

Pneumatic Actuator

PA-N

For the BOA-CVP H Type Series

Installation/Operating Manual



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Installation/Operating Manual PA-N

Original operating manual

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1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series, the main operating data and the serial number. The serial number uniquely describes the product and is used as identification in all further business processes.

In the event of damage, immediately contact your nearest service facility to maintain the right to claim under warranty.

1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

1.3 Symbols

Table 1: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇨	Result of an action
⇩	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

2 Safety



All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 Key to safety symbols/markings

Table 2: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
 - Markings for connections
 - Name plate
- The operator is responsible for ensuring compliance with all local regulations not taken into account.

2.3 Intended use

- Only operate actuators which are in perfect technical condition.
- Do not operate partially assembled actuators.
- Generally observe the operating limits given.
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

2.3.1 Prevention of foreseeable misuse

- Never exceed the permissible application and operating limits specified in the data sheet or product literature regarding temperature, etc.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and training

- All personnel involved must be fully qualified to install, operate, maintain and inspect the product this manual refers to.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the product must always be supervised by specialist technical personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.7 Safety information for the user/operator

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Provide the personnel with protective equipment and make sure it is used.

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the actuator are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Any work on the product shall only be performed when it has been disconnected from the power supply (de-energised) and is in unpressurised condition.
- Take suitable measures to rule out any danger from pneumatically actuated parts of the actuator.
- Carry out work on the product during standstill only.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 19)

2.9 Unauthorised modes of operation

Never operate the product outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the product supplied is only valid if the product is used in accordance with its intended use.

3 Transport/Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify or the supplying dealer and the insurer about the damage in writing immediately.

3.2 Transport

	<p>! DANGER</p>
	<p>Improper transport of the valve with actuator Danger to life from falling parts! Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe the operating manual of the valve.
	<p>CAUTION</p>
	<p>Improper transport Damage to the actuator!</p> <ul style="list-style-type: none"> ▷ Transport the actuator in its original packaging. Protect the coating against damage. ▷ Only transport the actuator in the specified position. ▷ Protect the actuator against external forces (e.g. impacts, blows, vibrations). When placing the actuator down in a horizontal position or pulling it upright, provide a suitable support underneath the coupling. ▷ Observe the information on weights, centre of gravity and fastening points. ▷ Observe the applicable local accident prevention regulations. ▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.

To transport the actuator, suspend it from the lifting tackle as illustrated.

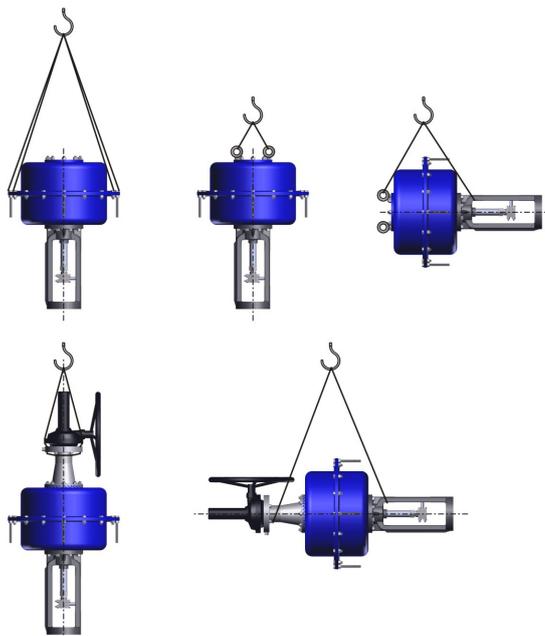


Fig. 1: Transporting the pneumatic actuator

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken:

If properly stored indoors, the equipment is protected for a maximum of 6 months.

For storing the actuators observe the following measures:

- Store the actuator in a dry and protected room where the atmospheric humidity is as constant as possible.
- Protect the actuator from dust during storage.
- Protect the actuator from impact, blows and vibrations.

Table 3: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-20 °C to +60 °C
Humidity	5 % to 65 % rH



NOTE

If the actuator is mounted on the valve, the operating manual of the valve must be observed in addition.

3.4 Disposal/recycling

Due to some components, the product is classified as special waste.

1. Dismantle the product.
2. Separate and sort the materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner. PCBs, power electronics, capacitors and electronic components are all hazardous waste.

4 Description

4.1 Product information

4.1.1 Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see <https://www.ksb.com/ksb-en/About-KSB/Corporate-responsibility/reach/>.

4.2 General description

- Pneumatic actuator for the automation of a valve

The pneumatic actuators are installed in industrial plants and power plants for actuating control valves and shut-off valves. They provide high actuating forces. In the event of a control air failure, the spring will move the valve to a fail-safe position.

4.3 Designation

Example: PA-N 540

Table 4: Designation key

Code	Description
PA-N	Product name
540	Diaphragm area in mm ²

4.4 Name plate

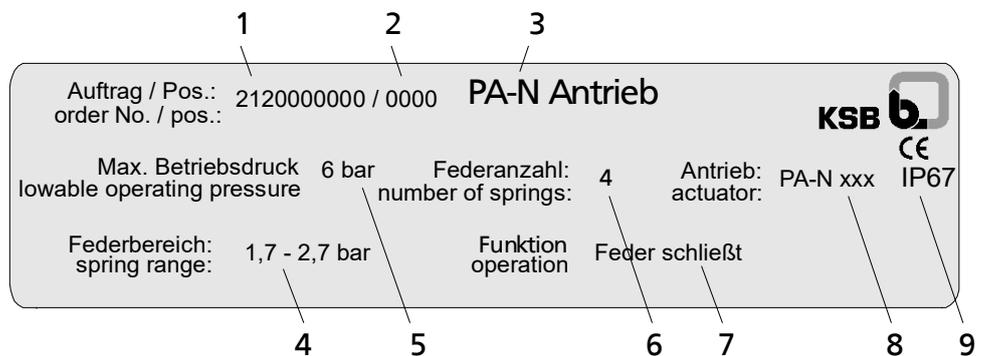


Fig. 2: Actuator name plate (example)

1	Order number	2	Order item number
3	Product name	4	Spring range
5	Maximum operating pressure	6	Number of springs
7	Function	8	Actuator size
9	Enclosure		

4.5 Design details

Actuating force

- To determine the actuating force, the diaphragm area is multiplied by the spring pressure or by the operating pressure minus the equivalent spring pressure, as applicable.
- Diaphragm area and spring range:
 - 300 mm² (1.6 - 2.8 bar)
 - 540 mm² (1.7 - 3.7 bar)

- 1080 mm² (1.5 – 2.7 bar)
- Example of a PA-N 1080 actuator with a spring range of 1.5 – 2.7 bar and an operating pressure of 6 bar:
 - Closing force of spring with stem extended: $F = 108000 \text{ mm}^2 \times 0.15 \text{ N/mm}^2 = 16200 \text{ N}$
 - Closing force of spring with stem retracted: $F = 108000 \text{ mm}^2 \times 0.27 \text{ N/mm}^2 = 29160 \text{ N}$
 - Opening force by operating pressure at start point: $F = 108000 \text{ mm}^2 \times (0.6 - 0.15) \text{ N/mm}^2 = 48600 \text{ N}$
 - Opening force by operating pressure at end point: $F = 108000 \text{ mm}^2 \times (0.6 - 0.27) \text{ N/mm}^2 = 35640 \text{ N}$

Design

Variants

- Actuator configured to match the order specification
- Emergency handwheel
- Intelligent electro-pneumatic positioner
- Pneumatic positioner
- Mechanical limit switches
- Inductive limit switches
- 3/2-way solenoid valve (230 V AC, 50 Hz or 24 V DC)
- Filter/reducing station with pressure gauge

4.6 Function

Principle The pneumatic actuator translates pneumatic actuating signals into a linear stem movement. The return force required is provided by the compression springs arranged on the diaphragm plate.

If the air supply should fail, the spring force will return the actuator to its original position. Unless otherwise stated in the data sheet, stroke is limited within the globe valves via a positioner or via limit switches (not covered by this documentation).

Function The actuator's working principle – spring-to-open / air-to-close (NO) or spring-to-close / air-to-open (NC) – is determined by the way it is assembled.

Emergency handwheel Pneumatic actuators with an emergency handwheel can be operated without control air by turning the handwheel. Turning the handwheel in clockwise direction will move the actuator stem downward. Emergency handwheel actuation opposes the spring force.

4.7 Noise characteristics

The sound pressure level depends on the local conditions and the duty point. It is $\leq 70 \text{ dB(A)}$.

5 Installation

5.1 Safety regulations

	<p style="background-color: #f4a460; padding: 2px;">⚠ WARNING</p> <p>Improper handling of a pneumatic actuator Crushing of fingers! Damage to the actuator or the valve!</p> <ul style="list-style-type: none"> ▷ When mounting the actuator on the valve make sure that the pneumatic supply port is not connected yet. ▷ Ensure that any objects and parts of the body are removed from the actuator coupling area prior to starting the actuator.
	<p style="background-color: #f4d03f; padding: 2px;">CAUTION</p> <p>Painting of the piping Valve function impaired! Loss of important information provided on the valve!</p> <ul style="list-style-type: none"> ▷ Protect stem and plastic components prior to applying paint. ▷ Protect printed name plates prior to applying paint.

5.2 Checks to be carried out prior to installation

Before beginning with the installation check the following:

- The actuator and valve are compatible.
- The valve has been prepared for the actuator to be mounted.
- The control air supply is not connected to the actuator yet.

5.3 Installation position

	<p style="background-color: #f4d03f; padding: 2px;">CAUTION</p> <p>Actuators installed in an inclined position of 30° or more off the vertical No valve function!</p> <ul style="list-style-type: none"> ▷ Support actuators > 13 kg.
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If the valve is installed in inclined position, mount the actuator with its pillars / ribs positioned in such a way as to achieve the maximum moment of resistance.

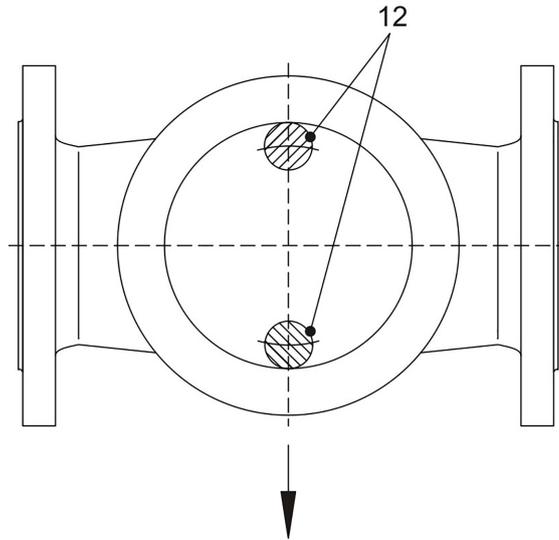


Fig. 3: Pillar (12) position for horizontal valve installation position

5.4 Mounting the actuator

5.4.1 Mounting the actuator with control air connection

	 WARNING
	<p>Pneumatic operation of the actuator Crushing of hands!</p> <ul style="list-style-type: none"> ▷ Connect the control air supply in step 4 of the mounting sequence. After the control air supply has been connected, check for any pressure loss caused by leakage.

- ✓ The actuator is unpressurised.
 - ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. Place the actuator on the valve.
 2. **Variant PA-N 300/540:** Insert the pillars (12) of the actuator into the drilled holes provided in the top flange of the valve.
Variant PA-N 1080: Place the foot (12) of the actuator on the top flange.

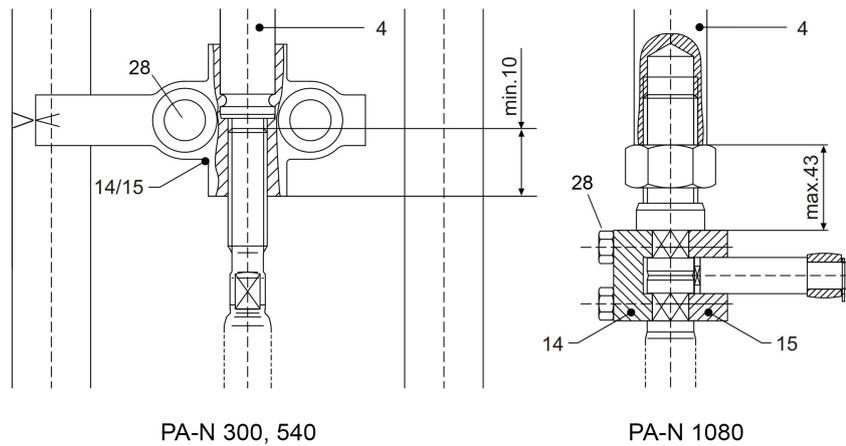


Fig. 4: Connection between valve and actuator

3. Loosely screw the hexagon nuts (27) onto the threads of the pillars (12) or screw in the hexagon head bolts (27) as applicable, leaving a clearance of 5 mm between the nut or bolt head and the top flange of the valve.
4. Connect the control air line to the actuator:
Spring to close (NC): Connect the control air line to the lower housing.
Spring to open (NO): Connect the control air line to the upper housing.

	CAUTION
	<p>Improper dismantling Ingress of dirt and escaping of air during actuator operation!</p> <ul style="list-style-type: none"> ▷ Only apply control pressure via the control air line to the side opposite the springs (pressure chamber). ▷ The connection port on the spring side must be closed with the vent plug.
	⚠ DANGER
	<p>Improper connection of control air supply Danger of death from parts flying off!</p> <ul style="list-style-type: none"> ▷ Make sure that the control air cannot escape from the actuator. ▷ Prevent a pressure drop in the actuator. ▷ Make sure that control air is supplied to the actuator gradually and in a controlled way.

5. Apply the specified control pressure to the actuator (see spring range on the name plate).
6. **Variant PA-N 300/540:** Make sure that the stem threads are properly engaged in the coupling (14, 15). Fasten the coupling (14, 15) with the hexagon socket head cap screws or hexagon head bolts (28). Tighten the screws / bolts evenly to the specified tightening torque. (⇒ Section 7.7, Page 24) .
Variant PA-N 1080: Connect the valve stem and the actuator stem (4) via the coupling (14, 15).
7. Fasten the actuator by tightening the fasteners (27) crosswise to the specified tightening torque. (⇒ Section 7.7, Page 24)

5.4.2 Mounting the actuator (NC) without control air connection

	<p>! DANGER</p>
	<p>Incorrect installation Danger of death from parts flying off!</p> <ul style="list-style-type: none"> ▷ Make sure that these steps are only performed on a spring-to-close (NC) actuator. ▷ The actuator is unpressurised and in its lower limit position. ▷ Make sure that the actuator is unpressurised.

- ✓ The actuator is unpressurised.
 - ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. Remove the control air line. Then relax the compression springs (16) in the actuator space.

	<p>! WARNING</p>
	<p>Sudden release of compression springs Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe the correct dismantling sequence. ▷ First undo the short and then the long hexagon head bolts.

2. Remove the short hexagon head bolts (25) with the washers (35) from the housing (1).
3. Evenly undo the long hexagon head bolts (26) until the spring preload of the compression springs (16) has been fully released.
4. Remove the housing (1).
5. Place the actuator on the valve.
6. **Variant PA-N 300/540:** Insert the pillars (12) of the actuator into the drilled holes provided in the top flange of the valve.
Variant PA-N 1080: Place the foot (12) of the actuator on the top flange.

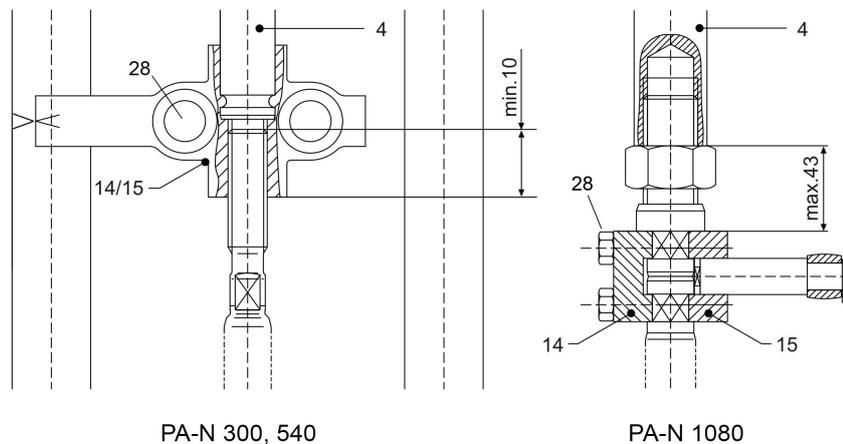


Fig. 5: Connection between valve and actuator

7. Loosely screw the hexagon nuts (27) onto the threads of the pillars (12) or screw in the hexagon head bolts (27) as applicable, leaving a clearance of 5 mm between the nut or bolt head and the top flange of the valve.

8. Connect the valve stem and the actuator stem (4) to each other via the coupling (14 / 15).
Variant PA-N 300/540: Make sure that the stem threads are properly engaged in the coupling (14, 15). Fasten the coupling (14, 15) with the hexagon socket head cap screws or hexagon head bolts (28). Tighten the screws / bolts evenly to the specified tightening torque. (⇒ Section 7.7, Page 24) .
9. Fasten the actuator by tightening the fasteners (27) crosswise to the specified tightening torque. (⇒ Section 7.7, Page 24)
10. Mount the housing (1).
11. Evenly tighten the long hexagon head bolts (26) until the compression springs (16) have been fully preloaded.
12. Fit the short hexagon head bolts (25) with the washers (35) in the housing (1).
13. Connect the control air line. Tighten the hexagon head bolts (25 / 26) to the tightening torque specified. (⇒ Section 7.7, Page 24)

5.4.3 Mounting the actuator with emergency handwheel

- ✓ The actuator is unpressurised.
 - ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. Place the actuator on the valve.
 2. **Variant PA-N 300/540:** Insert the pillars (12) of the actuator into the drilled holes provided in the top flange of the valve.
Variant PA-N 1080: Place the foot (12) of the actuator on the top flange.

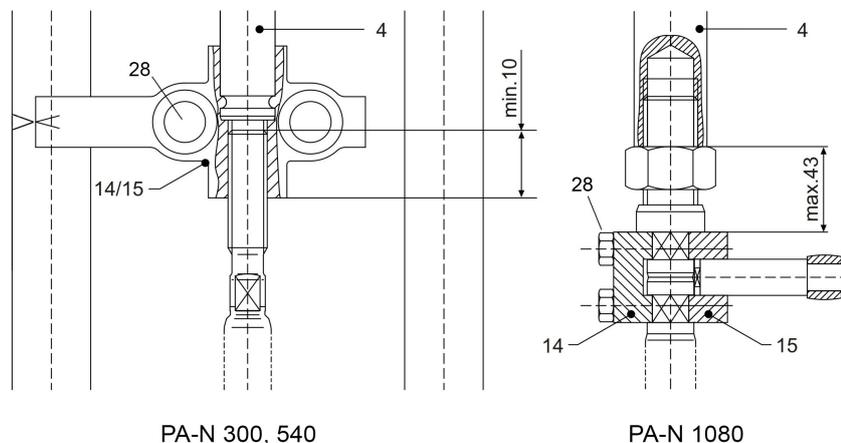


Fig. 6: Connection between valve and actuator

3. Loosely screw the hexagon nuts (27) onto the threads of the pillars (12) or screw in the hexagon head bolts (27) as applicable, leaving a clearance of 5 mm between the nut or bolt head and the top flange of the valve.
4. **Variant PA-N 300:** Use the emergency handwheel to move the anti-rotation device 72/73 into the middle position between the markings of the pillar (50).
Variants PA-N 540 and PA-N 1080: Moving the actuator with the handwheel requires several handwheel rotations until spring resistance is felt. On actuators with spring-to-close (NC) function turn the handwheel clockwise; on actuators with spring-to-open (NO) function turn it anti-clockwise. As soon as resistance can be felt at the handwheel, move the stem (4) by another 10 mm approximately.

5. Connect the valve stem and the actuator stem to each other with the coupling (14 / 15).
Variant PA-N 300/540: Make sure that the threads are properly engaged. Evenly tighten the hexagon socket head cap screws and hexagon head bolts of the coupling to the specified tightening torque. (⇒ Section 7.7, Page 24) .
6. Tighten the hexagon nuts (27) and hexagon head bolts (27) fastening the actuator to the specified tightening torque. (⇒ Section 7.7, Page 24)

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up

6.1.1 Prerequisites for commissioning/start-up

	<p>NOTE</p> <p>Never operate the actuator electrically or pneumatically before it has been mounted onto a valve.</p>
---	---

Before commissioning/starting up the actuator, make sure the following conditions are met:

- The actuator has been properly mounted and positioned .
- Make sure that the operating conditions correspond to the data specified and those provided on the name plate.
- All fastening bolts, connecting elements, and electrical connections have been properly tightened to the specified tightening torques.
- Implement all measures preventing accidental contact with moving and live parts.
- For the preconditions to be met prior to commissioning optional add-on parts refer to the operating manuals of the corresponding accessories.

6.2 Operating limits

6.2.1 Ambient temperature

Observe the following parameters and values during operation:

Table 5: Permissible ambient temperatures

Ambient condition	Value
Ambient temperature	-10 °C to +60 °C
Humidity	5 % to 95 % rH

6.3 Shutdown

6.3.1 Measures to be taken for shutdown

1. Allow the valve and actuator to cool down to ambient temperature.
2. Disconnect the compressed air supply.
3. De-energise electrical accessories and add-on parts and secure them against unauthorised start-up.

6.4 Returning to service

For returning the equipment to service, observe the sections on commissioning/start-up (⇒ Section 6.1, Page 19) and the operating limits (⇒ Section 6.2, Page 19) .

For the preconditions to be met prior to commissioning optional add-on parts refer to the individual operating manuals of the corresponding accessories.

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	<p>⚠ WARNING</p>
	<p>Unintentional starting of the actuator Risk of injury by moving components and dangerous shock currents!</p> <ul style="list-style-type: none"> ▷ Always make sure the electrical connections are de-energised before carrying out work on the actuator. Ensure that the main circuits as well as the supplementary and auxiliary circuits are de-energised. ▷ Ensure that the actuator cannot be energised unintentionally.

	<p>⚠ WARNING</p>
	<p>Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▷ Secure the actuator against tilting or tipping over during installation/dismantling.

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the actuator with a minimum of maintenance expenditure and work.

	<p>NOTE</p>
	<p>All maintenance work, service work and installation work can be carried out by Service or authorised workshops.</p>

Never use force when dismantling and reassembling the actuator.

7.2 Removing the actuator

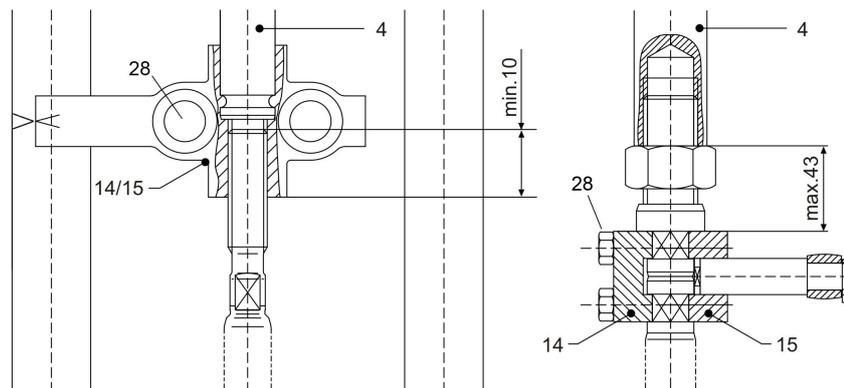
7.2.1 Removing the actuator with control air connection

- ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. Connect the control air supply to the actuator.
Spring to close (NC): Connect the control air line to the lower housing part.
Spring to open (NO): Connect the control air line to the upper housing part.

	<p>CAUTION</p>
	<p>Improper dismantling Ingress of dirt and escaping of air during actuator operation!</p> <ul style="list-style-type: none"> ▷ Only apply control pressure via the control air line to the side opposite the springs (pressure chamber). ▷ The connection port on the spring side must be closed with the vent plug.

	DANGER
	<p>Improper connection of control air supply Danger of death from parts flying off!</p> <ul style="list-style-type: none"> ▷ Make sure that the control air cannot escape from the actuator. ▷ Prevent a pressure drop in the actuator. ▷ Make sure that control air is supplied to the actuator gradually and in a controlled way.

2. Move the actuator to the middle position between the markings in the pillars (1-ear clamps).



PA-N 300, 540

PA-N 1080

Fig. 7: Connection between valve and actuator

3. Remove the coupling (14 / 15) connecting the valve stem and the actuator stem (4). To do so, undo the hexagon socket head cap screws or the hexagon head bolts (28).
4. **Variant PA-N 300/540:** Undo the hexagon nuts (27).
Variant PA-N 1080: Undo the hexagon head bolts (27) fastening the actuator crosswise.
5. Remove the actuator from the valve.
6. Gradually release the control air in a controlled way. Then remove the control air line.

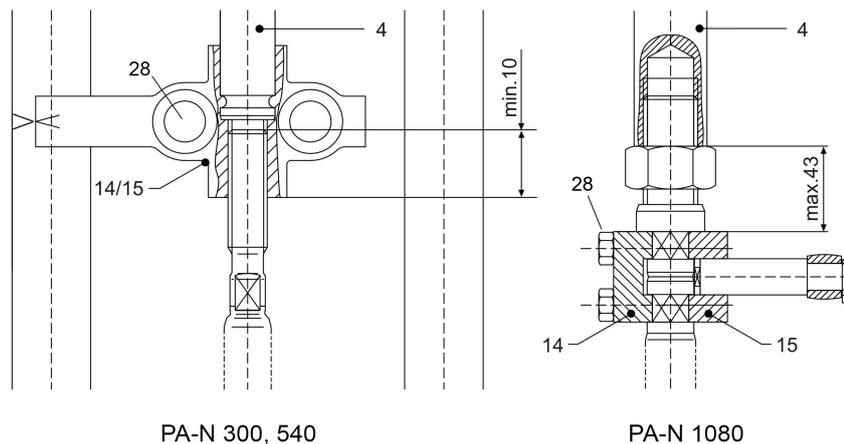
7.2.2 Removing the actuator (NC) without control air connection

	DANGER
	<p>Incorrect dismantling Danger of death from parts flying off!</p> <ul style="list-style-type: none"> ▷ Make sure that these steps are only performed on a spring-to-close (NC) actuator. ▷ The valve and actuator are unpressurised and in the lower limit position. ▷ Make sure that the actuator is unpressurised.

- ✓ The actuator is unpressurised.
 - ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. Remove the control air line. Then relax the compression springs (16) in the actuator space.

	WARNING
	<p>Sudden release of compression springs Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe the correct dismantling sequence. ▷ First undo the short and then the long hexagon head bolts.

2. Remove the short hexagon head bolts (25) with the washers (35) from the housing (1).
3. Evenly undo the long hexagon head bolts (26) until the spring preload of the compression springs (16) has been fully released.
4. Remove the housing (1).


Fig. 8: Connection between valve and actuator

5. Remove the coupling (14 / 15) connecting the valve stem and the actuator stem (4).
6. **Variant PA-N 300/540:** Undo the hexagon nuts (27).
Variant PA-N 1080: Undo the hexagon head bolts (27) fastening the actuator crosswise.
7. Remove the actuator from the valve.

7.2.3 Removing the actuator with emergency handwheel

- ✓ The valve is unpressurised.
 - ✓ The valve has cooled down to room temperature.
 - ✓ The valve has been moved into closed position.
1. **Variant PA-N 300:** Use the emergency handwheel to move the anti-rotation device 72/73 into the middle position between the markings of the pillar (50).
Variants PA-N 540 and PA-N 1080: Moving the actuator with the handwheel requires several handwheel rotations until spring resistance is felt. On actuators with spring-to-close (NC) function turn the handwheel clockwise; on actuators with spring-to-open (NO) function turn it anti-clockwise.
 2. Remove the coupling (14 / 15) connecting the valve stem and the actuator stem (4).

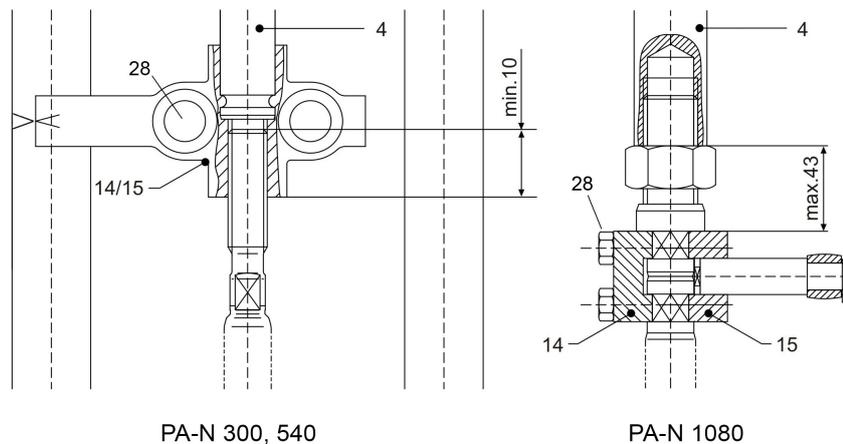


Fig. 9: Connection between valve and actuator

3. **Variant PA-N 300/540:** Undo the hexagon nuts (27).
Variant PA-N 1080: Undo the hexagon head bolts (27) fastening the actuator crosswise.
4. Remove the actuator from the valve.

7.3 Supervision of operation

The service life can be extended by taking the following measures:

- Regularly lubricating the stem with grease (⇒ Section 7.5, Page 24)

7.4 Cleaning

	CAUTION
	<p>Improper cleaning of actuators Damage to the actuator covers!</p> <ul style="list-style-type: none"> ▷ Clean the actuators in dry condition only. ▷ Do not use solvents. ▷ Use a soft cloth. ▷ Do not use abrasive substances.

7.5 Lubrication

Lubricating the emergency handwheel

- ✓ The actuator is unpressurised.
- 1. Remove the upper cap 59.
- 2. **For emergency handwheel sizes III and IV:** Unscrew the fastener (54) from the long sleeve (52).
- 3. Press in the grease.

Lubricating the stem

The stem is supplied greased with KLÜBERPLEX BE 31-502.

Other lubricants of at least equivalent quality can be used. In this case:

- 1. Clean all parts that will come into contact with the lubricant.
- 2. Contact the manufacturer if the lubricant is to be replaced by a different one.
- 3. Changing the lubricant every 8 - 10 years is recommended.

7.6 Spare parts stock

In the case of damage and malfunction, a full replacement is recommended.

7.6.1 Ordering spare parts

Always quote the following data when ordering replacement or spare parts:

- Order number
- Order item number

Refer to the name plate for all data. (⇒ Section 4.4, Page 11)

Also specify the following data:

- Quantity of spare parts
- Part number and description (⇒ Section 9, Page 26)
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

7.7 Tightening torques

Table 6: Tightening torques for the actuator

Size	Item 27	Item 28	Item 30	Item 31	Item 32
300	87	50	25	25	50
540	87	50	25	25	50
1080	87	25	25	40	190

Table 7: Tightening torques for the emergency handwheel

Size	Item 67	Item 68	Item 70	Item 71
I	25	87	50	-
II	-	87	50	50
II	-	87	50	50
IV	-	87	50	50

8 Trouble-shooting

	 WARNING
	<p>Improper work to remedy faults Risk of injury!</p> <p>▷ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.</p>

If problems occur that are not described in the following table, consultation with the service is required.

Table 8: Trouble-shooting

Problem	Possible cause	Remedy
The actuator stem is not moving.	The emergency handwheel is not in zero position.	Turn the emergency handwheel to zero position.
	The actuator is not supplied with control air.	Check the control air system.
	Ruptured diaphragm	Replace the diaphragm.
	Valve disc cannot be moved.	See the operating manual of the valve.
	The selected actuator force is insufficient for actuating the valve.	Check the selection and/or consult the manufacturer of the valve / actuator assembly.
	Broken spring	Replace the compression spring.
Jerky actuator stem movement	Insufficient control air	Inspect control air system for damage and check for sufficient flow rate.
	Positioner set incorrectly	Correct the settings. See operating manual of the positioner.
	Globe valve blocked by dirt particles	Clean or replace.
	Broken spring	Replace the compression spring.
High compressed air consumption	Diaphragm not clamped correctly.	Re-tighten the hexagon nuts (32) until the diaphragm is clamped correctly.
	Worn sealing elements	Replace the sealing elements (19, 20 and possibly 61).
	Actuator supply lines are leaking.	Check supply lines for leakage and replace or seal off if necessary.

9 Related Documents

9.1 General assembly drawing with list of components for PA-N 300 and PA-N 540

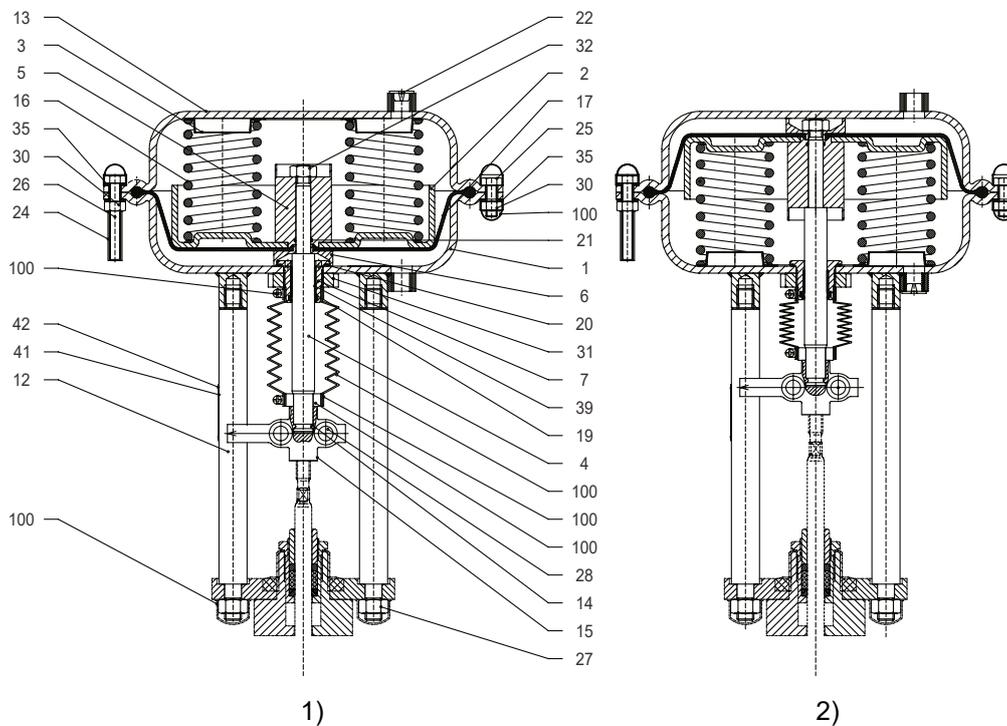


Fig. 10: PA-N 300 and PA-N 540 actuators

1)	Spring to close (NC)
2)	Spring to open (NO)

Table 9: List of components

Item	Description	Item	Description
1	Housing No. 1	24	Sheath
2	Diaphragm plate	25	Hexagon head bolt
3	Spring centring plate	26	Hexagon head bolt
4 ¹⁾	Stem	27	Hexagon nut
5	Sleeve	28	Hexagon socket head cap screw
6	Support disc	30	Hexagon nut
7 ¹⁾	Guiding element	31	Slotted round nut
12	Pillar	32	Hexagon nut
13 ²⁾	Housing No. 2	35	Washer
14	Coupling	39 ¹⁾	Plain bearing
15	Coupling	41	Stroke indicator plate
16 ¹⁾	Compression spring	42	Half round head grooved pin
17 ¹⁾	Diaphragm	101 ³⁾	Hose clip

1 Recommended spare parts

2 Replace with housing No. 1 if emergency handwheel is used.

3 Special accessory

Item	Description	Item	Description
19 ¹⁾	Rod seal	102 ³⁾	Bellows
20 ¹⁾	O-ring	103 ³⁾	Ring
21 ¹⁾	O-ring	104 ³⁾	Anti-corrosion cap
22	Vent plug	105 ³⁾	Anti-corrosion cap

9.2 General assembly drawing with list of components for PA-N 1080

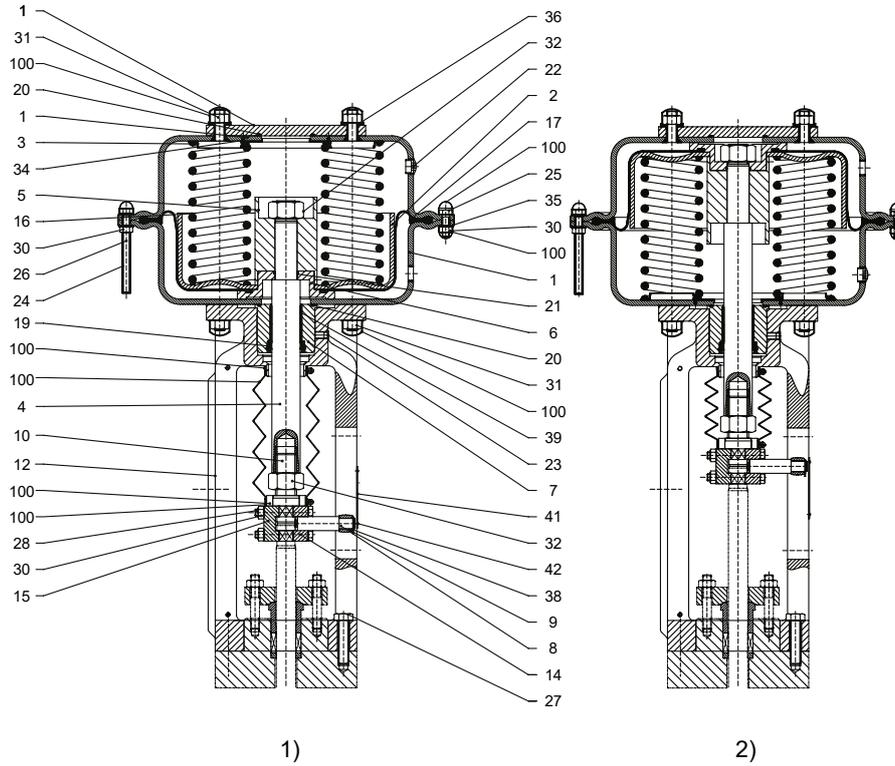


Fig. 11: PA-N 1080 actuator

1)	Spring to close (NC)
2)	Spring to open (NO)

Table 10: List of components

Item	Description	Item	Description
1	Housing	24	Sheath
2	Diaphragm plate	25	Hexagon head bolt
3	Spring centring plate	26	Hexagon head bolt
4 ⁴⁾	Stem	27	Hexagon head bolt
5	Sleeve	28	Hexagon head bolt
6	Support disc	30	Hexagon nut
7 ⁴⁾	Guiding element	31	Hexagon nut
8	Anti-rotation device	32	Hexagon nut
9	Bearing for the anti-rotation device	34	Self-tapping screw
10	Adapter	35	Washer
11 ⁵⁾	Cover	36	Washer
12	Foot	38	Circlip
14	Coupling	39 ⁴⁾	Plain bearing
15	Coupling	41	Stroke indicator plate
16 ⁴⁾	Compression spring	42	Half round head grooved pin
17 ⁴⁾	Diaphragm	101	Hose clip
19 ⁴⁾	Rod seal	102	Bellows

⁴ Recommended spare parts

⁵ Not fitted on version with emergency handwheel

Item	Description	Item	Description
20 ⁴⁾	O-ring	103	Ring
21 ⁴⁾	O-ring	104	Anti-corrosion cap
22	Vent plug	105	Anti-corrosion cap
23	Plug	-	-

9.3 General assembly drawing of emergency handwheel size I for a PA-N 300 actuator

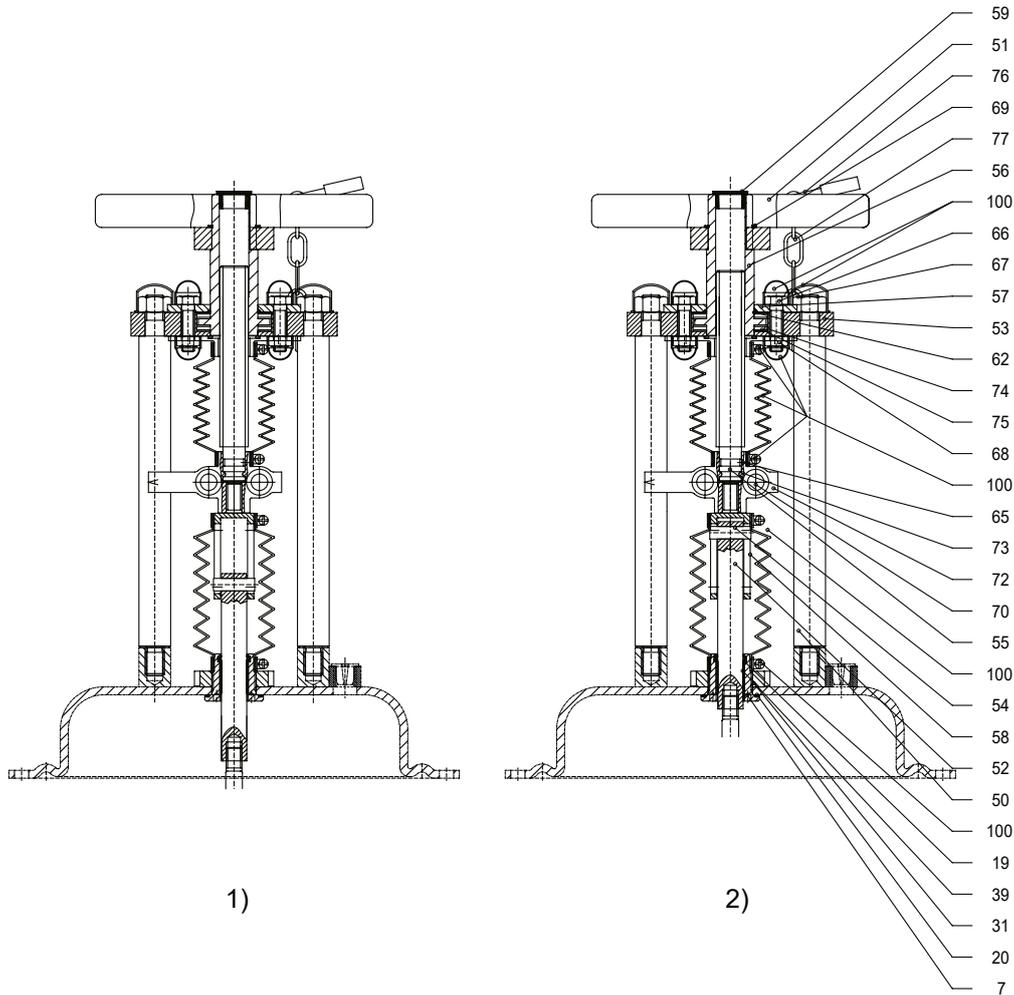


Fig. 12: Emergency handwheel size I

1)	Spring to close (NC)
2)	Spring to open (NO)

Table 11: List of components

Item	Description	Item	Description
7 ⁶⁾⁷⁾	Guiding element	62 ⁶⁾	O-ring
19 ⁶⁾⁷⁾	Rod seal	65	Grub screw
20 ⁶⁾⁷⁾	O-ring	66	Hexagon head bolt
31 ⁷⁾	Slotted round nut	67	Hexagon nut
39 ⁶⁾	Plain bearing	68	Hexagon nut
50	Pillar	69	Circlip
51	Handwheel	70	Hexagon socket head cap screw
52	Stem	72	Coupling
53	Bridge	73	Coupling
54	Centre grooved pin	74 ⁶⁾	Needle roller and cage assembly

⁶⁾ Recommended spare parts

⁷⁾ For connection to PA-N 300

Item	Description	Item	Description
55 ⁶⁾	Threaded stem	75 ⁶⁾	Thrust washer
56 ⁶⁾	Threaded bush	76	Padlock
57	Bolted bonnet	77	Chain
58	Fork	100 ⁸⁾	Corrosion protection kit
59	Protective cap	-	-

⁸ Special accessory

9.4 General assembly drawing of emergency handwheel size II for a PA-N 540 actuator

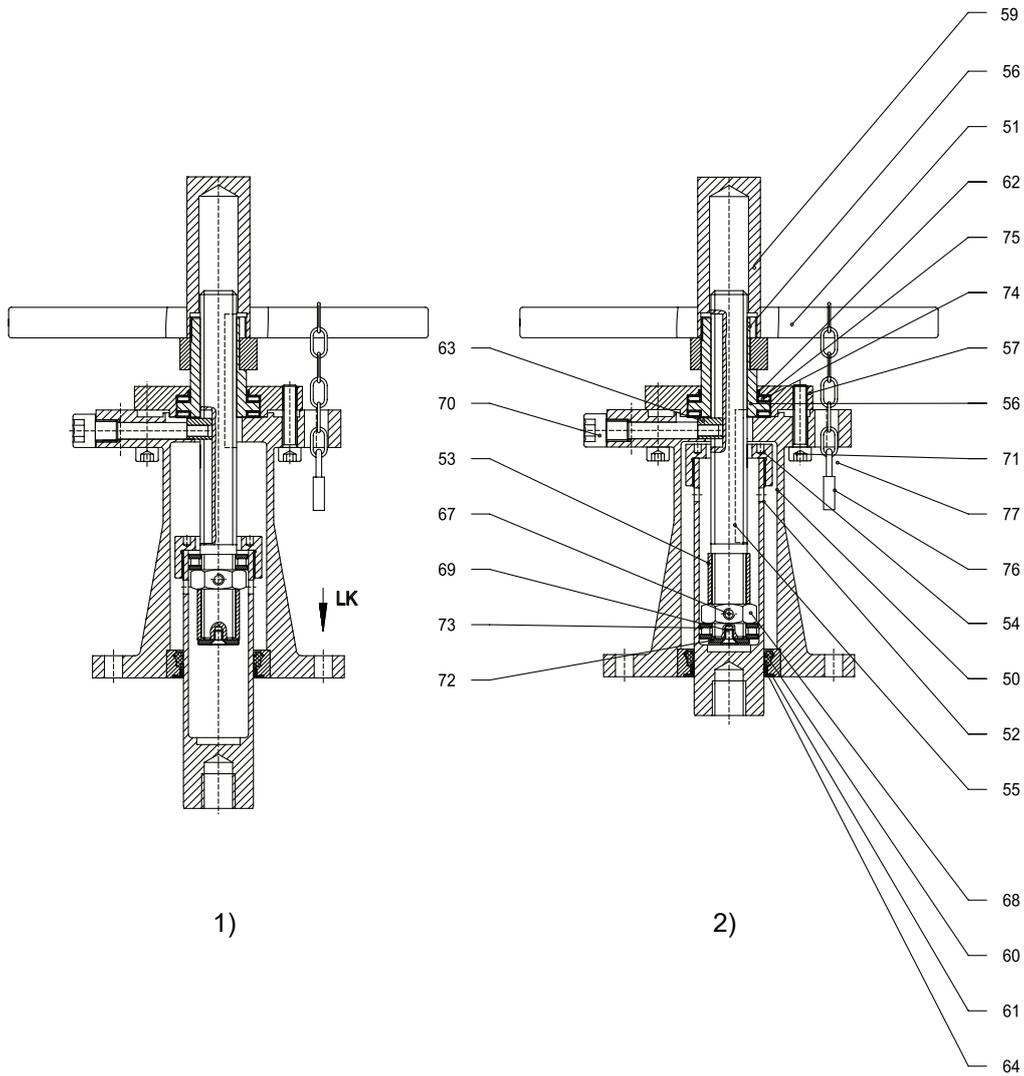


Fig. 13: Emergency handwheel size II

1)	Spring to close (NC)
2)	Spring to open (NO)

Table 12: List of components

Item	Description	Item	Description
50	Base	61	O-ring
51	Handwheel	62	O-ring
52	Sleeve	64	Guide strap
53	Washer	68	Hexagon nut
54	Fastener	70	Hexagon socket head cap screw
55 ⁹⁾	Threaded stem	71	Hexagon socket head cap screw
56 ⁹⁾	Threaded bush	72	Lock washer
57	Bolted bonnet	74 ⁹⁾	Needle roller and cage assembly
58	Guiding element	75 ⁹⁾	Thrust washer
59	Protective cap	73	Padlock
60 ⁹⁾	Rod seal	77	Chain

⁹⁾ Recommended spare parts

9.5 General assembly drawing of emergency handwheel sizes III and IV for PA-N 1080

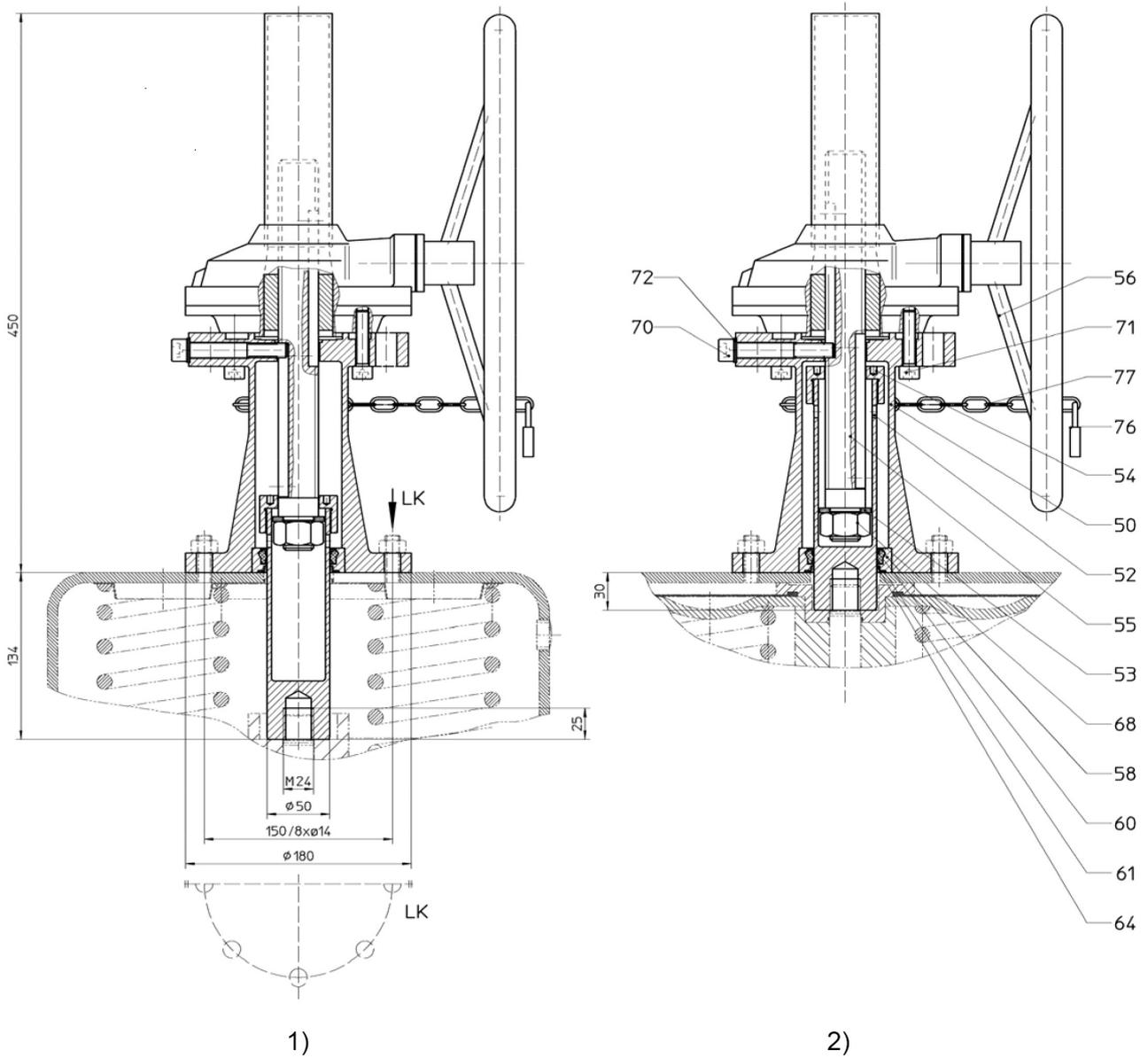


Fig. 14: Emergency handwheel sizes II and IV

1)	Spring to close (NC)
2)	Spring to open (NO)

Table 13: List of components

Item	Description	Item	Description
50	Base	61	O-ring
52	Sleeve	64	Guide strap
53	Washer	68	Hexagon nut
54	Fastener	70	Hexagon socket head cap screw
55 ¹⁰⁾	Threaded stem	71	Hexagon socket head cap screw
56	Handwheel	72	Lock washer
58	Guiding element	76	Padlock
60 ¹⁰⁾	Rod seal	77	Chain

¹⁰⁾ Recommended spare parts

7525.84/04-EN

10 EU Declaration of Conformity

Manufacturer: **KSB SE & Co. KGaA**
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

KSB PA-N 300, KSB PA-N 540, KSB PA-N 1080

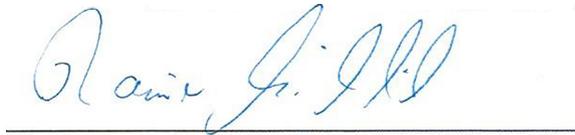
- is in conformity with the provisions of the following directives / regulations as amended from time to time:
 - Actuators: 2014/34/EU Equipment and protective systems intended for use in potentially explosive atmospheres ATEX zone 1. The actuators meet the requirements of equipment group IIG, category 2, suitable for gases of groups IIA and IIB.

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - EN 547
 - EN 983
 - EN 1127-1
 - EN ISO 12100-1
 - EN ISO 12100-2
 - EN ISO 80079-36
 - EN ISO 80079-37

The EU Declaration of Conformity was issued in/on:

Frankenthal, 17 November 2020



Rainer Michalik
Head of Integrated Management Systems



Dieter Hanewald
Product Management and Product Development II
Frankenthal

11 Declaration of Incorporation of Partly Completed Machinery

Manufacturer: **KSB SE & Co. KGaA**
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares for the partly completed machinery:

KSB PA-N 300, KSB PA-N 540, KSB PA-N 1080

- The following essential requirements of the Machinery Directive 2006/42/EC, Annex I, have been applied and fulfilled:
 - 1.1.1, 1.1.2, 1.1.3, 1.1.5,
 - 1.3.2, 1.3.4, 1.3.7,
 - 1.5.1, 1.5.2, 1.5.7, 1.5.8, 1.5.9,
 - 1.6.1,
 - 1.7.1, 1.7.2, 1.7.3, 1.7.4
- The relevant technical documentation has been compiled in accordance with Part B of Annex VII. This documentation or parts hereof will be transmitted by post or electronically in response to a reasoned request by the national authorities.

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC, where appropriate.

Person authorised to compile the technical file:

Dieter Hanewald
Product Management and Product Development II Frankenthal
KSB SE & Co. KGaA
Johann-Klein-Str. 9
67227 Frankenthal (Germany)

The Declaration of Incorporation was issued in/on:

Frankenthal, 17 November 2020



Dieter Hanewald
Product Management and Product Development II Frankenthal
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