

MOUNTING AND OPERATING INSTRUCTIONS



EB 31a

Translation of the original manual



Pneumatic rotary actuator Edition 2010
Single and double-acting piston actuator,
type DAP and SRP

February 2025 edition



Note regarding this installation and operating manual

This Installation and Operating Manual (EB) provides guidance for safe assembly and operation.

The notes and instructions in this EB are binding when handling PFEIFFER devices. The figures and illustrations in this EB are examples and must therefore be considered as such.

- ⇒ For safe and correct use, read this EB carefully prior to use and keep it for later reference.
- ⇒ In the case of questions that go beyond the scope of this EB, please contact the After Sales Service at PFEIFFER Chemie-Armaturenbau GmbH.
- ⇒ This manual only applies to the rotary actuator itself, the respective additional manual applies for the installed valve.

Definition of signal words

 DANGER

Hazardous situations that lead to death or serious injuries

 WARNING

Situations that can lead to death or serious injuries

 NOTE

Property damage and malfunctions

 Info

Additional information

 Tip

Recommended action

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1 Safety instructions and safety measures

Intended use

The PFEIFFER-rotary actuator BR 31a Edition 2010 is intended for the actuation of an installed control valve, ball valve or other actuation with a rotating throttle housing. Together with the valve, the rotary actuator is used to cut off fluid, gaseous or vaporous media in pipes. The rotary actuator is suitable for control tasks or ON/OFF operation. The rotary actuator can be used in process technology and industrial plants.

The rotary actuator is designed for precisely defined conditions (e.g. signal pressure, torque, opening angle, direction of turning and action). Therefore the operator must make sure that the rotary actuator is only used when the conditions of use comply with the design criteria defined in the order. If the operator would like to use the actuator in other applications or environments, they must contact PFEIFFER.

PFEIFFER shall not be held liable for damage that result from non-compliance with the intended use, as well as for damage that results from external forces or external influences.

⇒ Limits of use, areas of use and possible uses can be found in the technical data and on the type plate.

Reasonably foreseeable erroneous use and unintended use

The rotary actuator is not suited for the following areas of use:

- Use outside of the technical data and the limits defined by the design.
- Use outside of the limited defined by the attachments installed on the rotary actuator.
- Use in a corrosive environment with unsuitable protection.

Furthermore, the following activities are considered unintended use:

- Use of third-party spare parts.
- Disassembly of individual spring cartridges.
- Performance of maintenance and repair work that is not described.

Qualification of operating personnel

The rotary actuator may only be disassembled, dismantled, assembled and commissioned by specialist personnel who are familiar with the assembly, commissioning and operation of this product.

- Specialist personnel in terms of this installation and operating manual are persons who, on the basis of their vocational education, knowledge and experience and knowledge of the relevant standards, are capable of evaluating the assigned tasks and identifying possible hazards.

Personal protective equipment

PFEIFFER recommends the following protective equipment when handling the pneumatic rotary actuator BR 31a:

- Protective gloves and safety shoes during assembly and disassembly of the actuator.
 - Eye protection and hearing protection when operating the rotary actuator.
- ⇒ Request additional protective equipment from the plant operator.

Changes and other modifications

Changes, conversions and other modifications to the product are not permitted without consulting PFEIFFER. Non-compliance invalidates the product guarantee. PFEIFFER shall not be held liable for any resulting property damage or personal injury.

Protective devices

On their own, PFEIFFER pneumatic rotary actuators do not have any particular protective devices.

In the case of a power supply failure, the rotary actuator automatically switches to a certain fail-safe position.

- The fail-safe position corresponds to the direction of action and is indicated on the type plate of PFEIFFER rotary actuators, see chapter "2.1 Type plate of the actuator".

Warning of residual risks

To prevent personal injury or property damage, the operator and operating personnel must use suitable measures to prevent the hazards that can result from the signal pressure, tension energy of the springs and moving parts of the rotary actuator.

- Therefore, the operator and operating personnel must observe all the hazard information, warning information and information in this installation and operating manual.

Obligation of the operator to exercise diligence

The operator is responsible for proper operation as well as compliance with the safety regulations.

- The operator is responsible for providing operating personnel with this installation and operating manual as well as the applicable documents and to provide instructions on proper operation.
- Furthermore, the operator must ensure that operating personnel and third parties are not endangered.
- It is not the responsibility of PFEIFFER and therefore when using the rotary actuator make sure that the rotary actuator is only used as intended as described in this chapter.
- These instructions do not replace the safety and work instructions provided by the operator. In the case of conflicts between these instructions and the procedure defined by the operator, the differences shall be clarified in writing between an authorised representative of the operator and an authorised representative of PFEIFFER.

Obligation of operating personnel to exercise diligence

Operating personnel must be familiar with this installation and operating manual and the applicable documents and comply with the indicated hazard information, warning information and other information. Furthermore, operating personnel must be familiar with the applicable regulations concerning occupational safety and accident prevention and observe them.

Applicable standards and directives

- In reference to the Machinery Directive 2006/46/EU, the actuators can be classified as a “part of a machine”. The commissioning of the actuator is also prohibited until the machine and/or the final system in which the actuator is installed fulfils the requirements of directive 2006/46/EU and with which compliance is declared.
- The non-electrical actuators are designed, built and classified in compliance with ATEX Directive 2014/68/EU. Use in zones with a potentially explosive atmosphere must comply with the classification of the actuator and the ATEX safety regulations.
- PFEIFFER pneumatic rotary actuators are not considered pressure equipment according to Directive 2014/68/EU.
- The rotary actuators comply with TR CU 10/2011 and TR CU 12/2011.

Applicable documents

The following documents apply in addition to this installation and operating manual:

- Data sheet for the rotary actuator ► TB 31a.
- Single data sheets for the respective actuator sizes ► DB 31a-E2010
- Safety manual for use in safety-relevant systems ► SH 31a.

1.1 Notes regarding possible severe personnel injury

⚠ DANGER

Hazards and ineffectiveness of the warranty!

In the case of non-compliance with the following hazard and warning information, hazards may arise and the warranty provided by PFEIFFER may become invalid.

- ⇒ Observe the following hazards and warning information.
- ⇒ Contact PFEIFFER in the case of questions:

⚠ DANGER

Risk of bursting of the rotary actuator!

Rotary actuators are pressurised. Improper opening can cause the bursting of actuator components.

- ⇒ Before working on the actuator, depressurise the concerned plant parts and the actuator.

1.2 Notes regarding possible personnel injury

⚠ WARNING

Danger of crushing due to moving parts!

The rotary actuator contains moving parts (actuator stem, switching shaft, etc.) that can lead to crushing if reaching into it.

- ⇒ Do not reach into or under the switching shaft as long as the pneumatic power is connected to the actuator.
- ⇒ When working on the rotary actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects in the yoke to hinder the operation of the switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to “seizure” if not actuated for a long period of time”), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter “1.1.1 Releasing the spring tension in the actuator”.

Danger of injury due to venting the actuator!

The rotary actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ Install the valve such that at the operator level (unless otherwise described in the valve documentation, the operator level for the valve is the front view of all operating elements of the valve including the attachments from the perspective of operating personnel) there are no vent holes at eye level or valve holes that ventilate towards their eyes.
- ⇒ Use suitable silencers and plugs.
- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of injury due to preloaded springs!

The end caps are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Before starting work on the rotary actuator, disconnect all pneumatic, hydraulic and electrical supply lines and release the pressure from the rotary actuator.
- ⇒ When disassembling the end cap, bring the rotary actuator to the “closed” (0°) position and remove the fastening screws correctly.
- ⇒ Do not disassemble an individual spring cartridge.
- ⇒ Contact PFEIFFER to service the spring cartridges.

⚠ WARNING

Danger of injury due to incorrect operation, use or installation caused by illegible information on the actuator!

Over time, imprints or impressions on the actuator can soil the adhesives and signs or make them illegible for other reasons so that dangers are not recognised and necessary operational messages cannot be followed. Danger of injury can occur.

- ⇒ Keep all relevant markings on the device legible at all times.
- ⇒ Damaged, missing or faulty signs or adhesives must be replaced immediately.

1.3 Notes regarding possible property damage

NOTE

Damage to the rotary actuator due to improper fastening of the sling!

- ⇒ Do not fasten load-carrying fastening equipment to the travel limit or the optional hand wheel (emergency manual gear).

Damage to the rotary actuator due to excessively high or low tightening torques!

The rotary actuator components must be tightened with specific torques.

- ⇒ Excessively tightened components are subject to increased wear. Components that are not sufficiently tightened can cause the components to release, see Chapter "15.1.1 Tightening torques".

Damage to the rotary actuator due to unsuitable tools!

Unsuitable tools can damage the actuator.

- ⇒ Suitable tools are required to work on the actuator, see Figure 15-1 and Table 15-8 in Chapter "15.1.3 Tools".

Damage to the rotary actuator due to unsuitable lubricants!

Unsuitable lubricants can corrode and damage the surface.

- ⇒ The actuator material requires suitable lubricants, see Table 15-7 in Chapter "15.1.2 Lubricants".
-

2 Markings on the device

2.1 Actuator type plate

The actuator type, size, operating pressure, torque, rotation direction, spring effective direction, operating temperature and connection type are specified by the actuator designation.

The type plate is glued onto the actuator housing. The type plate contains all data required for device identification.

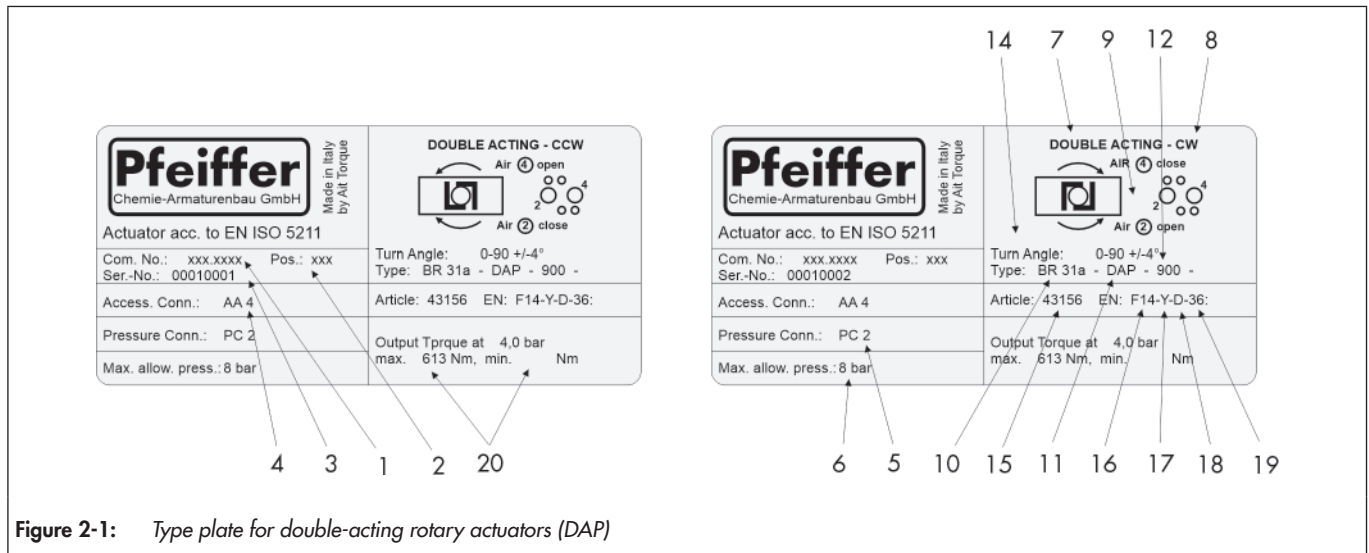


Figure 2-1: Type plate for double-acting rotary actuators (DAP)

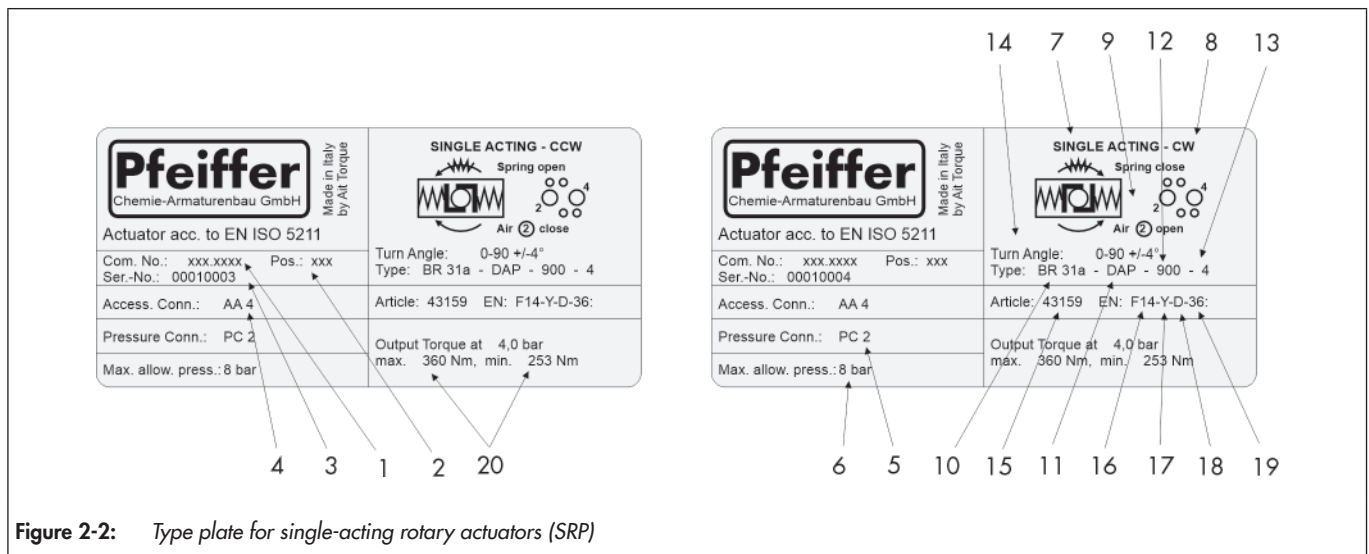


Figure 2-2: Type plate for single-acting rotary actuators (SRP)

i Info

Markings on the housing and the type plate must be permanent so that the valve remains identifiable.

Table 2-1: Marking on the actuator type plate

Information	Pos.	Remark
Distinctive marking: (variable)	1	Order number
	2	Item number from the order
	3	Serial number (automatic assignment)
Accessory connection: (fixed, depending on the actuator size)	4	AA1 to AA4 (according to VDE/VDI size 1 to 4)
Air connection: (fixed, depending on the actuator size)	5	PC1 = size 1/8" PC2 = size 1/4" PC3 = size 3/8" PC4 = size 1/2"
Max. permissible pressure: (fixed)	6	With BR 31a, always 10 bar
Mode of operation: (variable)	7	Actuator function: single-acting / double-acting
	8	Direction of action: CW = Clockwise (spring closes) CCW = Counterclockwise (spring opens)
	9	Schematic representation: Rotation direction to springs and air connection. Namur interface with marking of ports "2" and "4"
Exact type designation: (variable)	10	Series: BR 31a
	11	Type: SRP / DAP
	12	Actuator size: 00015 to 10000
	13	Spring designation: 2.5 to 6 (bar)
Swing angle: (fixed, depending on the actuator size)	14	0-90° +5/-15° 0-120° +5/-15° 0-180° +5/-15°
Item number: (variable)	15	Pfeiffer – item number
Version according to EN: (fixed, depending on the actuator size) Example: F07-Y-D-17	16	Flange F07
	17	Spigot (Y)
	18	Diagonal square drive (D)
	19	Square drive SW 17
Torques: (variable)	20	Specification of actuator torque depending on the supply air pressure

3 Design and principle of operation

The PFEIFFER-rotary actuator BR 31a is suitable for use in closed or open environments and is installed on

- Control valves
- Ball valves
- Rotary plug valves
- Sampling taps
- Pig valves
- Additional actuators installed with a rotating throttle housing.

3.1 Function

The actuator is a pneumatic component for the remote control of valves.

The signal pressure generates a force on the piston surface by means of springs installed in the actuator in the single-acting version (SRP) and by a counterpressure in the double-acting version that can be compensated for.

The force generated on the pistons is transformed by the piston shaft into a rotary movement.

In the single-acting version, the number of springs determines the spring return torque and the required signal pressure.

3.2 Technical data

The type plates of the rotary actuator offer information about the valve version, see Chapter "2 Markings on the device".

i Info

Detailed information is available on the data sheet ► TB 31a.

3.3 Variants

- Edition 2020+ automation to be integrated according to VDI/VDE 3847, see data sheet ► DB 31a-22.
- Double-acting rotary actuator for 120°, 135°, 180°, see data sheet ► DB 31a-08.
- Single-acting rotary actuator for 180°, see data sheet ► DB 31a-12.
- 3-position actuator, see data sheet ► DB 31a-09.
- Rotary actuator with hydraulic damping, see data sheet ► DB 31a-05.
- Rotary actuator with spring-centred mid-position, see data sheet ► DB 31a-07.
- Fast closing rotary actuator, see data sheet ► DB 31a-13.
- Rotary actuator for the low temperature range, see data sheet ► DB 31a-11.

- Rotary actuator for "water" control medium, see data sheet ► DB 31a-14.
- Rotary actuator with additional travel limit, see data sheet ► DB 31a-15.
- Rotary actuator with adjustable hydraulic damping, see data sheet ► DB 31a-23.
- Stainless steel actuator, see data sheet ► DB 31a-06.
- Addition variations possible upon request.

3.4 Rotation and travel limit

- Standard actuator: 90° rotation angle with end position adjustment at 0° and 90°, +5/-15° adjustable.
- 120° actuator: 120° rotation angle with end position adjustment at 0° and 120°, +5/-15° adjustable.
- 180° actuator: 180° rotation angle with end position adjustment at 0° and 180°, +5/-15° adjustable.

Adjustable end positions for the OPEN/CLOSED position permit the fine adjustment of the end stops of between +5° / -15°.

Refer to the respective data sheet for the travel of the rotary actuator, see chapter "3.3 Variants".

3.5 Fail-safe position and direction of action

3.5.1 Single acting rotary actuator (SRP)

Two different rotary movements are possible that become effective when the piston pressure is released or if there is a power supply failure.

Fail-close:

CW spring closing, the actuator turns clockwise.

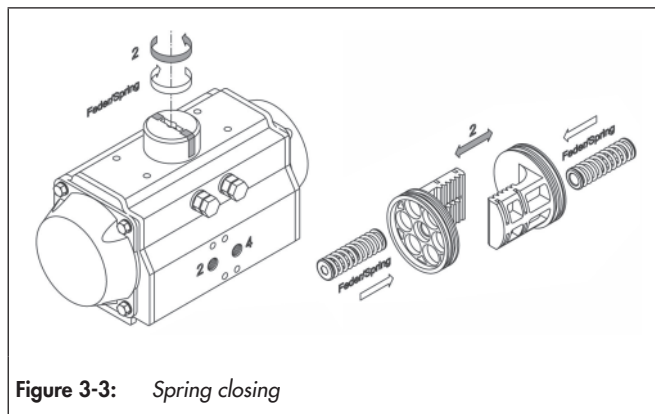


Figure 3-3: Spring closing

Design and principle of operation

The standard version of the BR 31a rotary actuator is installed along the valve flow direction.

When actuated at port "2", the shaft rotates counterclockwise from the start position "CLOSED" to the end position "OPEN".

In pressure is lost at port "2", the shaft turns clockwise to the start position "CLOSED".

The actuator is delivered in the start position.

i Info

If mounted diagonally to the valve flow direction (turn 90°), make sure that the position indicator is set correctly, see chapter "5 Assembly".

Fail-open:
CCW spring closing (only SRP), the actuator turns counterclockwise

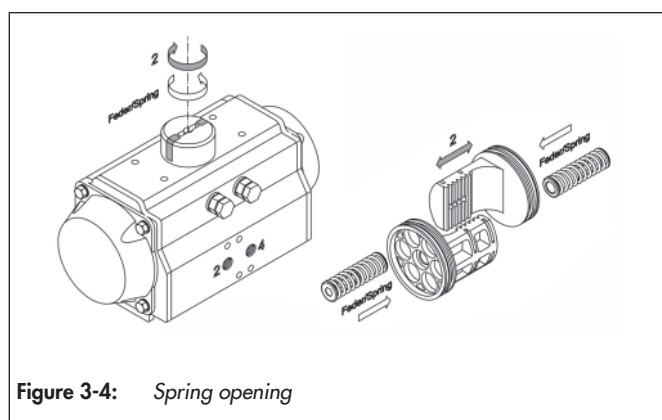


Figure 3-4: Spring opening

If the actuator shaft rotates clockwise when the valve is opened, in addition to the standard version pumps according to "Figure 3-2: Spring opening" are installed.

The shaft rotates clockwise from the start position "OPEN" to the end position "CLOSED".

The actuator is delivered in the start position.

3.5.2 Double-acting rotary actuator (DAP)

The actuator type DAP is equipped without springs. A defined end position is not reached upon air failure.

- The standard rotation direction is closing in the clockwise direction "CW".
- The counterclockwise direction "CCW" for double-acting actuators is achieved by applying pressure to port 2.

3.5.3 Changing the fail-safe position

The fail-safe position of the rotary actuator can be reversed if necessary, see Chapter "9.5 Conversion work".

3.6 Actuation

There are different options for the actuation (90°, 120° or 180° rotation angle):

- Direct mounting of a solenoid valve (5/2 or 5/3 for double acting, 3/2 for single acting) for connecting to ports "2" and "4".
- Hook-up (to ports "2" and "4") with separate control unit.

3.7 Attachments

The following accessories are available for the actuator, either individually or in combination:

- Positioner
- Limit switch
- Solenoid valves
- Pressure reducer
- Pressure gauge mounting blocks
- Throttles
- Volume booster
- Quick exhaust valve
- Emergency manual gear
- Other additional equipment is possible according to specifications.

3.8 Control pressure

The maximum control pressure is 10 bar (145 PSI).

For double-acting and single-acting actuators, the operating pressure is between 2.5 bar (36 PSI) and 10 bar (145 PSI).

3.9 Operating media

Dry or lubricated air or inert gases, provided that they are compatible with the actuator's internal parts and lubricant used.

i Info

The operating media must have a dew point of -20°C (-4°F) or at least 10°C (50°F) below the ambient temperature. The maximum particle size contained in the operator media must not exceed 30 µm.

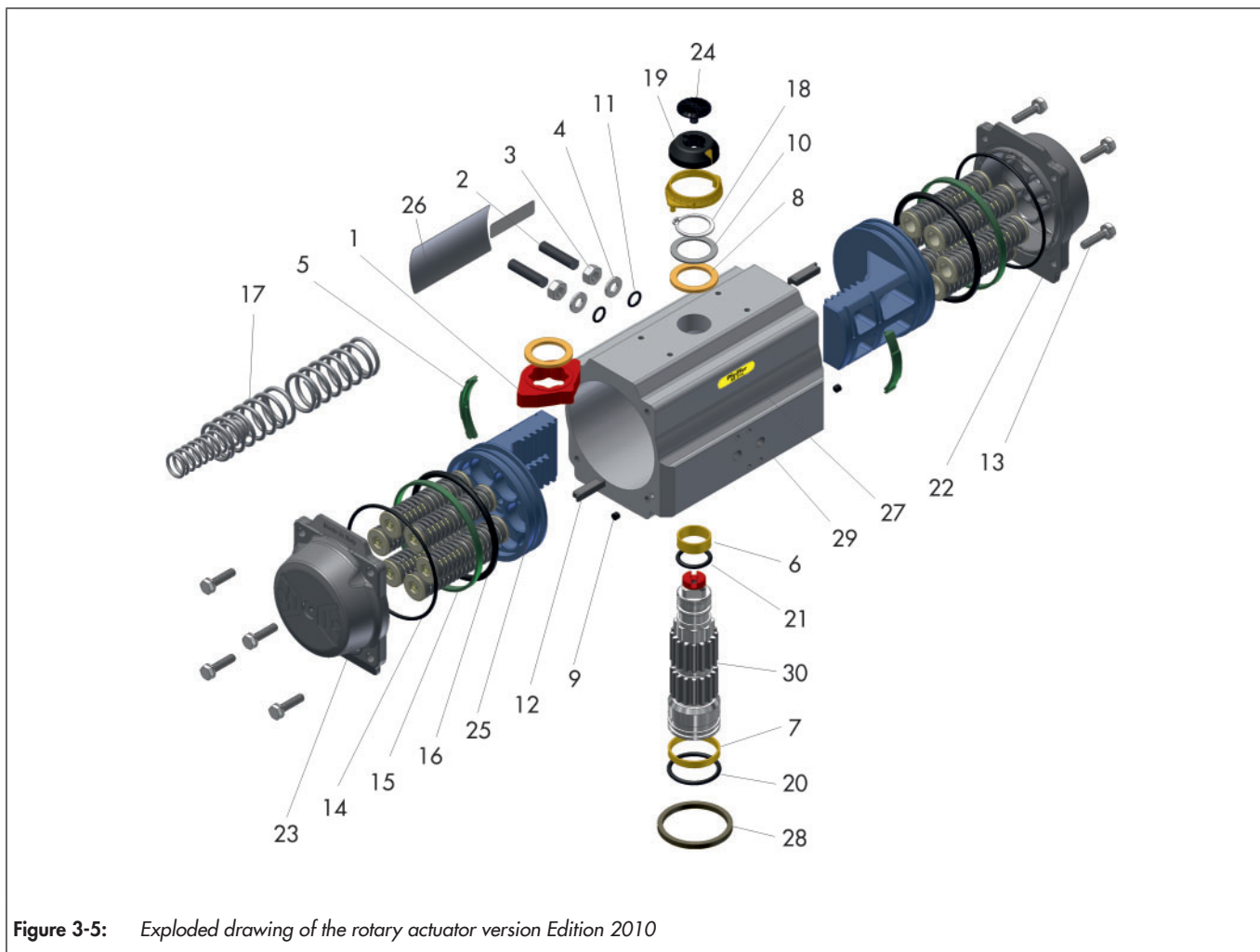


Figure 3-5: Exploded drawing of the rotary actuator version Edition 2010

Table 3-1: Parts list for the rotary actuator version Edition 2010

Pos.	Designation
1	Cam (end position adjustment)
2	Adjusting screw
3	Lock nut
4	Washer
5	Bearing (piston back)
6	Shaft bearing bushing (top)
7	Shaft bearing bushing (bottom)
8	Thrust bearing
9	Plug (to seal air port)
10	Supporting ring
11	Seal (adjusting screw)
12	Piston guide
13	Screw (end cap)
14	End cap seal
15	Bearing (piston head)

Pos.	Designation
16	O-ring
17	Spring cartridge
18	Retaining ring
19	Position indicator
20	Shaft seal (bottom)
21	Shaft seal (top)
22	End cap (right)
23	End cap (left)
24	Screw (position indicator)
25	Piston
26	Type plate
27	Type plate (end cap)
28	Spigot
29	Housing
30	Shaft

3.10 Operating temperature

- Standard actuator:
from -40°C (-40°F) to +80°C (+176°F).
- Low temperature actuator SLT with silicon o-rings:
from -55°C (-67°F) to +80°C (+176°F).
- High temperature actuator HT with FPM o-rings:
from -15°C (+5°F) to +150°C (+300°F).

i Info

For low as well as high temperature use, special lubricants are required. Please contact PFEIFFER. A high or low temperature can influence the service life of the actuator.

3.11 Lubrication

The actuators are delivered lubricated for the service life of the actuator. The standard lubricant is approved for a temperature range from -40°C (-40°F) to +80°C (+176°F). For low (SLT) and high (HT) temperatures, a special lubricant is required. Please contact PFEIFFER.

i Info

For lubricants recommended for the rotary actuators when used under standard conditions, see Table 15-7 in Chapter "15.1.2 Lubricants".

3.12 Coating and corrosion protection

All actuators are protected against corrosion under normal weather conditions. The corrosion resistance of the different types of coatings is described on the data sheet.

i Info

Before mounting the actuator in a corrosive environment, make sure that the selected type of protection is suitable.

3.13 Response time

The response times can be found on the data sheets for the respective actuator sizes, see ► DB 31a-E2010.

i Info

The response time depends on several factors, such as supply pressure, flow rate of the operating medium (pipe diameter, flow capacity of the pneumatic components), valve type, valve torque and characteristics, applied safety factor, operating frequency and temperature, etc.

3.14 Rotary actuator assembly

i Info

- All components are clean and in a perfect condition.
- For assembly, use the grease recommended by PFEIFFER, see Table 15-7 in Chapter "15.1.2 Lubricants".

3.14.1 Shaft assembly

(see Figure 3-3, Figure 3-4, Figure 3-5 and Figure 3-6)

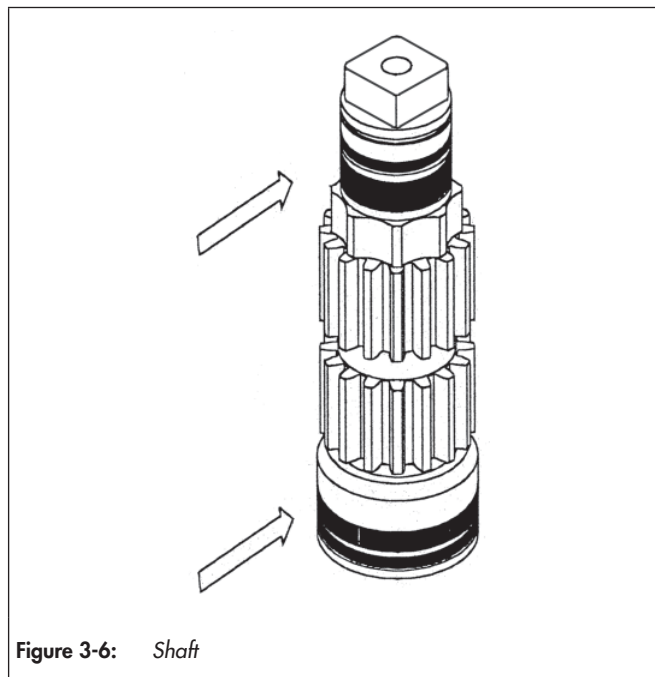


Figure 3-6: Shaft

- ⇒ Assemble the top and bottom shaft bearing bushings (6 and 7).
- ⇒ Assemble the top and bottom shaft seals (20 and 21) on the shaft.
- ⇒ Grease the outside of the shaft surface at the top and bottom, see Figure 3-4.
- ⇒ Guide the shaft (30) partially into the housing (29), see Figure 3-5.

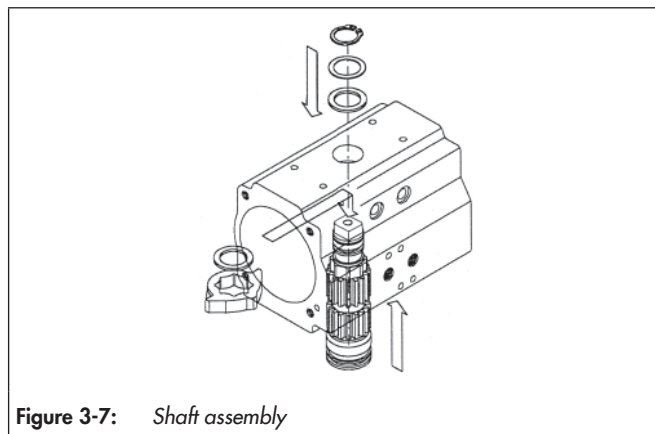


Figure 3-7: Shaft assembly

- ⇒ Fit the cam (1) in the desired position in reference to the top and bottom position of the shaft, as well as the direction of rotation of the actuator, see Figure 3-6.

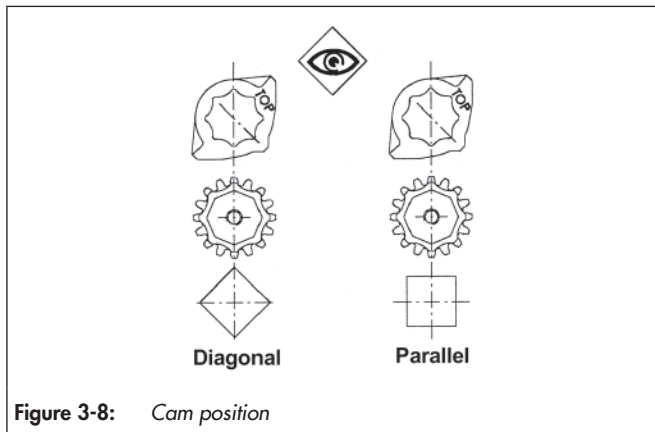


Figure 3-8: Cam position

- ⇒ Fit the internal thrust bearing (8).
- ⇒ Insert the shaft (30) completely.
- ⇒ Fit the external thrust bearing (8).
- ⇒ Fit the thrust washer (10) and spring clip (18) using pliers.

i Info

Information for actuators manufactured after 2006

With this actuator version, the adjusting screws (2) are fit from the inside in the actuator housing, see Figure 3-17. This assembly must be performed before piston and end cap assembly.

- ⇒ Carry out Chapter "3.14.5 Assembly of the adjusting screws, actuator version after 2006" before Chapter "3.14.2 Cam assembly" and Chapter "3.14.3 End cap assembly".

3.14.2 Cam assembly

(see Figure 3-3, Figure 3-7, Figure 3-8, Figure 3-9, Figure 3-10 and Figure 3-11)

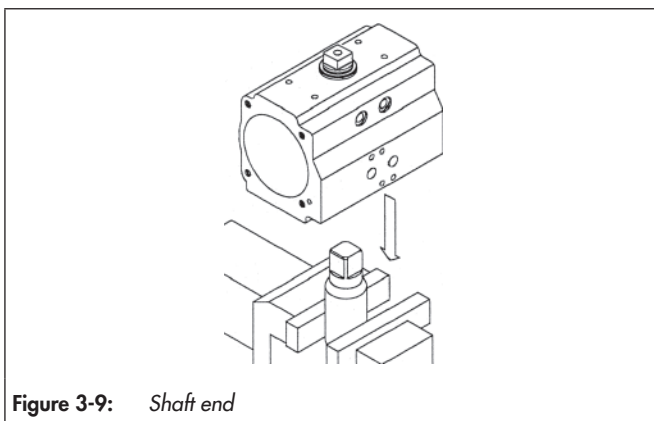


Figure 3-9: Shaft end

- ⇒ Assembling the piston o-ring (16)
- ⇒ Fit the piston bearing (5) and piston bearing (15).
- ⇒ Grease the bearing surface of the piston (25) in the housing (29) and the piston teeth.
- ⇒ Either clamp the top end of the shaft in a vice or hold the shaft end stationary with the corresponding counterpart and place the housing (29) in a horizontal position, see Figure 3-7.

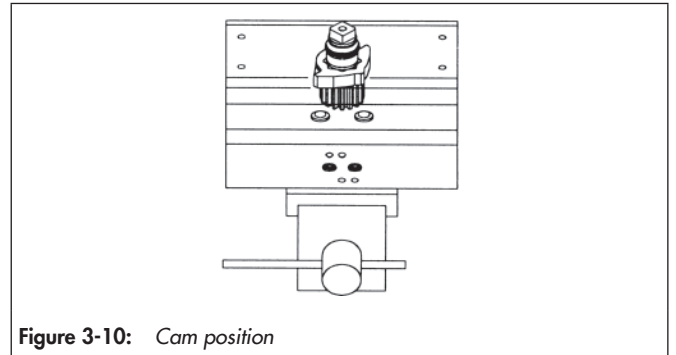


Figure 3-10: Cam position

- ⇒ The cam (1) is located in the correct position, see Figure 3-8.
- ⇒ For the standard direction of rotation (clockwise to close), turn the housing (29) 40° to 45° counterclockwise, view from below.
- ⇒ From the view from the top, turn clockwise, depending on how the shaft is held, see Figure 3-9.

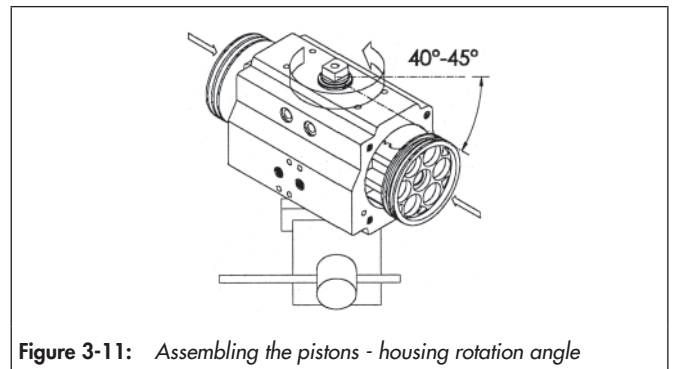


Figure 3-11: Assembling the pistons - housing rotation angle

- ⇒ Press both pistons (25) into the housing (29) at the same time until the pistons are engaged and turn the housing clockwise or counterclockwise until the travel end is reached, see Figure 3-9 and Figure 3-10.

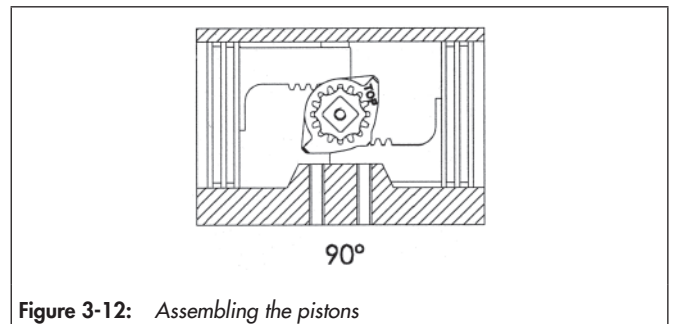


Figure 3-12: Assembling the pistons

Design and principle of operation

- ⇒ Check that the pistons in the end position turn the shaft 4° over the middle line (0°), see Figure 3-11.

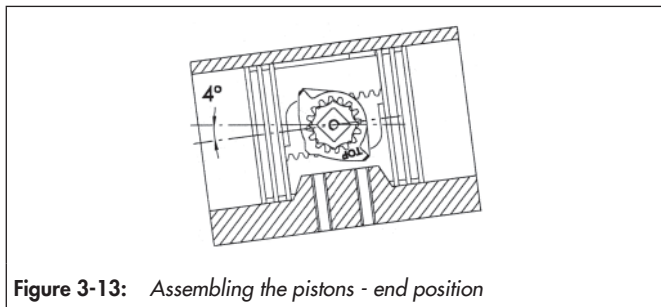


Figure 3-13: Assembling the pistons - end position

3.14.3 End cap assembly

(see Figure 3-3, Figure 3-12, Figure 3-13, Figure 3-14 and Figure 3-15)

For sizes 00900 to 03000, the end caps (22) and spring cartridges (17) are symmetric.

- ⇒ Housing bearing surface.
- ⇒ For single-acting actuators, insert the correct number of spring cartridges, according to the table on the respective data sheet, into the end cap, see Figure 3-12 and Figure 3-13.

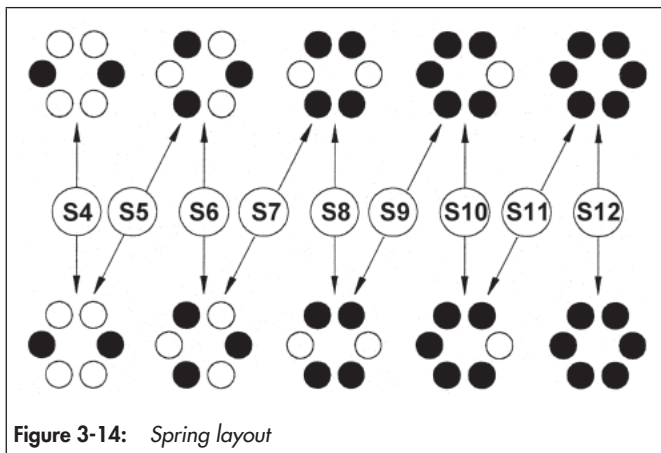


Figure 3-14: Spring layout

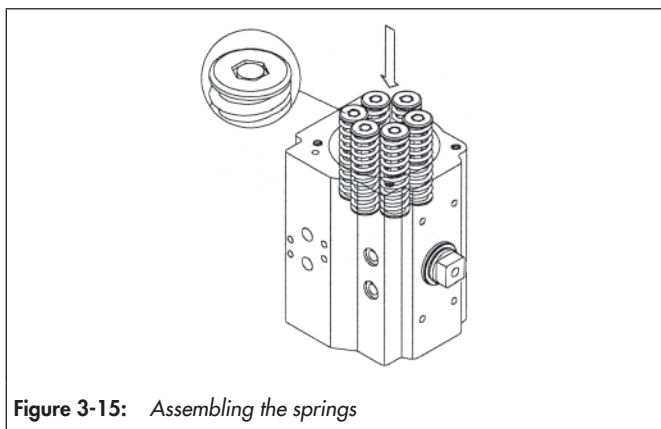


Figure 3-15: Assembling the springs

For actuators with additional travel limit:

- ⇒ Screw the adjusting screws (102) into the end caps (122 and 123).

- ⇒ Align the screw head on the end cap surface, see Figure 3-14.
- ⇒ Position the seal (111).
- ⇒ Fit the washer (103).
- ⇒ Screw on the lock nut (104).

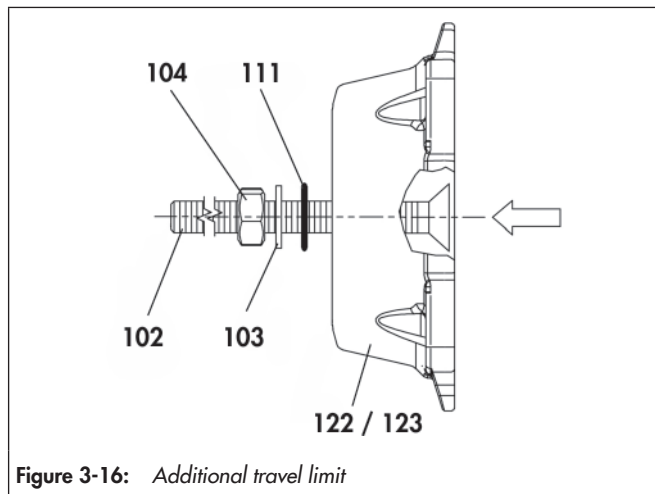


Figure 3-16: Additional travel limit

Table 3-2: Components of the additional travel limit

Pos.	Designation
102	Adjusting screw
103	Lock nut
104	Washer
111	Seal
122	End cap (right)
123	End cap (left)

- ⇒ Insert the end cap seal (14) in the groove of both end caps (22 and 23).

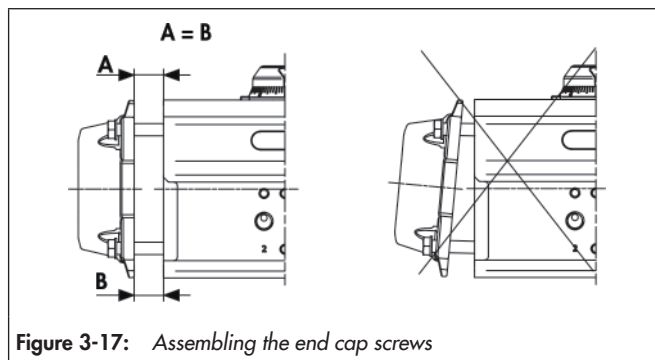


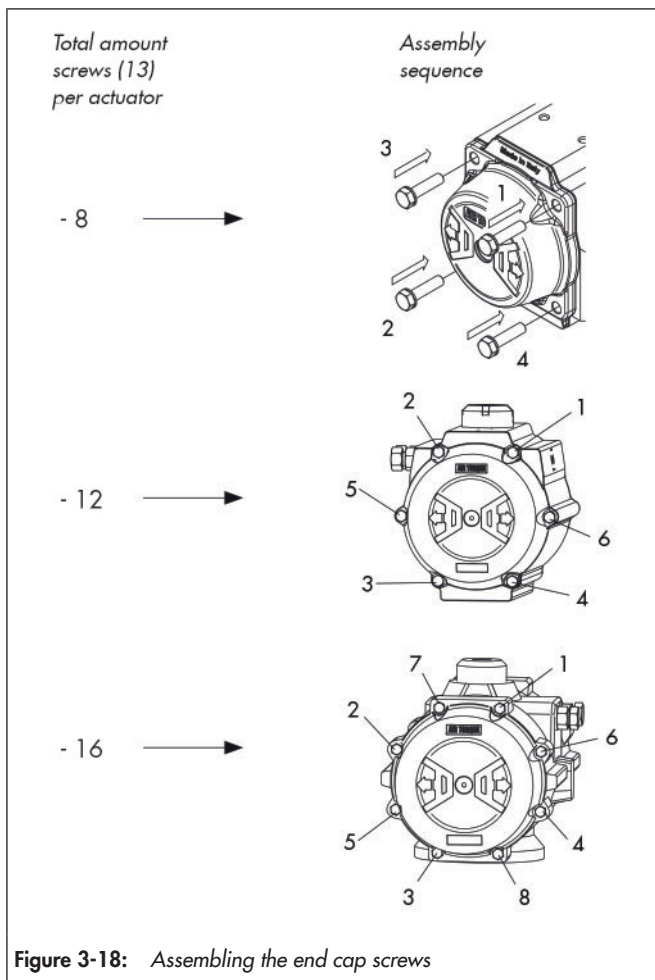
Figure 3-17: Assembling the end cap screws

! Note

Danger of damage to components due to incorrect assembly!

When reinstalling, the end cap can be damaged due to an uneven application of force of the compressed springs.

- ⇒ Assemble the end cap and maintain a constant distance ($A = B$) between the rotary actuator housing and the housing interface, see Figure 3-15.
- ⇒ Observe the installation sequence, see Figure 3-16.

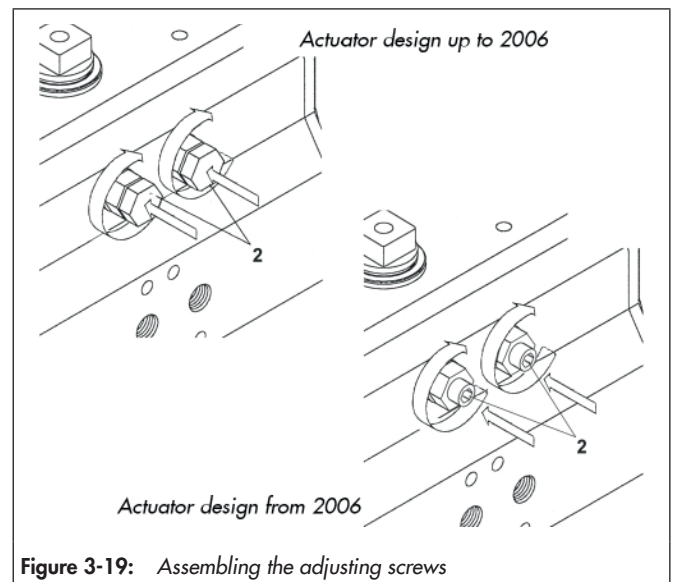


- ⇒ Assemble the end cap on the housing (29).
- ⇒ Make sure that the o-rings lie in the grooves.
- ⇒ Complete tightening the screws (13), tighten each screw in the indicated order one rotation each, see Figure 3-16.
- ⇒ Tightening torques, see "15.1.1 Tightening torques".

3.14.4 Assembly of the adjusting screws, actuator version before 2006

(see Figure 3-3 and Figure 3-17)

- ⇒ Insert both adjusting screws (2), lock nuts (4), washers (3) and seals (11).
- ⇒ Screw the adjusting screws (2) into the housing, see Figure 3-17.



3.14.5 Assembly of the adjusting screws, actuator version after 2006

(see Figure 3-3 and Figure 3-17)

i Info

Both adjusting screws (2) can only be inserted from the inside of the actuator.

- ⇒ Carry out the assembly of the adjusting screws before Chapter "3.14.2 Cam assembly" and Chapter "3.14.3 End cap assembly".

- ⇒ Insert the seals (11).
- ⇒ Place the lock nuts (4) and washers (3) on the adjusting screws (2).

3.14.6 Adjusting the end position on the standard actuator

(clockwise to close)

0° (close), end position adjustment for an actuator in the closed position

- ⇒ Turn the right screw (2) to the right or left (view from the top) until the required end position is reached.
- ⇒ Tighten the lock nut (4) to secure the position. Observe the tightening torque for the lock nut, see Table 15.2 in Chapter "15.1.1 Tightening torques".

90° (open), end position adjustment for an actuator in the opened position

- ⇒ Turn the left screw (2) (view from the top) to the right or left until the required end position is reached.

Design and principle of operation

- ⇒ Tighten the lock nut (4) to secure the position. Observe the tightening torque for the lock nut, see Table 15.2 in Chapter "15.1.1 Tightening torques".

3.14.7 Mounting the position indicator

(see Figure 3-3 and Figure 3-18)

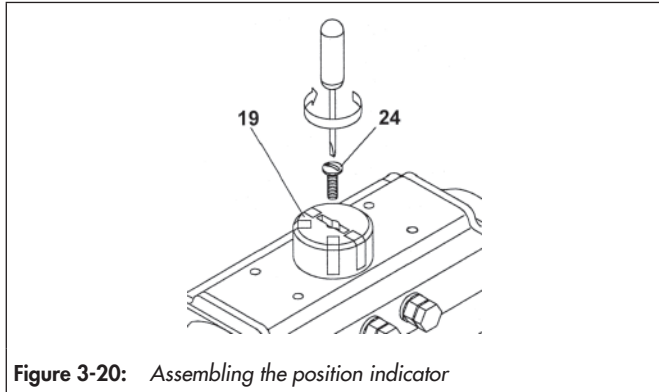


Figure 3-20: *Assembling the position indicator*

- ⇒ Place the position indicator (19) on the shaft and pay attention to the correct position.
- ⇒ Tighten the screw (24).

4 Shipment and on-site transport

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

4.1 Accepting delivery

Perform the following steps after receiving the goods:

- ⇒ Check the scope of supply. Compare the data on the actuator type plate with the delivery note. For details about the type plate, see Chapter "2 Markings on the device".
- ⇒ Check the supply for transport damage. Report transport damage to PFEIFFER and the transport company (see the delivery note).
- ⇒ Determine the weight and dimensions of the units to be transported and lifted to select the corresponding lifting equipment and load handling equipment.

4.2 Unpacking the actuator

Observe the following procedures:

- ⇒ Unpack the actuator only just before assembly.
- ⇒ Leave the actuator on the pallet or in the transport container for on-site transport.
- ⇒ Do not remove the plastic protective caps from the ports "2" and "4".
- ⇒ Dispose of the packaging according to local regulations.

4.3 Transporting and lifting the actuator

! DANGER

Danger due to falling of suspended loads!

- ⇒ *Do not stand under suspended loads.*
- ⇒ *Secure the transport paths.*

! WARNING

Overturning of the lifting equipment and damage to the load lifting equipment by exceeding the lifting capacity!

- ⇒ *Only used approved lifting equipment and load lifting equipment whose lifting capacity corresponds at least to the weight of the actuator including the packaging.*

! NOTE

Damage to the actuator due to improper fastening of the sling!
The screwed-in eyebolts on PFEIFFER rotary actuators are used only for actuator assembling and disassembling as well as for lifting the actuator without the valve.

- ⇒ The eyebolts may not be used for load bearing, vertical lifting of a complete valve.
- ⇒ *Do not fasten load bearing slings to the hand wheel of an optional emergency manual gear, bracket or any other component.*
- ⇒ *Observe the conditions for lifting, see Chapter "4.3.2 Lifting the actuator".*

4.3.1 Transporting the actuator

The actuator can be transported using lifting equipment such as a crane or a forklift.

- ⇒ Leave the actuator on the pallet or in the transport container for transport.
- ⇒ Comply with the transport conditions.

Transport conditions

- ⇒ Protect the actuator against external influences, such as impacts.
- ⇒ Do not damage the corrosion protection (paint, surface coating). Repair damage immediately.
- ⇒ Protect the actuator against moisture and dirt.
- ⇒ Observe the permissible temperature range, see data sheet ► TB 31a.

4.3.2 Lifting the actuator

When installing the actuator, larger actuators can be lifted using lifting equipment such as a crane or forklift.

Conditions for lifting

- ⇒ Use a hook with a safety clamp as the suspension element, see Figure 4-1 and Figure 4-2, so that the sling cannot slip off the hook during lifting and transport.
- ⇒ Secure the sling to the transport belt to prevent shifting and slipping off.
- ⇒ Fasten the sling such that it can be removed again after installation on the valve.
- ⇒ Avoid swinging and tipping the actuator.
- ⇒ Do not drill any additional holes into the actuator.
- ⇒ In the case of interruptions in work, do not leave the lifting equipment suspended in the air for a long period of time.
- ⇒ Lift always without the valve installed.

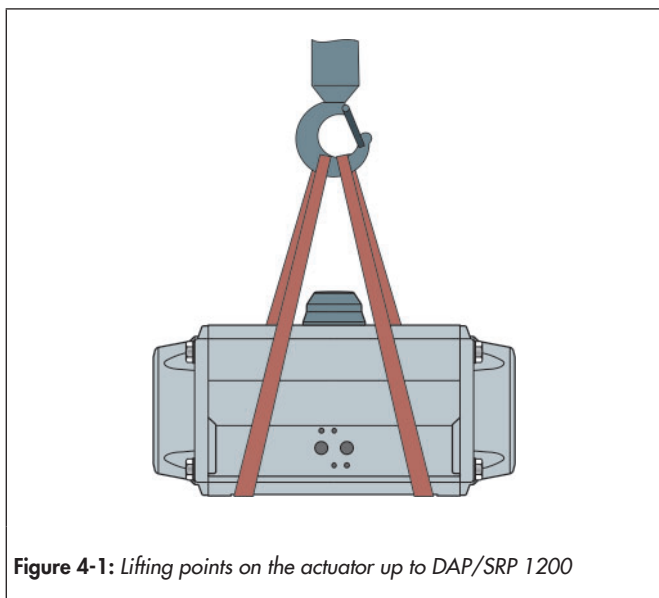


Figure 4-1: Lifting points on the actuator up to DAP/SRP 1200



Figure 4-2: Lifting points on the actuator from DAP/SRP 2000

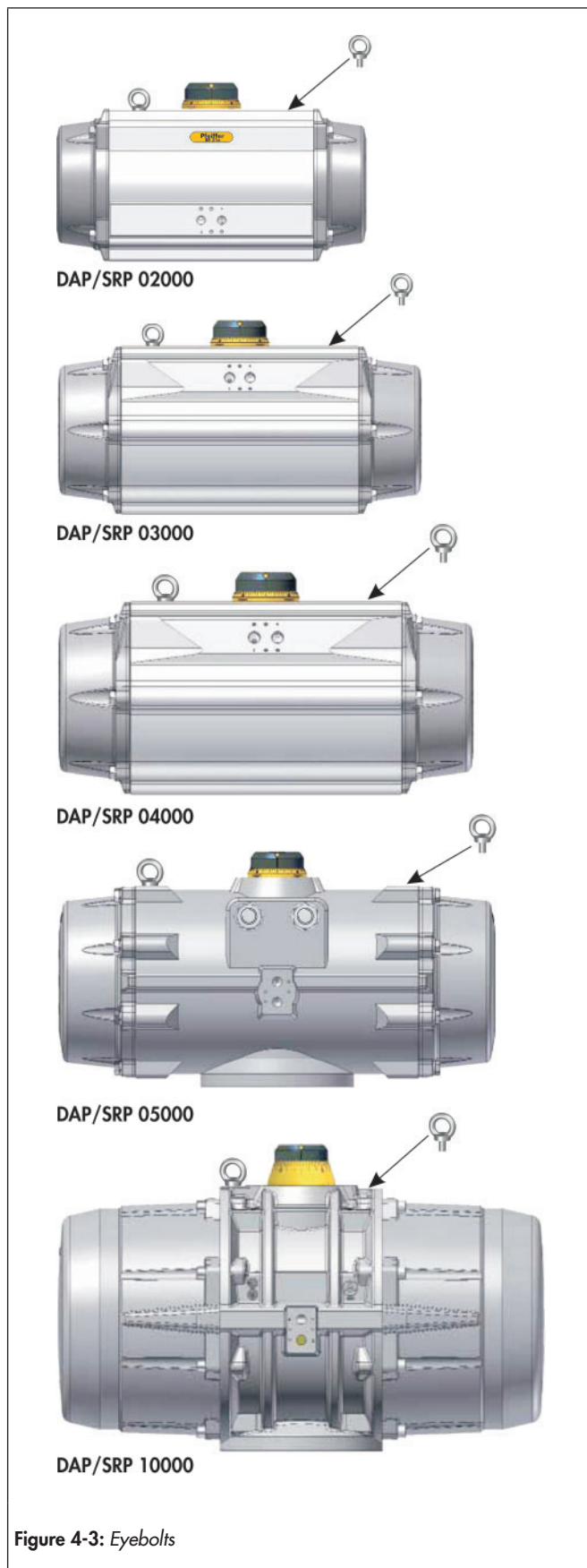


Figure 4-3: Eyebolts

Table 4-1: Eyebolt sizes

Actuator size	Eyebolt according to DIN 580
DAP/SRP 02000	M10
DAP/SRP 03000	
DAP/SRP 04000	M12
DAP/SRP 05000	
DAP/SRP 10000	

Lift the actuator (without the valve)

- ⇒ Use a hook with a safety clamp as the suspension element so that the sling cannot slip off the hook during lifting and transport, see Figure 4-1 and Figure 4-2.
- ⇒ Fasten the lifting sling on the actuator and the suspension element (e.g. hook) of the crane or forklift so it cannot slip.
- ⇒ Screw the eyebolts for larger rotary actuators from DAP/SRP 02000 into the provided threaded holes.
- ⇒ Fasten the lashing chain to the actuator eyebolt and to the suspension element (e.g. hook) of the crane or forklift.
- ⇒ Lift the actuator carefully. Check if the load lifting equipment holds.
- ⇒ Move the actuator at a constant speed to the assembly site.
- ⇒ Assemble the actuator on the valve, see Chapter "15-5: Tightening torques on the ISO connection".
- ⇒ **After assembly:** Remove the lashing chain or lifting sling.
- ⇒ Remove the eyebolts again.

⚠ DANGER

Danger due to incorrect lifting and transport!

The lifting points for the lifting slings shown on the schematic drawing serve as examples for most actuator variants. On site the conditions for lifting and transporting the actuator can change however.

- ⇒ The operator makes sure that the actuator is lifted and transported safely.

Lifting the actuator with the "Lift kit"

The actuators can also be lifted using the "Lift kit" designed for this purpose.

The Lift-kit is not part of the supply scope of the actuator and can be ordered separately, contact PFEIFFER.



Figure 4-4: Lift-kit

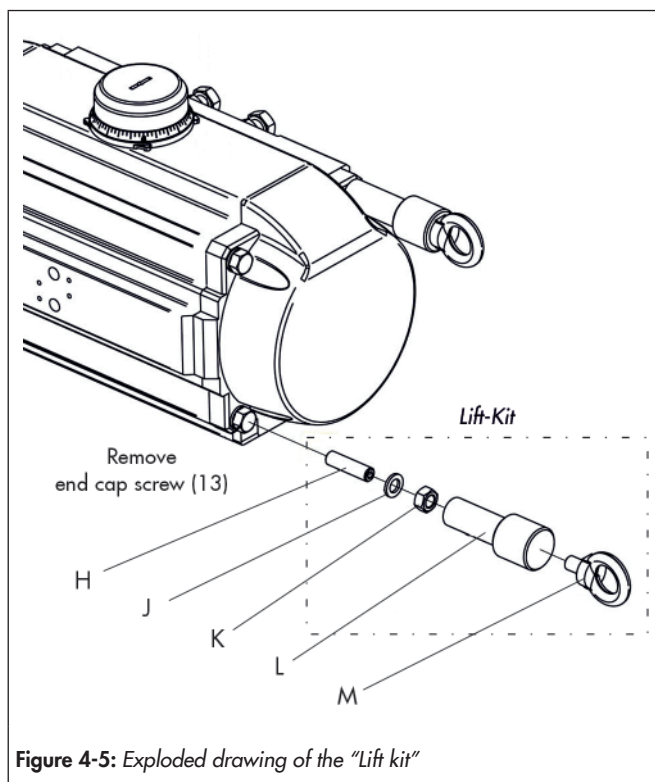


Figure 4-5: Exploded drawing of the "Lift kit"

Table 4-2: "Lift kit" components

Pos.	Designation
H	Threaded pin
J	Washer
K	Nut
L	Extension
M	Eyebolt

Table 4-3: "Lift kit" components

SRP/DAP actuator	Weight in kg ¹⁾	Screw on the end cap	Eyebolts	max. ZG in kg ²⁾
00300	12.6	4x M10x35	M10	300
00450	18.1	4x M10x35	M10	300
00600	24	4x M12x50	M12	400
00900	31.6	4x M12x50	M12	400
01200	45.1	4x M14x55	M14	600
02000	64	4x M16x60	M16	800
03000	102	6x M14x55	M14	600
04000	150	6x M16x60	M16	800
05000	169	8x M16x60	M16	800
10000	251	8x M16x70	M16	700

¹⁾ SRP weight with 6 springs

²⁾ Additional weight

Lifting the complete valve

– Case 1 (recommended solution)

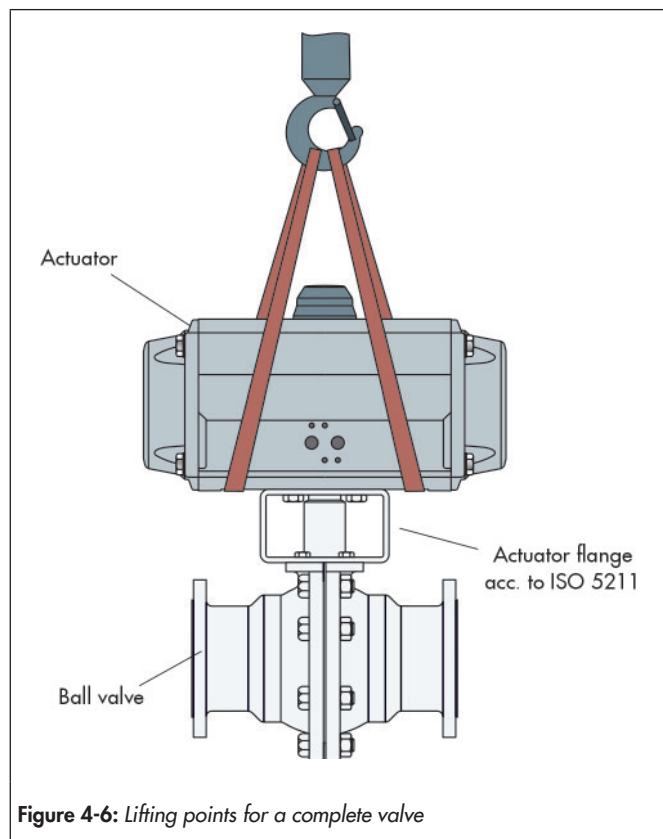


Table 4-4: Maximum load to be lifted ³⁾

DAP/SRP actuator	F04	F05	F07	F10	F12
00015	100				
00030		150			
00060		150			
00100			300		
00150			300		
00220				400	
00300				400	
00450					600

DAP/SRP actuator	F12	F14	F16	F25	F30
00600	600				
00900		1100			
01200		1100			
02000			1500		
03000			1500		
04000			1500		
05000				1500	
10000					1500

³⁾ Maximum load to be lifted in kg, in reference to the actuator size and flange pattern. Actuator flange according to ISO 5211.

– Case 2 (solution not recommended)

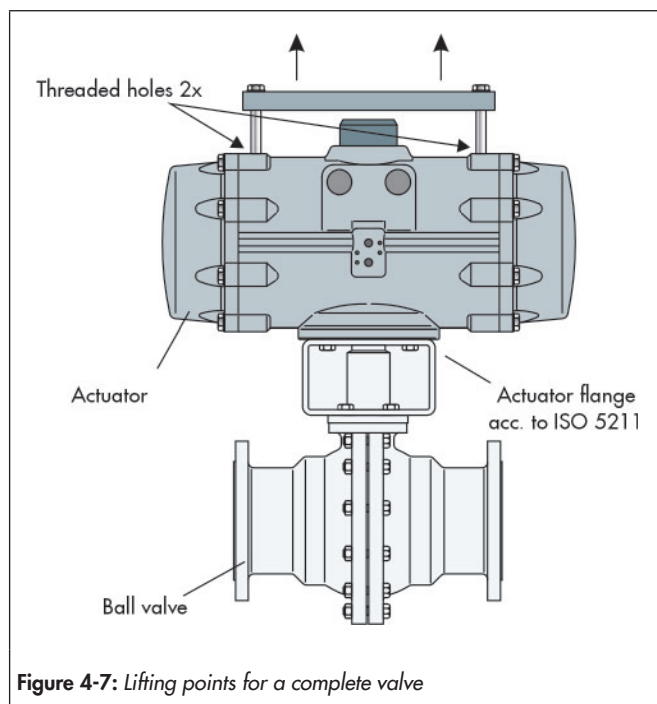


Table 4-5: Maximum permissible additional weight

DAP/SRP actuator	max. load for both holes in kg	Threaded holes	Weight in kg ⁴⁾	max. permissible additional weight in kg
02000	200	M10x15	64	136
03000	200	M10x15	102	98
04000	300	M12x15	150	150
05000	300	M12x15	169	131
10000	300	M12x15	251	49

⁴⁾ SRP weight with 6 springs

WARNING

Danger due to improper fastening of the sling to the valve!

⇒ Observe the detailed notes about lifting the complete valve, see the corresponding documentation for the respective valve.

Danger due to insufficient screw connections!

The lifted load requires a suitable screw connection of all screws and pins required for lifting.

⇒ Minimum screw connection, observe > 1x thread diameter.

Danger due to failure to observe the safety regulations!

⇒ Comply with the safety regulations for load handling.

PFEIFFER does not accept any liability for improper handling of the valve or additional loads.

Storage conditions

- ⇒ If the valve and actuator are already assembled, observe the storage conditions for the respective valve, see the corresponding documentation for the valve.
- ⇒ In the case of storage prior to installation, the actuator should normally be stored in a closed room where it is protected against harmful influences such as impacts, dirt or moisture. A room temperature of $25^{\circ}\text{C} \pm 15^{\circ}\text{C}$ and a relative humidity of <75% are recommended.
- ⇒ Secure the actuator in the storage position against slipping or tipping over.
- ⇒ Do not damage the corrosion protection (paint, surface coating). Remedy any damage immediately.
- ⇒ Make sure that the surrounding area is free of acids or other corrosive and aggressive media.
- ⇒ Do not place any objects on the actuator.

4.4 Storing the actuator

NOTE

Damage to the actuator due to improper storage!

- Comply with the storage conditions.
- Avoid long storage periods.
- In the case of deviating storage conditions and a longer storage period, contact PFEIFFER.

Info

PFEIFFER recommends checking the actuator and the storage conditions regularly during a longer storage period.

5 Installation

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

5.1 Installation conditions

Ensure the following conditions prior to assembly:

- The actuator is not damaged.
- The type, material and temperature range of the actuator match the ambient conditions (temperatures, etc.). For details about the type plate, see Chapter “2 Markings on the device”.

5.2 Preparing for assembly

Carry out the following preparation steps:

- ⇒ Get the material and tools ready that are required for assembly.
- ⇒ Check that the optional vent plugs are not clogged.
- ⇒ In the case of attachments, check the pressure gauge for proper function.
- ⇒ If the valve and actuator are already assembled together, check the screw connections for the correct tightening torques. Components can loosen up during transport.

5.3 Assembling the device

Depending on the version, PFEIFFER valves are supplied with the actuator and accessories already assembled on the valve.

The valve, actuator and accessories can also be supplied separately. If supplied separately, the valve, actuator and accessories must be assembled together at the installation site.

The tasks are listed below that are necessary for assembly and prior to the commissioning.

DANGER

Risk of bursting due to improper opening of pressurised devices and components!

Pneumatic rotary actuators are pressure equipment that can burst if handled improperly. Projecting, flying components and fragments can cause injuries or even death.

- ⇒ Depressurise the concerned plant parts and the actuator. Also residual energy must be discharged.

WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Opening of the rotary actuator only according to the instructions, see Chapter “11.1 Releasing the spring tension in the actuator”.

Danger of injury due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ During assembly, make sure that ventilation openings are not located at eye level on the operator level of the valve or ventilate towards eyes on the operator level.
- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to “seizure” if not actuated for a long period of time”), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter “11.1 Releasing the spring tension in the actuator”.

NOTE

Damage to the actuator due to excessively high or low tightening torques!

The rotary actuator components must be tightened with specific torques. Excessively tightened components are subject to increased wear. Components that are not sufficiently tightened can cause the components to release.

- ⇒ Observe the tightening torques, see “Table 15-1: Tightening torque of the end caps (13)”, “Table 15-4: Tightening torque on the port (NAMUR)”, “Table 15-5: Tightening torques on the ISO connection” and “Table 15-6: Tightening torques on the accessory connection”.

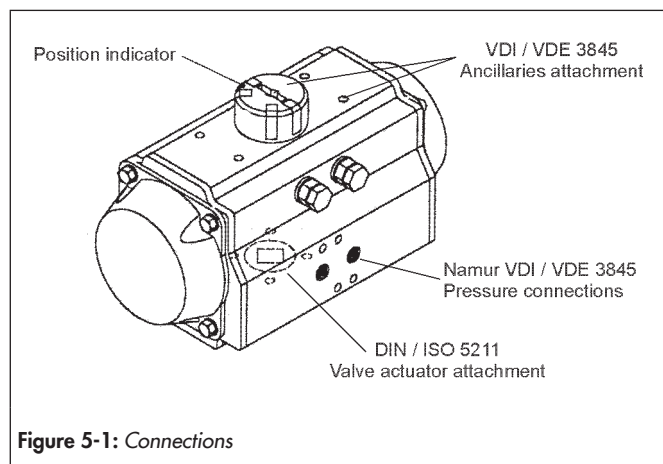
Damage to the actuator due to unsuitable tools!

- ⇒ Only use tools approved by PFEIFFER, see Figure 15-1 and Table 15-8 in Chapter “15.1.3 Tools”.

Damage to the actuator due to unsuitable lubricants!

- ⇒ Only use lubricants approved by PFEIFFER, see Table 15-7 in Chapter “15.1.2 Lubricants”.

5.3.1 Controls and connections



Tip

The assembly of the valve and actuator takes place according to the signal range and direction of action of the actuator. This information is available on the type plate of the actuator, see Chapter "2 Markings on the device".

5.3.2 Assembling the valve and actuator

The rotary actuator can be assembled on the valve as follows:

- Direct assembly of the rotary actuator directly on the valve interface.
- Assembly of a bracket and a coupling.

WARNING

Danger of damage and malfunction by exceeding the torque limit value.

In consideration of the maximum tightening torque, maximum air supply pressure and the maximum transmittable actuator torque, according to ISO 5211 the maximum transmittable tightening torque may not exceed the torque limit in relation to the installed ISO flange and the shaft connection.

⇒ This information is available on the type plate of the actuator, see "2 Markings on the device".

NOTE

Damage due to incorrect fail-safe position!

When installing a single-acting actuator (with spring) with a defined fail-safe position, check that when the pneumatic or electric energy fails the direction of rotation complies with the application (clockwise to close).

Info

- Before assembling the actuator on a valve, make sure that the actuator turns in the required direction of rotation and that the valve and actuator are correctly aligned with each other.
- All information necessary to assemble the actuator correctly and safely on the valve, e.g.: dimensions, torque, air volume, end position adjustment, response time, operating temperature, direction of rotation are clearly marked on the type plate, on the data sheet and /or the technical data sheets.

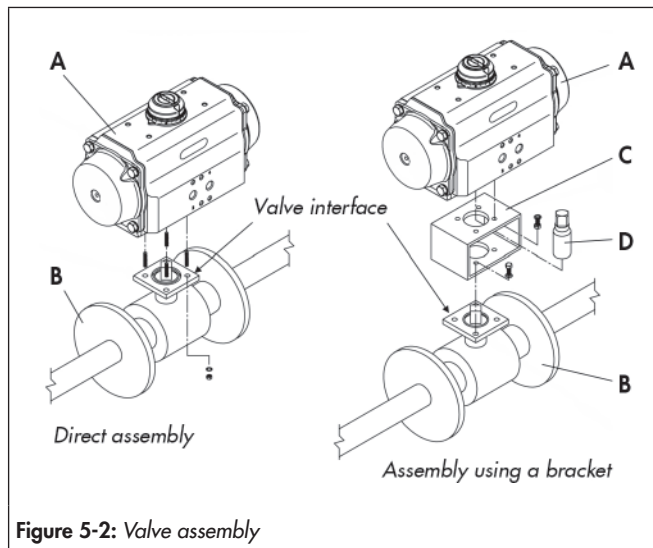


Figure 5-2: Valve assembly

Table 5-1: Components for valve assembly

Pos.	Designation
A	Rotary actuator
B	Valve
C	Console
D	Coupling

Direct assembly

- ⇒ Insert the square drive, flat head drive or key drive of the valve shaft directly into the actuator shaft of the rotary actuator (A).
- ⇒ Fasten the rotary actuator (A) and valve (B) with the corresponding screws through the ISO flange. Observe the tightening torques, see "Table 15-5: Tightening torques on the ISO connection " in Chapter "15.1.1 Tightening torques".

Assembly using a bracket

- ⇒ Fasten the bracket (C) to the valve (B) with the corresponding screws. Observe the tightening torques, see "Table 15-5: Tightening torques on the ISO connection " in Chapter "15.1.1 Tightening torques".
- ⇒ Plug the coupling (D) into the valve shaft.

Info

Make sure that the position indicator of the coupling matches the switch position of the valve. After adjusting the end stop screws, it is essential to tighten the lock nuts.

- ⇒ Place the rotary actuator (A) on the bracket (C) and fasten with the corresponding screws. Observe the tightening torques, see "Table 15-5 Tightening torques on the ISO connection" in Chapter "15.1.1 Tightening torques".

! WARNING

Danger and damage due to heavy actuator units!
 Rotary actuators that are heavier than the weight of the valve can pose a danger to the user and cause damage in the pipe system after installation.

- ⇒ These rotary actuators must be supported if they generate a bending stress on the valve due to their size and/or installation situation.

! NOTE

Damage to the valve due to the incorrect setting of the end stops!

The actuating device is adjusted to the operating data specified in the order.

- ⇒ The adjustment of the "OPEN" and "CLOSED" end stops is the responsibility of the user.

PFEIFFER rotary actuators can be controlled by directly assembled devices or remote control systems.

Therefore the rotary actuators have direct interfaces for the assembly of control and signalling devices (e.g. solenoid valves, positioners, control boxes) and threaded connections for remote control systems, see Figure 5-3.

- ⇒ Assembly and operating instructions, see the documentation from the control and signalling device manufacturer.

Assembling a solenoid valve

- ⇒ Before fastening a solenoid valve (G), check that the rotary actuator is in its initial position (closed position, pistons retracted).
- ⇒ For standard assembly and clockwise rotation to close, the groove on the shaft or position indicator (E) must be in the closed position, at a right angle to the longitudinal axis of the rotary actuator (A).
- ⇒ Fasten the solenoid valve (G) with suitable screws to the rotary actuator (A). Observe the tightening torques, see "Table 15-4: Tightening torques on the port (NAMUR)" in Chapter "15.1.1 Tightening torques".

Assembly of a limit switch / positioner

- ⇒ Use suitable screws to fasten the switch cabinet (F) and bracket to the actuator (A). Observe the tightening torques, see "Table 15-6: Tightening torques on the accessory connection" in Chapter "15.1.1 Tightening torques".

Assembling additional accessories

Additional accessories, such as air-sets, etc. can be installed on the rotary actuator. For assembly details, see the respective instructions for the accessory.

5.3.3 Assembling accessories

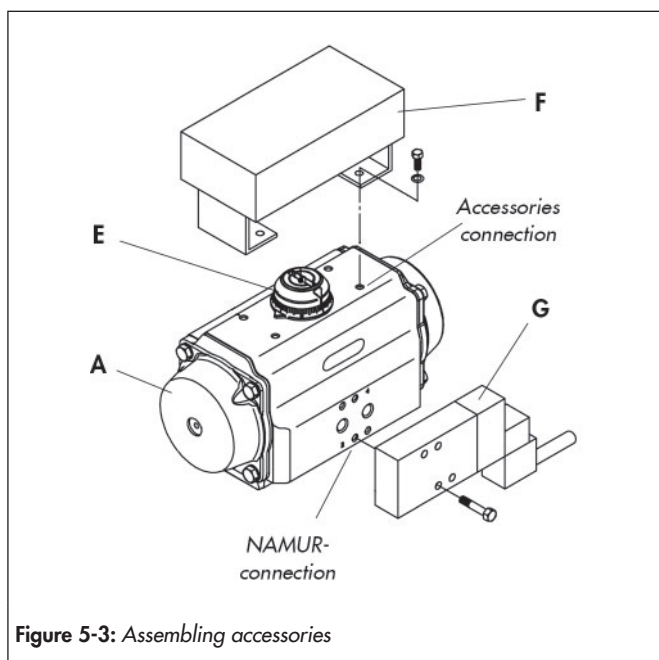


Figure 5-3: Assembling accessories

Table 5-2: Components for accessory assembly

Pos.	Designation
A	Rotary actuator
E	Position indicator
F	Limit switch / positioner
G	Solenoid valve

5.4 Establishing the pneumatic connection

The BR 31a actuator operates with a 90° (optionally 120° or 180°) rotation to "open" and "close" different types of valves.

Double-acting actuator (standard direction of rotation)

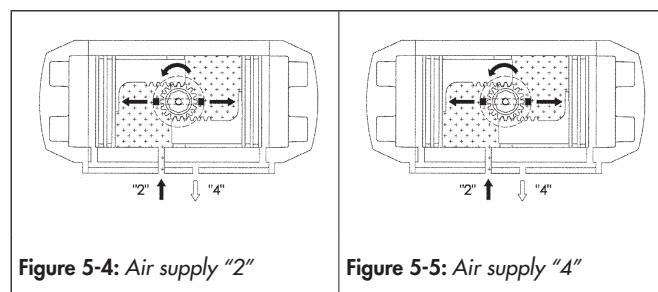


Figure 5-4: Air supply "2"

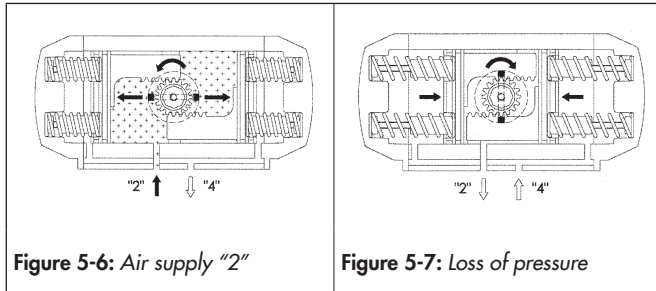
Figure 5-5: Air supply "4"

- Supply air to port "2" moves the pistons in the direction of the end positions, see Figure 5-4. Air supply to port "4" requires a clockwise direction of rotation.

Installation

- ⇒ Supply air to port "4" moves the pistons in the middle, see Figure 5-5. Air supply to port "2" requires a clockwise direction of rotation.

Single-acting actuator (standard direction of rotation)



- ⇒ Supply air to port "2" moves the pistons in the direction of the end positions, the springs are compressed, see Figure 5-6. Air supply to port "4" requires a clockwise direction of rotation.
- ⇒ Loss of pressure (air supply failure) at port "2" allows the pistons to return to the initial position, see Figure 5-7. Air supply to port "2" requires a clockwise direction of rotation.

6 Start-up

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

! DANGER

Risk of bursting due to improper opening of pressurised devices and components!

Pneumatic rotary actuators are pressure equipment that can burst if handled improperly. Projecting, flying components and fragments can cause injuries or even death.

Before working on the actuator:

- ⇒ Depressurise the concerned plant parts and the actuator. Also residual energy must be discharged.

! WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Opening of the rotary actuator only according to the instructions, see Chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to "seizure" if not actuated for a long period of time"), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to incorrect operation, use or installation caused by incorrect information on the actuator!

After performing adjustment or conversion work, the data on the actuator type plate is no longer correct. This concerns, for example, the direction of action and the schematic representation of the direction of action and actuator function.

- ⇒ Immediately replace the signs or adhesives with incorrect/outdated information.
- ⇒ Enter the newly adjusted values on the type plate, or request a new type plate from PFEIFFER.

! NOTE

Damage to the actuator due to excessively high or low tightening torques!

The rotary actuator components and additional equipment must be tightened with specific torques. Excessively tightened components are subject to increased wear. Components that are not sufficiently tightened can cause the components to release.

- ⇒ Comply with tightening torques, see Chapter "15.1.1 Tightening torques".

Damage to the actuator due to unsuitable tools!

Unsuitable tools can damage the actuator.

- ⇒ Suitable tools are required to work on the actuator, see Figure 15-1 and Table 15-8 in Chapter "15.1.3 Tools".

Ensure the following conditions prior to commissioning/recommissioning:

- ⇒ In reference to the Machinery Directive 2006/46/EU, the actuators can be classified as a "part of a machine". The commissioning of the actuator is also prohibited until the machine and/or the final system in which the actuator is installed fulfils the requirements of directive 2006/46/EU and with which compliance is declared.
- ⇒ The actuators are designed, built and classified in compliance with ATEX Directive 2014/68/EU. Use in zones with a potentially explosive atmosphere must comply with the classification of the actuator and the ATEX safety regulations.
- ⇒ It is important that the actuator is used only within the limits of use permitted by the technical specifications.
- ⇒ The actuator is installed properly on the valve, see Chapter "5 Assembly".
- ⇒ The function tests have been completed successfully.
- ⇒ The current conditions in the concerned plant section correspond to the design of the actuator, see Intended use in Chapter "1 Safety instructions and safety measures".

Commissioning/recommissioning

- ⇒ Check the correct function of the actuator.

7 Operation

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Opening of the rotary actuator only according to the instructions, see Chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to "seizure" if not actuated for a long period of time"), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to incorrect operation, use or installation caused by incorrect information on the actuator!

After performing adjustment or conversion work, the data on the actuator type plate is no longer correct. This concerns, for example, the direction of action and the schematic representation of the direction of action and actuator function.

- ⇒ Immediately replace the signs or adhesives with incorrect/ outdated information.
- ⇒ Enter the newly adjusted values on the type plate, or request a new type plate from PFEIFFER.

The rotary actuator can be operated after connection to the supply line and adjustment of the rotation angle.

Single-acting rotary actuators with spring return are operated by an air stroke or spring stroke by pressurising or ventilating the connection openings.

With double-acting rotary actuators, the connection openings for the stroke must be pressurised and ventilated alternately for the stroke, see Chapter "5.4 Establishing the pneumatic connection".

- ⇒ Select the accessories, operating elements, pipes and screw connections such that they do not restrict the flow or cause a large pressure drop that affects the performance of the rotary actuator.

Info

If the plant specifications require a supply air pressure for the rotary actuator that is lower than the maximum supply air pressure specified on the actuator type plate, mark the rotary actuator with the reduced supply air pressure (e.g. "max. supply air pressure limited to ... bar").

7.1 Actuator operation

- ⇒ If required, after commissioning and reaching the operating temperature, tighten all connections, see Chapter "15.1.1 Tightening torques".
- ⇒ The valve/actuator unit must be actuated with the control signals.

Info

Valves that were delivered from the factory with an actuator are precisely adjusted. The user is responsible for any changes they make.

8 Malfunction

When rectifying the faults, chapter "1 Safety instructions and safety measures" must be observed.

8.1 Detecting and rectifying errors

Type of fault	Possible cause	Measures
The actuator shaft does not move even if requested.	The actuator is mechanically blocked.	Check the installation. Remove the blockage, see Chapter "1 Safety instructions and safety measures". WARNING! A blocked actuator shaft (e.g. due to "seizure" if not actuated for a long period of time) can release unexpectedly and move uncontrolled. This can lead to crushing if reaching into them. Before trying to release a blockage of the actuator shaft, interrupt and lock the pneumatic energy and the control signal. Release the residual energy from the actuator (spring tension) before freeing the blockage, see chapter "11.1 Releasing the spring tension in the actuator".
	The signal pressure is not sufficient.	Check the signal pressure. Check the signal pressure line for leaks.
	Signal pressure not connected to the correct port ("2" or "4").	Connect the signal pressure, see Chapter "5.4 Establishing the pneumatic connection"
	Defective pistons or seals in the actuator.	Disassemble the rotary actuator, lubricate all sliding parts, see chapter "1 Safety instructions and safety measures". Replace the pistons and seals, see Chapter "12.1 Replacing defective components"
Uneven rotation	The signal pressure is not sufficient	Check the supply system and ensure the correct signal pressure.
	Lack of lubricant	Disassemble the rotary actuator, lubricate all sliding parts, see chapter "1 Safety instructions and safety measures". For the recommended lubricant, see Chapter "15.1.2 Lubricant" For the required repair instructions, see Chapter "12 Repairs".
	Worn components	Repairs are necessary. Disassemble the rotary actuator, see chapter "1 Safety instructions and safety measures". Request spare parts from PFEIFFER Chemie-Armaturenbau GmbH, see Chapter "15.2 Spare parts and wear parts". For the required repair instructions, see Chapter "12 Repairs".
	Control system	Check the correct assembly of the control system components. Check the control system documentation and contact the manufacturer.
	Defective valve	Disconnect the connection to the control pressure. Remove the actuator from the valve (observe the "Safety instructions and safety measures", see the included valve manuals). Check the valve documentation and contact the manufacturer.
Incomplete rotation	Incorrect end position adjustment	Observe the notes for the correct end position adjustment, see Chapter "3.14.6 End position adjustment for the standard actuator".
	Foreign material inside	Disassemble the rotary actuator, see chapter "1 Safety instructions and safety measures". Remove any foreign material. For the required repair instructions, see Chapter "12 Repairs".
	Incorrect assembly after maintenance	Disassemble the rotary actuator, see chapter "1 Safety instructions and safety measures". Assemble the rotary actuator correctly. For the required repair instructions, see chapter "3.14 Rotary actuator assembly" and "12 Repairs".
	Control system	Check the correct assembly of the control system components. Check the control system documentation and contact the manufacturer.
	Defective valve	Disconnect the connection to the control pressure. Remove the actuator from the valve (observe the "Safety instructions and safety measures", see the included valve manuals). Check the valve documentation and contact the manufacturer.

Malfunction

Type of fault	Possible cause	Measures
Loss of power	Signal pressure too low	Check the control system, Ensure a correct supply pressure.
	Supply line blocked, crushed or leaky	Check the pipes and fittings. Remove foreign matter/damaged components.
	Leakage in the rotary actuator seals	Disassemble the rotary actuator, see chapter "1 Safety instructions and safety measures". Replace the seals, see Chapter "12.1 Replacing defective components"
	Blocked exhaust opening	Remove plugs or foreign matter from the exhaust opening.
	Defective valve	Disconnect the connection to the control pressure. Remove the actuator from the valve (observe the "Safety instructions and safety measures", see the included valve manuals). Check the valve documentation and contact the manufacturer.

i Info

- In the case of faults that are not listed in the table, contact the After Sales Service at PFEIFFER.
 - Spare parts must be ordered indicating all the data according to the actuator marking. Only original parts from PFEIFFER Chemie-Armaturenbau GmbH may be installed.
-

8.2 Carrying out emergency measures

The system operator is responsible for emergency measures.

9 Servicing

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

The following documents are required in addition for the maintenance of the ball valve:

- Corresponding EB for the installed valve.

DANGER

Risk of bursting due to improper opening of pressurised devices and components!

Pneumatic rotary actuators are pressure equipment that can burst if handled improperly. Projecting, flying components and fragments can cause injuries or even death.

- ⇒ Depressurise the concerned plant parts and the actuator. Also residual energy must be discharged.

WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Opening of the rotary actuator only according to the instructions, see Chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to "seizure" if not actuated for a long period of time"), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to incorrect operation, use or installation caused by incorrect information on the actuator!

After performing adjustment or conversion work, the data on the actuator type plate is no longer correct. This concerns, for example, the direction of action and the schematic representation of the direction of action and actuator function.

- ⇒ Immediately replace the signs or adhesives with incorrect/ outdated information.
- ⇒ Enter the newly adjusted values on the type plate, or request a new type plate from PFEIFFER.

NOTE

Damage to the actuator due to excessively high or low tightening torques!

The rotary actuator components and additional equipment must be tightened with specific torques. Excessively tightened components are subject to increased wear. Components that are not sufficiently tightened can cause the components to release.

- ⇒ Comply with tightening torques, see Chapter "15.1.1 Tightening torques".

Damage to the actuator due to unsuitable tools!

Unsuitable tools can damage the actuator.

- ⇒ Suitable tools are required to work on the actuator, see Figure 15-1 and Table 15-8 in Chapter "15.1.3 Tools".

Damage to the ball valve due to unsuitable lubricants!

Unsuitable lubricants can corrode and damage the surface.

- ⇒ The actuator material requires suitable lubricants, see Table 15-7 in Chapter "15.1.2 Lubricants".

Info

The actuator was checked by PFEIFFER prior to delivery.

- If maintenance and repair work is performed without approval from the After Sales Service of PFEIFFER, the product guarantee will be voided.
- Only use original parts from PFEIFFER as spare parts that correspond to the original specification.

9.1 Periodic tests

Depending on the conditions of use, the actuator must be checked at defined intervals in order to take remedial measures prior to possible malfunctions. The plant operator is responsible for preparing a suitable test plan.

Tip

After Sales Service can provide you with support for creating a test plan specific to your plant.

9.2 Preparing for maintenance and conversion work

- ⇒ Get the material and tools ready that are required for the work.
- ⇒ Decommission the rotary actuator, see chapter "10 Decommissioning".
- ⇒ Disassemble the rotary actuator from the valve, see Chapter "11.2 Disassembling the actuator".
- ⇒ With preloaded actuators, release the spring tension, see chapter "11.1 Releasing the spring tension in the actuator".

⇒ Unscrew the screws on the end cap and put them down to the side.

After the preparation, the maintenance and/or conversion work can be carried out.

9.3 Assembling the valve after maintenance and conversion work

- ⇒ Assemble the actuator, see Chapter "5 Assembly".
- ⇒ Adjust the upper and lower signal range, see Chapter "6 Commissioning".

9.4 Maintenance work

- ⇒ Under normal operating conditions, only a periodic check to ensure proper functioning is necessary.
- ⇒ Depending on the operating and ambient conditions, maintenance can be necessary between 500,000 and 1,000,000 cycles.
- ⇒ Spare part kits for maintenance (replacement of seals and bearings) are available, see Chapter "1.5.2 Spare parts and wear parts".

9.5 Conversion work

See "Figure 3-3: Exploded drawing of the rotary actuator version Edition 2010" in Chapter "3 Design and principle of operation".

- ⇒ Move the actuator to the fail-safe position so that the springs are released.
- ⇒ Remove the screw (24).
- ⇒ Remove the position indicator (19) from the end of the shaft, and use a screwdriver as a lever if necessary.

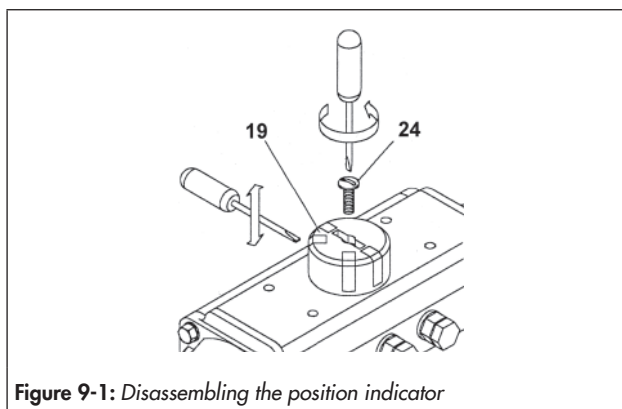


Figure 9-1: Disassembling the position indicator

Remove both adjusting screws (2) with washers (4) and lock nuts (3).

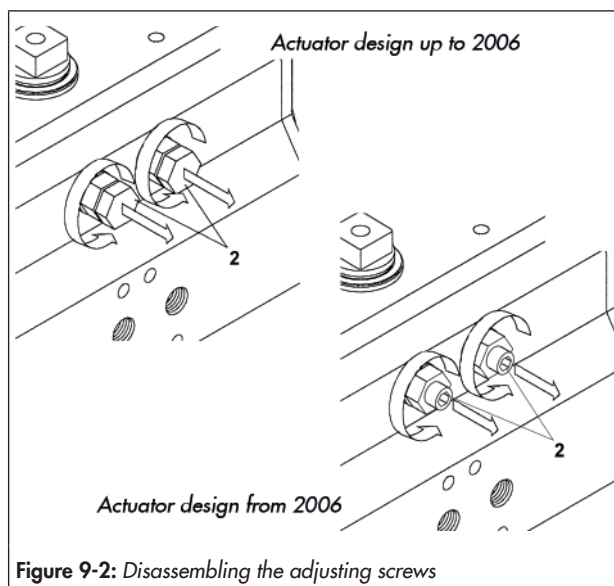


Figure 9-2: Disassembling the adjusting screws

- ⇒ Remove the seals (11).
- ⇒ Disassemble the end cap screws (13).
- ⇒ Disassemble one end cap after the other.
- ⇒ Disassemble the end cap screws (13) according to the order of the disassembly sequence, see Figure 9-4.
- ⇒ For single-acting actuators, remove the spring cartridge (17).

⚠ WARNING

Danger of damage to components due to incorrect disassembly!

During disassembly, the compressed springs can be damaged due to the uneven application of force.

- ⇒ When disassembling the end cap screws, observe the order, see Figure 9-4.
- ⇒ When disassembling the end cap, maintain a constant distance ($A = B$) between the actuator housing and the housing interface, see Figure 9-3.

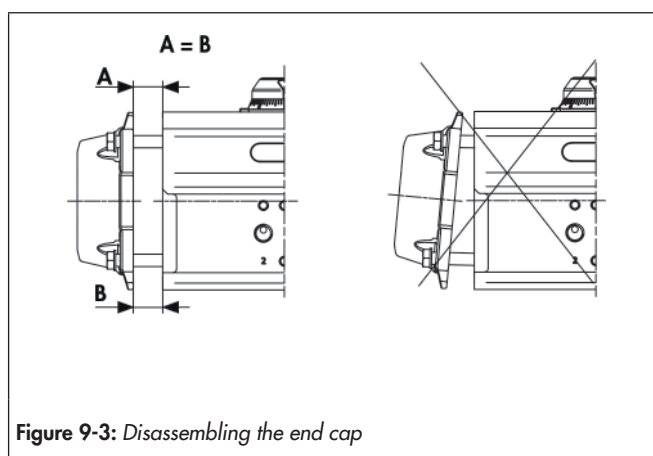
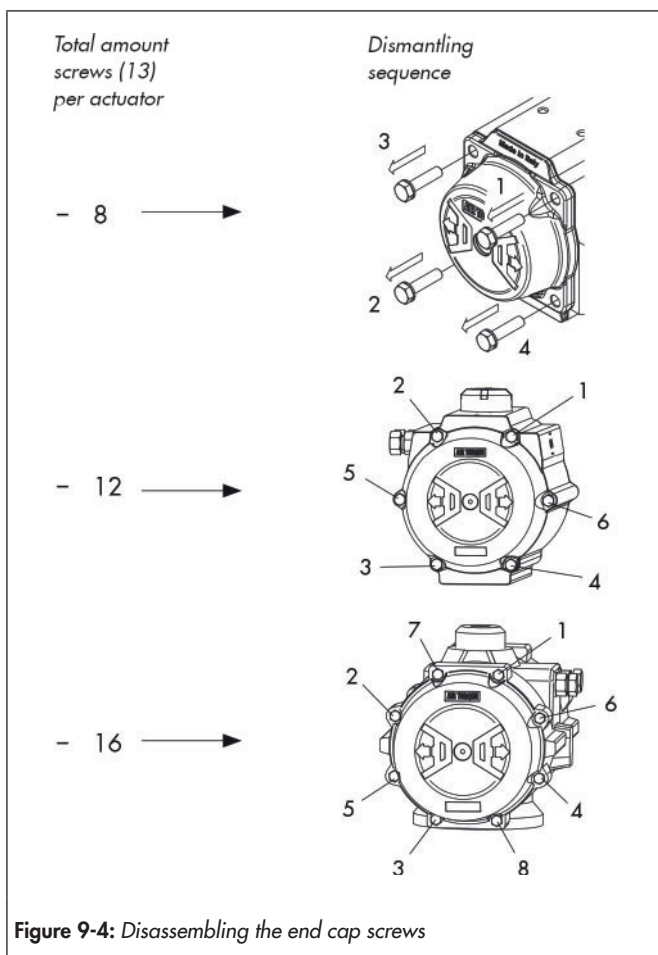


Figure 9-3: Disassembling the end cap



⇒ Release the spring compression. Unscrew each end cap screw (13) one rotation each according to the order shown in Figure 9-4 and the number of rotations specified in Table 9-1.

Table 9-1: Number of rotations

DAP/SRP rotary actuator	Number of screw rotations (13)
15	26 ... 28 Rotations
30	5 ... 7 Rotations
60	
100	
150	
220	
300	
450	
600	
900	
1200	
2000	6 ... 8 Rotations
3000	
4000	8 ... 10 Rotations
5000	
10000	

WARNING

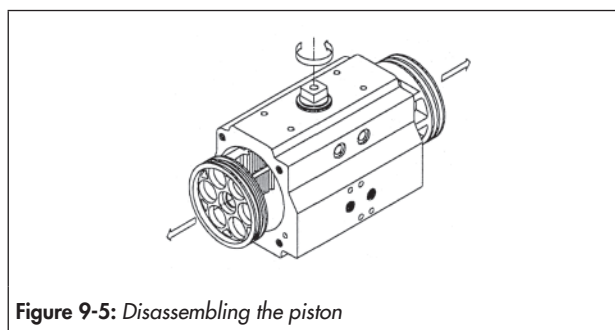
Danger of injury due to defective springs!

The end caps are tensioned when the springs are compressed. If after unscrewing the screws (13) with the number of rotations specified in Table 9-1 force is still applied on the end caps (23 and 23), the spring cartridge is possibly damaged or the pistons are not completely closed.

⇒ Stop disassembly and contact PFEIFFER.

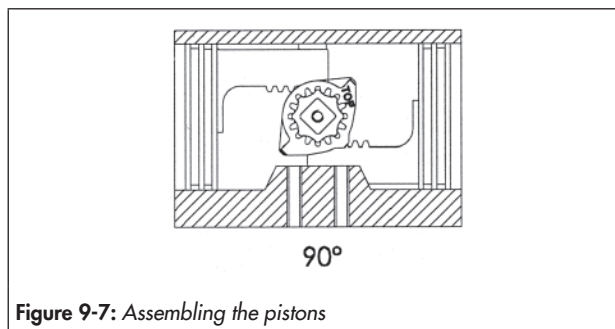
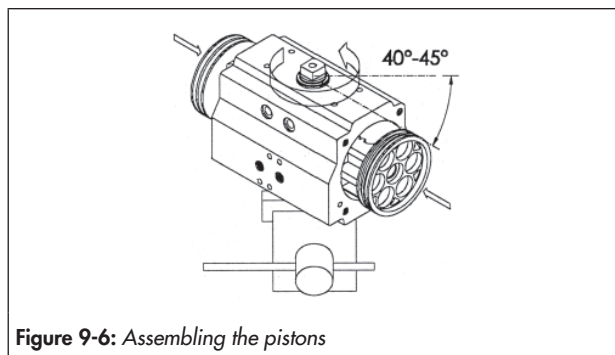
⇒ Remove the end cap seal (14).

⇒ Clamp the housing (29) in a vice or similar device, turn the shaft (30) until the pistons (25) are accessible.



⇒ Both pistons (25) are turned 180° in the axial direction and reassembled.

⇒ Press both pistons (25) into the housing (29) at the same time until the pistons are engaged and turn the housing until the travel end is reached.



Check that the pistons in the end position turn the shaft 4° over the middle line (0°), see Figure 9-8.

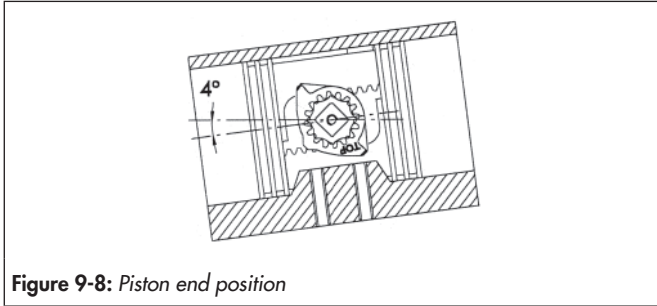


Figure 9-8: Piston end position

⇒ In the case of single-acting actuators, insert the spring cartridge in the end cap.

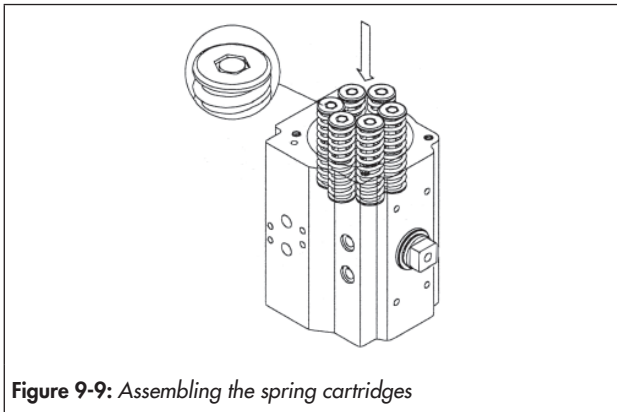


Figure 9-9: Assembling the spring cartridges

⇒ Insert the end cap seal (14) in the groove of both end caps (22 and 23).

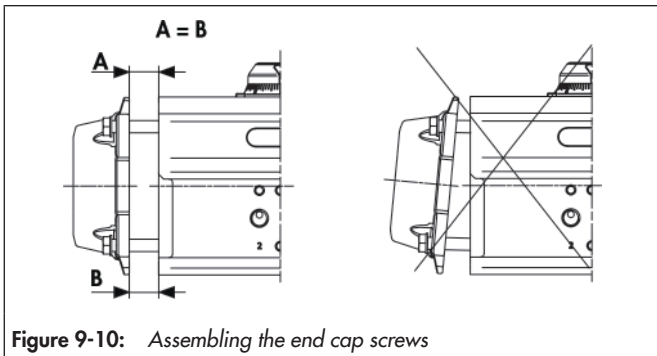


Figure 9-10: Assembling the end cap screws

Note

Danger of damage to components due to incorrect assembly!

When reinstalling, the end cap can be damaged due to an uneven application of force of the compressed springs.

⇒ Assemble the end cap and maintain a constant distance ($A = B$) between the rotary actuator housing and the housing interface, see Figure 9-10.

⇒ Observe the installation sequence, see Figure 9-11.

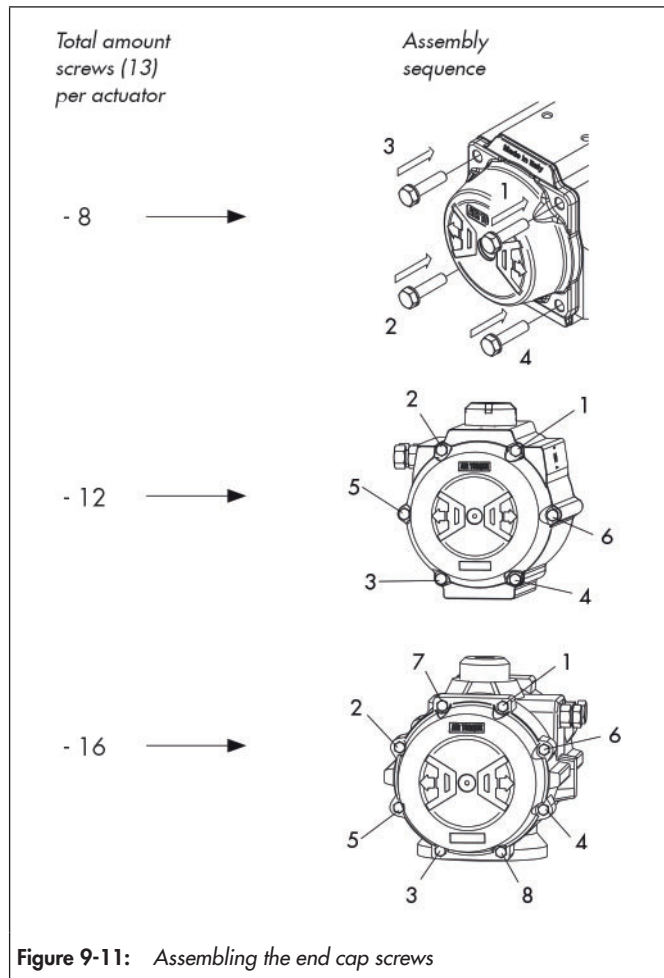


Figure 9-11: Assembling the end cap screws

- ⇒ Assemble the end cap on the housing (29).
- ⇒ Make sure that the o-rings lie in the grooves.
- ⇒ Complete tightening the screws (13), tighten each screw in the indicated order one rotation each, see Figure 9-11.
- ⇒ Tightening torques, see "15.1.1 Tightening torques".
- ⇒ Insert both adjusting screws (2), lock nuts (4), washers (3) and seals (11).
- ⇒ Screw the adjusting screws (2) into the housing, observe the end position adjustment.
- ⇒ Place the position indicator (19) on the shaft and pay attention to the correct position.

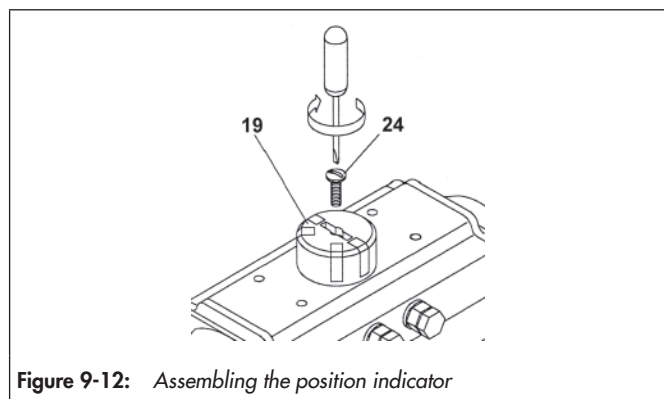


Figure 9-12: Assembling the position indicator

- ⇒ Tighten the screw (24).
- ⇒ Attach a new type plate to the actuator with the changed direction of action.

9.6 Ordering spare parts and consumables

Information about spare parts, lubricants and tools can be received from the After Sales Service at PFEIFFER.

Spare parts

Information on spare parts can be found in Chapter "15.2 Wear parts and spare parts".

Lubricant

For information on suitable lubricants, see Chapter "15-7: Recommended lubricants" in Chapter "15.1.2 Lubricants".

Tools

For information on suitable tools, see "Figure 15-1: Tools" and "Table 15-8 Tool dimensions" in Chapter "15.1.3 Tools".

10 Decommissioning

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

DANGER

Risk of bursting due to improper opening of pressurised devices and components!

Pneumatic rotary actuators are pressure equipment that can burst if handled improperly. Projecting, flying components and fragments can cause injuries or even death.

Before working on the actuator:

- ⇒ Depressurise the concerned plant parts and the actuator. Also residual energy must be discharged.

WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Opening of the rotary actuator only according to the instructions, see Chapter "11.1 Releasing the spring tension in the actuator".

Danger of injury due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to "seizure" if not actuated for a long period of time"), release the residual energy of the actuator (spring tension) before releasing the blockage, see chapter "11.1 Releasing the spring tension in the actuator".

Info

- Before any disassembly work is performed, it is important to make sure that the actuator is not pressurised and the springs are released in the end position.
- Always proceed with caution and check again that ports 2 and 4 are vented and all accessories or devices have been removed.
- In the case of a single-acting actuator, make sure prior to disassembly that the actuator is in the start position and the pistons are fully retracted.

To decommission the actuator for maintenance and repair work or for disassembly, perform the following steps:

- ⇒ Decommission the valve, see the corresponding valve documentation.
- ⇒ Shut off the pneumatic power and lock it, to depressurise the actuator.

11 Removal

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

! DANGER

Risk of bursting due to improper opening of pressurised devices and components!

Pneumatic rotary actuators are pressure equipment that can burst if handled improperly. Projecting, flying components and fragments can cause injuries or even death.

Before working on the actuator:

- ⇒ Depressurise the concerned plant parts and the actuator. Also residual energy must be discharged.

! WARNING

Danger of injury due to preloaded springs!

The rotary actuators are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

Open the rotary actuator only according to the instructions, see Chapter "11.1 Releasing the spring tension in the actuator".

Danger due to escaping exhaust air!

The actuator is pneumatically operated, therefore exhaust air escapes after it is controlled.

- ⇒ When working near the actuator, wear eye and hearing protection.

Danger of crushing due to moving actuator- and switching shaft!

- ⇒ Before working on the actuator, interrupt and lock pneumatic energy and the control signal.
- ⇒ Vent the actuator.
- ⇒ Do not allow the jamming of objects to hinder the operation of the actuator- and switching shaft.
- ⇒ If the actuator- and switching shaft are blocked (e.g. due to "seizure" if not actuated for a long period of time"), release the residual energy of the actuator (spring tension) before releasing the blockage, see Chapter "11.1 Releasing the spring tension in the actuator".

Prior to disassembly, make sure that the following conditions are met:

- The actuator is decommissioned, see chapter "10 Decommissioning".

11.1 Releasing the spring tension in the actuator

The end caps (22 and 23) are tensioned due to the compressed springs. Furthermore, improper disassembly of the spring cartridge can lead to serious injuries.

- ⇒ Before starting work on the rotary actuator, disconnect all pneumatic, hydraulic and electrical supply lines.
- ⇒ Depressurise the rotary actuator.
- ⇒ When disassembling the end cap, bring the rotary actuator to the "closed" (0°) position and remove the fastening screws correctly.
- ⇒ Disassemble one end cap after the other.

! WARNING

Danger of damage to components due to incorrect disassembly!

During disassembly, the compressed springs can be damaged due to the uneven application of force.

- ⇒ When disassembling the end cap screws, observe the order, see Figure 11-1.
- ⇒ When disassembling the end cap, maintain a constant distance (A = B) between the actuator housing and the housing interface, see Figure 11-2.

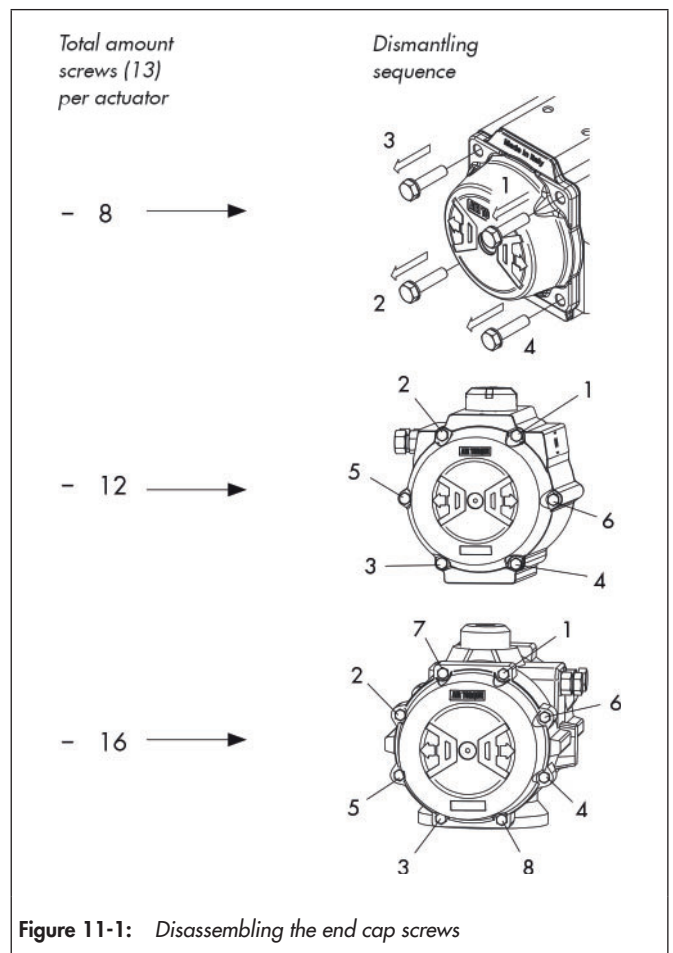


Figure 11-1: Disassembling the end cap screws

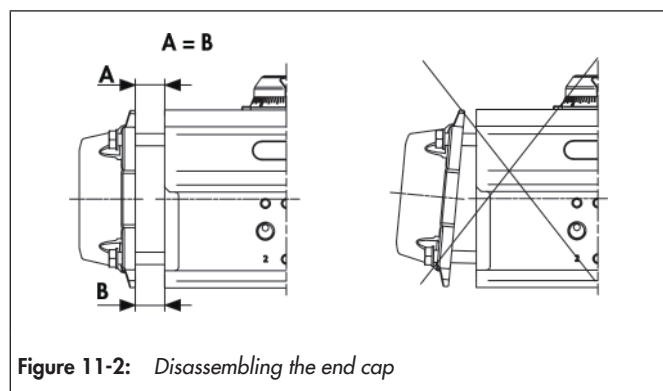


Figure 11-2: Disassembling the end cap

⇒ Release the spring compression. Unscrew each end cap screw (13) one rotation each according to the order shown in Figure 11-1 and the number of rotations specified in Table 11-1.

Table 11-1: Number of rotations

Rotary actuator DAP / SRP	Number of screw rotations (13)	
15	26 ... 28 Rotations	
30		
60		
100		
150		
220		
300		5 ... 7 Rotations
450		
600		
900		
1200		
2000	6 ... 8 Rotations	
3000		
4000		
5000	8 ... 10 Rotations	
10000		

⚠ WARNING

Danger of injury due to compressed springs!

The end caps are tensioned when the springs are compressed. If after unscrewing the screws (13) with the number of rotations specified in Table 11-1 force is still applied on the end caps (23 and 23), the spring cartridge is possibly damaged or the pistons are not completely closed.

- ⇒ Stop disassembly and contact PFEIFFER.
- ⇒ Do not disassemble an individual spring cartridge.
- ⇒ Contact PFEIFFER to service the spring cartridges.

11.2 Disassembling the actuator

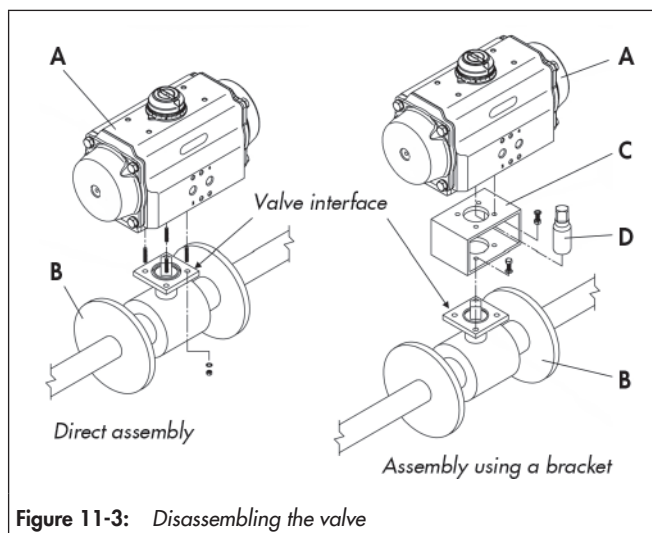


Figure 11-3: Disassembling the valve

Table 11-2: Components for valve disassembly

Pos.	Designation
A	Rotary actuator
B	Valve
C	Console
D	Coupling

Disassemble the rotary actuator (A) from the valve (B) as follows:

- ⇒ Do not endanger the plant.
- ⇒ Disconnect the electrical/pneumatic/hydraulic energy supply from the rotary actuator.
- ⇒ Vent the actuator.
- ⇒ If available, disconnect the electrical wiring for the control or signalling devices, see the documentation from the respective control or signalling device manufacturer.

To disconnect the actuator and valve, two assembly variations must be observed.

Disassembly in the case of direct assembly

- ⇒ Loosen the screws on the ISO flange.
 - ⇒ Disconnect the rotary actuator (A) and valve (B).
- Insert the square drive, flat head drive or key drive of the valve shaft directly into the actuator shaft of the actuator.
- ⇒ Release and remove the components.

Disassembling in the case of assembly using a bracket

- ⇒ Release the screws fixing the rotary actuator (A) to the bracket (C).
- ⇒ Separate the rotary actuator (A) from the bracket (C).
- ⇒ Release and remove the coupling (D) from the valve shaft.
- ⇒ If necessary, release the screws fixing the valve (A) to the bracket (C).
- ⇒ Separate the bracket from the valve.

12 Repairs

If the operation of the rotary actuator is no longer compliant or if it does not work at all, it is defective and must be repaired or replaced.

! NOTE

Damage to the actuator due to improper maintenance and repair!

- ⇒ Do not perform maintenance and repair work on your own.
- ⇒ Contact the After Sales Service at PFEIFFER for maintenance and repair work.

In special cases, certain maintenance and repair work may be performed.

The work described in this chapter may only be performed by specialist personnel qualified to perform the corresponding task.

For decommissioning and disassembly, observe Chapter "10 Decommissioning" and Chapter "11 Disassembly".

12.1 Replacement of defective components

If it is necessary to disassemble the actuator for repair:

- ⇒ Remove the rotary actuator from the valve.

The disassembly of the rotary actuator is described below. In this way, defective components can be reached and replaced.

12.1.1 Removing the position indicator

(see Figure 12-3 and Figure 12-1)

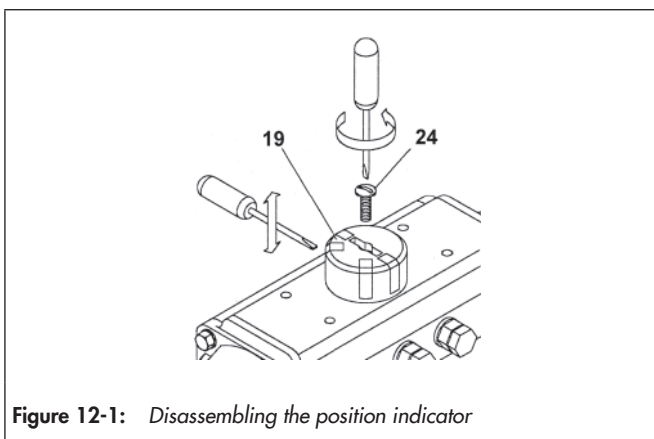


Figure 12-1: Disassembling the position indicator

- ⇒ Remove the screw (24).
- ⇒ Remove the position indicator (19) from the end of the shaft, and use a screwdriver as a lever if necessary.

12.1.2 Remove the adjusting screws, actuator version before 2006

(see Figure 12-3 and Figure 12-2)

- ⇒ Remove both adjusting screws (2) with washers (4) and lock nuts (3).
- ⇒ Remove the seals (11) and replace them when replacing spare parts.

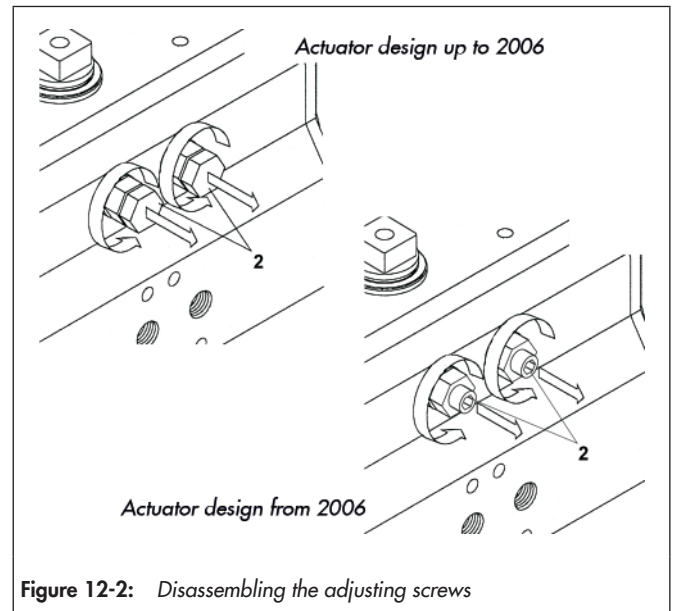


Figure 12-2: Disassembling the adjusting screws

12.1.3 Remove the adjusting screws, actuator version after 2006

(see Figure 12-3 and Figure 12-2)

- ⇒ Remove the lock nuts (3) with washers (4).
- ⇒ Remove the seals (11) and replace them when replacing spare parts.
- ⇒ Unscrew both adjusting screws (2) to their stopping point.

i Info

For final disassembly, the end caps (22 and 23) as well as the piston (25) must be disassembled beforehand, as the adjusting screws can only be removed from inside the actuator

- ⇒ Carry out the disassembly of the adjusting screws according to Chapter "12.1.4 End cap disassembly" and Chapter "12.1.5 Piston disassembly".

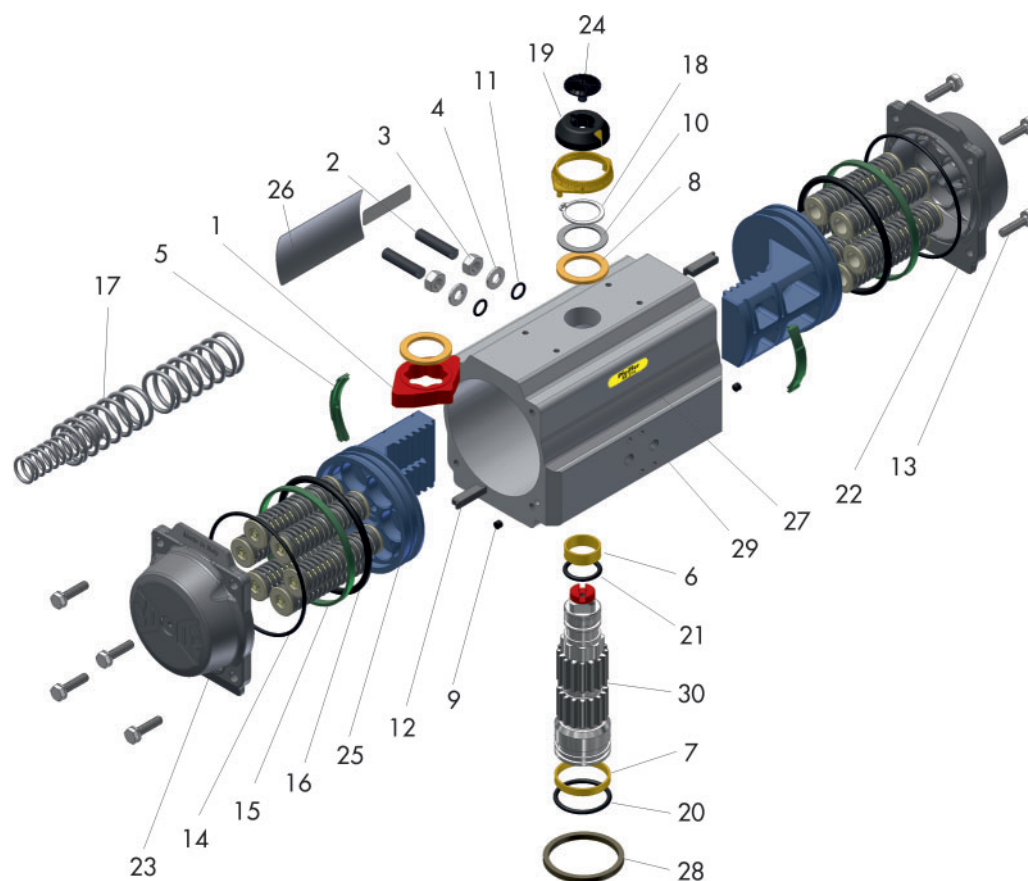


Figure 12-3: Exploded drawing of the rotary actuator version after 2010

Table 12-1: Parts list

Pos.	Designation
1	Cam (end position adjustment)
2	Adjusting screw
3	Lock nut
4	Washer
5	Bearing (piston back)
6	Shaft bearing bushing (top)
7	Shaft bearing bushing (bottom)
8	Thrust bearing
9	Plug (to seal air port)
10	Supporting ring
11	Seal (adjusting screw)
12	Piston guide
13	Screw (end cap)
14	End cap seal
15	Bearing (piston head)

Pos.	Designation
16	O-ring
17	Spring cartridge
18	Retaining ring
19	Position indicator
20	Shaft seal (bottom)
21	Shaft seal (top)
22	End cap (right)
23	End cap (left)
24	Screw (position indicator)
25	Piston
26	Type plate
27	Type plate (end cap)
28	Spigot
29	Housing
30	Shaft

12.1.4 End cap disassembly

(see Figure 12-3, Figure 12-4 and Figure 12-5)

- ⇒ Disassemble one end cap after the other.
- ⇒ Disassemble the end cap screws (13) according to the order of the disassembly sequence, see Figure 12-4.
- ⇒ For single-acting actuators, remove the spring cartridge (17).

WARNING

Danger of damage to components due to incorrect disassembly!

During disassembly, the compressed springs can be damaged due to the uneven application of force.

- ⇒ When disassembling the end cap screws, observe the order, see Figure 12-4.
- ⇒ When disassembling the end cap, maintain a constant distance ($A = B$) between the actuator housing and the housing interface, see Figure 12-5.

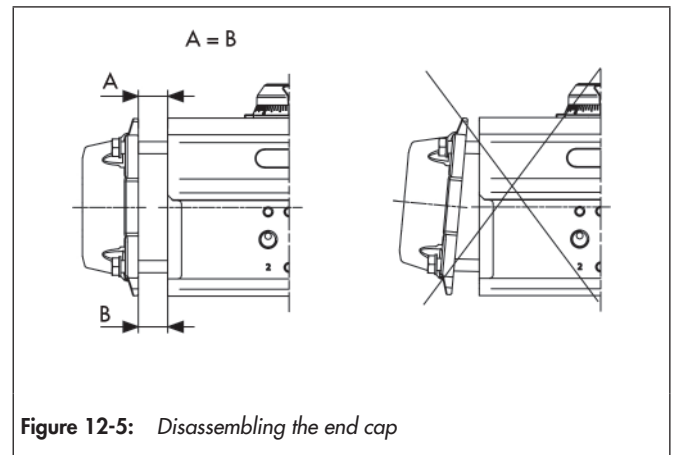


Figure 12-5: Disassembling the end cap

- ⇒ Release the spring compression. Unscrew each end cap screw (13) one rotation each according to the order shown in Figure 12-4 and the number of rotations specified in Table 12-2.

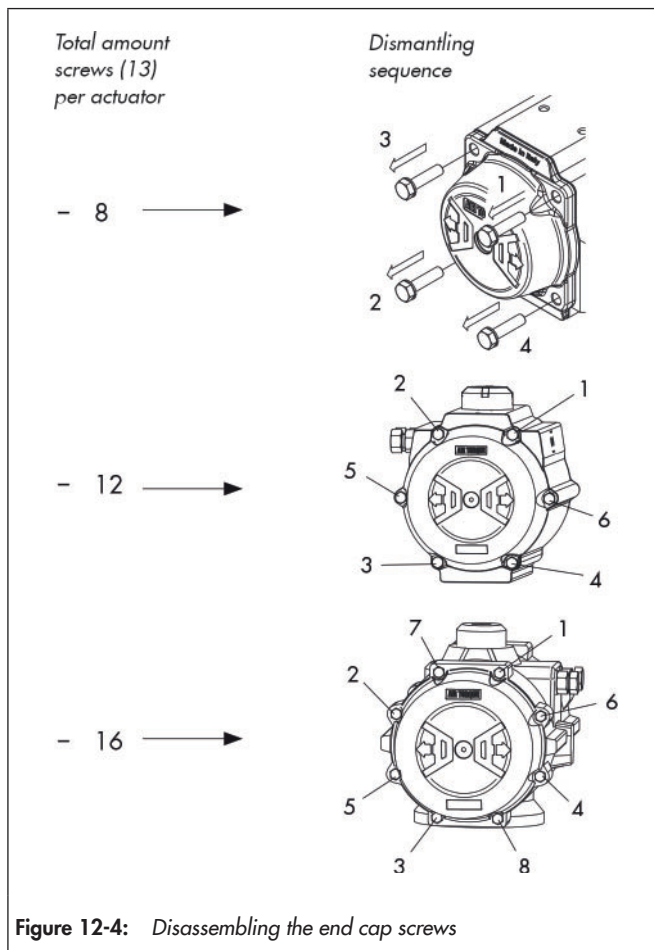


Figure 12-4: Disassembling the end cap screws

Table 12-2: Number of rotations

Rotary actuator DAP / SRP	Number of screw rotations (13)
15	26 ... 28 Rotations
30	
60	
100	
150	
220	
300	
450	5 ... 7 Rotations
600	
900	
1200	
2000	
3000	6 ... 8 Rotations
4000	
5000	8 ... 10 Rotations
10000	

WARNING

Danger of injury due to defective springs!

The end caps are tensioned when the springs are compressed. If after unscrewing the screws (13) with the number of rotations specified in Table 12-2 force is still applied on the end caps (23 and 23), the spring cartridge is possibly damaged or the pistons are not completely closed.

- ⇒ Stop disassembly and contact PFEIFFER.

- ⇒ Remove the end cap seal (14) and replace when replacing spare parts.

12.1.5 Piston disassembly

(see Figure 12-3 and Figure 12-6)

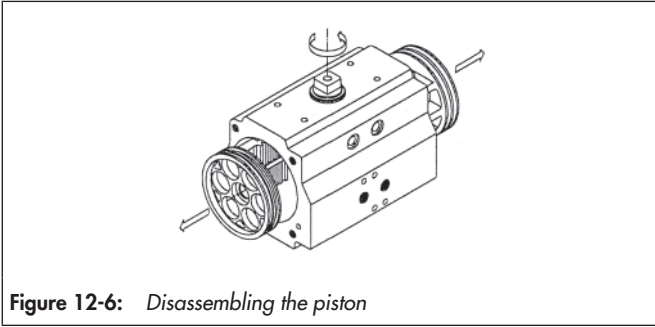


Figure 12-6: Disassembling the piston

- ⇒ Clamp the housing (29) in a vice or similar device.
- ⇒ Turn the shaft (30) until the pistons (25) are accessible.

WARNING

Danger of injury due to incorrect disassembly!

Do not use compressed air to remove the pistons from the housing (projectile impact).

- ⇒ Remove the piston bearings (16) carefully using a screwdriver.
- ⇒ Remove the piston bearing (5) and piston bearings (15).
- ⇒ Replace the end cap seal (14) when replacing spare parts.

12.1.6 Shaft disassembly

(see Figure 12-3 and Figure 12-7)

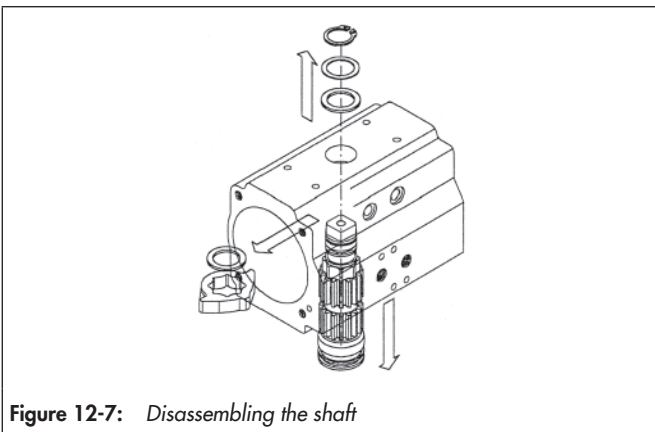


Figure 12-7: Disassembling the shaft

- ⇒ Use pliers for circlips to carefully remove the spring clip (18).
- ⇒ Remove the thrust bearing (8) and thrust washer (10).
- ⇒ Push down with light pressure on the top of the shaft (30) until it is possible to remove the cam (1) and the internal thrust bearing (8).
- ⇒ Pull the shaft (30) completely out of the housing.

Tip

If the shaft cannot be removed by hand, gently tap the top of the shaft with a plastic mallet to drive it out.

- ⇒ Remove the top and bottom shaft bearings (6 and 7).
- ⇒ Remove the top and bottom seals (20 and 21).
- ⇒ Replace the bearing bushings (6 and 7), internal and external thrust bearing (8), as well as the seals (20 and 21) when replacing the spare parts.

i Info

Thoroughly clean all disassembled and non-replaced parts and check for wear prior to assembly.

- ⇒ Assemble the actuator as described in Chapter "3.1.4 Rotary actuator assembly".

12.2 Additional repairs

- ⇒ In the case of additional major damage, it is recommended to have repairs performed by PFEIFFER.

12.3 Sending devices to PFEIFFER

Defective actuators can be sent to PFEIFFER for repair.

Proceed as follows to send devices:

- ⇒ Include the following information for returns:
 - Actuator type
 - Size
 - Number of springs
 - Fail-safe position
 - Supply air
 - Number of actuations (year, month, week or day)
 - VDI/VDE bracket

Tip

PFEIFFER recommends documenting the following contamination data in the form FM 8.7-6 "Declaration regarding the contamination of PFEIFFER valves and components".

13 Disposal

- ⇒ For disposal, observe the local, national and international regulations.
- ⇒ Do not dispose of old components, lubricant and hazardous materials with domestic waste.

14 Certificates

The declarations of conformity are available on the following page:

- Declaration of conformity in compliance with the EU Machinery Directive 2006/42/EU, see page 14-2.
- Declaration of conformity in compliance with the ATEX Directive 2014/34/EU, see page 14-2.
- Declaration of conformity in compliance with the Pressure Equipment Directive 2014/68/EU (PED), see page 14-2.

Comparison of the type designations

Table 1: Comparison of the type designations

Double-acting actuators		Single-acting actuators	
International actuator designation	Type	International actuator designation	Type
AT 051U	DAP 00015	AT 051U	SRP 00015
AT 101U	DAP 00030	AT 101U	SRP 00030
AT 201U	DAP 00060	AT 201U	SRP 00060
AT 251U	DAP 00100	AT 251U	SRP 00100
AT 301U	DAP 00150	AT 301U	SRP 00150
AT 351U	DAP 00220	AT 351U	SRP 00220
AT 401U	DAP 00300	AT 401U	SRP 00300
AT 451U	DAP 00450	AT 451U	SRP 00450
AT 501U	DAP 00600	AT 501U	SRP 00600
AT 551U	DAP 00900	AT 551U	SRP 00900
AT 601U	DAP 01200	AT 601U	SRP 01200
AT 651U	DAP 02000	AT 651U	SRP 02000
AT 701U	DAP 03000	AT 701U	SRP 03000
AT 751U	DAP 04000	AT 751U	SRP 04000
AT 801U	DAP 05000	AT 801U	SRP 05000
AT 1000U	DAP 10000	AT 1000U	SRP 10000

Temperatures

Table 2: Temperatures

Maximum environment temperature and / or process fluid maximum temperature (or surface temperature in the area of contact with the actuator)	Temperature class (Gas) / Maximum surface temperature (Dust)
70 °C	T6 / T85 °C
80 °C	T5 / T95 °C
120 °C	T4 / T135 °C
150 °C	T3 / T165 °C

15 Annex

15.1 Tightening torques, lubricant and tools

15.1.1 Tightening torques

i Info

- All tightening torques are indicated in Nm.
- Tightening torque tolerance: $\pm 10\%$.
- The tightening torques are based on a friction coefficient of 0.12 with a lubricated thread of the fastening elements (screws or nuts).
- After long operating times or use at temperatures above 80°C, the breakaway torque can be considerably higher.

Table 15-1: Tightening torque of the end caps (13)

Rotary actuator DAP / SRP	Thread	Tightening torque in Nm
00015	M5	4 => 5
00030	M6	7 => 8
00060		
00100		
00150	M8	18 => 20
00220		
00300		
00450	M10	34 => 36
00600		
00900		
01200	M14	96 => 102
02000	M16	150 => 160
03000	M14	96 => 102
04000	M16	150 => 160
05000		
10000		

Table 15-2: Tightening torques for nuts (4) for the adjusting screws (2)

Rotary actuator DAP / SRP	Thread	Tightening torque in Nm
00015	M6	8 => 9
00030		
00060	M8	18 => 20
00100		

Rotary actuator DAP / SRP	Thread	Tightening torque in Nm
00150	M10	34 => 36
00220	M12	60 => 64
00300		
00450	M14	96 => 102
00600		
00900	M16	150 => 160
01200	M20	290 => 310
02000		
03000	M24	235 => 250
04000	M30	470 => 500
05000		
10000	M39	1000 => 1050

Table 15-3: Tightening torques for nuts (104) for the additional travel limit (102)

Rotary actuator DAP / SRP	Thread	Tightening torque in Nm
00015	M6	8 => 9
00030		
00060	M8	18 => 20
00100		
00150	M10	34 => 36
00220	M12	60 => 64
00300		
00450	M14	96 => 102
00600		
00900	M16	80 => 86
01200	M20	160 => 170
02000		
03000	M24	270 => 290
04000	M30	540 => 570
05000		
10000	M39	1000 => 1050

Table 15-4: Tightening torque on the port (NAMUR)

Rotary actuator DAP / SRP	Thread	Tightening torque in Nm		
00015	M5	4 => 5		
00030				
00060				
00100				
00150				
00220				
00300				
00450				
00600				
00900				
01200				
02000			M6	8 => 9
03000				
04000				
05000				
10000				

Table 15-6: Tightening torques on the accessory connection

Rotary actuator DAP / SRP	Accessory con- nection	Thread	Tightening torque in Nm
00015	AA1	M5	4 => 5
00030			
00060			
00100			
00150			
00220			
00300			
00450			
00600	AA4	M5	4 => 5
00900			
01200			
02000			
03000			
04000			
05000			
10000			

Table 15-5: Tightening torques on the ISO connection

Rotary actuator DAP / SRP	DIN ISO Connection	Thread	Tightening torque in Nm
00015	F04	M5	5 => 6
00030	F05	M6	10 => 11
00060			
00100	F07	M8	23 => 25
00150			
00220			
00300			
00450	F12	M12	82 => 86
00600			
00900			
01200			
02000	F16	M20	390 => 410
03000			
04000			
05000			
10000	F30	M20	390 => 410

15.1.2 Lubricant

The actuators are delivered lubricated for the service life of the actuator. The standard lubricant is approved for a temperature range from -40°C (-40°F) to +80°C (+176°F). For low (SLT) and high (HT) temperatures, a special lubricant is required. Please contact PFEIFFER.

For lubricants recommended for the rotary actuators when used under standard conditions:

Table 15-7: Grease recommendation

Manufacturer	Grease
Tennex	TS 2066/2

15.1.3 Tools

Suitable tools are required to work on the rotary actuator. Unsuitable tools can damage the actuator.



Table 15-8: Tool dimensions

Rotary actuator DAP/SRP	d	SW 1	SW 2	SW 3	SW 4
00015	14	10	10	8	3
00030	16	10	10	10	3
00060	22	13	13	10	4
00100	25	13	13	10	4
00150	26	17	17	13	5
00220	36	19	19	13	6
00300	38	19	19	17	6
00450	45	22	22	17	6
00600	48	22	22	19	6
00900	52	24	24	19	8
01200	58	30	30	22	10
02000	68	30	30	24	10
03000	80	36	36	22	12
04000	85	46	46	24	17
05000	90	46	46	24	17
10000	102	24	60	Inbus 14	24

15.2 Spare and wear parts

PFEIFFER recommends wear part sets for "Commissioning" and for "2-year operation".

The recommended spare parts for the standard, high temperature and low temperature actuators of the BR 31a are listed in the following Chapters 15.2.1 to 15.2.6.

The corresponding wear part sets can also be found in Chapter "15.2.7 Wear part sets for rotary actuator DAP/SRP 00015 to 10000".

15.2.1 Spare parts for rotary actuator DAP/SRP 00015 (rotation angle 0° to 90°)

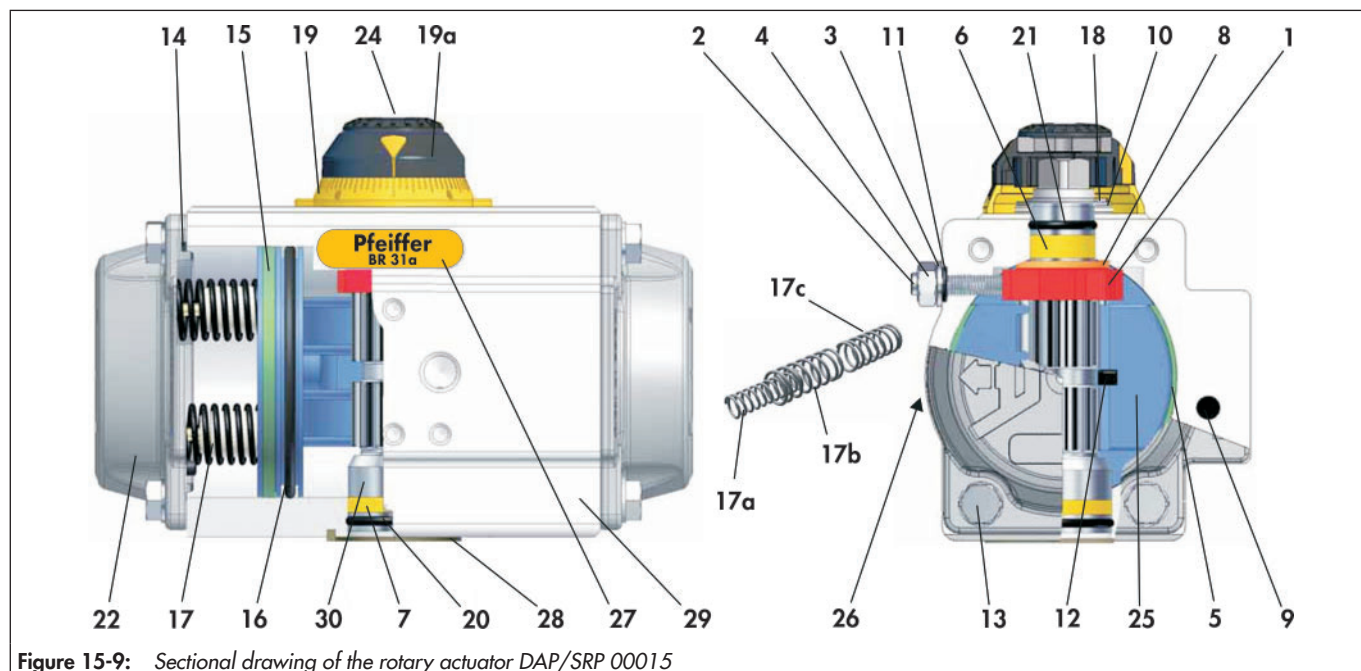


Figure 15-9: Sectional drawing of the rotary actuator DAP/SRP 00015

Table 15-9: Recommended spare parts for rotary actuator DAP/SRP 00015.

Pos.	Quantity	Description	Material
1	1	Cam	Stainless steel
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	PA46
7 ¹⁾	1	Shaft bearing bushing	PA46
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	8	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17a ⁴⁾	2 to 6	Spring	Si Cr epoxy coated spring steel alloy
17b ⁴⁾		Spring	
17c ⁴⁾		Spring	
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
19b	1	Shaft adapter	Anodised, extruded aluminium alloy
19c	2	Grub screw for shaft adapter	Stainless steel
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in the wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT) ⁴⁾ per side

15.2.2 Spare parts for rotary actuator DAP/SRP 00030 (rotation angle 0° to 90°)

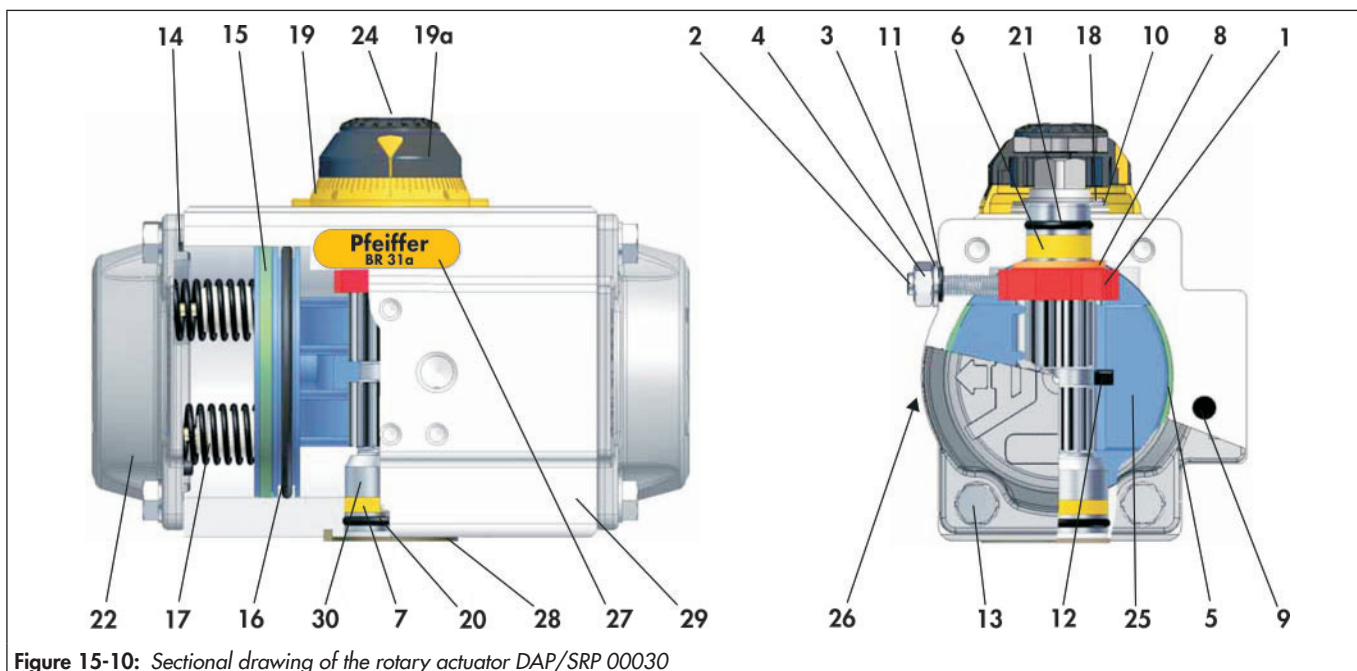


Figure 15-10: Sectional drawing of the rotary actuator DAP/SRP 00030

Table 15-10: Recommended spare parts for rotary actuator DAP/SRP 00030

Pos.	Quantity	Description	Material
1	1	Cam	Stainless steel
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	PA46
7 ¹⁾	1	Shaft bearing bushing	PA46
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	8	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17 ⁴⁾	2 to 6	Spring cartridge	Si Cr epoxy coated spring steel alloy
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in the wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT) ⁴⁾ per side

15.2.3 Spare parts for rotary actuator DAP/SRP 00060 to 02000 (rotation angle 0° to 90°)

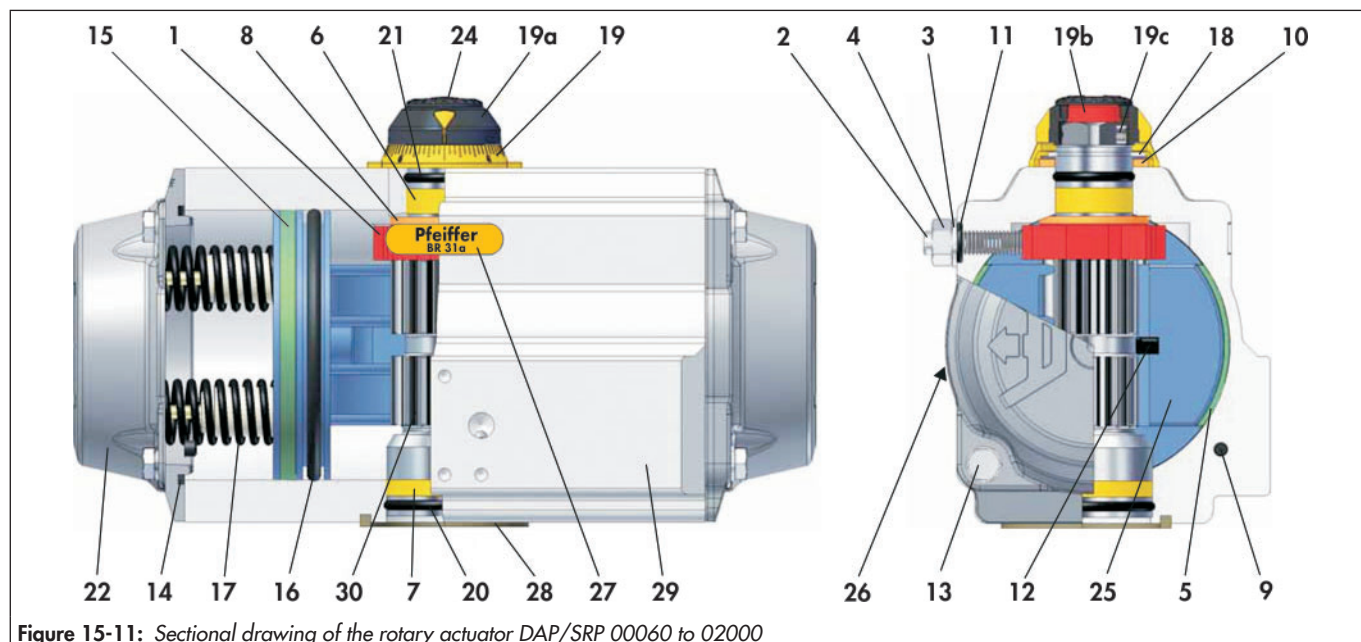


Figure 15-11: Sectional drawing of the rotary actuator DAP/SRP 00060 to 02000

Table 15-11: Recommended spare parts for rotary actuator DAP/SRP 00060 to 02000

Pos.	Quantity	Description	Material
1	1	Cam	Stainless steel
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	PA46
7 ¹⁾	1	Shaft bearing bushing	PA46
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	8	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17	5 to 12	Spring cartridge	Si Cr epoxy coated spring steel alloy
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
19b	1	Shaft adapter	Anodised, extruded aluminium alloy
19c	2	Grub screw for shaft adapter	Stainless steel
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT)

15.2.4 Spare parts for rotary actuator DAP/SRP 03000 to 04000 (rotation angle 0° to 90°)

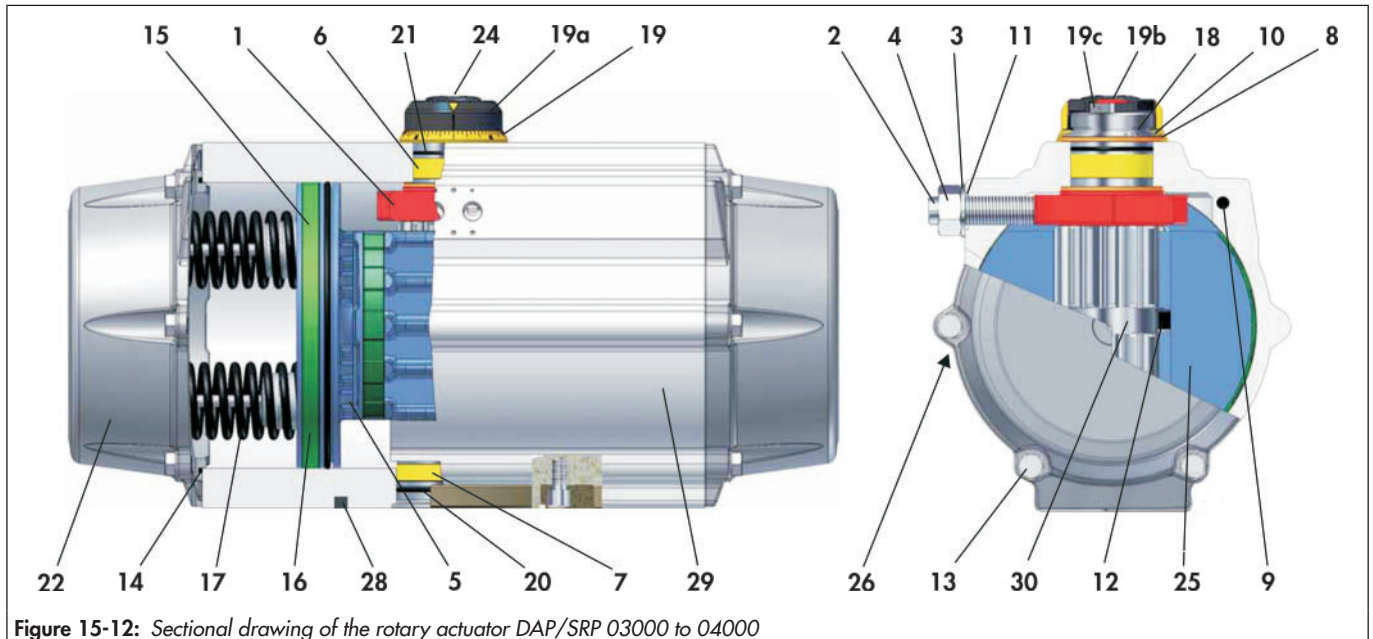


Figure 15-12: Sectional drawing of the rotary actuator DAP/SRP 03000 to 04000

Table 15-12: Recommended spare parts for rotary actuator DAP/SRP 03000 to 04000

Pos.	Quantity	Description	Material
1	1	Cam	C-steel, zinc coated
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	PA46
7 ¹⁾	1	Shaft bearing bushing	PA46
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	8	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17	5 to 12	Spring cartridge	Si Cr epoxy coated spring steel alloy
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
19b	1	Shaft adapter	Anodised, extruded aluminium alloy
19c	1	Grub screw for shaft adapter	Stainless steel
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT)

15.2.5 Spare parts for rotary actuator DAP/SRP 05000 (rotation angle 0° to 90°)

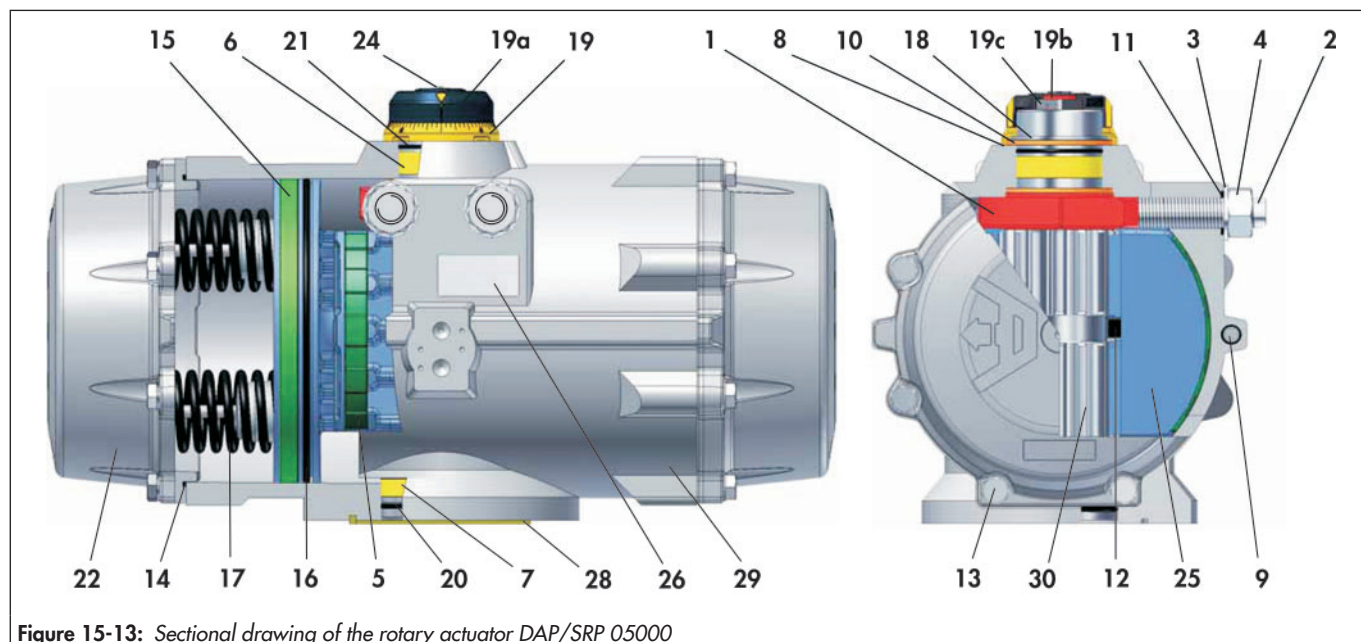


Figure 15-13: Sectional drawing of the rotary actuator DAP/SRP 05000

Table 15-13: Recommended spare parts for rotary actuator DAP/SRP 05000

Pos.	Quantity	Description	Material
1	1	Cam	C-steel, zinc coated
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	High-quality polymer
7 ¹⁾	1	Shaft bearing bushing	High-quality polymer
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	16	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17	5 to 12	Spring cartridge	Si Cr epoxy coated spring steel alloy
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
19b	1	Shaft adapter	Anodised, extruded aluminium alloy
19c	1	Grub screw for shaft adapter	Stainless steel
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT)

15.2.6 Spare parts for rotary actuator DAP/SRP 10000 (rotation angle 0° to 90°)

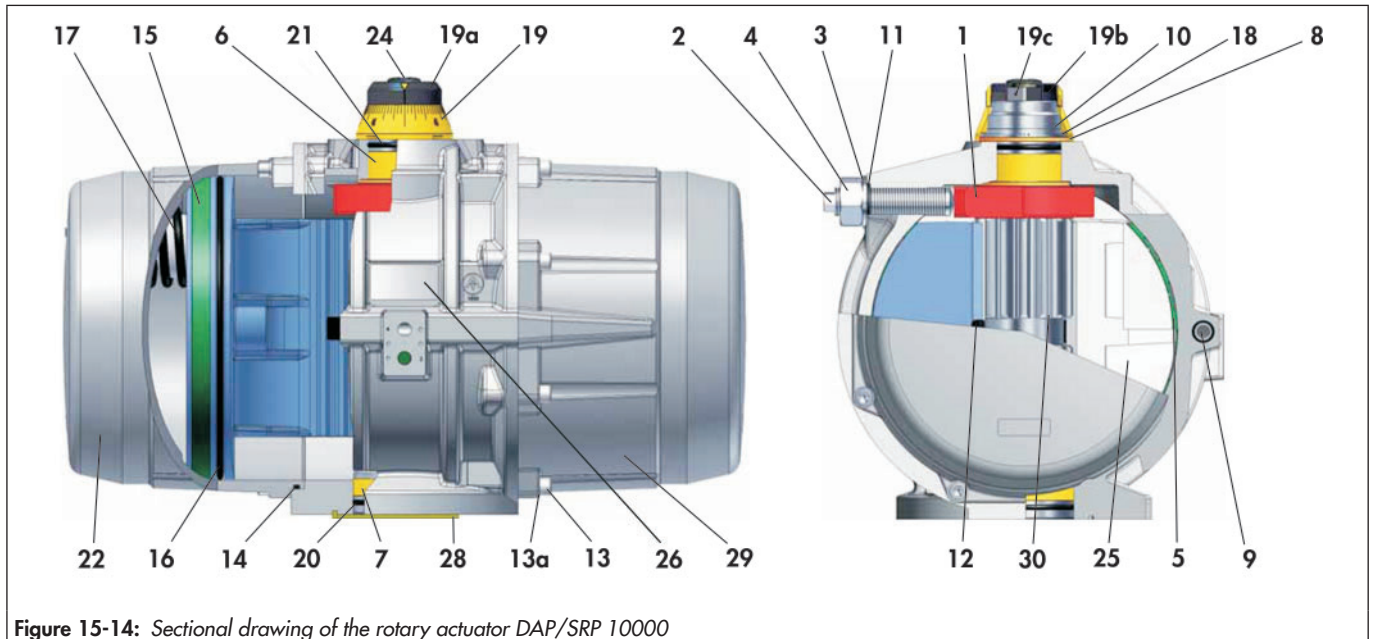


Figure 15-14: Sectional drawing of the rotary actuator DAP/SRP 10000

Table 15-14: Recommended spare parts for rotary actuator DAP/SRP 10000

Pos.	Quantity	Description	Material
1	1	Cam	C-steel, zinc coated
2	2	Adjusting screw	Stainless steel
3	2	Washer	Stainless steel
4	2	Lock nut	Stainless steel
5 ¹⁾	2	Bearing (piston back)	PA46
6 ¹⁾	1	Shaft bearing bushing	High-quality polymer
7 ¹⁾	1	Shaft bearing bushing	High-quality polymer
8 ¹⁾	2	Thrust bearing	PA46
9 ^{1) 2) 3)}	2	Plug (to seal air port)	Silicon
10	1	Supporting ring	Stainless steel
11 ^{1) 2) 3)}	2	Seal	M-NBR
12	2	Piston guide	PA66+GF
13	16	Screw (end cap)	Stainless steel
14 ^{1) 2) 3)}	2	End cap seal	M-NBR
15 ^{1) 2)}	2	Bearing (piston head)	POM
16 ^{1) 2) 3)}	2	O-ring	M-NBR
17	5 to 12	Spring cartridge	Si Cr epoxy coated spring steel alloy
18	1	Retaining ring	Spring steel, ENP
19	1	Graduated collar	PA66+GF(+CB)
19a	1	Position indicator	PA66+GF+CB
19b	1	Shaft adapter	Anodised, extruded aluminium alloy
19c	1	Grub screw for shaft adapter	Stainless steel
20 ^{1) 2) 3)}	1	Shaft seal	M-NBR
21 ^{1) 2) 3)}	1	Shaft seal	M-NBR
22	2	End cap	Anodised and coated die-cast aluminium alloy
24	1	Screw	PA66+GF+CB
25	2	Piston	Anodised die-cast aluminium alloy
26	1	Type plate	Polyester silver
27	1	Sign	Polyester
28	1	Spigot	Anodised, extruded aluminium alloy
29	1	Housing	Coated, extruded aluminium alloy
30	1	Shaft	Steel, ENP

¹⁾ Contained in wear part set (STD) ²⁾ Contained in the high temperature set (HT) ³⁾ Contained in the low temperature set (SLT)

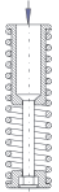
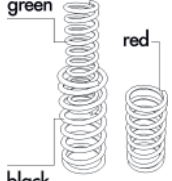
15.2.7 Wear part sets for rotary actuator DAP/SRP 00015 to 10000

Table 15-15: Wear part sets

Rotary actuator DAP/ SRP	Wear part sets		
	Standard (STD)	High temperature (HT)	Low temperature (SLT)
00015	43718v	45444v	48021v
00030	43719v	45445v	48022v
00060	43720v	45435v	48023v
00100	43721v	45436v	48024v
00150	43722v	45437v	48025v
00220	43728v	45438v	48026v
00300	43724v	45181v	48027v
00450	43725v	45439v	48028v
00600	43726v	45440v	48029v
00900	43356v	45441v	48030v
01200	43727v	44166v	48031v
02000	43728v	45442v	48032v
03000	43729v	44181v	48033v
04000	48020v	49462v	48034v
05000	43730v	45443v	48035v
10000	43731v	45859v	48036v

15.2.8 Springs Edition 2010

Table 15-16: Springs

Springs Edition 2010 Module: Green or natural-coloured	Springs only for DAP/SRP 00015
 <p>Figure 15-15: DAP/SRP spring</p>	 <p>Figure 15-16: DAP/SRP 00015 spring</p>

Necessary data

Provide the following information in the case of questions and for troubleshooting:

- Actuator type
- Size
- Number of springs
- Fail-safe position
- Supply air
- Number of actuations (year, month, week or day)

Further information

The indicated <data sheets> and further information is available, also in English, at the following address:

PFEIFFER Chemie-Armaturenbau GmbH

Hooghe Weg 41 • 47906 Kempen • Germany
 Phone: +49 2152 2005-0 • Telefax +04 2152 1580
 E-Mail: sales-pfeiffer-de@samsongroup.com
 Internet: www.pfeiffer-armaturen.com

15.3 Service

For maintenance and repair work as well as malfunctions or defects, contact the After Sales Service at PFEIFFER for support.

E-mail

The After Sales Service can be reached at the e-mail address "sales-pfeiffer-de@samsongroup.com".



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