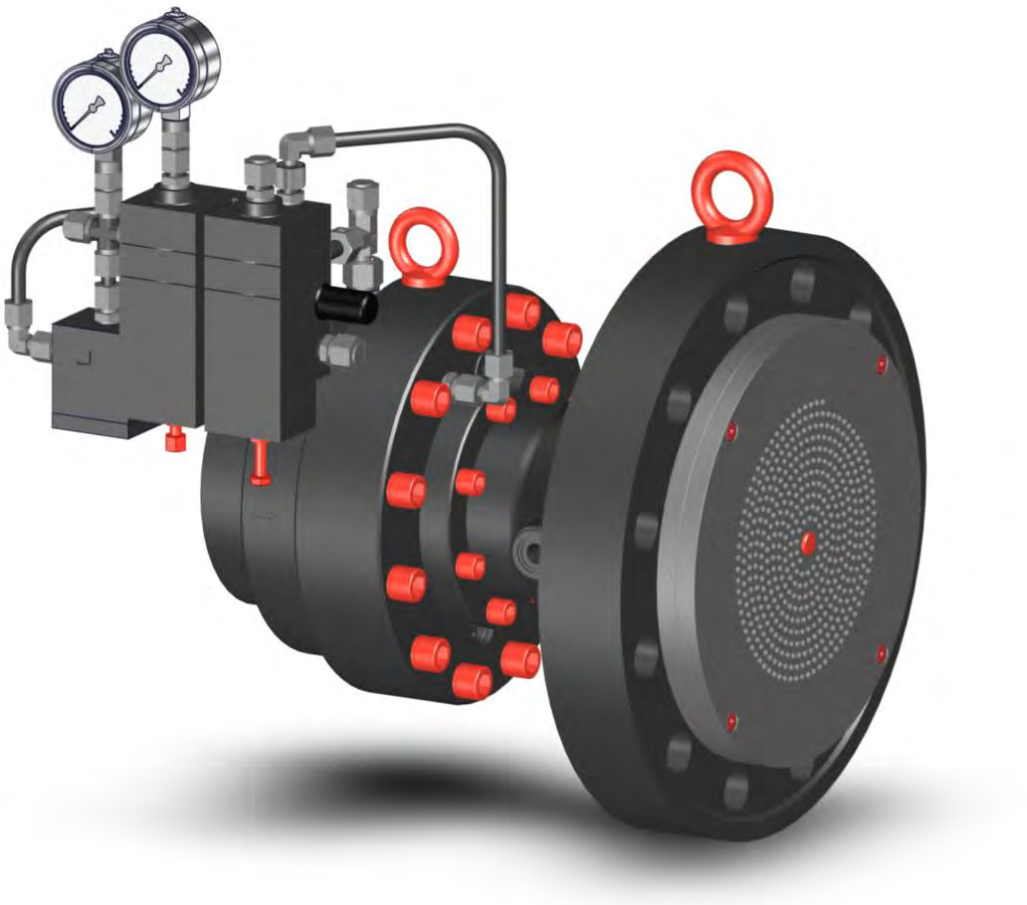
Honeywell | Connected Industrial



HON 512
gas pressure regulator with HON 650 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 gas pressure regulators consisting of an HON 512 actuator assembly combined with an HON 650 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
- Troubleshooting
- Converting
- Maintenance
- Putting the valve back into operation
- Decommissioning, disassembly, 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

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
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

Gas pressure regulators consisting of an HON 512 actuator assembly combined with an HON 650 pilot can be used to maintain the outlet pressure constant within set limits within a gas regulating line regardless of gas discharge changes and inlet pressure changes. These gas pressure regulators work on a purely pneumatic basis. Typical applications include gas regulating lines in transfer stations, transmission networks, power stations, and industrial facilities. Due to their control dynamics, the gas pressure regulators are used especially for gas turbine circuits. The gas pressure regulators are suitable for use with natural gas or dry, non-aggressive industrial gases.

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

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

Limitations of use

Please observe the following limitations of use:

- Do not use the device for any media other than those mentioned in the intended use or those discussed with and approved by the manufacturer.
- Do not use the device in any installation position other than the one documented in this 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 512 regulator unit combined with an HON 650 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 650 pilot models

The HON 650 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 650 pilot version features two stages, i.e., it includes both a load limiting stage and a control stage.

The manufacturer uses designation HON 650-1 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 650 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 650 pilot always features a diaphragm assembly regardless of the control stage's setpoint range (W_d).

HON 512 actuator assembly models

The HON 512 actuator assembly is available in three different designs:

- Two of the designs are different from each other in terms of their nominal inlet size, and can either include or omit a noise-reducing outlet body.
- The third design is different from the other two in terms of its pressure rating and is only available without a noise-reducing outlet body. This design is available for all nominal inlet sizes.

Design 1		**Design 2**		**Design 3**
Nominal inlet sizes DN 25 to DN 100		Nominal inlet sizes DN 150 to DN 250		Nominal inlet sizes DN 25 to DN 250
Inlet body without flange facing		Inlet body with flange facing		Inlet body with and without flange facing
Two-piece outlet body		One-piece outlet body		One-piece outlet body
Pressure ratings PN 25, PN 40, ANSI Class 300, ANSI Class 600		Pressure ratings PN25, PN 40, ANSI Class 300, ANSI Class 600		Pressure ratings PN 16, ANSI Class 150
Without integrated noise reduction	With integrated noise reduction	Without integrated noise reduction	With integrated noise reduction	Without integrated noise reduction
Nominal outlet size = Nominal inlet size	Nominal outlet size > Nominal inlet size	Nominal outlet size = Nominal inlet size	Nominal outlet size > Nominal inlet size	Nominal outlet size = Nominal inlet size

Versions and designs in this user manual

The *technical specifications* (see page 22), as well as the spare parts lists and spare parts drawings in the *appendix* (see page 152), 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 go over the version with the two-stage pilot featuring a control stage with a diaphragm assembly and the actuator assembly with design 1, featuring a two-piece outlet body and an integrated noise reduction element, in detail. 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.

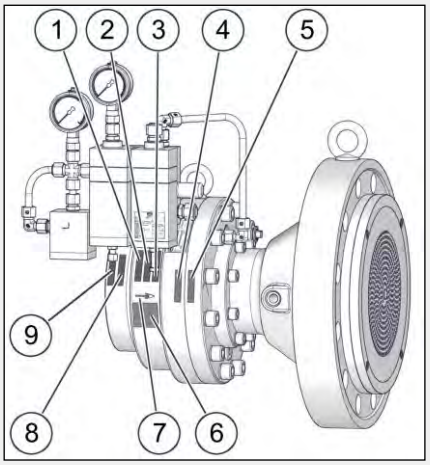
Labels, as well as inscriptions and stamping on the device, can eventually become soiled or otherwise unrecognizable to such an extent that users will not be warned effectively of hazards and may be unable to follow required operating instructions. This will pose a risk of injury.

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

⇨ Immediately replace damaged and missing labels.

Gas pressure regulator labels and markings

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

Figure	No.	Meaning
	**1**	Body part number
	2	Body material
	3	Material grade
	4	Body pressure testing specifications
	5	Body pressure testing specifications
	6	▪ Manufacturer's logo ▪ Batch number ▪ Foundry marking ▪ Radiographic film number
	7	Arrow indicating the direction of flow
	8	Manufacturer plant number
	9	Flange type

Labels on connection lines

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

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 13)

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.

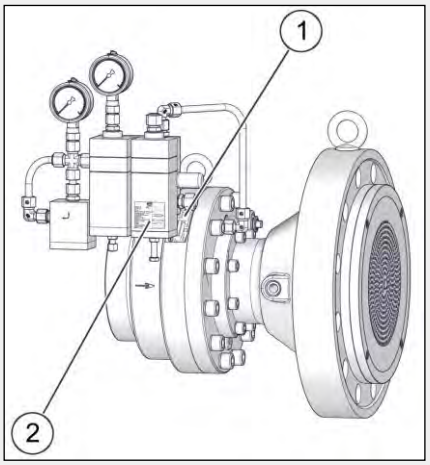
Verifying the technical specifications

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

Technical specifications (see page 22)

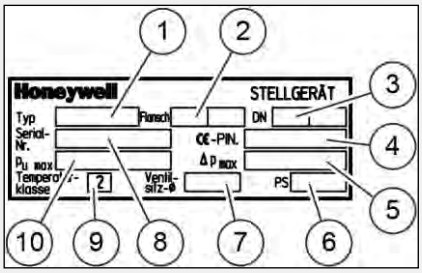
Locating the gas pressure regulator's nameplates

The nameplates can be found in the locations shown below:

Figure	No.	Description
	**1**	Actuator assembly nameplate
	2	Pilot nameplate

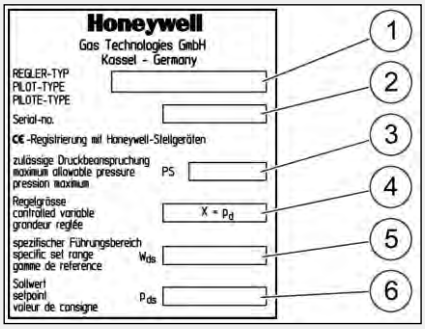
Interpreting the type plate of the actuator assembly

The details on the type plate have the following meaning:

Figure	No.	Meaning
	**1**	Name of the device
	2	Pressure rating / Flange standard
	3	Inlet/outlet nominal size
	4	CE specifications
	5	Differential pressure (max.)
	6	Max. permissible pressure
	7	Valve seat diameter
	8	Serial number
	9	Temperature class
	10	Inlet pressure (max.)

Interpreting the type plate of the pilot

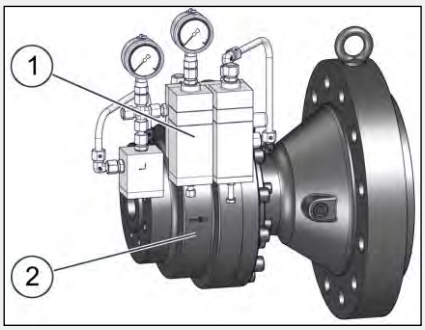
The details on the type plate have the following meaning:

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

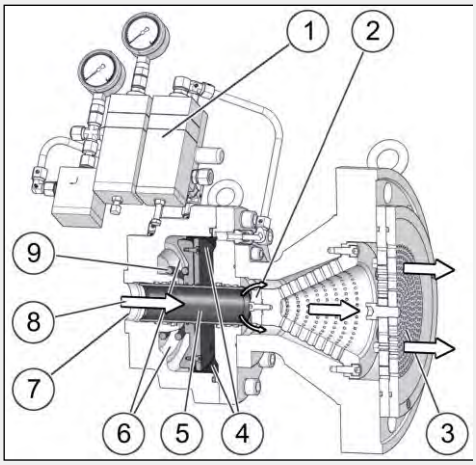
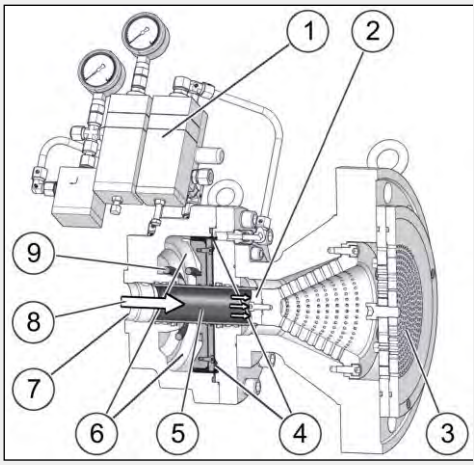
Figure

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

Figure	No.	Description
	**1**	HON 650 pilot ▪ Optionally single-stage or two-stage (with or without load limiting stage)
	2	HON 512 actuator assembly ▪ For nominal inlet sizes of DN 25 to DN 100: ▪ 3-piece body with / without expander for pressure ratings PN 25, PN 40, ANSI Class 300, ANSI Class 600 ▪ 2-piece body without expander for pressure ratings PN 16, ANSI Class 150 ▪ For nominal inlet sizes of DN 150 to DN 300: ▪ 2-piece body without expander for all pressure ratings ▪ 2-piece body with expander for pressure ratings PN 25, PN 40, ANSI Class 300, ANSI Class 600 ▪ Noise-reducing outlet duct in all devices with an expander

How it works

Gas pressure regulators consisting of an HON 512 actuator assembly combined with an HON 650 pilot can be used to maintain the outlet pressure constant within set limits within a gas regulating line regardless of gas discharge changes and inlet pressure changes. Connection lines are used to connect the pilot both to the actuator assembly's inlet pressure and to the outlet pressure downstream of the actuator assembly within the gas regulating line. The actuator assembly's degree of opening is used to control the outlet pressure at the actuator assembly. When closed, the gas will be prevented from flowing through the actuator assembly and, accordingly, within the gas regulating line. The gas pressure regulator works on a purely pneumatic basis and does not require any external energy.

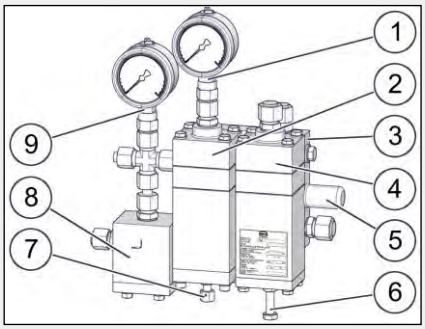
Gas pressure regulator open	Gas pressure regulator closed
	
▪ The pilot's control stage (1) is used to build up a motorization pressure in the body chamber (4) behind the diaphragm unit (shown in gray). The force of this pressure acts on the diaphragm unit. ▪ In the body chamber (6) upstream of the diaphragm unit, the force of the outlet pressure and the force of the installed compression spring(s) (9) act on the diaphragm unit. ▪ If the force of the motorization pressure is greater than the forces opposing it, the diaphragm unit will be axially displaced towards the gas inlet side (7), i.e., against the gas' direction of flow (8). ▪ As a result of this axial displacement, the diaphragm unit's gas-conveying sleeve (5) will unblock the gas flow at the valve disc (2). ▪ The actuator assembly's degree of opening will be dynamically regulated as a result of the changing motorization pressure on one side of the diaphragm unit and the changing outlet pressure on the other side of the diaphragm unit. This keeps the outlet pressure on the gas outlet side (3) constant within specific limits. ▪ The limits within which the outlet pressure must remain are set with the pilot.	▪ If the gas regulating line has a zero flow or bubble-tight sealing downstream of the gas pressure regulator, the outlet pressure will rise all the way to the set upper limit, which is referred to as the "reseat pressure." ▪ When this reseat pressure is reached, the pilot's control stage (1), which builds up the motorization pressure at the diaphragm unit, will be completely closed. ▪ The motorization pressure in the body chamber (4) downstream of the diaphragm unit will be relieved. ▪ In the body chamber (6) upstream of the diaphragm unit, the force of the outlet pressure and the force of the compression spring(s) (9) will now act alone and on one side on the diaphragm unit. ▪ The diaphragm unit will be axially displaced towards the gas outlet side (3) until the gas-conveying sleeve (5) is pushed onto the valve disc (2) and no further axial movement in this direction is possible. ▪ As a result, the gas pressure regulator will be closed. The gas flow (8) will continue to be suppressed until gas is discharged again and the outlet pressure drops as a result, opening the control stage (1) first and then the actuator assembly as a result.

The visual position indicator and the optional electrical displacement transducer can be used to read the device's degree of opening.

2.6 Assemblies and their function

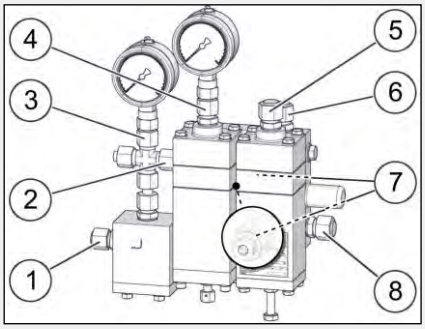
Pilot components

The HON 650 pilot features the following components:

Figure	No.	Description
	**1**	Loading pressure gauge (not part of single-stage pilot version)
	2	Load limiting stage (not part of single-stage pilot version)
	3	Base plate
	4	Control stage
	5	Amplifying valve
	6	Control stage spring adjuster
	7	Load limiting stage spring adjuster (not part of single-stage pilot version)
	8	HON 905 fine mesh filter
	9	Inlet pressure gauge

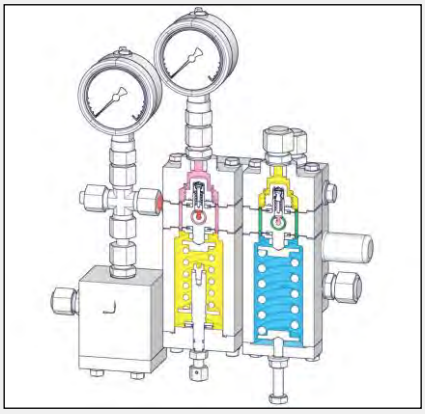
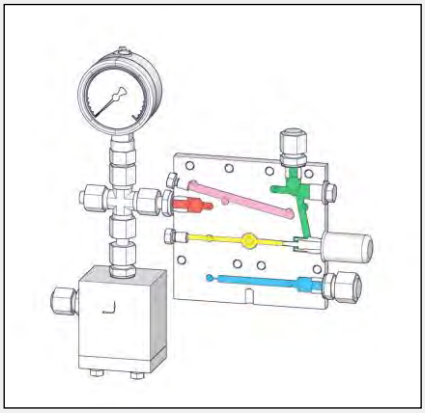
Pilot connection lines

The HON 650 pilot features the following connections:

Figure	No.	Meaning
	**1**	Port for inlet pressure line
	2	Inlet pressure fitting
	3	Inlet pressure gauge fitting
	4	Loading pressure gauge fitting (not part of single-stage pilot version)
	5	Port for outlet pressure sensing line
	6	Port for motorization line
	7	Outlet pressure bleed line / return line fitting (back of base plate)
	8	Vent line connection

Pilot pressure sections

The HON 650 pilot is subdivided into the following pressure sections:

Figure	Color	Meaning
Load limiting stage and control stage: 		Inlet pressure
		Motorization pressure
		Loading pressure (not part of single-stage pilot version)
		Outlet pressure
		Atmospheric pressure
Base plate: 		

How the pilot works

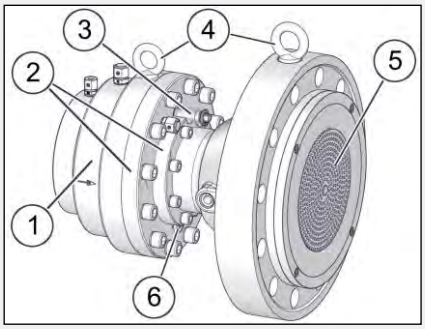
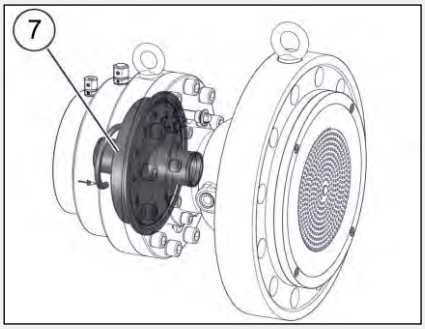
- The gas pressure being regulated is conveyed into the upper segment of the control stage and produces a force component that acts on the double diaphragm system in the control stage's center segment from above.
- The control stage's spring adjuster is used to tighten the pilot spring, producing a force component that acts on the control stage's double diaphragm system in the control stage's center segment from below.
- The force components being exerted on the control stage's double diaphragm system are used by the system in order to compare the setpoint and the process value. Depending on the gas pressure and on the set setpoint, the position of the double diaphragm system position inside the control stage will vary slightly. This position change will result in a small/large gap between the stationary nozzle and the deflector plate being cleared inside the double diaphragm system. At the nozzle, there will be gas with the loading pressure generated in the load limiting stage (in the case of the two-stage pilot version) or with the inlet pressure (in the case of the single-stage pilot version). The dynamically regulated gap between the nozzle and the deflector plate is used to build up the motorization pressure inside the control stage's double diaphragm system.
- The motorization pressure generated inside the control stage is delivered to the actuator assembly via a connection line.
- The optional load limiting stage works in a manner similar to the control stage. The loading pressure built up in this case is generated with the inlet pressure's auxiliary energy.

- The pilot's amplifying valve is used to set the speed of the motorization pressure changes.

- The pilot's two-stage version guarantees a high level of accuracy.
- In order to provide protection from soiling, a HON 905 fine mesh filter is installed upstream of the pilot's gas inlet.

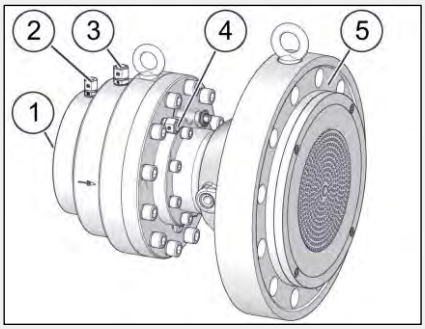
Actuator assembly configuration

The HON 512 actuator assembly features the following components:

Figure	No.	Description
	**1**	Inlet body
	2	Outlet body (two-piece in this case)
	3	Visual position indicator for opening state
	4	Slinging point, eye bolt
	5	Gas outlet expansion consisting of noise reducing outlet duct (optional)
	6	Electrical displacement transducer (optional), opening state monitoring
	**7**	Diaphragm unit (inside)

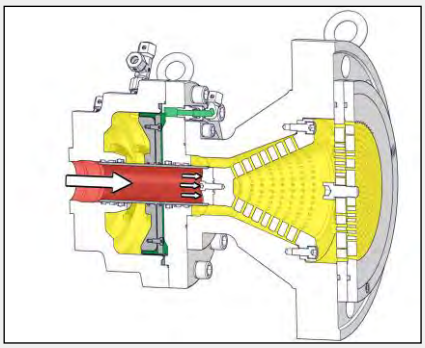
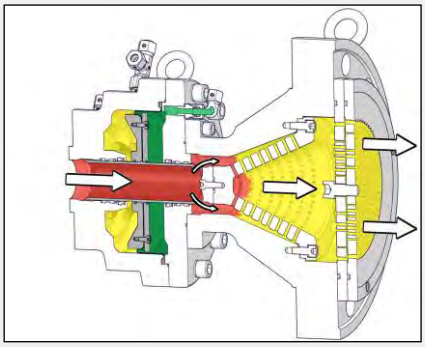
Actuator assembly connection lines

The HON 512 actuator assembly features the following connections:

Figure	No.	Meaning
	**1**	Gas regulating line gas inlet fitting
	2	Port for inlet pressure line
	3	Outlet pressure bleed line / return line fitting
	4	Port for motorization line
	5	Gas regulating line gas outlet fitting

Actuator assembly pressure sections

The HON 512 actuator assembly is subdivided into the following pressure sections:

Figure	Color	Meaning
Closed state: 		Inlet pressure
		Motorization pressure
		Outlet pressure
Open state: 		

How the actuator assembly works

- The diaphragm unit inside the actuator assembly subdivides the inside of the body into two chambers that are separated from each other in a gas-tight manner and into the gas flow path.
- The diaphragm unit inside the actuator assembly can be moved axially.
  When this unit is moved to its right-hand end position (in the gas' direction of flow), the sleeve that conveys gas will slide onto the valve disc. Accordingly, the actuator assembly will be closed and the flow of gas will be suppressed.
  In the left-hand end position, there will be the biggest possible gap between the sleeve and the valve disc. In this state, the actuator assembly will be completely open and the flow of gas will be at its maximum level.
- The actuator assembly's degree of opening dynamically regulates the gas pressure.
- The actuator assembly's degree of opening will depend on the position of the diaphragm unit.

- The position of the diaphragm unit, in turn, will depend on the pressure conditions inside the body chambers upstream and downstream of the diaphragm unit.
  In the body chamber downstream of the diaphragm unit, a motorization pressure is built up with the pilot, with this pressure acting as a force component on the diaphragm unit
  In the body chamber upstream of the diaphragm unit, the force of the compression spring(s) and the force of the gas pressure there both act on the diaphragm unit.
  In order for the actuator assembly to be opened or kept open, the force exerted by the motorization pressure must be greater than the forces opposing it.
- The visual position indicator and the optional electrical displacement transducer can be used to read the device's degree of opening.

2.7 Technical specifications

Characteristic device values

Description	Value
Max. inlet pressure p_{umax}	100 bar (1450 psi)
Look-up pressure class	SZ 2.5
Min. pressure drop $\triangle p$	1.5 bar
Temperature range	▪ -20 to +60 °C (-4 to +140 °F) ▪ Upon request: -40 °C to +60 °C (-40 °F to +140 °F)

Materials

Component	Material
Actuator assembly - body	Cast steel, steel
Actuator assembly - internal parts	Steel, aluminum, brass
Pilot	Aluminum alloy, steel
Actuator assembly and pilot: Diaphragms	▪ NBR ▪ Upon request: FKM / FPM
Actuator assembly and pilot: Gaskets	▪ NBR ▪ Upon request: FKM / FPM

Valve flow coefficient

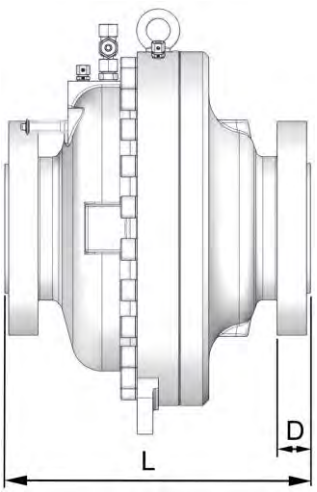
The K_G values apply to natural gas with a density of $\rho_n = 0.83$ kg/m³.

Nominal size DN		
Inlet	Outlet	K_G coefficient [m³/h]
25	25	550
	100	490
	150	490
50	50	2200
	150	1920
	200	1980
80	80	5610
	250	5060
100	100	8800
	300	7810

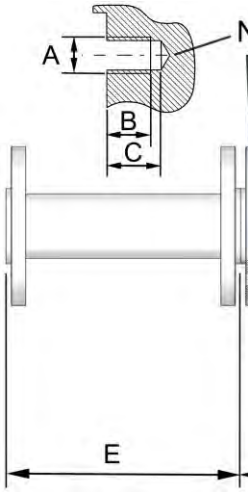
Nominal size DN		
Inlet	Outlet	K_G coefficient [m³/h]
150	150	19800
	300	14630
	400	16830
200	200	37400
	400	25850
	500	30800
250*	250	41800
	400	25850
	500	30800
250	250	55000
	500	39600
	600	46750

*with reduced valve seat diameter of 200 mm

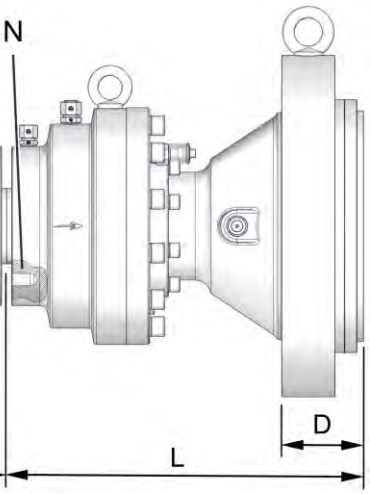
Actuator assembly dimensions and weights



Schematic diagram: Actuator assembly with flange facing, without expander



Adapter



Schematic diagram: Actuator assembly without flange facing, with expander

The following tables, which are subdivided by pressure rating, apply to nominal inlet sizes DN 25 - 100:

Nominal size DN		PN 16 / ANSI 150 RF					
Inlet	Outlet	L mm (in)	A	B mm (in)	C mm (in)	N Qty.	Weight kg (lbs)
25	25	200 (7.9)	M12	16 (0.6)	21 (0.8)	4	28 (61.7)
50	50	270 (10.6)	M16	20 (0.8)	25 (1)	8	61 (134.5)
80	80	310 (12.2)	M16	20 (0.8)	25 (1)	8	63 (138.9)
100	100	370 (14.6)	M16	26 (1.0)	32 (1.3)	12	Approx. 120 (264.6)

Nominal size DN		PN 25 / PN 40							
Inlet	Outlet	D mm (in)	E mm (in)	L mm (in)	A	B mm (in)	C mm (in)	N Qty.	Weight kg (lbs)
25	25	-	-	200 (7.9)	M12	16 (0.6)	21 (0.8)	4	35 (77.2)
	100	75 (3.0)	180 (7.1)	360 (14.2)	M12	16 (0.6)	21 (0.8)	4	80 (176.4)
	150	84 (3.3)	180 (7.1)	360 (14.2)	M12	16 (0.6)	21 (0.8)	4	90 (198.4)
50	50	-	-	270 (10.6)	M16	20 (0.8)	25 (1.0)	4	70 (154.3)
	150	84 (3.3)	220 (8.7)	422 (16.6)	M16	20 (0.8)	25 (1.0)	4	130 (286.6)
	200	92 (3.6)	220 (8.7)	422 (16.6)	M16	20 (0.8)	25 (1.0)	4	150 (330.7)

Nominal size DN				PN 25 / PN 40					
Inlet	Outlet	D	E	L	A	B	C	N	Weight
		mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	Qty.	kg (lbs)
80	80	-	-	310 (12.2)	M16	20 (0.8)	25 (1.0)	8	120 (264.6)
	250	100 (3.9)	260 (10.2)	512 (20.2)	M16	20 (0.8)	25 (1.0)	8	300 (661.4)
100	100	-	-	370 (14.6)	M20	26 (1.0)	32 (1.3)	8	180 (396.8)
	300	103 (4.1)	300 (11.8)	548 (21.6)	M20	26 (1.0)	32 (1.3)	8	425 (937.0)

Nominal size DN				ANSI 300 RF					
Inlet	Outlet	D	E	L	A	B	C	N	Weight
		mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	Qty.	kg (lbs)
25	25	-	-	197 (7.8)	M16	20 (0.8)	25 (1.0)	4	35 (77.2)
	100	75 (3.0)	180 (7.1)	359 (14.1)	M16	20 (0.8)	25 (1.0)	4	80 (176.4)
	150	84 (3.3)	180 (7.1)	359 (14.1)	M16	20 (0.8)	25 (1.0)	4	90 (198.4)
50	50	-	-	267 (10.5)	M16	20 (0.8)	25 (1.0)	8	70 (154.3)
	150	84 (3.3)	220 (8.7)	421 (16.6)	M16	20 (0.8)	25 (1.0)	8	130 (286.6)
	200	92 (3.6)	220 (8.7)	421 (16.6)	M16	20 (0.8)	25 (1.0)	8	150 (330.7)
80	80	-	-	318 (12.5)	M20	26 (1.0)	32 (1.3)	8	120 (264.6)
	250	100 (3.9)	260 (10.2)	516 (20.3)	M20	26 (1.0)	32 (1.3)	8	300 (661.4)
100	100	-	-	368 (14.5)	M20	26 (1.0)	32 (1.3)	8	180 (396.8)
	300	103 (4.1)	300 (11.8)	548 (21.6)	M20	26 (1.0)	32 (1.3)	8	425 (937.0)

Nominal size DN				ANSI 300 RTJ					
Inlet	Outlet	D	E	L	A	B	C	N	Weight
		mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	Qty.	kg (lbs)
25	25	-	-	210 (8.3)	M16	20 (0.8)	25 (1.0)	4	35 (77.2)
	100	75 (3.0)	180 (7.1)	365 (14.4)	M16	20 (0.8)	25 (1.0)	4	80 (176.4)
	150	84 (3.3)	180 (7.1)	365 (14.4)	M16	20 (0.8)	25 (1.0)	4	90 (198.4)

Nominal size DN				ANSI 300 RTJ					
Inlet	Outlet	D	E	L	A	B	C	N	Weight
		mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	Qty.	kg (lbs)
50	50	-	-	283 (11.1)	M16	20 (0.8)	25 (1.0)	8	70 (154.3)
	150	84 (3.3)	220 (8.7)	429 (16.9)	M16	20 (0.8)	25 (1.0)	8	130 (286.6)
	200	92 (3.6)	220 (8.7)	429 (16.9)	M16	20 (0.8)	25 (1.0)	8	150 (330.7)
80	80	-	-	333 (13.11)	M20	26 (1.0)	32 (1.3)	8	120 (264.6)
	250	100 (3.9)	260 (10.2)	523 (20.6)	M20	26 (1.0)	32 (1.3)	8	300 (661.4)
100	100	-	-	384 (15.1)	M20	26 (1.0)	32 (1.3)	8	180 (396.8)
	300	103 (4.1)	300 (11.8)	555 (21.9)	M20	26 (1.0)	32 (1.3)	8	425 (937.0)

Nominal size DN				ANSI 600 RF/RTJ					
Inlet	Outlet	D	E	L	A	B	C	N	Weight
		mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	Qty.	kg (lbs)
25	25	-	-	210 (8.3)	M16	20 (0.8)	25 (1.0)	4	35 (77.2)
	100	75 (3.0)	180 (7.1)	365 (14.4)	M16	20 (0.8)	25 (1.0)	4	80 (176.4)
	150	84 (3.3)	180 (7.1)	365 (14.4)	M16	20 (0.8)	25 (1.0)	4	90 (198.4)
50	50	-	-	286 (11.3)	M16	20 (0.8)	25 (1.0)	8	70 (154.3)
	150	84 (3.3)	220 (8.7)	430 (16.9)	M16	20 (0.8)	25 (1.0)	8	130 (286.6)
	200	92 (3.6)	220 (8.7)	430 (16.9)	M16	20 (0.8)	25 (1.0)	8	150 (330.7)
80	80	-	-	337 (13.3)	M20	26 (1.0)	32 (1.3)	8	120 (264.6)
	250	100 (3.9)	260 (10.2)	525 (20.7)	M20	26 (1.0)	32 (1.3)	8	300 (661.4)
100	100	-	-	394 (15.5)	M24	31 (1.2)	38 (1.5)	8	180 (396.8)
	300	103 (4.1)	300 (11.8)	560 (22.0)	M24	31 (1.0)	38 (1.5)	8	425 (937.0)

The following tables apply to nominal inlet sizes DN 150 - 250 based on the relevant pressure rating:

Nominal size DN		PN 16 / ANSI 150 RF	
Inlet	Outlet	L	Weight
		mm (in)	kg (lbs)
150	150	450 (17.7)	266 (586.4)
200	200	607 (23.9)	520 (1146.4)
250	250	675 (26.6)	750 (1653.5)

Nominal size DN				PN 25 / PN 40		ANSI 300 RF	
Inlet	Outlet	D	E	L	Weight	L	Weight
		mm (in)	mm (in)	mm (in)	kg (lbs)	mm (in)	kg (lbs)
150	150	-	-	508 (20.0)	500 (1102)	508 (20.0)	500 (1102)
	300	103 (4.1)	350 (13.8)	550 (21.7)	580 (1279)	550 (21.7)	580 (1279)
	400	113 (4.4)	350 (13.8)	550 (21.7)	770 (1698)	550 (21.7)	770 (1698)
200	200	-	-	610 (24.0)	850 (1874)	610 (24.0)	850 (1874)
	400	113 (4.4)	380 (15.0)	650 (25.6)	1000 (2205)	650 (25.6)	1000 (2205)
	500	137 (5.4)	380 (15.0)	650 (25.6)	1100 (2425)	650 (25.6)	1100 (2425)
250*	250	-	-	630 (24.8)	980 (2161)	630 (24.8)	980 (2161)
	400	113 (4.4)	420 (16.5)	660 (26.0)	1100 (2425)	660 (26.0)	1100 (2425)
	500	137 (5.4)	420 (16.5)	660 (26.0)	1200 (2646)	660 (26.0)	1200 (2646)
250	250	-	-	752 (29.6)	Upon request	752 (29.6)	Upon request
	500	137 (5.4)	420 (16.5)	752 (29.6)	Upon request	752 (29.6)	Upon request
	600	148 (5.8)	420 (16.5)	752 (29.6)	Upon request	752 (29.6)	Upon request

*with reduced valve seat diameter of 200 mm

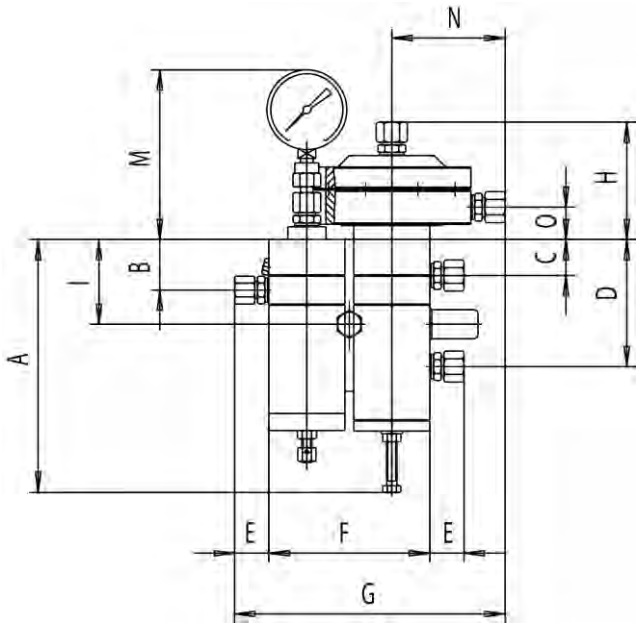
Nominal size DN				ANSI 300 RTJ		ANSI 600 RF / RTJ	
Inlet	Outlet	D	E	L	Weight	L	Weight
		mm (in)	mm (in)	mm (in)	kg (lbs)	mm (in)	kg (lbs)
150	150	-	-	508 (20.0)	500 (1102)	508 (20.0)	500 (1102)
	300	103 (4.1)	350 (13.8)	550 (21.7)	580 (1279)	550 (21.7)	580 (1279)
	400	113 (4.4)	350 (13.8)	550 (21.7)	770 (1698)	550 (21.7)	770 (1698)
200	200	-	-	610 (24.0)	850 (1874)	610 (24.0)	850 (1874)
	400	113 (4.4)	380 (15.0)	650 (25.6)	1000 (2205)	650 (25.6)	1000 (2205)
	500	137 (5.4)	380 (15.0)	650 (25.6)	1100 (2425)	650 (25.6)	1100 (2425)
250*	250	-	-	630 (24.8)	980 (2161)	630 (24.8)	980 (2161)
	400	113 (4.4)	420 (16.5)	660 (26.0)	1100 (2425)	660 (26.0)	1100 (2425)
	500	137 (5.4)	420 (16.5)	660 (26.0)	1200 (2646)	660 (26.0)	1200 (2646)
250	250	-	-	752 (29.6)	Upon request	752 (29.6)	Upon request
	500	137 (5.4)	420 (16.5)	752 (29.6)	Upon request	752 (29.6)	Upon request
	600	148 (5.8)	420 (16.5)	752 (29.6)	Upon request	752 (29.6)	Upon request

*with reduced valve seat diameter of 200 mm

Pilot dimensions and weights

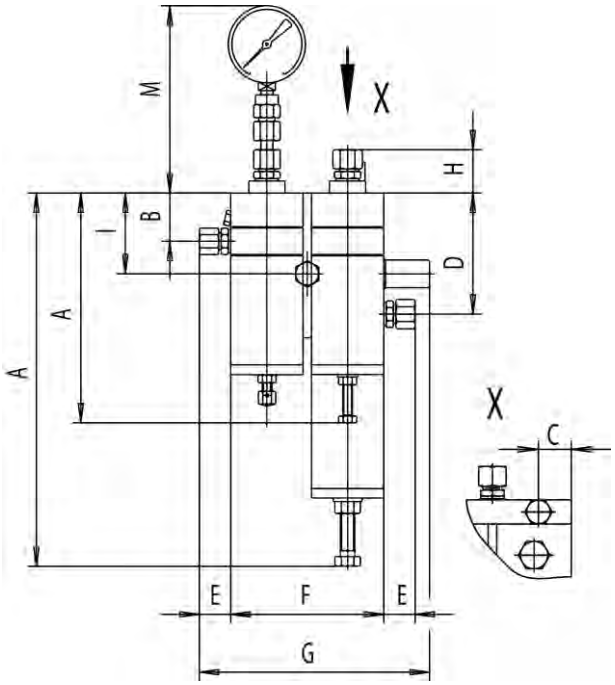
The figure below shows the dimensions for the pilot with a control stage for a setpoint range W_d = 0.3 – 1 bar:

Without pressure gauge for outlet pressure

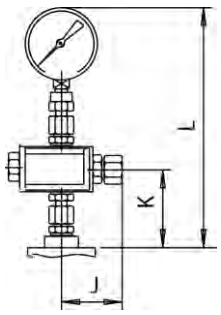


The figure below shows the dimensions for the pilot with the control stages for setpoint ranges W_d = 0.5 – 90 bar:

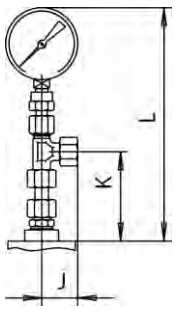
Without pressure gauge for outlet pressure



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	Approx. 6.0			195	40	29	101	26	127
0.5 – 40	Approx. 5.0			195	40	27	101	26	127
10 – 90	Approx. 6.5			315	40	27	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	215	93	67	56	88	230	132	90	24
0.5 – 40	191	36	67	56	68	209	156	-	-
10 – 90	191	36	67	32	75	202	132	-	-

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	Approx. 13.5			7.7	1.6	1.2	4.0	1.0	5.0
0.5 – 40	Approx. 11.0			7.7	1.6	1.1	4.0	1.0	5.0
10 – 90	Approx. 14.5			12.4	1.6	1.1	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	8.5	3.7	2.6	2.2	3.5	9.1	5.2	3.5	0.9
0.5 – 40	7.5	1.4	2.6	2.2	2.7	8.2	6.1	-	-
10 – 90	7.5	1.4	2.6	1.3	3.0	8.0	5.2	-	-

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

Specific set range W_{ds}	Pilot spring		
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

Connection lines

	Inlet DN nominal size						
	25	**50**	**80**	**100**	**150**	**200**	**250**
Inlet pressure line pipe	Ø10	Ø10	Ø10	Ø10	Ø10	Ø10	Ø10
Inlet pressure line thread	M14 x 1.5	M14 x 1.5	M14 x 1.5	M14 x 1.5	M14 x 1.5	M14 x 1.5	M14 x 1.5
Measuring impulse line pipe	12 x 1.5						
Measuring impulse line thread	M14 x 1.5						
Bleed/Return line pipe	12 x 1.5	12 x 1.5	16 x 2.0	16 x 2.0	16 x 2.0	16 x 2.0	16 x 2.0
Bleed/Return line thread	M16 x 1.5	M16 x 1.5	M22 x 1.5	M22 x 1.5	M22 x 1.5	M22 x 1.5	M22 x 1.5
Vent line pipe	12 x 1.5						
Vent line thread	M14 x 1.5						

Accuracy class AC and look-up pressure class SG

The following accuracy class and look-up pressure class apply to gas pressure regulators consisting of an HON 512 actuator assembly combined with an HON 650 pilot.

Setpoint range W_d [bar]	Accuracy class AC	Look-up pressure class SG
0.3 – 0.5	10	30
> 0.5 – 1	10	20
> 1 – 2.5	2.5	10
> 2.5 – 5.0	1	10
> 5.0	1	5

Gas properties

The properties of the gas conveyed through the gas pressure regulator consisting of an HON 512 actuator assembly combined with an HON 650 pilot must meet the requirements specified by the DVGW German Technical and Scientific Association for Gas and Water in the latest version of DVGW Code of Practice G 260 (A).

ATEX specifications

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

3 Safety

Contents

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.
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
Electricians	Electrical installation and removal	▪ Professional training and electrician certification in accordance with applicable country-specific and local regulations
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

Personnel	Responsibilities	Required qualification
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

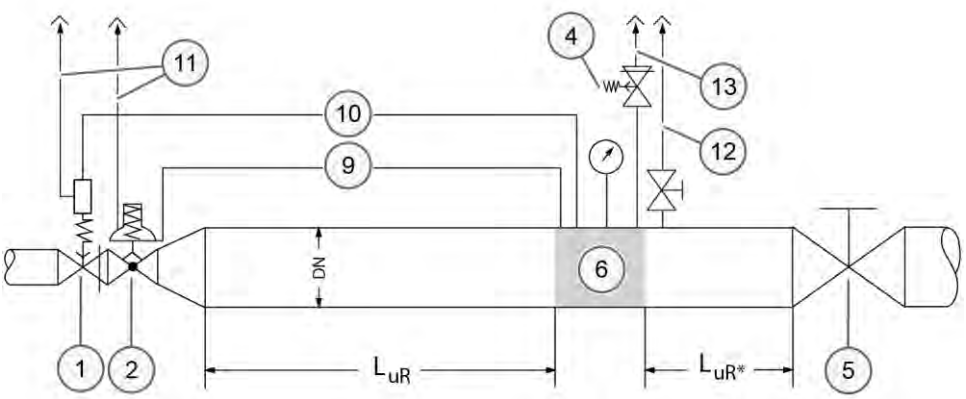
Contents

4.1 Installation examples

Gas pressure regulating line - example 1

Configuration:

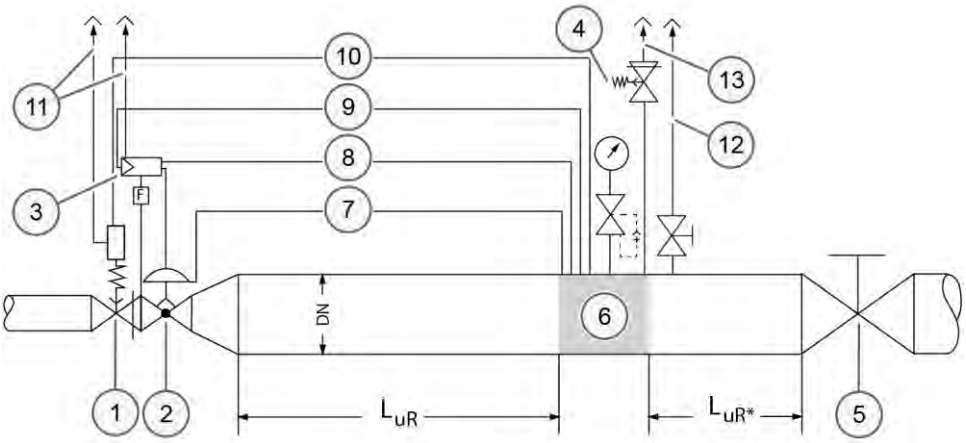
- Direct acting gas pressure regulator (non-piloted)
- With expander without noise reduction element downstream of the gas pressure regulator



Gas pressure regulating line - example 2

Configuration:

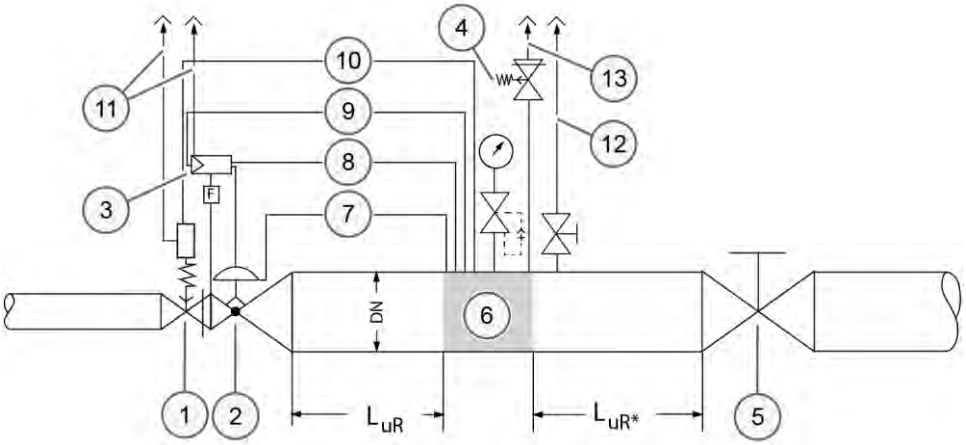
- Indirect acting gas pressure regulator (pilot-operated)
- With expander without noise reduction element downstream of the gas pressure regulator
- Outlet pressure gauge with protection against overpressure



Gas pressure regulating line - example 3

Configuration:

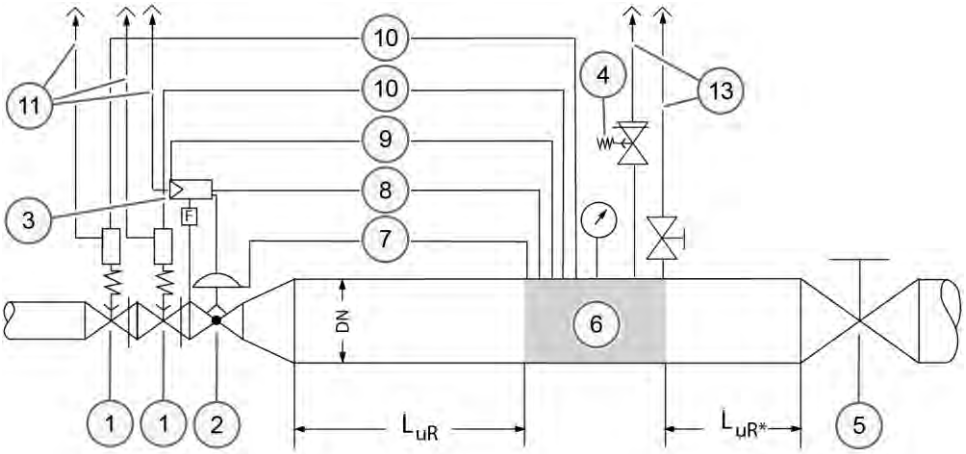
- Indirect acting gas pressure regulator (pilot-operated)
- With expander and integrated noise reduction element
- Outlet pressure gauge with protection against overpressure



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	Return line
8	Bleed line
9	Gas pressure regulator measuring impulse line
10	Slam-shut device measuring impulse 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 Meter run characteristics

Standards used as a basis

The following recommendations are based on the measuring impulse 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 impulse 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 impulse 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 impulse 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 impulse line is **L_{uR} min. 3 x DN**.
- Gas meter pressure losses must be taken into account based on system conditions if applicable.

4.3 Operating and measuring impulse 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 impulse line**
  - The measuring impulse 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 impulse 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 impulse 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 impulse 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.

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

5 Transport, installation and start-up

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.

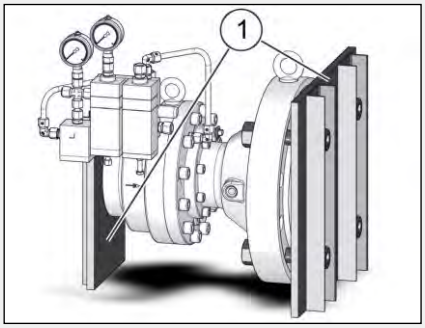
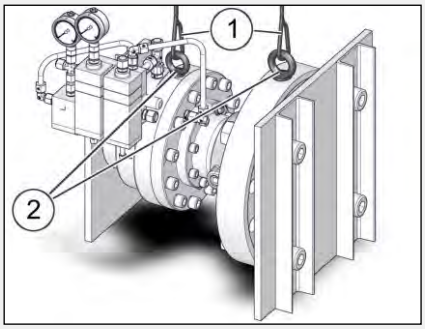
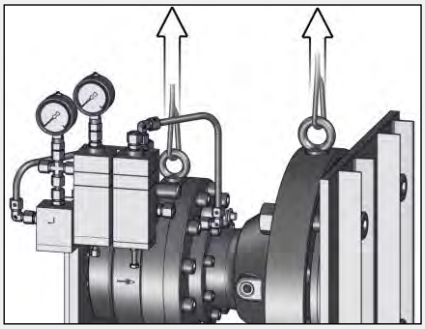
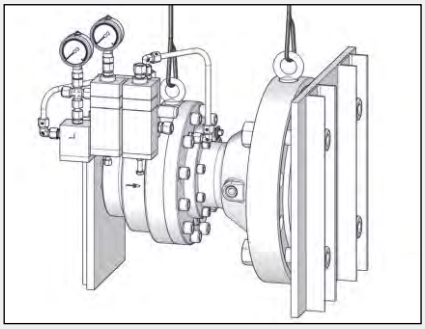
Preparing for transportation

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 gas pressure regulator

Proceed as follows:

Figure	Step	Description
	**1**	Leave the transport panels (1) on the gas pressure regulator during transport.
	**2**	Hook the slings (1) into all the eye bolts (2) intended to function as attachment points for transportation.
	**3**	Slowly and carefully lift the device.
	**4**	Slowly and carefully transport the device to the location where it will be installed.

5.2 Installing the gas pressure regulator

Insert the adapter upstream of the gas pressure regulator

For actuator assemblies with nominal inlet sizes of DN 25 to DN 100 and an expander at the gas outlet, the manufacturer recommends adding an adapter, immediately upstream of the gas pressure regulator, to the gas regulating line. If there is a device fault, or in order to check the device's state, the body segment with the expander and integrated noise reduction can remain in the regulating line in this case while the adapter and the remaining gas pressure regulator sub-assemblies are removed from the regulating line one after the other.

Preparing the materials

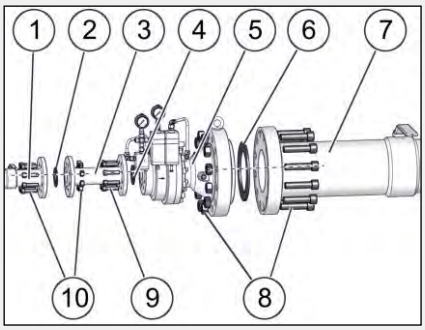
Prepare the following materials:

- Flange gaskets
  Number, design, and size as per flange connections
- Fasteners (screws, bolts, studs, washers, nuts)
  The number, size, and thread type are based on the flange design and size
- Adapter (optional)
  Length as per *Technical specifications* (see page 22), version as per gas regulating line

Assessing the situation

Assess the installation situation.

The numbers have the following meaning:

Figure	No.	Meaning
	**1**	Gas inlet side gas regulating line
	2	Gas regulating line flange gasket / adapter
	3	Adapter (optional)
	4	Adapter flange gasket / gas regulating line
	5	Gas pressure regulator
	6	Gas pressure regulator flange gasket / gas regulating line
	7	Gas outlet side gas regulating line
	8	Gas outlet side fasteners
	9	Gas inlet side fasteners
	10	Adapter fasteners

Installing the gas pressure regulator

Proceed as follows:

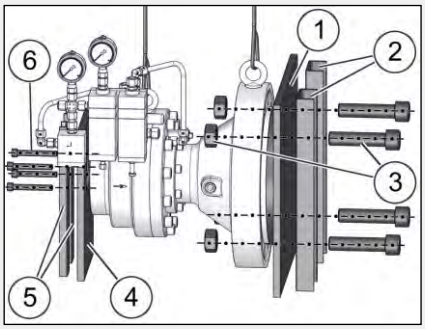
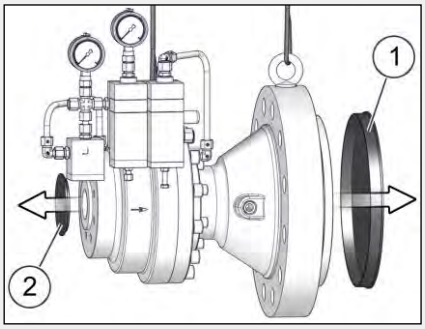
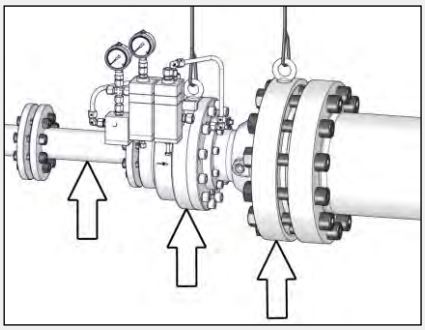
Figure	Step	Description
	**1**	Secure the gas pressure regulator's position and support the position independently of the transport panels (1, 4) and U-sections (2, 5).
	2	Remove the fittings (3, 6) and the transport panels (1, 4), including the U-sections (2, 5).

Figure	Step	Description
	**3**	Remove the flange caps (1, 2).
	**4**	Transport the device to the location where it will be installed. ▪ The device needs to be installed in the gas regulating line 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.
	5	Secure and support the position of the components you are installing in such a way that the components can be installed in the gas regulating line without any stress and that the gas regulating line's weight will be supported as well.
	6	Install the flange gaskets.
	7	Insert the screws.
	8	Tighten the screws on the flanges in a criss-cross sequence. 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 screws on the device have been checked to make sure 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:

Installing the device connections (see page 48)

5.3 Installing the device connections

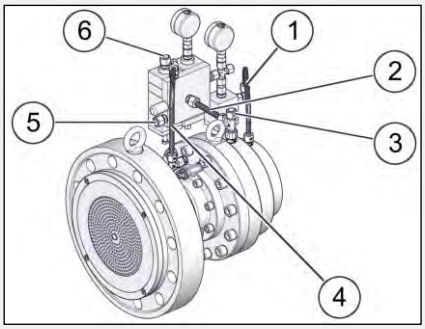
Categories of connection lines between pilot, actuator assembly, and gas regulating unit

The connection lines are categorized as follows:

- Measuring impulse lines
  The pressure of a gas is found inside measuring impulse lines. Gas does not flow through these lines.
- Operating lines
  A gas flows through operating lines. The specific operating lines are as follows:
  - Vent lines
  - Blowdown lines
  - Bleed lines
  - Return lines

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	Bleed line, operating line, pre-installed
	3	Return line, operating line, needs to be installed
	4	Motorization line, operating line, pre-installed
	5	Vent line, operating line, needs to be installed
	6	Outlet pressure measuring impulse line, Measuring impulse line, needs to be installed

Preparing the materials

Prepare the following materials:

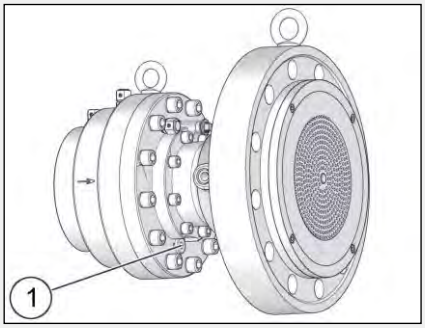
- Pipes, connecting pieces, and fittings as per the specifications in the *Technical specifications* (see page 22)
- Shut-off devices for the operating and measuring impulse lines, as well as other accessories as required.

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 36) section for more information on what needs to be ensured without fail in the corresponding design and implementation.

Install the electrical connection for the optional displacement transducer

Proceed as follows:

Figure	Step	Description
	**1**	Connect the electrical displacement transducer (optional) to position (1) on the actuator assembly as per the technical specifications in the *appendix* (see page 152) in these operating instructions.

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.
- All electrical connections are securely fastened / clamped and fused.

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 50)

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

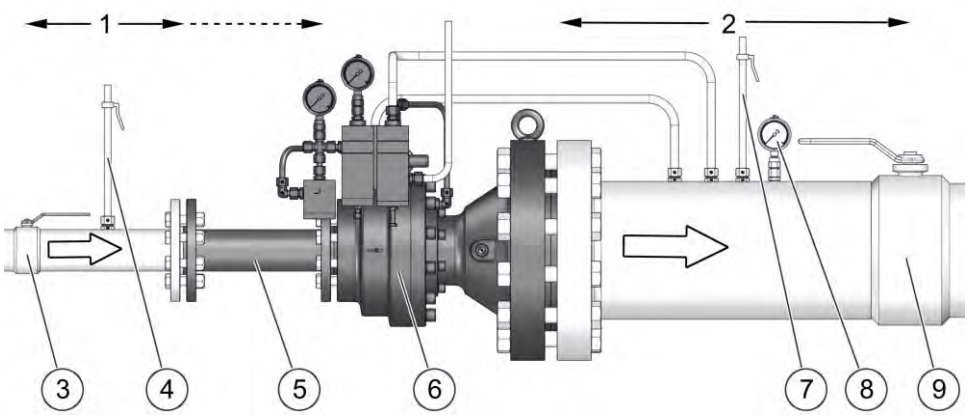
Risk of injury posed by bursting parts in the event that they are subjected to pressure in the wrong direction

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.

Test configuration

The test configuration for the gas pressure regulator is shown below (schematic diagram):



The numbers have the following meaning:

No.	Meaning
1	Inlet chamber
2	Outlet chamber
3	Inlet stop valve armature
4	Inlet chamber blowdown line with shut-off device
5	Adapter (optional)
6	Gas pressure regulator
7	Outlet chamber blowdown line with shut-off device
8	Outlet pressure gauge
9	Outlet stop valve armature

Gas pressure regulator factory settings

By default, the gas pressure regulators supplied by the manufacturer are configured at the factory as required for the operating specifications provided by the customer. These specifications will be found in the inspection certificate associated with the gas pressure regulator.

Requirements

Make sure that the following requirements are met:

- The specifications for the gas pressure regulator in the test setup are the same as the specifications in the inspection certificate.
- The blowdown lines (4.7) are sealed with a shut-off device (e.g., ball valve).

Checking the system for leaks

Proceed as follows:

Step	Description
1	Close the outlet valve.
2	Slowly pressurize the inlet chamber with 1.1 times the operating pressure (MOP). Details about the operating pressure can be found in the *technical specifications* (see page 22).
3	Wait for the following to occur: ▪ The actuator assembly will open first. You can observe this by monitoring the visual position indicator. ▪ The actuator assembly will close once the reseat pressure is reached. You can observe this by monitoring the visual position indicator.
4	Check whether the maximum permissible setpoint for the gas pressure regulator is reached and maintained in the outlet chamber.

If ...	then ...
The maximum permissible setpoint for the gas pressure regulator is reached and maintained in the outlet chamber	proceed with step 5.
The maximum permissible setpoint for the gas pressure regulator is not reached or maintained in the outlet chamber	▪ Adjust the setpoints for the load limiting stage and control stage on the pilot as specified in *Adjusting the settings of the device* (see page 55). ▪ Proceed with step 4.

Step	Description
5	Apply the test medium to all detachable pipe joints.
6	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 7.

Step	Description
7	Close the inlet shut-off device (the outlet shut-off device should still be closed).
8	Depressurize the area between the inlet and outlet shut-off devices by first opening the shut-off device for the blowdown lines (7) in the outlet chamber and then the shut-off device for the blowdown lines (4) in the inlet chamber.
9	Seal the leaking pipe joints.
10	Close the blowdown lines' shut-off devices.
11	Repeat the leak test starting with step 1.

5.5 Starting up the gas pressure regulator

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.

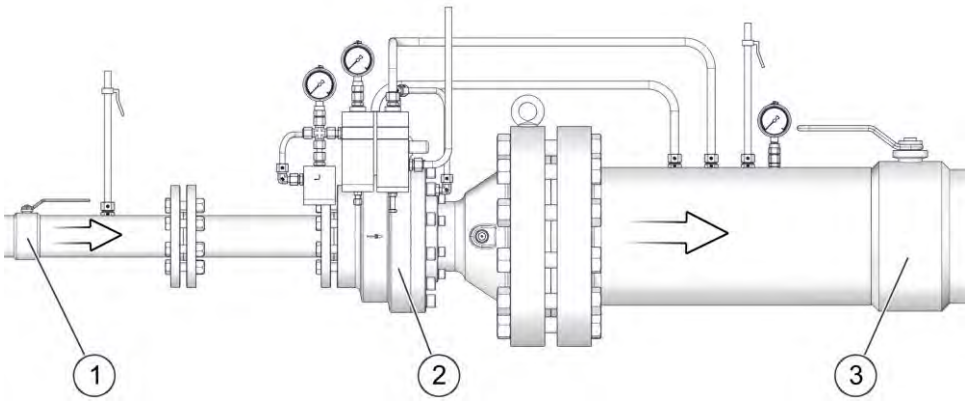
⇨ Pressurize the system only on the inlet side.

Requirements

Make sure that the following requirements are met:

- The system has been checked, is fully functional, and has no leaks.
- The inlet and outlet shut-off devices for the gas regulating line section are closed.
- The shut-off devices for the blowdown lines are closed.
- The inlet pressure is present upstream of the inlet shut-off device. Details about the operating pressure can be found in the *technical specifications* (see page 22).
- The system is depressurized between the inlet shut-off device and the outlet shut-off device.

Gas regulating line schematic diagram



The numbers have the following meaning:

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

Start-up

Proceed as follows:

Step	Description
1	Slowly open the inlet shut-off device (1). Result: The inlet pressure will be present at the gas pressure regulator (2).
2	Wait for the following to occur: ▪ The actuator assembly will open first. You can observe this by monitoring the visual position indicator. ▪ The actuator assembly will close. You can observe this by monitoring the visual position indicator. Result: The reseating pressure set with the pilot will be reached in the outlet chamber. The outlet pressure will be present inside the outlet chamber upstream of the outlet shut-off device.
3	Slowly open the outlet shut-off device (3).
4	Monitor the gas pressure regulator's control behavior for a few minutes. If required, adjust the settings as specified in *Adjusting the settings of the device* (see page 55).

6 Adjusting the settings of the device

Contents

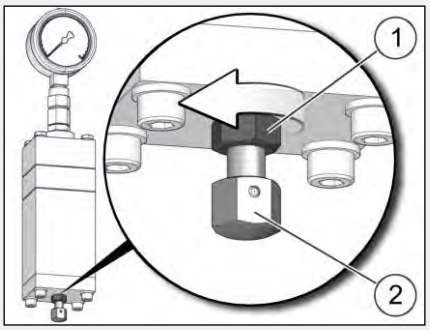
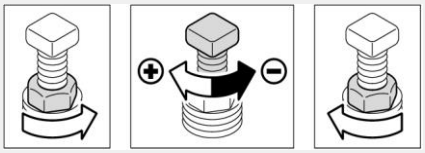
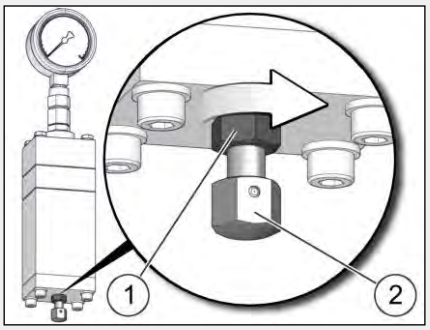
6.1 Adjusting the loading pressure

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:

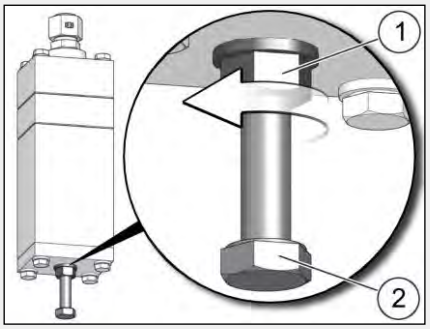
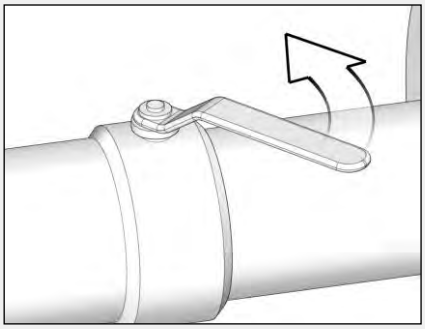
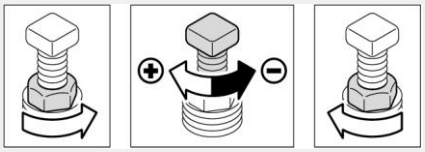
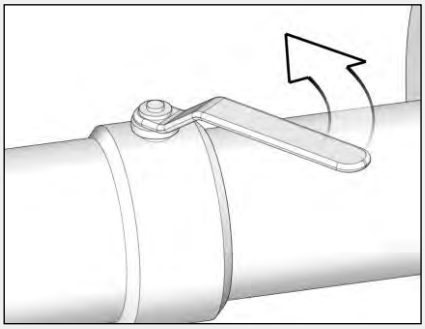
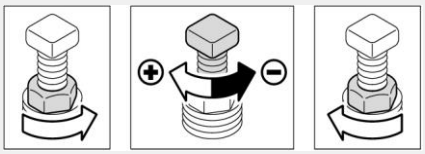
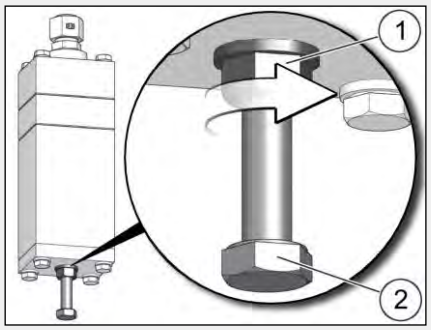
Figure	Step	Description
	**1**	Unscrew the lock nut (1) on the set screw (2) located on the underside of the pilot's control stage.
	2	Loosen the set screw (2) until the tension in the pilot spring has been relieved.
	**3**	Open the inlet shut-off device.
	**4**	Turn the set screw in small increments 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

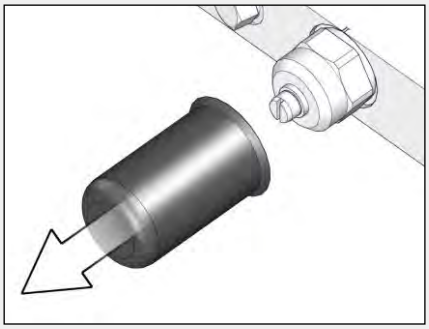
Control behavior changes achieved by adjusting the amplifying valve

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

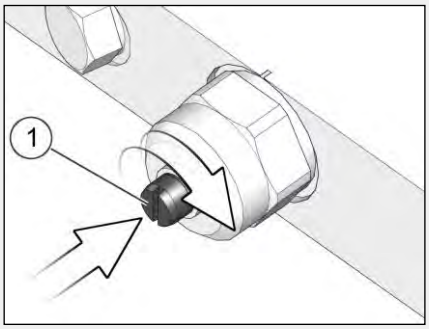
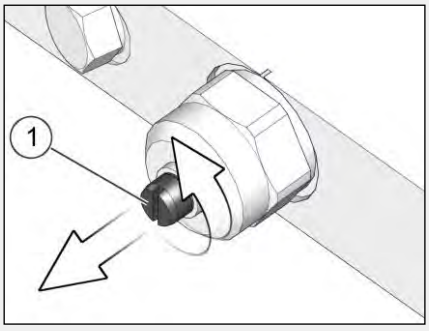
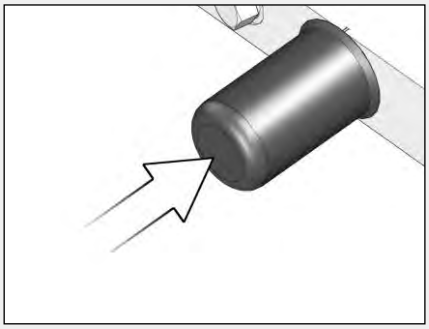
Figure	Step	Description
	**2a**	Use a flat-blade screwdriver to screw the spindle (1) deeper into the sleeve turn by turn while monitoring the actuator assembly's control behavior. As soon as you achieve the actuator assembly response you want, stop changing the spindle's position.
	**2b**	Use a flat-blade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

Figure	Step	Description
	**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

Always contact the manufacturer's After-Sales Service Department for troubleshooting if one of the following occurs:

- You are not absolutely sure what the exact fault is.
- The fault that occurred is not described in the table below.
- The possible cause behind the fault is not listed in the table below.
- Despite your troubleshooting attempts, the fault persists.

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
No flow	Pilot: Not connected correctly	Check the pilot's operation and connections and make any adjustments required
	Pilot: Not enough amplification	Adjust the amplifying valve as specified in *Adjusting the amplifying valve* (see page 59)
	Pilot: The filter is dirty	Clean the filter insert as specified in the *Maintaining the filter* section in *Maintaining the pilot* (see page 102)
	Pilot: The diaphragm is defective	Perform maintenance on the pilot as specified in *Maintaining the pilot* (see page 102)
	Actuator assembly: The diaphragm is defective	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
Low flow rate	Pilot: Not enough amplification	Adjust the amplifying valve as specified in *Adjusting the amplifying valve* (see page 59)
	Pilot: The filter is dirty	Perform maintenance on the filter as specified in the *Maintenance* (see page 65) section
	Pilot: The diaphragm is defective	Perform maintenance on the pilot as specified in *Maintaining the pilot* (see page 102)
	Actuator assembly: The diaphragm is defective	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section

Malfunction	Possible causes	Correction
The actuator assembly is opening/closing too slowly	Pilot: Not enough amplification	Adjust the pilot as specified in *Maintaining the pilot* (see page 102)
	Pilot: The filter is dirty	Clean the filter insert as specified in the *Maintaining the filter* section in *Maintaining the pilot* (see page 102)
	Actuator assembly: The diaphragm is defective	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
	Actuator assembly: The sleeve is getting jammed	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
Leaks on the outside	The flange gaskets are damaged or are not in place	Use new flange gaskets
	Gas pressure regulator: The gaskets are damaged or are not in place	Perform maintenance as specified in the *Maintenance* (see page 65) section
	Screws not tightened enough	Check that all screws have the right tightening torque as specified in the tables in the *Maintenance* (see page 65) section
The actuator assembly will not close	Pilot: Faulty amplifying valve	Perform maintenance on the pilot as specified in *Maintaining the pilot* (see page 102)
	Pilot: Motorization pressure too high	Check the pilot spring to make sure it is set correctly and is not damaged as specified in *Maintaining the pilot* (see page 102)
		Adjust the control stage's setpoint as specified in *Adjusting the control stage setpoint* (see page 57)
	Actuator assembly: The compression spring is faulty	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
	Actuator assembly: The valve sleeve is jammed	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
Leaks on the inside of the actuator assembly in the "closed" position	Actuator assembly: The valve disc is damaged	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
	Actuator assembly: The sleeve's sealing edge is damaged	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
	All the reasons why the actuator assembly is not closing	See above
Sudden outlet pressure drop	Pilot: Not enough amplification	Perform maintenance on the pilot as specified in *Maintaining the pilot* (see page 102)

Malfunction	Possible causes	Correction
	Pilot: The diaphragm is defective	Perform maintenance on the pilot as specified in *Maintaining the pilot* (see page 102)
	Filter: The filter is dirty	Perform maintenance on the filter as specified in the “Maintaining the filter” section in *Maintaining the pilot* (see page 102)
	Actuator assembly: The diaphragm is defective	Perform maintenance on the actuator assembly as specified in the *Maintenance* (see page 65) section
Unstable outlet pressure behavior (oscillations)	Pilot: Excessive amplification	Adjust the amplifying valve as specified in *Adjusting the amplifying valve* (see page 59)
	The actuator assembly is operating in the reseating pressure range	Check the design specifications; contact the manufacturer if necessary
The visual position indicator is not working	Position indicator: The magnetic ring is jammed	Perform maintenance on the position indicator as specified in the *Maintenance* (see page 65) section
	Position indicator: The spring is damaged or not in place	Perform maintenance on the position indicator as specified in the *Maintenance* (see page 65) section

8 Maintenance

Contents

8.1 Maintenance schedule

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

8.2 Preparing for the maintenance

Preparation work for gas pressure regulator 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 153) to find out which spare parts lists correspond your specific gas pressure regulator model and have the corresponding maintenance parts and servicing parts ready to go before maintenance.
		▪ The spare parts always required for maintaining the actuator assembly are marked with an “x” in the “Maint.” column in the spare parts lists for the actuator assembly. ▪ The bills of materials for the pilots are broken down by maintenance parts and servicing parts. ▪ Spare part drawings and bills of materials are listed in the *appendix* (see page 152).
		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 actuator assembly: ▪ Sleeve ▪ Compression spring(s) ▪ Guide rings ▪ Visual position indicator ▪ Wire springs (in the case of actuator assemblies with an expander) ▪ Electrical displacement transducer For the pilot: ▪ Compression spring(s) ▪ Pressure gauge(s) ▪ Filter insert
2	Preparing special tools	▪ In addition to standard tools, have the special tools required for your specific gas pressure regulator model ready to go before maintenance. Please refer to the *Special tools* section in *Lubricants, threadlockers, and tools* (see page 202). ▪ 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 tools* (see page 202).
4	Preparing to disassemble the device	Follow the steps outlined in *Preparing for disassembly* (see page 145).
5	Remove the device from the gas regulating line	Follow the steps outlined in *Disassembling the gas pressure regulator* (see page 147).
6	Remove the pilot from the actuator assembly	Disconnect all operating lines between the actuator assembly and the pilot.

Sample maintenance instructions

The maintenance instructions below are provided as examples for the various gas pressure regulator designs and versions. In other words, it does not explicitly describe every single version and design. Use the bills of materials to make sure that you replace all the maintenance parts relevant to your specific device model during maintenance.

If you have trouble understanding the information in this documentation, contact the manu-

facturer without fail before starting any work on the device.

8.3 Maintaining the actuator assembly

Contents

8.3.1 Maintaining the actuator assembly - Design 1, example with expander

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.

Moving heavy weights

⚠WARNING

Risk of injury due to improper lifting

When lifting and handling device components, the weight of the components and assemblies can result in injury, especially in the torso area.

- ⇨ Make sure to always have enough people lifting heavy device components (guideline using metric units: 15 - max. 55 kg / guideline using imperial units: 30 - max. 120 lbs, depending on age and gender). Comply with all the occupational health and safety regulations and instructions that apply at the installation location!
- ⇨ Use suitable hoisting equipment and slings in order to handle heavy device components. Make sure to take into account the device components' center of gravity and to attach the slings only to the secure device component locations intended for this purpose.
- ⇨ Wear the required personal protective equipment.

Sample maintenance instructions

The maintenance described below is meant for devices with design 1 and nominal inlet sizes of DN 25 – DN 100, and uses the DN 50 Class 600 model with an expander and noise reduction as a reference. *Device models* (see page 10)

Refer to the spare parts lists in the *appendix* (see page 152) to make sure that you replace all the maintenance parts relevant to your device model during maintenance.

Tightening torques for DN 25 – DN 100 actuator assembly

The tightening torques specified in the table apply to the maintenance instructions for the actuator assembly. When screwing the body sections (step 24 in the *Maintaining the inlet body* section and step 1 in the *Assembling the actuator assembly* section), the tightening torques must be increased gradually. Start by tightening the screws with a third of the tightening torque, then with two thirds, and, finally, with the full tightening torque in a criss-cross sequence.

Section	Tightening torque by DN nominal sizes in Nm (ft lbs)									
Step	**25/ 25**	**25/ 100**	**25/ 150**	**50/ 50**	**50/ 150**	**50/ 200**	**80/ 80**	**80/ 250**	**100/ 100**	**100/ 300**
Maintaining the outlet body 10	-	30 (22)	55 (41)	-	55 (41)	55 (41)	-	100 (74)	-	100 (74)
Maintaining the inlet body 18	4 (3)	4 (3)	4 (3)	8 (6)	8 (6)	8 (6)	8 (6)	8 (6)	15 (11)	15 (11)
Maintaining the inlet body 24	100 (74)	100 (74)	100 (74)	250 (185)	250 (185)	250 (185)	250 (185)	250 (185)	500 (369)	500 (369)
Assembling the actuator assembly 1	30 (22)	30 (22)	30 (22)	100 (74)	100 (74)	100 (74)	100 (74)	100 (74)	250 (185)	250 (185)

Notes on filling the relief housing with wire springs

For purposes of clarity, the wire springs are shown as hatched areas in the diagrams. When the relief housing is filled with wire springs, the wire springs must protrude upwards beyond the outlet section's screw-on surface. The following clearance must be maintained based on the nominal outlet size:

Nominal outlet size	Clearance X [mm]
DN 100	8
DN 150	10
DN 200	12
DN 250	16
DN 300	16

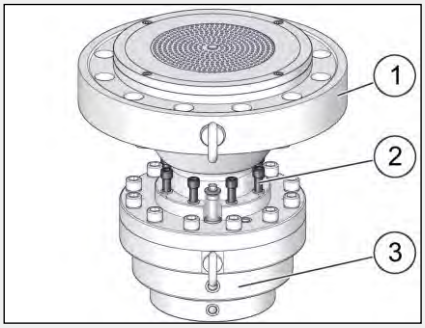
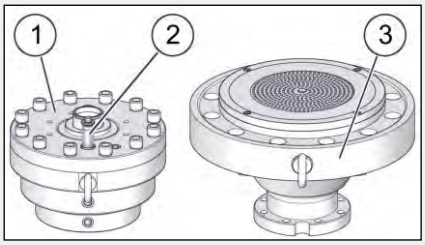
Cleaning

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 actuator assembly

Proceed as follows:

Figure	Step	Description
	**1**	Set down the actuator assembly on the inlet body (3). Take the assembly's high center of gravity into account. Secure the assembly's position. Unscrew the outlet body's (1) screws (2).
	**2**	Carefully remove the outlet body (3) from the inlet body (1) downwards. During lifting, make sure not to damage the position indicator (2). Set down the outlet body (3) on a separate working surface as shown and secure the assembly's position, taking its high center of gravity into account.

Removing the position indicator

Proceed as follows:

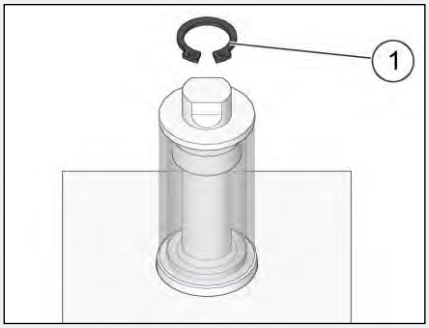
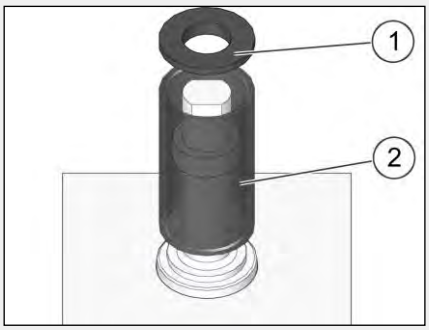
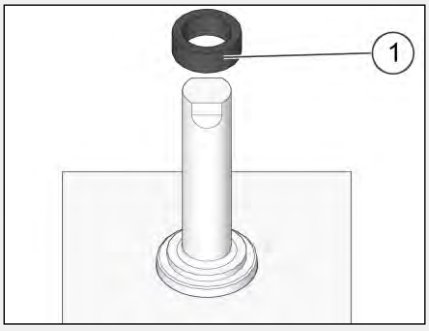
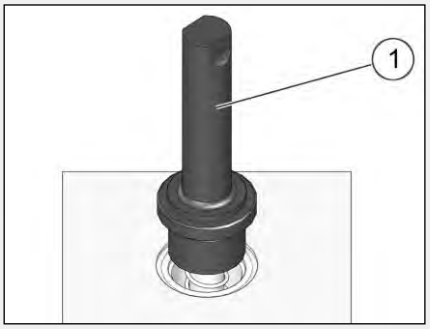
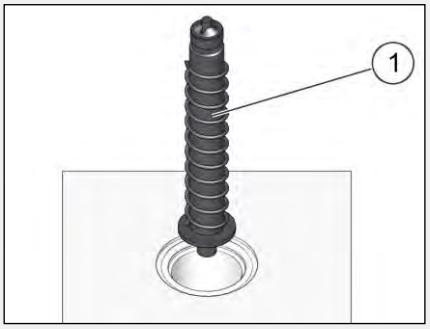
Figure	Step	Description
	**1**	Remove the visual position indicator's retaining ring (1).
	**2**	Remove the cover ring (1) and the sight glass (2).
	**3**	Remove the magnetic ring (1).

Figure	Step	Description
	**4**	Use an open-end wrench to unscrew the guide pin (1).
	**5**	Remove the inner pin, including the spring (1).

Maintaining the inlet body

Proceed as follows:

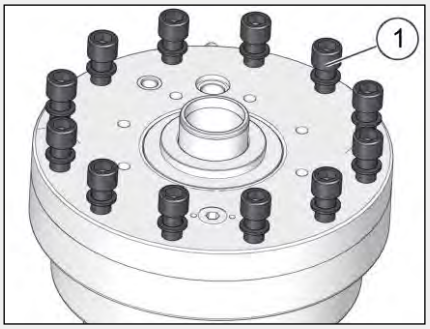
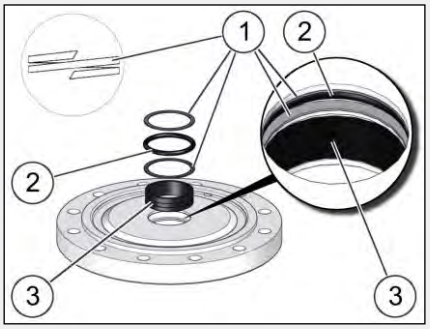
Figure	Step	Description
	**1**	Unscrew the connection flange's screws (1) in a criss-cross sequence. Please note that the spring will be exerting a slight amount of pressure on the body. Slowly unscrew the screws until the compression spring's pressure is relieved.
	**2**	Turn the connection flange 180°. Remove the two support rings (1). Replace the O-ring (2) with a new, greased O-ring. Insert the support rings back in place as shown in the diagram on the top left. In the case of nominal sizes DN > 50, the support rings will not be split in a helical pattern.
	3	Check the guide ring (3) for damage. Replace it if necessary. Fill the chamber with grease for valve sleeves (as per the lubricant table) via the guide ring.

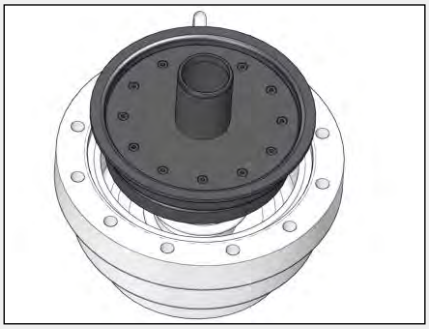
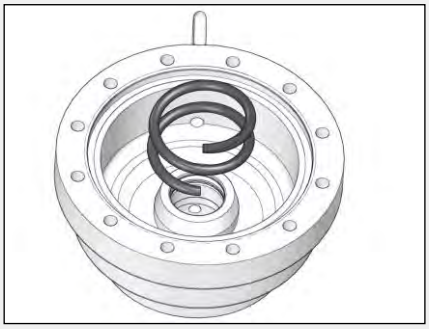
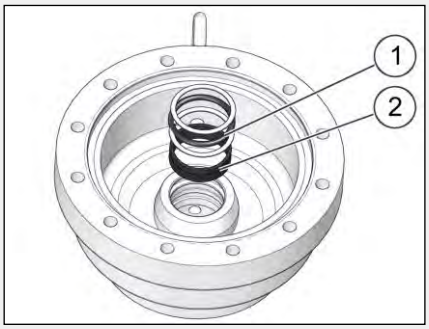
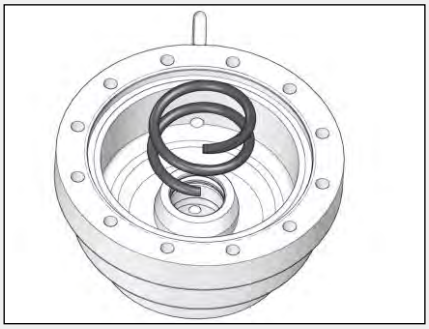
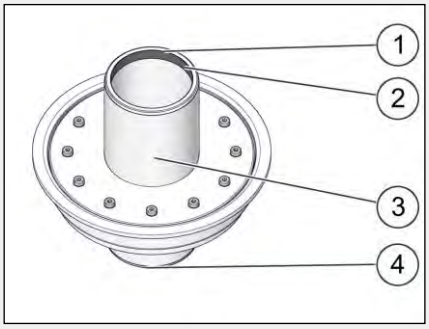
Figure	Step	Description
	**4**	Take the inlet body. Remove the diaphragm unit.
	**5**	Remove the compression spring.
	**6**	Replace the O-ring (1) with a new, greased O-ring. Follow the instructions in step 2.
	7	Check the guide ring (2) for damage. Replace it if necessary. Fill the chamber with grease for valve sleeves (as per the lubricant table) via the guide ring.
	**8**	Check the compression spring for damage. Replace it if necessary. Place the compression spring back in the inlet body.
	**9**	Take the diaphragm unit. Use the sleeve (3) as a reference. The figure on the left shows the sealing edge (1) facing upwards. This sealing edge features a longer chamfer (2) than the sleeve's lower edge (4).

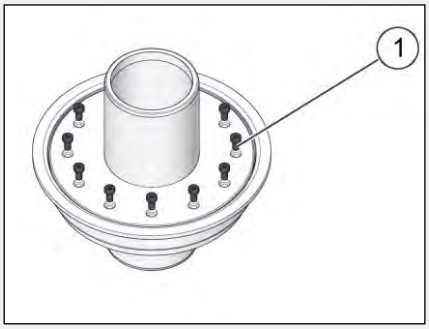
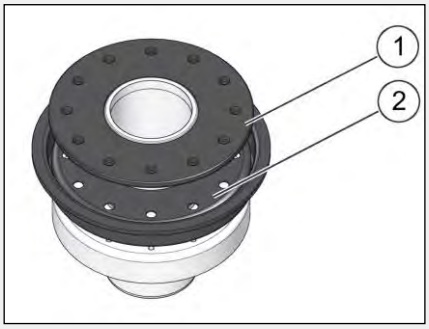
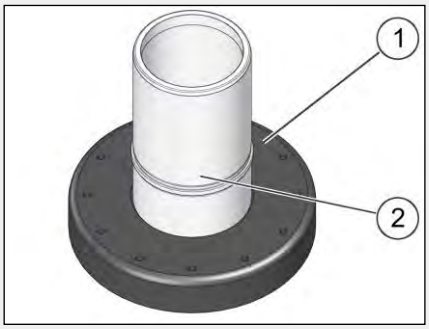
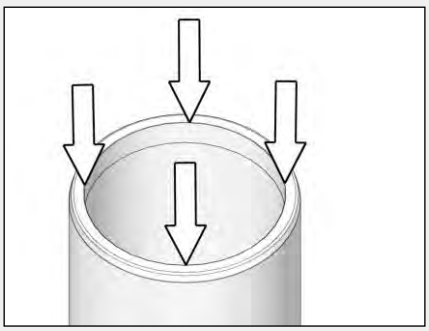
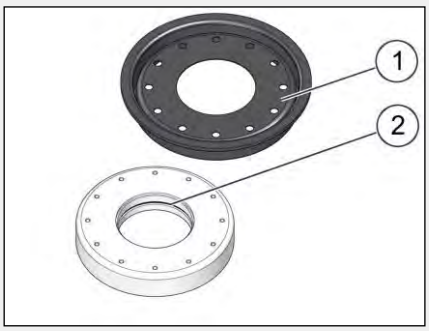
Figure	Step	Description
	**10**	Unscrew the diaphragm unit screws (1) in a criss-cross sequence.
	**11**	Remove the mounting plate (1) and the diaphragm (2).
	12	Replace the O-ring in the mounting plate (1) with a new O-ring.
	**13**	Slide the diaphragm plate (1) downwards and remove the sleeve (2). Use a rubber mallet if necessary.
	**14**	Check the sleeve's sealing edge for notches/damage. If necessary, replace the sleeve with a new one. See step 9 for reference. In versions with reverse flow protection, the outer upper edge will be the sealing edge.
	**15**	Replace the O-ring (2) in the diaphragm plate with a new, greased O-ring and clean the diaphragm unit during the process. Remove the old, used diaphragm (1).

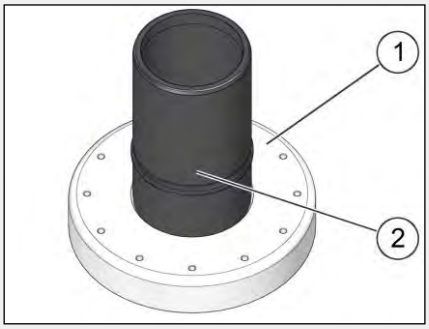
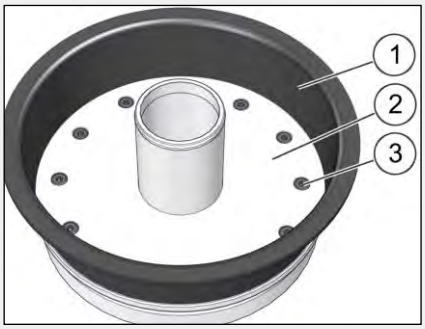
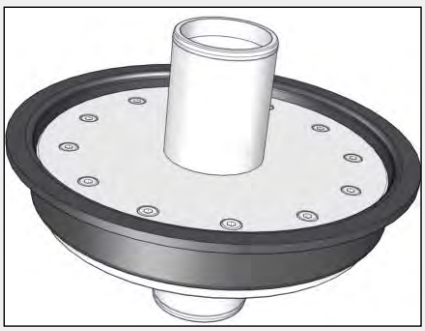
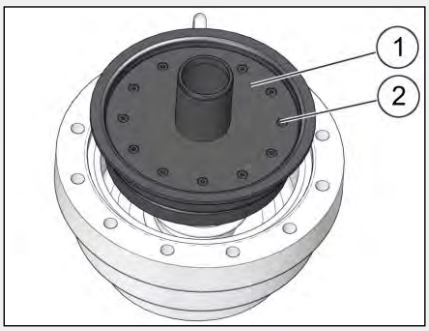
Figure	Step	Description
	**16**	Slide the sleeve (2) back into the diaphragm plate (1). Make sure that the sealing edge is facing upwards. See step 9 for reference.
	**17**	Take a new diaphragm that has not yet been unfolded and grease it.
	**18**	Place the new diaphragm (1) and the mounting plate (2) on the diaphragm plate as shown in the figure to the left. Tighten the screws (3) in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	**19**	Pull the diaphragm all the way down over the diaphragm plate. Fold the diaphragm body back to half its height.
	**20**	Place the diaphragm unit back in the inlet body. Make sure that the mounting plate (1) and the screws (2) are facing upwards.

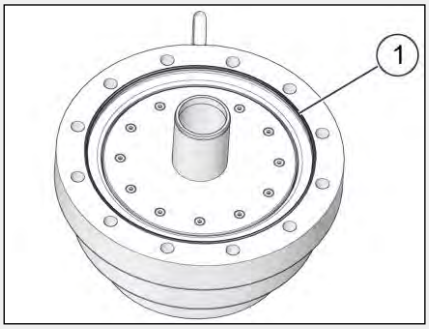
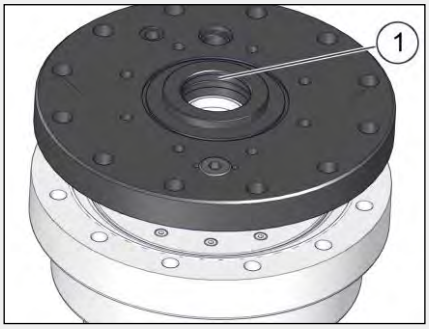
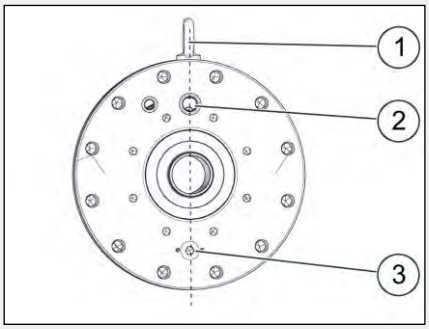
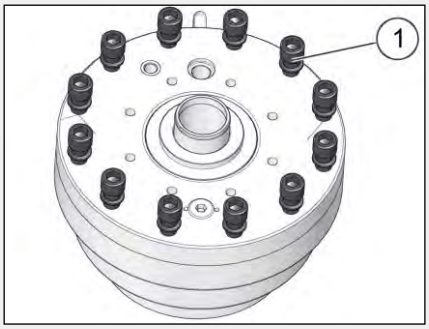
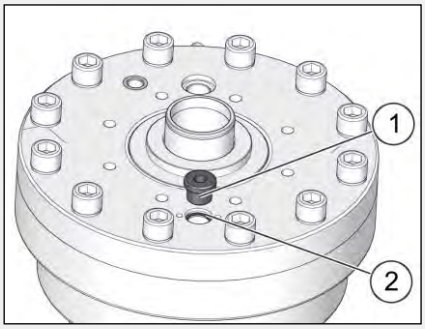
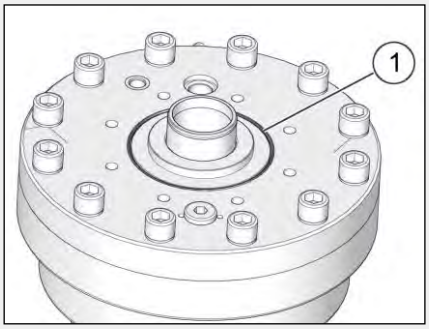
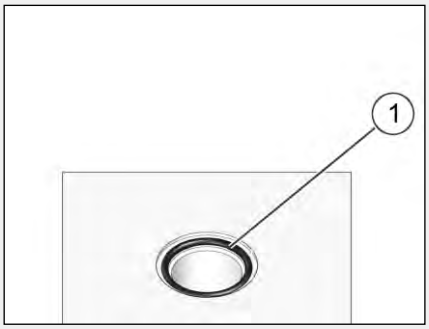
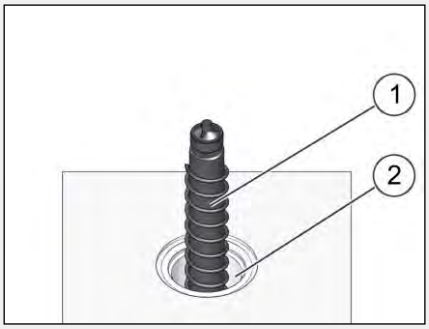
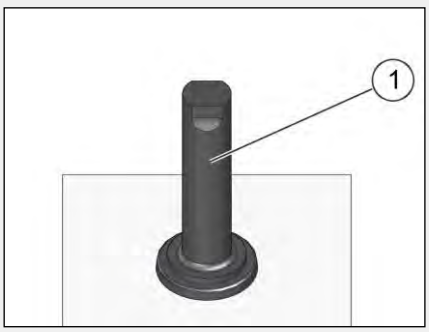
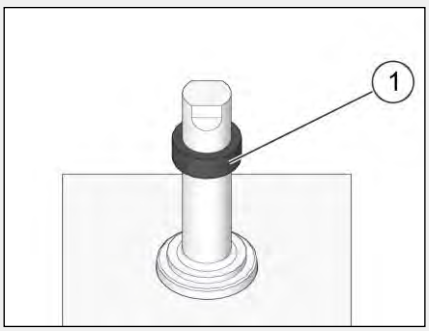
Figure	Step	Description
	**21**	Replace the O-ring (1) in the inlet body with a new, greased O-ring.
	**22**	Place the connection flange on the inlet body. Make sure that the guide ring (1) is seated inside the hole on top. In the case of versions with reverse flow protection for nominal inlet sizes of DN25 – DN100, protect the valve sleeve with an assembly disc as per the list of special tools.
	**23**	Align the connection flange on the body in such a way that the eye bolt (1) is aligned with the two holes (2, 3).
	**24**	Tighten the outlet body's screws (1) and washers in a criss-cross sequence. When doing so, press down on the plate until the screws are screwed in all the way. Refer to the additional tightening torque information at the beginning of this topic.
	**25**	Remove the dummy plug (1) and replace the O-ring (2) with a new, greased one.

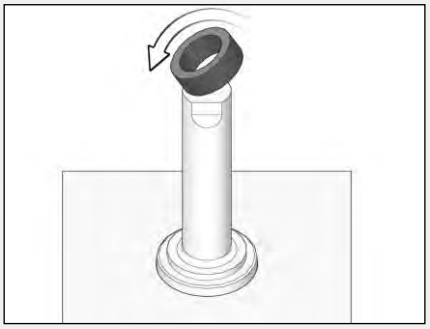
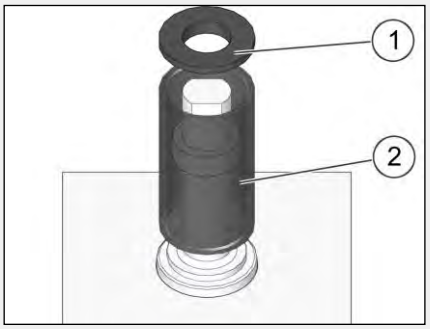
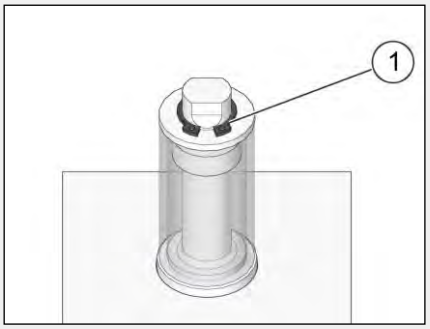
Figure	Step	Description
	**26**	Replace the O-ring (1) with a new, greased O-ring.

Maintaining and installing the position indicator

Proceed as follows:

Figure	Step	Description
	**1**	Replace the O-ring (1) in the body hole intended for the position indicator with a new, greased O-ring.
	**2**	Insert the inner pin, including the spring (1), back into the hole (2) for the position indicator.
	**3**	Use an open-end wrench to install the guide pin (1) back in place.
	**4**	Place the magnetic ring (1) over the guide pin. The magnetic ring position shown in the figure to the left shows the correct installation height.

If ...	then ...
The magnetic ring is resting over the guide pin in the position shown in step 4	proceed with step 6.
The magnetic ring is NOT resting over the guide pin in the position shown in step 4, but is instead in a higher or lower position	proceed with step 5.

Figure	Step	Description
	**5**	Remove the magnetic ring from the guide pin, turn it 180°, and place it back over the guide pin.
	**6**	Place the sight glass (2) and the cover ring (1) back on the guide pin. Make sure that the magnetic ring stays in the required position.
	**7**	Install the retaining ring (1).

Maintaining the outlet body

Proceed as follows:

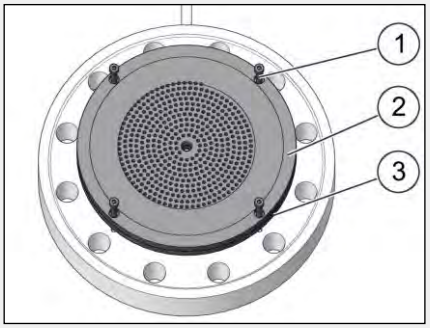
Figure	Step	Description
	**1**	Unscrew the screws (1) that connect the two release plates (2, 3) to the outlet body.

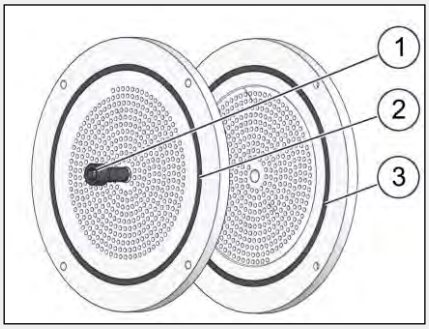
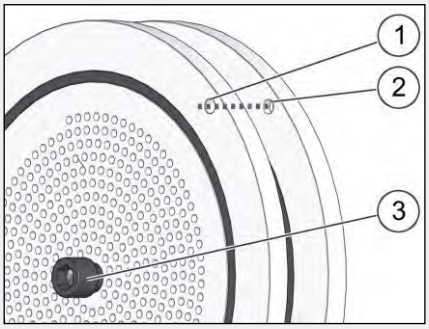
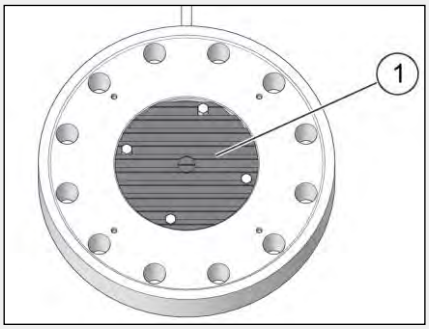
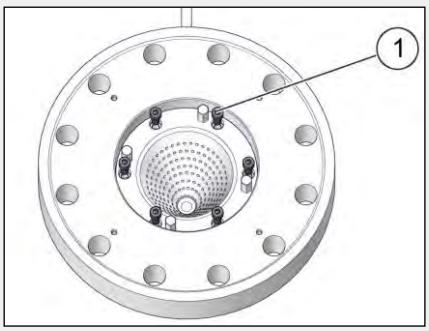
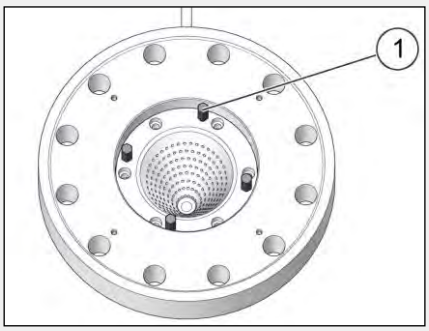
Figure	Step	Description
	**2**	Unscrew the screw (1) that holds the two release plates together. Replace the O-rings (2, 3) in the release plates with new, greased spare parts.
	**3**	Screw the two release plates back together with the socket cap screw (3), including the retaining ring. Make sure that the holes (1, 2) for the threaded joint at the outlet body are aligned.
	**4**	Take the outlet body. Remove the wire springs (1).
	**5**	Unscrew the relief housing's socket cap screws (1).
	**6**	Unscrew the studs (1) on the relief housing.

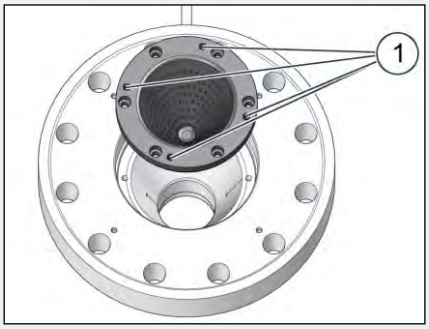
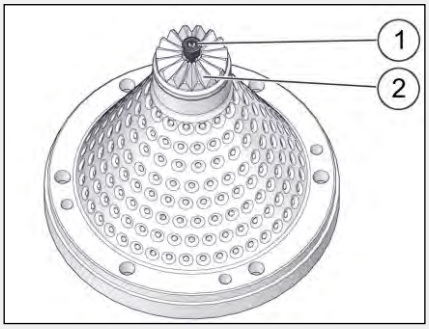
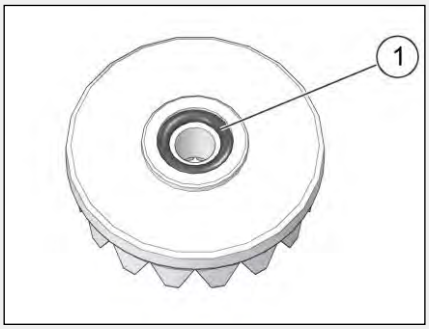
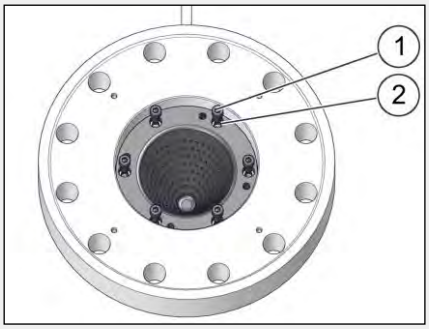
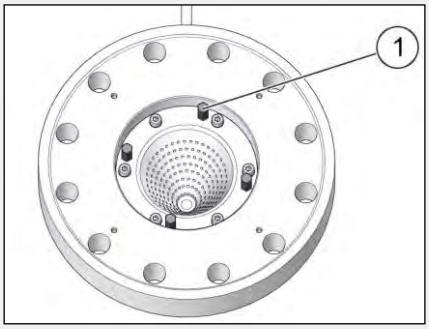
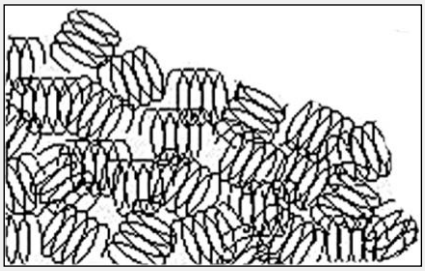
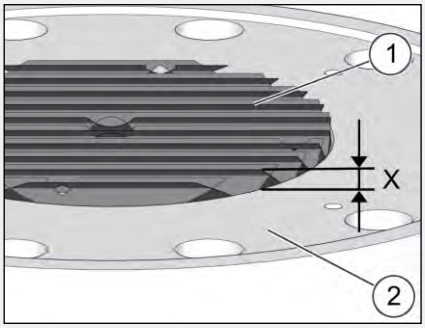
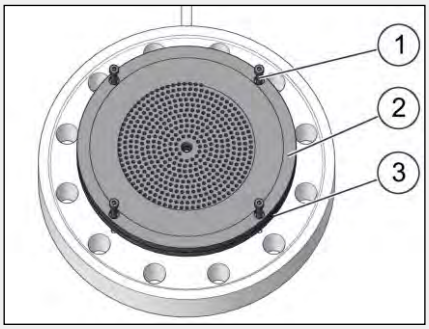
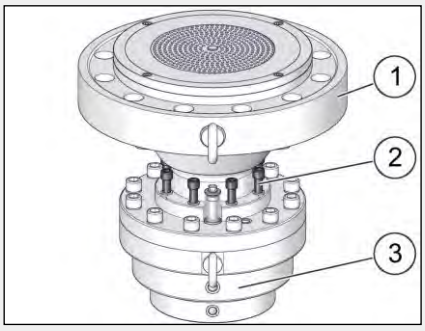
Figure	Step	Description
	**7**	Remove the relief housing with the help of the insertion aids. For this purpose, insert the special top piece (as per the list of special tools) into the stud (1) holes.
	**8**	Turn the relief housing. Unscrew the screw (1) on the valve disc (2) and remove the valve disc.
	**9**	Check the valve disc for damage and replace it with a new one if necessary. Replace the O-ring (1) with a new, greased O-ring. Screw the valve disc back onto the relief housing.
	**10**	Insert the relief housing back into the outlet body. Tighten the socket cap screws (1), including retaining rings (2), in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	**11**	Screw the studs (1) back into the relief housing.

Figure	Step	Description
	**12**	Check the wire springs for impurities and soiling. Replace them with new springs if necessary.
	**13**	Fill the outlet body with wire springs (1). The wire springs must protrude upwards beyond the screw-on surface of the outlet body (2). For more information regarding the wire spring filling height, refer to the additional information at the beginning of this section.
	**14**	Screw the release plates (2, 3) back onto the outlet body. Tighten the screws (1) in a criss-cross sequence.

Assembling the actuator assembly

Proceed as follows:

Figure	Step	Description
	**1**	Set the outlet body (1) back on the inlet body (3). Take the assembly's high center of gravity into account. Secure the assembly's position. Tighten the screws (2) in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.

Next task

Proceed as follows:

Completing the maintenance (see page 141)

8.3.2 Maintaining the actuator assembly - Design 2, example without expander

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.

Moving heavy weights

⚠WARNING

Risk of injury due to improper lifting

When lifting and handling device components, the weight of the components and assemblies can result in injury, especially in the torso area.

- ⇨ Make sure to always have enough people lifting heavy device components (guideline using metric units: 15 - max. 55 kg / guideline using imperial units: 30 - max. 120 lbs, depending on age and gender). Comply with all the occupational health and safety regulations and instructions that apply at the installation location!
- ⇨ Use suitable hoisting equipment and slings in order to handle heavy device components. Make sure to take into account the device components' center of gravity and to attach the slings only to the secure device component locations intended for this purpose.
- ⇨ Wear the required personal protective equipment.

Sample maintenance instructions

The maintenance described below is meant for devices with design 2 and nominal inlet sizes of DN 150 – DN 250, and uses the DN 150 Class 600 model without an expander and noise reduction as a reference. *Device models* (see page 10)

Refer to the spare parts lists in the *appendix* (see page 152) to make sure that you replace all the maintenance parts relevant to your device model during maintenance.

Actuator assembly tightening torques

The tightening torques specified in the table apply to the maintenance instructions for the actuator assembly. When screwing the body sections in step 27, the tightening torques must be increased gradually. Start by tightening the screws with a third of the tightening torque, then with two thirds, and, finally, with the full tightening torque in a criss-cross sequence.

Section	Tightening torque by DN nominal sizes in Nm (ft lbs)								
Step	150/ 150	150/ 300	150/ 400	200/ 200	200/ 400	200/ 500	250/ 250	250/ 500	250/ 600
Maintaining the actuator assembly 17					15 (12)				
Maintaining the actuator assembly 27		500 (370)					1150 (850)		

Notes on filling the relief housing with wire springs in versions with an expander

In versions with an expander, the relief housing must be refilled with the wire springs after maintenance as indicated in the maintenance instructions for DN 25 – 100 actuator assemblies in the *Maintaining the outlet body* section. When the relief housing is filled with wire springs, the wire springs must protrude upwards 10 mm beyond the outlet section's screw-on surface.

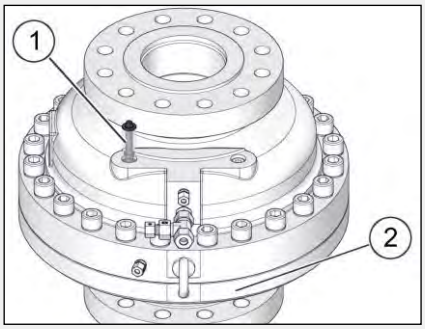
Cleaning

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.

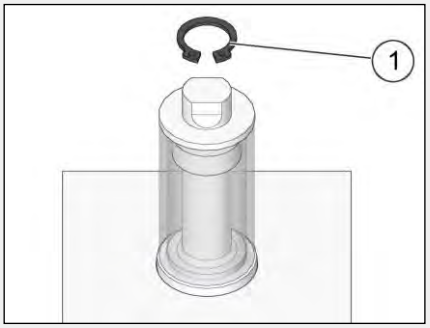
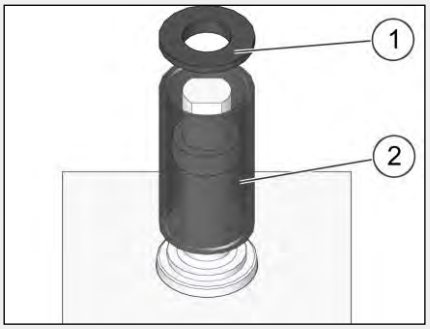
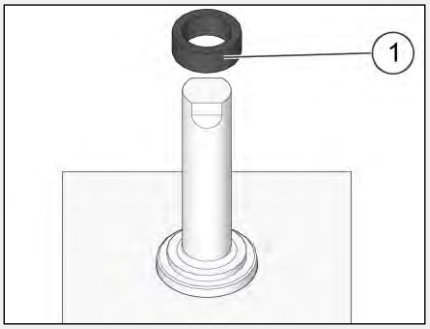
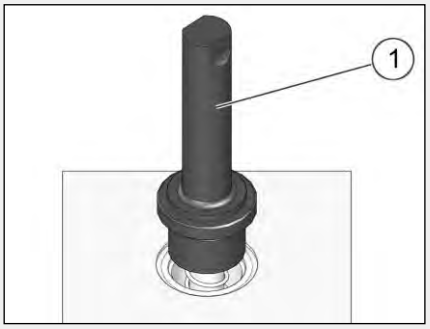
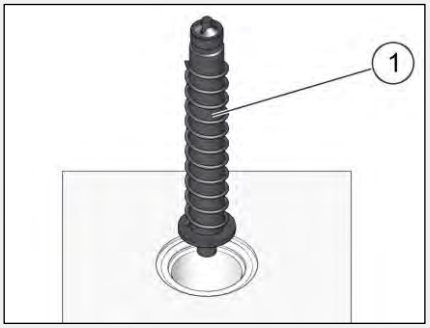
Positioning the actuator assembly as necessary for maintenance

Proceed as follows:

Figure	Step	Description
	1	Set down the actuator assembly on the inlet body (2) in such a way that the position indicator (1) points upwards. Take the assembly's high center of gravity into account. Secure the assembly's position.

Removing the position indicator

Proceed as follows:

Figure	Step	Description
	**1**	Remove the visual position indicator's retaining ring (1).
	**2**	Remove the cover ring (1) and the sight glass (2).
	**3**	Remove the magnetic ring (1).
	**4**	Use an open-end wrench to unscrew the guide pin (1).
	**5**	Remove the inner pin, including the spring (1).

Maintaining the actuator assembly

Proceed as follows:

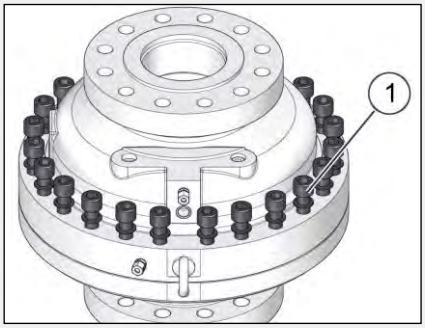
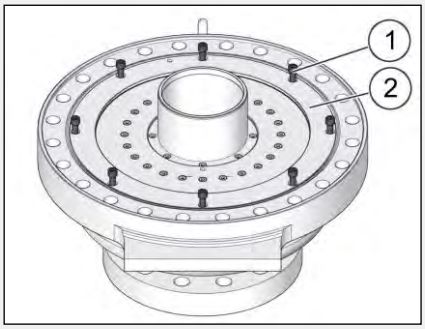
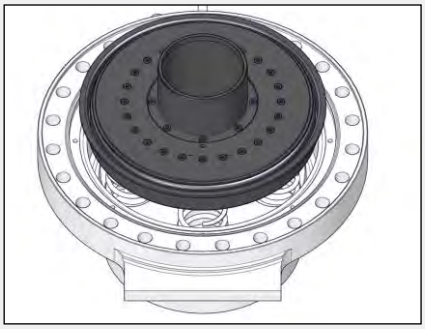
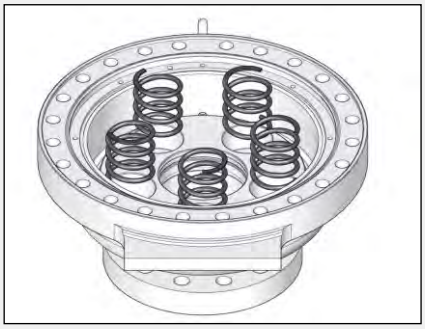
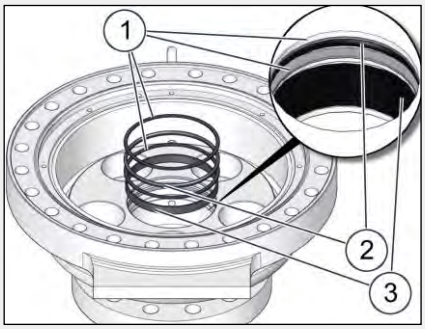
Figure	Step	Description
	**1**	Unscrew the inlet body's screws (1). Lift the inlet body off. Use suitable hoisting equipment and slings for this purpose.
	**2**	Loosen the screws (1) on the tension ring on the inlet body and lift off the tension ring (2).
	**3**	Remove the diaphragm unit.
	**4**	Remove the compression springs.
	**5**	Remove the two support rings (1). Replace the O-ring (2) with a new, greased O-ring and insert the support ring back in place.
	6	Check the guide ring (3) for damage. Replace it if necessary. Fill the chamber with grease for valve sleeves (as per the lubricant table) via the guide ring.

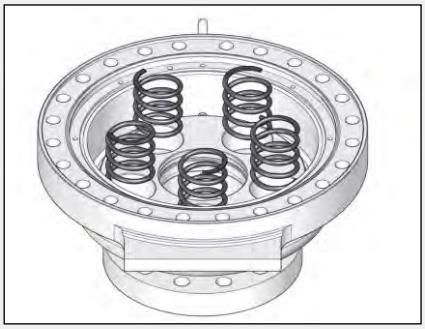
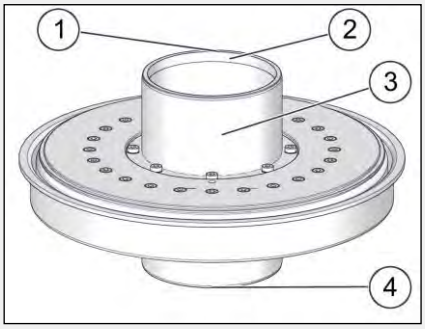
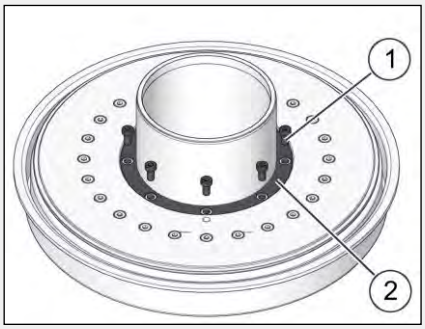
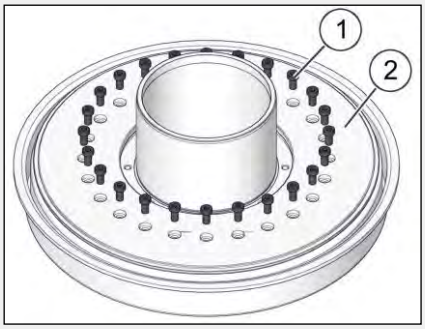
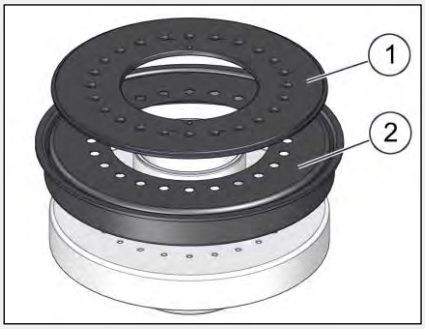
Figure	Step	Description
	**7**	Check the compression springs for damage and replace them with new ones if necessary. Put the compression springs back in the inlet body.
	**8**	Take the diaphragm unit. Use the sleeve (3) as a reference. The figure on the left shows the sealing edge (1) facing upwards. This sealing edge features a longer chamfer (2) than the sleeve's lower edge (4).
	**9**	Take the diaphragm unit. Unscrew the screws (1) and remove the mounting ring (2).
	**10**	Unscrew the screws (1) on the mounting plate (2).
	**11**	Remove the mounting plate (1) and the diaphragm (2).

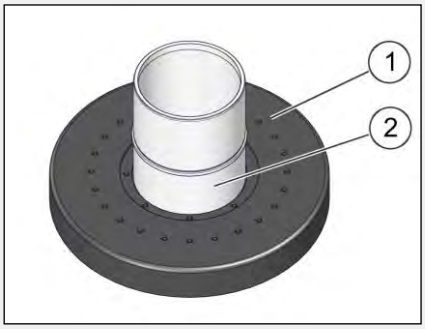
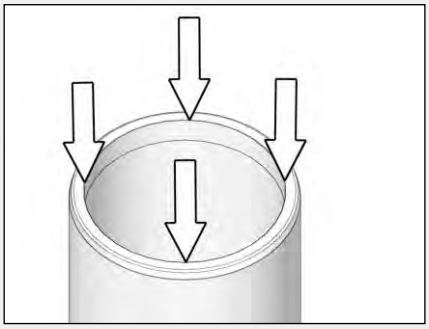
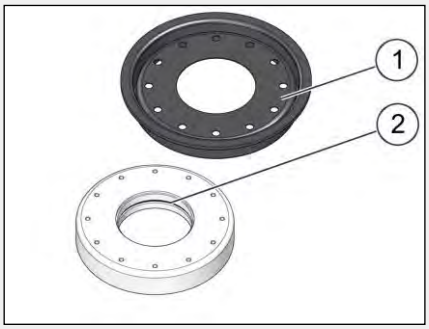
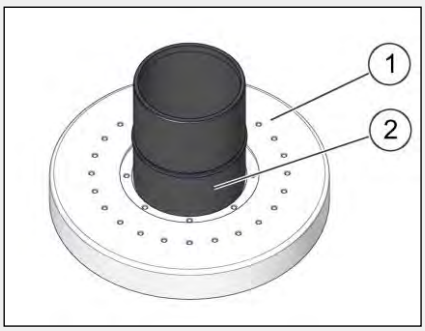
Figure	Step	Description
	**12**	Slide the diaphragm plate (1) downwards and remove the sleeve (2). Use a rubber mallet if necessary.
	**13**	Check the sleeve's sealing edge (1) for notches/damage. If necessary, replace the sleeve with a new one. See step 15 for reference.
	**14**	Replace the O-ring (2) in the diaphragm plate with a new, greased O-ring and clean the diaphragm unit during the process. Remove the old, used diaphragm (1).
	**15**	Slide the sleeve (2) back into the diaphragm plate (1). Make sure that the sealing edge is facing upwards. See step 15 for reference.
	**16**	Take a new diaphragm that has not yet been unfolded and grease it.

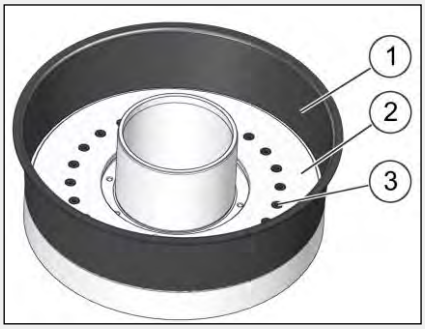
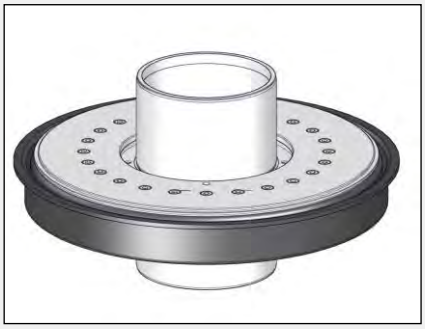
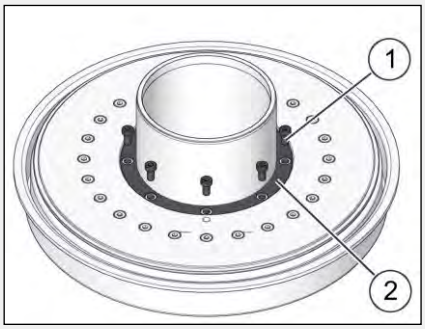
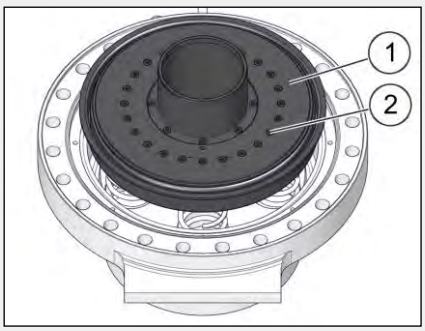
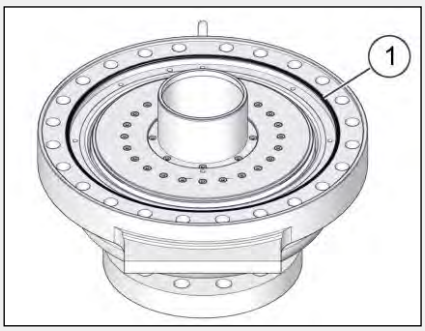
Figure	Step	Description
	**17**	Place the new diaphragm (1) and the mounting plate (2) on the diaphragm plate as shown in the figure to the left. Tighten the screws (3) in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	**18**	Pull the diaphragm all the way down over the diaphragm plate. Fold the diaphragm body back to half its height.
	**19**	Put the mounting ring (2) back in place and tighten the screws (1), including retaining rings, in a criss-cross sequence.
	**20**	Place the diaphragm unit back in the inlet body. Make sure that the mounting plate (1) and the screws (2) are facing upwards.
	**21**	Replace the O-ring (1) with a new one.

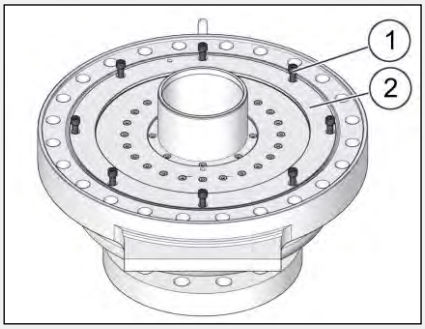
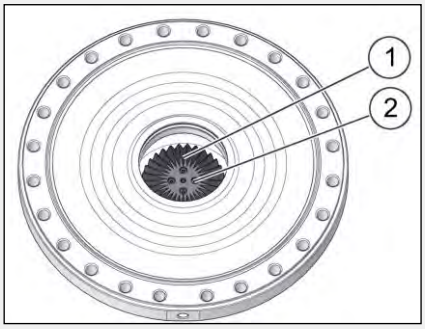
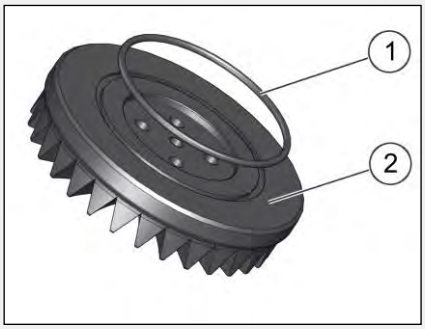
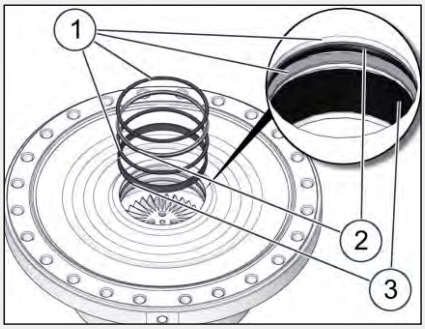
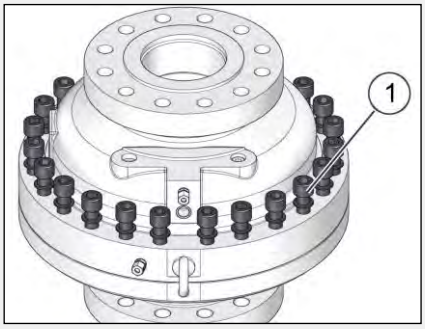
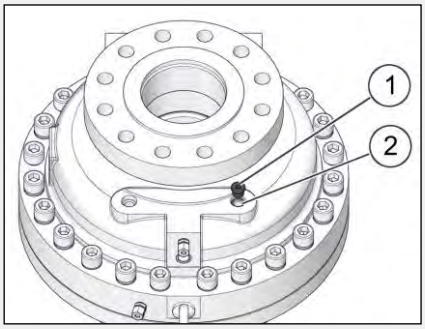
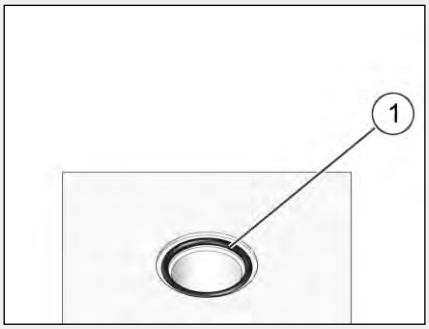
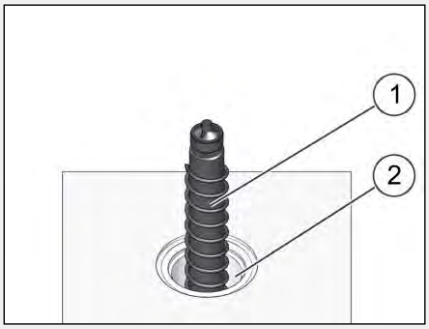
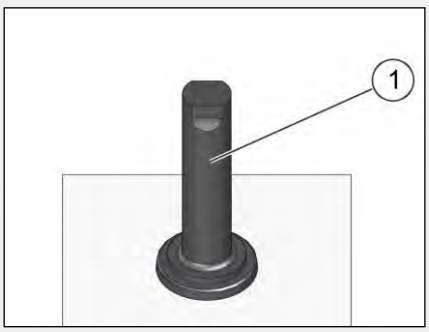
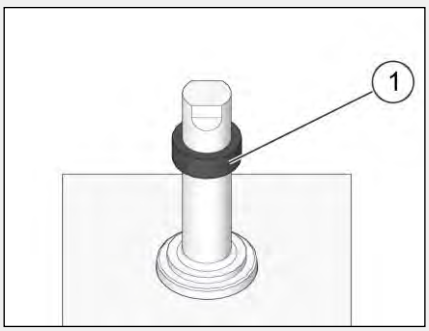
Figure	Step	Description
	**22**	Put the tension ring (2) back in place and tighten the screws (1) in a criss-cross sequence.
	**23**	Take the outlet body. Unscrew the screws (2) on the valve disc (1). Remove the valve disc. Use the assembly screw specified in the list of special tools for this purpose.
	**24**	Replace the valve disc (2) and the O-ring (1) with new ones. Screw the valve disc back in the outlet body.
	**25**	Remove the two support rings (1). Replace the O-ring (2) with a new, greased O-ring and insert the support ring back in place.
	26	Check the guide ring (3) for damage. Replace it if necessary. Fill the chamber with grease for valve sleeves (as per the lubricant table) via the guide ring.
	**27**	Set the inlet body back on the outlet body. Take the assembly's high center of gravity into account. Secure the assembly's position if necessary. Tighten the screws (1) in a criss-cross sequence. Refer to the additional procedure and tightening torque information at the beginning of this topic.

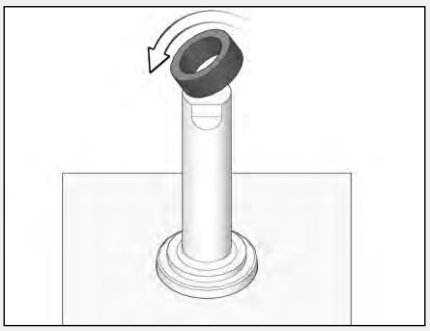
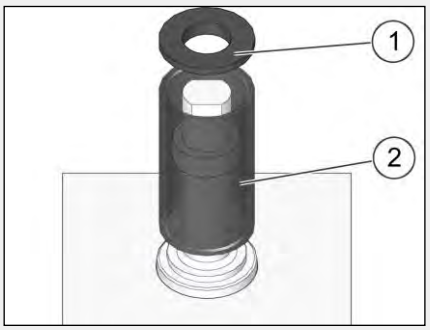
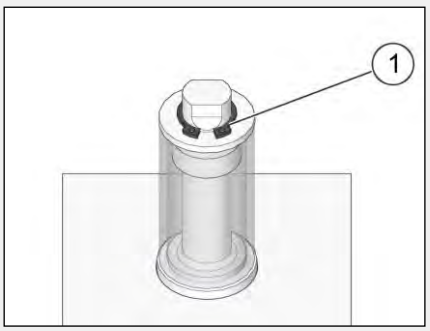
Figure	Step	Description
	**28**	Remove the dummy plug (1). Replace the O-ring (2) with a new one and screw the dummy plug back in.

Maintaining and installing the position indicator

Proceed as follows:

Figure	Step	Description
	**1**	Replace the O-ring (1) in the body hole intended for the position indicator with a new, greased O-ring.
	**2**	Insert the inner pin, including the spring (1), back into the hole (2) for the position indicator.
	**3**	Use an open-end wrench to install the guide pin (1) back in place.
	**4**	Place the magnetic ring (1) over the guide pin. The magnetic ring position shown in the figure to the left shows the correct installation height.

If ...	then ...
The magnetic ring is resting over the guide pin in the position shown in step 4	proceed with step 6.
The magnetic ring is NOT resting over the guide pin in the position shown in step 4, but is instead in a higher or lower position	proceed with step 5.

Figure	Step	Description
	**5**	Remove the magnetic ring from the guide pin, turn it 180°, and place it back over the guide pin.
	**6**	Place the sight glass (2) and the cover ring (1) back on the guide pin. Make sure that the magnetic ring stays in the required position.
	**7**	Install the retaining ring (1).

Next task

Proceed as follows:

Completing the maintenance (see page 141)

8.3.3 Maintaining the actuator assembly - Design 3

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.

Sample maintenance instructions

The maintenance described below is meant for devices with design 3 and nominal inlet sizes of DN 25 – DN 250, and uses the DN 50 Class 150 model as a reference. *Device models* (see page 10)

Refer to the spare parts lists in the *appendix* (see page 152) to make sure that you replace all the maintenance parts relevant to your device model during maintenance.

Actuator assembly tightening torques

The tightening torques specified in the table apply to the maintenance instructions for the actuator assembly. When screwing the body sections in step 25, the tightening torques must be increased gradually. Start by tightening the screws with a third of the tightening torque, then with two thirds, and, finally, with the full tightening torque in a criss-cross sequence.

Section	Tightening torque by DN nominal sizes in Nm (ft lbs)						
Step	25	50	80	100	150	200	250
Maintaining the actuator assembly 25	-	-	-	-	425 (315)	730 (540)	400 (295)

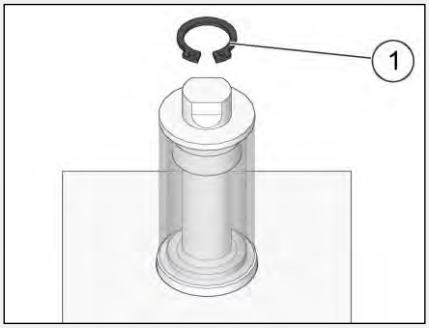
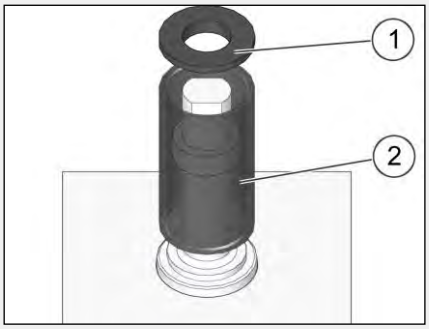
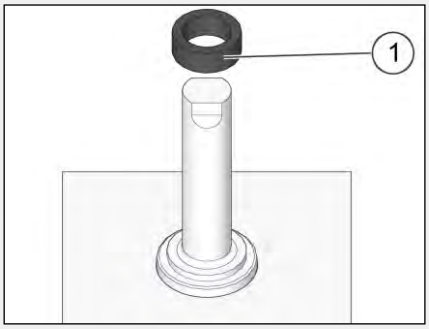
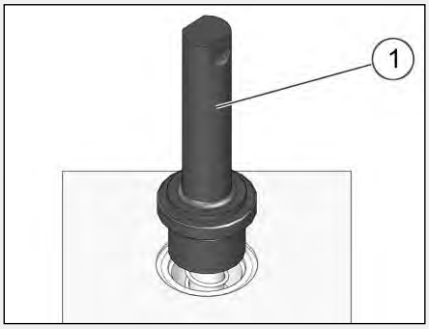
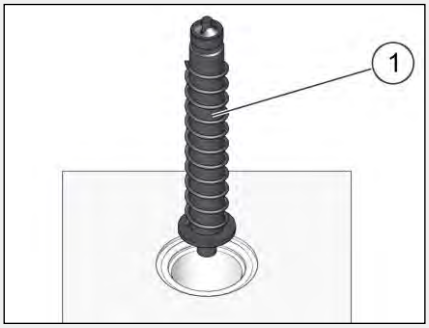
Cleaning

Observe the following cleaning instructions:

- Before assembly, all parts must be cleaned in order to remove any foreign particles (swarf) and soiling.
- Aside from one exception, the oil on screws and washers must be removed in advance when they are being used as new parts to replace identical parts.
  The exception are the screws that have a tightening torque specification as per the table in the *Actuator assembly tightening torques* section. These screws must be screwed in while still oiled.

Removing the position indicator

Proceed as follows:

Figure	Step	Description
	**1**	Remove the visual position indicator's retaining ring (1).
	**2**	Remove the cover ring (1) and the sight glass (2).
	**3**	Remove the magnetic ring (1).
	**4**	Use an open-end wrench to unscrew the guide pin (1).
	**5**	Remove the inner pin, including the spring (1).

Maintaining the actuator assembly

Proceed as follows:

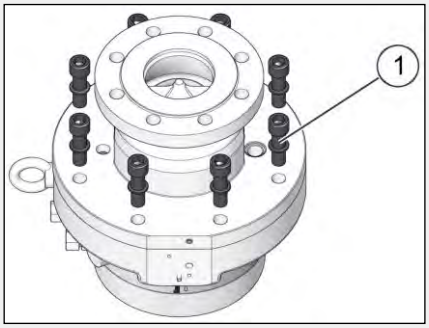
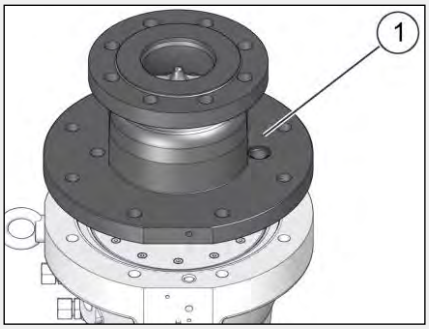
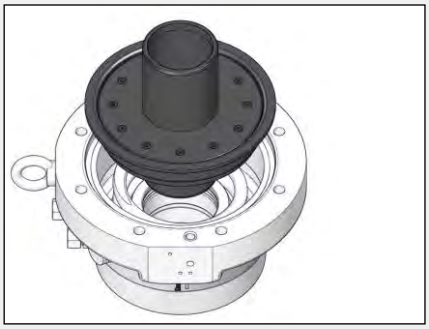
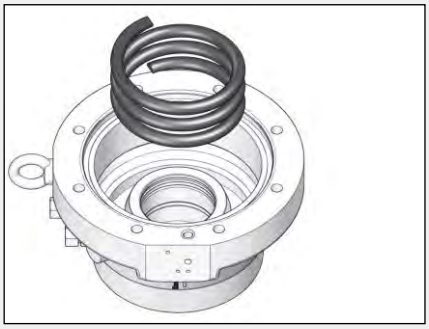
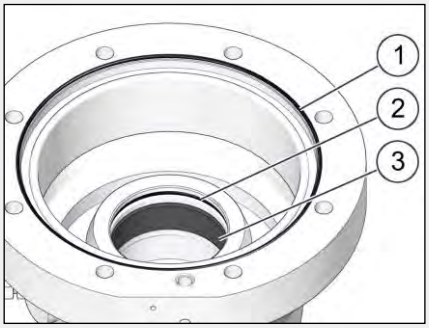
Figure	Step	Description
	**1**	Unscrew the outlet body. When doing so, make sure to unscrew the screws (1) in a criss-cross sequence. Please note that the spring will be exerting a slight amount of pressure on the body. Slowly unscrew the screws until the compression spring's pressure is relieved.
	**2**	Remove the outlet body (1).
	**3**	Remove the diaphragm unit from the inlet body.
	**4**	Remove the compression spring.
	**5**	Replace the O-rings (1, 2) in the inlet body with new, greased O-rings and clean the inlet body during the process. Check the guide ring (3) for damage and replace it with a new one if necessary.

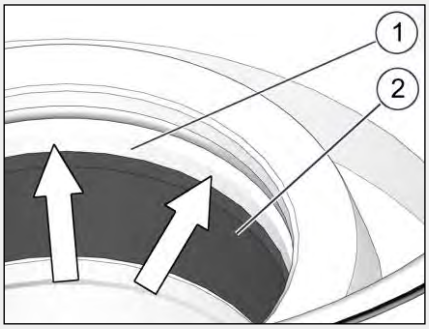
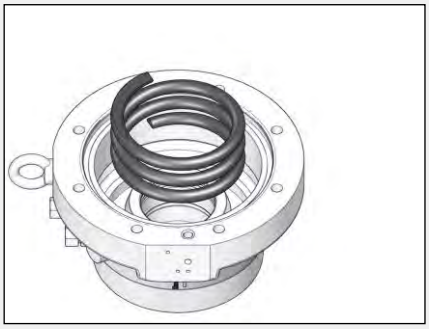
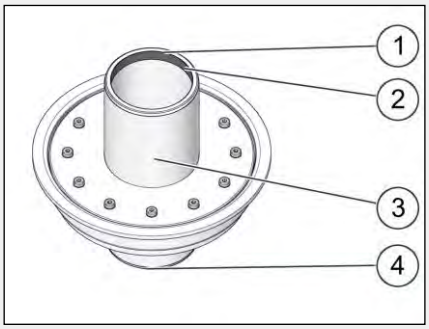
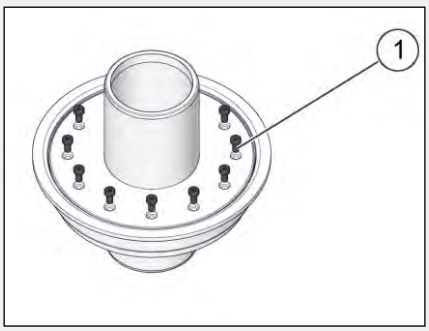
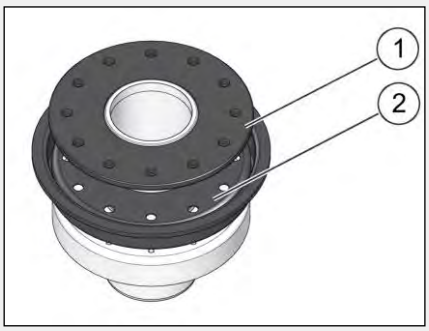
Figure	Step	Description
	**6**	Use grease for valve sleeves (as specified in the lubricant table) to fill the chamber (1) via the guide ring (2).
	**7**	Check the compression spring for damage and replace it with a new one if necessary. Place the compression spring back in the inlet body.
	**8**	Take the diaphragm unit. Use the sleeve (3) as a reference. The figure on the left shows the sealing edge (1) facing upwards. This sealing edge features a longer chamfer (2) than the sleeve's lower edge (4).
	**9**	Unscrew the diaphragm unit screws (1) in a criss-cross sequence.
	**10**	Remove the mounting plate (1) and the diaphragm (2).
	11	Replace the O-ring in the mounting plate with a new, greased O-ring.

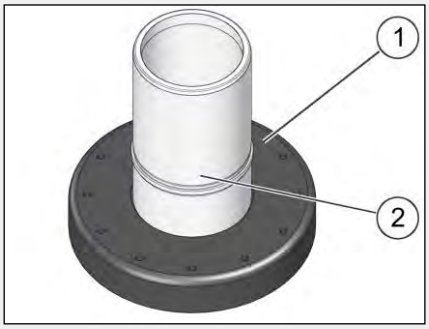
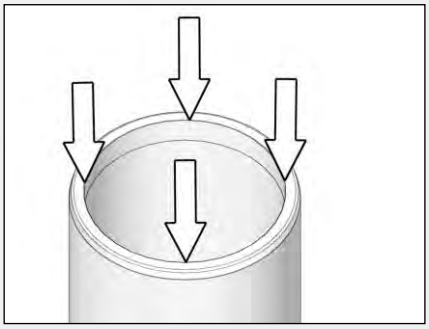
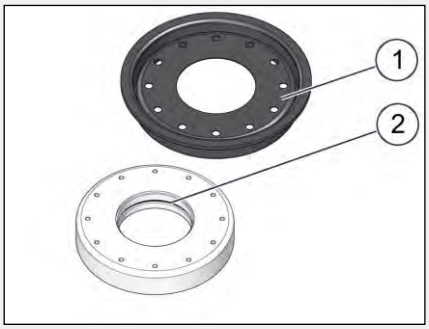
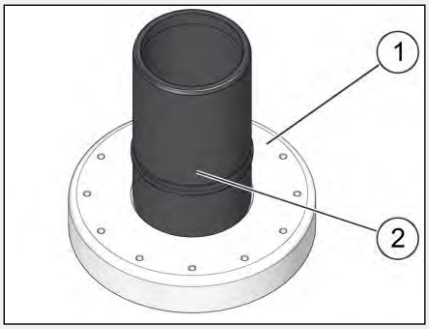
Figure	Step	Description
	**12**	Slide the diaphragm plate (1) downwards and remove the sleeve (2). Use a rubber mallet if necessary.
	**13**	Check the sleeve's sealing edge (1) for notches/damage. If necessary, replace the sleeve with a new one. See step 8 for reference.
	**14**	Replace the O-ring (2) in the diaphragm plate with a new, greased O-ring and clean the diaphragm unit during the process. Remove the old, used diaphragm (1).
	**15**	Slide the sleeve (2) back into the diaphragm plate (1). Make sure that the sealing edge is facing upwards. See step 8 for reference.
	**16**	Take a new diaphragm that has not yet been unfolded and grease it.

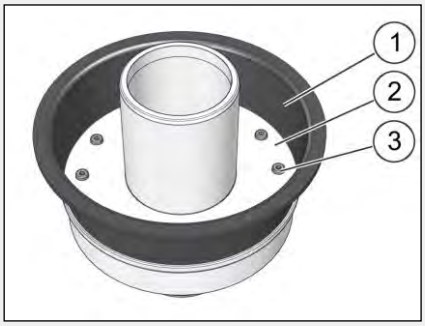
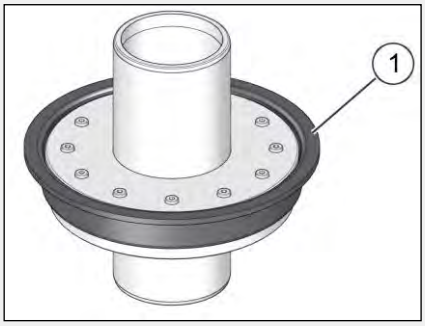
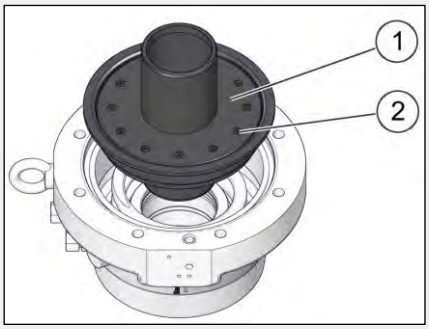
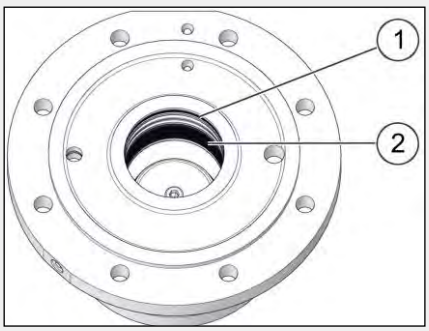
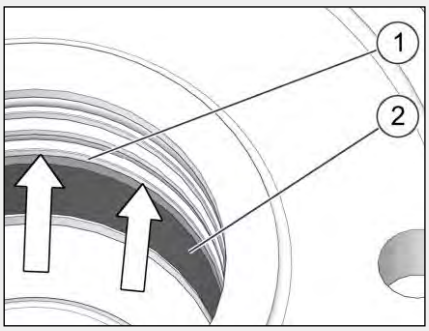
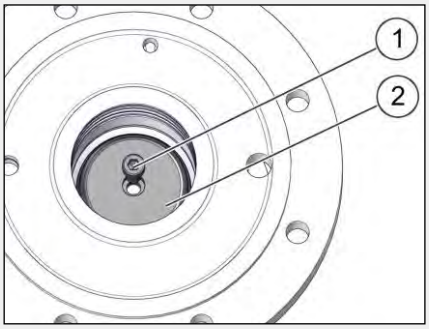
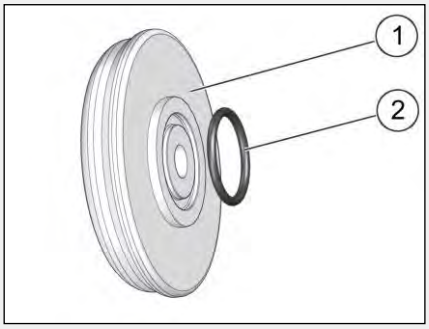
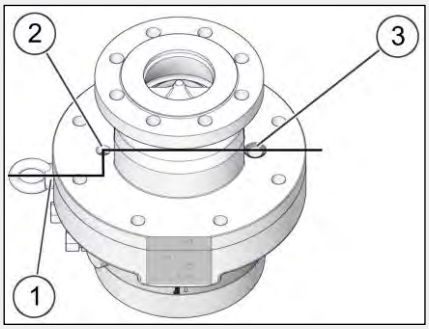
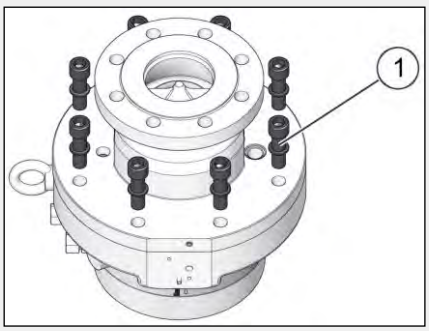
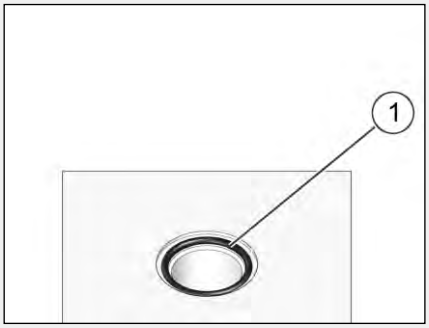
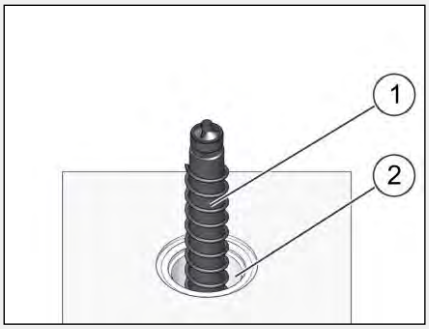
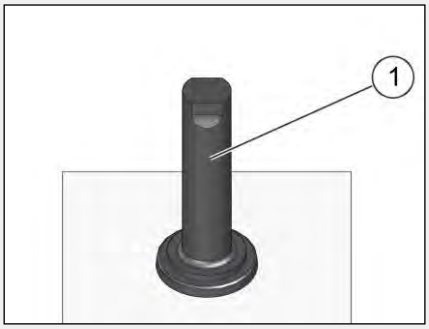
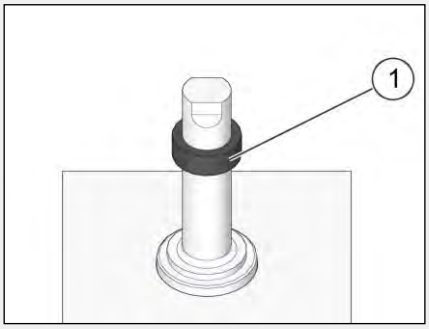
Figure	Step	Description
	**17**	Place the new diaphragm (1) and the mounting plate (2) on the diaphragm plate as shown in the figure to the left. Tighten the screws (3) in a criss-cross sequence.
	**18**	Pull the diaphragm (1) all the way down over the diaphragm plate. Then fold the diaphragm body back to half its height.
	**19**	Place the diaphragm unit back in the inlet body. Make sure that the mounting plate (1) and the screws (2) are facing upwards.
	**20**	Take the outlet body. Replace the O-ring (1) with a new, lubricated O-ring. Check the guide ring (2) for damage and replace it with a new one if necessary.
	**21**	Use grease for valve sleeves (as specified in the lubricant table) to fill the chamber (1) via the guide ring (2).

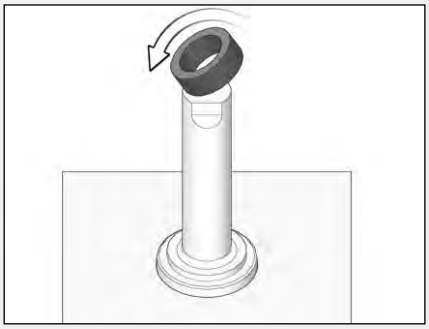
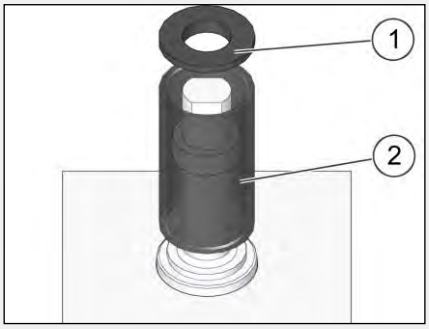
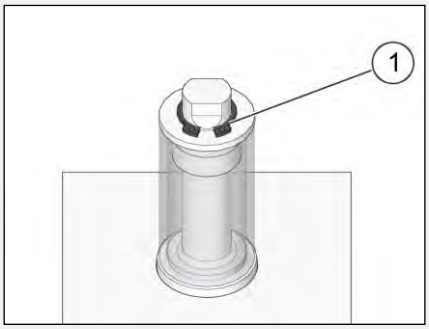
Figure	Step	Description
	**22**	Unscrew the screw (1) on the valve disc (2).
	**23**	Replace the valve disc (1) and the O-ring (2) with new ones and screw the new replacements into the outlet body. Do NOT use an impact driver to screw in the valve disc screw(s).
	**24**	Put the outlet body back on the inlet body and align them in such a way that the eye bolt (1), the hole for the displacement sensor connection (2), and the hole for the position indicator (3) form a line.
	**25**	Tighten the outlet body's screws (1) and washers in a criss-cross sequence. When doing so, press down on the plate until the screws are screwed in all the way. Refer to the additional tightening torque information at the beginning of this topic.

Maintaining and installing the position indicator

Proceed as follows:

Figure	Step	Description
	**1**	Replace the O-ring (1) in the body hole intended for the position indicator with a new, greased O-ring.
	**2**	Insert the inner pin, including the spring (1), back into the hole (2) for the position indicator.
	**3**	Use an open-end wrench to install the guide pin (1) back in place.
	**4**	Place the magnetic ring (1) over the guide pin. The magnetic ring position shown in the figure to the left shows the correct installation height.

If ...	then ...
The magnetic ring is resting over the guide pin in the position shown in step 4	proceed with step 6.
The magnetic ring is NOT resting over the guide pin in the position shown in step 4, but is instead in a higher or lower position	proceed with step 5.

Figure	Step	Description
	**5**	Remove the magnetic ring from the guide pin, turn it 180°, and place it back over the guide pin.
	**6**	Place the sight glass (2) and the cover ring (1) back on the guide pin. Make sure that the magnetic ring stays in the required position.
	**7**	Install the retaining ring (1).

Next task

Proceed as follows:

Completing the maintenance (see page 141)

8.4 Maintaining the pilot

Contents

8.4.1 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.

Sample maintenance instructions

The maintenance described below uses the two-stage pilot as a reference. Refer to the spare parts lists to make sure that you replace all the maintenance parts relevant to your device model during maintenance.

Cleaning

Observe the following cleaning instructions:

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

Disassembling the pilot and maintaining the base plate

Proceed as follows:

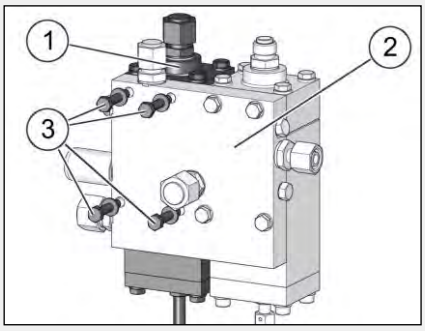
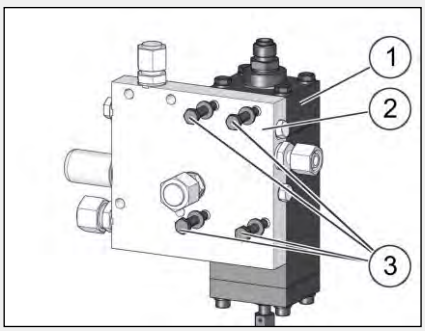
Figure	Step	Description
	**1**	Unscrew the 4 screws (3) between the control stage (1) and the base plate (2) and remove the control stage.
	**2**	Unscrew the 4 screws (3) between the load limiting stage (1) and the base plate (2) and remove the load limiting stage.

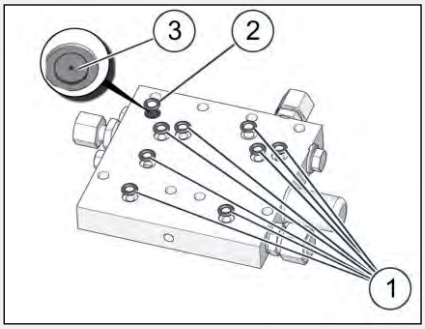
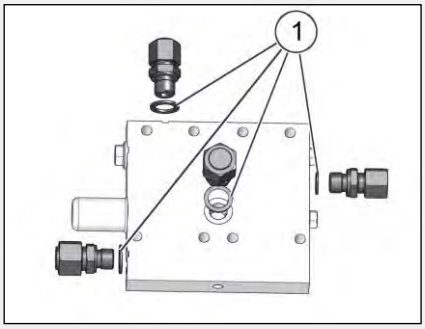
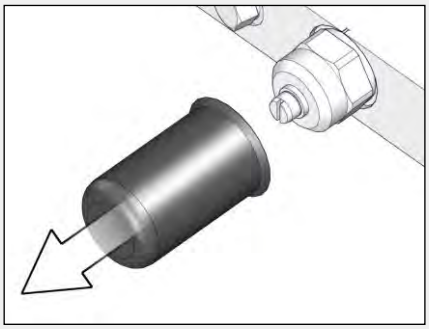
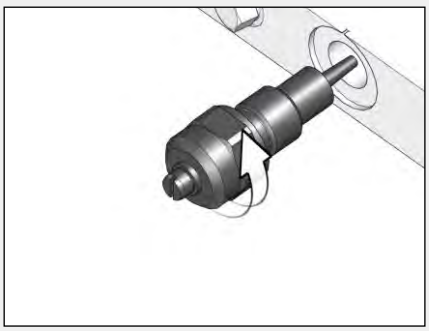
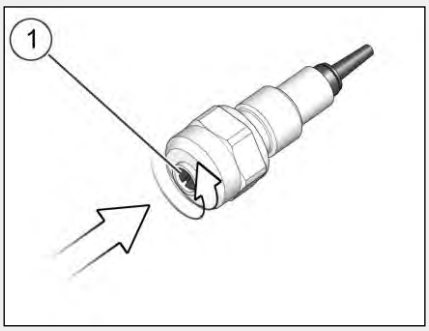
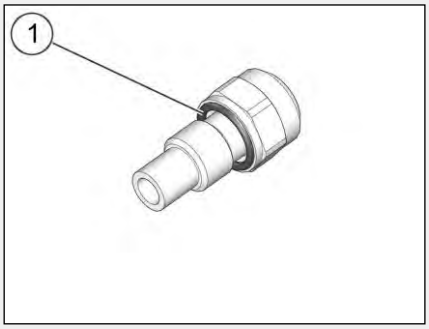
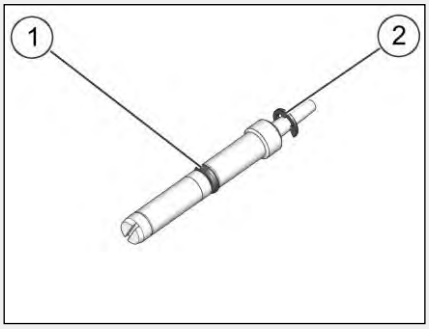
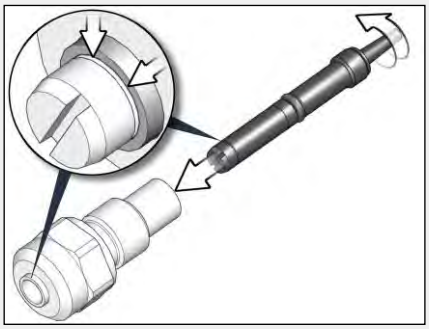
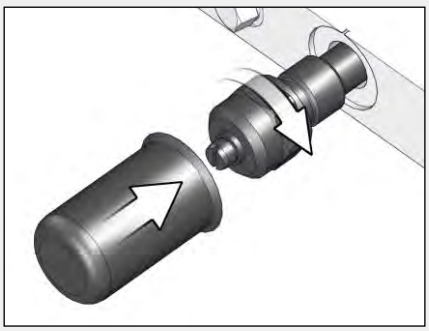
Figure	Step	Description
	**3**	Replace the 7 O-rings (1) and the O-ring (2) over the washer (3) with new, greased ones.
	**4**	Turn the base plate over. Replace the 4 sealing rings (1) with new, greased ones. Lubricate the thread surfaces before screwing the fittings back in.
	**5**	Remove the cap from the amplifying valve.
	**6**	Unscrew the amplifying valve and remove it.
	**7**	Loosen the spindle (1) and pull it out towards the back.

Figure	Step	Description
	**8**	Replace the O-ring (1) with a new, greased O-ring.
	**9**	Take the spindle. Replace the O-ring (1) and the retaining ring (2) with new, greased ones.
	**10**	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.
	**11**	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 106)

Maintaining the control stage with a larger diaphragm assembly (see page 114)

Maintaining the control stage with a metal bellows assembly (see page 125)

8.4.2 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 fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

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

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

Maintaining the control stage

Proceed as follows:

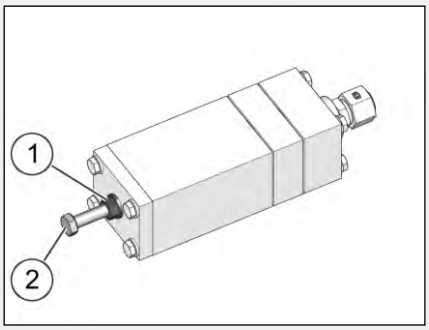
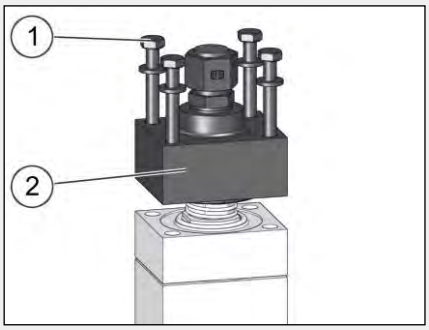
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Loosen the screws (1) and lift off the upper cover (2).

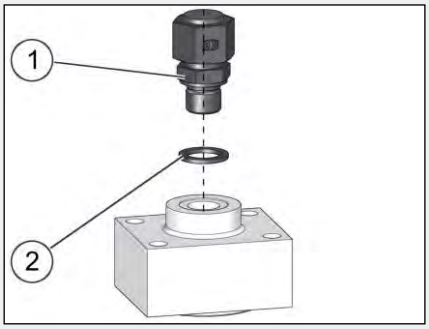
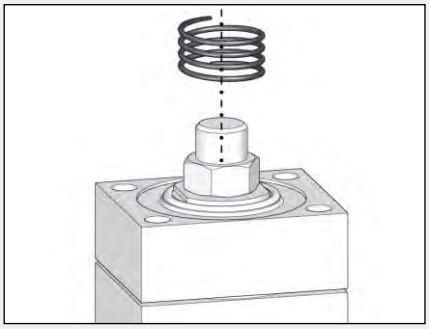
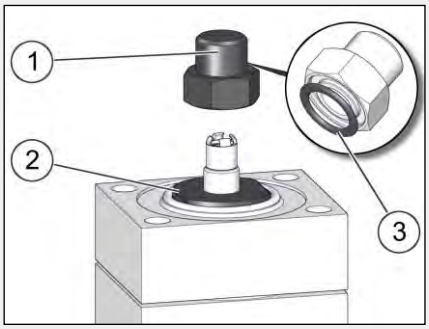
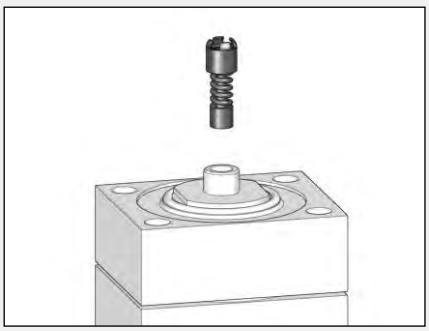
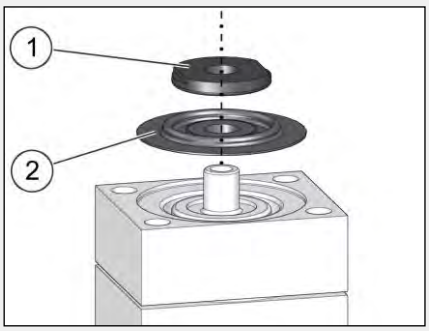
Figure	Step	Description
	**3**	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2) with a new, greased sealing ring. Lubricate the thread surfaces. Screw the fitting (1) back in.
	**4**	Remove the spring from the cap.
	**5**	Unscrew the cap (1) while using an open-end wrench to hold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

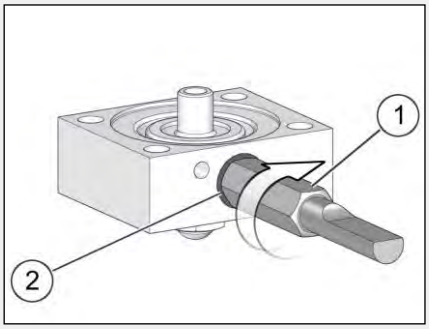
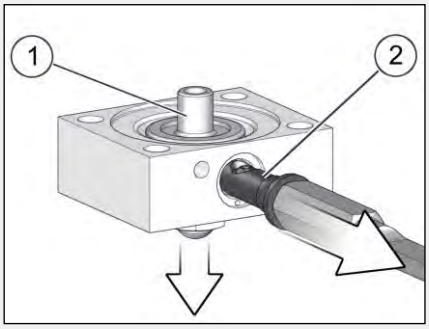
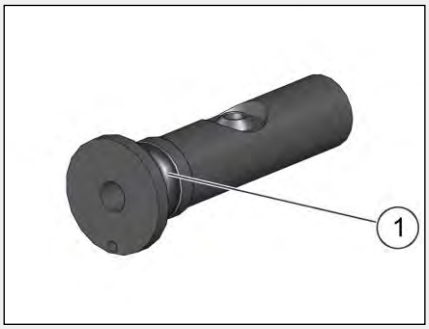
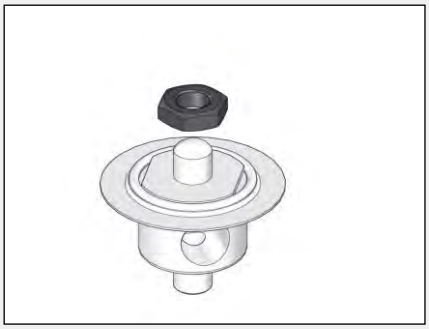
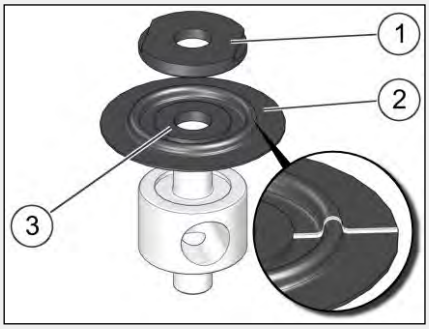
Figure	Step	Description
	**8**	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	**9**	Hold on to the connecting piece (1) and pull out the valve insert (2). Remove the connecting piece.
	**10**	Replace the valve insert with a new one. Insert a new,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

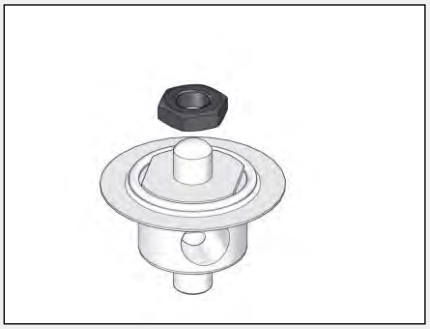
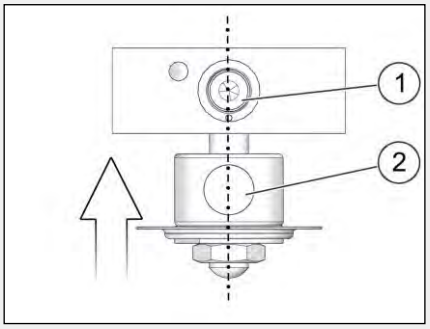
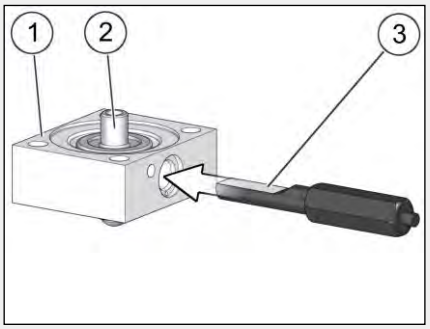
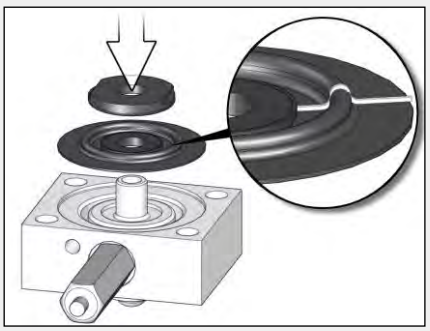
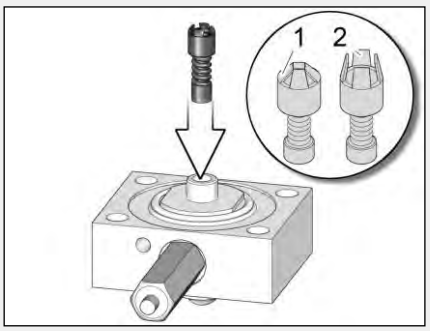
Figure	Step	Description
	**13**	Lightly coat the thread surfaces with threadlocker. Screw the hex nut back onto the connecting piece. Observe the tightening torque information provided in the table before this section.
	**14**	Insert the connecting piece into the valve body. Make sure that the holes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

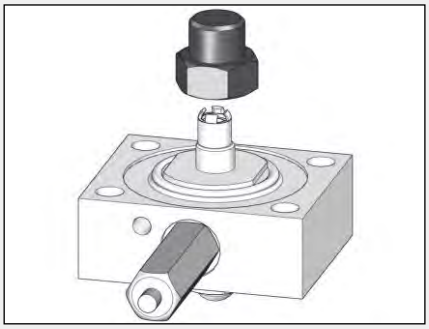
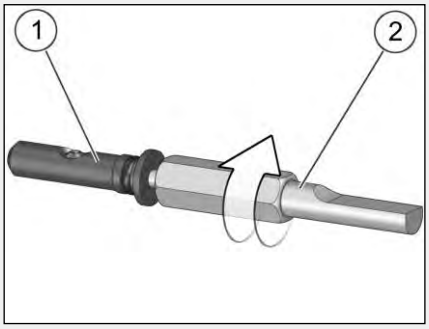
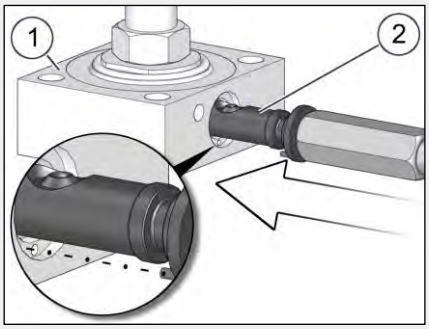
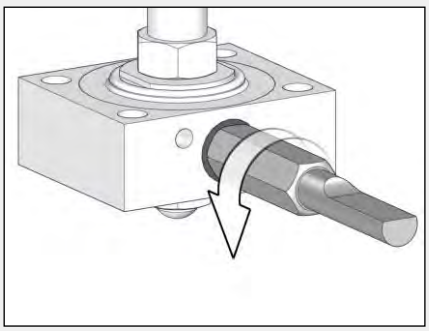
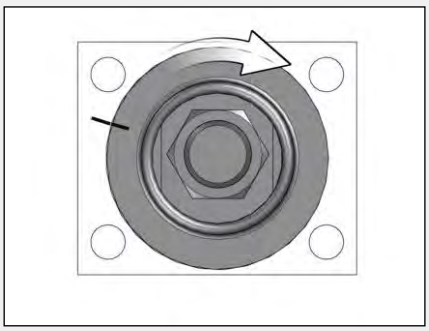
Figure	Step	Description
	**18**	Lightly coat the thread surfaces with threadlocker. Put the cap in place. Tighten the cap while using an open-end wrench to hold the diaphragm plate in place so as to prevent the components from turning. Observe the tightening torque information provided in the table before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

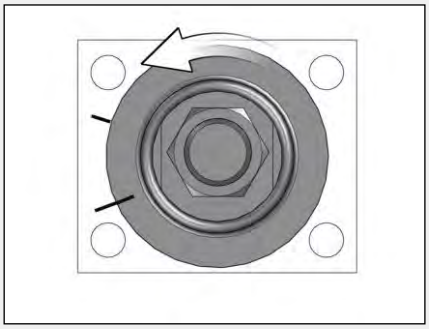
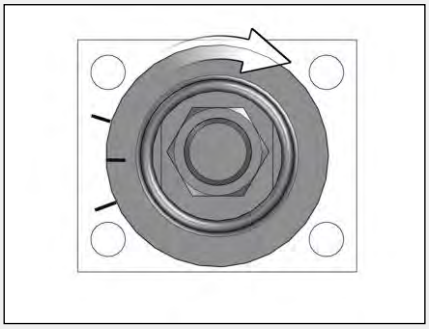
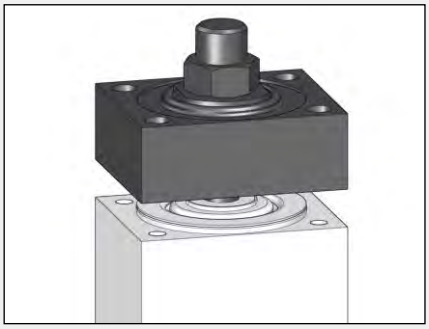
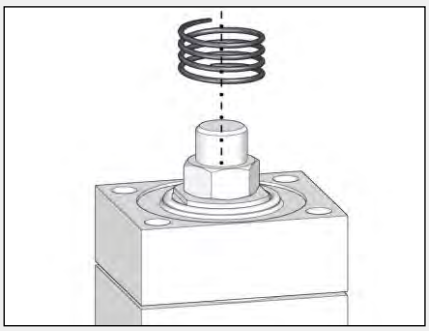
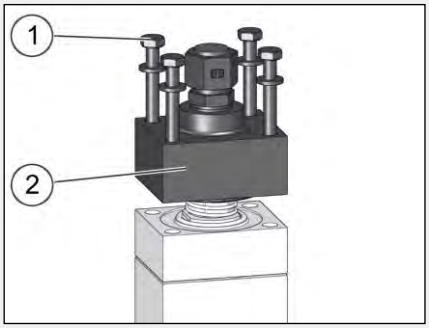
Figure	Step	Description
	**23**	Use the cap to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	**24**	Use the cap to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings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

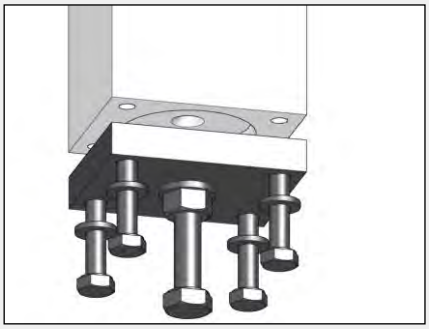
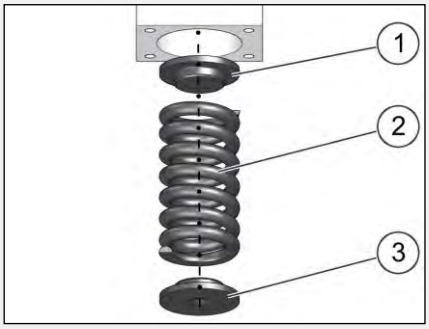
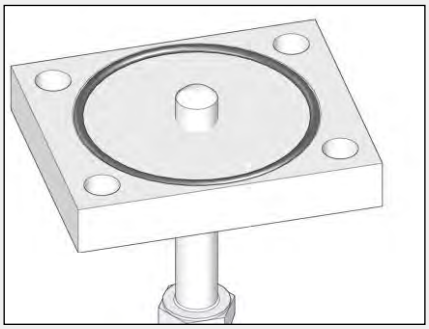
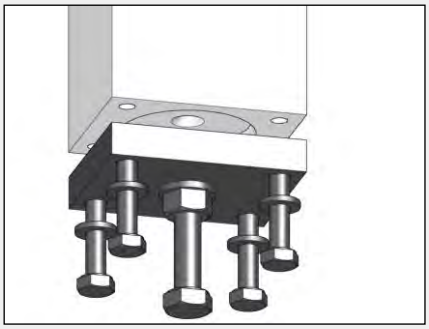
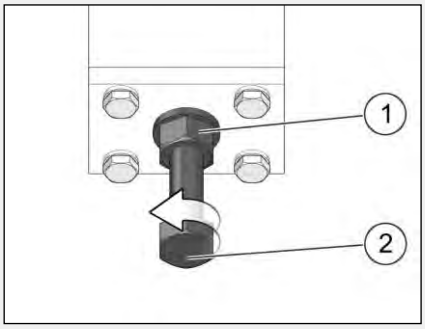
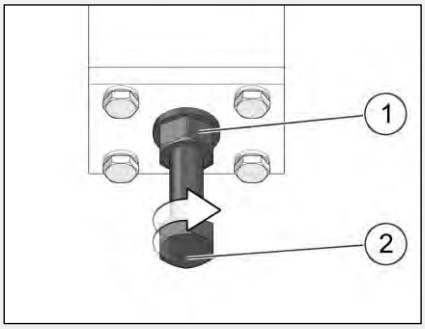
Figure	Step	Description
	**28**	Loosen the base plate screws and remove the base plate. **Important!** While removing the base plate, parts on the inside may fall out from the spring housing by accident!
	**29**	Remove the lower spring plate (3), the compression spring (2), and the upper spring plate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

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

Next task

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

For the multi-stage pilot version: *Maintaining the load limiting stage* (see page 134)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 137)

8.4.3 Maintaining the control stage with a larger diaphragm assembly

Falling components

⚠CAUTION

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

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

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

Cleaning

Observe the following cleaning instructions:

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

Tightening torques

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

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

Maintaining the control stage

Proceed as follows:

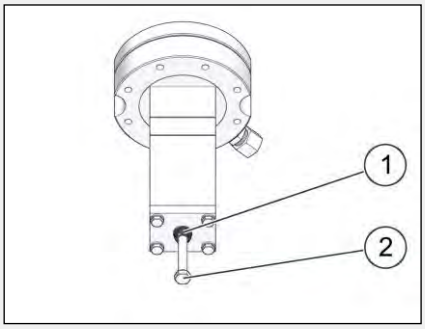
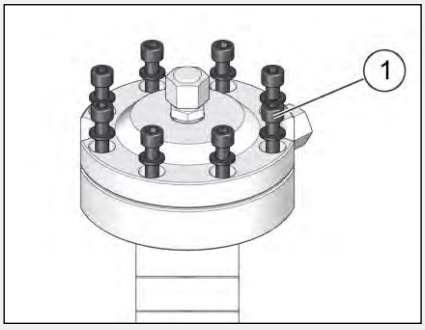
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Unscrew the diaphragm cover's screws (1).

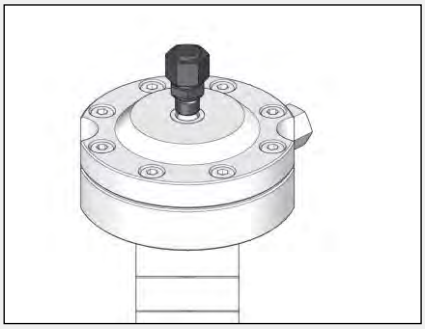
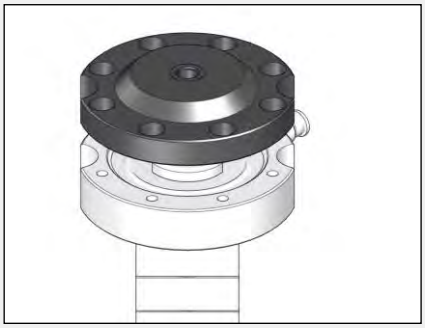
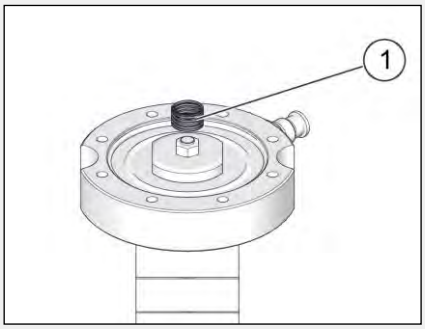
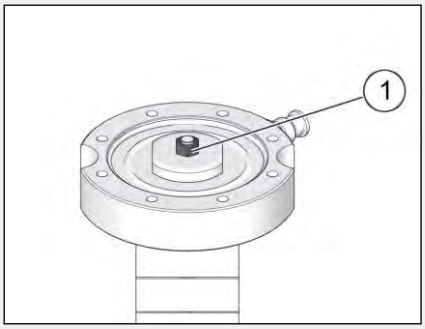
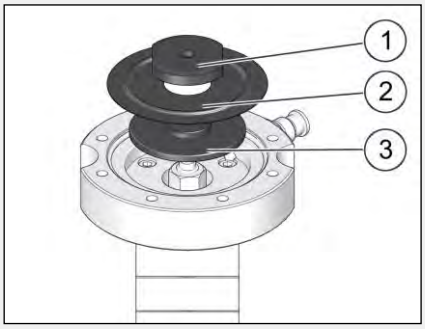
Figure	Step	Description
	**3**	Unscrew the screw-in fitting.
	**4**	Remove the diaphragm cover.
	**5**	Remove the spring (1) from the hex nut.
	**6**	Unscrew the hex nut (1) while using an open-end wrench to hold the pressure piece (2) in place so as to prevent the components from turning.
	**7**	Remove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

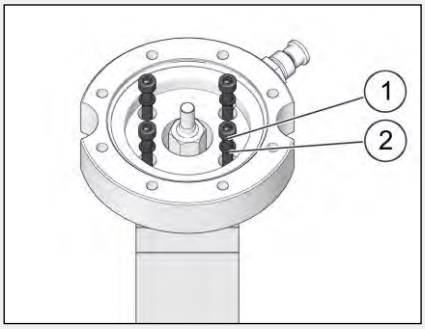
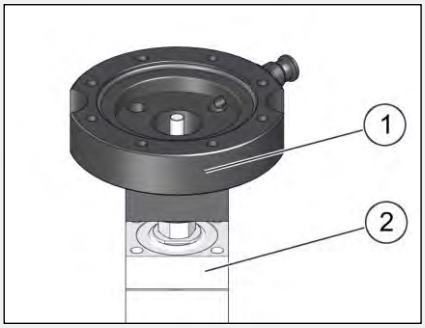
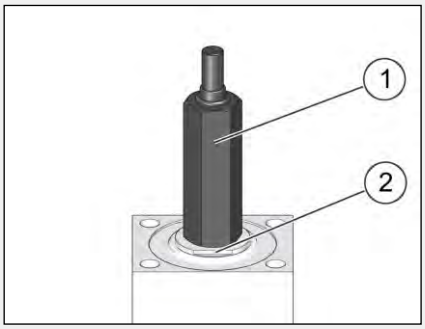
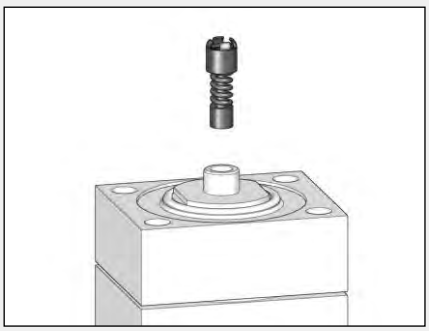
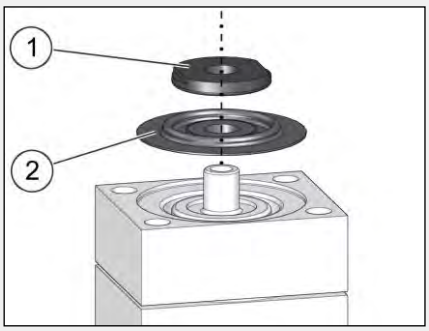
Figure	Step	Description
	**8**	Unscrew the diaphragm housing's screws (1). Remove the screws and the bonded seals (2).
	**9**	Hold the valve body (2) in place and lift the diaphragm housing off (1).
	**10**	Unscrew the upper connecting piece (1) while using an open-end wrench to hold the diaphragm plate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

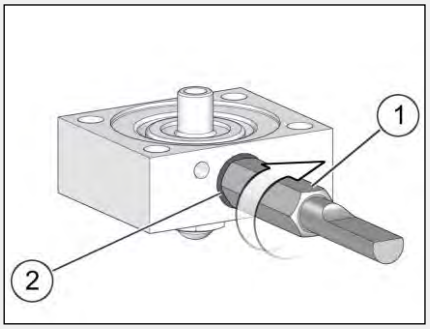
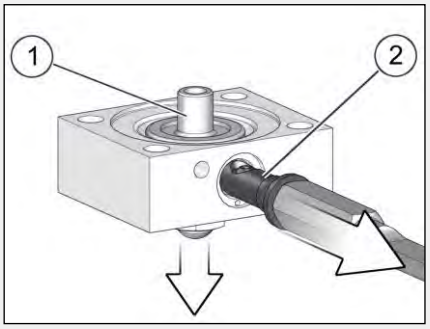
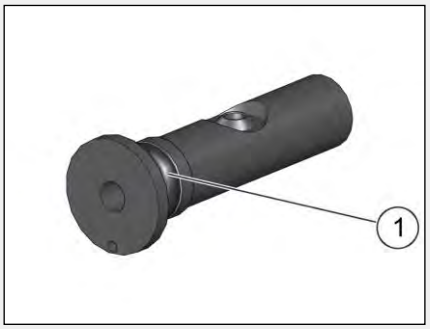
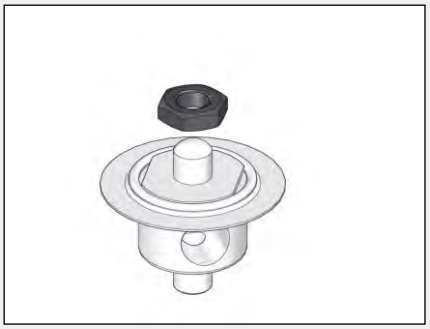
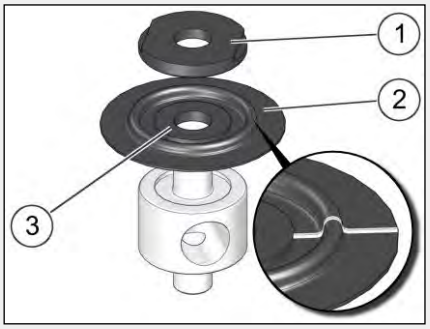
Figure	Step	Description
	**13**	Remove the valve body from the spring housing. Screw the assembly aid (1) into the valve insert (2).
	**14**	Hold on to the connecting piece (1) and pull out the valve insert (2). Remove the connecting piece.
	**15**	Replace the valve insert with a new one. Insert a new,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

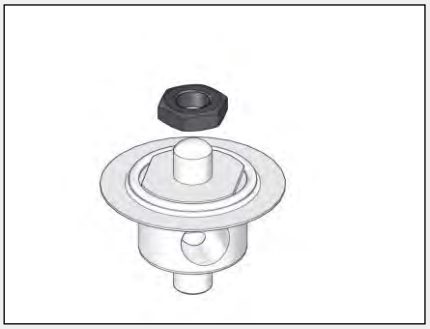
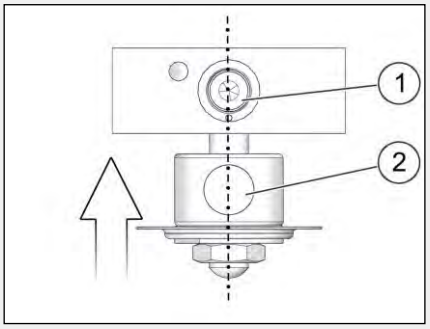
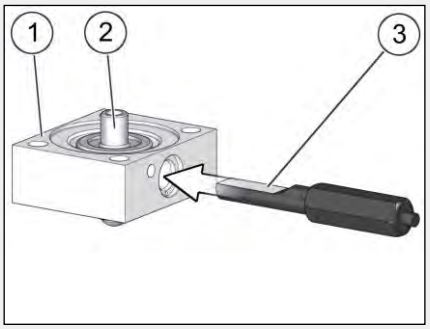
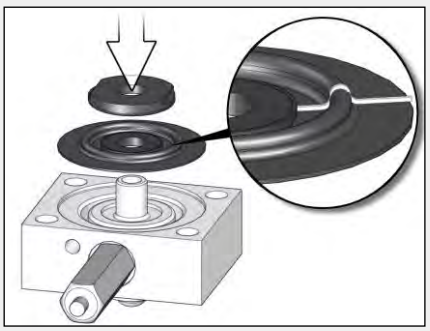
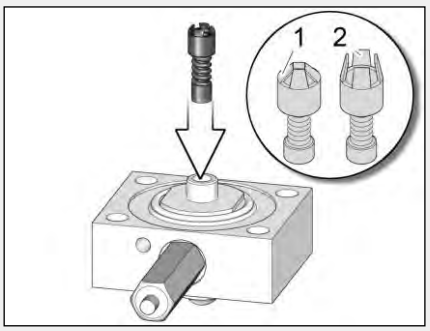
Figure	Step	Description
	**18**	Lightly coat the thread surfaces with threadlocker. Screw the hex nut back onto the connecting piece. Observe the tightening torque information provided in the table before this section.
	**19**	Insert the connecting piece into the valve body. Make sure that the holes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

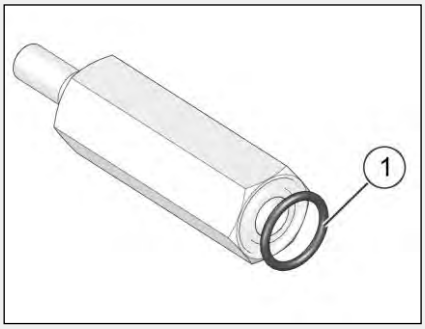
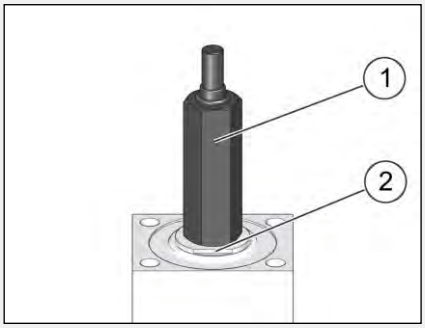
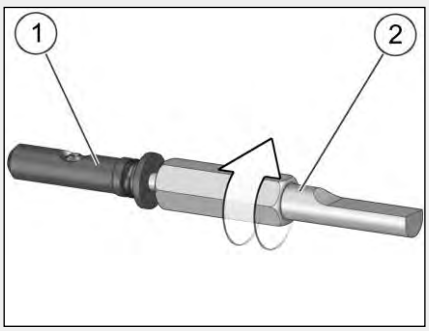
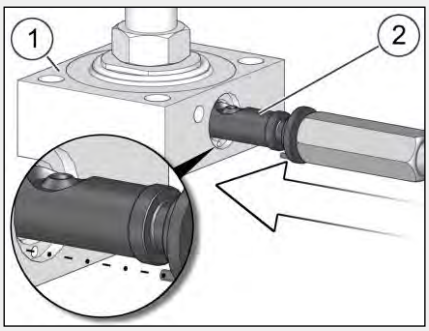
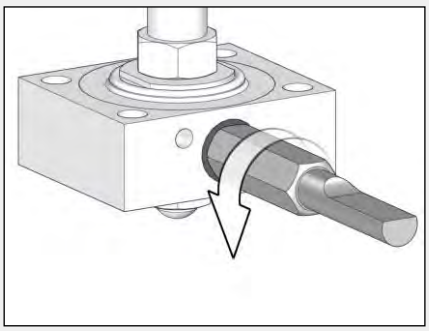
Figure	Step	Description
	**23**	Take the upper connecting piece. Replace the O-ring (1) with a new, greased O-ring.
	**24**	Lightly coat the thread surfaces with threadlocker. Screw the connecting piece (1) back in place while using an open-end wrench to hold the diaphragm plate (2) in place so as to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

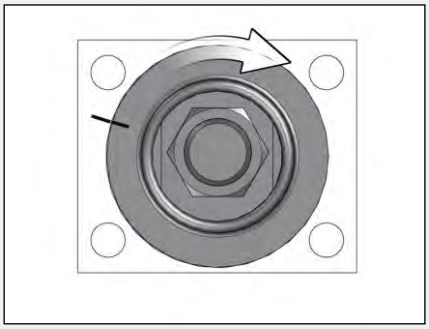
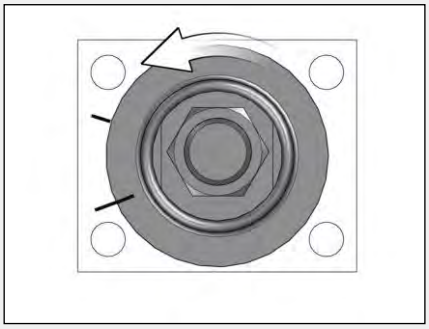
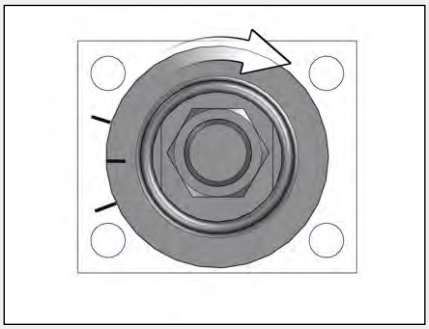
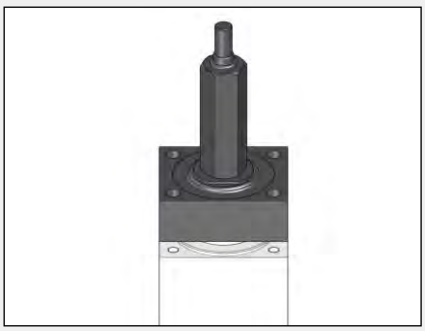
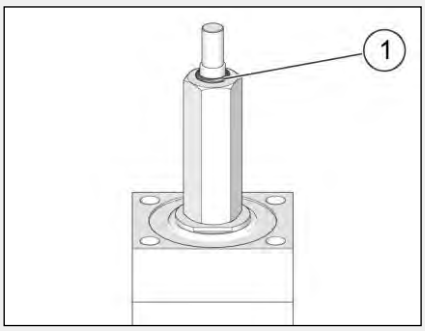
Figure	Step	Description
	**28**	To align the cross hole of the lower connecting piece correctly with the valve insert: Use the upper connecting piece to turn the diaphragm by hand clockwise until it will not rotate any further. Use a marker or pen to mark the position on the body and on the convoluted diaphragm.
	**29**	Use the upper connecting piece to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	**30**	Use the upper connecting piece to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings on the body.
	**31**	Place the valve body on the spring housing.
	**32**	Replace the O-ring (1) with a new, greased O-ring.

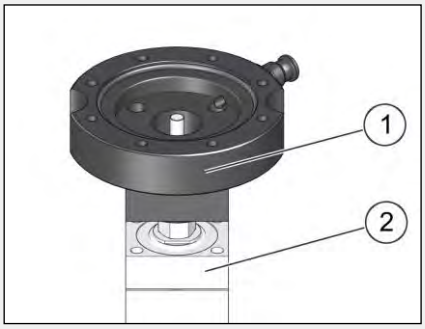
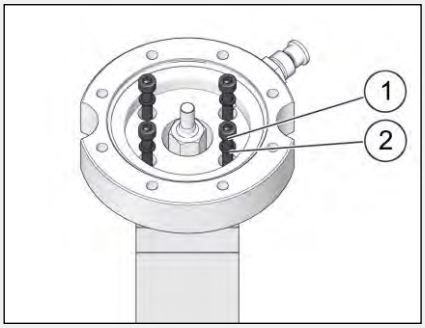
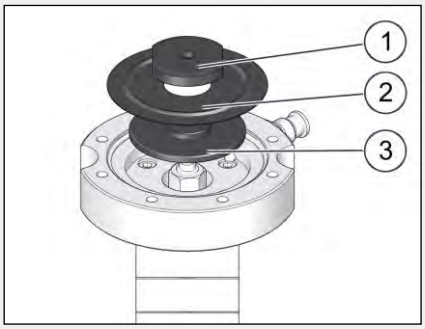
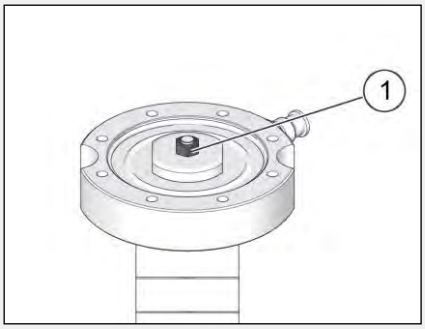
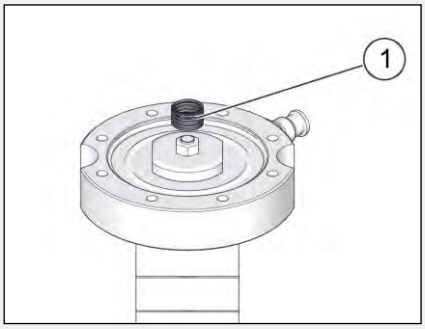
Figure	Step	Description
	**33**	Hold the valve body (2) in place and put the diaphragm housing (1) back in place.
	**34**	Replace the bonded seals (2) with new ones. Lubricate the thread surfaces. Tighten the diaphragm housing's screws (1) in a criss-cross sequence. Observe the tightening torque information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

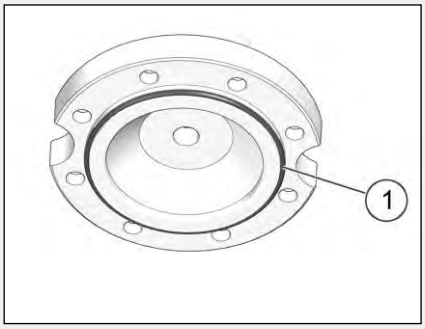
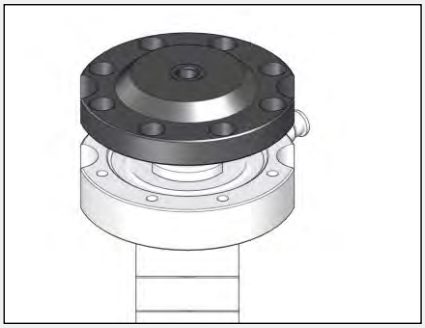
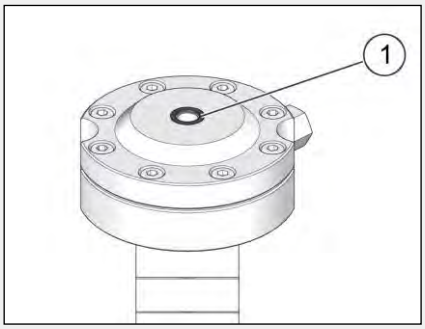
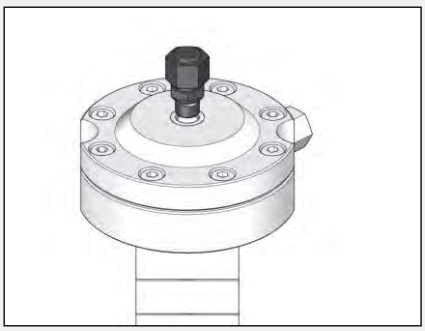
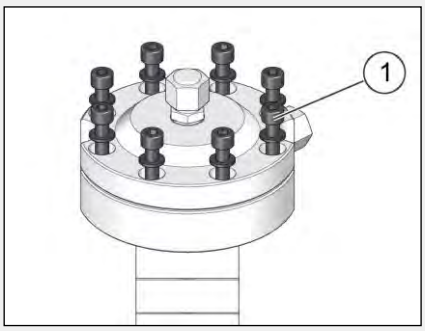
Figure	Step	Description
	**38**	Take the diaphragm cover. Replace the O-ring (1) with a new, greased O-ring.
	**39**	Put the diaphragm cover back in place.
	**40**	Replace the O-ring (1) with a new, greased O-ring.
	**41**	Lubricate the thread surfaces. Screw the screw-in fitting back in.
	**42**	Lubricate the thread surfaces. Tighten the screws (1) in a criss-cross sequence. Observe the tightening torque information provided in the table before this section.

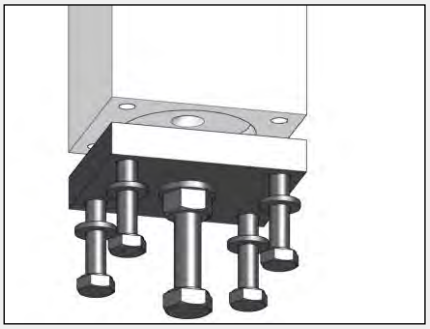
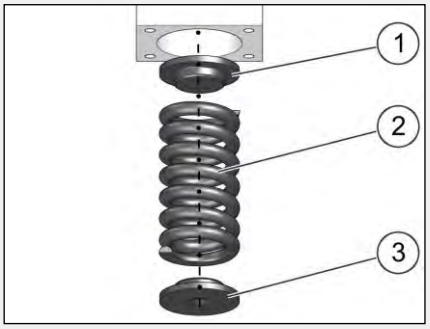
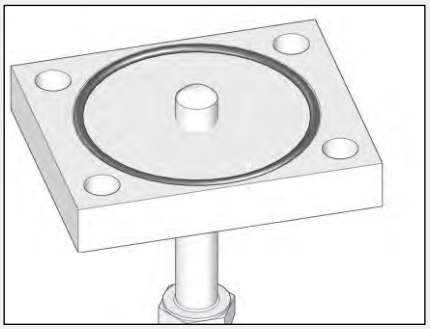
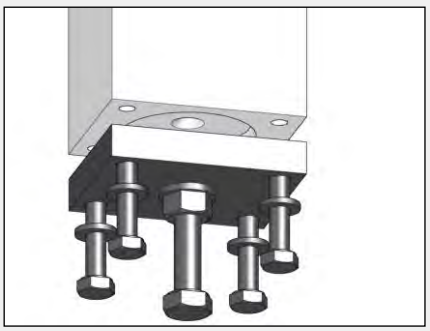
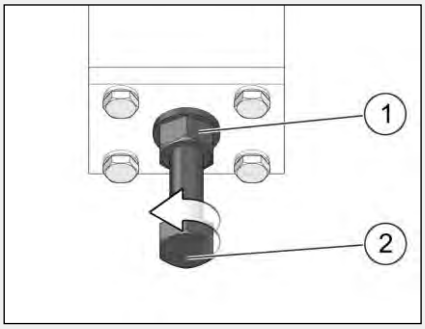
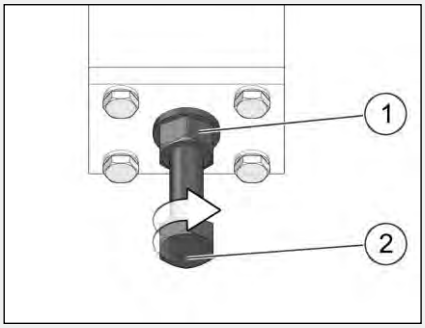
Figure	Step	Description
	**43**	Loosen the base plate screws. Remove the base plate. **Important!** While removing the base plate, parts on the inside may fall out from the spring housing by accident!
	**44**	Remove the lower spring plate (3), the compression spring (2), and the upper spring plate (1)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

Figure	Step	Description
	**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 134)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 137)

8.4.4 Maintaining the control stage with a metal bellows assembly

Falling components

⚠CAUTION

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

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

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

Cleaning

Observe the following cleaning instructions:

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

Tightening torques

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

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

Maintaining the control stage

Proceed as follows:

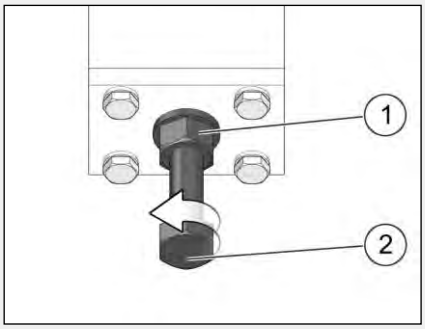
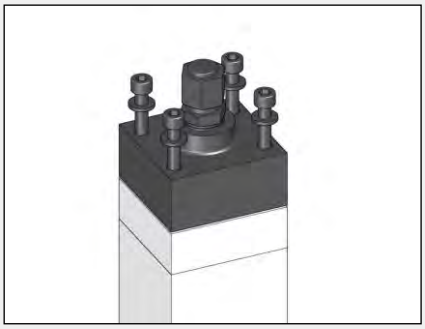
Figure	Step	Description
	**1**	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	**2**	Loosen the screws and lift off the upper cover.

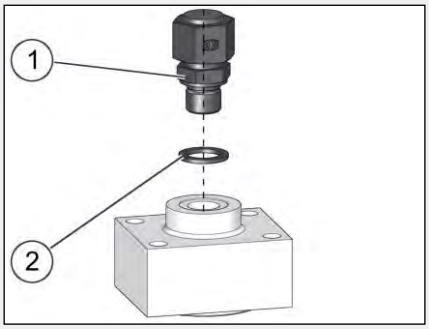
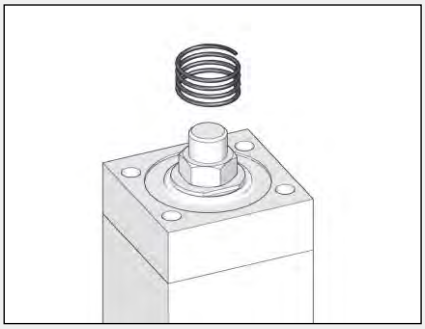
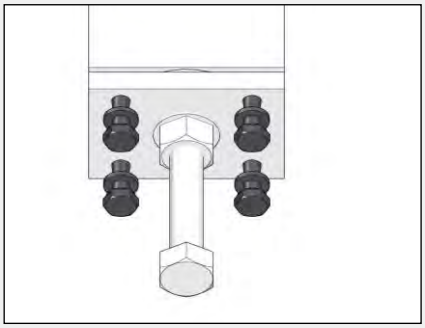
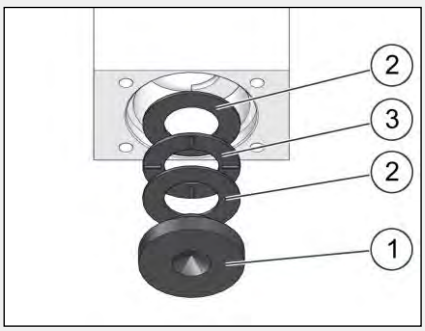
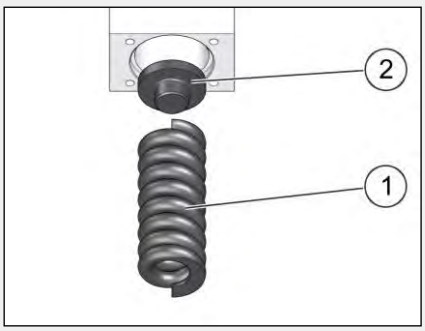
Figure	Step	Description
	**3**	Unscrew the fitting (1) on the upper cover. Replace the sealing ring (2) with a new, greased sealing ring. Lubricate the thread surfaces. Screw the fitting (1) back in.
	**4**	Remove the spring from the cap.
	**5**	Loosen the screws and slowly and carefully remove the lower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

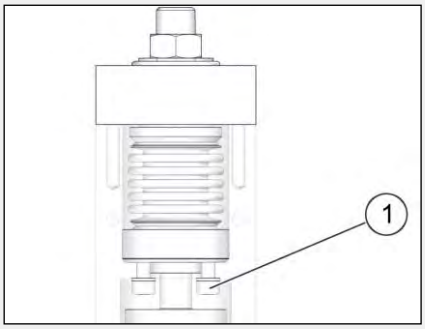
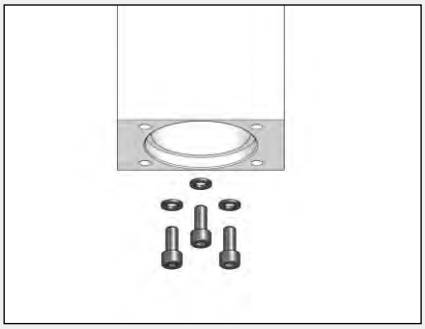
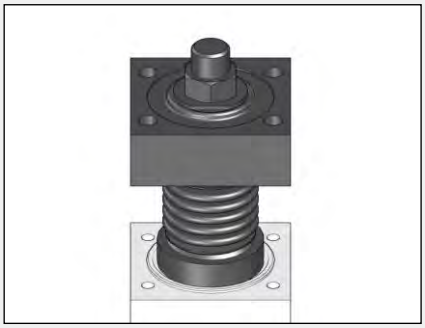
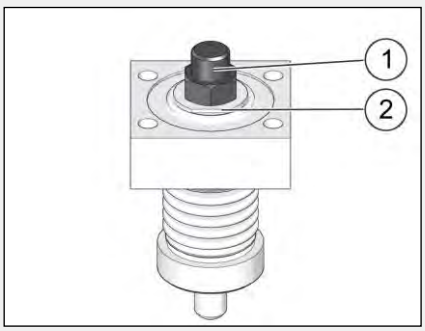
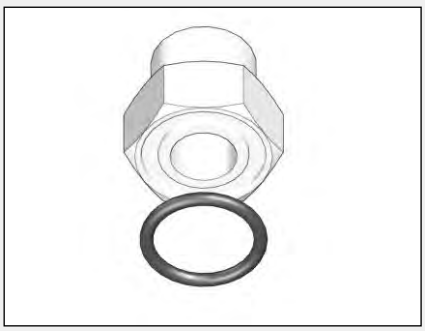
Figure	Step	Description
	**8**	Unscrew the metal bellows' internal screws (1) from the lower section of the spring housing.
	**9**	Remove the screws and the corresponding washers from the lower section of the spring housing.
	**10**	Pull the valve body, including the metal bellows, upwards in order to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

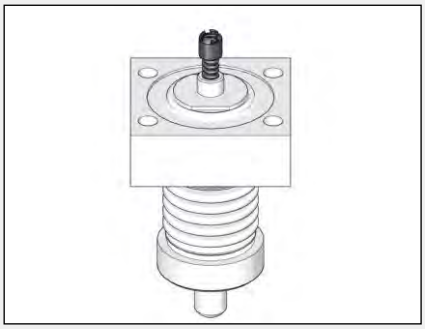
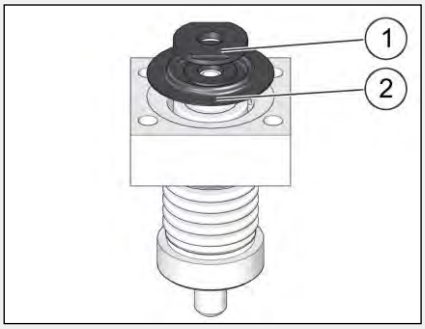
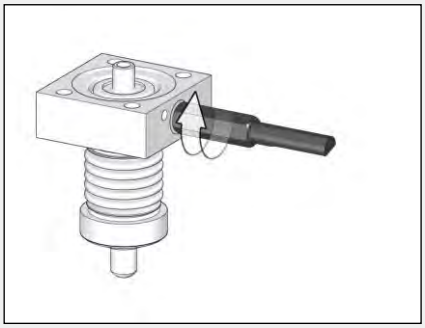
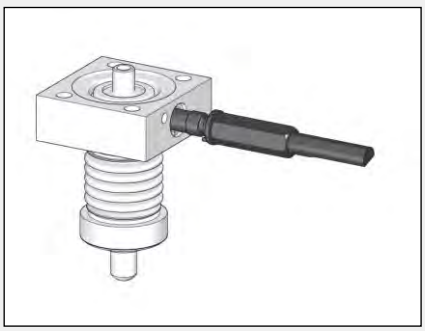
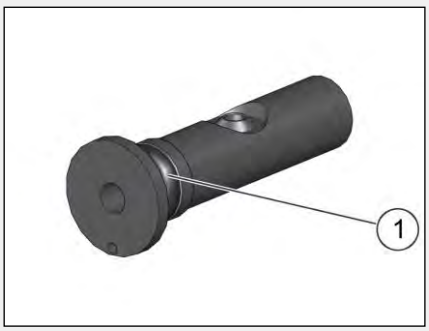
Figure	Step	Description
	**13**	Remove the pistons from the connecting piece.
	**14**	Remove the diaphragm plate (1) and the diaphragm (2).
	**15**	Screw the assembly aid into the valve insert.
	**16**	Pull out the valve insert.
	**17**	Replace the valve insert with a new one. Insert a new, greased O-ring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

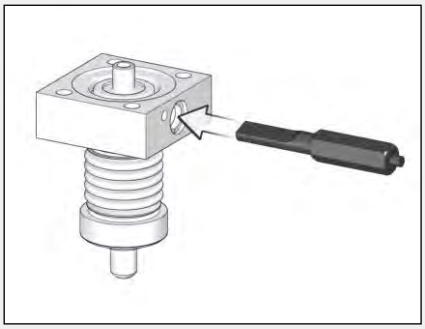
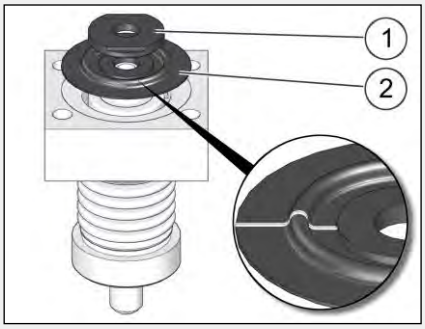
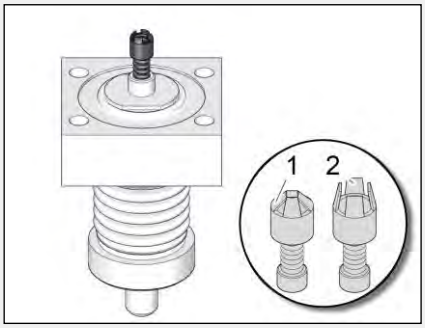
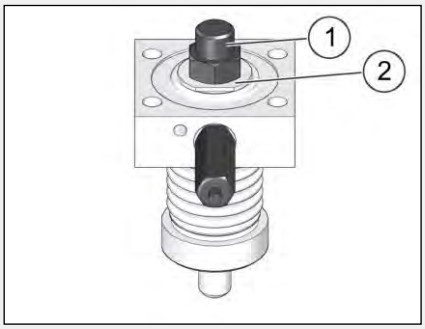
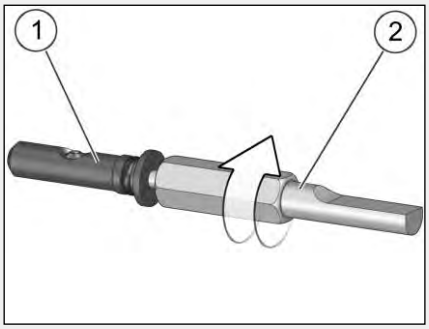
Figure	Step	Description
	**18**	Align the valve body as shown. Insert the assembly aid, with the milled surface facing upward towards the piston opening, into the valve body.
	**19**	Replace the diaphragm (2) and the stem seal with new ones. Install the diaphragm, including the stem seal and the diaphragm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

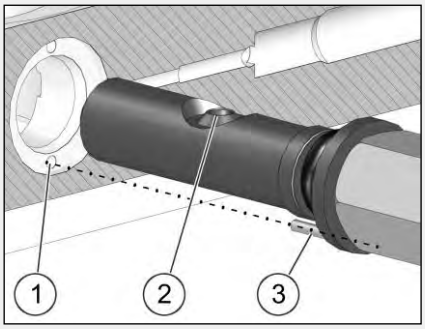
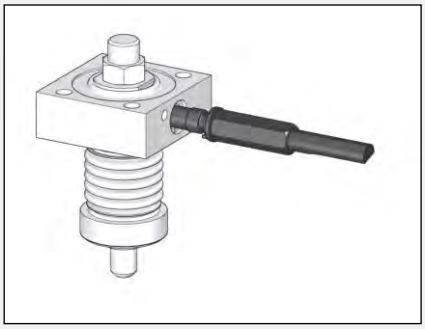
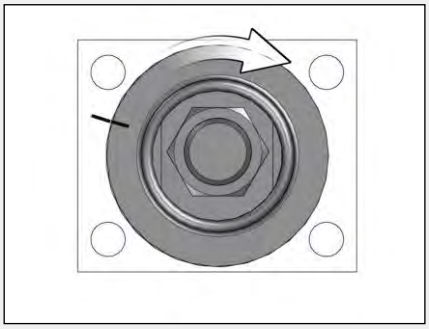
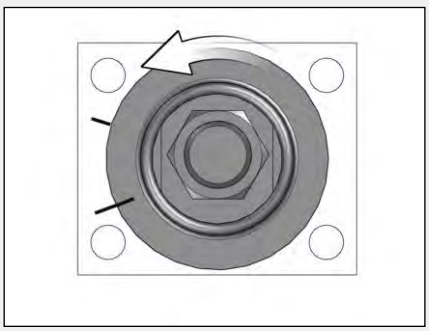
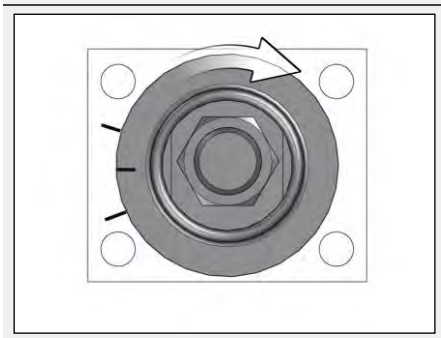
Figure	Step	Description
	**23**	Align the valve body as shown in figure 24. Turn the valve insert in such a way that, as shown in the sectional view, the dowel pin (3) is coaxially aligned with the lower hole (1) and the nozzle opening (2) is facing upward.
	**24**	Insert the valve insert all the way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

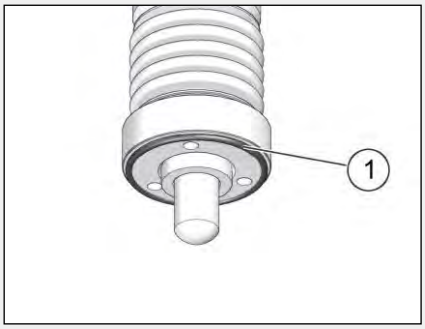
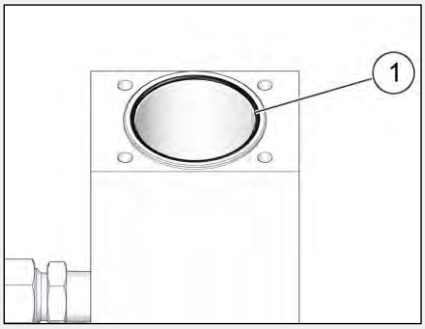
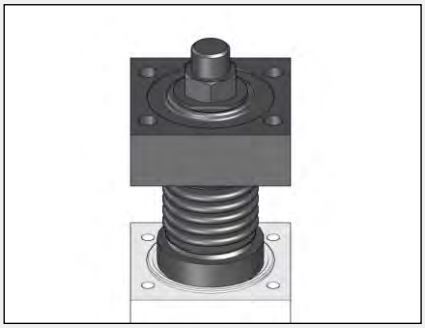
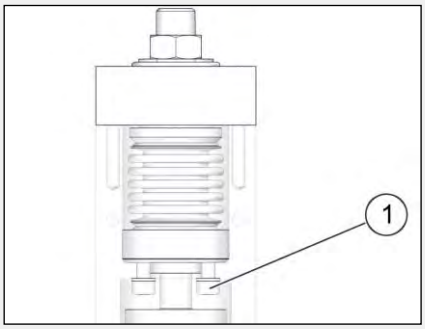
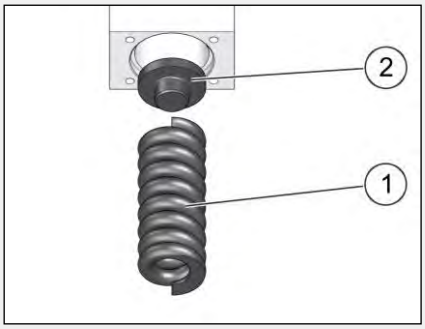
Figure	Step	Description
	**28**	Replace the O-ring (1) with a new, greased O-ring.
	**29**	Take the spring housing. Replace the O-ring (1) at the top of the spring housing with a new, greased O-ring.
	**30**	Insert the unit consisting of the valve body and the metal bellows back into the spring housing.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

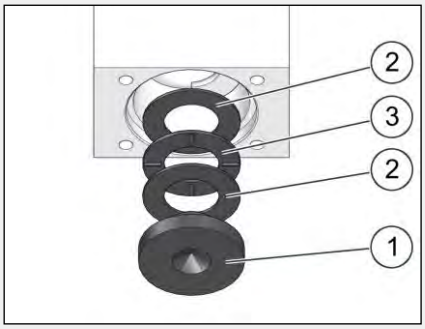
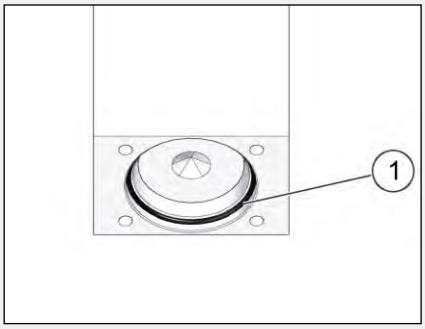
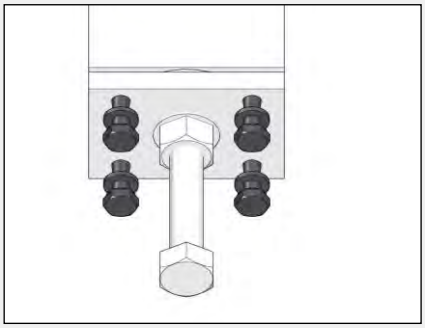
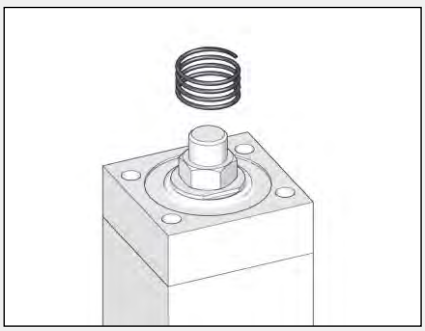
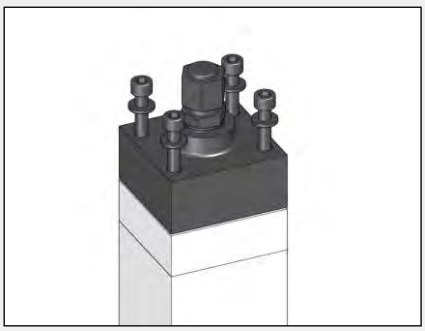
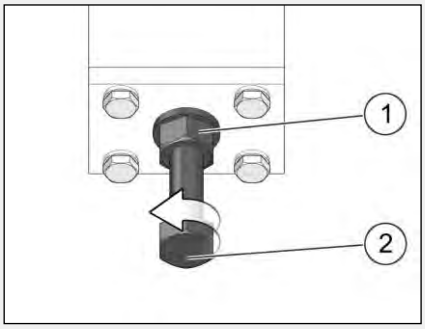
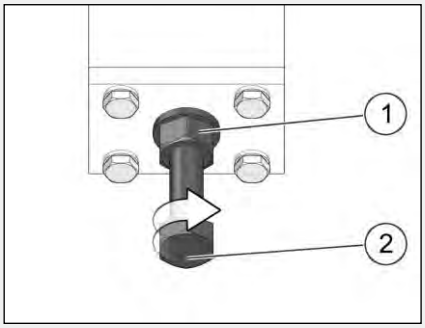
Figure	Step	Description
	**33**	Lubricate the lower spring plate's depressions (1). Reinsert the axial needle roller bearing (3), the axial washers (2), and the lower spring plate (1) into the spring housing from the bottom in the right order and alignment.
	**34**	Replace the O-ring (1) at the bottom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

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

Next task

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

For the multi-stage pilot version: *Maintaining the load limiting stage* (see page 134)

For the single-stage pilot version: *Maintaining the fine mesh filter* (see page 137)

8.4.5 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 fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

When tightening fasteners, observe the following tightening torques:

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

Maintaining the load limiting stage

Proceed as follows:

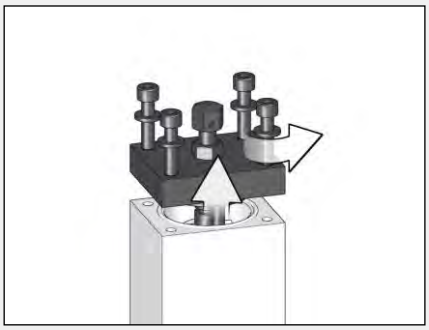
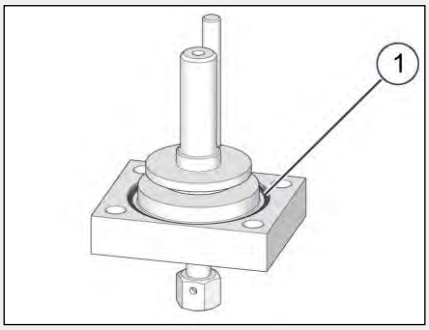
Figure	Step	Description
	1 - 27	Same as in *Maintaining the control stage with a diaphragm assembly* (see page 106)
	**28**	Turn the load limiting stage. Unscrew the socket cap screws and washers on the base plate
	**29**	Remove the base plate. Replace the O-ring (1) with a new, greased O-ring.

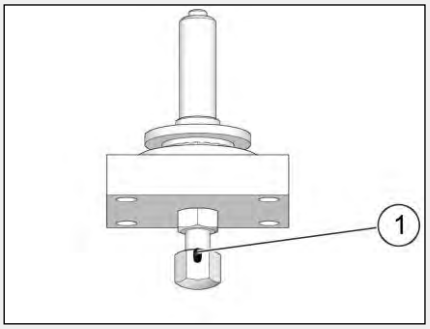
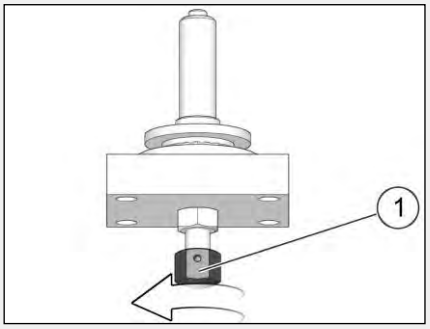
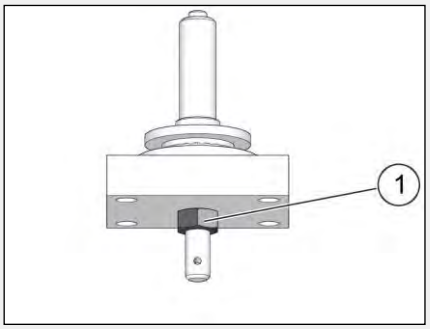
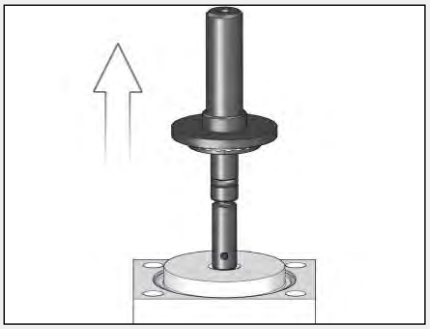
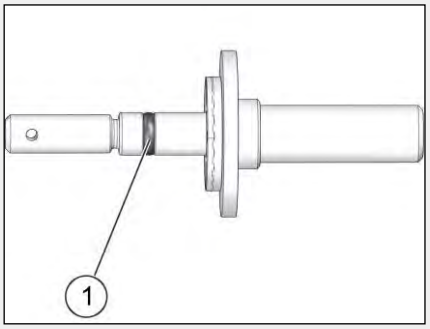
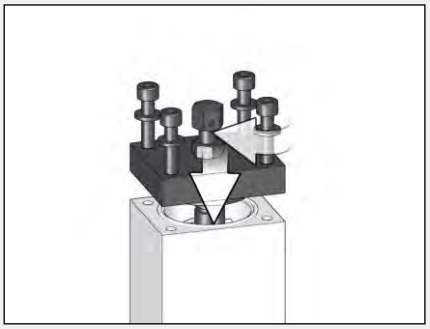
Figure	Step	Description
	**30**	Remove the cotter pin (1) from the cap nut.
	**31**	Unscrew the cap nut (1).
	**32**	Unscrew the nut (1).
	**33**	Remove the spring adjuster from the base plate.
	**34**	Replace the O-ring (1) with a new, greased O-ring.

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

Next task

Proceed as follows:

Maintaining the fine mesh filter (see page 137)

8.4.6 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 fasteners (screws, washers, etc.) are replaced with identical new parts, any oil on these new parts must first be removed.

Tightening torques

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

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

Maintaining the filter

Proceed as follows:

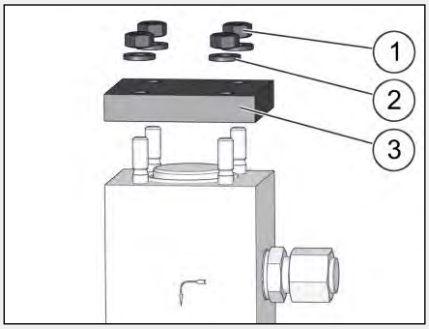
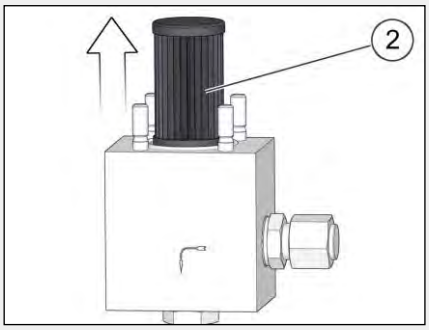
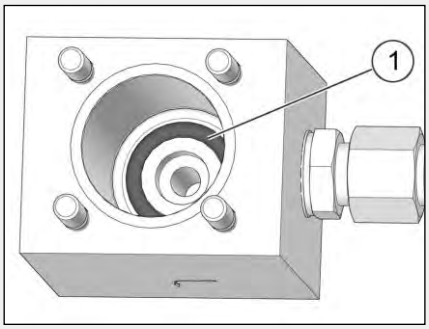
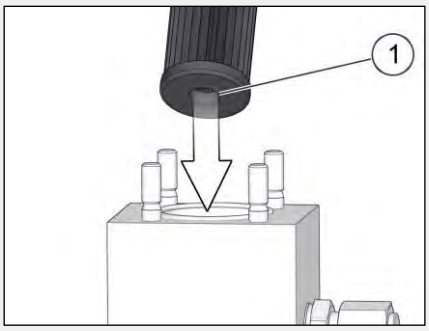
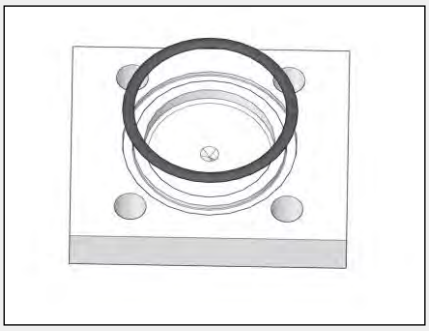
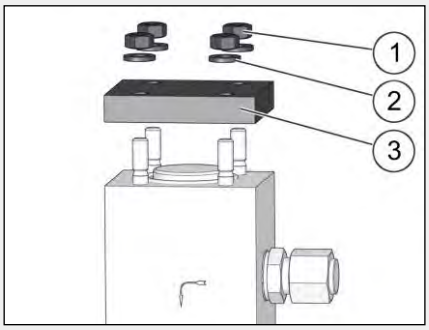
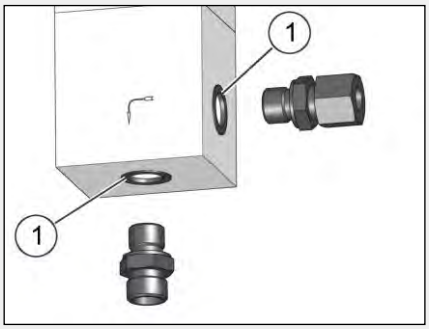
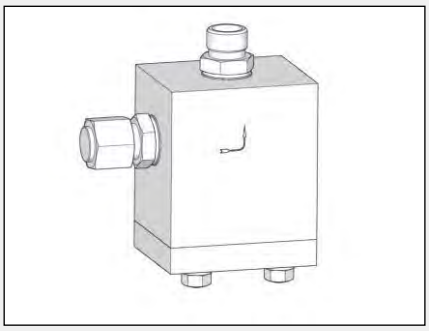
Figure	Step	Description
	**1**	Unscrew the nuts (1) and washers (2). Remove the base plate (3) from the body.
	**2**	Remove the filter insert (1) and clean it.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	**4**	Replace the O-ring (1) in the body with a new, greased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

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

Next task

Proceed as follows:

Reassembling the pilot (see page 139)

8.4.7 eassembling the pilot

Falling components

⚠CAUTION

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

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

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

Cleaning

Observe the following cleaning instructions:

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

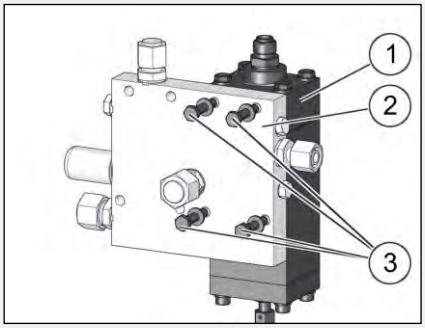
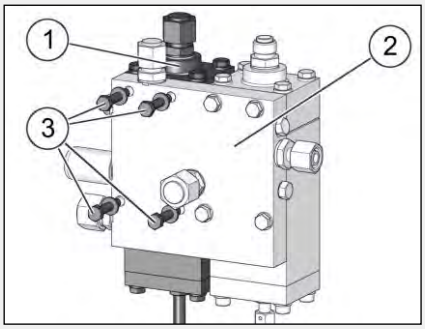
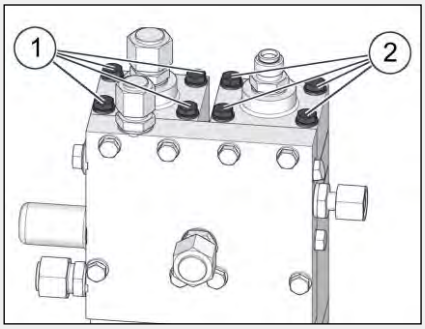
Tightening torques for assembling the pilot

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

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.
	**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 141)

8.5 Completing the maintenance

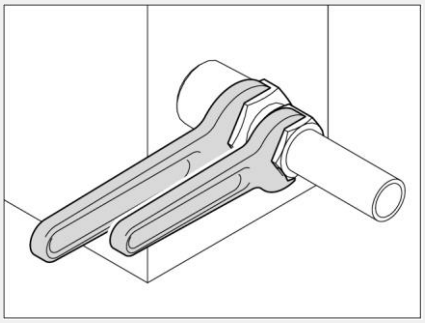
Have the materials for installing the operating lines ready

Prepare the following materials in order to install the operating lines between the pilot and the actuator assembly:

- Pipes, connecting pieces, and fittings as per the specifications in the *Technical specifications* (see page 22)

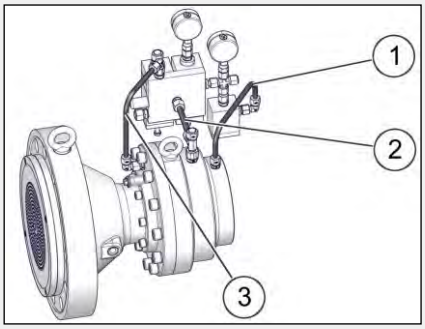
Protecting the pipe connections from being twisted

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 the operating lines between the pilot and the actuator assembly

Proceed as follows:

Figure	No.	Designation, category, installation condition
	**1**	Install the inlet pressure line (1).
	2	Install the bleed line (2).
	3	Install the motorization line (3).

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.

Tools and media for internal leak test

You will require the following tools and media:

- Testing device for an internal leak test with a bubble-tight sealing unit and pressure measurements at the actuator assembly's gas inlet and gas outlet sides
- Air or inert gas as a test medium for the leak test
- Foam-generating leakage medium for the leak test

Testing the gas pressure regulator for internal leaks

Proceed as follows:

Step	Description
1	Prepare an appropriate test setup that will ensure that the gas pressure regulator can be tested for leaks with a bubble-tight sealing unit and pressure measurements at the actuator assembly's gas inlet and outlet sides.
2	Install the gas pressure regulator in the test setup. Proceed as indicated in the topics; see page 43.
3	Seal off the pilot connections that are not connected to the actuator assembly. These connections include: ▪ Port for outlet pressure sensing line ▪ Outlet pressure bleed line / return line fitting ▪ Vent line connection
4	Pressurize the gas pressure regulator from the inlet side with 1.1 times the operating pressure (MOP).
5	Apply the test medium to all detachable pipe joints and fittings on the pilot and on the actuator assembly. Also add test medium to the amplifying valve on the pilot.
6	Monitor the pressure at the gas outlet side.
7	Observe the test medium on all detachable pipe joints for several minutes.

If ...	then ...
No foam or bubbles are formed and no pressure builds up at the bubble-tight sealing unit on the gas inlet side	▪ The gas pressure regulator has no leaks. ▪ The gas pressure regulator can be installed back in the gas regulating line. ▪ Proceed with one of the next activities.
foam or bubbles are formed	▪ The gas pressure regulator has leaks. ▪ The gas pressure regulator must NOT be installed again and must NOT be put into operation. ▪ Proceed with the following steps: 8, 9 and 13.
The pressure at the bubble-tight sealing unit at the gas outlet side rises	▪ The gas pressure regulator must NOT be installed again and must NOT be put into operation. ▪ Proceed with the following steps: 8, 10, 11, 12 and 13.

Step	Description
8	Establish a depressurized status. Residual amounts of energy must be depressurized as well.
9	Seal the leaking pipe joints.
10	Disassemble the gas pressure regulator as indicated in the *Maintenance* (see page 65) section.
11	Check all spare parts to make sure they are in good condition. Replace any damaged or questionable spare parts.
12	Properly reassemble the gas pressure regulator as indicated in the *Maintenance* (see page 65) section.
13	Repeat the leak test starting with step 2.

Next task

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

- *Installing the gas pressure regulator* (see page 46)
- *Storing the gas pressure regulator* (see page 149)
- *Disposing of the gas pressure regulator* (see page 151)

9 Decommissioning, storage, renewed start-up, disposal

Contents

9.1 Preparing for disassembly

Pressurized parts

⚠WARNING

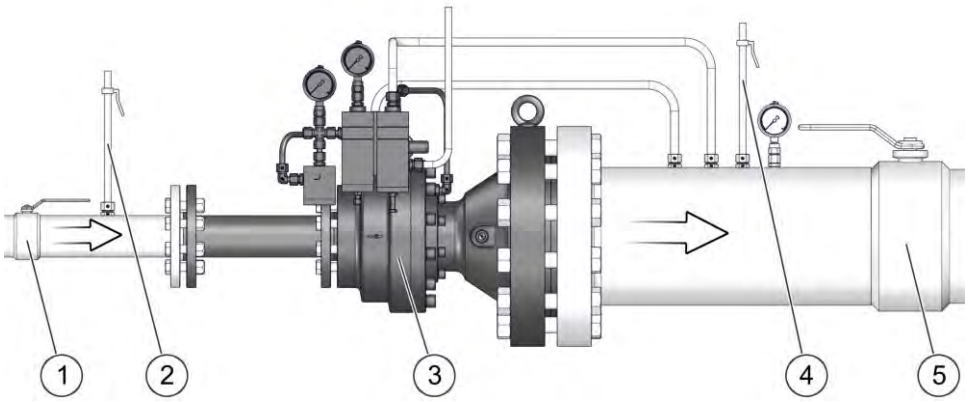
Risk of serious injury posed by pressurized components moving in an uncontrolled manner when handled improperly.

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.

Gas regulating line schematic diagram



The numbers have the following meaning:

No.	Meaning
1	Inlet stop valve armature
2	Inlet chamber blowdown line with shut-off device
3	Gas pressure regulator
4	Outlet chamber blowdown line with shut-off device
5	Outlet stop valve armature

Establishing the depressurized status

Proceed as follows:

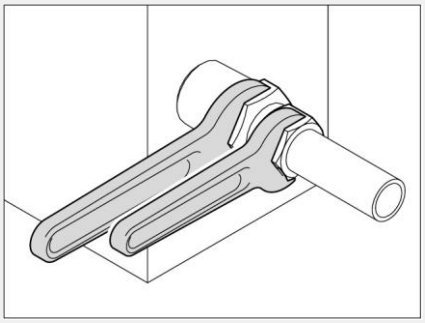
Step	Description
1	Close the outlet valve (5).
2	Close the inlet stop valve armature (1).
3	Open the shut-off device in the blowdown line (4) in order for the pressure in the outlet chamber to be relieved.
4	Open the shut-off device in the blowdown line (2) in order for the pressure in the inlet chamber to be relieved.
5	Wait a few minutes so that the pressure in the entire gas pressure regulator (3) can be relieved.

Purging the lines with nitrogen

Purge all of the gas pressure regulator's lines with nitrogen before removing the device.

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.

9.2 Disassembling the device

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.

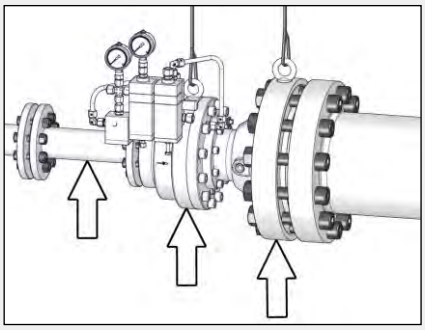
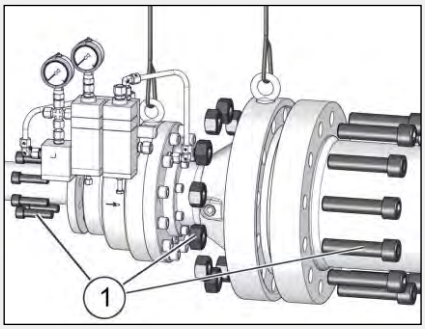
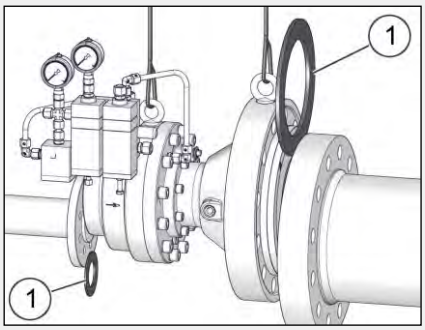
Requirements

Make sure that the following requirements are met:

- The inlet and outlet shut-off devices for the gas regulating line section are closed.
- The system is depressurized between the inlet shut-off device and the outlet shut-off device.
- All the gas pressure regulator's lines have been purged with nitrogen.
- The gas pressure regulator's electrical connections (electrical displacement transducer, optional) are de-energized and locked and tagged out.

Disassembling the device

Proceed as follows:

Figure	Step	Description
	1	▪ Stabilize the gas pressure regulator in its installation position without using the fittings to do so. ▪ Hook the slings into all the eye bolts intended to function as attachment points for transportation.
	2	Remove all connection lines between the pilot and the gas regulating line, as well as the pilot's vent line.
	3	If there is one, disconnect the electrical connection for the electrical displacement transducer.
	4	Unscrew the threaded joints (1) on the connection flange. Make sure to follow a criss-cross sequence when doing so.
	5	Remove the device from the regulating line and remove the flange gaskets (1).
	6	Slowly and carefully transport the device.

Next task

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

- *Maintenance* (see page 65)
- *Storing the gas pressure regulator* (see page 149)
- *Disposing of the gas pressure regulator* (see page 151)

9.3 Storing the gas pressure regulator

Storage of the packing units

Observe the following rules:

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

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

Storage of spare parts

The following rules apply to the storage of spare parts:

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

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

Observe the following rules:

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

9.4 Putting the gas pressure regulator back into operation

Starting up the device again

Proceed as follows:

Step	Description
1	Check the device with regard to its maintenance condition as indicated in the *Maintenance* (see page 65) chapter.
2	Put the device back into operation as indicated in the *Transport, installation and start-up* (see page 43) chapter.

9.5 Disposing of the gas pressure regulator

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 and bills of materials in addition to maintenance and servicing parts so as to improve communications between the customer and the manufacturer, but that it is impermissible to order or replace without first contacting the manufacturer.

Maintenance and servicing parts for actuator assembly

- The spare parts always required for maintenance are marked with an “x” in the “Maint.” column in the spare parts lists for the actuator assembly.
- The required number of spare parts is indicated under the 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 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.

Overview of bills of materials

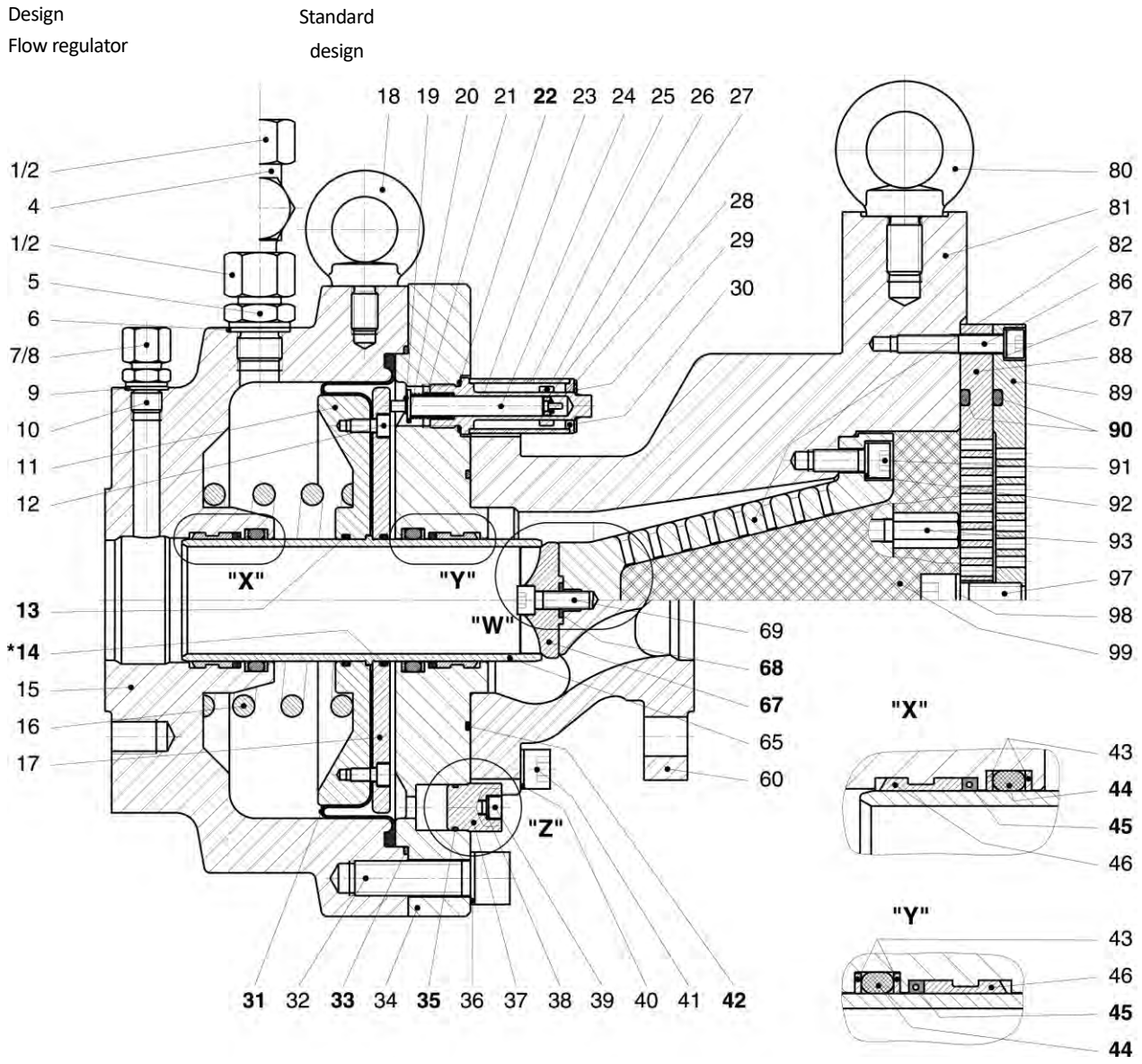
The bills of materials are subdivided as follows:

- Spare parts lists for HON 512 actuator assembly, design 1:
  - Spare parts list for HON 512 actuator assembly, design 1, nominal inlet sizes of DN 25 – DN 100
  - Additional list for version without expander
  - Additional list for version without reverse flow protection
  - Additional list for version with reverse flow protection
  - Additional list for version with expander
  - Additional list for HON 970 displacement transducer
  - Additional list for HON 970a displacement transducer
- Spare parts lists for HON 512 actuator assembly, design 2:
  - Spare parts list for HON 512 actuator assembly, design 2, DN 150 – DN 250
  - Additional list for version without expander
  - Additional list for version without expander, with reverse flow protection
  - Additional list for valve seat version with a valve disc without reverse flow protection
  - Additional list for valve seat version with a valve disc with reverse flow protection
  - Additional list for valve seat version with a perforated flow restrictor without reverse flow protection
  - Additional list for valve seat version with a perforated flow restrictor with reverse flow protection
  - Additional list for version with expander
  - Additional list for HON 970a displacement transducer
- Spare parts lists for HON 512 actuator assembly, design 3:
  - Spare parts list for HON 512 actuator assembly, design 3, DN 25 – DN 100:
  - Spare parts list for HON 512 actuator assembly, design 3, DN 150 – DN 250
  - Additional list for HON 970 displacement transducer
  - Additional list for HON 970a displacement transducer
- Spare parts lists for two-stage HON 650 pilot for the three setpoint ranges and for the version for pneumatic follow-up setpoint values
  - Maintenance parts for HON 650 pilot
  - Maintenance parts for load limiting stage
  - Servicing parts for load limiting stage
  - Maintenance parts for control stage with metal bellows assembly
  - Servicing parts for control stage with metal bellows assembly
  - Maintenance parts for control stage with diaphragm assembly
  - Servicing parts for control stage with diaphragm assembly
  - Maintenance parts for control stage with larger diaphragm assembly
  - Servicing parts for control stage with larger diaphragm assembly
  - Maintenance parts for HON 905 fine mesh filter
  - Servicing parts for HON 905 fine mesh filter
- Spare parts lists for single-stage HON 650-1 pilot for the three setpoint ranges
  - Maintenance parts for single-stage HON 650-1 pilot

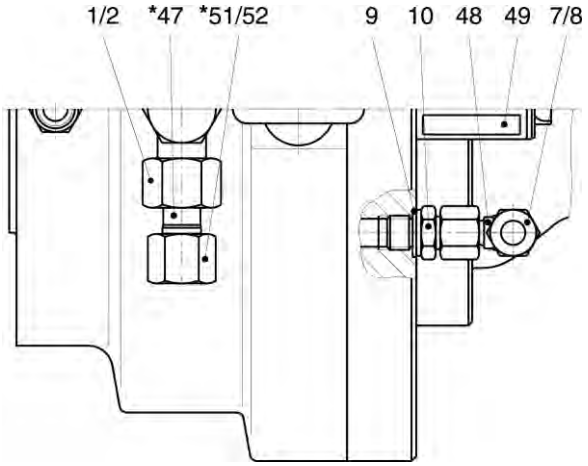
10.2 Spare parts for HON 512 actuator assembly, design 1, DN 25 – DN 100

Spare parts drawing for HON 512 actuator assembly, design 1

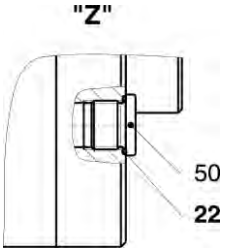
The top half of the figure shows the version with an expander. The bottom half shows the version without an expander.



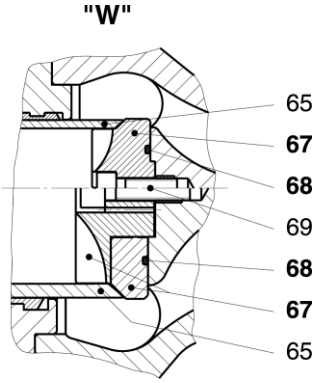
* Item No. not found in all versions.



For DN 80 and DN 100 only



Version with reverse flow protection



* Item No. not found in all versions.

Spare parts list for HON 512 actuator assembly, design 1, DN 25 – DN 100

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80	DN 100
1	Sleeve nut		30 804	30 804	30 807	30 807
2	Cutting ring		30 904	30 904	30 906	30 906
4	Fitting		30 608	30 608	30 615	30 615
5	Screw-in connecting piece		30 113	30 113	30 112	30 112
6	Gasket		18 694	18 694	18 787	18 787
7	Sleeve nut		30 803	30 803	30 803	30 803
8	Cutting ring		30 903	30 903	30 903	30 903
9	Gasket		18 842	18 842	18 842	18 842
10	Screw-in connecting piece		30 111	30 111	30 111	30 111
11	Diaphragm disc		10 013 484	10 013 534	10 013 584	10 013 634
12	Socket cap screw		10 318	10 596	10 596	10 355
13	O-ring	x	20 430	20 413	20 414	21 016
14	O-ring	x	20 430	20 413	-	-
15	Body. Versions:					
	PN 25 and PN 40		10 013 472	10 013 522	10 013 572	10 013 622
	Class 300 - B (ANSI 300 RF)		10 013 475	10 013 525	10 013 575	10 013 625
	Class 300 - J (ANSI 300 RJ)		10 013 478	10 013 526	10 013 576	10 013 626
	Class 600 - B (ANSI 600 RF)		10 013 477	10 013 527	10 013 577	10 013 627
	Class 600 - J (ANSI 600 RJ)		10 013 478	10 013 528	10 013 578	10 013 628
16	Compression spring		10 013 287	10 013 387	10 013 587	10 013 637
17	Mounting plate		10 013 486	-	-	-
17	Mounting plate with socket cap screw		-	10 013 539	10 013 590	10 013 640

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80	DN 100
18	Eye bolt		10 487	10 021	10 003	10 003
19	Retaining ring		19 140	19 140	19 140	19 140
20	Washer		14 082	14 082	14 082	14 082
21	Compression spring		10 013 284	10 013 384	19 081 838	19 081 838
22	O-ring	x	20 382 (1 unit)	20 382 (1 unit)	20 382 (2 units)	20 382 (2 units)
23	Case for position indicator		10 013 280	10 013 380	10 013 639	10 013 639
24	Indicator pin		10 013 491	10 013 541	10 013 641	10 013 641
25	Sight glass		10 013 283	10 013 383	10 013 642	10 013 642
26	Solenoid		27 043	27 043	27 043	27 043
27	Solenoid		27 044	27 044	27 044	27 044
28	Seeger reinforced circular self-locking ring		27 063	27 063	27 063	27 063
29	Seeger circlip		19 172	19 172	19 172	19 172
30	Lock ring		10 013 286	10 013 286	10 013 286	10 013 286
31	Diaphragm	x	10 013 485	10 013 535	10 013 585	10 013 635
32	Socket cap screw		10 330	10 332	10 345	10 354
33	O-ring	x	20 827	20 843	20 838	20 866
34	Connection flange		10 013 480	10 013 530	10 013 580	10 013 630
35	O-ring	x	20 415	20 415	-	-
36	Retaining ring		14 114	14 116	14 116	14 124
37	Plug		10 013 549	10 013 549	-	-
38	Retaining ring		14 123	14 123	-	-
39	Socket cap screw		10 055	10 055	-	-
40	Retaining ring		14 112	14 114	14 115	14 116
41	Socket cap screw		10 324	10 330	10 331	10 332
42	O-ring	x	20 246	20 335	20 249	20 262
43	Support ring		21 024	21 025	21 019	21 017
44	O-ring	x	20 252 (2 units)	20 596 (2 units)	20 976 (2 units)	21 016 (2 units)
45	Silicone grease	x	27 052	27 052	27 052	27 052
46	Guide ring		21 014	21 009	21 018	21 015
47	Reducer		-	-	31 809	31 809
48	Fitting		31 207	31 207	31 207	31 207
49	Valve scale		10 013 285	10 013 385	10 013 594	10 013 644
50	Screw plug		-	-	10 539	10 539
51	Sleeve nut		-	-	30 805	30 805
52	Cutting ring		-	-	30 904	30 904

Version without expander

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80	DN 100
60	Valve body depending on version:					
	PN 25 and PN 40 - B		10 013 242	10 013 342	10 000 434	10 000 534
	Class 300 - B (ANSI 300 RF)		10 013 245	10 013 345	10 000 444	10 000 544
	Class 300 - J (ANSI 300 RJ)		10 013 246	10 013 346	10 000 446	10 000 546
	Class 600 - B (ANSI 600 RF)		10 013 247	10 013 347	10 000 448	10 000 548
	Class 600 - J (ANSI 600RJ)		10 013 248	10 013 348	10 000 450	10 000 550

Version without reverse flow protection

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80	DN 100
65	Valve sleeve		10 013 481	10 013 531	10 013 581	10 013 631
67	Valve disc	x	10 013 483	10 013 533	10 013 583	10 013 633
68	O-ring	x	20 231	20 234	20 235	20 236
69	Socket cap screw		10 361	10 324	10 325	10 328

Version with reverse flow protection

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80	DN 100
65	Valve sleeve		10 013 496	10 013 546	10 013 596	10 013 646
67	Valve disc	x	10 013 457	10 013 507	10 013 557	10 013 607
68	O-ring	x	20 310	20 237	20 425	20 246
69	Socket cap screw		10 318	10 324	10 441	10 556

Version with expander

No.	Name	Maint.	Part no.		
			DN 25/100	DN 25/150	DN 50/150
80	Eye bolt		10 003	10 003	10 003
81	Relief housing		10 013 251	10 013 250	10 006 830
82	Relief disc		10 006 791	10 006 345	10 006 841
86	Socket cap screw		10 389	10 389	10 389
87	Retaining ring		14 112	14 112	14 112
88	Release plate 1		10 006 782	10 006 329	10 006 329
89	Release plate 2		10 006 783	10 006 331	10 006 331
90	O-ring	x	20 261 (2 units)	20 433 (2 units)	20 433 (2 units)
91	Socket cap screw		10 324	10 325	10 325
92	Retaining ring		14 112	14 113	14 113
93	Spacer pin		10 006 452	10 006 452	10 006 452

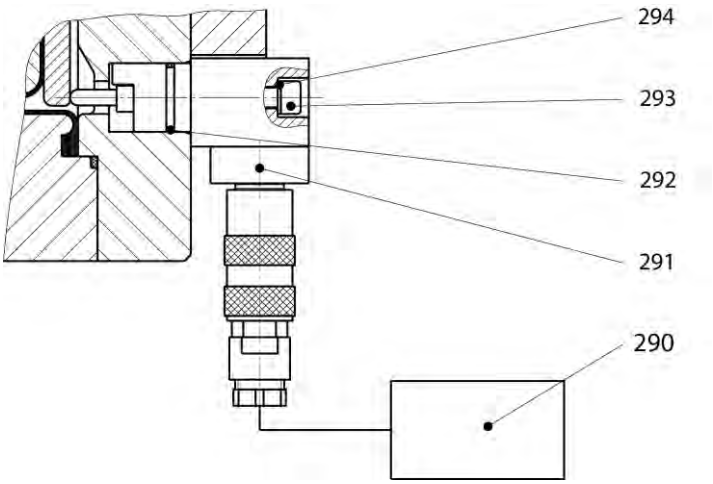
No.	Name	Maint.	Part no.		
			DN 25/100	DN 25/150	DN 50/150
97	Socket cap screw		10 394	10 394	10 394
98	Retaining ring		14 116	14 116	14 116
99	Wire spring		26 415 (0.5 kg)	26 415 (1.1 kg)	26 415 (1.3 kg)
99	Wire spring, stainless		26 725	26 725	26 725

No.	Name	Maint.	Part no.		
			DN 50/200	DN 80/250	DN 100/300
80	Eye bolt		10 003	10 003	10 003
81	Relief housing		10 013 350	10 006 445	10 006 505
82	Relief disc		10 006 405	10 006 471	10 006 531
86	Socket cap screw		10 389	10 389	10 389
87	Retaining ring		14 112	14 112	14 112
88	Release plate 1		10 006 389	10 006 449	10 006 509
89	Release plate 2		10 006 391	10 006 451	10 006 511
90	O-ring	x	20 314 (2 units)	20 397 (2 units)	20 339 (2 units)
91	Socket cap screw		10 325	10 393	10 393
92	Retaining ring		14 113	14 114	14 114
93	Spacer pin		10 006 452	10 006 452	10 006 452
97	Socket cap screw		10 394	10 394	10 394
98	Retaining ring		14 116	14 116	14 116
99	Wire spring		26 361 (1.8 kg)	26 361 (3.4 kg)	26 361 (5.3 kg)
99	Wire spring, stainless		26 362	26 362	26 362

Electrical displacement transducer

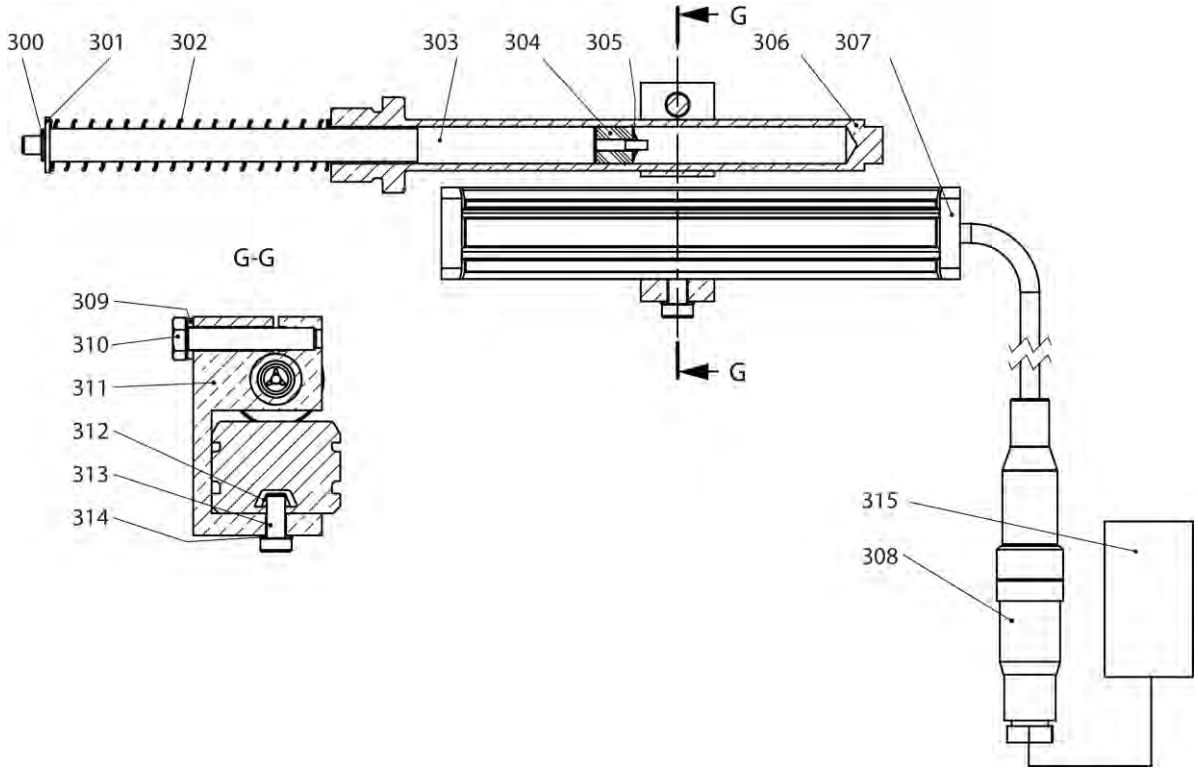
HON 970

displacement transducer for nominal inlet sizes of up to DN 50



No.	Name	Maint.	Part no. DN 25	Part no. DN 50
290	Transmitter		24 333	24 333
291	HON 970 displacement transducer		18 353 620	18 353 702
292	O-ring	x	20 415	20 415
293	Socket cap screw		10 349	10 343
294	Retaining ring		14 123	14 123

HON 970a
displacement transducer for nominal inlet sizes of DN 80 or greater

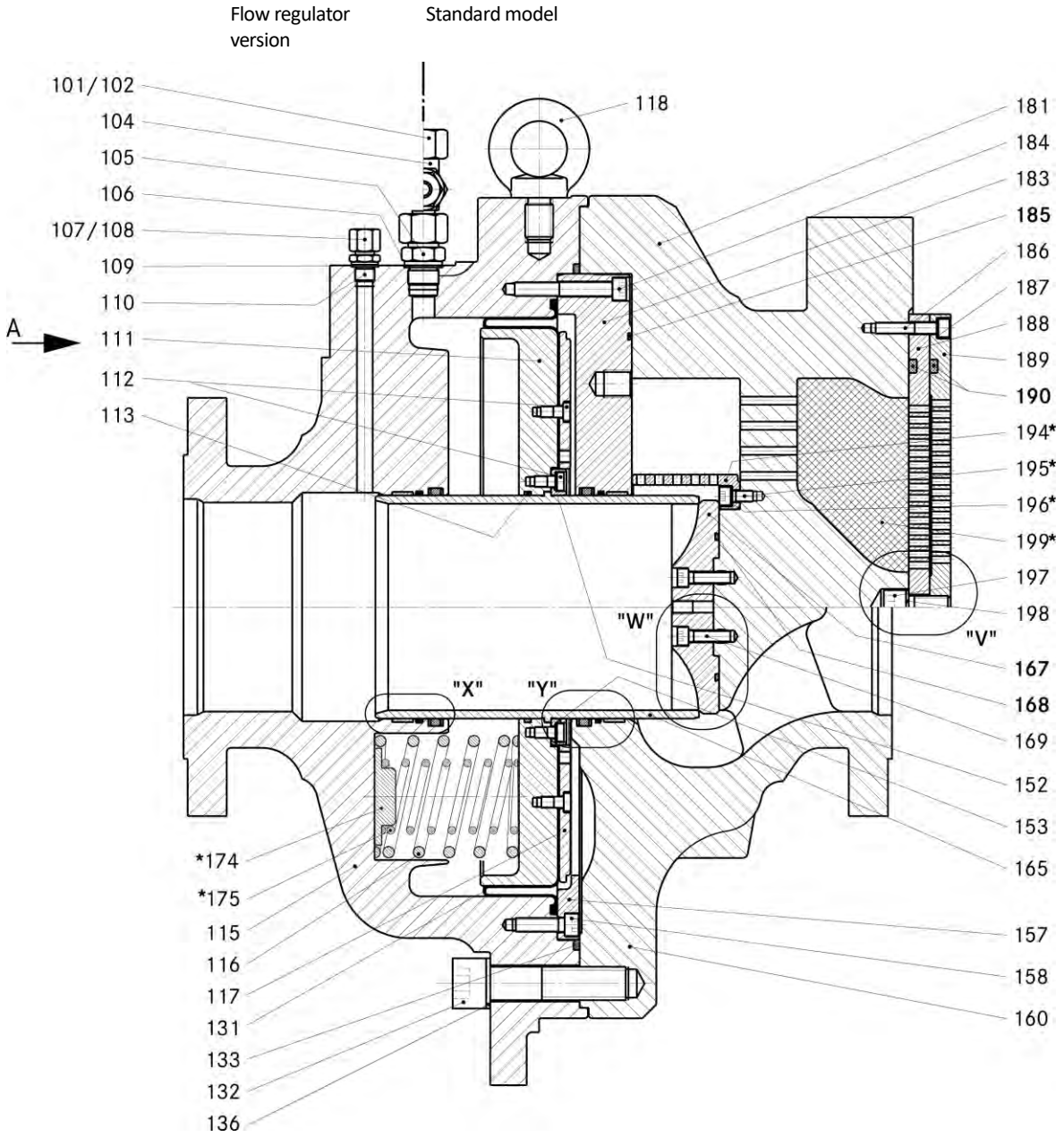


No.	Name	Maint.	Part no. DN 80
	970a whole unit		10 031 666
300	Retaining ring		19 140
301	Washer		14 082
302	Compression spring		1 981 838
303	Rod		10 031 668
304	Magnetic ring		101 378
305	Fixing disc		27 063
306	Case		10 031 667
307	Sensor		300 642
308	Cable connector		24 158
309	Washer		14 156
310	Hex bolt		10 024
311	Mounting angle bracket		18 361 003
312	T-nut		101 379
313	Socket cap screw		10 540
314	Retaining ring		14 118
315	Transmitter		Upon request

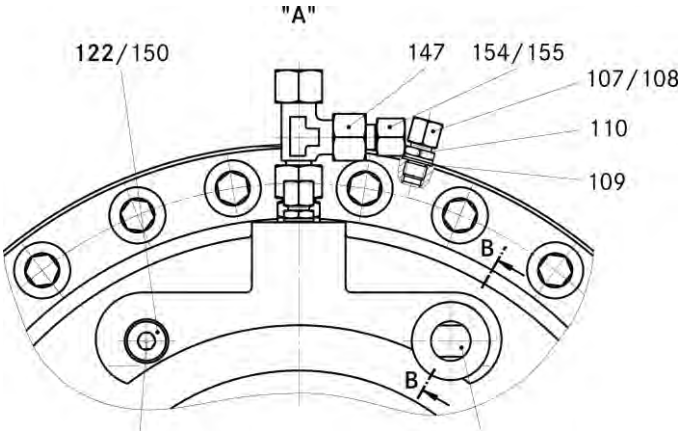
10.3 Spare parts for HON 512 actuator assembly, design 2, DN 150 – DN 250

Spare parts drawing for HON 512 actuator assembly, design 2

The top half of the figure shows the version with an expander. The bottom half shows the version without an expander.



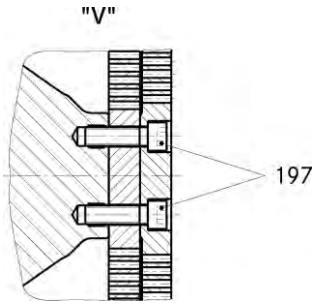
* Item No. not found in all versions.



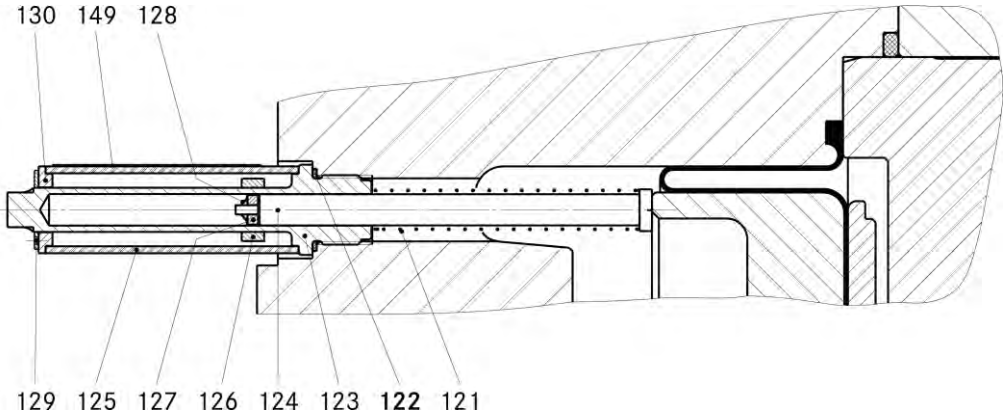
Connection for HON 970 displacement transducer

Visual position indicator connection

For nominal inlet sizes DN 500 and DN 600



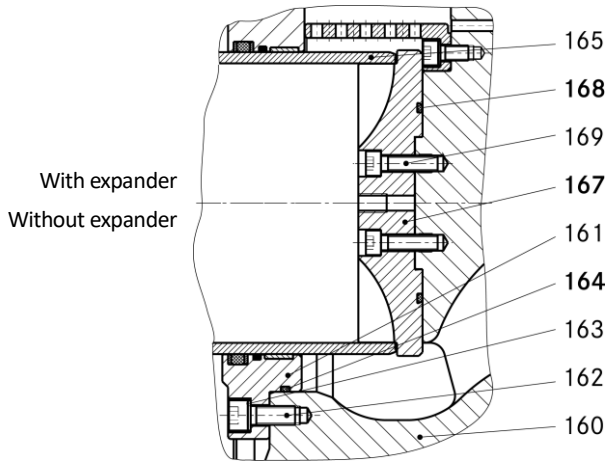
Visual position indicator
section B-B rotated 30°



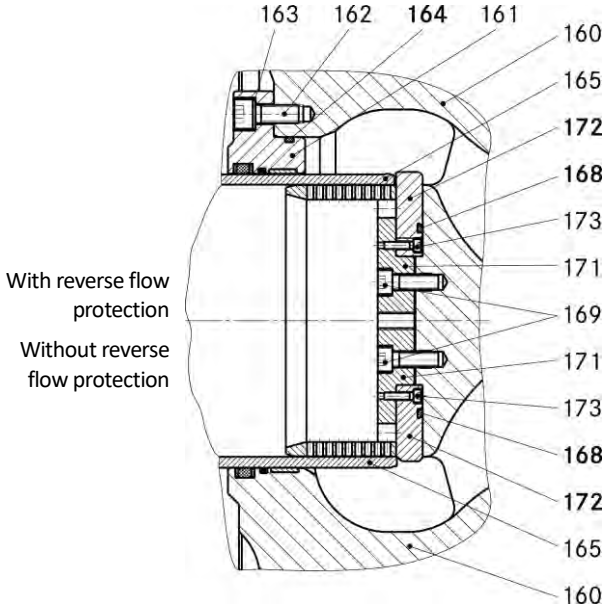
"W"

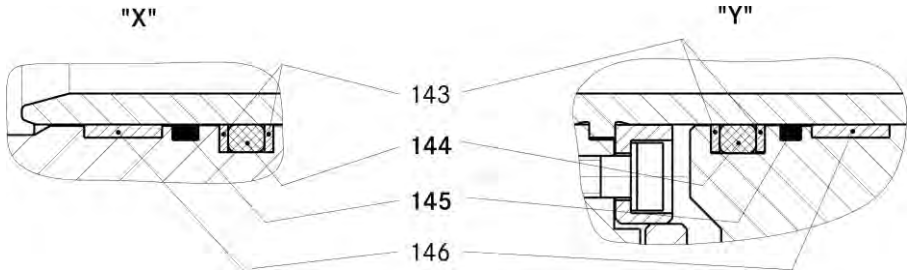
"W"

Version with reverse flow protection



Version with perforated flow restrictor





Spare parts list for HON 512 actuator assembly, design 2, DN 150 – DN 250

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
101	Sleeve nut		30 807	30 807	30 807
102	Cutting ring		30 906	30 906	30 906
104	Fitting		30 615	31434	31434
105	Screw-in connecting piece		30 112	30 112	30 112
106	Gasket		18 787	18 787	18 787
107	Sleeve nut		30 803	30 803	30 803
108	Cutting ring		30 903	30 903	30 903
109	Gasket		18 842	18 842	18 842
110	Screw-in connecting piece		30 111	30 111	30 111
111	Diaphragm disc		10 026 872	10 026 972	10 030 557
112	Socket cap screw		10 355	10 355	10 067
113	O-ring	x	20 514	20 329	100700
115	Body. Versions:				
	PN 25		-	10 026 930	10 030 523
	PN 40		10 026 831	10 026 931	10 030 524
	Class 300 - B (ANSI 300 RF)		10 026 832	10 026 932	10 030 525
	Class 300 - J (ANSI 300 RJ)		10 026 833	10 026 933	10 030 526
	Class 600 - B (ANSI 600 RF)		10 026 834	10 026 934	10 030 527
	Class 600 - J (ANSI 600 RJ)		10 026 835	10 026 935	10 030 528
116	Compression spring		27 894	10 013 887	10 030 561
117	Mounting plate		10 026 874	10 026 974	10 030 559
118	Eye bolt		10 590	10 047	28 049
121	Compression spring		19 081 973	10 013 893	19 081 838
122	O-ring	x	20 382 (2 units)	20 382 (2 units)	20 382 (2 units)
123	Case for position indicator		10 013 689	10 013 889	10 030 569
124	Indicator pin		10 013 691	10 013 891	10 030 570
125	Sight glass		19 081 972	10 013 892	10 030 571
126	Solenoid		27 043	27 043	27 043
127	Solenoid		27 044	27 044	27 044

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
128	Seeger reinforced circular self-locking ring		27 063	27 063	27 063
129	Seeger circlip		19 172	19 172	19 172
130	Lock ring		10 013 286	10 013 286	10 013 286
131	Diaphragm	x	10 000 688	10 013 885	10 030 558
132	Socket cap screw		10 665	10 664	100 703
133	O-ring	x	21 354	21 349	100 699
136	Retaining ring		10 129	14 140	14 140
143	Support ring		21 217	21 235	100 701
144	O-ring	x	21 215 (2 units)	20 542 (2 units)	100 700 (2 units)
145	Silicone grease	x	27 052	27 052	27 052
146	Guide ring		21 353	21 348	100 702
147	Reducer		31 809	31 809	31 809
149	Valve scale		10 013 694	10 013 894	10 030 573
150	Screw plug		10 539	10 539	10 539
152	Retaining ring		14 112	14 112	14 112
153	Mounting ring		10 026 875	10 026 975	10 030 560
154	Sleeve nut		30 805	30 805	30 805
155	Cutting ring		30 904	30 904	30 904

Version without expander

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
157	Tension ring		10 026 869	10 026 969	10 030 555
158	Socket cap screw		10 441	10 441	10 441
160	Valve body depending on version:				
	PN 25		-	10 026 940	10 030 531
	PN 40		10 026 841	10 026 941	10 030 532
	Class 300 - B (ANSI 300 RF)		10 026 842	10 026 942	10 030 533
	Class 300 - J (ANSI 300 RJ)		10 026 843	10 026 943	10 030 534
	Class 600 - B (ANSI 600 RF)		10 026 844	10 026 944	10 030 535
	Class 600 - J (ANSI 600RJ)		10 026 845	10 026 945	10 030 536

Version without expander, with reverse flow protection

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
157	Tension ring		10 026 869	10 026 969	10 030 555
158	Socket cap screw		10 441	10 441	10 441
160	Valve body depending on version:				
	PN 25		-	10 026 950	10 030 539
	PN 40		10 026 851	10 026 951	10 030 540
	Class 300 - B (ANSI 300 RF)		10 026 852	10 026 952	10 030 541
	Class 300 - J (ANSI 300 RJ)		10 026 853	10 026 953	10 030 542
	Class 600 - B (ANSI 600 RF)		10 026 854	10 026 954	10 030 543
	Class 600 - J (ANSI 600RJ)		10 026 855	10 026 955	10 030 544
161	Guide ring		10 026 871	10 026 971	10 030 556
162	Socket cap screw		10 207	10 328	10 328
163	Retaining ring		14 113	14 114	14 114
164	O-ring	x	20 625	21 193	21 311

Valve seat version with a valve disc without reverse flow protection

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
165	Valve sleeve		10 026 876	10 026 976	10 030 562
167	Valve disc	x	10 026 878	10 026 978	10 030 564
168	O-ring	x	21 356	21 351	20 329
169	Socket cap screw		10 098	10 441	10 441

Valve seat version with a valve disc with reverse flow protection

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
165	Valve sleeve		18 360 046	10 030 269	-
167	Valve disc	x	18 360 047	10 030 271	-
168	O-ring	x	21 356	21 351	-
169	Socket cap screw		10 098	10 441	-
174	Spring collar		18 360 048	10 030 272	-
175	Compression spring		10 014 961	100 151	-

Valve seat version with a perforated flow restrictor without reverse flow protection

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
165	Valve sleeve		10 026 876	10 026 976	10 030 562
168	O-ring	x	21 356	21 351	20 329
169	Socket cap screw		10 551	10 207	10 207
171	Perforated flow restrictor		10 026 881	10 026 981	10 030 566
172	Gasket	x	10 026 882	10 026 982	10 030 567
173	Socket cap screw		10 382	10 602	10 591

Valve seat version with a perforated flow restrictor with reverse flow protection

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
165	Valve sleeve		18 360 046	10 030 269	-
168	O-ring	x	21 356	21 351	-
169	Socket cap screw		10 551	10 207	-
171	Perforated flow restrictor		10 026 881	10 026 981	-
172	Gasket	x	10 030 266	10 030 270	-
173	Socket cap screw		10 382	10 602	-
174	Spring collar		18 360 048	10 030 272	-
175	Compression spring		10 014 961	100 151	-

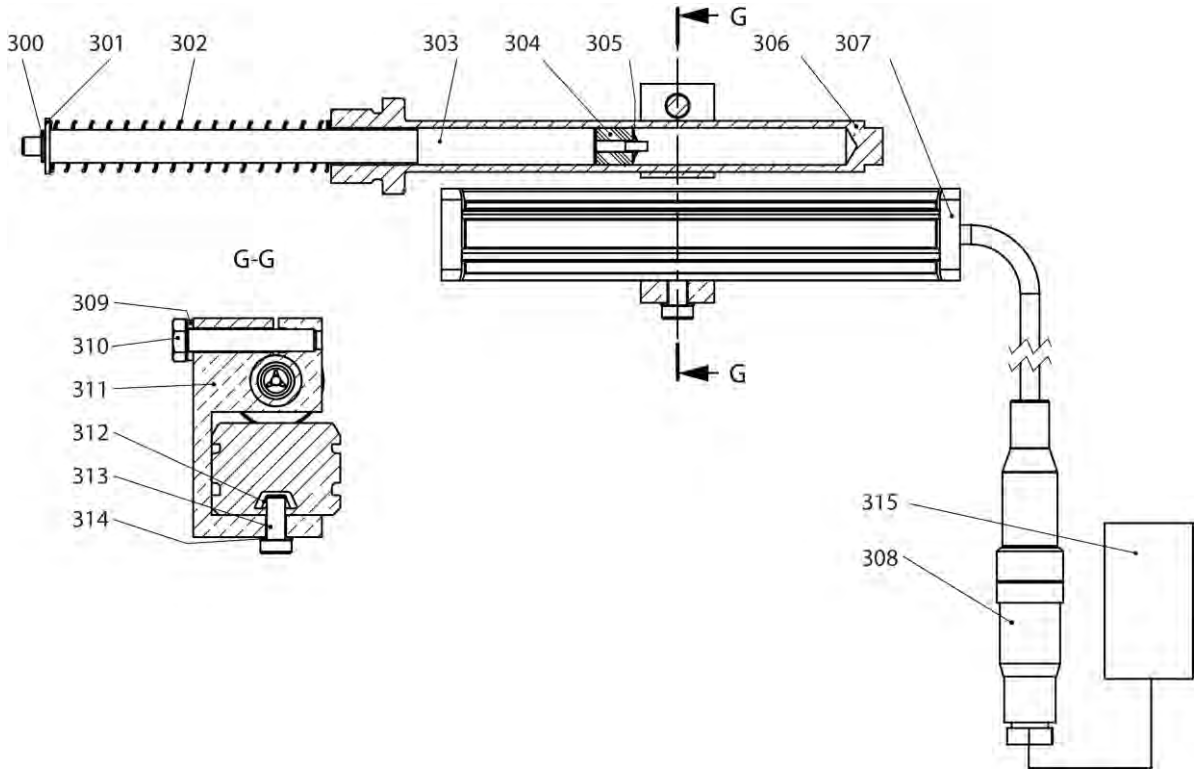
Version with expander

No.	Name	Maint.	Part no.			
			DN 150/300	DN 150/400	DN 200/400	DN 200/500
181	Relief housing		10 026 860	10 026 865	10 026 960	10 026 965
183	Guiding flange		10 026 859	10 026 859	10 026 959	10 026 959
184	Socket cap screw		10 610	10 610	10 386	10 386
185	O-ring	x	21 355	21 355	21 350	21 350
186	Socket cap screw		10 433	10 433	10 433	10 428
187	Retaining ring		14 112	14 112	14 112	14 112
188	Release plate 1		10 026 862	10 006 569	10 026 962	10 026 967
189	Release plate 2		10 026 863	10 006 571	10 026 963	10 026 968
190	O-ring	x	20 339 (2 units)	20 424 (2 units)	20 424 (2 units)	21 243 (2 units)
194	Relief bushing		10 026 864	10 026 864	10 026 964	10 026 964
195	Socket cap screw		8 176	8 176	8 176	8 176
196	Retaining ring		14 112	14 112	14 112	14 112
197	Socket cap screw		10 394	10 394	10 394	10 556
198	Retaining ring		14 116	14 116	14 116	-

No.	Name	Maint.	Part no.	
			DN 250/500	DN 250/600
181	Relief housing		10 030 547	10 030 551
183	Guiding flange		10 030 546	10 030 546
184	Socket cap screw		10 386	10 386
185	O-ring	x	21 349	21 349
186	Socket cap screw		10 428	10 428
187	Retaining ring		14 112	14 112
188	Release plate 1		10 030 549	10 030 553
189	Release plate 2		10 030 550	10 030 554
190	O-ring	x	21 243	21 365
197	Socket cap screw		10 556	10 556
199	Wire springs		26 361 (21.4 kg)	26 361 (28.5 kg)

HON 970a electrical displacement transducer

For nominal inlet sizes of DN 80 or greater

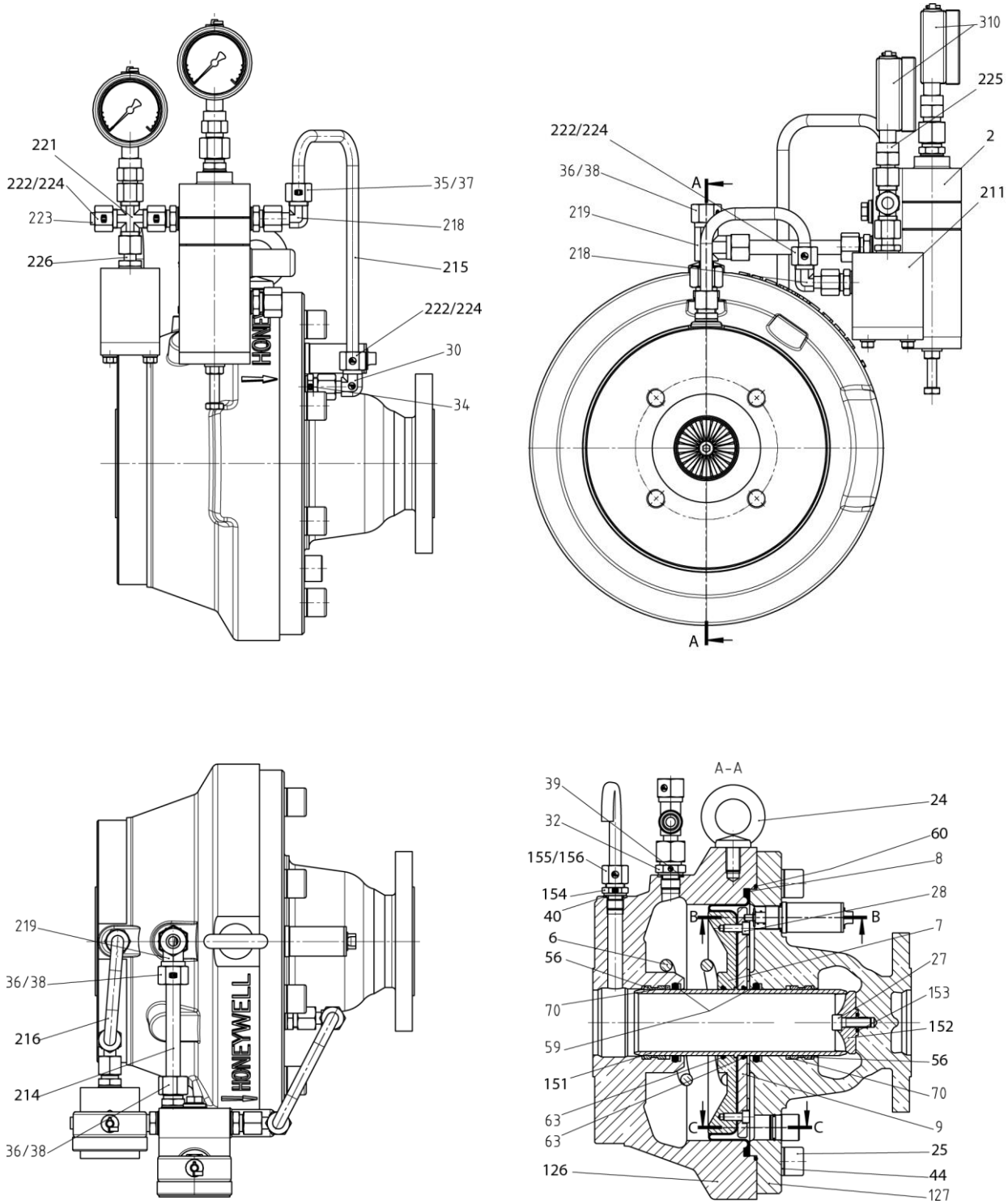


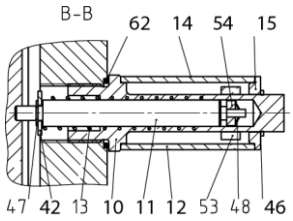
No.	Name	Maint.	Part no. DN 150, DN 200	DN 250
	970a whole unit		10 031 669	10 031 671
300	Retaining ring		19 140	19 140
301	Washer		14 082	14 082
302	Compression spring		101 562	101 562
303	Rod		10 031 670	10 031 672
304	Magnetic ring		101 378	101 378
305	Fixing disc		27 063	27 063
306	Case		10 031 667	10 031 667
307	Sensor		300 642	300 642
308	Cable connector		24 158	24 158
309	Washer		14 156	14 156
310	Hex bolt		10 024	10 024
311	Mounting angle bracket		18 361 003	18 361 003
312	T-nut		101 379	101 379
313	Socket cap screw		10 540	10 540
314	Retaining ring		14 118	14 118
315	Transmitter		Upon request	Upon request

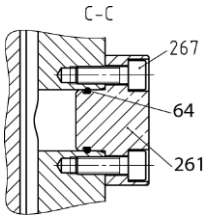
10.4 Spare parts for HON 512 actuator assembly, design 3, DN 25 – DN 250

Spare parts drawing for HON 512 actuator assembly, design 3, DN 50

This spare parts drawing is used as an example for design 3 with nominal sizes of DN 25 to DN 100.







Spare parts list for HON 512 actuator assembly, design 3, DN 25 – DN 100:

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80*	DN 100
6	Compression spring					
	7 X 65 X 58		10013287	-	-	-
	10 x 97 x 85		-	10013387	-	-
	16 x 168 x 130		-	-	-	10013637
7	Diaphragm disc		10013484	10013534	-	10013634
8	Diaphragms					
	ROLLING DIAPHRAGM 140/130-55 FTGT.	x	10013485	-	-	-
	ROLLING DIAPHRAGM 200/190-60	x	-	10013535	-	-
	ROLLING DIAPHRAGM 348/333-60 FTGT.	x	-	-	-	10013635
9	Mounting plate		10013486	18353705	-	10013636
10	Case for visual position indicator		10013280	10013380	10013380	10013639
11	Indicator pin for visual position indicator		10013491	10013541	10013541	10013641
12	Sight glass for visual position indicator		10013283	10013383	10013642	10013642
13	Compression spring for visual position indicator		10013284	10013384	10013384	19081838
14	Valve scale for visual position indicator		10013285	10013385	10013385	10013644
15	LOCK RING		10013286	10013286	10013286	10013286
16	LABEL FOR FLANGED THREADED HOLE		10013294	10013294	10013294	10013294
24	EYE BOLT					
	M10		10487-RMK	-	-	-
	M12		-	10021	-	10021
25	Socket cap screw					
	M12 X 35		10563-RMK (8 units)	-	-	-
	M16 X 50		-	10555-RMK (8 units)	-	-
	M16 X 55		-	-	-	10609-RMK (12 units)
27	M8 X 25 SOCKET CAP SCREW		-	10324	-	-

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80*	DN 100
28	Socket cap screw					
	M5 X 12		10318-RMK (6 units)	-	-	-
	M6 X 12		-	10596-RMK (12 units)	-	-
	M8 X 16		-	-	-	10355-RMK (16 units)
30	Fitting					
	EO EVW 10L OMD CF		31207	31207	31207	31207
32	Fitting					
	EO GE 12L M16 X 1.5 CF X		30113-RMK	30113-RMK	30113-RMK	-
	EO GE 16S M22 X 1.5 CF X		-	-	-	30112-RMK
34	Fitting					
	EO GE 10L M14 X 1.5 CF X		30111-RMK	30111-RMK	30111-RMK	30111-RMK
35	Fitting					
	EO M 10L CF X		30803-RMK	30803-RMK	30803-RMK	30803-RMK
36	Fitting					
	EO M 12L CF X		30804-RMK (3 units)	30804-RMK (3 units)	30804-RMK (3 units)	-
	EO M 16S CF X		-	-	-	30807
37	Fitting					
	EO PSR 10L X		30903	30903	30903	30903
38	Fitting					
	EO PSR 12L X		30904 (3 units)	30904 (3 units)	30904 (3 units)	-
	EO PSR 16S X		-	-	-	30906
39	Aluminum sealing rings					
	A 16 X 22		18694	18694	18694	-
	A 22 X 27		-	-	-	18787
40	SEALING RING A 14.0 X 20.0		18842-RMK	18842-RMK	18842-RMK	18842-RMK (2 units)
42	WASHER B 5.3		14082	14082	14082	14082
44	Retaining ring					
	VS 12		14114 (8 units)	-	-	-
	VS 16		-	14116-RMK (8 units)	-	14116-RMK (12 units)
46	CIRCLIP NA3555-05S1		19172-RMK	19172-RMK	19172-RMK	19172-RMK
47	RETAINING RING ST5X0.6		19140	19140	19140	19140
48	SEEGER REINFORCED CIRCULAR SELF-LOCKING RING KS2.5		27063-RMK	27063-RMK	27063-RMK	27063-RMK

No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80*	DN 100
53	MAGNETIC RING 18/12.8X6.5AXIALMAG		27043	27043	27043	27043
54	MAGNETIC RING 8.5/ 2.7X3AXIAL-MAG		27044-RMK	27044-RMK	27044-RMK	27044-RMK
56	Guide ring					
	FAI 30X19		21014 (2 units)	-	-	-
	FAI 56X19		-	21009 (2 units)	-	-
	FAI110X24		-	-	-	21015-RMK (2 units)
59	O-ring					
	2-217 W3.53 D 29.74	x	20252-RMK (2 units)	-	-	-
	2-331 W5.33 D 56.52	x	-	20596-RMK (2 units)	-	-
	2-348 W5.33 D110.49	x	-	-	-	21016 (3 units)
60	O-ring					
	W 3.00 D 170.00	x	20827	-	-	-
	2-175 W2.62 D228.27	x	-	20843-RMK	-	-
	W4.00 D380.00	x	-	-	-	20866-RMK
62	O-RING 2-019 W1.78 D 20.35	x	20382	20382	-	20382 (2 units)
63	O-ring					
	2-025 W1.78 D 29.87	x	20430-RMK	-	-	-
	2-140 W2.62 D 56.82	x	-	20413	-	-
64	O-ring					
	2-018 W1.78 D 18.77	x	20415	20415	-	-
126	Case					
	DN25, PN16		10032150	-	-	-
	DN25, CLASS150RF		10032151	-	-	-
	DN50, PN16		-	10032154	-	-
	DN50, CLASS150RF		-	10032155	-	-
	DN100, PN16		-	-	-	10032120
	DN100, CLASS150RF		-	-	-	10032121
127	Valve body					
	DN25, PN16		10032152	-	-	-
	DN25, CLASS150RF		10032153	-	-	-
	DN50, PN16		-	10032156	-	-
	DN50, CLASS150RF		-	10032157	-	-
	DN100, PN16		-	-	-	10032123
	DN100, CLASS150RF		-	-	-	10032124

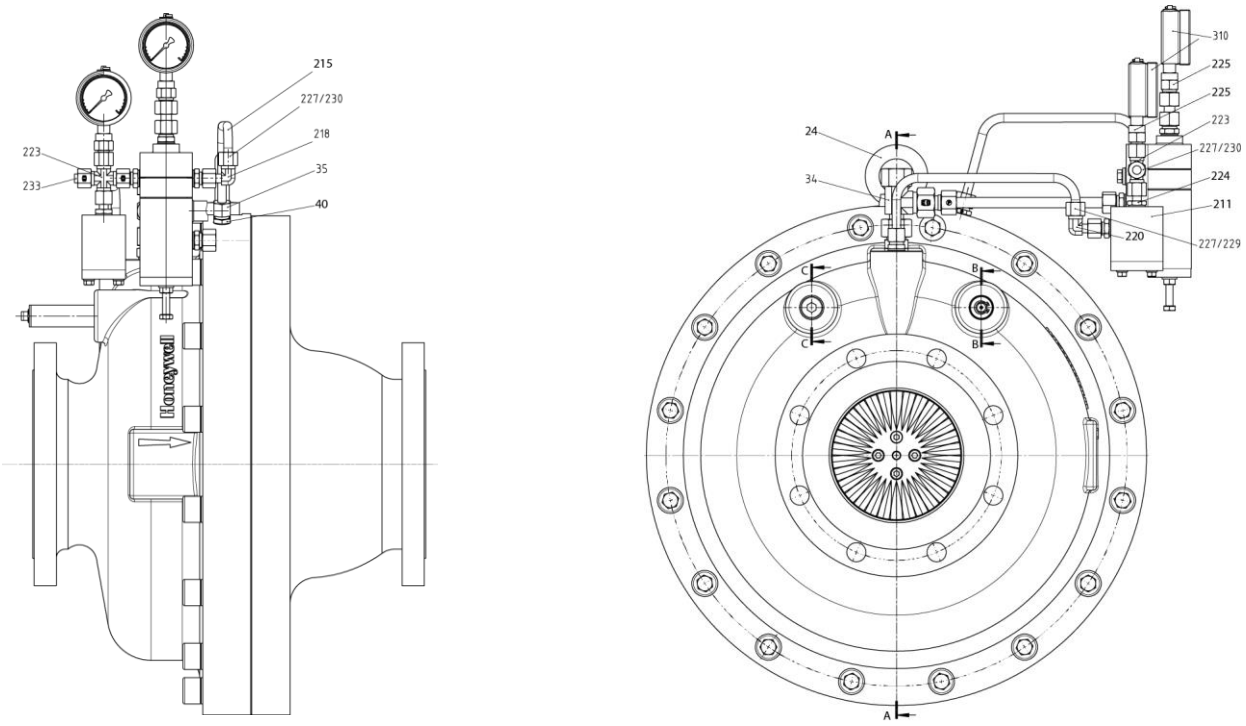
No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80*	DN 100
151	Valve sleeve		10032164	10032110	-	10032165
152	Valve disc	x	10013483	10013533	-	10013633
153	O-ring					
	2-011 W1.78 D 7.65	x	20231-RMK	-	-	-
	2-111 W2.62 D 10.77	x	-	20234-RMK	-	-
	2-121 W2.62 D 26.64	x	-	-	-	20236-RMK
154	Fitting					
	EO GE 10L M14 X 1.5 CF X		30111-RMK	30111-RMK	30111-RMK	-
155	Fitting					
	EO M 10L CF X		30803-RMK	30803-RMK	30803-RMK	-
156	Fitting					
	EO PSR 10L X		30903	30903	30903	-
157	Socket cap screw					
	M5 X 16		10361-RMK	-	-	-
	M12 X 30		-	-	-	10328
212	Label, return		10014041	10014041	10014041	10014041
214	PIPE 12 X 1.5 GALV. ST35		35507	35507	35507	35507
215	PIPE 10 X 1.5 GALV. ST35		35505	35505	35505	35505
216	PIPE 10 X 1.5 GALV. ST35		35505	35505	35505	35505
218	Fitting					
	EO EVW 10L OMD CF		31207	31207	31207	31207
219	Fitting					
	EO EVL 12L OMD CF		30608	30608	30608	-
	EO EVL 12L OMD 71		-	-	-	30616-RMK
220	Fitting					
	EO KOR 16/12S OMD CF		-	-	-	31809
221	Fitting					
	EO K 10L CF X		31609	31609	31609	31609
222	Fitting					
	EO M 10L CF X		30803-RMK	30803-RMK	30803-RMK	30803-RMK
223	Fitting					
	EO VKA 10 CF		32004-RMK	32004-RMK	32004-RMK	32004-RMK
224	Fitting					
	EO PSR 10L X		30903	30903	30903	30903
225	Fitting					
	EO MAVE 10L R1/4 CF		31810	31810	31810	31810
226	Fitting					
	EO EVGE 10L M14 X 1.5 ED CF		30023	30023	30023	30023

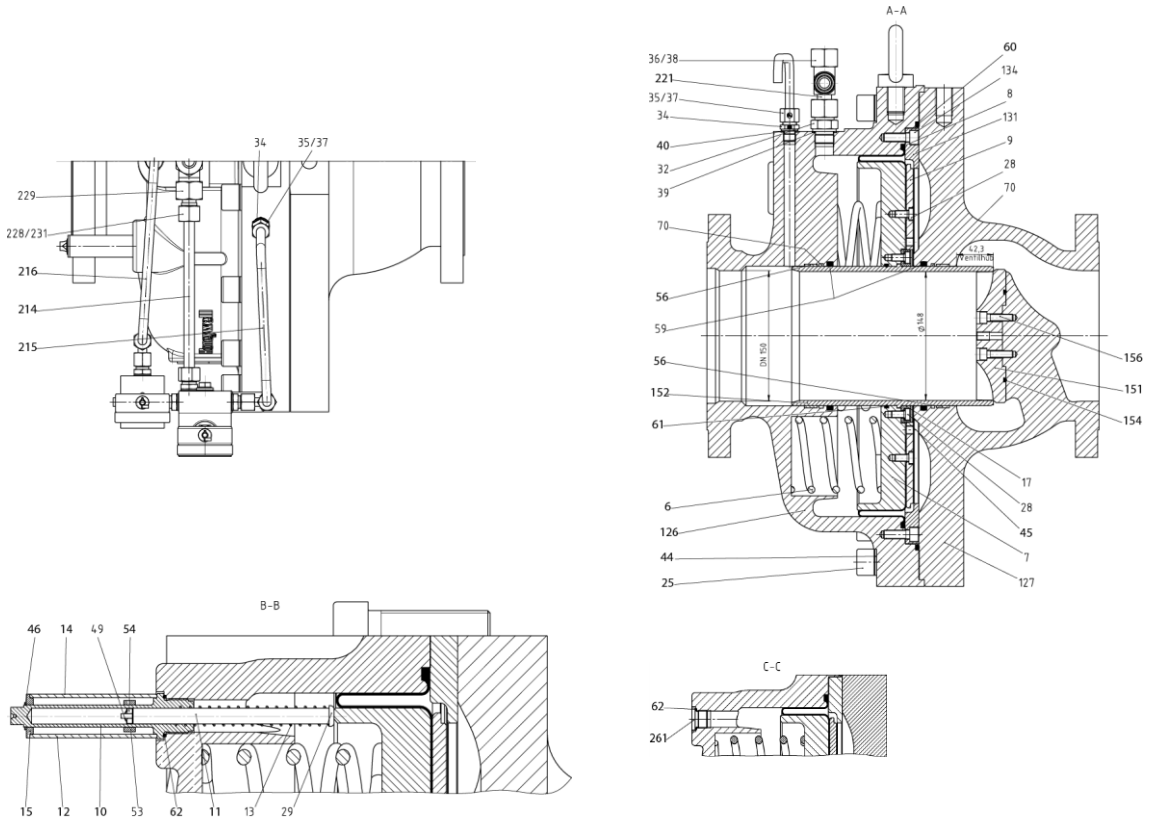
No.	Name	Maint.	Part no.			
			DN 25	DN 50	DN 80*	DN 100
235	Fitting					
	EO M	12L CF X	-	-	-	30804-RMK
236	Fitting					
	EO M	12S CF X	-	-	-	30805-RMK
261	Plug					
	PLUG		-	10013549	-	-
	M20 X 1.5 SCREW PLUG		10539	-	10539	10539

* Non-listed part numbers for nominal size DN 80 available from the manufacturer upon request.

Spare parts drawing for HON 512 actuator assembly, design 3, DN 150

This spare parts drawing is used as an example for design 3 with nominal sizes of DN 150 to DN 250.





Spare parts list for HON 512 actuator assembly, design 3, DN 150 – DN 250

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
2	Electrical measuring equipment				
	HON 970a for HON 512c DN150-200		10031669	10031669	-
	HON 970a for HON 512c DN250		-	-	10031671
6	Compression spring				
	8.0 X 80.0 X 125		27894	-	-
	10 x 120 x 145		-	10013887	-
	12 x 133 x 170		-	-	10030561
7	Diaphragm disc		10026872	10026972	10030557
8	Diaphragms				
	Rolling diaphragm 415/400-110	x	10000688	-	-
	DIAPHRAGM, ROLLING 575/560- 90	x	-	10013885	-
	ROLLING DIAPHRAGM 690/675-110	x	-	-	10030558
9	Mounting plate		10026874	10026974	10030559
10	Case for visual position indicator		10013689	10013889	10030569
11	Indicator pin for visual position indicator		10013691	10013891	10030570
12	Sight glass for visual position indicator		19081972	10013892	10030571
13	Compression spring for visual position indicator		19081973	10013893	19081838
14	Valve scale for visual position indicator		10013694	10013894	10030573

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
15	LOCK RING		10013286	10013286	10013286
17	Mounting ring		10026875	10026975	10030560
24	EYE BOLT				
	M16		-	-	10003-RMK
	M20		10590-RMK (2 units)	10590-RMK (2 units)	10590-RMK
25	Socket cap screw				
	M20 x 70		100683-RMK (16 units)	-	-
	M24 x 70		-	11147-RMK (18 units)	-
	M20 x 70		-	-	100683-RMK (24 units)
28	Socket cap screw				
	M8 X 16		10355-RMK (32 units)	10355-RMK (32 units)	-
	M8 X 20		-	-	10067 (42 units)
29	M6 X 8 PAN HEAD SCREW		11144-RMK	11144-RMK	11144-RMK
32	Fitting				
	EO GE 16S M22 X 1.5 CF X		30112-RMK	30112-RMK	30112-RMK
34	Fitting				
	EO GE 10L M14 X 1.5 CF X		30111-RMK	30111-RMK	30111-RMK
35	Fitting				
	EO M 10L CF X		30803-RMK	30803-RMK	30803-RMK
36	Fitting				
	EO M 16S CF X		30807 (2 units)	30807	30807
37	Fitting				
	EO PSR 10L X		30903	30903	30903
38	Fitting				
	EO PSR 16S X		30906 (2 units)	30906	30906
39	O-RING A 22 X 27		18787	18787	18787
40	Gasket				
	SEALING RING A 14.0 X 20.0		18842-RMK (2 units)	18842-RMK (2 units)	18842-RMK (2 units)

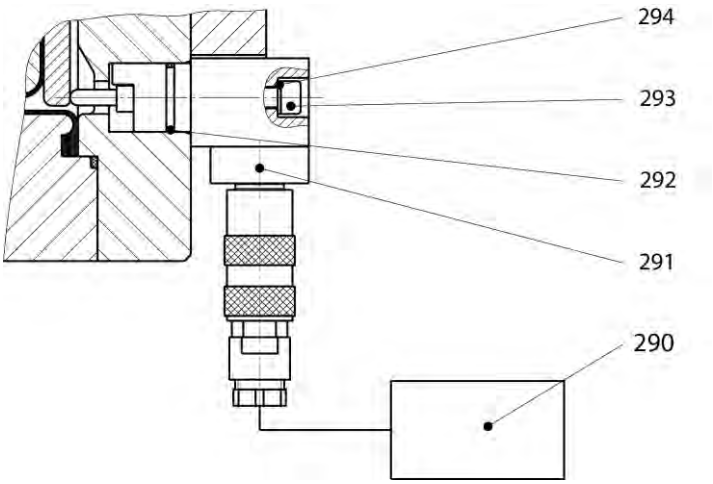
No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
44	Retaining ring				
	VS 20		14124 (16 units)	-	-
	VS 24		-	14129-RMK (18 units)	-
	VS 20		-	-	14124 (24 units)
45	RETAINING RING VS 8		-	-	14112-RMK (12 units)
46	CIRCLIP NA3555-05S1		19172-RMK	19172-RMK	19172-RMK
49	SEEGER REINFORCED CIRCULAR SELF-LOCKING RING KS2.5		27063-RMK	27063-RMK	27063-RMK
53	MAGNETIC RING 18/12.8X6.5AXIALMAG		27043	27043	27043
54	MAGNETIC RING 8.5/ 2.7X3AXIAL-MAG		27044-RMK	27044-RMK	27044-RMK
56	Guide ring				
	FR G007 POLON 052		21353-RMK	-	-
	FR L509 POLON 052		-	21348-RMK	-
	270 x 275 x 25		-	-	100702-RMK
59	O-ring				
	6-1292W6.0 D160.0	x	21215-RMK (2 units)	-	-
	2-370 W5.33 D208.92	x	-	20542-RMK (2 units)	-
	W7.00 D270.00	x	-	-	100700-RMK (2 units)
60	O-ring				
	2-388 W5.33 D481.41	x	21354-RMK	-	-
	W5.00 D643.0	x	-	21349-RMK	-
	W5.00 D760;0	x	-	-	100699-RMK
61	O-ring				
	2-259 W3.53 D158.34	x	20514-RMK	-	-
	2-267 W3.53 D209.14	x	-	20329-RMK	-
62	O-RING 2-019 W1.78 D 20.35	x	20382 (2 units)	20382 (2 units)	20382 (2 units)
126	Case				
	DN150, PN16		10032126	-	-
	DN150, CLASS150RF		10032127	-	-
	DN200, PN16		-	10032132	-
	DN200, CLASS150RF		-	10032133	-
	DN250, PN16		-	-	10032138
	DN250, CLASS150RF		-	-	10032139

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
127	Valve body				
	DN150, PN16		10032129	-	-
	DN150, CLASS150RF		10032130	-	-
	DN200, PN16		-	10032135	-
	DN200, CLASS150RF		-	10032136	-
	DN250, PN16		-	-	10032141
	DN250, CLASS150RF		-	-	10032142
131	Tension ring		10026869	10026969	10030555
134	M10 X 25 SOCKET CAP SCREW		10207-RMK (8 units)	10207-RMK (8 units)	10207-RMK (12 units)
151	Valve disc	x	10026878	10026978	10030564
152	Valve sleeve		10032166	10032167	10032168
154	O-ring				
	2-241 W3.53 D 98.02	x	21356-RMK	-	-
	2-257 W3.53 D148.82	x	-	21351-RMK	-
	2-267 W3.53 D209.14	x	-	-	20329-RMK
156	Socket cap screw				
	M8 X 30		10098 (4 units)	-	-
	M10 X 35			10441 (10 units)	10441 (10 units)
211	Filter				
	Fine mesh filter M14 x 1.5 / M14 x 1.5 - Al - NBR		10031825		
	Fine mesh filter M14 x 1.5 / M14 x 1.5 - Al - FPM		10031826		
	Fine mesh filter M14 x 1.5/M14 x 1.5-Al-NBR-40-130		10032014		
	Double fine mesh filter ISO 8434-1-10/10-Al-NBR		10010700		
	Double fine mesh filter_ISO 8434-CF_10/10_Al_FPM		10031872		
	Double fine mesh filter_ISO 8434-71_10/10_Al_NBR		10031871		
	Double fine mesh filter_ISO 8434-71_10/10_Al_FPM		10032038		
212	Label, return		10014041	10014041	10014041
214	PIPE 12 X 1.5 GALV. ST35		35507	35507	35507
215	PIPE 10 X 1.5 GALV. ST35		35505	35505	35505
216	PIPE 10 X 1.5 GALV. ST35		35505	35505	35505
217	PIPE 16 X 2 ST35 GALVANIZED		-	35512	35512
218	Fitting				
	EO EVW 10L OMD CF		31207	31207	31207
221	Fitting				

No.	Name	Maint.	Part no.		
			DN 150	DN 200	DN 250
	EO EVL 16S OMD CF		30615-RMK	-	-
	EO T 16S CF X		-	31434	31434
222	Fitting				
	EO KOR 16/12S OMD CF		31809	31809	31809
223	Fitting				
	EO K 10L CF X		31609	31609	31609
224	Fitting				
	EO EVGE 10L M14 X 1.5 ED CF		30023	30023	30023
225	Fitting				
	EO MAVE 10L R1/4 CF		31810	31810	31810
226	Fitting				
	EO M 16S CF X		-	30807 (2 units)	30807 (2 units)
227	Fitting				
	EO M 10L CF X		30803-RMK	30803-RMK	30803-RMK
228	Fitting				
	EO M 12L CF X		30804-RMK	30804-RMK	30804-RMK
229	Fitting				
	EO M 12S CF X		30805-RMK	30805-RMK	30805-RMK
230	Fitting				
	EO PSR 10L X		30903	30903	30903
231	Fitting				
	EO PSR 12L X		30904 (2 units)	30904 (2 units)	30904 (2 units)
232	Fitting				
	EO PSR 16S X		-	30906 (2 units)	30906 (2 units)
233	Fitting				
	EO VKA 10 CF		32004-RMK	32004-RMK	32004-RMK
261	M20 X 1.5 SCREW PLUG		10539	10539	10539

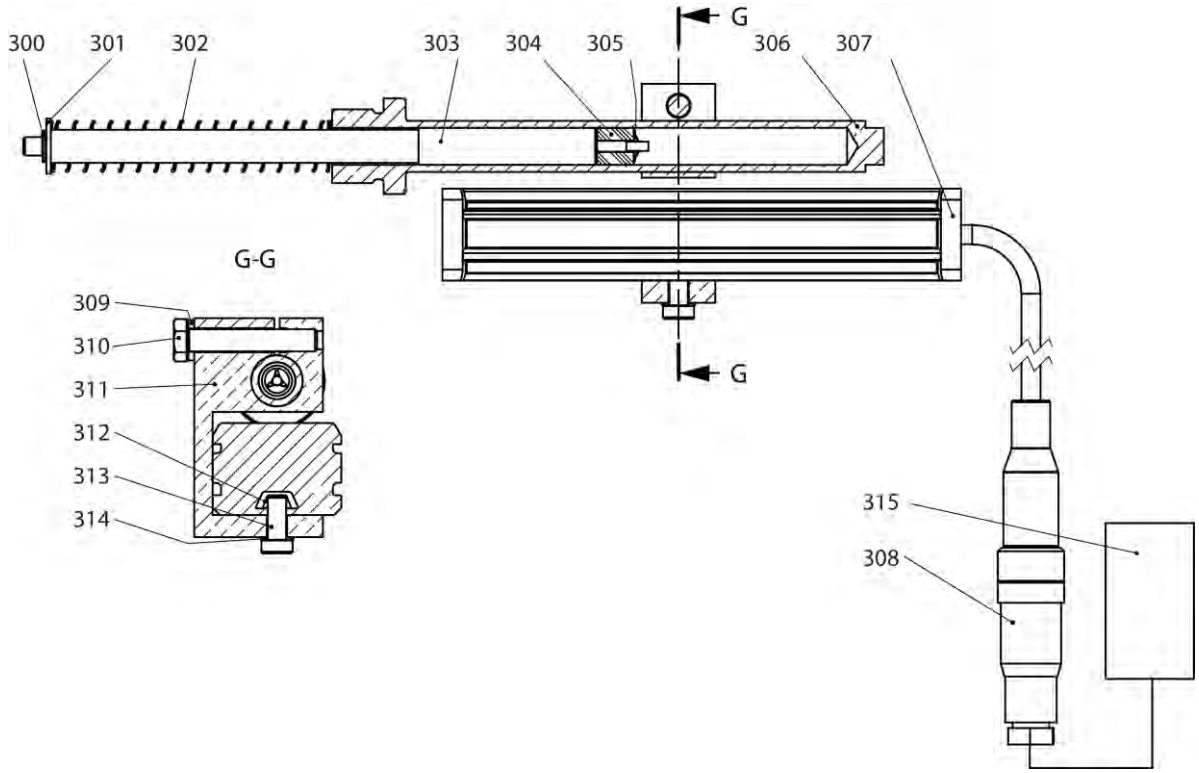
Electrical displacement transducer

HON 970
displacement transducer for nominal inlet sizes of up to DN 50



No.	Name	Maint.	Part no. DN 25	Part no. DN 50
290	Transmitter		24 333	24 333
291	HON 970 displacement transducer		18 353 620	18 353 702
292	O-ring	x	20 415	20 415
293	Socket cap screw		10 349	10 343
294	Retaining ring		14 123	14 123

HON 970a
displacement transducer for nominal inlet sizes of DN 80 or greater

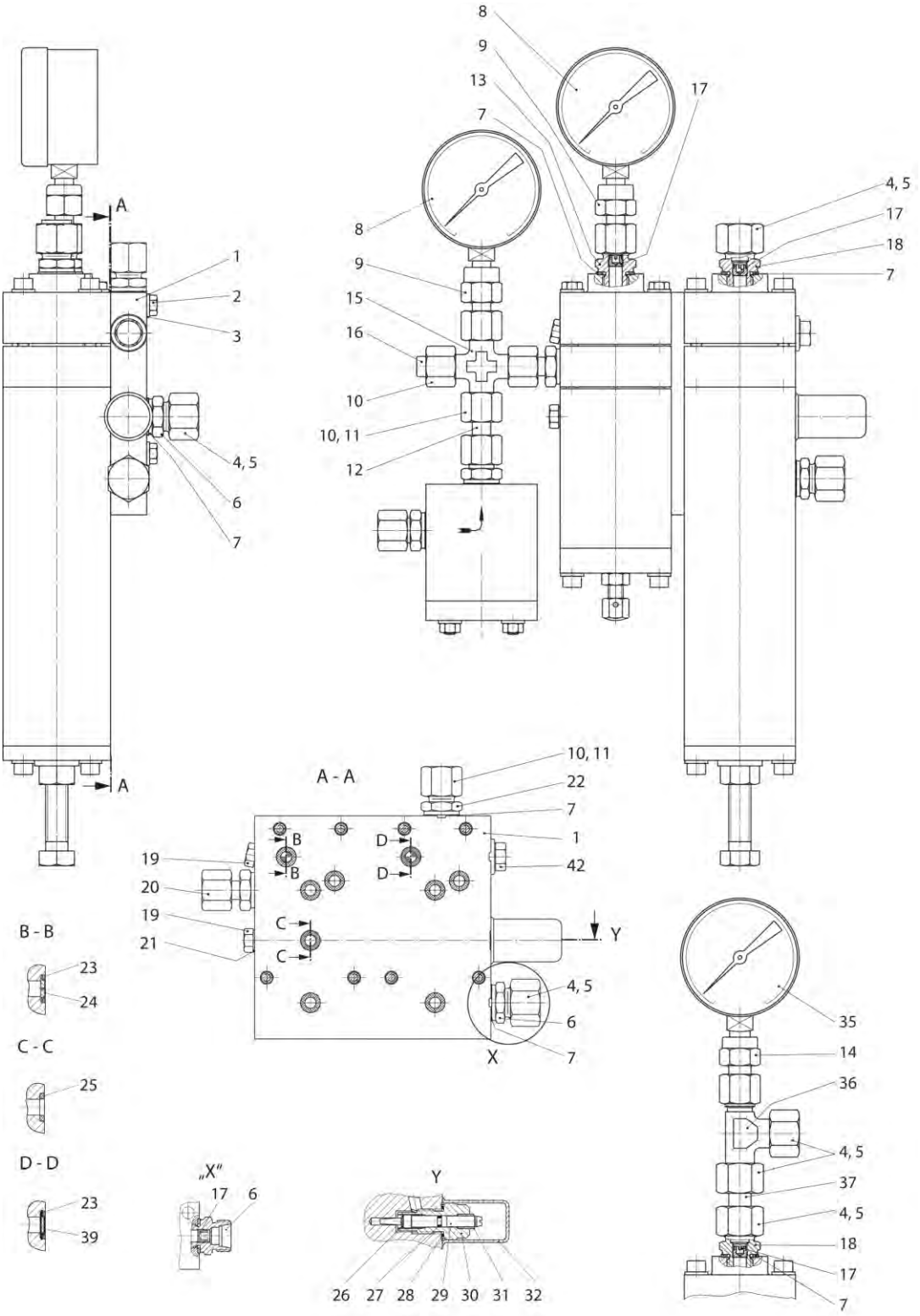


No.	Name	Maint.	Part no. DN 80
	970a whole unit		10 031 666
300	Retaining ring		19 140
301	Washer		14 082
302	Compression spring		1 981 838
303	Rod		10 031 668
304	Magnetic ring		101 378
305	Fixing disc		27 063
306	Case		10 031 667
307	Sensor		300 642
308	Cable connector		24 158
309	Washer		14 156
310	Hex bolt		10 024
311	Mounting angle bracket		18 361 003
312	T-nut		101 379
313	Socket cap screw		10 540
314	Retaining ring		14 118
315	Transmitter		Upon request

10.5 Spare parts for two-stage HON 650 pilot

Spare parts drawing for pilot with metal bellows assembly

Without pressure gauge p_d

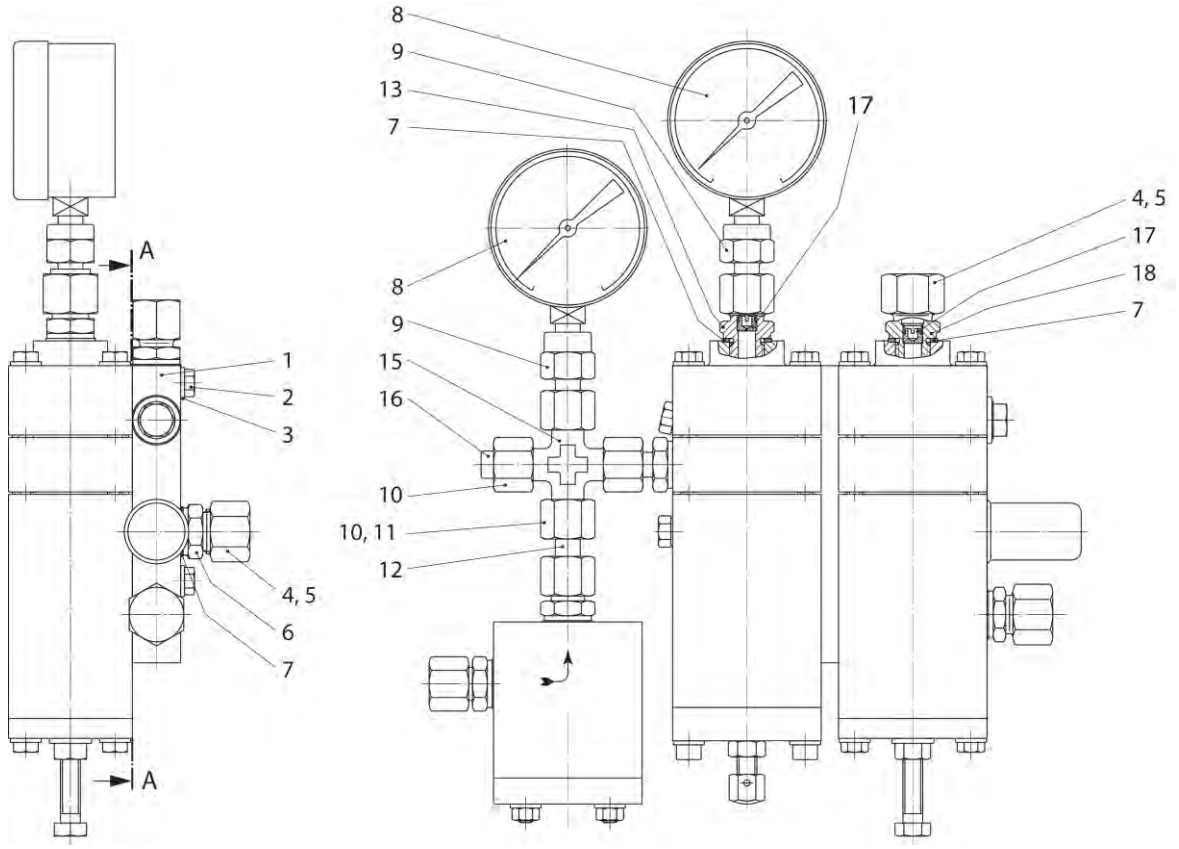


X: Fail-to-open version
Y: Amplifying valve

With pressure gauge p_d
W_d 20 to 90 bar

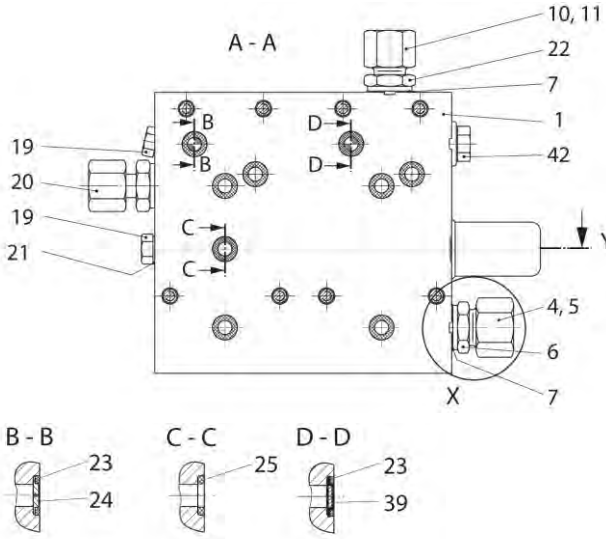
Spare parts drawing for pilot with diaphragm assembly

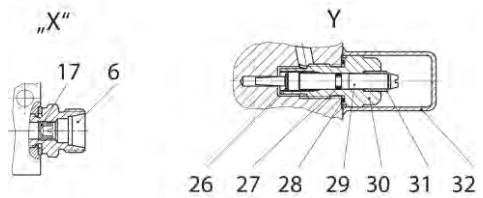
Without pressure gauge p_d



With pressure gauge p_d and HON 925

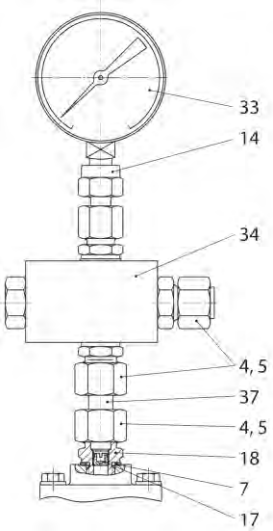
W_d 0.5 to 20 bar

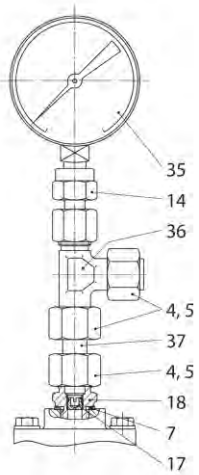




With pressure gauge p_d without HON 925

W_d 10 to 40 bar

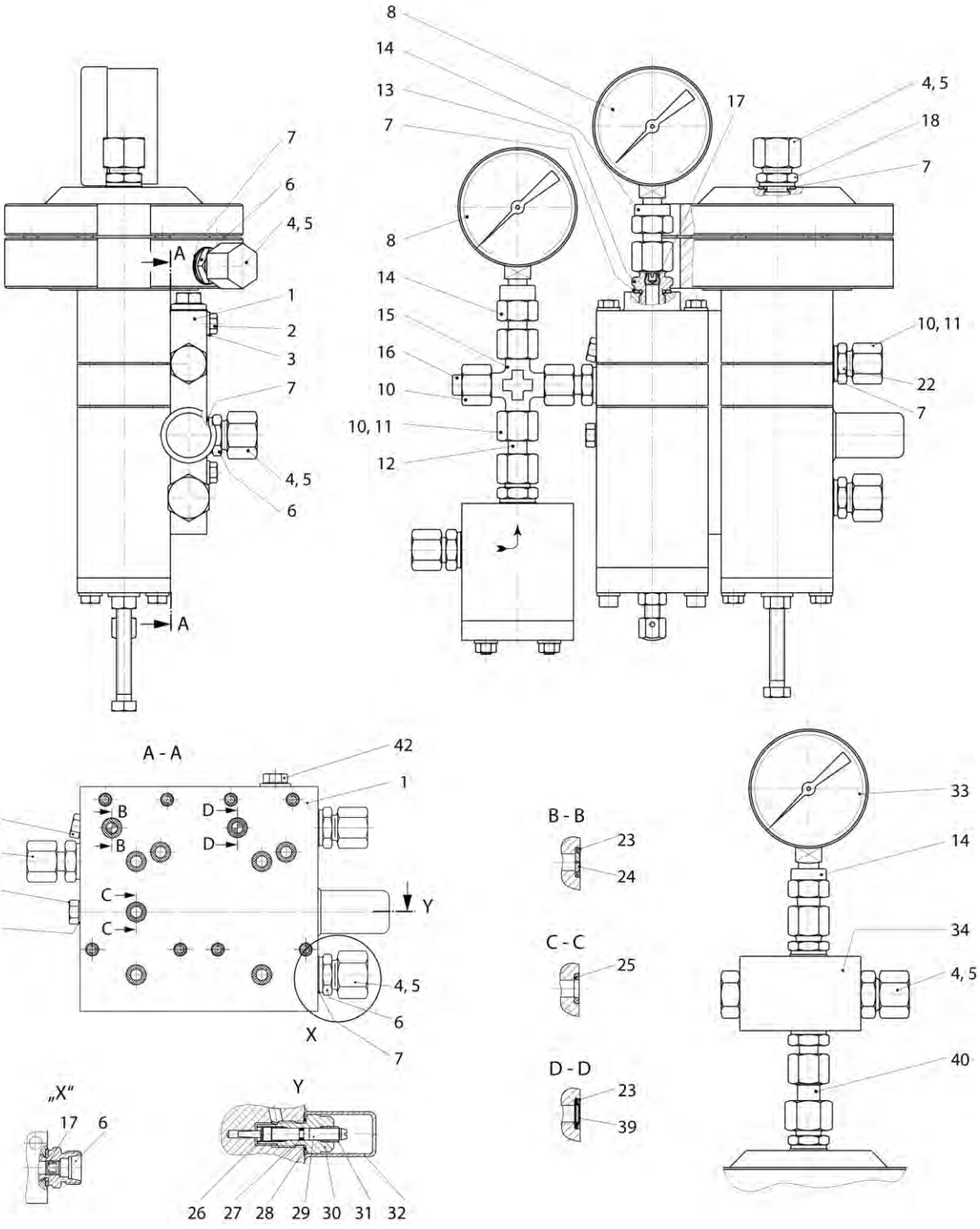




X: Fail-to-open version
Y: Amplifying valve

Spare parts drawing for pilot with larger diaphragm assembly

Without pressure gauge p_d



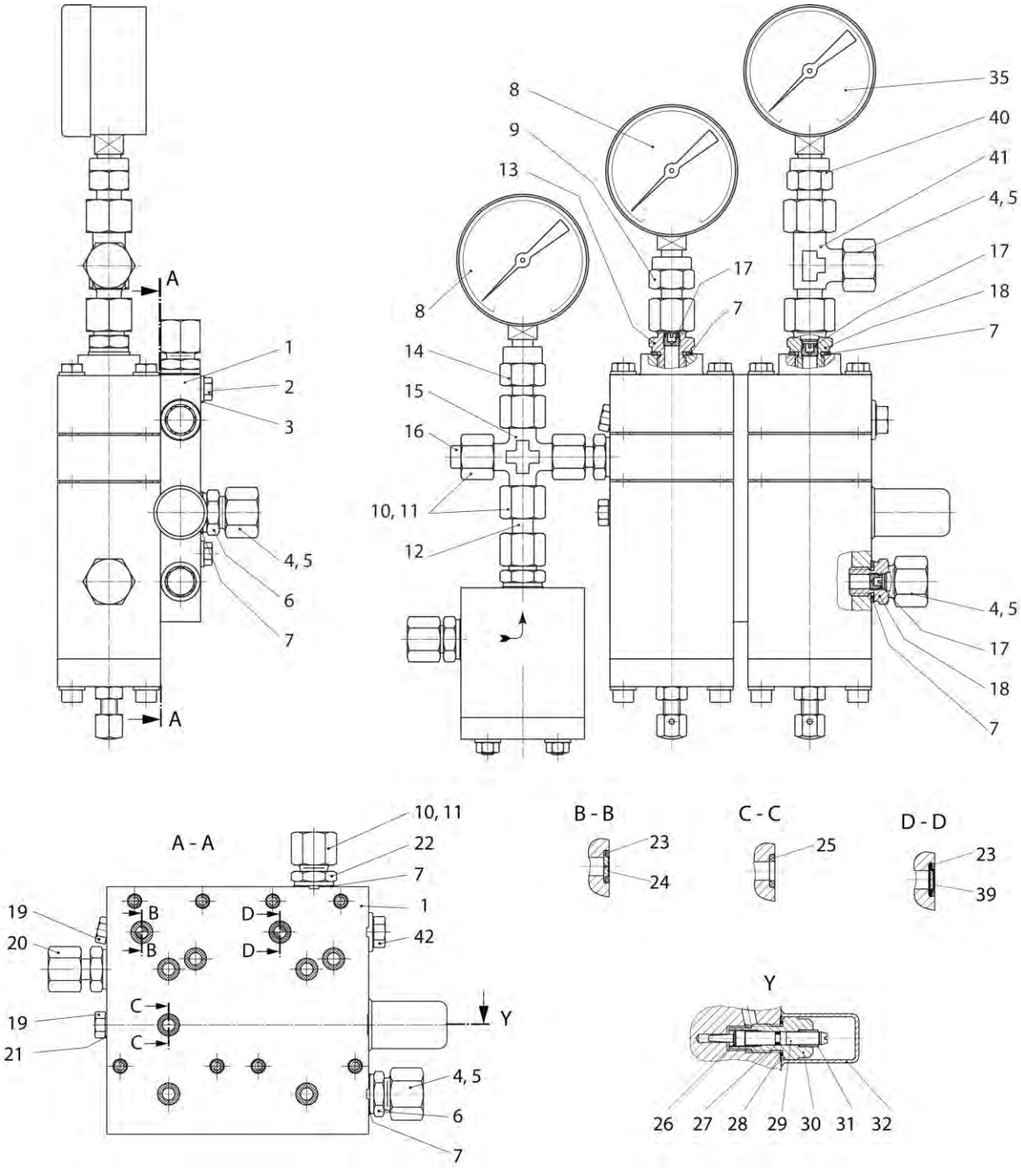
X: Fail-to-open version

Y: Amplifying valve

With pressure gauge p_d and HON 925

W_d 0.3 to 1 bar

Spare parts drawing for pilot with diaphragm assembly for pneumatic follow-up setpoint value

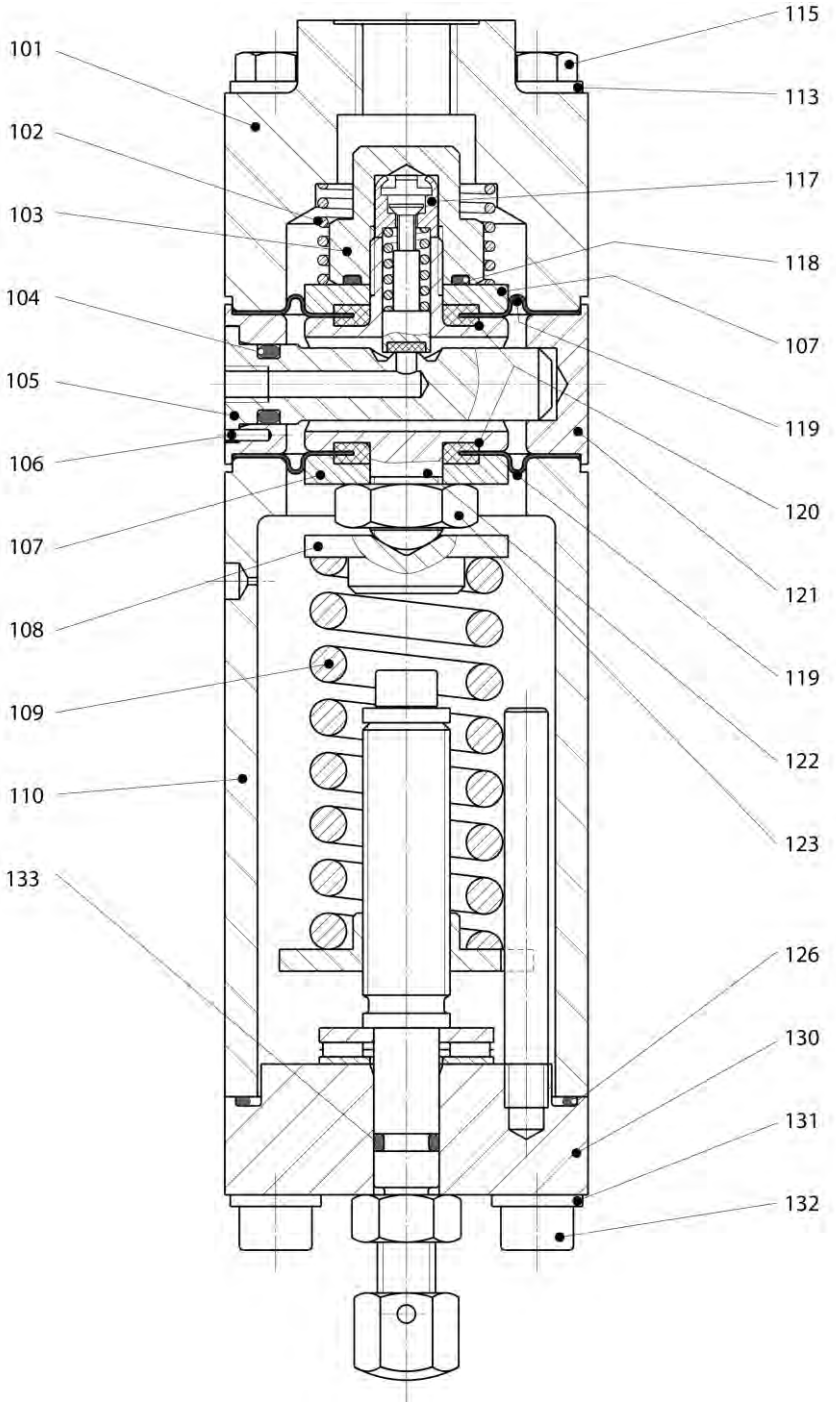


Y: Amplifying valve

Maintenance parts for HON 650 pilot

No.	Name	Part no.			
		Larger diaphragm assembly	Diaphragm measuring unit	Metal bellows measuring unit	Diaphragm assembly for pneumatic follow-up set-point value
7	Gasket	18 842 (5 units)	18 842 (5 units)	18 842 (5 units)	18 842 (5 units)
21	Gasket	18 710	18 710	18 710	18 710
23	O-ring	20 231 (2 units)	20 231 (2 units)	20 231 (2 units)	20 231 (2 units)
25	O-ring	20 225 (7 units)	20 225 (7 units)	20 225 (8 units)	20 225 (7 units)
26	Retaining ring	19 065	19 065	19 065	19 065
27	O-ring	20 283	20 283	20 283	20 283
28	O-ring	20 332	20 332	20 332	20 332

Spare parts drawing for load limiting stage



Maintenance parts

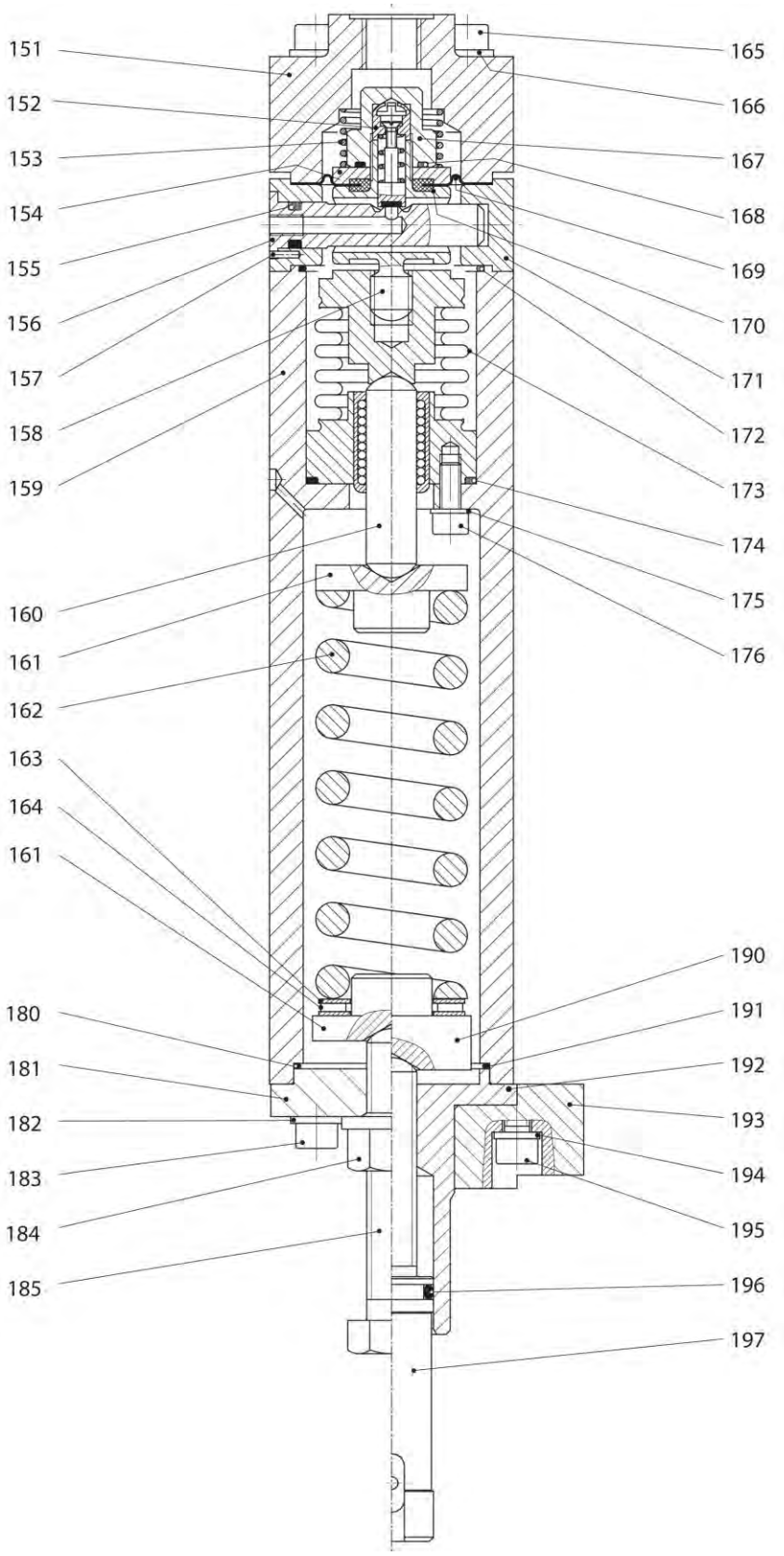
No.	Name	Part no.
104	O-ring	20 225
105	Valve insert	10 000 061
117	Piston, pre-assembled	10 000 186
118	O-ring	20 332
119	Convoluted diaphragm	10 000 191 (2 units)
120	Snap-on gasket	10 000 066 (2 units)
126	O-ring	20 293
133	O-ring	20 226

Servicing parts

No.	Name	Part no.
108	Spring collar	10 000 073
109	Compression spring	10 000 072
	Compression spring when used as control stage	10 000 088
110	Spring housing	10 000 071
	Spring housing when used as control stage	10 000 087
130	Plate, pre-assembled	10 010 480
	Plate, pre-assembled, when used as control stage	10 010 080

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

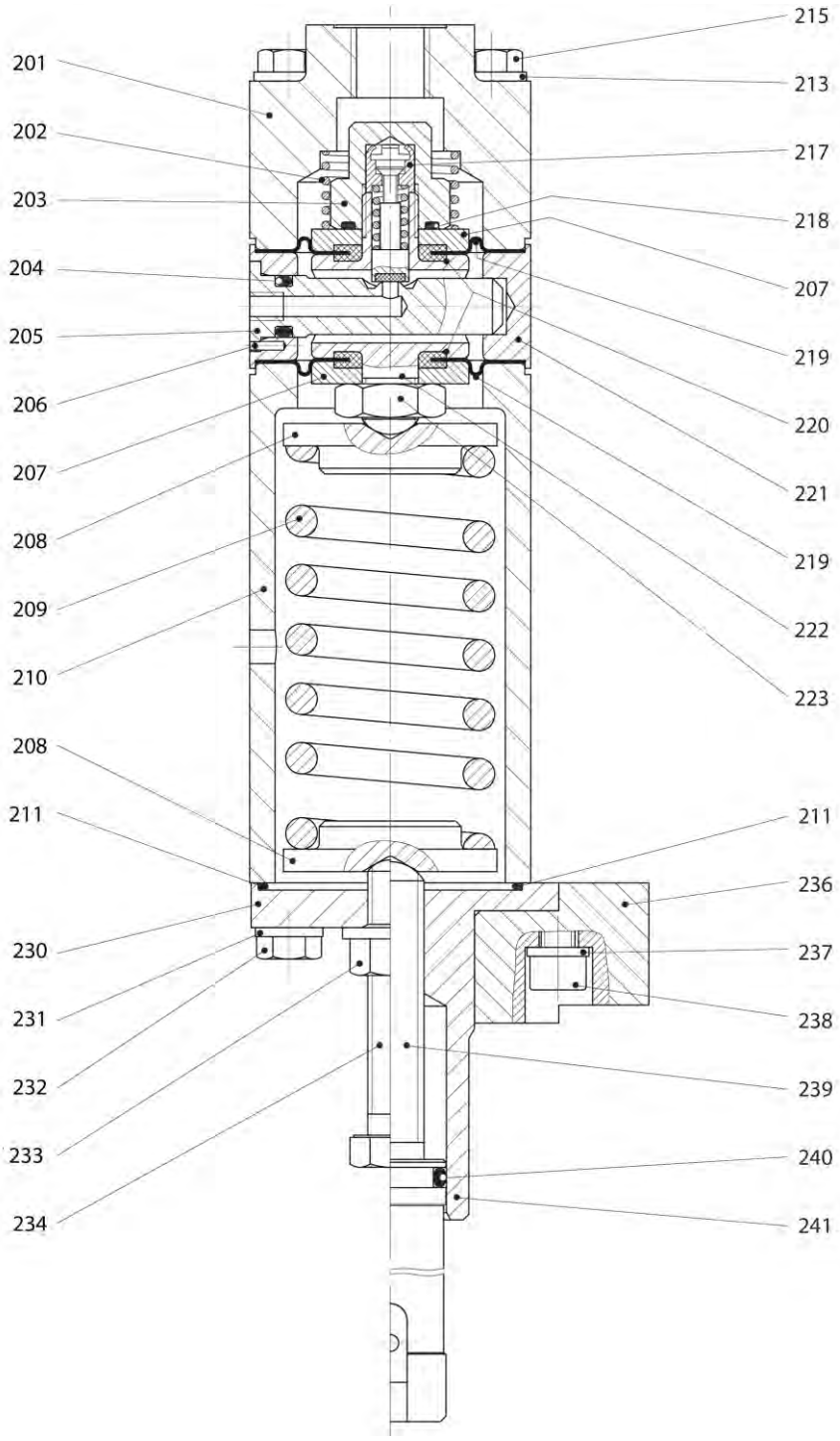
No.	Name	Part no.
152	Piston, pre-assembled	10 000 186
155	O-ring	20 225
156	Valve insert	10 011 775
168	O-ring	20 332
169	Convoluted diaphragm	10 000 191
170	Snap-on gasket	10 000 066
172	O-ring	20 416
174	O-ring	20 317
180	O-ring	20 293
184	Hex flange nut	13 145
	For installation on electric actuator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

Servicing parts

No.	Name	Part no.
162	Compression spring for the following specific setpoint ranges:	
	▪ W_{ds} = 10-50 bar	10 000 149
	▪ W_{ds} = 20-90 bar	10 010 444
190	Spring plate for the following specific setpoint ranges:	
	▪ W_{ds} = 10-50 bar	19 084 400
	▪ W_{ds} = 20-90 bar	10 011 774

Spare parts drawing for control stage with diaphragm 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

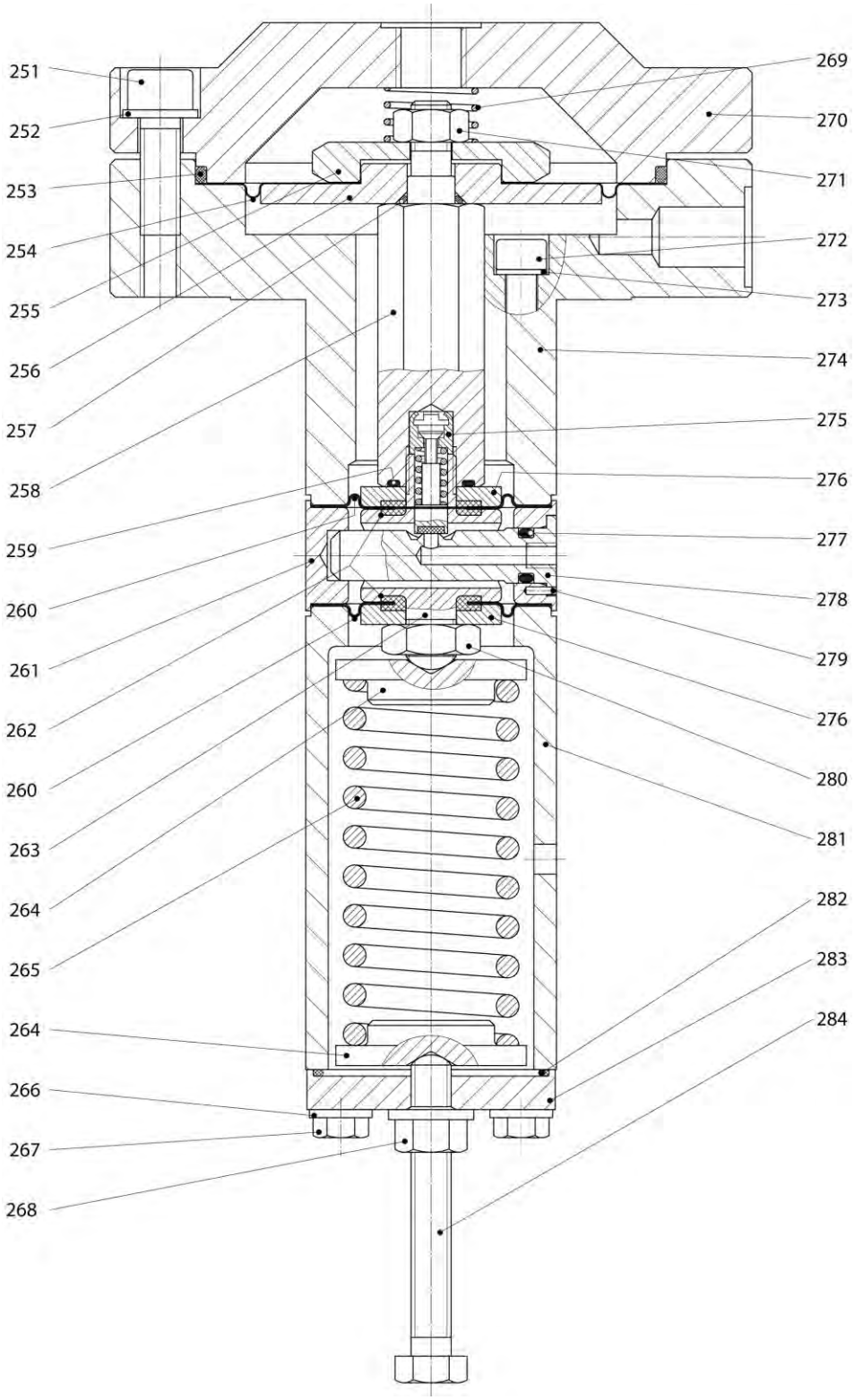
No.	Name	Part no.
204	O-ring	20 225
205	Valve insert	10 000 061
211	O-ring	20 293
217	Piston, pre-assembled	10 000 186
218	O-ring	20 332
219	Convoluted diaphragm	10 000 191 (2 units)
220	Snap-on gasket	10 000 066 (2 units)
233	Hex flange nut	13 136
For installation on electric actuator		
240	O-ring	20 326

Servicing parts

No.	Name	Part no.
208	Spring plate for the following specific setpoint ranges:	
	▪ W_{ds} = 0.5 – 10 bar	10 000 114
	▪ W_{ds} = 10-40 bar	10 000 148
209	Compression spring for the following specific setpoint ranges:	
	▪ W_{ds} = 0.5-2 bar	10 000 156
	▪ W_{ds} = 1-5 bar	10 009 671
	▪ W_{ds} = 2-10 bar	10 000 139
	▪ W_{ds} = 5-2 bar	10 000 115
	▪ W_{ds} = 10-40 bar	10 000 064

Spare parts for control stage with larger diaphragm 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.



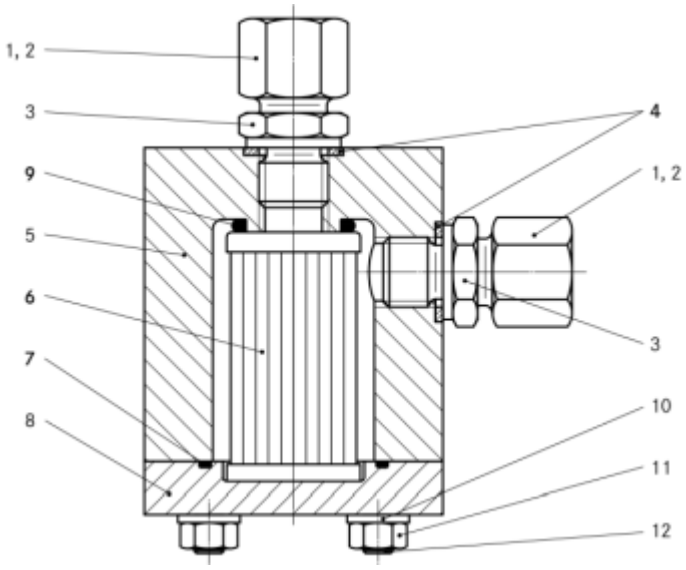
Maintenance parts

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 (2 units)
262	Snap-on gasket	10 000 066 (2 units)
264	Spring collar	10 000 114
265	Compression spring	10 000 156
268	Hex flange nut	13 136
273	Bonded seal	20 908 (4 units)
275	Piston, pre-assembled	10 000 186
277	O-ring	20 225
278	Valve insert	10 000 061
282	O-ring	20 293

Servicing parts

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

Spare parts drawing for HON 905 fine mesh filter



Maintenance parts

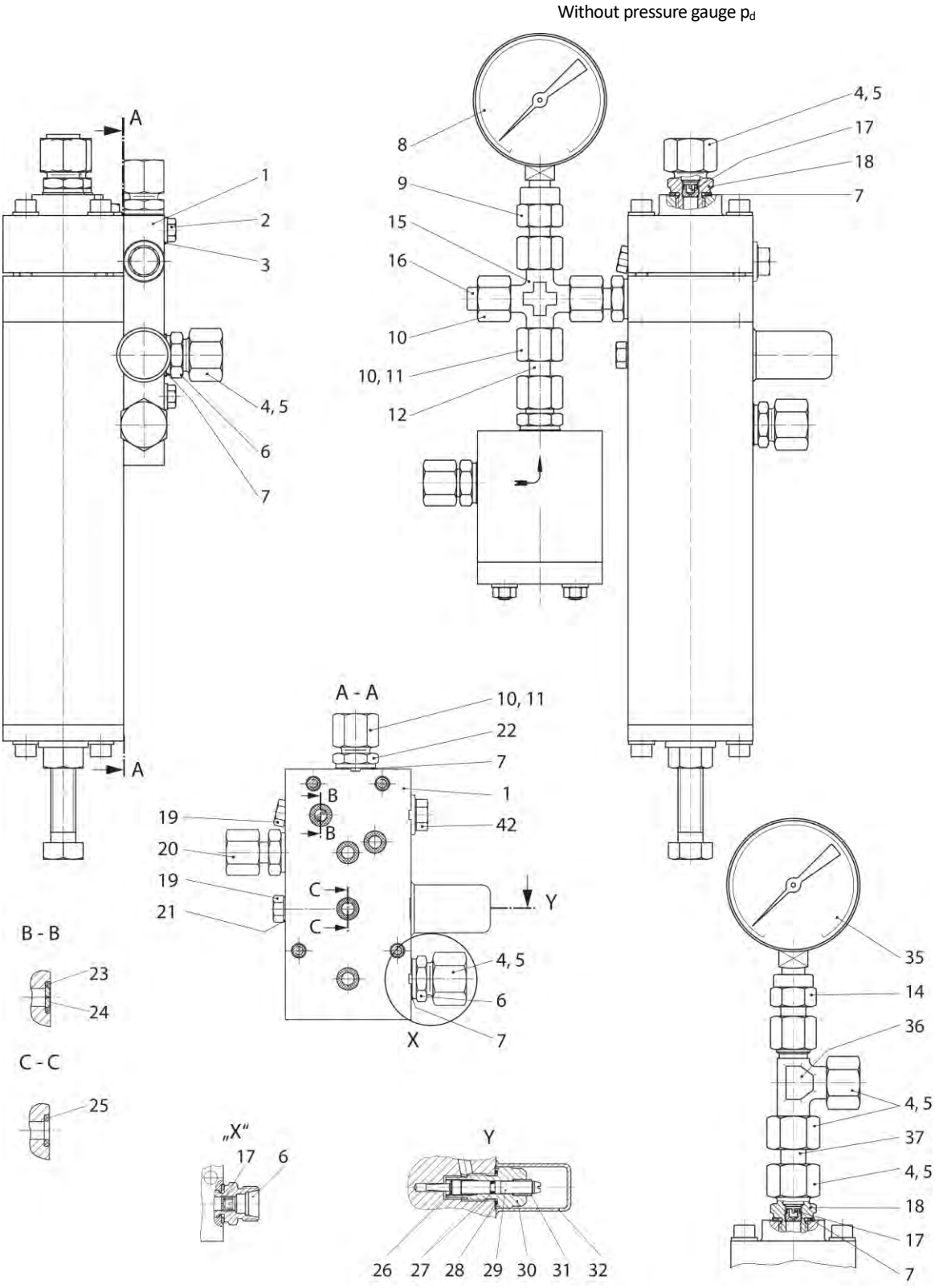
No.	Name	Part no.
4	Gasket	18 842 (2 units)
7	O-ring	20 317
9	O-ring	20 282

Servicing parts

No.	Name	Part no.
6	Filter insert	26 183

10.6 Spare parts for single-stage HON 650-1 pilot

Spare parts drawing for single-stage pilot with metal bellows assembly

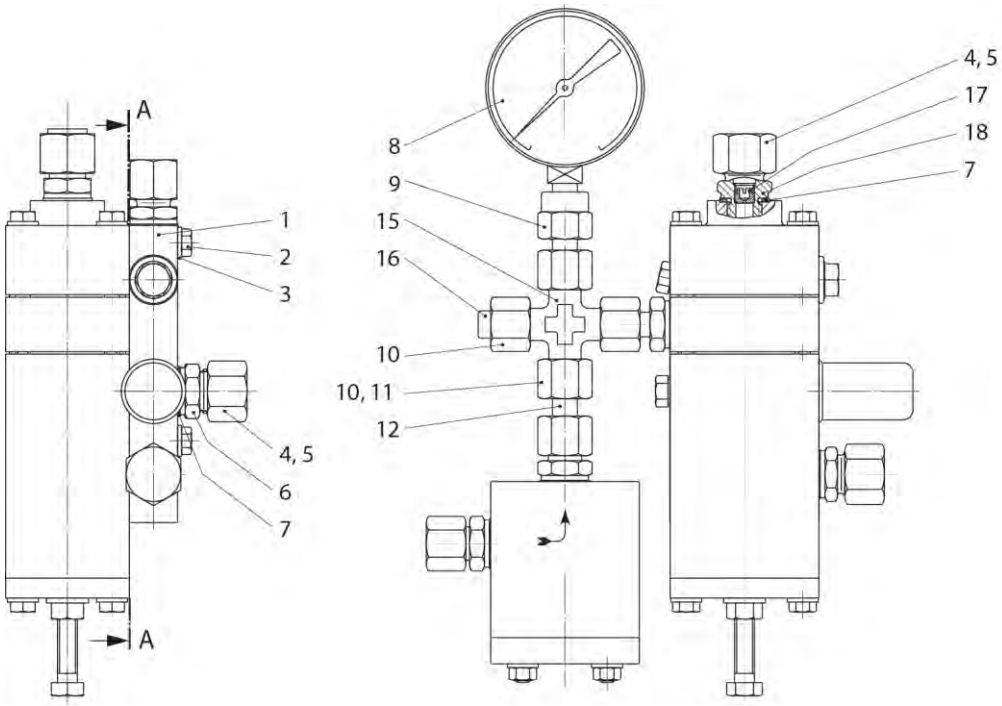


X: Fail-to-open version
Y: Amplifying valve

With pressure gauge p_d
W_d 20 to 90 bar

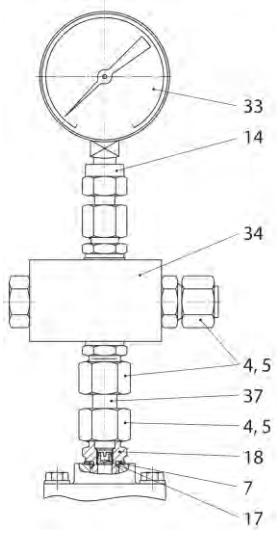
Spare parts drawing for single-stage pilot with diaphragm assembly

Without pressure gauge p_d



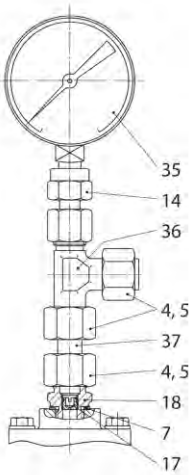
With pressure gauge p_d and HON 925

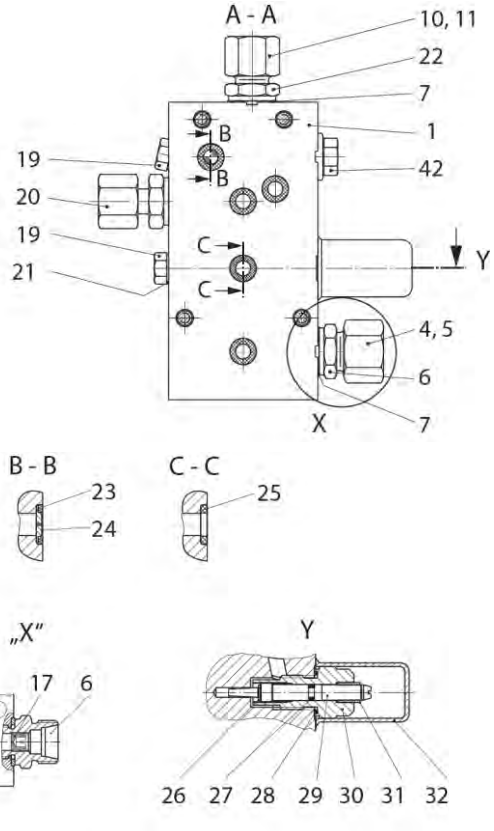
W_d 0.5 to 20 bar



With pressure gauge p_d without HON 925

W_d 10 to 40 bar

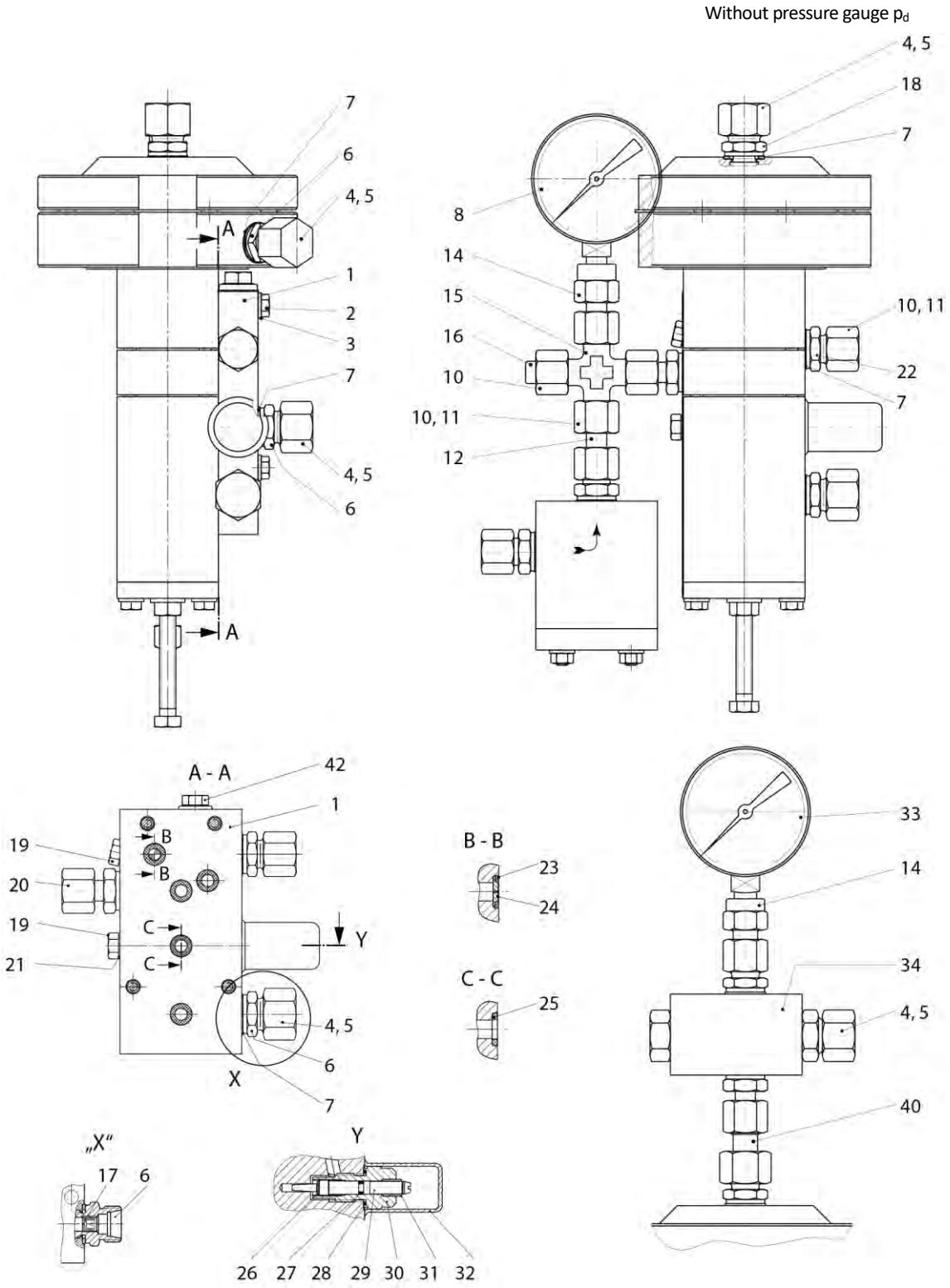




X: Fail-to-open version

Y: Amplifying valve

Spare parts drawing for single-stage pilot with larger diaphragm assembly



X: Fail-to-open version

Y: Amplifying valve

With pressure gauge p_d and HON 925

W_d 0.3 to 1 bar

Maintenance parts for single-stage HON 650-1 pilot

No.	Name	Part no.		
		Larger diaphragm assembly	Diaphragm assembly	Metal bellows assembly
7	Gasket	18 842 (5 units)	18 842 (5 units)	18 842 (5 units)
21	Gasket	18 710	18 710	18 710
23	O-ring	20 231	20 231	20 231
25	O-ring	20 225 (3 units)	20 225 (3 units)	20 225 (4 units)
27	O-ring	20 283	20 283	20 283
28	O-ring	20 332	20 332	20 332

Spare parts for control stage and fine mesh filter

The spare parts for the three different control stage versions and the spare parts for the fine mesh filter are listed in the “Spare parts for two-stage HON 650 pilot” section.

10.7 Lubricants, threadlockers, and tools

Lubricants

Important! All parts must be slightly greased.

Use the following lubricants:

Application	Remark	Lubricant	Part no.
O-rings Stationary and moving		**Standard model:**	
Flat gaskets		Silicone grease (jar)	27079
Diaphragms	Grease the diaphragm grip body on all sides	Silicone grease (tube)	27081
	Do NOT grease the flat grip		
Valve rod sliding surfaces	Grease film only	**Low-temperature model:**	
Sliding guides		Silicone grease (jar)	27993
Guide bushings			
Moving parts in SAV controlgear and switchgear		**High-temperature model:**	
Switch jacks and locking sleeves		PFPE grease	102389
Control balls and control rollers			
Ball bearing			
Valve sleeves and valve sleeve gaskets in gas pressure regulators		Silicone grease	27052
Setpoint set screws Power screws		Assembly paste	27091
Thread material combination: Al/Al			
Screw-in fittings and fastening screws			
Spring plate depressions (pilot)			
Devices for oxygen **Important!** Oil-free and grease-free installation; only antiseize agents are permissible	Upper oxygen pressure limit: 260 bar at 60 °C	Antiseize agent	28211
Devices for ammonia		Antiseize agent	28211

Threadlocker

Important! All parts must be coated slightly.

Use the following threadlockers:

Application	Threadlocker	Part no.
For the HON 650 pilot ▪ Cap threads ▪ Hex nut threads ▪ Connecting piece threads	LOCTITE	26 688

Standard tools

The following standard tools can be acquired through the manufacturer:

Tool		Part no.
Torque wrench		
	▪ 4 – 20 Nm	12 132 313
	▪ 20 – 100 Nm	26 192
	▪ 38 – 407 Nm	26 569
	▪ 100 – 600 Nm	26 316
	▪ 750 – 2000 Nm	28 397
Hex socket for torque wrench		
	▪ Width across flats of 4 mm	12 132 314
	▪ Width across flats of 5 mm	12 132 315
	▪ Width across flats of 6 mm	26 195
	▪ Width across flats of 10 mm	26 197
	▪ Width across flats of 12 mm	26 904
	▪ Width across flats of 14 mm	26 571
	▪ Width across flats of 17 mm	26 572
	▪ Width across flats of 19 mm	27 000
	▪ Width across flats of 22 mm	28 398

Special tools

You will need the following special tools for maintenance purposes:

Application	Special tools	Part no.
Maintaining the pilot	Assembly aid	19 083 319
Maintaining the actuator assembly		
▪ DN 25 nominal inlet size	Assembly disc	10 002 218
▪ DN 50 nominal inlet size	Assembly disc	10 013 547
▪ DN 80 nominal inlet size	Assembly disc	19 081 843
▪ DN 100 nominal inlet size	Assembly disc	10 013 647
▪ DN 150, DN 200, and DN 250 nominal inlet sizes	Assembly screw	10 000 725
Additionally for the versions with an expander:		
▪ DN 25 nominal inlet size with DN 100 expander	Special top piece	27 077
▪ DN 25 nominal inlet size with DN 150 expander	Special top piece	26 706
▪ DN 50 nominal inlet size	Special top piece	26 706
▪ DN 80 nominal inlet size	Special top piece	27 078
▪ DN 100 nominal inlet size	Special top piece	27 078

10.8 Technical specifications for HON 970a electrical displacement transducer

Magnetically actuated
Linear position sensor
WIM100-Q25L-Li-Exi-H1141

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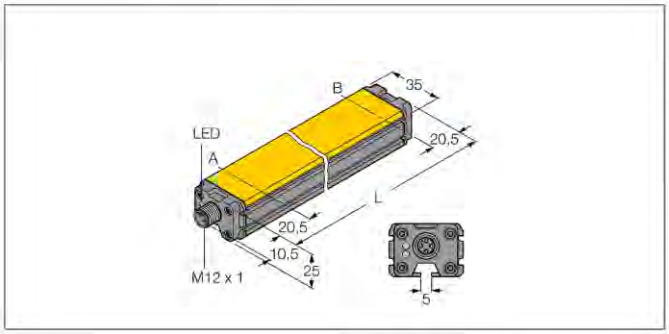
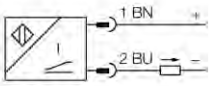


- **ATEX category II 2 G, Ex Zone 1**
- **ATEX category II 2 D, Ex Zone 21**
- **Cuboid-shaped, aluminium / plastic**
- **Versatile mounting possibilities**
- **Immune to external magnetic fields**
- **Extremely short blind zones**
- **2-wire, 14…30 VDC**
- **Analog output**
- **4 … 20 mA**
- **Male connector, M12 x 1**

Wiring diagram

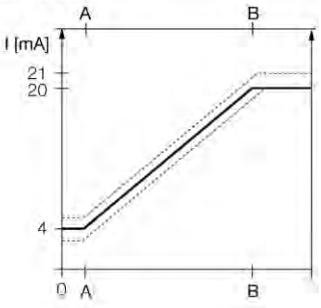


Type	WIM100-Q25L-Li-Exi-H1141
Ident-No.	1536642
Measuring range [A…B]	100 mm
Resolution	0,1mm/10
Repeatability	ð 0.1% of the IA-BI measurement range ð depending on positioning magnet
Linearity deviation	ð 1 % of full scale
Temperature drift	ð ± 0.03 % / K
Ambient temperature	-25…+65 °C
Operating voltage	14…30 VDC
Residual ripple	ð 10 % U_{ss}
Rated insulation voltage	ð 0.5 kV
Short-circuit protection	yes
Wire breakage / Reverse polarity protection	yes/ complete
Output function	2-wire, Analog output
Current output	4…20 mA
Load resistance current output	ð [(U_B -14 V) / 20 mA] kò
Sample rate	150 Hz
Approval acc. to	KEMA 03 ATEX 1122 X Edition no. 2
Internal capacitance (C_i) / inductance (L_i)	0 nF / 0 µH
Device designation	É II 2 G Ex ia IIC T6 Gb / II 2 D Ex ia IIIC T85°C Db (max. Ui = 30V, Ii = 120mA, Pi = 675mW)
Design	rectangular, Q25L
Dimensions	141 x 35 x 25 mm
Housing material	aluminium
Connection	connector, M12 x 1
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class	IP67

Functional principle

Linear position sensors operate on the Hall principle and accomplish simple control tasks. They provide an output signal proportional to the actuating magnet. The polarity of the magnet has no effect on the output signal. The outstanding features of these robust sensors are excellent repeatability, resolution and linearity, excellent electromagnetic capability and a broad temperature range.

Characteristic



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Magnetically actuated
Linear position sensor
WIM100-Q25L-Li-Exi-H1141

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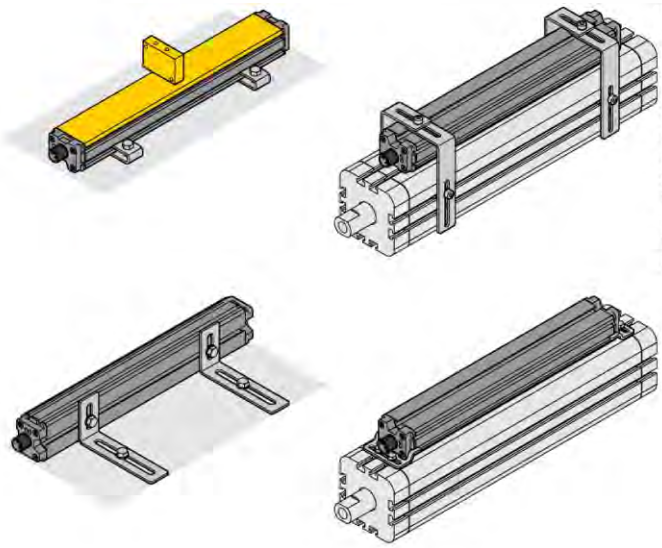
Mounting instructions



Numerous accessories allow the sensor to be mounted in various postions. Opposite to the active face the sensor housing features a mounting groove for which sliding blocks are available. The lateral slot profiles can be used for mounting, too.
When used with an external positioning element, the sensor can either be mounted with the active face opposite or laterally to the mounting surface. Drilling slots guarantee highest flexibility for fine adjustment.
The mounting accessories for linear position sensors can be adjusted to the corresponding cylinder sizes. The stainless steel accessories guarantee safe and robust mounting as well as highest flexibility.

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Magnetically actuated
Linear position sensor
WIM100-Q25L-Li-Exi-H1141

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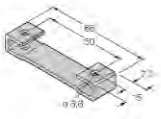
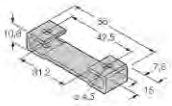
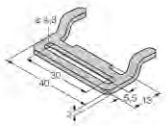
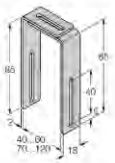
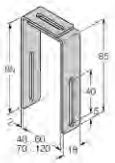
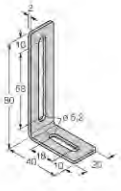
Accessories

Type code	Ident-No.	Short text	Dimension drawing
M1-Q25L	6901045	Mounting foot for linear position sensor Q25L; aluminium; 2 pcs. per bag	
M2-Q25L	6901046	Mounting foot for linear position sensor Q25L; aluminium; 2 pcs. per bag	
MB1-Q25	6901026	Mounting clip for linear position sensor Q25L; material Stainless steel; 2 pcs. per bag	
MB2.1-Q25	6901027	Mounting bracket for linear position sensors Q25L; mounting on pneumatic cylinders (40…60mm); material: Stainless steel; 4 pcs. per bag	
MB2.2-Q25	6901028	Mounting bracket for linear position sensors Q25L; mounting on pneumatic cylinders (70…120mm); material: Stainless steel; 4 pcs. per bag	
M4-Q25L	6901048	Mounting bracket for linear position sensor Q25L; material Stainless steel; 2 pcs. per bag	

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Magnetically actuated
Linear position sensor
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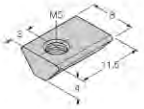
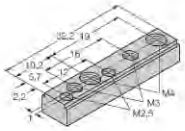
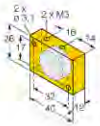
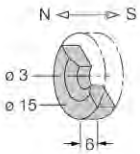
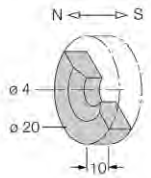
Accessories

Type code	Ident-No.	Short text	Dimension drawing
MN-M4-Q25	6901025	Sliding block with M4 thread for the backside profile of the Q25L; material Brass; 10 pcs. per bag	
MN-M5-Q25	6901039	Sliding block with M5 thread for the backside profile of the Q25L; material Stainless steel; 10 pcs. per bag	
MN-C	6901024	Sliding block for T-groove cylinder 5-8mm; 1 pcs. per bag	
DM-Q12	6900367	Actuation magnet; cuboid-shaped plastic; sensing range 58 mm on BIM-(E)M12 sensors resp. 49 mm on BIM-EG08 sensors; in combination with Q25: Recommended distance between sensor and magnet:3 … 5 mm	
DMR15-6-3	6900216	Actuation magnet, Ø 15 mm (Ø 3 mm), h: 6 mm; sensing range 36 mm on BIM-(E)M12 sensors resp. 32 mm on BIM-EG08 sensors; in combination with Q25L: Recommended distance between sensor and magnet: 3 … 4 mm	
DMR20-10-4	6900214	Actuation magnet; Ø 20 mm (Ø 4 mm), h: 10 mm; sensing range 59 mm on BIM-(E)M12 sensors resp. 50 mm on BIM-EG08 sensors; in combination with Q25L: Recommended distance between sensor and magnet: 3 … 4 mm	

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