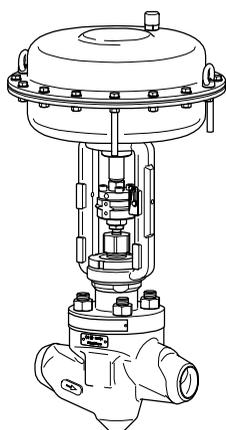


Control Valve

ZK 29



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Foreword

This installation & operating manual (IOM) will help you use the control valve ZK 29 and its variants (referred to as "equipment" in this document) safely and efficiently for its intended purpose.

This installation & operating manual is intended for anyone commissioning, using, operating, servicing, cleaning or disposing of this equipment and, in particular, for professional after-sales service technicians, qualified personnel and authorised and trained staff.

All of these persons must read and understand the content of this installation & operating manual.

Following the instructions given in this installation & operating manual helps avoiding danger and increases the reliability and service life of the equipment. Please note that in addition to the instructions given in this installation & operating manual you must also observe all locally applicable rules and regulations concerning the prevention of accidents as well as approved safety guidelines for good professional practice.

Availability

Keep this installation & operating manual together with the plant documentation for future reference. Make sure that this installation & operating manual is available to the operator.

The installation & operating manual is part of the equipment. Please hand over this installation & operating manual when selling the equipment or passing it on.

Keep the applicable documents specified on page 7 together with this installation & operating manual for future reference.

Formatting features in the document

Certain text elements of this installation & operating manual feature a specific typographic design. You can easily distinguish the following text elements:

Standard text

Cross-reference

- ▶ Listing
 - ▶ Sub-items in listings
- Steps for action.



Here you will find additional useful information and tips serving to assist you in using the equipment to its fullest potential.

Shown and described types of equipment

The drawings and descriptions in this installation & operating manual refer to type ZK 29/14

If any other variant is shown or described it will be explicitly stated.

This installation & operating manual (IOM) describes standard equipment. Contact the manufacturer for more information on the variants and types not described in this document.

Safety

Use for the intended purpose

The equipment is designed for controlling and regulating the level, pressure and flowrate of fluids in heat and process control systems.

Correct use includes compliance with the instructions given in this installation & operating manual, in particular obedience to all safety instructions.

Indications and instructions stated in the applicable documents are part of this installation & operating manual.

Any other use of the equipment is considered to be improper.

Note that the equipment is also used incorrectly if the materials of the equipment are not suitable for the fluid.

The equipment is also considered to be used improperly if:

- ▶ the equipment is not in proper working condition when being used
- ▶ the equipment is used in operating conditions that exceed the pressure and temperature ratings and limits stated in this IOM and the applicable documents
- ▶ the equipment is retrofitted or modified without the written approval of the manufacturer
- ▶ the equipment is fitted with spare parts that are not approved by the manufacturer
- ▶ the equipment is provided with an actuator that is not approved by the manufacturer
- ▶ the equipment is operated or serviced by unqualified personnel.

The personnel must have the qualification and experience specified in section "*Qualification of personnel*" on page 6.

Basic safety notes

Explosion hazard

- ▶ Explosion risk if equipment is used that is not suitable for the environmental conditions. When using the equipment in explosion risk areas make sure that:
 - ▶ The permissible surface temperature of the equipment for the place of installation must not be exceeded.
 - ▶ If electrically insulated equipment is installed appropriate measures must be taken to discharge any static electricity between pipe flanges.
- ▶ The heat generated by friction caused by moving parts that do not run smoothly can cause explosions. Make sure that all moving parts can operate smoothly.
- ▶ When carrying out welding work in order to install or remove the equipment flying sparks may be generated that can cause fire or explosion. Observe any on-site regulations for fire and explosion prevention. Only qualified personnel is allowed to mount or remove the equipment or its components.

Risk of severe injuries

- ▶ The equipment may become hot during operation. Do not operate the equipment unless thermal insulation or protection against accidental contact prevents you from touching hot surfaces.
- ▶ The equipment is under pressure during operation and may be hot. Before carrying out any work on the equipment make sure that the following requirements are met:
 - ▶ The pipes must be depressurized (0 bar).
 - ▶ The fluid must be completely removed from the pipes and the equipment.
 - ▶ During work on the equipment the installation must be switched off and protected against unauthorised or unintended activation.
 - ▶ The pipes and the equipment must have cooled down to room temperature (approx. 20 °C).

Risk of minor injuries

- ▶ Sharp edges on component parts can cause cuts. Always wear industrial gloves when servicing the equipment.
- ▶ The equipment can become hot during operation. This presents the risk of burns caused by heat radiation or when touching the equipment. Do not touch the equipment during operation. Always wear heat resistant protective gear when working on the equipment.

Information on property damage or malfunctions

- ▶ Malfunctions will occur if the equipment is installed in a wrong position or with the flow arrow pointing in the opposite direction of the fluid flow. This may result in damage to the equipment or the installation. Make sure that the flow arrow on the equipment body matches the indicated direction of the fluid flow in the pipe.
- ▶ If the material is unsuitable for the fluid, increased wear may occur and fluid may escape. Make sure that the material is suitable for the fluid used in your installation.

Qualification of personnel

A qualified person must be acquainted with and experienced in the following:

- ▶ the pertinent on-site rules and regulations for preventing fire and explosions as well as industrial safety regulations
- ▶ working on pressure equipment
- ▶ making pipe connections
- ▶ working with dangerous (hot or pressurized) fluids
- ▶ lifting and transporting loads
- ▶ observing all notes and instructions in this installation & operating manual and the applicable documents
- ▶ connecting the power supply of the actuator

Protective gear

The required protective gear depends on the types of fluid used and the regulations on site. For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

Protective gear comprises the following items:

- ▶ Safety helmet to EN 397
- ▶ Safety footwear to EN ISO 20345
- ▶ Protective leather gloves to EN 388

Wear some form of ear protection to EN 352 when standing close to the equipment (1 m or less) during operation.

Typographic features of warning notes



DANGER

Notes with the heading DANGER warn against imminent dangerous situations that can lead to death or serious injuries.



WARNING

Notes with the heading WARNING warn against possibly dangerous situations that could lead to death or serious injuries.



CAUTION

Notes with the heading CAUTION warn against dangerous situations that could lead to minor or moderate injuries.

Formatting features for warnings of property damage

Attention!

This information warns of a situation leading to property damage.

Description

Scope of supply and equipment specification

Scope of supply

The equipment is available with fitted actuator or without actuator.

Our equipment is delivered packed and ready for assembly.

Applicable documents

The following documents are part of the supply of the equipment:

- ▶ Declaration of incorporation
- ▶ Documents provided by the manufacturer of actuator
- ▶ Dimensional drawing with indications of centre of mass
- ▶ Data sheet
- ▶ Parts list

These documents are part of the user documentation and must be kept together with this installation & operating manual for future reference.

Equipment specification

The equipment consists of the following main components:

- ▶ Body
- ▶ Bonnet
- ▶ Cover (only for ZK29/20)

▶ Nozzle

If the equipment is fitted with a rotary actuator, the bonnet and the upper part of the equipment form a functional unit.

If the equipment is fitted with a pneumatic diaphragm actuator, you can detach the bonnet from the cover.

Different equipment variants are available. The type designation has a code that indicates the respective variant.

- ▶ The equipment is available in sizes between DN 25 and DN 150.
 - ▶ The body is available as straight-through or angle-type. The code letter "D" in the type designation indicates straight-through and "E" indicates angle-type.
 - ▶ The equipment can be fitted with various types of actuators. The actuator type is indicated by the following code numbers in the type designation:
 - ▶ 01: Handwheel (retrofitting of an electric rotary actuator NOT possible)
 - ▶ 02: Handwheel (retrofitting of an electric rotary actuator possible)
 - ▶ 12: Electric rotary actuator¹
 - ▶ 13: Electric linear actuator¹
 - ▶ 14: Plug-in connection form B1, EN ISO 5210 for an electric rotary actuator
 - ▶ 20: Pneumatic diaphragm actuator
 - ▶ 30: Lever actuator without part-turn actuator attached¹
 - ▶ 31: Lever actuator with part-turn actuator attached¹
 - ▶ 40: Hydraulic cylinder¹
 - ▶ The throttling system has four stages for pressure reduction.
- 1 Special design (Note that special design versions are not described in this installation & operating manual)

Example of type designations

"ZK 29-D50/14"

Straight-through equipment DN50 with plug-in connection form B1 to EN ISO 5210 for an electric rotary actuator.

"ZK 29-E/20"

Angle-type equipment with pneumatic diaphragm actuator.



In most cases the equipment described in this IOM is of the straight-through type and has a spindle bearing for an electric rotary actuator.

If any other variant is shown or described it will be explicitly stated.

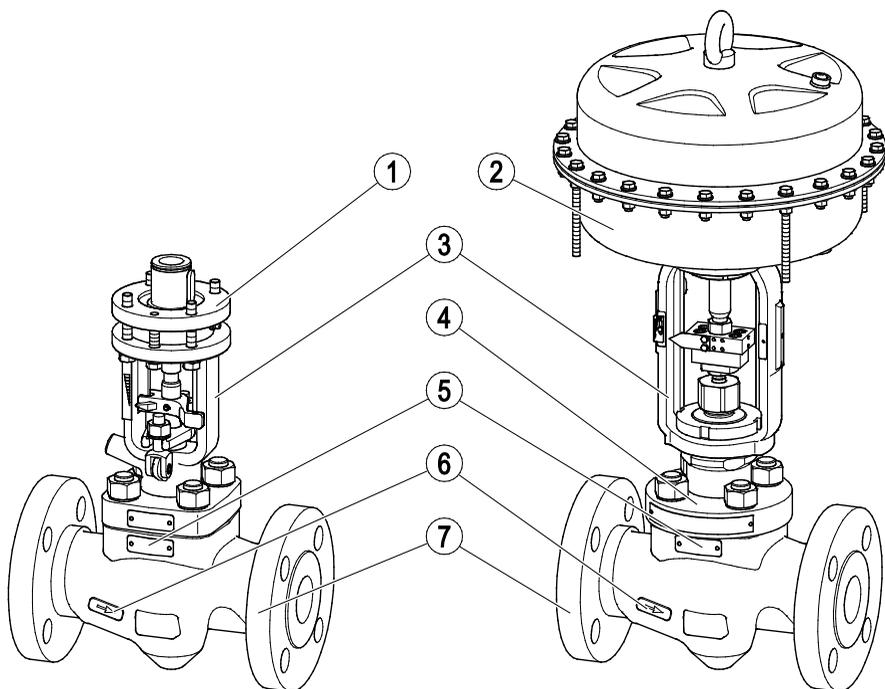
End connections

The equipment is available with the following end connections:

- ▶ Butt-weld ends
- ▶ Socket-weld ends
- ▶ Flanges

The end connection is not specified in the type designation.

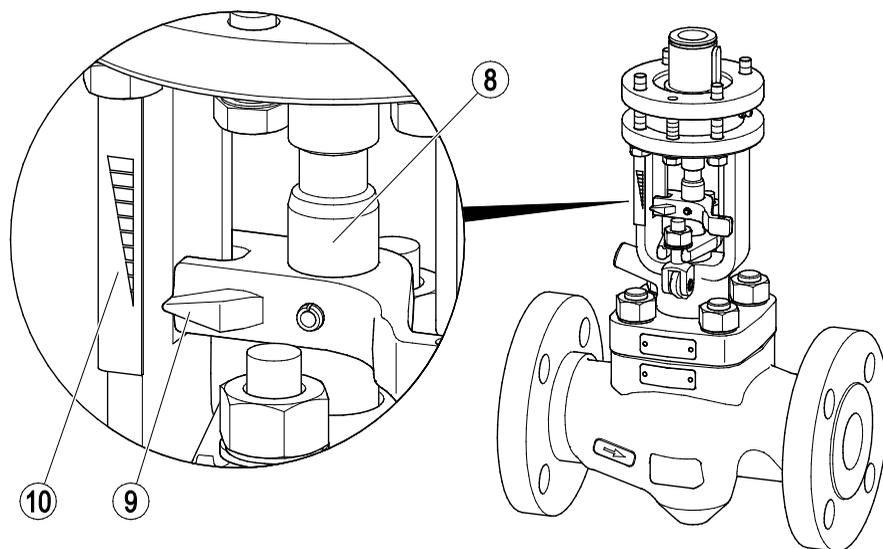
Component parts



No.	Designation
1	Mechanical connection for actuator, in equipment with rotary actuator this is a spindle bearing (shown here)
2	Pneumatic diaphragm actuator
3	Bonnet

No.	Designation
4	Cover
5	Name plate
6	Flow direction arrow (on both sides)
7	Body

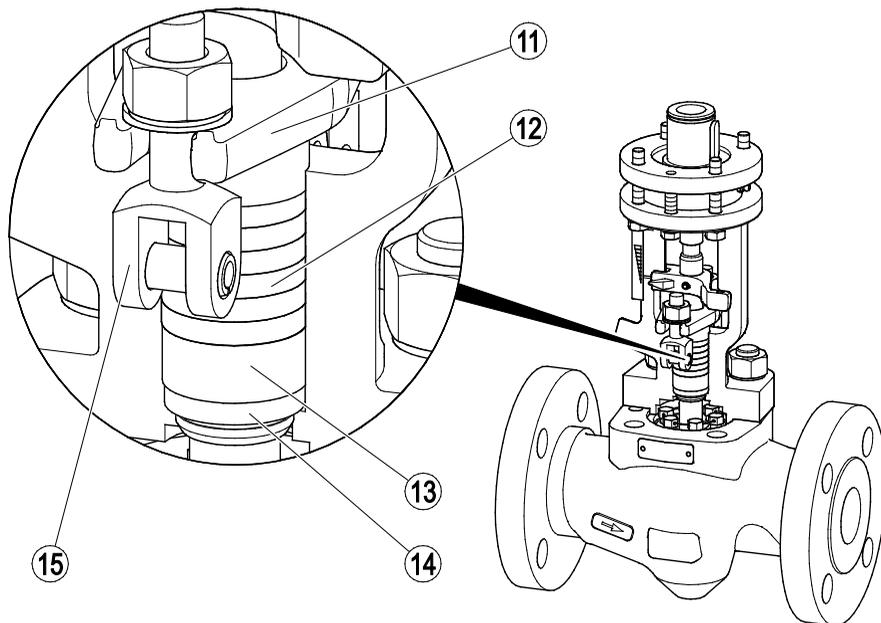
The yoke is fitted with the following items:



No.	Designation
8	Spindle
9	Scale marking indicator
10	Scale

The design and mounting of the stuffing-box packing is different in equipment with rotary actuator and equipment with pneumatic diaphragm actuator

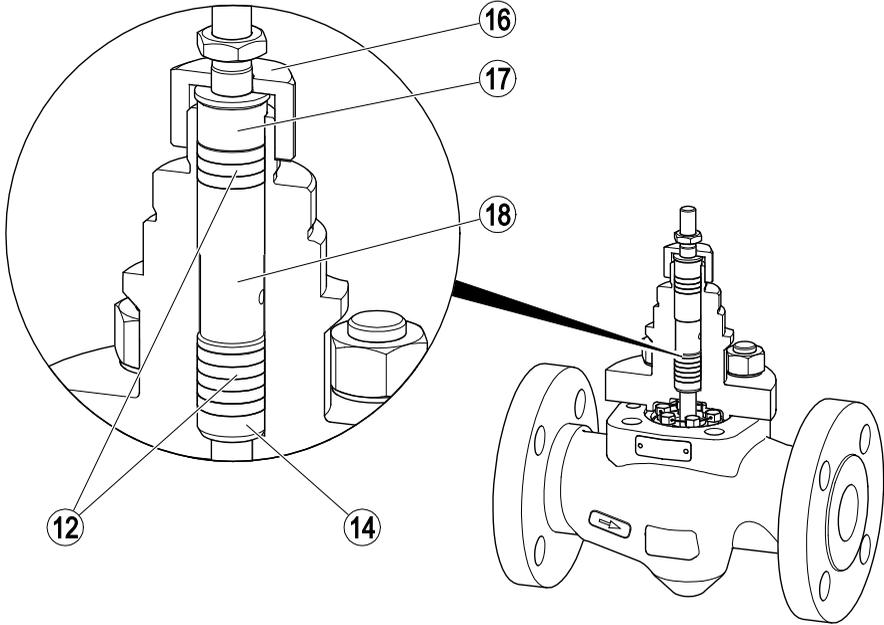
Stuffing box in equipment with rotary actuator



No.	Designation
11	Stuffing box gland
12	Packing rings
13	Distance sleeve

No.	Designation
14	Base bushing
15	Hinged bolts

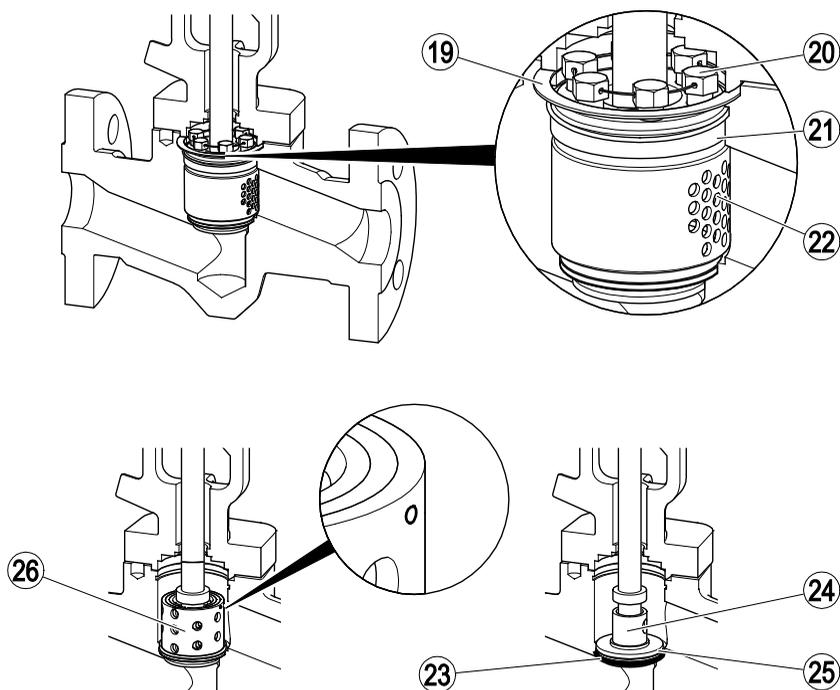
Stuffing box in equipment with pneumatic diaphragm actuator



No.	Designation
12	Packing rings
14	Base bushing
16	Union nut

No.	Designation
17	Packing gland
18	Grooved ring

The following items are fitted inside the equipment:



No.	Designation
19	Body gasket
20	Hexagon-head screws with lock wire
21	Thrust ring
22	Anti-wear element (sleeve or ring - depending on equipment type)

No.	Designation
23	Gasket
24	Stem
25	Seat ring
26	Sleeve insert (pinned together with rivet)

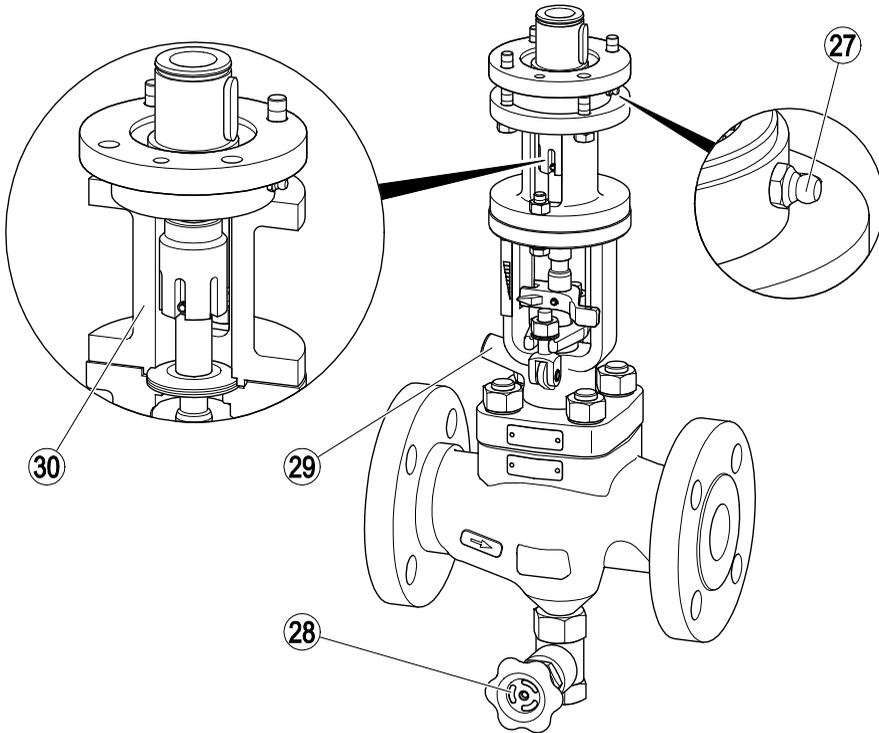
Optional extras

The following items are available as optional extras:

- ▶ Grease nipple (only on actuator with handwheel or electric rotary actuator)
- ▶ Connecting for sealing fluid
- ▶ Sampling valve
- ▶ Mechanical lift stop (not for equipment with pneumatic diaphragm actuator)



The stem lift in equipment fitted with a pneumatic diaphragm actuator can be limited by means of a handwheel attached to the actuator.



No.	Designation
27	Grease nipple
28	Sampling valve
29	Connecting for sealing fluid
30	Mechanical lift stop

Name plate

The following items are indicated on the name plate:

- ▶ Manufacturer
- ▶ Type designation
- ▶ Design
- ▶ Nominal size
- ▶ Pressure rating
- ▶ Max. service temperature
- ▶ Max. service pressure
- ▶ Max. admissible differential pressure
- ▶ Flow characteristic
- ▶ CE marking
- ▶ Serial number

The following items are indicated on the equipment body:

- ▶ Material
- ▶ Identification marking of material testing
- ▶ Batch code
- ▶ Direction of flow
- ▶ Manufacturing date (quarter/year)

Application of European Directives

Pressure Equipment Directive

The equipment conforms to this Directive (see "Declaration of Incorporation" section) and can be used for the following media:

- ▶ Fluids of group 2

ATEX Directive

The equipment has classification: CE Ex II 2G/D c X.

For use in potentially explosive atmospheres in zones (surrounding atmosphere to Directive 1999/92/EC) 1, 2, 21 and 22, please read and observe the following information:

The sign "X" in the Ex label signifies that operation at an excessive surface temperature caused by the medium must be avoided. The equipment itself does not generate additional surface temperatures.

Once installed, static electricity may arise between the equipment and the connected system. During use in potentially explosive atmospheres, the discharge or prevention of possible electrostatic charging is the responsibility of the manufacturer or owner of the system. If there is a possibility that medium might escape, e.g. via actuating devices or leaks in screwed couplings, the manufacturer or owner of the system must take this into consideration when dividing the area into zones.

The equipment classification and Declaration of Conformity do not apply to any electric, hydraulic or pneumatic drive that may be installed.

If using the equipment with a drive, the category of the drive may have an adverse effect on the equipment category 2G/D.

- Please read and observe the relevant information in the drive manufacturer's documentation.

Task and function

Purpose

The equipment is designed to reduce pressure in pipes through which the following fluids flow:

- ▶ water
- ▶ steam
- ▶ condensed water

In addition the equipment can control the flowrate and the fluid level. The equipment can stop the fluid flow completely, effecting a pipe seal to attain bubble-tight shut off.

The control edge prevents high flow velocities at the seat area during the opening and closing process, thereby minimizing wear on the seating surfaces.

Function

The equipment features a system of flash chambers where the differential pressure is reduced in stages and the flow is split up into many partial flows.

This decreases the noise level during operation and extends the service life of the equipment thanks to reduced wear.

The equipment is fitted with an externally actuated stem. During the opening process the stem controls the fluid flow by successively opening a series of flash chambers.

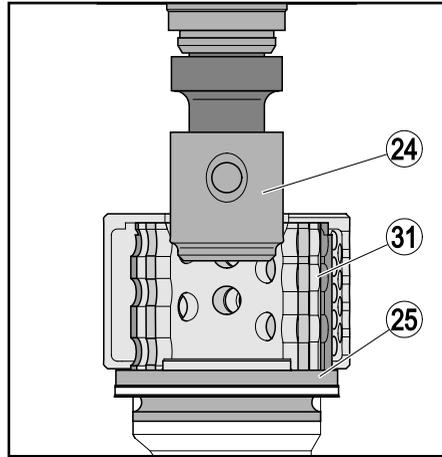
When the stem is in the closed position the fluid flow is completely stopped and bubble-tight closure is ensured.

When the equipment is closed the stem (24) is in the lowest position.

In this position the fluid flow is stopped.

During opening the stem is lifted off the seat ring (25). As a result the nozzle orifices (31) in the sleeves are opened successively.

When the stem is completely lifted, the fluid can flow through all nozzle sleeves and the max. fluid flowrate is reached.



The optional mechanical lift stop allows you to set a minimum flowrate that will constantly flow through the equipment.

Storing and transporting the equipment

Attention!

Equipment can be damaged if stored or transported improperly.

- Close all openings with the sealing plugs or covers supplied with the equipment or use similar sealing covers.
- Protect the equipment against moisture and corrosive atmospheres.
- Please contact the manufacturer if the specified transport and/or storage requirements cannot be met.

Storing the equipment

- Please observe the following items when storing the equipment:
 - ▶ Make sure that the equipment is completely disconnected.
 - ▶ Before storage make sure that the equipment is dry and free from any fluid residues.
 - ▶ The equipment must be protected by its packaging. The packaging must protect the equipment from moisture and mechanical damage.
 - ▶ The equipment must be stored in a horizontal position.
 - ▶ Make sure that the stem of the equipment is moved at least every two months in order to avoid that the packing rings get stuck.



CAUTION

There is a risk of getting crushed by the spindle.

- Wear sturdy leather gloves when working on the spindle or stem.
- Make sure that no persons are in the area of the spindle or stem.
- Move the spindle slowly.

-
- Follow all instructions given in the installation & operating manual of the actuator.
 - Make sure that all these requirements are always met when storing the equipment.
 - Please contact the manufacturer if you cannot comply with the recommended storage conditions.

Transporting the equipment



DANGER

Risk of bruises if the equipment or component parts fall down.

- Always wear protective gear when working on the equipment.
- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- To lift the equipment use only the valve body or the bonnet.
- Make sure that nobody is standing below the lifted equipment.

The protective gear must comprise at least the following:

- ▶ Safety helmet to EN 397
- ▶ Safety footwear to EN ISO 20345
- ▶ Protective leather gloves to EN 388

For more information on suitable safety clothing and safety gear refer to the safety data sheet of the fluid in question.

The lifting gear must be of sufficient strength for the equipment including the actuator. For more information on the weight of the equipment see the attached documents. For more information on the weight of the actuator see the documents provided by the actuator manufacturer.

For more information on lifting points and the centres of mass see the attached documents.

- Carefully clean the equipment before transportation.
- Meet the requirements for storage also when transporting the equipment.
- Prior to transport seal off connections with sealing plugs.



If you do not have the sealing plugs supplied with the equipment use appropriate seal caps to seal off the connections.

- For short distances (only a few metres) you can transport the equipment unpacked.
- When transporting the equipment over larger distances use the original packaging.
- If you do not have the original packaging use a box that protects the equipment adequately against corrosion and physical damage.

Mounting and connecting the equipment



DANGER

Risk of bruises if the equipment or component parts fall down.

- Always wear protective gear when working on the equipment.
- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- To lift the equipment use only the valve body or the bonnet.
- Make sure that nobody is standing below the lifted equipment.

The protective gear must comprise at least the following:

- ◆ Safety helmet to EN 397
- ◆ Safety footwear to EN ISO 20345
- ◆ Protective leather gloves to EN 388

For more information on suitable safety clothing and safety gear refer to the safety data sheet of the fluid in question.

The lifting gear must be of sufficient strength for the equipment including the actuator.

For more information on the weight of the equipment see the attached documents. For more information on the weight of the actuator see the documents provided by the actuator manufacturer.

Preparing installation

- Remove the transport packaging.
- Check the equipment for transport damage.
- If you detect any transport damage, please contact the manufacturer.

When supplied by the factory, the connections may be sealed off with sealing plugs.

- Remove sealing plugs before mounting the equipment.
- Keep the sealing plugs and the packing for further use.



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

- Drain pipes until they are empty.

- Switch the installation off and protect it against unauthorised or unintended re-activation.

Connecting the equipment



DANGER

Incorrectly connected equipment can result in accidents with extremely severe injuries or death.

- Make sure that only specialist personnel connect the equipment to the pipe.
- Make sure that the direction of flow in the pipe matches the flow direction arrow on the equipment.
- Make sure that the connected pipe does not subject the body to any stress (forces or torques) during installation and operation.

Specialist personnel must have knowledge and experience of the type of pipe connection used.



An arrow indicating the flow direction is provided on both sides of the inlet of the valve body.

Attention!

Equipment will be damaged if the support is undersized or in the wrong place.

- Mount the support to the pipes next to the equipment.
- Make sure that the supports are strong enough to hold the weight of the equipment and to withstand the forces that occur during operation.
- Contact the manufacturer if you want to mount the supports directly to the equipment.



The equipment is designed for installation with the stem in vertical position and the actuator mounted on top.

Other installation positions are possible.

- Contact the manufacturer if you want to mount the equipment in a different position of installation.
 - Mount the equipment in the desired installation position.
 - Make sure that the equipment is supported by the pipes.
-  If the supports can only be attached directly to the equipment ask the manufacturer for more information on possible positions for the supports.
- Connect the end connections of the equipment properly to the pipes.

Some materials require a subsequent heat treatment of the welds after the equipment has been welded in place. If you want to perform a heat treatment please observe the following notes:



You do not have to remove the internals of the equipment in order to perform the heat treatment.

Attention!

The equipment might get damaged.

- Make sure that only qualified personnel carries out the heat treatment.
- Before starting the heat treatment make sure that the equipment is not insulated.

Specialist personnel must be highly qualified and fully experienced in making welded joints with the type of material used. For information on the materials of the equipment see the nameplate on the equipment.

- Make sure that the valve is at its middle position, i. e. half stroke.

- Make sure that only qualified personnel carries out the heat treatment.
- After the heat treatment you may insulate the equipment if necessary.



DANGER

Incorrectly connected equipment can cause fatal accidents or severe injuries.

- Make sure that only qualified skilled personnel connect the actuator to the power supply.
- Follow all instructions given by the actuator manufacturer.

Specialist personnel must be highly qualified and fully experienced in connecting the power supply in question.

- Connect the actuator properly with the mechanical connection of the equipment.



For more details on how to connect the actuator with the stem and how to mount the mechanical connection see page 37.

- Connect the actuator properly to its power supply.

Checking the function

- Make sure that the equipment is safely mounted and that all connections are made correctly.



CAUTION

There is a risk of getting crushed by the spindle.

- Wear sturdy leather gloves when working on the spindle or stem.
- Make sure that no persons are in the area of the spindle or stem.
- Move the spindle slowly.

- Carry out a performance test to check the functions of the equipment.

The stem must perform at least one full valve stroke.

- Change, if necessary, the actuator settings as indicated in the operating manual of the actuator.

Starting up the equipment

To finish the installation work please perform the following jobs:

- Adjust the stuffing box
- Rinse the equipment
- Adjust the mechanical lift stop (if provided)
- Flush the installed equipment as described on page 26.

Adjusting the gland seal



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

In equipment with pneumatic diaphragm actuator the stuffing box can be adjusted via the union nut.

In equipment with other actuators the stuffing box can be adjusted via the hinged bolts.

The following section describes how to adjust the stuffing box in equipment with electric rotary actuator.

The adjustment procedure is the same for other types of equipment.

The torque required for tightening the stuffing box screws depends on the type.

The torque required for tightening the screwed union depends on the condition of the stuffing-box packing. Tighten the screwed union until the following requirements are met:

- ▶ The stuffing box must not leak.
- ▶ The movement of the stem must not be impaired by the stuffing box.
- If it is not possible to meet both requirements you have to replace the stuffing-box packing.
- Tighten the nuts on the two hinged bolts evenly.
- Allow medium to flow through the equipment.
- Move the spindle fully several times.
- Tighten the hinged bolts evenly again so that no medium escapes.
- Check that the spindle can move easily.
- If necessary, slacken the hinged bolts evenly.

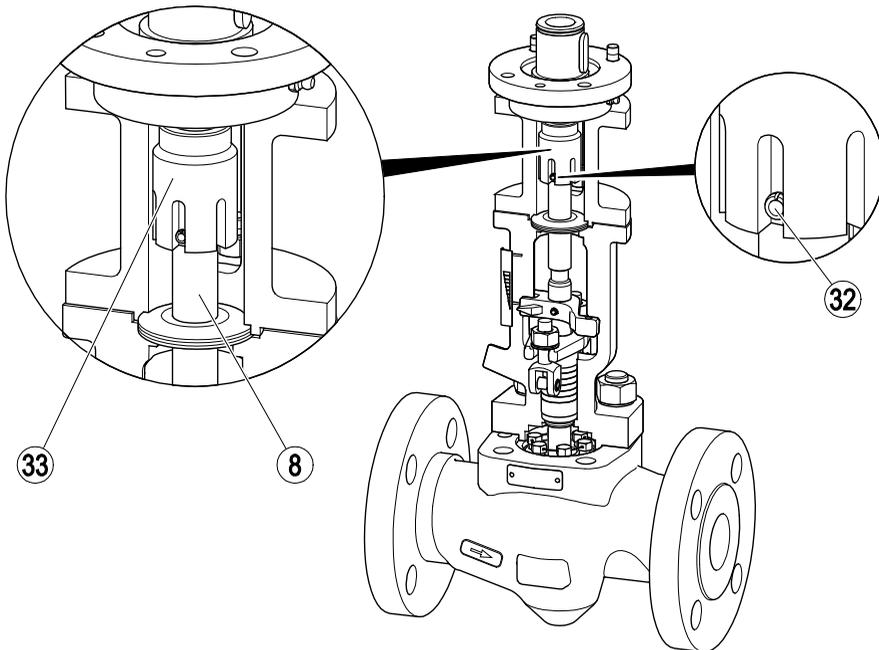
The stuffing box is correctly adjusted if no medium escapes and the spindle can move easily.

Adjusting the mechanical stroke limiter

You can adjust the lowest stem position using the optional stroke limiter (8) on the spindle. This ensures that an adjustable minimum quantity of medium continually flows through the equipment.

The optional stroke limiter is only available for equipment with a rotary actuator. For equipment with a pneumatic diaphragm actuator, you can adjust the stem stroke via a handwheel on the actuator.

- Lift the stem until the desired minimum stem lift is reached.
- Loosen the spring pin (32).
- Turn the adjustment nut (33) downwards until it hits the stop.
- Re-insert the spring pin (7).



Turning the sleeve insert

The equipment can be adapted to the operating conditions.

For this purpose shift the sleeves of the sleeve insert relative to each other.

For more information on shifting the sleeve insert see the drawing "Adjusting the nozzle" or contact the manufacturer.

- Remove the sleeve insert as described in the section "*Disassembling the equipment*" on page 28.
- Knock the parallel grooved pin out of the sleeve insert using a copper mandrel.
- Turn the sleeves in accordance with the manufacturer's instructions.
- If necessary, you may have to drill new holes as per the manufacturer's instructions.
- Drive a new parallel grooved pin into the sleeve insert using a copper mandrel.
- Install the sleeve insert as described in the section "*Assembling the equipment*" on page 37.

Operating the equipment

Do not work on the equipment while it is operating.



DANGER

Risk of bruises when working on the equipment during operation.

- Switch off the equipment if you have to work close to any moving equipment parts.
- Make sure that the equipment cannot be switched on inadvertently.

The stem of the equipment is moved according to the actuator setting.

- If you want to change the settings please follow the instructions given in the operating manual for the actuator.

In equipment with a mechanical stroke limiter, you can determine the minimum stroke.

- To do so, proceed as described in the section "*Adjusting the mechanical stroke limiter*" on page 22.

Attention!

Damage to the equipment or malfunctions may occur if the stem is not moved for a longer period of time.

- Make sure that the stem performs at least one full stroke every two months.

After operation



DANGER

If the equipment is used in contaminated areas there is a risk of severe injuries or death caused by harmful substances in or on the equipment.

- Only qualified personnel are allowed to perform work on contaminated equipment.
- Always wear the protective clothing prescribed for contaminated areas when working on the equipment.
- Make sure that the equipment is completely decontaminated before carrying out any service work.
- Follow the pertinent instructions for handling the hazardous substances in question.



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.



DANGER

Risk of bruises when working on the equipment during operation.

- Switch off the equipment if you have to work close to any moving equipment parts.
- Make sure that the equipment cannot be switched on inadvertently.

Attention!

Damage to the equipment due to improper maintenance work.

- Make sure that only qualified personnel performs maintenance work.

A qualified person must be acquainted with and experienced in the following:

- Working on pressure equipment
- Lifting loads
- Assembling and disassembling the equipment
- The qualified personnel must observe and follow the instructions given in this operating manual and in the applicable documents.

Maintaining the equipment

Maintenance schedule

Interval	Component	Activity
2 months	Spindle	Move spindle by at least one complete stroke.
3 months	Stuffing box seal	Visually inspect to ensure tightness. Retighten a leaky stuffing box, replace if necessary.
	<ul style="list-style-type: none"> ▶ Connections ▶ Body gasket ▶ Positioning of spindle in gland seal ▶ Spindle 	Visually inspect the following points: <ul style="list-style-type: none"> ▶ Tightness ▶ Cleanliness ▶ Wear Replace leaky or worn components. Remove dirt.
	<ul style="list-style-type: none"> ▶ Stem ▶ Seat ring 	Check that the equipment closes correctly when the stem is in closed position by measuring the temperature. Replace leaky or worn components.
	Spindle bearing	Grease with the recommended grease (see next section) and a lint-free cloth.
	Lubricating nipples on spindle bearing (equipment with rotating motor)	Apply the recommended grease (see next section).
12 months	Secure actuator fastening	Check that screws and bolts are secure. Tighten loose screws to the specified torque. You can find information on the required torques in the actuator installation instructions.
36 months	Overall equipment	Check condition of inner parts. Check condition of spindle actuator. Replace faulty or worn components. Replace stuffing box. Replace body gasket and sealing ring before assembly.

Lubricating the equipment

Attention!

Equipment may be damaged if unsuitable lubricant is used.

- Use only specified lubricants.

- Use only lithium-saponified grease, penetration grade 2, with MoS₂ additive.

The following lubricants are recommended for lubricating the equipment:

- ▶ WINIX 5000
- Lubricate all moving parts of the equipment every three months.
- Lubricate the thread of the spindle and the sliding surfaces of the position indicator while operating the equipment at a speed of one stroke movement an hour.
- Keep lubricating until all old grease has exited the spindle bearing.

Removing dirt deposits

- To remove dirt deposits rinse the equipment with fresh water and wipe it with a clean, lint-free cloth.
- To remove any persistent residues use a cleaning agent that is suitable for the material and carefully wipe the equipment with a clean, lint-free cloth.

For information on the materials of the equipment see section *Disposing of the equipment*.

- For more information on material options please contact the manufacturer.

Replacing component parts

To replace a component part proceed as follows:

- Disassemble the equipment as described from page 28 onwards.
- Replace the component part with an original spare part from the manufacturer.

For details on how to order spare parts refer to the parts list.

- The gaskets of the equipment must be replaced in any case.
- Re-assemble the equipment as described from page 37 onwards.

Rinse the equipment

Rinse the equipment in order to remove any dirt particles or fluid residues inside the equipment.



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

Preparing equipment for rinsing

Remove all parts from the body before rinsing the equipment.

- Disassemble the equipment as described from page 28 onwards.
- Put a blind flange with gasket onto the body.

Contact the manufacturer to obtain information on suitable blind flanges.

- Fasten the blind flange and the gasket with the stud bolts and hexagon nuts for the upper part.
- Tighten the hexagon nuts with the same torque that is specified for tightening the upper part.

Rinsing equipment and pipes

You can rinse the equipment with the same fluid that is used during normal operation. You can also use a special cleaning agent.



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

Attention!

Equipment may be damaged by unsuitable cleaning fluid.

- Rinse the pipe with the same fluid that is used during normal operation.
- Make sure that the cleaning fluid does not damage the equipment material if you use a different fluid for cleaning than the normal operating fluid.
- Make sure that the cleaning fluid does not come into contact with the fluid used during normal operation.

For information on the materials of the equipment see section *Disposing of the equipment*.

- For more information on material options please contact the manufacturer.
- Switch on the installation and rinse the pipes.
- Check connections for leaks.
- After rinsing keep the installation switched on until the pipes are completely empty.
- Switch the installation off and protect it against unauthorised or unintended re-activation.

Mounting parts after rinsing

After rinsing re-install the removed parts to render the equipment operational.

- Undo the hexagon nuts of the blind flange.
- Remove the blind flange and the gasket.
- Keep the blind flange for further use.
- Re-assemble the equipment as described from page 37 onwards.

Disassembling the equipment

You have to disassemble the equipment if you want to

- ▶ rinse the pipes and the equipment
- ▶ service component parts
- ▶ replace or exchange component parts.



If you exchange component parts you can use the equipment for different application conditions.

For this purpose you do not have to remove the equipment from the installation.

- Ask the manufacturer for information on possible retrofitting modifications for your equipment.



CAUTION

Sharp edges on component parts can cause cuts.

- Wear industrial gloves when servicing equipment parts.

To dismantle and re-assemble the equipment use the following tools:

- ▶ Torque spanner (US: wrench) 20–550 Nm (depending on nominal size)
- ▶ Open-end spanner

For equipment of size DN 25 the following additional tool is required:

- ▶ Hexagon socket spanner (US: Allen wrench) A. F. 19 mm



The size of the tools depends on the equipment type.

- Use only tools of suitable size.

Preparing the equipment for disassembly



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.

- Shut off the pipes upstream and downstream of the equipment.



DANGER

Risk of bruises if the equipment or component parts fall down.

- Always wear protective gear when working on the equipment.
- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- To lift the equipment use only the valve body or the bonnet.
- Make sure that nobody is standing below the lifted equipment.

The protective gear must comprise at least the following:

- ◆ Safety helmet to EN 397
- ◆ Safety footwear to EN ISO 20345
- ◆ Protective leather gloves to EN 388

For more information on suitable safety clothing and safety gear refer to the safety data sheet of the fluid in question.

The lifting gear must be of sufficient strength for the equipment including the actuator.

For more information on the weight of the equipment see the attached documents. For more information on the weight of the actuator see the documents provided by the actuator manufacturer.

Connect the lifting gear to the equipment or part that you want to lift.

- For this purpose use a noose strap of sufficiently sturdy material.
- Attach the noose strap to the lifting points or a flange.



The space required for disassembling and re-assembling the equipment depends on the optional extras and the type of actuator.

For more information on the required service space see the attached drawings.

Attention!

The equipment or component parts may be damaged if it is disassembled or re-assembled in the wrong order.

- Always follow the sequence of activities described in the following sections.

Attention!

Equipment may be damaged if unsuitable tools are used.

- Use only tools that are suitable for the size of the equipment components.
 - If a tools list is supplied with the equipment, use only tools specified in this list.
 - For more information on suitable tools please contact the manufacturer.
-

Detaching actuator parts and removing the cap

If the equipment is fitted with an actuator first remove the actuator.

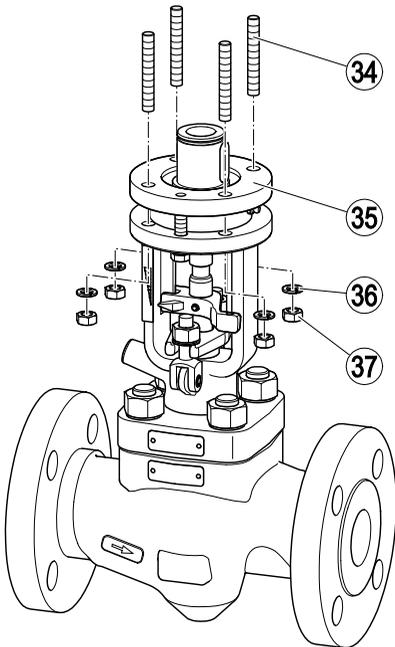
- Disconnect the actuator as described in the operating manual for the actuator.
- Remove the actuator as described in the operating manual for the actuator.

You can now remove the mechanical connection for the actuator from the equipment.

There are different procedures for equipment with rotary actuator and equipment with pneumatic diaphragm actuator.

Removing the rotary actuator

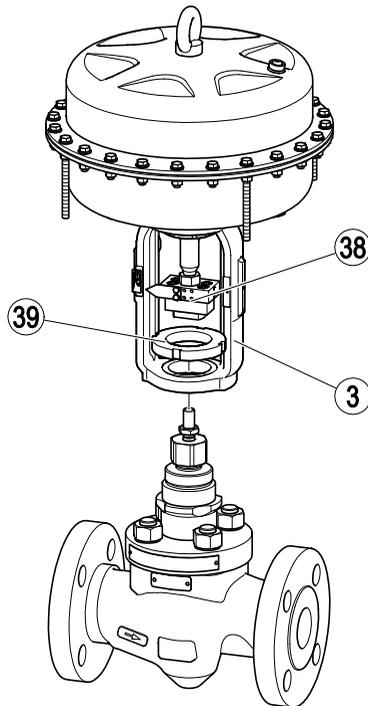
- Undo the nuts (37) on the stud bolts (34).
- Remove the locking washers (36) from the stud bolts.
- Lift off the actuator from the actuator flange (35).
- Remove the stud bolts (34).



Equipment that cannot be retrofitted with an electric actuator is provided with a handwheel which is firmly attached to the threaded bush.

Removing the pneumatic diaphragm actuator

- Unscrew the coupling (38) between the spindle and the actuator.
- Remove the groove nut (39).
- Lift off the bonnet (3) together with the actuator (3.).



The following steps are the same for both types of actuator.

- Remove the sealing fluid line (if mounted) from the connection (29).
- Unscrew the hexagon nuts (40) of the stud bolts (41) on the cover.

You can now take the bonnet with stem off the body.

Attention!

Equipment may not work properly or get damaged if parts are canted or tilted during removal work.

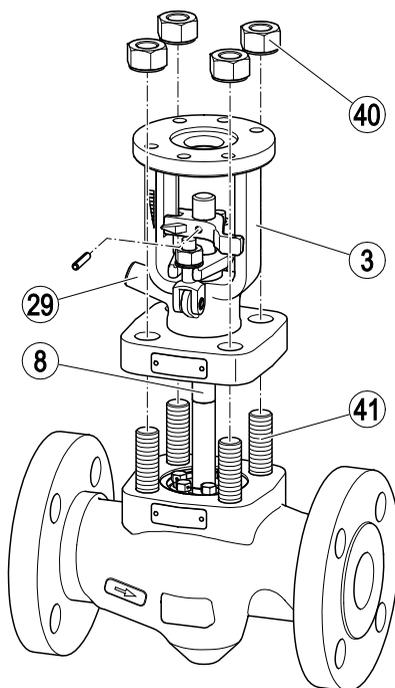
- Use suitable lifting gear to lift the components off the body.
- Make sure that the components are not canted or tilted.
- Make sure that the component parts are not damaged by physical shocks.

The required bearing capacity of the lifting gear depends on the equipment type. Contact the manufacturer for more information on the weights of the individual parts.

- Lift the cap (3) off the body together with the spindle (8).



The following drawing shows the equipment with actuator bearing for an electric rotary actuator.

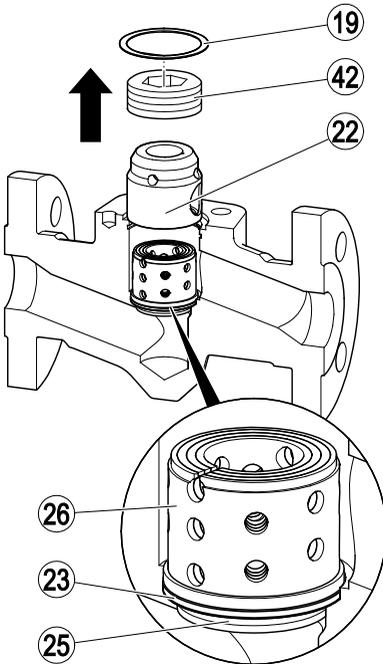


Removing inner parts

The procedure for removing the internals depends on the size of the equipment.

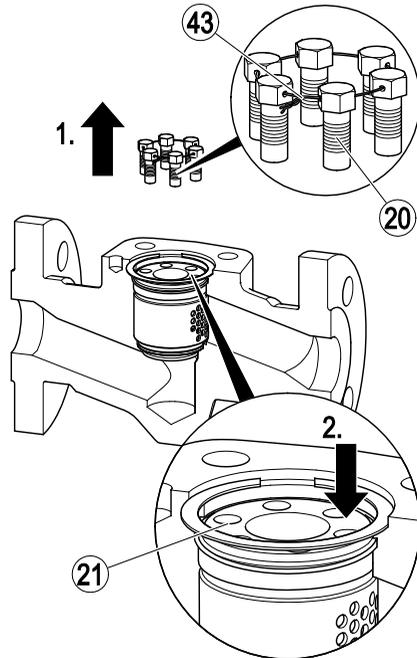
Equipment of size DN 25

- Loosen the nut (42).
- Take the body gasket (19) out of the body.
- Take the protective sleeve against wear (22) out of the body.
- Take the pinned sleeve insert (26) out of the body.
- Take the seat ring (25) out of the body.
- Take the gasket (23) out of the body.

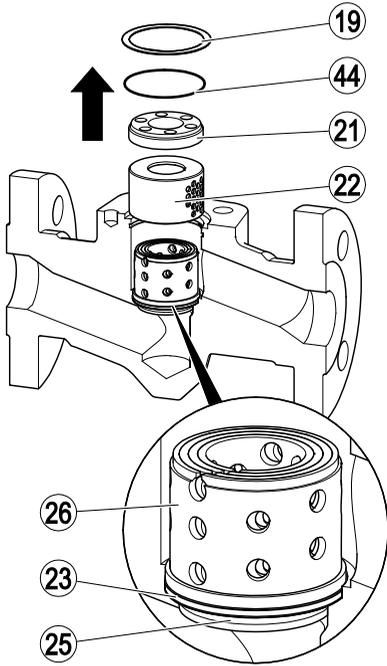


Equipment of size DN 50

- Remove the locking wire (43) from the hexagon-head cap screws (20).
- Loosen the hexagon-head cap screws (1).
- Push the thrust ring (21) downwards and hold it down (2.)

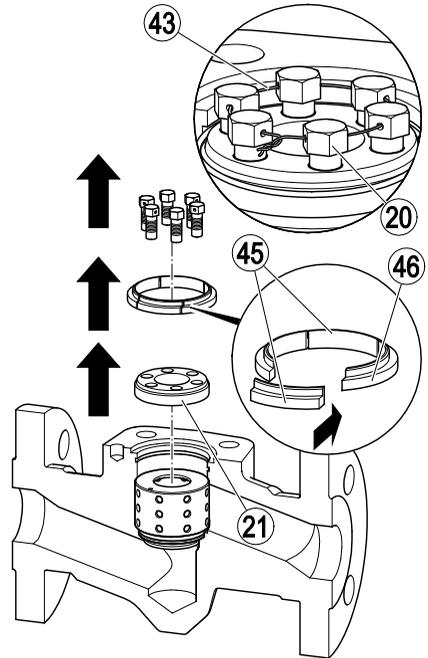


- Take the retaining ring (44) out of the body.
- Take the thrust ring (21) out of the body.
- Take the body gasket (19) out of the body.
- Take the protective sleeve against wear (22) out of the body.
- Take the pinned sleeve insert (26) out of the body.
- Take the pinned sleeve insert (26) out of the body.
- Take the seat ring (25) out of the body.
- Take the gasket (23) out of the body.

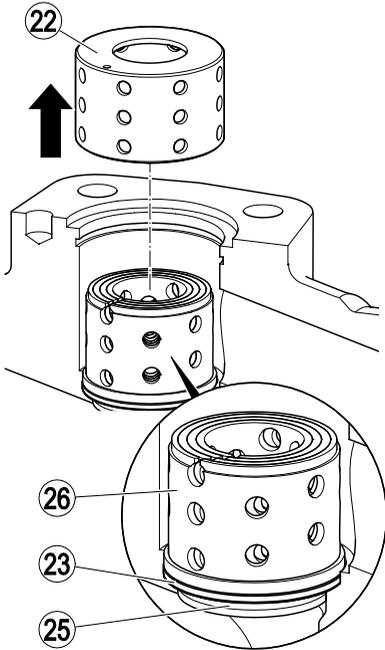


Equipment of size DN 80

- Remove the locking wire (43) from the hexagon head bolts (20).
- Loosen the hexagon head bolts.
- Take the smaller parts (45) out of the split ring.
- Take the larger section (46) of the split ring out of the body.
- Take the thrust ring (21) out of the body.

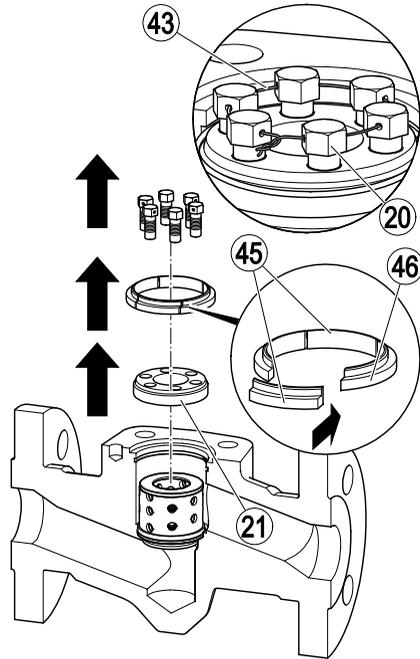


- Take the protective sleeve against wear (22) out of the body.
- Take the pinned sleeve insert (26) out of the body.
- Take the seat ring (25) out of the body.
- Take the sealing ring (23) out of the body.

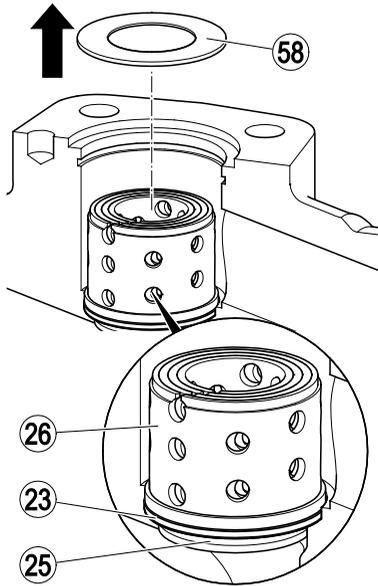


Equipment of size DN 100–150

- Remove the locking wire (43) from the hexagon head bolts (20).
- Loosen the hexagon head bolts.
- Take the smaller parts (45) out of the split ring.
- Take the larger section (46) of the split ring out of the body.
- Take the thrust ring (21) out of the body.



- Take the ring (58) out of the body.
- Take the pinned sleeve insert (26) out of the body.
- Take the seat ring (25) out of the body.
- Take the sealing ring (23) out of the body.



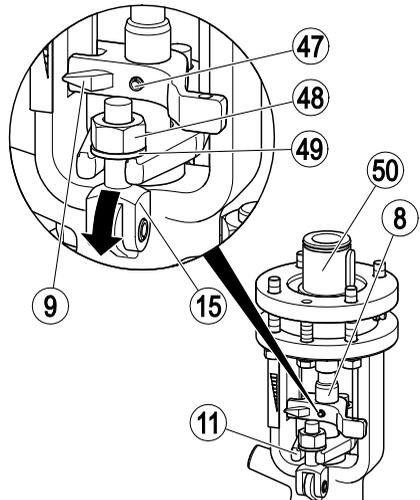
Removing the gland seal

i You only have to dismantle the stuffing box if you want to exchange parts of the stuffing-box packing.

i There are different procedures for equipment with rotary actuator and equipment with pneumatic diaphragm actuator.

Removing the stuffing box in equipment with rotary actuator

- Knock the dowel pin (47) out of the position indicator (9).
- Loosen the hexagon nuts (48) on the hinged bolts (15).
- Fold the hinged bolts to the side.
- Remove the washers (49).
- Screw the spindle (8) out of the threaded bush (50).
- Pull the spindle out of the cap.
- Remove the stuffing box gland (11).





The number of pure graphite rings depends on the size of the equipment.

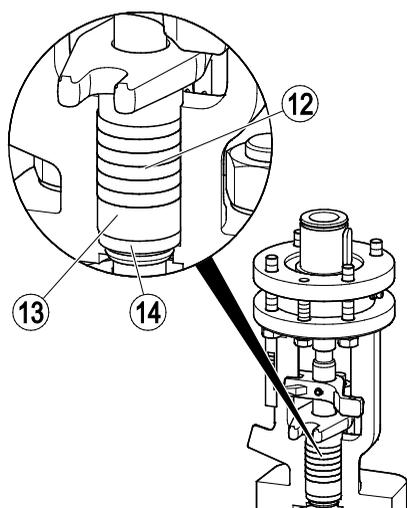
- Make a note of the type and order of the individual packing rings for their later re-installation.

Attention!

The packing rings may get damaged.

- Make sure you do not damage the packing rings during installation and removal.
- When installing and removing the packing rings never use force. Make sure that the packing rings are correctly positioned and not skewed.

- Position a punch made from aluminium or copper onto the base bushing (14).
- Force the rings out of the stuffing-box packing:
 - ▮ Packing rings (12)
 - ▮ Distance sleeve (13)
 - ▮ Grooved ring (if provided)



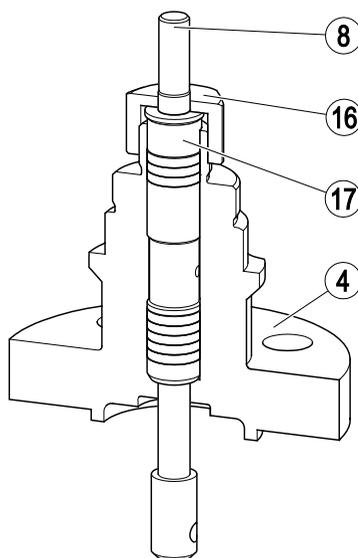
- Replace all worn or damaged parts.
- Clean all dirty parts.

Removing the stuffing box in equipment with pneumatic diaphragm actuator

The body cover must be detached in order to remove the gland seal.

Removal of the cover is described on page 30.

- Remove the union nut (16).
- Remove the stuffing box bush (17).
- Pull the spindle (8) out of the cover (4).



The number of pure graphite rings depends on the size of the equipment.

- Make a note of the type and order of the individual packing rings for their later re-installation.

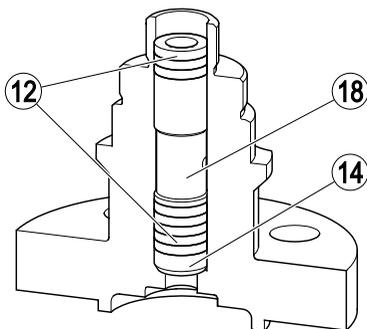
- Check the stuffing-box chamber and all disassembled parts for signs of damage.

Attention!

The packing rings may get damaged.

- Make sure you do not damage the packing rings during installation and removal.
- When installing and removing the packing rings never use force. Make sure that the packing rings are correctly positioned and not skewed.

-
- Position a punch made from aluminium or copper onto the base bushing (14).
 - Force the rings out of the stuffing-box packing:
 - ▶ Packing rings (12)
 - ▶ Grooved ring (18)



- Check the stuffing-box chamber and all disassembled parts for signs of damage.
- Replace all worn or damaged parts.
- Clean all dirty parts.

Detaching the stem from the spindle



The stem and spindle are connected by a rivet pin. Only separate the stem and spindle in order to replace damaged parts.

- Use a punch to knock out the rivet.
- Check all parts for signs of damage.
- Replace all worn or damaged parts.

Dismantling the sleeve insert



The sleeve insert is pinned together with a slotted straight pin. You only have to disassemble the sleeve insert if you want to replace sleeves.

- Use a punch to knock the slotted straight pin out of the sleeve insert.

Assembling the equipment

Work prior to re-installation



CAUTION

Sharp edges on component parts can cause cuts.

- Wear industrial gloves when servicing equipment parts.
-
- Clean all component parts before re-installing them.

Attention!

The equipment may leak if seals are damaged.

- Always insert new packing rings and a new body gasket when assembling the equipment.
- Inspect all seals and packing rings before installation to ensure they are in perfect condition.
- Replace damaged seals and packing rings.

- Make sure that the sealing surfaces of the stem and seat are correctly surfaced in relation to one another.
- Check all component parts.
- Replace all gaskets and all worn or damaged parts.
- Replace the two main gaskets and any damaged components.

Attention!

Equipment may not work properly or get damaged if parts are tilted or skewed when installed.

- Use suitable lifting gear to mount the component parts.
- Do not tilt or skew the component parts during installation.
- During installation make sure that the component parts are not damaged by physical shocks.

The required bearing capacity of the lifting gear depends on the equipment type. Contact the manufacturer for more information on the weights of the individual parts.

Fitting the sleeve insert

- Assemble and align the sleeve insert.

Make sure that the holes in the sleeves for the slotted straight pin are in alignment. For more information on how to adjust the sleeve insert refer to the manufacturer.

- Use a punch to knock the slotted straight pin into the sleeve insert.

Connecting the stem to the spindle

- Align the stem and spindle so that the holes are lined up.
- Drive a new rivet pin into the hole.

Mounting the gland packing

Attention!

Malfunctions may occur if the packing rings are damaged.

- Before installation discard and replace any damaged packing rings.
- Make sure that the packing rings are correctly positioned and not damaged or skewed when fitted.



There are different procedures for equipment with rotary actuator and equipment with pneumatic diaphragm actuator.

Mounting the stuffing box in equipment with rotary actuator

Attention!

The stem may be damaged if not installed with due care.

- Do not tilt the spindle during installation.
- Make sure the control notch and seat of the stem are not damaged by impact on hard surfaces.

The stem and spindle are pinned and installed together.

- Push the spindle halfway into the cap.
- Insert the base bushing (14) in the cap.

Attention!

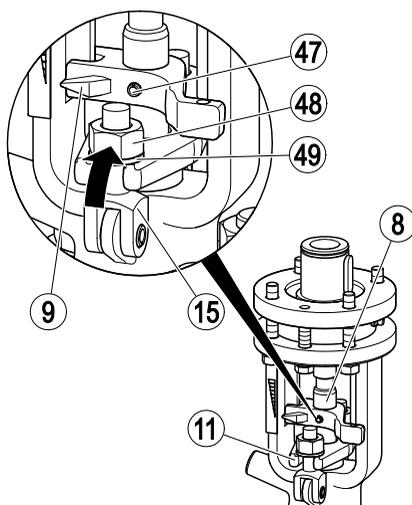
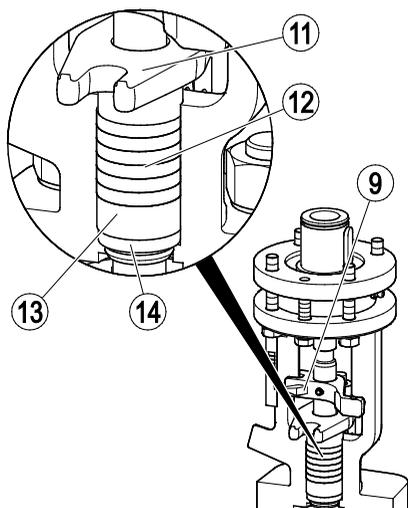
Malfunctions may occur if the packing rings are fitted incorrectly.

- Make sure that the packing rings of the stuffing box are inserted in the following order:
-

i The number of pure graphite rings depends on the size of the equipment. The exact number is indicated in the parts list.

➤ For more detailed information please contact the manufacturer.

- Put the following parts of the stuffing-box packing into the stuffing-box bore:
 - ▶ Distance sleeve (13)
 - ▶ Grooved ring (if provided)
 - ▶ Packing rings (12)
- Position the stuffing box gland (11) on the spindle.
- Place the scale marking indicator (9) on the spindle.



The torque required for tightening the screwed union depends on the condition of the stuffing-box packing. Tighten the screwed union until the following requirements are met:

- ▶ The stuffing box must not leak.
 - ▶ The movement of the stem must not be impaired by the stuffing box.
- If it is not possible to meet both requirements you have to replace the stuffing-box packing.

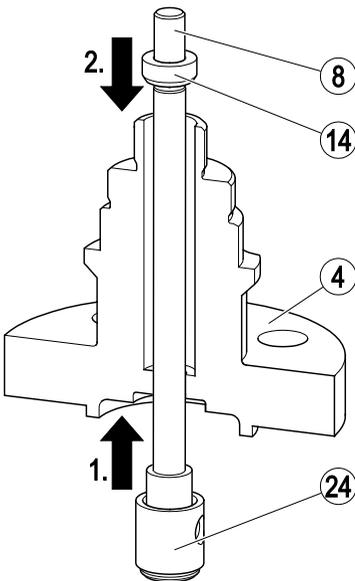
- Align the scale marking indicator (9) so that the hole for the dowel pin (47) is located above the hole in the spindle (8).
- Drive the dowel pin (47) into the holes using a mandrel.
- Fold up the hinged bolts (15) in the slots of the stuffing box gland (11).
- Place the shims (49) and hexagon nuts (48) on the hinged bolts.

Mounting the stuffing box in equipment with pneumatic diaphragm actuator

Attention!

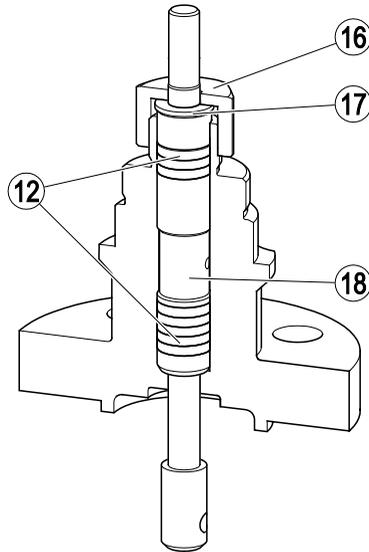
The stem may be damaged if not installed with due care.

- Do not tilt the spindle during installation.
 - Make sure the control notch and seat of the stem are not damaged by impact on hard surfaces.
-
- Insert the spindle (8) and stem (24) fully in the cover (4) (1.).
 - Insert the base bushing (14) in the cap (2.).



The number of pure graphite rings depends on the size of the equipment. The exact number is indicated in the parts list.

- For more detailed information please contact the manufacturer.
- Put the following parts of the stuffing-box packing into the stuffing-box bore:
 - ▶ Packing rings (12)
 - ▶ Grooved ring (18)
- Put the packing gland (17) into the stuffing-box bore.
- Tighten the union nuts (16) hand tight.



Attention!

Malfunctions may occur if the packing rings are fitted incorrectly.

- Make sure that the packing rings of the stuffing box are inserted in the following order:

Installing inner parts



DANGER

Risk of bruises if the equipment or component parts fall down.

- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- Make sure that nobody is standing below the lifted equipment.

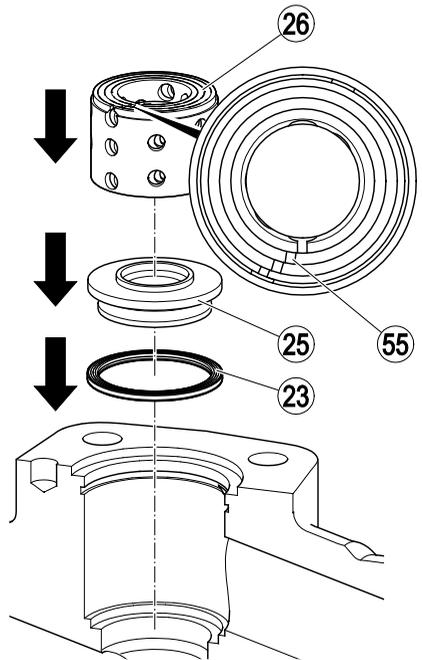
Attention!

Equipment may not work properly or get damaged if parts are tilted or skewed when installed.

- Use suitable lifting gear to mount the component parts.
- Do not tilt or skew the component parts during installation.
- During installation make sure that the component parts are not damaged by physical shocks.

The required bearing capacity of the lifting gear depends on the equipment type. Contact the manufacturer for more information on the weights of the individual parts.

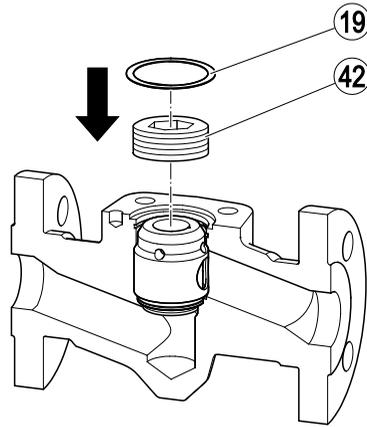
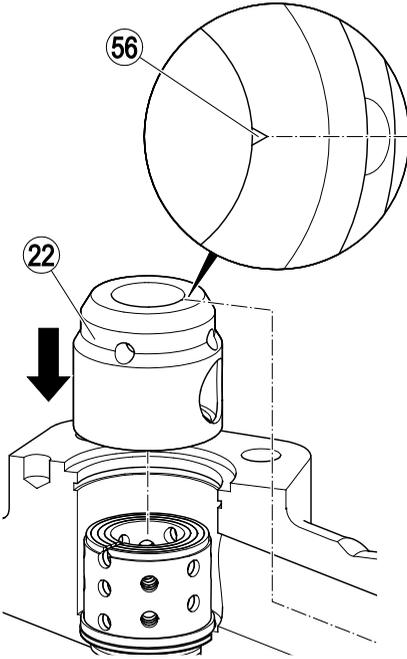
- Clean the sealing surface for the sealing ring in the body.
- Insert a new sealing ring (23) in the body.
- Insert the seat ring (25) in the body.
- Install the sleeve insert (26) in such a way that the adjusting slots (55) face upward.



The next steps depend on the size of the equipment.

Mounting internals of equipment size DN 25

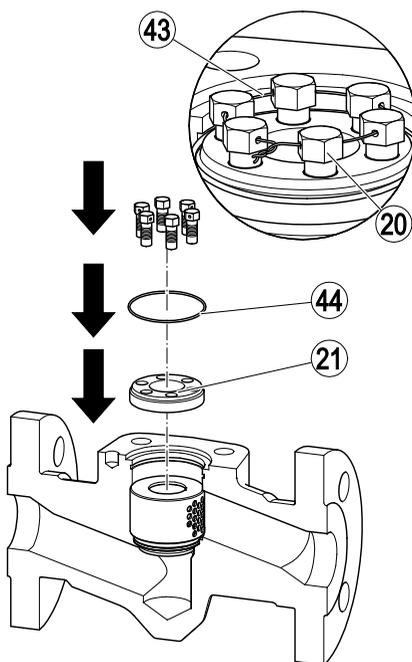
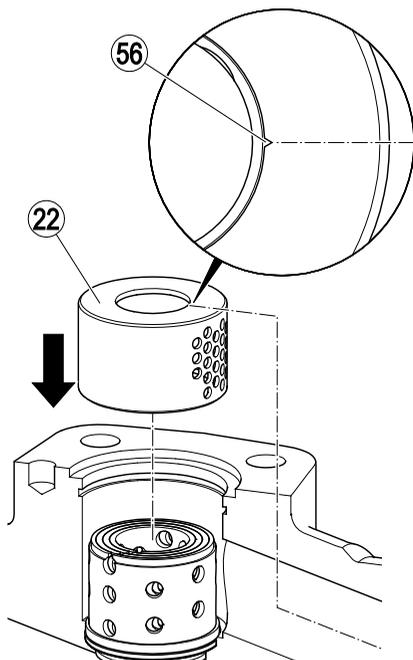
- Put the protective sleeve against wear (22) onto the sleeve insert and make sure that the marking notch (56) is centrally aligned and points towards the outlet.



- Apply lubricant to the socket-head cap screw (42).
- Screw the socket-head cap screw (42) into the body.
- Tighten the socket-head cap screw with a torque of 160 Nm.
- Insert a new body gasket (19).

Mounting internals of equipment size DN 50

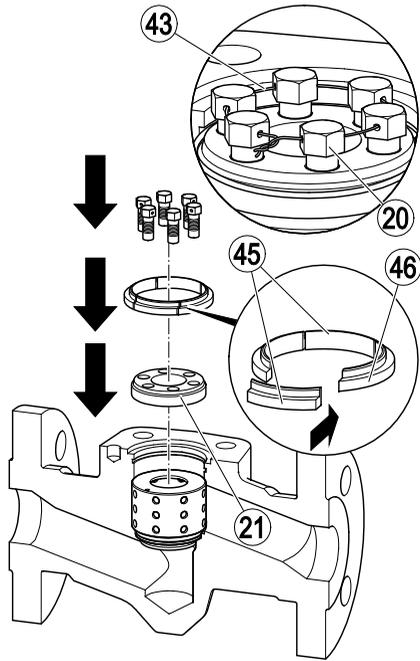
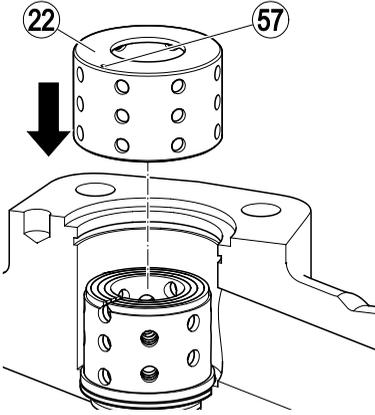
- Put the protective sleeve against wear (22) onto the sleeve insert and make sure that the marking notch (56) is centrally aligned and points towards the outlet.



- Put the thrust ring (21) into the body.
- Insert the retaining ring (44) into the body.
- Apply lubricant to the hexagon-head cap screws (20).
- Screw the hexagon-head cap screws into the thrust ring.
- Tighten the hexagon-head cap screws with a torque of 40 Nm.
- Secure the hexagon-head cap screws with the locking wire (43).

Mounting internals of equipment size DN 80

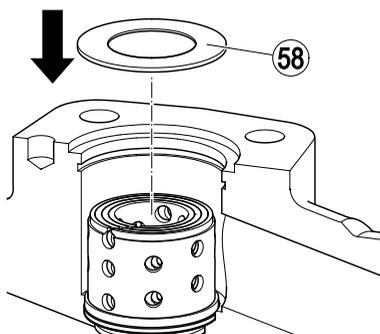
- Place the protective sleeve against wear (22) on the sleeve insert.
- Align the protective sleeve against wear so that the hole (57) is positioned above the slot in the outermost sleeve.



- Put the thrust ring (21) into the body.
- Insert the large parts of the segmented ring (46) into the body.
- To fix the large parts of the segmented ring insert the small parts (45) into the body.
- Screw the hexagon-head cap screws (20) into the thrust ring.
- Tighten the hexagon-head cap screws with a torque of 100 Nm.
- Secure the hexagon-head cap screws with the locking wire (43).

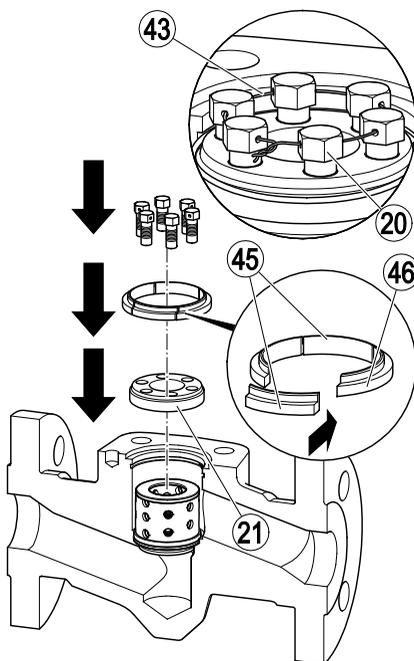
Mounting internals of equipment sizes DN 100 and 150

- Put the ring (58) onto the sleeve insert.



- Put the thrust ring (21) into the body.
- Insert the large parts of the segmented ring (46) into the body.
- To fix the large parts of the segmented ring insert the small parts (45) into the body.
- Screw the hexagon-head cap screws (20) into the thrust ring.
- Tighten the hexagon-head cap screws with a torque of 100 Nm.

- Secure the hexagon-head cap screws with the locking wire (43).



Fitting the cap in equipment with a rotary actuator

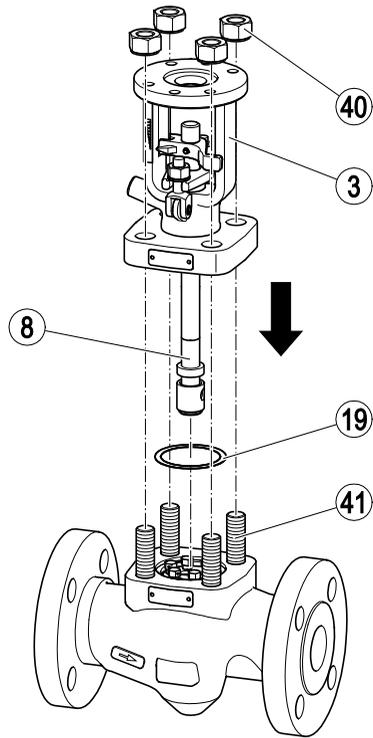


DANGER

Risk of bruises if the equipment or component parts fall down.

- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- Make sure that nobody is standing below the lifted equipment.

- Inspect the sealing surfaces in the body and on the cap for damage.
- Replace damaged parts of the equipment.
- Insert a new gasket (19).
- Clean the sealing surfaces.
- Coat the thread of the stud bolts (41) with high-temperature paste.
- Position the cap (3) and spindle (8) on the body.
- Place the nuts (40) on the stud bolts.



Attention!

Malfunctions due to incorrect tightening torques.

- Tighten the screws, nuts and bolts listed in the following table only with the indicated torques.

DN [mm (inch)]	Tightening torque [Nm]
25 (1'')	50
50 (2'')	150
80 (3'')	180
100 (4'')	300
150 (6'')	550

- Tighten the nuts crosswise and evenly to the specified torque.
- With each round of tightening, check that the spindle moves easily in the gland seal.
- Screw the sealing fluid line (if provided) to the connection for the sealing fluid.
- If necessary, adjust the stuffing box as described on page 20.

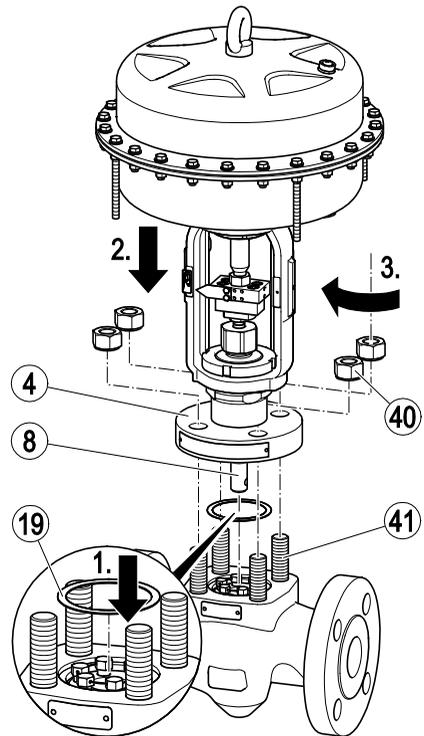
Fitting the cover on equipment with a pneumatic diaphragm actuator



DANGER

Risk of bruises if the equipment or component parts fall down.

- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
 - Make sure that the equipment cannot topple over.
 - Make sure that nobody is standing below the lifted equipment.
-
- Inspect the sealing surfaces in the body and on the cover for damage.
 - Replace damaged parts of the equipment.
 - Clean the sealing surfaces.
 - Coat the thread of the stud bolts (41) with high-temperature paste.
 - Make sure that a new body gasket (19) is inserted in the body (1.).
 - Position the cover (4) and spindle (8) on the body (2.).
 - Place the nuts (40) on the stud bolts (3).



Attention!

Malfunctions due to incorrect tightening torques.

- Tighten the screws, nuts and bolts listed in the following table only with the indicated torques.

DN [mm (inch)]	Tightening torque [Nm]
25 (1")	50
50 (2")	150
80 (3")	180
100 (4")	300
150 (6")	550

- Tighten the nuts crosswise and evenly to the specified torque.
- With each round of tightening, check that the spindle moves easily in the gland seal.
- Screw the sealing fluid line (if provided) to the connection for the sealing fluid.
- If necessary, adjust the stuffing box as described on page 20.

Installing the rotary actuator

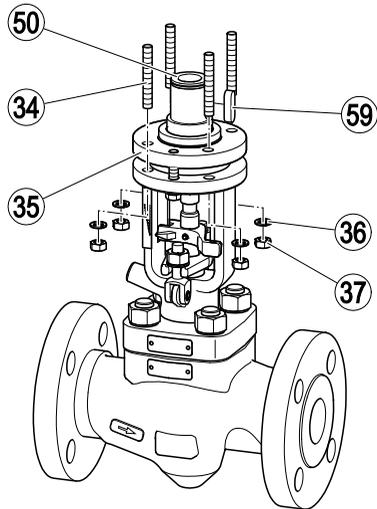


DANGER

Risk of bruises if the equipment or component parts fall down.

- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- Make sure that nobody is standing below the lifted equipment.

- Put the feather key (59) into the threaded bush (50).
- Screw the stud bolts (34) handtight into the actuator.
- Put the actuator onto the actuator flange (35).
- Put the locking washers (36) onto the stud bolts.
- Screw the nuts (37) onto the stud bolts.



- Tighten the nuts with a torque of 40 Nm or according to the specification of the actuator manufacturer.

Installing the pneumatic diaphragm actuator

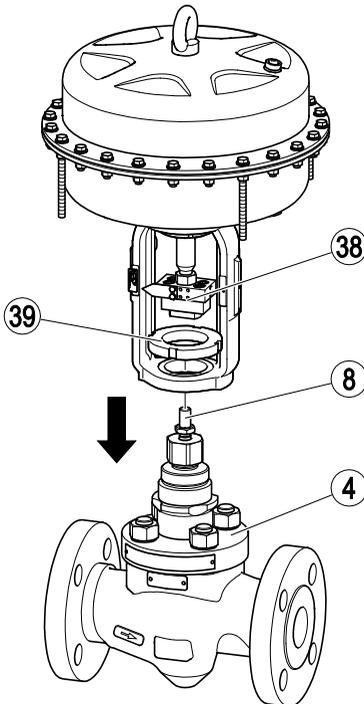


DANGER

Risk of bruises if the equipment or component parts fall down.

- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- Make sure that nobody is standing below the lifted equipment.

- Place the actuator on the cover (4).
- Hand-tighten the groove nut (39).
- Install the coupling (38) between the spindle (8) and the actuator spindle.



Attention!

The equipment may suffer damage or malfunctions if actuator parts are not correctly aligned.

- Make sure that the spindle is connected flush with the actuator spindle.

Connecting the actuator

- Connect the actuator properly to its power supply.

Completing assembly

- Bring the equipment back into operation as described on page 20.

Servicing the equipment and installing spare parts

You may exchange the following component parts in case of wear or damage:



The material specification and stock code numbers of the component parts are indicated in the supplied parts list.

- Disassemble the equipment as described from page 28 onwards.
 - Remove the defective component part from the equipment.
-

Attention!

Equipment may leak if the gaskets are damaged.

- Always insert new main gaskets when assembling the equipment.
 - Check all gaskets, seals and packing rings before installing them.
 - Replace any damaged gasket, seal or packing ring.
-

- Mount the new component part.
- Check all component parts before re-installing them.
- Replace defective component parts.
- Replace the joint ring and the body gasket.
- Re-assemble the equipment as described from page 37 onwards.

Troubleshooting

Problem	Cause	Remedy
The stem moves with difficulty or jerky.	Malfunction in actuator.	Follow the instructions in the operating manual for the actuator.
The actuator switches off automatically.	Malfunction in controller.	Follow the instructions in the operating manual for the controller.
	The stuffing box packing affects the stem lift.	Slightly loosen the stuffing-box screw. Replace the stuffing box packing if it keeps affecting the stem lift.
The flowrate is too small.	The stem lift is affected by foreign matter. The nozzles are dirty or clogged by foreign particles.	Rinse the installation. If necessary disassemble the equipment and clean the component parts.
During operation loud noises are audible.	The nozzles are dirty or clogged by foreign particles.	
The stuffing box is leaking.	The stuffing box has not been tightened enough.	Adjust the stuffing-box packing. Make sure that the stuffing box does not impair the movement of the stem and that it does not leak.
	The stuffing-box packing is damaged.	Replace the stuffing-box packing.

- If faults occur that are not listed above or cannot be corrected, please contact our Technical Service or authorized agency in your country.

Putting the equipment out of operation

Removing harmful substances



DANGER

If the equipment is used in contaminated areas there is a risk of severe injuries or death caused by harmful substances in or on the equipment.

- Only qualified personnel are allowed to perform work on contaminated equipment.
- Always wear the protective clothing prescribed for contaminated areas when working on the equipment.
- Make sure that the equipment is completely decontaminated before carrying out any service work.
- Follow the pertinent instructions for handling the hazardous substances in question.

Qualified personnel must have extensive experience with and a working knowledge of:

- ◆ pertinent rules and regulations concerning handling hazardous substances
- ◆ special regulations for handling the hazardous substances encountered on site
- ◆ using the required personal protective equipment (PPE) and clothing



Caution

Environmental damage may be caused by poisonous fluid residues.

- Before disposing of the equipment make sure that it is clean and free of fluid residues.
 - For the disposal of all materials observe the pertinent legal regulations concerning waste disposal.
-
- Remove all residues from the equipment.
 - For the disposal of all residues observe the pertinent legal regulations concerning waste disposal.

Removing the equipment



DANGER

Personnel working on pipes are exposed to safety risks and may suffer severe injuries, poisoning or even loss of life.

- Make sure that no hot or hazardous fluid is in the equipment or the pipes.
- Make sure that the pipes upstream and downstream of the equipment are depressurised.
- Make sure that the installation is switched off and protected against unauthorised or unintended activation.
- Make sure that the equipment and the pipes have cooled down to room temperatures.
- Wear protective clothing that is suitable for the fluid and, if necessary, wear protective gear.

For more information on suitable protective clothing and safety gear refer to the safety data sheet of the fluid in question.



DANGER

Risk of bruises if the equipment or component parts fall down.

- Always wear protective gear when working on the equipment.
- Use suitable lifting gear when moving or lifting the equipment and/or component parts.
- Make sure that the equipment cannot topple over.
- To lift the equipment use only the valve body or the bonnet.
- Make sure that nobody is standing below the lifted equipment.

The protective gear must comprise at least the following:

- ◆ Safety helmet to EN 397
- ◆ Safety footwear to EN ISO 20345
- ◆ Protective leather gloves to EN 388

For more information on suitable safety clothing and safety gear refer to the safety data sheet of the fluid in question.

The lifting gear must be of sufficient strength for the equipment including the actuator.

For more information on the weight of the equipment see the attached documents. For more information on the weight of the actuator see the documents provided by the actuator manufacturer.

- Switch the installation off and protect it against unauthorised or unintended re-activation.



WARNING

Risk of severe injuries or death if the actuator is not removed correctly.

- Before working on the actuator cut off power supply to the actuator.
- Follow all instructions and observe all notes given in the operating manual for the actuator.
- Make sure that only qualified and trained personnel work on the actuator and its connections.

A qualified person must be acquainted with and experienced in the following:

- ◆ safety issues when working on the installation
- ◆ establishing connections with the respective power source of the actuator
- ◆ mechanical work on pipes.
- Cut off the power supply to the actuator.
- Detach the actuator from the mechanical connection of the equipment.
- Detach the end connections of the equipment from the pipes.
- Put the equipment onto a suitable base.

The base must be sufficiently strong to withstand the weight of the equipment.

- If necessary disassemble the equipment and put down individual parts.
- Store the equipment as described on page 17.

Disposing of the equipment



Caution

Environmental damage may be caused by poisonous fluid residues.

- Before disposing of the equipment make sure that it is clean and free of fluid residues.
 - For the disposal of all materials observe the pertinent legal regulations concerning waste disposal.
-

The equipment is made from the following materials:

Component	EN	ASME
Body DN 25 (1'') and DN 50 (2'')	1.7335	A182F12Cl.2
Body DN 80 (3''), 100 (4''), 150 (6'')	1.7357	A217WC6
Bonnet	1.7357	A217WC6
Cover	1.7335	A182F12Cl.2
Threaded bolt	1.7709	A193B16
Nuts	1.7709	A194-7

Technical data

Dimensions and weights

For information on the exact dimensions of the equipment see the dimensional drawing supplied with the equipment.

For information on the exact weights of the equipment see the dimensional drawing supplied with the equipment.

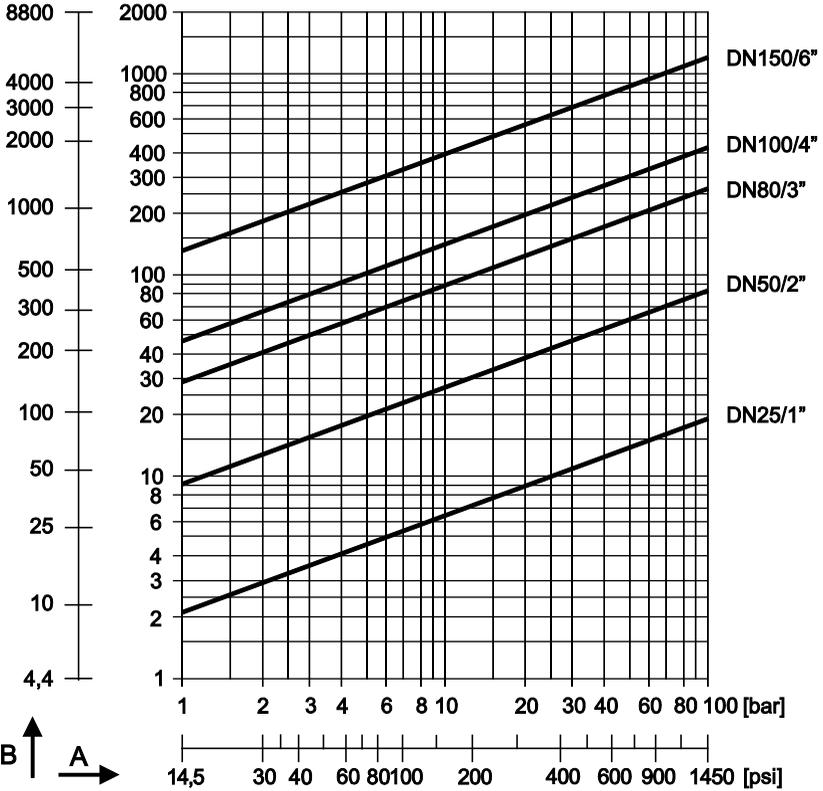
For information on dimensions and weights of the actuator please refer to the documents provided by the manufacturer of the actuator.

- For more information please contact the manufacturer.

Fluid flowrate and differential pressure

Flowrates, cold water

[US gal/min] [m³/h]

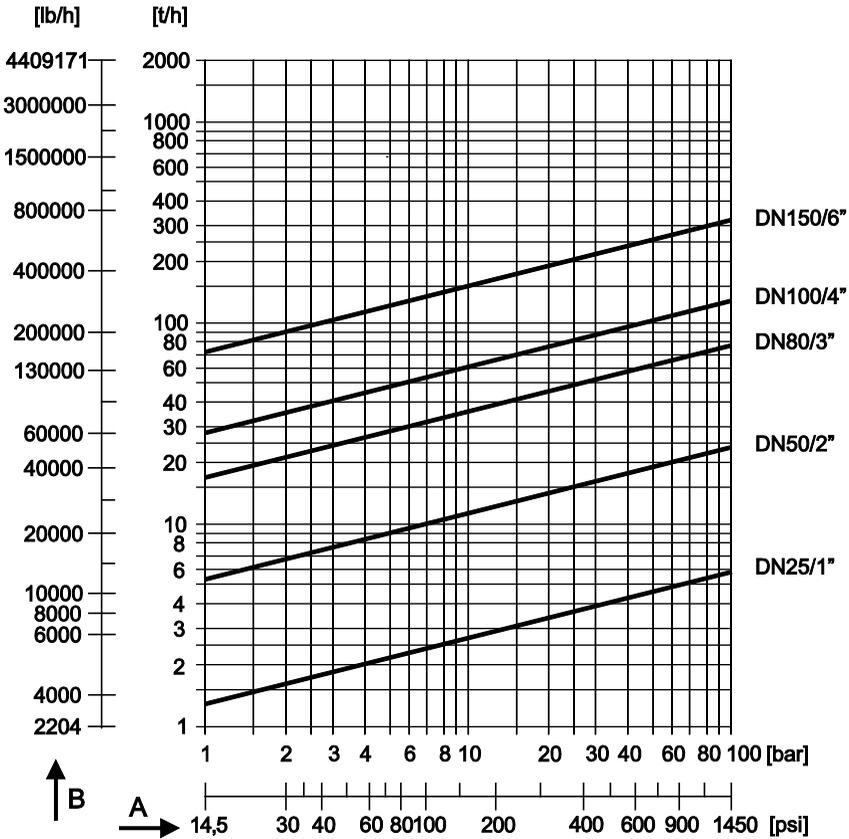


A Differential pressure

B Flowrate

The chart shows the max. flowrates of cold water at the extreme regulation position with linear characteristic curves and maximum Kv_s value.

Flowrates, hot water, ts-5 K



A Differential pressure (assuming discharge to atmospheric pressure)

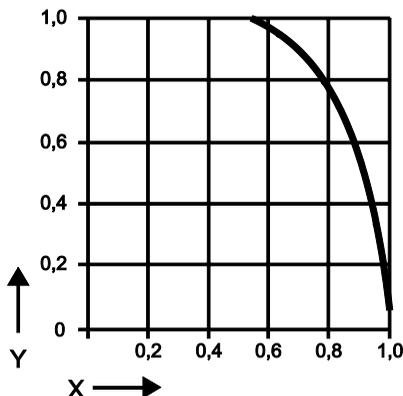
For higher back pressure take a correction factor into account. The ascertained flowrate is reduced by the correction factor.

B Flowrate

The chart shows the max. flowrates of hot water at the extreme regulation position with linear characteristic curves and maximum K_{Vs} value.

If $p_2/p_1 > 0.5$ multiply the flowrate read-out by the correction factor K taken from the backpressure chart.

Back pressure diagram



- Y Correction factor
X Pressure ratio p_2/p_1 (absolute)



For more information see data sheet.

Pressure & temperature ratings



The following specifications refer to the equipment and not to the end connection.

- Please contact the manufacturer for more information on the application limits dictated by the type of end connection used.

Admissible differential pressure Δ PMX:

	[bar]	[psig]
Single stage	40	580
Multi stage	100	1,450

Maximum pressure

You can find precise information on the pressure and temperature ratings of your equipment on the name plate and in the data sheet.

Manufacturer's Declaration

You can find details on the conformity assessment in accordance with European Directives in our Declaration of Conformity or our Declaration of Incorporation.

To request the valid Declaration of Conformity or Declaration of Incorporation, please contact:

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28215 Bremen

Germany

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Telefax +49 421 3503-393

E-Mail info@de.gestra.com

Web www.gestra.de

This declaration is no longer valid if modifications are made to the equipment without consultation with us.



Agencies all over the world: www.gestra.de

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