

Operating and maintenance manual
Multi-spring actuator ARCAPAQ®
Series 812

Original instructions

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Table of contents

1	General data	5
1.1	Validity of the manual	5
1.2	Contact details.....	5
1.3	Other applicable documents.....	5
1.4	Place of storage of the manual.....	5
1.5	ARCA ONSITE	5
2	Safety	7
2.1	General safety information	7
2.2	Explanation of symbols and notices	7
2.3	Structure of the warning notices	7
2.4	Intended use.....	8
2.5	Inappropriate use	9
2.6	Use in potentially explosive areas (optional)	9
2.7	Residual risks	13
2.8	Qualification of the personnel.....	13
2.9	Operator's duty of care	14
2.10	Personal protective equipment.....	15
3	Transport, storage and packaging	16
3.1	Transport	16
3.2	Storage	16
3.3	Packaging.....	16
4	Nameplate	17
5	Type key	18
6	Sectional drawings	20
6.1	Parts list.....	20
6.2	812-****-OB0	22
6.3	812-****-SB0	23
6.4	812-****-OE0	24
6.5	812-****-SE0	25
6.6	812-****-OB0 HV	26
6.7	812-****-SB0 HV	27
6.8	812-****-OBB	28
6.9	812-****-SBB.....	29
6.10	812-****-OB1	30
6.11	812-****-OB0	31
7	Functional description	32
8	Installation	33
9	Commissioning	34

9.1	Adjustment	34
9.1.1	If stroke limitation is fitted	34
9.1.2	If manual operation is fitted	34
9.2	Actuating signal connection.....	35
9.3	Positioner installation	36
10	Maintenance.....	37
10.1	Care.....	37
10.2	Maintenance.....	37
11	Disassembly / assembly of the actuator	38
11.1	Procedure.....	38
11.2	Manual operation (if mounted)	38
11.3	Stroke limitation (if mounted).....	39
11.4	Reversing the direction of action	39
11.5	Guide and sealing element.....	40
11.6	Diaphragm.....	40
11.7	Springs	41
12	Torque tables - bolted connections.....	43
12.1	Screws according to DIN EN ISO 4017/4014, DIN 939	43
12.2	Screws according to ASME B16.5	43
12.3	Sealing plug (39)	43
12.4	Bushing (4, 93, 123)	43
12.5	Hex nut (18).....	43
13	Fault removal	44
14	Disposal and recycling	45

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.

1.5 ARCA ONSITE

Acceptance documents (if ordered) and operating documentation for this product can be downloaded from the ARCA ONSITE portal.

Two options are available here:

1. Scan the **QR Code**¹ on the product. Further entries are not required.

2. Visit the website <https://onsite.arca-valve.com/search> and enter the ARCA order no. and ARCA serial no. The order no. and serial no. can be found in the device pass and in our order confirmation.

Entry example

2512345	1234567
---------	---------

Search	Clear
--------	-------

[← back / zurück](#)

Illustration 1: ARCA ONSITE

¹ **QR Code** is a registered trademark of DENSO WAVE INCORPORATED

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 preload; it is imperative to follow the disassembly instructions according to the chapter entitled [11.6] *Diaphragm*.
- 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. Refer also to the chapter [2.6] *Use in potentially explosive areas (optional)*.

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	-20 / Low temperature version -40	+80

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

The max. permissible switching 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 Use in potentially explosive areas (optional)

The product can also be used in potentially explosive areas if fitted with the **optional** additional "EXD" or "EXG" equipment.



⚠ WARNING

Unsuitable product for potentially explosive areas

Risk of explosion!

- ▶ Use only products that are approved for use in Ex-zones and are marked accordingly.
- ▶ Make sure that the product is suitable for the area of use.



⚠ WARNING

Impermissible accessories and impermissible spare parts

Risk of explosion or damage to the product!

- ▶ Use exclusively original accessories and original spare parts.
- ▶ Observe all relevant installation and safety instructions described in the manuals for the product, accessories and spare parts.



⚠ WARNING

Exceeding the maximum ambient or media temperature

Risk of explosion due to high surface temperature!

The temperature class of the product is no longer valid if the maximum permissible ambient or media temperature is exceeded!

- ▶ Make sure that the maximum permissible ambient or media temperature of the product is not exceeded.



⚠ WARNING

Contaminated operating medium

Risk of explosion and damage to the product due to clogging up with fine dust or solid contents!

- ▶ Install a pre-filter or fine filter
- ▶ Clean the filter after 100,000 switching cycles or at least twice annually.



⚠ WARNING

Heat radiation

Risk of explosion due to high surface temperature as a result of heat radiation from additionally attached products!

- ▶ Make sure that the maximum permissible surface temperature is not exceeded.
- ▶ Insulate or decouple any attached products that radiate increased heat.



⚠ WARNING

Dust deposits

Risk of explosion due to raised product temperature as a result of dust deposits!

- ▶ Remove dust deposits that are thicker than 2 mm.
- ▶ Avoid electrostatic charging of the surface; remove dust deposits properly without rubbing the surface.



⚠ WARNING

Damaged surface coating

Risk of explosion due to damage to the surface coating in conjunction with corrosion and aluminium!

- ▶ Make sure that the surface coating is not damaged and that there is no corrosion.



⚠ WARNING

Exceeding the layer thickness of the surface coating

Risk of explosion due to electrostatic charging of the electrically non-conductive surface coating!

- ▶ Make sure in case of overpainting that the surface coating does not exceed a total thickness of 0.2 mm.



⚠ WARNING

External impact effect

Risk of explosion due to generation of sparks caused by an impact!

- ▶ Avoid external impact effects on the product.



⚠ WARNING

Dismantling the product

Risk of explosion due to the ingress of an explosive atmosphere!

- ✓ The product may only be opened after it has been proven that no explosive atmosphere exists in the area around the product
- ▶ Ensure through ventilation that there is no explosive atmosphere. If this is not possible, take the product to an area where there is no risk of explosion.



⚠ WARNING

Non-conductive materials with pipe-laying work

Risk of explosion due to potential differences when using non-conductive materials!

- ▶ When using non-conductive materials for piping or sealing, care must be taken that they are bridged with conductors.



⚠ WARNING

Non-conductive lubricants

Risk of explosion due to potential differences when using non-conductive lubricants!

- ▶ Use only electrically conductive lubricants to lubricate the components.



⚠ WARNING

Contaminated breathing air

Risk of explosion due to the ingress of dust via the breathing aperture and breathing line!

- ✓ The product is equipped with exhaust air ventilation, which prevents dust entering the spring chamber via the breathing aperture.
- ▶ The exhaust air ventilation components must be inspected after 100,000 operating cycles or at least twice annually.



⚠ WARNING

Exceeding the max. surface temperature at bearing points

Risk of explosion due to raised surface temperature in case of inadequate lubrication and dust deposits at the bearing points!

- ▶ Make sure that the maximum permissible surface temperature is not exceeded.
- ▶ The lubrication and dust deposits at the bearing points must be inspected after 100000 operating cycles or at least twice annually.

Nameplate Ex

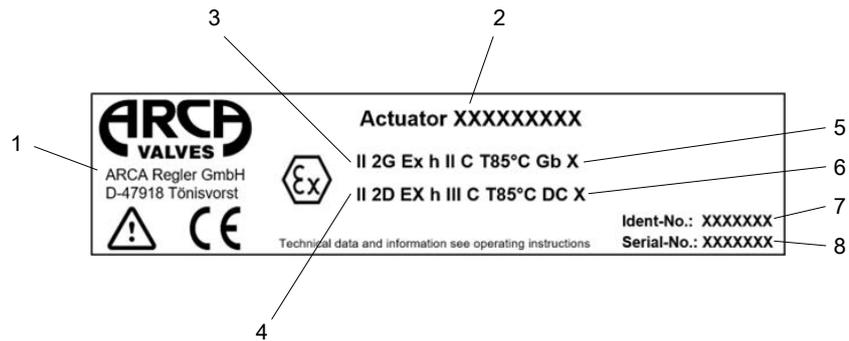


Illustration 2: Nameplate Ex

1	Manufacturer
2	Type designation
3	ATEX identifier for gas atmosphere
4	ATEX identifier for dust atmosphere
5	"X" identifier - the actuator can be used for an ambient temperature of -40 °C up to a surface temperature of +80 °C.
6	"X" identifier - the actuator can be used for an ambient temperature of -40 °C up to a surface temperature of +80 °C. - The actuator exhaust (49) must be replaced by an exhaust line that leads to a non-explosive atmosphere.
7	Part number
8	Serial number

Dust atmospheres

For the use of the product in dust atmospheres of device category 2D, the drive exhaust (49) must be replaced by an exhaust line that leads to a non-explosive atmosphere.

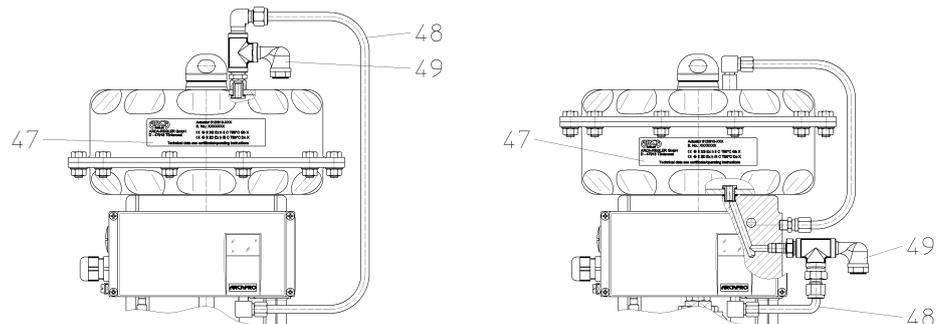


Illustration 3: Additional equipment EXD with positioner

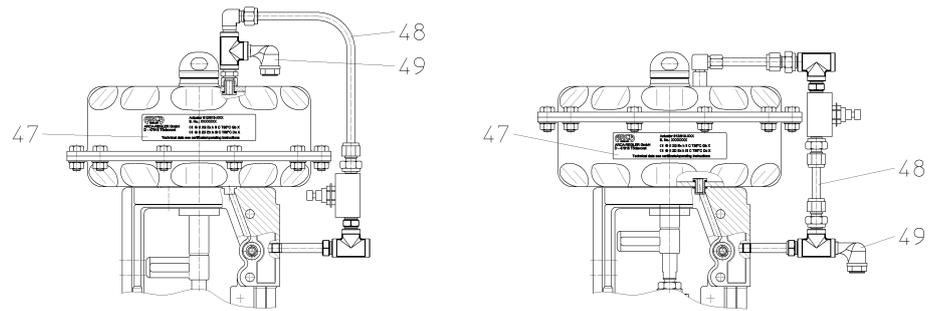


Illustration 4: Additional equipment EXD without positioner

2.7 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.

2.8 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
Activity					
Transport	X	X	X	X	X

Persons	Instructed persons	Persons with a recognised technical education	Persons with a recognised electrotechnical education	Superiors with relevant skills	ARCA service personnel
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

2.9 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.

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

Made in Germany

Illustration 5: 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

812	-	2	2	3	3	N	-	O	B	5	-	HV
[1]		[2]	[3]	[4]	[5]	[6]		[7]	[8]	[9]		[10]

1. Series

812	
-----	--

2. Actuator size

2	MFI diaphragm area 320 cm ²
3	MFIII diaphragm area 720 cm ²

3. Yoke (Ø = mounting in mm)

0	without
1	Ø40
2	Ø48
3	Ø56
4	Ø72
9	Special version

4. Stroke

3	20 mm
4	30 mm
6	60 mm

5. Spring set

3	3 springs
6	6 springs
7	7 springs
9	9 springs
0	12 springs

6. Diaphragm head / yoke material

N	Steel / Steel
A	Steel / Stainless steel
V	Stainless steel / Stainless steel

7. Function

O	Stem extended by spring (normally closed)
S	Stem retracted by spring (normally open)

8. Version	
B	Standard version
E	Integrated ventilation of the spring chamber

9. Additional equipment	
0	none
1	Stroke limitation in the opening direction
4	Low temperature version max. -40 °C (incl. 6)
5	Air connection ½"
6	Screws, stainless steel (long)
A	Special stem (813)
AP	External stainless steel parts, passivated (incl. 6)
B	Stroke limitation in the opening and closing direction
EXD	Explosion-proof version for dust/gas
EXG	Explosion-proof version for gas
FG	Spring cover turned by 180°
S	Contact module
SD	Stem 1.4462 (incl. 6)
V	Actuator, preloaded
VB	For VDI/VDE fitting (incl. 6+FG)
X	Peripheral bolts XYLAN
Z	Peripheral bolts ASME

10. Manual operation	
HV	Manual operation

Example of type designation

812-2233N-OB5-HV

Multi-spring actuator MFI – mounting diameter 48 mm – stroke 20 mm – 3 springs – steel diaphragm head / yoke – normally closed function – standard version – air connection ½" – manual operation.

6 Sectional drawings

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

Connections

Z1, Z2, Z3 see [9.2] *Actuating signal connection*

6.1 Parts list

Item	Name
1	Stem
3	* Sealing ring
4	Bushing
5	* Plain bearing
6	* O-ring
7	Filter
8	Converter bushing
9	Diaphragm cover
10	Diaphragm plate
13	* Diaphragm
14	* Compression spring
15	Spring cover
16	Sealing
17	* Protective cap
18	* Hex nut
20	Sealing
21	Hex screw
22	Washer
23	Hex nut
24	Sealing
25	Screw sleeve
26	* O-ring
27	Cup
28	* O-ring
29	Sealing plug
30	Stroke plate
31	Cylinder head bolt
32	Serrated washer
33	Hex nut
34	Lantern
35	Feedback lever
36	Grub screw
38	* Sealing
39	Sealing plug
40	Screw sleeve
42	Sealing plug

Item	Name
43	* Pipework, compl.
44	Screw
45	Spring stop
46	Thread adapter
47	Nameplate Ex
48	Exhaust air ventilation
49	Actuator exhaust
80	Hex screw
81	Flange
82	Plain bearing
83	Threaded bushing
84	Roller bearing
85	Circlip
86	Grub screw
87	Upper part
89	Hand wheel
90	Cylinder head bolt
91	Adjusting ring
92	Grub screw
93	* Bushing
94	* Sealing
95	* Plain bearing
96	* O-ring
97	Double nipple
98	Protective cap
99	* O-ring
100	Adapter flange
101	Stem
102	* O-ring
103	Latching stop
104	Pin
105	Circlip
109	Stop
116	Pillar
117	Hex nut
120	Lantern
121	Stem
122	Hex nut
123	* Bushing
124	* Sealing ring
125	* Plain bearing
126	* O-ring
127	* O-ring

Item	Name
128	Cover
129	Cylinder head bolt
130	Protective cap
131	End position screw
132	Lock nut
133	* Sealing ring
	* recommended spare part / wearing part

6.2 812-****-OB0

Function: Normally closed O; Version B: reversible.

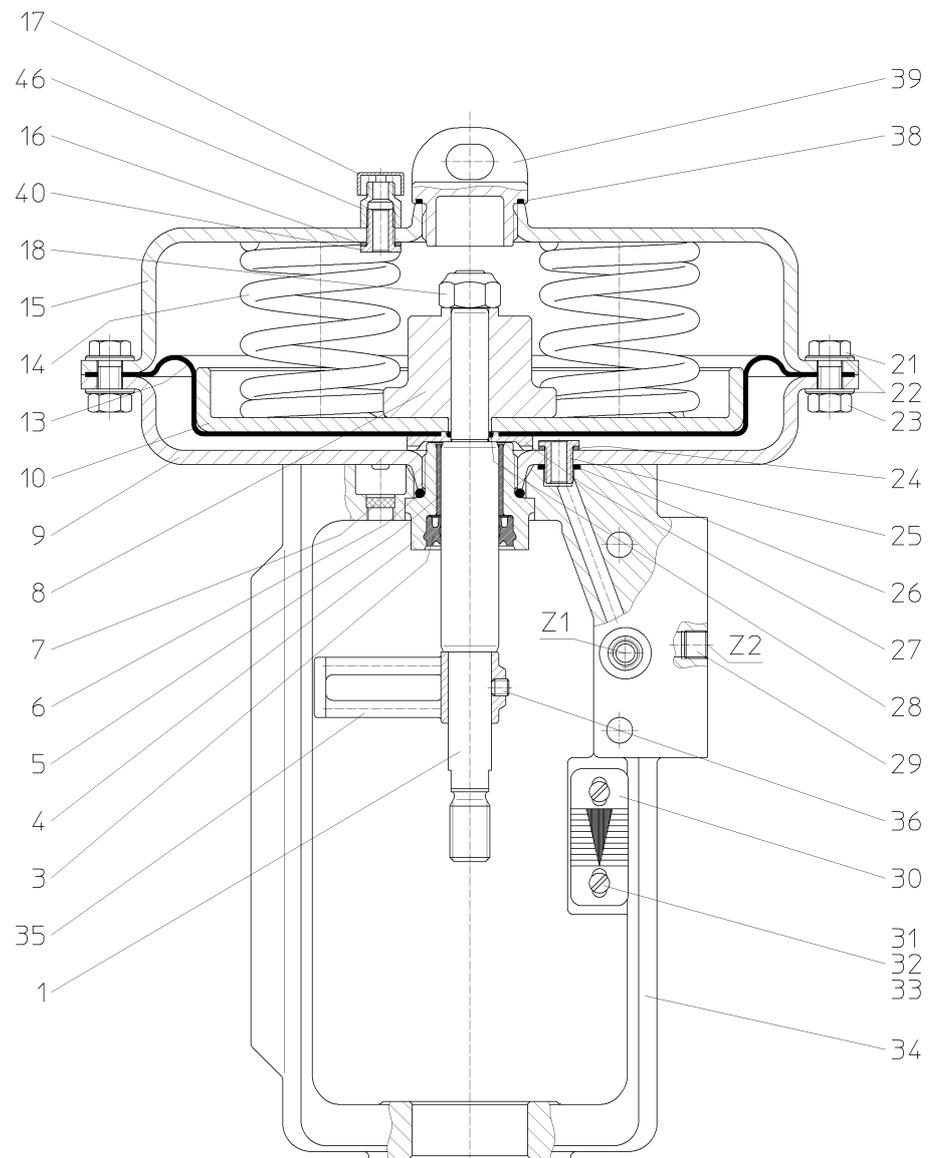


Illustration 6: 812-****-OB0

6.4 812-**-OE0**

Function: Normally closed O; Version E: reversible, with integrated ventilation of the spring chamber.

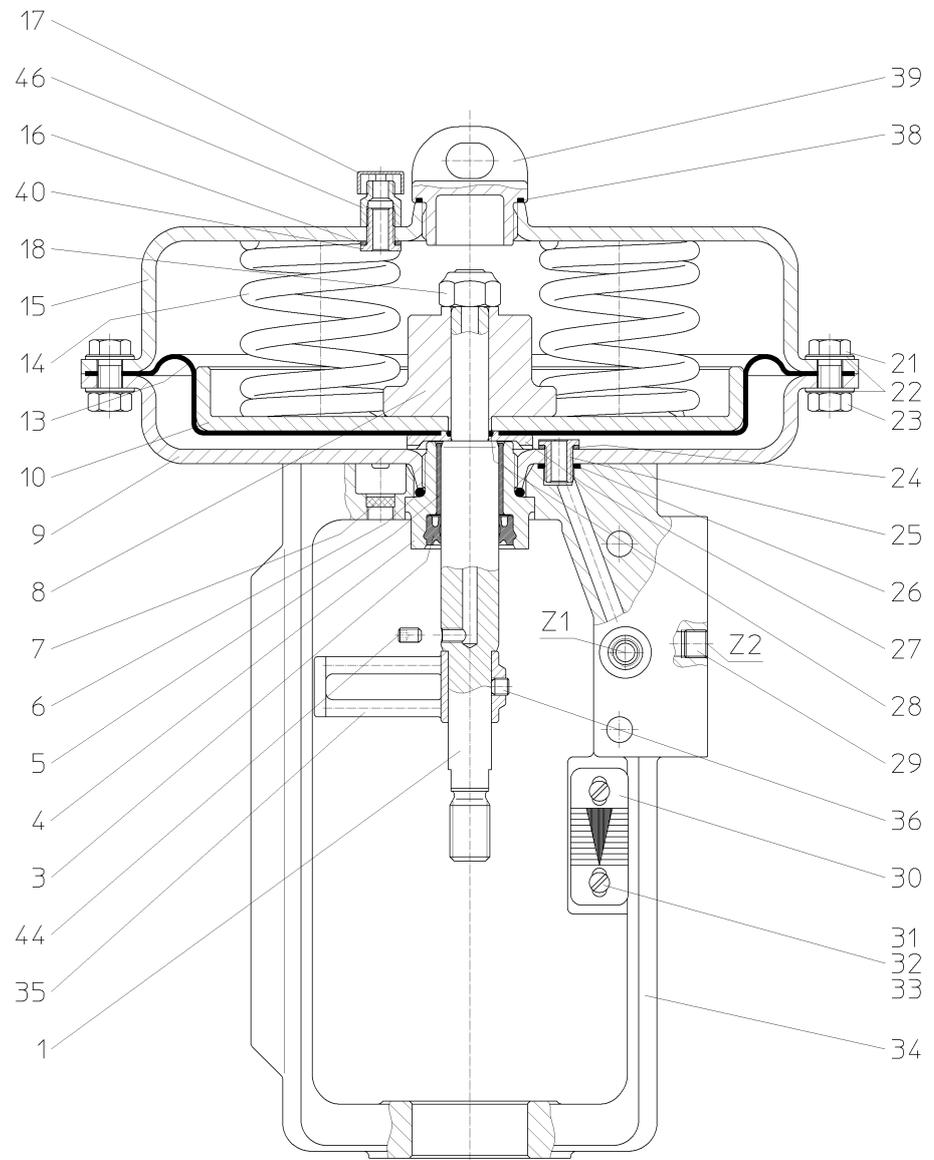


Illustration 8: 812-****-OE0

6.5 812-**-SE0**

Function: Normally open S; Version E: reversible, with integrated ventilation of the spring chamber.

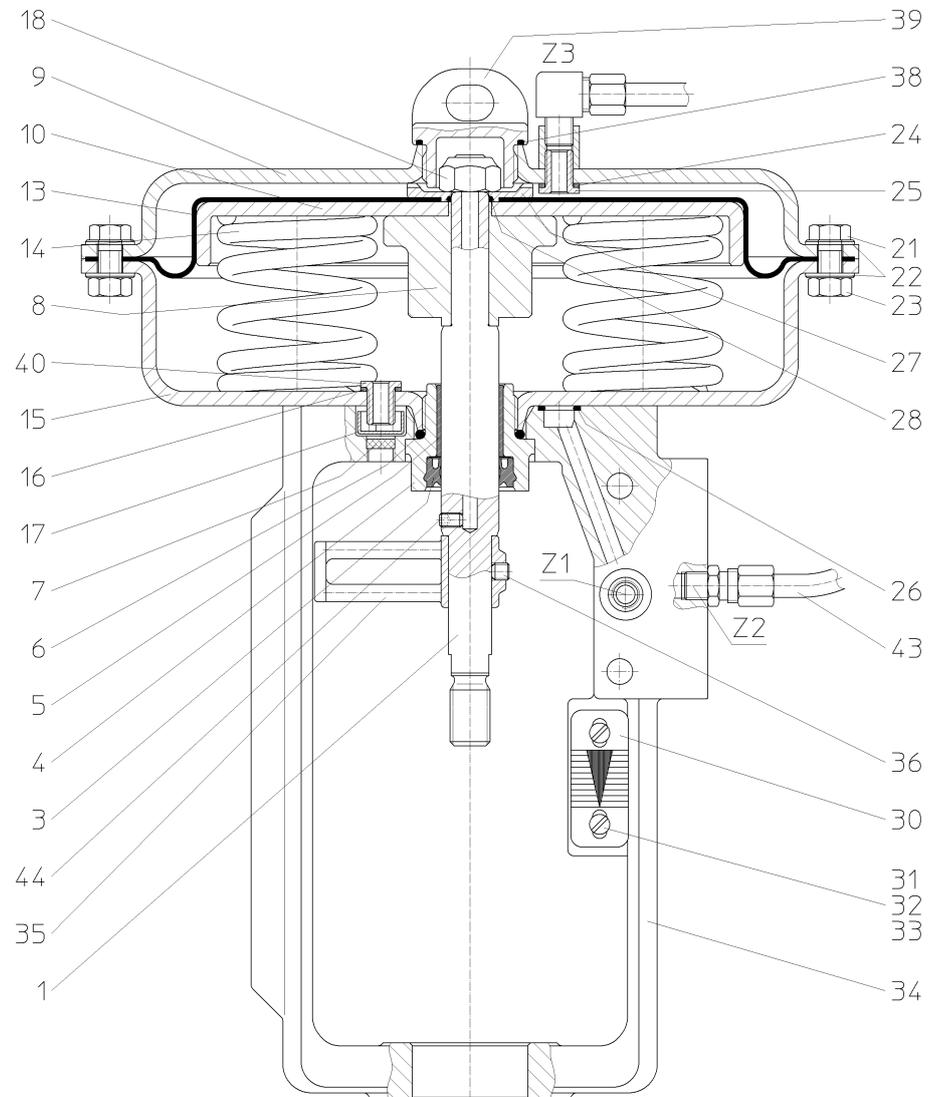


Illustration 9: 812-****-SE0

6.6 812-**-OB0 HV**

Function: Normally closed O; Version B: Reversible, with manual adjustment HV.

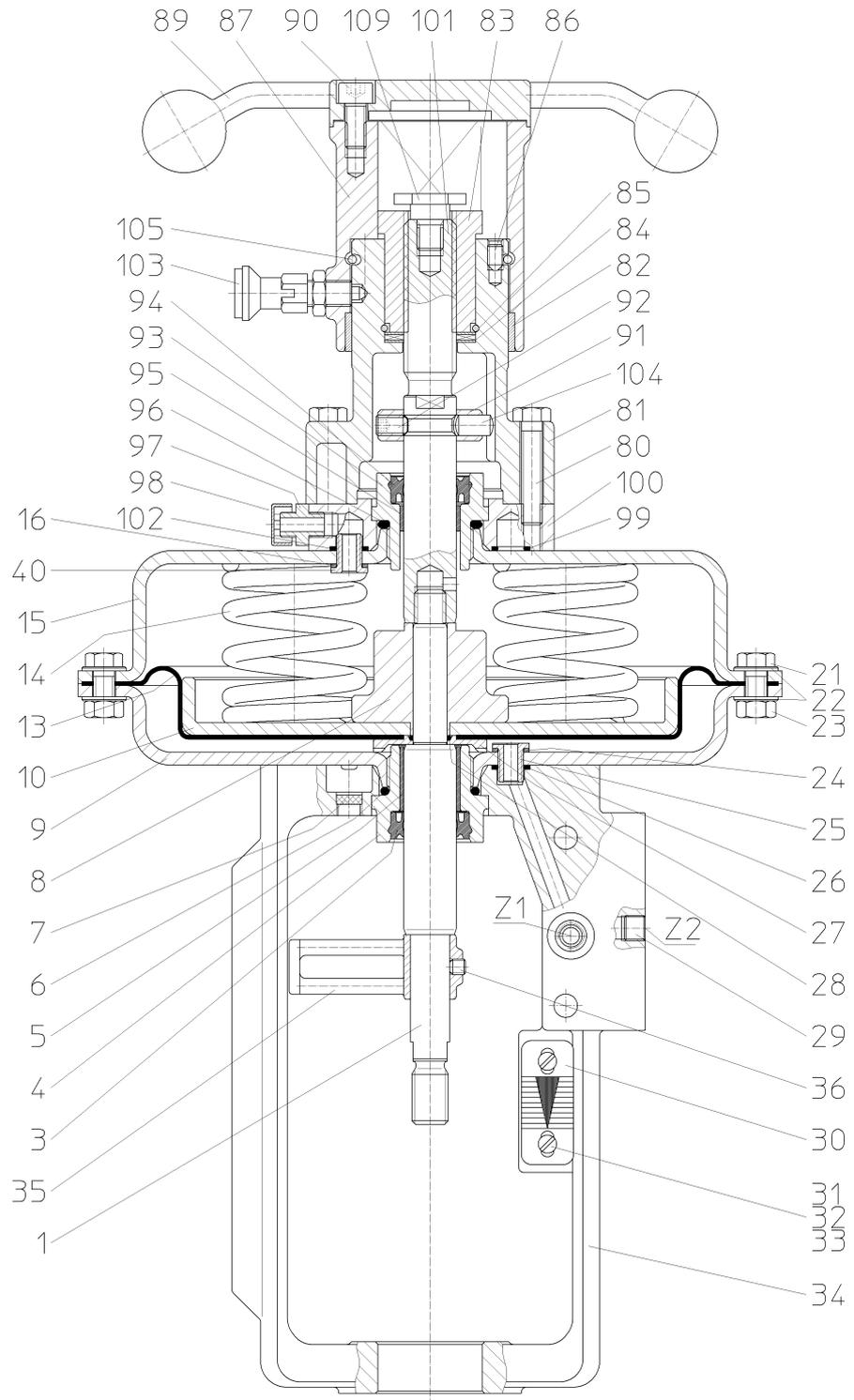


Illustration 10: 812-****-OB0 HV

6.8 812-**-OBB**

Function: Normally closed O; Version B: Reversible, with stroke limitation B for opening and closing direction

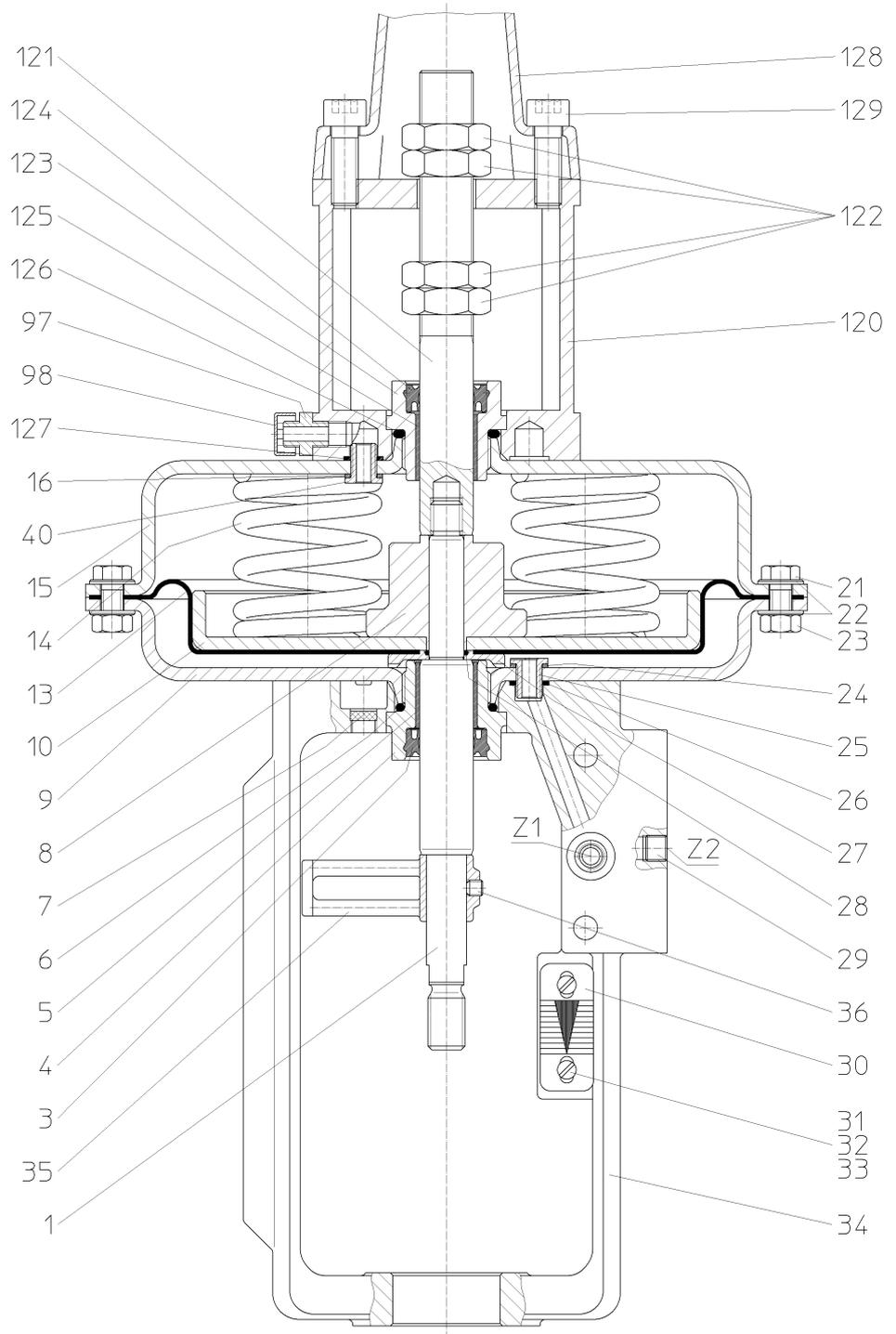


Illustration 12: 812-****-OBB

6.9 812-**-SBB**

Function: Normally open S; Version B: Reversible, with stroke limitation B for opening and closing direction

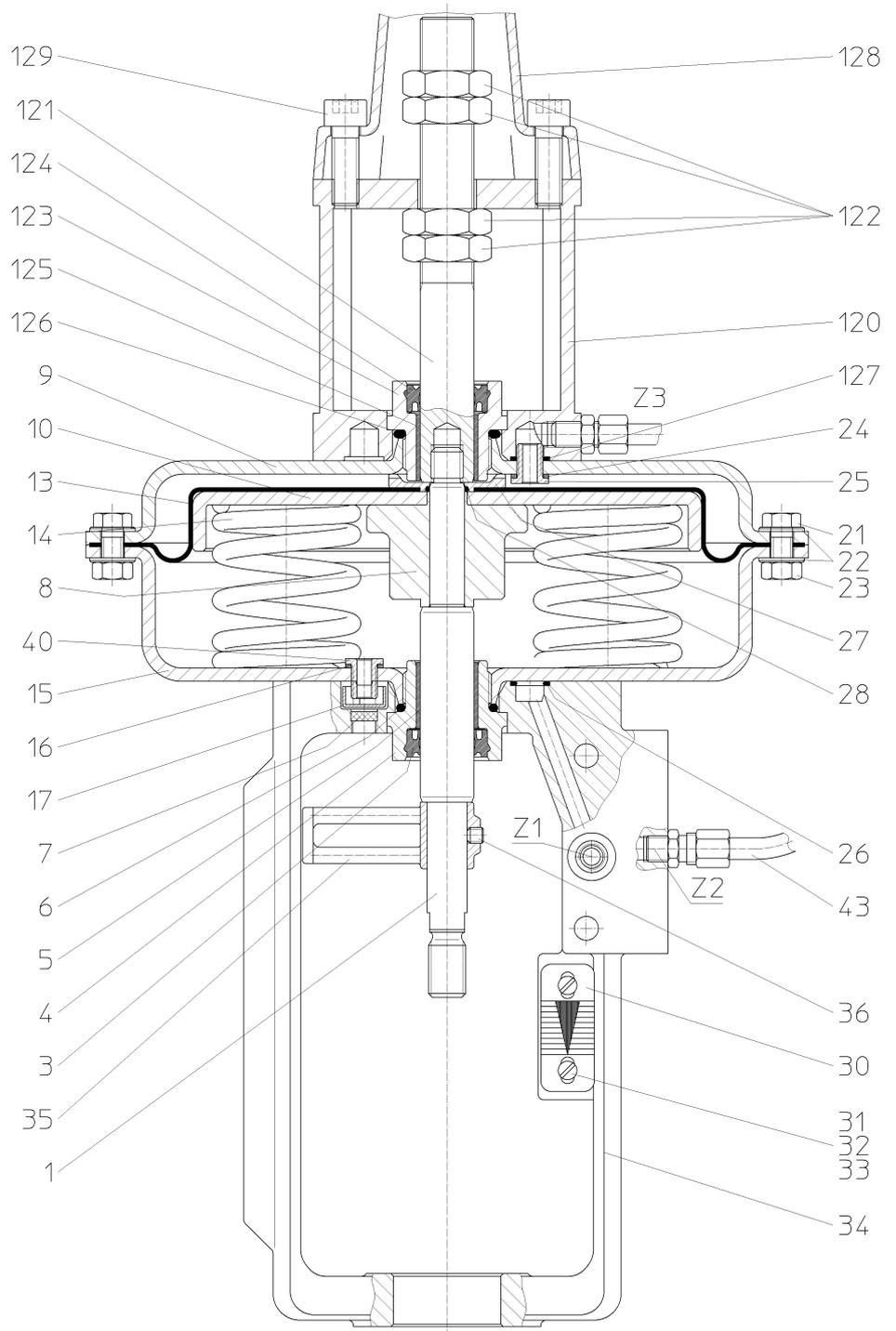


Illustration 13: 812-****-SBB

6.10 812-**-OB1**

Function: Normally closed O; Version B: Reversible, with stroke limitation 1 for opening direction.

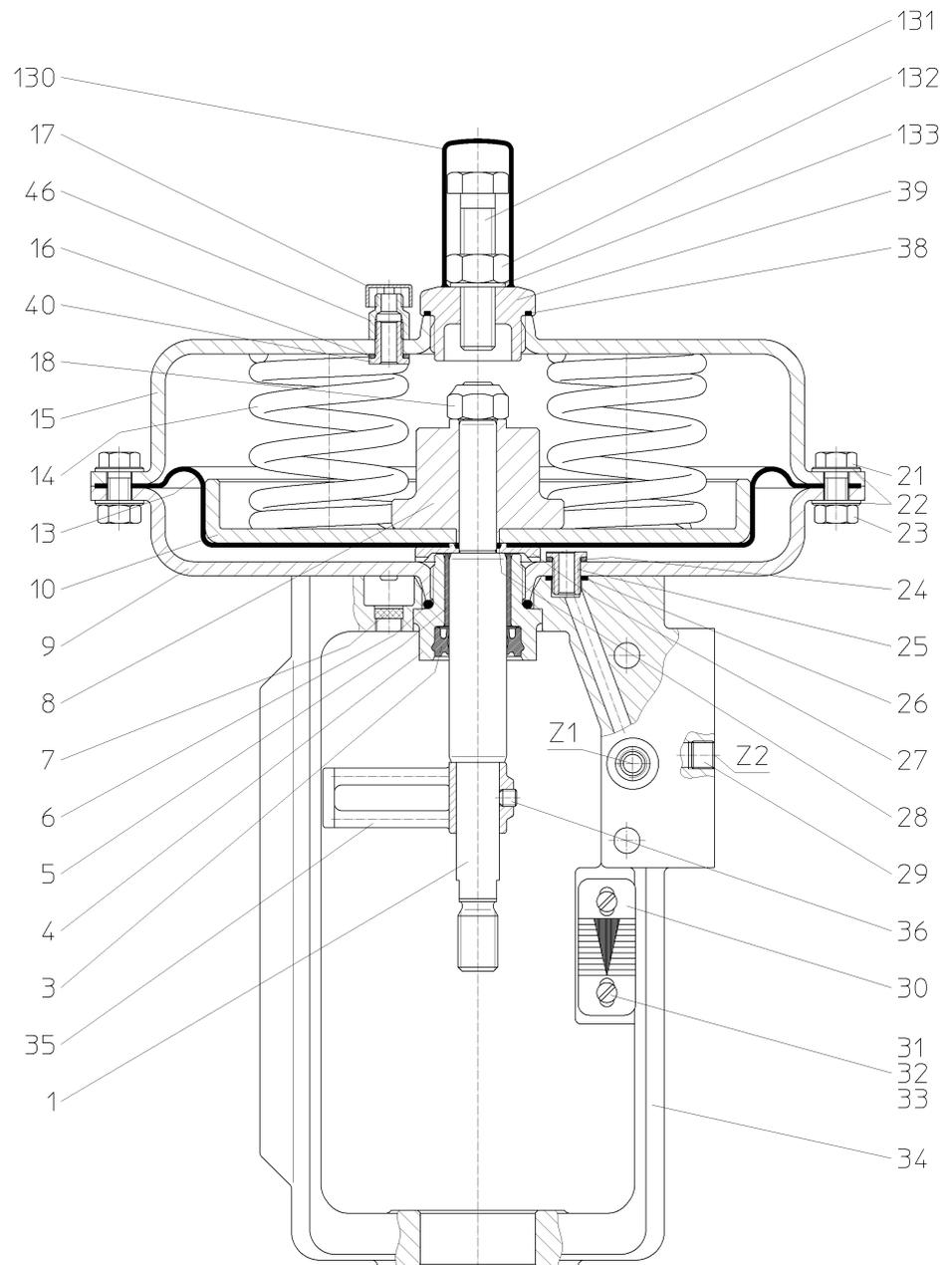


Illustration 14: 812-****-OB1

6.11 812-**-OB0**

Function: Normally closed O; Version B: reversible. (With spring stop (45), MFIII with 3 or 6 springs only)

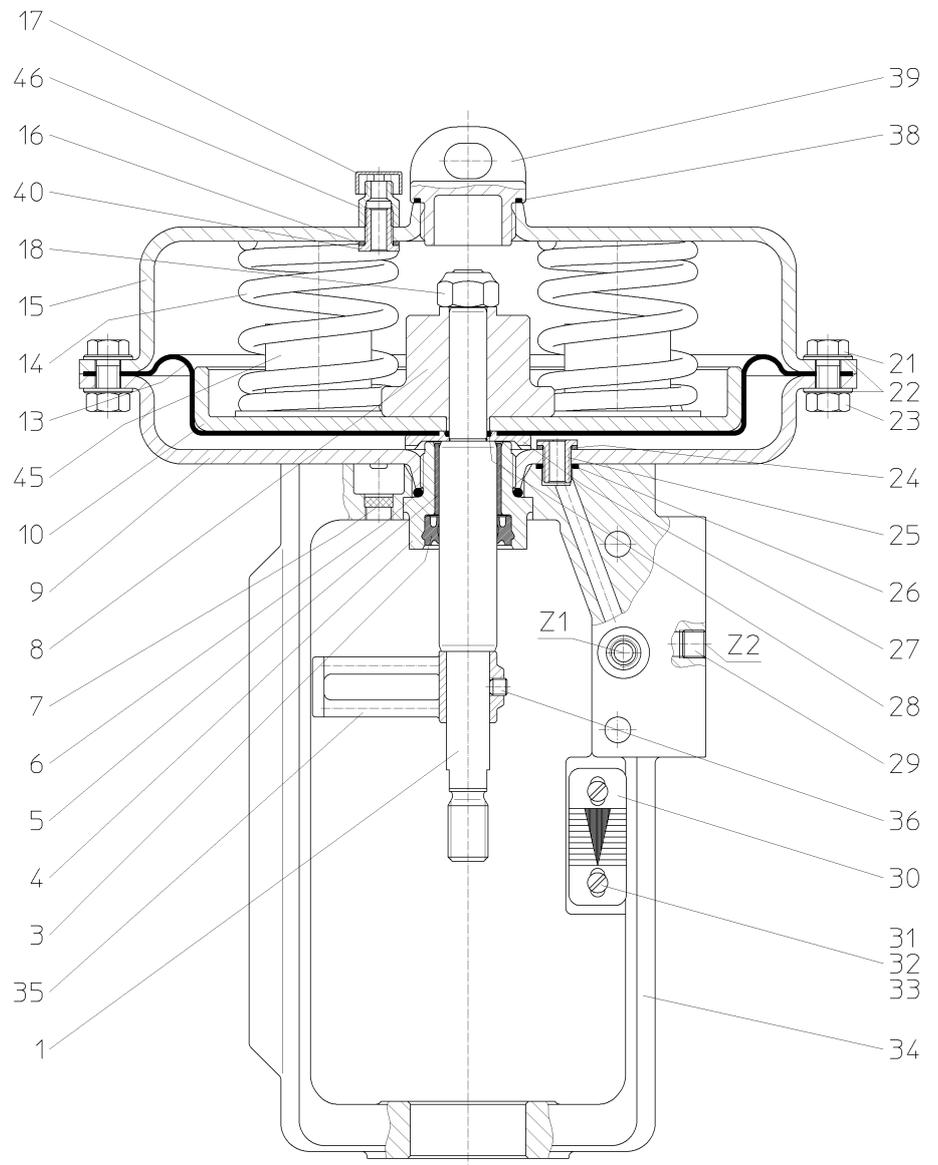


Illustration 15: 812-****-OB0

7 Functional description

The series 812 has been developed as a single-action, multi-spring diaphragm actuator for linear valves. The centrally located stem (1) is connected through a coupling for this purpose to the operating stem of the valve.

The actuator stem is precisely guided by a plain bearing (5) and the air-pressurised pressure chamber is sealed by a special sealing element with a wiper (3). Connected to the actuator stem (1) is a diaphragm plate (10) that supports the diaphragm (13) and transmit its movement to the stem (1). The diaphragm (13) divides the actuator housing (9, 15) into pressure and spring chambers. The actuator stem (1) moves when the force applied by the actuation signal air pressure is higher on one side of the diaphragm (13) than the force of the springs (14).

In order to avoid overpressure or underpressure in the spring chamber, the latter is aerated and vented via a splash-proof protective cap (17).

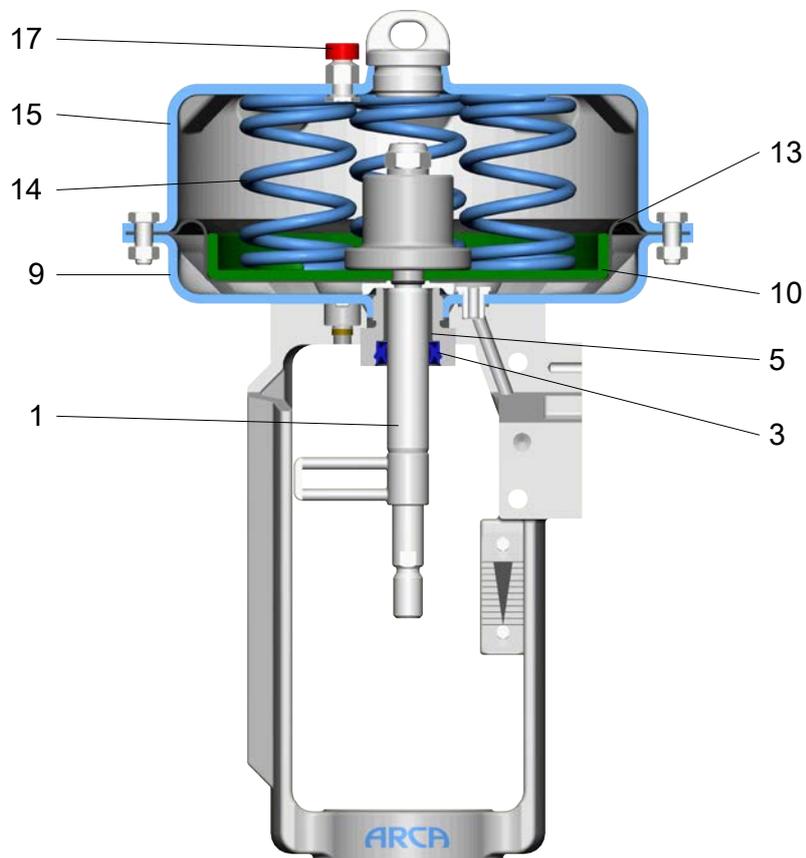


Illustration 16: Sectional drawing

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 is to be provided from an actuator size of MFIII upwards.

Installation

The actuator lantern (34) has a central bore that enables rotation of the actuator in any direction. The actuator is fastened to the valve with the slotted nut of the valve. Actuator and valve are coupled to each other via a stroke indicator.

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

Installation position



Please note:

CAUTION

Installation position

- ▶ Pipeline must be horizontal
- ▶ Diaphragm chamber 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 (1) when coupling actuator and valve.
- **⚠CAUTION!** Do not turn the actuator stem (1) in a radial direction.
 - The feedback lever (35) must lie in the transverse axis of the lantern (34) as shown in the sectional drawing.
- **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.

9.1.1 If stroke limitation is fitted

Version 1

The **upper** end position of the actuator can be limited with the end position screw (131). Refer also to chapter [6.10] *812-*****-OB1*

- Depressurise the actuator
- Remove the protective cap (130)
- Loosen the nut (132)
- Adjust the end position with the end position screw (131)
- Lock the end position screw (131) with the nut (132)
- Fit the protective cap (130)

Version B

The **upper** and **lower** end positions of the actuator can be limited with the adjusting nuts (122). See also chapters [6.8] *812-*****-OBB* and [6.9] *812-*****-SBB*

- Depressurise the actuator
- Unscrew and remove the screws (129) and remove the cover (128)
- Loosen the nuts (122)
- Adjust the upper and lower end positions
- Lock the nuts (122)
- Fit the cover (128)

9.1.2 If manual operation is fitted

With the manual operation the actuator can be moved within its stroke range without an actuation signal being present. See also chapters [6.6] *812-*****-OB0 HV* and [6.7] *812-*****-SB0 HV*.

- Pull out the latching stop (103) and rotate it by 90°
- Actuate the hand wheel (89)
- After use, turn the latching stop (103) by 90° and allow it to latch
 - **NOTICE!** To do this, turn the hand wheel (89) further by approx. a quarter turn until the latching stop latches.

NOTICE! The manual operation must be placed in the neutral position again in order to be able to move the actuator over the entire stroke range by means of an actuation signal.

Actuator size	Number of revolutions required to traverse the entire stroke range (approx.)
MFI-20	5
MFI-30	8
MFIII-30	11
MFIII-60	22

"Air to open" function
(normally closed)

The neutral position can be reached by turning the hand wheel (89) in the clockwise direction up to the stop.

"Air to close" function
(normally open)

The neutral position can be reached by turning the hand wheel (89) in the anticlockwise direction up to the stop.

9.2 Actuating signal connection

Air quality

CAUTION! Ensure correct air quality!

Oil-free, instrument-quality air with no water or dust, solid material content max. 1 mg/m³ (standard atmospheric conditions), max. particle size 0.1 mm, oil content max. 1 mg/m³ (standard atmospheric conditions), pressurised dew point 20 K below the lowest ambient temperature.

When working on the compressed air system ensure that any contamination present such as water, oil, chips, soldering material residues, etc. are expelled by blowing out.

Air connections

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

Actuator size	Connection Z1	Connection Z2	Connection Z3
MFI	G 1/8"	G 1/8"	G 1/8" *
MFIII	G 1/8"	G 1/4"	G 1/4" *

* G 1/2" alternatively also possible.

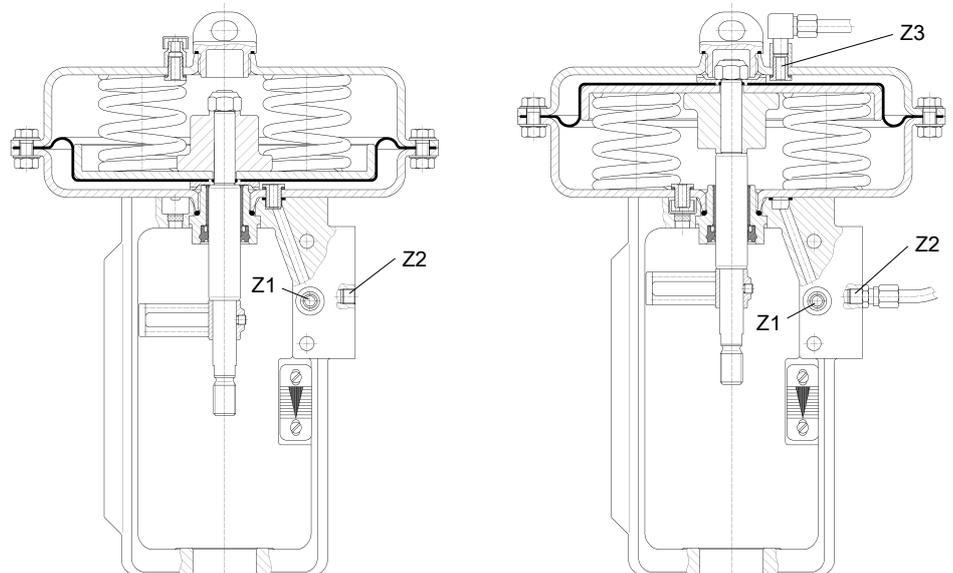


Illustration 17: Air connections

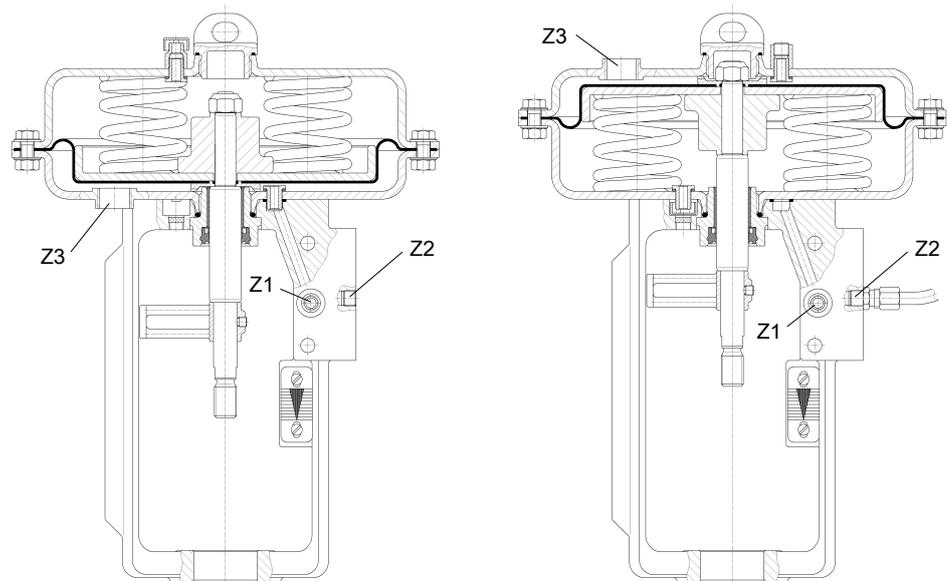


Illustration 18: Air connections with additional equipment Z3 G ½"

Standard (normally closed)

- Seal connection "Z1" on the yoke (34) with a plug.
- Connect the air supply pipe to the connection "Z2" on the yoke (34) with the aid of a screw connection.

Standard (normally open)

- Connect the air supply pipe to the connection "Z1" on the yoke (34) with the aid of a screw connection.

When using an ARCA positioner (integrated installation, normally closed)

- Seal connection "Z2" on the yoke (34) with the plug (29).
- Connect the positioner in accordance with the operating manual.

When using an ARCA positioner (integrated installation, normally open)

- Connect the positioner in accordance with the operating manual.

9.3 Positioner installation

Integrated installation of positioners

The actuation signal connection and feedback lever take place directly when fitting the positioner. Refer to the operating manual for the respective device for the mounting instructions.

Installation according to IEC 534 (NAMUR)

The actuator yoke (34) is designed on the basis of the directive IEC 534 Part 6 (NAMUR) and enables the attachment on one side of auxiliary devices with an M8 fastening thread.

10 Maintenance

10.1 Care

- Clean the actuator stem (1) if necessary
 - Clean the actuator stem (1) 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 must be checked after 100,000 operating cycles or twice per year for leaks.

In addition it is necessary to check and clean the gliding surfaces.

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 Manual operation (if mounted)

See also chapters [6.6] *812-*****-OB0 HV* and [6.7] *812-*****-SB0 HV*

- Place the manual operation in the neutral position – see chapter [9.1.2] *If manual operation is fitted*
- Undo the screws (90)
- Remove the hand wheel (89)
- Loosen the grub screw (86)
- Remove the upper part (87)
- Unscrew and remove the hex screws (80)
- Remove the flange (81)
- Unscrew and remove the stem (101)
 - **NOTICE!** Lock the stem (1) when doing this
- Unscrew and remove the fastening bushing (93)
- Remove the adapter flange (100) with O-rings (99, 102)
- Observe the following during the assembly:
 - **NOTICE!** Secure the screwed connection between stem (101) and actuator stem (1) with Loctite 601 → tightening torque 70 Nm
 - **NOTICE!** Lubricate the roller bearing (84)

11.3 Stroke limitation (if mounted)

Version 1

Refer also to chapter [6.10] 812-*****-OB1

- Unscrew and remove the complete sealing plug (39, 130, 131, 132, 133)

Version B

See also chapters [6.8] 812-*****-OBB and [6.9] 812-*****-SBB

- Unscrew and remove the screws (129) and remove the cover (128)
- Unscrew and remove the stem (121)
 - **NOTICE!** Lock the stem (1) when doing this
- Unscrew and remove the complete bushing (123)
- Remove the lantern (120), stem (121) and bushing (123)
- Observe the following during the assembly:
 - **NOTICE!** Secure the screwed connection between stem (121) and actuator stem (1) with Loctite 601 → tightening torque 70 Nm

11.4 Reversing the direction of action

From O function "Air to open" to S function "Air to close"

- Remove any positioner if fitted
- **If manual operation is fitted:** Dismount the manual operation as described in chapter [11.2] *Manual operation*.
 - **NOTICE!** When reversing the actuator, a new manual operation corresponding to the direction of action must be mounted.
- **If stroke limitation B is fitted:** Dismount the stroke limitation as described in the chapter [11.3] *Stroke limitation*.
 - Unscrew and remove the stem (121) from the stem (1)
- **Without manual operation or stroke limitation B fitted:**
 - Unscrew and remove the sealing plug (39) with sealing ring (38)
 - Unscrew and remove the hex nut (18)
 - Remove the protective cap (17)
 - Unscrew and remove the thread adapter (46)
- Unscrew and remove the complete bushing (4)
- Raise and rotate the complete actuator head
- Observe the notes in the chapter [9.1] *Adjustment* when assembling!
- Additional work steps for the assembly:
 - Mount the external pipework (43)
 - **In case of Version E:** Unscrew and remove the grub screw (44) from the exhaust hood of the positioner and screw it into the actuator stem (1) to seal.

From S function "Air to close" to O function "Air to open"

- Remove any positioner if fitted
- Dismount the external pipework (43)
- **If manual operation is fitted:** Dismount the manual operation as described in chapter [11.2] *Manual operation*.

- When reversing the actuator, a new manual operation corresponding to the direction of action must be mounted.
- **If stroke limitation B is fitted:** Dismount the stroke limitation as described in the chapter [11.3] *Stroke limitation*.
 - In case of Version B: Unscrew and remove the stem (121) from the stem (1)
- **Without manual operation or stroke limitation B fitted:**
 - Unscrew and remove the sealing plug (39) with sealing ring (38)
 - Unscrew and remove the hex nut (18)
- **In case of Version E:** Unscrew and remove the grub screw (44) and screw it into the exhaust hood of the positioner.
- Unscrew and remove the complete bushing (4)
- Raise and rotate the complete actuator head
- Observe the notes in the chapter [9.1] *Adjustment* when assembling!
- Additional work steps for the assembly:
 - Mount the thread adapter (46) and protective cap (17)
 - Mount the sealing plug (29)

11.5 Guide and sealing element

- Remove the stroke indicator
- Remove any positioner if fitted
- **In the case of S function "Air to close":** Dismount the external pipework (43)
- **If manual operation is fitted:** Dismount the manual operation as described in chapter [11.2] *Manual operation*.
- **If stroke limitation B is fitted:** Dismount the stroke limitation as described in the chapter [11.3] *Stroke limitation*.
- Loosen the grub screw (36) and remove the feedback lever (35)
- Unscrew and remove the complete bushing (4)
- Observe the following during the assembly:
 - Observe the notes in the chapter [9.1] *Adjustment!*

11.6 Diaphragm



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
 - **If manual operation is fitted:** Dismount the manual operation as described in chapter [11.2] *Manual operation*.

- **If stroke limitation B is fitted:** Dismount the stroke limitation as described in the chapter [11.3] *Stroke limitation*.
- **In the case of S function "Air to close":**
 - Dismount the external pipework (43)
 - Decouple the actuator stem (1) and the valve stem
- Dismount 4 hex nuts (23) and bolts (21) **evenly** at the periphery.
- Mount assembly/disassembly bolts (21) in grade 8.8 and new hex nuts (23) in grade 8.8.
 - **NOTICE!** The assembly/disassembly bolts (21) and nuts (23) in grade 8.8 are not part of the scope of delivery!

Actuator size	Bolt size
MFI	M8 x 50
MFIII	M10 x 80

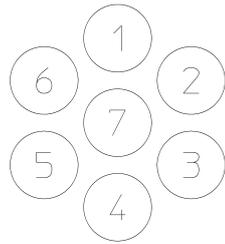
- Loosen the hex nuts (23) of the short bolts (21)
- Loosen the hex nuts (23) of the newly mounted assembly/disassembly bolts (21) **evenly** in order to relax the springs (14).
- **In the case of O function "Air to open":**
 - Remove the upper actuator cover (15)
 - Remove the compression springs (14)
 - **Without manual operation or stroke limitation B fitted:** Unscrew and remove the hex nuts (18)
 - Pull the converter bushing (8) with diaphragm plate (10) off the stem (1)
- **In the case of S function "Air to close":**
 - Remove the upper actuator cover (9)
 - **Without manual operation or stroke limitation B fitted:** Unscrew and remove the hex nuts (18)
 - Remove the cup (27) from the stem (1)
- Remove the diaphragm (13) and replace it by a new diaphragm
 - **NOTICE!** Fabric side faces the diaphragm plate (10)

11.7 Springs

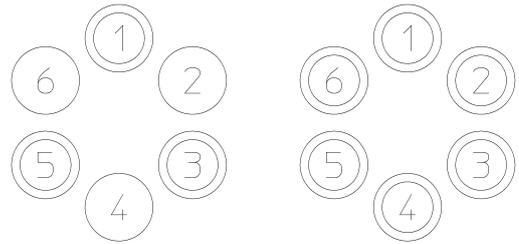
- **In the case of O function "Air to open":**
 - Disassembly according to chapter [11.6] *Diaphragm* up to removal of the compression springs (14).
- **In the case of S function "Air to close":**
 - Disassembly according to chapter [11.6] *Diaphragm* up to removal of the diaphragm (13).
 - Pull the converter bushing (8) with diaphragm plate (10) off the stem (1).
- Replace the compression springs (14) by new compression springs.
 - **CAUTION!** Always replace the compression springs as a complete set! Observe the arrangement of the compression springs (14)!

Mounting position

Number of springs	Mounting at position
2	1 + 4
3	1 + 3 + 5
4	2 + 3 + 5 + 6
6	1-6
7	1-7
9	1 + 3 + 5 + 1-6
12	2x 1-6



MFI



MFIII

Illustration 19: Spring arrangement

12 Torque tables - bolted connections

12.1 Screws according to DIN EN ISO 4017/4014, DIN 939

Thread	Torque [Nm]	
	A4-80	8.8
M6	7	8
M8	30	30
M10	45	60

12.2 Screws according to ASME B16.5

Thread	Torque [Nm/lbf ft]	
	A193B8	A193B7
1/4"-UNC	7/5	8/6
5/16"-UNC	30/22	30/22
3/8"-UNC	45/33	60/44

12.3 Sealing plug (39)

Actuator size	Torque [Nm]
MFI	40
MFIII	60

12.4 Bushing (4, 93, 123)

Actuator size	Torque [Nm]
MFI	170
MFIII	300

12.5 Hex nut (18)

Actuator size	Thread	Torque [Nm]
MFI	M12	50
MFIII	M20x1.5	170

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
	Actuator diaphragm defective	Replace actuator diaphragm
	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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