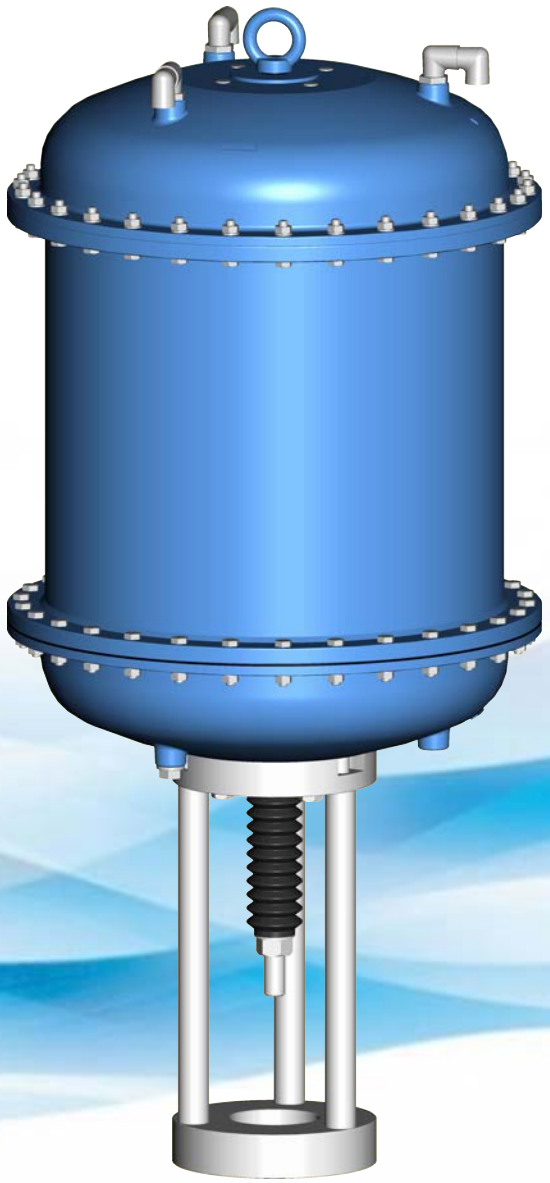
ARCA VALVES
quality engineered control valves



Operating and maintenance manual
Pneumatic diaphragm actuator
MA60 series

12.2020 / 1.0

Original instructions

Cover picture background: Freepik.com

Table of contents

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

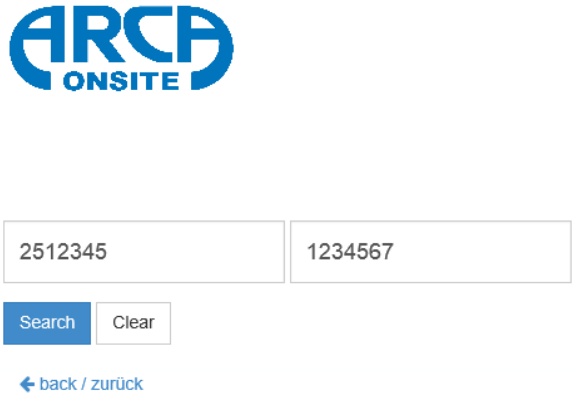


Illustration 1: ARCA ONSITE

[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 [11.5] *Springs*.
- 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 every 3 seconds.

2.5 Inappropriate use

Inappropriate use is use of the product other than as described is 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 "EX" 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 and gas via the breathing aperture and breathing line!

✓ The product is equipped with exhaust air blanketing, which prevents dust or gas entering the spring chamber via the breathing aperture.

► The exhaust air blanketing components must be inspected after 100,000 switching 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.

ATEX nameplate

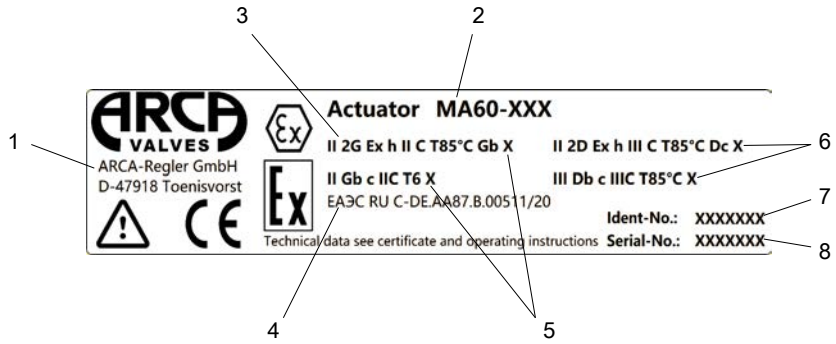


Illustration 2: ATEX nameplate

1	Manufacturer
2	Type designation
3	ATEX marking
4	EAC marking
5	"X" marking – the actuator can be used for an ambient temperature of -40 °C up to a surface temperature of +80 °C.
6	"X" marking – the actuator can be used for an ambient temperature of -40 °C up to a surface temperature of +80 °C. - The actuator exhaust (97) must be replaced by an exhaust line that leads to a non-explosive atmosphere.
7	Part number
8	Serial number

Gas atmospheres

When using the product in gas atmospheres of device category 2G, it must be ensured that the spring chamber is ventilated with instrument air. To this end the product is equipped with exhaust air ventilation (95) from the positioner. If no positioner is mounted, the spring chamber must be connected to the supply air pipe via a locking throttle on the factory side.

Dust atmospheres

For the use of the product in dust atmospheres of device category 2D, the actuator exhaust (97) must be replaced by an exhaust line that leads to a non-explosive atmosphere.

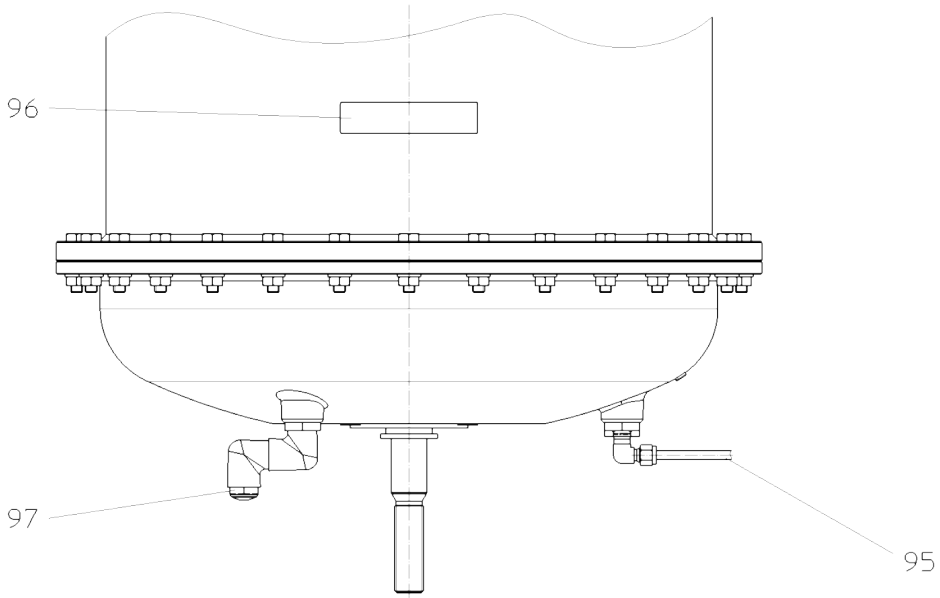


Illustration 3: Additional equipment - EX

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 Activity	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

2.9 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	
	**Protective clothing** 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. Do not wear rings, chains or other jewellery.
	**Safety shoes** To protect against heavy falling parts and slipping on smooth floors.

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

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 °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 °C is not permissible.
- ► It must be stored in roofed-over storage places and that are weatherproof.

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

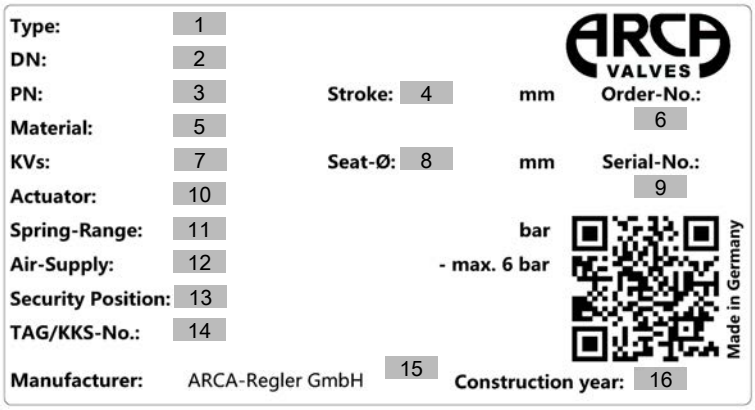


Illustration 4: Nameplate

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 code

MA..	60	A6	6G	O	HVH S0 T
[1]	[2]	[3]	[4]	[5]	[6]

1. Series	
MA	

2. Actuator size	
60	Diaphragm area 1500 - 2185 cm²

3. Actuator version (stroke)	
G6	Stroke 60 mm
A6	Stroke 83 mm
D6	Stroke 125 mm
C6	Stroke 136 mm

4. Spring set	
4B 6B 8B 12B 16B	4, 6, 8, 12, 16 blue springs (vers. G6)
2G 4G 6G 8G	2, 4, 6, 8 green springs (vers. A6)
2S 4S 6S 8S	2, 4, 6, 8 silver springs (vers. D6)
2R 4R 6R 8R	2, 4, 6, 8 red springs (vers. C6)

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

6. Additional equipment	
EX	Explosion-proof version
HB	Stroke limiter
HVH	Emergency manual operation, hydraulic
HVS	prepared for emergency manual actuation
S0	without yoke ring, without columns
S6	with yoke ring, without columns
S7	with yoke ring, with columns
SD	Actuator stem 1.4462
T	Low temperature version max. -40 °C
VA	external screws VA

Example of type designation

MA60 A6 6G O HVH S0 T

Diaphragm actuator MA ─ actuator size 60 ─ actuator version A6 (stroke 83 mm) ─ spring set 6G ─ normally closed function ─ additional equipment hydraulic emergency manual actuation + without yoke ring, without columns + low temperature version.

6 Sectional drawings

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

Connections

Z1 see chapter [9.2] *Actuation signal connection*

6.1 Parts list

Item		Name
1		Bottom cover
6	*	Guide bush
9	*	Sealing ring
10	*	O-ring
13		Circlip
15		Hex screw
18		Stem
19		Split ring
21	*	O-ring
22	*	Diaphragm
24		Diaphragm plate
25		Diaphragm plate
29		Hex screw
31		Clamping ring
33		Anti-rotation device
34		Screw
35		Bearing
36		Spacer ring
37		Hex nut
38		Spring lock washer
39		Hex screw
40		Stroke limiter
41		Hex screw
43		Spring
51		Intermediate ring
52		Spring washer
53		Guide bush
54		Top cover
55		Hex screw
56		Sealing ring
57		Lifting eye
60		Hex screw
64		Hex screw
65		Hex nut
66		Spring lock washer
67		Bellows

Item		Name
70		Spring centring
84		Pipe elbow
85		Pipe elbow
86		Bushing
91		Hex nut
95		Exhaust air ventilation
96		Nameplate Ex
97		Actuator exhaust
115		Washer
116		Yoke
117		Stroke dial
118		Plug
311		Cylinder
314		Hex nut
315		Housing
317		Pump
327	*	Sealing ring
328	*	O-ring
329		Circlip
332		Hex screw
345		Holder compl.
346		Hex screw
347		Hex screw
348		Hex nut
349		Washer
350	*	Guide bush
354		Hex screw
355		Hex nut
356		Locking plate
357		Locking plate
358		Intermediate piece
360		Hex nut
364		Hex nut
365		Threaded bushing
	*	Recommended spare part / wearing part

6.2 MA60 A/D6 ** O

Version: stroke 83+125 mm [A6+D6]; function: normally closed [O].

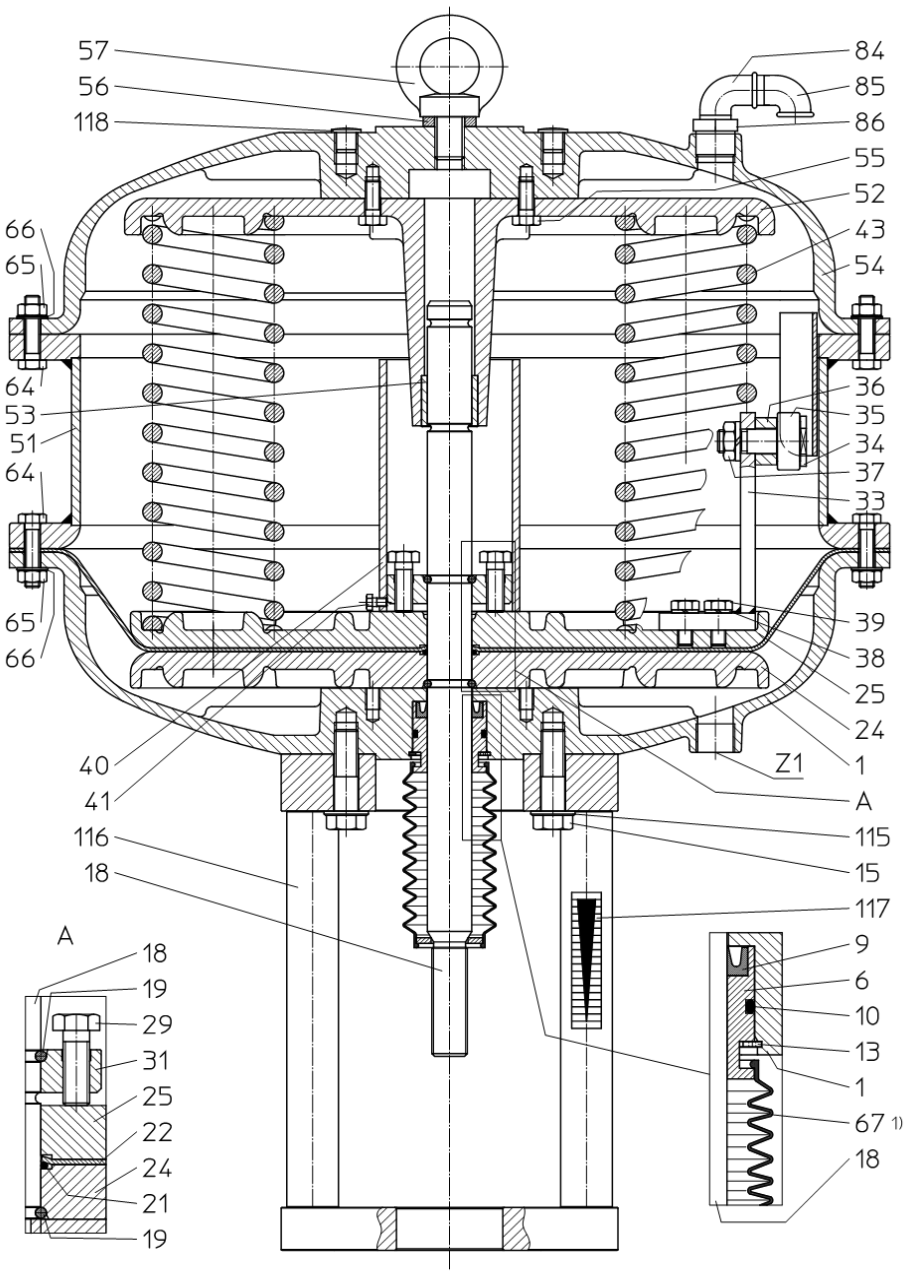


Illustration 5: MA60 A/D6 ** O

1) Not included with additional equipment EX.

6.3 MA60 A/D6 ** S

Version: stroke 83+125 mm [A6+D6]; function: normally open [S].

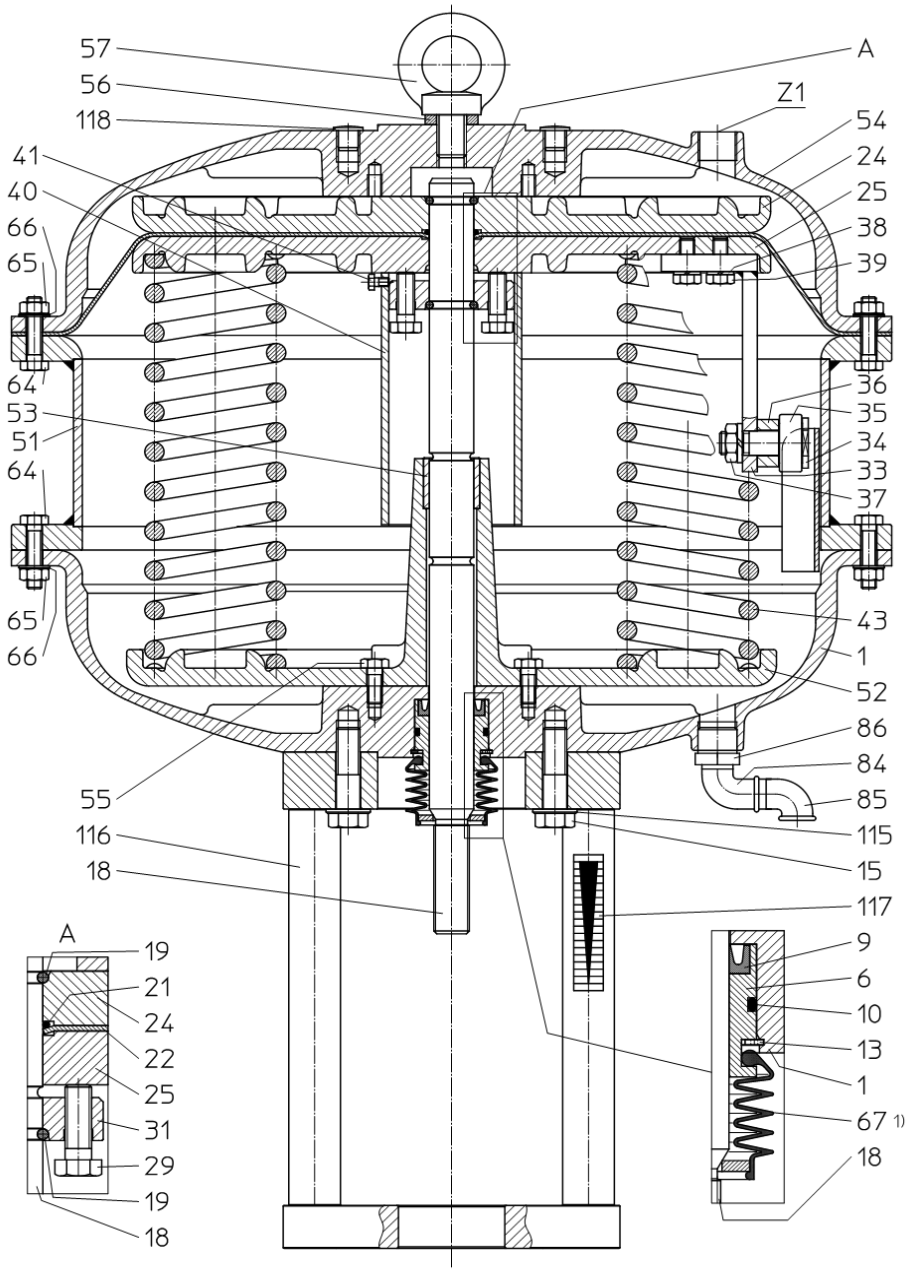


Illustration 6: MA60 A/D6 ** S

1) Not included with additional equipment EX.

6.4 MA60 A/D6 ** O HB

Version: stroke 83+125 mm [A6+D6]; function: normally closed [O]; additional equipment: stroke limiter [HB].

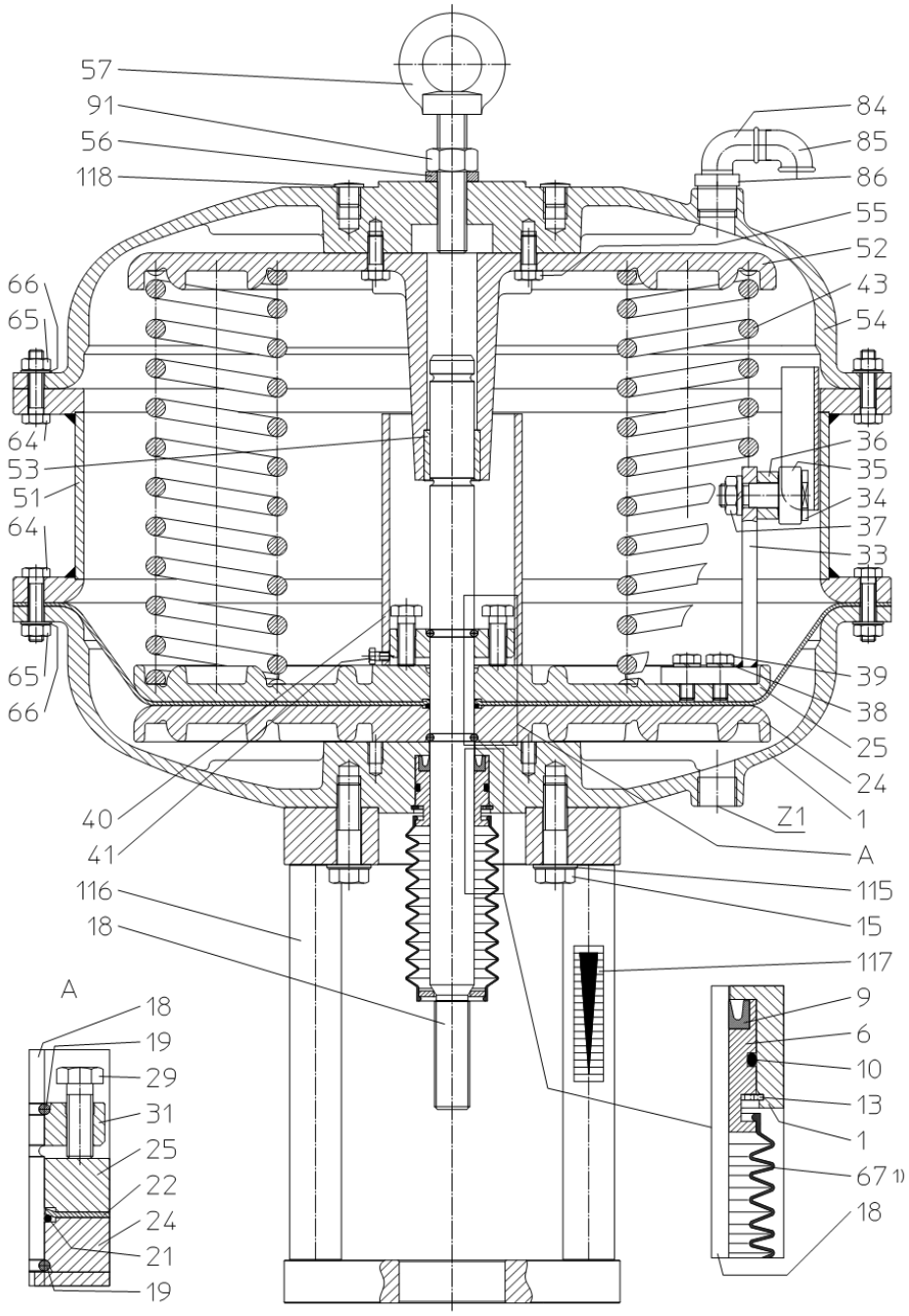


Illustration 7: MA60 A/D6 ** O HB

1) Not included with additional equipment EX.

6.5 MA60 A/D6 ** S HB

Version: stroke 83+125 mm [A6+D6]; function: normally open [S]; additional equipment: stroke limiter [HB].

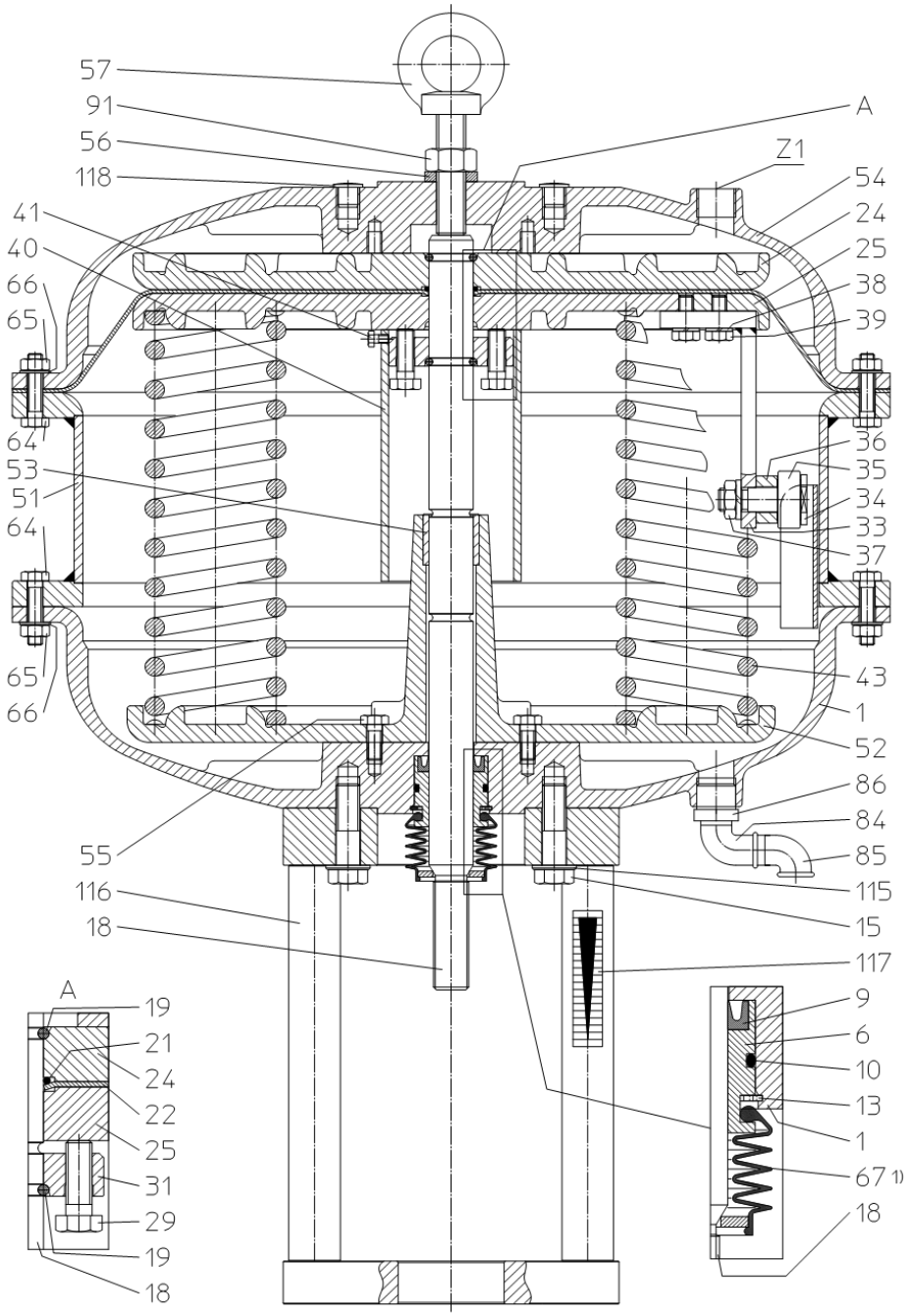


Illustration 8: MA60 A/D6 ** S HB

1) Not included with additional equipment EX.

6.6 MA60 C6 ** O

Version: stroke 136 mm [C6]; function: normally closed [O].

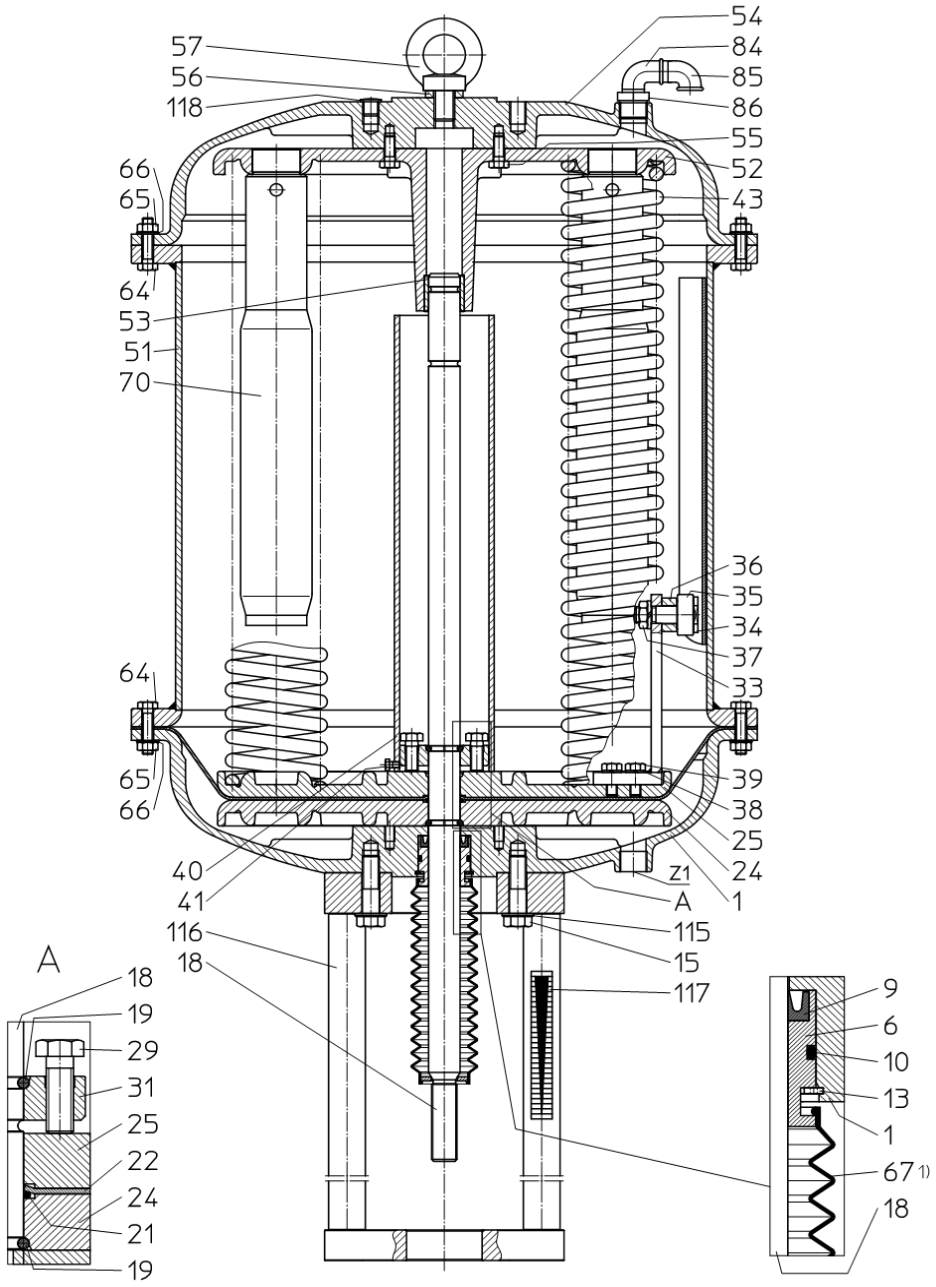


Illustration 9: MA60 C6 ** O

1) Not included with additional equipment EX.

6.7 MA60 C6 ** S

Version: stroke 136 mm [C6]; function: normally open [S].

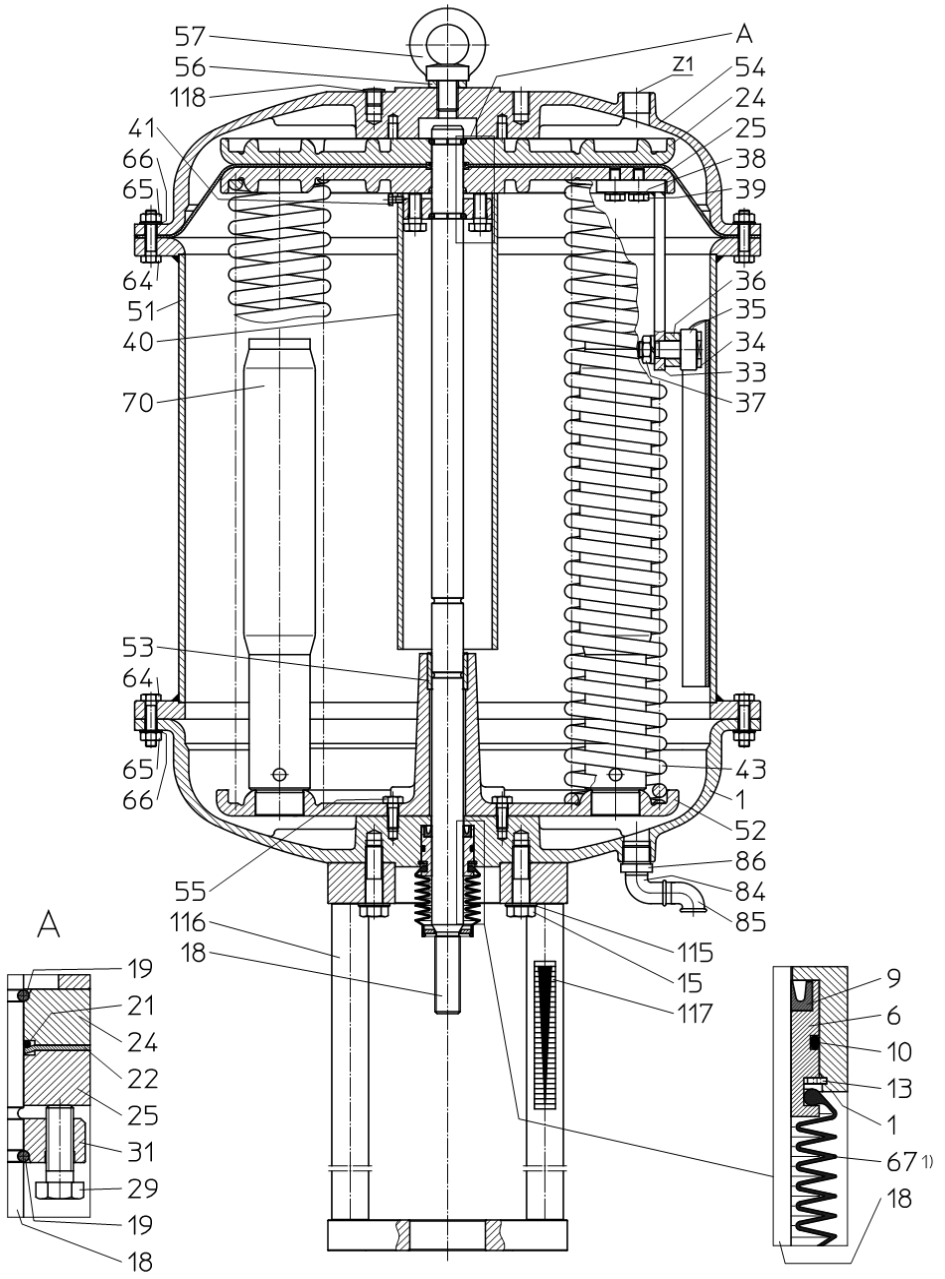


Illustration 10: MA60 C6 ** S

1) Not included with additional equipment EX.

6.8 MA60 C6 ** O HVH

Version: stroke 136 mm [C6]; function: normally closed [O]; additional equipment: hydraulic emergency manual actuation [HVH].

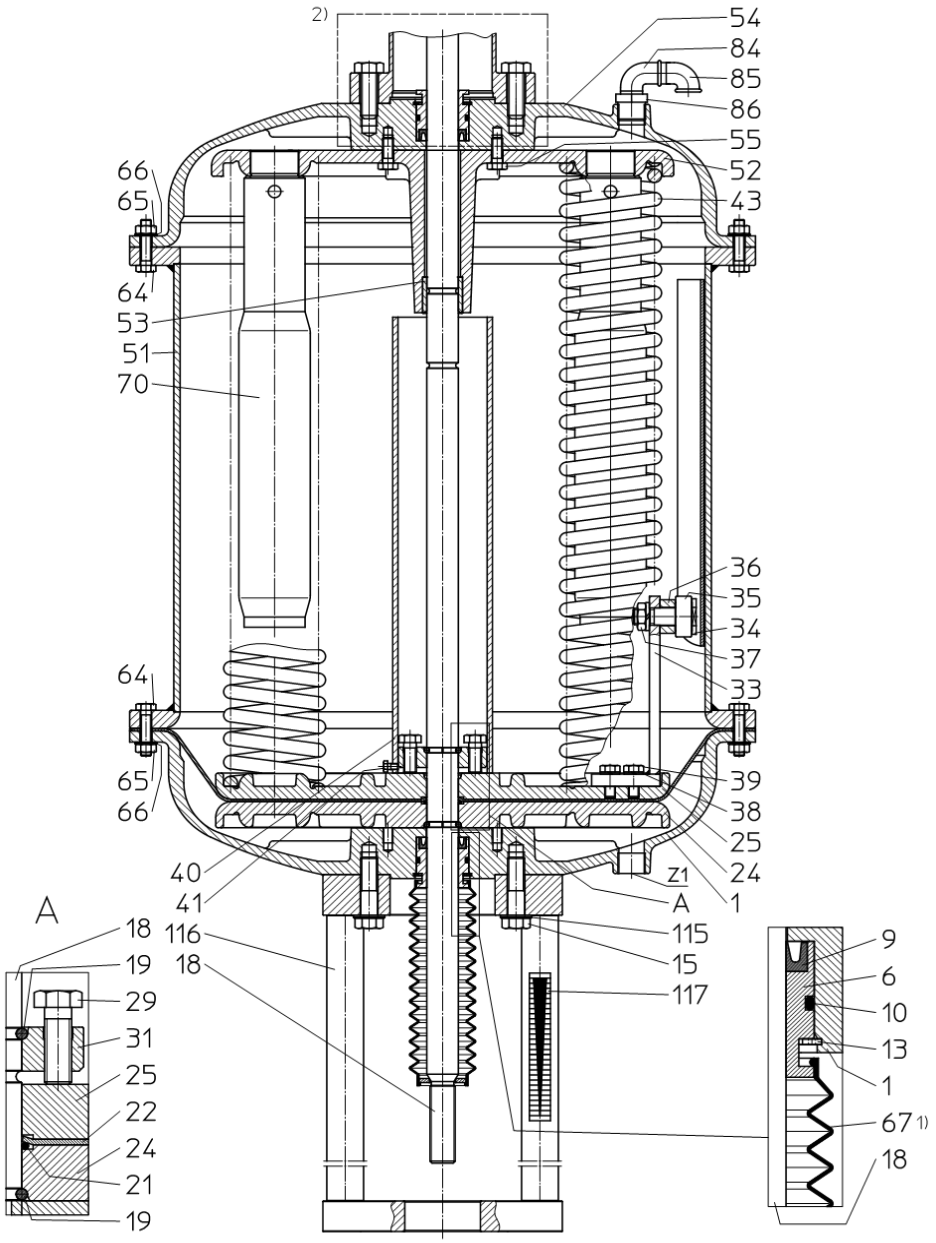


Illustration 11: MA60 C6 ** O HVH

1) Not included with additional equipment EX.

2) See chapter [11.2] *Hydraulic emergency manual actuation* for an illustration and positioning of the complete emergency manual actuation.

6.9 MA60 C6 ** S HVH

Version: stroke 136 mm [C6]; function: normally open [S]; additional equipment: hydraulic emergency manual actuation [HVH].

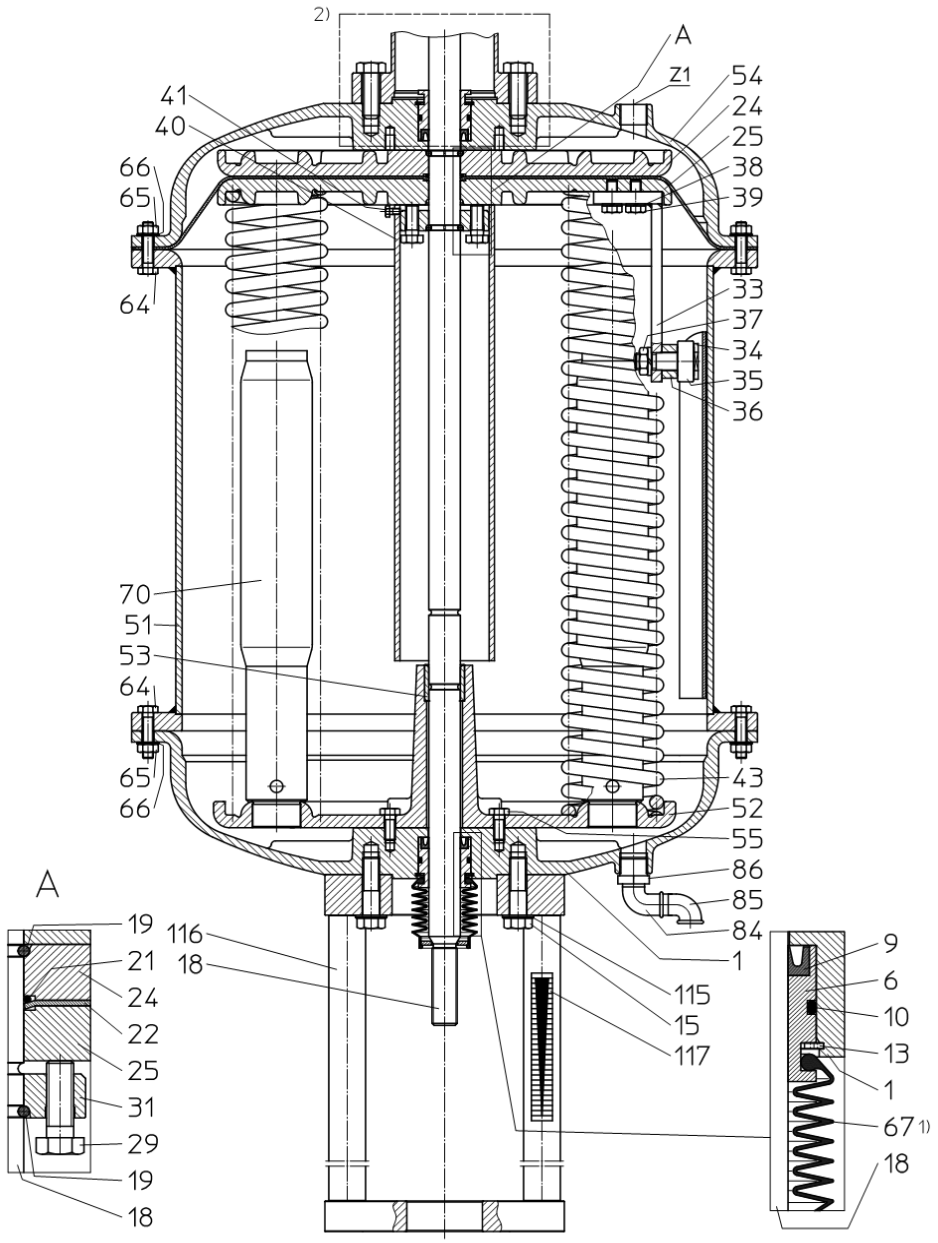


Illustration 12: MA60 C6 ** S HVH

1) Not included with additional equipment EX.

2) See chapter [11.2] *Hydraulic emergency manual actuation* for an illustration and positioning of the complete emergency manual actuation.

6.10 MA60 G6 ** O

Version: stroke 60 mm [G6]; function: normally closed [O].

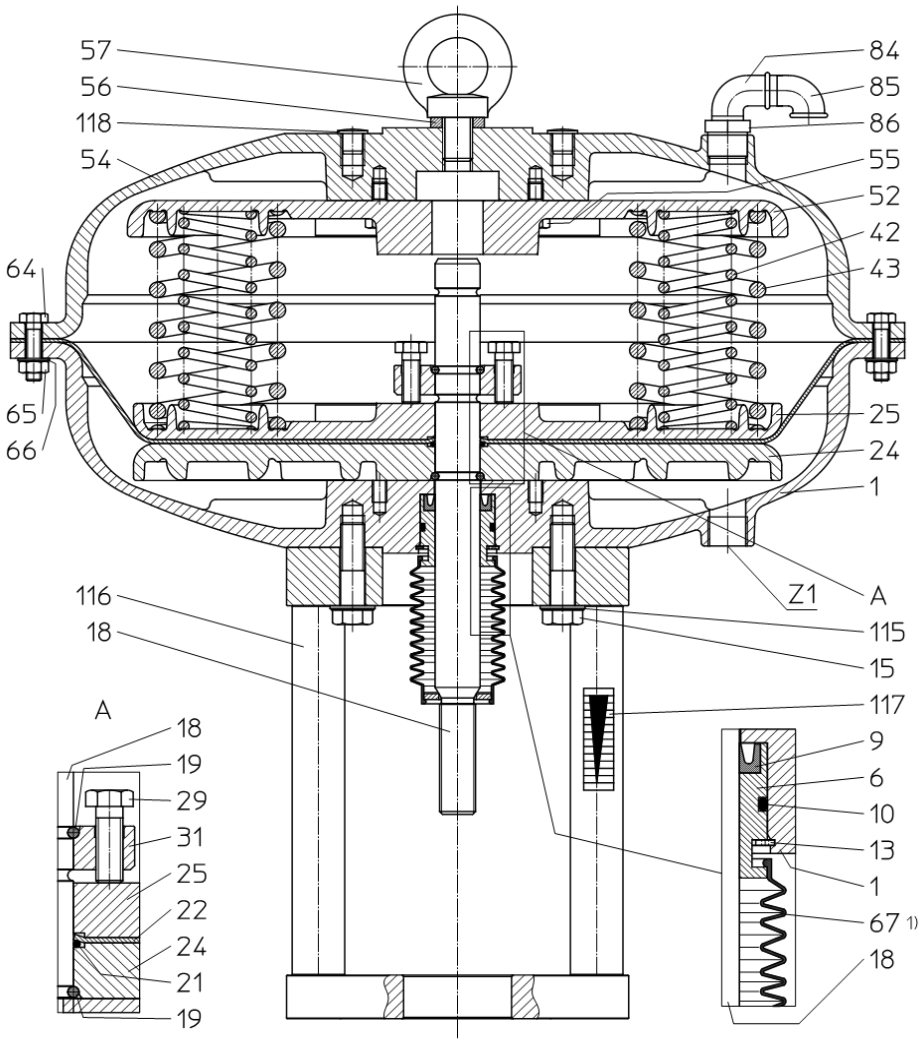


Illustration 13: MA60 G6 ** O

1) Not included with additional equipment EX.

6.11 MA60 G6 ** S

Version: stroke 60 mm [G6]; function: normally open [S].

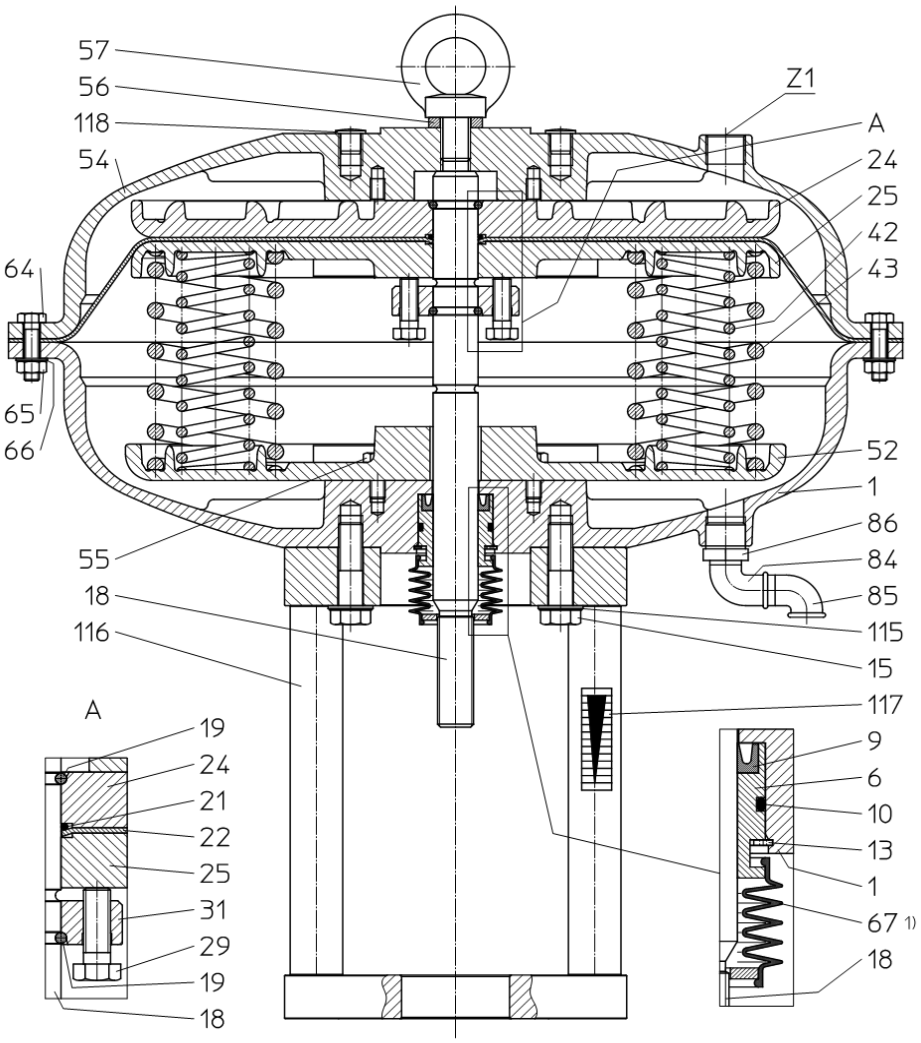


Illustration 14: MA60 G6 ** S

1) Not included with additional equipment EX.

7 Functional description

The MA60 series is a single-acting, multi-spring diaphragm actuator for linear valves. The centrally located stem (18) is connected through a coupling for this purpose to the operating stem of the valve.

The stem (18) is guided accurately by the plain bearings (6, 53). The diaphragm plates (24, 25) that support the diaphragm (22) and transmit its movement to the stem (18) are connected to the stem (18). The diaphragm (22) divides the actuator housing (1, 51, 54) into pressure and spring chambers. The stem (18) moves when the force applied by the air pressure actuation signal is higher on one side of the diaphragm (22) than the force of the springs (43).

In order to avoid overpressure or underpressure in the spring chamber, the latter is aerated and vented via a vent bore.

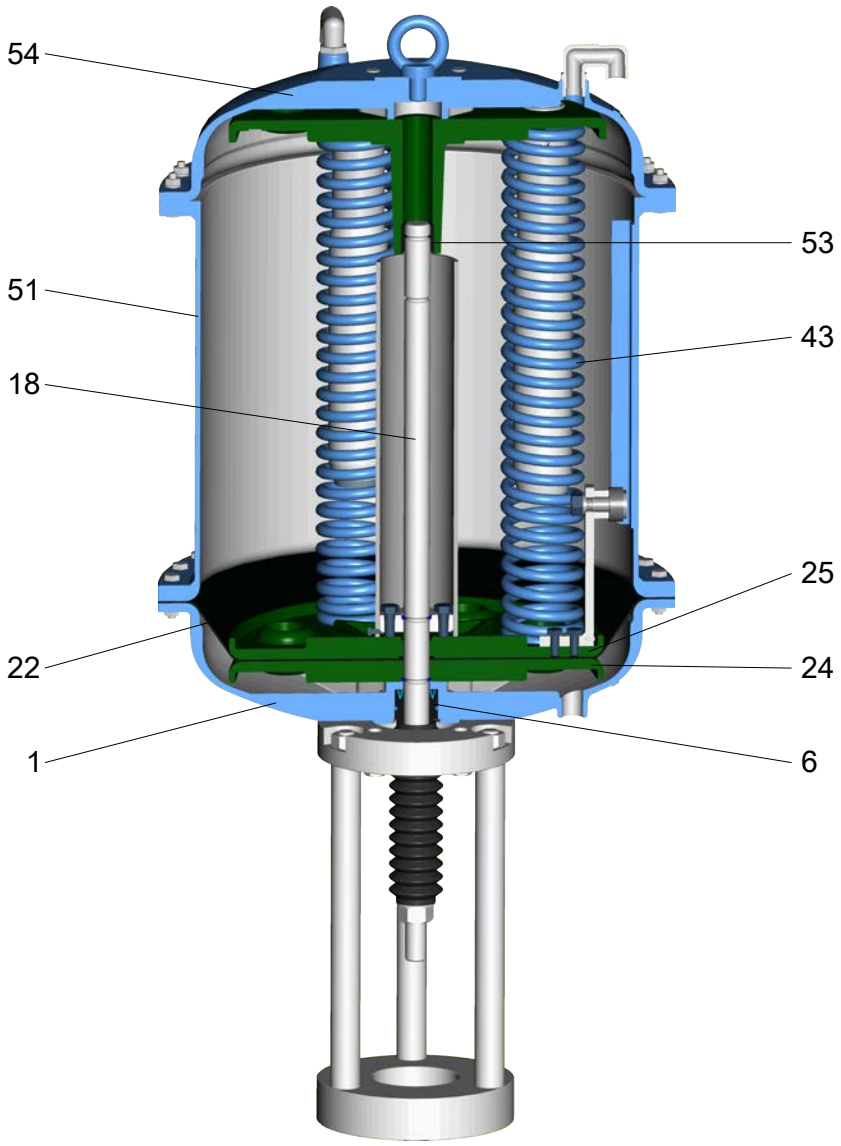


Illustration 15: Sectional drawing

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 for the actuator size MA60.

Installation

The actuator yoke (116) has a central bore that enables alignement of the actuator to any position. The actuator is fastened to the valve with the slotted nut of the valve. Actuator and valve are coupled to each other via a coupling.

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

Mounting position

Please note:

⚠ CAUTION

Mounting position

- ► Pipeline horizontal
- ► Diaphragm chamber above the valve
- ► Align the actuator and attached parts to the valve

Please consult us in case of a different mounting position!

9 Commissioning

9.1 Adjustment

Stroke adjustment

- ⚠**CAUTION!** Shear forces must not be transmitted to the actuator stem (18) when coupling actuator and valve.
- ⚠**CAUTION!** Do not turn the actuator stem (18) 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 limiter of the actuator.

9.1.1 If stroke limitation is fitted

The **upper** end position of the actuator can be limited with the lifting eye (57). Refer also to the chapters [6.4] *MA60 A/D6 ** O HB* and [6.5] *MA60 A/D6 ** S HB*.

- Depressurise the actuator
- Loosen the hex nut (91)
- Adjust the end position with the lifting eye (57)
- Lock the lifting eye (57) with the hex nut (91)

9.1.2 If hydraulic emergency manual actuation is fitted

Using the hydraulic emergency manual actuation, the actuator can be moved within its stroke range without applying an actuation signal. Refer also to the chapter *"Hydraulic emergency manual actuation"*.

Manual operation (hydraulic operation)

- Switching lever to position "H"
  - **NOTICE!** When switching from automatic operation to manual operation, the switching lever must be moved slowly to the position "H" starting from the lever position "B" in order to avoid foaming of the hydraulic oil.

"Air to open" function (normally closed)

  - By actuating the pump (317), the hydraulic cylinder piston (311) is retracted and pulls the actuator stem (18) upwards.

"Air to close" function (normally open)

  - By actuating the pump (317), the hydraulic cylinder piston (311) is extended and presses the actuator stem (18) downwards.

Automatic operation (pneumatic operation)

- Switching lever to position "A"

"Air to open" function (normally closed)

  - To extend the piston, move the switching lever **slowly** to position **"A"**. The actuator stem (18) moves downwards by spring force.

"Air to close" function (normally open)

  - To retract the piston, move the switching lever **slowly** to position **"A"**. The actuator stem (18) moves upwards by spring force.

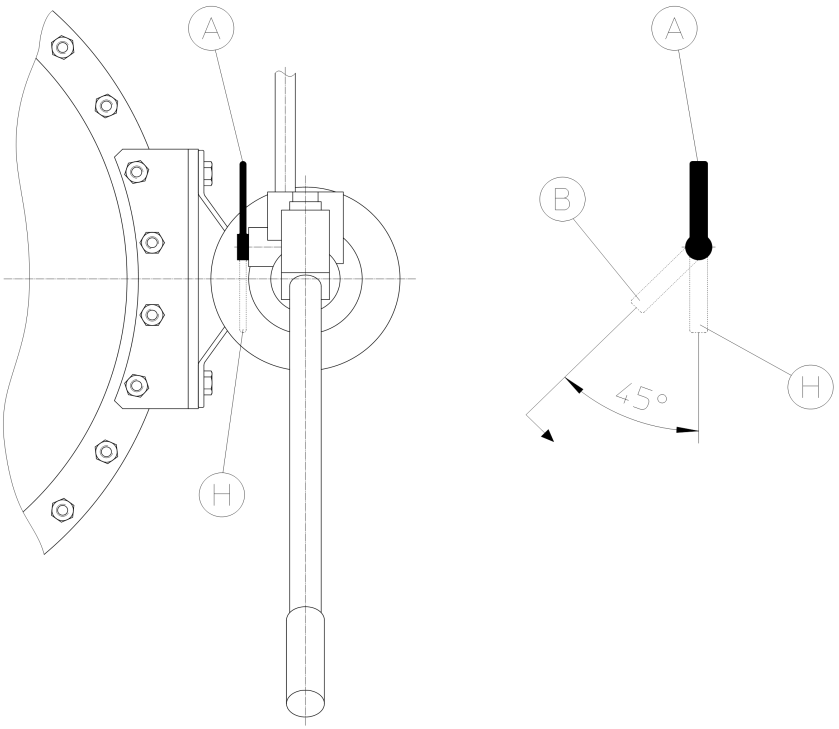


Illustration 16: Switching lever

Filling quantity

The hydraulics of the emergency manual actuation is filled with approx. 2 litres of hydraulic oil type Mobil NUTO H 32.

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 (Z1) with an internal thread.

Actuator size	Connection Z1
MA60	3x G ¾“

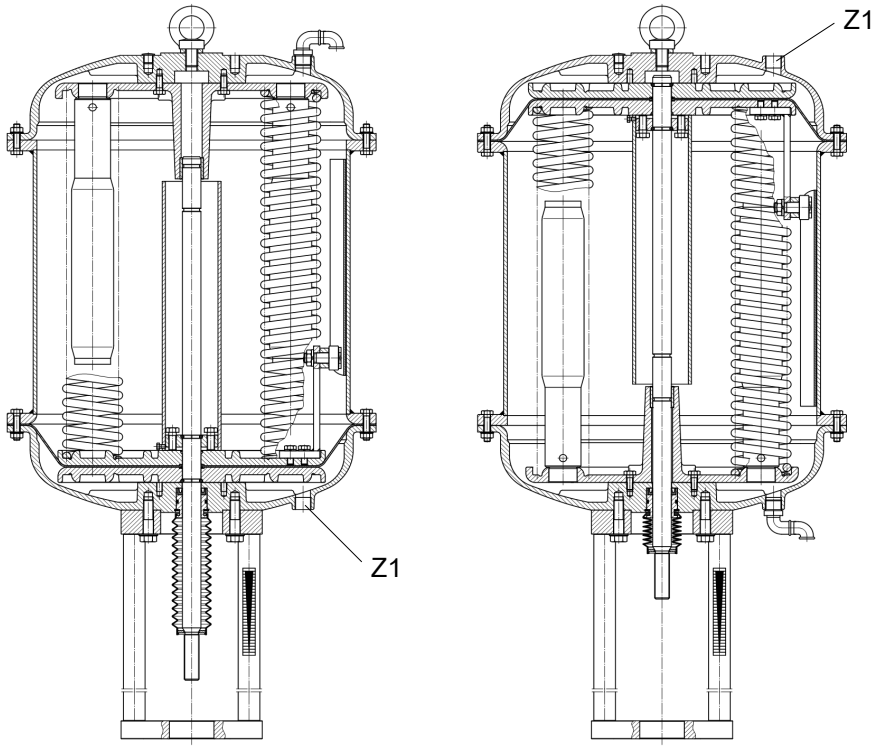


Illustration 17: Air connections

9.3 Positioner installation

Mounting with ARCA mounting bracket

The actuator yoke (118) enables auxiliary devices to be attached to its columns (modified mounting 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

- Inspect the bellows (67) for damage and replace if necessary
  - **NOTICE!** There are no bellows (67) in the case of the additional equipment EX.
- Clean the stem (18) if necessary
  - Clean the stem (18) 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 Hydraulic emergency manual actuation (if fitted)

"Air to open" function (normally closed)

Refer also to chapter [6.8] *MA60 C6 ** O HVH*

⚠CAUTION! Do not undo the hose connections!

- Loosen the bolted connection (354, 355)
- Move the actuator in the opening direction with auxiliary energy until the hex nut (360) is accessible.
- Loosen the hex nut (360)
- Undo the bolted connection (347, 348, 349) between the holder (345) and the pump (317)
- Unscrew the cylinder (311) by unscrewing it from the threaded bushing (365) and remove it complete with the pump (317) and holder (345).
- Unscrew and remove the threaded bushing (365) and hex nut (364)

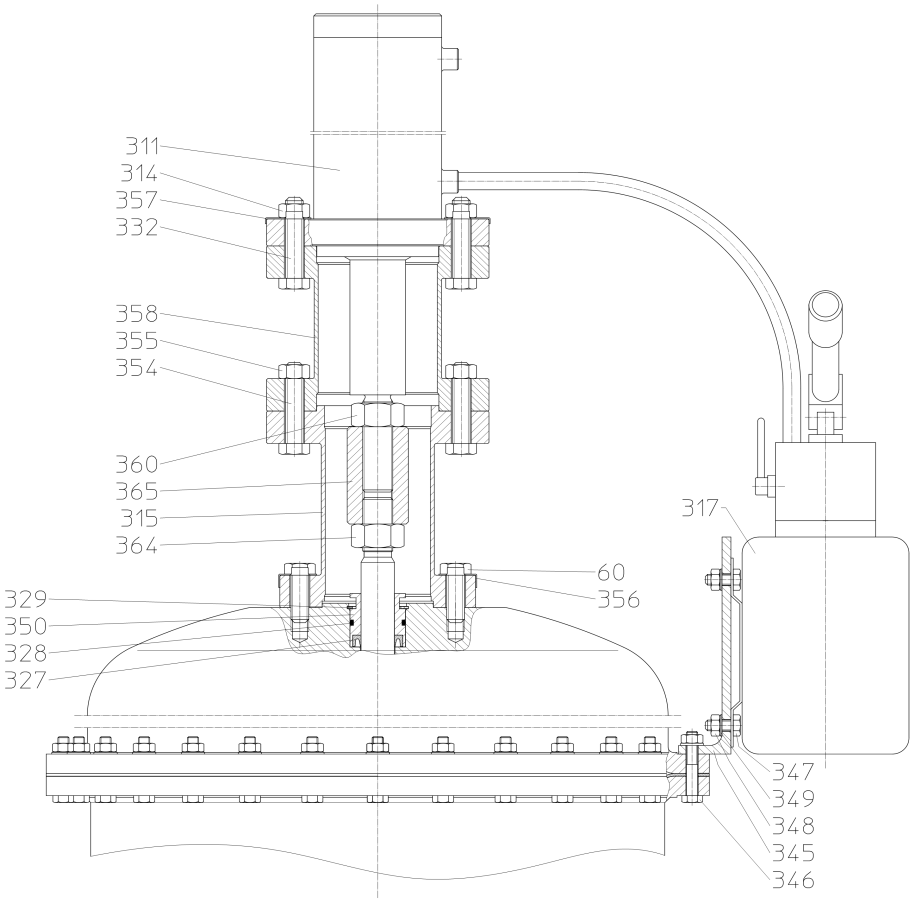


Illustration 18: Hydraulic emergency manual actuation "normally closed"

"Air to close" function (normally open)

Refer also to chapter [6.9] *MA60 C6 ** S HVH*

⚠CAUTION! Do not undo the hose connections!

- Loosen the bolted connection (354, 355)
- Move the cylinder (311) in the closing direction by actuating the pump (317) until the hex nut (360) is accessible.
- Loosen the hex nut (360)
- Undo the bolted connection (347, 348, 349) between the holder (345) and the pump (317)
- Unscrew the cylinder (311) by unscrewing it from the threaded bushing (365) and remove it complete with the pump (317) and holder (345).
- Unscrew and remove the threaded bushing (365) and hex nut (364)

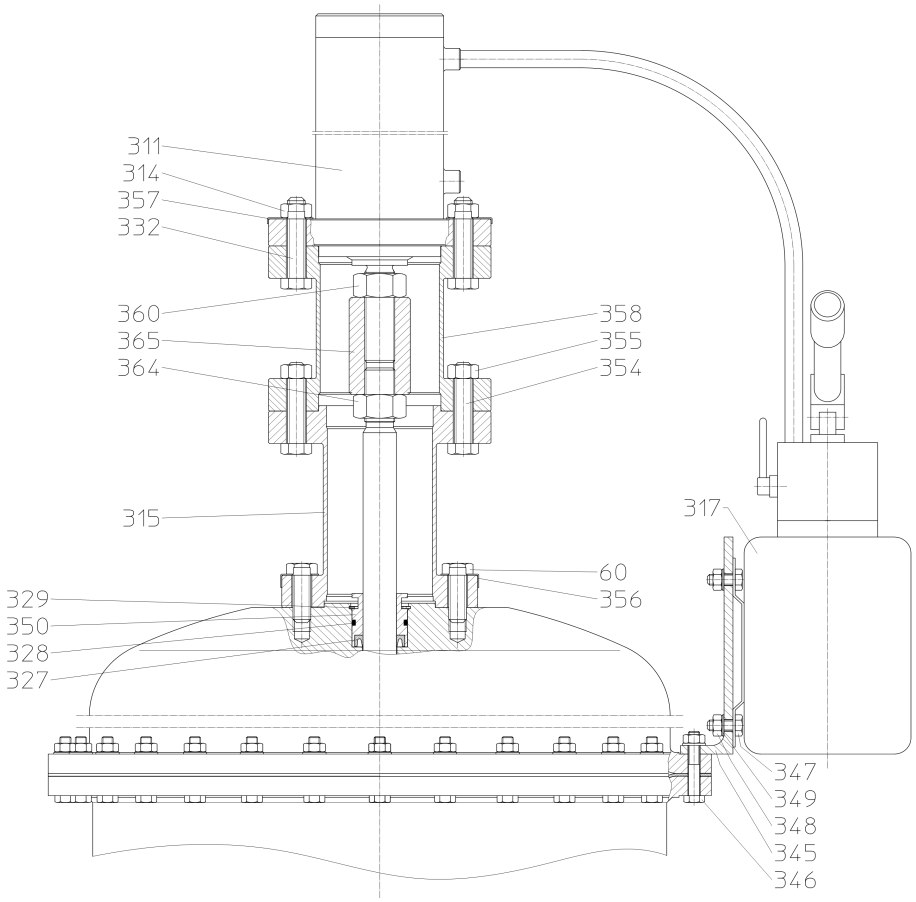


Illustration 19: Hydraulic emergency manual actuation "normally open"

11.3 Stroke limitation (if mounted)

Refer also to the chapters [6.4] *MA60 A/D6 ** O HB* and [6.5] *MA60 A/D6 ** S HB*

- Loosen the hex nut (91)
- Unscrew and remove the lifting eye (57)
- Remove the sealing ring (56)

11.4 Guide and sealing element

- Remove the stroke indicator
- Remove any positioner if fitted
- If fitted, remove the protective bellows (67)
- Dismount the circlip (13)
- Pull out the guide bushing (6) with O-ring (10) and sealing ring (9)
- Observe the following during the assembly:
  - Observe the notes in the chapter [9.1] *Adjustment*!

11.5 Springs

⚠ DANGER

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

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

- Dismantle any existing pipeline
- **If emergency manual actuation is fitted:** Disassemble the emergency manual actuation as described in the chapter [11.2] *Hydraulic emergency manual actuation*.

- **In the case of S function "Air to close":**
  – Decouple the actuator stem (18) and the valve stem

- Six long bolts / threaded rods in grade 8.8 and new hex nuts in grade 8 are required for the disassembly!
  – **NOTICE!** The bolts / threaded rods and hex nuts in grades 8.8 and 8 respectively are not part of the scope of delivery!

Actuator version	Bolt / threaded rod size
G6	M10 x 150
A6	M10 x 200
D6	M10 x 200
C6	M10 x 400

- Dismount six bolts (64) on the top cover (54) **evenly** distributed around the circumference.
- Mount the long bolts / threaded rods (grade 8.8).
- Loosen the bolted connection of the short bolts (64)
- Loosen the hex nuts of the newly mounted bolts / threaded rods **evenly** in order to relax the springs (42, 43).
- Remove the top cover (54)

- **In the case of S function "Air to close":**
  – Remove the complete diaphragm unit from the actuator

- Remove the springs (42, 43) from the actuator
  – **⚠CAUTION!** Always replace the springs as a complete set! Observe the arrangement of the springs (42, 43)!

Mounting position

Number of springs	Mounting at position
2	1 + 5
4	1 + 3 + 5 + 7

Number of springs	Mounting at position
6	1 + 2 + 4 + 5 + 6 + 8
8	1-8
12	1 + 3 + 5 + 7 + 1-8
16	2x 1-8

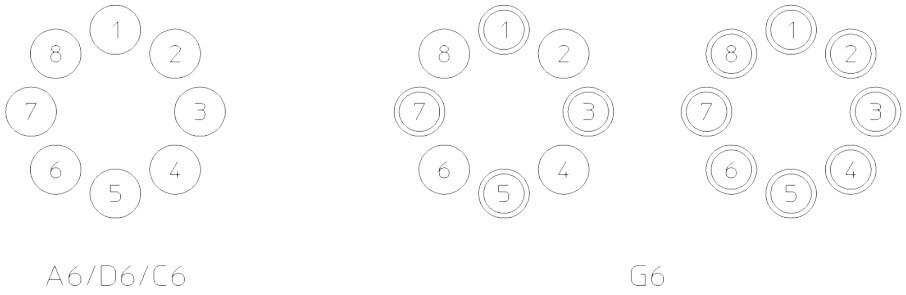


Illustration 20: Spring arrangement

11.6 Diaphragm

- **In the case of O function "Air to open":**
  - Disassemble according to the chapter [11.5] *Springs* up to removal of the springs (42, 43).
  - Loosen the bolted connection (64, 65, 66) between bottom cover (1) and intermediate ring (51)
  - Remove the intermediate ring (51)
  - Remove the complete diaphragm unit from the actuator
- **In the case of S function "Air to close":**
  - Disassemble according to the chapter [11.5] *Springs* up to the removal of the diaphragm unit.
- Loosen the hex screw (41).
- Remove the stroke limiter (40)
- Loosen the hex screws (29)
- Remove the split ring (19)
- Remove the clamping ring (31)
- Remove the diaphragm plate (25)
- Replace the diaphragm (22) and O-ring (21)

12 Torque tables - bolted connections

12.1 Bolts conforming to DIN EN ISO 4017/4014/4762

Thread	Torque [Nm]	
	A4-80	8.8
M10	34	36
M12	60	65
M16	140	150

12.2 Hex nut (360, 364)

Actuator size	Thread	Torque [Nm]
MA60	M27	500

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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