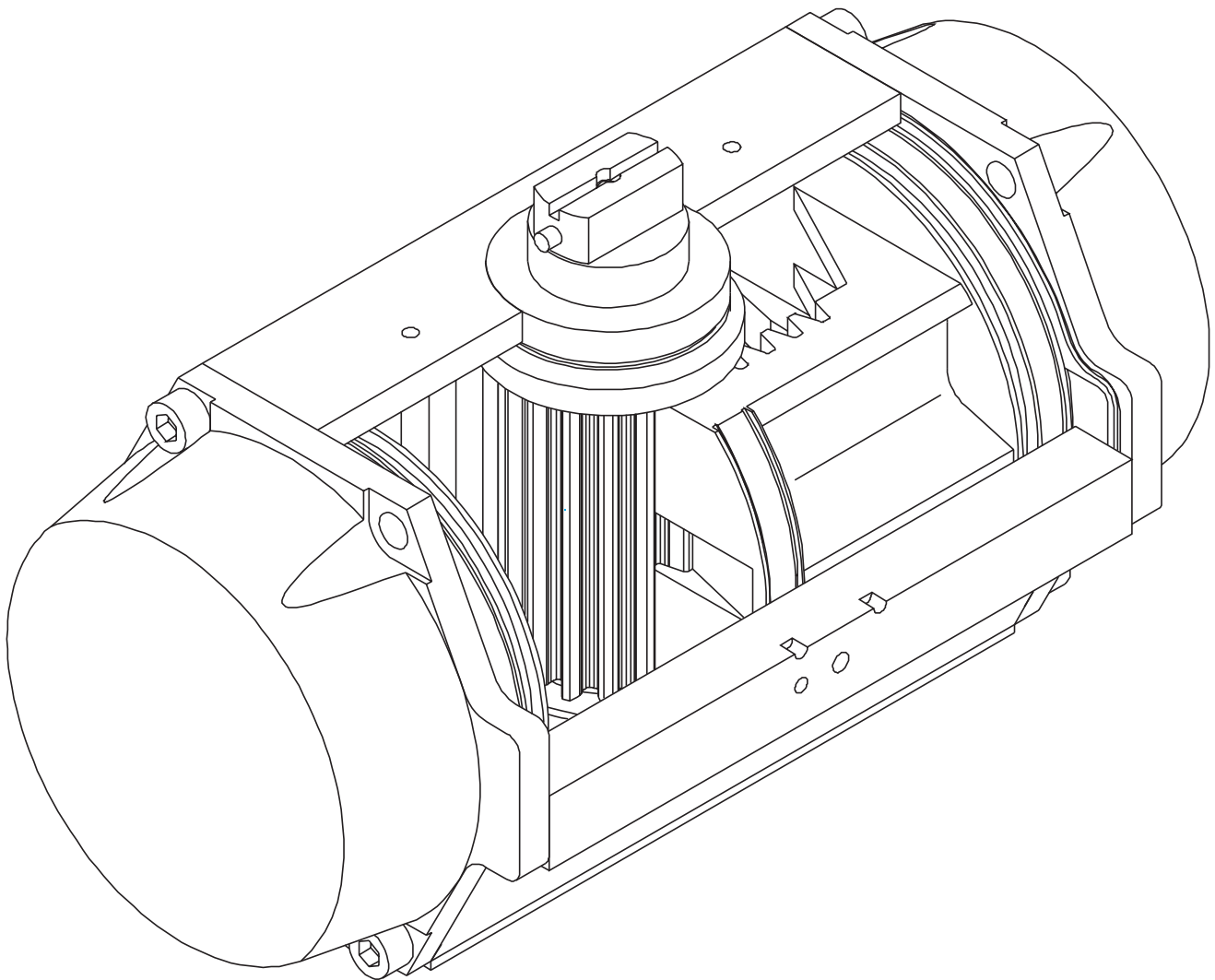




Revo

Pneumatic Valve Actuator, Series R Double-Acting or with Spring Reset

Installation, Operation and Maintenance



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1. Area of Application

These concise instructions apply for

Revo Double-Acting Pneumatic Valve Actuator, Series R

Revo Spring Reset Pneumatic Valve Actuator, Series R

Note 1:

These instructions are only valid in connection with the instructions for the valve the actuator is mounted to.

Note 2:

For information that is already required during the planning phase reference is made to CRANE Process Flow Technologies <Publications>, which can be viewed on the CRANE Process Flow Technologies <Homepage> www.craneflow.de or which are available from the manufacturer, in order to keep the arrangement of this instruction manual as clear as possible. These publications also contain a description of the actuator.

Note 3:

Since the pneumatic actuator can also be used with control media other than compressed air, it is hereafter simply referred to as "actuator".

2. Intended Use

These Revo actuators are intended

- for installation to a valve, attachment of a solenoid valve and connection of this solenoid valve to a control provided by the customer,
- for operation with control medium compressed air, water or hydraulic oil of maximum 10 bar,
- on condition that in normal operation a control pressure in compliance with the type plate on the pneumatic actuator is permanently applied and that this pressure is not exceeded,
- to actuate valves with 90° travel (e.g. butterfly valves and ball valves) by executing the commands of the above mentioned control (for special applications actuators are available with travel of 120° or 180°).
- An actuator properly mounted on the valve shows the position of the valve by means of an optical indicator.
- An (optional) "position indicator" module mounted to the actuator is used to signalise the position of the valve to the control provided by the customer.

Double-Acting Actuators

stop at the current position in case of a control pressure failure. With control pressure applied, but after a shut-down or failure of the control voltage on the solenoid valve, it solely depends on the control of this solenoid valve to which position the actuator will travel.

Unless otherwise specified by the customer, the actuator should close.

Spring Reset Actuators with Closing Spring:

travel to safe position "CLOSED" in case of failure / control pressure shut-down.

Spring Reset Actuators with Opening Spring

travel to safe position "OPEN" in case of failure / control pressure shut-down.

Design and control of the solenoid valve must ensure the above mentioned functions of a spring reset actuator.

Notes on equipment for manual emergency actuation in case of control pressure failure:

Double-Acting Actuators:

The extension of the control shaft has a dihedron as standard, which is most suitable for manual operation of the actuator with an appropriate open-end spanner.

Spring Reset Actuators

can only be actuated with the assistance of an (optionally available) additional gearbox, these are also recommended for bigger double-acting actuators (size 090 and bigger).

The actuator is not intended to be used for purposes other than the ones specified hereunder. We would particularly like to point out that the actuator has not been approved for:

- a manual emergency actuation using the extension of the control shaft while control pressure is applied.
- emergency operation of spring reset actuators using open-end spanner or similar tools.
- When installing electrical assemblies without ATEX-approval the unit must not be identified as being in compliance with ATEX.
- According the directive EC 94/9 and the corresponding safety standards the start-up is the sole responsibility of the person using the unit to create a functioning system.
- use of control media other than those specified in these instructions without the consent of the manufacturer.
- use of control pressures higher than 10 bar.
- use of the actuator in a chemically aggressive environment without the consent of the manufacturer.
- operation of the actuator at ambient temperatures above 60°C or below minus 20°C without the consent of the manufacturer.

3. Declaration of Manufacturer

3.1 Declaration of Manufacturer acc. to Machine Directive 98/37 EEC

The manufacturer

Crane Process Flow Technologies GmbH
Heerdter Lohweg 63-71
D-40459 Düsseldorf

declares that the actuators:

Revo double-acting pneumatic valve actuator, series RS, (design identical with Xomox pneumatic valve actuator XRP), Revo pneumatic valve actuator with spring accumulator, series R (design identical with Xomox pneumatic valve actuator XRP)

1. are incomplete machines as defined by the EC machine directive 98/37 EEC, but meet the requirements of this directive,
2. must only be operated in compliance with the accompanying operating instructions (also the ones for the supplied additional electric modules).

Start-up of these actuators is not permitted until conformity with the specified EC-directive has been declared for the plant equipped with the actuator/valve unit.

Applied technical specifications:

EN 292, Part 1 and Part 2
EN 5211, Part 3, Draft 2002

Type description and technical features Safety of machines:

Technical principles and specifications

Design standard for pneumatic piston actuators

See paragraphs 1 and 2 in these operating instructions

Modifications to actuators and/or additional modules affecting the technical data specified in these operating instructions, the use as specified in section 2 <intended use> and essentially change the actuator and/or a module, will make these declarations null and void.

Düsseldorf, 23rd of June 2003:



H. Ptak, Managing Director

3.2 Declaration of Conformity acc. to Directive 94/9/EC (ATEX 100a)

In compliance with EC-Directive 94/9/EC dated 23rd of March 1994 "Equipment intended for use in potentially explosive atmospheres"

The manufacturer:

Crane Process Flow Technologies GmbH
Heerdter Lohweg 63-71
D-40459 Düsseldorf

declares that the following product:

Type: REVO Pneumatic Actuator
Series 2, 3, 5, 6 and 7
(excluding sizes 001-006 of series 3)

Actuator sizes:

001-006, 012-180 (with and without overtravel and limit stop), 205, 380, 630, 960, H 15 double-acting with spring return, service unit, muffler, mounting bracket, quick-action ventilating valve, pipes and hoses

is according to article 1, (3) a) of the directive 94/9/EG. This actuator, described in the operating and safety instructions, is intended for use in potentially explosive atmospheres.

The actuator meets fundamental safety- and health requirements according to appendix II of the directive 94/EC and the following harmonized standards:

DIN EN 13463-1
E DIN EN 13463-5

The actuator meets the requirements of protection by constructional safety, type "c" and is market with:

  II 2GD c

According to article 8, (1) b) ii) of directive 94/9/EC, in connection with the appendix VIII, an ignition hazards assessment report has been included in the required technical report.

Düsseldorf, 23rd of June 2003:



H.- D. Ptak, Managing Director

3.3 Notes Concerning the Pressure Equipment Directive 97/23 EEC

These actuators are dimensioned as positioning devices in accordance with article 1, section (3.10) of the pressure equipment directive and are therefore no pressure equipment as defined by the EC pressure equipment directive 97/23 EEC.

3.4 Declaration of Manufacturer for Electric Accessories

are – if applicable – enclosed with the delivered accessories.

4 Notes on Safety

4.1 Important Information for the User

The actuators described hereunder have been designed and manufactured in compliance with standards and regulations stipulated above. They therefore comply with the latest technical standards and meet the requirements of these standards.

However, safety during operation in practice can only be achieved if all necessary measures are applied. It is the responsibility of design engineer and operator of pipeline systems equipped with valve and actuator to plan appropriate measures and to monitor their implementation and execution.

In particular the operator must ensure that

- the actuator is only used as described in section 2 <Intended Use>,
- the actuator is only operated in fault-free, fully functional condition and the function of the safety installations in control pressure generation and distribution system and in the electric control provided by the customer are checked at regular intervals,
- all guards and safety installations for electrically and mechanically moved parts of the actuator and its accessory modules are maintained in as-delivered condition and the safety covers of junction boxes are properly closed again after electrical connection,
- All components (1-4) of the REVO pneumatic valve actuator must be installed by skilled

personnel of the operator, as far as the installation is not carried out by the manufacturer. In this context the responsibility concerning the compliance with directive 94/9EC, intended use and applicable safety regulations lies solely with the party using this unit to create a functioning machine.

1. Installation kits
2. Quick ventilation valves
3. Service units
4. Piping and hoses

- this personnel has the necessary equipment available to carry out the work steps described hereunder,
- this personnel is familiar with these operating instructions and the instructions for the associated valve and observes the information contained therein,
- repairs and conversions on spring reset actuators are only carried out under the supervision of a safety expert.

If the information contained in these instructions is not observed, the liability of Crane Process Flow Technologies GmbH for the above mentioned products shall become null and void.

4.2 General Safety Regulations

Basically the same safety regulations apply for actuators as well as the equipment for the generation and distribution of control pressure and for the electrical control system they are connected to. Compliance with these regulations is also assumed for operation of the actuator.

The following must be additionally observed, especially for these pneumatic/hydraulic actuators:

- actuators are designed for control pressures of max. 10 bar; compressed air, neutral gas, water or hydraulic oil at room temperature may be used. In order to protect the solenoid valves, the control medium should be filtered with a mesh size of 40 µm (see ISO 8573-1, class 5). Compressed air must be dried and may be slightly oiled for special applications. (According to ATEX only compressed air)
- manual emergency actuation of double-acting actuators with dihedron on the extension of the

control shaft is only permitted if no control pressure is applied to the actuator. For actuation use only exactly fitting open-end spanners.

- manual emergency actuation of spring reset actuators must only be performed using an additionally mounted manual emergency device (e.g. uncoupling worm gears). Such equipment are also recommended for double-acting actuators of size 090 and bigger.

In this case the following also applies: Do not actuate while control pressure is applied.

- work on electric connections must only be carried out by appropriately trained specialists with responsibility for the control of the entire plant.
- if these actuators are not delivered by the manufacturer together with the valve, but are to be installed by the customer, the information in section 9.1 <Installation of an Actuator...> must be strictly observed.

4.3 Particular Types of Danger



Under normal conditions the actuator must only be operated with the safety installations in place. If these need to be removed for adjustment or connecting work, all connections to the control medium must be disconnected beforehand.



Electrical assemblies shall only be operated with safety covers closed and connections covered. If these need to be removed for adjustment/connecting work, connections for supply and control voltage must be disconnected beforehand. Adjustments to be made in live condition must be performed with properly insulated tools.

5. Transport and Storage

(A valve with) actuator is a high-quality product and as such must be handled, transported and stored with utmost care, in order to avoid damage to actuator and additional assemblies.



If lifting tackle (ropes or similar) is used on the lifting eyelets (bores) of the actuator provided for this purpose, these must only be used to mount the actuator to the valve, but under no circumstances to transport the unit (valve + actuator).

- If the actuator or the unit valve/actuator is to be stored prior to installation, it must be sufficiently protected against harmful influences from dust, dirt and moisture.
- The actuator or the unit valve/actuator shall be stored in its original packaging material (on a pallet or similar).
- The unit valve/actuator shall not be permanently exposed to full sunlight – even if properly packed.
- The actuator or the unit valve/actuator must not be actuated in packed condition.

If the packaging does not show any transport damage the actuators or the unit valve/actuator should only be unpacked just before installation. Unpacked parts must be properly protected against any dirt, moisture and corrosion.

6. Installation and Connection to the Control System

For the most part actuators are delivered ready for installation together with the necessary electrical assemblies (solenoid valve, position indicator and/or position control). Should this not be the case, the actuators must be mounted to the valve and/or electrical assemblies to the actuator by the customer, before the valve is installed in the pipeline. The instructions in section 9.1 <Installation of an Actuator...> must be strictly followed.

When installing a solenoid valve the following section 6.2 must be observed.



When starting installation work one must make sure that the system data for control pressure, control voltage and frequency for all assemblies are in compliance with the technical data specified on the type plate of the actuator and/or the module.

Consumption of control medium and recommended supply line cross-sections are listed in table 1. The shortest possible closing speed mentioned in this table is a reference value for standard double-acting actuators without mounted valve and with optimal supply and discharge of control medium. Friction inside the valve will considerably extend this limit value.

As far as the following description concerns pneumatic control systems, the instructions analogically also apply for hydraulic systems with a pressure of up to 10 bar (e.g. water).

6.1 Installation of a Valve with Pneumatic Actuator into the Pipeline



When connecting electric/pneumatic supplies to the accessory modules for controlling the valves, the special instructions for these electrical accessory modules must be strictly observed.

The actuator is normally delivered together with the valve and is in this case adjusted to the end positions of the valve. Position indicated included in the delivery are normally also adjusted to the end positions, a solenoid valve in the scope of delivery is normally mounted to the actuator.

If the electrical modules solenoid valve and/or position indicator and/or position controller are delivered as separate items, this (these) module(s) must first be mounted to the actuator, before the complete unit is installed into the pipeline, see section 6.2.

The interfaces for the installation of the modules solenoid valve and/or position indicator and/or position controller are standardised acc. to VDI / VDE 3845.

On an actuator of standard design the supply of control medium through port "A" causes an anti-clockwise and the supply through port "B" a clockwise actuation. Spring reset actuators must only be supplied with control medium through port "A". See Fig. 1.



If, for example, the actuator is separately delivered as a spare part, the instructions in sections 9.1, 9.3 and 9.4 must be observed. In this case it is recommended to mount the actuator to the valve prior to the first installation of the valve into the pipeline and to the unit according to 6.1.1

Table 1: Important actuator data

Size	001	002	006	012	025	050	090
Volume/travel [L]	0,06	0,12	0,28	0,53	1,02	1,9	3,6
Compressed air line (length up to 6m)	6 mm	6 mm	6 mm	6 mm	6 mm	8 mm	8 mm
Strokes / nominal lifetime min. *)	500.000	500.000	500.000	500.000	500.000	500.000	500.000
Min. closing time [s] **)	approx. 0,25	approx. 0,35	approx. 0,4	approx. 0,5	approx. 0,7	approx. 0,9	approx. 1,1

Size	130	180	205	380	630	960	H15
Volume/travel [L]	5,49	7,21	9,0	13,0	22,0	32,5	52,0
Compressed air line (length up to 6m)	8 mm	8 mm	10 mm	10 mm	10 mm	10 mm	10 mm
Strokes / nominal lifetime min. *)	250.000	250.000	100.000	100.000	100.000	25.000	25.000
Min. closing time [s] **)	approx. 1,3	approx. 1,4	approx. 1,6	approx. 2	approx. 2,5	approx. 2,8	approx. 3,5

*) acc. to draft ISO 5211 (CEN / TC 69 / WG 1 / SG 10, para. 4.2)

**) These data are limit or reference values for double-acting drives with 6 bar control pressure and apply only for the actuator (no valve attached).

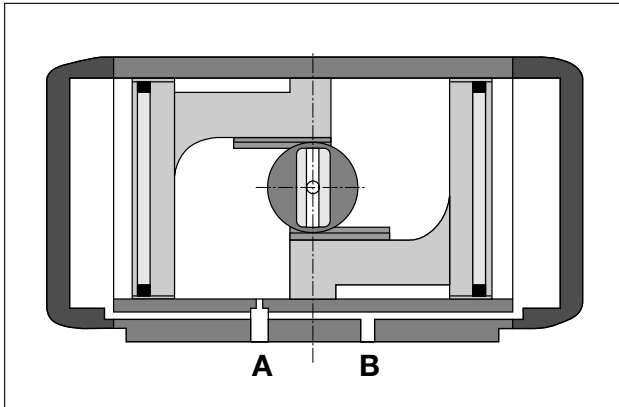


Fig. 1 Revo actuator series R

Installation of valve with actuator should be performed in the following sequence:

6.1.1 Checking the Actuator Position before Installation

If not specified differently in the purchase order, the actuator is delivered in a space-saving position parallel to the pipeline.

If it needs to be installed 90° offset:

- convert the actuator as described in section 9.2 „Conversion of the actuator shaft“ in the detailed instructions.

6.1.2 Checking the Position Indicator before Installation

- **if delivered without electrical position indicator:**

- Slot diagonal to pipeline axis:
Valve is closed,
- Slot parallel to pipeline axis:
Valve is open.

If the positions of valve and indicator do not match, see section 9.2 .

- **if delivered with electrical position indicator:**
The optical indicator “OPEN” and “CLOSED” in the module must be compared with the position of the valve. If the positions of valve and indicator do not match: Plug the indicator in the accessory module position indicator (electric/ pneumatic) into a different socket.



An incorrect position indication is a potential risk for later operation.

Valves/actuators with incorrect position indication must not be installed and should be rejected.

6.1.3 Installation into the Pipeline

Installation of the unit valve/actuator into the pipeline is described in the operating instructions for the valve, these instructions must be treated with priority.

The following is additionally valid:



Actuators must be appropriately supported in order to relieve the valve housing from excessive loads. They must be supported if their size and/or installation orientation applies any bending strain to the valve.



Actuators of any size must not be subjected to any external loads, since this may damage or even destroy the valve. Actuators are no "stepladders".

6.2 Connecting the Solenoid Valve

The actuator is controlled by a solenoid valve.

The solenoid valve is normally connected to the actuator via the standardized interface on the side of the actuator. The connection to the control must

- meet the prerequisites specified in section 2 "Intended Use",
- be in compliance with the documentation of the solenoid valve included in the delivery.

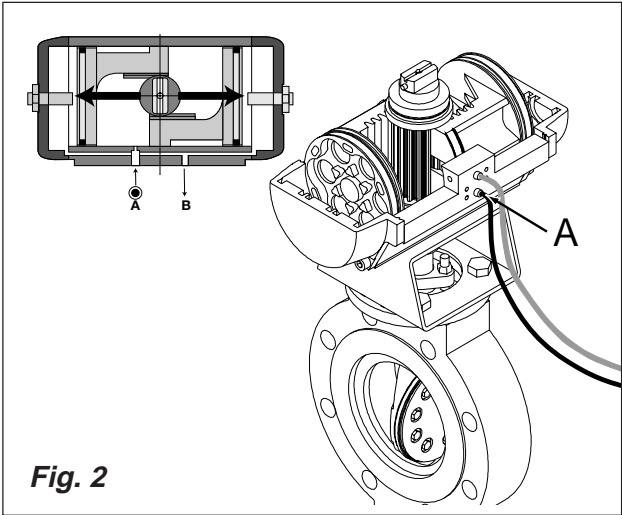


Note: This must be observed particularly if the solenoid valve has not been delivered together with the actuator.

- be in compliance with the following schematics in Fig. 2 to 5.

Air connections double-acting

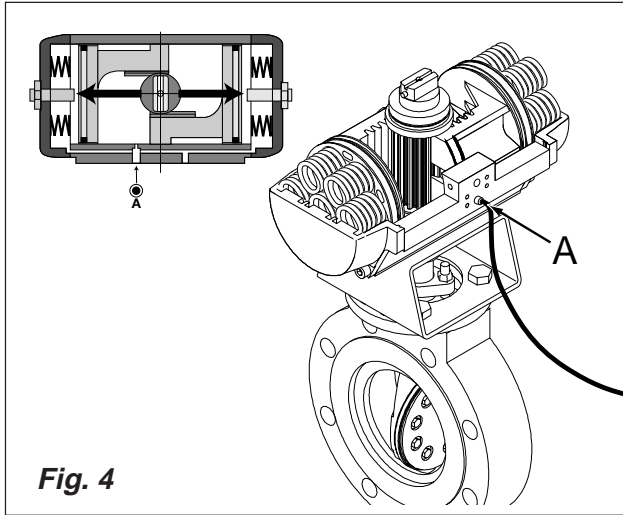
Air supply to port A: anti-clockwise/open



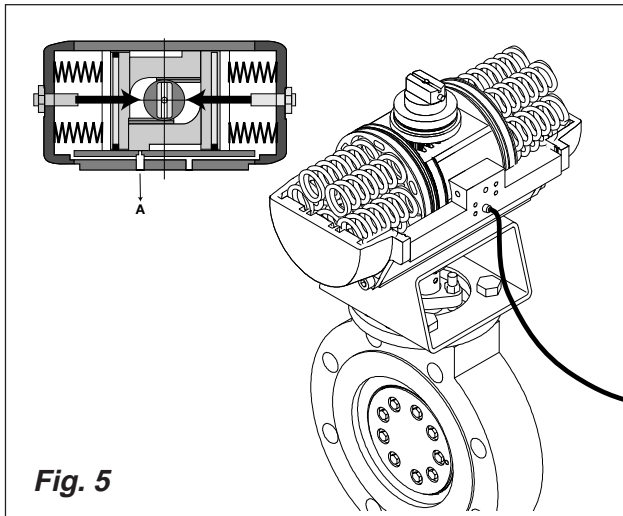
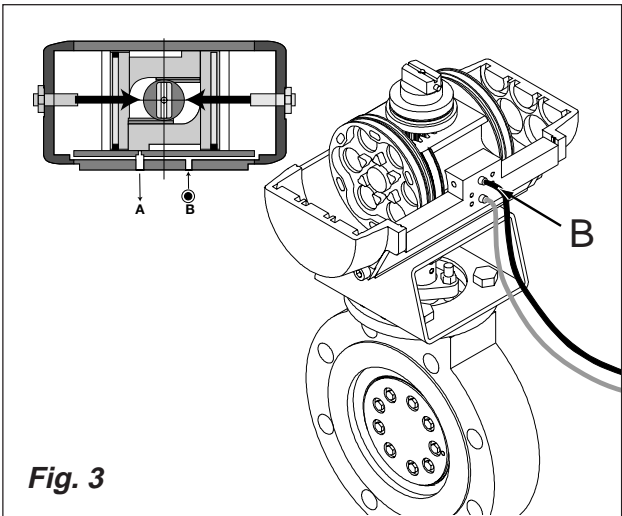
Air supply to port B: clockwise/closed

Air connections with spring reset

Air supply to port A: anti-clockwise/open



Spring reset: clockwise/closed



Recommended Pipe Diameters for Compressed Air Lines

Actuator size	up to 1.20 m	longer than 1.20 m, max. 6 m
001 - 025	6 mm	6 mm
050 - 180	8 mm	8 mm
205 - H15	10 mm	15 mm

6.3 Connecting the Position Indicator and/or Position Controller Module (if present)

This type of module may already be installed (or can be mounted) to the interface on top of the actuator, instead of the optical position indicator. It has the purpose to signalize the position of the valve to the customer supplied control and signalizes the end positions "OPEN" and "CLOSED" and/or intermediate positions (on valves used for throttling/regulation).

Electric and pneumatic connections must be made in compliance with the documentation for position indicator and/or position controller.

6.4 Tests upon Completion of Installation

Once the installation of a valve/actuator unit is completed, it is highly recommended to perform the following test steps on each valve:

Is the "local" control pressure sufficient?

At least the control pressure determined by the design of the actuator must be available directly on the solenoid valve.

Is the solenoid valve correctly connected?

With control pressure applied, but failure of the control signal (to check: pull out plug), the valve must travel to the following position:

double-acting actuator:

The valve closes or opens, see section 2, Intended Use, note 1

actuator, spring closing:

The valve must travel to safety position "CLOSED".

actuator, spring opening:

The valve must travel to safety position "OPEN".

If this fails check control system and/or solenoid valve.

Check actuating function and indication:

With control pressure applied the control commands "OPEN" and "CLOSE" must move the valve to the corresponding end positions. The optical indicator on the actuator must show this correctly. If this fails check the actuator control.

Connection actuator/valve properly tightened?

During the function test no relative movements should occur between valve, mounting bridge (if applicable) and pneumatic actuator.

If necessary tighten the fastening screws.

(if module is available) check electrical position indicator:

The electrical signals for indication "OPEN" and "CLOSED" can be compared with optical indication of the valve. Signal and indication must match.

If this fails check control system and/or position indicator.

If a valve cannot be actuated correctly as described above, even though it is properly connected, actuator and/or valve must be replaced.

Once the installation has been completed valves should generally remain in "open" position for pressure testing the pipeline section.

7. Start-up

The actuator can only be started via the plant control after all tests described in the previous section 6.4 have been completed without objections. The instructions for valves supplied by CRANE Process Flow Technologies specify whether and which additional steps are required for start-up.

The technical rating of the actuator for permanent operation can be found in section 6, table 1.



Important for operation with short closing times: The wear inside the valve may be disproportionately high. With the installation of throttle valves in the supply line or in the discharge line for the control medium the travel time can be extended to a normal value.



In any case the travel frequency must be limited to such an extent, that the temperature measured on the actuator housing does not exceed 80°C during continuous operation.

8. Troubleshooting

When rectifying a fault section 4: <Notes on Safety> must be strictly observed.

Note: In case of malfunctions in the valve: Follow the instructions for the valve.

Type of fault	Action	Remark
Actuator does not respond to control signal	<p>Check control pressure on actuator: The minimum pressure for the rating of the actuator is required.</p> <p>If the control pressure is sufficient, but the actuator does still not respond: Check whether the valve hard to move: For remedy refer to the instructions for the valve. If the valve is also free of faults: Check control and/or dismantle the actuator, see section 9.4.</p>	<p><u>Note 1:</u> When working on electric modules strictly observe the warnings in section 4.3!</p> <p><u>Note 2:</u> If a module needs replacement or spare parts: Always specify all data mentioned on the type plate of this module in your order.</p>
Solenoid valve does not switch	<p>Check whether the magnetic coil has burned out. Check whether the coil was is compatible with the control voltage. If the magnetic coil is OK: Observe the instructions for the solenoid valve.</p>	
Valve switches too quickly	<p>Install a restrictor into the supply or discharge line on the solenoid valve.</p>	
	<p>If the leak is to be eliminated by changing the end position "CLOSED": Adjust the setscrew in the actuator, see section 9.5 of the detailed instructions.</p>	
Valve is leaking Actuator consumes air in end position "OPEN" and "CLOSED"	<p>Check the solenoid valve and its mounting on the actuator. If there is no leakage on the solenoid valve: Dismantle the actuator and renew the seals inside the actuator, see section 9.4.</p>	

9. Work on the Pneumatic Actuator

CRANE Process Flow Technologies as manufacturer delivers Revo pneumatic actuators normally

- in the design that has been ordered (double-acting or with springs),
- in size and rating adapted to the valve,
- with the required accessories, if ordered,
- adjusted and mounted to the valve – as standard positioned parallel to the pipeline.

If an actuator needs to be subsequently converted in exceptional cases, this may also be performed by the user. If the actuator needs to be dismantled for this purpose, this should generally be done in an appropriate workshop with experts for the assembly of high-quality function parts.

9.1 Mounting an Actuator to the Valve



For better understanding of the following instructions you may also use the publications mentioned in section 1, Area of Application, under note 2.

Revo valve actuators have an interface to the valve in accordance with ISO 5211 and a form-closed bore in the control shaft (4), which

- either in form of a square socket acc. to ISO 5211 in the end positions of the actuator positioned 45° “on the tip”,
- or as square socket acc. to ISO 5211 parallel to the longitudinal axis of the housing.

The actuator ordered must match the valve.

The valve must

- have a fitting control spindle end and
- a matching fastening flange acc. to ISO 5211, this must be checked before the installation.

Please observe when mounting the actuator to the valve that

- the longitudinal axis of the actuator should normally be orientated parallel to the pipeline axis,
- the fastening screws match the standardized thread depth acc. to table 2 (see below). Screws too short or too long for the thread depth must not be used,
- the position indicator on the pneumatic drive matches the position of the valve. If a conversion is required, please refer to the next section 9.2.

Table 2: Connection measurements

Size	001	002	006	012	025	050	090
Thread depth [mm]	8	8	6,5/7,5/8	9	9	12	12/16
Square s =	9	9/11	11/14	14	14	17	17/22

Size	130	180	205	380	630	960	H15
Thread depth [mm]	16/18	18	20/25	20/25	25/32	25/32	25/32
Square s =	22/27	27	27/36	27/36	36/46	46/55	55/75



If the actuator has already been mounted by the supplier, the supplier is solely responsible for correct adjustment of the position indicator.

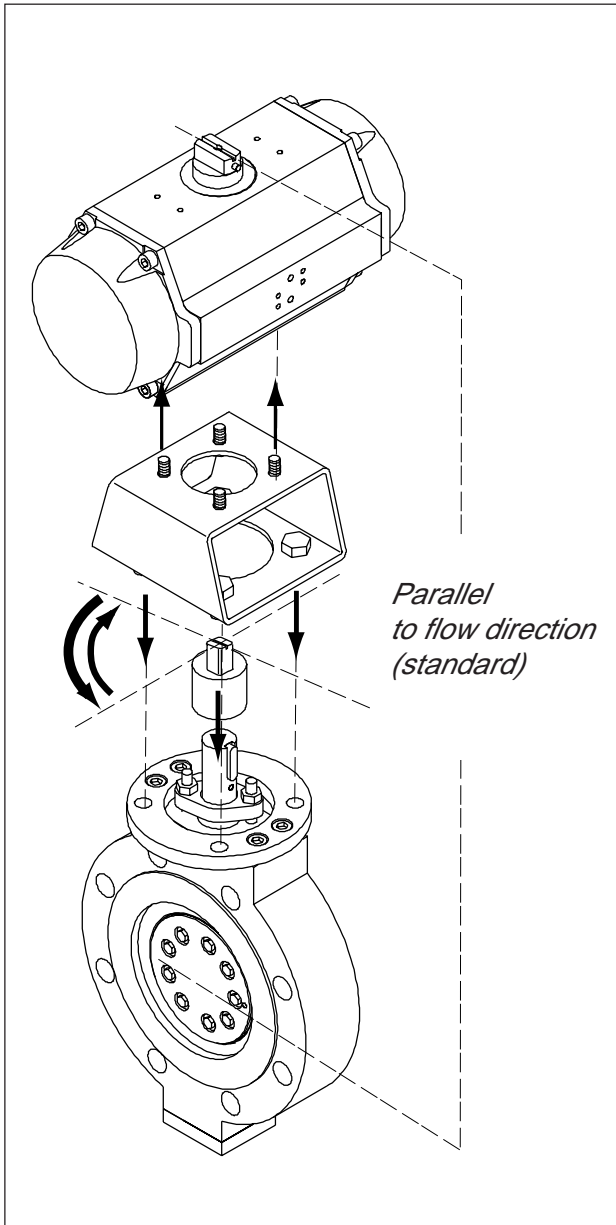


Fig. 6 Mounting an Actuator to the Valve

9.2 Conversion of Drive Shaft to Change the Position Indicator

If the position indicator is not correctly adjusted or the position of the actuator to the valve needs to be changed for 90° by the customer, the control shaft with its position indication must be turned by 90°.



Be careful when removing the actuator from the valve installed in the pipeline: The actuator must only be removed after the pressure in the pipeline has been relieved.

- Disconnect all connections to the control, unscrew the fastening screws to the mounting flange and take the actuator off the valve, see Fig. 6 in previous section 9.1,
- Disassemble the actuator, as described in section 9.4, Disassembling an Actuator,
- Assemble the actuator shaft 90° offset, reassemble the actuator (not series 6).



Be careful when working on actuators with spring reset: Dismantling and assembly should be performed under the supervision of a safety expert or by the manufacturer.

- Before mounting the actuator to the valve make sure that the position indicator is correctly adjusted, see Fig. 6 and section 9.1, Mounting an Actuator to the Valve.

9.3 Changing the Spring Force



Danger of injury: Spring reset actuators contain compressed spiral springs.

In order to prevent a risk of injury caused by unprofessional work the following steps must be performed with greatest care and only under the supervision of a safety expert.



Since the spring reset is dimensioned by the manufacturer Crane Process Flow Technologies, any modifications to this dimensioning should also be coordinated with the manufacturer.

If the factory installed spring assembly in actuators with spring reset is to be changed, both covers (2) must be opened.

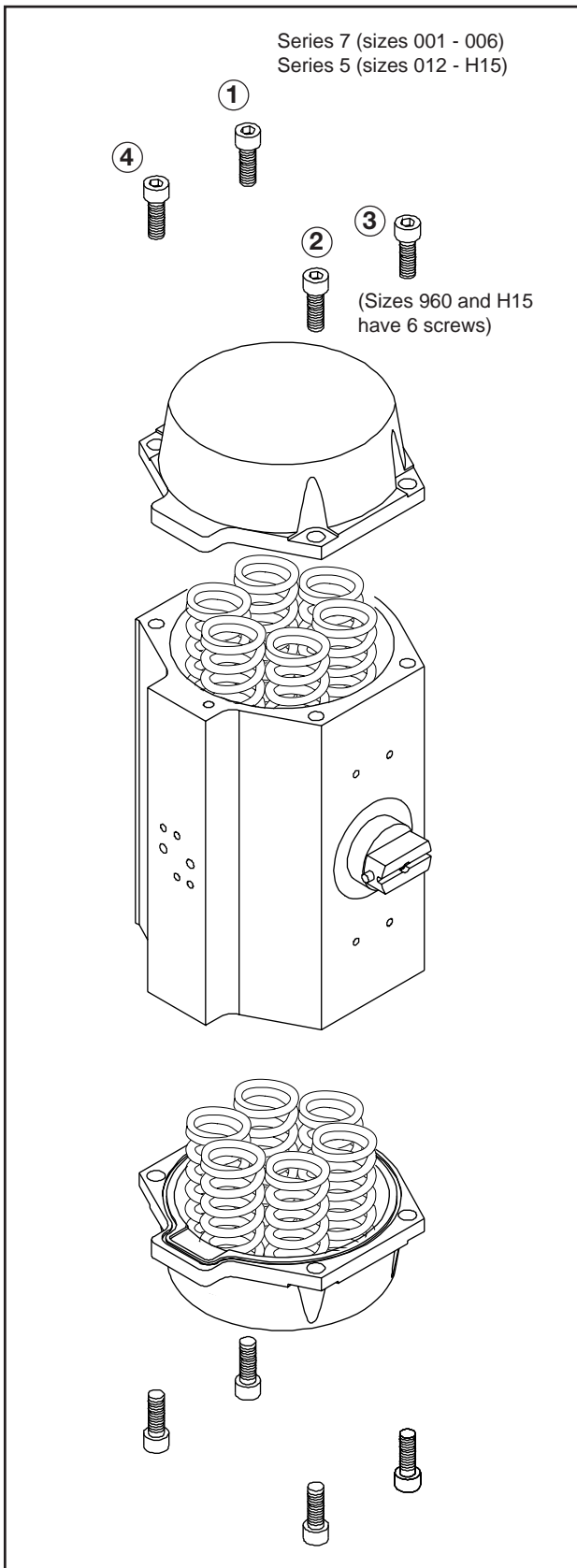





Fig. 7 Mounting an Actuator to the Valve

-  **Note 1: First read the following instructions to end before starting to disassemble!**
 -  **Open the actuator only outside the danger zone.**
 -  **Models 002 and 006 spring return actuators: Place actuator in a press before removing endcap bolts. The springs in these units are still compressed when the endcap bolts are disengaged from body.**
- Be extremely careful while disassembling the end caps on actuators with spring reset.**

The conversion should be performed in the following steps:

- a) Strictly depressurize the actuator beforehand, so that it travels to safety position.

It is also mandatory to depressurize the valve,

- b) then mark the position of the actuator and remove it from the valve, disassemble all accessory modules (solenoid valve, position indicator and/or position controller),
- c) remove screws in the sequence 1-4 (Fig. 7) by each only 1 cm. That's important for an even load during the relaxation process of the endcap.
- d) repeat step c) so often until screws are completely removed.

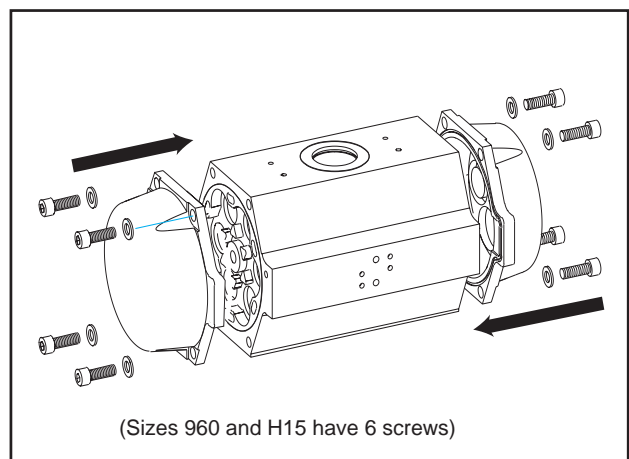


Fig. 8 Disassembling the end cap

- then loosen the first cover (2),

Before loosening the screws (18) it must be assured that the actuator is completely depressurized.

- slacken the screws (18) crosswise and in pairs uniformly and in small steps in order to relieve the springs slowly, then change the spring assembly as shown in Fig. 9 and retighten the cover (2) in reverse order.

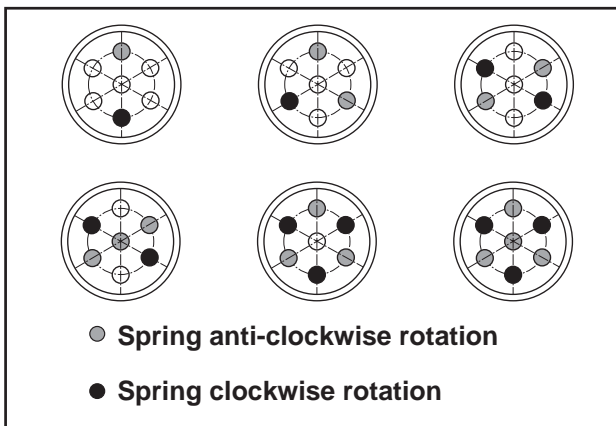


Fig. 9 Arrangement of springs on spring reset actuators

- place the cover (2) centrally on the spring pack and press it slightly down, so that the screws (18) reach into the tapped bores.



The strength of the housing material requires the reuse of all screws (18) with original length, do not use any shorter screws! (Observe the tightening torques given on page 22)

- then turn the actuator around and change the springs on the opposite site in the same way.
- After this reassemble the electric modules (solenoid valve, position indicator and/or position controller).
- Then mount the actuator back to the valve, as described in section 9.1 <Mounting...>.
- Finally check the actuator with the control to find out whether the valve is correctly actuated and whether the position indication is correct.

9.4 Dismantling an Actuator

In case of a defect remove and dismantle the actuator and replace the defective part. You must only use original spare parts from the manufacturer CRANE Process Flow Technologies.



Note: First read the following instructions to end before starting to disassemble!



Be careful when working on spring reset actuators: These actuators contain compressed spiral springs. For dismantling these actuators section 9.3 must be additionally strictly observed in order to prevent the risk of injury.

- Close valves with double-acting actuators,
- depressurize double-acting and spring reset actuators,
- if possible disassemble the actuator from the valve. This requires depressurizing of the valve (if this is not possible clarify the procedure with the locally responsible safety officer!),
- then make a note of the currently indicated position of the position indicator on the actuator,
- then mark the position of the actuator on the valve and separate the actuator from the valve,
- then loosen screws (18) on covers (2) crosswise and uniformly and take off covers (2),
- then turn the dihedron on shaft head (5) and push both pistons (3) out of the drive housing, until they are disengaged,
- take both pistons (3) carefully out.

Both pistons (3) must be reassembled in correct position and with the racks to the right and left of control shaft (4), as they have been taken out, as otherwise the sense of rotation of the actuator will be reversed! See also Fig. 4 (spring closing) and Fig. 5 (spring opening).

Pneumatic Valve Actuator, Series R

You should therefore make a note of the position of both racks on the pistons before pulling them out of the housing.

- then disengage circlip (17) with a special pliers from inside, slide it up and push down Pos.(4) together with Pos.(7),

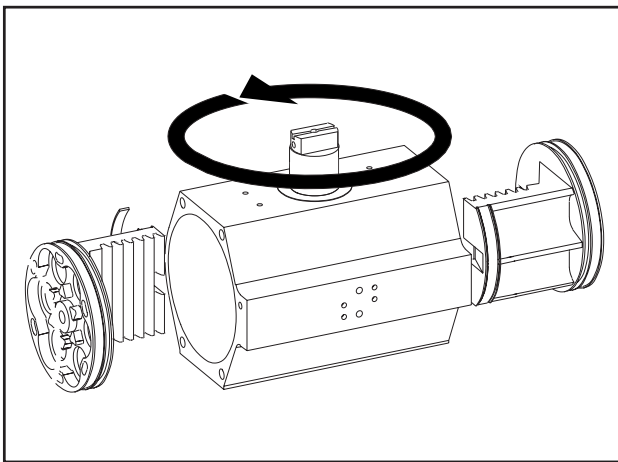


Fig. 10 Pushing down the pistons

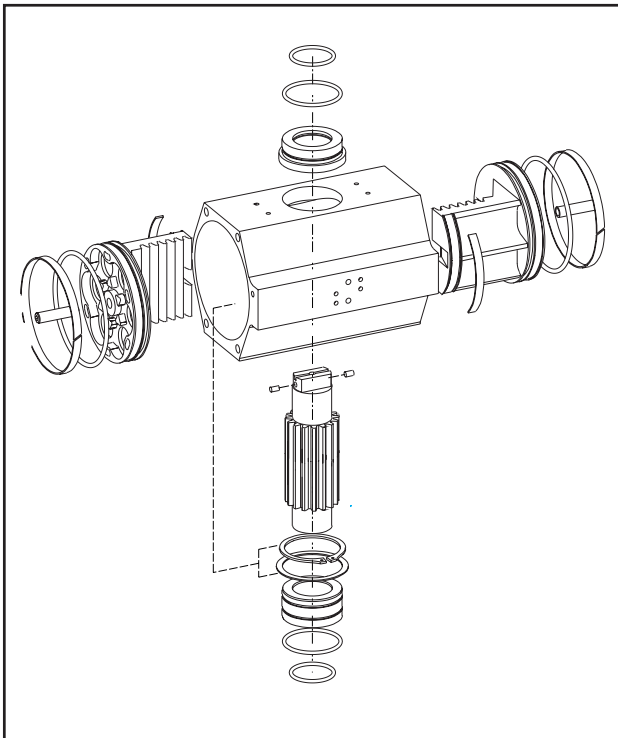


Fig. 11 Removing internal parts

- then check which parts are damaged and need to be replaced. All O-rings and slide belts should be replaced in any case. These are available from Crane Flow as a spare part set.

The actuator must be reassembled and mounted to the valve in reverse order. The above mentioned spare parts kit also contains lubrication grease.

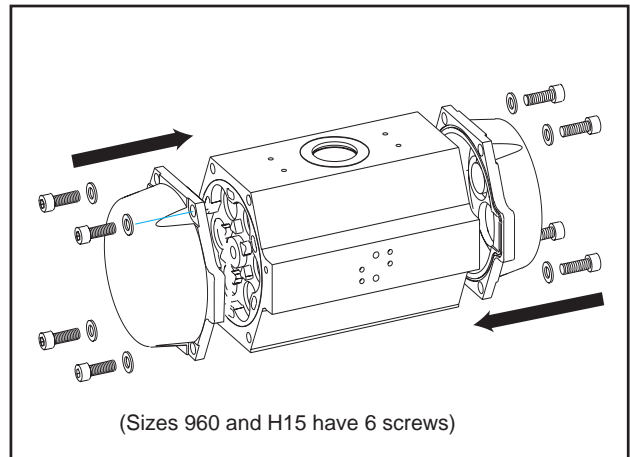


Fig. 12 Preparations for assembly

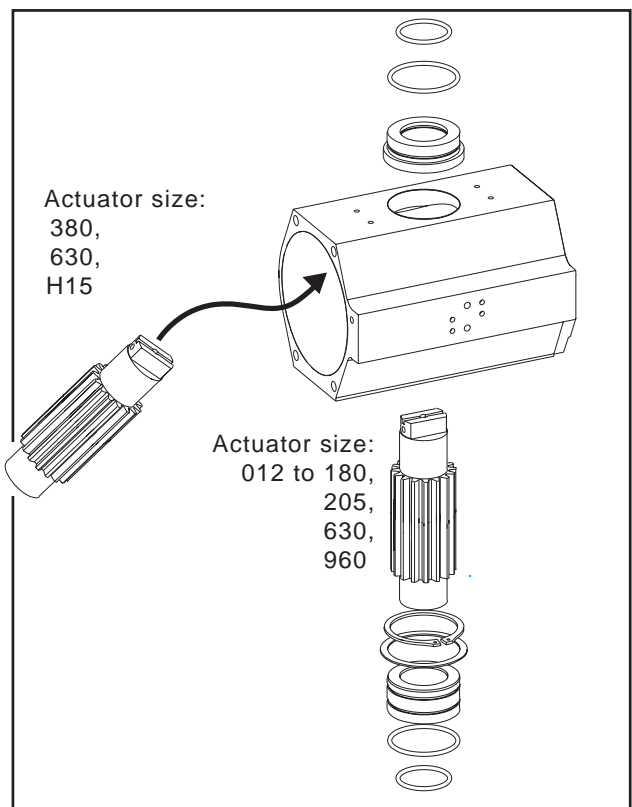


Fig. 13 Inserting the shaft

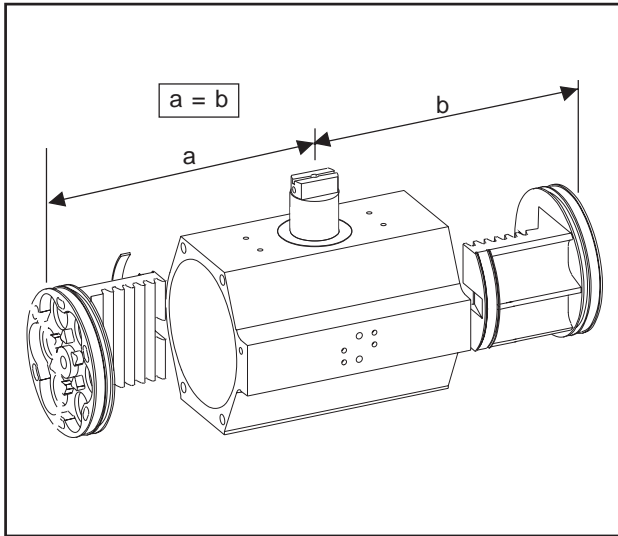


Fig. 14 Inserting the pistons



Both pistons (3) must be reassembled in correct position and with the racks to the right and left of control shaft (4), as they have been taken out, as otherwise the sense of rotation of the actuator will be reversed! See also Fig. 1 (spring closing) and Fig. 2 (spring opening).



For this purpose observe the positions of both pistons (3) noted before disassembly.

Note: Please observe Fig. 15 to 18 for the different types and sizes of actuators as guidance:

9.5 Setting the End Position on Series 6 (Sizes 012 - 180)

Setting the End Position Limitation

On valves with actuators delivered from the factory the travel limitations, e.g. for butterfly valves, are normally adjusted in a way that the valve is leak tight in position "CLOSED" and has a travel of 90°. For e.g. ball valves the possibility of an exact adjustment to position "OPEN" may be requested. The following procedure describes how this final adjustment can be readjusted for actuators starting from size 012.



All adjustment work must first be carried out with the unit disconnected from the compressed air supply. A test run with compressed air must only be carried out after this adjustment has been made. Only on actuators with resetting springs the setscrews should only be unloaded by means of compressed air.

Actuator size 012 - 180

Setscrew „A“ for position „OPEN“ is located on the right hand side of the actuator (see Fig. 1). Setscrew for position „CLOSED“ is located on the left hand side. The total available adjustment range is 98°.

Setting to „normally OPEN“ for function „double-acting“ and „spring resetting“:

- Pull of the protection cap and loosen the locking nut.
- Turn setscrew „A“ by the hexagon socket in clockwise direction. This means „Reduction of travel in opening direction (94° to -4°)“. Turning setscrew anti-clockwise means „Increase of travel in closing direction“.
- After the adjustment retighten the locking nut and push the protective cap back on.

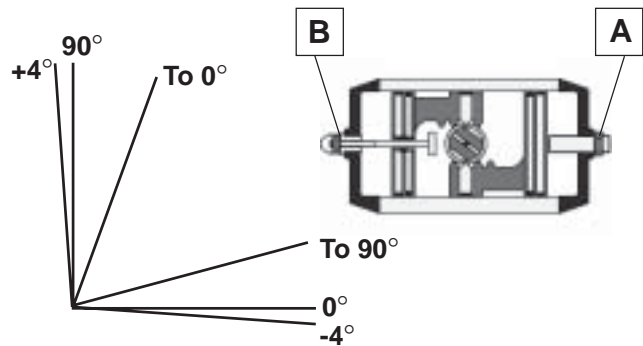
Setting to „normally CLOSED“ for function „double-acting“:

- Pull of the protection cap and loosen the locking nut.

- Turn setscrew „B“ by the hexagon socket in clockwise direction. This means „Increase of travel in closing direction (-4° to 94°)“. Turning the setscrew anti-clockwise means „Reduction of travel in opening direction“.
- After the adjustment retighten the locking nut and push the protective cap back on.

Setting to „normally CLOSED“ for function „spring resetting“:

- Here the same applies as described under „double-acting“. However, setscrew „B“ must not be adjusted anti-clockwise against the tensioned resetting springs, thus to avoid excessive strain and damage. The adjustment of this screw in anti-clockwise direction is considerably accommodated by a carefully dosed supply of compressed air through air inlet port „A“ on the actuator. Only the amount of compressed air that is necessary to enable force-free turning of the setscrew shall be supplied.



Actuator	Torque /Nm	
	A	B
012	12	12
025	12	12
050	15	16
090	15	15
130	20	20
180	20	20

9.6 Schematic Structure

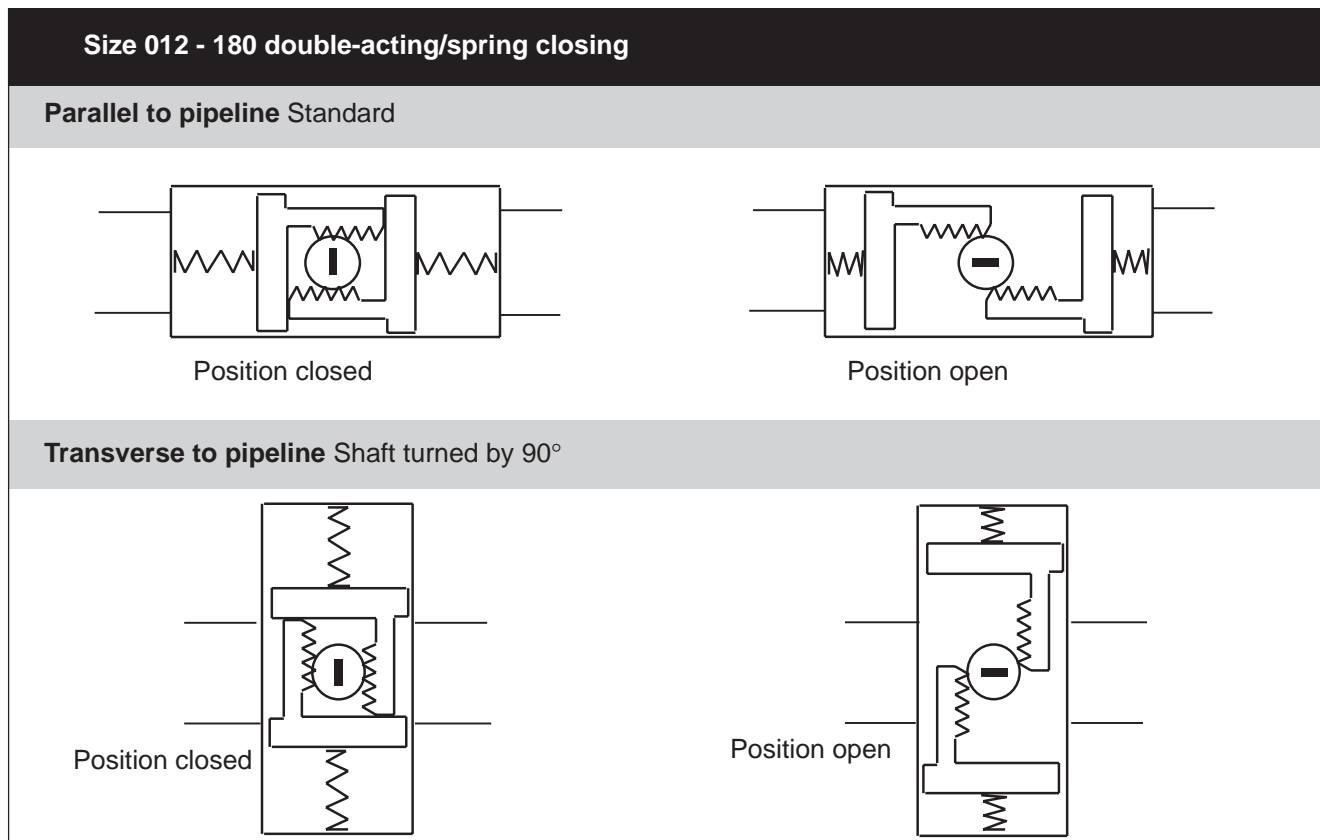


Fig. 15 Schematic of actuator double-acting and with closing spring (sizes 012 to 180)

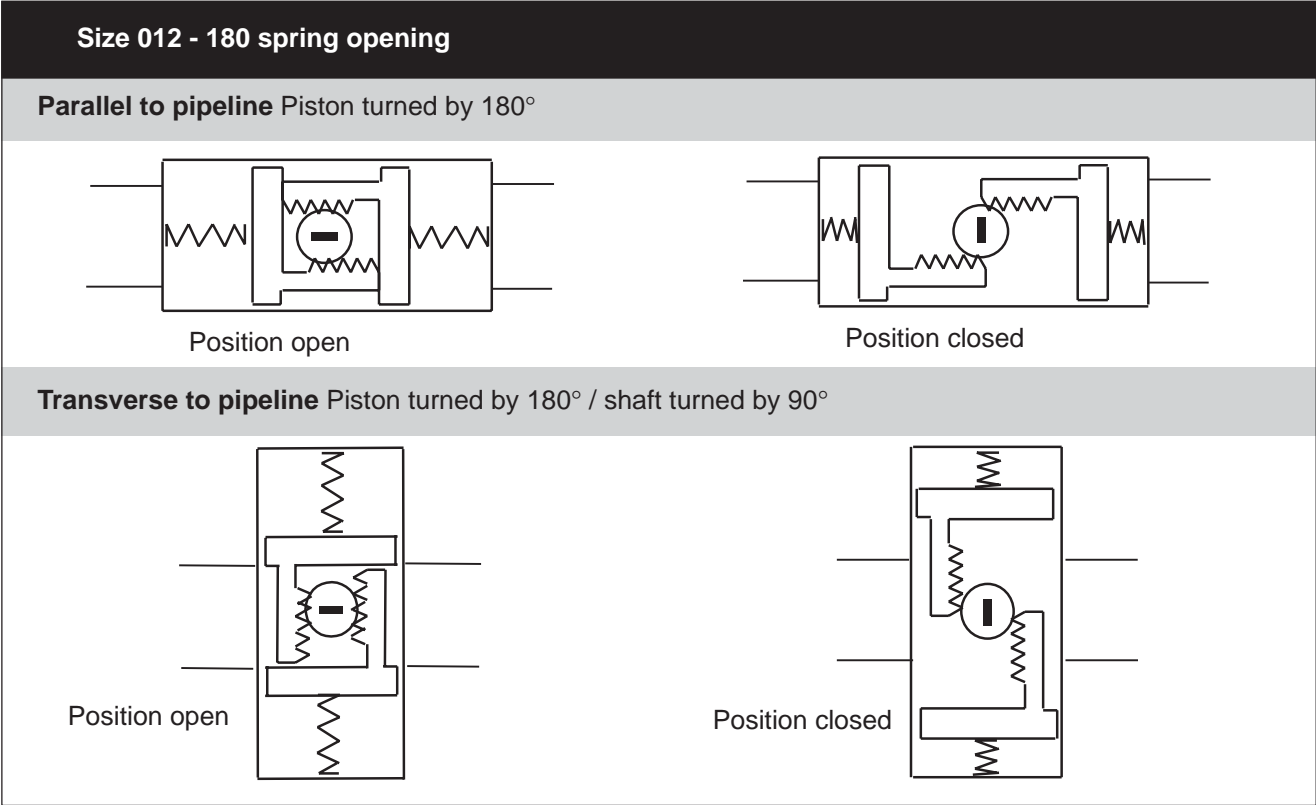


Fig. 16 Schematic of actuator with opening spring (sizes 012 to 180)

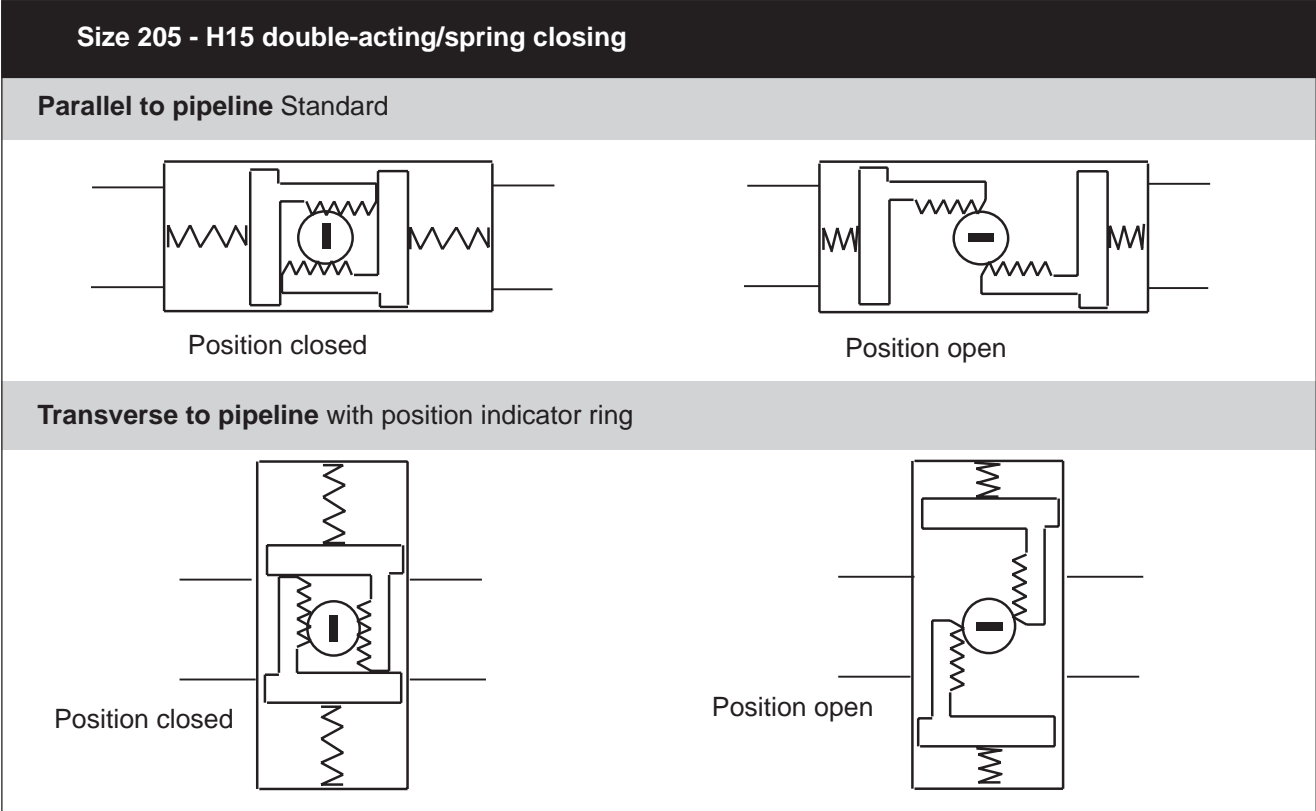


Fig. 17 Schematic of actuator double-acting/with closing spring (sizes 205 to H15)

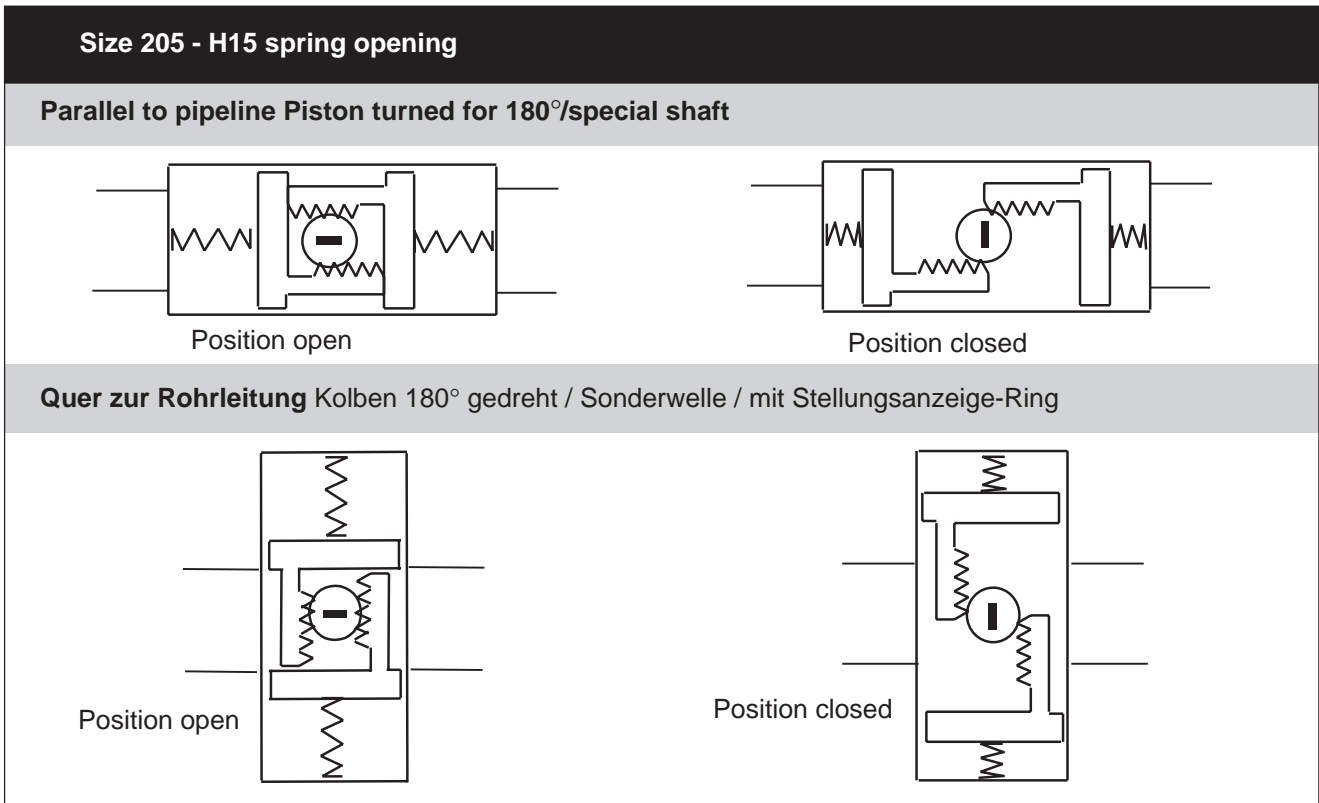


Fig. 18 Schematic of actuator with opening spring (sizes 205 to H15)

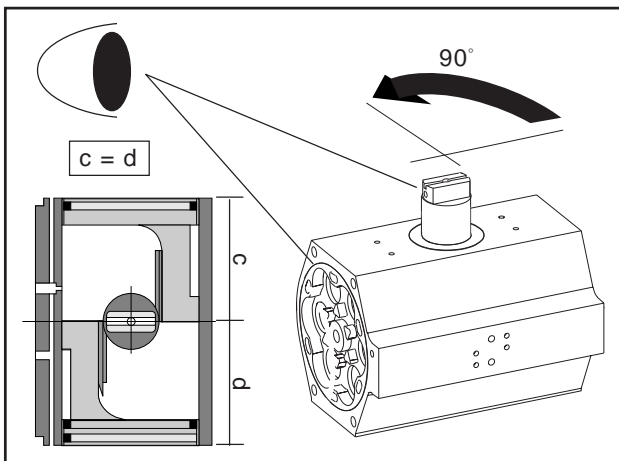


Fig. 19 In "OPEN"-position pistons must be flush with the housing

- When assembling the O-rings (14) it is advisable to lubricate these with grease on silicon or polyglycol basis before inserting them into their chamber in the cover. Do not use any mineral oil based greases or Vaseline. O-rings must not be "twisted" when being inserted into their seat.

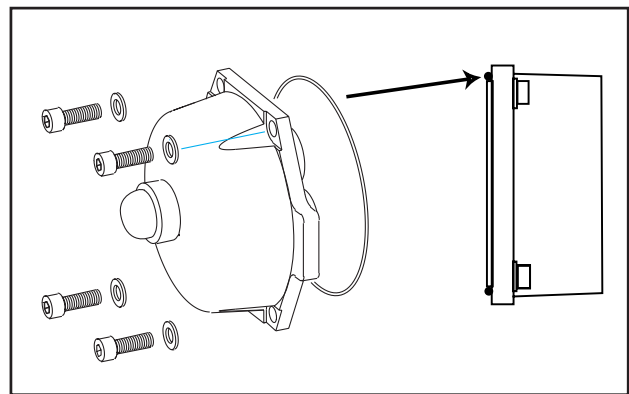


Fig. 20 Assembly of cover with O-ring



The strength of the housing material requires the reuse of all screws (18) with original length, do not use any shorter or longer screws!

10. Maintenance

Revo pneumatic actuators of series R normally do not require any maintenance.

We recommend to replace O-rings and sliding belts after 500.000 switching cycles.

It is quite adequate to check periodically that no control medium leaks out. In events of emergency section 8 "Troubleshooting" must be observed.

Table 1 in section 6 <Installation... into the pipeline> shows the expected lifetime under the specified rating conditions.

11. Spare Parts

Spare parts sets for the actuators are available from the manufacturer's stock and must be ordered with all details specified on the type plate.



All parts made of elastomers are organic materials, which must be stored in an environment as cool, dry and dark as possible. Due to ageing these parts should not be stored for longer than 2-3 years.

Spare parts for the valve are specified in the instructions contained in the complete delivery.

12. Further Information

can be obtained from your nearest office of CRANE Process Flow Technologies or from our head office.

13. Mini Drives

Series 7 (sizes 001 - 006)

General

REVO Mini actuators differ from the bigger actuators in a few details. The following description explains these differences. All other points apply also for Mini actuators.

Revo Mini actuators have a standardized interface acc. to ISO 5211.

The control shaft is provided with an octagon to plug on a socket

- either in form of a square socket acc. to ISO 5211 in the end positions of the actuator positioned 45°,
- or as square socket at 0° in end position
- or, if demanded by the customer, as diehedron or another shape

Conversion of Drive Shaft to Change the Position Indicator

The procedure is as described under 9.2, however, it must be assured that the control shaft is not displaced axially in the housing. This is possible, because the shaft is not retained by a circlip, but the pistons are positively connected with the shaft and the shaft will float freely in the housing once the pistons have been removed.

Changing the Spring Force

Spring resetting Mini actuators of sizes 002 and 006 are equipped with max. 4 pieces of centrally arranged springs.



The springs are pre-loaded can cannot be relieved by means of the cover fastening screws..

The cover plate must be held in place to open the actuator. This can be accomplished by using a screw clamp, in a vice or by using longer screws.

Also here the notes given under 9.4 must be additionally observed.

Dismantling the actuator 001, 002 and 006

The procedure is as described under 9.4, with the difference that the control shaft on the „Minis" is not retained by a circlip, but positively connected with the pistons.

After disassembling the pistons the shaft can therefore push up out of the housing without any tools.

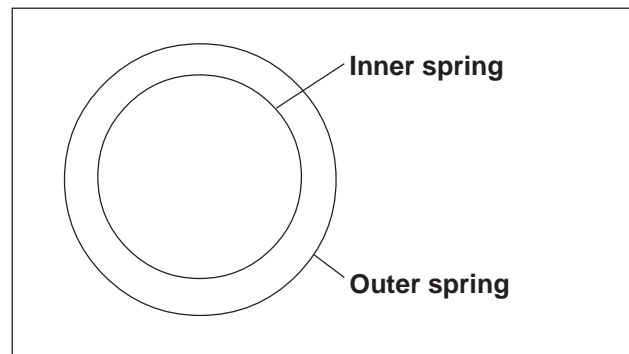
Make sure that O-rings and sliding belts are not sheared off when pushing out the shaft.

Series 7

Concentric springs (sizes 001 - 006)

In contrast to sizes 012 - H15 the coding of springs (digit 10 in code) does not correspond with the number of springs. The coding is made in accordance with the following list:

10. digit	Outer spring	Inner spring
2	0	1
4	0	2
6	1	1
8	2	0
10	2	1
12	2	2



14. Screw Tightening Torques

Tightening torques

Actuator	Cover plate screws	Screwer used	adjusted stage	Tightening torque	Counter nut end position	Tightening torque
001	M 4 x 10 mm	-/-	-/-	2 - 2,5 Nm	M 5	2 Nm
002	M 4 x 20 mm	-/-	-/-	2 - 2,5 Nm	M 5	2 Nm
006	M 5 x 20 mm	-/-	-/-	2,5 - 3 Nm	M 6	4 Nm
012	M 6 x 40 mm	1	2	9 Nm	M 12 x 1	12 Nm
025	M 6 x 40 mm	1	2	9 Nm	M 16 x 1,5	12 Nm
050	M 8 x 50 mm	1	4	18 Nm	M 18 x 1,5	15 Nm
090	M 10 x 70 mm	2	9	30 Nm	M 20 x 1,5	15 Nm
130 / 180	M 10 x 80 mm	2	9	30 Nm	M 24 x 2	20 Nm
205 / 380	M 12 x 40 mm	2	9	35 Nm	-/-	-/-
205	M 12 x 80 mm	2	9	35 Nm	-/-	-/-
380	M 12 x 110 mm	2	9	35 Nm	-/-	-/-
630 - H15	M 16 x 50 mm	3	8	110 Nm	-/-	-/-
630 / 960	M 16 x 110 mm	3	8	110 Nm	-/-	-/-
H15	M 16 x 140 mm	3	8	110 Nm	-/-	-/-

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