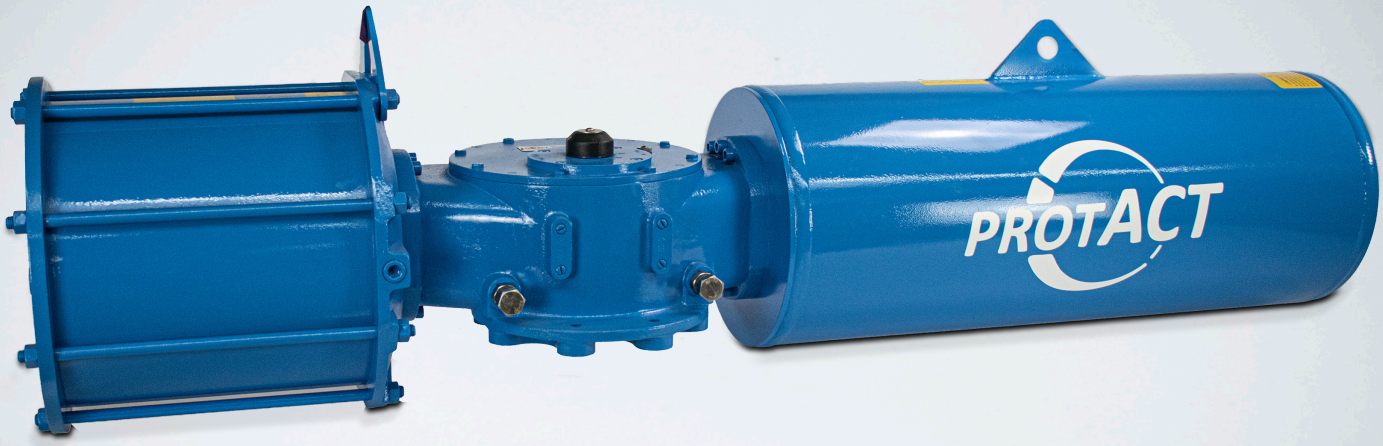
PROTACT

MANUAL AND MAINTENANCE GUIDELINES



PNEUMATIC ACTUATORS

PRY series

Documentnr.: BWA.PRY.200116| Issued: 09/2024

Notes

Content:

Chapter 1: Preparation

1.1 Marking of safety instructions

This symbol indicates safety instructions which can cause personal injury if not respected.

This symbol indicates an important note

1.2 Safety fundamental

Failure to follow the safety basics can void the warranty claims.

Rotary actuators must be isolated both pneumatically and electrically before any intervention.

The installation, assembly, commissioning, maintenance and any other work on pneumatic actuators must be performed by qualified personnel.

This manual is part of the device and must be available for the operating personnel at all times. This manual must be read and understood before operation.

The device may only be operated in perfect condition. No safety devices are removed or deactivated. A rebuilding or modification of the device is strictly prohibited.

Installation, operation and maintenance of the products are strictly subject to the local safety and accident prevention regulations!

1.3 Transport, storage and packaging

The devices must be carefully handled, transported and stored.

The devices should be transported to the end destination in their original packaging and unpacked immediately before installation.

The actuators are to be stored in a clean, dry storage, which is neither exposed to excessive vibration nor to rapid temperature changes.

Prevent ingress of dirt or moisture into the actuator. Close or tighten both air connections.

Proper disposal of packaging is the customer´s responsibility.

Failure to comply may void the warranty claims.

Chapter 2: Preliminary

2.1 Design description

Pneumatic actuators of the PRY series are designed for the automation of rotary valves with a 90° rotation angle. They have a modular structure and, depending on the application, consist of one or two pneumatic modules, a center module, a spring module and an optional module for manual actuation. In the single-acting version, the spring module ensures closing or opening in the event of a control media failure (spring-closing or spring-opening).

Two characteristic torque profiles are available for generating a drive torque that is adapted to the valve torque. These are created using either a symmetrical or a canted yoke.

The PRY actuator series offers a torque range of 1000 – 250.000 Nm (double-acting) and 300 – 150.000 Nm (single-acting). The standard version of the actuators provides valve mounting interfaces according to ISO 5211 and an accessory interface according to VDI/VDE 3845.

The maximum operating pressure of the pneumatic Scotch-Yoke actuators of the PRY series is between 3 and 10 bar depending on size and configuration. The maximum operating pressure is specified on the typelabel of the respective actuator.

2.2 Intended use

Actuators of the PYR series are primarily used for the automation of quarter-turn valves such as ball valves, butterfly valves or plug valves, but can also be used for other applications. Contact our qualified personnel where required. The specified operating and limiting values for temperature, pressure, control medium, etc. must be observed.In operation of valves high kinetic energies may arise, which are transmitted to the actuator. Make sure that the drive is protected from damage by complying with the minimum travel times safely. Control speed can be reduced by the use of throttle valves, which can be purchased from our sales department.
For valve types with high flywheel mass and low torque requirements the operating conditions of the actuator must be coordinated with us in advance

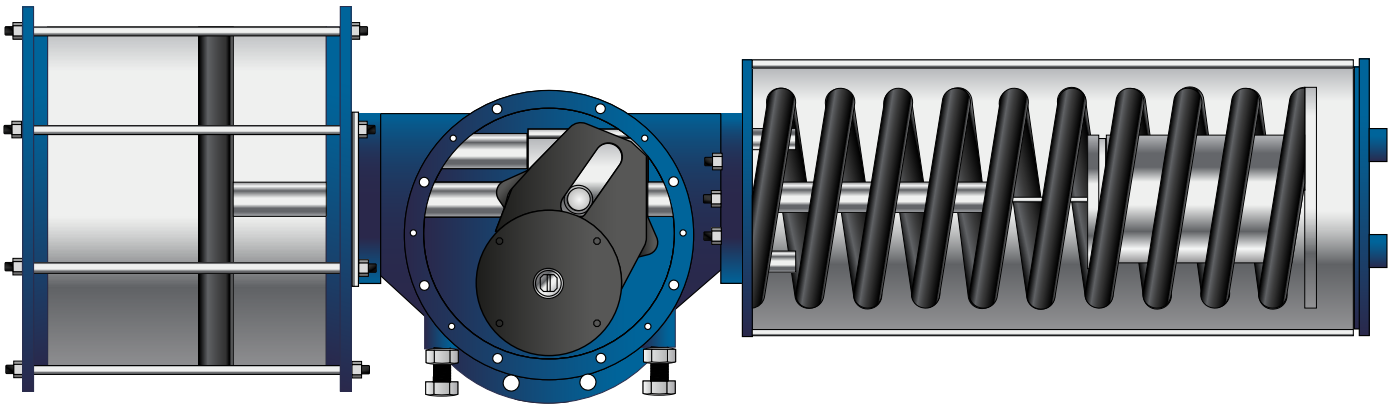
The actuator may only be used:

- in perfect condition
- as stipulated
- safety- and danger-conscious in consideration of the operating instructions
- if all safety devices are in place and functioning

Any use not pre-approved by the manufacturer is considered improper!

2.3 Technical information

Construction principle	Pneumatic heavy-duty rotary actuator in Scotch-Yoke design; double and single acting version	
Materials	See section 4.5	
Temperature range	Standard Low temperature version High temperature version	-20°C to +80°C -40°C to +80°C -15°C to +150°C
Control pressure	3 … 10 bar (depending on the actuator version, check typelabel!)	
Pressure media	dry, filtered air or inert gases in respect of remaining oil-, dust and water-content according to DIN ISO 8573-1 / class 4, maximum particle diameter 30µm, dew point minimum 10°C below ambient temperature	
Nominal rotation angle	90°, adjustable in both end positions +/-6°	
Torque range	double-acting: up to 250.000Nm single-acting: up to 150.000Nm	
Standards	Interface actuator/control-unit Interface actuator/control media supply Interface actuator/valve	VDI/VDE 3845 resp. NAMUR G- or NPT-Thread ISO 5211



2.4 Typecode

PRY . C1 . 50 1 S . 04 . 1625 S 55 . P R S . 00

Type

Body size

Cylinder size

Quantity cylinders (1 or 2)

Function

D: Double-acting
S: Single-acting

Spring set

ISO valve interface

14:	F14	1625:	F16 + F25
16:	F16	2530:	F25 + F30
25:	F25	3035:	F30 + F35
30:	F30	4048:	F40 + F48
35:	F35	4860:	F48 + F60
40:	F40		
48:	F48		
60:	F60		

Stem connection

S: Square acc. to ISO 5211 or DIN 3337
D: Double-d
K: Key connection

Stem connection dimension

Dimension in mm (not applicable for key connection)

Mounting direction

P: Parallel to pipe
T: Transversal to pipe

Spring rotation sense

R: Clockwise CW (normally closed)
L: Counterclockwise CCW (normally open)

Temperature version

S: Standard (-20°...+80°C)
H: High temperature (-15°...+150°C)
T: Low temperature (-40° ... +80°C)

Manual operation

00: Without
01: Screw manual
02: Gear manual
03: Hydraulic manual

Chapter 3: Installation

3.1 Remarks

- **The actuator must not be installed in potentially explosive areas that are not compatible with the specified gas groups and temperature classes.**
- **The spring container and the end cover of the spring module protect the spring. Due to the preload force of the spring, it is strictly forbidden to cut open the end cover or the spring container in order to avoid serious injuries.**

- **Only lift the drive using suitable lifting straps. The holes provided for the eyebolts are only for lifting the actuator and not for lifting the entire assembly incl. valve.**
- **To achieve the desired service life of the actuator, only the recommended, filtered control media may be used**
- **When using a separate manual emergency gearbox, it must be ensured that the gearbox offers a rotation angle that corresponds at least to that of the actuator.**
- **The actuators can be installed in any position. However, care must be taken to ensure that some accessories, such as filter regulating units, reservoirs for hydraulic override units, etc., whose proper functioning depends on gravity, are realigned appropriately.**

3.2 Installation instructions

1. Ensure that the pneumatic module is completely depressurized by venting it into the atmosphere and disconnecting all power sources from the accessories.

2. Make sure that the valve and the actuator are aligned in the same position (i.e. valve closed - actuator in the closed position or both open). In the case of actuators with spring return, align the valve to the safe position of the actuator. If a manual override is used, it must also be ensured that it corresponds to the valve and actuator position.

3. Position the valve, attach the mounting bracket and then mount the coupling shaft on the valve shaft (when using a mounting kit). Check the position of the actuator and valve, align the valve shaft (or shaft coupling) with the actuator shaft and slide the actuator onto the mounting surface of the mounting bracket (or onto the ISO flange of the valve if no mounting bracket is used).

4. When using an emergency manual gearbox between actuator and valve, the gearbox must first be attached and fastened to the valve according to the prescribed procedure. Then turn back the stop screws on the gearbox. Mount the actuator with the coupling shaft on the gearbox and fix the actuator on the gearbox flange.

5. To align the screw holes, the valve mounting screws on the mounting bracket may need to be loosened slightly. The actuator fixing screws should be easy to screw into the threaded holes of the actuator interface without the mounting bracket (or the ISO flange of the valve) being loaded by transverse forces. If necessary, turn the drive a little and/or adjust the adjusting screws of the drive. Fasten the actuator to the mounting bracket/on the gearbox flange/on the head flange of the valve.

6. Before operating the actuator, the manual override (if available) must be disengaged.

7. Adjust the adjusting screws of the quarter turn actuator correctly for open and closed valve positions according to the recommendations of the valve manufacturer. The adjusting screws of the quarter turn actuator should define the end stops, not that of the gearbox.

8. Tighten the lock nuts on the stop screws after adjusting the stop screws. Make sure that the screws on the gearbox (if present) are now set and locked so that they are slightly behind the end position of the drive.

9. Make sure that the manual actuation modules are unlocked before you start up the actuator.

10. Pneumatically operate the actuator several times to check that it is operating correctly and smoothly. If the actuator is equipped with a switch box or other accessories, set it now.

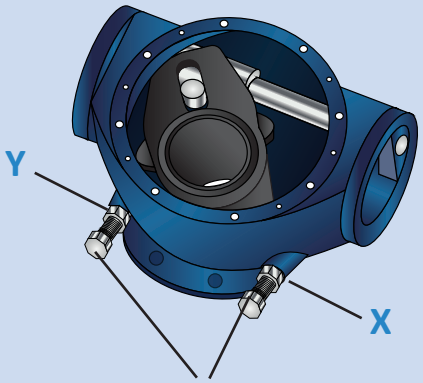
3.3 Setting the end positions

Setting the end position clockwise (CW):

1. Turn the actuator clockwise until it reaches the end stop and check the setting.
2. Loosen lock nut "X"
3. Vent the actuator and turn the adjusting screw in the desired direction (unscrewing expands the swivel angle, screwing in reduces the swivel angle)
4. Vent the actuator and check the setting again.
5. Repeat the setting procedure (steps 2 to 4) if necessary.
6. Tighten the lock nut again.

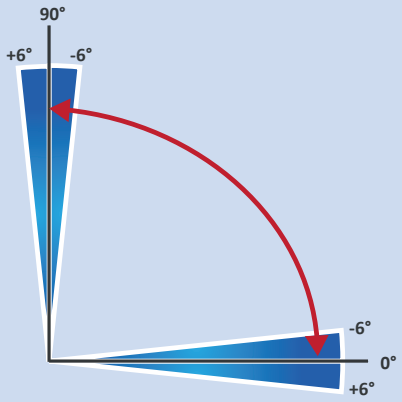
Setting the end position counterclockwise (CCW):

1. Turn the actuator counterclockwise until it reaches the end stop and check the setting.
2. Loosen lock nut "Y"
3. Vent the actuator and turn the adjusting screw in the desired direction (unscrewing expands the swivel angle, screwing in reduces the swivel angle)
4. Vent the actuator and check the setting again.
5. Repeat the setting procedure (steps 2 to 4) if necessary.
6. Tighten the lock nut again.



Stop screws

By adjusting the stop screws, both end positions can be adjusted by +/- 6° for fine adjustment of the valve end position. The respective setting position is secured by tightening the lock nut.



3.4 Assembly to a valve

- The valve bore (for ball and plug valves) resp. the valve disc (for butterfly valves) must correspond to the groove on the top of the actuator pinion shaft during installation in order to make signal- or control units work correctly. The groove symbolizes the valve position (acc. to VDI/VDE 3845).

- Make sure that the valve shaft corresponds to the connection in the drive pinion in shape and size. Differences can be compensated by using adaptation inserts. These can be ordered separately via our sales department.

- Check whether valve and actuatorhave corresponding ISO interfaces. If not, an additional mounting kit will be required. It can be ordered separately via our sales department.

- Fasten the actuator to the valve by using matching screws. We recommend using stainless steel screws to ensure appropriate corrosion resistance. The number of screws is relevant for the stability of the assembly and power transmission. Therefore, do not miss any attachment point. Take the correct tightening torques into account during fixation.

3.5 Tightening torques for screw connection

Tightening torques in Nm	
Nominal size	Nm
M16	220
M20	430
M22	425
M24	585
M27	785
M30	1250
M33	1400
M36	1750
M48	5000
M64	9200

Chapter 4: Maintenance

4.1 General

Actuators of the PRY series are designed to be maintenance-free and supplied with sufficient lubrication for their normal service life. The normal lifespan depends on the size and application conditions and is subject to EN 15714-3.

Carry out regular inspections to ensure a failure-free operation. Check whether there are visible or audible defects. Regular maintenance and exchange of seals and bearings extends the normal lifespan. Corresponding spare part sets are available from our sales department.

4.2 Safety instructions

- **Rotary actuators must be pneumatically and electrically isolated prior to any intervention.**
- **Rotary actuators and the connected valve can move when the control pressure gets disconnected and/or an electrical control signal is switched off.**
- **In single-acting actuators with an incomplete spring stroke, there is a high spring force that can trigger a sudden rotary movement when the actuator is disassembled. This can cause serious injuries or damages.**
- **Interventions in electrical installations may only be carried out by appropriate specialists. A switched off power supply must be secured against unintentional restart.**

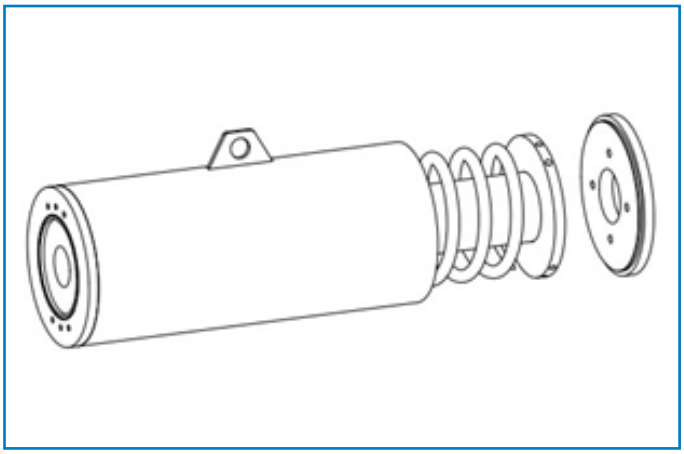
4.3 Disassembly and maintenance of the modules

To avoid injuries, please read the relevant operating and maintenance instructions. Before removing or disassembling the spring module, make sure that the actuator is depressurized, the stroke limitation devices are deactivated and the end stop positions are fully reached. Do not manipulate factory-welded parts of the spring tank!

- **Before dismantling the actuator, disconnect all air and power from the actuator, remove all accessories from the actuator, and remove the actuator from the valve (or disable the gearbox, if present).**
- **If the actuator is equipped with a manual operation module, first make sure that the override is completely reset to relieve it of any spring force.**

4.3.1 Spring module

Disassembly of the spring module



1. Shut off the air supply and ensure that the control media has been completely vented from the actuator into the atmosphere.
2. Release the spring module from the center module.
3. Carefully pull the spring module away from the center module in order not to damage the threads on the spring rod and the stud bolts of the adapter plate.
4. The spring module is welded as an integral component and the internal components cannot be disassembled.

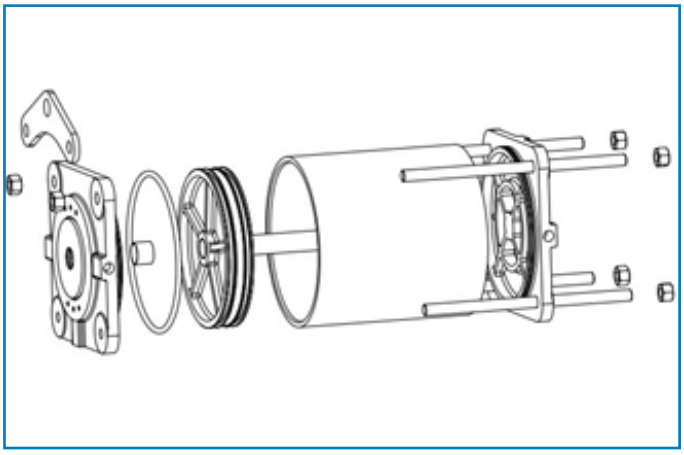
Maintenance of the spring module

1. Clean and lubricate the spring rod and push it back in.
2. Replace the O-ring between the spring module and the center body module.

4.3.2 Pneumatic module

Make sure that the control media has been completely vented from the actuator into the atmosphere before you disassemble the pneumatic module. Otherwise, serious injuries can result. To remove the pneumatic module from the spring-reset actuator, first disassemble the spring module as described in section 4.3.1.

Disassembly of the pneumatic module



1. Remove the pneumatic module from the quarter turn actuator.
2. Loosen the tie rod nuts and remove the end plate from the pneumatic module.
3. The tie rods can be unscrewed from the adapter plate.
4. Remove the cylinder.

Maintenance of the cylinder module

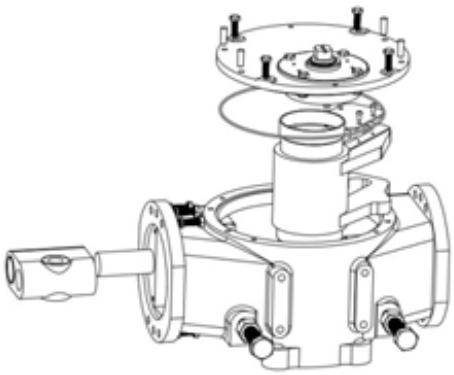
1. Clean the cylinder and grease the inside of the cylinder.
2. Replace the piston and the O-ring on the cover.

4.3.3 Center module

Either the spring module or the pneumatic module must be removed from the center module before it can be disassembled.

Disassembly of the center module

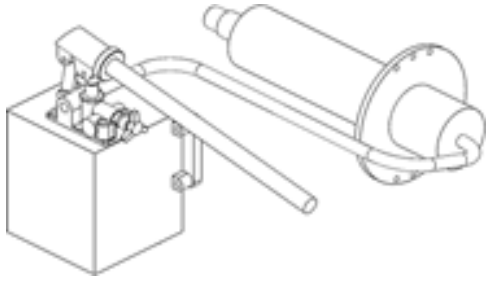
1. Remove the position indicator, if applied.
2. Loosen and remove the top cover screen.
3. Loosen the screws on the housing cover and open it.
4. Turn the yoke to the appropriate position, loosen the screw on the cover plate of the pin roller and take out the cover and the drive pin.
5. Take out the yoke.



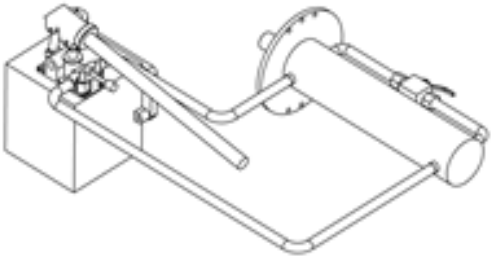
4.3.4 Manual hydraulic module

Instructions

1. After installation, the hydraulic unit must be vented first.
2. For the single-acting pump, open the relief valve and quickly move the operating lever a few times.
3. With the single-acting pump, the hydraulic cylinder remains in the original position after stopping operation. When the relief valve is opened, the hydraulic cylinder is slowly reset under the spring force. When the reset process is finished, close the relief valve again to make the hydraulic unit ready for the next process.
4. In case of a double-acting pump, the threaded connector that is connected to the oil line must be loosened. Move the operating lever up and down several times until hydraulic oil seeps out of the thread and then tighten the thread again.
5. Before operating the double-acting pump, the compensation valve of the hydraulic cylinder must be closed. If the reversing lever is on the left side, the left connection builds up oil pressure, while the hydraulic oil on the other side flows back to the oil tank via the right connection and vice versa.
6. In the case of double-acting actuators it must be ensured that the compensating valve is open and there is no pressure difference between the left and the right side of the hydraulic cylinder, before canceling manual operation and returning to automatic mode via the pneumatic control.



hydraulic module single-acting



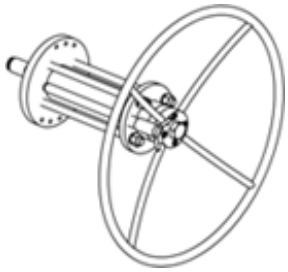
hydraulic module double-acting

Please use mineral oil or phosphate ester hydraulic oil in the hydraulic unit. The hydraulic oil filter should have a pore size of max. 20 µm. The degree of pollution of the hydraulic fluid is not below requirements of ISO 19/16 (NAS10). Oil pollution leads directly to damage of the pump and valve function. The hydraulic fluid can be an environmentally harmful product. Do not pour hydraulic fluid into collection tanks and protect yourself against accidental leakage and spillage of the hydraulic fluid with oil-absorbing products.

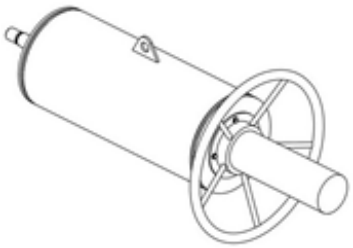
4.3.5 Mechanical manual modules

The manual modules are either a screw- or a gear-module for double-acting and single-acting actuators.

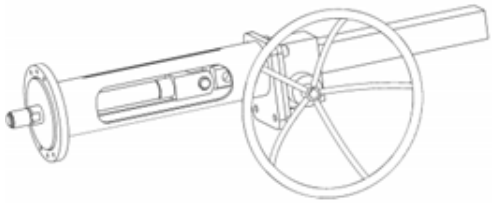
The manual modules are not used as a stroke limitation device. For automatic operation, the manual actuation unit must be moved completely into the basic position.



screw module double-acting



screw module single-acting



double-/single-acting gear module

Instructions for the spindle and gear modules

1. **For actuators with spring action CW:**
   If there is a loss of compressed air, turn the handwheel counterclockwise to move the actuator in the CCW direction. The handwheel must be turned clockwise to the starting position before the drive resumes automatic operation.
2. **For actuators with CCW spring action:**
   If there is a loss of compressed air, turn the handwheel clockwise to move the drive in the CW direction. The handwheel must be turned counterclockwise to the starting position before the drive resumes automatic operation.

The push rod of the gear module moves back and forth in normal operation. Do not remove protective covers without ensuring that the air supply is interrupted and the automatic operation of the actuator is deactivated.

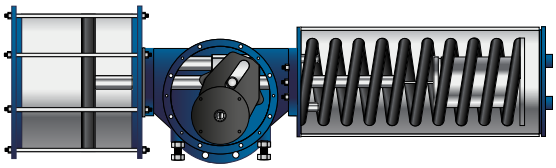
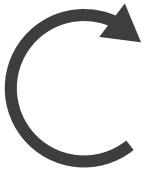
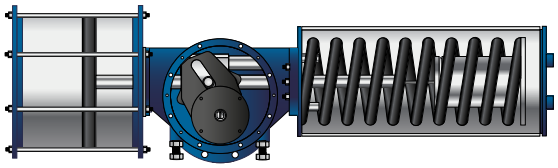
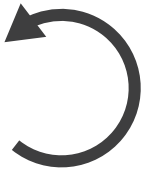
4.4 Field reversions

4.4.1 Changing the direction of spring action (for single-acting actuators)

The safety position of the single-acting actuator can be changed from CW to CCW and vice versa. This requires swapping the pneumatic and spring modules.

Never attempt to unscrew and remove the spring bar without completely relieving the springs.

1. Follow the steps to remove the spring and pneumatic modules from the actuator as described in sections 4.3.1 and 4.3.2.
2. Change the positions of the two modules and first assemble the pneumatic module. Make sure that the module seal O-ring is properly seated in the groove.
3. Mount the actuator back on the valve/gearbox and adjust the adjusting screws as required for the correct operation of the valve. Tighten the lock nuts on the stop screws.
4. Check the actuator for correct operation at the nominal operating pressure.

Mounting version	Actuator configuration		Safety rotation
PR		CW	
PL		CCW	

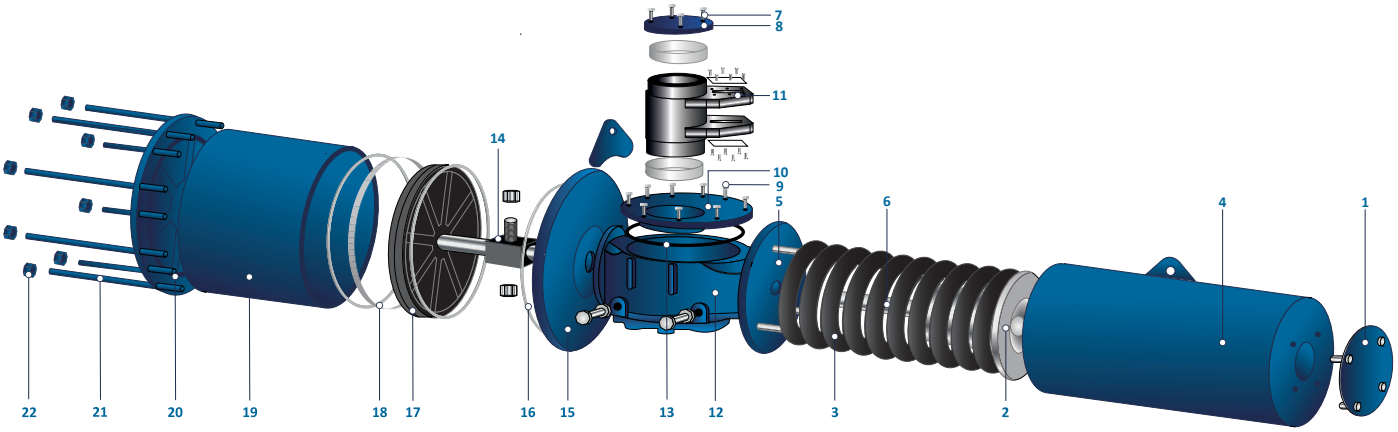
4.4.2 Conversion from double-acting to single-acting

1. To convert a double-acting actuator to single-acting (fail-CW mode), a spring module must be mounted opposite on the center module. If the CCW mode is to be achieved, the pneumatic module must first be dismantled and mounted on the opposite side of the center module. Then the spring module can be mounted at the previous position of the pneumatic module.
2. If the pneumatic module needs to be enlarged for the required configuration of the single-acting actuator, first carry out the complete replacement of the pneumatic module. Follow the instructions in section 4.3.2 to remove the pneumatic module. Then mount the new pneumatic module accordingly.
3. Connect the spring module and the center module with stop screws, insert the O-ring of the module into the adapter groove of the spring module.
4. Reassemble the actuator.
5. Adjust the stop screws to ensure correct installation with the valve.

4.4.3 Conversion from single-acting to double-acting

1. Remove the spring module from the actuator (see section 4.3.1).
2. Attach the end cover with the O-ring to the spring module side of the center module.
3. Adjust the adjusting screws if necessary.

4.5 Components



Center module			
Item	**Designation**	**Quantity**	**Material**
5	Bear seat	1	Carbon Steel
7	Screw	n	Carbon Steel
8	Indicator	1	Carbon Steel
9	Screw	n	Carbon Steel
10	Center body cap	1	Ductile Iron
11	Yoke	1	Ductile Iron
12	Center body	1	Ductile Iron
13	Cap O-ring	1	Rubber
14	Drive mechanism	1	Alloy Steel
Spring module			
Item	**Designation**	**Quantity**	**Material**
1	Flange cap	1	Carbon Steel
2	Spring seat	1	Carbon Steel
3	Spring	1	Spring Steel
4	Spring body	1	Carbon Steel
6	Spring stem	1	Alloy Steel
Pneumatic module			
Item	**Designation**	**Quantity**	**Material**
15	Cylinder seat	1	Ductile Iron
16	O-ring	1	Rubber
17	Piston	1	Carbon Steel
18	Guide ring	1	Resin
19	Cylinder body	1	Carbon Steel
20	Cylinder cap	1	Ductile Iron
21	Screw	n	Carbon Steel
22	Nut	n	Carbon Steel

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