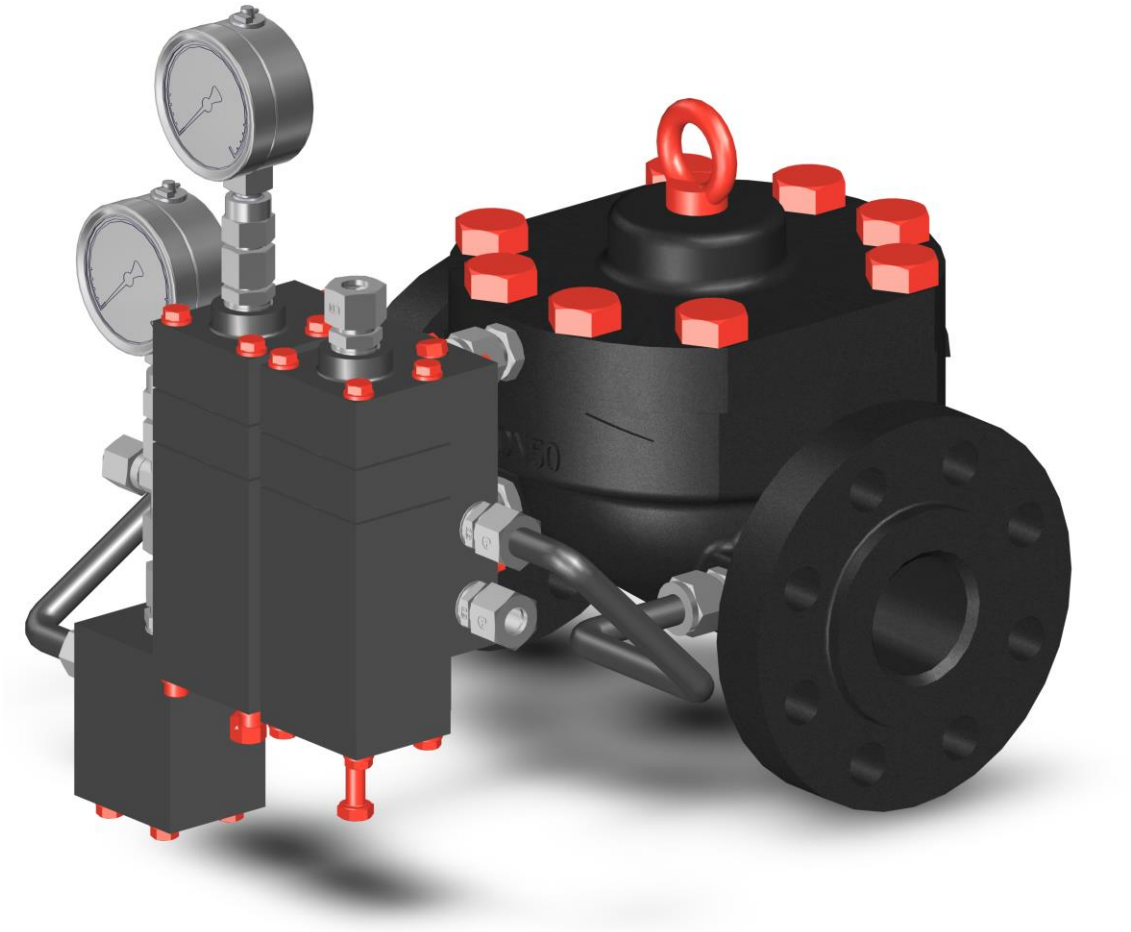
Honeywell



HON 5020
gas pressure regulator with HON 630 pilot

User and maintenance manual

Spare parts

Contents

1 General considerations

Contents

1.1 About this user manual

Validity and purpose

This user manual applies to HON 5020 gas pressure regulators featuring an HON 630 pilot.

This user manual provides all individuals with the information required for the safe handling in connection with the following tasks:

- Transport
- Installation
- Start-up
- Set-up
- Maintenance
- Decommissioning, disassembly, renewed start-up, storage and disposal

Target group

This user manual is intended for anyone working with the product:

- Transportation personnel
- Installation personnel
- Set-up and operating personnel
- Maintenance and service personnel

Illustration

Honeywell offers products with identical functions in a number of different sizes. For this reason, we are unable to guarantee that illustrations in this user manual coincide with 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

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Details about the manufacturer's liability

The manufacturer is not liable for damages and malfunctions arising from non-observance of this user manual and the 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

Type of safety notice	Description	Sign
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

2.1 Intended use

Intended use

HON 5020 gas pressure regulators featuring an HON 630 pilot can be used to maintain the outlet pressure of a gas constant within a regulating line regardless of the influence of disturbance variables such as inlet pressure changes and/or discharge changes. These devices are also characterized by high accuracy even in the event of large inlet pressure changes. It can be used in transfer stations of gas transportation networks, in power plants and industrial plants. HON 5020 gas pressure regulators featuring an HON 630 pilot are suitable for use with natural gas or dry, non-aggressive industrial gases.

Note: The utilization limits of the device with regard to the medium, operating pressure and operating temperature can be gathered from the type plate attached on the device or the 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 user manual.
- Do not use the device against the direction of flow specified on the device and in the user manual.
- 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

Gas pressure regulator versions

Gas pressure regulators consisting of an HON 5020 regulator unit combined with an HON 630 pilot are available in a number of versions. These versions are derived from the various possible combinations between the various pilot and actuator assembly versions.

HON 5020 actuator assembly models

The following table shows which models are available:

Nominal diameters of 1" (DN 25); 2" (DN 50); 3" (DN 80); 4" (DN 100), and 6" (DN 150) with			
Flange facing as defined by standard	**Pressure rating**	**Maximum operating pressure [bar]**	**Flange facing**
ASME B16.5	Class 150	20	Raised face; ring joint
	Class 300	51	
	Class 600	102	
DIN EN 1759-1	Class 150	20	B flange; J flange
	Class 300	51	
	Class 600	102	
DIN EN 1092-1	PN 16	16	B flange
	PN 25	25	
	PN 40	40	

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 user manual

The *technical specifications* and the *Maintenance* section, as well as the spare parts lists and spare parts drawings in the *appendix*, describe all the gas pressure regulator versions and all the models corresponding to the standard for this device type. Special-purpose versions are identified with "SO" in the inspection certificate, which is included with the gas pressure regulator.

The remaining sections in this user manual mostly use the version with the two-stage pilot with a diaphragm assembly as a reference. However, other versions and models will be covered specifically as well when there are important differences that need to be pointed out.

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.

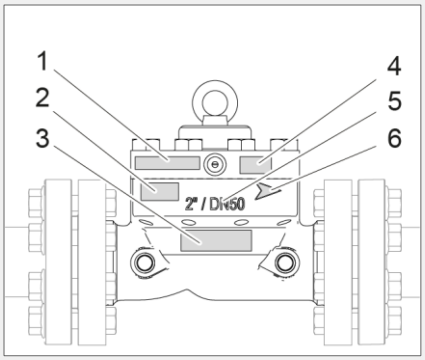
Labels, as well as inscriptions and stamping on the device, can eventually become soiled or otherwise unrecognizable to such an extent that users will not be warned effectively of hazards and may be unable to follow required operating instructions. This will pose a risk of injury.

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

⇨ Immediately replace damaged and missing labels.

Labels on the HON 5020 actuator assembly

The following labels/markings can be found on the actuator assembly's casing:

Figure	No.	Meaning
	**1**	Nameplate
	2	Body part number
	3	▪ Batch number ▪ Foundry code
	4	CE PIN (only if the unit has been granted a CE type approval)
	5	Body nominal size
	6	Arrow indicating the direction of flow

Nameplates

For the location of the nameplates, as well as a detailed list of the information on them and what it means, please refer to:

Identifying the device (see page 10)

Labels on connection lines

Small labels must be used to color-code and explicitly name the gas pressure regulator's connection lines (measuring impulse lines and operating lines) based on what the lines are intended for and their minimum nominal size.

2.4 Identifying the device

Identifying the gas pressure regulator

Make sure you have the right manual for your gas pressure regulator.

Use the nameplates to identify the gas pressure regulator.

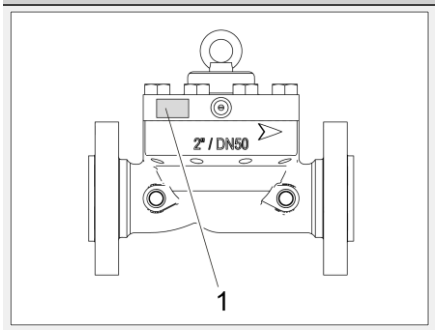
Verifying the technical specifications

Make sure that the on-site conditions match the information on the nameplates and the technical specifications.

Technical specifications (see page 16)

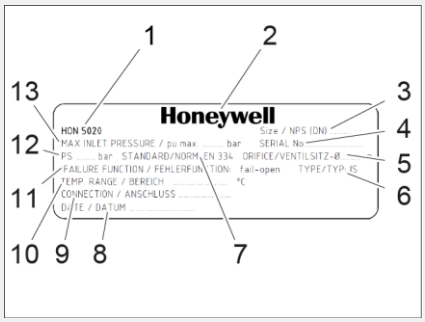
Locating the type plate of the actuator assembly

The type plate of the actuator assembly can be found here:

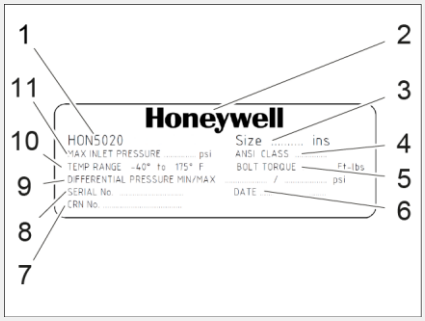
Figure	No.	Meaning
	**1**	Front of the actuator assembly

Interpreting the type plate of the actuator assembly

For **actuator assembly models that use the metric system**, the information on the nameplate will be as follows:

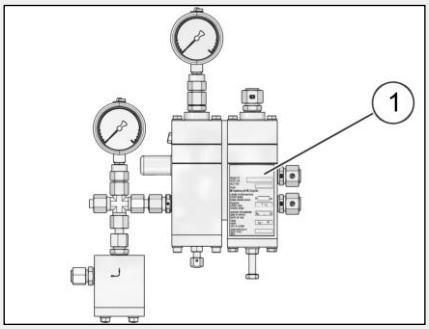
Figure	No.	Meaning
	**1**	Model name
	2	Manufacturer
	3	Nominal size
	4	Serial number of the device
	5	Valve seat diameter
	6	Device version (IS = version with integral overpressure protection)
	7	Standard (EN 334)
	8	Manufacturing date (month/year)
	9	Connection
	10	Temperature range
	11	Failure function (fail-open)
	12	Maximum allowable pressure
	13	Maximum allowable inlet pressure

For **actuator assembly models that use the imperial system**, the information on the name-plate will be as follows:

Figure	No.	Meaning
	**1**	Model name
	2	Manufacturer
	3	Nominal size
	4	Nominal pressure / Flange standard
	5	Tightening torque
	6	Manufacturing date (month/year)
	7	Customer reference number
	8	Serial number
	9	Differential pressure
	10	Temperature range (-40° to 175° F)
	11	Maximum allowable inlet pressure

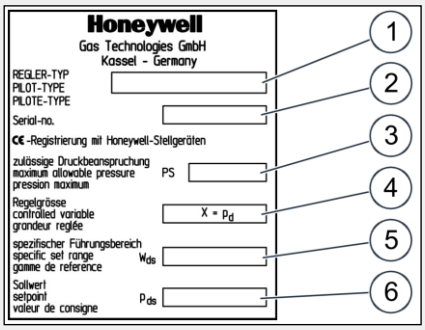
Locating the type plate of the pilot

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

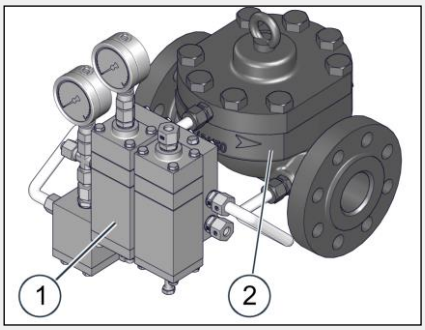
The details on the type plate have the following meaning:

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

2.5 Layout and operation

Figure

The gas pressure regulator is made up of the following assemblies:

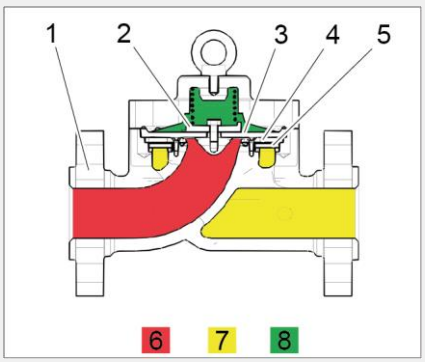
Figure	No.	Description
	**1**	HON 630 pilot
	2	HON 5020 actuator assembly

How it works

- Gas pressure regulators consisting of an HON 5020 actuator assembly combined with an HON 630 pilot can be used to maintain the outlet pressure of a gas constant within set limits within a regulating line regardless of the influence of disturbance variables such as inlet pressure changes and/or discharge changes.
- The pressure that needs to be regulated is fed to the pilot via the measuring line. The diaphragm system in the pilot determines the pressure actual value as a force on the measuring diaphragm and compares it with the force of the pilot spring, which is used as reference variable. If control deviations are detected based on the results from this comparison, the opening position of the actuator assembly's regulating diaphragm will be changed by adjusting the motorization pressure so that the pressure being regulated (actual value) will change to match the setpoint. When there is zero pressure flow, the device seals tightly.

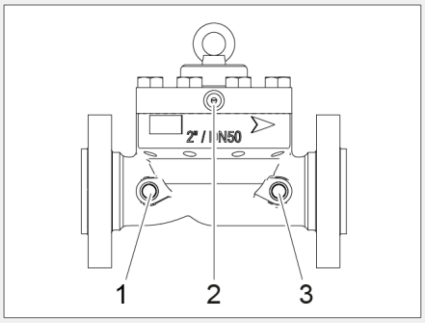
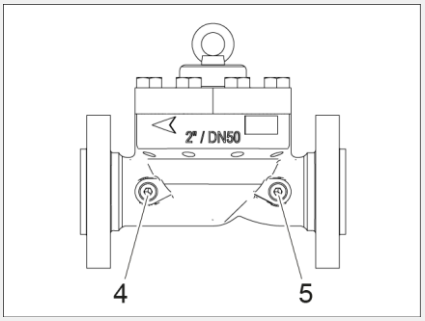
Actuator assembly configuration

Actuator assembly configuration:

Figure	No.	Meaning
	**1**	Actuator body
	2	Diaphragm assembly
	3	Flow restrictor
	4	Noise reduction element
	5	Support disc
	6	Inlet pressure
	7	Outlet pressure
	8	Motorization pressure

Actuator assembly connection lines

Actuator assembly connection lines:

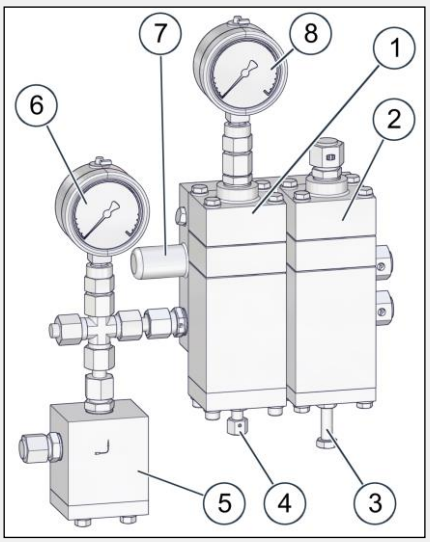
Figure	No.	Connection
Front: 	**1**	Inlet pressure
	2	Motorization pressure
	3	Outlet pressure / feedback
Back: 	**4**	Outlet pressure
	5	Inlet pressure

The actuator assembly's connections have the following dimensions:

- **M 14 x 1.5** if the pilot being connected uses the metric system
- **3/8 NPT** if the pilot being connected uses the imperial system

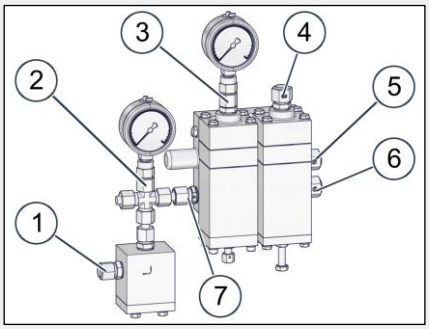
Pilot components

The pilot is made up of the following individual components:

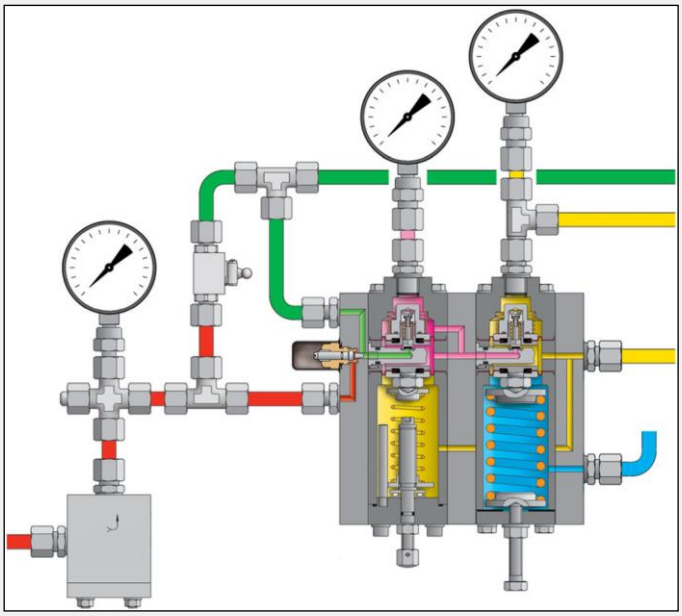
Figure	No.	Description
	**1**	Load limiting stage (optional)
	2	Control stage
	3	Control stage spring adjuster
	4	Load limiting stage spring adjuster
	5	HON 905 fine mesh filter
	6	Inlet pressure gauge
	7	Amplifying valve
	8	Load limiting stage pressure gauge

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
		Motorization pressure
		Outlet pressure
		Atmospheric pressure

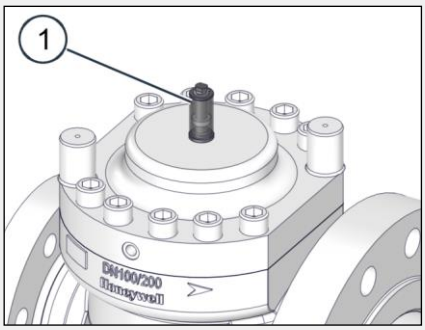
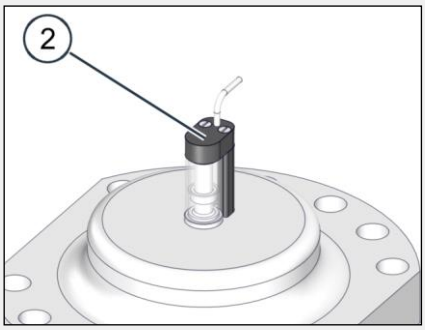
How the pilot works

- 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.

Travel indication option

The numbers have the following meaning:

Figure	No.	Description
	**1**	Optical travel indicator
	**2**	Optical travel indicator with remote control

How the travel indication option works

Optical travel indicator

- The regulator is in the closed position when the magnet is located completely behind the diffuse surface.
- When the travel position is in the open position, this is not a position indicator, but only shows that the regulator is in operation.

Optical travel indicator with remote control

- The optical travel indication can also be equipped with a remote indication.
- The positions open and closed are switched by means of a reed contact.
- The remote indication is also not a position indicator, but only shows whether or not the regulator is in operation.

2.6 Technical specifications

Materials

Criterion	Value
Actuator assembly materials	Case: Steel Internal parts: Steel Diaphragm: Elastomer Gaskets: Elastomer
Pilot materials	Case: Aluminum alloy Internal parts: Aluminum alloy/steel Diaphragms: NBR Gaskets: NBR

Environmental conditions

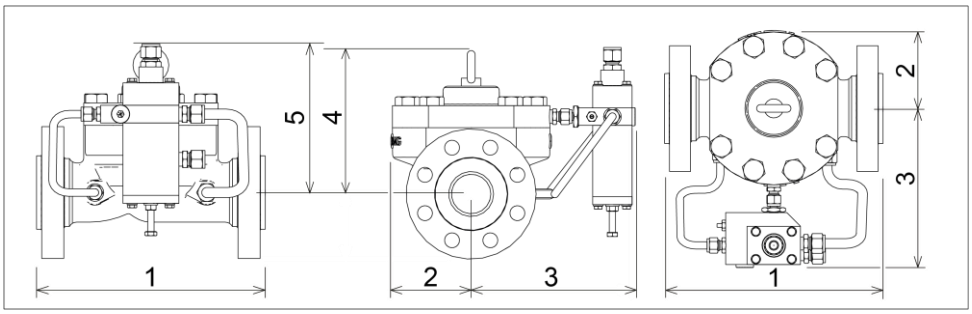
Criterion	Value
Temperature range	-20 to +60 °C (-4 to +140 °F)

Nominal pressure rating and flange facing standards

There are various flange facings for the nominal diameters of 1" (DN 25); 2" (DN 50); 3" (DN 80); 4" (DN 100), and 6" (DN 150), as specified in the following standards:

- **ASME B16.5**
  Pressure rating as per Class 150; 300; 600 / Class 150 = 20 bar; Class 300 = 51 bar; Class 600 = 102 bar
  Flange facing: Raised face; ring joint
- **DIN EN 1759-1**
  Pressure rating as per Class 150; 300; 600 / Class 150 = 20 bar; Class 300 = 51 bar; Class 600 = 102 bar
  Flange facing: B flange; J flange
- **DIN EN 1092-1**
  Pressure rating as per PN 16; 25; 40 / PN 16 = 16 bar; PN 25 = 25 bar; PN 40 = 40 bar
  Flange facing: B flange

HON 5020 dimensions and weights when using HON 640a pilot as an example

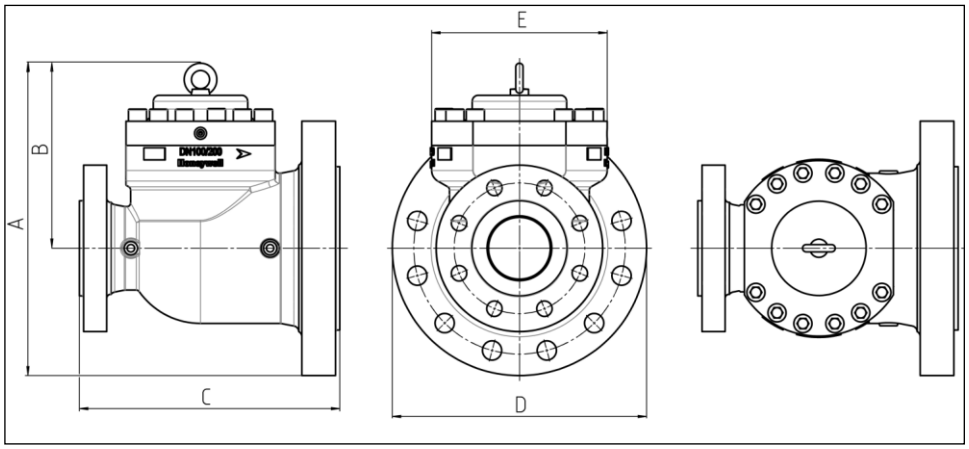


Size	PN	Class	1 inch (mm)	2 inch (mm)	3 inch (mm)	4 inch (mm)	5 inch (mm)	Weight* lbs (kg)
1″ (DN 25)	16	150	7.24 (184)	2.83 (72)	5.95 (151)	6.46 (164)	6.54 (166)	29.8 (13.7)
1″ (DN 25)	25 / 40	300	7.76 (197)	2.83 (72)	6.93 (176)	6.46 (164)	6.54 (166)	32.8 (14.9)
1″ (DN 25)		600	8.27 (210)	2.83 (72)	6.93 (176)	6.46 (164)	6.54 (166)	33.6 (15.4)
2″ (DN 50)	16	150	10.00 (254)	3.23 (82)	7.32 (186)	7.17 (182)	7.32 (186)	47.6 (21.6)
2″ (DN 50)	25 / 40	300	10.51 (267)	3.23 (82)	7.32 (186)	7.17 (182)	7.32 (186)	52.9 (24.0)
2″ (DN 50)		600	11.26 (286)	3.98 (101)	8.03 (204)	7.17 (182)	6.54 (166)	63.5 (28.8)

Size	PN	Class	1 inch (mm)	2 inch (mm)	3 inch (mm)	4 inch (mm)	5 inch (mm)	Weight* lbs (kg)
3″ (DN 80)	16	150	11.73 (298)	4.80 (122)	8.58 (218)	8.70 (221)	7.80 (198)	95.7 (43.4)
3″ (DN 80)	25 / 40	300	12.48 (317)	4.80 (122)	9.06 (230)	8.70 (221)	7.80 (198)	105.8 (48.0)
3″ (DN 80)		600	13.27 (337)	5.00 (127)	9.06 (230)	8.70 (221)	7.80 (198)	148.6 (67.4)
4″ (DN 100)	16	150	13.86 (352)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	151.0 (68.5)
4″ (DN 100)	25 / 40	300	14.49 (368)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	170.0 (77.1)
4″ (DN 100)		600	15.51 (394)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	205.0 (93.0)
6″ (DN 150)	16	150	17.76 (451)	7.56 (192)	11.61 (295)	11.85 (301)	10.59 (269)	286.6 (130.0)
6″ (DN 150)	25 / 40	300	18.62 (473)	7.56 (192)	11.97 (304)	11.69 (297)	10.59 (269)	324.1 (147.0)
6″ (DN 150)		600	20.00 (508)	7.91 (201)	11.97 (304)	11.89 (302)	10.59 (269)	425.5 (193.0)

*The HON 640a pilot used in this example weighs: 4.19 lbs (1.9 kg)

Dimensions and weights for a HON 5020 body with expander as example



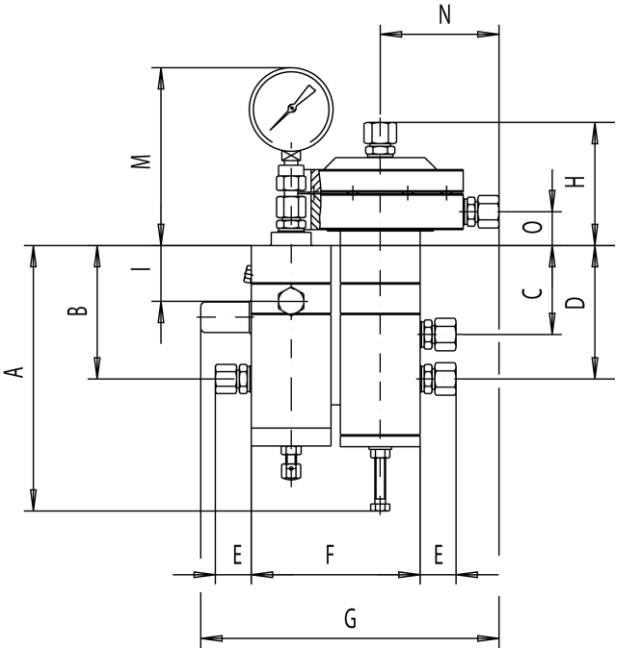
Size	PN	Class	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	E inches (mm)	Weight* lbs (kg)
1''-2"	16 / 25 / 40		247	164	240	165	144	31.5 (14.3) 33.7 (15.3) 33.7 (15.3)
1''-2"		150	239			150		31.1 (14.1)
1''-2"		300	247			165		33.7 (15.3)
1''-2"		600	247			165		36.6 (16.6)

Size	PN	Class	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	E inches (mm)	Weight* lbs (kg)
2''-4''	16		292	182	310	220	164	52.9 (24)
2''-4''	25 / 40		300			235		59.5 (27) 59.5 (27)
2''-4''		150	297			230		56.2 (25.5)
2''-4''		300	310			255		67.3 (30.5)
2''-4''		600	320			275	205	88.2 (40)
3''-6''	16		377	234	400	285	254	122.6 (55.6)
3''-6''	25 / 40		384			300		134.1 (60.8)
3''-6''		150	374			280		121.7 (55.2)
3''-6''		300	394			320		144.9 (65.7)
3''-6''		600	412			355		211.2 (95.8)
4''-8''	16		536	306	430	460	294	225.1 (102.1)
4''-8''	25		549			485		246.5 (111.8)
4''-8''	40		564			515		253.4 (114.9)
4''-8''		150	549			485		228.0 (103.4)
4''-8''		300	566			520		256.7 (116.4)
4''-8''		600	586			560		310.0 (140.6)
6''-12''	16		611	381	570	460	385	402.0 (182.3)
6''-12''	25		624			485		454.0 (205.9)
6''-12''	40		639			515		481.1 (218.2)
6''-12''		150	624			485		423.6 (192.1)
6''-12''		300	641			520		479.1 (217.3)
6''-12''		600	657	377		560	403	703.0 (318.8)

Pilot dimensions and weights

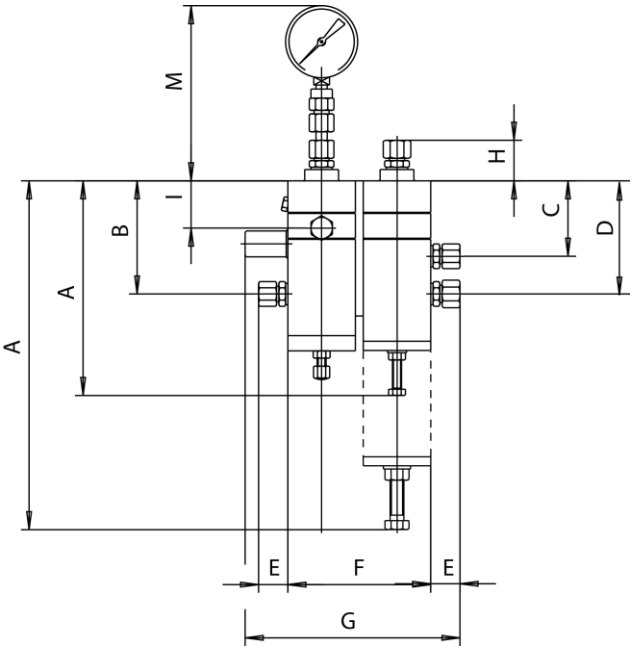
The figure below shows the dimensions for the pilot with a control stage for a setpoint range W_d = 0.3 – 1 bar:

Without pressure gauge for outlet pressure

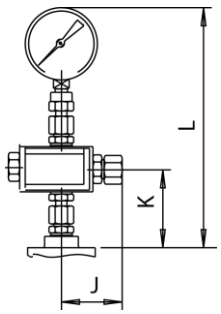


The figure below shows the dimensions for the pilot with the control stages for setpoint ranges W_d = 0.5 – 90 bar:

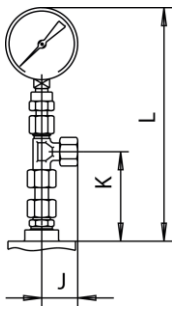
Without pressure gauge for outlet pressure



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	-	-

Operating pressure, Class 150

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	285 psi (19.65 bar)

Operating pressure, Class 300

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	740 psi (51 bar)

Operating pressure, Class 600

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	1480 psi (102 bar)

Operating pressure, PN 16

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	232 psi (16 bar)

Operating pressure, PN 25

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	362 psi (25 bar)

Operating pressure, PN 40

Criterion	Value
Nominal diameter	1″ (DN 25), 2″ (DN 50), 3″ (DN 80), 4″ (DN 100), 6″ (DN 150)
Maximum operating pressure	580 psi (40 bar)

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

Accuracy class AC and look-up pressure class SG for HON 630

Outlet pressure area p_d range [bar]	Accuracy class AC	Look-up pressure class SG
0.3 – 0.5	20	30
> 0.5 – 1	10	20
> 1 – 5	2.5	10
> 5	1	5

Accuracy class AC and look-up pressure class SG for HON 630-1

Outlet pressure area p_d range [bar]	Accuracy class AC	Look-up pressure class SG
0.3 – 1	20*/30	30*/50
> 1 – 3	20	30
> 3 – 5	10	20
> 5 – 10	5	10
> 10 – 40	2.5	10
> 40	1	5

*This (better) accuracy class and this (also better) look-up pressure class apply when the inlet pressure fluctuations are < 8 bar.

Gas properties

The properties of the gas conveyed through the devices 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

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 handling the device obtain detailed information about the dangers and safety procedures and observe the safety notices contained in the user manual and on the device. If you do not follow these rules, there is a risk of injury including death and material damages.

Handling the user manual

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 the user manual close by the device so that you can refer to it again.
- Include the user manual if you are giving the device away.

Handling the device

Observe the following rules:

- Only individuals who meet the requirements set forth in this user manual have permission to handle 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 safety procedures outlined in this user manual and on the device. In particular, wear the mandatory personal protective gear.
- Only stay at the specified work places.
- 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.
- Adhere to the device maintenance intervals specified in this user manual.
- When replacing defective parts, only use original spare parts or manufacturer-approved standard parts.

Operator's duties opposite the employees

In your capacity as the company operating the device, you must ensure the following:

- All personnel must meet the requirements corresponding to their duties.
- All personnel must read and understand this user manual before working with/on the device.
- All occupational health and safety regulations that apply in your country must be complied with.
- Hazards resulting from specific working conditions at the location where the device is being used must be determined by means of a risk assessment and rendered avoidable by means of appropriate operating instructions.
- 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
Skilled person or expert	Any work on and with the device	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Certified, independent competent person	Safety checks	▪ Professional training ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Carrier	Company-to-company transport	▪ Professional training and experience transporting pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously ▪ Knowledge with securing hauling distances ▪ Knowledge with the use of hoisting equipment
Transportation personnel	Intra-company transport	Professional training and experience with the transport using stackers, etc.

Personnel	Responsibilities	Required qualification
Mechanical fitter	Mechanical installation	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Tasked with the commissioning	▪ Initial start-up ▪ Renewed start-up	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Tasked with the installation	Set-up	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Mechanical maintenance personnel	Involving mechanical parts: ▪ Fault finding ▪ Maintenance ▪ Repairs	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Inspector	Safety check	Qualified inspector with adequate knowledge of gas pressure regulators
Tasked with the disposal	Disposal of the device	▪ Professional training and experience with the disposal of 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
Start-up, operation (including partial), cleaning, maintenance, search and remedy of errors	▪ Industrial protective helmet ▪ Protective clothing ▪ Safety harness ▪ Ear protection ▪ Safety boots with protection for electrostatic discharge (ESD) ▪ Safety goggles ▪ 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
▪ Installation ▪ Start-up ▪ Set-up ▪ Maintenance, repairs ▪ Decommissioning	All around the device, depending on the task

4 Basics for installing the device in a pipe

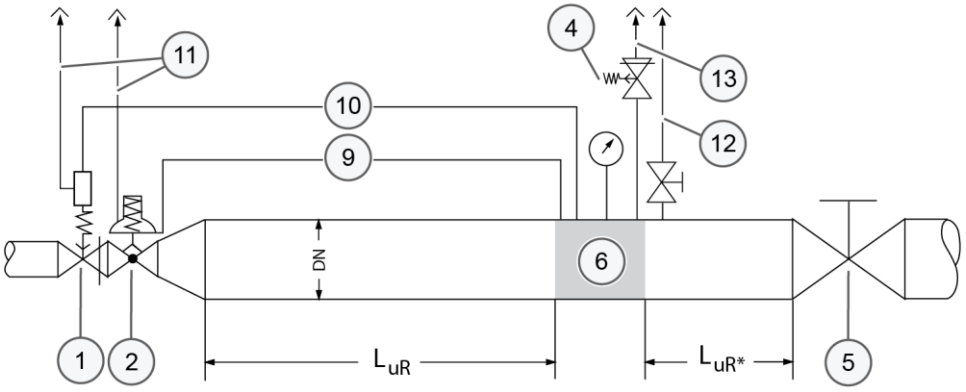
Contents

4.1 Installation examples

Gas pressure regulating line - example 1

Configuration:

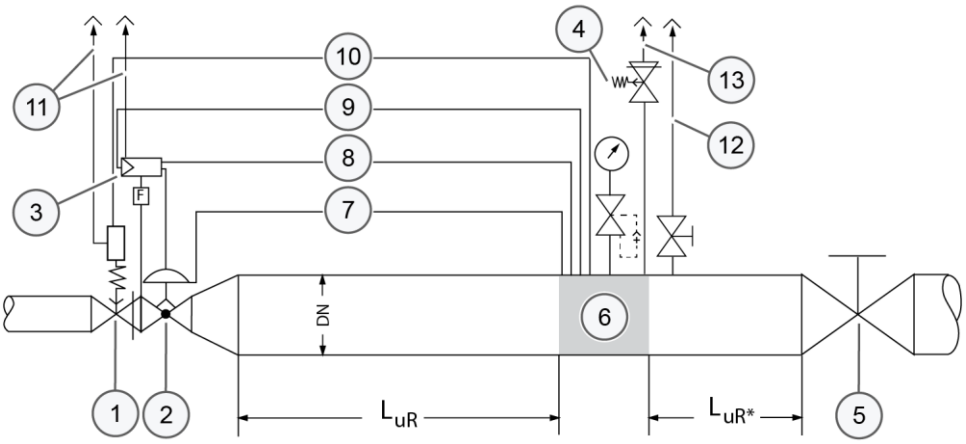
- Direct acting gas pressure regulator (non-piloted)
- With expander without noise reduction element downstream of the gas pressure regulator



Gas pressure regulating line - example 2

Configuration:

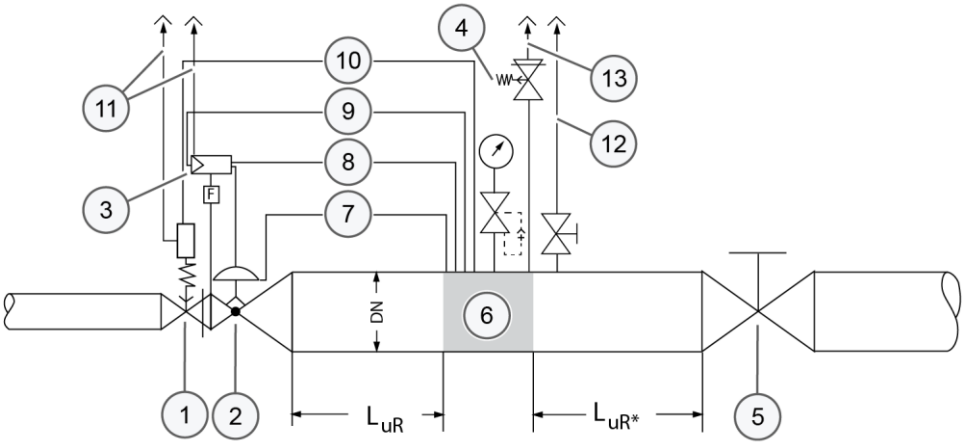
- Indirect acting gas pressure regulator (pilot-operated)
- With expander without noise reduction element downstream of the gas pressure regulator
- Outlet pressure gauge with protection against overpressure



Gas pressure regulating line - example 3

Configuration:

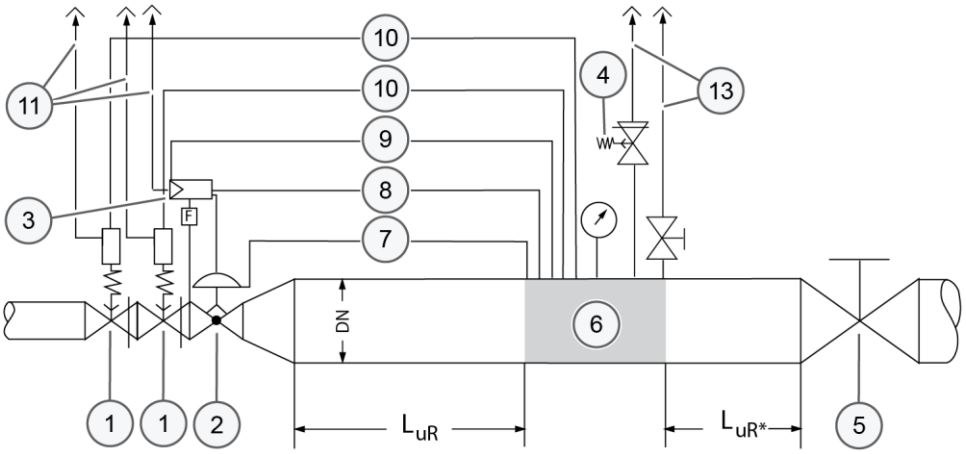
- Indirect acting gas pressure regulator (pilot-operated)
- With expander and integrated noise reduction element
- Outlet pressure gauge with protection against overpressure



Gas pressure regulating line - example 4

Configuration:

- Indirect acting gas pressure regulator (pilot-operated)
- Indirect acting slam-shut device (pilot-operated) (two)
- With expander without noise reduction element downstream of the gas pressure regulator



Legend

The numbers have the following meaning:

No.	Meaning
1	Safety Shut-Off Valve
2	Gas pressure regulator
3	Pilot
4	Safety relief valve
5	Outlet stop valve armature
6	Sensing point for connection lines (gray area)
7	Feedback line
8	Discharging line
9	Gas pressure regulator measuring line
10	Slam-shut device measuring line

No.	Meaning
11	Vent line
12	Relief line
13	Blowdown line

Following is the meaning of the acronyms:

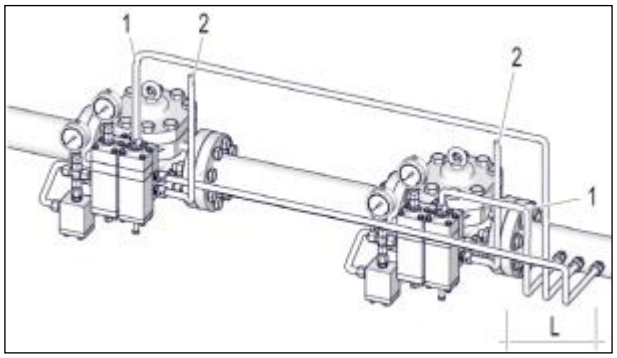
Acr.	Meaning
DN	Nominal size of pipe
L_{uR}	Undisturbed length of pipe

* Shut-off device with undisturbed flow pattern (ball valve) can be incorporated

4.2 Alternative application example: Active monitor regulator

Overview

Active monitor regulator with HON 5020 monitor regulator unit (left) and HON 5020 active regulator unit (right):



Schematic diagram: Measuring line (1), vent line (2)

How it works

Active regulator unit:

The HON 630 pilot of the active regulator unit compares the outlet pressure process value with the set setpoint and uses the resulting motorization pressure to control the movement of the main diaphragm on the flow restrictor in the actuator assembly. This maintains the outlet pressure constant, irrespective of changes in the inlet pressure or changes in the discharge. If the consumption is zero, the built up motorization pressure pushes the diaphragm onto the seat edge surrounding the flow restrictor by means of the closing spring.

Monitor regulator unit:

The outlet pressure is monitored by the upstream monitor regulator unit in addition to the active regulator unit. The setpoint on the monitor regulator unit is set to a value higher than the setpoint for the active regulator unit being controlled, which ensures that the monitor regulator unit will normally be fully open. In the event of malfunction, the active regulator unit opens according to the fail-open principle. As soon as the set target value of the monitor regulator unit has been reached, it starts regulating the outlet pressure.

Measuring line connection

The measuring impulse line must be positioned at least five times the nominal diameter of the pipework from the regulator outlet flange (see figure above).

4.3 Meter run characteristics

Standards used as a basis

The following recommendations are based on the measuring line connection conditions set forth in standards (DIN) EN 334 and (DIN) EN 14382. The company operating the system is the sole party responsible for the meter run working properly.

Conditions for the meter run

- A pipe area with a steady flow pattern must be selected for the sensing point. There must not be any components that disturb the flow directly upstream and downstream of the sensing point, e.g., orifice plates, expanders, bends, junctions, shut-off devices, etc.
- The flow rate at the sensing point should not exceed approx. 25 m/s, depending on the system conditions.
- In the case of specific system circuits (such as gas regulating lines for gas engines) and in the case of gas burners, flow rates higher than 25 m/s may be allowed following consultation with the manufacturer.
- Within a low-pressure range of up to approx. 250 mbar, a maximum flow rate of approx. 15 to 20 m/s is recommended at the sensing point. On a case-by-case basis, and following consultation with the manufacturer, even lower flow rates may be allowed.

Upstream of the sensing point

Depending on the specific system design, the L_{uR} lengths of the undisturbed pipes upstream of the sensing point must be (2.5 to 5) x DN of the pipe, with the specifics depending on the gas pressure regulator model and whether or not there is a pipe expander downstream:

If ...	and...	then...
A gas pressure regulator with an expander that is part of the device is used	The nominal size of the pipe is equal to the outlet-side nominal size of the gas pressure regulator	L_{uR} min. 2.5 x DN
	The nominal size of the pipe is the next larger standard nominal size	L_{uR} min. 3 x DN
	The nominal size of the pipe is two standard nominal size increments larger	L_{uR} min. 4 x DN
	The nominal size of the pipe is more than two standard nominal size increments larger	L_{uR} min. 5 x DN
A gas pressure regulator with the same outlet nominal size as the inlet nominal size is used	The nominal size of the pipe is the next larger standard nominal size	L_{uR} min. 4 x DN
	The nominal size of the pipe is two standard nominal size increments larger	L_{uR} min. 5 x DN

Downstream of the sensing point

Depending on the specific system design, the L_{uR} lengths of the undisturbed pipes downstream of the sensing point must be (1.5 to 4) x DN of the pipe:

Undisturbed length of pipe	for
L_{uR} min. 1.5 x DN	Thermowells
L_{uR} min. 1.5 x DN	Reducers and expanders, depending on the specific system conditions
L_{uR} min. 3 x DN	Shut-off devices (gate valves, check valves, and reduced bore ball valves)
L_{uR} min. 4 x DN	Tees

Details

- Shut-off devices with an undisturbed flow pattern (such as full bore ball valves) and, if applicable, pipe bends (depending on the design) are considered to be non-disturbing elements in terms of measuring line connections.
- For gas meters (turbine gas meters including quantometers, ultrasonic gas meters, and vortex flow meters, but NOT rotary piston gas meters), there are no restrictions in terms of measuring line configurations, as these meters are not considered to be flow-disturbing within this context.
- The following applies to rotary piston gas meters: Minimum distance between gas pressure regulator or reducer / expander and gas meter: **L_{uR} min. 3 x DN**.
- Measuring line connections downstream of gas meters must be at a distance of **L_{uR} min. 2 x DN**.
- If shut-off valves are used (reduced bore), the recommended distance downstream of a measuring line is **L_{uR} min. 3 x DN**.
- Gas meter pressure losses must be taken into account based on system conditions if applicable.

4.4 Operating and measuring lines

Connection lines between device and gas regulating line

The lines must be arranged and sized in such a way that the devices' intended function will be ensured.

- **Measuring line**
  - The measuring line transmits the pressure process value from the sensing point to the measuring diaphragm of a controller or the pilot of a gas pressure regulator or safety relief valve or to the measuring diaphragm of the monitoring device of a slam-shut device. It needs to be connected to the pipe sideways or upwards separately for each device. In the case of safety equipment, the measuring line must be connected upstream of the first outlet-side shut-off device in such a way that it cannot be shut off. If the measuring line is additionally connected downstream of the first outlet-side shut-off device, 3-way ball valves with negative overlap must be used for switching. These ball valves do not have a valve position in which both measuring lines can be fully closed at the same time.
- **Vent line**
  - The vent line is used to connect a measuring diaphragm to the atmosphere. If the measuring unit becomes damaged (e.g., diaphragm rupture), it can start conveying gas. Under certain operating conditions, and following consultation with the manufacturer, vent lines can be omitted if vent valves (HON 915) or safety diaphragm configurations can be used instead.

- **Blowdown line**
  - The blowdown line in a safety relief valve is used to divert gas (leaking gas, for example) into the atmosphere.

Grouping vent lines or blowdown lines (into a header) is permissible if it does not have a negative impact on the individual devices' operation. Within this context, it is recommended to have the cross-sectional area of the header be at least five times as large as the total of the individual lines' cross-sectional areas.

For primary slam-shut devices, it is recommended to route the slam-shut devices' vent lines separately. Vent lines must not be grouped together with blowdown lines.

- **Discharging line**
  - When using indirect acting (pilot-operated) slam-shut devices, the discharging line is used to divert the exhaust gas from the pilot into the system's outlet chamber. On certain devices, the discharging line will be grouped with the feedback line.
- **Feedback line**
  - When using indirect acting (pilot-operated) slam-shut devices, the feedback line is used to return the outlet pressure to the actuator.

5 Transport and installation

Contents

5.1 Transporting the gas pressure regulator

Heavy transport units

⚠WARNING

Risk of serious injury posed by heavy loads when using cranes for transportation

Transporting heavy devices or components with a crane may result in serious impact and crush injuries if the loads start moving in an uncontrolled manner.

⇨ Loads may only be transported with a crane by a duly qualified person.
⇨ Markings and information about the center of gravity of the load (if applicable) must be observed.
⇨ Loads may only be moved under supervision.

Suspended loads

⚠WARNING

Risk of serious injury in the event that load handling attachments break while holding a suspended load

Heavy loads picked up or transported with hoisting and slinging gear may result in serious impact and crush injuries if the load handling attachments fail.

⇨ Only fasten the device at the positions intended for the transport.
⇨ The load-bearing capacity of the appropriate hoisting equipment must correspond at least to the weight of the load to be transported.
⇨ Always stand clear of suspended loads.
⇨ Ensure that no person is within the danger zone.

Selecting the hoisting equipment and slings

A mobile workshop crane is suitable for use as hoisting equipment. A pallet jack or forklift is also suitable for intraplant transportation.

The following are adequate for use as slings:

- Ropes
- Belts
- Chains

The hoisting equipment and slings must meet the following criteria:

- The load capacity must be sufficient for the gas pressure regulator's weight.
- The hoisting height is adequate for the mounting position at the installation site.

Preparing for transportation

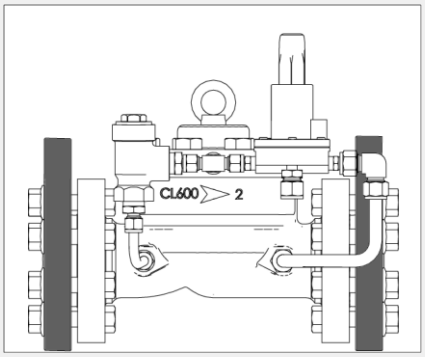
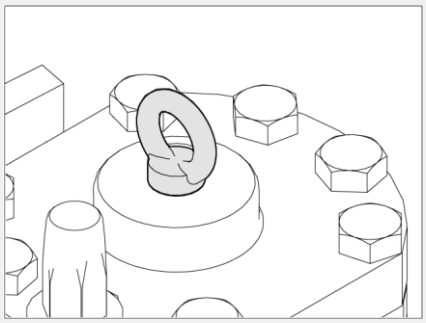
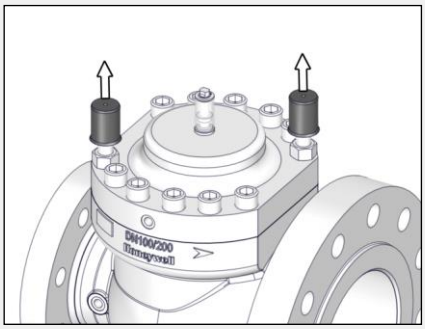
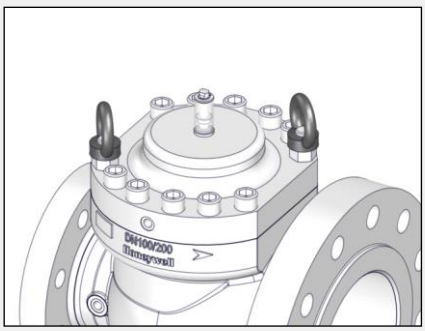
Make sure that the following requirements are met before transportation:

- You have seen and taken into account all instructions on the packaging regarding the orientation of the packed device, the center of gravity, and attachment points.
- The transport route is clear of obstacles and other barriers, and there is enough space available for the dimensions of the packed device and the handling equipment. Make sure to measure all of the package's dimensions!
- The transport route will be able to handle the load exerted by the total weight of the handling equipment and the load being transported.

- There is enough space for unpacking and installing the device at the installation location.

Transporting the device

Proceed as follows:

Figure	Step	Description
	**1**	Leave the flange protective plates on the HON 5020 during transport.
	**2**	Hook the sling into the eye bolt.
	3	Lift the HON 5020. Slowly and carefully transport the HON 5020 to the location where it will be installed.
If the travel indication option is present, proceed as follows:		
	**1**	Remove the protective caps.
	**2**	Install the ring bolts included in delivery and attach the slings to the ring bolts.
	3	Lift the HON 5020. Slowly and carefully transport the HON 5020 to the location where it will be installed.

5.2 Installing the gas pressure regulator

Preparing the materials

Prepare the following materials:

- Flange gaskets
- Screws
- Washers
- Nuts

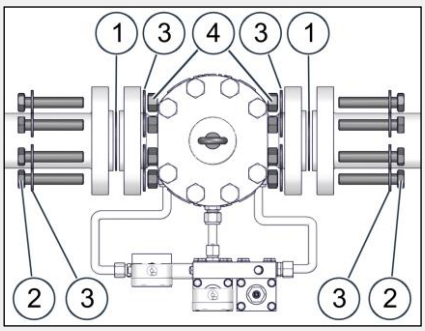
The quantity and size are dependent on the following criteria:

- Design and size of the flange

Assessing the situation

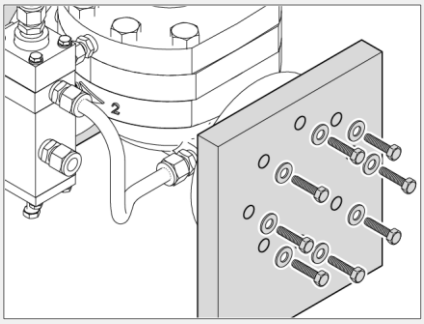
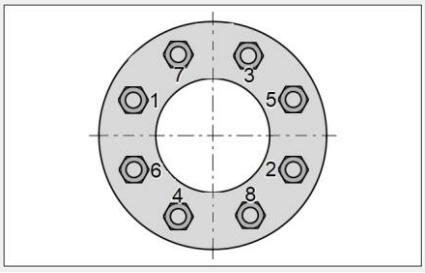
Assess the installation situation.

The numbers have the following meaning:

Figure	No.	Meaning
	**1**	Flange gasket
	2	Screws
	3	Washer
	4	Nut

Mounting the actuator assembly

Proceed as follows:

Figure	Step	Description
	1	Remove the protective plates from the flange.
	**2**	Transport the device to the location where it will be installed. ▪ The device needs to be installed in the piping in a horizontal and level position. If you want to use a different installation position, consult with the manufacturer first. ▪ Pay attention to the direction of flow for the gaseous fluid as marked on the body.
	3	Secure and support the device's position in such a way that the device can be installed in the piping without any stress and that the piping's weight will be supported as well.
	4	Install the flange gaskets.
	**5**	Screw down the flange crosswise in the specified order. When doing so, make sure to observe the torques specified by the flange gaskets' manufacturer.

Final inspection

Conduct a final inspection to check whether the following criteria are met:

- All screwed connections on the device and supply lines are securely fastened.

If ...	then ...
at least one criterion is not met	you should correct the error before proceeding with the next task.
all criteria are met	you may proceed with the next task.

Next task

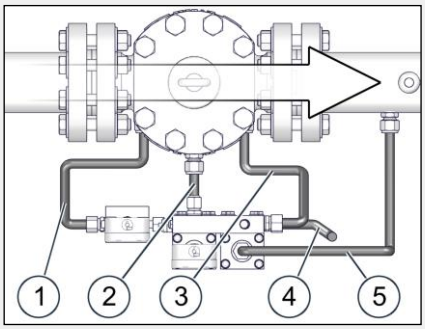
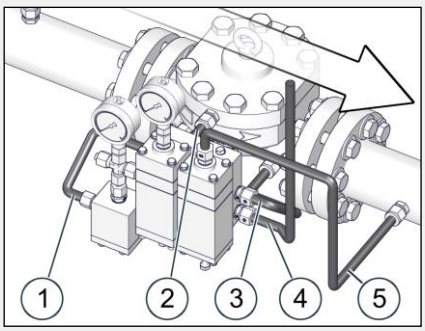
Proceed as follows:

Installing the device connections (see page 36)

5.3 Installing the device connections

HON 630 operating and measuring impulse lines that are pre-installed and that need to be installed

Some of the measuring impulse lines will come pre-installed:

Figure	No.	Designation, category, installation condition
	**1**	Inlet pressure line, operating line, pre-installed
	2	Motorization line, operating line, pre-installed
	3	Outlet pressure line, operating line, pre-installed
	**4**	Vent line, operating line, needs to be installed
	5	Outlet pressure measuring impulse line, measuring impulse line/operating line, needs to be installed

Preparing the materials

Prepare the following materials:

- Pipes, connecting pieces, and fittings as per the specifications in the *Technical specifications* (see page 16)
- Shut-off devices for the operating and measuring impulse lines, as well as other accessories, as required, as per the *Basics for installing the device in a pipe* (see page 27) section.

Installing the operating and measuring impulse lines

The installation of the operating and measuring impulse lines depends on the local conditions and the gas regulating line in which the gas pressure regulator is being used. Please refer to the *Basics for installing the device in a pipe* (see page 27) section for more information on what needs to be ensured without fail in the corresponding design and implementation.

Final checks

Conduct a final inspection to check whether the following criteria are met:

- All threaded joints on the connection lines have been checked to ensure that they have a secure fit.

If …	then …
at least one criterion is not met	you should correct the error before proceeding with the next task.
all criteria are met	you may proceed with the next task.

Next task

Proceed as follows:

Checking the system for leaks (see page 37)

5.4 Checking the system for leaks

Leak test conducted by the manufacturer

Prior to delivery, the manufacturer conducted a pressure and leak test on the gas pressure regulator as specified in DIN EN 334.

Leak test at the set-up location (in Germany)

The gas pressure regulator installed in the system must be subjected to a leak test at the setup location as follows:

Normative basis	DVGW Code of Practice G 491
Test method	Bubble test method
Test medium	Air or inert gas
Scope of the test	All detachable pipe joints
Test equipment	Foam-generating leakage medium
Test pressure	1.1 times the operating pressure (MOP)

Leak test at the set-up location (in other countries)

The device installed into the system must undergo a leak test at the set-up location in accordance with applicable international and national standards.

Pressurized parts

⚠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.

Pressurized parts

⚠WARNING

Risk of injury posed by bursting parts in the event that they are subjected to pressure in the wrong direction

The device has been designed for a specific direction of flow, which is labeled on the device. Subjecting the device to pressure in the wrong direction may result in serious injury caused by bursting parts.

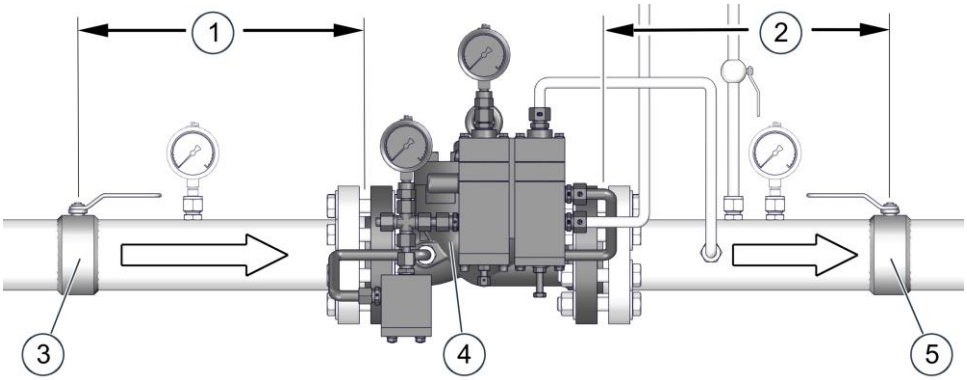
⇨ Pressurize the system only on the inlet side.

Details about the operating pressure can be found in the technical specifications.

Technical specifications (see page 16)

Test configuration

The test setup is as follows (schematic diagram, using the two-stage HON 630 pilot with a diaphragm assembly as a reference):



The numbers have the following meaning:

No.	Meaning
1	Inlet chamber
2	Outlet chamber
3	Inlet stop valve armature
4	Gas pressure regulator
5	Outlet stop valve armature

Checking the system for leaks

Proceed as follows:

Step	Description
1	Slowly close the outlet stop valve armature.
2	Apply the test medium to all detachable pipe joints.
3	Observe the test medium on all detachable pipe joints for several minutes.

If ...	then ...
no foam or bubbles are formed	▪ the system is leak-proof. ▪ the system may be put into operation.
foam or bubbles are formed	▪ the affected pipe joint is leaking. ▪ the system may **not** be put into operation. ▪ Proceed with step 4.

Step	Description
4	Slowly close the inlet stop valve armature.
5	Depressurize the inlet chamber and the outlet chamber.
6	Seal the leaking pipe joints.
7	Repeat the leak test starting with step 1.

6 Adjusting the settings of the device

Contents

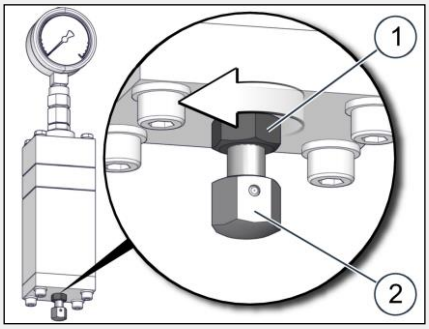
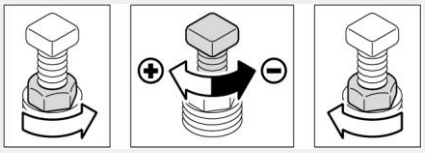
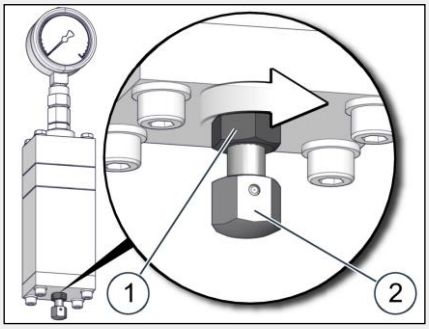
6.1 Adjusting the loading pressure

Default loading pressure setting

The manufacturer will have already preset the loading pressure based on the customer's specifications. By default, the loading pressure will be set to 5 - 10 bar over outlet pressure p_d. For the current loading pressure, please check the load limiting stage pressure gauge reading.

Adjusting the loading pressure

Proceed as follows:

Figure	Step	Description
	**1**	Unscrew the lock nut (1) on the set screw (2) located on the underside of the pilot's load limiting stage.
	**2**	Turn the set screw until the load limiting stage pressure gauge shows the setpoint you want: ▪ Counterclockwise (-) to loosen the pilot spring or ▪ Clockwise (+) to tighten the pilot spring
	**3**	Tighten the lock nut (1) to secure the set screw (2) setting.

6.2 Adjusting the control stage setpoint

Requirements

Make sure that the following requirements are met:

- The load limiting stage is preset to a default value for the loading pressure (usually 5 - 10 bar over the setpoint for outlet pressure p_d).
- The inlet and outlet shut-off devices for the gas regulating line section with the gas pressure regulator are closed.
- The pressure in the outlet chamber downstream of the gas pressure regulator is lower than the setpoint for outlet pressure p_d.
- The shut-off devices for the blowdown lines are closed.
- The inlet pressure is present upstream of the inlet shut-off device.

Adjusting the control stage setpoint

Proceed as follows:

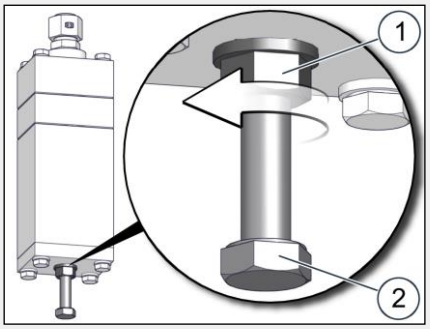
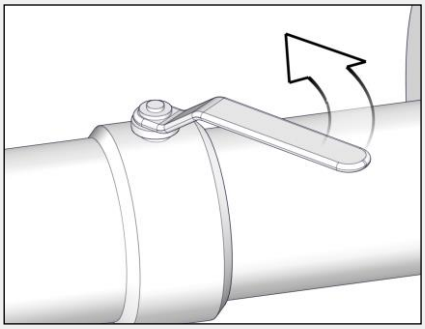
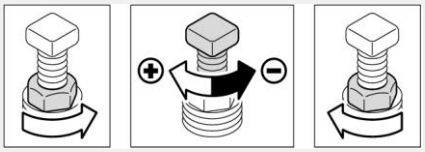
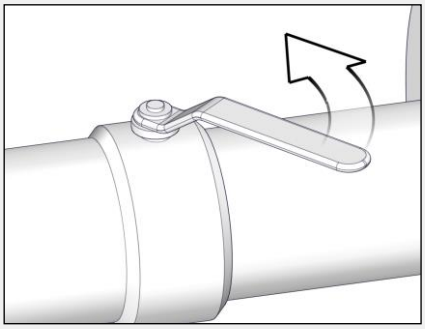
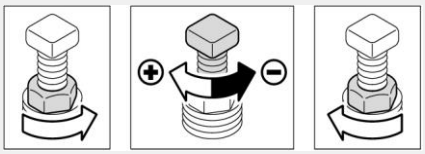
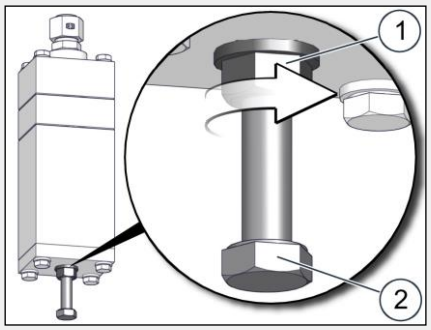
Figure	Step	Description
	**1**	Unscrew the lock nut (1) on the set screw (2) located on the underside of the pilot's control stage.
	2	Loosen the set screw (2) until the tension in the pilot spring has been relieved.
	**3**	Open the inlet shut-off device.
	**4**	Turn the set screw in small increments until the pressure gauge in the outlet chamber shows the setpoint for the correct outlet pressure p_d. Turn the set screw: ▪ Clockwise (+) to tighten the pilot spring or ▪ Counterclockwise (-) to loosen the pilot spring
	**5**	Open the outlet shut-off device.

Figure	Step	Description
	**6**	Wait a few minutes and check the reading for outlet pressure p_d in the outlet chamber.
	7	If necessary, keep adjusting the set screw setting until you get the right outlet pressure p_d.
	**8**	Tighten the lock nut (1) to secure the set screw (2) setting.

6.3 Adjusting the amplifying valve

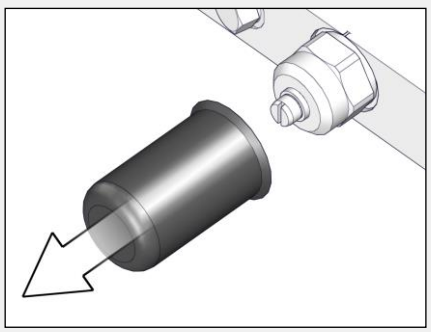
Control behavior changes achieved by adjusting the amplifying valve

The following changes in the gas pressure regulator's control behavior can be achieved by adjusting the amplifying valve on the pilot:

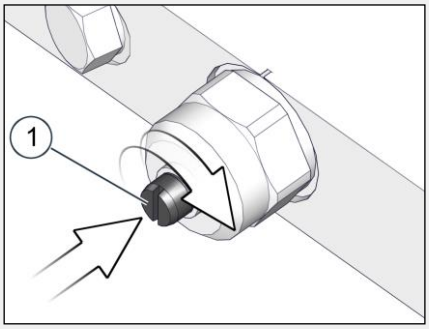
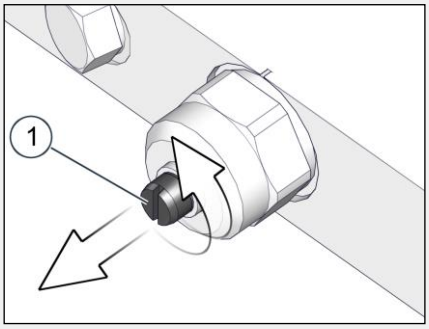
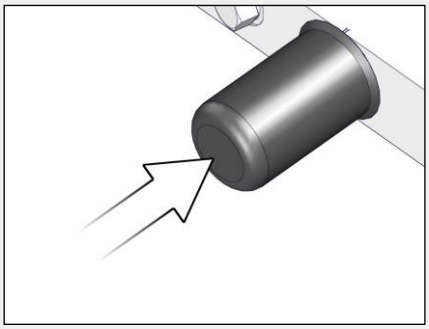
- If the gas pressure regulator exhibits a sluggish response to changes in the manipulated variable, the response times can be shortened.
- If the gas pressure regulator's dynamic response to changes in the manipulated variable is too fast and this results in oscillations, the gas pressure regulator's response can be slowed down.

Adjusting the amplifying valve

Proceed as follows:

Figure	Step	Description
	**1**	Remove the cap from the amplifying valve.

If ...	then ...
You want to speed up the actuator assembly's response	Carry out step 2a and then continue to step 3.
You want to slow down the actuator assembly's response, e.g., in the case that there are oscillations	Carry out step 2b and then continue to step 3.

Figure	Step	Description
	**2a**	Use a flat-blade screwdriver to screw the spindle (1) deeper into the sleeve turn by turn while monitoring the actuator assembly's control behavior. As soon as you achieve the actuator assembly response you want, stop changing the spindle's position.
	**2b**	Use a flat-blade screwdriver to unscrew the spindle (1) out from the sleeve turn by turn while monitoring the actuator assembly's control behavior. As soon as you achieve the actuator assembly response you want, stop changing the spindle's position.
	**3**	Put the amplifying valve cap back in place.

7 Malfunctions

Contents

7.1 Malfunctions

Pressurized parts

⚠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.

Malfunctions and abnormalities

The following table contains a description of malfunctions and abnormalities that may occur during the operation and lists procedures to correct them:

Malfunction	Possible causes	Correction
The regulator unit does not open	The pilot is not working correctly	*Maintaining the pilot* (see page 53)
The actuator assembly will not close	Faulty actuator assembly	*Maintaining the actuator assembly* (see page 50)
	The pilot is not building up sufficient motorization pressure	*Maintaining the pilot* (see page 53)
The actuator assembly is opening/closing too slowly	The pilot's response speed is not correct	Adjust the pilot's response speed, *Adjusting the amplifying valve* (see page 41)
	The actuator assembly's diaphragm is faulty	*Maintaining the actuator assembly* (see page 50), replace the actuator assembly if necessary
Low flow rate	The flow restrictor's openings are clogged	Check the actuator assembly's flow restrictor for impurities and clean it if necessary
The pressure that needs to be regulated is not being regulated	The pilot's pilot spring is not compatible with the desired control range	Remove the pilot spring and check the color code against the control ranges listed in the spare parts list
	The pilot's pilot spring is faulty	Remove the pilot spring and check it for damage
The sealing pressure is too high	The control diaphragm is too hard	Check the actuator assembly's control diaphragm
Leaks on the outside	The screws and/or fittings were not tightened correctly	Check the tightening torques
	The gaskets are faulty	Check the gaskets for damage

Malfunction	Possible causes	Correction
Leaks on the inside	Faulty actuator assembly diaphragm	Check the actuator assembly's diaphragm for damage
	Faulty pilot diaphragm	Check the pilot's diaphragm for damage
	Faulty pilot piston	Check the pilot's piston for damage
	The flow restrictor's screws are not tightened properly	Check the flow restrictor's screws to make sure they have a tight fit
Unstable outlet pressure behavior (oscillations)	The regulator is not being operated with sufficient differential pressure	Increase the differential pressure with the regulator
	The actuator assembly's diaphragm is too soft	Check the actuator assembly's diaphragm; contact the manufacturer if necessary
	Pilot not compatible with application	Contact the manufacturer
	The amplifying valve setting is not correct	*Adjusting the amplifying valve* (see page 41)

8 Maintenance

Contents

8.1 Maintenance schedule

Meaning

The maintenance schedule provides an overview of the periodically required maintenance and repairs and makes reference to the appropriate instructions.

Note: The maintenance intervals specified below are recommendations only. Since the intervals for maintenance work depend heavily on the system's operating conditions and on the gas' properties, the maintenance intervals specified below may have to be adjusted based on the relevant operating 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.

Maintenance schedule

Perform the following maintenance and repairs within the specified time intervals:

Task	See section	Interval			
		as needed	every 3 months	every year	every 5 years
Maintaining the pilot	*Maintaining the pilot* (see page 53)			●	
Maintaining the actuator assembly	*Maintaining the actuator assembly* (see page 50)			●	
Adjusting the loading pressure	*Adjusting the loading pressure* (see page 39)			●	
Adjusting the control stage setpoint	*Adjusting the control stage setpoint* (see page 40)			●	

8.2 Preparing for the maintenance

Preparation work for 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 92) to find out which bills of materials correspond your specific gas pressure regulator model and have the corresponding maintenance parts and servicing parts ready to go before maintenance.
		▪ The spare parts that are always required for the actuator assembly's maintenance are listed in the spare parts kits for the actuator assembly. ▪ The bills of materials for the pilots are broken down by maintenance parts and servicing parts. ▪ The spare parts always required for maintenance of the travel indication (optional) are defined in the list of maintenance and servicing parts. ▪ Spare part drawings and bills of materials are listed in the *appendix* (see page 92).
		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 servicing parts ready for maintenance in order to avoid downtimes: For the pilot: ▪ Compression spring(s) and, if applicable, spring plates ▪ Pressure gauge(s) ▪ Filter insert For the actuator assembly: ▪ Closing spring ▪ Flow restrictor
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 113).
		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 113).

Sample maintenance instructions

The maintenance instructions below are provided as examples for the various gas pressure regulator models and versions. Use the bills of materials to make sure that you replace all the maintenance parts relevant to your specific device model during maintenance.

8.3 Starting maintenance

Pressurized parts

⚠WARNING

Risk of serious injury posed by pressurized components moving in an uncontrolled manner when handled improperly.

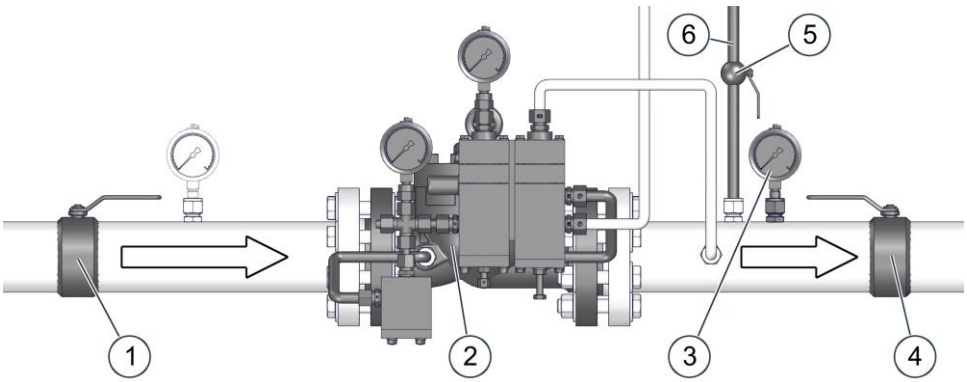
If not handled properly or in the event of a defect, gas can escape from pressurized components under high pressure and cause serious injuries and even death. Before you start working on these components:

⇨ Close all connections leading to the gas-carrying line.

⇨ Establish a depressurized status. Residual amounts of energy must be depressurized as well.

Overview

Schematic diagram using the two-stage HON 630 pilot with a diaphragm assembly as a reference



The numbers have the following meaning:

No.	Meaning
1	Inlet stop valve armature
2	Gas pressure regulator
3	Pressure gauge
4	Outlet stop valve armature
5	Valve for blowdown line
6	Blowdown line

Establishing the depressurized status

Proceed as follows:

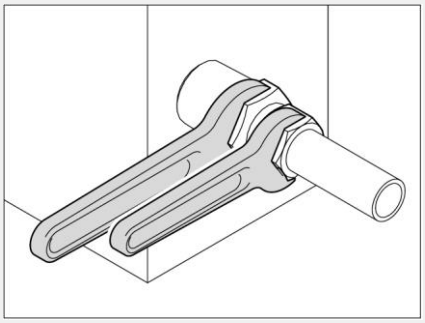
Step	Description
1	Close the outlet stop valve armature (4).
2	Close the inlet stop valve armature (1).
3	Depressurize the pilot: Turn the set screw on the pilot's control stage – and the set screw on the pilot's load limiting stage as well if applicable – clockwise until the pressure in the pilot is equalized.
4	Open the valve (5) in the blowdown line (6) to discharge the pressure between the inlet and the outlet valves.

Purging the lines with nitrogen

All the gas pressure regulator's lines must be purged with nitrogen before the device is removed.

Protecting the pipe connections from being twisted

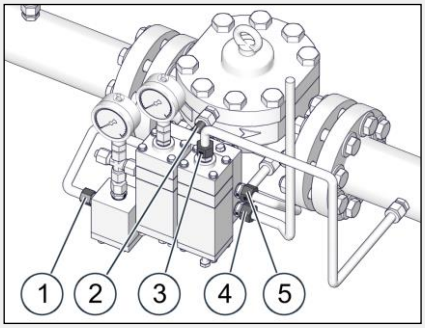
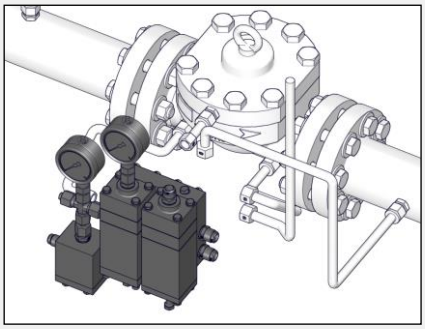
When conducting work involving the pipework, please always observe the following:

Figure	Description
	Do not twist the pipe connections in the assemblies. Use a second spanner wrench for securing when loosening and tightening pipe joints.

Removing components

If ...	then ...
You want to perform maintenance on the pilot only	▪ The measuring impulse line and the vent line on the pilot need to be uninstalled. ▪ The inlet pressure line, motorization line, and outlet pressure line on the pilot need to be uninstalled. ▪ The actuator assembly, including the pipes, can remain in the gas regulating line.
You want to perform maintenance on the actuator assembly only	▪ The motorization line between the pilot and the actuator assembly needs to be uninstalled. ▪ The actuator assembly can remain in the gas regulating line. ▪ The pilot, including the remaining pipes (with the exception of the motorization line), can remain in the gas regulating line.
You want to perform maintenance on both the actuator assembly and the pilot	▪ The measuring impulse line and the vent line on the pilot need to be uninstalled. ▪ The motorization line between the pilot and the actuator assembly needs to be uninstalled. ▪ The pilot needs to be removed from the actuator assembly. ▪ The actuator assembly, including the remaining pipes (with the exception of the motorization line), can remain in the gas regulating line.

To **remove the pilot**, follow the steps below:

Figure	Step	Description
	**1**	Disconnect all the pilot pipes: ▪ Inlet pressure line (1) ▪ Motorization line (2) ▪ Measuring impulse line (3) ▪ Vent line (4) ▪ Outlet pressure line (5)
	**2**	Remove the pilot.

8.4 Maintaining the actuator assembly

Contents

8.4.1 Maintaining the actuator assembly

Requirements

Make sure that the following requirements are met:

- The system is not pressurized, see *Starting maintenance* (see page 47).
  WARNING! Mortal danger associated with pressurized components.

Cleaning

Observe the following cleaning instructions:

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

Tightening torques

Tightening torques of the bolts securing the regulator top cover are as follows:

Nominal size	Pressure rating	Screw specifications	Tightening torque
1″ (DN 25)	Class 150/300/600 PN 16/25/40	5/8″ UNC grade 7 M16	203 Nm (150 ft lbs)
2″ (DN 50)	Class 150/300/600 PN 16/25/40	5/8″ UNC grade 7 M16	203 Nm (150 ft lbs)
3″ (DN 80)	Class 150 PN 16	5/8″ UNC grade 7 M16	203 Nm (150 ft lbs)
3″ (DN 80)	Class 300/600 PN 25/40	3/4″ UNC grade 7 M20	353 Nm (260 ft lbs)
4″ (DN 100)	Class 150 PN 16	5/8″ UNC grade 7 M16	203 Nm (150 ft lbs)
4″ (DN 100)	Class 300/600 PN 25/40	3/4″ UNC grade 7 M20	353 Nm (260 ft lbs)
6″ (DN 150)	Class 150 PN 16	5/8″ UNC grade 7 M16	203 Nm (150 ft lbs)
6″ (DN 150)	Class 300 PN 25/40	3/4″ UNC grade 7 M20	353 Nm (260 ft lbs)
6″ (DN 150)	Class 600	1″ UNC grade 7 M24	705 Nm (520 ft lbs)

Maintaining the actuator assembly

Proceed as follows:

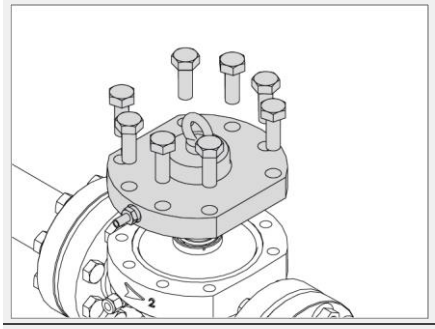
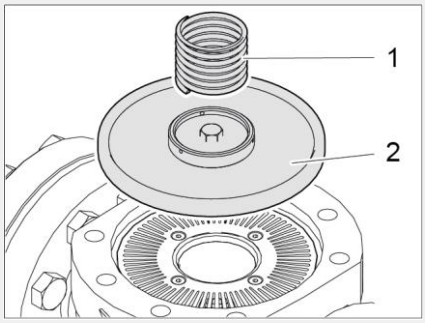
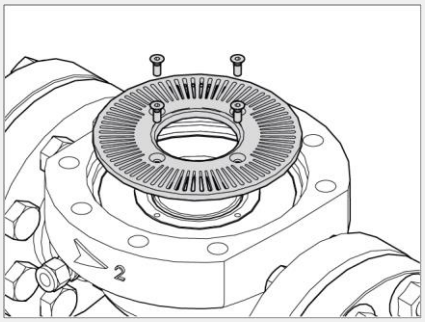
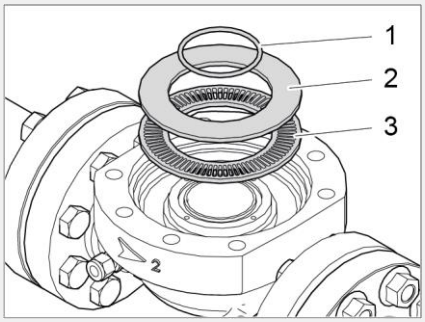
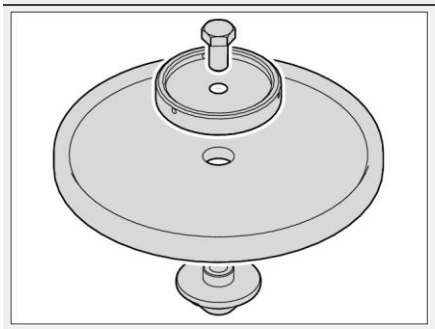
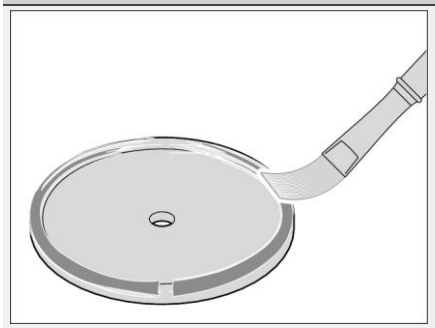
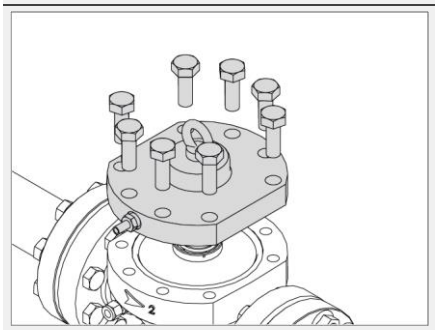
Figure	Step	Description
	**1**	Disassemble the lid. **CAUTION!** The lid is spring-loaded. Risk of injury due to bouncing up when the screws are unscrewed. Push the lid down when unscrewing the screws.
	**2**	Remove the closing spring (1) and the diaphragm unit (2).
	**3**	Remove the flow restrictor. If the flow restrictor is damaged: Replace the flow restrictor with a new one.
	**4**	Remove the O-ring (1), the noise reduction element (2), and the supporting shim (3). Replace the O-ring with a new, lubricated O-ring. Check the noise reduction element and the support disc for damage and replace them if necessary.
	**5**	If the diaphragm is damaged: Dismantle the diaphragm unit. Replace the diaphragm with a new diaphragm.

Figure	Step	Description
	**6**	Lightly grease the inside and outside edge of the new diaphragm.
	7	Re-assemble the diaphragm unit.
	**8**	Re-assemble the regulator unit. Push the lid down when screwing down the screws until they are completely secured. Refer to the additional tightening torque information at the beginning of this topic. Tighten the screws in a criss-cross sequence.

Next task

Depending on what you want to do next, proceed as indicated in the relevant section:

- *Maintaining the pilot* (see page 53)
- *Completing the maintenance* (see page 88)

8.5 Maintaining the pilot

Contents

8.5.1 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 screws, bolts, or washers 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:

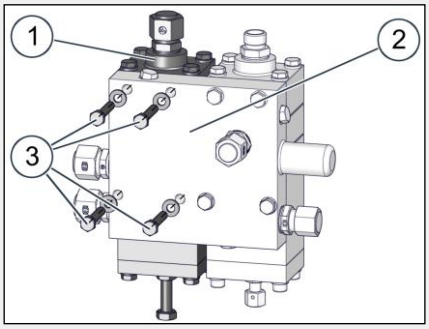
Figure	Step	Description
	**1**	Unscrew the 4 screws (3) between the control stage (1) and the base plate (2) and remove the control stage.

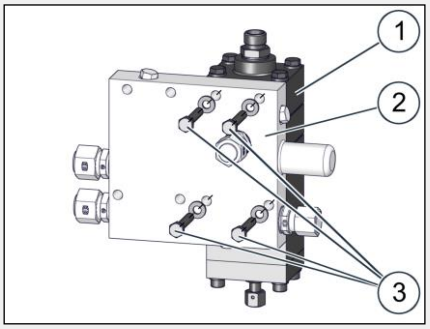
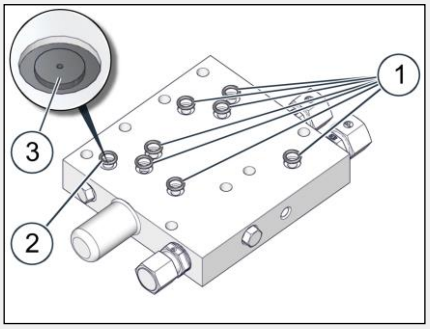
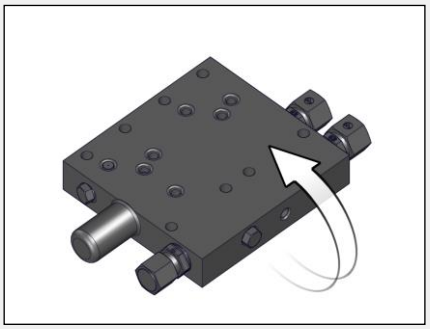
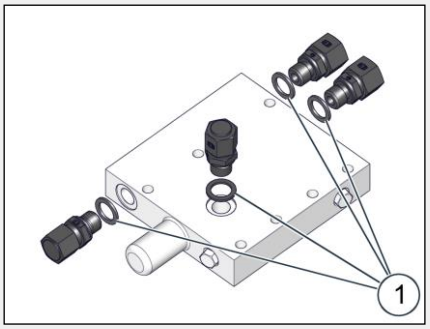
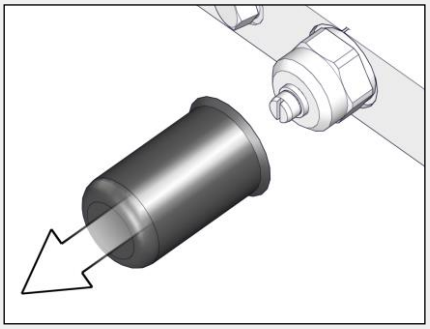
Figure	Step	Description
	**2**	Unscrew the 4 screws (3) between the load limiting stage (1) and the base plate (2) and remove the load limiting stage.
	**3**	Replace the 7 O-rings (1) and the O-ring (2) over the washer (3) with new, greased ones.
	**4**	Turn the base plate over.
	**5**	Replace the 4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

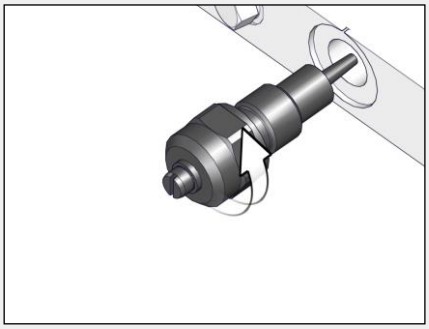
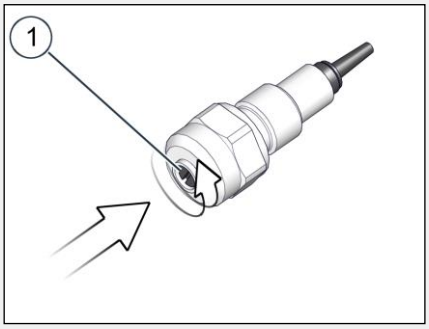
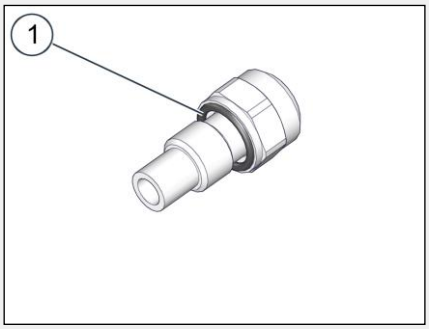
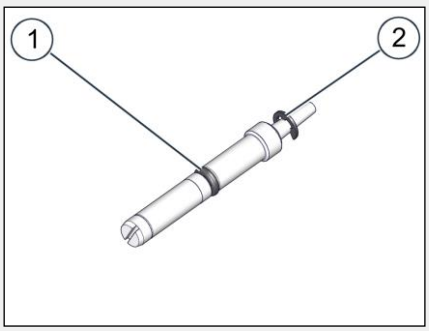
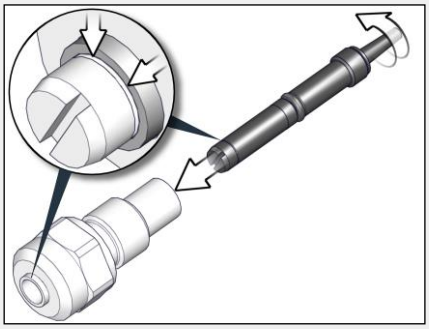
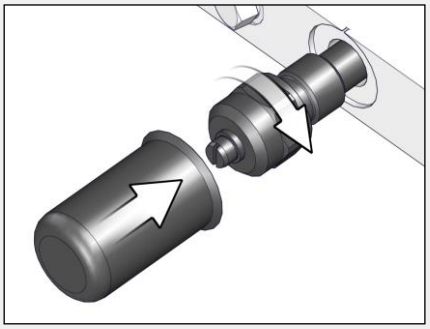
Figure	Step	Description
	**7**	Unscrew the amplifying valve and remove it.
	**8**	Loosen the spindle (1) and pull it out towards the back.
	**9**	Replace the O-ring (1) with a new, greased O-ring.
	**10**	Take the spindle. Replace the O-ring (1) and the retaining ring (2) with new, greased ones.
	**11**	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.

Figure	Step	Description
	**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 56)

Maintaining the control stage with a larger diaphragm assembly (see page 72)

Maintaining the control stage with a metal bellows assembly (see page 63)

8.5.2 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 screws, bolts, or washers 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:

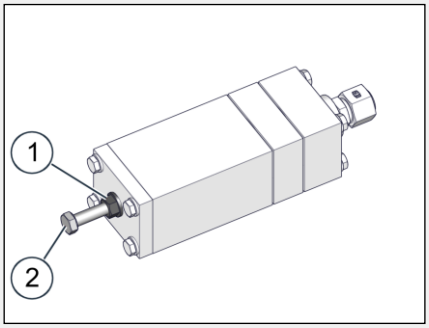
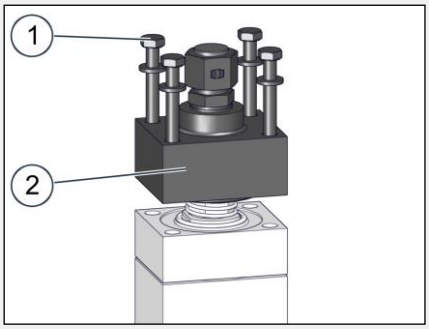
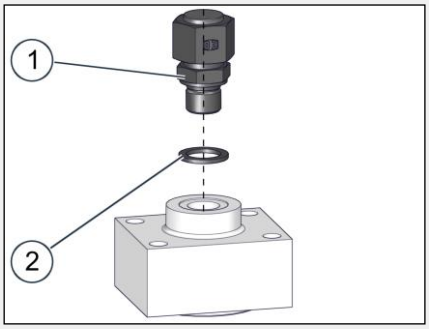
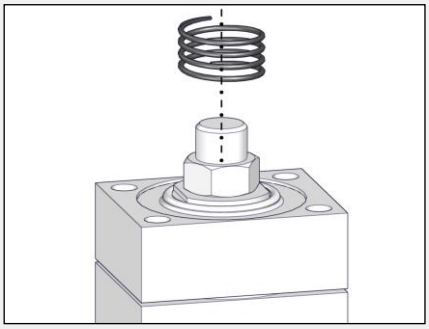
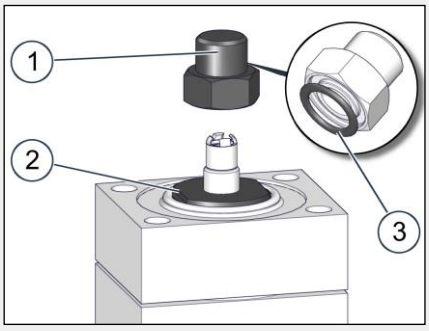
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Loosen the screws (1) and lift off the upper cover (2).
	**3**	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2)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

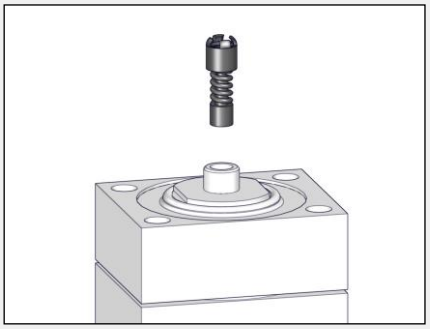
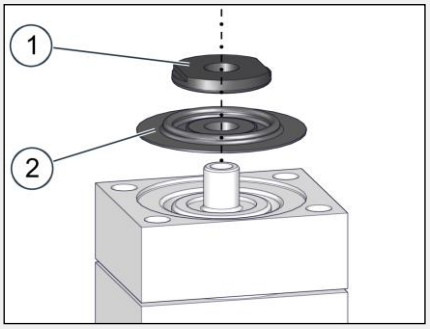
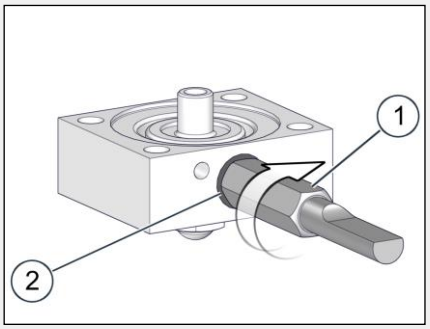
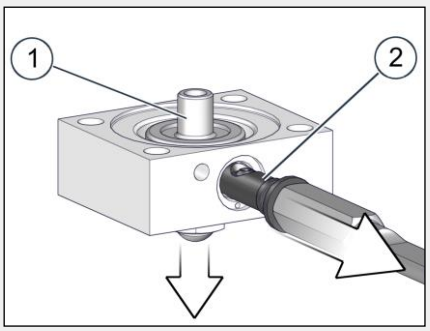
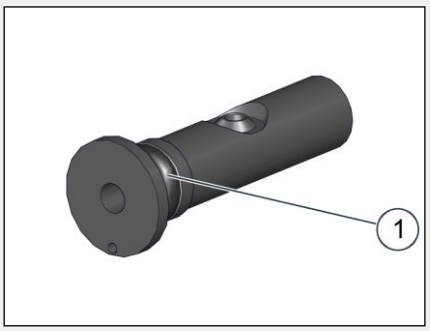
Figure	Step	Description
	**6**	Remove the pistons from the connecting piece.
	**7**	Remove the diaphragm disc (1) and the diaphragm (2).
	**8**	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	**9**	Hold on to the connecting piece (1) and pull out the valve insert (2). Remove the connecting piece.
	**10**	Replace the valve insert with a new one. Insert a new, greased O-ring (1).

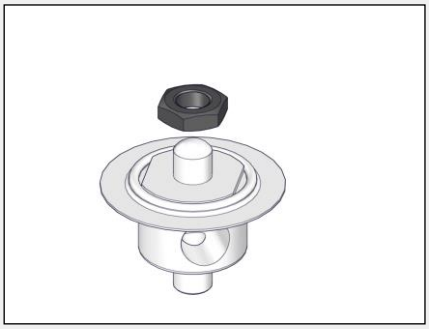
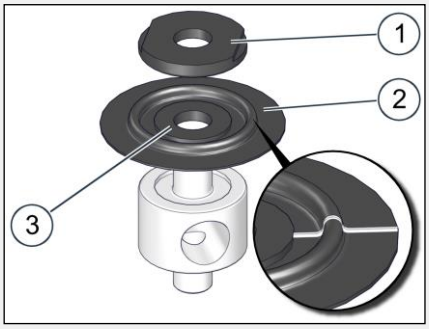
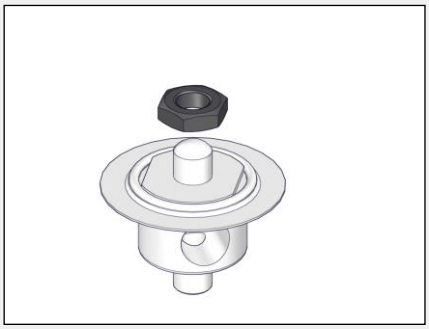
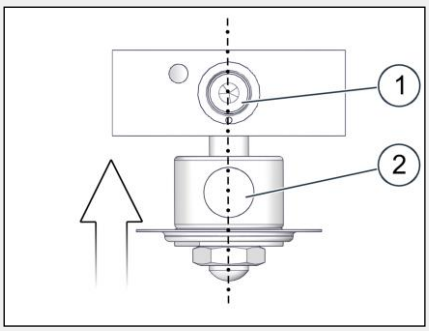
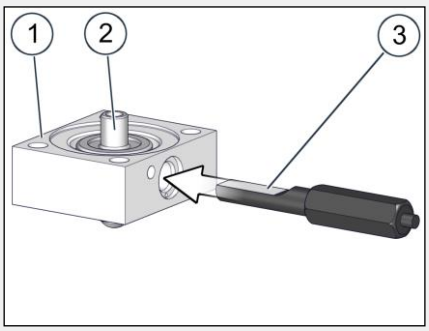
Figure	Step	Description
	**11**	Take the connecting piece and unscrew the hex nut.
	**12**	Remove the diaphragm plate (1) and the diaphragm (2). Replace the diaphragm (2) and the stem seal (3) with new ones. When inserting the new diaphragm in place, make sure that it is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	**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.

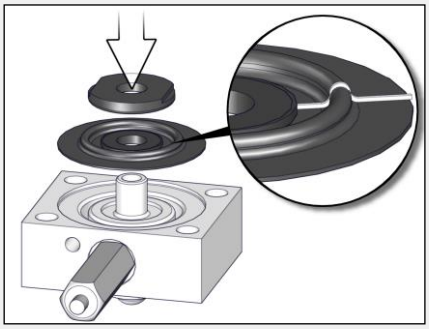
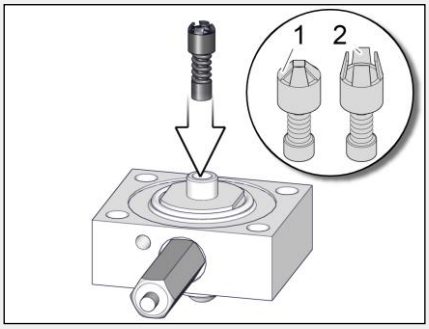
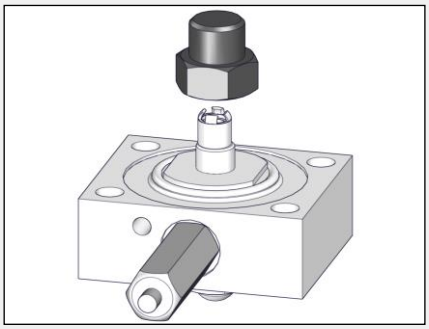
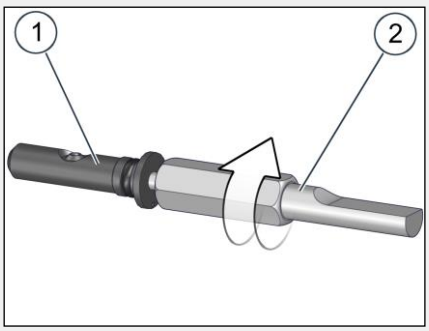
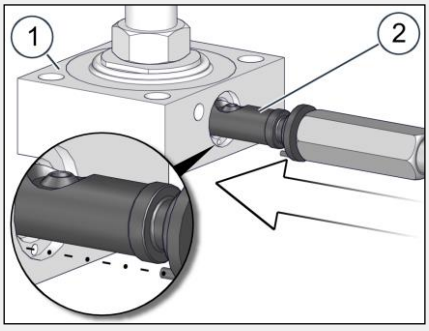
Figure	Step	Description
	**16**	Replace the diaphragm and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate, on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should 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
	**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).

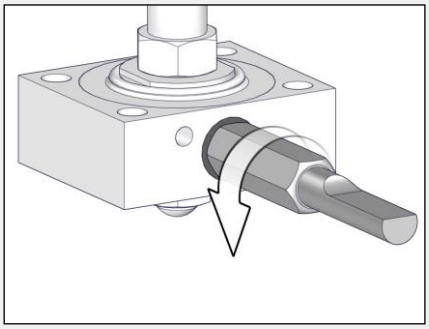
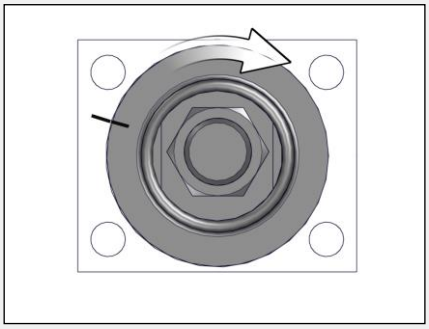
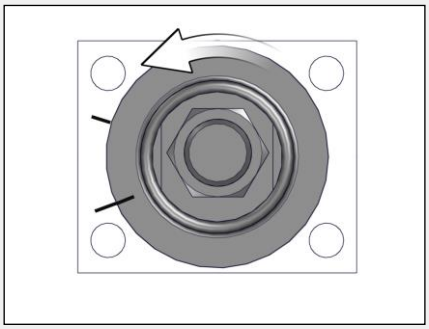
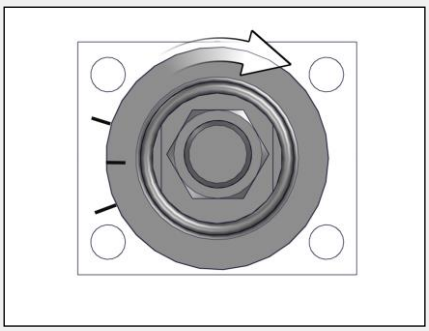
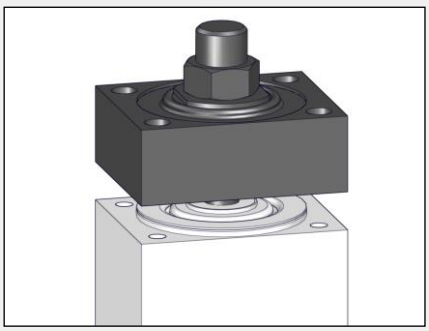
Figure	Step	Description
	**21**	Remove the assembly aid.
	**22**	To align the cross hole of the connecting piece correctly with the valve insert: Use the cap to turn the diaphragm by hand clockwise until it will not rotate any further. Use a marker or pen to mark the position on the body and on the convoluted diaphragm.
	**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.

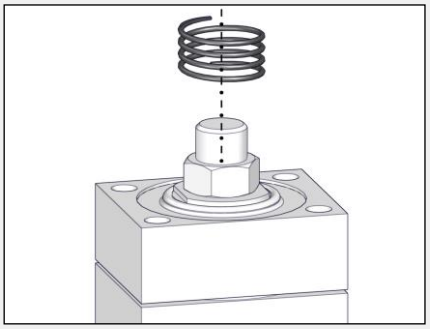
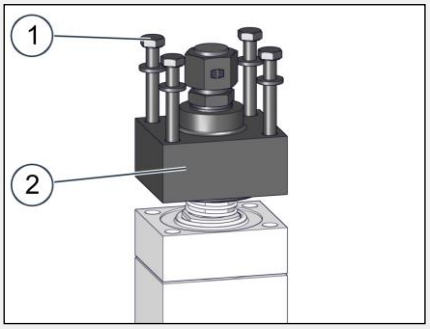
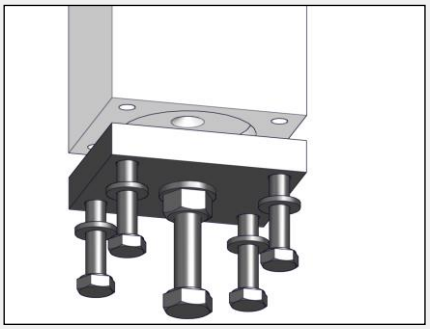
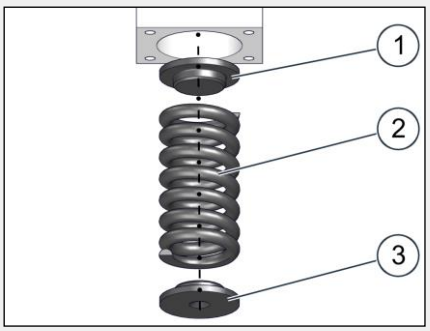
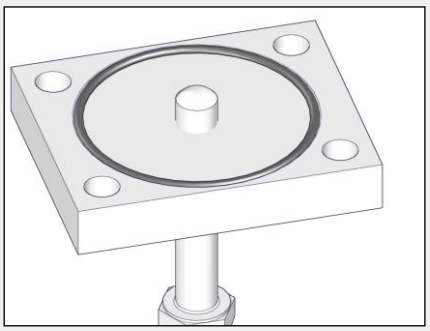
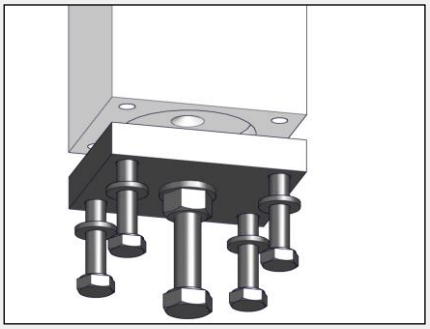
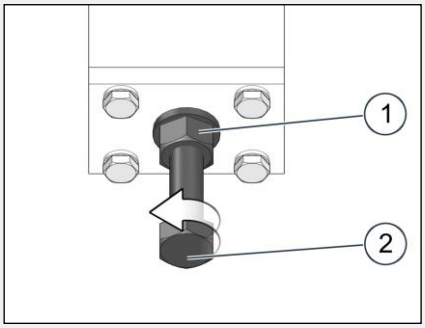
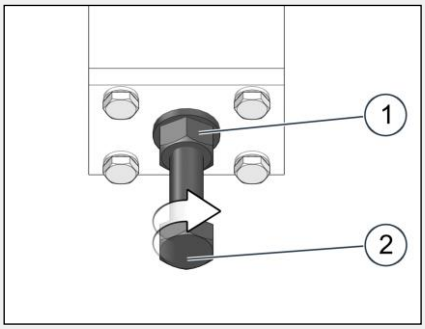
Figure	Step	Description
	**26**	Place the spring on the cap.
	**27**	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 22). Put the cover (2) in place. Tighten the screws (1) hand-tight at first.
	**28**	Loosen the base plate screws 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.

Figure	Step	Description
	**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.
	**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 82)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 85)

8.5.3 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 screws, bolts, or washers 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:

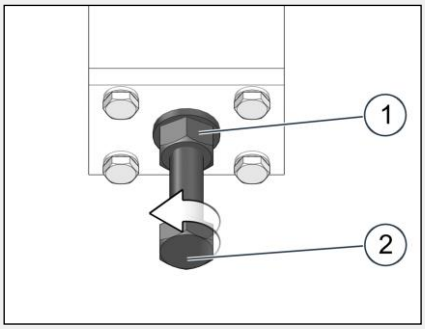
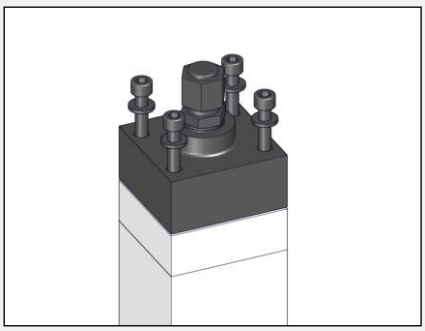
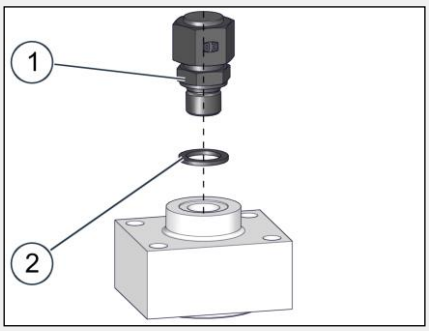
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Loosen the screws and lift off the upper cover.
	**3**	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2) with a new, greased sealing ring. Lubricate the thread surfaces. Screw the fitting (1) back in.

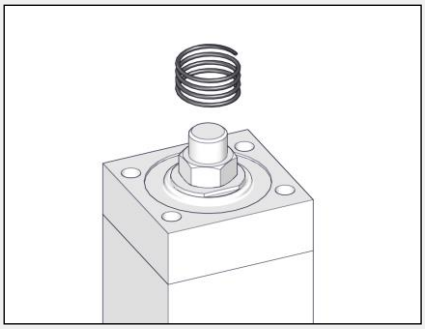
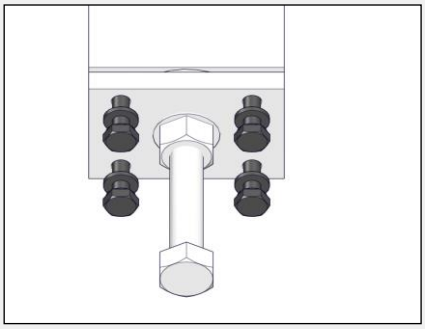
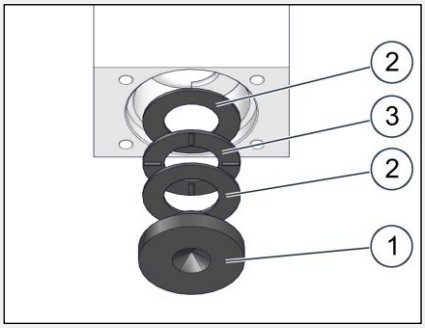
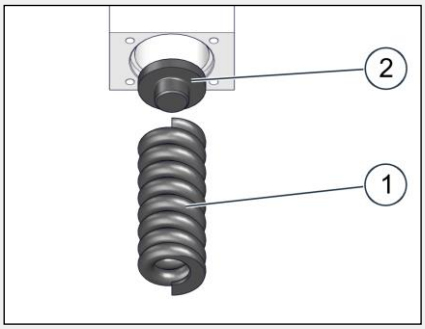
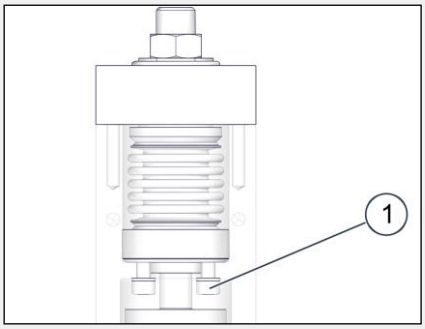
Figure	Step	Description
	**4**	Remove the spring from the cap.
	**5**	Loosen the screws and slowly and carefully remove the lower cover. **Important!** While removing the cover, parts on the inside may fall out from the spring housing by accident!
	**6**	Remove the lower spring plate (1), the axial washers (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.
	**8**	Unscrew the metal bellows' internal screws (1) from the lower section of the spring housing.

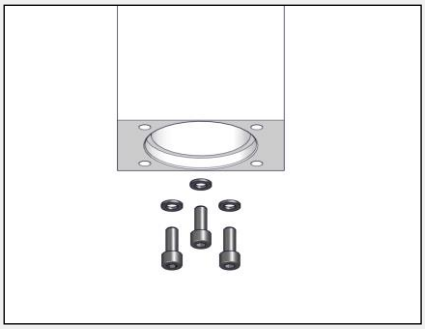
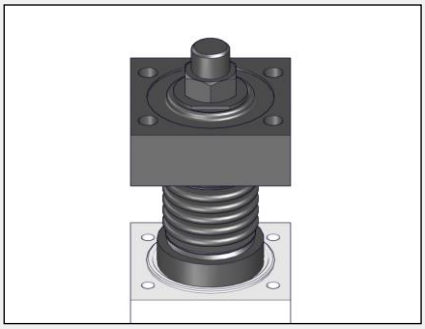
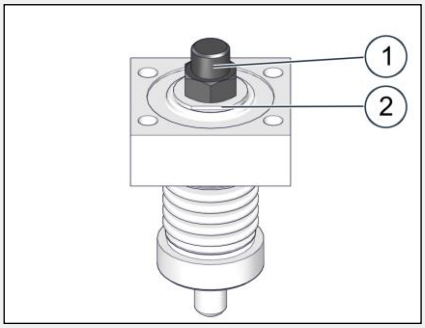
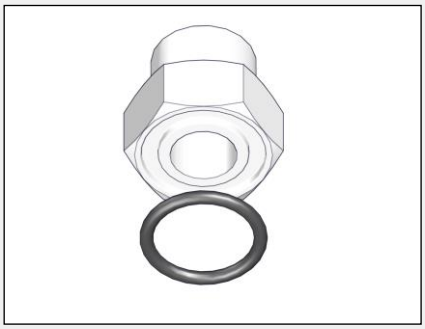
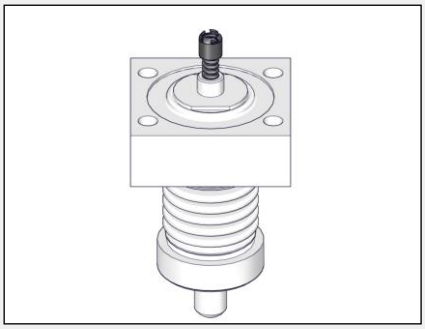
Figure	Step	Description
	**9**	Remove the screws and the corresponding washers from the lower section of the spring housing.
	**10**	Pull the valve body, including the metal bellows, upwards in order to remove it as a complete unit from the spring housing.
	**11**	Unscrew the cap (1) while using an open-end 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.
	**13**	Remove the pistons from the connecting piece.

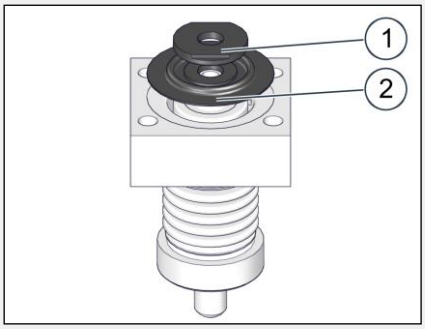
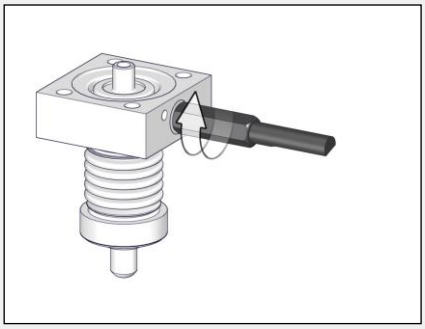
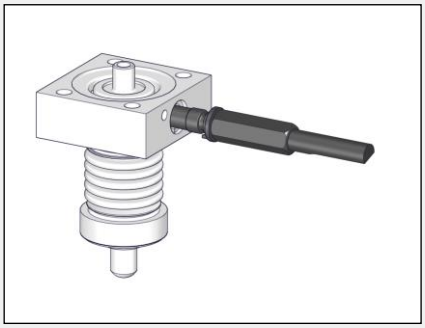
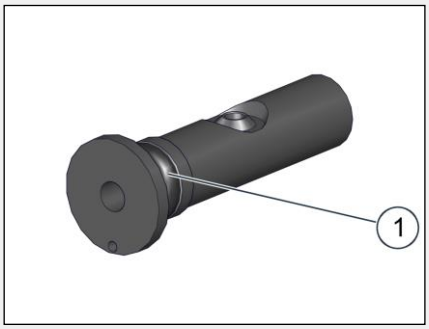
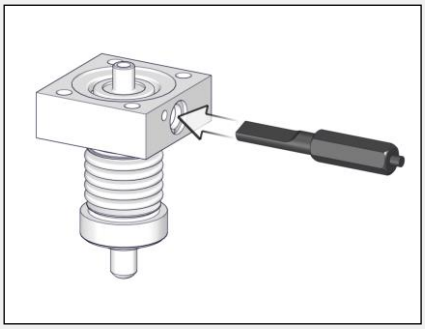
Figure	Step	Description
	**14**	Remove the diaphragm plate (1) and the diaphragm (2).
	**15**	Screw the assembly aid into the valve insert.
	**16**	Pull out the valve insert.
	**17**	Replace the valve insert with a new one. Insert a new, greased O-ring (1).
	**18**	Align the valve body as shown. Insert the assembly aid, with the milled surface facing upward towards the piston opening, into the valve body.

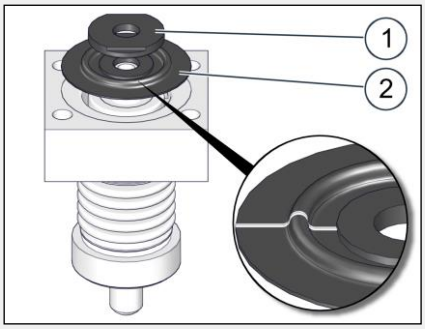
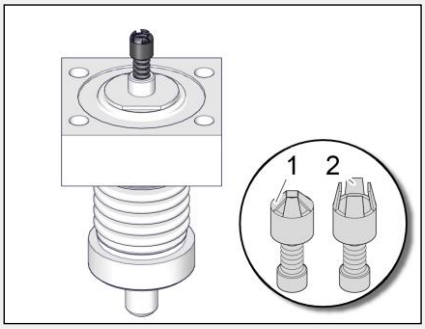
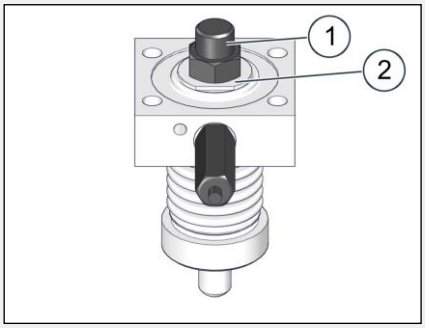
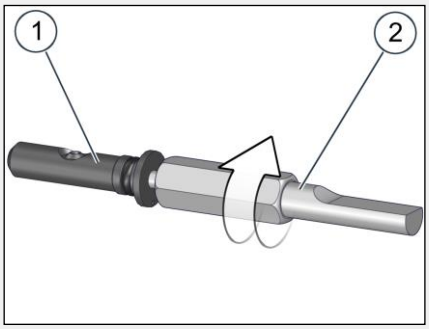
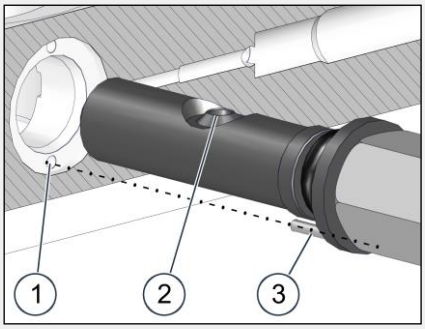
Figure	Step	Description
	**19**	Replace the diaphragm (2) and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate (1), on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center 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).
	**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.

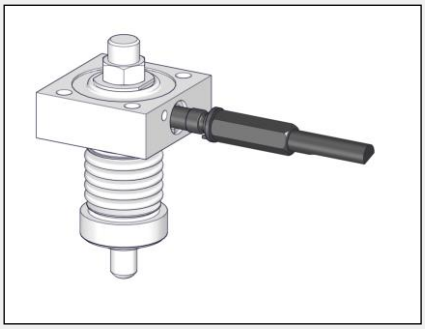
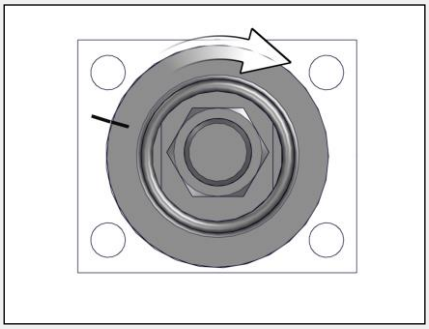
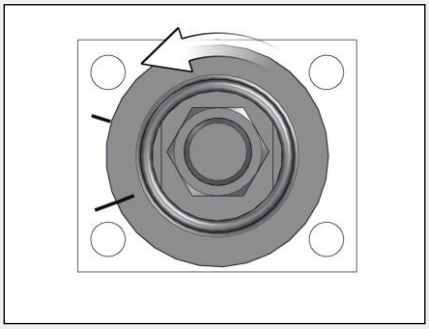
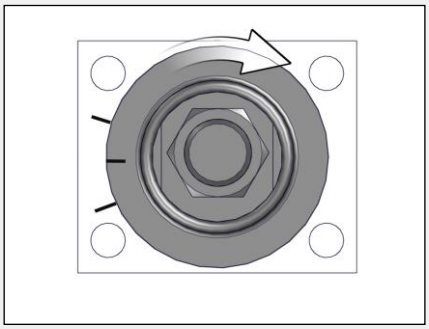
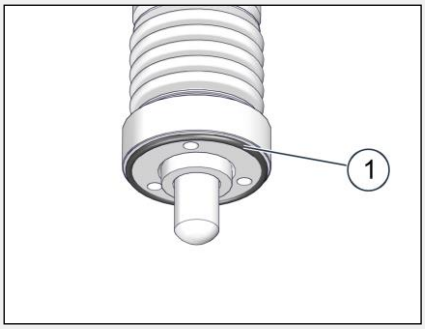
Figure	Step	Description
	**24**	Insert the valve insert all the way into the connecting piece. Remove the assembly aid.
	**25**	To align the cross hole of the connecting piece correctly with the valve insert: Use the cap to turn the diaphragm by hand clockwise until it will not rotate any further. Use 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.
	**28**	Replace the O-ring (1) with a new, greased O-ring.

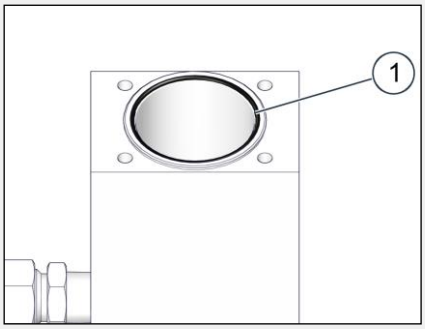
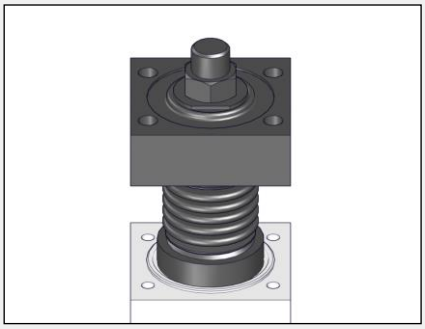
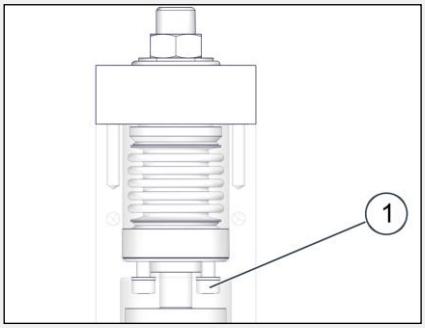
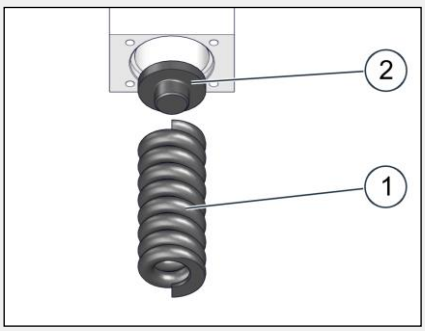
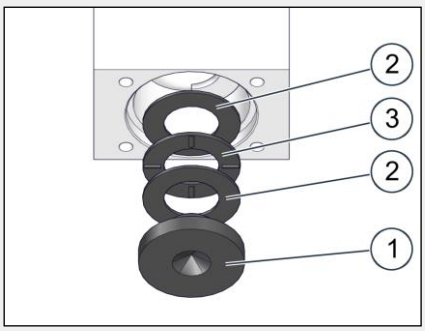
Figure	Step	Description
	**29**	Take the spring housing. Replace the O-ring (1) at the top of the spring housing with a new, greased O-ring.
	**30**	Insert the unit consisting of the valve body and the metal bellows back into the spring housing.
	**31**	Lubricate the thread surfaces. Tighten the screws (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.
	**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.

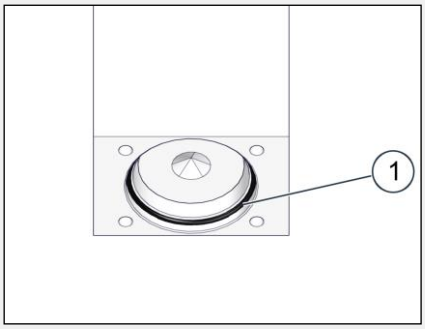
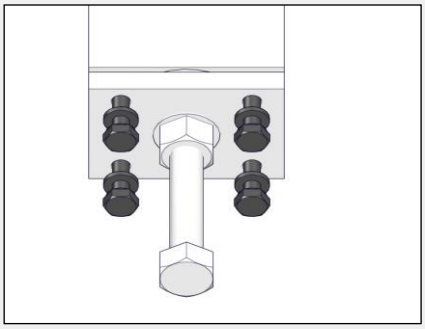
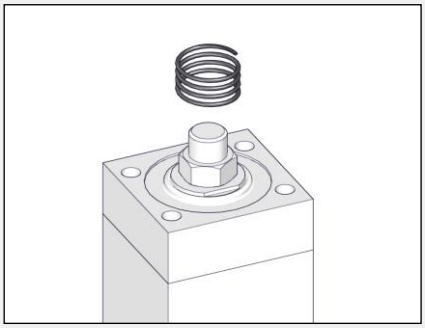
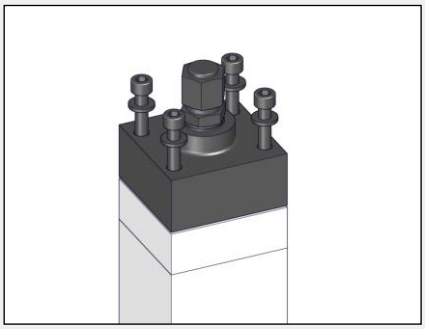
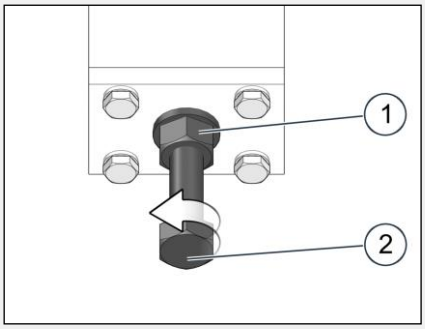
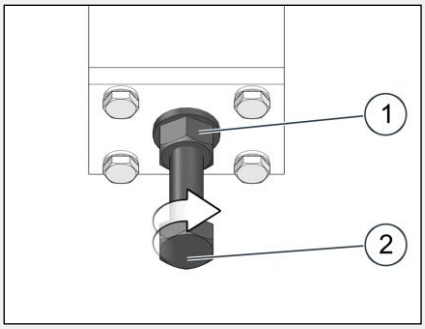
Figure	Step	Description
	**34**	Replace the O-ring (1) at the bottom of the spring housing with a new, greased O-ring.
	**35**	Lubricate the thread surfaces. Put the lower cover back in place. Tighten the screws in a criss-cross sequence. Observe the tightening torque information provided in the table 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.
	**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.

Figure	Step	Description
	**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 82)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 85)

8.5.4 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 screws, bolts, or washers 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:

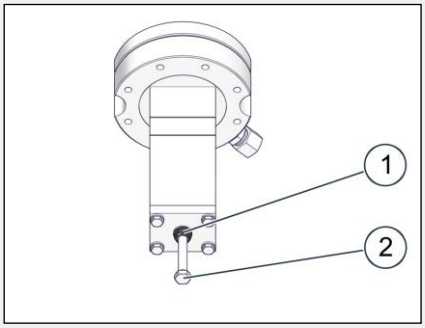
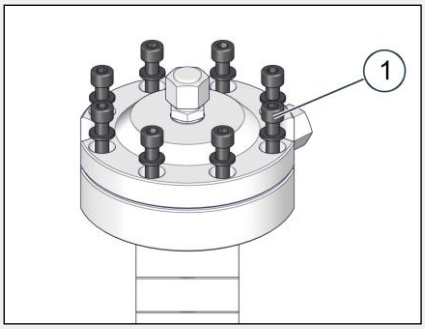
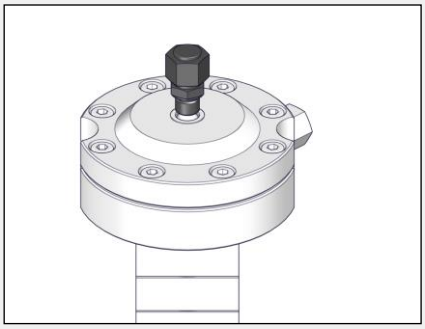
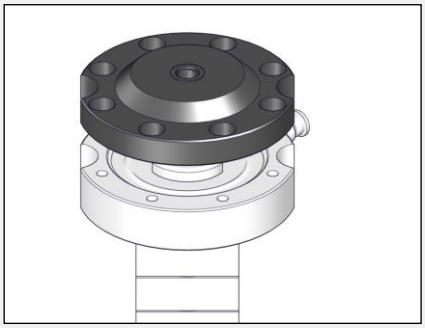
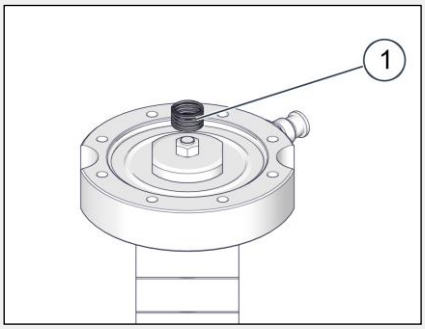
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Unscrew the diaphragm cover's screws (1).
	**3**	Unscrew the screw-in fitting.
	**4**	Remove the diaphragm cover.
	**5**	Remove the spring (1) from the hex nut.

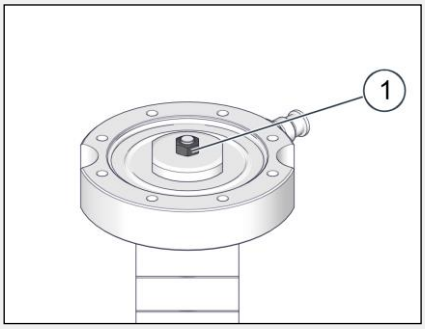
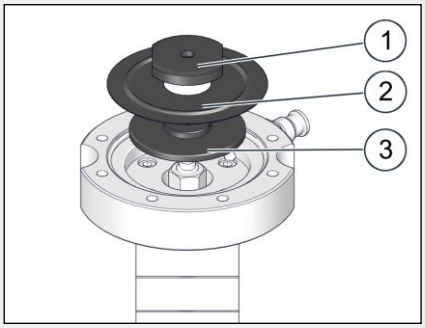
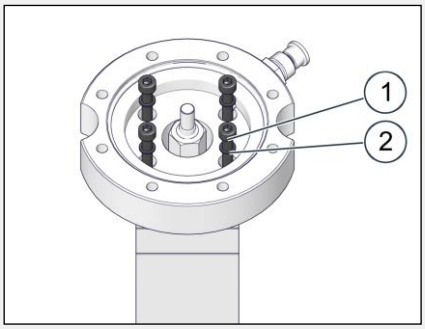
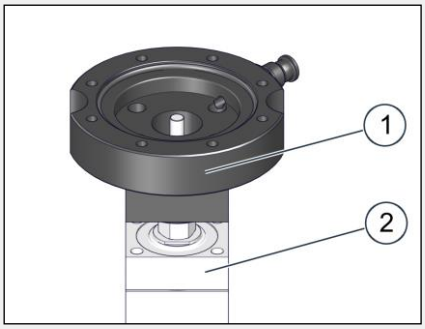
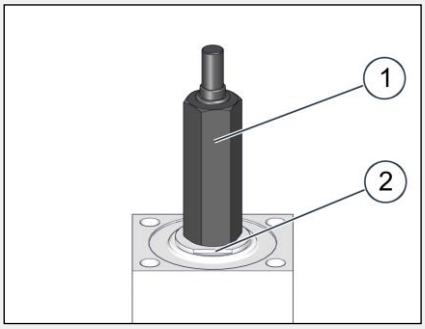
Figure	Step	Description
	**6**	Unscrew the hex nut (1) while using an open-end wrench to hold the pressure piece in place so as to prevent the components from turning.
	**7**	Remove the pressure piece (1), the diaphragm (2), and the diaphragm plate (3).
	**8**	Unscrew the diaphragm housing's screws (1). 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.

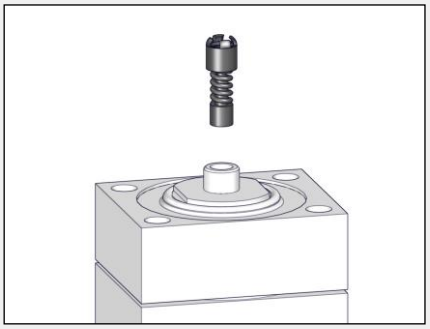
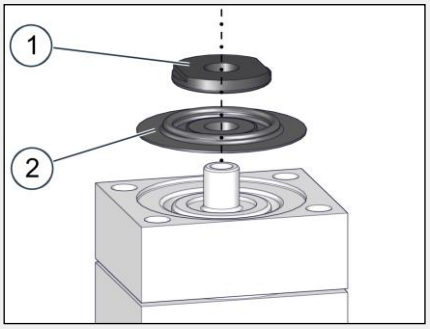
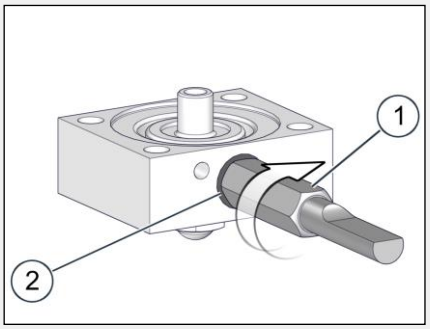
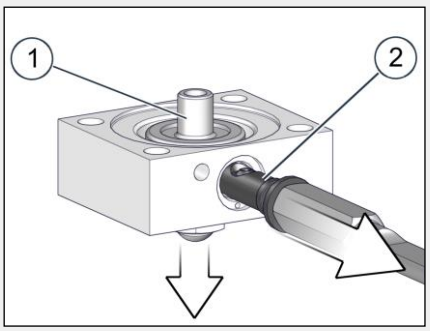
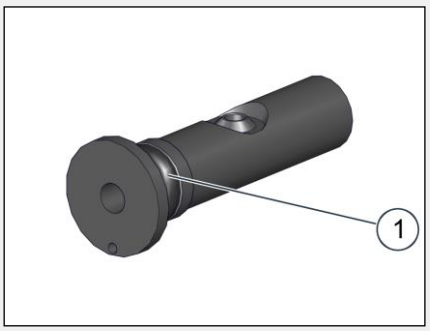
Figure	Step	Description
	**11**	Remove the piston.
	**12**	Remove the diaphragm plate (1) and the diaphragm (2).
	**13**	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	**14**	Hold on to the connecting piece (1) and pull out the valve insert (2).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

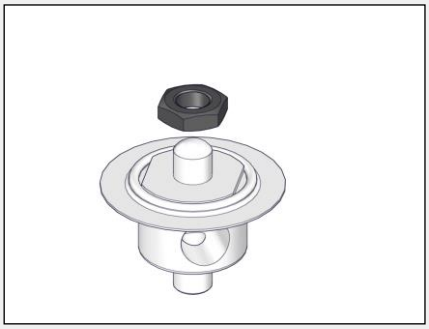
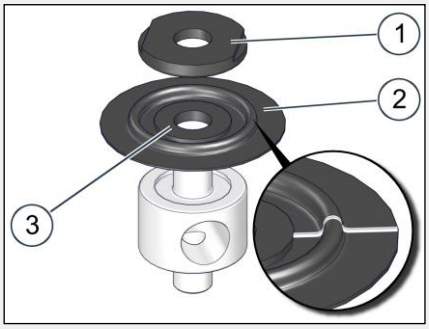
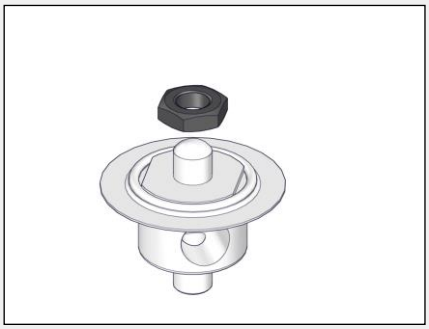
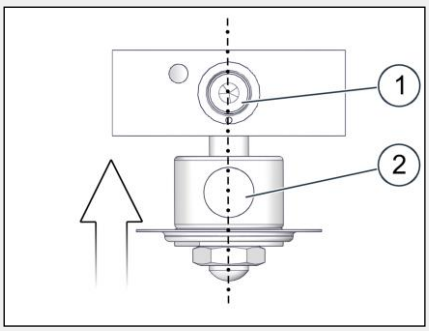
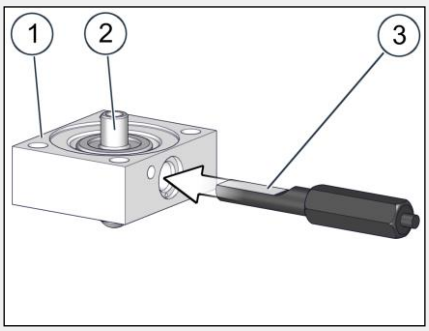
Figure	Step	Description
	**16**	Take the connecting piece and unscrew the hex nut.
	**17**	Remove the diaphragm plate (1) and the diaphragm (2). Replace the diaphragm (2) and the stem seal (3) with new ones. When inserting the new diaphragm in place, make sure that it is aligned correctly: The side of 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.

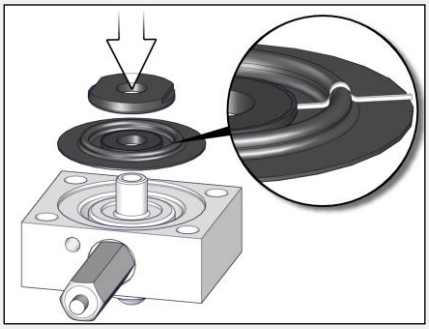
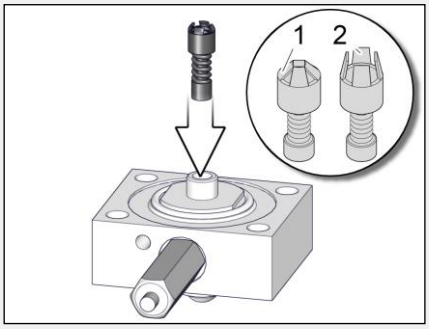
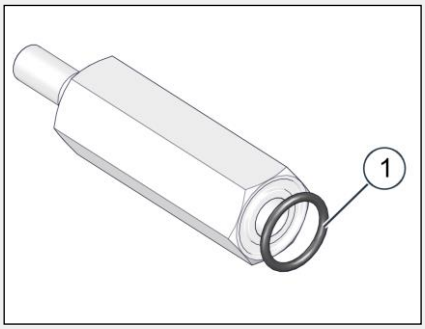
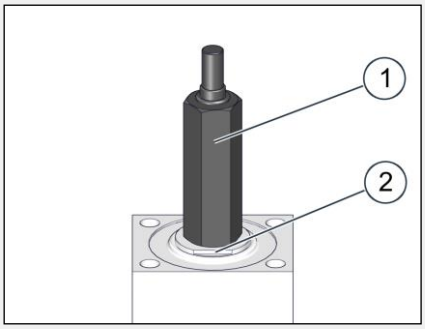
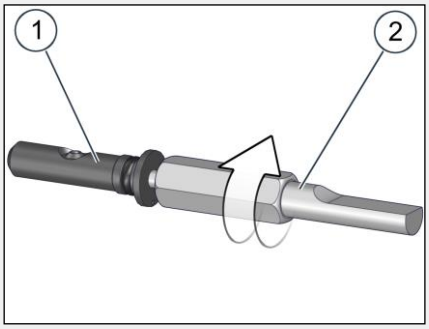
Figure	Step	Description
	**21**	Replace the diaphragm and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm plate, on the connecting piece. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	**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).

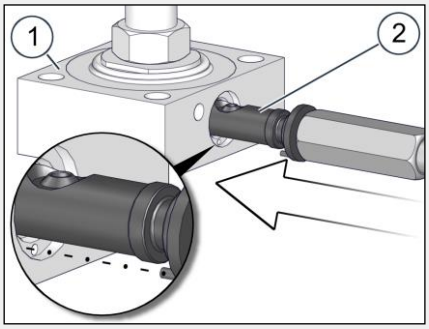
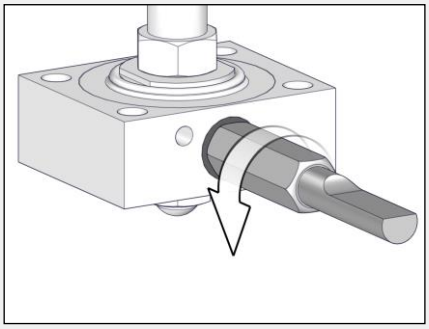
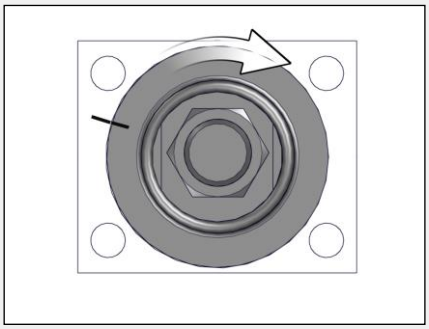
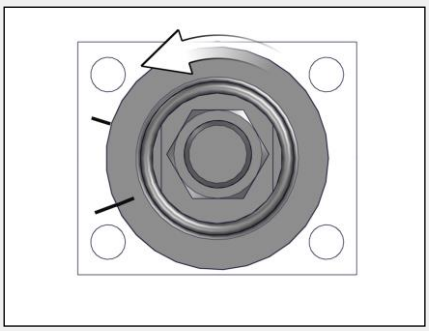
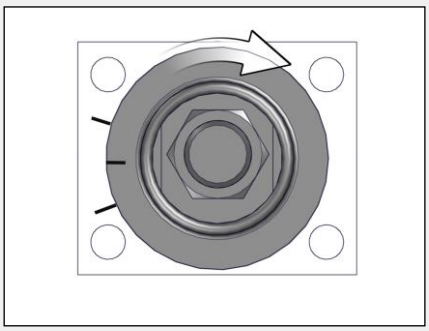
Figure	Step	Description
	**26**	Position the valve body (1) as shown. Turn the valve insert (2) in such a way that the dowel pin will engage the intended hole on the valve body (1) and the nozzle opening is pointing upwards. Insert the valve insert (2) as far as it will go into the connecting piece (1).
	**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.

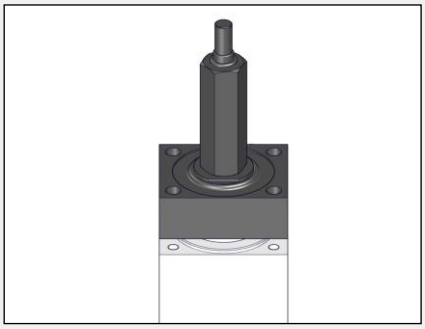
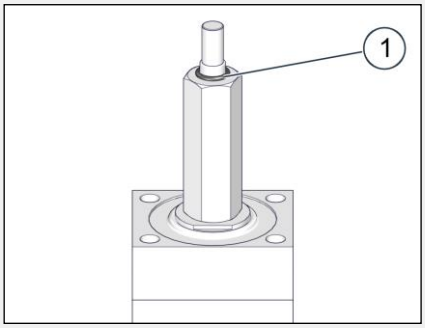
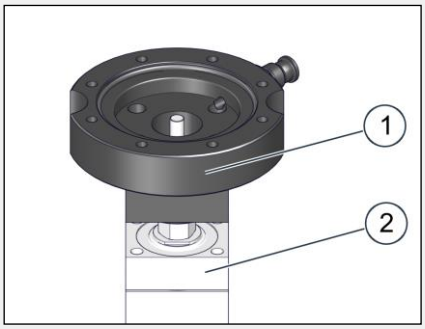
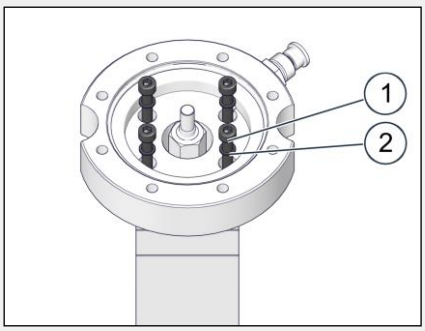
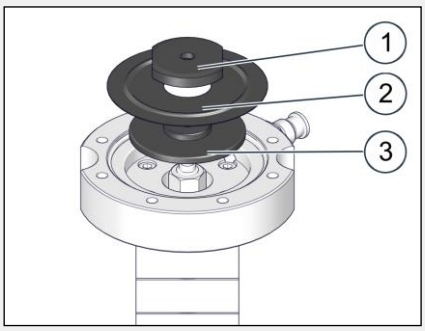
Figure	Step	Description
	**31**	Place the valve body on the spring housing.
	**32**	Replace the O-ring (1) with a new, greased O-ring.
	**33**	Hold the valve body (2) in place and put the diaphragm housing (1) back in place.
	**34**	Replace the bonded seals (2) with new ones. Lubricate the thread surfaces. 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.

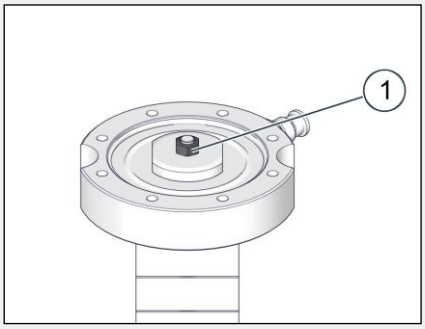
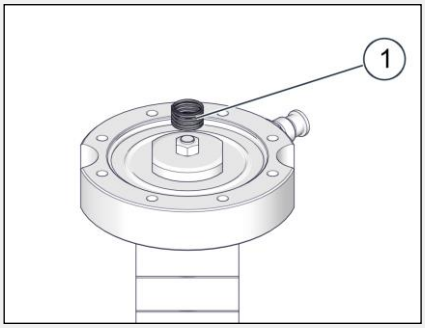
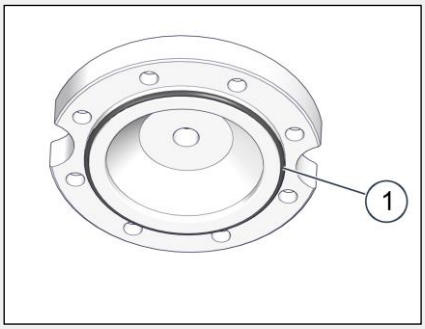
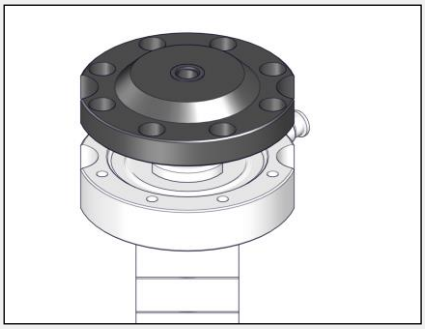
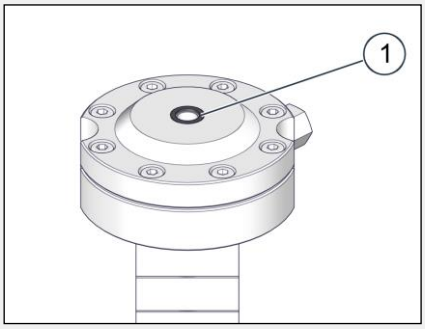
Figure	Step	Description
	**36**	Tighten the hex nut (1) while using an open-end wrench to hold the pressure piece in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before this section.
	**37**	Put the spring (1) back in place.
	**38**	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.

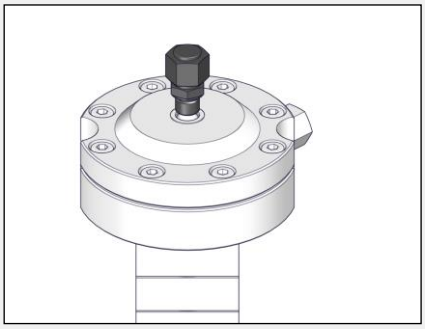
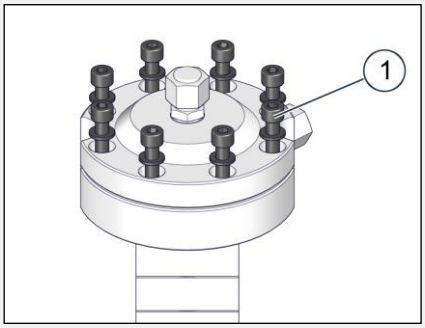
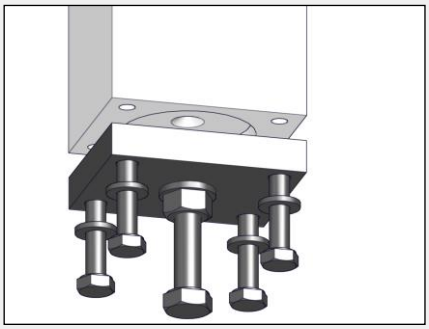
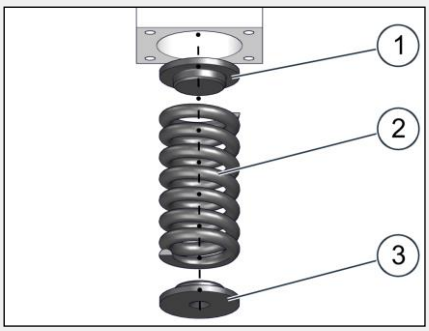
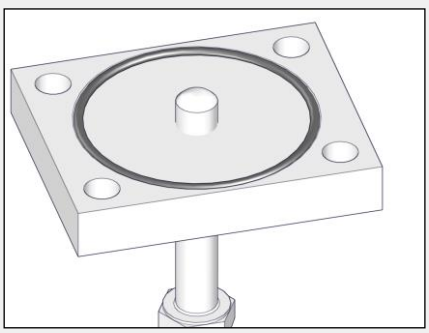
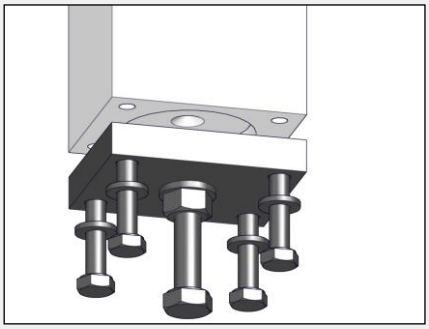
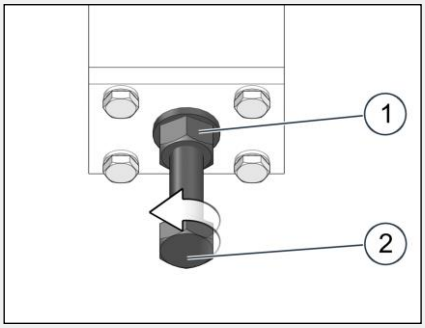
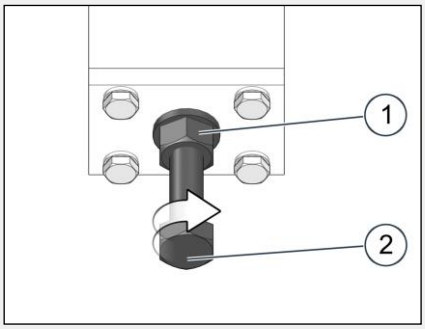
Figure	Step	Description
	**41**	Lubricate the thread surfaces. Screw the screw-in fitting back in.
	**42**	Lubricate the thread surfaces. Tighten the screws (1) in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.
	**43**	Loosen the base plate 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.

Figure	Step	Description
	**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 82)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 85)

8.5.5 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 screws, bolts, or washers 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:

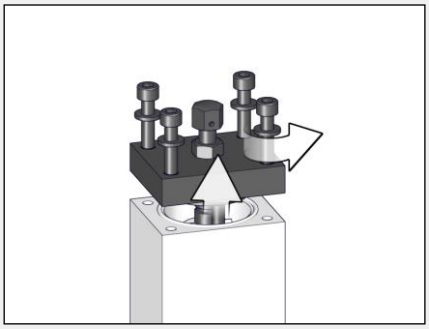
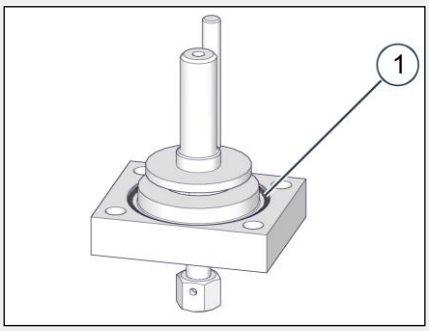
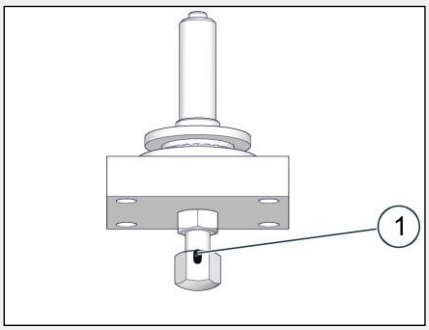
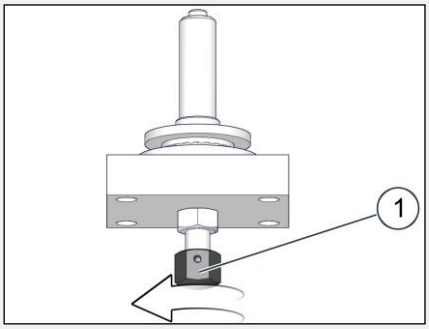
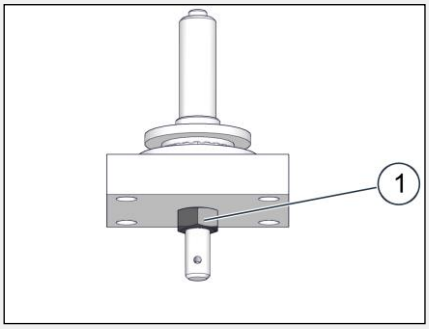
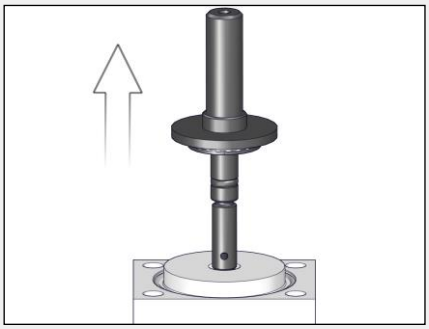
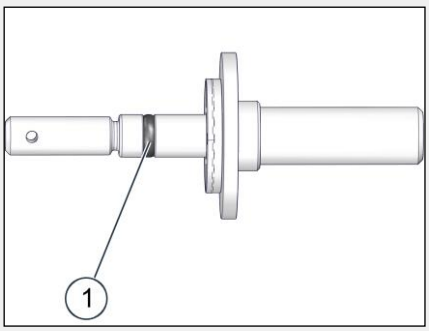
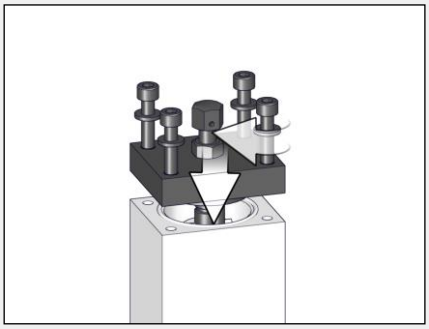
Figure	Step	Description
	1 - 27	Same as in *Maintaining the control stage with a diaphragm assembly* (see page 56)
	**28**	Turn the load limiting stage. Unscrew the socket cap screws and washers on the base plate
	**29**	Remove the base plate. Replace the O-ring (1) with a new, greased O-ring.
	**30**	Remove the cotter pin (1) from the cap nut.

Figure	Step	Description
	**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.
	**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 85)

8.5.6 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 screws, bolts, or washers 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:

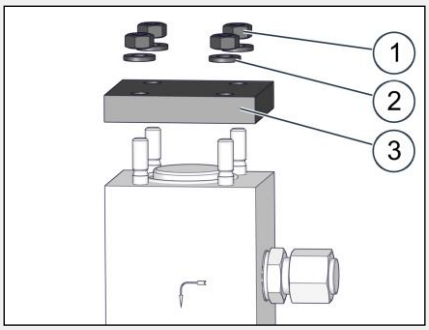
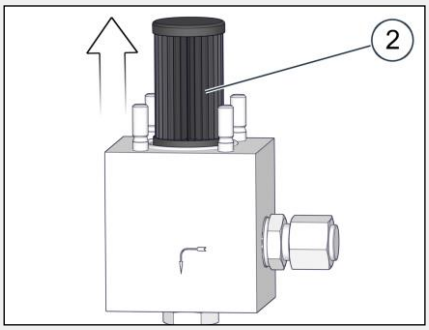
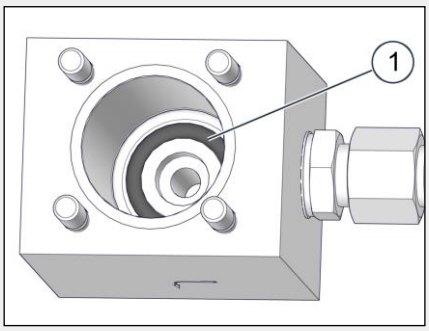
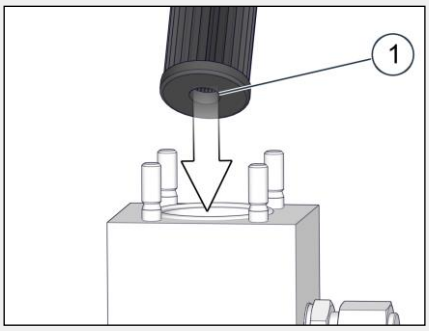
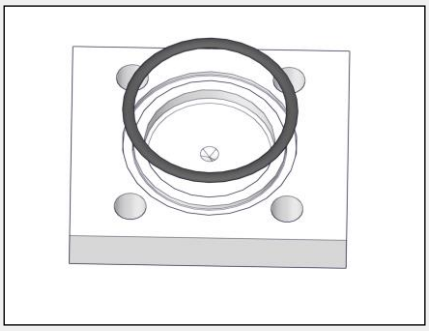
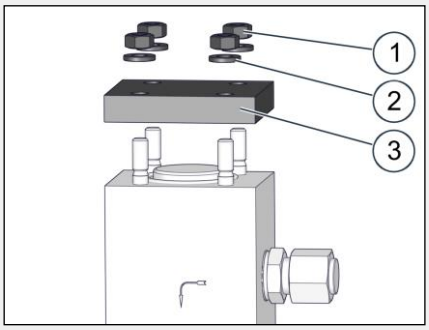
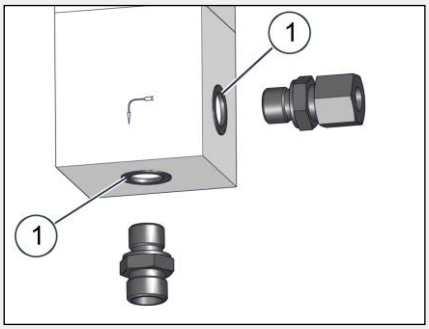
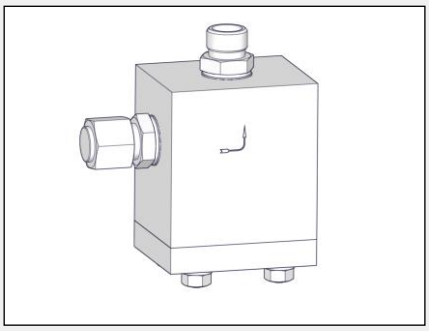
Figure	Step	Description
	**1**	Unscrew the nuts (1) and washers (2). Remove the base plate (3) from the body.
	**2**	Remove the filter insert (1) and clean it.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	**4**	Replace the O-ring (1) in the body with a new, greased 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 87)

8.5.7 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 screws, bolts, or washers 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:

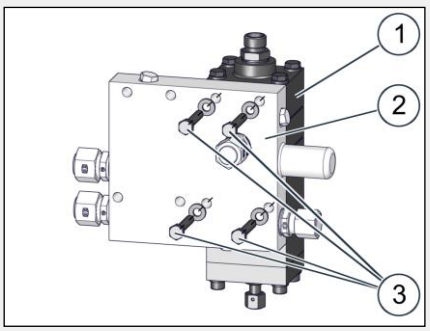
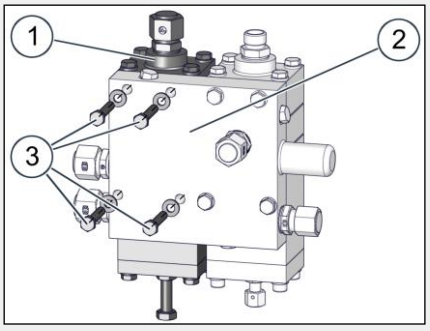
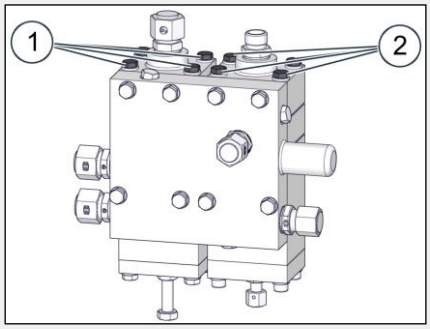
Figure	Step	Description
	**1**	Use the 4 hex bolts (3) and washers to fasten the load limiting stage (1) back onto the base plate (2). Observe the tightening torque information provided in the table before this section.
	**2**	Use the 4 hex bolts (3) and washers to fasten the control stage (1) back onto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

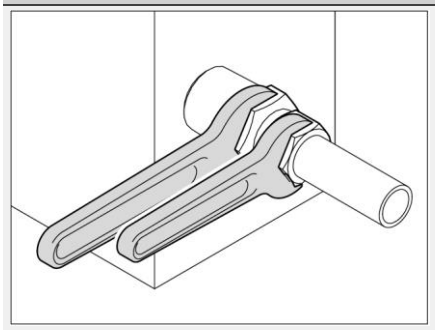
Proceed as follows:

Completing the maintenance (see page 88)

8.6 Completing the maintenance

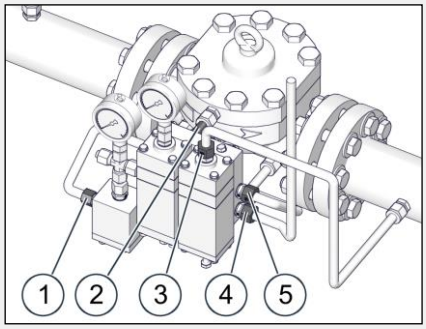
Protecting the pipe connections from being twisted

When conducting work involving the pipework, please always observe the following:

Figure	Description
	Do not twist the pipe connections in the assemblies. Use a second spanner wrench for securing when loosening and tightening pipe joints.

Installing components

Proceed as follows:

Figure	Step	Description
	**1**	Reinstall all the pipes you removed previously on the actuator assembly. ▪ Inlet pressure line (1) ▪ Motorization line (2) ▪ Outlet pressure line (5)
	2	Reinstall all the pipes you removed previously on the pilot. ▪ Inlet pressure line (1) ▪ Motorization line (2) ▪ Measuring impulse line (3) ▪ Vent line (4) ▪ Outlet pressure line (5) **Result:** The pilot is now installed on the actuator assembly and in the gas regulating line.

Next task

Proceed as follows:

Checking the system for leaks (see page 37)

9 Storage, removal, and disposal

Contents

9.1 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: 32 °F to 77 °F (0 °C to 25 °C)
  - 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.
  - When storing the device for more than one year (e.g., as a backup device):
    Store the device in its original packaging and in the same condition it was 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.

9.2 Disassembling the device

Pressurized parts

⚠WARNING

Risk of serious injury posed by pressurized components moving in an uncontrolled manner when handled improperly.

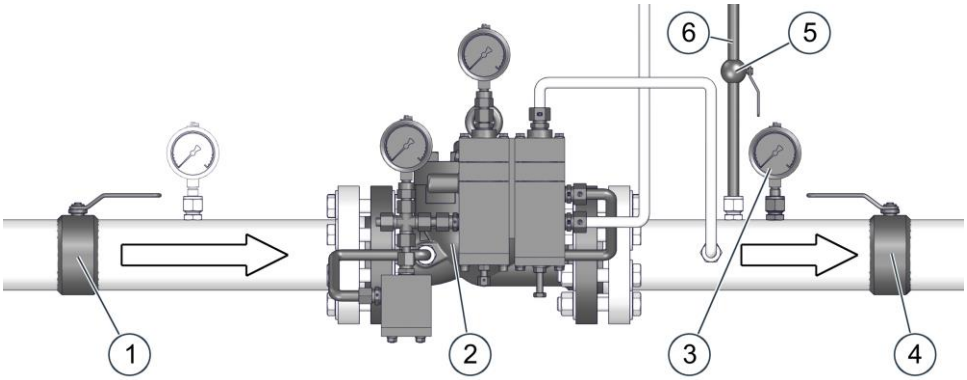
If not handled properly or in the event of a defect, gas can escape from pressurized components under high pressure and cause serious injuries and even death. Before you start working on these components:

⇨ Close all connections leading to the gas-carrying line.

⇨ Establish a depressurized status. Residual amounts of energy must be depressurized as well.

Overview

Schematic diagram using the two-stage HON 630 pilot with a diaphragm assembly as a reference



The numbers have the following meaning:

No.	Meaning
1	Inlet stop valve armature
2	Gas pressure regulator
3	Pressure gauge
4	Outlet stop valve armature
5	Valve for blowdown line
6	Blowdown line

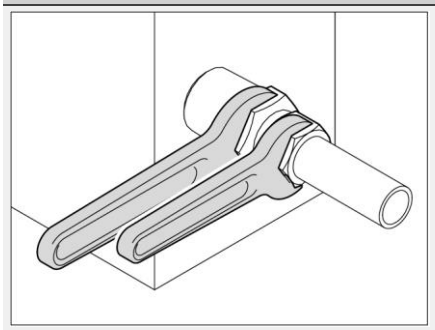
Establishing the depressurized status

Proceed as follows:

Step	Description
1	Close the outlet stop valve armature (4).
2	Close the inlet stop valve armature (1).
3	Depressurize the pilot: Turn the set screw on the pilot's control stage – and the set screw on the pilot's load limiting stage as well if applicable – clockwise until the pressure in the pilot is equalized.
4	Open the valve (5) in the blowdown line (6) to discharge the pressure between the inlet and the outlet valves.

Protecting the pipe connections from being twisted

When conducting work involving the pipework, please always observe the following:

Figure	Description
	Do not twist the pipe connections in the assemblies. Use a second spanner wrench for securing when loosening and tightening pipe joints.

Purging the lines with nitrogen

All the gas pressure regulator's lines must be purged with nitrogen before the device is removed.

Disassembling the device

Proceed as follows:

Step	Description
1	Disassemble the device. Observe the information and instructions in the *Transport and installation* (see page 33) section when doing so.

9.3 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.

10 Appendix

Contents

10.1 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 actuator assembly

- The spare parts always required for the actuator assembly's maintenance are grouped together into spare parts kits appropriate for the device in question. Each spare parts kit has its own part number.
- Individual servicing parts can be ordered by using the corresponding part number, which is specified in the bill of materials for the actuator assembly. The required number of parts is specified in the "Quantity" column.

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.

Maintenance and servicing parts for travel indication (optional)

- The bill of materials for the travel indication is broken down into 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)

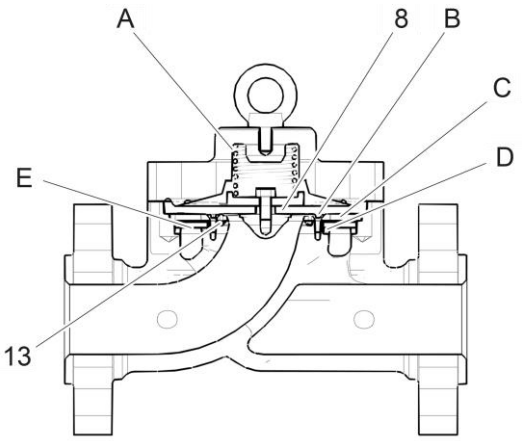
Overview of bills of materials

The bills of materials are subdivided as follows:

- HON 5020 actuator assembly
  - Maintenance and servicing parts
  - Various spare parts kits, grouped by nominal size and pressure rating
- 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
- Travel indication option
  - Maintenance and servicing parts

10.2 Spare parts for the HON 5020 actuator assembly

Spare parts drawing for actuator assembly



Maintenance and servicing parts for actuator assembly

Nominal size	No. / Letter	Qty	Name	Part no.
1″	8	1	Diaphragm, up to 50 bar DP	201/MJ/001
1″	8	1	Diaphragm, up to 70 bar DP	201/MJ/004
1″	13	1	O-ring	730ODVN224
1″	A	1	Closing spring	18358049
1″	B	4	Screws	710BCFE03010
1″	C	1		
			Flow restrictor, 100%	201/MZ/001
			Flow restrictor, 75%	201/MZ/004
			Flow restrictor, 50%	201/MZ/006
			Flow restrictor 25%	201/MZ/008
1″	D	1	Carrier plate	201/MN/001
1″	E	1	Metal foam	201/MF/001
2″	8	1	Diaphragm, up to 50 bar DP	202/MJ/012
2″	8	1	Diaphragm, up to 70 bar DP	202/MJ/013
2″	13	1	O-ring	730ODVN229
2″	A	1	Closing spring	SS1075
2″	B	4	Screws	710BCFE03010
2″	C	1		
			Flow restrictor, 100%	202/MZ/011
			Flow restrictor, 75%	202/MZ/019
			Flow restrictor, 50%	202/MZ/013
			Flow restrictor 25%	202/MZ/020

2″	D	1	Carrier plate	202/MN/001
2″	E	1	Metal foam	202/MF/001
3″	8	1	Diaphragm, up to 50 bar DP	203/MJ/013
3″	8	1	Diaphragm, up to 70 bar DP	203/MJ/014
3″	13	1	O-ring	730ODVN238
3″	A	1	Closing spring	SS1293
3″	B	6	Screws	710BCFE03010
3″	C	1		
			Flow restrictor, 100%	203/MZ/010
			Flow restrictor, 75%	203/MZ/018
			Flow restrictor, 50%	203/MZ/012
			Flow restrictor 25%	203/MZ/019
3″	D	1	Carrier plate	203/MN/001
3″	E	1	Metal foam	203/MF/001
4″	8	1	Diaphragm, up to 50 bar DP	204/MJ/003
4″	8	1	Diaphragm, up to 70 bar DP	204/MJ/004
4″	13	1	O-ring	730ODVN244
4″	A	1	Closing spring	10024055
4″	B	6	Screws	710BCFE03010
4″	C	1		
			Flow restrictor, 100%	204/MZ/010
			Flow restrictor, 75%	204/MZ/016
			Flow restrictor, 50%	204/MZ/012
			Flow restrictor 25%	204/MZ/017
4″	D	1	Carrier plate	204/MN/002
4″	E	1	Metal foam	204/MF/001
6″	8	1	Diaphragm 50/70 bar DP	10011307
6″	13	1	O-ring	730ODVN261
6″	A	1	Closing spring	10011249
6″	B	6	Screws	710BCFE03010
6″	C	1		
			Flow restrictor, 100%	206/MZ/002
			Flow restrictor, 75%	206/MZ/010
			Flow restrictor, 50%	206/MZ/006
			Flow restrictor 25%	206/MZ/011

6″	D	1	Carrier plate	206/MN/001
6″	E	1	Metal foam	206/MF/001

Spare part kits for the actuator assembly

Nominal size	No. / Letter	Qty	Name	Part no.
1″			1" Class 150/300, PN 16/25/40 series 5020 IGP spare parts kit	201/MS-001
	8	1	Diaphragm, up to 50 bar DP	201/MJ/001
	13	1	O-ring	730ODVN224

Nominal size	No. / Letter	Qty	Name	Part no.
1″			1" Class 600 5020 series IGP spare parts kit	201/MS-002
	8	1	Diaphragm, up to 70 bar DP	201/MJ/004
	13	1	O-ring	730ODVN224

Nominal size	No. / Letter	Qty	Name	Part no.
2″			2" Class 150/300, PN 16/25/40 series 5020 IGP spare parts kit	202/MS-008
	8	1	Diaphragm, up to 50 bar DP	202/MJ/012
	13	1	O-ring	730ODVN229

Nominal size	No. / Letter	Qty	Name	Part no.
2″			2" Class 600 5020 series IGP spare parts kit	202/MS-009
	8	1	Diaphragm, up to 70 bar DP	202/MJ/013
	13	1	O-ring	730ODVN229

Nominal size	No. / Letter	Qty	Name	Part no.
3″			3" Class 150/300, PN 16/25/40 series 5020 IGP spare parts kit	203/MS-006
	8	1	Diaphragm, up to 50 bar DP	203/MJ/013
	13	1	O-ring	730ODVN238

Nominal size	No. / Letter	Qty	Name	Part no.
3″			3" Class 600 5020 series IGP spare parts kit	203/MS-007
	8	1	Diaphragm, up to 70 bar DP	203/MJ/014
	13	1	O-ring	730ODVN238

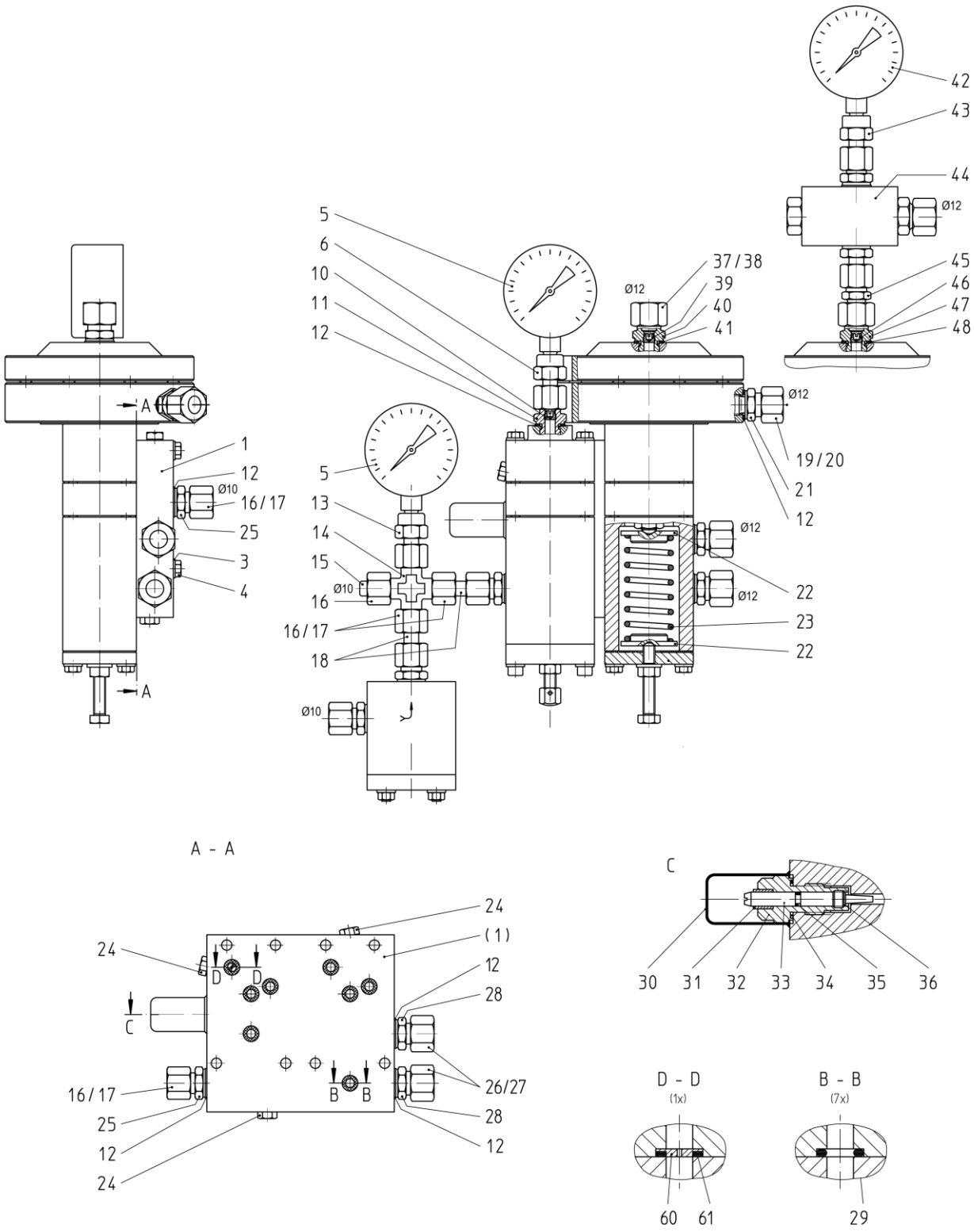
Nominal size	No. / Letter	Qty	Name	Part no.
4″			4" Class 150/300, PN 16/25/40 series 5020 IGP spare parts kit	204/MS-008
	8	1	Diaphragm, up to 50 bar DP	204/MJ/003
	13	1	O-ring	730ODVN244

Nominal size	No. / Letter	Qty	Name	Part no.
4″			4" Class 600 5020 series IGP spare parts kit	204/MS-009
	8	1	Diaphragm, up to 70 bar DP	204/MJ/004
	13	1	O-ring	730ODVN244

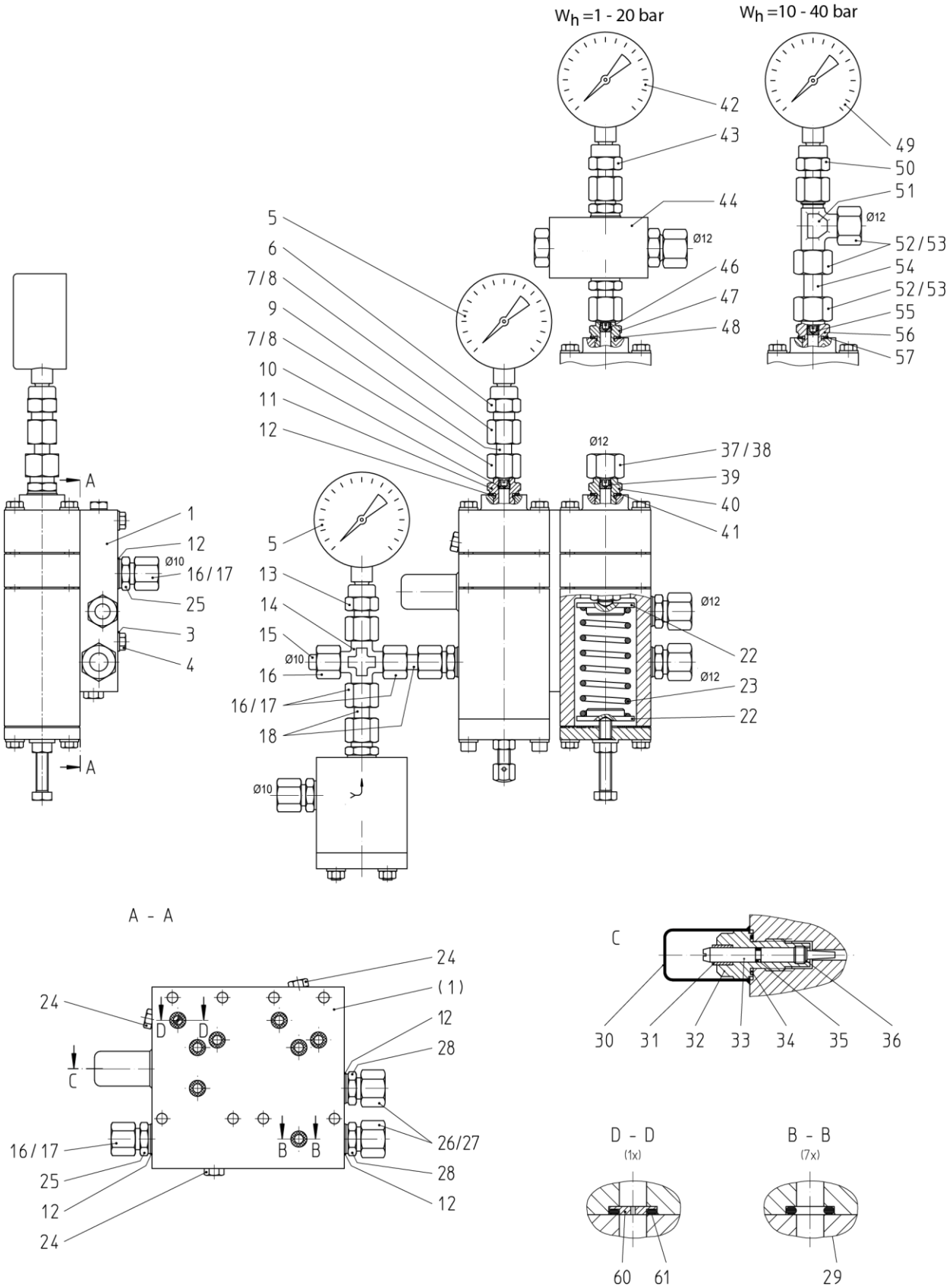
Nominal size	No. / Letter	Qty	Name	Part no.
6″			6" Class 150/300/600, PN 16/25/40 series 5020 IGP spare parts kit	206/MS-001
	8	1	Diaphragm 50/70 bar DP	10011307
	13	1	O-ring	730ODVN261

10.3 Spare parts for two-stage HON 630 pilot

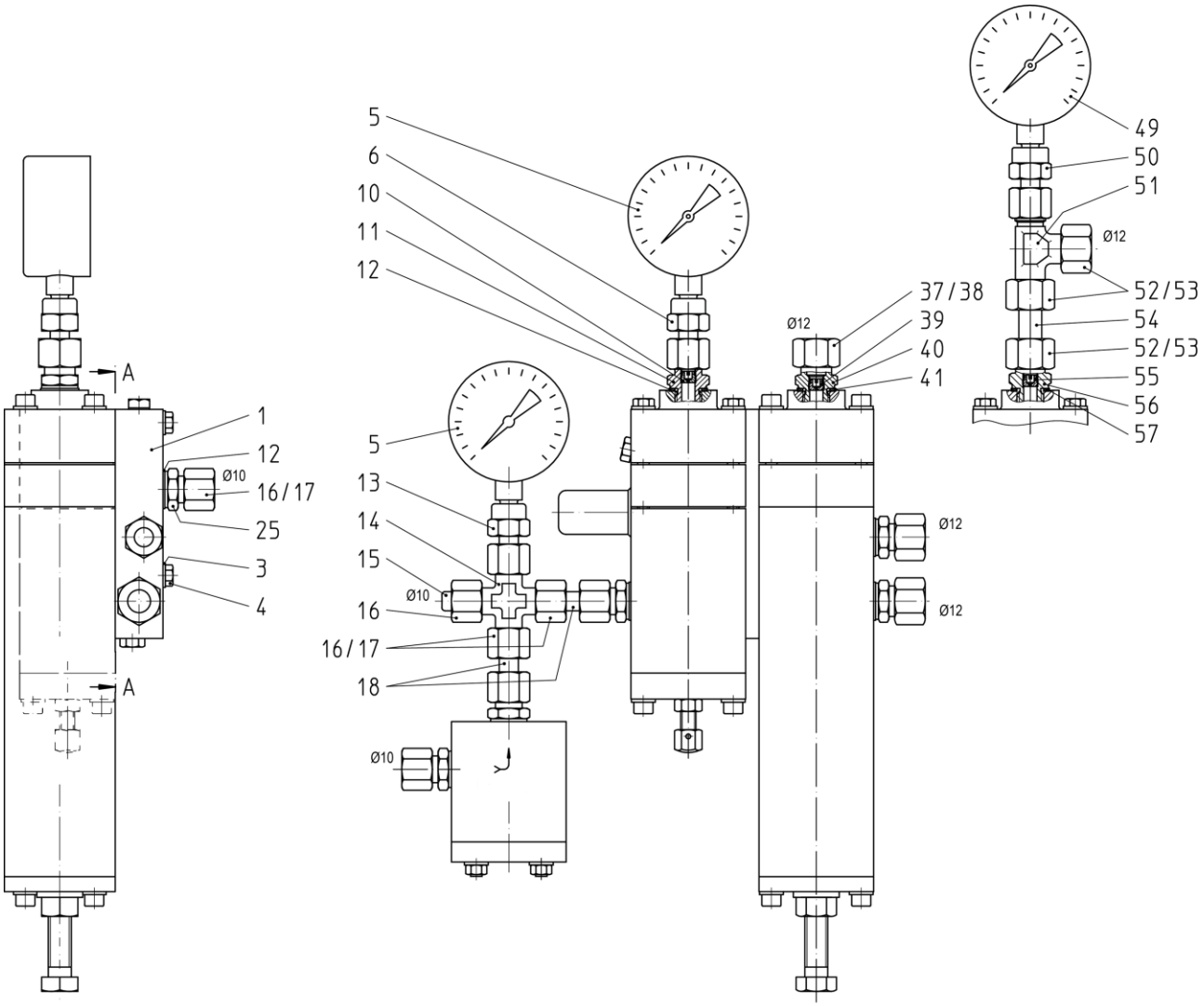
Spare parts drawing for pilot with larger diaphragm assembly

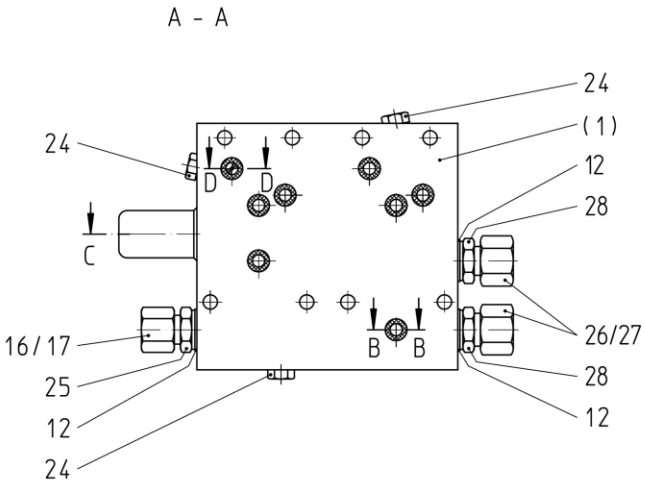


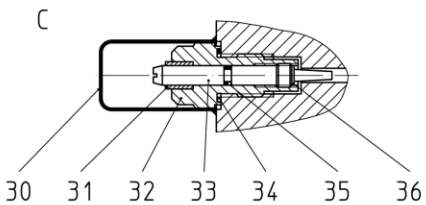
Spare parts drawing for pilot with diaphragm assembly

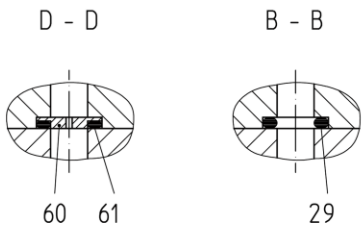


Spare parts drawing for pilot with metal bellows assembly









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

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
	▪ 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 set-point 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:

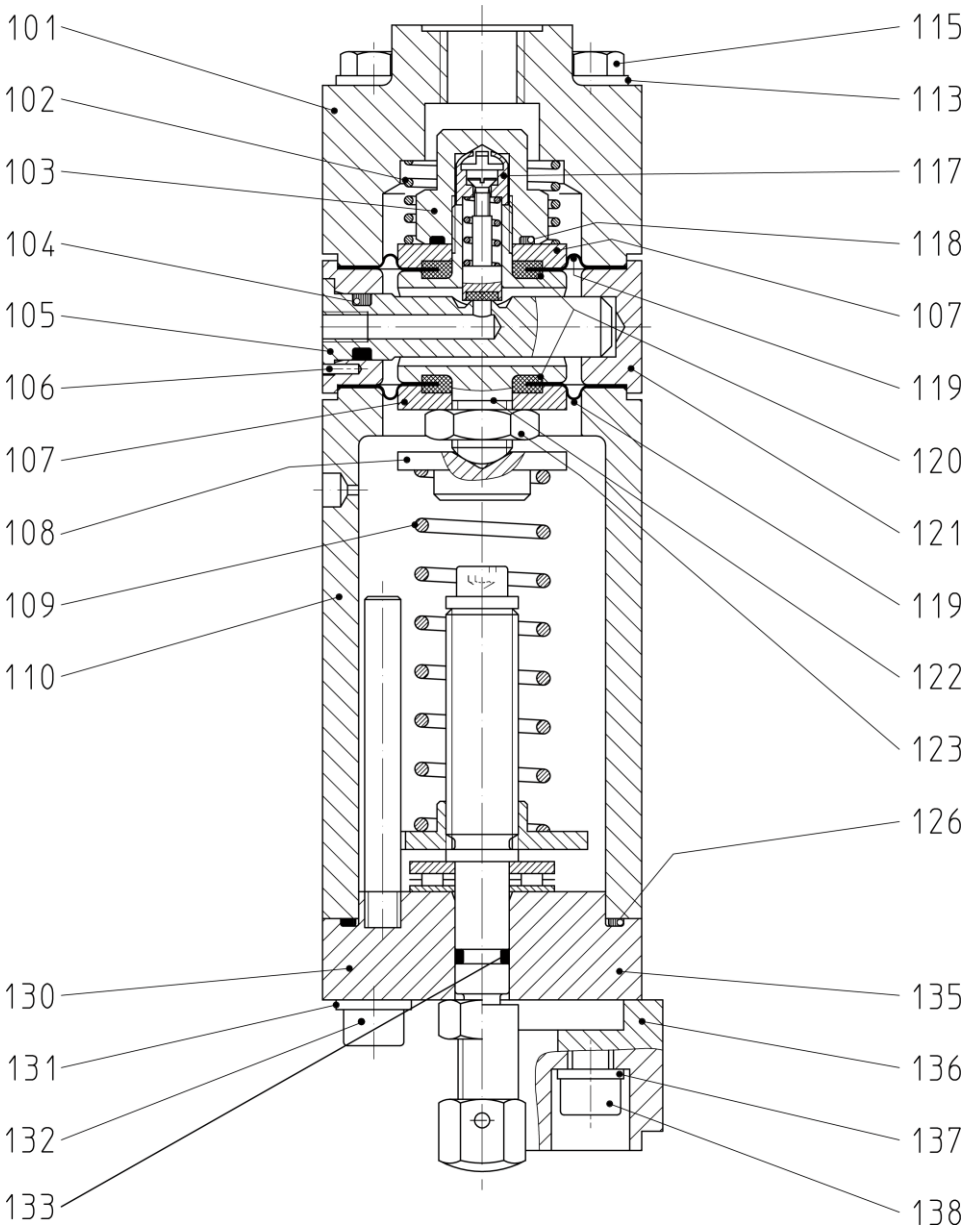
No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
49	Pressure gauge for the following specific setpoint ranges:			
	▪ W_{ds} = 10-40 bar	-	26 282	26 282

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit
	▪ W_{ds} = 10-50 bar	-	26 283	26 283
	▪ W_{ds} = 20-90 bar	-	-	26 285

10.4 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

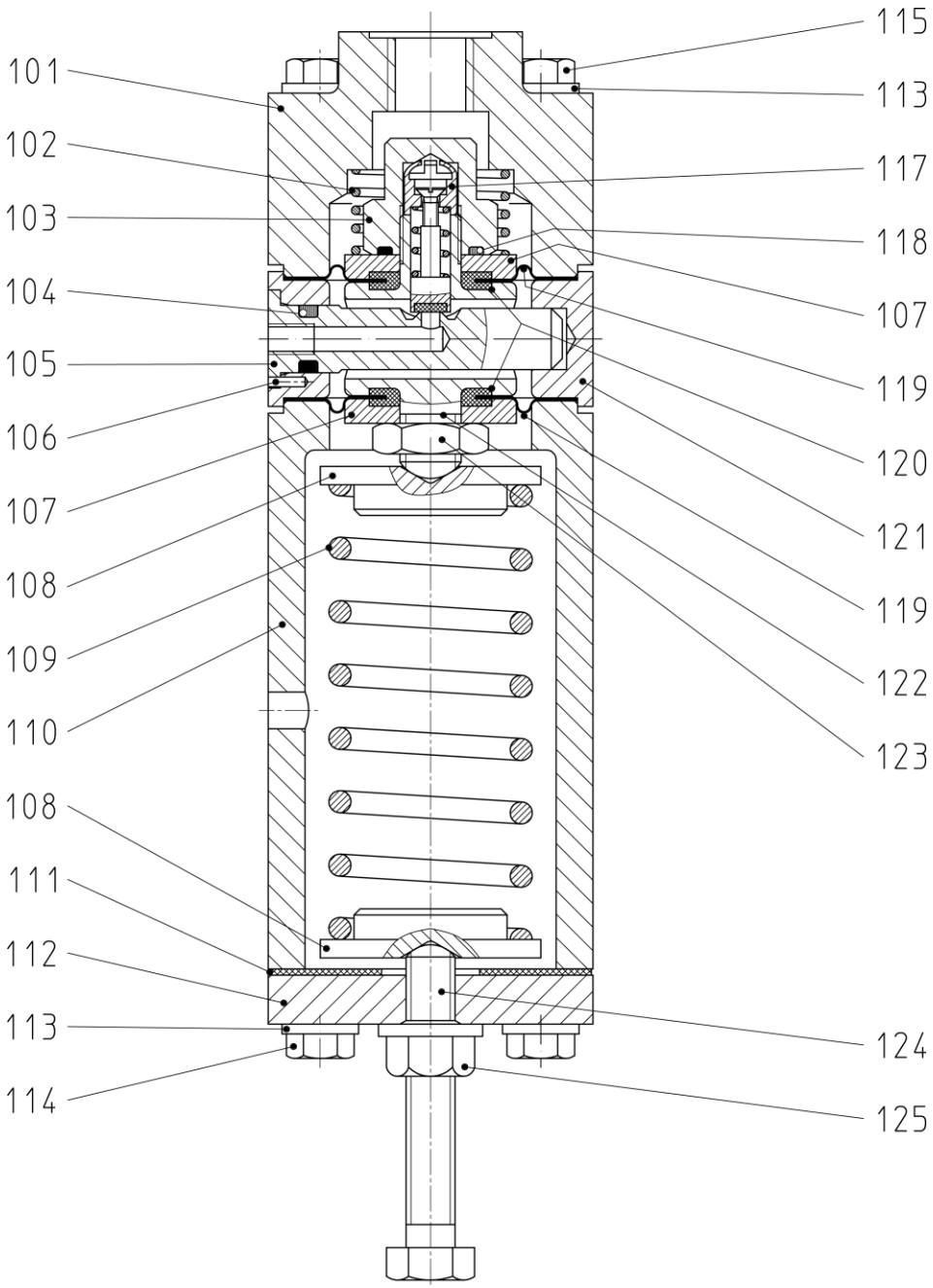
No.	Name	Part no.
104	O-ring	20 225
105	Valve insert	10 000 061
117	Piston, pre-assembled	10 000 186
118	O-ring	20 332
119	Convoluted diaphragm	10 000 191 (2 units)
120	Snap-on gasket	10 000 066 (2 units)
126	O-ring	20 293
130	Plate, pre-assembled	10 010 480
133	O-ring	20 226

Servicing parts for load limiting stage

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

10.5 Spare parts for control stage

Spare parts drawing for control stage with diaphragm assembly



Maintenance parts for control stage with diaphragm assembly

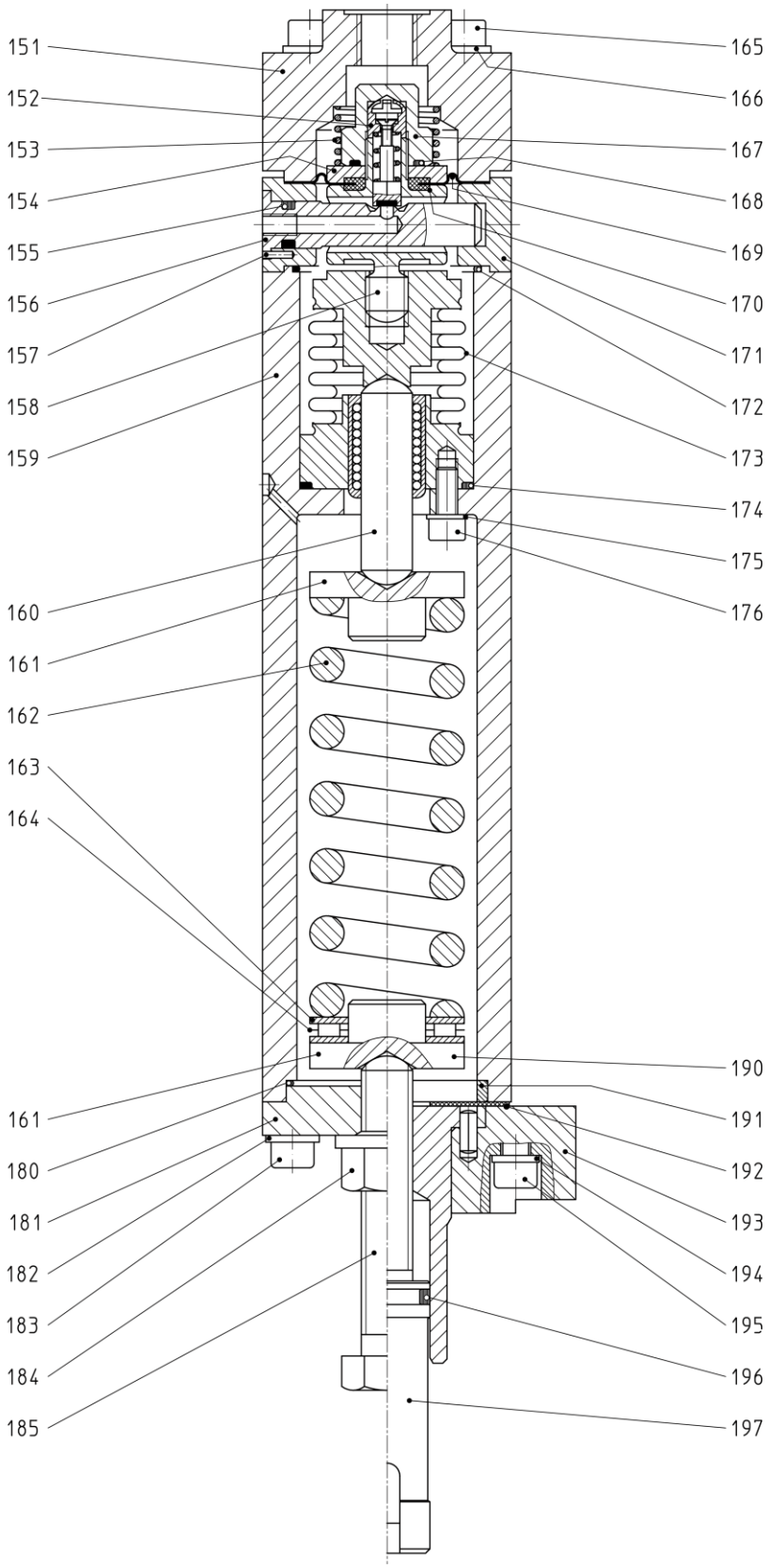
No.	Name	Part no.
104	O-ring	20 225
105	Valve insert	10 000 061
111	Gasket	10 000 100
117	Piston, pre-assembled	10 000 186
118	O-ring	20 332
119	Convoluted diaphragm	10 000 191 (2 units)
120	Snap-on gasket	10 000 066 (2 units)
125	Hex flange nut	13 136

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.



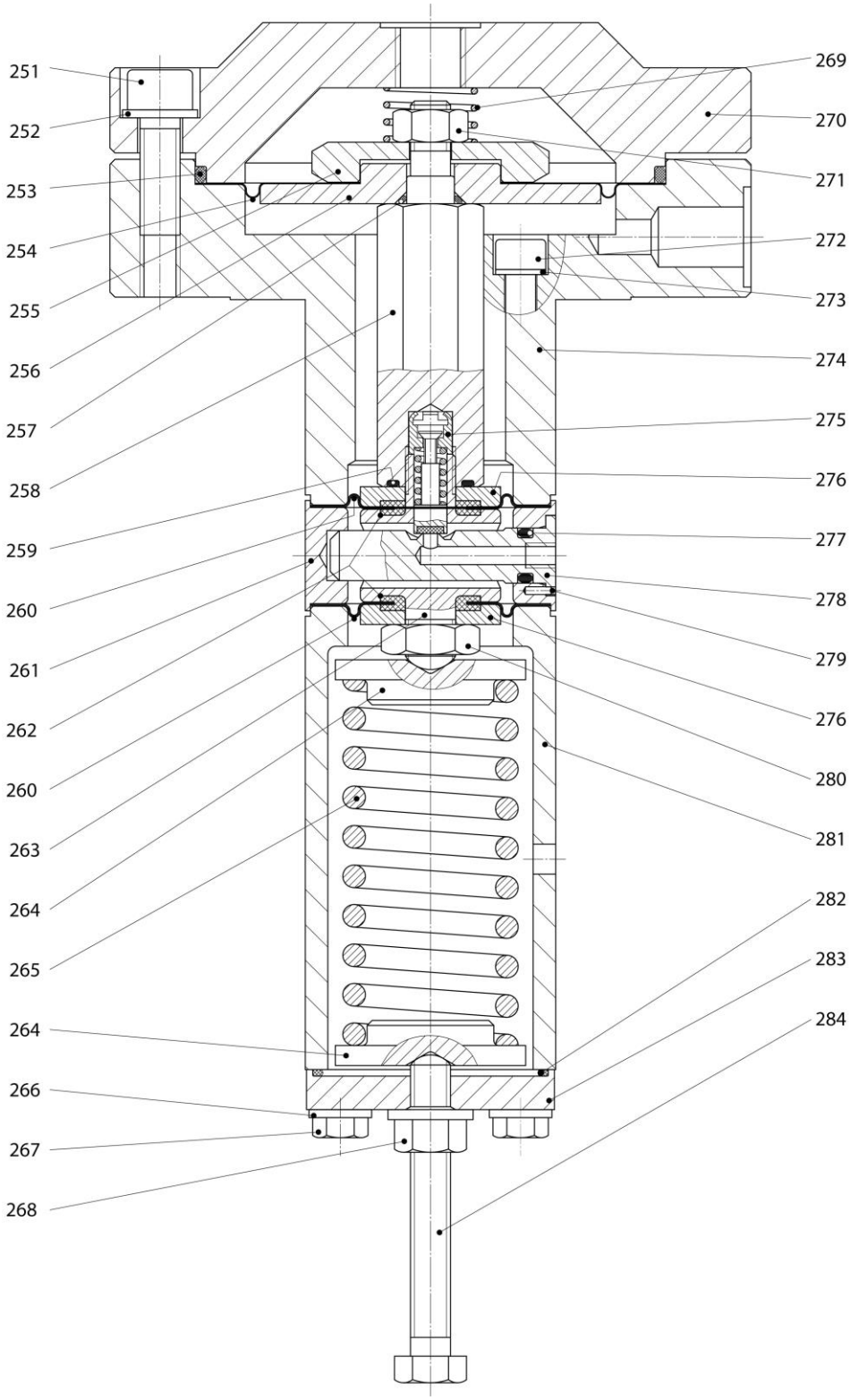
Maintenance parts for control stage with metal bellows assembly

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

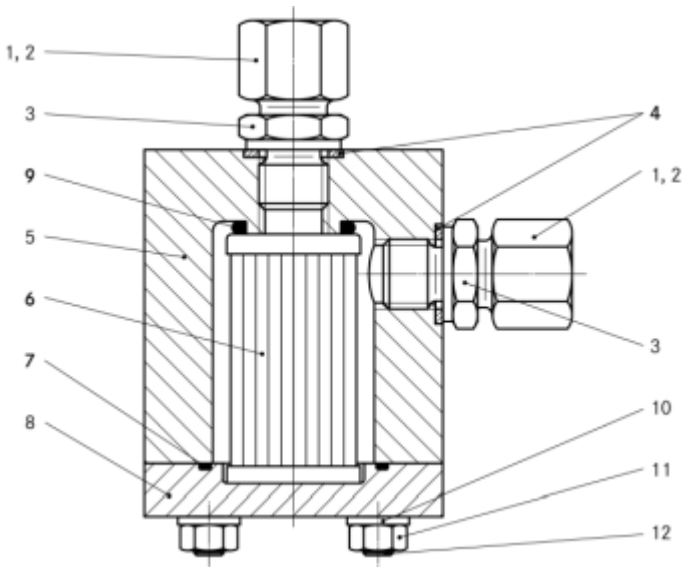
No.	Name	Part no.
253	O-ring	20 518
254	Diaphragm	10 008 547
257	O-ring	20 595
259	O-ring	20 332
260	Convoluted diaphragm	10 000 191
262	Snap-on gasket	10 000 066
264	Spring collar	10 000 114
265	Compression spring	10 000 156
268	Hex flange nut	13 136
273	Bonded seal	20 908
275	Piston, pre-assembled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

10.6 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

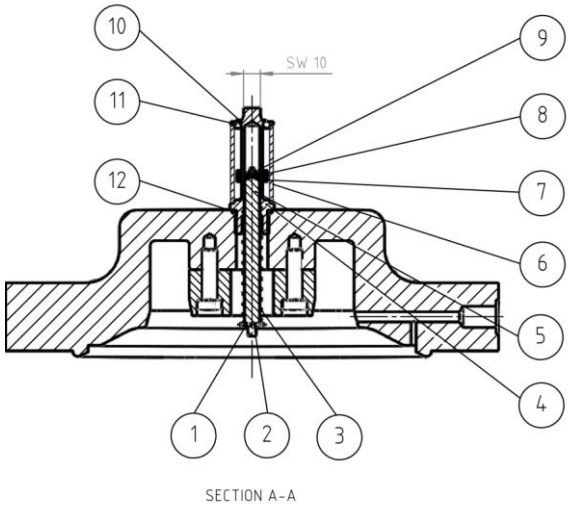
Servicing parts

No.	Name	Part no.
6	Filter insert	26 183

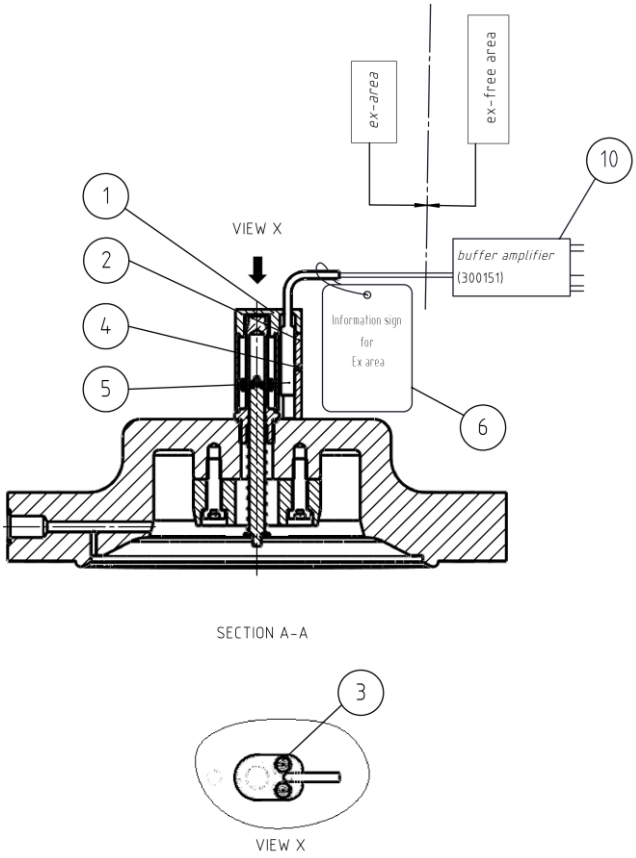
10.7 Spare parts for travel indication option

Spare part drawings

Optical travel indicator



Optical travel indicator with remote control



Maintenance and servicing parts

No.	Qty	Name	NBR Part no.	FKM Part no.
12	1	O-Ring	100448-RMK	20823

10.8 Lubricants, threadlockers, and special tools

Lubricants

Important! All parts must be slightly greased.

Use the following **lubricants for the pilot**:

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

Use the following lubricants **for the actuator assembly**:

Components	Remark	Lubricant	Part no.
O-rings		Silicone grease	27 052
Diaphragm grip body	Grease the diaphragm grip body on all sides		
All fastening screws		Assembly lubricant	27 091
All fittings			

Threadlocker

Important! All parts must be coated slightly.

Use the following **threadlocker for the pilot**:

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

Special tools

You will need the following special tools for maintenance purposes:

Application	Special tools	Part no.
Maintaining the pilot (see page 53)	Assembly aid	19 083 319

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