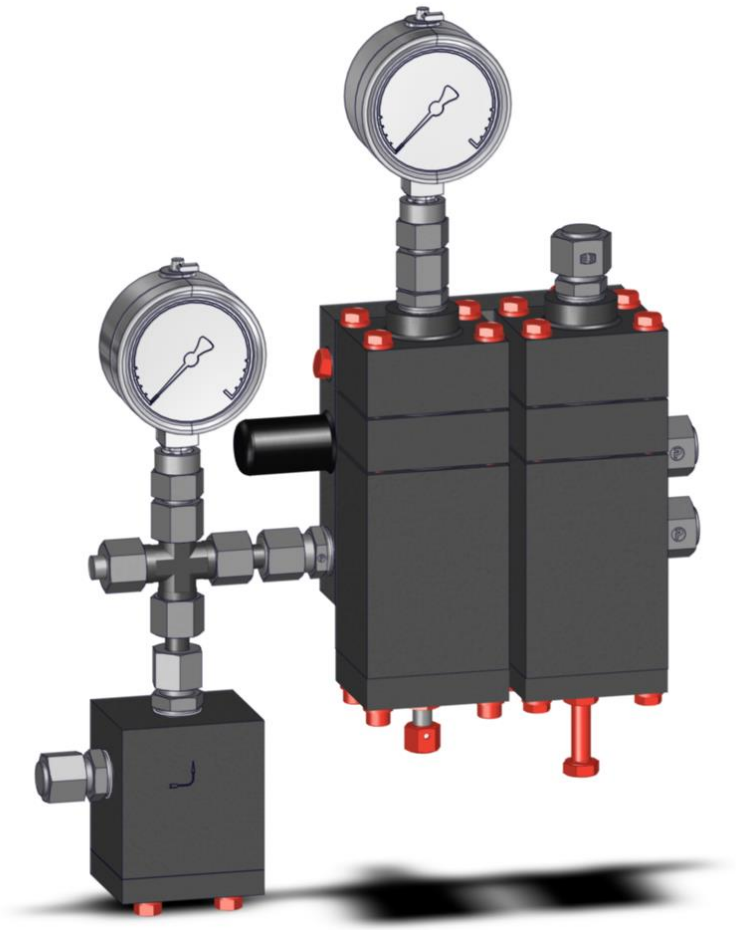
Honeywell I Connected Industrial



HON 630
Pilot

Component documentation,
Maintenance manual and spare parts

Contents

1	**General considerations**	**3**
1.1	About this component documentation	4
1.2	About the safety notices	6
2	**Description**	**7**
2.1	Intended use	8
2.2	Device models	9
2.3	Labels/Markings	10
2.4	Layout and operation	11
2.5	Technical specifications	13
3	**Safety**	**16**
3.1	Basic safety rules	17
3.2	Requirements concerning the workforce, personal protective gear, workplaces	18
4	**Maintenance**	**19**
4.1	Maintenance schedule	20
4.2	Preparing for the maintenance	21
4.3	Disassembling the pilot and maintaining the base plate	22
4.4	Maintaining the control stage with a diaphragm assembly	25
4.5	Maintaining the control stage with a larger diaphragm assembly	33
4.6	Maintaining the control stage with a metal bellows assembly	44
4.7	Maintaining the load limiting stage	53
4.8	Maintaining the fine mesh filter	56
4.9	Reassembling the pilot	58
4.10	Completing the maintenance	60
5	**Storage and disposal**	**61**
5.1	Storing the device	62
5.2	Disposing of the device	63
6	**Appendix**	**64**
6.1	Additional information regarding spare parts	65
6.2	Spare parts for two-stage HON 630 pilot	67
6.3	Spare parts for control stage	73
6.4	Spare parts for load limiting stage	79
6.5	Spare parts for fine mesh filter	81
6.6	Lubricants, threadlockers, and special tools	82

1 General considerations

Contents

Topic	Page
About this component documentation	4
About the safety notices	6

1.1 About this component documentation

Validity and purpose

This component documentation applies to HON 630 pilots.

This component documentation provides all individuals with the information required in order to safely handle the device in connection with the following tasks:

- Maintenance and servicing
- Storage and disposal

Target group

This component documentation is intended for anyone who requires the following information concerning the product:

- Intended use
- Device models
- Technical specifications
- How it works
- Maintenance manual
- Spare parts drawings and spare parts lists

Illustration

Honeywell offers products with identical functions in a number of different sizes. For this reason, we are unable to guarantee that the illustrations in this documentation will match the dimensions of your product. In these cases, the illustrations should be viewed as a concept sketch.

Safety

Failing to observe the information provided in this document may lead to injuries, including death and material damages.

To ensure the safety, any persons handling the product must have read and understood the following parts of this document before they start with any work involving it:

- the chapter entitled Safety
- the chapters that describe the work to be done

Copyright notice

Copyright	 Honeywell Process Solutions Honeywell Gas Technologies GmbH Osterholzstraße 45 34123 Kassel GERMANY Tel: +49 561 5007-0 Phone number for service: +49 561 5007-180 Fax: +49 561 5007-107 Fax number for service: +49 561 5007-108 E-mail: gas-ks@honeywell.com Website: www.honeywellprocess.com www.hongastec.de Printed in Germany
Details about the manufacturer's liability	The manufacturer will not be liable for damages and malfunctions arising from failure to observe this component documentation and other applicable documents.
Constructive changes	The written approval from Honeywell Gas Technologies GmbH, Kassel, is required for any modifications and additions to the product. Any violation will void the legal liability for consequences arising thereof.

1.2 About the safety notices

Meaning

The information contained in the safety notices is intended to prevent personal injury. Safety notices contain the following information:

- Nature and source of the danger
- Possible consequences associated with the non-observance of the notice
- Procedures for the prevention of personal injury

Types of safety notices

This document contains the following types of safety notices:

Type of safety notice	Description	Sign
Basic safety notices	Superordinate safety notices not relating to a specific task: ▪ They contain a summarized description of hazards, risks and safety procedures associated with the handling of the device. ▪ Their purpose is to inform and educate the user about an existing danger and about practicing behavioral safety. ▪ They are suitable as safety instruction for all employees handling the device.	Recognizable by the heading of the chapter
Instruction-related safety notices	Safety notices containing specific instructions relating to the entire manual or a group of manuals	⚠DANGER ⚠WARNING ⚠CAUTION
Step-related safety notices	Safety notices containing specific instructions relating only to the step	DANGER WARNING CAUTION
Additional safety notice	Instruction to observe certain safety notices with reference to a location in the document where safety notices containing specific information about dangers, risks and specific instructions for safety procedures can be found	⚠

Danger levels

The safety notices containing specific instructions are identified with a signal word. The signal word represents a certain danger level:

Danger level	If you fail to follow the instruction, then ...	And the consequence is ...
DANGER	an accident will happen	serious bodily injury or death.
WARNING	an accident may happen	possible serious bodily injury or death.
CAUTION	an accident may or will happen.	minor or moderate bodily injury.

Warnings about material damages

Warnings about possible material damages are identified with the word **Attention** in this document.

2 Description

Contents

Topic	Page
Intended use	8
Device models	9
Labels/Markings	10
Layout and operation	11
Technical specifications	13

2.1 Intended use

Intended use

HON 630 pilots are used to regulate the outlet pressure of a gas pressure regulator in a gas regulating line. These pilots are used for HON 402, HON 502, HON 503, and HON 505 gas pressure regulators conforming to DIN EN 334 / DIN EN 14382 and are an integral part of these gas pressure regulators. These pilots are also characterized by high accuracy even in the event of large inlet pressure changes. The pilots are controlled pneumatically, with the control system being put together in a modular system with an automatic load limiting stage and a control stage. The pilot is also available in a single-stage version that only features a control stage. The pilot features pressure gauges for the inlet pressure and the loading pressure, as well as the upstream HON 905 fine mesh filter. and can be used for neutral, non-aggressive gases and the gases specified in DVWG Code of Practice G260.

Note: The device's operating limits concerning the gas, the operating pressure, and the operating temperature can be found either on the rating plate affixed to the device or in the device's technical specifications.

The use under different operating conditions must be coordinated in consultation with the manufacturer.

Limitations of use

Please observe the following limitations of use:

- Do not use the device for any media other than those mentioned in the intended use or those discussed with and approved by the manufacturer.
- Do not use the device in any installation position other than the one documented in this component documentation.
- Do not use the device against the direction of flow specified on the device and in the component documentation.
- When replacing defective parts, only use original spare parts or manufacturer-approved standard parts.
- Do not attempt to modify or remodel the device on your own.

2.2 Device models

HON 630 pilot models

The HON 630 pilot features a number of individual expansion options.

The following individual components are always part of the device:

- HON 905 fine mesh filter
- Inlet pressure gauge
- Amplifying valve
- Control stage, including spring adjuster and base plate

The following individual components are optional expansions:

- Load limiting stage, including spring adjuster and loading pressure gauge
- Outlet pressure gauge
  - With HON 925 protection against overpressure for setpoint ranges W_d of 0.3 to 20 bar
  - Without protection against overpressure for setpoint ranges W_d of 10 to 40 bar
- HON 915 vent valve
- Electrical remote setpoint adjustment for control stage and/or load limiting stage

The standard HON 630 pilot version features two stages, i.e., it includes both a load limiting stage and a control stage.

The manufacturer uses designation HON 630-1 for the single-stage pilot version featuring a control stage but no load limiting stage.

Control stage models

There are three different versions of the individual control stage component installed in the HON 630 pilot, with the specific version used depending on the control stage's setpoint range (W_d):

Setpoint range W_d	Design
0.3 to 1 bar	With larger diaphragm assembly
0.5 to 40 bar	With diaphragm assembly
10 to 90 bar	With metal bellows assembly

Models for the optional load limiting stage

The optional load limiting stage for the HON 630 pilot always features a diaphragm assembly regardless of the control stage's setpoint range (W_d).

Versions and designs in this component documentation

This documentation predominantly uses the two-stage pilot version with a control stage and a load limiting stage as a reference. It does not explicitly describe every single version and design.

If you have trouble understanding the information in this documentation, contact the manufacturer without fail before starting any work on the device.

2.3 Labels/Markings

Illegible labels

⚠WARNING

Illegible information on the device poses a risk of injury due to resulting erroneous operation, use, or installation.

Labels, as well as inscriptions and stamping on the device, can eventually become soiled or otherwise unrecognizable to such an extent that users will not be warned effectively of hazards and may be unable to follow required operating instructions. This will pose a risk of injury.

⇨ Make sure to always keep all relevant labels in good condition so that they will be easily legible.

⇨ Immediately replace damaged and missing labels.

Identifying the device

Make sure you have the right component documentation for your device.

To identify your device, look at the nameplate.

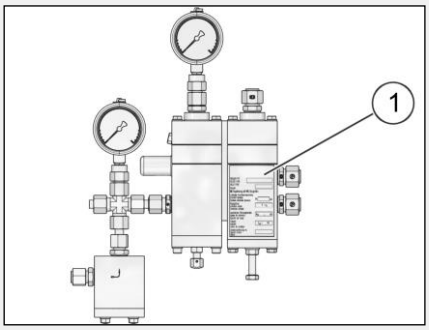
Verifying the technical specifications

Make sure that the conditions on site correlate with the information on the type plate and the technical specifications.

Technical specifications (see page 13)

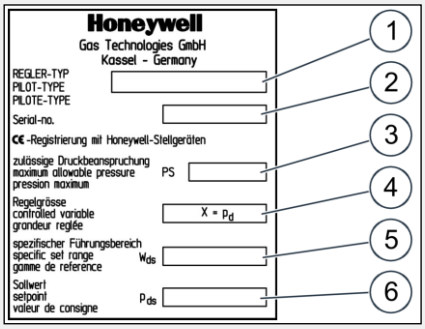
Locating the type plate of the pilot

The type plate of the pilot can be found here:

Figure	No.	Description
	1	Front of control stage

Interpreting the type plate of the pilot

The details on the type plate have the following meaning:

Figure	No.	Meaning
	1	Name of the device
	2	Serial number
	3	Maximum allowable pressure
	4	Controlled variable
	5	Specific set range
	6	Setpoint

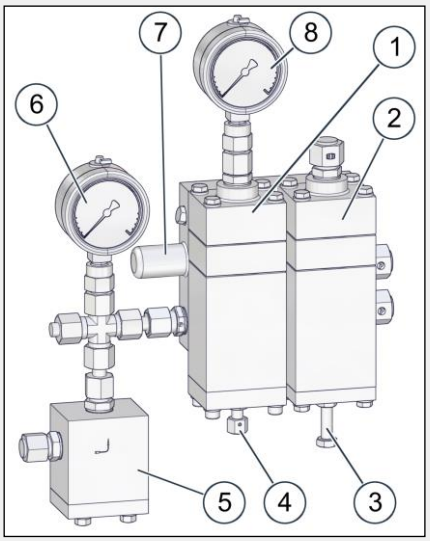
Labels on connection lines

Small labels must be used to color-code and explicitly name the pilot's connection lines based on what the lines are intended for.

2.4 Layout and operation

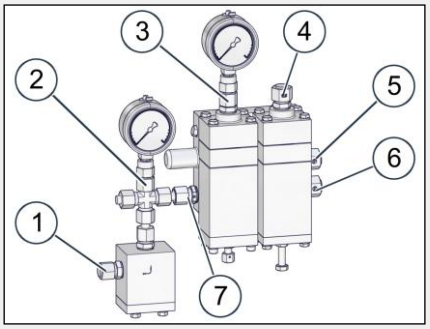
Pilot components

The pilot is made up of the following individual components:

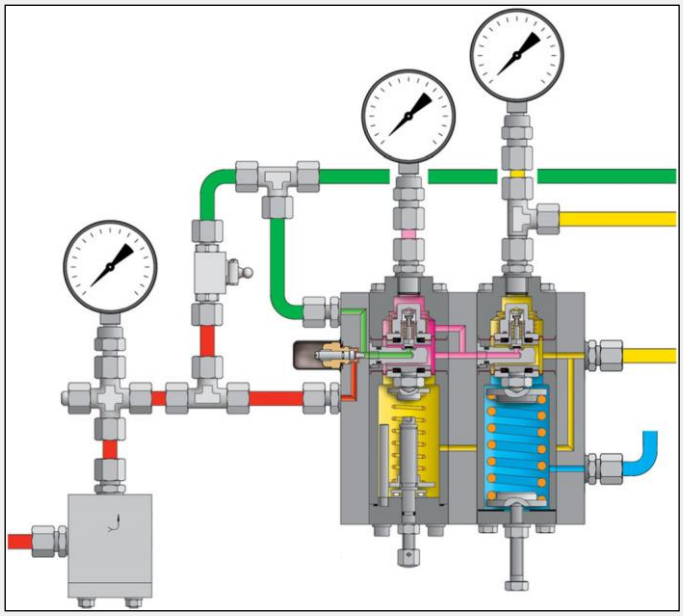
Figure	No.	Description
	1	Load limiting stage (optional)
	2	Control stage
	3	Control stage spring adjuster
	4	Load limiting stage spring adjuster
	5	HON 905 fine mesh filter
	6	Inlet pressure gauge
	7	Amplifying valve
	8	Load limiting stage pressure gauge

Pilot connection lines

The pilot features the following fittings:

Figure	No.	Description
	1	Port for inlet pressure line Ø10, M 14 x 1.5
	2	Inlet pressure gauge fitting
	3	Loading pressure gauge fitting
	4	Port for outlet pressure sensing line Ø12, M 14 x 1.5 ▪ Optionally with pressure gauge for outlet pressure and protection against overpressure
	5	Port for outlet pressure process line
	6	Vent line connection Ø12, M 14 x 1.5 (ambient pressure compensation)
	7	Inlet pressure fitting

Pilot pressure sections

Figure	Color	Meaning
		Inlet pressure
		Loading pressure
		Motoriza-tion pres-sure
		Outlet pressure
		Atmos-pheric pressure

How the pilot works

- The inlet pressure is conveyed into the load limiting stage via the fine mesh filter.
- The outlet pressure is conveyed into the control stage and produces a force component that acts on the double diaphragm system from above.
- The pilot's set screw is used to tighten the pilot spring, producing a force component that acts on the control stage's double diaphragm system from below.
- The force components being exerted on the double diaphragm system are used by the system in order to compare the setpoint and the process value. Depending on the outlet pressure and on the set setpoint, a small/large gap relative to the load limiting stage will be cleared. This, in turn, will result in an accordingly low/high loading pressure being passed on to the load limiting stage.
- Inside the load limiting stage, the double diaphragm system (much like the control stage) performs a setpoint/process value comparison between the loading pressure acting from above and the outlet pressure acting from below.
- The HON 630 pilot delivers a motorization pressure to the actuator assembly that, as a function of the outlet pressure and the set setpoint, will result in an opening or closing operation in the actuator assembly.
- The start-up valve is needed exclusively to start the regulating line and is closed during normal operation.
- The pilot's amplifying valve is used to set the speed of the motorization pressure changes.
- The load limiting stage guarantees high accuracy even in the event of large inlet pressure changes.

2.5 Technical specifications

Characteristic device values and materials

The following characteristic values apply to all setpoint ranges:

	Value
Max. inlet pressure p_{umax}	100 bar (1450 psi)
Temperature range	-20 to +60 °C (-4 to +140 °F)
Materials	Case: Aluminum alloy Internal parts: Aluminum alloy/steel Diaphragms: NBR Gaskets: NBR

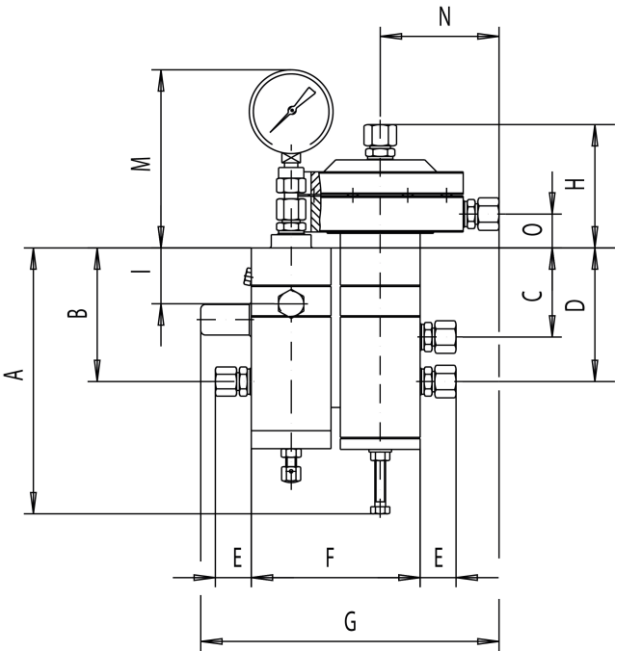
Pilot springs

Specific set range W_{ds}	Pilot spring		
	No.	Color	Wire diameter [mm]
Control stage			
0.3 – 1 bar (4.4 – 14.5 psi)	0	black	4.5
0.5 – 2 bar (7.3 – 29 psi)	1	blue	3.6
1 – 5 bar (14.5 – 72.5 psi)	2	black	4.5
2 – 10 bar (29 – 145 psi)	3	grey	5
5 – 20 bar (72.5 – 290 psi)	4	brown	6.3
10 – 40 bar (145 – 580 psi)	5	red	7.0
10 – 50 bar (145 – 725 psi)	6	Green	8/7
20 – 90 bar (290 – 1305 psi)	7	White	9
Load limiting stage			
0.5 – 10 bar (7.3 – 145 psi) Automatically over outlet pressure p_d		Green	5.0

Pilot dimensions and weights

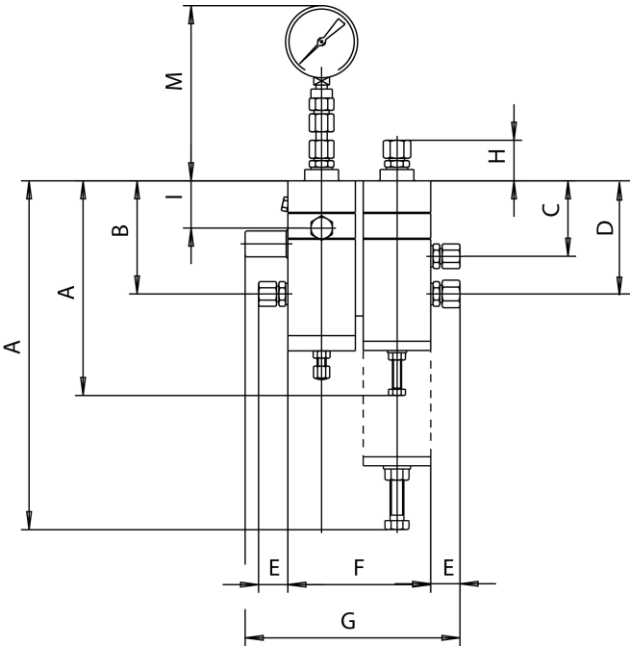
The figure below shows the dimensions for the pilot with a control stage for a setpoint range W_d = 0.3 – 1 bar:

Without pressure gauge for outlet pressure

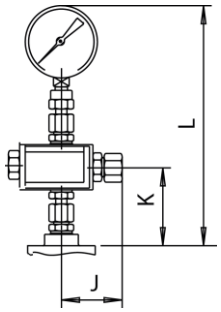


The figure below shows the dimensions for the pilot with the control stages for setpoint ranges W_d = 0.5 – 90 bar:

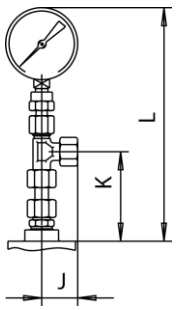
Without pressure gauge for outlet pressure



With outlet pressure gauge p_d 1 - 20 bar



With outlet pressure gauge p_d 10 - 90 bar



Metric system:

Outlet pressure area p_d range [bar]	Weight [kg]			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
0.3 – 1	6.0			195	101	67	101	26	127
0.5 – 40	5.0			195	101	67	101	26	127
10 – 90	6.5			315	101	67	101	26	127
Outlet pressure area p_d range [bar]	**G [mm]**	**H [mm]**	**I [mm]**	**J [mm]**	**K [mm]**	**L [mm]**	**M [mm]**	**N [mm]**	**O [mm]**
0.3 – 1	225	93	42	56	88	230	132	90	24
0.5 – 40	191	36	42	56	68	209	156	-	-
10 – 90	191	36	42	32	75	202	156	-	-

Imperial system:

Outlet pressure area p_d range [bar]	Weight [lbs]			A [in]	B [in]	C [in]	D [in]	E [in]	F [in]
0.3 – 1	13.5			7.7	4.0	2.6	4.0	1.0	5.0
0.5 – 40	11.0			7.7	4.0	2.6	4.0	1.0	5.0
10 – 90	14.5			12.4	4.0	2.6	4.0	1.0	5.0
Outlet pressure area p_d range [bar]	**G [in]**	**H [in]**	**I [in]**	**J [in]**	**K [in]**	**L [in]**	**M [in]**	**N [in]**	**O [in]**
0.3 – 1	8.9	3.7	1.7	2.2	3.5	9.1	5.2	3.5	0.9
0.5 – 40	7.5	1.4	1.7	2.2	2.7	8.2	6.1	-	-
10 – 90	7.5	1.4	1.7	1.3	3.0	8.0	6.1	-	-

Gas properties

The properties of the gas conveyed through the HON 630 pilot must meet the requirements specified by the DVGW German Technical and Scientific Association for Gas and Water in the latest version of DVGW Code of Practice G 260 (A).

ATEX specifications

The device's mechanical components do not contain any potential sources of ignition, and accordingly do not fall under the scope of ATEX 95 (94/9/EC). The electrical components used on the device meet all applicable ATEX requirements.

3 Safety

Contents

Topic	Page
Basic safety rules	17
Requirements concerning the workforce, personal protective gear, workplaces	18

3.1 Basic safety rules

Target group of these rules	These rules are intended for any individuals handling the device.
Purpose of these rules	These rules are designed to make sure that any individuals working with or on the device will thoroughly familiarize themselves with the corresponding hazards and safety measures and will observe the safety notices contained in this component documentation and on the device. If you do not follow these rules, there is a risk of injury including death and material damages.
How to use this component documentation	Observe the following rules: ▪ Read the chapter entitled Safety and the chapters relating to your responsibilities in their entirety. It is vital that you have understood these contents. ▪ Always keep this component documentation in the vicinity of the device so that you can consult it when necessary. ▪ Include this component documentation if you are transferring ownership of the device.
Handling the device	Observe the following rules: ▪ Only individuals who meet the requirements set forth in this component documentation have permission to work with/on the device. ▪ The device's intended use includes its use in hazardous locations. All work with and on the device must be carried out only after the presence of an explosive atmosphere has been fully ruled out. ▪ Only use the device for the intended purpose. Never use the device for any other, potentially logical purposes. ▪ Follow all the safety measures outlined in this component documentation and on the device. In particular, wear the mandatory personal protective gear. ▪ Do not modify the device in any way, e. g. by removing parts or adding unapproved parts. In particular, you have no permission to modify or disable any safety contrivances. ▪ When replacing defective parts, only use original spare parts or manufacturer-approved standard parts.
Requirements concerning the workforce	Personnel must meet the following requirements: ▪ All personnel must meet the requirements corresponding to their duties. ▪ All personnel must read and understand this component documentation before working with/on the device. ▪ All occupational health and safety regulations that apply in your country must be complied with. ▪ All personnel must be provided with the personal protective equipment required for their work. This personal protective equipment must be in good condition at all times. ▪ All personnel must wear the personal protective equipment required for their work.
Conduct in the event of accidents	The device is designed and built such that the employees can work with it without being at risk. In spite of all the precautions, accidents can happen under unfavorable circumstances. Always consult the directives of your company concerning the protection of the workforce.

3.2 Requirements concerning the workforce, personal protective gear, workplaces

Requirements concerning the workforce

Individuals tasked with handling the device must meet the following requirements:

Personnel	Responsibilities	Required qualification
Mechanical fitter	▪ Mechanical removal and installation ▪ Maintenance and servicing	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously

Requirements for the personal protective gear

Any persons handling the device must be equipped with the following personal protective gear:

Task	Required personal protective gear
Mechanical activities involved in maintenance, storage, disposal	▪ Safety boots with protection for electrostatic discharge (ESD) ▪ Safety gloves

Workplace requirements

To ensure the safe handling of the device, the personnel must remain at the workplaces intended for performing their tasks.

The workplaces for performing the various tasks are at the following locations:

Task	Workplaces
▪ Maintenance, repairs ▪ Storage ▪ Disposal	All around the device, depending on the task

4 Maintenance

Contents

Topic	Page
Maintenance schedule	20
Preparing for the maintenance	21
Disassembling the pilot and maintaining the base plate	22
Maintaining the control stage with a diaphragm assembly	25
Maintaining the control stage with a larger diaphragm assembly	33
Maintaining the control stage with a metal bellows assembly	44
Maintaining the load limiting stage	53
Maintaining the fine mesh filter	56
Reassembling the pilot	58
Completing the maintenance	60

4.1 Maintenance schedule

Meaning	The maintenance schedule provides an overview of the periodically required maintenance.
Maintenance schedule	Since the maintenance intervals are highly dependent on the operating conditions and the gas quality, it is impossible to provide set maintenance intervals. It is recommended to use maintenance intervals conforming to the specifications in DVGW Code of Practice G 495. In addition, the need for maintenance must be determined and documented on the basis of operational requirements and experience. Maintenance must be carried out in compliance with all federal and state laws and regulations, as well as with the local rules and regulations set forth by the relevant utilities and authorities and any other applicable regulations.

4.2 Preparing for the maintenance

Preparation work for pilot maintenance

Proceed as follows:

Step	Description	Explanation
1	Have the maintenance and servicing parts ready	Please refer to *Additional information regarding spare parts* (see page 65) to find out which bills of materials correspond your specific pilot model and have the corresponding maintenance parts and servicing parts ready to go before maintenance. ▪ The bills of materials for the pilots are broken down by maintenance parts and servicing parts. Spare parts drawings and spare parts lists are listed in the *appendix* (see page 64). ▪ In addition to these maintenance parts, there are also servicing parts that need to be checked during maintenance in order to make sure that they are in working condition. and they must be replaced if necessary. Because of this, it is recommended to have the following spare parts ready for maintenance in order to avoid downtimes: ▪ Compression spring(s) ▪ Pressure gauge(s) ▪ Filter insert
2	Preparing special tools	▪ In addition to standard tools, have the special tools required for your specific gas pressure regulator model ready to go before maintenance. Please refer to the *Special tools* section in *Lubricants, threadlockers, and special tools* (see page 82). ▪ You will also need a ballpoint pen or felt tip marker to perform maintenance on the pilot.
3	Have the required lubricants and threadlockers ready	For specifications concerning the lubricants and threadlockers that must be used, please refer to the sections of the same name under *Lubricants, threadlockers, and special tools* (see page 82).
4	Removing the pilot from the actuator assembly	**WARNING!** Risk of serious injury posed by pressurized components moving in an uncontrolled manner when handled improperly. If not handled properly or in the event of a defect, gas can escape from pressurized components under high pressure and cause serious injuries and even death. Before you start working on these components: ▪ Close all connections leading to the gas-carrying line. ▪ Establish a depressurized status. Residual amounts of energy must be depressurized as well. Before starting with the maintenance work, the pilot must be removed from the actuator assembly being used to operate it. For instructions on how to remove the pilot, please refer to the user manual for the relevant gas pressure regulator. Keep in mind that it is always necessary to depressurize the actuator assembly (including the pilot) and purge all gas-conveying lines with nitrogen before removal.

Sample maintenance instructions

The maintenance described below uses the two-stage pilot as a reference. Use the bills of materials to make sure that you replace all the maintenance parts relevant to your specific device model during maintenance.

4.3 Disassembling the pilot and maintaining the base plate

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Disassembling the pilot and maintaining the base plate

Proceed as follows:

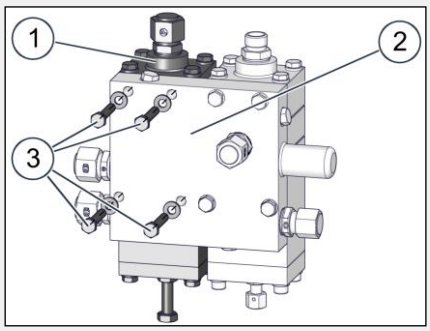
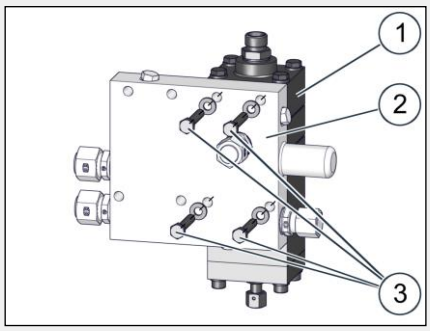
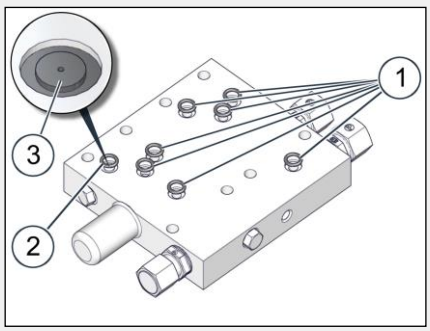
Figure	Step	Description
	1	Unscrew the 4 screws (3) between the control stage (1) and the base plate (2) and remove the control stage.
	2	Unscrew the 4 screws (3) between the load limiting stage (1) and the base plate (2) and remove the load limiting stage.
	3	Replace the 7 O-rings (1) and the O-ring (2) over the washer (3) with new, greased ones.

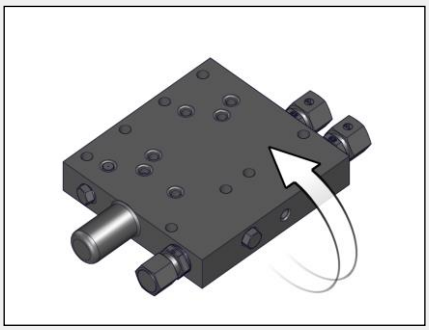
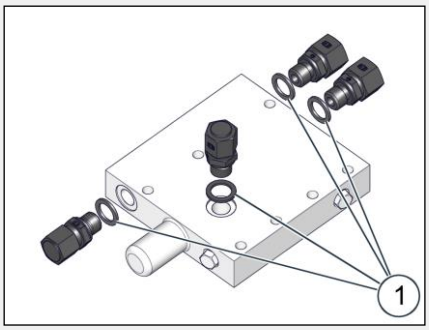
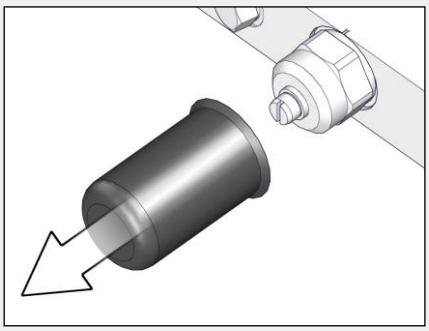
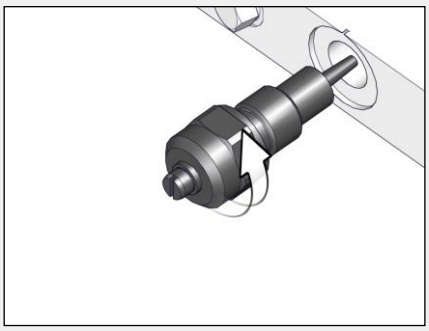
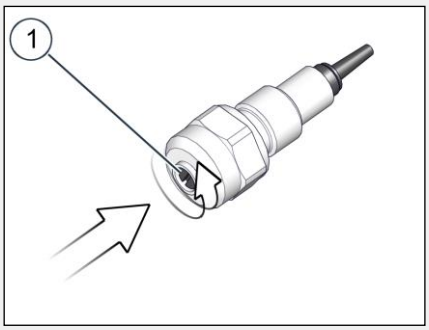
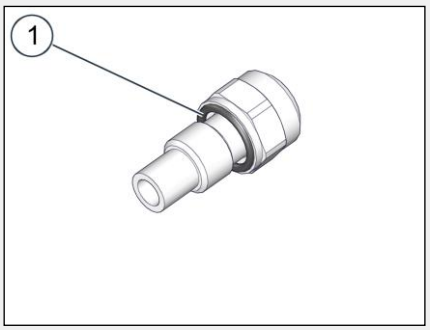
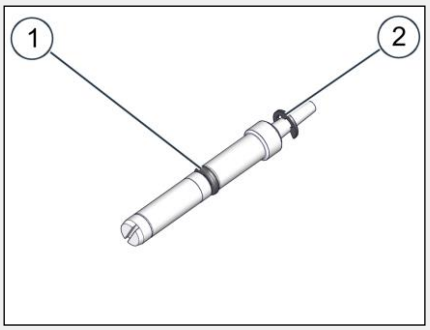
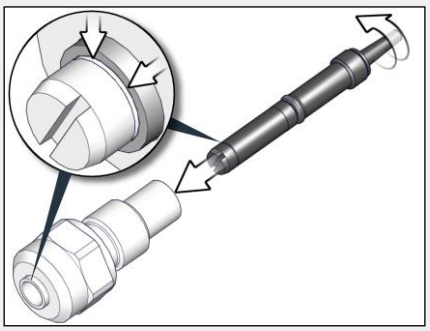
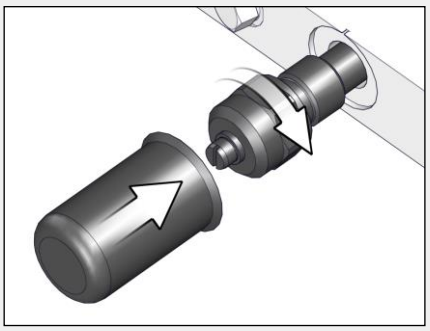
Figure	Step	Description
	4	Turn the base plate over.
	5	Replace the 4 sealing rings (1) with new, greased ones. Lubricate the thread surfaces before screwing the fittings back in.
	6	Remove the cap from the amplifying valve.
	7	Unscrew the amplifying valve and remove it.
	8	Loosen the spindle (1) and pull it out towards the back.

Figure	Step	Description
	9	Replace the O-ring (1) with a new, greased O-ring.
	10	Take the spindle. Replace the O-ring (1) and the retaining ring (2) with new, greased ones.
	11	Lubricate the thread surfaces. Slide the spindle into the sleeve and screw in the spindle all the way to the position shown. The notch on the spindle should be flush with the sleeve's front edge.
	12	Lubricate the thread surfaces. Screw the amplifying valve into the base plate and put the cap back in place.

Next task

Depending on the specific pilot model, proceed as indicated in the relevant section:

Maintaining the control stage with a diaphragm assembly (see page 25)

Maintaining the control stage with a larger diaphragm assembly (see page 33)

Maintaining the control stage with a metal bellows assembly (see page 44)

4.4 Maintaining the control stage with a diaphragm assembly

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

Observe the tightening torques below when following the instructions in this section:

Part	Tightening torque	Step
Hex nut	12 Nm (9 ft lbs)	13
Closing cap	20 Nm (15 ft lbs)	18
Base plate screws	12 Nm (9 ft lbs)	31

Maintaining the control stage

Proceed as follows:

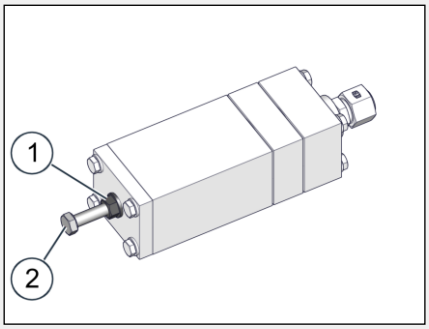
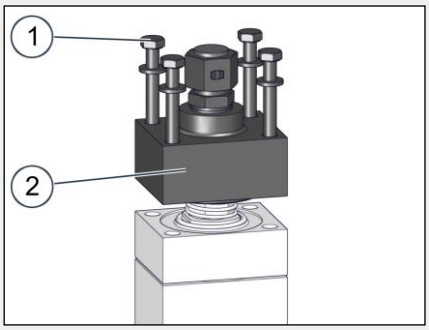
Figure	Step	Description
	1	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	2	Loosen the screws (1) and lift off the upper cover (2).

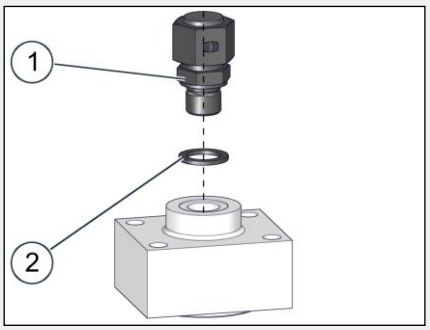
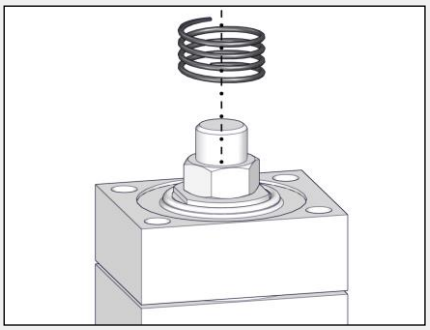
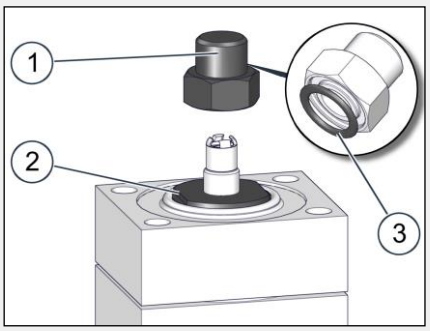
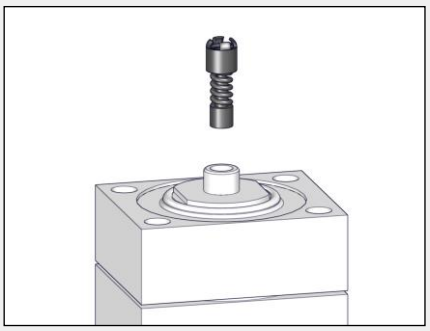
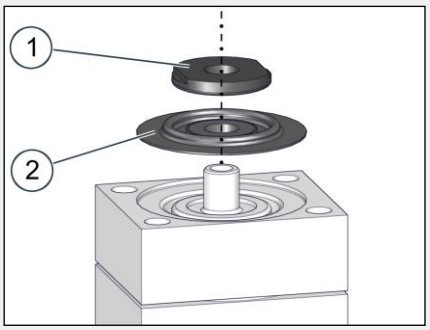
Figure	Step	Description
	3	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2) with a new, greased sealing ring. Lubricate the thread surfaces. Screw the fitting (1) back in.
	4	Remove the spring from the cap.
	5	Unscrew the cap (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning. Replace the O-ring (3) in the cap with a new, greased O-ring.
	6	Remove the pistons from the connecting piece.
	7	Remove the diaphragm disc (1) and the diaphragm (2).

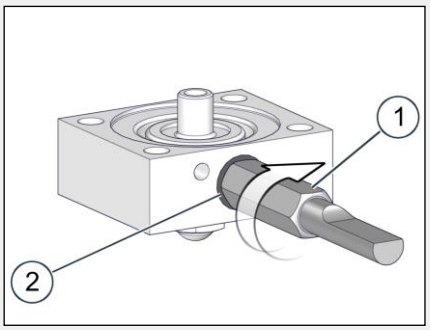
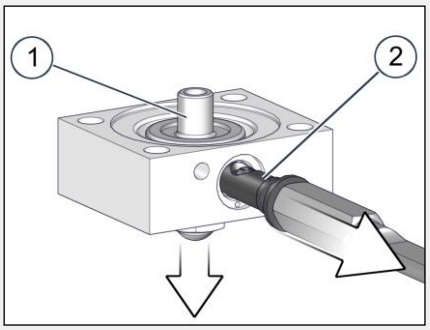
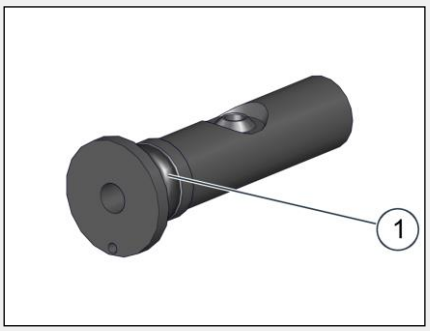
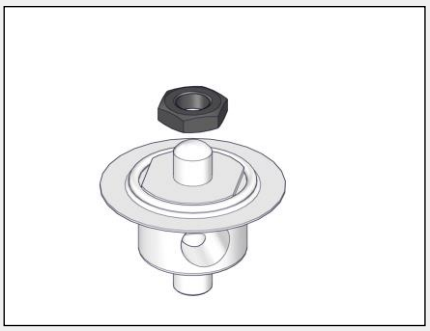
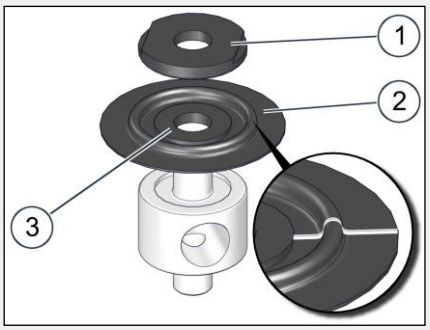
Figure	Step	Description
	8	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	9	Hold on to the connecting piece (1) and pull out the valve insert (2). Remove the connecting piece.
	10	Replace the valve insert with a new one. Insert a new, greased O-ring (1).
	11	Take the connecting piece and unscrew the hex nut.
	12	Remove the diaphragm plate (1) and the diaphragm (2). Replace the diaphragm (2) and the stem seal (3) with new ones. When inserting the new diaphragm in place, make sure that it is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.

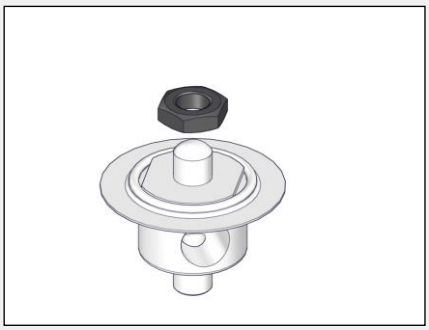
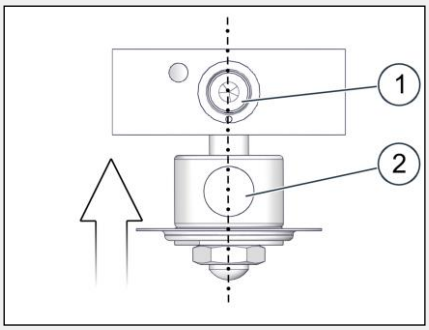
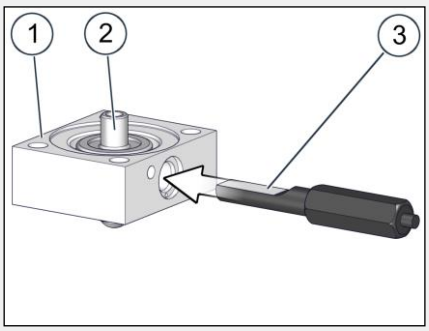
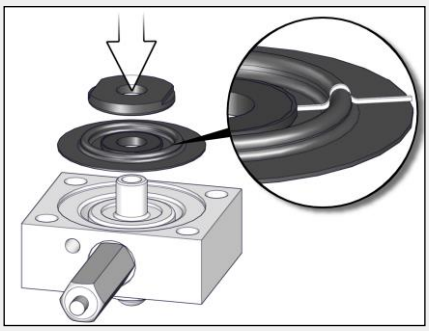
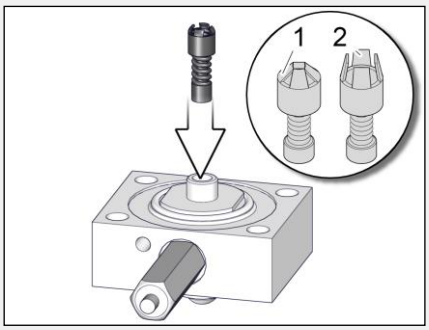
Figure	Step	Description
	13	Lightly coat the thread surfaces with threadlocker. Screw the hex nut back onto the connecting piece. Observe the tightening torque information provided in the table before this section.
	14	Insert the connecting piece into the valve body. Make sure that the holes (1, 2) are aligned.
	15	Align the valve body (1) as shown. Hold the connecting piece (2) in position. Insert the assembly aid, with the milled surface (3) facing upward towards the piston opening, into the valve body.
	16	Replace the diaphragm and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate, on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	17	Replace the piston with a new one. Insert the new piston into the connecting piece. Risk of confusion! Please observe the characterizing difference between the old and the new piston: ▪ Old piston (1): Castellated nut closed ▪ New piston (2): Castellated nut open

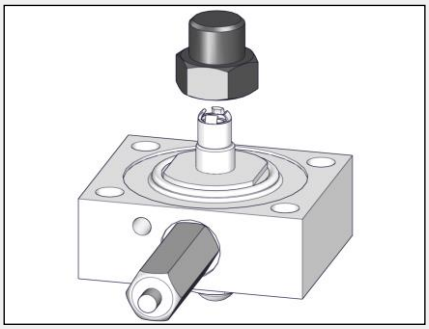
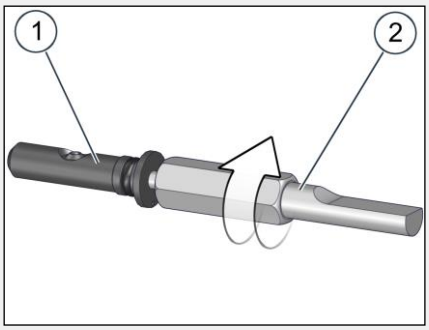
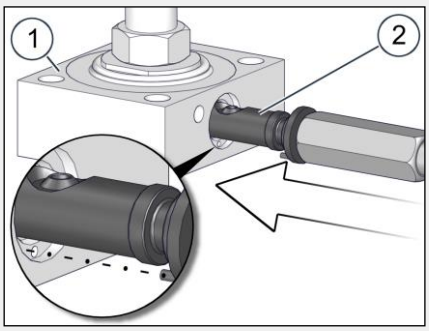
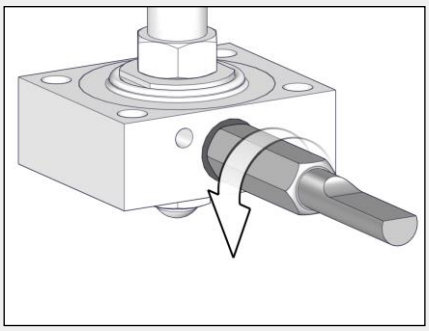
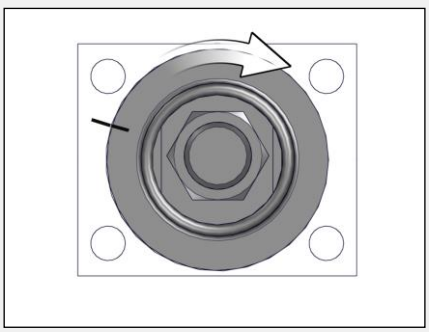
Figure	Step	Description
	18	Lightly coat the thread surfaces with threadlocker. Put the cap in place. Tighten the cap while using an open-end wrench to hold the diaphragm plate in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before this section.
	19	Remove the assembly aid (2) from the valve body. Screw the assembly aid (2) into the new valve insert (1).
	20	Position the valve body (1) as shown. Turn the valve insert (2) in such a way that the dowel pin will engage the intended hole on the valve body (1) and the nozzle opening is pointing upwards. Insert the valve insert (2) as far as it will go into the connecting piece (1).
	21	Remove the assembly aid.
	22	To align the cross hole of the connecting piece correctly with the valve insert: Use the cap to turn the diaphragm by hand clockwise until it will not rotate any further. Use a marker or pen to mark the position on the body and on the convoluted diaphragm.

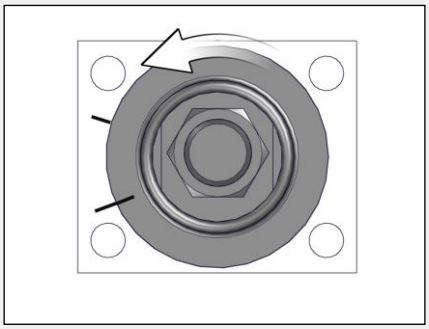
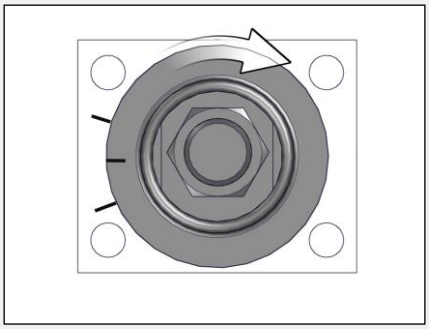
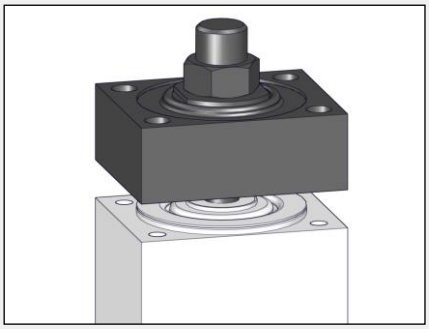
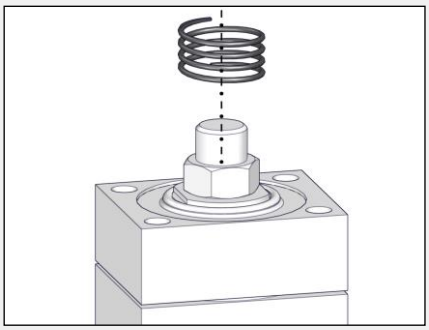
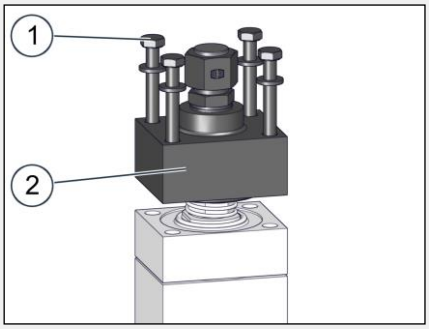
Figure	Step	Description
	23	Use the cap to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	24	Use the cap to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings on the body.
	25	Place the valve body on the spring housing.
	26	Place the spring on the cap.
	27	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 22). Put the cover (2) in place. Tighten the screws (1) hand-tight at first.

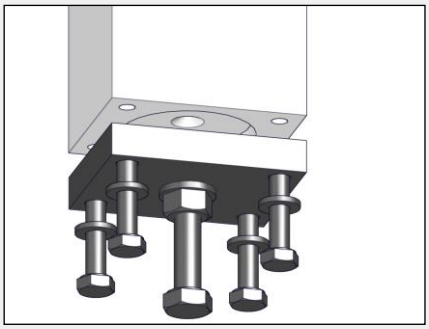
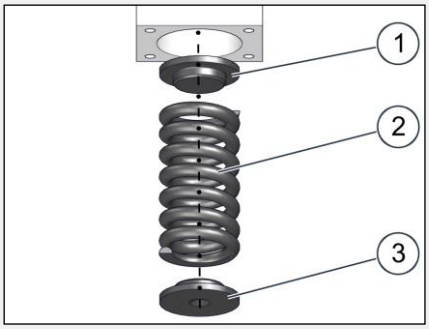
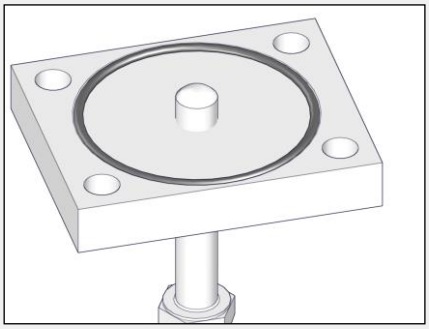
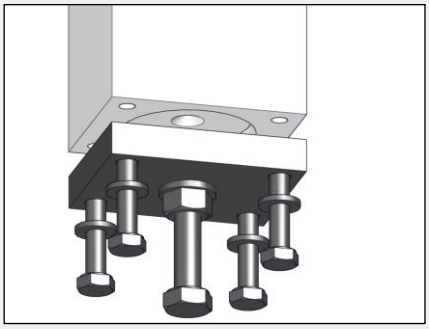
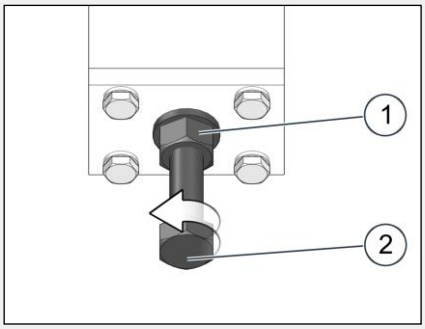
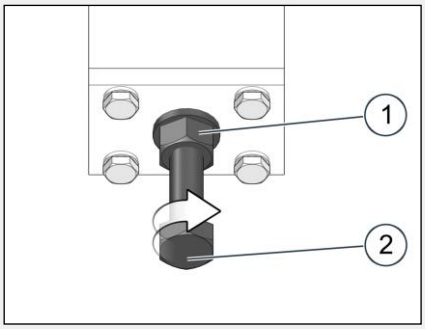
Figure	Step	Description
	28	Loosen the base plate screws and remove the base plate. **Important!** While removing the base plate, parts on the inside may fall out from the spring housing by accident!
	29	Remove the lower spring plate (3), the compression spring (2), and the upper spring plate (1) from the spring housing. Lubricate the spring plates' depressions and reinsert the parts into the spring housing in the right order and alignment.
	30	Replace the base plate gasket with a new, greased one.
	31	Lubricate the thread surfaces. Put the base plate back in place. Tighten the screws in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	32	Unscrew the adjusting screw (2) and remove it from the base plate. Clean and lubricate the adjusting screw.
	33	Replace the hex flange nut (1) with a new one. Lubricate the thread surfaces.

Figure	Step	Description
	34	Screw the spring adjuster (2) back in a bit. The correct setpoint adjustment cannot be carried out until before commissioning with the pilot installed.

Next task

Depending on the specific pilot version, proceed as indicated in the relevant section:

For the multi-stage pilot version: *Maintaining the load limiting stage* (see page 53)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 56)

4.5 Maintaining the control stage with a larger diaphragm assembly

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

Observe the tightening torques below when following the instructions in this section:

Part	Tightening torque	Step
Hex nut	20 Nm (15 lbs)	18
Upper connecting piece	20 Nm (15 lbs)	24
Diaphragm housing screws	12 Nm (9 lbs)	34
Hex nut	10 Nm (8 lbs)	36
Diaphragm cover screws	12 Nm (9 lbs)	42
Base plate screws	12 Nm (9 lbs)	46

Maintaining the control stage

Proceed as follows:

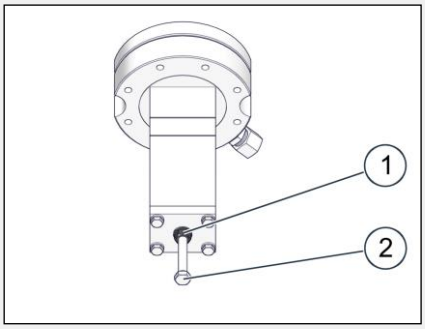
Figure	Step	Description
	1	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.

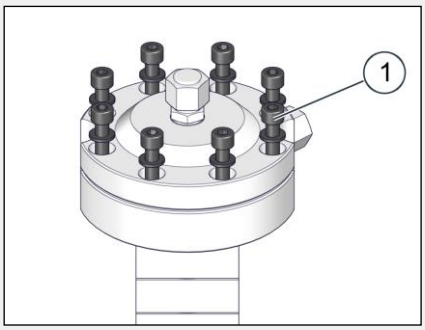
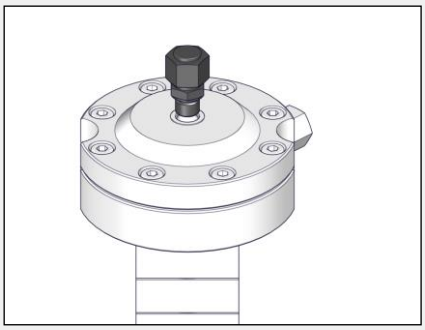
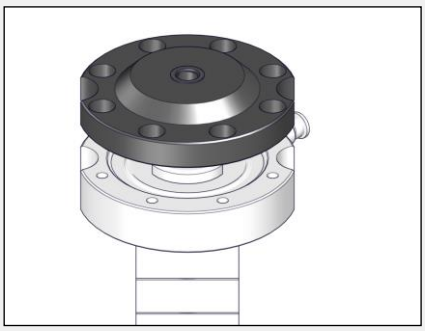
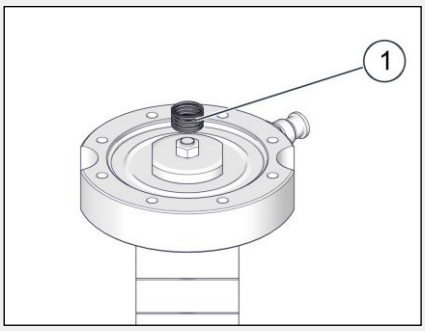
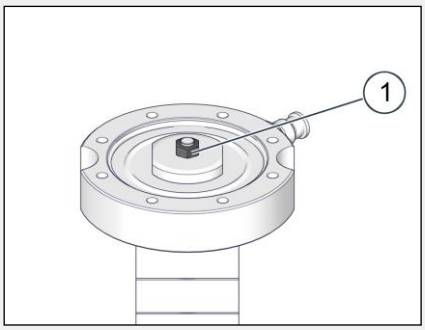
Figure	Step	Description
	2	Unscrew the diaphragm cover's screws (1).
	3	Unscrew the screw-in fitting.
	4	Remove the diaphragm cover.
	5	Remove the spring (1) from the hex nut.
	6	Unscrew the hex nut (1) while using an open-end wrench to hold the pressure piece (2) in place so as to prevent the components from turning.

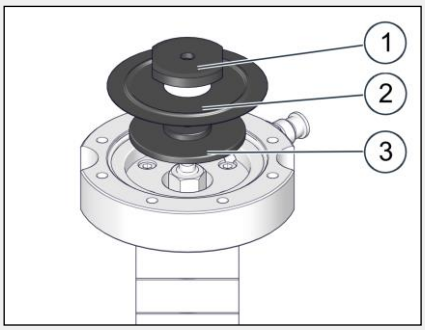
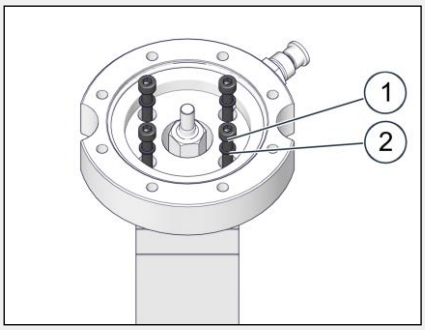
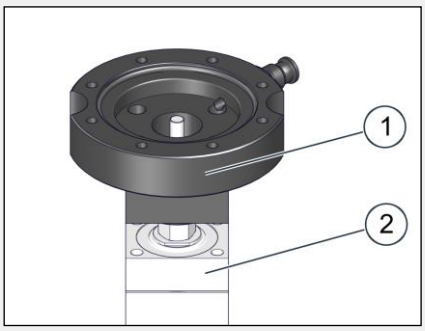
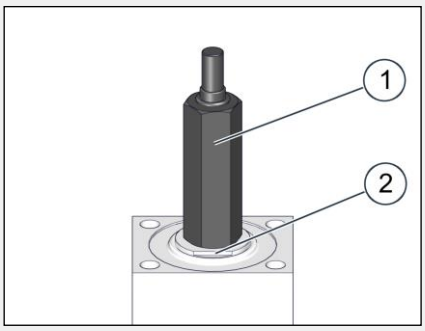
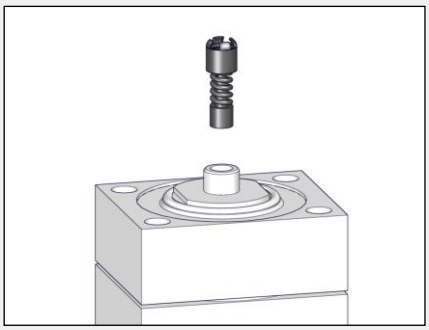
Figure	Step	Description
	7	Remove the pressure piece (1), the diaphragm (2), and the diaphragm plate (3).
	8	Unscrew the diaphragm housing's screws (1). Remove the screws and the bonded seals (2).
	9	Hold the valve body (2) in place and lift the diaphragm housing off (1).
	10	Unscrew the upper connecting piece (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning.
	11	Remove the piston.

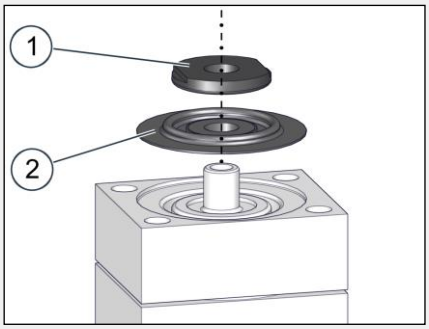
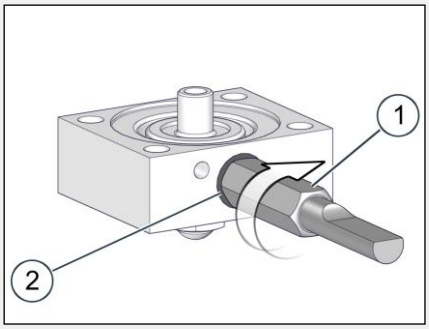
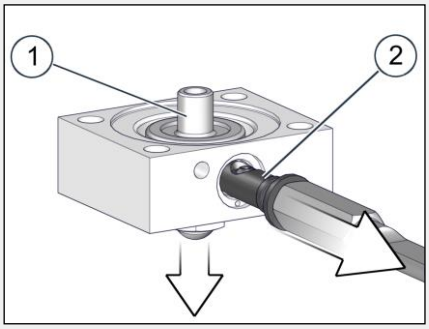
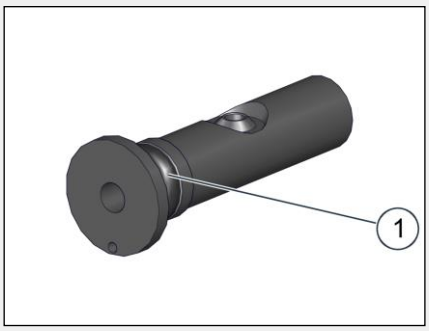
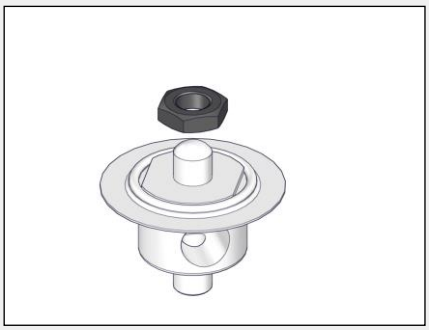
Figure	Step	Description
	12	Remove the diaphragm plate (1) and the diaphragm (2).
	13	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	14	Hold on to the connecting piece (1) and pull out the valve insert (2). Remove the connecting piece.
	15	Replace the valve insert with a new one. Insert a new, greased O-ring (1).
	16	Take the connecting piece and unscrew the hex nut.

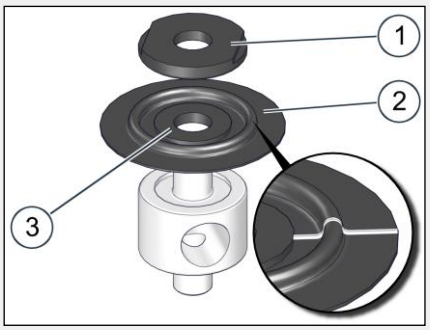
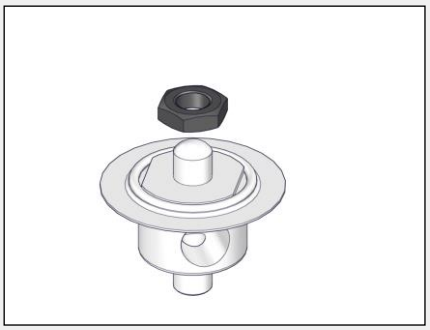
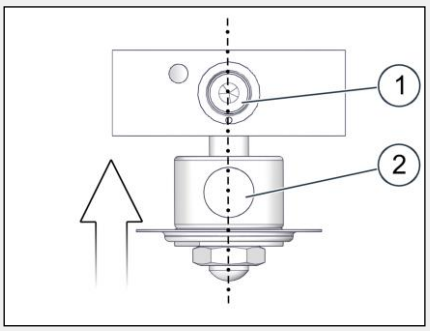
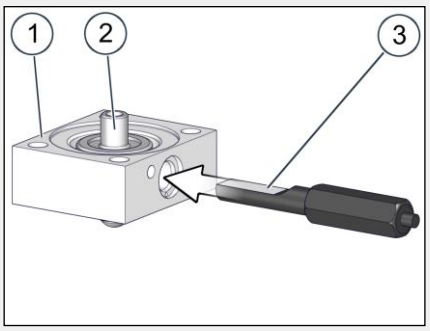
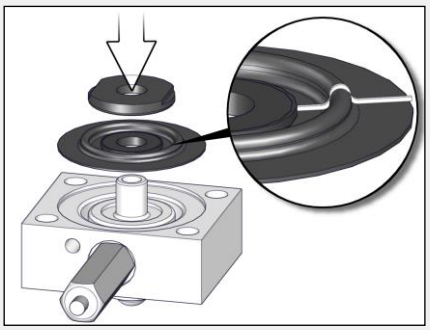
Figure	Step	Description
	17	Remove the diaphragm plate (1) and the diaphragm (2). Replace the diaphragm (2) and the stem seal (3) with new ones. When inserting the new diaphragm in place, make sure that it is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	18	Lightly coat the thread surfaces with threadlocker. Screw the hex nut back onto the connecting piece. Observe the tightening torque information provided in the table before this section.
	19	Insert the connecting piece into the valve body. Make sure that the holes (1, 2) are aligned.
	20	Align the valve body (1) as shown. Hold the connecting piece (2) in position. Insert the assembly aid, with the milled surface (3) facing upward towards the piston opening, into the valve body.
	21	Replace the diaphragm and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate, on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.

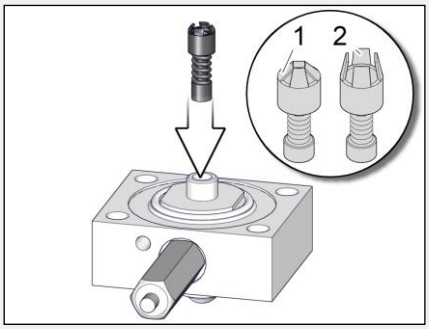
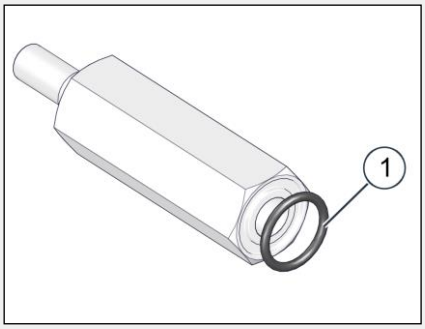
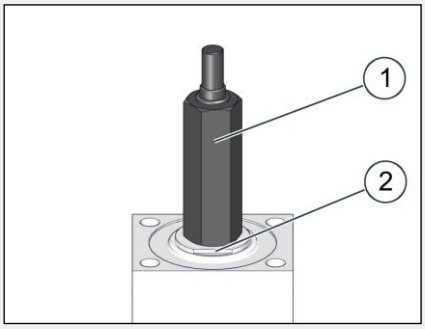
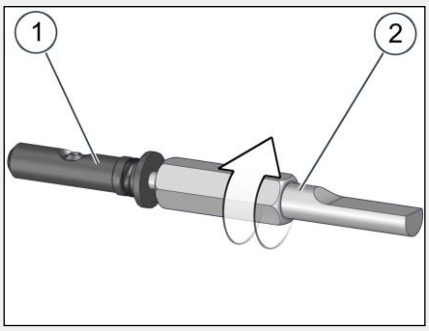
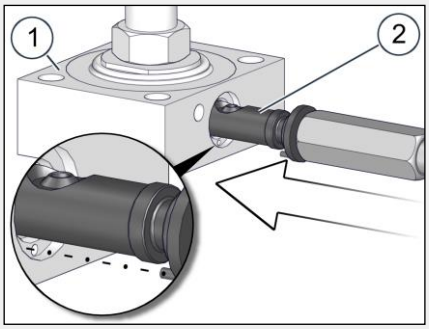
Figure	Step	Description
	22	Replace the piston with a new one. Insert the new piston into the connecting piece. Risk of confusion! Please observe the characterizing difference between the old and the new piston: ▪ Old piston (1): Castellated nut closed ▪ New piston (2): Castellated nut open
	23	Take the upper connecting piece. Replace the O-ring (1) with a new, greased O-ring.
	24	Lightly coat the thread surfaces with threadlocker. Screw the connecting piece (1) back in place while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before this section.
	25	Remove the assembly aid (2) from the valve body. Screw the assembly aid (2) into the new valve insert (1).
	26	Position the valve body (1) as shown. Turn the valve insert (2) in such a way that the dowel pin will engage the intended hole on the valve body (1) and the nozzle opening is pointing upwards. Insert the valve insert (2) as far as it will go into the connecting piece (1).

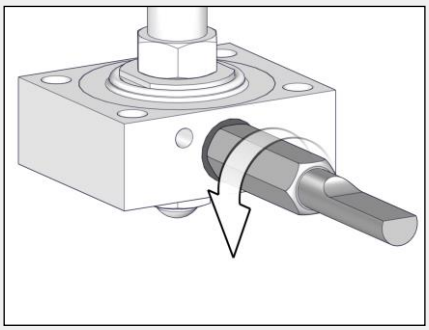
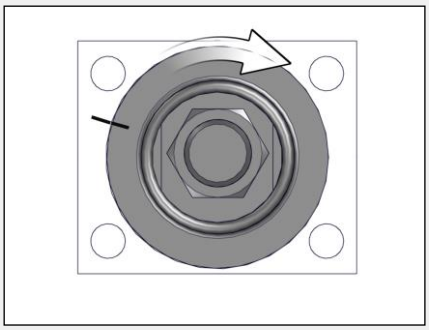
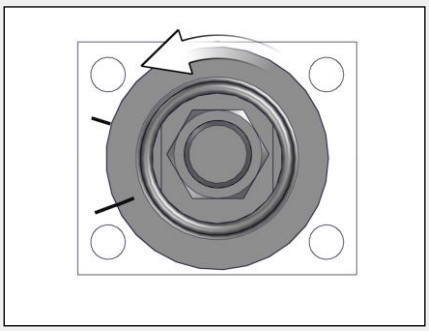
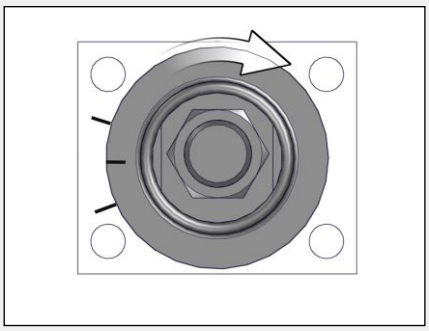
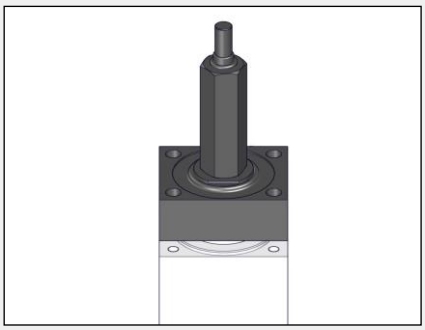
Figure	Step	Description
	27	Remove the assembly aid.
	28	To align the cross hole of the lower connecting piece correctly with the valve insert: Use the upper connecting piece to turn the diaphragm by hand clockwise until it will not rotate any further. Use a marker or pen to mark the position on the body and on the convoluted diaphragm.
	29	Use the upper connecting piece to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	30	Use the upper connecting piece to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings on the body.
	31	Place the valve body on the spring housing.

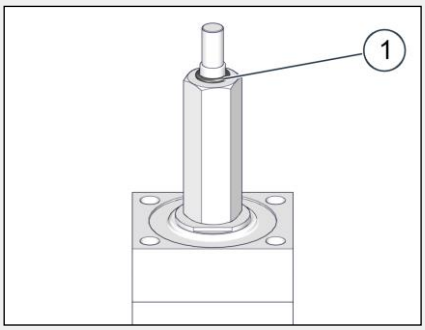
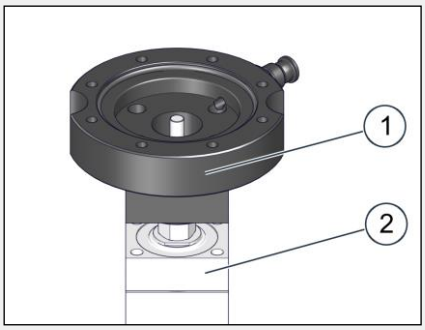
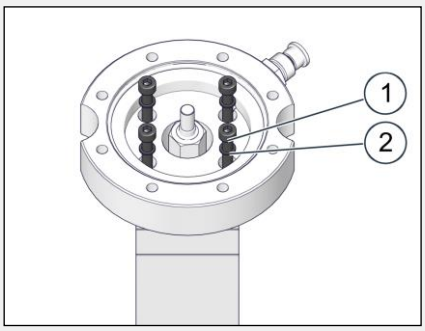
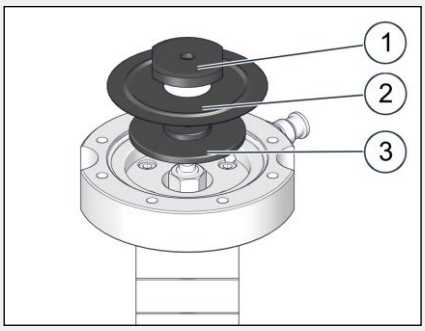
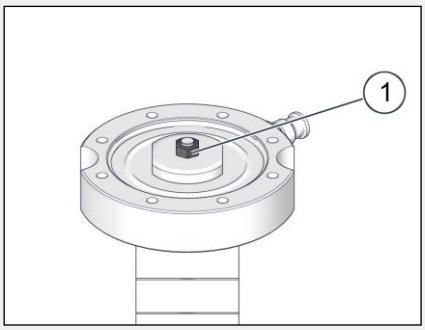
Figure	Step	Description
	32	Replace the O-ring (1) with a new, greased O-ring.
	33	Hold the valve body (2) in place and put the diaphragm housing (1) back in place.
	34	Replace the bonded seals (2) with new ones. Lubricate the thread surfaces. Tighten the diaphragm housing's screws (1) in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	35	Replace the diaphragm (2) with a new one. Put the diaphragm plate (3), the new diaphragm (2), and the pressure piece (1) back in place.
	36	Tighten the hex nut (1) while using an open-end wrench to hold the pressure piece in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before this section.

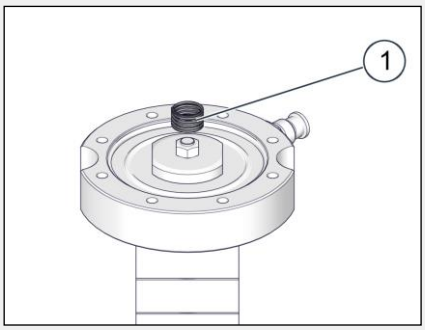
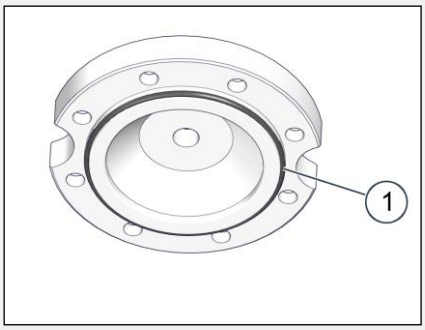
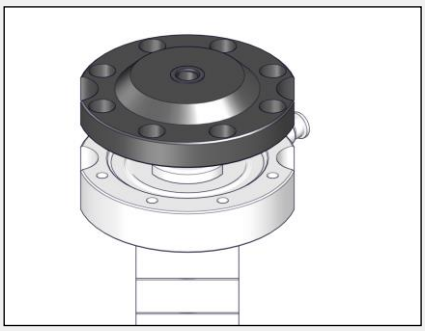
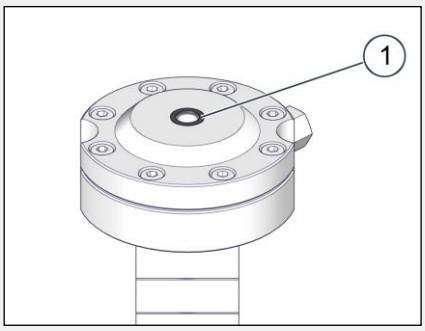
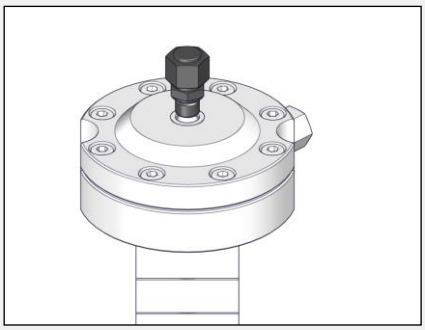
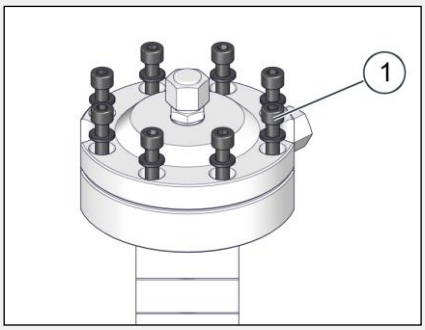
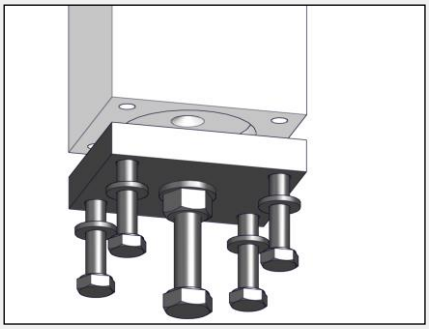
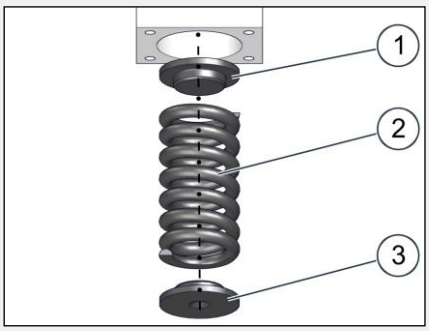
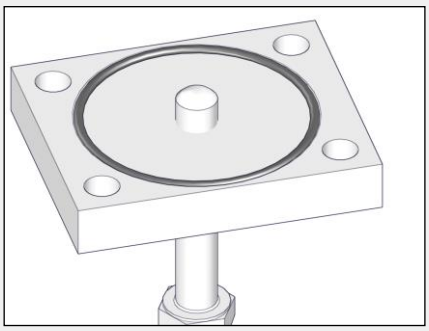
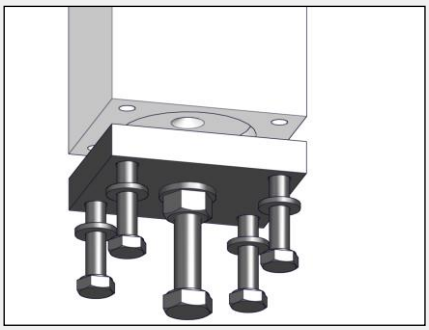
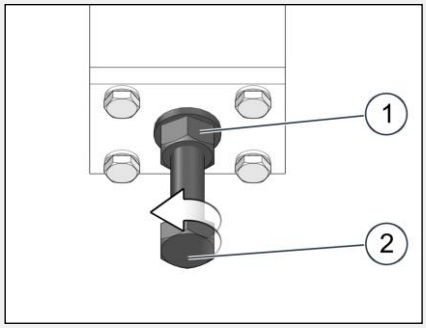
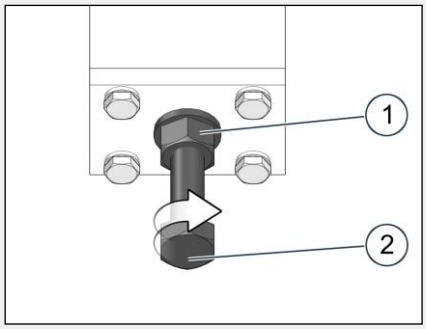
Figure	Step	Description
	37	Put the spring (1) back in place.
	38	Take the diaphragm cover. Replace the O-ring (1) with a new, greased O-ring.
	39	Put the diaphragm cover back in place.
	40	Replace the O-ring (1) with a new, greased O-ring.
	41	Lubricate the thread surfaces. Screw the screw-in fitting back in.

Figure	Step	Description
	42	Lubricate the thread surfaces. Tighten the screws (1) in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	43	Loosen the base plate screws. Remove the base plate. **Important!** While removing the base plate, parts on the inside may fall out from the spring housing by accident!
	44	Remove the lower spring plate (3), the compression spring (2), and the upper spring plate (1) from the spring housing. Lubricate the spring plates' depressions and reinsert the parts into the spring housing in the right order and alignment.
	45	Replace the O-ring with a new, greased O-ring.
	46	Lubricate the thread surfaces. Put the base plate back in place. Tighten the screws in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.

	**47**	Unscrew the adjusting screw (2) and remove it from the base plate. Clean and lubricate the adjusting screw.
	48	Replace the hex flange nut (1) with a new one. Lubricate the thread surfaces.
	**49**	Screw the spring adjuster (2) back in a bit. The correct setpoint adjustment cannot be carried out until before commissioning with the pilot installed.

Next task

Depending on the specific pilot version, proceed as indicated in the relevant section:

For the multi-stage pilot version: *Maintaining the load limiting stage* (see page 53)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 56)

4.6 Maintaining the control stage with a metal bellows assembly

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

Observe the tightening torques below when following the instructions in this section:

Part	Tightening torque	Step
Closing cap	20 Nm (15 ft lbs)	21
Cylinder screws	6 Nm (5 ft lbs)	31
Hex bolt	12 Nm (9 ft lbs)	35
Hex bolt	12 Nm (9 ft lbs)	37

Maintaining the control stage

Proceed as follows:

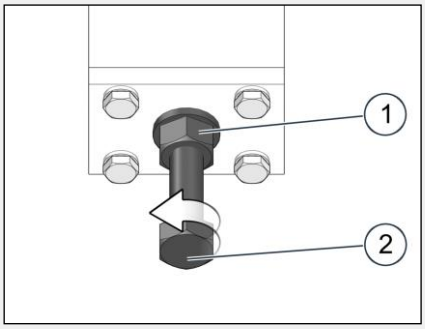
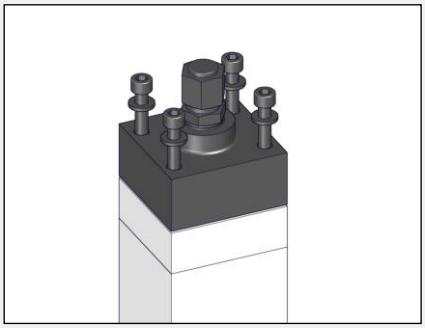
Figure	Step	Description
	1	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	2	Loosen the screws and lift off the upper cover.

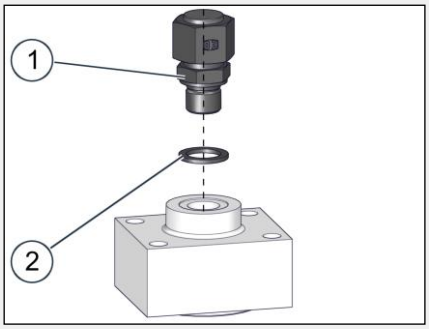
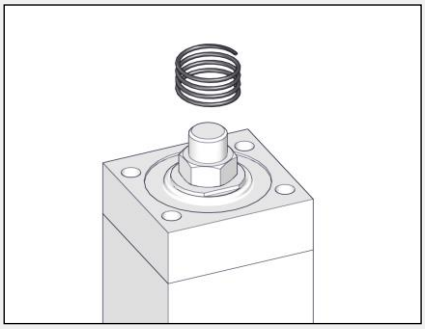
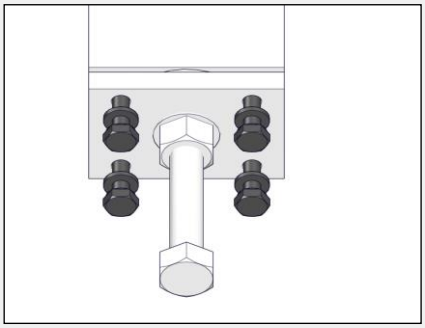
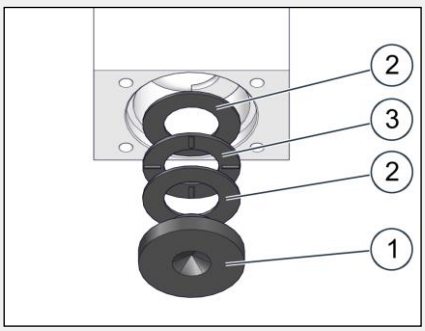
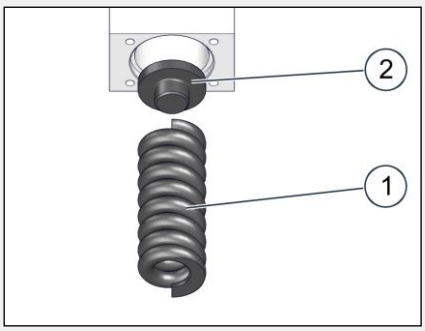
Figure	Step	Description
	3	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2) with a new, greased sealing ring. Lubricate the thread surfaces. Screw the fitting (1) back in.
	4	Remove the spring from the cap.
	5	Loosen the screws and slowly and carefully remove the lower cover. **Important!** While removing the cover, parts on the inside may fall out from the spring housing by accident!
	6	Remove the lower spring plate (1), the axial washers (2), and the axial needle roller bearing (3) from the spring housing.
	7	Remove the compression spring (1) and the upper spring plate (2) from the spring housing.

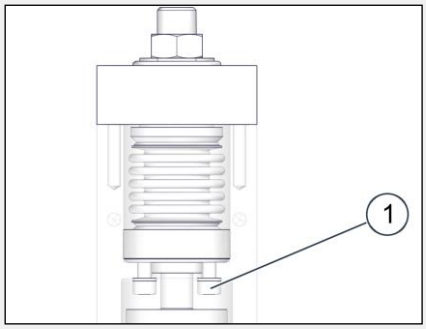
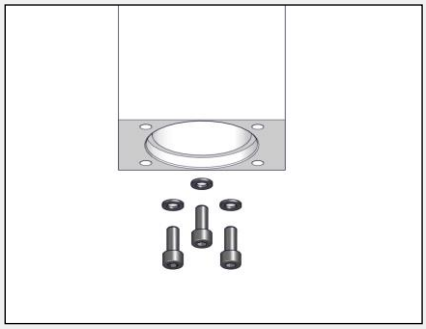
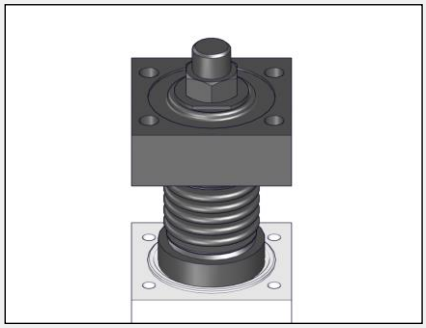
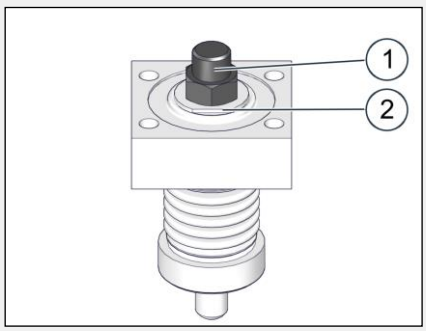
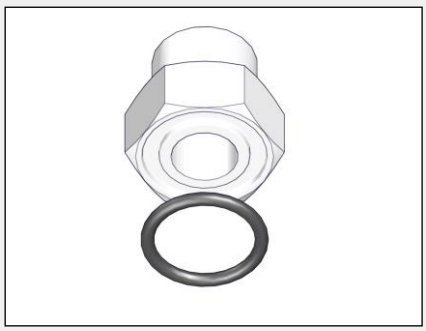
Figure	Step	Description
	8	Unscrew the metal bellows' internal screws (1) from the lower section of the spring housing.
	9	Remove the screws and the corresponding washers from the lower section of the spring housing.
	10	Pull the valve body, including the metal bellows, upwards in order to remove it as a complete unit from the spring housing.
	11	Unscrew the cap (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning.
	12	Replace the O-ring with a new, greased O-ring.

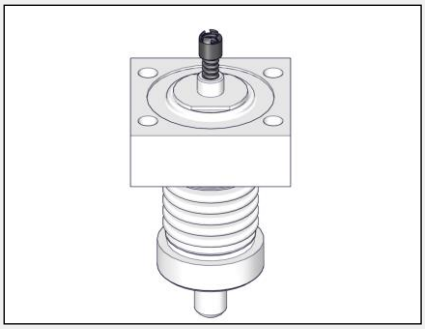
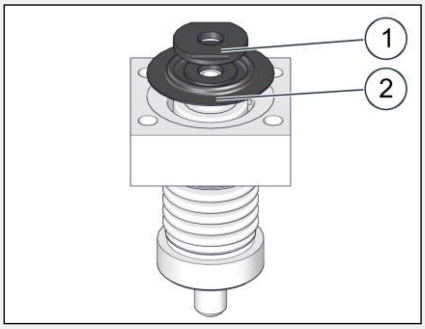
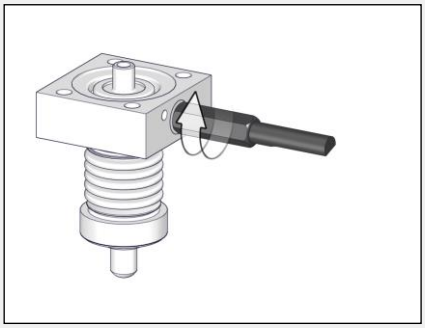
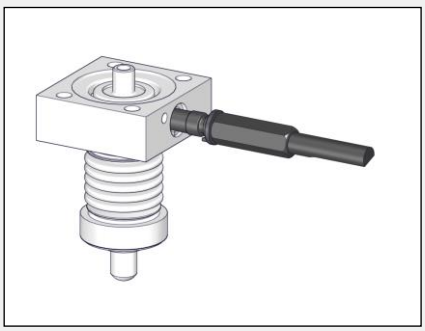
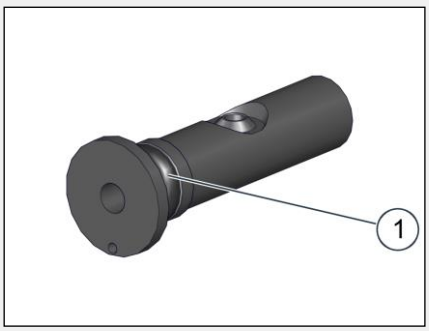
Figure	Step	Description
	13	Remove the pistons from the connecting piece.
	14	Remove the diaphragm plate (1) and the diaphragm (2).
	15	Screw the assembly aid into the valve insert.
	16	Pull out the valve insert.
	17	Replace the valve insert with a new one. Insert a new, greased O-ring (1).

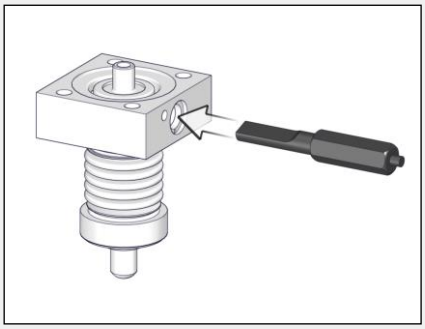
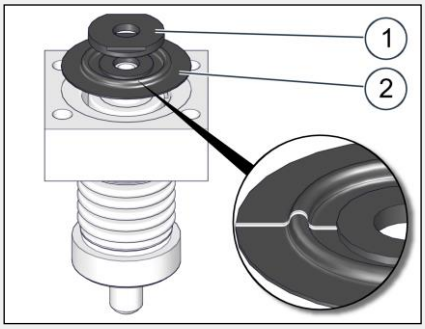
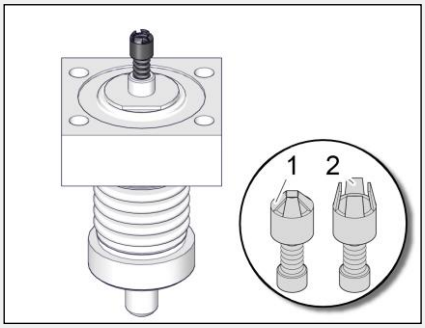
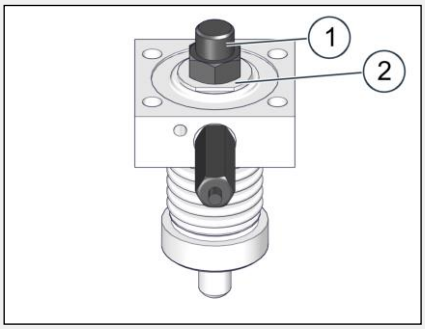
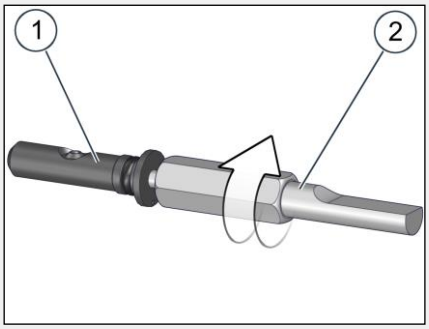
Figure	Step	Description
	18	Align the valve body as shown. Insert the assembly aid, with the milled surface facing upward towards the piston opening, into the valve body.
	19	Replace the diaphragm (2) and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate (1), on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	20	Replace the piston with a new one. Insert the new piston into the connecting piece. Risk of confusion! Please observe the characterizing difference between the old and the new piston: ▪ Old piston (1): Castellated nut closed ▪ New piston (2): Castellated nut open
	21	Lightly coat the thread surfaces with threadlocker. Put the cap (1) in place. Tighten the cap (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before this section.
	22	Remove the assembly aid (2) from the valve body. Screw the assembly aid (2) into the new valve insert (1).

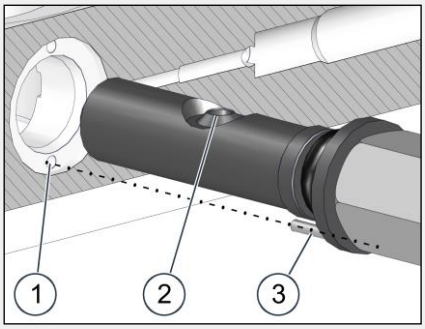
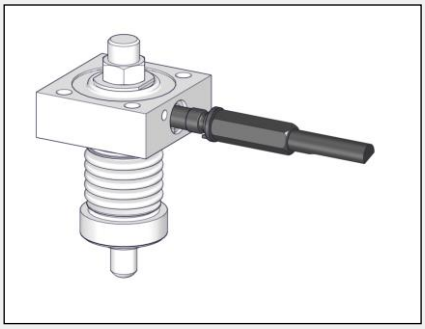
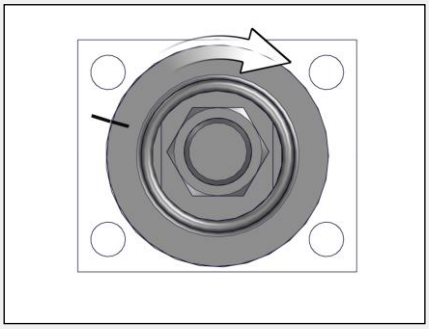
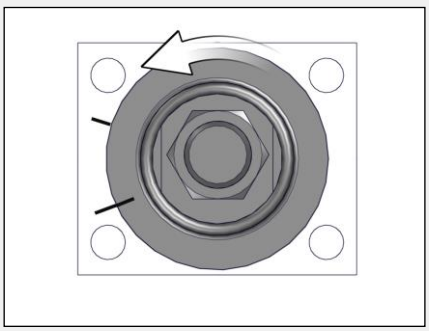
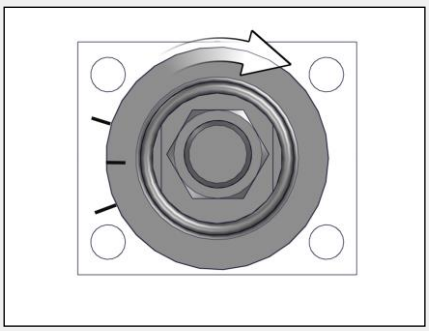
Figure	Step	Description
	23	Align the valve body as shown in figure 24. Turn the valve insert in such a way that, as shown in the sectional view, the dowel pin (3) is coaxially aligned with the lower hole (1) and the nozzle opening (2) is facing upward.
	24	Insert the valve insert all the way into the connecting piece. Remove the assembly aid.
	25	To align the cross hole of the connecting piece correctly with the valve insert: Use the cap to turn the diaphragm by hand clockwise until it will not rotate any further. Use a marker or pen to mark the position on the body and on the convoluted diaphragm.
	26	Use the cap to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	27	Use the cap to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings on the body.

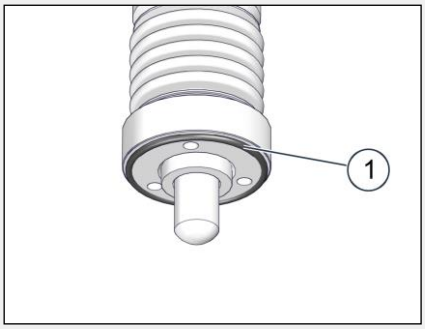
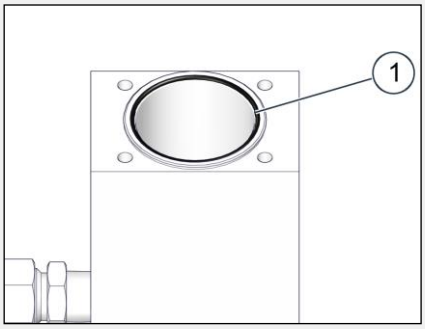
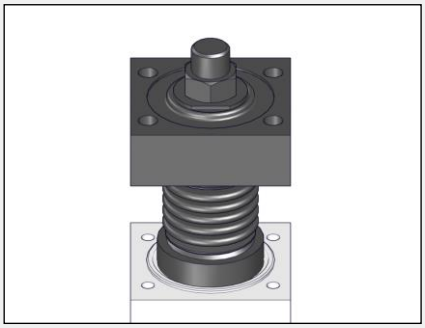
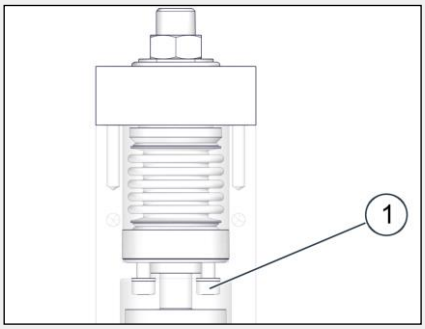
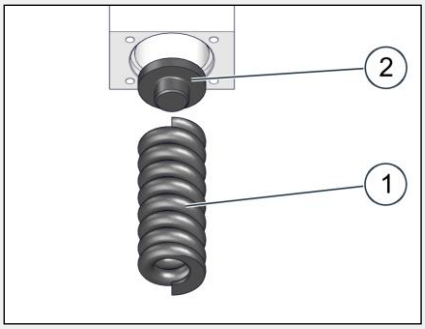
Figure	Step	Description
	28	Replace the O-ring (1) with a new, greased O-ring.
	29	Take the spring housing. Replace the O-ring (1) at the top of the spring housing with a new, greased O-ring.
	30	Insert the unit consisting of the valve body and the metal bellows back into the spring housing.
	31	Lubricate the thread surfaces. Tighten the screws (1), including the corresponding washers, from the underside of the spring housing. Observe the tightening torque information provided in the table before this section.
	32	Lubricate the upper spring plate's depressions (2). Reinsert the upper spring plate (2) and the compression spring (1) into the spring housing in the right order and alignment.

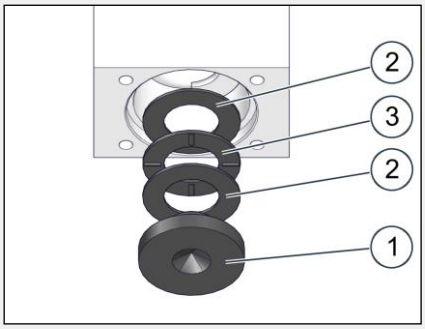
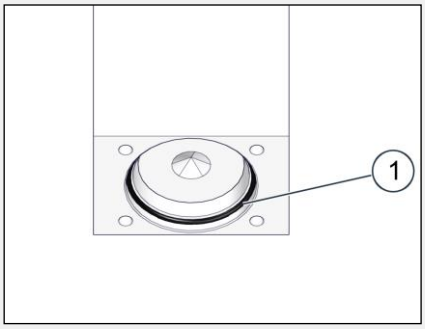
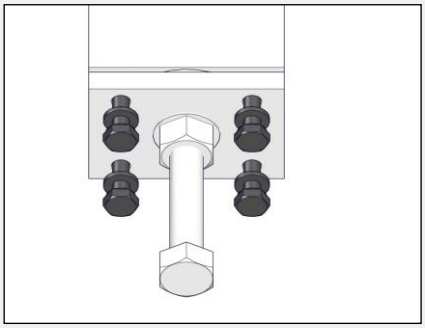
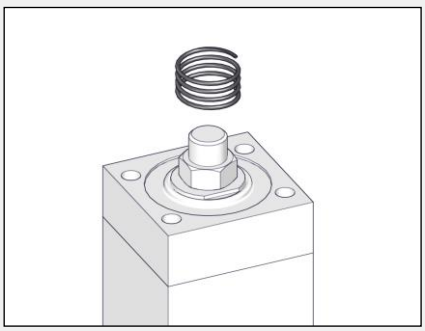
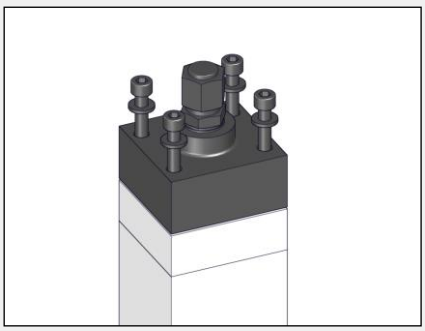
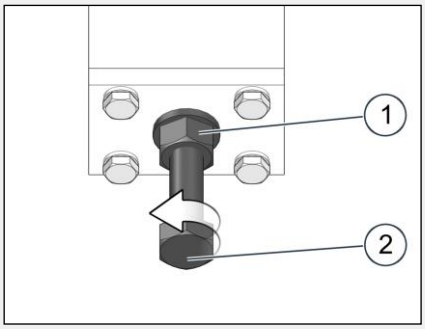
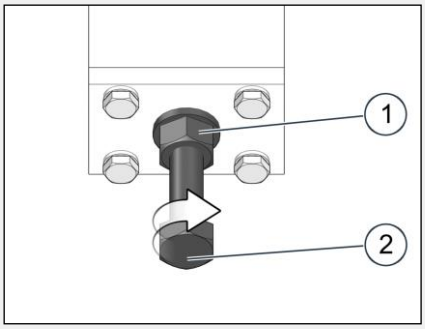
Figure	Step	Description
	33	Lubricate the lower spring plate's depressions (1). Reinsert the axial needle roller bearing (3), the axial washers (2), and the lower spring plate (1) into the spring housing from the bottom in the right order and alignment.
	34	Replace the O-ring (1) at the bottom of the spring housing with a new, greased O-ring.
	35	Lubricate the thread surfaces. Put the lower cover back in place. Tighten the screws in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	36	Turn the spring housing. Place the spring back on the cap.
	37	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 27). Place the upper cover back in place. Tighten the screws hand-tight at first.

Figure	Step	Description
	38	Unscrew the adjusting screw (2) and remove it from the base plate. Clean and lubricate the adjusting screw.
	39	Replace the hex flange nut (1) with a new one. Lubricate the thread surfaces.
	40	Screw the spring adjuster (2) back in a bit. The correct setpoint adjustment cannot be carried out until before commissioning with the pilot installed.

Next task

Depending on the specific pilot version, proceed as indicated in the relevant section:

For the multi-stage pilot version: *Maintaining the load limiting stage* (see page 53)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 56)

4.7 Maintaining the load limiting stage

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

When tightening fasteners, observe the following tightening torques:

Part	Tightening torque	Step
Socket cap screw	12 Nm (9 ft lbs)	35

Maintaining the load limiting stage

Proceed as follows:

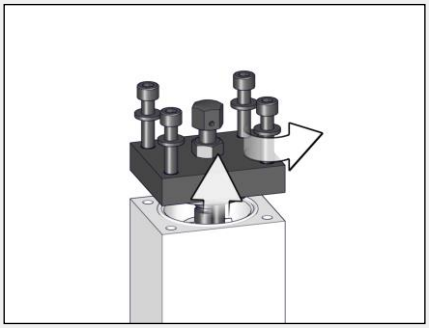
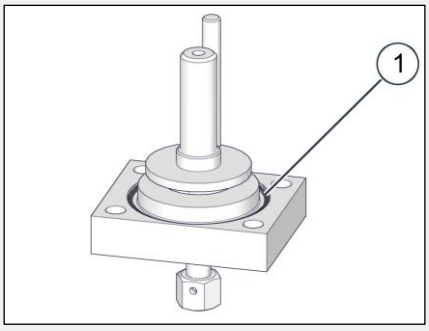
Figure	Step	Description
	1 - 27	Same as in *Maintaining the control stage with a diaphragm assembly* (see page 25)
	28	Turn the load limiting stage. Unscrew the socket cap screws and washers on the base plate
	29	Remove the base plate. Replace the O-ring (1) with a new, greased O-ring.

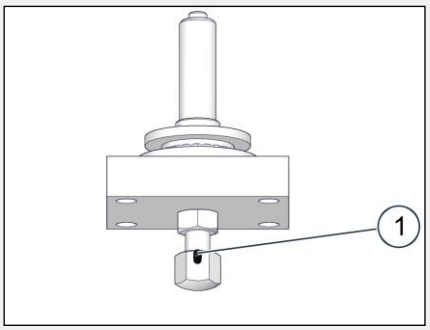
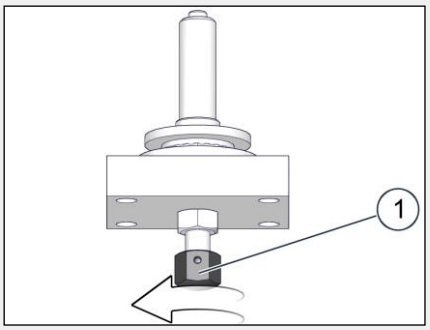
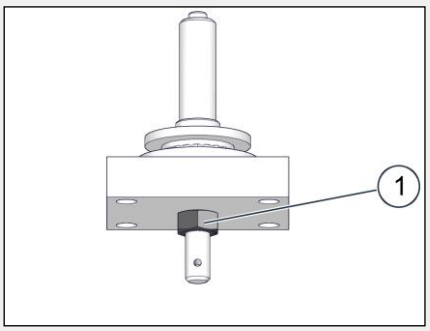
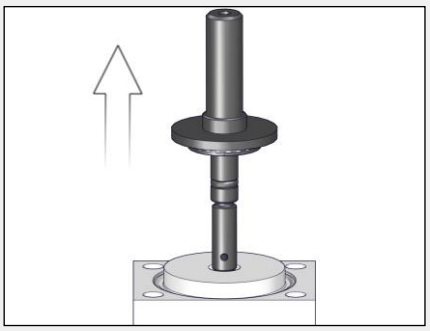
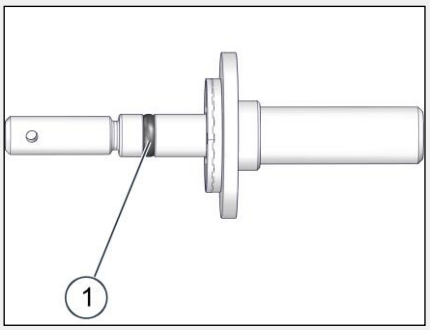
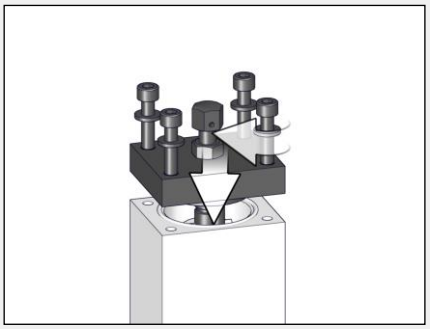
Figure	Step	Description
	30	Remove the cotter pin (1) from the cap nut.
	31	Unscrew the cap nut (1).
	32	Unscrew the nut (1).
	33	Remove the spring adjuster from the base plate.
	34	Replace the O-ring (1) with a new, greased O-ring.

Figure	Step	Description
	35	Put the base plate back in place. Insert the base plate back into the body. Tighten the screws, with the washers, in a criss-cross sequence. Refer to the additional lubricant and tightening torque information at the beginning of this topic.

Next task

Proceed as follows:

Maintaining the fine mesh filter (see page 56)

4.8 Maintaining the fine mesh filter

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

Observe the tightening torques below when following the instructions in this section:

Part	Tightening torque	Step
Base plate hex nut	10 Nm (8 ft lbs)	7
Fitting	40 Nm (30 ft lbs)	9

Maintaining the filter

Proceed as follows:

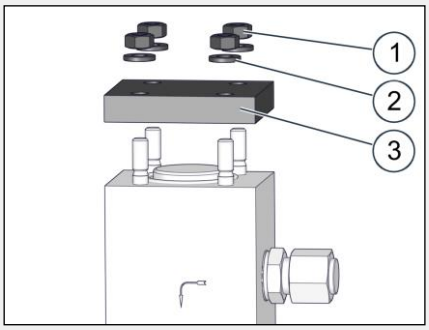
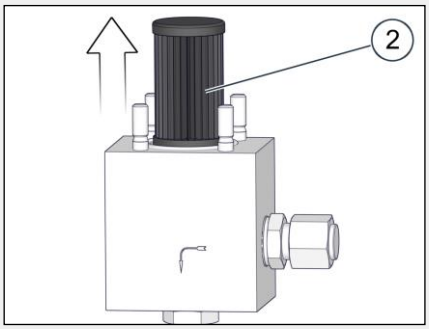
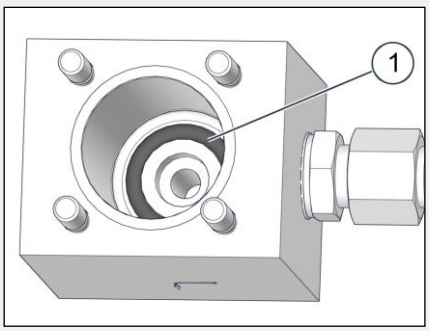
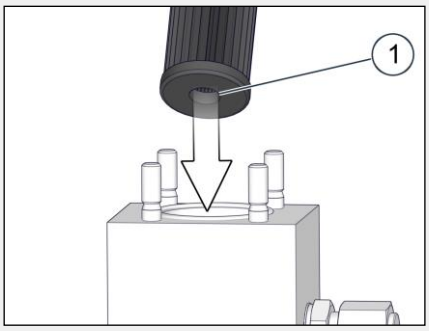
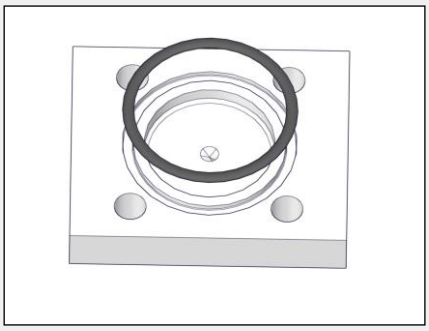
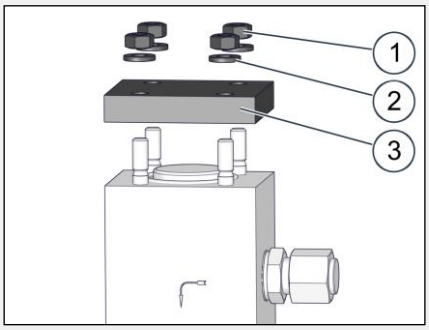
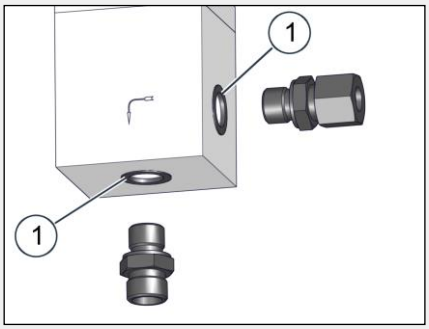
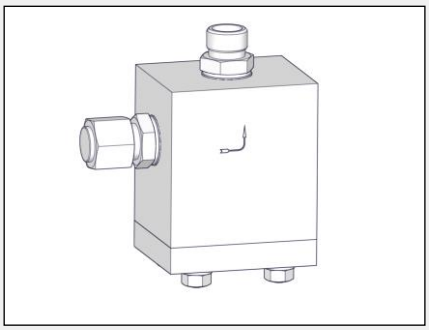
Figure	Step	Description
	1	Unscrew the nuts (1) and washers (2). Remove the base plate (3) from the body.
	2	Remove the filter insert (1) and clean it.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	4	Replace the O-ring (1) in the body with a new, greased O-ring.

Figure	Step	Description
	5	Insert the filter insert (1), with the opening facing downwards, into the body.
	6	Take the base plate. Replace the O-ring with a new, greased O-ring.
	7	Put the base plate on the body. Tighten the nuts (1) and washers (2) for the base plate (3) in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	8	Unscrew the fittings and replace the sealing rings (1) with new, greased ones.
	9	Install the greased fittings back in place. Observe the tightening torque information provided in the table before this section.

Next task

Proceed as follows:

Reassembling the pilot (see page 58)

4.9 Reassembling the pilot

Falling components

⚠CAUTION

Crush and impact hazard posed by components falling or toppling over accidentally.

When working with heavy components that have been removed or are yet to be installed, injury may result if the components start moving in an uncontrolled manner, e.g., fall down from the working surface or topple over.

⇨ Place removed components exclusively on level, horizontal working surfaces with enough load-bearing capacity.
⇨ If necessary, secure removed components so that they will not fall or topple over.
⇨ Wear the required personal protective equipment.
⇨ Exercise caution when performing the relevant tasks.

Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- If fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

When tightening fasteners, observe the following tightening torques:

Part	Tightening torque	Step
Hex nut	12 Nm (9 ft lbs)	1, 2, 3

Reassembling the pilot

Proceed as follows:

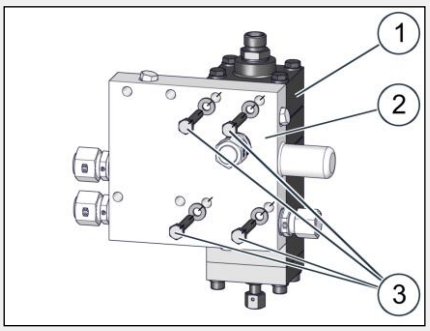
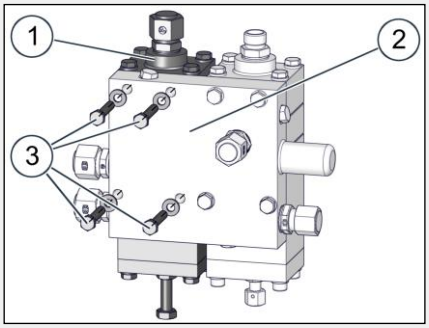
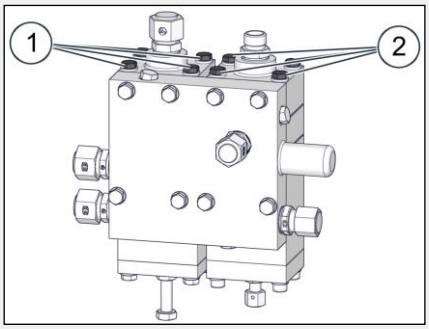
Figure	Step	Description
	1	Use the 4 hex bolts (3) and washers to fasten the load limiting stage (1) back onto the base plate (2). Observe the tightening torque information provided in the table before this section.
	2	Use the 4 hex bolts (3) and washers to fasten the control stage (1) back onto the base plate (2). Observe the tightening torque information provided in the table before this section.

Figure	Step	Description
	3	Tighten the 4 hex bolts on the control stage (1) cover and on the load limiting stage (2) cover. Observe the tightening torque information provided in the table before this section.

Next task

Proceed as follows:

Completing the maintenance (see page 60)

4.10 Completing the maintenance

Installing the pilot on the actuator assembly	For instructions on how to install the pilot on the actuator assembly that will be used to operate it, please refer to the user manual for the relevant gas pressure regulator. Keep in mind that it is always necessary to check the entire gas pressure regulator for internal and external leaks and fix them before putting it into operation for the first time or putting it back into operation.
Next task	Depending on what you want to do next, proceed as indicated in the relevant section: ▪ *Storing the device* (see page 62) ▪ *Disposing of the device* (see page 63)

5 Storage and disposal

Contents

Topic	Page
Storing the device	62
Disposing of the device	63

5.1 Storing the device

Storage of the packing units

Observe the following rules:

- Do not store the device outdoors.
- Store the device in a dry and dust-free environment on a flat surface.
- Do not expose the device to any aggressive media, ozone or ionizing radiation or to direct heat sources.
- Storage conditions:
  - Temperature: 0 °C to 25 °C (32 °F to 77 °F)
  - Relative humidity: < 55%.
- Avoid mechanical vibrations.
- Storage periods:
  - When storing the device for up to one year:
    Store the device in its original packaging and in the same condition it was delivered. All protective caps of the device must remain in place.
  - If the device is stored longer than 1 year (e.g., as a backup device):
    Store the device in the original packaging as it was originally delivered and check it annually for damage and soiling. Consider the storage period in the maintenance cycles.

Note: Please also observe any storage information provided on the packaging.

Storage of spare parts

The following rules apply to the storage of spare parts:

- Apply an appropriate protective agent to assemblies at risk of corrosion.
- If stored correctly, O-rings and gaskets should not be kept longer than 7 years.
- Store the spare parts in the original package until they are used.

Storing devices that have already been in operation and that are intended to be put back into operation later on

Observe the following rules:

- All device openings and fittings must be sealed and protected from soiling and damage.
- The device's maintenance condition must be indicated with a label:
  - Date when maintenance was last performed
  - Operating times and operation cycles since the last time maintenance was performed
- Do not store the device outdoors.
- Store the device in a dry and dust-free environment on a flat surface.
- Do not expose the device to any aggressive media, ozone or ionizing radiation or to direct heat sources.
- Storage conditions:
  - Temperature: 0 °C to 25 °C (32 °F to 77 °F)
  - Relative humidity: < 55%.
- Avoid mechanical vibrations.
- Storage periods: Check the device for damage and soiling at least annually. When it comes to maintenance cycles, take the preceding operating time into account in addition to the storage time.

5.2 Disposing of the device

Appropriate disposal

Comply with the legally stipulated disposal rules. Observe the following details pertaining to the appropriate disposal (not all of the items may be applicable to your device):

- Dispose of the metals according to their types and grades (steel scrap, cast iron scrap, light alloy scrap, nonferrous heavy metal scrap, synthetic rubber scrap, electronic scrap).
- Recycle elements made of synthetic materials.
- Dispose of any other components according to the quality of the materials.

6 Appendix

Contents

Topic	Page
Additional information regarding spare parts	65
Spare parts for two-stage HON 630 pilot	67
Spare parts for control stage	73
Spare parts for load limiting stage	79
Spare parts for fine mesh filter	81
Lubricants, threadlockers, and special tools	82

6.1 Additional information regarding spare parts

Spare parts categories

Spare parts fall into the following categories:

Spare parts category	Definition
Maintenance part	Spare parts that always have to be replaced during maintenance.
Servicing parts	Spare parts that need to be checked during maintenance and that must be replaced if necessary due to their condition.
	Spare parts that qualified personnel employed by the company operating the device is allowed to replace in order to convert the device (e.g., when changing the pressure range).
	Spare parts that qualified personnel employed by the company operating the device is allowed to replace in the event of a fault or defect.
Miscellaneous spare part	Parts that are listed in the spare part drawings in addition to maintenance and servicing parts so as to improve communications between the customer and the manufacturer, but that are not allowed to be ordered or replaced without first contacting the manufacturer.

Maintenance and servicing parts for pilot

- The bills of materials for the pilots are broken down by maintenance parts and servicing parts.
- The required number of maintenance or servicing parts is indicated under the relevant part number in the “Part No.” column. If no quantity is specified, this means that only one unit is required.

Setpoint ranges

The bills of materials for the HON 630 pilot and the associated control stages are subdivided into the following three setpoint ranges:

- W_d = 0.3 – 1 bar (with larger diaphragm assembly)
- W_d = 0.5 – 40 bar (with diaphragm assembly)
- W_d = 10 – 90 bar (with metal bellows assembly)

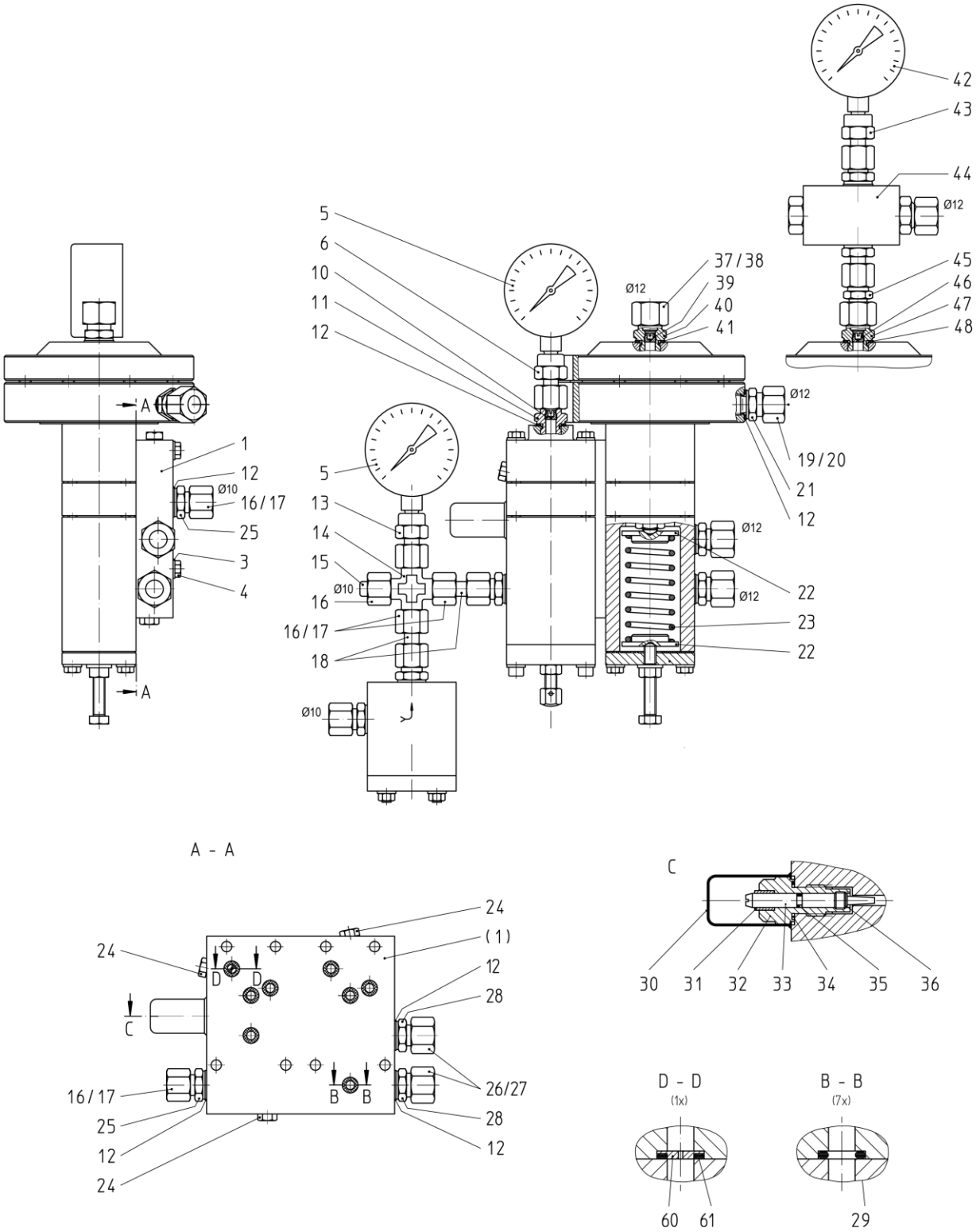
Overview of bills of materials

The bills of materials are subdivided as follows:

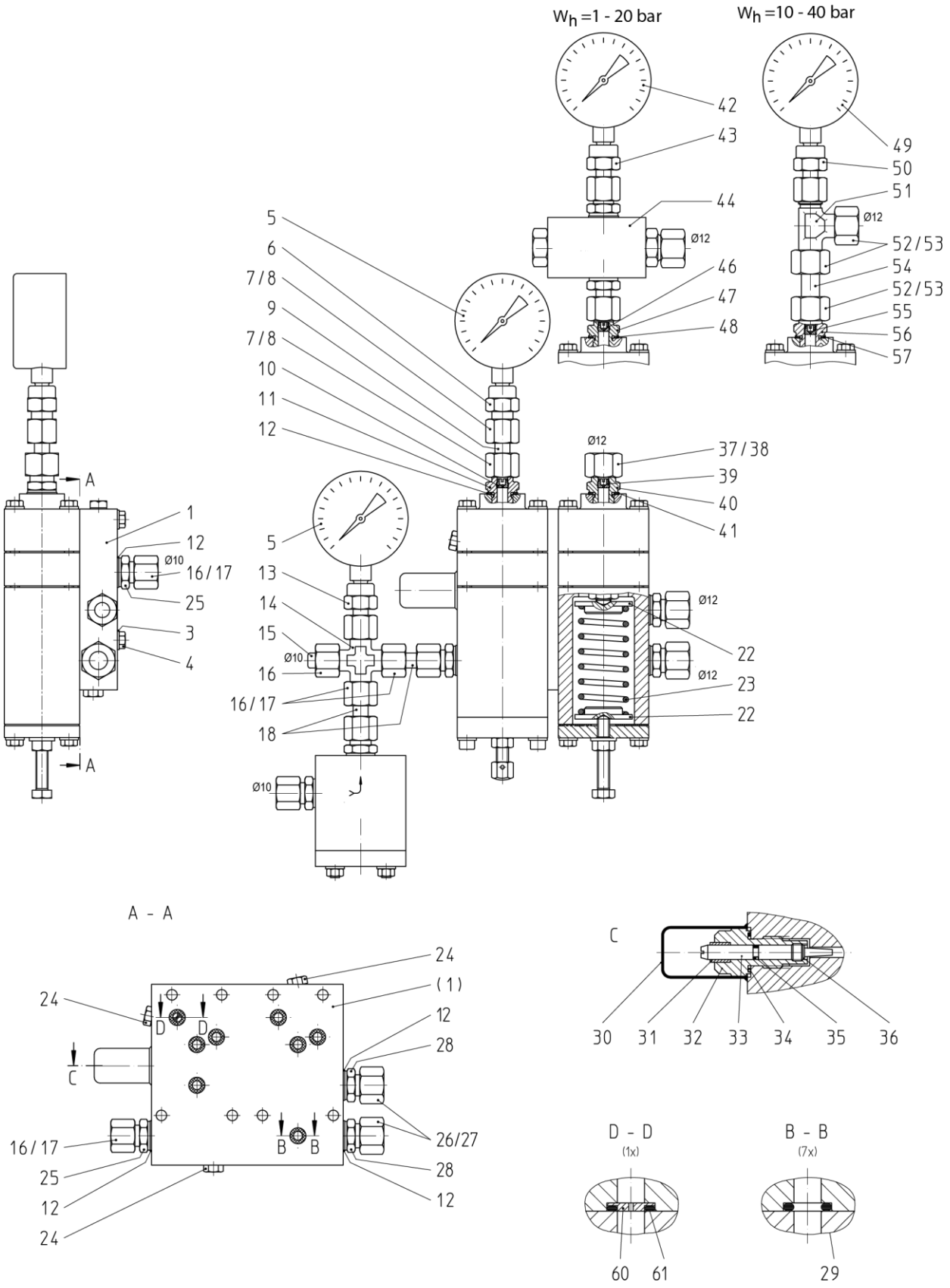
- Maintenance parts for two-stage HON 630 pilot, for the three setpoint ranges
  - Additional list without outlet pressure gauge
  - Additional list with outlet pressure gauge, W_d = 0.3 – 20 bar
  - Additional list with outlet pressure gauge, W_d = 10 – 90 bar
- Servicing parts for two-stage HON 630 pilot, for the three setpoint ranges
  - Additional list with outlet pressure gauge, W_d = 0.3 – 20 bar
  - Additional list with outlet pressure gauge, W_d = 10 – 90 bar
- Load limiting stage
  - Maintenance parts
  - Servicing parts
- Control stage with diaphragm assembly
  - Maintenance parts
  - Servicing parts
- Control stage with metal bellows assembly
  - Maintenance parts
  - Servicing parts
- Control stage with larger diaphragm assembly
  - Maintenance parts
  - Servicing parts
- HON 905 fine mesh filter
  - Maintenance parts
  - Servicing parts

6.2 Spare parts for two-stage HON 630 pilot

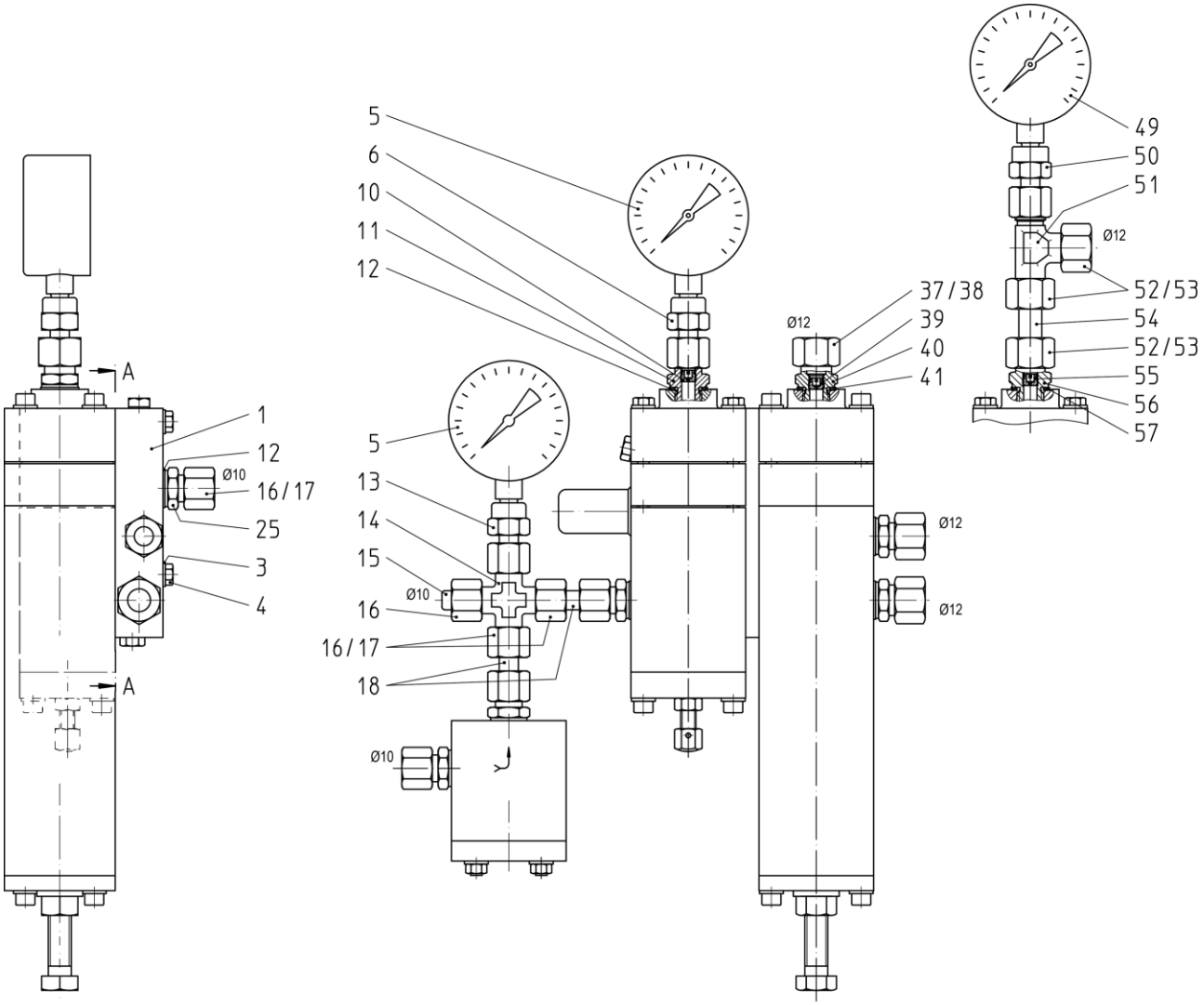
Spare parts drawing for pilot with larger diaphragm assembly

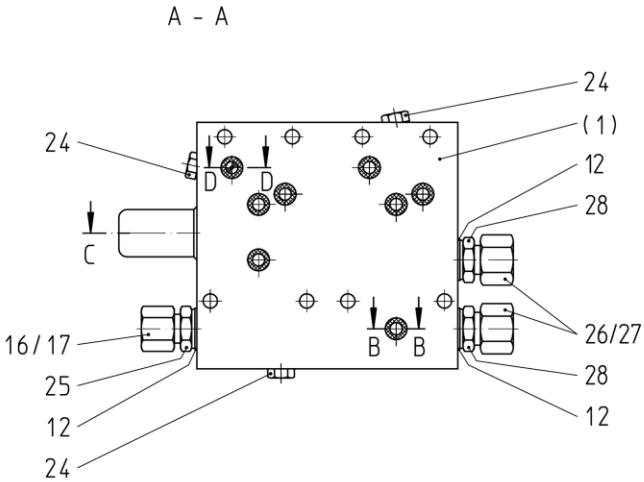


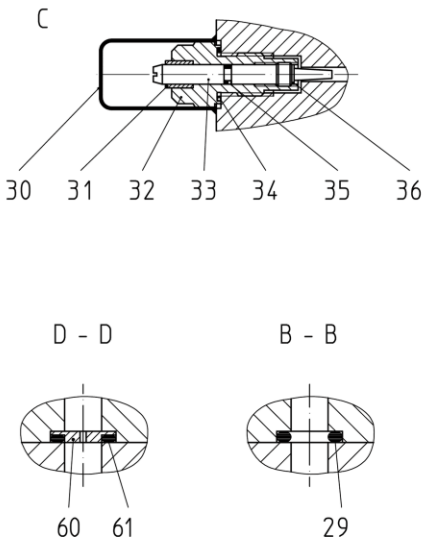
Spare parts drawing for pilot with diaphragm assembly



Spare parts drawing for pilot with metal bellows assembly







Maintenance parts for HON 630 pilot

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
12	Gasket	18 842 (6 units)	18 842 (5 units)	18 842 (5 units)
29	O-ring	20 225 (8 units)	20 225 (8 units)	20 225 (8 units)
34	O-ring	20 332	20 332	20 332
35	O-ring	20 283	20 283	20 283
36	Retaining ring	19 065	19 065	19 065
61	O-ring	20 231	20 231	20 231

Additional bills of materials for maintenance parts, differentiated based on outlet pressure gauge.

Without pressure gauge

The following bill of materials applies to the version without a pressure gauge:

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
41	Gasket	18 842	18 842	18 842

Pressure gauge for W_{ds} = 0.3 – 20 bar

The following bill of materials applies to the version with a pressure gauge for a specific setpoint range of W_{ds} = 0.3 – 20 bar:

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
48	Gasket	18 842	18 842	-

Pressure gauge for a specific setpoint range of W_{ds} = 10 – 90 bar

The following bill of materials applies to the version with a pressure gauge for a specific setpoint range of W_{ds} = 10 – 90 bar:

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
57	Gasket	-	18 842	18 842

Servicing parts for HON 630 pilot

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
5	Pressure gauge by actuator assembly pressure rating:			
	▪ For pressure rating PN 16	26 890	26 890	-
	▪ For pressure rating PN 25/ANSI 150	100 418	100 418	-
	▪ For pressure rating PN 40	26 282	26 282	-
	▪ For pressure rating ANSI 300	26 283	26 283	26 285
	▪ For pressure rating ANSI 600	26 285	26 285	26 285
22	Spring plate for the following specific setpoint ranges:			
	▪ W_{ds} = 0.3–1 bar	10 000 114	-	-
	▪ W_{ds} = 0.5 – 10 bar	-	10 000 114	-
	▪ W_{ds} = 10–40 bar	-	10 000 148	-
23	Compression spring for the following specific setpoint ranges:			
	▪ W_{ds} = 0.3 – 1 bar (black)	10 009 671	-	-
	▪ W_{ds} = 0.5 – 2 bar (blue)	-	10 000156	-
	▪ W_{ds} = 1 – 5 bar (black)	-	10 009 671	-
	▪ W_{ds} = 2 – 10 bar (gray)	-	10 000 139	-
	▪ W_{ds} = 5 – 20 bar (brown)	-	10 000 115	-
	▪ W_{ds} = 10 – 40 bar (red)	-	10 000 064-RMK	-

Additional bills of materials for servicing parts, differentiated based on outlet pressure gauge.

Pressure gauge for W_{ds} = 0.3 – 20 bar

The following bill of materials applies to the version with a pressure gauge for a specific setpoint range of W_{ds} = 0.3 – 20 bar:

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
42	Pressure gauge for the following specific setpoint ranges:			
	▪ W_{ds} = 0.3-1 bar	27 933	-	-
	▪ W_{ds} = 0.5-2 bar	-	27 933	-
	▪ W_{ds} = 1-5 bar	-	27 933	-
	▪ W_{ds} = 2-10 bar	-	26 890	-
	▪ W_{ds} = 5-20 bar	-	100 418-RMK	-
44	Protection against overpressure for the following specific setpoint ranges:			
	▪ W_{ds} = 0.3-1 bar	10 023 335	-	-
	▪ W_{ds} = 0.5-2 bar	-	10 023 335	-
	▪ W_{ds} = 1-5 bar	-	10 023 336	-
	▪ W_{ds} = 2-10 bar	-	10 023 337	-
	▪ W_{ds} = 5-20 bar	-	10 023 338	-

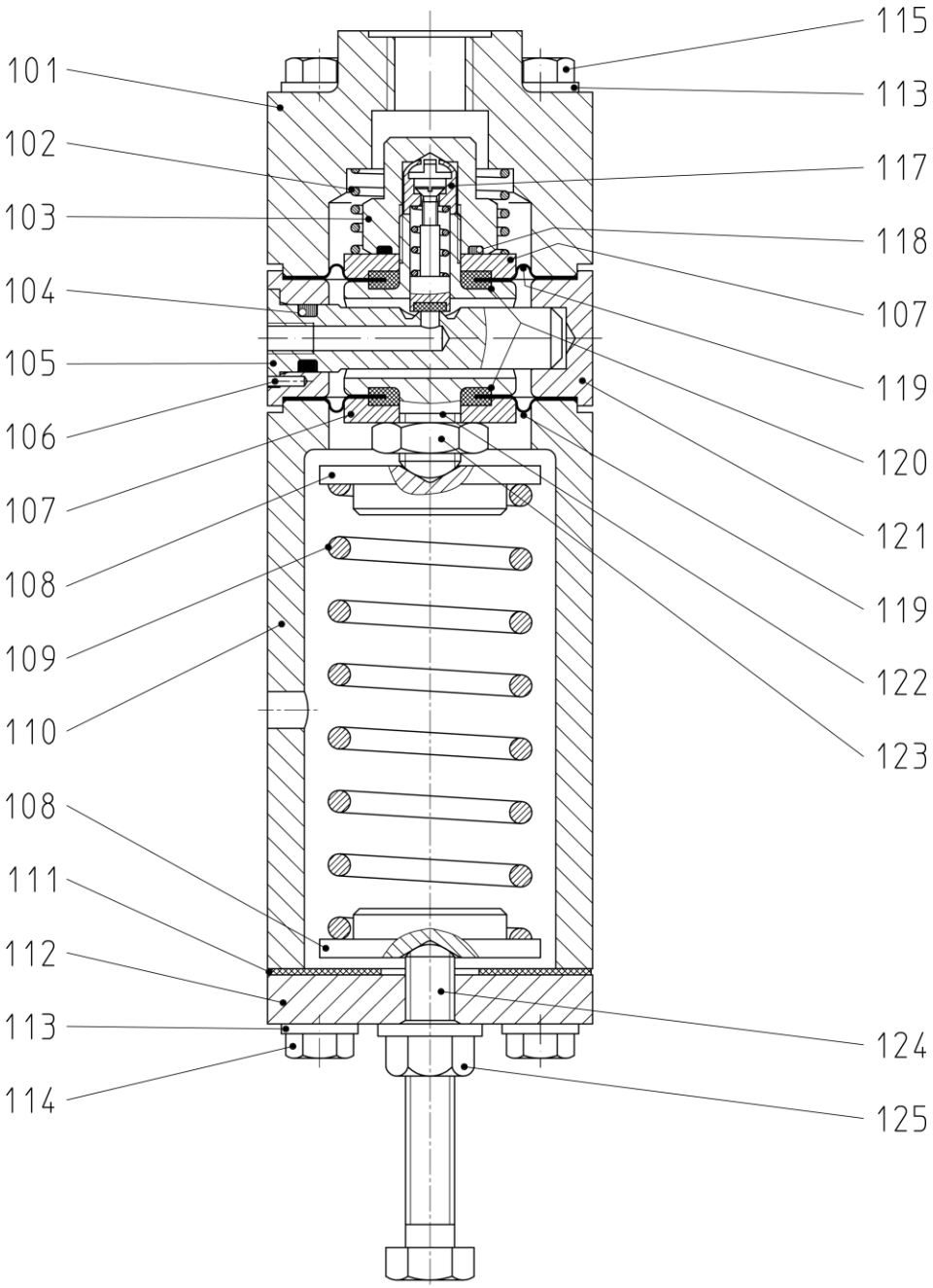
Pressure gauge for a specific setpoint range of W_{ds} = 10 – 90 bar

The following bill of materials applies to the version with a pressure gauge for a specific setpoint range of W_{ds} = 10 – 90 bar:

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
49	Pressure gauge for the following specific setpoint ranges:			
	▪ W_{ds} = 10-40 bar	-	26 282	26 282
	▪ W_{ds} = 10-50 bar	-	26 283	26 283
	▪ W_{ds} = 20-90 bar	-	-	26 285

6.3 Spare parts for control stage

Spare parts drawing for control stage with diaphragm assembly



Maintenance parts for control stage with diaphragm assembly

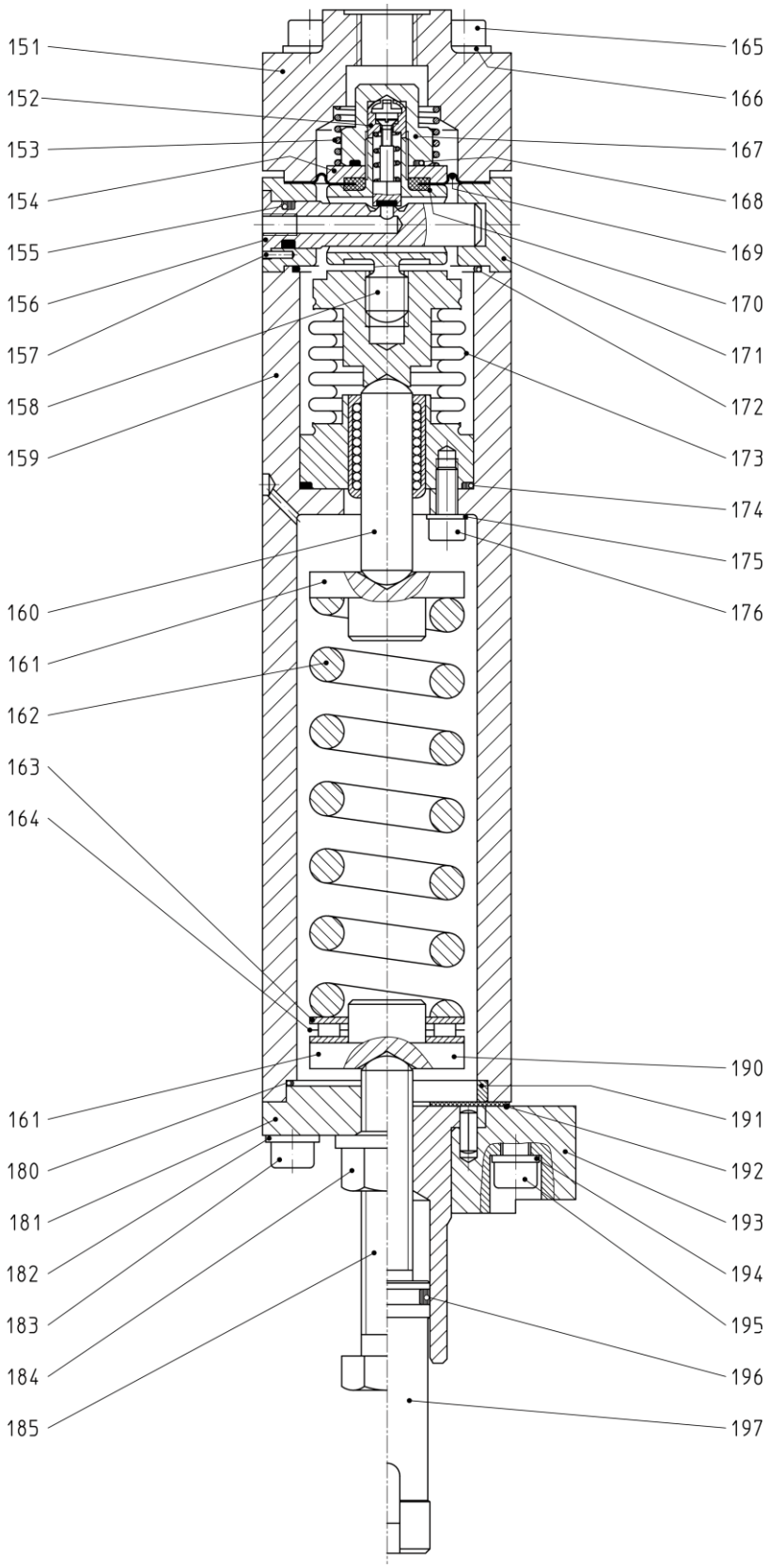
No.	Name	Part no.
104	O-ring	20 225
105	Valve insert	10 000 061
111	Gasket	10 000 100
117	Piston, pre-assembled	10 000 186
118	O-ring	20 332
119	Convoluted diaphragm	10 000 191 (2 units)
120	Snap-on gasket	10 000 066 (2 units)
125	Hex flange nut	13 136

Servicing parts for control stage with diaphragm assembly

No.	Name	Part no.
108	Spring collar	See No. 22
109	Compression spring	See No. 23

Spare parts drawing for control stage with metal bellows assembly

The left half of the figure shows the standard design without an electric actuator. The right half shows the version with the electric actuator installed.



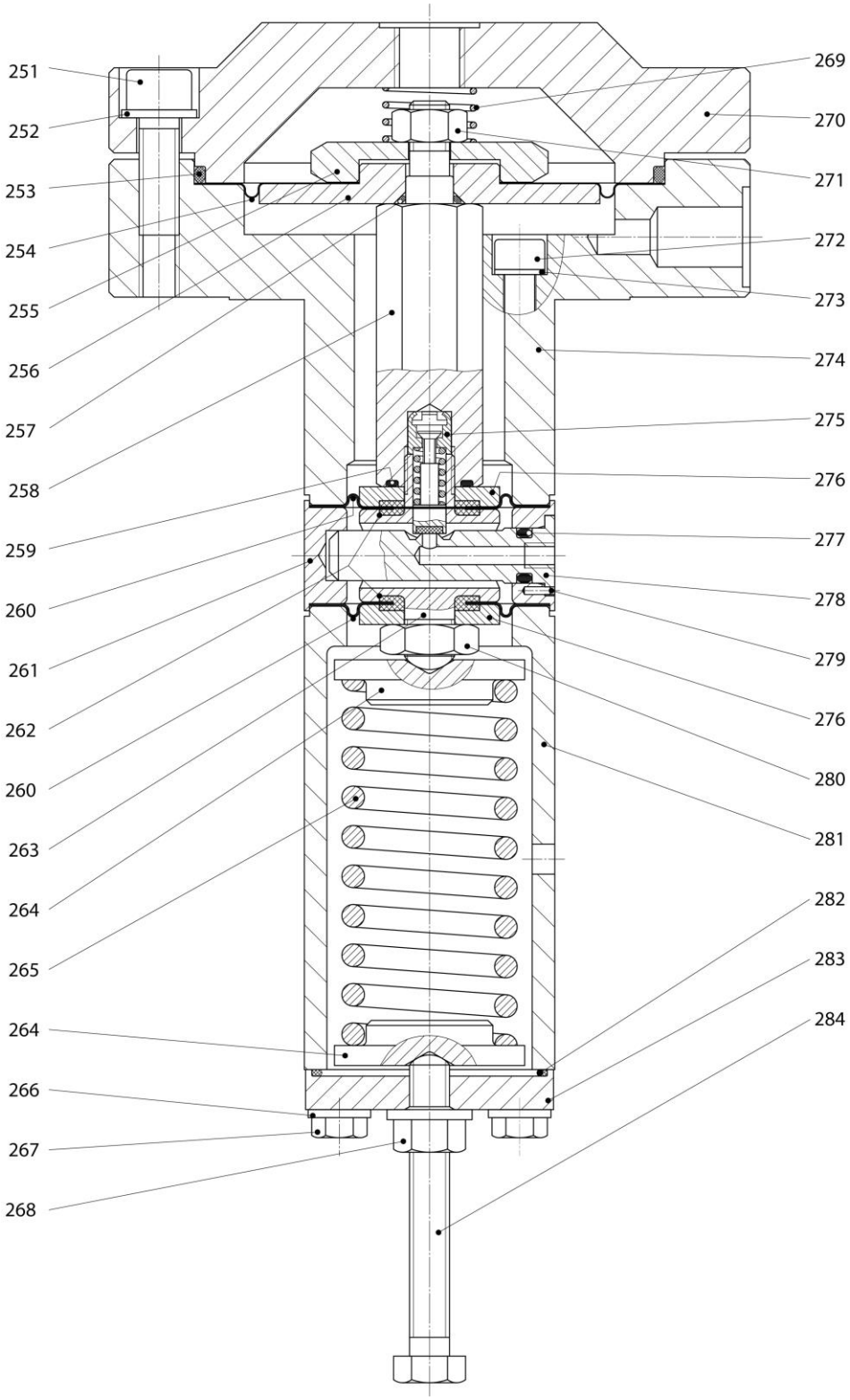
Maintenance parts for control stage with metal bellows assembly

No.	Name	Part no.
152	Piston, pre-assembled	10 000 186
155	O-ring	20 225
156	Valve insert	10 011 775
168	O-ring	20 332
169	Convoluted diaphragm	10 000 191
170	Snap-on gasket	10 000 066
172	O-ring	20 416
174	O-ring	20 317
180	O-ring	20 293
184	Hex flange nut	13 145
	For installation on electric actuator	
192	Gasket	10 021 765
196	O-ring	20 326

Servicing parts for control stage with metal bellows assembly

No.	Name	Part no.
161	Spring plate for the following specific setpoint ranges:	
	▪ W_{ds} = 10-50 bar	10 011 774
	▪ W_{ds} = 20-90 bar	10 011 774
162	Compression spring for the following specific setpoint ranges:	
	▪ W_{ds} = 10 – 50 bar (green)	10 000 149
	▪ W_{ds} = 20 – 90 bar (white)	10 010 444
	For installation on electric actuator	
190	Spring plate for the following specific setpoint ranges:	
	▪ W_{ds} = 10-50 bar	19 084 000
	▪ W_{ds} = 20-90 bar	10 011 774

Spare parts drawing for control stage with larger diaphragm assembly



Maintenance parts for control stage with larger diaphragm assembly

No.	Name	Part no.
253	O-ring	20 518
254	Diaphragm	10 008 547
257	O-ring	20 595
259	O-ring	20 332
260	Convoluted diaphragm	10 000 191
262	Snap-on gasket	10 000 066
264	Spring collar	10 000 114
265	Compression spring	10 000 156
268	Hex flange nut	13 136
273	Bonded seal	20 908
275	Piston, pre-assembled	10 000 186
277	O-ring	20 225
278	Valve insert	10 000 061
282	O-ring	20 093

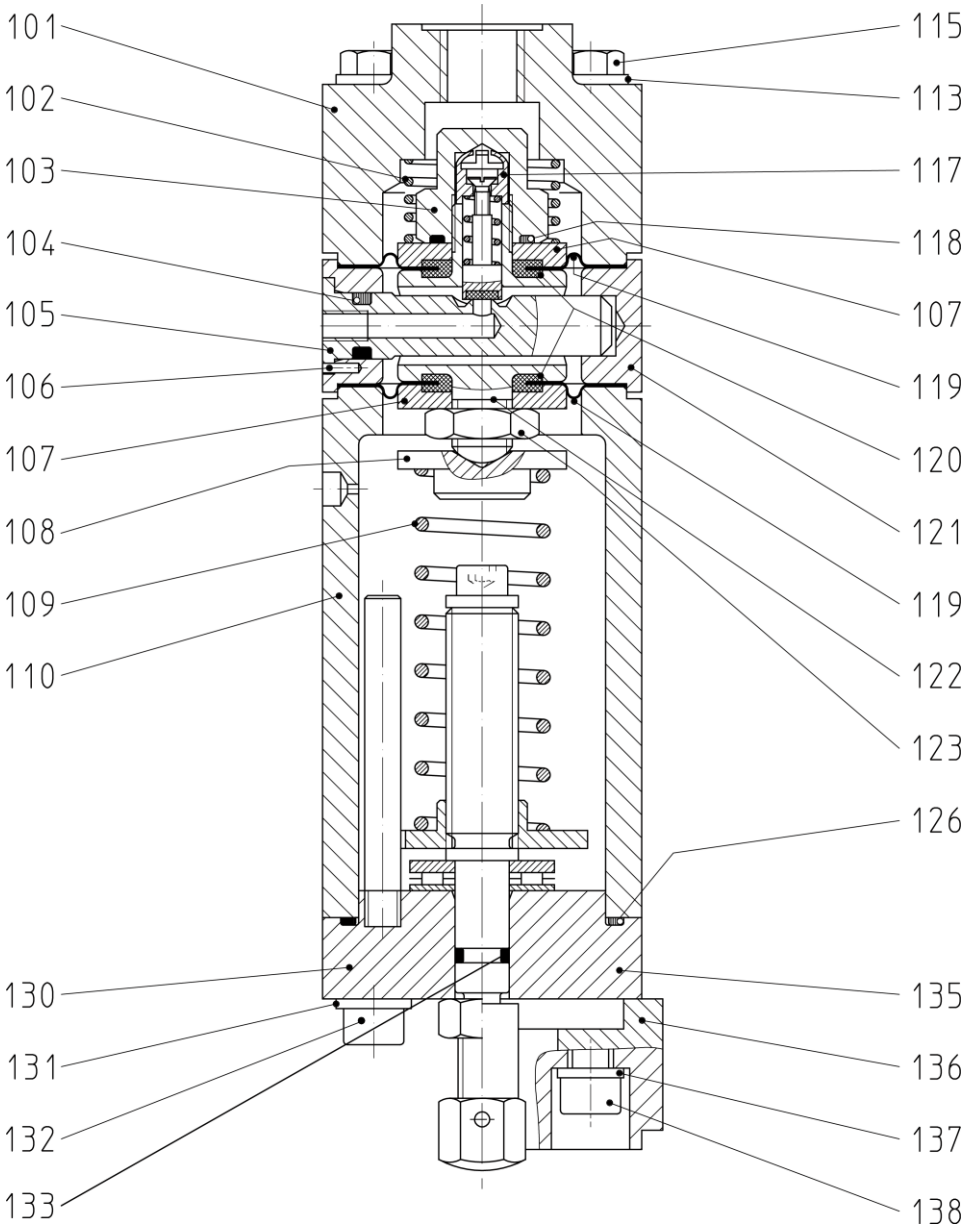
Servicing parts for control stage with larger diaphragm assembly

No.	Name	Part no.
264	Spring collar	10 000 114
265	Compression spring	10 000 156

6.4 Spare parts for load limiting stage

Spare parts drawing for load limiting stage

The left half of the figure shows the standard design without an electric actuator. The right half shows the version with the electric actuator installed.



Maintenance parts for load limiting stage

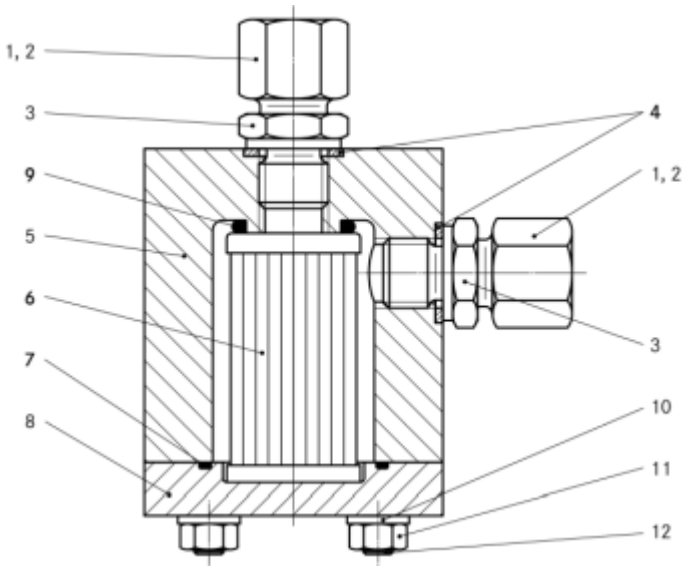
No.	Name	Part no.
104	O-ring	20 225
105	Valve insert	10 000 061
117	Piston, pre-assembled	10 000 186
118	O-ring	20 332
119	Convoluted diaphragm	10 000 191 (2 units)
120	Snap-on gasket	10 000 066 (2 units)
126	O-ring	20 293
130	Plate, pre-assembled	10 010 480
133	O-ring	20 226

Servicing parts for load limiting stage

No.	Name	Part no.
108	Spring collar	10 000 073
109	Compression spring	10 000 072

6.5 Spare parts for fine mesh filter

Spare parts drawing for HON 905 fine mesh filter



Maintenance parts

No.	Name	Part no.
4	Gasket	18 842 (2 units)
7	O-ring	20 317
9	O-ring	20 282

Servicing parts

No.	Name	Part no.
6	Filter insert	26 183

6.6 Lubricants, threadlockers, and special tools

Lubricants

Important! All parts must be slightly greased.

Use the following lubricants:

Application	Lubricant	Part no.
▪ All O-rings ▪ Sliding guides ▪ All sliding surfaces ▪ Control elements	Silicone grease	27 081
▪ All fastening screws ▪ All pipes ▪ Spring plate depressions ▪ Base plate threads	Assembly paste	27 091

Threadlocker

Important! All parts must be coated slightly.

Use the following threadlockers:

Application	Threadlocker	Part no.
▪ Cap threads ▪ Hex nut threads ▪ Connecting piece threads	LOCTITE	26 688

Special tools

You will need the following special tools for maintenance purposes:

Application	Special tools	Part no.
Topic: ▪ *Maintaining the control stage with a diaphragm assembly* (see page 25) ▪ *Maintaining the control stage with a larger diaphragm assembly* (see page 33) ▪ *Maintaining the control stage with a metal bellows assembly* (see page 44) ▪ *Maintaining the load limiting stage* (see page 53)	Assembly aid	19 083 319

Subject to change without notice

Scan these QR Codes to see how Honeywell's integrated gas solutions can help you to better manage your gas assets and optimize your value chain.

Additional information

To learn more about Honeywell's product contact your Honeywell Process Solutions representative, or visit www.honeywellprocess.com or www.hongastec.de.

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