

Operating and maintenance manual
Pneumatic piston actuator
Series 814

Original instructions

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1 General data

This operating manual contains instructions that enable the product to be safely and properly installed, put into operation and maintained.

The target group for this operating manual is exclusively specially trained and authorised technical personnel.

Please contact the manufacturer if you encounter problems that cannot be solved with the aid of this operating manual.

The product is subject to technical changes at any time.

1.1 Validity of the manual

This operating manual applies to the product in the version described in the device pass.

1.2 Contact details

Further information about the product can be obtained from:

Manufacturer's address

ARCA Regler GmbH

Kempener Str. 18

D-47918 Tönisvorst

Tel.: +49 (0) 2156-7709-0

Fax: +49 (0) 2156-7709-55

E-mail: sale@arca-valve.com

www.arca-valve.com

1.3 Other applicable documents

The product can be delivered as part of an actuator and equipped with additional components that are described in their own operating manuals. The instructions as well as the warning and safety information contained therein must also be observed.

Furthermore, the following documents apply in addition to this operating manual.

- Device pass
- Installation drawing

1.4 Place of storage of the manual

The operating manual and all other applicable documents are part of the product. They must be kept in the immediate vicinity of the product and must be accessible to the personnel at all times.

2 Safety

2.1 General safety information

The operating manual contains detailed descriptions for the safe installation, commissioning and maintenance of the product.

- Read this operating manual attentively in its entirety in order to familiarise yourself with the product.
- Particular attention must be paid to the information in this chapter.

2.2 Explanation of symbols and notices

Safety and warning instructions are intended to avoid hazards to the life or health of operating or maintenance personnel, and to avoid material damage. It is emphasised through the use of the special terms defined here. Additionally, their location is marked by warning symbols (pictograms). The signal terms used have the following meanings:



DANGER

means that death, serious injuries and/or considerable damage to property will occur if the corresponding preventive measures are not taken and maintained.



WARNING

means that death, serious injuries and/or considerable damage to property can occur if the corresponding preventive measures are not taken and maintained.



CAUTION

means that minor injuries and/or damage to property can occur if the corresponding preventive measures are not taken and maintained.



NOTICE

indicates an important item of information about the product itself or how the product should be handled, to which special attention should be paid.

2.3 Structure of the warning notices

Section-related warning notice

Section-related warning notices refer to the entire chapter, sections or several paragraphs within this operating manual. Section-related warning notices are structured as follows:



DANGER

Type and source of the danger

Possible consequences of disregard

- ▶ Measure to avoid the danger
- ▶ Further measures

Embedded warning notice

Embedded warning notices refer to a certain area within a section. They apply to smaller information units than the section-related warning notices. Embedded warning notices are structured as follows:

 **DANGER!** Instructions for avoiding a dangerous situation.

2.4 Intended use

The product complies with laws, regulations and standards valid at the time of delivery.

The product does not pose a danger to people, property or environment if it is used for its intended purpose and the warning notices contained in this operating manual and attached to the product are observed. This applies to the entire lifetime, from the delivery, assembly and operation to the disassembly and disposal.

The following is deemed to be used for the intended purpose:

- Operate the product exclusively in accordance with this operating manual and in accordance with the specification in the order confirmation and the device pass.
- Use exclusively original ARCA spare parts for the maintenance of the product.



DANGER

Risk of death and serious injuries as well as damage to property and the environment!

Risk of death and serious injuries as well as damage to property and the environment due to hazardous operating media, high temperatures and pressures as well as moving parts.

- ▶ The following requirements and conditions must be complied with without fail.
- ▶ Observe warning notices.

Maintenance

Ensure or observe the following before performing any maintenance work:

- Depressurise the actuator and the attached valve.
- If necessary, cool the actuator down or heat it up to ambient temperature.
- Disconnect electrical connections, if any.
- The actuator springs are inserted with a high pre-tension; it is imperative to follow the disassembly instructions according to the chapter entitled [11.3] *Piston*.
- Ensure that the system cannot be started up by third parties.

- You are expressly directed to observe the regulations for potentially explosive equipment where necessary.

Limits of use

Operate the actuator only within the following limits of use.

Max. operating pressure [bar]	Min. operating temperature [°C]	Max. operating temperature [°C]
6	-10 / Low temperature version -40	+80

The actuator is designed for a maximum number of operating cycles of 1 million full strokes.

The max. permissible operating cycle frequency is 1 full stroke per second.

2.5 Inappropriate use

Inappropriate use is use of the product other than as described in the chapter entitled [2.4] *Intended use*.

In the addition, the following applies:

- Unauthorised modifications to the product can lead to injuries, damage to property and malfunctions. The user alone bears this risk. Warranty and liability claims are excluded.

2.6 Residual risks

There may still be residual risks even if the product is used for its intended purpose.

- Danger of being crushed by unsecured actuators

In case of negligent use of personal protective equipment:

- Danger due to noise resulting in hearing loss
- Thermal hazards (burning, scalding, etc.)
- Danger due to escape of the operating medium

Furthermore, there may be unapparent residual risks despite all precautions taken.

Residual risks can be minimised if the notes on safety and commissioning as well as the operating manual as a whole are observed.

2.7 Qualification of the personnel

The product is exclusively intended for use in plants and installations in which trained technical personnel carry out the necessary work. Technical personnel are persons who are entrusted with the installation, commissioning and operation of this product and who have the appropriate qualifications for their work activities, such as, for example:

- training or instruction in accordance with current technical safety standards in the maintenance and usage of appropriate safety equipment.
- Training in First Aid.
- In the case of systems with explosion protection: training or instruction and authorisation to carry out work on potentially explosive systems.

Repair work may be carried out only by trained and qualified technical personnel.

Work on electrical equipment may be carried out only by trained electricians or persons who have received electrotechnical instruction.

Persons	Instructed persons	Persons with a recognised technical education	Persons with a recognised electrotechnical education	Superiors with relevant skills	ARCA service personnel
Transport	X	X	X	X	X
Installation	X	X	X	X	X
Commissioning		X	X	X	X
Maintenance	X	X	X	X	X
Fault finding		X	X		X
Mechanical troubleshooting		X			X
Electrical troubleshooting			X		X
Repairs		X	X	X	X
Disposal	X	X	X	X	X

2.8 Operator's duty of care

To avoid accidents, malfunctions and environmental impacts, the respective person responsible for the transport, commissioning, operation, maintenance and disposal of the product must ensure the following:

- Observation of all warning and danger notices.
- Regular instruction of personnel on all applicable questions of work safety, the operating manual and in particular the safety instructions that it contains.
- Regulations and work instructions for safe working as well as the corresponding instructions for the conduct of the personnel in case of accidents and fire are to be kept at the ready at all times and hung up in the plant if necessary.
- Operate the product only if it is in perfect working order.
- Use only spare parts, lubricants and operating resources approved by the manufacturer.
- Observe the specified operating conditions and requirements at the place of installation.
- Provide all necessary devices and the personal protective equipment required for the respective task.
- Refer to the chapter entitled Maintenance for the prescribed maintenance intervals and comply with the corresponding regulations.
- Allow installation, commissioning and maintenance of the product to be carried out only by qualified and trained personnel in accordance with this operating manual.
- The operator must ensure that the product is used for its intended purpose.

- Before commissioning the product the operator must carry out a risk assessment and define appropriate inspection and maintenance intervals according to the operating conditions.

2.9 Personal protective equipment

Personal protective equipment must be worn during work in order to minimise health risks.

- During work, always wear the protective equipment necessary for the respective work
- Follow the notices about personal protective equipment displayed in the working area.

Always wear	
	<p>Protective clothing</p> <p>Tight-fitting work clothes with a low tear resistance, with narrow sleeves and without protruding parts. They primarily serve to protect against being caught up by moving machine parts.</p> <p>Do not wear rings, chains or other jewellery.</p>
	<p>Safety shoes</p> <p>To protect against heavy falling parts and slipping on smooth floors.</p>

Wear in case of particular environmental conditions	
<p>Special protective equipment is necessary in particular environmental conditions.</p> <p>It is to be selected according to the environment.</p>	
	<p>Safety glasses</p> <p>To protect the eyes against flying parts and splashes of liquids.</p>
	<p>Helmet</p> <p>To protect against falling and flying parts and materials.</p>
	<p>Hearing protection</p> <p>To protect against hearing damage.</p>

3 Transport, storage and packaging

3.1 Transport



WARNING

Tipping or falling load!

Danger of death and danger of damage to property due to load tipping over or falling!

- ▶ Only suitable and approved means of transport and lifting equipment may be used for transporting the product.
- ▶ Lifting equipment must generally be attached to the housing of the product, not to attachments.
- ▶ Allow only instructed persons to select and attach the lifting equipment.
- ▶ Do not stand under suspended loads.

Transport at a temperature lower than -40 °C or higher than $+80\text{ °C}$ is not permissible.

The attachment points on actuators (lifting eyes, ring bolts, etc.) are designed solely for transporting the actuator. Under no circumstances may these attachment points be used if the actuator is coupled to a valve.

3.2 Storage



NOTICE

Improper storage!

There is a danger of the product and in particular the attached electronic accessories no longer functioning if stored improperly.

- ▶ Storage at a temperature lower than -40 °C or higher than $+80\text{ °C}$ is not permissible.
- ▶ It must be stored in roofed-over storage places and that are weather-proof.

To protect against contamination and to protect the sealing surfaces, openings such as nozzles, flanges, etc. must be sealed using suitable means. These should be removed by technical personnel at the place of installation.


3.3 Packaging


The product is packed in a PE film inside the outer packaging (cardboard box, wooden crate, pallet, lattice box).

If the packaging, in particular the PE film, has been opened, the product must be stored immediately in a heated room.

The product must be packed in weatherproof or seaworthy packaging for transport by ship, airplane, rail or truck.

4 Nameplate

Type:	1					
DN:	2					
PN:	3	Stroke:	4	mm		Order-No.:
Material:	5					6
KVs:	7	Seat-Ø:	8	mm		Serial-No.:
Actuator:	10					9
Spring-Range:	11					
Air-Supply:	12				bar	
Security Position:	13				- max. 6 bar	
TAG/KKS-No.:	14					
Manufacturer:	ARCA-Regler GmbH					
			15			Construction year:
						16



 Made in Germany

Illustration 1: Nameplate

1	Type designation valve
2	Nominal size
3	Nominal pressure
4	Valve stroke
5	Material of housing / trim
6	ARCA order number
7	Flow coefficient, characteristic curve
8	Seat diameter
9	Serial number
10	Actuator type code
11	Actuation pressure range
12	Max. actuation pressure
13	Valve safety position
14	Marking
15	Conformity mark
16	Year of manufacture

Place of installation

The nameplate is attached to the actuator yoke or the actuator head.

5 Type key

814	-	3	2	3	2	N	-	O	B	0	-	HV
[1]		[2]	[3]	[4]	[5]	[6]		[7]	[8]	[9]		[10]
1. Series												
814												
2. Actuator size												
3 PKIII piston area 2825 cm ²												
3. Yoke (Ø = mounting in mm)												
0 without												
2 Ø150												
9 Special version												
4. Stroke												
3 180 / 200 mm												
4 250 mm												
5. Spring set												
1 1 spring												
2 2 springs												
6. Actuator head material												
N Steel												
7. Function												
O Stem extended by spring (normally closed)												
S Stem retracted by spring (normally open)												
8. Version												
B Standard version												
9. Additional equipment												
0 none												
1 Low temperature version max. -40 °C												
10. Manual operation												
HV Manual operation												

Example of type designation

814-3232N-OB0-HV

Pneumatic piston actuator PKIII – Mounting diameter 150 mm – Stroke 200 mm – 2 springs – Steel actuator head – Function normally closed – Standard version – no additional equipment – Manual operation.

6 Sectional drawings

Some versions of the actuator are illustrated below. Further versions are possible by combining the different components.

Connections

Z1 see section on [9.2] *Actuating signal connection*

6.1 Parts list

Item	Name
1	Lantern
2	* Stem
4	* Spring
5	* Spring
10	Lifting eye
11	Top cover
12	Bottom cover
13	Tube
14	Bolt
15	Hex nut
16	Screw
17	Long nut
18	Disc
19	* O-ring
21	Piston
22	* Sealing element
23	* Guide band
24	Segment ring
25	Clamping ring
26	Locking screw
27	Hex nut
28	* O-ring
31	Bushing
32	* Plain bearing
33	* Sealing element
34	* O-ring
40	Stroke plate
41	Hex screw
42	Disc
43	Guard
44	Hex screw
45	Disc
46	Hex screw
47	Hex screw
	* recommended spare part / wearing part

6.2 814-****-OA0

Function: Normally closed O; Version A:

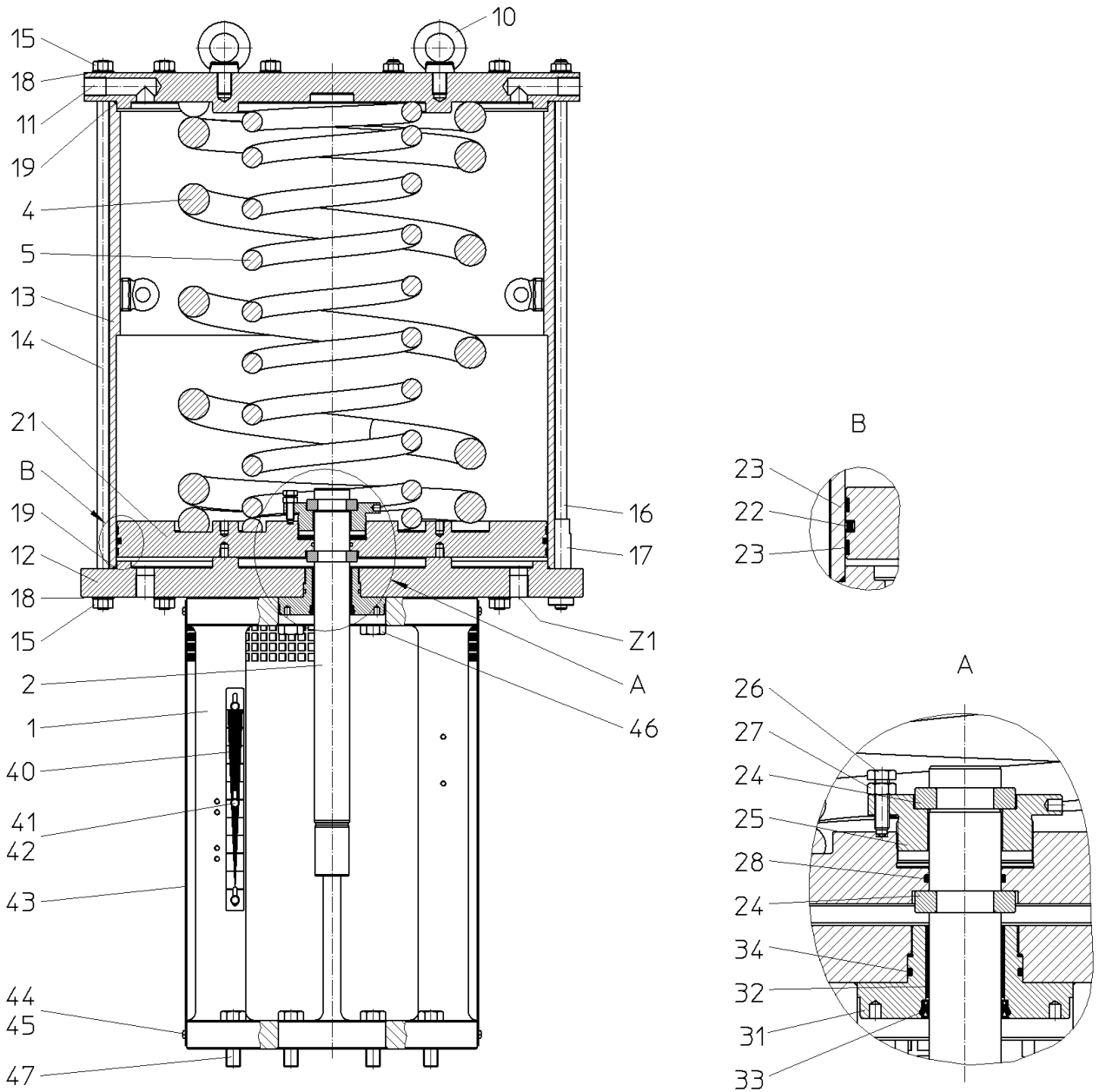


Illustration 2: 814-****-OA0

6.3 814-**-SA0**

Function: Normally open S; Version A:

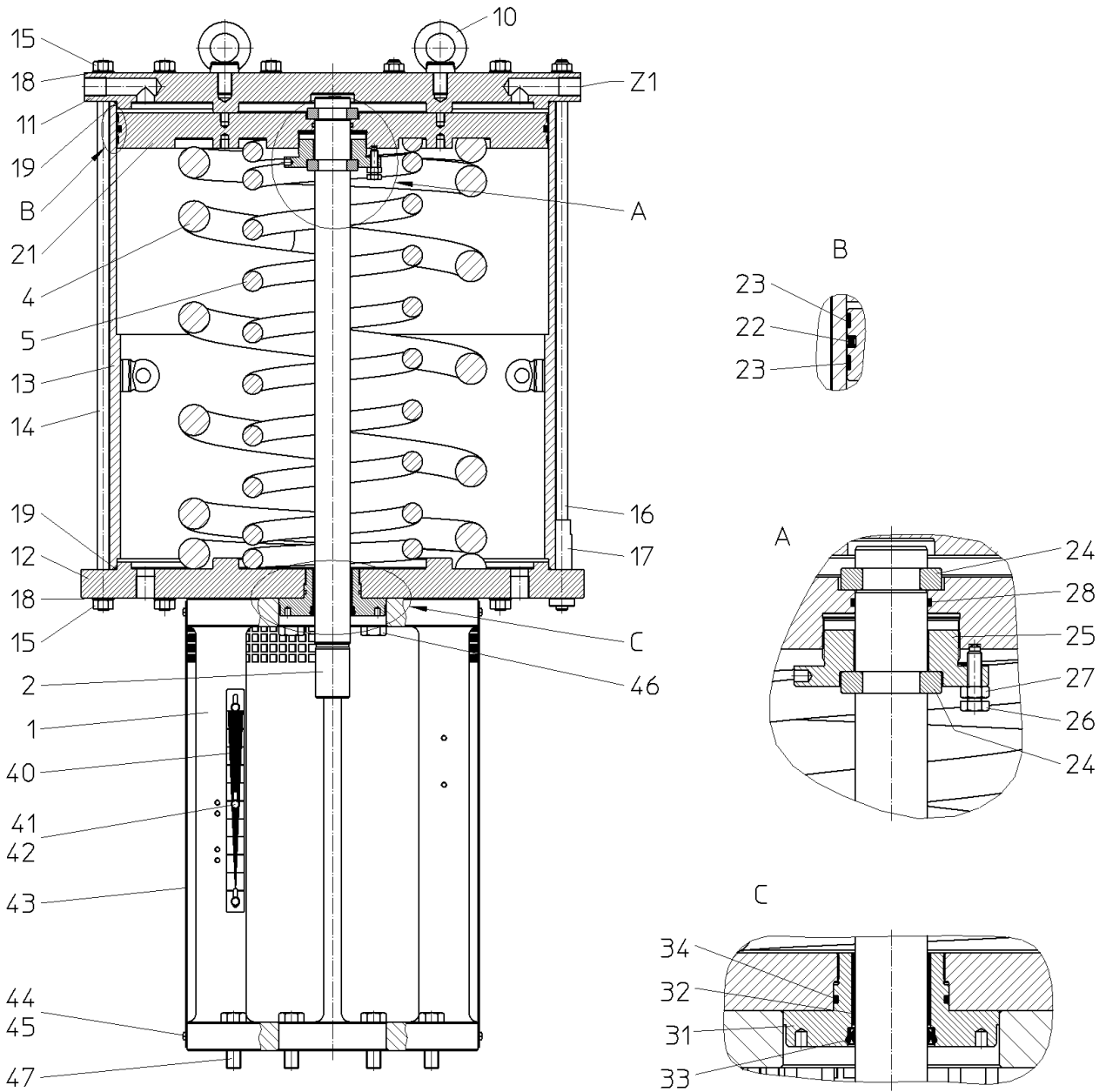


Illustration 3: 814-****-SA0

7 Functional description

The series 814 has been developed as a single-action, pneumatic piston actuator for linear valves. The centrally located stem (2) is connected through a coupling for this purpose to the operating stem of the valve.

The actuator stem (2) is precisely guided by a plain bearing (32) and the air-pressurised pressure chamber is sealed by a special sealing element with a wiper (33). A piston (21) is connected to the actuator stem (2), it divides the actuator housing (11, 12, 13) into pressure and spring chambers. The actuator stem (2) moves when the force applied by the actuation signal air pressure is higher on one side of the piston (21) than the force of the spring(s) (4, 5).

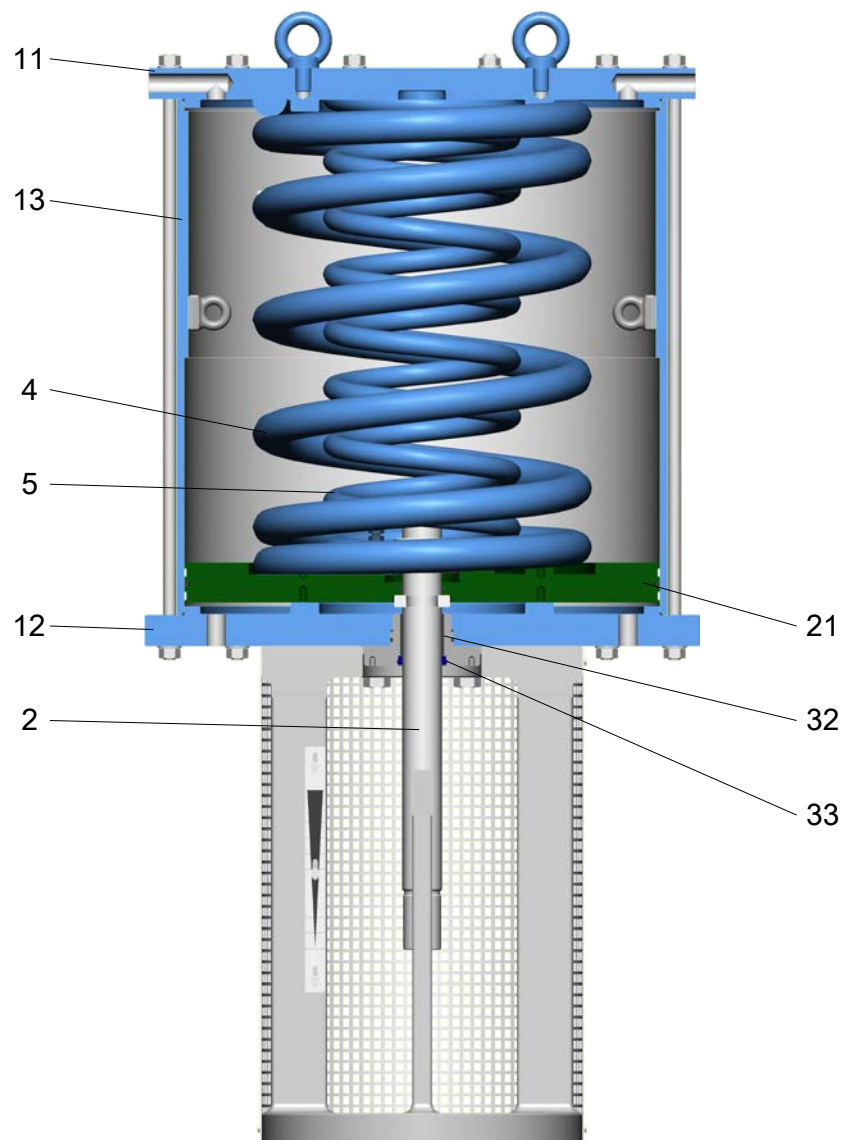


Illustration 4: Sectional drawing

8 Installation

Place of installation

The actuator should be easily accessible from at least one side and from above.

Include a catwalk or similar in the planning in case of greater heights.

An electric crane or block and tackle should be provided.

Installation

The actuator lantern (1) has a central bore and a hole circle that enables rotation of the actuator in 45 degree steps. Attachment to the valve is by means of hex bolts (47). Actuator and valve are coupled to each other via a coupling.

The maximum permissible actuating forces of the valve must be observed.

Installation position



Please note:

CAUTION

Installation position

- ▶ Pipeline must be horizontal
- ▶ Actuator above the valve.
- ▶ Align the actuator and attached parts to the valve

Please consult us in case of a different installation position!

9 Commissioning

9.1 Adjustment

Stroke adjustment

- **⚠ CAUTION!** Shear forces must not be transmitted to the actuator stem (2) when coupling actuator and valve.
- **⚠ CAUTION!** Do not turn the actuator stem (2) in a radial direction.
- **NOTICE!** Adjust the stroke so that the closing position of the valve is not hindered by the internal, non-adjustable stroke limitation of the actuator.

9.2 Actuating signal connection

The actuator has air connections (Z...) with an internal thread.

Actuator size	Connection Z1
PKIII	4x G 3/4"

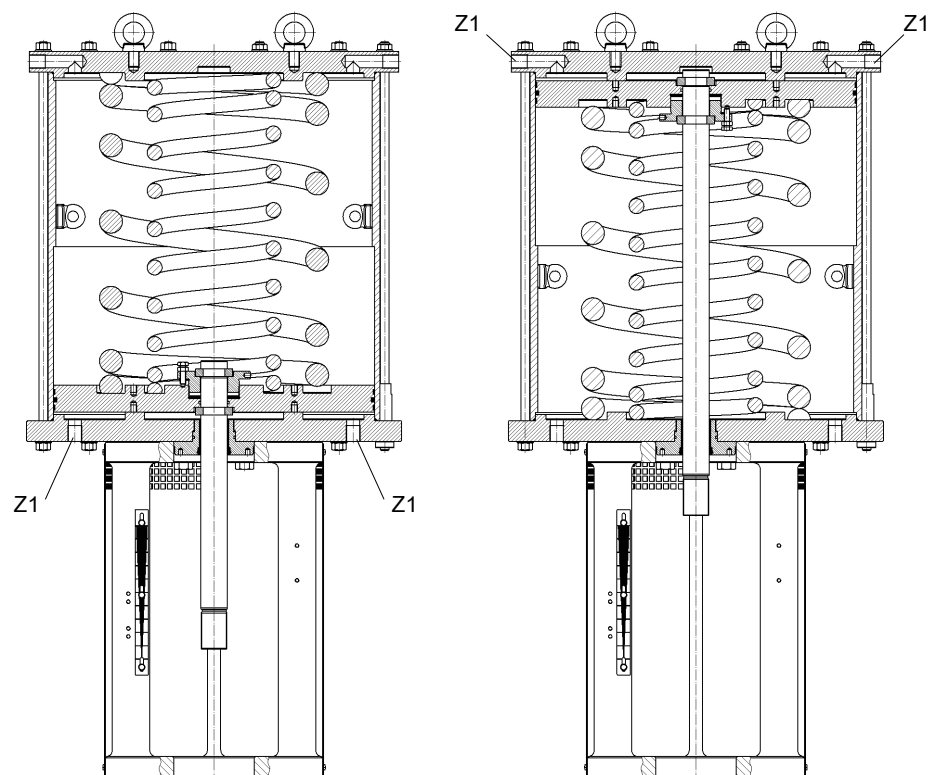


Illustration 5: Air connections

9.3 Positioner installation

Mounting with ARCA mounting bracket

The actuator lantern (1) enables auxiliary devices to be attached on two sides with the M8 fastening thread (modified mount conforming to NAMUR / IEC 60534-6-1). Refer to the operating manual for the respective device for the mounting instructions.

10 Maintenance

10.1 Care

- Clean the stem (2) if necessary
 - Clean the stem (2) of adhering dirt using a soft cloth

NOTICE! Never use sandpaper, since this will damage the surface of the stem and reduce the lifetime of the stem sealing.

10.2 Maintenance

The actuator requires almost no maintenance.

Nevertheless, the connections and the piston seal must be checked regularly for leaks.

Depending on the operating conditions of the actuator, the operator is responsible for defining appropriate inspection and maintenance intervals.

11 Disassembly / assembly of the actuator



WARNING

Disregarding the safety instructions

Risk of injury!

- ▶ Observe the notes in the chapter entitled [2] *Safety*

11.1 Procedure

- Disassembly in the given order.
 - Dismounted parts are to be secured carefully against falling down (risk of injury or damage).
- Clean all components.
- Before assembly, all components must be inspected for damage or wear and replaced where necessary.
- Assembly in the reverse order using the new components.
 - Seals must generally be replaced.
 - Insert O-rings and shaped rings with a suitable lubricant.
 - Refer to the chapter entitled [12] *Torque tables* for the tightening torques of bolted connections.

Recommended lubricants

O-rings, shaped rings, guide bands	Bolted connections	Roller bearing
Molykote 55	Metaflux lubricating metal paste 70-85	Shell Retinax Grease EP2

11.2 Guide and sealing element

- Remove any positioner if fitted
- Decouple the actuator stem (2) and the valve stem
- **In the case of O function "Air to open":**
 - Remove the actuator from the valve
- Unscrew and remove the complete bushing (31)
- Replace the plain bearing (32), the sealing element (33) and the O-ring (34)
- Observe the following during the assembly:
 - Observe the notes in the chapter [9.1] *Adjustment!*

11.3 Piston



⚠ DANGER

Danger of death and serious injuries as well as damage to property due to high spring tension!

If the following instructions are disregarded, serious injuries resulting in death as well as severe damage to property cannot be ruled out!

- ▶ It is imperative to follow the instructions and the given order below
- ▶ Observe warning notices

- Remove any positioner if fitted
- Decouple the actuator stem (2) and the valve stem
- Remove hex nuts (15) and bolts (14) **evenly** around the periphery
 - **⚠ DANGER!** Under no circumstances must the 3 bolts (16) and long nuts (17) be removed at this point; they will be used in the next step to relax the springs (4, 5).
- Loosen the 3 long nuts (17) **evenly** in order to relax the springs (4, 5).
- **In the case of O function "Air to open":**
 - Remove the upper actuator cover (11)
 - Remove the compression springs (4, 5)
 - With the aid of the mounting thread, withdraw the piston (21) complete with stem (2).
- **In the case of S function "Air to close":**
 - Remove the upper actuator cover (11)
 - With the aid of the mounting thread, withdraw the piston (21) complete with stem (2).
- Replace the sealing element (22) and guide bands (23)

Assembly

NOTICE! The guide bands (23) must be treated with a suitable lubricant before the piston (21) is fitted. The threads of the screws (14) and bolts (16) must also be treated with a suitable lubricant.


Refer to the [11.1] *Procedure* section for recommended lubricants.

11.4 Stem

- Disassembly according to [11.3] *Piston* section up to withdrawal of the piston (21).
 - Unfasten the lock nut (27) and unscrew and remove the hex bolt (26)
 - Screw the clamping ring (25) into the piston (21)
 - Remove the segment rings (24)
 - Pull the stem (2) out of the piston (21)
 - Replace the O-ring (28)

11.5 Springs

- **In the case of O function "Air to open":**

- Disassembly according to [11.3] *Piston* section up to removal of the compression springs (4, 5).
- **In the case of S function "Air to close":**
 - Disassembly according to [11.3] *Piston* section up to withdrawal of the piston (21).
 - Remove the compression springs (4, 5)
- Replace the compression springs (4, 5) with new ones.
 -  **CAUTION!** Always replace the compression springs as a complete set!

12 Torque tables - bolted connections

12.1 Bolts conforming to DIN EN ISO 4017/4014

Thread	Torque [Nm]
	A2-70
M6	5
M10	25
M20	200

12.2 Clamping ring (25)

Actuator size	Torque [Nm]
PKIII	500

12.3 Bushing (31)

Actuator size	Torque [Nm]
PKIII	300

12.4 Hex nut (15), long nut (17)

Actuator size	Thread	Torque [Nm]
PKIII	M16	120

13 Fault removal



WARNING

Improper troubleshooting work

Risk of injury!

- ▶ For all troubleshooting work, observe the corresponding notes – in particular the safety instructions – in this operating manual or in the operating manuals for the additionally installed components.

Please contact the manufacturer if problems occur that are not described in this table.

Fault	Possible causes	Action
Actuator stem doesn't move	No actuation air pressure signal present	Check signal source
	Actuation signal connection incorrectly implemented	Check actuation signal connection and direction of action of the actuator
	Actuation signal air pressure too low	Increase air pressure, observe max. permissible air pressure
	Piston seal defective	Replace sealing element
	Manual operation, if any, is engaged	Relieve manual operation
Actuator stem seal is leaking	Sealing element worn	Replace sealing element, clean stem surface
	Stem surface damaged	Replace stem and sealing elements
Actuating force too low	Actuation signal air pressure too low	Increase air pressure, observe max. permissible air pressure
	Leaks in the actuation signal line	Check the signal line
	Positioner, if any, is incorrectly adjusted	Check the positioner adjustment
	Incorrect actuator	Use a more powerful actuator, check operating data

14 Disposal and recycling



⚠ DANGER

Danger of death and serious injuries as well as damage to property due to high spring tension!

If the following instructions are disregarded, serious injuries resulting in death as well as severe damage to property cannot be ruled out!

- ▶ The actuator may only be disposed of with the actuator springs removed
- ▶ Remove actuator springs before disposal
- ▶ Strictly follow the disassembly instructions



⚠ WARNING

Operating media and auxiliary materials that are hazardous to health

Danger to people and the environment!

- ▶ Wear suitable protective equipment
- ▶ If applicable, collect and dispose of rinsing medium or residual medium. Particular attention is to be paid to dead spaces (pressure compensation, bellows, etc.)
- ▶ Observe the legal regulations for the disposal of media that are hazardous to health

ARCA products are modularly constructed and can be sorted by material into the following components.

- Electronic components
- Metals
- Plastics
- Greases and oils
- Packaging material

The general rules are:

- greases and oils are usually water pollutants and must not be allowed to escape into the environment
- Dispose of dismantled materials properly or recycle the separate materials
- Observe national disposal regulations



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