Pneumatic Actuators
Type 3271-5 (120 cm²)
Type 3277-5 (120 cm²)

Translation of original instructions

Type 3271 Pneumatic Actuator

Type 3277 Pneumatic Actuator

Mounting and Operating Instructions

EB 8310-1 EN

Edition April 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 (aftersalesservice@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

Intended use

The SAMSON Type 3271 and Type 3277 Actuators are 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, SAMSON must be contacted.

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 and Type 3277 Pneumatic Actuators:

– Protective gloves when mounting or removing the actuator

Note

More information on the safe handling of the diaphragms installed in the pneumatic actuators is available in ▶ http://www.samson.de/reach-en.html.

➔ 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 and Type 3277 Actuators do 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 maintenance.

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 to the operating personnel and to instruct them in proper operation. Furthermore, operators 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 specified hazard statements, warning, and caution notes. 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 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 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 finger 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.

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.

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 actuator:

2 Configuration ID
3 Serial no.
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)

14 Connecting thread
15 Diaphragm material
16 Date of manufacture

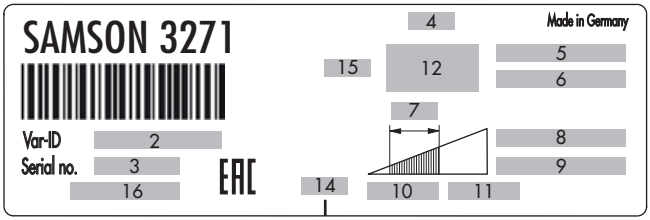


Fig. 1: *Nameplate of Type 3271 Actuator*

3 Design and principle of operation

The Type 3271-5 and Type 3277-5 Actuators have an actuator area of 120 cm². The actuators mainly consist of two diaphragm cases (A1, A2), a rolling diaphragm (A4), and internal springs (A10). See Fig. 2 and Fig. 3. The actuators are mounted in particular on SAMSON Series 240 Valves and Type 3510 Micro-flow 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 (A10) in the actuator. The bench range is determined by the number of springs used, 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 twelve springs, partly fitted in one another, can be installed in the actuator.

The stem connector clamps (A26/27) of Series 240 Valves connect the actuator stem (A7) with the plug stem of the valve. The actuator stem (A7) and plug stem (5) of the micro-flow valve are connected using a threaded stem connection.

The Type 3277-5 Actuator is fitted with an additional yoke on the bottom diaphragm case (see Fig. 3). It allows the direct attachment of a positioner and/or limit switch. The benefit of this design is that the travel pick-off located inside the yoke is protected against external influences.

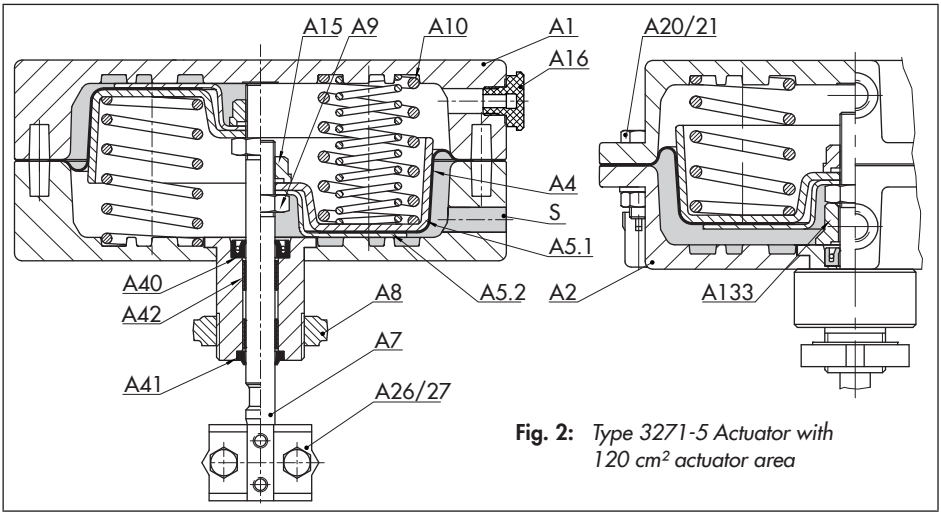
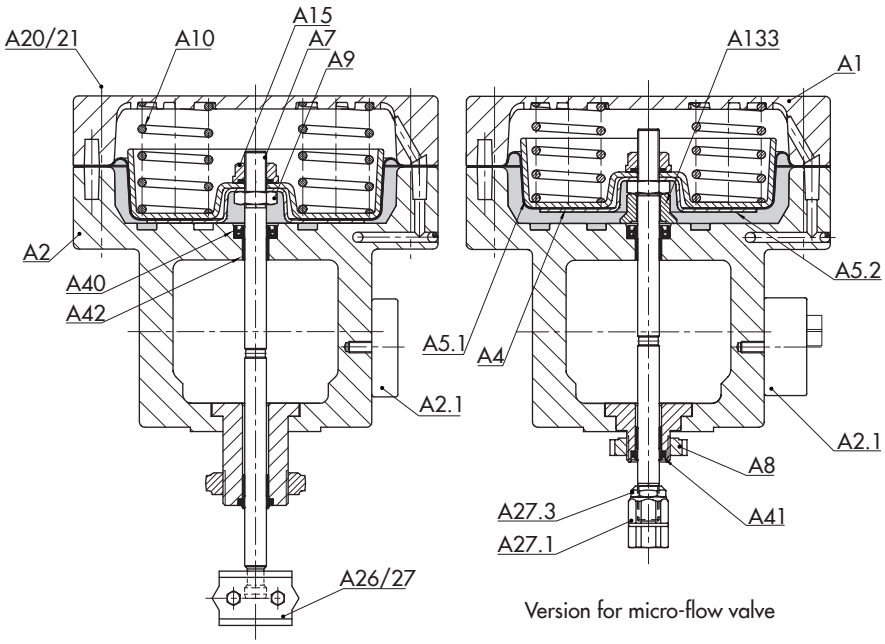


Fig. 2: *Type 3271-5 Actuator with 120 cm² actuator area*



Legend for Fig. 2 and Fig. 3

A1	Top diaphragm case	A5.2	Diaphragm plate	A27.1	Stem connector nut
A2	Bottom diaphragm case	A7	Actuator stem	A27.3	Lock nut
A2.1	Switchover/connecting plate for signal pressure routing	A8	Ring nut	A40	Radial shaft seal
		A9	Hexagon nut	A41	Wiper ring
A2.2	Connection for actuator stem extends (FA)	A10	Spring	A42	Dry bearing
		A15	Collar nut	A133	Stop bushing
A2.3	Connection for actuator stem retracts (FE)	A16	Vent plug	S	Signal pressure connection
		A20	Hexagon bolt		
A4	Diaphragm	A21	Hexagon nut		
A5.1	Diaphragm plate	A26/27	Stem connector clamps		

Fig. 3: *Type 3277-5 Actuator with 120 cm² actuator area*

3.1 Direction of action and signal pressure routing

Tip

The direction of action for both Type 3271 and Type 3277 can be reversed (see section 6.3).

Type 3271-5 (see Fig. 2)

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.

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.

Type 3277-5 (see Fig. 3 and Fig. 4)

In the Type 3277-5 Actuator, the signal pressure is transmitted to the diaphragm chamber through the holes on the left or right side of the yoke and over a switchover plate (A2.1, accessories, see Fig. 4). The fail-safe action of the actuator ("actuator stem extends" or "actuator stem retracts") determines how the switchover plate must be aligned with the marking (A2.5).

If the actuator is operated without a positioner, a connecting plate (A2.1, accessories, see Fig. 4) is required instead of the switchover plate. In this case, the signal pressure is routed directly over the signal pressure connection (A2.9) of the connecting plate to the diaphragm chamber.

Note

Actuators with device index .01 are equipped with new connecting plates. Old and new connecting plates are not interchangeable.

Accessories

Switchover plates and connecting plates are listed as accessories.

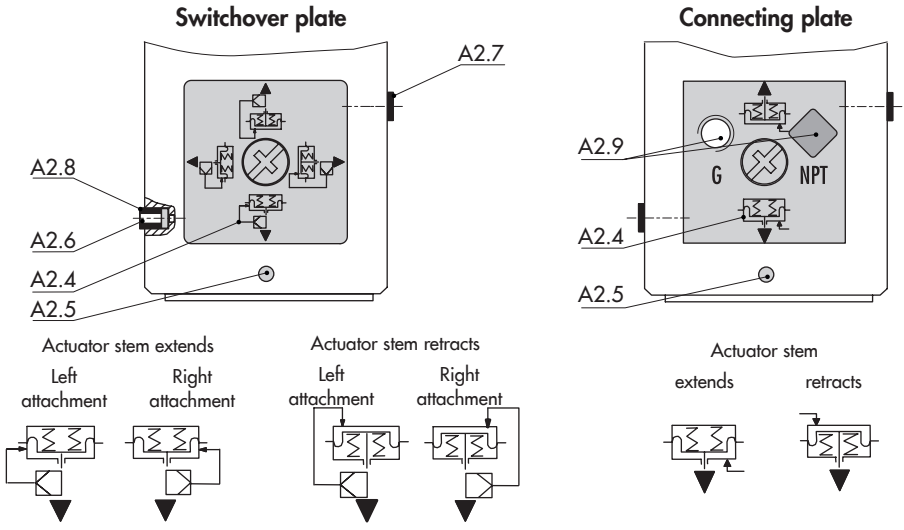
		With index	Order no.
Switchover plate	**New**	**.01**	**1400-6822**
	Old	.00	1400-6819
Connecting plate	**New**	**.01**	**1400-6823**
	G thread	.00	1400-6820
	NPT thread	.00	1400-6821

3.2 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.

Version with fail-safe 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.



A2.4	Symbol	A2.7	With right attachment
A2.5	Marking for signal pressure input	A2.8	Seal with filter
A2.6	With left attachment	A2.9	Signal pressure connection

Fig. 4: *Switchover plate and connecting plate in Type 3277-5*

Version with fail-safe 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.

3.3 Versions

– **Standard version**
The housings of Type 3271-5 and Type 3277-5 Pneumatic Actuators have an actuator area of 120 cm² and are made of die-cast aluminum.

– **Version with travel stop**
The Type 3271-5 and Type 3277-5 Actuators can be fitted with a mechanically adjustable travel stop. The travel is limited in both directions of action (stem extends or retracts).

– **Version with handwheel**
The Type 3271-5 and Type 3277-5 Actuators can be fitted with an additional handwheel. The handwheel is mounted on the top diaphragm case and is used to adjust the travel manually.

3.4 Technical data

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

i Note

More information is available in Data Sheet ▶ T 8310-1.

Compliance

The Type 3271 and Type 3277 Pneumatic Actuators bear the EAC mark of conformity.

Temperature range

The permissible temperature range is determined by the NBR diaphragm material.

Throttling service:	–35 to +80 °C –31 to +176 °F
On/off service:	–20 to +80 °C –4 to +176 °F

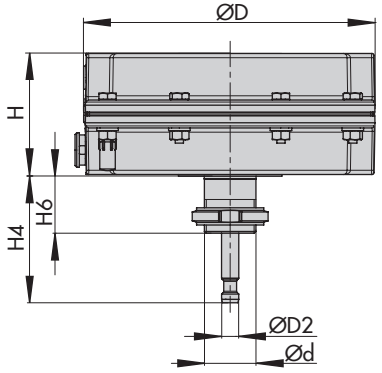
Supply pressure

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

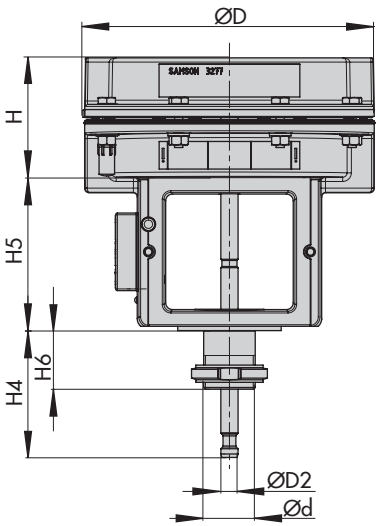
Dimensions and weights

See Table 1 and dimensional drawings on page 16 and 18.

Dimensional drawings



Type 3271-5



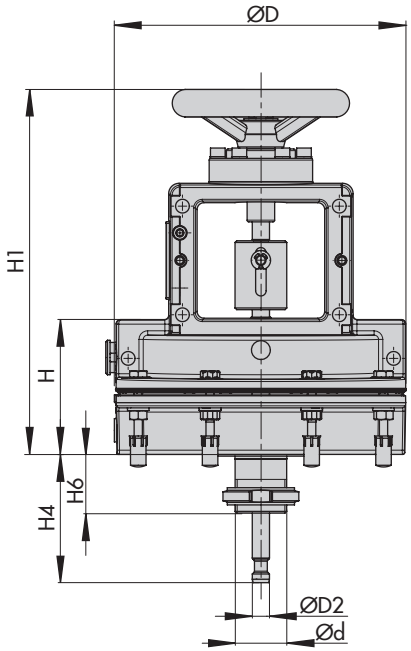
Type 3277-5

Table 1: *Dimensions in mm and weights in kg*

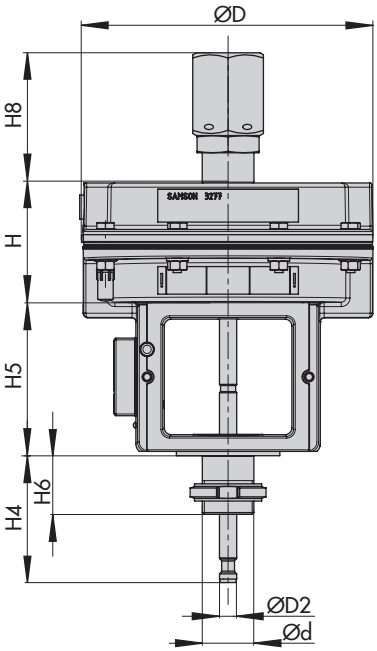
Actuator	Type	3271-5	3277-5
Actuator area	**cm²**	**120**	**120**
Height	H	69	70
	H1	205	293
	$H4_{rated}FA$	75	75
	$H4_{max}FA$	78	78
	$H4_{max}FE$	78	78
	H5	–	88
	H6	34	34
	H8	75	75
Diameter	ØD	168	168
	ØD2	10	10
Thread	Ød	M30 x 1.5 [1]	M30 x 1.5 [1]
Air connection	a	G ⅛ (⅛ NPT)	–
Weight			
Without handwheel		2.5	3.2
With handwheel		4	4.5

[1] In version for micro-flow valve: M20 x 1.5 thread

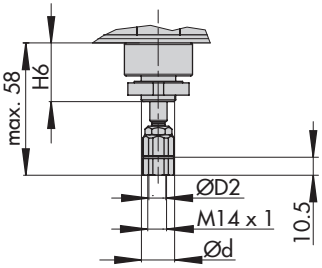
Dimensional drawings

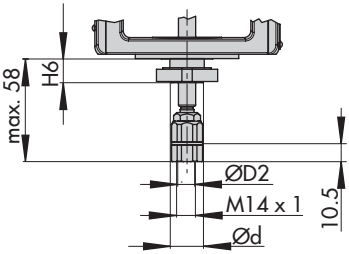


Type 3271-5 with handwheel



Type 3277-5 with travel stop





Versions with 7.5 mm travel for Type 3510 Micro-flow Valve

4 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

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). Remove any damage immediately.
– Protect the actuator against moisture and dirt.
– The permissible transportation temperature is between –20 and +65 °C.

4.2.2 Lifting

Due to the low service weight, lifting equipment is not required to lift the actuator (e.g. to mount it onto a valve).

Note

See valve documentation for more information on lifting the entire control valve assembly.

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 longer storage times.

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). Remove 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.
– The permissible storage temperature is between –20 and +65 °C.
– 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 plant conditions.

➔ 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

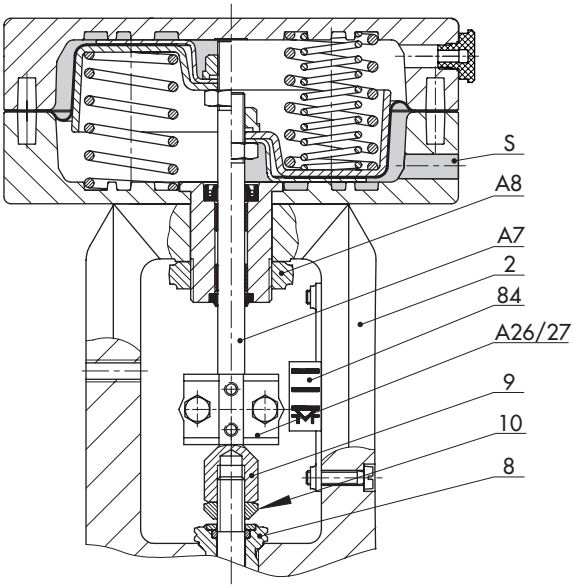
- *Remove the mounted actuator before mounting the other actuator (see section 9.2).*
- *If the valve and actuator have different rated travels, adapt the travel range after mounting. See section 5.3.*

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).

5.1.1 Mounting onto Series 240 Valves

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 (A26/27) and the ring nut (A8) from the actuator.
5. Slide the ring nut over the plug stem.



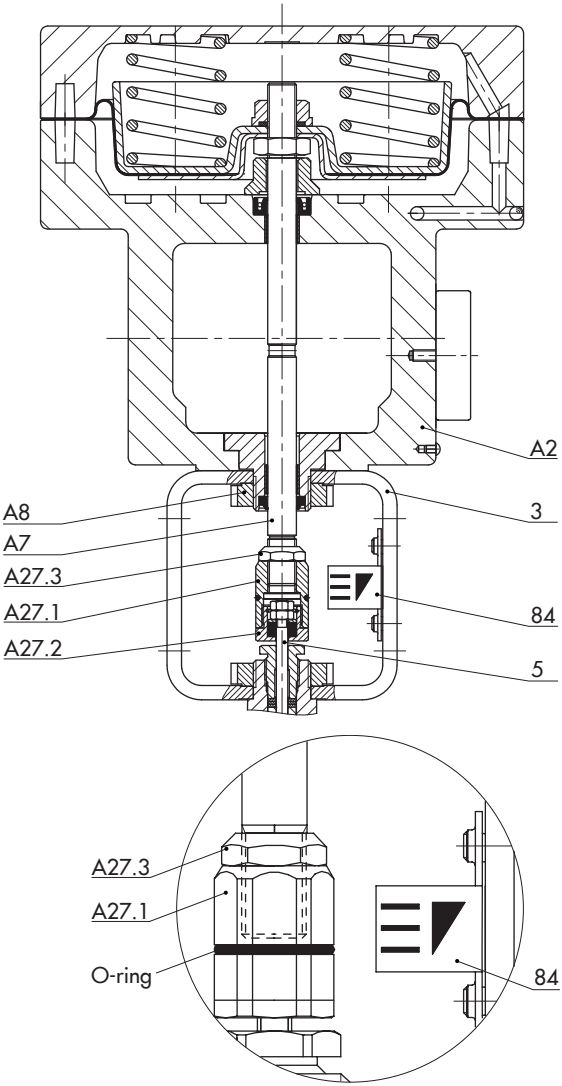
2	Bonnet/flange
8	Threaded bushing
9	Stem connector nut
10	Lock nut
84	Travel indicator scale
A7	Actuator stem
A8	Ring nut
A26/27	Stem connector clamps
S	Signal pressure connection

Fig. 5: *Type 3271 Pneumatic Actuator on a Series 240 Valve*

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 corresponds to the minimum value of the bench range or operating range (see section 5.3 for adapted travel range).

   The upper signal pressure range value corresponds to the maximum value of the bench range or operating range (see section 5.3 for adapted travel range).
8. Connect the signal pressure. See section 5.2.
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 (A26/27) and screw them tight.
12. Align the travel indicator (84) with the tip of the stem connector clamp.



3	Yoke
5	Plug stem with plug
84	Travel indicator scale
A2	Bottom diaphragm case
A7	Actuator stem
A8	Ring nut
A27.1	Stem connector nut
A27.2	Bearing sleeve (bottom part of the stem connector)
A27.3	Lock nut

Fig. 6: *Type 3277 Pneumatic Actuator on a Type 3510 Micro-flow Valve*

Fig. 7: *Aligning the travel indicator scale*

5.1.2 Mounting onto Type 3510 Micro-flow Valve

1. Remove the ring nut (A8) from the actuator.
2. Loosely thread the lock nut (A27.3) and stem connector nut (A27.1) upward on the actuator.
3. Place the actuator on the yoke (3).
4. Slide the ring nut (A8) over the stem connector nut (A27.1) and the lock nut (A27.3) onto the actuator stem (A7) and und screw tight. Observe tightening torques.
5. Determine the lower and upper signal pressure range values.

   The lower signal pressure range value corresponds to the minimum value of the bench range or operating range (see section 5.3 for adapted travel range).

   The upper signal pressure range value corresponds to the maximum value of the bench range or operating range (see section 5.3 for adapted travel range).
6. Connect the signal pressure. See section 5.2.
7. **In the "actuator stem extends" version:** to retract the actuator stem, apply a signal pressure corresponding to approx. 50 % of the bench range to the actuator. Fasten tight the stem connector nut (A27.1) at the bottom end of the actuator stem (A7) to the bearing sleeve (A27.2) on the plug stem (5). Disconnect the signal pressure.

   In the "actuator stem retracts" version: fasten tight the stem connector nut (A27.1) at the bottom end of the actuator stem (A7) to the bearing sleeve (A27.2) on the plug stem (5).
8. **In the "actuator stem extends" version:** apply a signal pressure that corresponds to the lower bench range value to the actuator. Turn the stem connector (A27.1 and A27.2) on the actuator stem until the plug (5) starts to move out of the seat.

   In the "actuator stem retracts" version: apply a signal pressure that corresponds to the upper bench range value to the actuator. Turn the stem connector (A27.1 and A27.2) on the actuator stem until the plug (5) starts to move out of the seat.

i ***Note***

If necessary, repeat the action described in 8 until the stem connector is correctly adjusted.

9. Lock the position of the stem connector with the lock nut (A27.3).
10. Align the travel indicator scale (84) so that the bottom line on the scale is at the same level as the O-ring on the stem connector nut. See Fig. 7.

5.2 Connecting the signal pressure

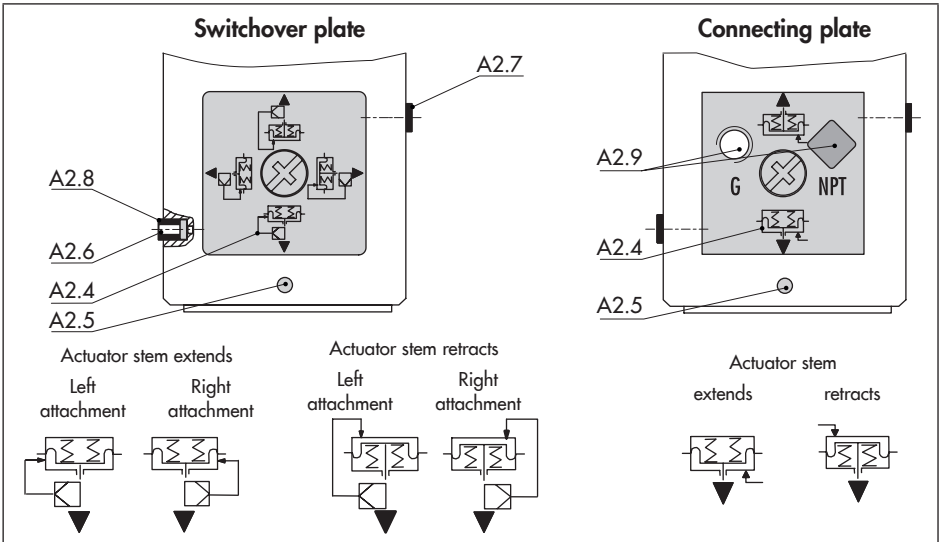
5.2.1 Type 3271-5

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

➔ Connect the signal pressure to the bottom signal pressure connection (S). See Fig. 5.
The signal pressure is routed to the bottom diaphragm chamber and moves the actuator stem (A7) upward opposing the spring force.

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

➔ Connect the signal pressure to the top signal pressure connection (S).
The signal pressure is routed to the top diaphragm chamber and moves the actuator stem (A7) downward opposing the spring force.



A2.4	Symbol	A2.7	With right attachment
A2.5	Marking for signal pressure input	A2.8	Seal with filter
A2.6	With left attachment	A2.9	Signal pressure connection

Fig. 8: *Switchover plate and connecting plate in Type 3277-5*

5.2.2 Type 3277-5

Operation with positioner (switchover plate)

➔ Turn the switchover plate to align the symbol (A2.4) matching the fail-safe action and attachment side with the marking (A2.5). See Fig. 8.

Operation without positioner (connecting plate)

➔ Turn the connecting plate to align the symbol (A2.4) matching the fail-safe action with the marking (A2.5). See Fig. 8.

➔ Make sure that the gasket for the connecting plate is correctly inserted.

➔ The connecting plate has threaded holes with NPT and G threads. Seal the connection that is not used with the rubber seal and square plug.

5.3 Adapting the travel range

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

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

When a SAMSON valve is combined with an oversized actuator (i.e. the rated actuator travel is larger than rated valve travel), the bench range is shifted.

Example: DN 25 valve with 7.5 mm rated travel and 120 cm² actuator with 15 mm rated travel; 0.4 to 1.2 bar bench range.

The signal pressure for half of the actuator travel (7.5 mm) is 0.8 bar. Adding it to the lower signal pressure range value of 0.4 bar results in a signal pressure of 1.2 bar required for adapting the travel range. The new lower signal pressure range value is 1.2 bar and the new upper signal pressure range value 2.0 bar.

➔ Write the new signal pressure range of 1.2 to 2.0 bar on the nameplate as the operating range with adapted travel range.

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

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 25 valve with 7.5 mm rated travel and 120 cm² actuator with 15 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.

➔ Write the new signal pressure range of 0.2 to 0.6 bar on the nameplate as the operating range with adapted travel range.

5.4 Additional fittings

Vent plug

Vent plugs are screwed into the exhaust air ports of pneumatic, electropneumatic, and electric devices. They ensure that any exhaust air that forms can be vented to the atmosphere (to avoid excess pressure in the device). Furthermore, the vent plugs allow air intake to prevent a vacuum from forming in the device.

➔ Locate the vent plug on the opposite side to the workplace of operating personnel.

➔ On mounting valve accessories, make sure that they can be operated from the workplace of the operating personnel.

i ***Note***

The workplace of operating personnel is the location from which the valve, actuator and any mounted valve accessories can be accessed to operate them.

6 Operation

⚠ WARNING

Crush hazard arising from moving parts (actuator stem).
Do not insert hands or finger into the yoke while the valve is in operation.

⚠ 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 3271-5 and Type 3277-5 Pneumatic Actuators are 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).

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

With fail-safe 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

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

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

Additional points that apply concerning operation:

- ➔ Label actuators 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 (16 in Fig. 2).

6.3 Reversal of the direction of action

⚠ 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.

❗ 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.

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 (see section 2.1).

	Actuator stem extends (FA)
	Actuator stem retracts (FE)

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. Lift off the top diaphragm case (A1) and remove springs (A10).
4. Pull the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Unscrew the collar nut (A15).

❗ NOTICE

Malfunction due to loosened nut.
The nut (A9) on the actuator stem serves to adjust the dimension a. Do not undo the nut (A9). If the nut has come undone, readjust the dimension a according to Table 2.

6. Remove the diaphragm plate (A51), diaphragm (A4), and diaphragm plate (A5.2) from the actuator stem (A7) and place them back on again in the reverse order.
7. Tighten the collar nut (A15).

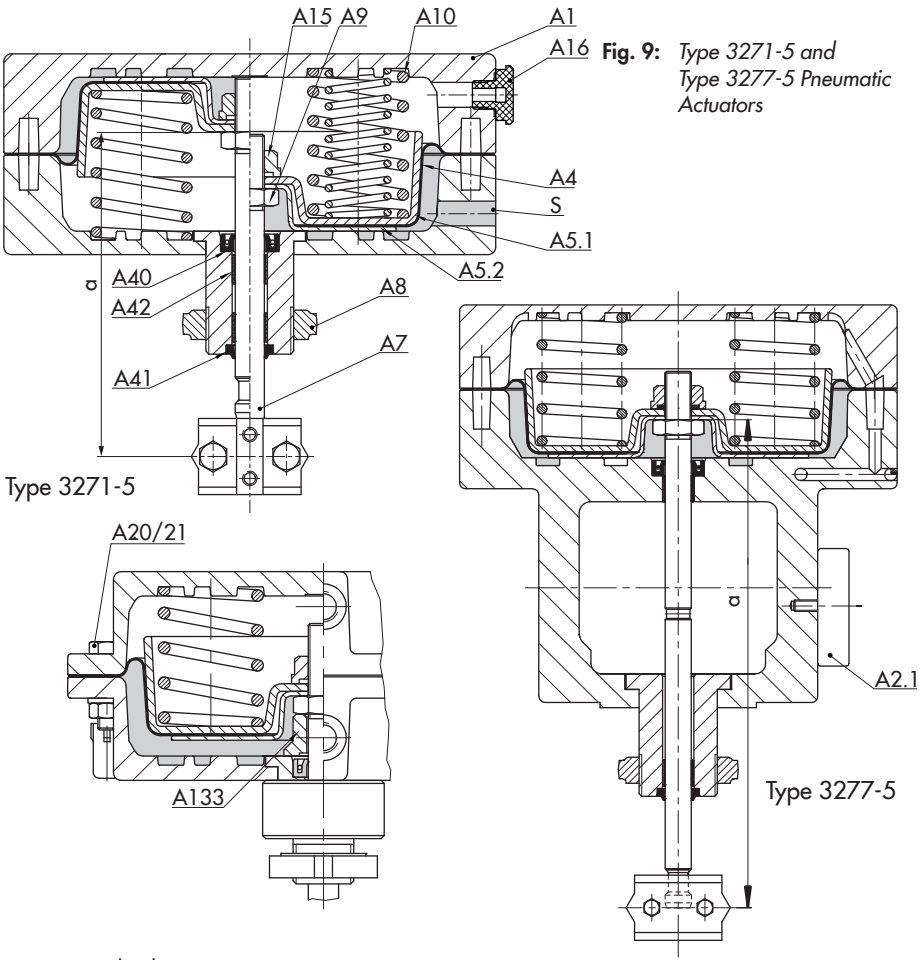


Fig. 9: *Type 3271-5 and Type 3277-5 Pneumatic Actuators*

A1	Top diaphragm case	A7	Actuator stem	A21	Hexagon nut
A2	Bottom diaphragm case	A8	Ring nut	A40	Radial shaft seal
A2.1	Switchover/connecting plate for signal pressure routing	A9	Hexagon nut	A41	Wiper ring
		A10	Spring	A42	Dry bearing
A4	Diaphragm	A15	Collar nut	A133	Stop bushing
A5.1	Diaphragm plate	A16	Vent plug	S	Signal press. connection
A5.2	Diaphragm plate	A20	Hexagon bolt	Dim. a	See Table 2

8. Apply a suitable lubricant to the actuator stem (A7).
9. Place the springs (A10) in the bottom diaphragm case (A2), centering them in the intended recesses.
10. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) in the bottom diaphragm case (A2).
11. Place on the top diaphragm case (A1).
12. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
13. **Type 3271-5:** connect the signal pressure as described in section 5.2. Unscrew the vent plug (A16) from the top signal pressure connection and screw it into the bottom connection (S).

    Type 3277-5: connect the signal pressure as described in section 5.2.

    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.
14. Affix a new nameplate with changed symbol and new configuration ID to the actuator.
15. Mount the actuator on the valve (see section 5.1).

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 actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Remove the springs (A10).
6. Unscrew the collar nut (A15).

NOTICE

Malfunction due to loosened nut.
The nut (A9) on the actuator stem serves to adjust the dimension a. Do not undo the nut (A9). If the nut has come undone, readjust the dimension a according to Table 2 on page 42.

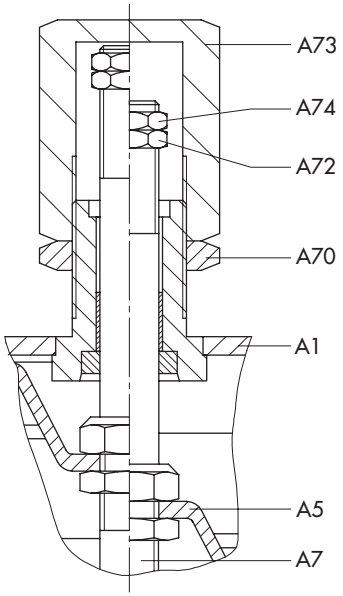
7. Remove the diaphragm plate (A51), diaphragm (A4), and diaphragm plate (A5.2) from the actuator stem (A7) and place them back on again in the reverse order.
8. Tighten the collar nut (A15).
9. Apply a suitable lubricant to the actuator stem (A7).
10. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate

(A5.2) in the bottom diaphragm case (A2).

11. Place the springs (A10) in the bottom diaphragm case (A2), centering them in the intended recesses.
12. Place on the top diaphragm case (A1).
13. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
14. **Type 3271-5:** Connect the signal pressure as described in section 5.2. Unscrew the vent plug (A16) from the bottom signal pressure connection and screw it into the top connection (S).

    Type 3277-5: Connect the signal pressure as described in section 5.2.

    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.
15. Affix a new nameplate with changed symbol and new configuration ID to the actuator.
16. Mount the actuator on the valve (see section 5.1).



A1 Top diaphragm case
A5 Diaphragm plate
A7 Actuator stem
A70 Lock nut
A72 Adjustment nut
A73 Cover
A74 Lock nut

Left half: Actuator stem retracts (FE)
Right half: Actuator stem extends (FA)

Fig. 10: *Travel stop*

6.4 Travel stop

In the version with travel stop, the maximum and minimum actuator travel can be limited.

6.4.1 Bottom travel stop (minimum travel)

1. Loosen lock nut (A70) and remove cover (A73).
2. Unscrew lock nut (A74) and turn the adjustment nut (A72) to adjust the travel stop.
3. Tighten lock nut (A74).
4. Attach the cover (A73) and retighten the lock nut (A70).

6.4.2 Top travel stop (maximum travel)

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

6.5 Version with handwheel

A stem connector (A51) links the handwheel and actuator stem. The actuator stem position can be adjusted using the handwheel (A60). See Fig. 11.

i Note

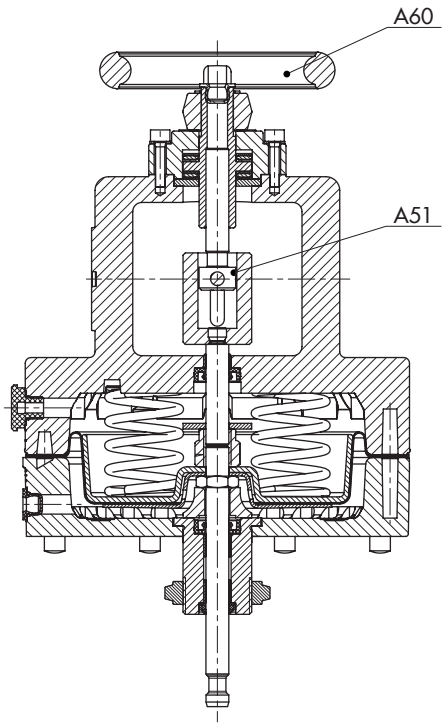
If you want to fit a handwheel to an actuator, contact SAMSON's After-sales Service department.

6.5.1 Extending the actuator stem manually

1. Turn the handwheel clockwise until the bottom stop position is reached.
2. Extend the actuator stem up to the required position.

6.5.2 Retracting the actuator stem manually

1. Turn the handwheel counterclockwise until the top stop position is reached.
2. Retract the actuator stem up to the required position.



A51 Stem connector
A60 Handwheel

Fig. 11: *Type 3271-5 Actuator with handwheel*

7 Maintenance

⚠ 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.

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).

Note

– *The product warranty becomes void if maintenance 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.*

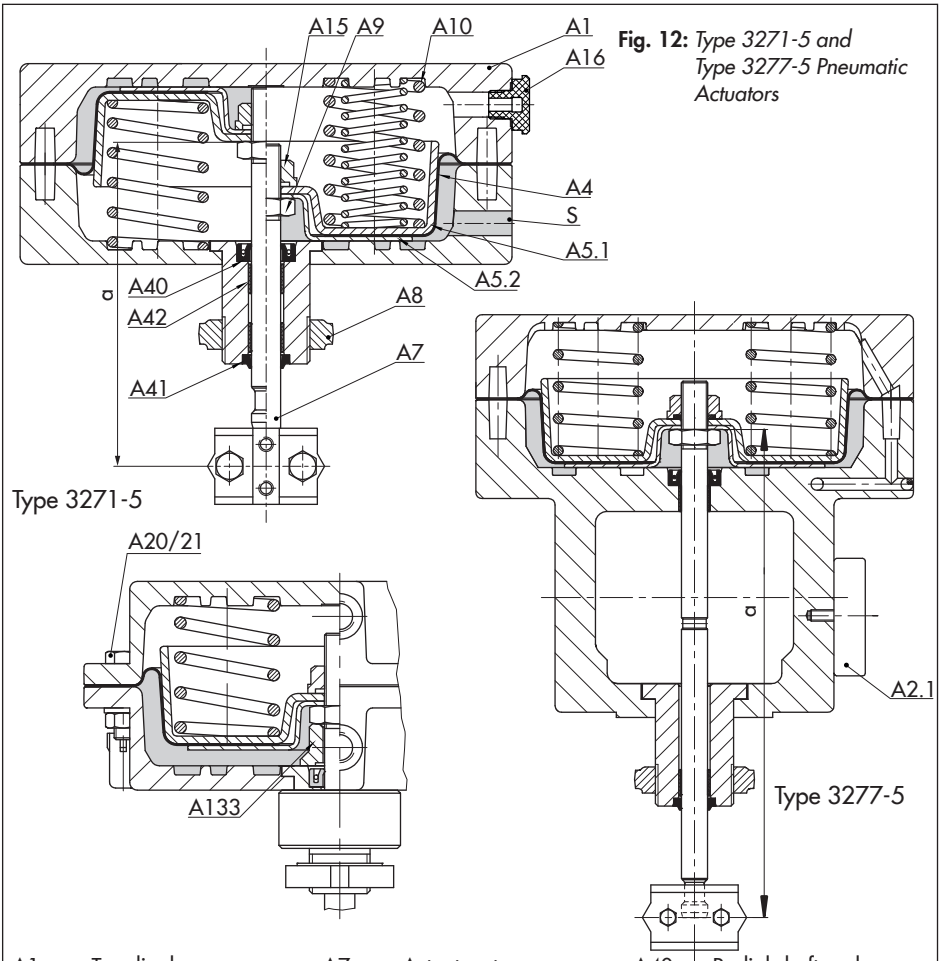


Fig. 12: *Type 3271-5 and Type 3277-5 Pneumatic Actuators*

A1	Top diaphragm case	A7	Actuator stem	A40	Radial shaft seal
A2	Bottom diaphragm case	A8	Ring nut	A41	Wiper ring
A2.1	Switchover/connecting plate for signal pressure routing	A9	Hexagon nut	A42	Dry bearing
		A10	Springs	A133	Stop bushing
A4	Diaphragm	A15	Collar nut	S	Signal press.connection
A5.1	Diaphragm plate	A16	Vent plug	Dim. a	See Table 2
A5.2	Diaphragm plate	A20	Hexagon bolt		
		A21	Hexagon nut		

7.1 Replacing the diaphragm

Tip

We recommend to also replace the actuator stem seal on replacing the diaphragm. See section 7.2.

Version with fail-safe 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. Lift off the top diaphragm case (A1) and remove springs (A10).
4. Pull the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Unscrew the collar nut (A15).

NOTICE

Malfunction due to loosened nut.
The nut (A9) on the actuator stem serves to adjust the dimension a. Do not undo the nut (A9). If the nut has come undone, readjust the dimension a according to Table 2 on page 42.

6. Remove the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) from the actuator stem (A7).
7. Place the new diaphragm on the diaphragm plate (A5.2). Place on the other diaphragm plate (A5.1).
8. Check the sealing element of the collar nut (A15). If necessary, renew it (order no. 8353-0533).
9. Apply a suitable lubricant to the actuator stem (A7).
10. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) in the bottom diaphragm case (A2).
11. Tighten the collar nut (A15).
12. Place the springs (A10) in the bottom diaphragm case, centering them in the intended recesses.
13. Place on the top diaphragm case (A1).
14. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
15. Mount the actuator on the valve (see section 5.1).

Version with fail-safe 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 actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Unscrew the collar nut (A15).

NOTICE

Malfunction due to loosened nut.
The nut (A9) on the actuator stem serves to adjust the dimension a. Do not undo the nut (A9). If the nut has come undone, readjust the dimension a according to Table 2 on page 42..

6. Remove the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) from the actuator stem (A7).
7. Place the new diaphragm on the diaphragm plate (A5.2). Place on the other diaphragm plate (A5.1).
8. Check the sealing element of the collar nut (A15). If necessary, renew it (order no. 8353-0533).
9. Check whether the springs (A10) rest correctly in the bottom diaphragm case (A2).
10. Apply a suitable lubricant to the actuator stem (A7).
11. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) in the bottom diaphragm case (A2).
12. Tighten the collar nut (A15).
13. Place on the top diaphragm case (A1).
14. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
15. Mount the actuator on the valve (see section 5.1).

7.2 Replacing the actuator stem seals

Tip

We recommend to also replace the diaphragm on replacing the actuator stem seal. See section 7.1.

Version with fail-safe 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. Lift off the top diaphragm case (A1) and remove springs (A10).
4. Pull the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Remove the radial shaft seal (A40).
6. Apply a suitable lubricant to the new radial shaft seal.
7. Use a suitable tool to mount the radial shaft seal.
8. Renew the dry bearing (A42) and wiper (A41), if necessary.
9. Apply a suitable lubricant to the actuator stem (A7).
10. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) in the bottom diaphragm case (A2).

11. Place the springs (A10) in the bottom diaphragm case, centering them in the intended recesses.
12. Place on the top diaphragm case (A1).
13. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
14. Mount the actuator on the valve (see section 5.1).

Version with fail-safe 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 actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) out of the bottom diaphragm case (A2).
5. Remove the radial shaft seal (A40).
6. Apply a suitable lubricant to the new radial shaft seal.
7. Use a suitable tool to mount the radial shaft seal.
8. Renew the dry bearing (A42) and wiper (A41), if necessary.
9. Apply a suitable lubricant to the actuator stem (A7).
10. Place the actuator stem (A7) together with the diaphragm plate (A5.1), diaphragm (A4), and diaphragm plate (A5.2) in the bottom diaphragm case (A2).
11. Place on the top diaphragm case (A1).
12. Fasten the top and bottom diaphragm cases (A1, A2) together using the nuts (A21) and bolts (A20).
13. Mount the actuator on the valve (see section 5.1).

7.3 Determining dimension a

If the nut (A9) has come undone at the actuator stem (A7) during service and repair work, the dimension a (see Fig. 12) must be readjusted.

Table 2: *Dimension a*

Type/version	Travel [mm]	Dimension a [mm]
3271-5	15	100.75
Type 3271-5 for micro-flow valve	7.5	86
3277-5	15	188.5
3277-5	20	185.5
Type 3277-5 for micro-flow valve	7.5	158.5

7.4 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. Send the actuator to your nearest SAMSON subsidiary. SAMSON subsidiaries are listed on our website at ▶ www.samson.de > Contact.

7.5 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 a test plan.

Tip

SAMSON's After-sales Service department can support you to draw up a maintenance plan for your plant.

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 3.1 and section 5.2.
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.

Note

Contact SAMSON's After-sales Service department for malfunctions not listed in the table.

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.

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

9.2.1 Series 240 Valves

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. **In the "actuator stem extends" version:** to retract the actuator stem, apply a signal pressure corresponding to approx. 50 % of the bench range to the actuator. Undo the ring nut (A8). Disconnect the signal pressure.

   In the "actuator stem retracts" version: undo ring nut (A8).
5. Lift the actuator off the valve.
6. Fasten the lock nut (10) and stem connector nut (9) on the valve.
7. Fasten ring nut (A8) on the actuator.

9.2.2 Type 3510 Micro-flow Valve

1. Put the control valve out of operation. See associated valve documentation.
2. Loosen the lock nut (A27.3).
3. **In the "actuator stem extends" version:** to retract the actuator stem, apply a signal pressure corresponding to approx. 50 % of the bench range to the actuator. Use a suitable tool to hold the stem connector nut (A27.1) and bearing sleeve (A27.2) stationary and unscrew them. Disconnect the signal pressure.

   In the "actuator stem retracts" version: use a suitable tool to hold the stem connector nut (A27.1) and bearing sleeve (A27.2) stationary and unscrew them.
4. Loosen the ring nut (A8).
5. Lift the actuator off the valve.
6. Loosely thread the lock nut (A27.3) and stem connector nut (A27.1) on the actuator.

i ***Note***

The bearing sleeve (A27.3) remains on the valve.

7. Fasten ring nut (A8) on the actuator.

9.3 Disposal

➔ Observe local, national, and international refuse regulations.

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

10 Appendix

10.1 After-sales service

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

E-mail

You can reach the After-sales Service Department at aftersalesservice@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

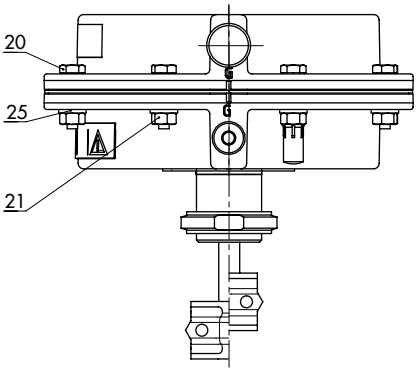
Please submit the following details:

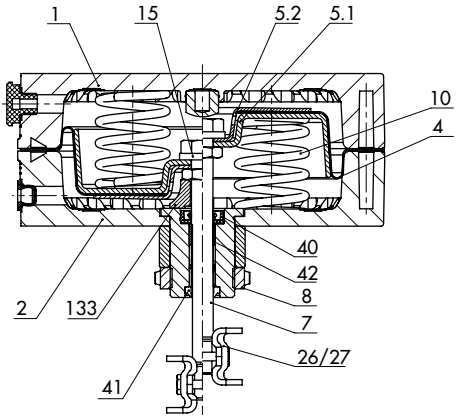
- Order number and position number in the order
- Type, model number, actuator area, travel and bench range (e.g. 0.2 to 1 bar) or the operating range of the actuator
- Type designation of mounted valve.
- Installation drawing

10.2 Spare parts

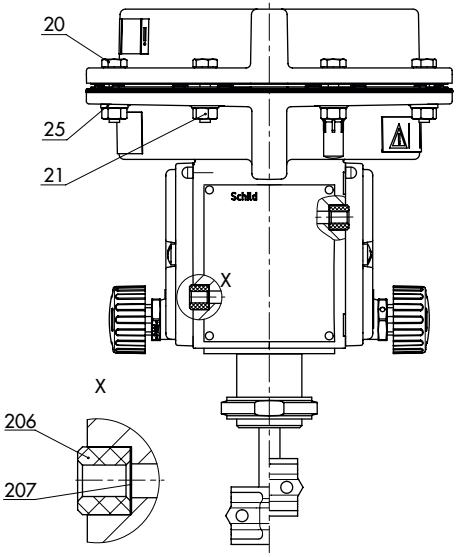
1	Top diaphragm case
2	Bottom diaphragm case
2.1	Switchover or connecting plate [1]
4	Diaphragm
5.1	Diaphragm plate
5.2	Diaphragm plate
7	Actuator stem
8	Ring nut
10	Spring
15	Collar nut
20	Hexagon bolt
21	Hexagon nut
25	Washer
26/27	Stem connector clamps
27.1	Stem connector nut [2]
27.3	Lock nut [2]
39	Stop bushing
40	Radial shaft seal
41	Wiper ring
42	Dry bearing
133	Stop bushing
206	Seal
207	Filter
FA	Actuator stem extends
FE	Actuator stem retracts

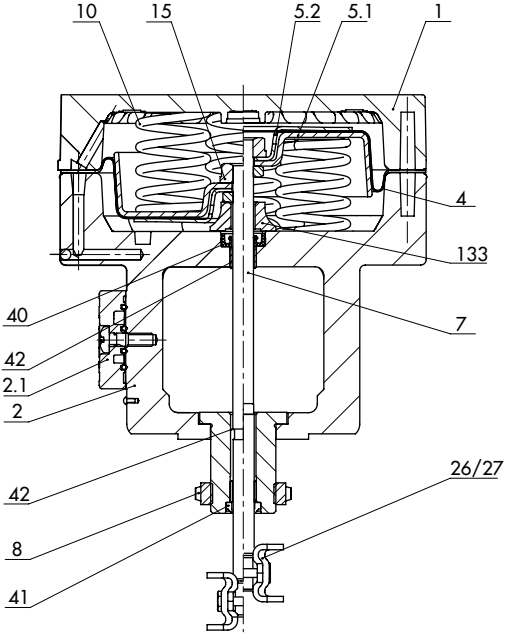
1) Type 3277 only
2) Only in version for micro-flow valve



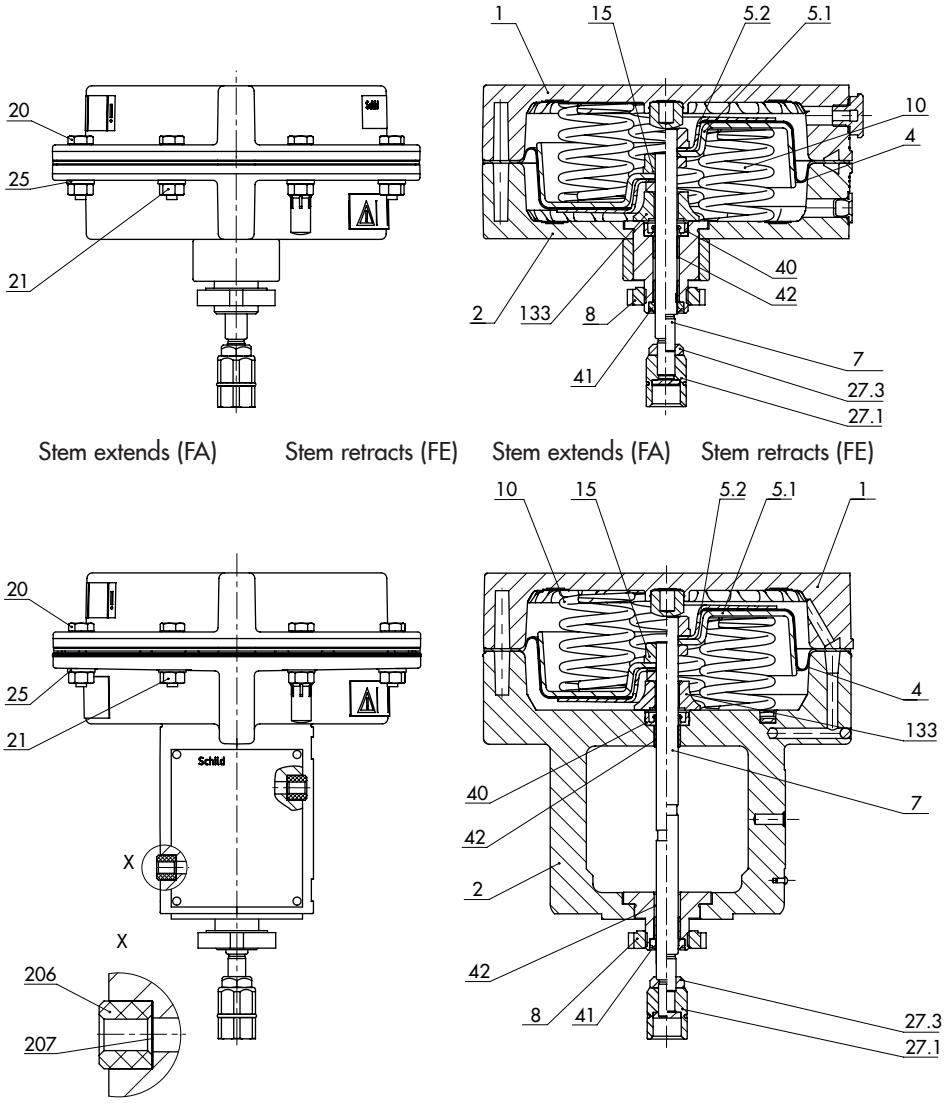


Stem extends (FA) Stem retracts (FE) Stem extends (FA) Stem retracts (FE)





Type 3271-5 and Type 3277-5 Actuators, 120 cm²



Type 3271-5 and Type 3277-5 Actuator, 120 cm², as version for micro-flow valve

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