valve. The valve opens when the signal pressure is increased enough to overcome the spring force.

3.3.2 Version with direction of action "actuator stem retracts" (FE)

When the signal pressure is reduced or the control signal 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 spring force.

3.4 Versions

Type 3271 Pneumatic Actuator with 1000 cm²:

- **Standard version**
The top and bottom diaphragm cases are made of painted sheet steel.
- **Travel stop**
The actuator as a special version can be fitted with a mechanically adjustable travel stop. The travel is reduced by up to 50 % in both directions of action (stem extends or retracts).
- **Side-mounted handwheel**
The actuator can be combined with a Type 3273 Side-mounted Handwheel with max. 60 mm travel (▶ T 8312).

3.5 Technical data

The nameplate provides information on the actuator version (see section 2.1).

i Note

More information is available in Data Sheet ▶ T 8310-2.

Temperature range

The permissible temperature range depends on the diaphragm material (NBR) and is between -35 and +90 °C (-31 and +194 °F) for throttling service. In on/off service, the lowest temperature restricted to -20 °C (-4 °F).

Supply pressure

The maximum permissible supply pressure is 6 bar in throttling service. See section 6.2 for restrictions in on/off service.

Accessories

The pneumatic actuators with 1000 cm² actuator area have a female thread on the top diaphragm case to allow an eyebolt or swivel lifting hook to be screwed into it. The eyebolt can be used to vertically lift the actuator and is included in the scope of delivery. The swivel lifting hook is designed for setting a control valve assembly upright or for lifting the actuator without valve. The swivel lifting hook can be ordered (accessories).

Actuator area	Item no.	
	Eyebolt (DIN 580)	Swivel lifting hook
1000 cm ²	8322-0135	8442-1018

Compliance

The Type 3271 Pneumatic Actuator bears the EAC mark of conformity.

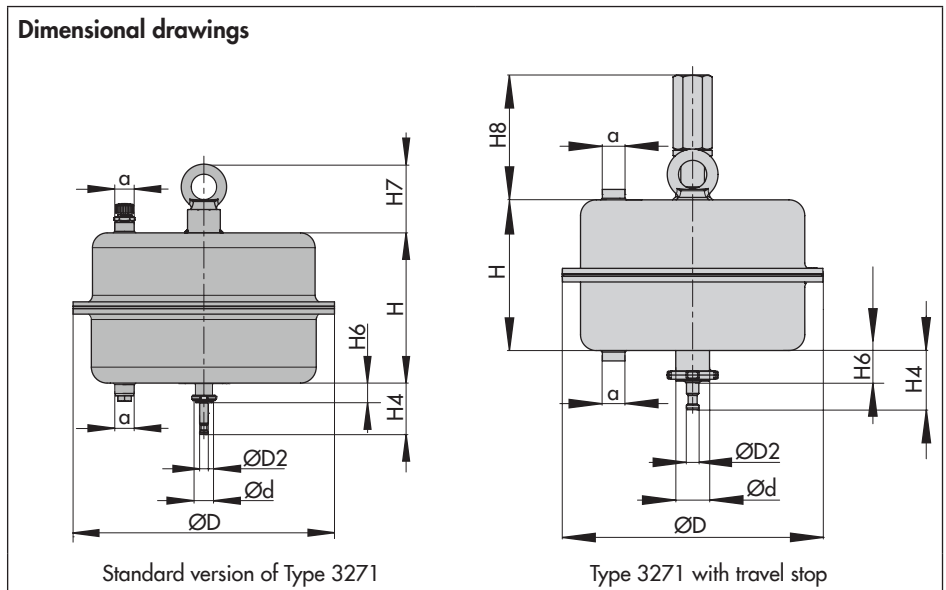


Table 1: Dimensions in mm and weights in kg

Actuator	Type	3271
Actuator area	cm ²	1000
Height	H	313
	H4 _{rated} FA	165
	H4 _{max} FA	169
	H4 _{max} FE	185
	H7 ¹⁾	90
Travel limitation	H8	220
Diameter	∅D	462
	∅D2	22
∅d (thread)		M60 x 1.5
Air connection	a	G 3/4/3/4 NPT
Weight		80

1) Height with welded-on lifting eyelet or height of eyebolt according to DIN 580. Height of the swivel lifting hook may differ.

Dimensional drawings



4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received against the delivery note.
2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).

4.1 Unpacking

Note

Do not remove the packaging until immediately before mounting.

Proceed as follows to lift and mount the actuator:

1. Remove the packaging from the actuator.
2. Dispose of the packaging in accordance with the valid regulations.

4.2 Transporting and lifting

DANGER

*Hazard due to suspended loads falling.
Stay clear of suspended or moving loads.*

WARNING

Risk of lifting equipment tipping and risk of damage to lifting accessories due to exceeding the rated lifting capacity.

- Only use approved lifting equipment and accessories whose minimum lifting capacity is higher than the weight of the actuator.
- Refer to section 3.5 for weights.

NOTICE

Risk of actuator damage due to incorrectly attached slings.

- The welded-on lifting eyelet, eyebolt or swivel lifting hook on the top diaphragm case is intended for mounting and removing the actuator as well as lifting the actuator without valve. Do not lift the entire control valve assembly using the lifting eyelet, eyebolt or swivel lifting hook.
- Do not attach load-bearing slings to the travel stop.
- Observe lifting instructions (see section 4.2.2).

Tip

SAMSON's After-sales Service department can provide more detailed transport and lifting instructions on request.

4.2.1 Transporting

The actuator can be transported using lifting equipment (e.g. crane or forklift).

- Leave the actuator in its transport container or on the pallet to transport it.
- Observe the transport instructions.

Transport instructions

- Protect the actuator against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the actuator against moisture and dirt.
- Observe permissible temperatures (see section 3.5).

4.2.2 Lifting

To mount a large actuator, use lifting equipment (e.g. crane or forklift) to lift it.

Lifting instructions

- Secure slings against slipping.
- Make sure the slings can be removed from the actuator once it has been mounted onto the valve.
- Prevent the actuator from tilting or tipping.
- Do not leave loads suspended when interrupting work for longer periods of time.
- Make sure that the additional sling between the lifting eyelet, eyebolt or swivel lifting hook and the rigging equipment (hook, shackle etc.) does not bear any load when lifting control valves larger than DN 150 with the actuator already mounted. The sling only protects the control valve from tilting while being lifted. Before lifting the control valve, tighten the sling. The slings attached to the valve body must bear the entire load (see Fig. 4).

Lifting the actuator (without valve)

NOTICE

Risk of actuator damage due to incorrectly attached slings.

The welded-on lifting eyelet, eyebolt or swivel lifting hook on the top diaphragm case is intended for mounting and removing the actuator as well as lifting the actuator without valve. Do not lift the entire control valve assembly using the lifting eyelet, eyebolt or swivel lifting hook.

1. Attach a sling to the lifting eyelet, eyebolt or swivel lifting hook of the actuator and to the rigging equipment (e.g. hook) of the crane or forklift (see Fig. 3).
2. Carefully lift the actuator. Check whether the lifting equipment and accessories can bear the weight.
3. Move the actuator at an even pace to the mounting site.
4. Mount the actuator to the valve. See section 5.1.
5. Remove slings after mounting.

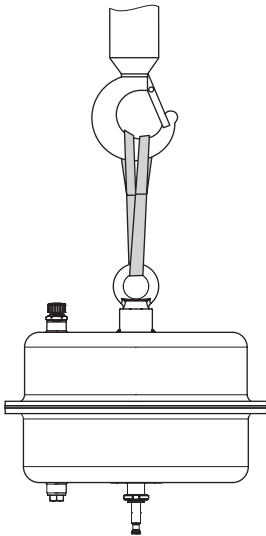


Fig. 3: Lifting point on the actuator

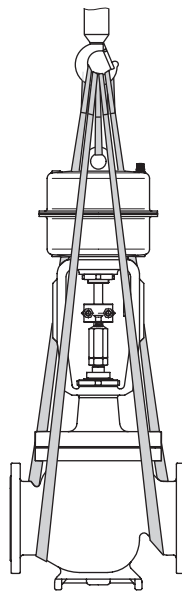


Fig. 4: Lifting points on the control valve (example)

**Tip**

We recommend using a hook with safety latch (see Fig. 3). The safety latch prevents the slings from slipping during lifting and transporting.

Lifting the entire control valve assembly

A swivel lifting hook can be screwed into versions with a female thread on the top diaphragm case (see section 3.5 on Accessories). The swivel lifting hook is designed for setting a control valve assembly upright.

→ See associated valve documentation for instructions on how to lift a control valve.

4.3 Storage**NOTICE**

Risk of actuator damage due to improper storage.

- Observe storage instructions.
- Avoid long storage times.
- Contact SAMSON in case of different storage conditions or long storage periods.

Note

We recommend regularly checking the actuator and the prevailing storage conditions during long storage times.

Storage instructions

- When the valve and actuator are already assembled, observe the storage conditions for control valves. See associated valve documentation.
- Protect the actuator against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the actuator against moisture and dirt. Store it at a relative humidity of less than 75 %. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
- Make sure that the ambient air is free of acids or other corrosive media.
- Observe permissible temperatures (see section 3.5).
- Do not place any objects on the actuator.

Special storage instructions for elastomers

Elastomer, e.g. actuator diaphragm

- To keep elastomers in shape and to prevent cracking, do not bend them or hang them up.
- We recommend a storage temperature of 15 °C for elastomers.
- Store elastomers away from lubricants, chemicals, solutions, and fuels.

**Tip**

SAMSON's After-sales Service department can provide more detailed storage instructions on request.

4.4 Preparation for installation

Proceed as follows:

- Check the actuator for damage.
- Check to make sure that the type designation, material and temperature range of the actuator match the ambient conditions (temperatures etc.).
- Check the pressure gauge installed on valve accessories to make sure it functions.
- When the valve and actuator are already assembled, check the tightening torques of the bolted joints (▶ AB 0100). Components may loosen during transport.

5 Mounting and start-up

SAMSON control valves are delivered ready for use. In special cases, the valve and actuator are delivered separately and must be assembled on site. The procedure to mount and start up the actuator are described in following.

NOTICE

Risk of actuator damage due to excessively high or low tightening torques. Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are not tightened far enough may loosen.

Observe the specified tightening torques (▶ AB 0100).

NOTICE

Risk of actuator damage due to the use of unsuitable tools. Only use tools approved by SAMSON (▶ AB 0100).

Note

See associated valve documentation for additional mounting instructions.

5.1 Mounting the actuator onto the valve

Proceed as follows if the valve and actuator have not been assembled by SAMSON:

Note

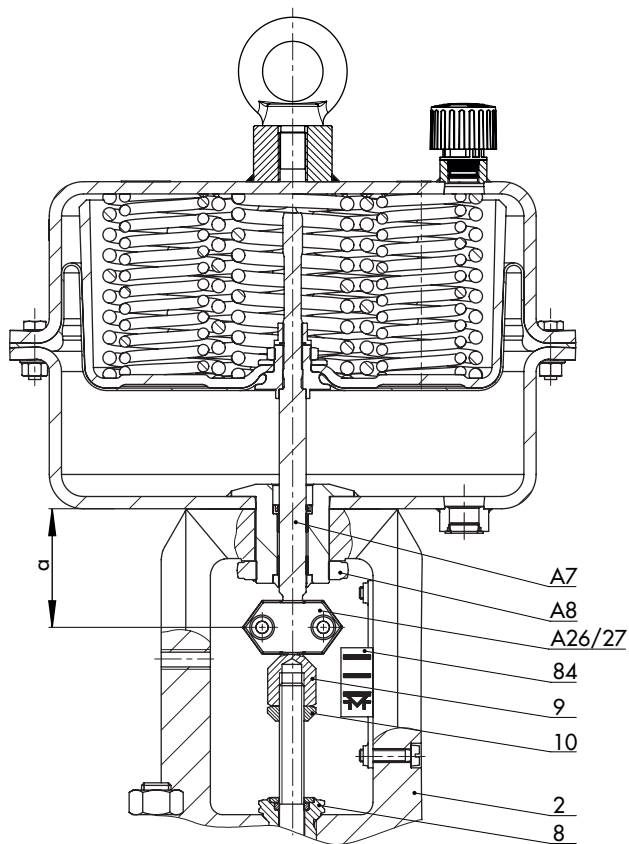
- *Remove the mounted actuator before mounting another actuator (see section 9.2).*
- *Preloading the actuator springs increases the thrust and reduces the travel range of the actuator (see section 5.2).*

Tip

The valve and actuator are assembled with special attention paid to the actuator's bench range and direction of action. These details are specified on the actuator nameplate (see section 2.1).

1. Loosen the lock nut (10) and stem connector nut (9) on the valve.
2. Press the plug together with the plug stem firmly into the seat ring.
3. Thread down the lock nut and stem connector nut.
4. Remove the clamps of the stem connector (A26) and the ring nut (A8) from the actuator.
5. Slide the ring nut over the plug stem.
6. Place the actuator onto the valve bonnet (2) and secure it with the ring nut.
7. Determine the lower and upper signal pressure range values:

The lower signal pressure range value is the same as the minimum value of the bench range or operating range (with preloaded springs).



- | | | | |
|----|------------------------|-------------|-----------------------|
| 2 | Bonnet/flange | A7 | Actuator stem |
| 8 | Threaded bushing | A8 | Ring nut |
| 9 | Stem connector nut | A26/27 | Stem connector clamps |
| 10 | Lock nut | Dimension A | Refer to Table 2 |
| 84 | Travel indicator scale | | |

Fig. 5: Type 3271 Pneumatic Actuator mounted on globe valve

The upper signal pressure range value is the same as the maximum value of the bench range or operating range (with preloaded springs).

For actuator springs that are to be preloaded subsequently, determine the upper and lower signal pressure range as described in section 5.2.

8. Depending on the direction of action:

Actuator stem extends

Apply a signal pressure that corresponds to the lower signal pressure range value to the connection on the bottom diaphragm chamber.

Actuator stem retracts

Apply a signal pressure that corresponds to the upper signal pressure range value to the connection on the top diaphragm chamber.

9. Screw on the stem connector nut (9) by hand until it touches the actuator stem (A7).
10. Turn the stem connector nut a further quarter turn and secure this position with the lock nut (10).
11. Position clamps of the stem connector (A26) and screw them tight.
12. Make sure that the dimension a is adjusted as specified in Table 2.
13. Align the travel indicator (84) with the tip of the stem connector clamp.

5.2 Preloading the springs

By preloading the springs in the actuator, the following can be achieved:

- The thrust is increased (only actuators with "stem extends")
- In combination with a SAMSON valve: the actuator travel range can be adapted to a smaller valve travel range

i Note

Actuators that have already been preloaded by SAMSON without mounting the valve are labeled correspondingly.

Additionally, they can be identified by the longer bolts with nuts protruding from the bottom diaphragm case. They allow the spring compression to be relieved evenly when disassembling the actuator (see section 9.3).

5.2.1 Tensioning the springs

! NOTICE

Risk of actuator damage due to the springs being tensioned unevenly.

- *Distribute clamping bolts and nuts evenly around the circumference.*
 - *Tighten the nuts gradually in a crisscross pattern.*
-

1. Distribute the long bolts (A22) evenly around the circumference.
2. Screw the long nuts (A23) together with one washer (A25) onto the clamping bolts (A22) until they rest on the bottom diaphragm case (A2).
3. To tension the springs evenly, tighten the nuts (A23) gradually in a crisscross pat-

tern until both diaphragm cases (A1, A2) rest on the diaphragm (A4). Hold the bolt head stationary with a suitable tool and apply the tightening torque to the nuts. Observe tightening torques.

4. Insert the short bolts (A20) through the intended holes on the diaphragm cases (A1, A2).
5. Screw the short nuts (A21) with washers (A25) onto the bolts (A20). Observe tightening torques.

5.2.2 Increasing the actuator thrust

The thrust can only be increased in actuators with "stem extends" direction of action. To achieve this, the springs of the actuators can be preloaded by up to 25 % of their travel or bench range.

Example: Preloading is required for a bench range of 0.4 to 2 bar. 25 % of this span corresponds to 0.4 bar. Therefore, the signal pressure range is shifted by 0.4 bar to 0.8 to 2.4 bar. The new lower signal pressure

range value is 0.8 bar and the new upper signal pressure range value 2.4 bar.

- Write the new signal pressure range of 0.8 to 2.4 bar on the actuator nameplate as the operating range with preloaded springs.

5.2.3 Adapting the travel range

In some cases, the valve and actuator have different rated travels. Depending on the direction of action, proceed as follows:

Direction of action: actuator stem extends

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 1000 cm² actuator with 60 mm rated travel; 0.4 to 2 bar bench range.

The signal pressure for half of the actuator travel (30 mm) is 1.2 bar. Adding it to the lower signal pressure range value of 0.4 bar results in a signal pressure of 1.6 bar required for preloading the springs. The new

Table 2: Values for dimension a (see Fig. 5)

Travel in mm	Dimension a in mm
0 (0 %)	165
60 (100 %)	105
75 (125 %)	90
Min. (stem extends)	85
Min. (stem retracts)	100
Max. (stem extends)	169
Max. (stem retracts)	185

lower signal range value is 1.6 bar and the new upper signal range value 2.4 bar.

- Write the new signal pressure range of 1.6 to 2.4 bar on the actuator nameplate as the operating range with preloaded springs.

Direction of action: actuator stem retracts

The springs of actuators with "stem retracts" action cannot be preloaded. When a SAMSON valve is combined with an oversized actuator (e.g. the rated travel of the actuator is larger than the rated travel of the valve), only the first half of the actuator's bench range can be used.

Example: DN 100 valve with 30 mm rated travel and 1000 cm² actuator with 60 mm rated travel; 0.2 to 1 bar bench range.

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

6 Operation

⚠ WARNING

Crush hazard arising from moving parts. The actuator contains moving parts (actuator stem), which can injure hands or fingers if inserted into the actuator.

- Do not insert hands or fingers into the yoke while the valve is in operation.
- While working on the actuator, disconnect and lock the pneumatic air supply as well as the control signal.

⚠ WARNING

Risk of personal injury when the actuator vents.

Wear eye protection when working in close proximity to the control valve.

ⓘ NOTICE

Operating disturbed by a blocked actuator stem.

Do not impede the movement of the actuator stem by inserting objects into its path.

6.1 Throttling service

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

6.2 On/off service

In on/off service, the supply pressure must be limited depending on the bench range or operating range of the actuator. The applicable bench range or operating range which the actuator can move through is written on the nameplate (see section 2.1).

Actuator stem retracts (FE)

For the direction of action "actuator stem retracts (FE)", the permissible supply pressure must not exceed the upper bench range value by more than 3 bar:

Bench range	Fail-safe action	Max. supply pressure
0.2 to 1.0 bar	Actuator stem retracts	4 bar
0.4 to 2.0 bar		5 bar
0.6 to 3.0 bar		6 bar

Actuator stem extends (FA)

With fail-safe action "actuator stem extends" and travel stop, the supply pressure must not exceed the upper spring range value by more than 1.5 bar.

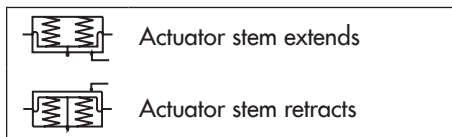
Additional points that apply concerning operation:

- ➔ Label actuator with reduced supply pressure with a sticker ("Max. supply pressure limited to ... bar").
- ➔ Only apply the signal pressure to the signal pressure connection (S) on the diaphragm chamber of the actuator which does not contain any springs (see Fig. 2).

→ Only use vent plugs that let air through them (A16 in Fig. 2).

6.3 Reversal of the direction of action

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



⚠ DANGER

Risk of bursting in the actuator. Actuators are pressurized. Improper opening can lead to actuator components bursting. Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

⚠ WARNING

Risk of personal injury due to preloaded springs. Actuators with preloaded springs are under tension. They can be identified by three long bolts protruding from the bottom of the actuator. Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

ⓘ NOTICE

Risk of malfunction due to incorrect details on the nameplate after the reversal of the direction of action.

After reversal, the symbol and configuration ID on the nameplate are no longer valid.

Contact SAMSON to request a new nameplate.

6.3.1 Reversal of the direction of action from stem extends to stem retracts

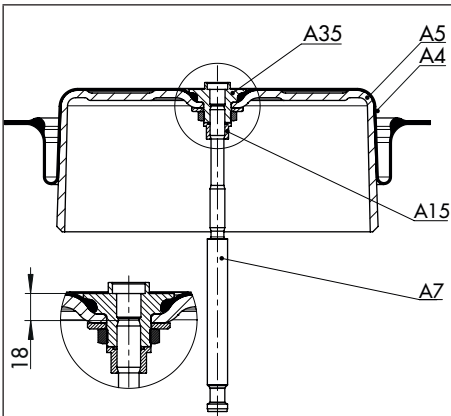
1. Lift the actuator off the valve. See section 9.2.
2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
3. Relieve the spring compression of actuators with preloaded springs (see section 9.3).
4. Lift off the top diaphragm case (A1) and remove springs (A10).
5. Pull the diaphragm plate assembly out of the actuator.
6. Clamp the bottom section of the actuator stem (A7) into a vise using protective jaws. Make sure that the actuator stem is not damaged.
7. Unscrew the collar nut (A15).
8. Unscrew the actuator stem out of the compressor (A35).
9. Screw the collar nut (A15) with the collar facing upward at least 20 mm onto the actuator stem (A7).

10. Screw the actuator stem (A7) the other way round into the compressor (A35). Adjust the dimension to 18 mm (see Fig. 6).
11. Screw the collar nut (A15) against the compressor (A35). Observe tightening torques.
12. Apply a suitable lubricant to the actuator stem (A7).
13. Clamp the top diaphragm case (A1) with the opening facing upward into a suitable clamping fixture.
14. Place the diaphragm plate assembly together with the actuator stem (A7) pointing upward into the diaphragm case (A1).

15. Place the springs (A10) in the diaphragm plate (A5), centering them in the intended recesses.
16. Carefully guide the bottom diaphragm case (A2) over the actuator stem (A7) and place it on the springs (A10). Make sure that the sealing elements are not damaged. Ensure that the compressed air connections on the cases (A1, A2) are correctly aligned with each other.
17. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
18. Unscrew the vent plug (A16) from the top signal pressure connection and screw it into the bottom connection (S).

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 top connection (S) on the top diaphragm case. As a result, the actuator stem extends opposing the spring force as the signal pressure increases.

19. Affix a new nameplate with changed symbol and new configuration ID to the actuator.



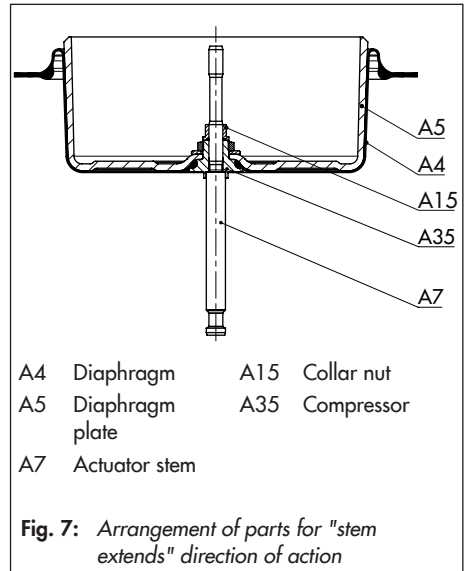
A4	Diaphragm	A15	Collar nut
A5	Diaphragm plate	A35	Compressor
A7	Actuator stem		

Fig. 6: Arrangement of parts for "stem retracts" direction of action

6.3.2 Reversal of the direction of action from stem retracts to stem extends

1. Lift the actuator off the valve. See section 9.2.

2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
3. Lift off the top diaphragm case (A1).
4. Pull the diaphragm plate assembly out of the bottom diaphragm case (A2).
5. Loosen the collar nut (A15).
6. Loosen the compressor (A35)
7. Unscrew the actuator stem (A7) out of the compressor (A35).
8. Unscrew the collar nut (A15) from the actuator stem (A7).
9. Take the springs (A10) out of the bottom diaphragm case (A2).
10. Screw the actuator stem (A7) the other way round into the compressor (A35).
11. Clamp the bottom section of the actuator stem (A7) into a vise using protective jaws. Make sure that the actuator stem is not damaged.
12. Screw the collar nut (A15) with the collar facing downward completely onto the actuator stem (A7) and tighten it against the compressor (A35). Observe tightening torques.
13. Apply a suitable lubricant to the actuator stem (A7).
14. Place the diaphragm plate assembly together with the actuator stem (A7) pointing downward into the bottom diaphragm case (A2). Make sure that the sealing elements are not damaged.
15. Place the springs (A10) into the bottom diaphragm case, centering them in the intended recesses.



16. Place on the top diaphragm case (A1).
17. If necessary, preload the springs (see section 5.2).
18. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
19. Unscrew the vent plug (A16) from the bottom signal pressure connection and screw it into the top connection (S). 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 bottom connection (S) on the bottom diaphragm case. As a result, the actuator stem retracts opposing the spring force as the signal pressure increases.

20. Affix a new nameplate with changed symbol and new configuration ID to the actuator.

6.4 Adjusting the travel stop

In the version with travel stop, the maximum and minimum actuator travel can be limited as follows:

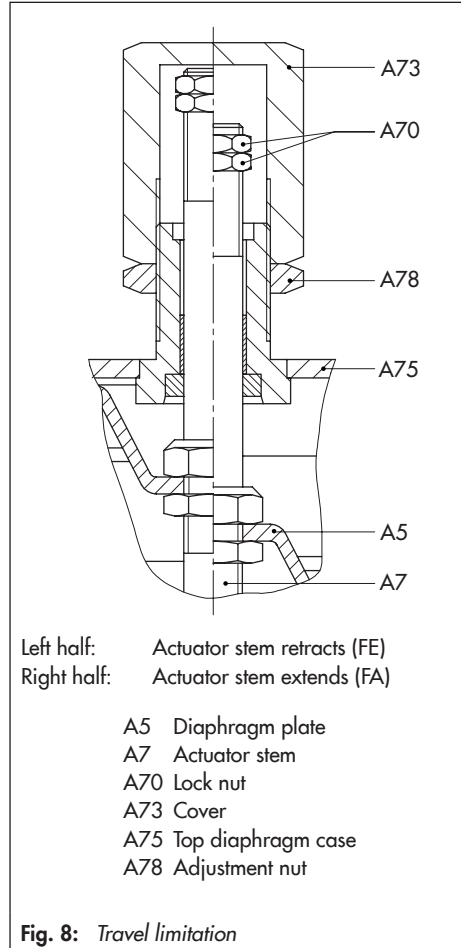
Direction of action	Min. stop	Max. stop
Stem extends (FA)	0 to 125 %	33 to 125 %
Stem retracts (FE)	0 to 100 %	33 to 100 %

6.4.1 Bottom travel stop (minimum travel)

1. Loosen top lock nut (A70) and unscrew cover (A73).
2. Loosen bottom lock nut (A70) and turn the adjustment nut (A78) to adjust the travel stop.
3. Tighten bottom lock nut (A70).
4. Attach the cover (A73) and retighten the lock nut (A70).

6.4.2 Top travel stop (maximum travel)

1. Loosen top lock nut (A70).
2. Adjust the cover (A73) to the required travel stop.
3. Retighten top lock nut (A70).



7 Servicing

⚠ DANGER

Risk of bursting in the actuator.

Actuators are pressurized. Improper opening can lead to actuator components bursting.

Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

⚠ WARNING

Risk of personal injury due to preloaded springs.

Actuators with preloaded springs are under tension. They can be identified by three long bolts protruding from the bottom of the actuator.

Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

ⓘ NOTICE

Risk of actuator damage due to incorrect service or repair.

- Do not perform any service or repair work other than the activities described in this section on your own. Contact SAMSON's After-sales Service department.*
- Service and repair work must only be performed by staff trained for this purpose.*

ⓘ NOTICE

Risk of actuator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker.

Parts that are not tightened far enough may loosen.

Observe the specified tightening torques

▶ AB 0100).

ⓘ NOTICE

Risk of actuator damage due to the use of unsuitable tools.

Only use tools approved by SAMSON

▶ AB 0100).

ⓘ NOTICE

Risk of actuator damage due to the use of unsuitable lubricants.

Only use lubricants approved by SAMSON

▶ AB 0100).

i Note

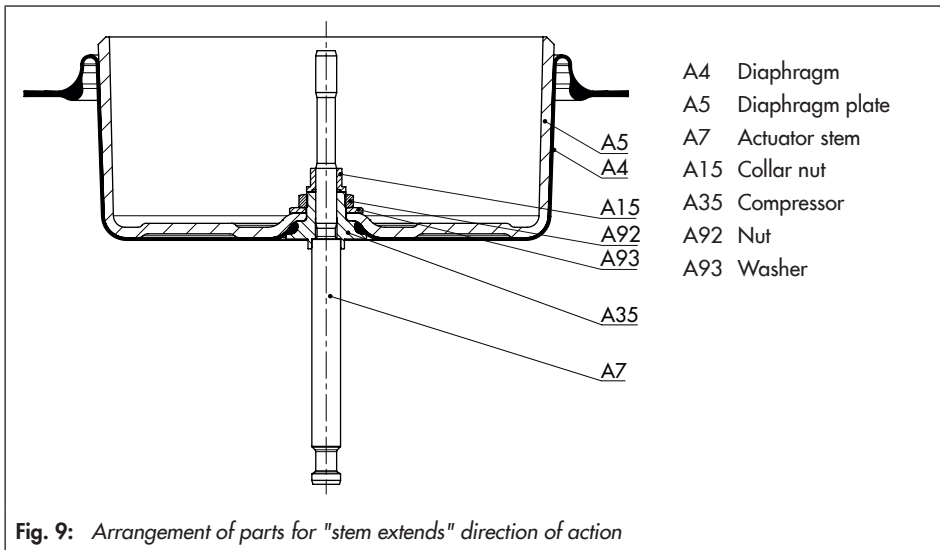
– The product warranty becomes void if service or repair work not described in these instructions is performed without prior agreement by SAMSON's After-sales Service department.

– Only use original spare parts by SAMSON, which comply with the original specifications.

7.1 Replacing the diaphragm

Version with direction of action "actuator stem extends" (FA)

1. Lift the actuator off the valve. See section 9.2.
2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
3. Relieve the spring compression of actuators with preloaded springs (see section 9.3).
4. Lift off the top diaphragm case (A1) and remove springs (A10).
5. Pull the diaphragm plate assembly out of the actuator.
6. Clamp the bottom section of the actuator stem (A7) into a vise using protective jaws. Make sure that the actuator stem is not damaged.
7. Unscrew the collar nut (A15).
8. Unscrew the actuator stem out of the compressor (A35).
9. Loosen the nut (A92) and remove it together with the washer (A93) from the compressor (A35).
10. Take the compressor (A35) and diaphragm (A4) off the diaphragm plate (A5).
11. Mount the new diaphragm (A4) on the compressor (A35). Make sure that the seal lip of the diaphragm is fully engaged into the groove of the compressor.
12. Place the diaphragm (A4) and compressor (A35) into the diaphragm plate (A5).



13. Place the washer (A93) onto the compressor (A35). Tighten the nut (A92). Observe tightening torques.
 14. Screw the actuator stem (A7) into the compressor (A35).
 15. Screw the collar nut (A15) with the collar facing downward completely onto the actuator stem (A7) and tighten it against the compressor (A35). Observe tightening torques.
 16. Apply a suitable lubricant to the actuator stem (A7).
 17. Place the diaphragm plate assembly together with the actuator stem (A7) pointing downward into the bottom diaphragm case (A2). Make sure that the sealing elements are not damaged.
 18. Place the springs (A10) into the bottom diaphragm case, centering them in the intended recesses.
 19. Place on the top diaphragm case (A1).
 20. If necessary, preload the springs (see section 5.2).
 21. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
 22. Mount the actuator on the valve (see section 5.1).
- Version with direction of action "actuator stem retracts" (FE)**
1. Lift the actuator off the valve. See section 9.2.
 2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
 3. Lift off the top diaphragm case (A1).
 4. Pull the diaphragm plate assembly out of the bottom diaphragm case (A2).
 5. Loosen the collar nut (A15).
 6. Loosen the compressor (A35)
 7. Unscrew the actuator stem (A7) out of the compressor (A35).
 8. Unscrew the collar nut (A15) from the actuator stem (A7).
 9. Take the springs (A10) out of the bottom diaphragm case (A2).
 10. Loosen the nut (A92) and remove it together with the washer (A93) from the compressor (A35).
 11. Take the compressor (A35) and diaphragm (A4) off the diaphragm plate (A5).
 12. Mount the new diaphragm (A4) on the compressor (A35). Make sure that the seal lip of the diaphragm is fully engages into the groove of the compressor.
 13. Place the diaphragm (A4) and compressor (A35) into the diaphragm plate (A5).
 14. Place the washer (A93) onto the compressor (A35). Tighten the nut (A92). Observe tightening torques.
 15. Screw the actuator stem (A35) into the actuator stem (A7).
 16. Screw the collar nut (A15) with the collar facing upward at least 20 mm onto the actuator stem (A7).
 17. Screw the actuator stem (A7) the other way round into the compressor (A35).

Adjust the dimension to 18 mm (see Fig. 6).

18. Screw the collar nut (A15) against the compressor (A35). Observe tightening torques.
19. Apply a suitable lubricant to the actuator stem (A7).
20. Clamp the top diaphragm case (A1) with the opening facing upward into a suitable clamping fixture.
21. Place the diaphragm plate assembly together with the actuator stem (A7) pointing upward into the diaphragm case (A1).
22. Place the springs (A10) in the diaphragm plate (A5), centering them in the intended recesses.
23. Carefully guide the bottom diaphragm case (A2) over the actuator stem (A7) and place it on the springs (A10). Make sure that the sealing elements are not damaged. Ensure that the compressed air connections on the cases (A1, A2) are correctly aligned with each other.
24. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
25. Mount the actuator on the valve (see section 5.1).

7.2 Replacing the actuator stem seals

Version with direction of action "actuator stem extends" (FA)

1. Lift the actuator off the valve. See section 9.2.
2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
3. Relieve the spring compression of actuators with preloaded springs (see section 9.3).
4. Lift off the top diaphragm case (A1) and remove springs (A10).
5. Pull the diaphragm plate assembly out of the bottom diaphragm case (A2).
6. Use a suitable punch to remove the radial shaft seal.
7. Apply a suitable sealant and lubricant to the new radial shaft seal (A40).
8. Use a suitable mandrel to mount the radial shaft seal (A40).
9. Renew the dry bearing (A42) and wiper (A41), if necessary.
10. Apply a suitable lubricant to the actuator stem (A7).
11. Place the diaphragm plate assembly together with the actuator stem (A7) pointing downward into the bottom diaphragm case (A2). Make sure that the sealing elements are not damaged.
12. Place the springs (A10) into the bottom diaphragm case, centering them in the intended recesses.

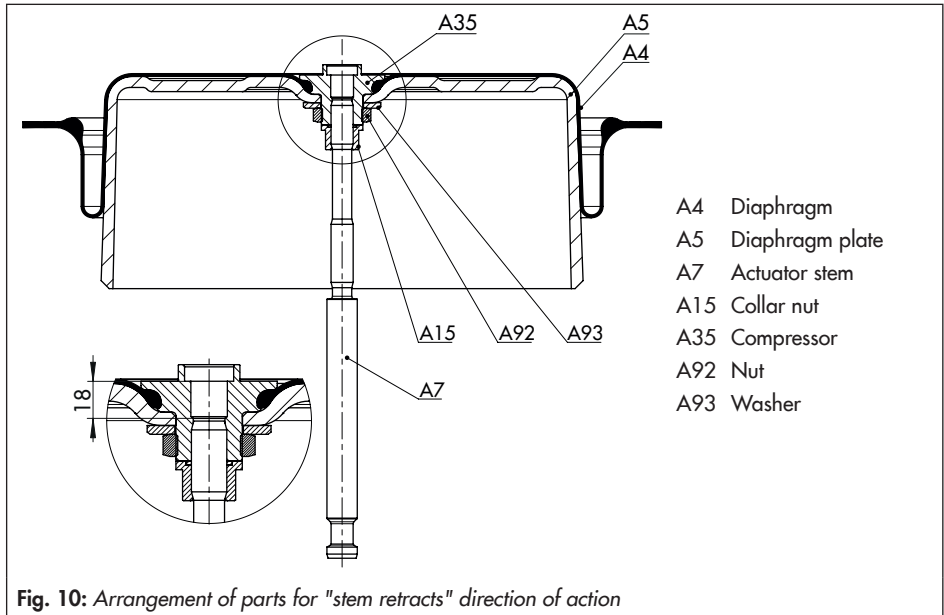


Fig. 10: Arrangement of parts for "stem retracts" direction of action

13. Place on the top diaphragm case (A1).
14. If necessary, preload the springs (see section 5.2).
15. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
16. Mount the actuator on the valve (see section 5.1).

Version with direction of action "actuator stem retracts" (FE)

1. Lift the actuator off the valve. See section 9.2.
2. Unscrew the nuts (A21) and bolts (A20) on the diaphragm case.
3. Lift off the top diaphragm case (A1).
4. Pull the diaphragm plate assembly out of the bottom diaphragm case (A2).
5. Use a suitable punch to remove the radial shaft seal.
6. Apply a suitable sealant and lubricant to the new radial shaft seal (A40).
7. Use a suitable mandrel to mount the radial shaft seal (A40).
8. Renew the dry bearing (A42) and wiper (A41), if necessary.
9. Apply a suitable lubricant to the actuator stem (A7).
10. Clamp the top diaphragm case (A1) into a suitable clamping fixture.

11. Place the diaphragm plate assembly together with the actuator stem (A7) pointing upward into the diaphragm case (A1).
12. Place the springs (A10) in the diaphragm plate (A5), centering them in the intended recesses.
13. Carefully guide the bottom diaphragm case (A2) over the actuator stem (A7) and place it on the springs (A10). Make sure that the sealing elements are not damaged. Ensure that the compressed air connections on the cases (A1, A2) are correctly aligned with each other.
14. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20). Observe tightening torques.
15. Mount the actuator on the valve (see section 5.1).

7.3 Preparation for return shipment

Defective actuators can be returned to SAMSON for repair.

Proceed as follows to return valves to SAMSON:

1. Put the control valve out of operation. See associated valve documentation.
2. Lift the actuator off the valve. See section 9.2.
3. If necessary, relieve the spring compression (see section 9.3).
4. Send the actuator to your nearest SAMSON subsidiary. SAMSON

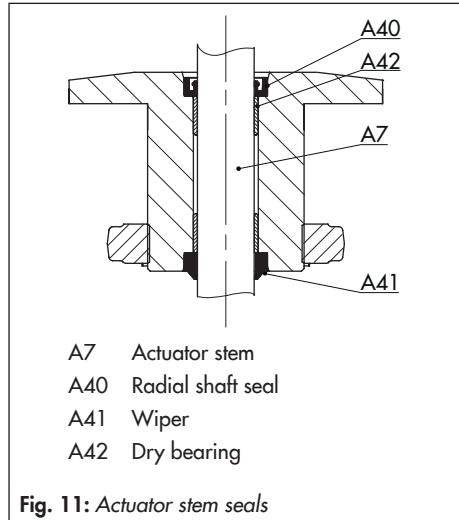


Fig. 11: Actuator stem seals

subsidiaries are listed on our website at
 ► www.samson.de > Contact.

7.4 Ordering spare parts and operating supplies

Contact your nearest SAMSON subsidiary or the SAMSON After-sales Service department for information on spare parts, lubricants, and tools.

Spare parts

See section 10.2 for details on spare parts.

Lubricant

Details on suitable lubricants can be found in the document ► AB 0100.

Tools

Details on suitable tools can be found in the document ► AB 0100.

8 Malfunctions

Depending on the operating conditions, check the actuator at certain intervals to prevent possible failure before it can occur. Operators are responsible for drawing up an inspection plan.

Troubleshooting

Malfunction	Possible reasons	Recommended action
Actuator stem does not move on demand.	Actuator is blocked.	Check attachment. Unblock the actuator.
	Insufficient signal pressure	Check the signal pressure. Check the signal pressure line for leakage.
	Signal pressure not connected to the correct diaphragm chamber.	See section 3.2.
Actuator stem does not stroke through its complete travel range.	Travel stop active	See section 6.4.
	Insufficient signal pressure	Check the signal pressure. Check the signal pressure line for leakage.
	Valve accessories incorrectly set.	Check the actuator without valve accessories. Check the settings of the valve accessories.

9 Decommissioning and disassembly

DANGER

Risk of bursting in the actuator. Actuators are pressurized. Improper opening can lead to actuator components bursting. Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

WARNING

Risk of personal injury due to preloaded springs. Actuators with preloaded springs are under tension. They can be identified by three long bolts protruding from the bottom of the actuator. Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

9.1 Decommissioning

To decommission the actuator for service and repair work or disassembly, proceed as follows:

1. Put the control valve out of operation. See associated valve documentation.
2. Disconnect the pneumatic air supply to depressurize the actuator.

9.2 Removing the actuator from the valve

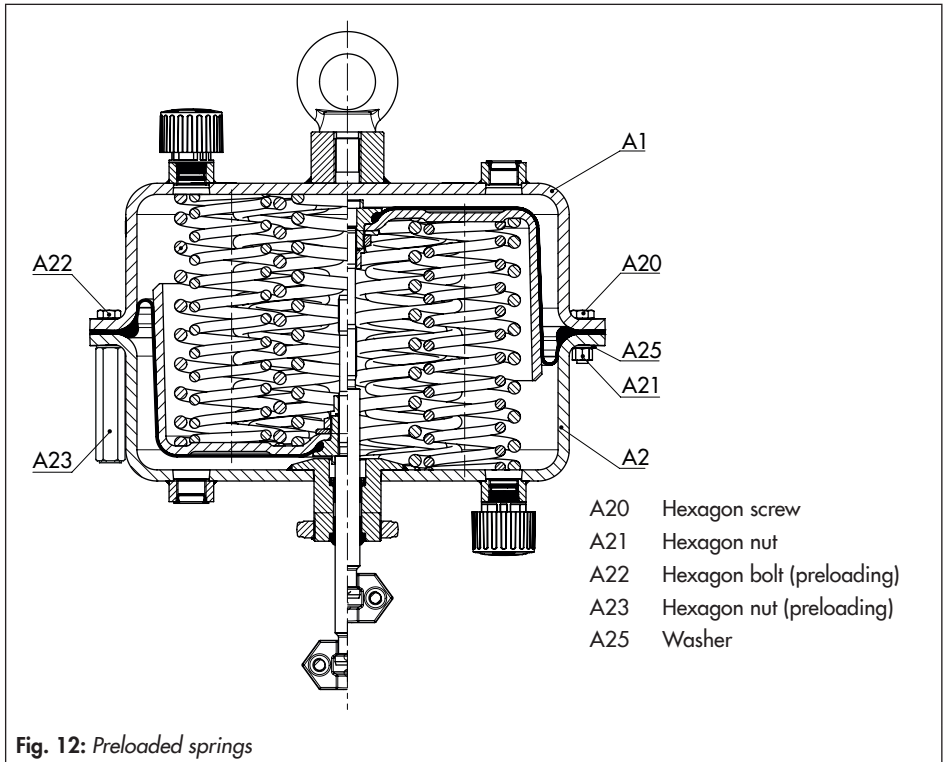
1. Put the control valve out of operation. See associated valve documentation.
2. Undo the clamps of the stem connector (A26/27).
3. Loosen the stem connector nut (9) and lock nut (10).
4. **Removing actuators with "stem extends" action with/without preloaded springs:** to undo the ring nut (A8), apply approx. 50 % signal pressure to open the valve.
5. Unscrew the ring nut on the valve bonnet.
6. Disconnect the signal pressure again.
7. Separate the actuator from the valve by undoing the ring nut.
8. Fasten the lock nut and stem connector nut on the valve.

9.3 Relieving the spring compression in the actuator

1. Undo the short nuts (A21) and bolts (A20) on the diaphragm cases (A1, A2).
2. Undo the the long nuts (A23) and bolts (A22) on the diaphragm cases evenly in a crisscross pattern.

9.4 Disposal

- Observe local, national, and international refuse regulations.



→ Do not dispose of components, lubricants, and hazardous substances together with your other household waste.

10 Annex

10.1 After-sales service

Contact SAMSON's After-sales Service department for support concerning service or repair work or when malfunctions or defects arise.

E-mail

You can reach the After-sales Service Department at aftersaleservice@samson.de.

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website, in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

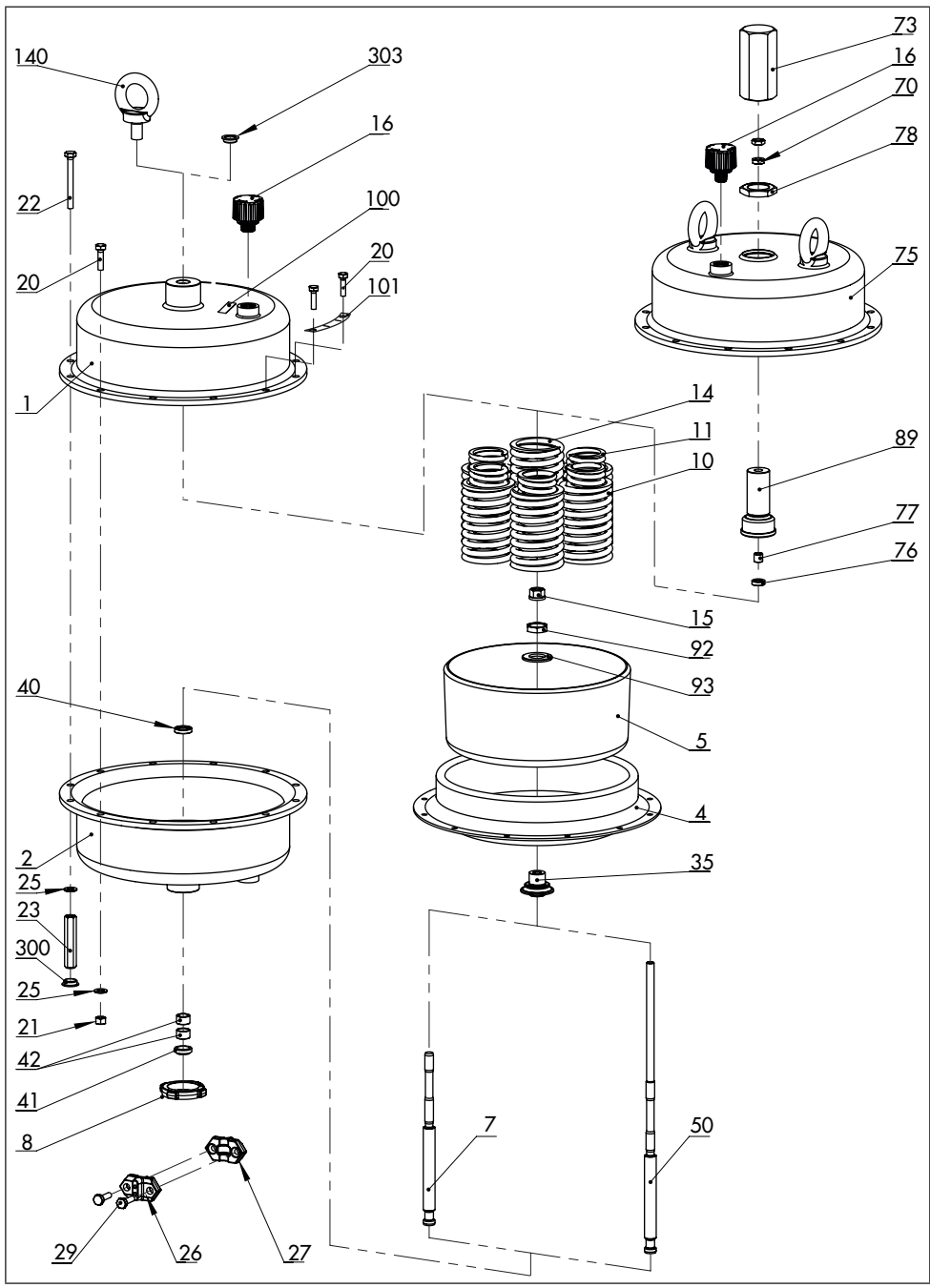
Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, model number, actuator area, travel, direction of action and bench range (e.g. 0.2 to 1 bar) or the operating range of the actuator
- Type designation of mounted valve (if applicable)
- Installation drawing

10.2 Spare parts

- 1 Top diaphragm case
- 2 Bottom diaphragm case
- 4 Diaphragm
- 5 Diaphragm plate
- 7 Actuator stem
- 8 Ring nut
- 10 Spring (external)
- 11 Spring (internal)
- 15 Collar nut
- 16 Vent plug
- 20 Hexagon bolt
- 21 Hexagon nut
- 22 Hexagon bolt (preloading)
- 23 Hexagon nut (preloading)
- 25 Washer
- 26/27 Stem connector clamp
- 29 Hexagon screw
- 35 Compressor
- 40 Radial shaft seal
- 41 Wiper
- 42 Dry bearing
- 50 Actuator stem
- 70 Lock nut
- 73 Cover
- 75 Top diaphragm case (with travel stop)
- 76 Radial shaft seal
- 77 Dry bearing
- 78 Adjustment nut
- 89 Bushing
- 92 Hexagon nut
- 93 Washer
- 100 Nameplate
- 101 Label (preloading)
- 140 Lifting eyelet
- 300 Screw plug
- 303 Screw plug





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