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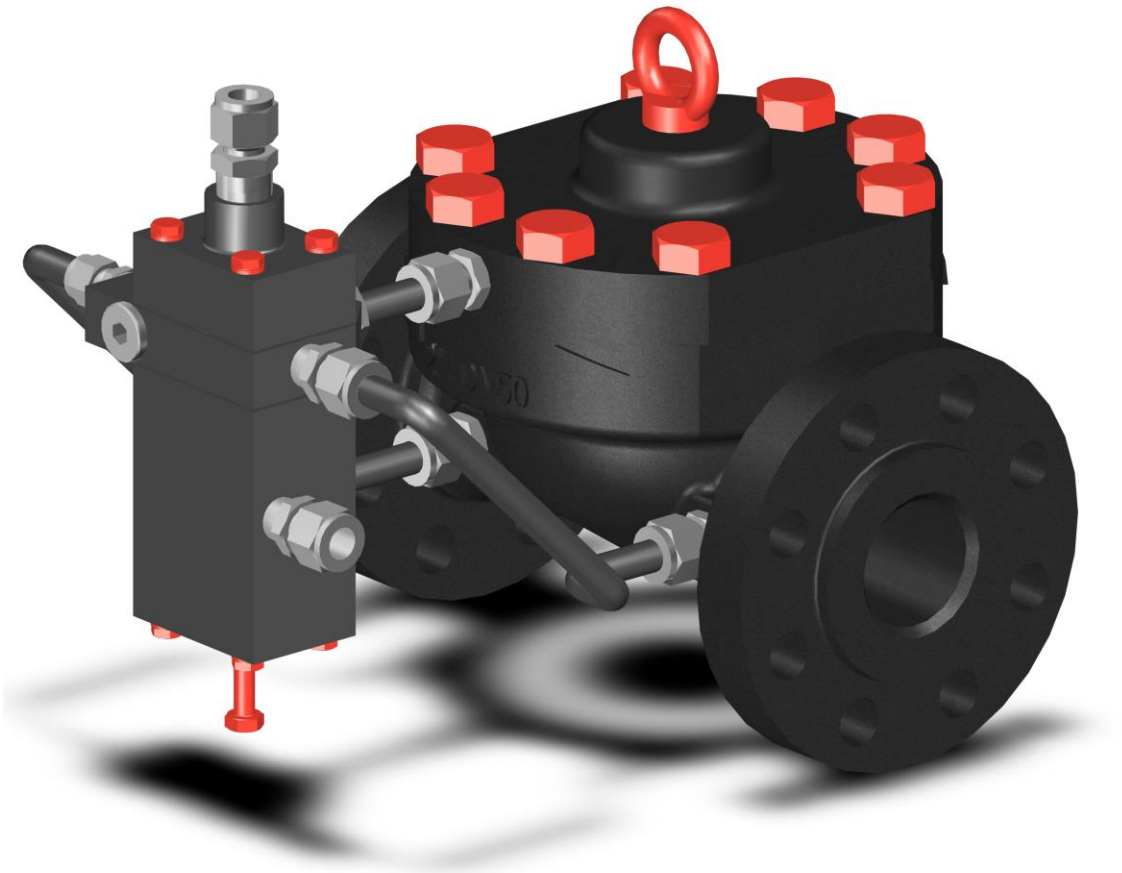


HON 5020

gas pressure regulator with HON 640a / HON 642a pilot

User and maintenance manual
Spare parts

Contents

1 General considerations

Contents

1.1 About this user manual

Validity and purpose

This user manual applies to HON 5020 gas pressure regulators featuring a pilot from the HON 640a / HON 642a series.

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

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

Target group

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

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

Illustration

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

Safety

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

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

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

Copyright notice

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

HON 5020 gas pressure regulators featuring an HON 640a / HON 642a pilot can be used to maintain the outlet or inlet pressure of a gas constant within a regulating line regardless of the influence of disturbance variables such as pressure changes and/or discharge changes. In addition, these gas pressure regulators can be used to implement an active-monitor regulator configuration. It can be used in transfer stations of gas transportation networks, in power plants and industrial plants. HON 5020 gas pressure regulators featuring an HON 640a / HON 642a pilot are suitable for use with natural gas or dry, non-aggressive industrial gases.

Note: The utilization limits of the device with regard to the medium, operating pressure and operating temperature can be gathered from the type plate attached on the device or the technical specifications.

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

Limitations of use

Please observe the following limitations of use:

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

2.2 Device models

Gas pressure regulator versions

Gas pressure regulators consisting of an HON 5020 regulator unit combined with a pilot from the HON 640a or HON 642a series are available in a number of versions. These versions are derived from the various possible combinations between the various pilot and actuator assembly versions.

HON 5020 actuator assembly models

The following table shows which models are available:

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

Designs and versions in the HON 640a and HON 642a pilot series

The following table shows which designs and versions are available:

Series	Design	System of measurement	Setpoint range [bar]	Standard components	Versions / optional components
640a	Diaphragm measuring unit	Imperial	1 - 40	Integrated filter	None
	Metal bellows measuring unit	Imperial	20 - 90	Integrated filter	None
	Diaphragm measuring unit	Metric	1 - 40	▪ Integrated filter ▪ Inlet pressure gauge	▪ Outlet pressure gauge ▪ Protection against overpressure
642a	Diaphragm measuring unit	Imperial	1 - 40	Integrated filter	None

The designs that use the imperial system of measurement feature ports that conform to Anglo-American thread standards and use inches as a unit.

The designs that use the metric system of measurement feature ports that conform to European thread standards and use metric units.

Versions and designs in this user manual

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

The remaining sections in this user manual mostly use the version with the HON 640a imperial pilot with a diaphragm assembly as a reference. However, other versions and models will be covered specifically as well when there are important differences that need to be pointed out.

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

2.3 Labels/Markings

Illegible labels

⚠WARNING

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

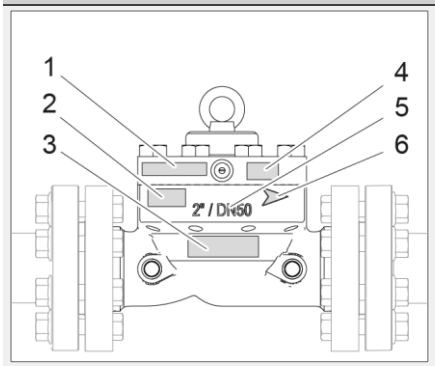
Labels, as well as inscriptions and stamping on the device, can eventually become soiled or otherwise unrecognizable to such an extent that users will not be warned effectively of hazards and may be unable to follow required operating instructions. This will pose a risk of injury.

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

⇨ Immediately replace damaged and missing labels.

Labels on the HON 5020 actuator assembly

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

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

Nameplates

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

Identifying the device (see page 13)

Labels on connection lines

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

2.4 Identifying the device

Identifying the gas pressure regulator

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

Use the nameplates to identify the gas pressure regulator.

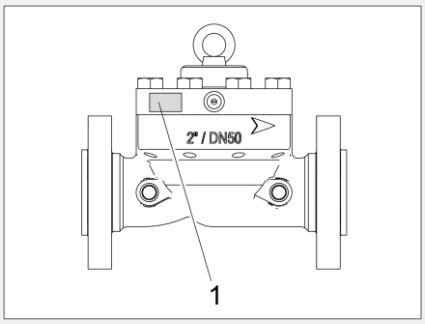
Verifying the technical specifications

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

Technical specifications (see page 20)

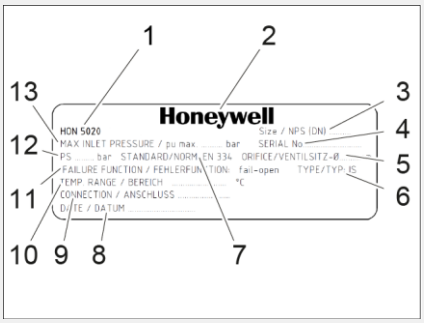
Locating the type plate of the actuator assembly

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

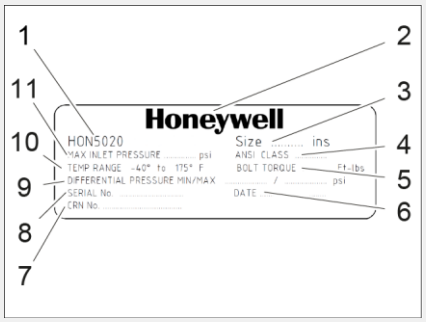
Figure	No.	Meaning
	1	Front of the actuator assembly

Interpreting the type plate of the actuator assembly

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

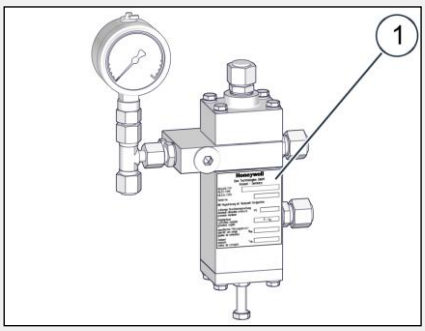
Figure	No.	Meaning
	1	Model name
	2	Manufacturer
	3	Nominal size
	4	Serial number of the device
	5	Valve seat diameter
	6	Device version (IS = version with integral overpressure protection)
	7	Standard (EN 334)
	8	Manufacturing date (month/year)
	9	Connection
	10	Temperature range
	11	Failure function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

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

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

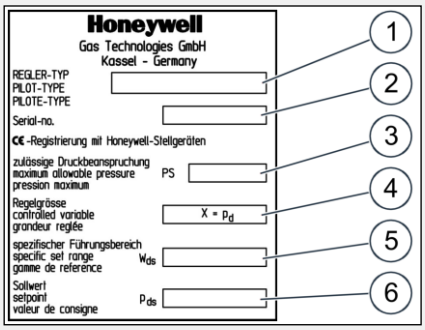
Locating the type plate of the pilot

The nameplate can be found in the location shown below:

Figure	No.	Description
	1	Front of the pilot

Interpreting the type plate of the pilot

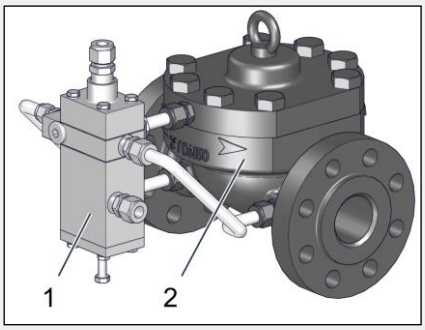
The details on the type plate have the following meaning:

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:

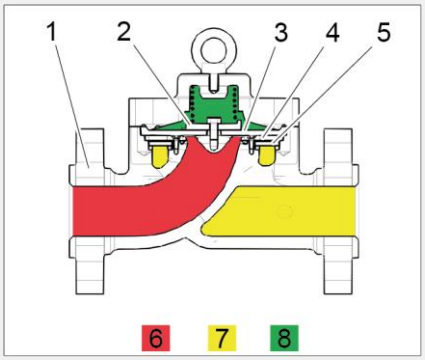
Figure	No.	Description
	1	HON 640a / HON 642a pilot
	2	HON 5020 actuator assembly

How it works

- Gas pressure regulators consisting of an HON 5020 actuator assembly combined with an **HON 640a** pilot can be used to maintain the **outlet pressure** of a gas constant within set limits within a regulating line regardless of the influence of disturbance variables such as pressure changes and/or discharge changes.
- Gas pressure regulators consisting of an HON 5020 actuator assembly combined with an **HON 642a** pilot can be used to maintain the **inlet pressure** of a gas constant within set limits within a regulating line regardless of the influence of disturbance variables such as pressure changes and/or discharge changes.
- The pressure that needs to be regulated is fed to the pilot via the measuring impulse line. The diaphragm system in the pilot determines the pressure process value as a force on the measuring diaphragm and compares it with the force of the pilot spring, which is used as reference variable. If control deviations are detected based on the results from this comparison, the opening position of the actuator assembly's regulating diaphragm will be changed by adjusting the set pressure so that the pressure being regulated (process value) will change to match the setpoint. When there is zero pressure flow, the device seals tightly.

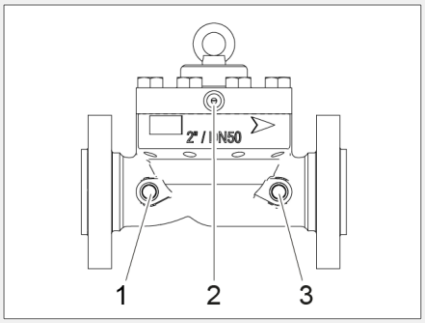
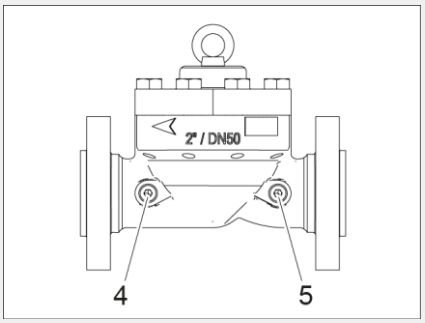
Actuator assembly configuration

Actuator assembly configuration:

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

Actuator assembly connection lines

Actuator assembly connection lines:

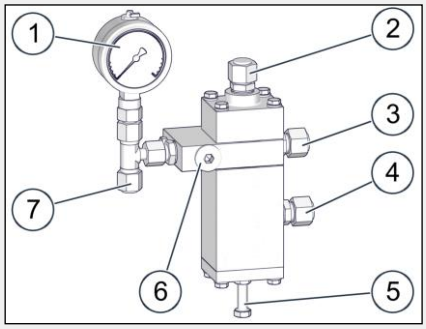
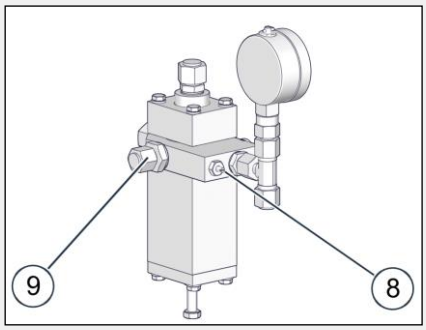
Figure	No.	Connection
Front: 	1	Inlet pressure
	2	Motorization pressure
	3	Outlet pressure / feedback
Back: 	4	Outlet pressure
	5	Inlet pressure

The actuator assembly's connections have the following dimensions:

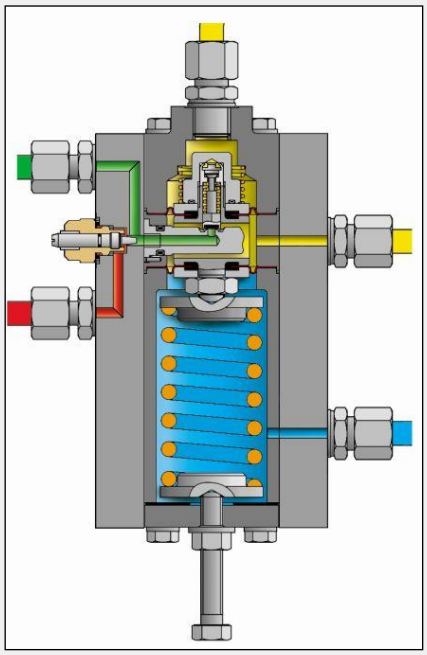
- **M 14 x 1.5** if the pilot being connected uses the metric system
- **3/8 NPT** if the pilot being connected uses the imperial system

HON 640a configuration

The pilots in the HON 640a series are made up of the following individual components and feature the ports indicated below:

Figure	No.	Description
	1	Inlet pressure gauge (only on metric HON 640a)
	2	Port for outlet pressure sensing line
	3	Port for outlet pressure process line
	4	Breather line fitting (ambient pressure compensation)
	5	Spring adjuster
	6	Integrated filter
	7	Port for inlet pressure line
	8	Amplifying valve
	9	Port for motorization line

Pressure sections in HON 640a pilot series

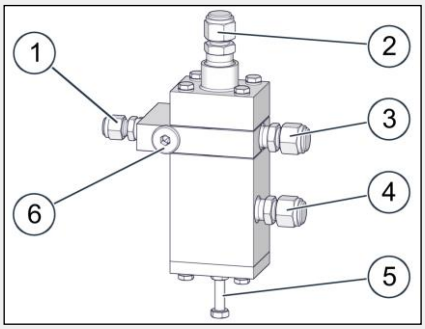
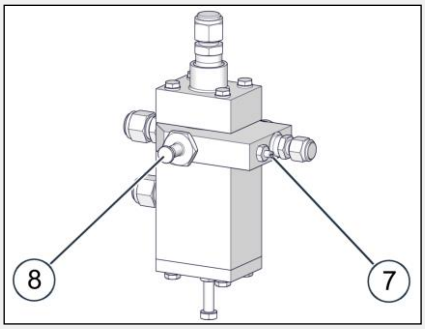
Figure	Color	Meaning
		
		Inlet pressure
		Motorization pressure
		Outlet pressure
		Atmospheric pressure

How the HON 640a pilot works

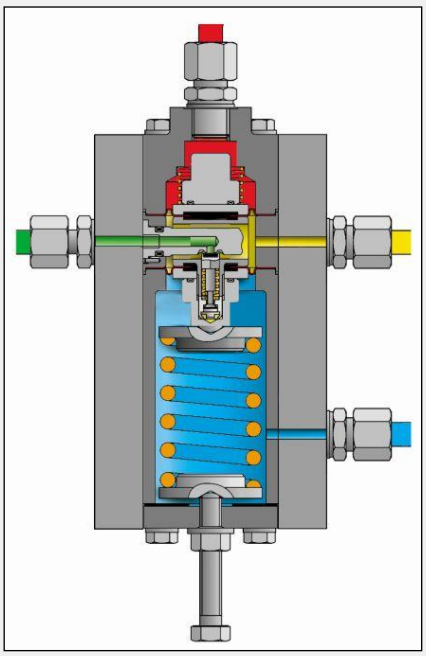
- The inlet pressure is conveyed into the pilot through the filter.
- The outlet pressure is conveyed into the pilot from the other side and produces a force component that acts on the double diaphragm system from above.
- The pilot's set screw is used to tighten the pilot spring, producing a force component that acts on the double diaphragm system from below.
- The force components being exerted on the double diaphragm system are used by the system in order to compare the setpoint and the process value. Depending on the gas pressure and on the set setpoint, the double diaphragm system's position inside the pilot 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. The dynamically regulated gap between the nozzle and the deflector plate is used to build up the motorization pressure inside the double diaphragm system.
- The motorization pressure causes the gas pressure regulator being operated to open and close as appropriate.
- The pilot's amplifying valve is used to set the speed of the motorization pressure changes.

HON 642a configuration

The pilots in the HON 642a series are made up of the following individual components and feature the ports indicated below:

Figure	No.	Description
	1	Port for outlet pressure line
	2	Port for inlet pressure line
	3	Port for outlet pressure process line
	4	Breather line fitting (ambient pressure compensation)
	5	Spring adjuster
	6	Integrated filter
	7	Amplifying valve
	8	Port for motorization line

Pressure sections in HON 642a pilot series

Figure	Color	Meaning
		Inlet pressure
		Motorization pressure
		Outlet pressure
		Atmospheric pressure

How the HON 642a pilot works

- The outlet pressure is conveyed into the pilot through the filter.
- The inlet pressure is conveyed into the pilot from above and produces a force component that acts on the double diaphragm system from above.
- The pilot's set screw is used to tighten the pilot spring, producing a force component that acts on the double diaphragm system from below.
- The force components being exerted on the double diaphragm system are used by the system in order to compare the setpoint and the process value. Depending on the gas pressure and on the set setpoint, the double diaphragm system's position inside the pilot 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. The dynamically regulated gap between the nozzle and the deflector plate is used to build up the motorization pressure inside the double diaphragm system.
- The motorization pressure causes the gas pressure regulator being operated to open and close as appropriate.
- The pilot's amplifying valve is used to set the speed of the motorization pressure changes.

2.6 Technical specifications

Materials

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

Environmental conditions

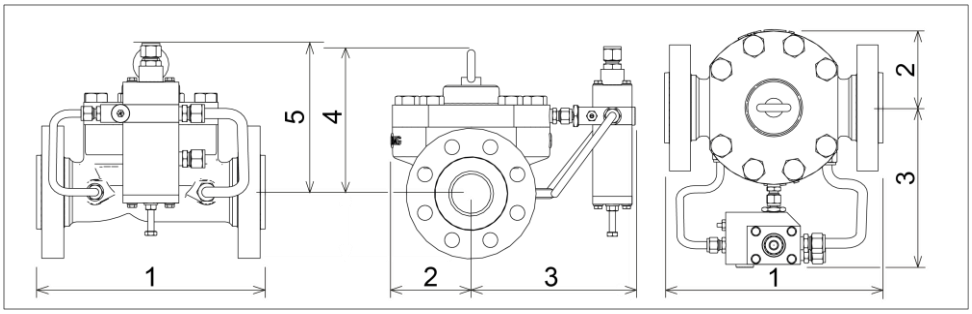
Criterion	Value
Temperature range for gas pressure regulator with HON 640a imperial or HON 642a imperial pilot	-40 to +80 °C (-40 to +176 °F)
Temperature range for gas pressure regulator with HON 640a metric pilot	-20 to +60 °C (-4 to +140 °F)

Nominal pressure rating and flange facing standards

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

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

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



Size	PN	Class	1 inch (mm)	2 inch (mm)	3 inch (mm)	4 inch (mm)	5 inch (mm)	Weight* lbs (kg)
1″ (DN 25)	16	150	7.24 (184)	2.83 (72)	5.95 (151)	6.46 (164)	6.54 (166)	29.8 (13.7)
1″ (DN 25)	25 / 40	300	7.76 (197)	2.83 (72)	6.93 (176)	6.46 (164)	6.54 (166)	32.8 (14.9)
1″ (DN 25)		600	8.27 (210)	2.83 (72)	6.93 (176)	6.46 (164)	6.54 (166)	33.6 (15.4)
2″ (DN 50)	16	150	10.00 (254)	3.23 (82)	7.32 (186)	7.17 (182)	7.32 (186)	47.6 (21.6)
2″ (DN 50)	25 / 40	300	10.51 (267)	3.23 (82)	7.32 (186)	7.17 (182)	7.32 (186)	52.9 (24.0)
2″ (DN 50)		600	11.26 (286)	3.98 (101)	8.03 (204)	7.17 (182)	6.54 (166)	63.5 (28.8)
3″ (DN 80)	16	150	11.73 (298)	4.80 (122)	8.58 (218)	8.70 (221)	7.80 (198)	95.7 (43.4)
3″ (DN 80)	25 / 40	300	12.48 (317)	4.80 (122)	9.06 (230)	8.70 (221)	7.80 (198)	105.8 (48.0)
3″ (DN 80)		600	13.27 (337)	5.00 (127)	9.06 (230)	8.70 (221)	7.80 (198)	148.6 (67.4)
4″ (DN 100)	16	150	13.86 (352)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	151.0 (68.5)
4″ (DN 100)	25 / 40	300	14.49 (368)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	170.0 (77.1)
4″ (DN 100)		600	15.51 (394)	5.71 (145)	9.84 (250)	10.04 (255)	8.98 (228)	205.0 (93.0)
6″ (DN 150)	16	150	17.76 (451)	7.56 (192)	11.61 (295)	11.85 (301)	10.59 (269)	286.6 (130.0)
6″ (DN 150)	25 / 40	300	18.62 (473)	7.56 (192)	11.97 (304)	11.69 (297)	10.59 (269)	324.1 (147.0)
6″ (DN 150)		600	20.00 (508)	7.91 (201)	11.97 (304)	11.89 (302)	10.59 (269)	425.5 (193.0)

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

Pilot dimensions and weights

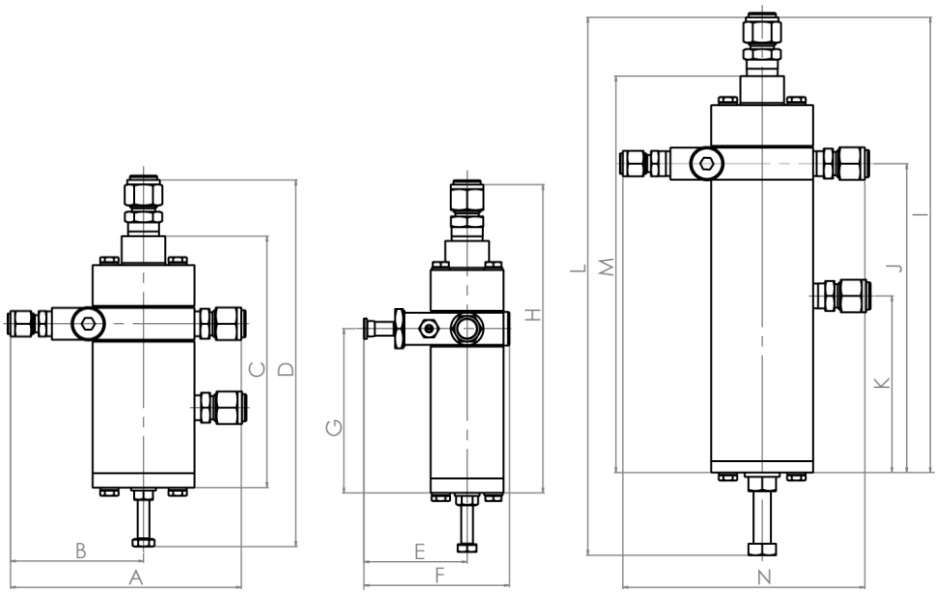
Imperial **HON 640a**

Diaphragm measuring unit

W_d = 1 - 40 bar

Metal bellows measuring unit

W_d = 40 - 90 bar



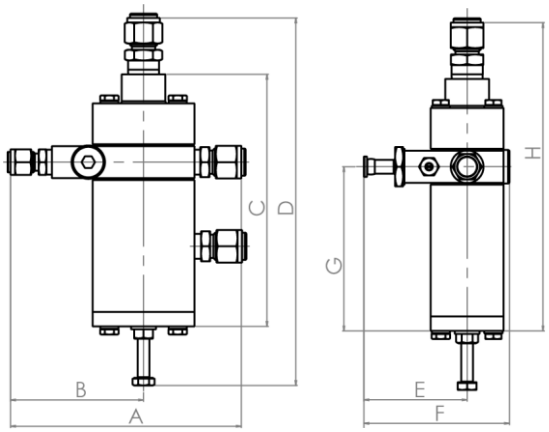
Weight [lbs]	**A** [in]	**B** [in]	**C** [in]	**D** [in]	**E** [in]	**F** [in]	**G** [in]
Diaphragm measuring unit: 4.2							
Metal bellows measuring unit: 7.3	6.3	3.6	6.8	9.9	2.8	3.9	4.4

H [in]	**I** [in]	**J** [in]	**K** [in]	**L** [in]	**M** [in]	**N** [in]
8.3	12,3	8.3	4.8	14,6	10,7	6.5

Imperial **HON 642a**

Diaphragm measuring unit

W_d = 1 - 40 bar

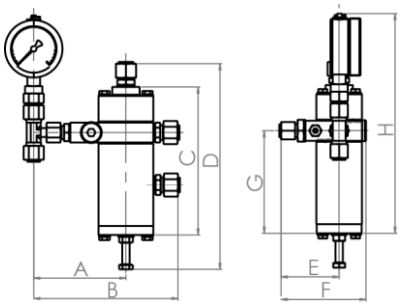


Weight [lbs]	**A** [in]	**B** [in]	**C** [in]	**D** [in]	**E** [in]	**F** [in]	**G** [in]	**H** [in]
4.2	6.3	3.6	6.8	9.9	2.8	3.9	4.4	8.3

Metric **HON 640a**

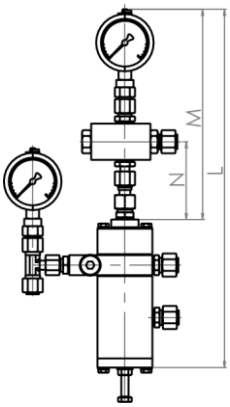
Without pressure gauge for outlet pressure

W_d = 1 - 40 bar

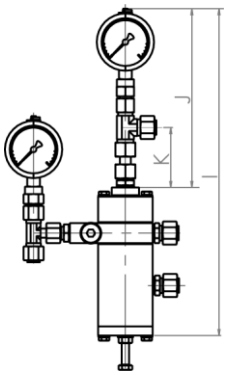


With outlet pressure gauge

W_d = 1 - 20 bar



W_d = 10 - 40 bar



Weight [kg]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
2.6	100	158	162	226	64	93	112
	H [mm]	**I** [mm]	**J** [mm]	**K** [mm]	**L** [mm]	**M** [mm]	**N** [mm]
	241	359	197	66	394	231	86

Operating pressure, Class 150

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

Operating pressure, Class 300

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

Operating pressure, Class 600

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

Operating pressure, PN 16

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

Operating pressure, PN 25

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

Operating pressure, PN 40

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

Pilot springs

Specific set range W_{ds}	Pilot spring		
	No.	Color	Wire diameter [mm]
0.5 – 2 bar (7 – 29 psi)	1	blue	3.6
1 – 5 bar (14.5 – 72.5 psi)	2	black	4.5
2 – 10 bar (29 – 145 psi)	3	grey	5
5 – 20 bar (72.5 – 290 psi)	4	brown	6.3
10 – 40 bar (145 – 580 psi)	5	red	7.0
10 – 50 bar (145 – 725 psi)	6	Green	8/7*
20 – 90 bar (290 – 1305 psi)	7	White	9

*Spring with rectangular cross section

Accuracy class AC and look-up pressure class SG for imperial and metric HON 640a and imperial HON 642a

Outlet pressure range p_d range [bar]	Accuracy class AC	Look-up pressure class SG
0.3 – 1	20*/30	30*/50
> 1 – 3	20	30
> 2.5 – 5	10	20
> 5 – 10	5	10
> 10 – 40	2.5	10
> 40 – 90**	1	5

*This (better) accuracy class and this (also better) look-up pressure class apply when the inlet pressure fluctuations are < 8 bar (applies to imperial and metric HON 640a).

**Applies to metal bellows measuring unit only

Gas properties

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

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

3 Safety

Contents

3.1 Basic safety rules

Target group of these rules

These rules are intended for any individuals handling the device.

Purpose of these rules

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

Handling the user manual

Observe the following rules:

- Read the chapter entitled Safety and the chapters relating to your responsibilities in their entirety. It is vital that you have understood these contents.
- Always keep the user manual close by the device so that you can refer to it again.
- Include the user manual if you are giving the device away.

Handling the device

Observe the following rules:

- Only individuals who meet the requirements set forth in this user manual have permission to handle the device.
- The device's intended use includes its use in hazardous locations. All work with and on the device must be carried out only after the presence of an explosive atmosphere has been fully ruled out.
- Only use the device for the intended purpose. Never use the device for any other, potentially logical purposes.
- Follow all safety procedures outlined in this user manual and on the device. In particular, wear the mandatory personal protective gear.
- Only stay at the specified work places.
- Do not modify the device in any way, e. g. by removing parts or adding unapproved parts. In particular, you have no permission to modify or disable any safety contrivances.
- Adhere to the device maintenance intervals specified in this user manual.
- When replacing defective parts, only use original spare parts or manufacturer-approved standard parts.

Operator's duties opposite the employees

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

- All personnel must meet the requirements corresponding to their duties.
- All personnel must read and understand this user manual before working with/on the device.
- All occupational health and safety regulations that apply in your country must be complied with.
- Hazards resulting from specific working conditions at the location where the device is being used must be determined by means of a risk assessment and rendered avoidable by means of appropriate operating instructions.
- All personnel must be provided with the personal protective equipment required for their work. This personal protective equipment must be in good condition at all times.
- All personnel must wear the personal protective equipment required for their work.

Conduct in the event of accidents	The device is designed and built such that the employees can work with it without being at risk. In spite of all the precautions, accidents can happen under unfavorable circumstances. Always consult the directives of your company concerning the protection of the workforce.

3.2 Requirements concerning the workforce, personal protective gear, workplaces

Requirements concerning the workforce

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

Personnel	Responsibilities	Required qualification
Skilled person or expert	Any work on and with the device	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Certified, independent competent person	Safety checks	▪ Professional training ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Carrier	Company-to-company transport	▪ Professional training and experience transporting pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously ▪ Knowledge with securing hauling distances ▪ Knowledge with the use of hoisting equipment
Transportation personnel	Intra-company transport	Professional training and experience with the transport using stackers, etc.
Mechanical fitter	Mechanical installation	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Tasked with the commissioning	▪ Initial start-up ▪ Renewed start-up	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously
Tasked with the installation	Set-up	▪ Professional training and experience operating pressure equipment and systems ▪ Knowledge of the relevant standards and regulations ▪ Ability to identify and avoid dangers autonomously

Personnel	Responsibilities	Required qualification
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

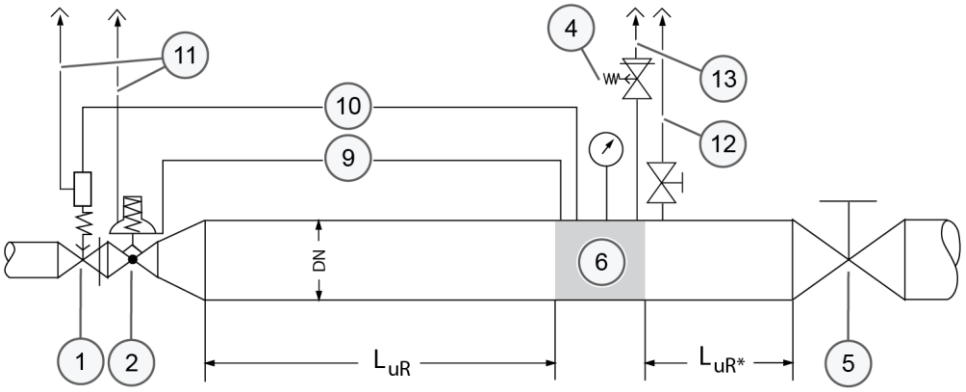
Contents

4.1 Installation examples

Gas pressure regulating line - example 1

Configuration:

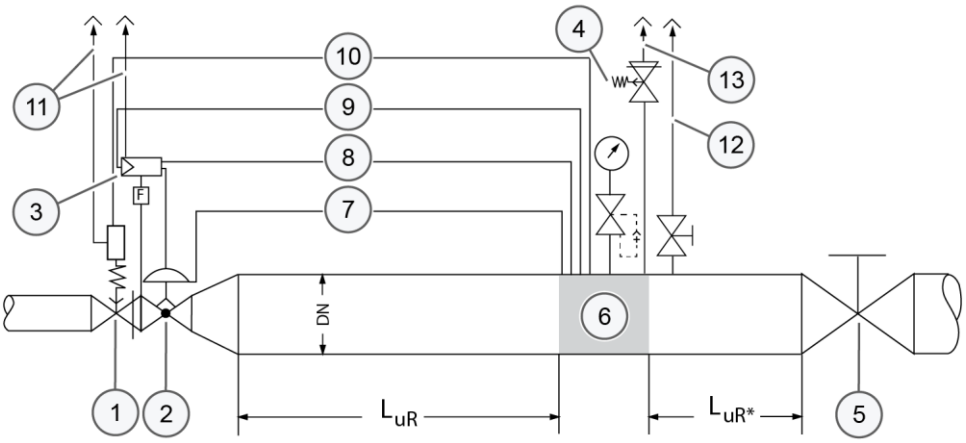
- Direct acting gas pressure regulator (non-piloted)
- With expander without noise reduction element downstream of the gas pressure regulator



Gas pressure regulating line - example 2

Configuration:

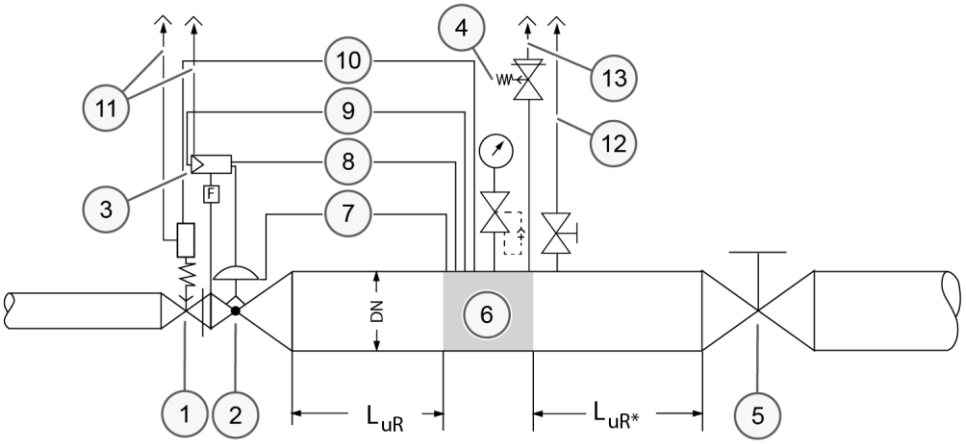
- Indirect acting gas pressure regulator (pilot-operated)
- With expander without noise reduction element downstream of the gas pressure regulator
- Outlet pressure gauge with protection against overpressure



Gas pressure regulating line - example 3

Configuration:

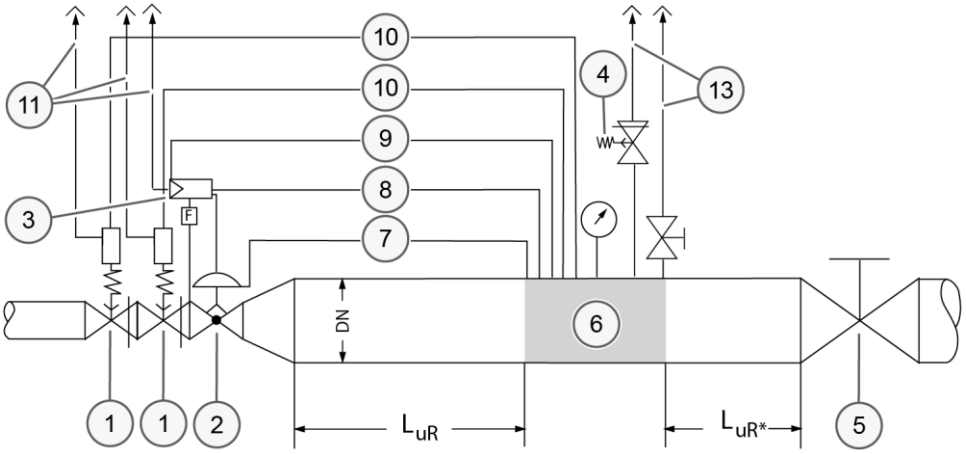
- Indirect acting gas pressure regulator (pilot-operated)
- With expander and integrated noise reduction element
- Outlet pressure gauge with protection against overpressure



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
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.

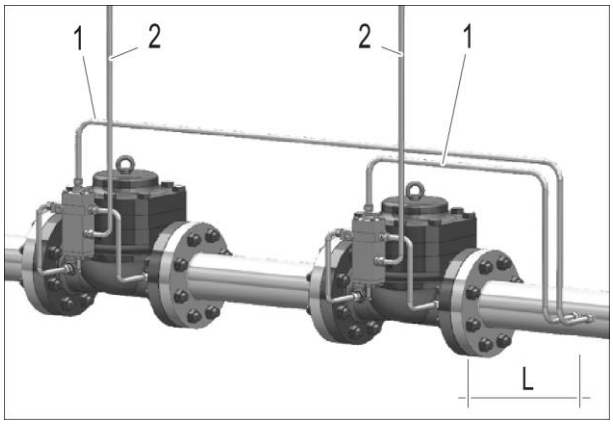
For primary slam-shut devices, it is recommended to route the slam-shut devices' vent lines separately. Vent lines must not be grouped together with blowdown lines.

- **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.

4.4 Alternative application example: Active monitor regulator

Overview

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



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

How it works

Active regulator unit:

The HON 640a pilot of the active regulator unit compares the outlet pressure process value with the set setpoint and uses the resulting motorization pressure to control the movement of the main diaphragm on the flow restrictor in the actuator assembly. This maintains the outlet pressure constant, irrespective of changes in the inlet pressure or changes in the discharge. If the consumption is zero, the built up set pressure pushes the diaphragm onto the seat edge surrounding the flow restrictor by means of the closing spring.

Monitor regulator unit:

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

Measuring impulse line connection

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

5 Transport and installation

Contents

5.1 Transporting the gas pressure regulator

Heavy transport units

⚠WARNING

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

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

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

Suspended loads

⚠WARNING

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

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

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

Selecting the hoisting equipment and slings

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

The following are adequate for use as slings:

- Ropes
- Belts
- Chains

The hoisting equipment and slings must meet the following criteria:

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

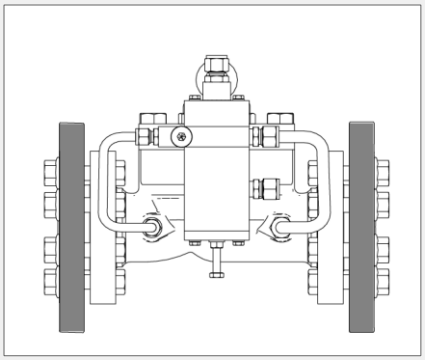
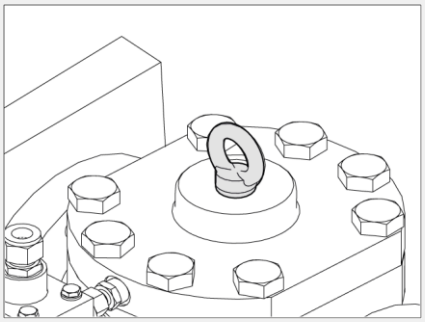
Preparing for transportation

Make sure that the following requirements are met before transportation:

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

Transporting the device

Proceed as follows:

Figure	Step	Description
	1	Leave the flange protective plates on the HON 5020 during transport.
	2	Hook the sling into the eye bolt.
	3	Lift the HON 5020. Slowly and carefully transport the HON 5020 to the location where it will be installed.

5.2 Installing the gas pressure regulator

Preparing the materials

Prepare the following materials:

- Flange gaskets
- Threaded bolts
- Washers
- Nuts

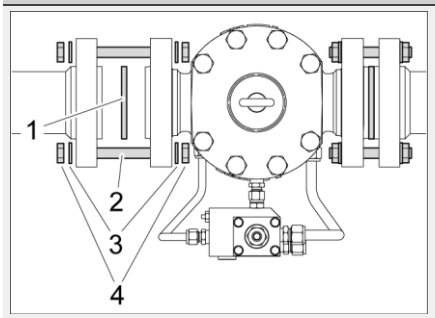
The quantity and size are dependent on the following criteria:

- Design and size of the flange

Assessing the situation

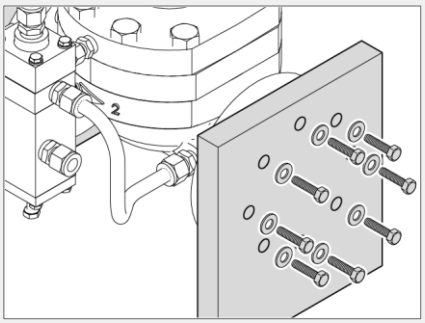
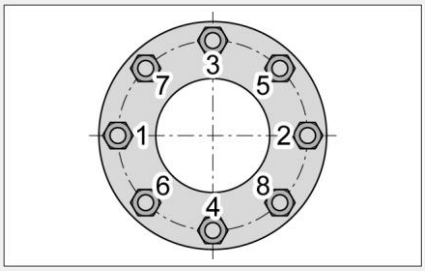
Assess the installation situation.

The numbers have the following meaning:

Figure	No.	Meaning
	1	Flange gasket
	2	Threaded bolts
	3	Washer
	4	Nut

Mounting the actuator assembly

Proceed as follows:

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

Final inspection

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

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

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

Next task

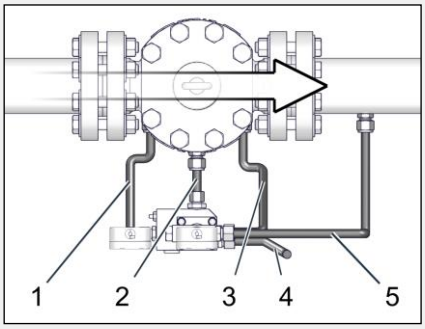
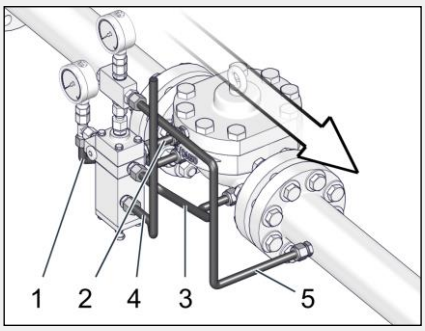
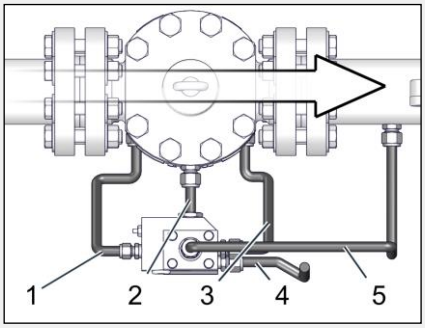
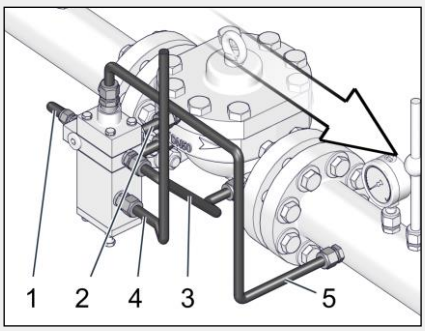
Proceed as follows:

Installing the device connections (see page 44)

5.3 Installing the device connections

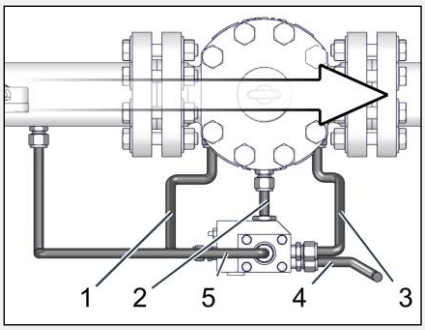
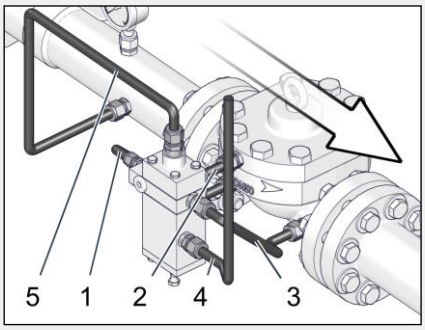
HON 640a operating and measuring impulse lines that are pre-installed and that need to be installed

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

Figure	No.	Designation, category, installation condition
Metric HON 640a:   	1	Inlet pressure line, operating line, pre-installed
	2	Motorization line, operating line, pre-installed
	3	Outlet pressure line, operating line, pre-installed
	4	Vent line, operating line, needs to be installed
	5	Outlet pressure measuring impulse line, Measuring impulse line, needs to be installed
Imperial HON 640a:   		

HON 642a 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
Imperial HON 642a:  	1	Inlet pressure line, operating line, pre-installed
	2	Motorization line, operating line, pre-installed
	3	Outlet pressure line, operating line, pre-installed
	4	Vent line, operating line, needs to be installed
	5	Inlet 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 20)
- Shut-off devices for the operating and measuring impulse lines, as well as other accessories, as required, as per the *Basics for installing the device in a pipe* (see page 31) section.

Installing the operating and measuring impulse lines

The installation of the operating and measuring impulse lines depends on the local conditions and the gas regulating line in which the gas pressure regulator is being used. Please refer to the *Basics for installing the device in a pipe* (see page 31) section for more information on what needs to be ensured without fail in the corresponding design and implementation.

Final checks

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

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

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

Next task

Proceed as follows:

Checking the system for leaks (see page 46)

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

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

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

Pressurized parts

⚠WARNING

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

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

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

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

Pressurized parts

⚠WARNING

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

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

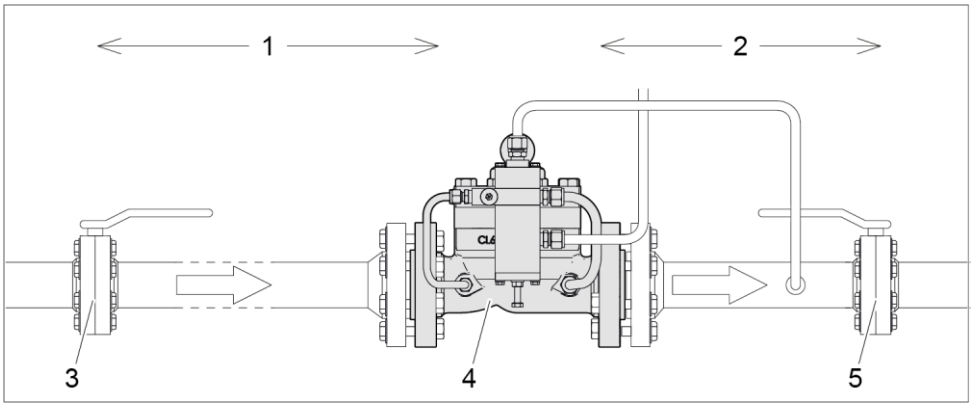
⇨ Pressurize the system only on the inlet side.

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

Technical specifications (see page 20)

Test configuration

The test setup is as follows (schematic diagram, using the imperial system HON 640a as an example):



The numbers have the following meaning:

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

Checking the system for leaks

Proceed as follows:

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

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

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

6 Adjusting the settings of the device

Contents

6.1 Setting the target pressure

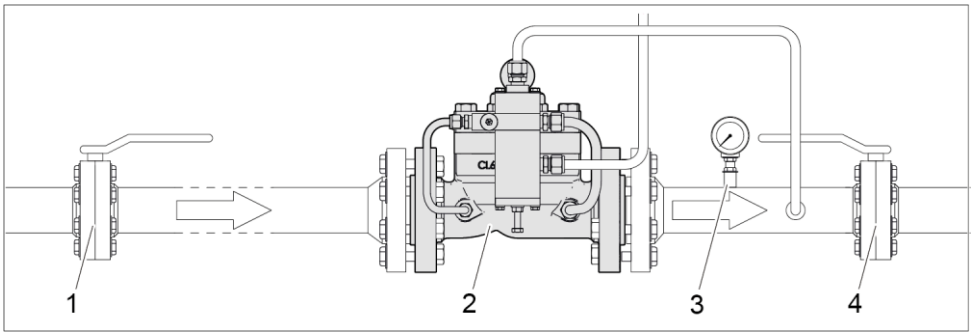
Requirements

Make sure that the following requirements are met:

- The system is pressurized with the operating pressure.
- The outlet valve is closed.
- **HON 640a pilot:**
  A pressure gauge is connected upstream of the outlet shut-off device.
- **HON 642a pilot:**
  A pressure gauge is connected between the inlet shut-off device and the gas pressure regulator.

Design of the system

The test setup is as follows (schematic diagram, using the HON 640a imperial pilot as a reference):

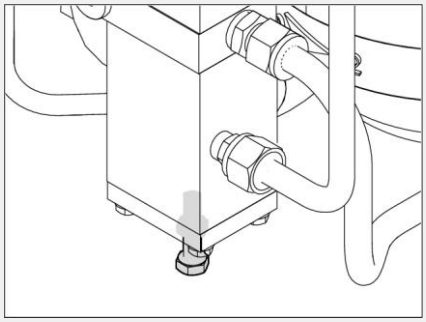


The numbers have the following meaning:

No.	Description
1	Inlet stop valve armature
2	Gas pressure regulator
3	Outlet pressure gauge
4	Outlet stop valve armature

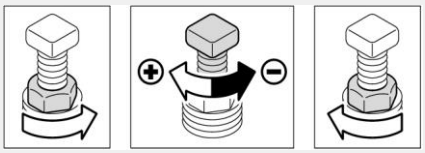
Position of the set screw

The set screw can be found here:

Figure	Description
	Set screw underneath the pilot

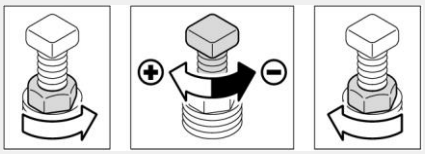
Adjusting the pressure setpoint for the HON 640a pilot

Proceed as follows:

Figure	Step	Description
	1	Unscrew the lock nut of the set screw.
	2	Turn the set screw in counterclockwise direction (-) to release the tension from the pilot spring.
	3	Open the inlet shut-off valve to pressurize the pilot with the operating pressure.
	4	Turn the set screw in clockwise direction (+) until the pressure regulator displays the target value.
	5	Slowly open the outlet valve.
	6	Correct the setting of the set screw as necessary.
	7	Secure the setting of the set screw by tightening the lock nut.

Adjusting the pressure setpoint for the HON 642a pilot

Proceed as follows:

Figure	Step	Description
	1	Unscrew the lock nut of the set screw.
	2	Turn the set screw in counterclockwise direction (-) to release the tension from the pilot spring.
	3	Open the inlet shut-off valve to pressurize the pilot with the operating pressure.
	4	Slowly open the outlet valve.
	5	Turn the set screw in clockwise direction (+) until the pressure regulator displays the target value.
	6	Correct the setting of the set screw as necessary.
	7	Secure the setting of the set screw by tightening the lock nut.

6.2 Adjusting the amplifying valve

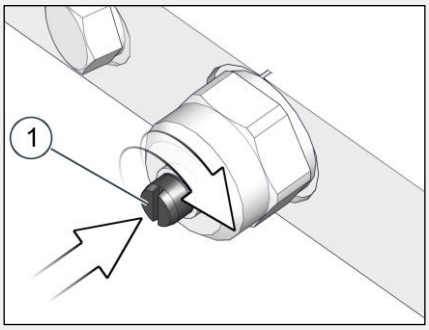
Control behavior changes achieved by adjusting the amplifying valve

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

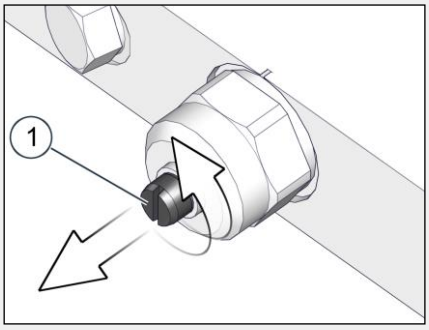
- If the gas pressure regulator exhibits a sluggish response to changes in the manipulated variable, the response times can be shortened.
- If the gas pressure regulator's dynamic response to changes in the manipulated variable is too fast and this results in oscillations, the gas pressure regulator's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

Adjusting the amplifying valve

If you want to **speed up the actuator assembly's response**, follow the steps below:

Figure	Step	Description
	1	Unscrew the spacer nut a bit.
	2	Use a flat-blade screwdriver to screw the spindle (1) in turn by turn while monitoring the actuator assembly's control behavior. As soon as you achieve the actuator assembly response you want, stop changing the spindle's position.
	3	Tighten the spacer nut.

If you want to **slow down the actuator assembly's response**, e.g., in the case that there are oscillations, follow the steps below:

Figure	Step	Description
	1	Unscrew the spacer nut a bit.
	2	Use a flat-blade screwdriver to unscrew the spindle (1) out turn by turn while monitoring the actuator assembly's control behavior. As soon as you achieve the actuator assembly response you want, stop changing the spindle's position.
	3	Tighten the spacer nut.

7 Malfunctions

Contents

7.1 Malfunctions

Pressurized parts

⚠WARNING

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

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

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

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

Malfunctions and abnormalities

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

Malfunction	Possible causes	Correction
The regulator unit does not open	Filter: The filter is dirty	Replace the filter as specified in *Maintaining the pilot* (see page 64)
	Pilot: The diaphragm is defective	Replace the diaphragm as specified in *Maintaining the pilot* (see page 64)
	Actuator assembly: The diaphragm of the regulator unit is defective	Replace the actuator assembly diaphragm as specified in *Maintaining the actuator assembly* (see page 60)
The pressure that needs to be regulated is not being regulated	Check the setting of the target value	Check the setpoint as specified in the *Adjusting the settings of the device* (see page 48) section
	The pilot is defective	Check the pilot and replace it with a new pilot if necessary as specified in *Maintaining the pilot* (see page 64)
The sealing pressure is too high	The regulator unit is leaking due to contamination or damage	Perform maintenance on the actuator assembly as specified in *Maintaining the actuator assembly* (see page 60)

8 Maintenance

Contents

8.1 Maintenance schedule

Meaning

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

Note: The maintenance intervals specified below are recommendations only. Since the intervals for maintenance work depend heavily on the system's operating conditions and on the gas' properties, the maintenance intervals specified below may have to be adjusted based on the relevant operating requirements and experience. Maintenance must be carried out in compliance with all federal and state laws and regulations, as well as with the local rules and regulations set forth by the relevant utilities and authorities and any other applicable regulations.

Maintenance schedule

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

Task	See section	Interval			
		as needed	every 3 months	every year	every 5 years
Maintaining the pilot	*Maintaining the pilot* (see page 64)			●	
Maintaining the actuator assembly	*Maintaining the actuator assembly* (see page 60)			●	
Setting the target pressure	*Setting the target pressure* (see page 49)			●	

8.2 Preparing for the maintenance

Preparation work for maintenance

Proceed as follows:

Step	Description	Explanation
1	Have the maintenance and servicing parts ready	Please refer to *Additional information regarding spare parts* (see page 100) to find out which spare part drawings correspond your specific gas pressure regulator model and have the corresponding maintenance parts and servicing parts ready to go before maintenance.
		▪ The spare parts that are always required for the pilot's maintenance are listed in the spare parts kits for the pilot. ▪ The spare parts that are always required for the actuator assembly's maintenance are listed in the spare parts kits for the actuator assembly. ▪ Spare part drawings and bills of materials are listed in the *appendix* (see page 99).
		In addition to these maintenance parts, there are also servicing parts that need to be checked during maintenance in order to make sure that they are in working condition. and they must be replaced if necessary. Because of this, it is recommended to have the following servicing parts ready for maintenance in order to avoid downtimes: For the pilot: ▪ Compression spring(s) and, if applicable, spring plates ▪ Pressure gauge(s) ▪ Filter insert ▪ Nozzle ▪ Locking ring For the actuator assembly: ▪ Closing spring ▪ Flow restrictor
2	Preparing special tools	In addition to standard tools, have the special tools required for your specific gas pressure regulator model ready to go before maintenance. Please refer to the *Special tools* section in *Lubricants, threadlockers, and special tools* (see page 113).
		You will also need a ballpoint pen or felt tip marker to perform maintenance on the pilot.
3	Have the required lubricants and threadlockers ready	For specifications concerning the lubricants and threadlockers that must be used, please refer to the sections of the same name under *Lubricants, threadlockers, and special tools* (see page 113).

Sample maintenance instructions

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

8.3 Starting maintenance

Pressurized parts

⚠WARNING

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

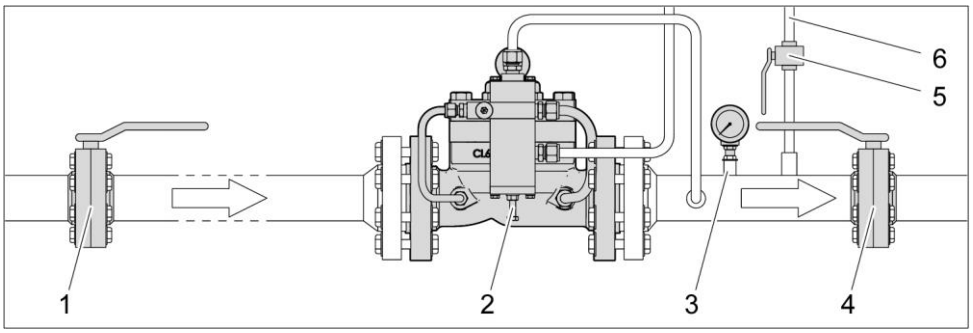
If not handled properly or in the event of a defect, gas can escape from pressurized components under high pressure and cause serious injuries and even death. Before you start working on these components:

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

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

Overview

Schematic diagram using the imperial system HON 640a as an example:



The numbers have the following meaning:

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

Establishing the depressurized status

Proceed as follows:

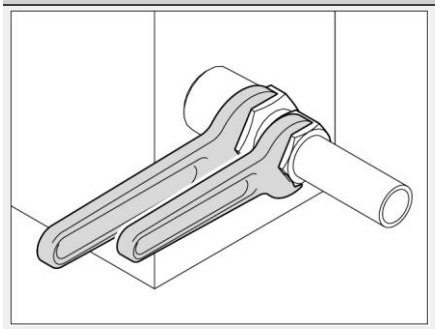
Step	Description
1	Close the outlet stop valve armature (4).
2	Close the inlet stop valve armature (1).
3	Depressurize the pilot: Turn the set screw on the pilot clockwise until the pressure in the regulator is equalized.
4	Open the valve (5) in the blowdown line (6) to discharge the pressure between the inlet and the outlet valves.

Purging the lines with nitrogen

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

Protecting the pipe connections from being twisted

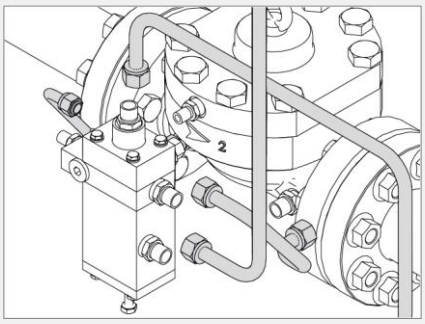
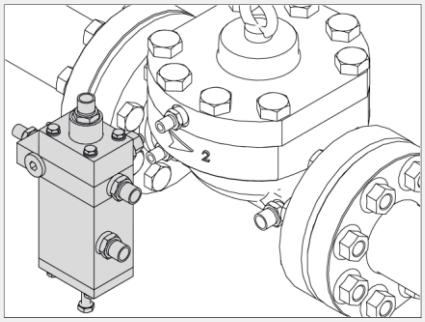
When conducting work involving the pipework, please always observe the following:

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

Removing components

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

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

Figure	Step	Description
	1	Remove all the pilot pipes.
	2	Disassemble the pilot.

8.4 Maintaining the actuator assembly

Contents

8.4.1 Maintaining the actuator assembly

Requirements

Make sure that the following requirements are met:

- The system is not pressurized, see *Starting maintenance* (see page 57).
  WARNING! Mortal danger associated with pressurized components.

Cleaning

Observe the following cleaning instructions:

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

Tightening torques

When screwing the actuator assembly's lid, make sure to observe the following tightening torques:

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

Maintaining the actuator assembly

Proceed as follows:

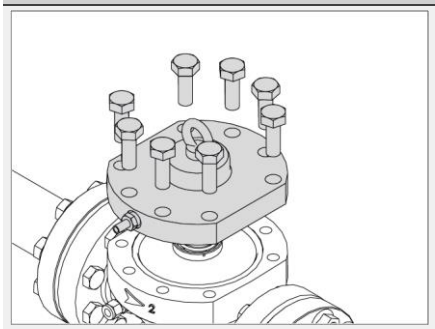
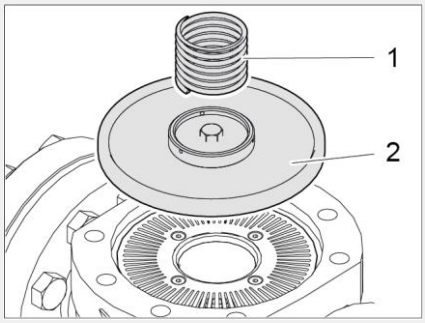
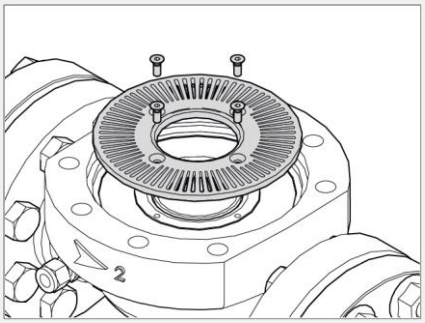
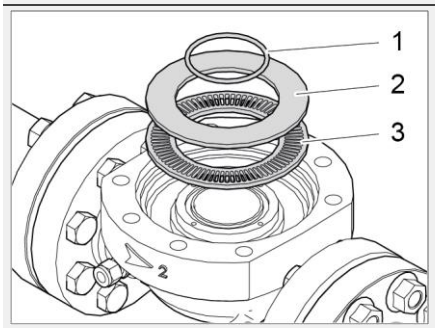
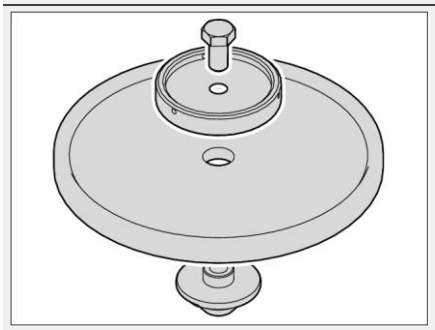
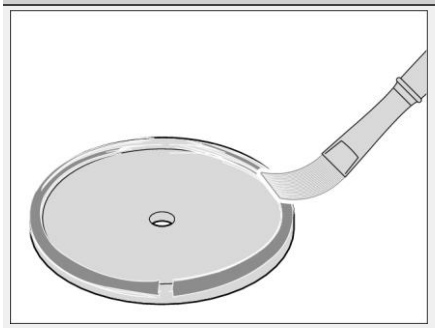
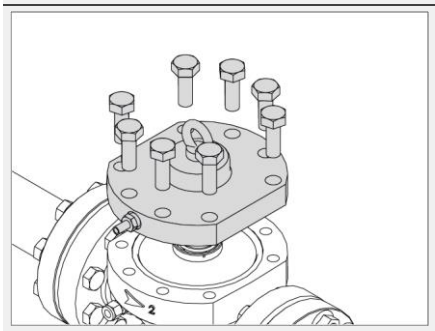
Figure	Step	Description
	1	Disassemble the lid. **CAUTION!** The lid is spring-loaded. Risk of injury due to bouncing up when the screws are unscrewed. Push the lid down when unscrewing the screws.
	2	Remove the closing spring (1) and the diaphragm unit (2).
	3	Remove the flow restrictor. If the flow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

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

Next task

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

- *Maintaining the pilot* (see page 64)
- *Completing the maintenance* (see page 93)

8.5 Maintaining the pilot

Contents

8.5.1 Maintenance for imperial HON 640a / metric HON 640a with diaphragm measuring unit

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)	29
Hex nut	12 Nm (9 ft lbs)	31
Hex bolt	12 Nm (9 ft lbs)	40
Hex bolt	12 Nm (9 ft lbs)	44

Maintaining the pilot

Proceed as follows:

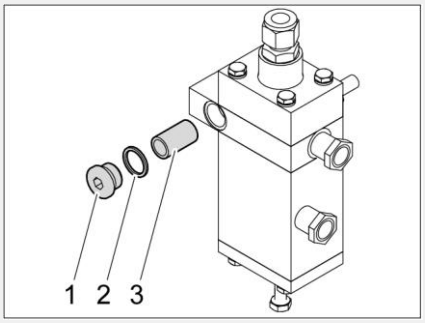
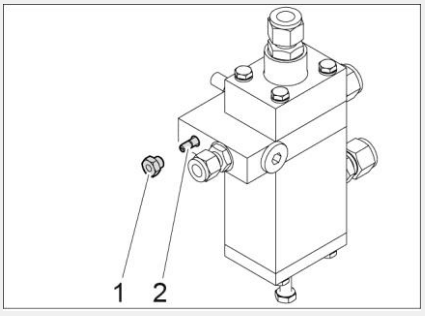
Figure	Step	Description
	1	Remove the locking screw (1) by unscrewing it.
	2	Remove the O-ring (2) and replace it with a new one.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	4	Lubricate the thread surfaces. Re-install the filter insert.
	5	Unscrew the spacer nut (1) on the spindle (2) out from the body.

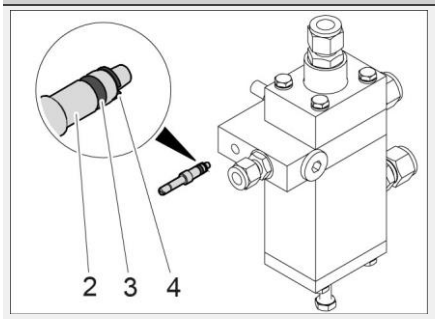
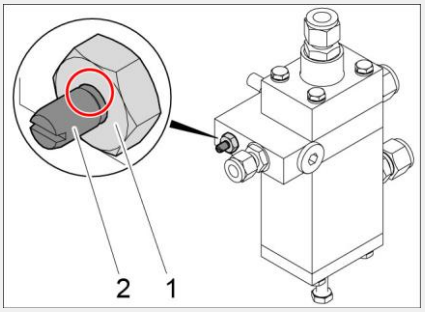
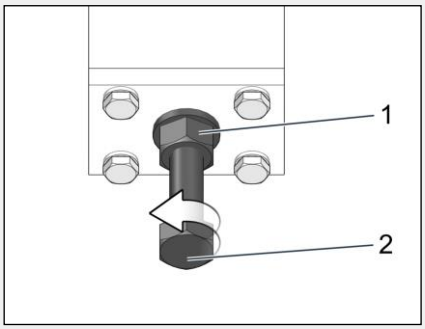
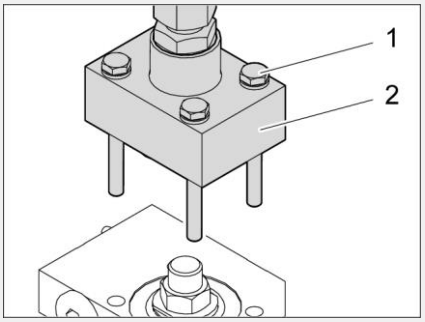
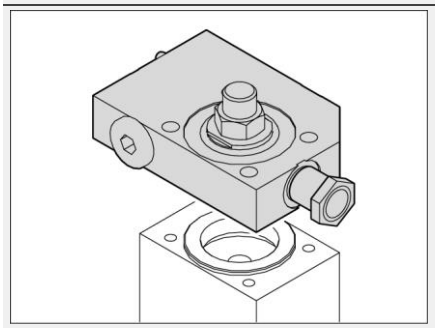
Figure	Step	Description
	6	Remove the spindle (2) by unscrewing it. Remove the O-ring (3) and the locking ring (4).
	7	Replace the O-ring (3) with a new, greased O-ring. Reinstall the locking ring (4).
	8	Lubricate the thread surfaces. First screw the spindle (2) back into the body. Then slide the locknut (1) over the spindle and tighten the locknut (1).
	9	Check that the spindle is in the right position and adjust it if necessary: The spindle's groove must be flush with the locknut's surface.
	10	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	11	Loosen the screws (1) and lift off the upper lid (2). Remove the spring (not shown) from the cap.
	12	Remove the valve body by lifting it off.

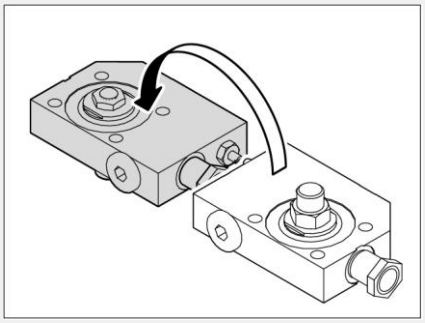
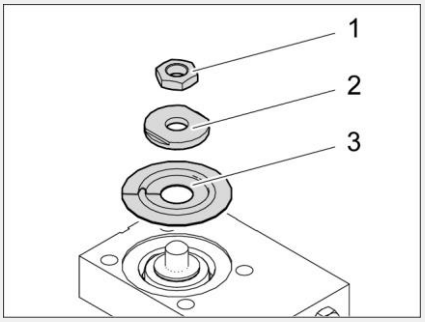
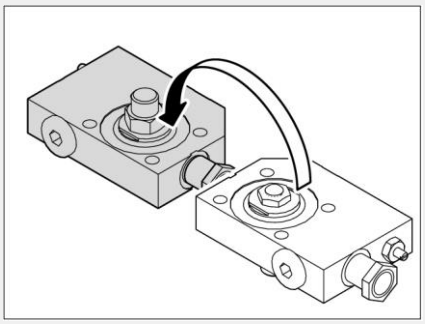
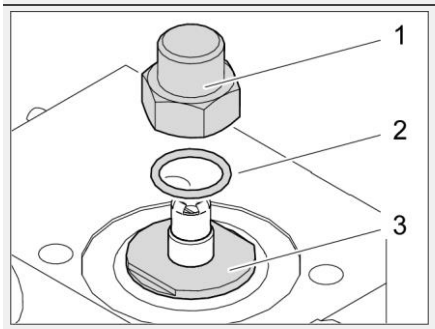
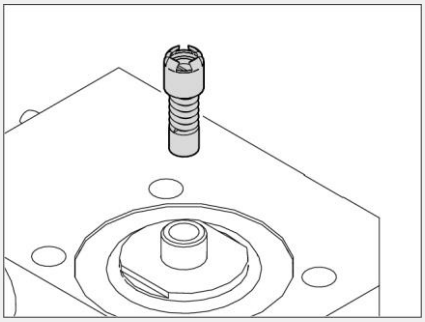
Figure	Step	Description
	13	Flip the valve body over.
	14	Unscrew the nut (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning. Remove the diaphragm plate (2) and the diaphragm (3).
	15	Flip the valve body over.
	16	Unscrew the cap (1) while using an open-end wrench to hold the diaphragm plate (3) in place so as to prevent the components from turning.
	17	Replace the O-ring (2) with a new, greased O-ring.
	18	Remove the pistons from the connecting piece.

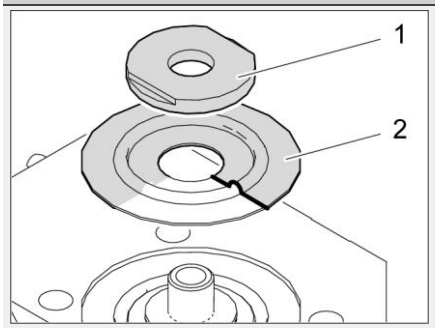
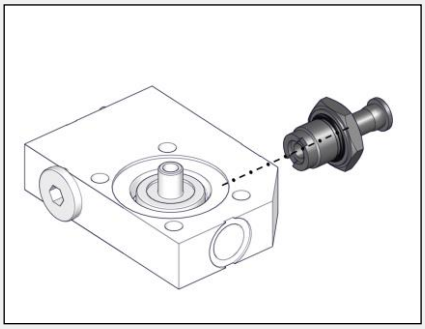
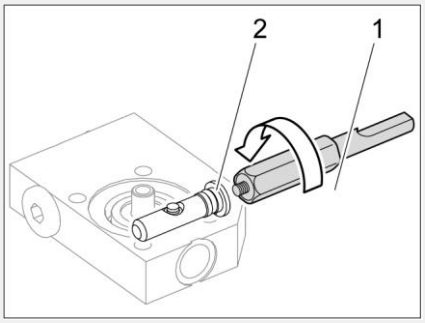
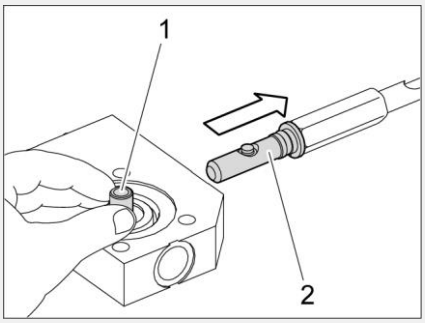
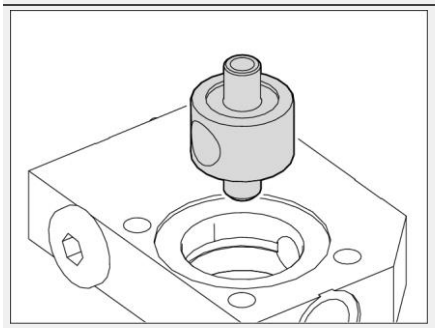
Figure	Step	Description
	19	Remove the diaphragm plate (1) and the diaphragm (2).
	20	Unscrew the screw-in fitting for the motorization line.
	21	Screw the assembly aid (1) into the nozzle (2).
	22	Hold the connecting piece in place (1) and pull the nozzle (2) out.
	23	Remove the connecting piece.

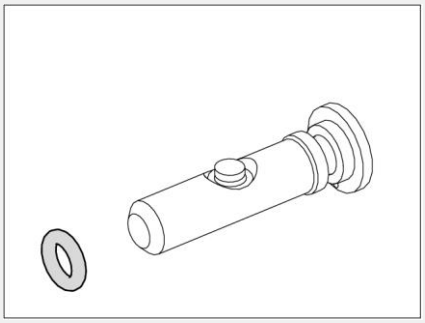
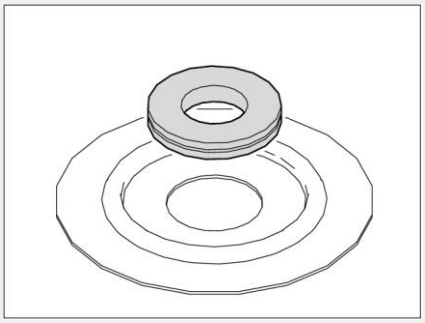
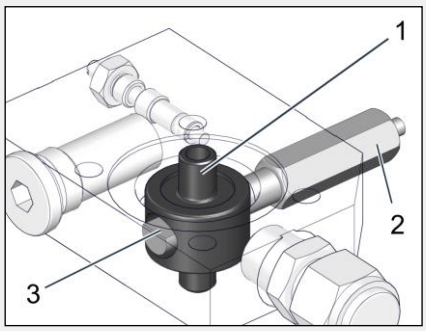
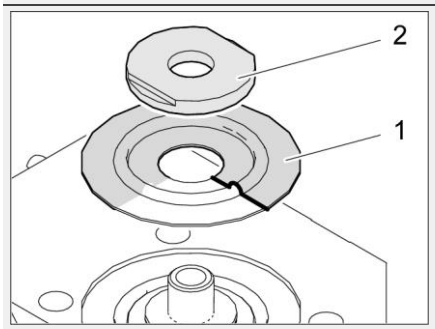
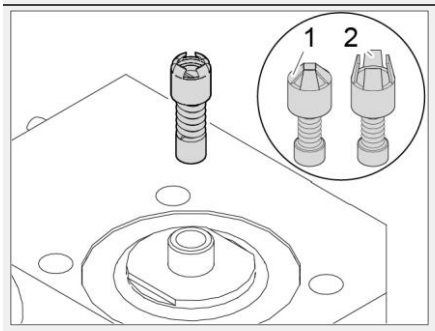
Figure	Step	Description
	24	Take the nozzle. Replace the O-ring with a new, greased O-ring.
	25	Replace the stem seals and the diaphragms on the top and bottom with new ones. Insert the stem seals into the diaphragms.
	26	Align the valve body as shown. Align the connecting piece (1) as shown and hold it in position. Insert the assembly aid (2), with the milled surface (3) facing upward towards the piston opening, into the valve body.
	27	Install the new diaphragm, including the stem seal and the diaphragm plate. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	28	Insert the new piston. 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

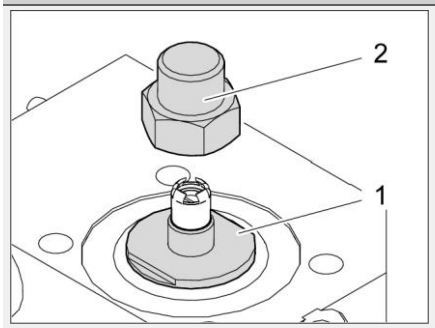
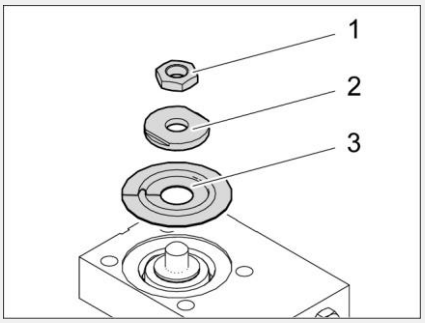
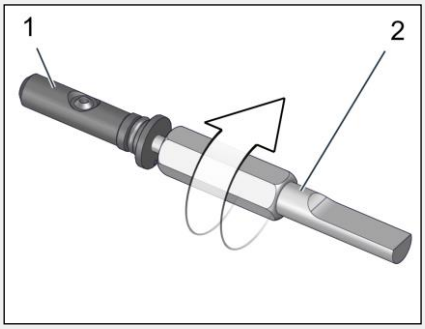
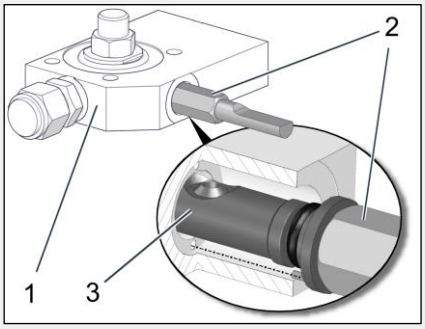
Figure	Step	Description
	29	Lightly coat the thread surfaces with threadlocker. Put the cap (2) in place. Tighten the cap while using an open-end wrench to hold the diaphragm plate (1) in place so as to prevent the components from turning. Observe the tightening torque information provided at the beginning of this section.
	30	Flip the valve body over. Install the new diaphragm (3), including the stem seal. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	31	Lightly coat the thread surfaces with threadlocker. Install the diaphragm plate (2) and the nut (1). Tighten the nut 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 at the beginning of this section.
	32	Remove the assembly aid from the valve body. Screw the assembly aid (2) into the nozzle (1).
	33	Align the valve body (1) as shown. Turn the nozzle (3) in such a way that, as shown in the sectional view, the dowel pin is coaxially aligned with the lower hole and the nozzle opening is facing upward. Insert the nozzle (3) with the assembly aid (2) all the way into the connecting piece.

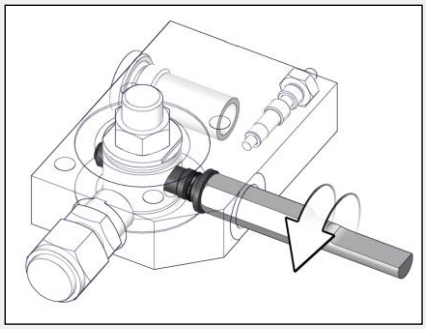
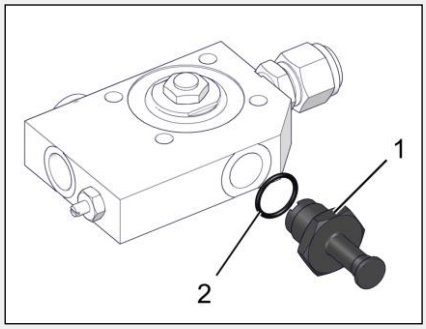
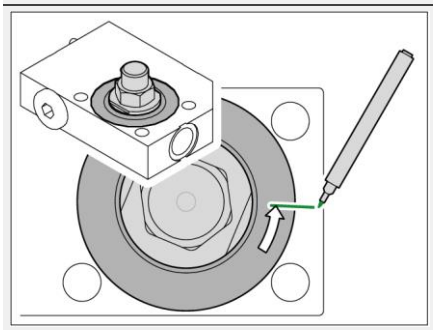
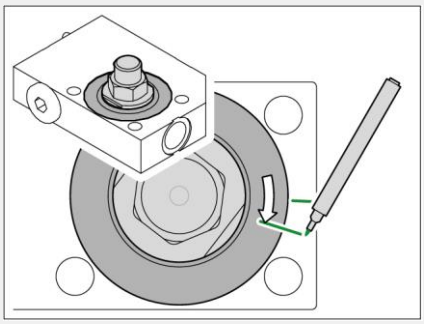
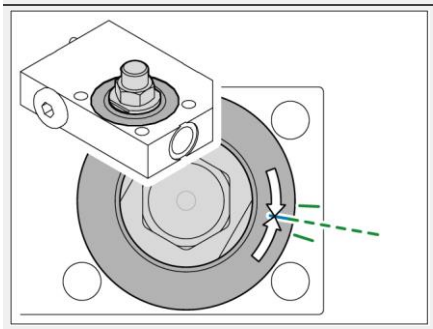
Figure	Step	Description
	34	Remove the assembly aid.
	35	Take the screw-in fitting (1) for the motorization line. ▪ Imperial HON 640a only: Replace the O-ring (2) with a new, greased O-ring. Lubricate the thread surfaces. Screw the screw-in fitting back in.
	36	To align the cross hole of the connecting piece correctly with the nozzle: 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 and on the convoluted diaphragm.
	37	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.
	38	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.

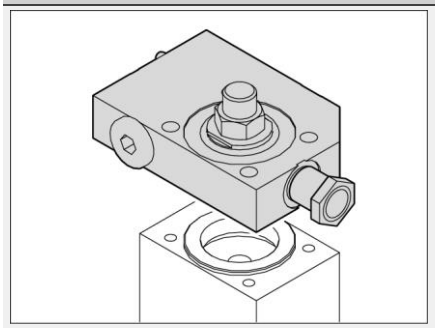
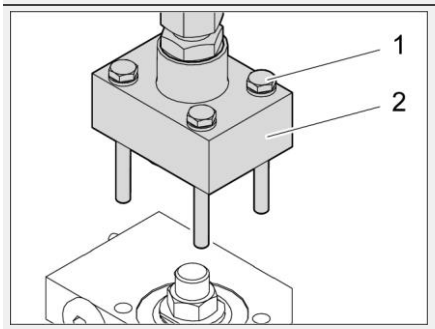
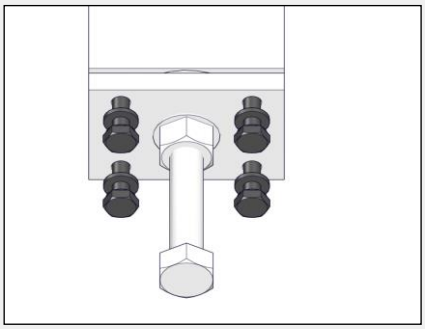
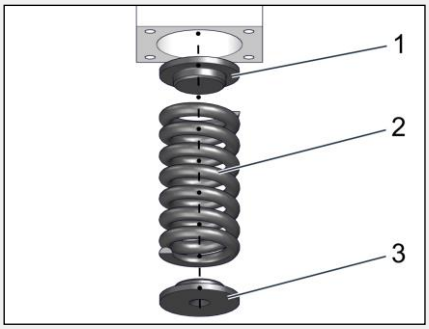
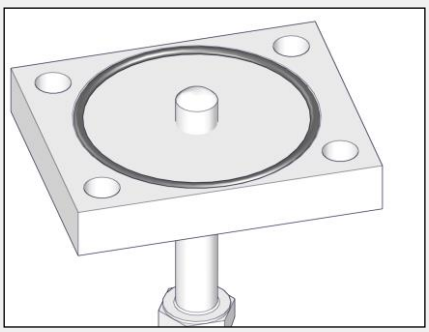
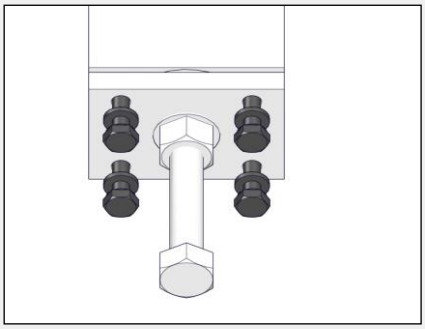
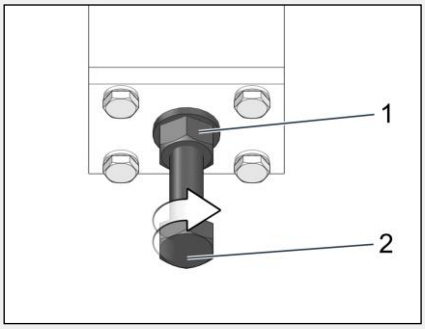
Figure	Step	Description
	39	Place the valve body on the spring housing. Place the spring (not show) back on the cap.
	40	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 36). Put the upper cover (2) back in place. Tighten the screws (1) in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	41	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!
	42	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.
	43	Replace the O-ring with a new, greased O-ring.

Figure	Step	Description
	44	Lubricate the thread surfaces. Put the lower cover back in place. Tighten the screws in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	45	Tighten the hex flange nut (1). 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

Proceed as follows:

Completing the maintenance (see page 93)

8.5.2 Maintenance for imperial HON 640a with metal bellows measuring unit

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)	31
Cylinder screws	6 Nm (5 ft lbs)	43
Hex bolt	12 Nm (9 ft lbs)	47
Hex bolt	12 Nm (9 ft lbs)	49

Maintaining the pilot

Proceed as follows:

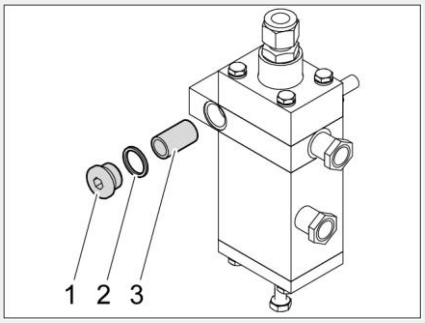
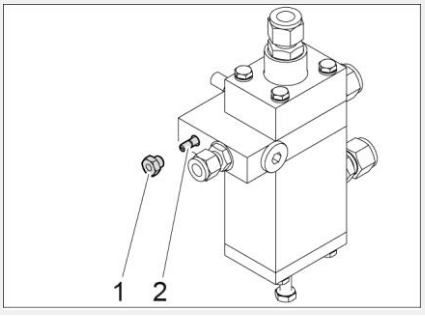
Figure	Step	Description
	1	Remove the locking screw (1) by unscrewing it.
	2	Remove the O-ring (2) and replace it with a new one.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	4	Lubricate the thread surfaces. Re-install the filter insert.
	5	Unscrew the spacer nut (1) on the spindle (2) out from the body.

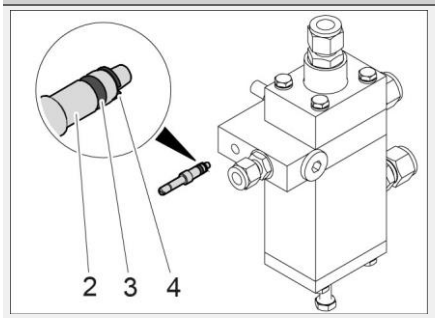
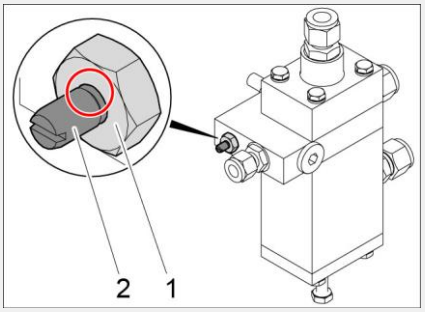
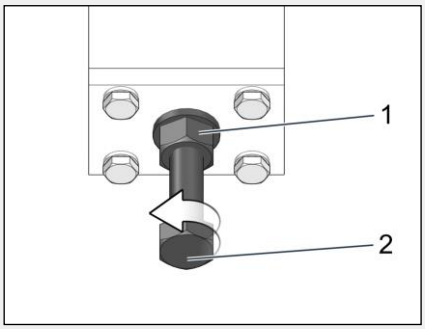
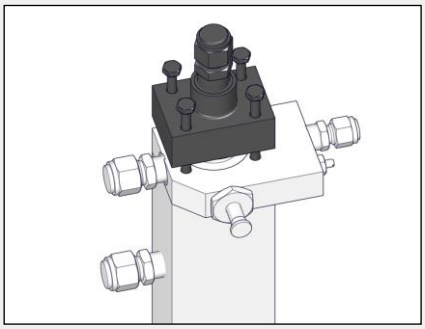
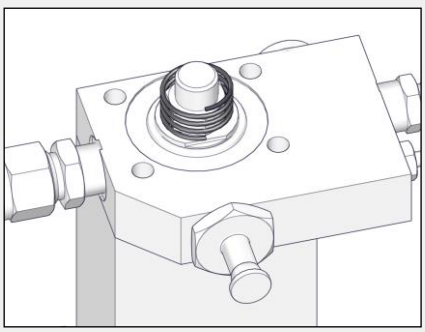
Figure	Step	Description
	6	Remove the spindle (2) by unscrewing it. Remove the O-ring (3) and the locking ring (4).
	7	Replace the O-ring (3) with a new, greased O-ring. Put the locking ring (4) back in place.
	8	Lubricate the thread surfaces. First screw the spindle (2) back into the body. Then slide the locknut (1) over the spindle and tighten the locknut (1).
	9	Check that the spindle is in the right position and adjust it if necessary: The spindle's groove must be flush with the locknut's surface.
	10	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	11	Turn the spring housing. Loosen the screws and lift off the upper cover.
	12	Remove the spring from the cap.

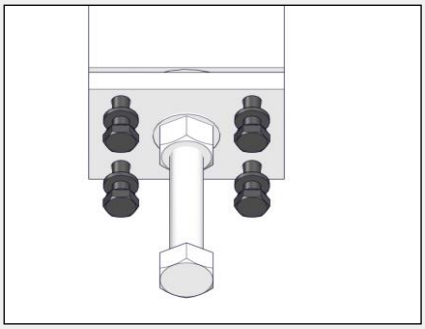
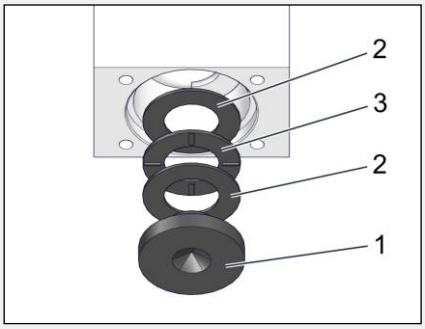
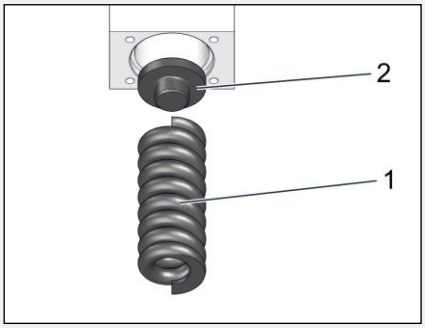
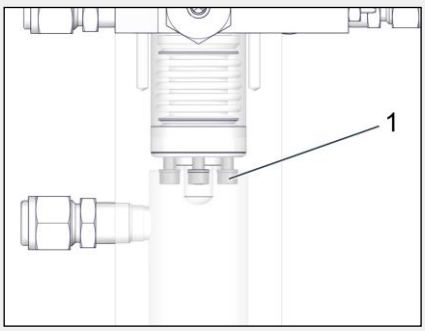
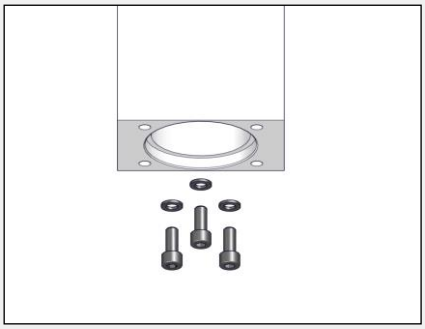
Figure	Step	Description
	13	Loosen the screws and slowly and carefully remove the lower cover. **Important!** While removing the cover, parts on the inside may fall out from the spring housing by accident!
	14	Remove the lower spring plate (1), the axial washers (2), and the axial needle roller bearing (3) from the spring housing.
	15	Remove the compression spring (1) and the upper spring plate (2) from the spring housing.
	16	Unscrew the metal bellows' internal screws (1) from the lower section of the spring housing.
	17	Remove the screws and the corresponding washers from the lower section of the spring housing.

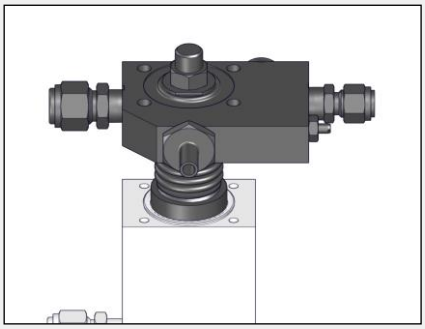
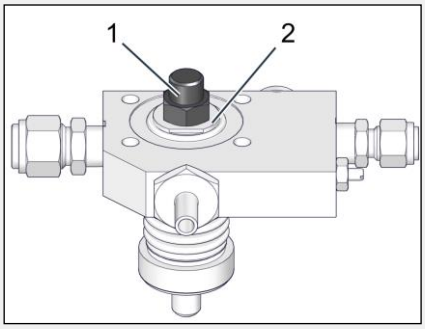
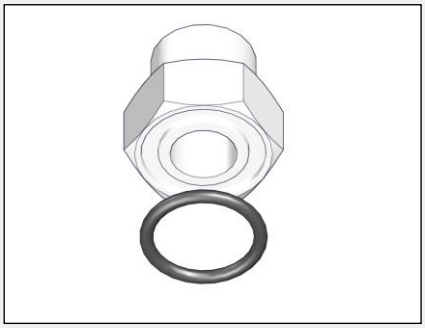
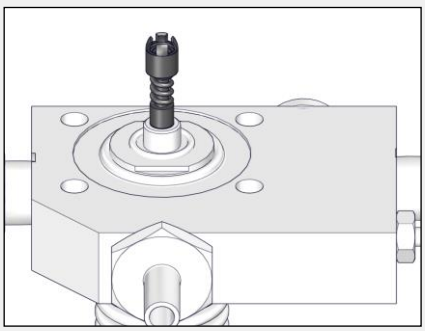
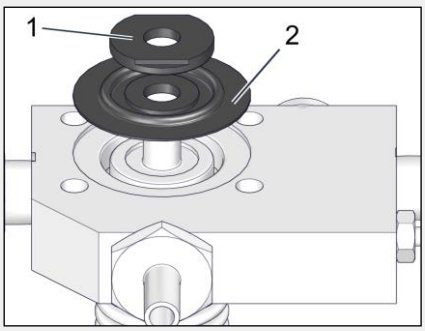
Figure	Step	Description
	18	Pull the valve body, including the metal bellows, upwards in order to remove it as a complete unit from the spring housing.
	19	Unscrew the cap (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning.
	20	Replace the O-ring (1) with a new, greased O-ring.
	21	Remove the pistons from the connecting piece.
	22	Remove the diaphragm plate (1) and the diaphragm (2).

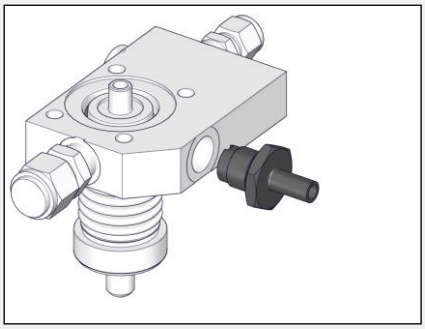
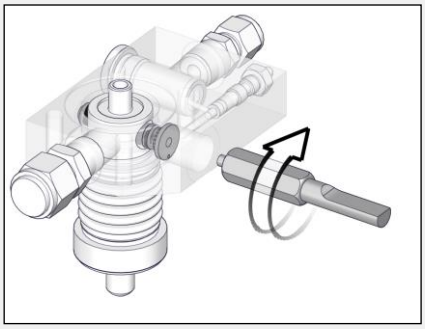
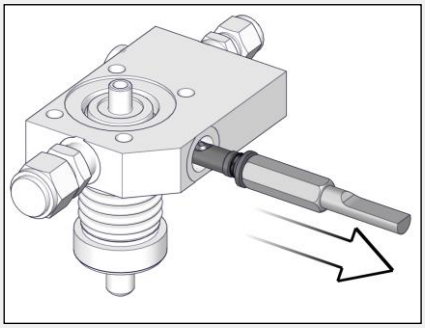
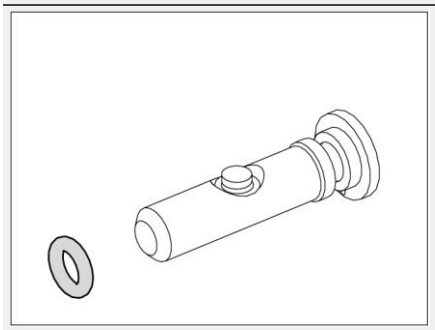
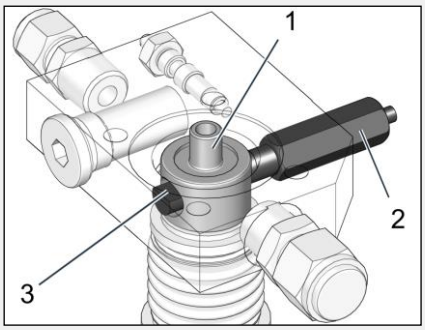
Figure	Step	Description
	23	Unscrew the screw-in fitting for the motorization line.
	24	Screw the assembly aid into the nozzle.
	25	Pull the nozzle out.
	26	Take the nozzle. Replace the O-ring with a new, greased O-ring.
	27	Align the valve body as shown. Align the connecting piece (1) as shown and hold it in position. Insert the assembly aid (2), with the milled surface (3) facing upward towards the piston opening, into the valve body.

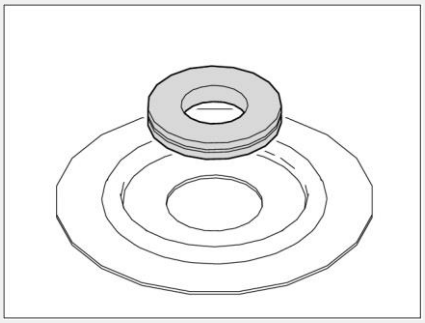
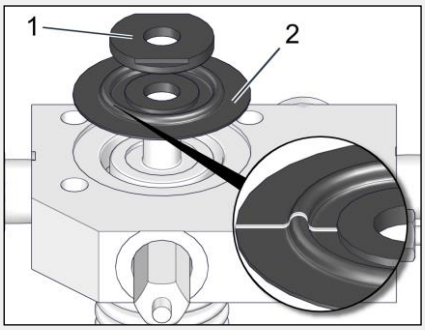
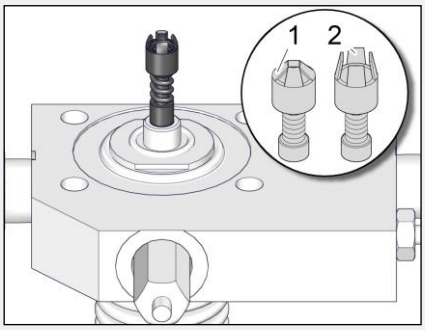
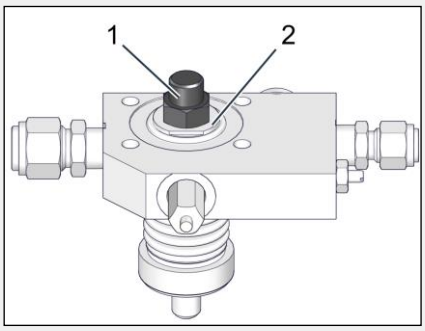
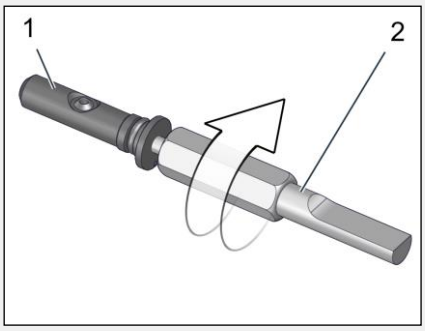
Figure	Step	Description
	28	Replace the stem seal and the diaphragm with new ones. Insert the stem seal into the diaphragm.
	29	Install the new diaphragm (2), including the stem seal and the diaphragm plate (1). Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	30	Insert the new piston. 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
	31	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 at the beginning of this section.
	32	Remove the assembly aid from the valve body. Screw the assembly aid (2) into the nozzle (1).

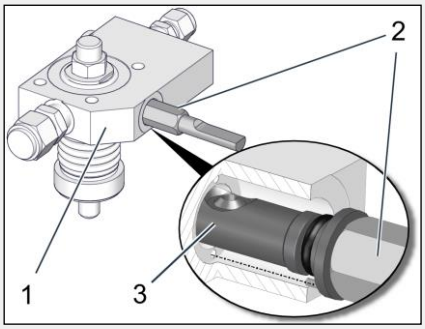
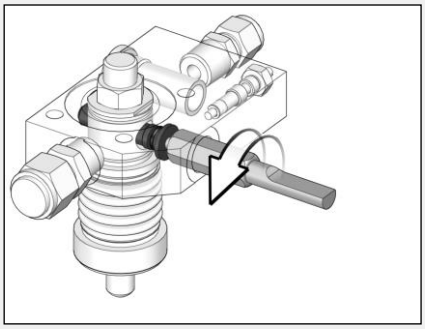
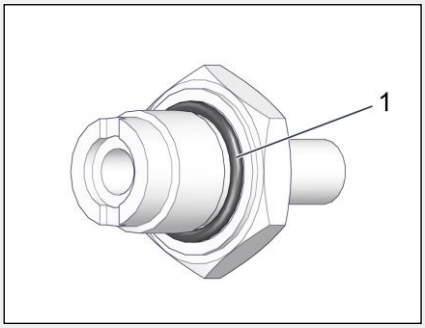
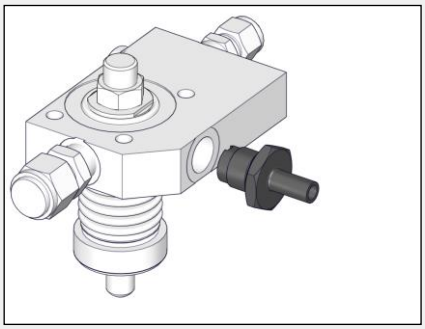
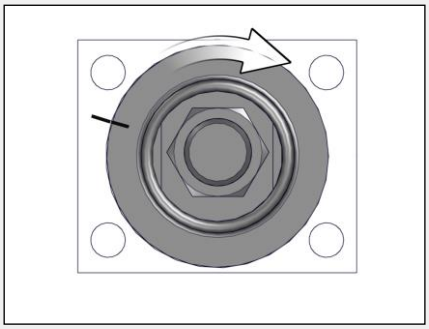
Figure	Step	Description
	33	Align the valve body (1) as shown. Turn the nozzle (3) in such a way that, as shown in the sectional view, the dowel pin is coaxially aligned with the lower hole and the nozzle opening is facing upward. Insert the nozzle (3) with the assembly aid (2) all the way into the connecting piece.
	34	Remove the assembly aid.
	35	Take the screw-in fitting for the motorization line. Replace the O-ring (1) with a new, greased O-ring.
	36	Lubricate the thread surfaces. Screw the screw-in fitting back in.
	37	To align the cross hole of the connecting piece correctly with the nozzle: 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.

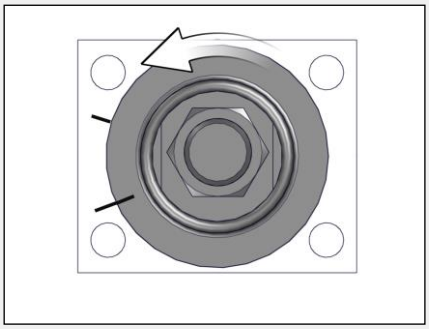
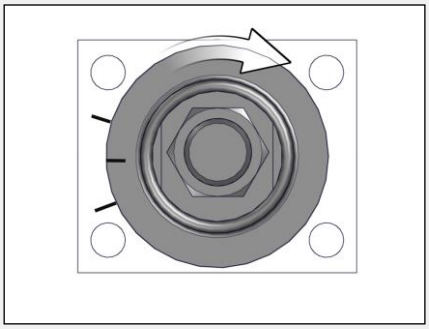
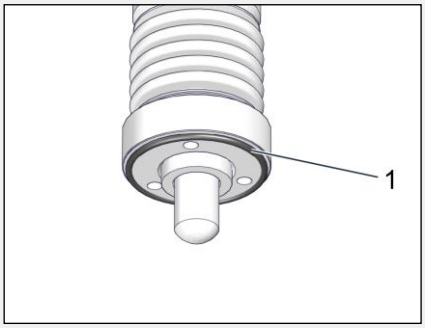
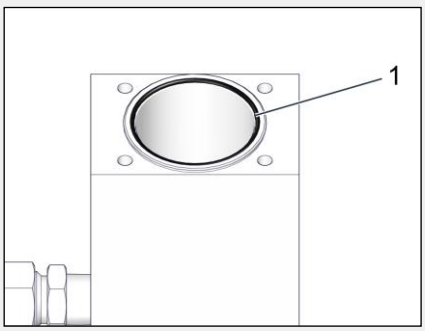
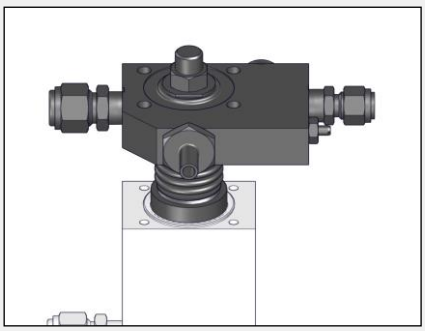
Figure	Step	Description
	38	Use the cap to turn the diaphragm by hand counterclockwise until it will not rotate any further. Use a marker or pen to mark the position on the body.
	39	Use the cap to turn the diaphragm by hand so that the marking on the diaphragm is right between the two markings on the body.
	40	Replace the O-ring (1) with a new, greased O-ring.
	41	Take the spring housing. Replace the O-ring (1) at the top of the spring housing with a new, greased O-ring.
	42	Insert the unit consisting of the valve body and the metal bellows back into the spring housing.

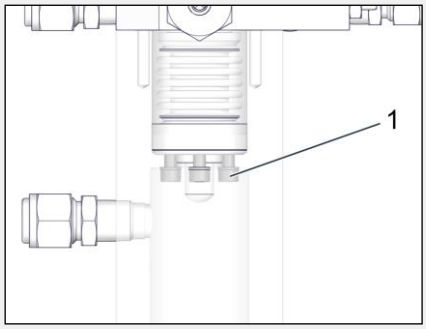
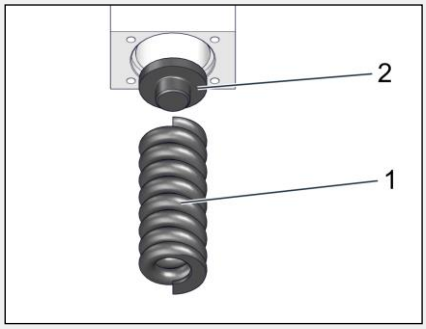
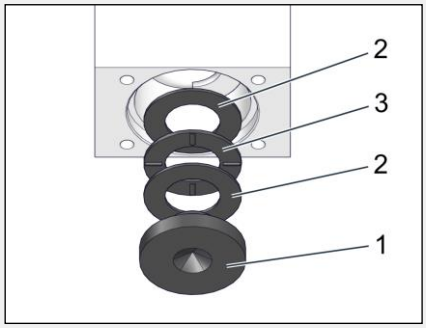
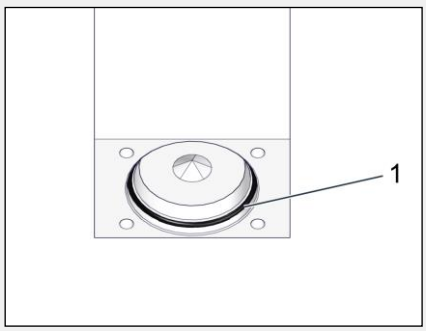
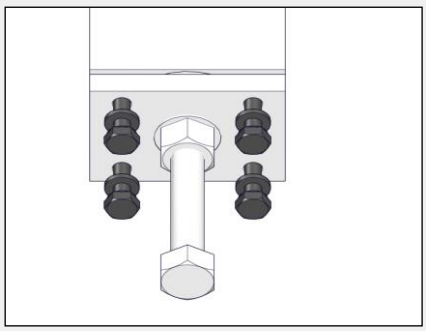
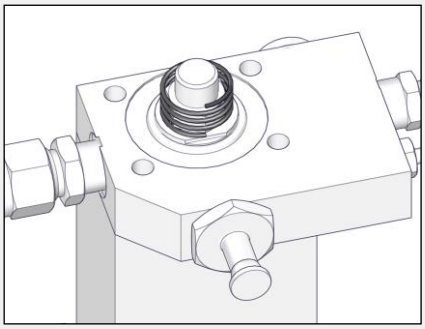
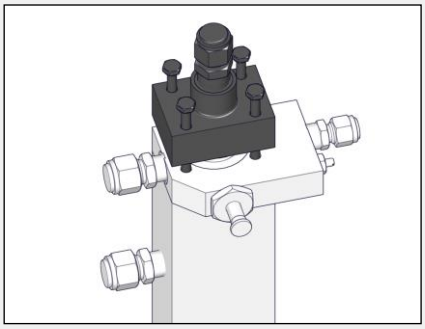
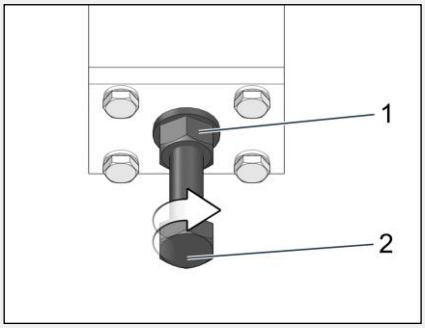
Figure	Step	Description
	43	Lubricate the thread surfaces. Tighten the screws (1), including the corresponding washers, from the underside of the spring housing. Refer to the additional tightening torque information at the beginning of this topic.
	44	Lubricate the upper spring plate's depressions (2). Reinsert the upper spring plate (2) and the compression spring (1) into the spring housing in the right order and alignment.
	45	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.
	46	Replace the O-ring (1) at the bottom of the spring housing with a new, greased O-ring.
	47	Lubricate the thread surfaces. Put the lower cover back in place. Tighten the screws in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.

Figure	Step	Description
	48	Turn the spring housing. Place the spring back on the cap.
	49	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 38). Place the upper cover back in place. Tighten the screws in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	50	Tighten the hex flange nut (1). 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

Proceed as follows:

Completing the maintenance (see page 93)

8.5.3 Maintenance for imperial HON 642a with diaphragm measuring unit

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)	26
Hex nut	12 Nm (9 ft lbs)	28
Hex bolt	12 Nm (9 ft lbs)	38
Hex bolt	12 Nm (9 ft lbs)	42

Maintaining the pilot

Proceed as follows:

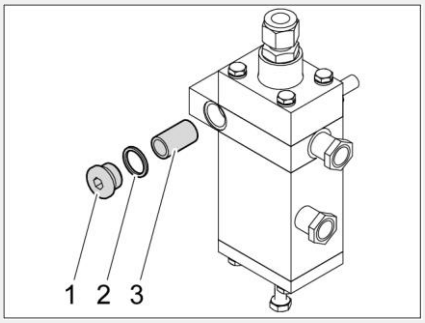
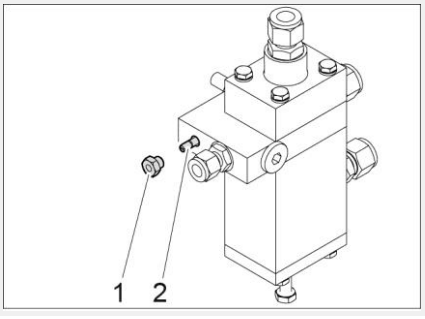
Figure	Step	Description
	1	Remove the locking screw (1) by unscrewing it.
	2	Remove the O-ring (2) and replace it with a new one.
	3	Check the filter cartridge for damage and replace it with a new one if necessary.
	4	Lubricate the thread surfaces. Re-install the filter insert.
	5	Unscrew the spacer nut (1) on the spindle (2) out from the body.

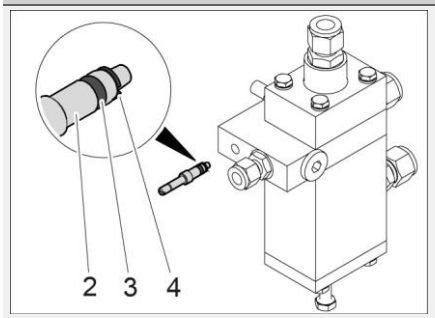
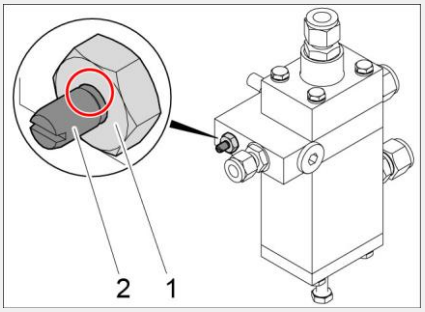
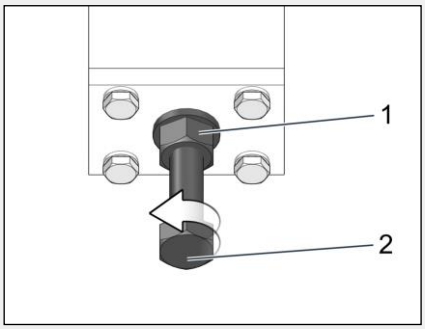
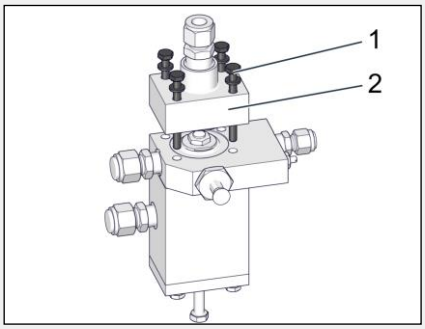
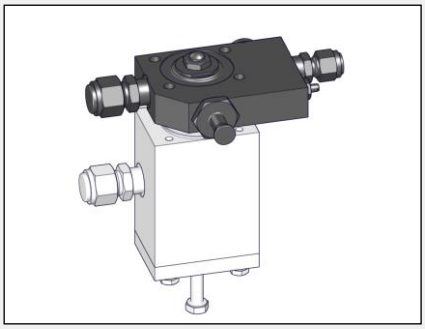
Figure	Step	Description
	6	Remove the spindle (2) by unscrewing it. Remove the O-ring (3) and the locking ring (4).
	7	Replace the O-ring (3) with a new, greased O-ring. Reinstall the locking ring (4).
	8	Lubricate the thread surfaces. First screw the spindle (2) back into the body. Then slide the locknut (1) over the spindle and tighten the locknut (1).
	9	Check that the spindle is in the right position and adjust it if necessary: The spindle's groove must be flush with the locknut's surface.
	10	Release the tension on the pilot spring by loosening the hex flange nut (1) and unscrewing the spring adjuster (2) a few turns.
	11	Loosen the screws (1) and lift off the upper cover (2).
	12	Remove the valve body by lifting it off.

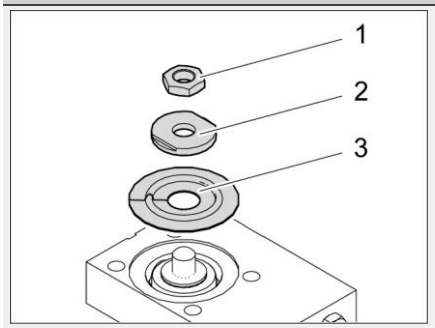
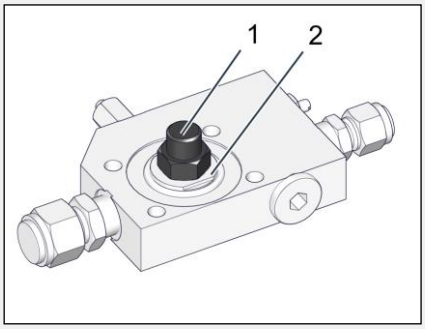
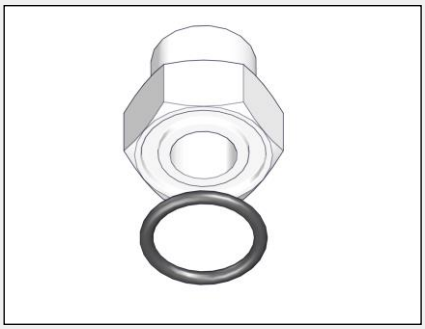
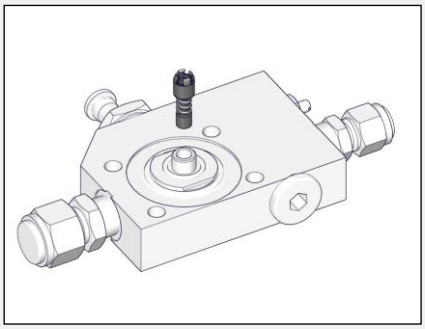
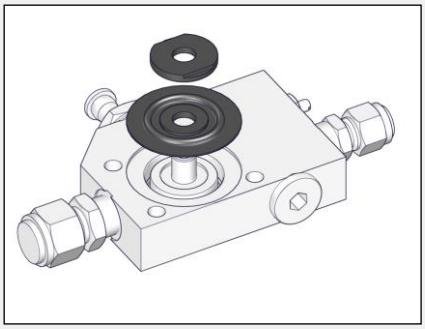
Figure	Step	Description
	13	Unscrew the nut (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning. Remove the diaphragm plate (2) and the diaphragm (3).
	14	Flip the valve body over. Unscrew the cap (1) while using an open-end wrench to hold the diaphragm plate (2) in place so as to prevent the components from turning.
	15	Replace the O-ring with a new, greased O-ring.
	16	Remove the pistons from the connecting piece.
	17	Remove the diaphragm plate and the diaphragm.

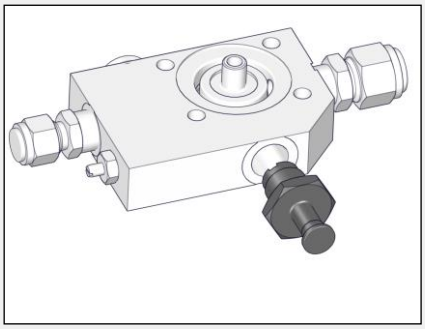
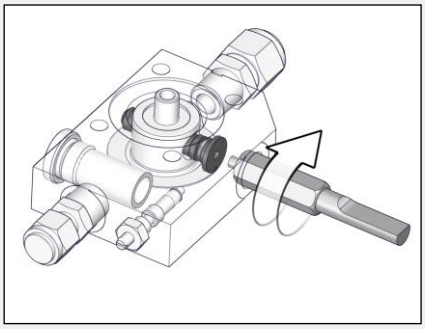
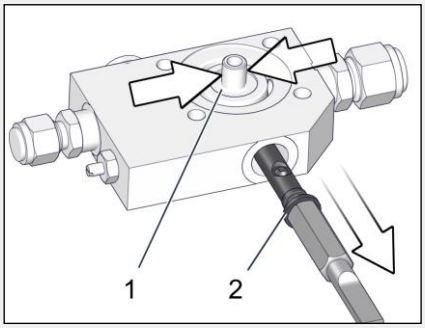
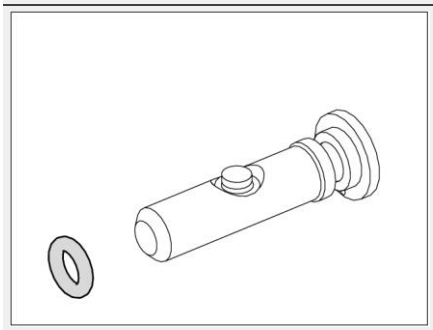
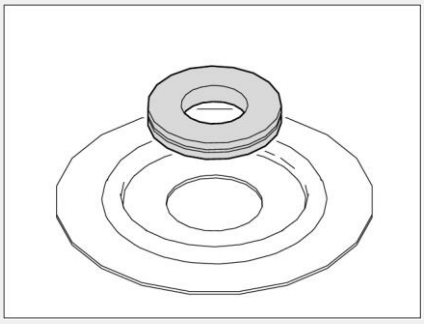
Figure	Step	Description
	18	Unscrew the screw-in fitting for the motorization line.
	19	Screw the assembly aid into the nozzle.
	20	Hold the connecting piece in place (1) and pull the nozzle (2) out. Remove the connecting piece (1).
	21	Take the nozzle. Replace the O-ring with a new, greased O-ring.
	22	Replace the stem seals and the diaphragms on the top and bottom with new ones. Insert the stem seals into the diaphragms.

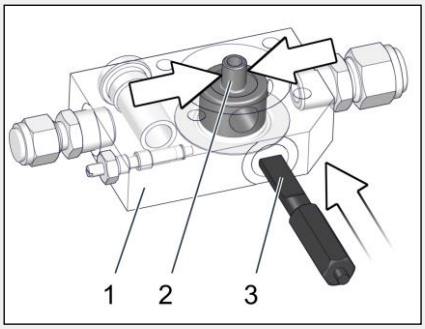
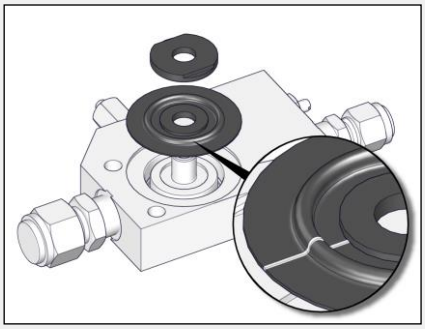
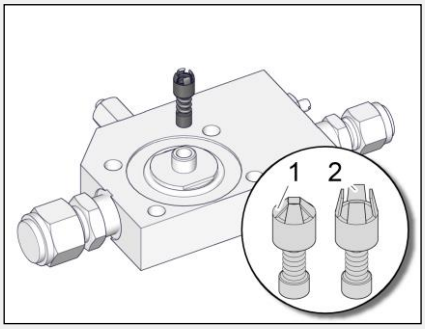
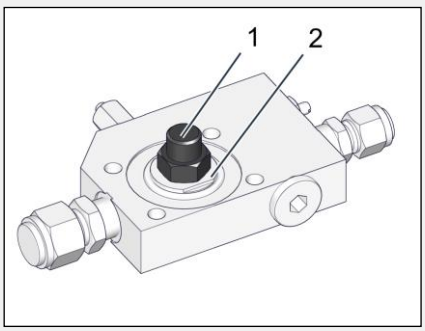
Figure	Step	Description
	23	Align the valve body (1) as shown. Align the connecting piece (2) as shown and hold it in position. Insert the assembly aid, with the milled surface (3) facing upward towards the piston opening, into the valve body.
	24	Install the new diaphragm, including the stem seal and the diaphragm plate. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	25	Insert the new piston. 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
	26	Lightly coat the thread surfaces with threadlocker. Put the cap (1) in place. Tighten the cap while using an open-end wrench to hold the diaphragm plate (1) in place so as to prevent the components from turning. Observe the tightening torque information provided at the beginning of this section.

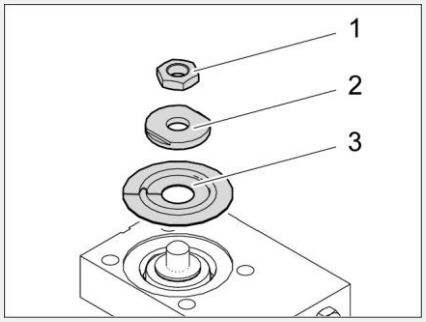
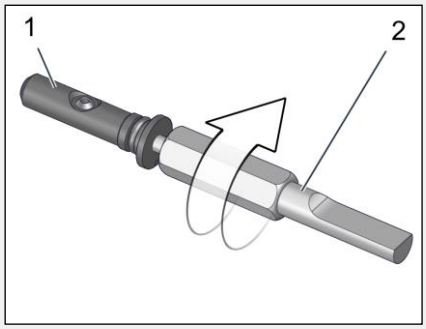
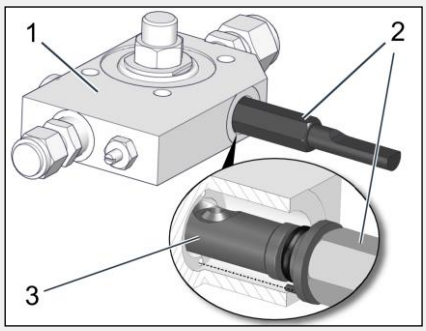
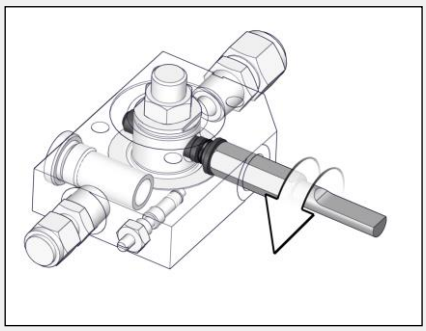
Figure	Step	Description
	27	Flip the valve body over. Install the new diaphragm (3), including the stem seal. Make sure that the diaphragm is aligned correctly: The side of the diaphragm that has a depression at the center should be facing upward.
	28	Lightly coat the thread surfaces with threadlocker. Install the diaphragm plate (2) and the nut (1). Tighten the nut 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 at the beginning of this section.
	29	Remove the assembly aid from the valve body. Screw the assembly aid (2) into the nozzle (1).
	30	Align the valve body (1) as shown. Turn the nozzle (3) in such a way that, as shown in the sectional view, the dowel pin is coaxially aligned with the lower hole and the nozzle opening is facing upward. Insert the nozzle (3) with the assembly aid (2) all the way into the connecting piece.
	31	Remove the assembly aid.

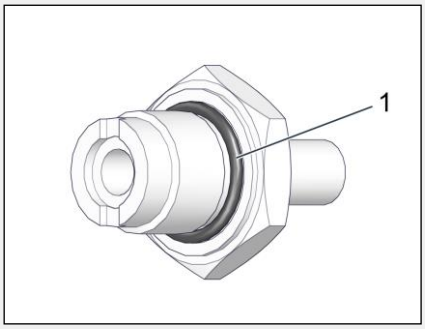
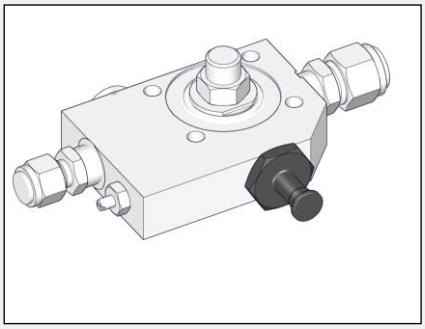
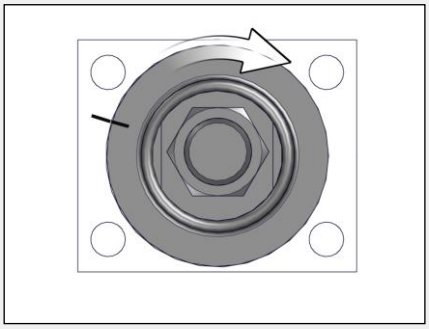
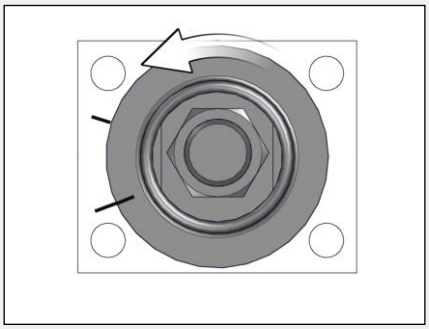
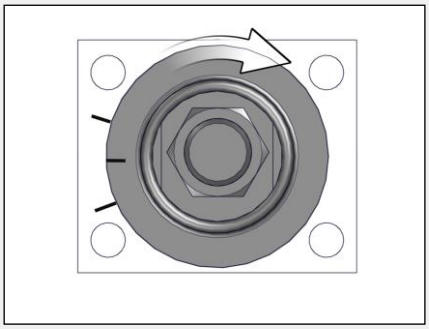
Figure	Step	Description
	32	Take the screw-in fitting for the motorization line. Replace the O-ring (1) with a new, greased O-ring.
	33	Lubricate the thread surfaces. Screw the screw-in fitting back in.
	34	To align the cross hole of the connecting piece correctly with the nozzle: Use the cap to turn 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.
	35	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.
	36	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.

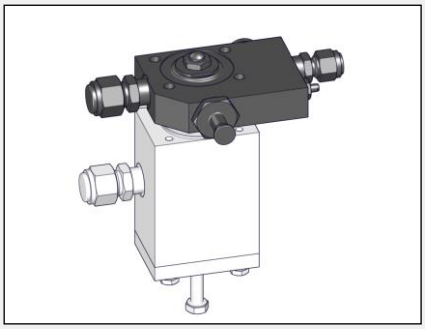
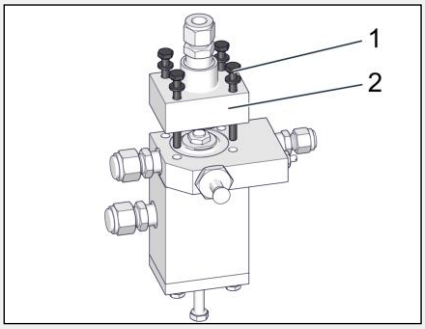
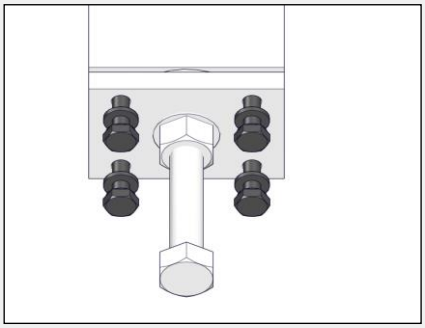
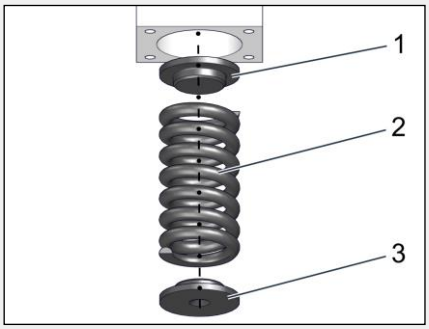
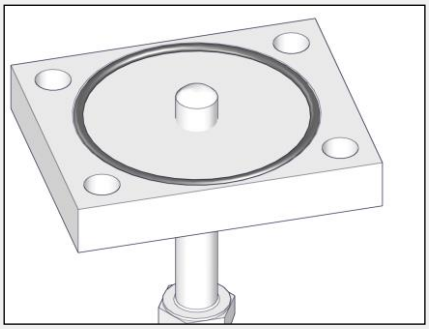
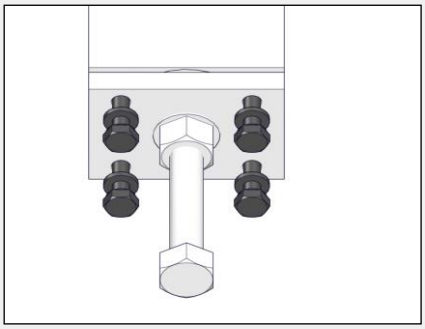
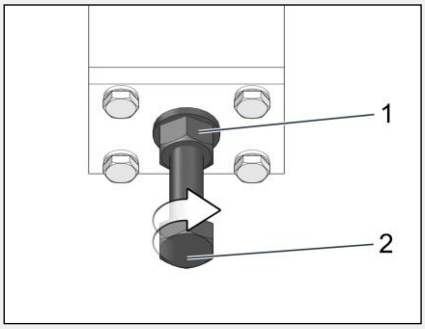
Figure	Step	Description
	37	Place the valve body on the spring housing.
	38	Lubricate the thread surfaces. Check to make sure that the diaphragm marking is still in the center position (see step 35). Put the upper cover (2) back in place. Tighten the screws (1) in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	39	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!
	40	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.
	41	Replace the O-ring with a new, greased O-ring.

Figure	Step	Description
	42	Lubricate the thread surfaces. Put the lower cover back in place. Tighten the screws in a criss-cross sequence. Refer to the additional tightening torque information at the beginning of this topic.
	43	Tighten the hex flange nut (1). 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

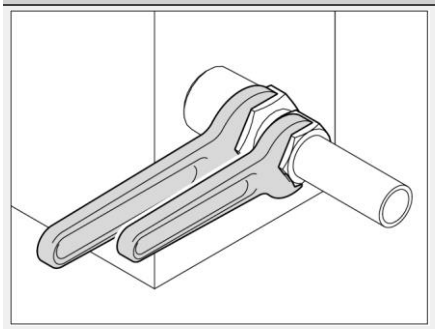
Proceed as follows:

Completing the maintenance (see page 93)

8.6 Completing the maintenance

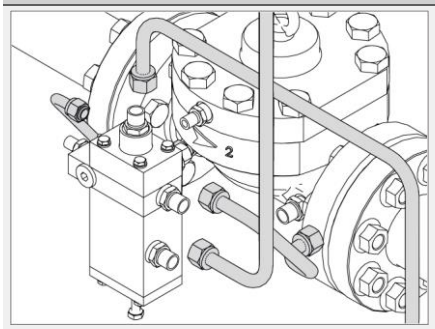
Protecting the pipe connections from being twisted

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

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

Installing components

Proceed as follows:

Figure	Step	Description
	1	Reinstall all the pipes you removed previously on the actuator assembly.
	2	Reinstall all the pipes you removed previously on the pilot. **Result:** The pilot is now installed on the actuator assembly and in the gas regulating line.

Next task

Proceed as follows:

Checking the system for leaks (see page 46)

9 Storage, removal, and disposal

Contents

9.1 Storing the device

Storage of the packing units

Observe the following rules:

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

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

Storage of spare parts

The following rules apply to the storage of spare parts:

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

9.2 Disassembling the device

Pressurized parts

⚠WARNING

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

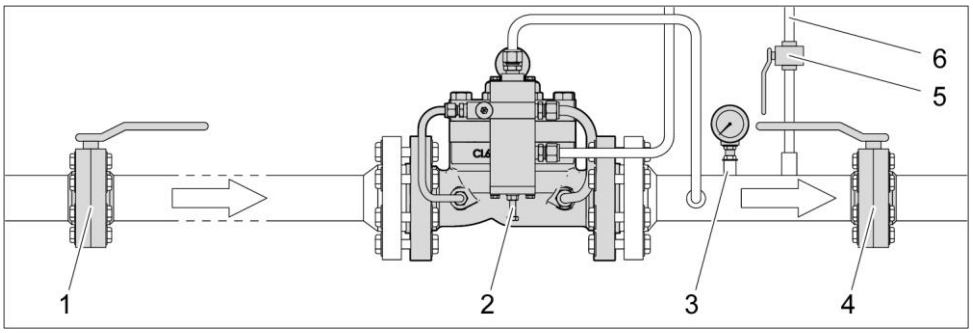
If not handled properly or in the event of a defect, gas can escape from pressurized components under high pressure and cause serious injuries and even death. Before you start working on these components:

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

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

Overview

Schematic diagram using the imperial system HON 640a as an example:



The numbers have the following meaning:

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

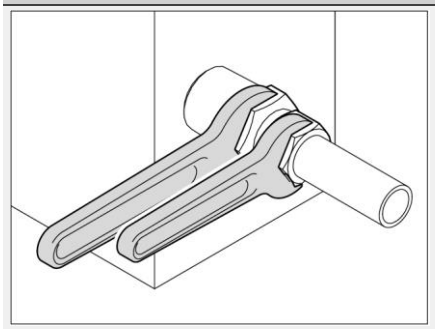
Establishing the depressurized status

Proceed as follows:

Step	Description
1	Close the outlet stop valve armature (4).
2	Close the inlet stop valve armature (1).
3	Depressurize the pilot: Turn the set screw on the pilot clockwise until the pressure in the regulator is equalized.
4	Open the valve (5) in the blowdown line (6) to discharge the pressure between the inlet and the outlet valves.

Protecting the pipe connections from being twisted

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

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

Purging the lines with nitrogen

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

Disassembling the device

Proceed as follows:

Step	Description
1	Disassemble the device. Observe the information and instructions in the *Transport and installation* (see page 39) section when doing so.

9.3 Disposing of the device

Appropriate disposal

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

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

10 Appendix

Contents

10.1 Additional information regarding spare parts

Spare parts categories

Spare parts fall into the following categories:

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

Maintenance and servicing parts for actuator assembly

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

Maintenance and servicing parts for pilot

- The spare parts always required for the pilot's maintenance are grouped together into spare parts kits appropriate for the device in question. Each spare parts kit has its own part number.
- Individual servicing parts can be ordered by using the corresponding part number, which is specified in the bill of materials for the pilot. The required number of maintenance and/or servicing parts is specified under the relevant part number in the "Part No." column. If no quantity is specified, this means that only one unit is required.

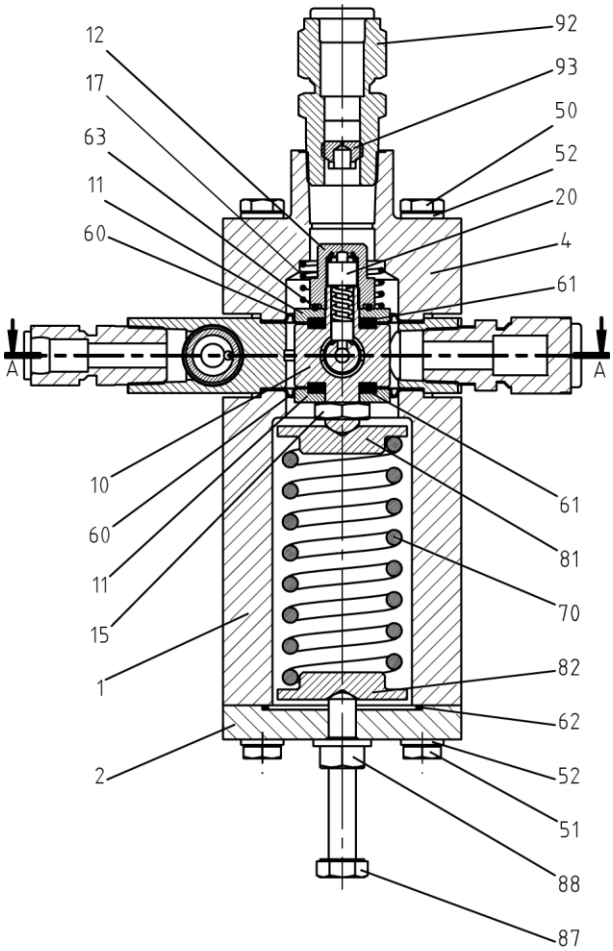
Overview of spare parts drawings

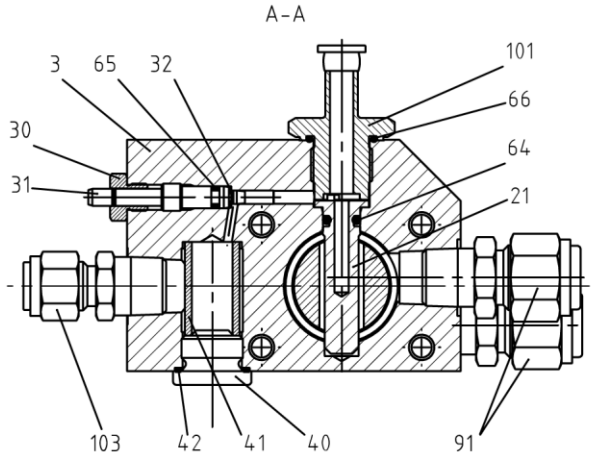
The spare parts drawings are subdivided as follows:

- HON 640a imperial pilot with diaphragm assembly
- HON 640a imperial pilot with metal bellows assembly
- HON 640a metric pilot with diaphragm assembly
- HON 642a imperial pilot with diaphragm assembly
- HON 5020 actuator assembly

10.2 Spare parts drawing for imperial HON640a pilot with diaphragm measuring unit

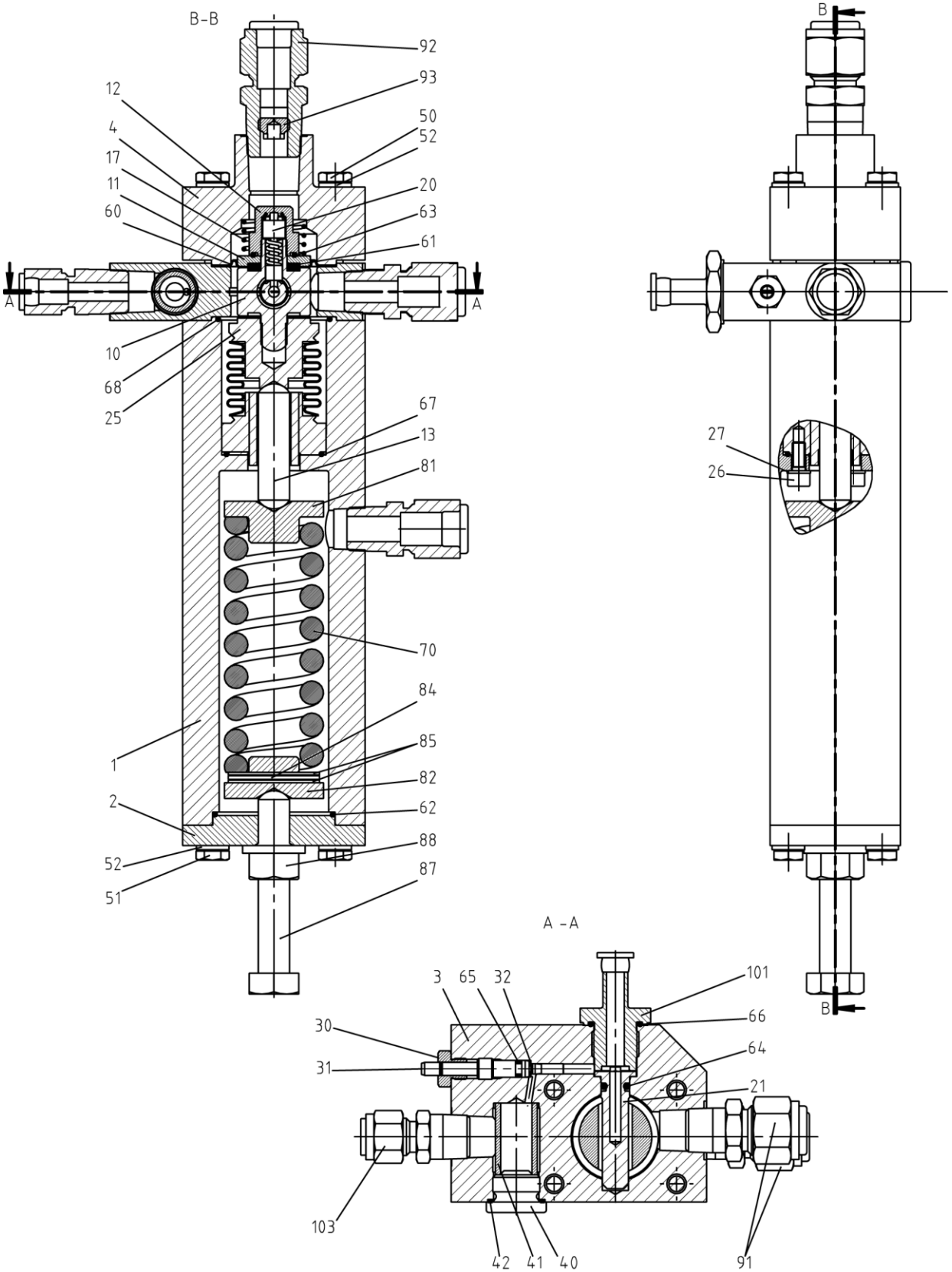
Drawing





10.3 Spare parts drawing for imperial HON640a pilot with metal bellow measuring unit

Drawing

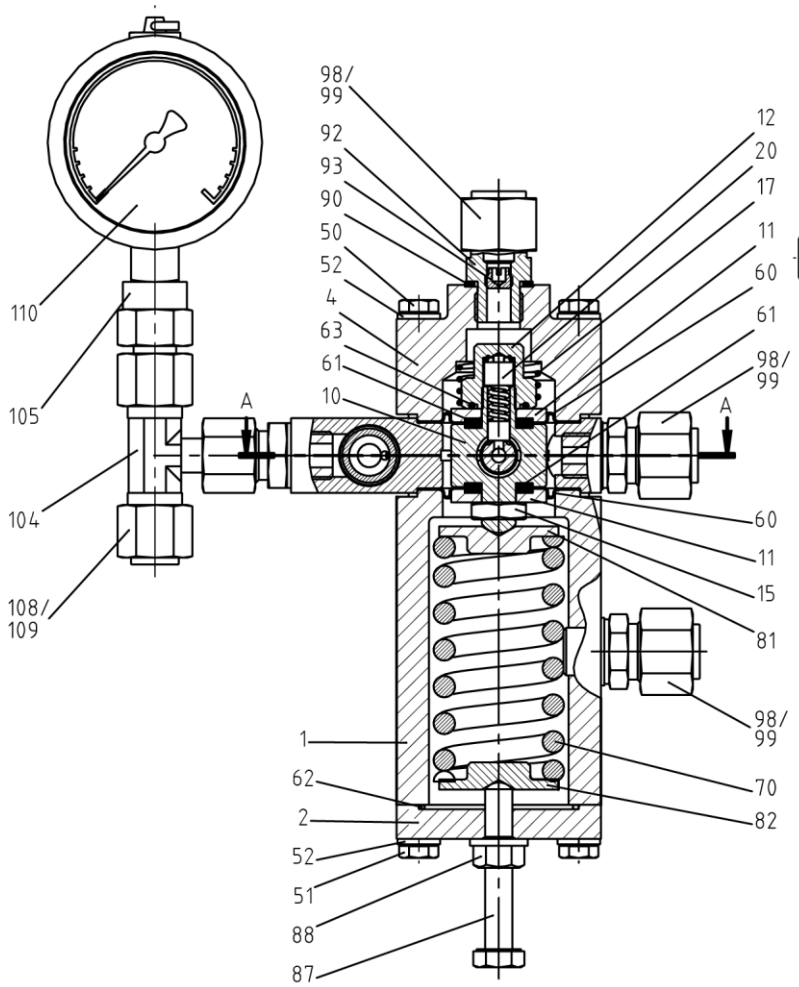


10.4 Spare parts drawing for metric HON640a with diaphragm measuring unit

Drawing

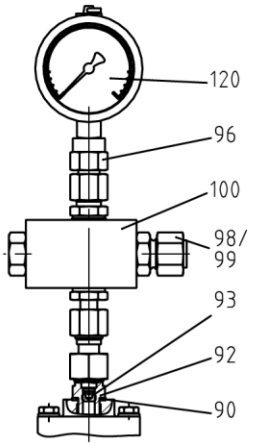
Without pressure gauge for outlet pressure

W_d = 1 - 40 bar

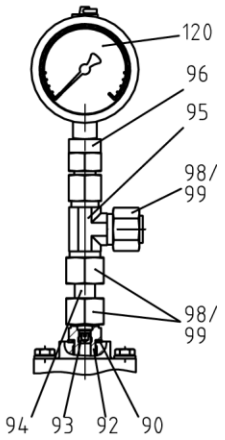


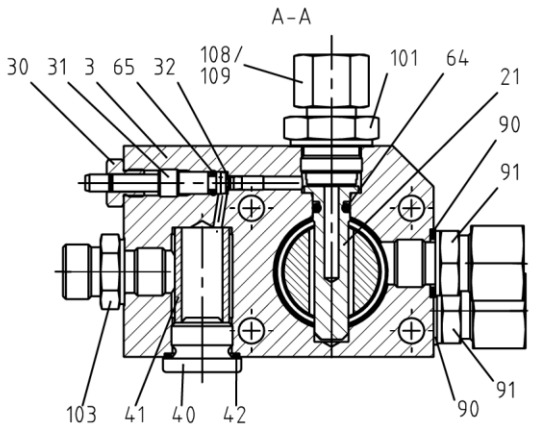
With pressure gauge for outlet pressure

W_d = 1 - 20 bar



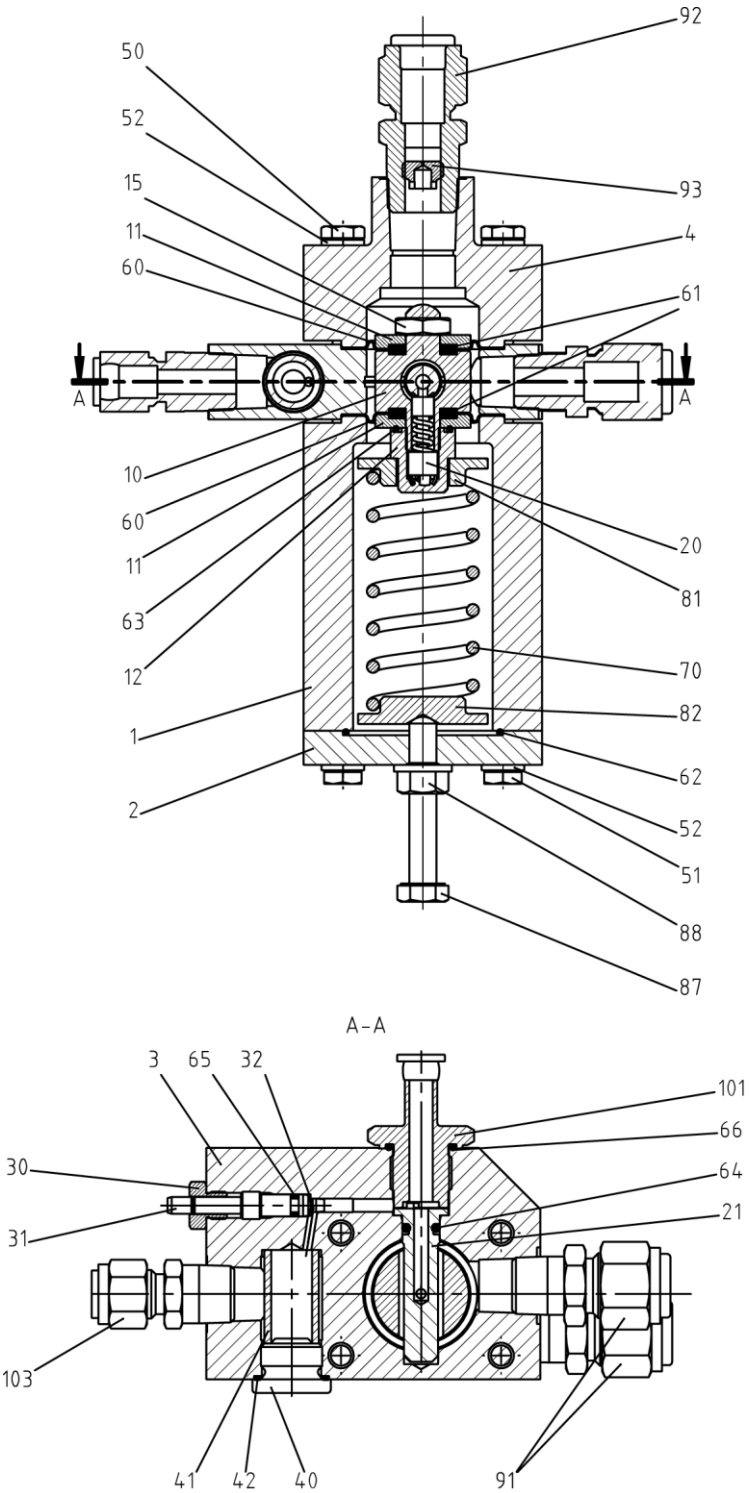
W_d = 1 - 40 bar





10.5 Spare parts drawing for imperial HON642a pilot with diaphragm measuring unit

Drawing



10.6 Bill of materials and spare parts for pilots

Spare parts kits

Imperial HON 640a with diaphragm measuring unit

Name	Description	Part no.
Imperial spare parts kit for 640a with diaphragm measuring unit	Consisting of: ▪ One each of Nos. 20, 42, 62, 63, 64, 65, 66 ▪ Two each of Nos. 60, 61	K640-004

Imperial HON 640a with metal bellows measuring unit

Name	Description	Part no.
Imperial spare parts kit for 640a with metal bellows measuring unit	Consisting of: ▪ One each of Nos. 20, 42, 60, 61, 62, 63, 64, 65, 66, 67, 68	K640-005

Metric HON 640a with diaphragm measuring unit

Name	Description	Part no.
Metric spare parts kit for 640a with diaphragm measuring unit	Consisting of: ▪ One each of Nos. 20, 42, 62, 63, 64, 65 ▪ Two each of Nos. 60, 61	K640-003

Imperial HON 642a with diaphragm measuring unit

Name	Description	Part no.
Imperial spare parts kit for 642a with diaphragm measuring unit	Consisting of: ▪ One each of Nos. 20, 42, 62, 63, 64, 65, 66 ▪ Two each of Nos. 60, 61	K642-001

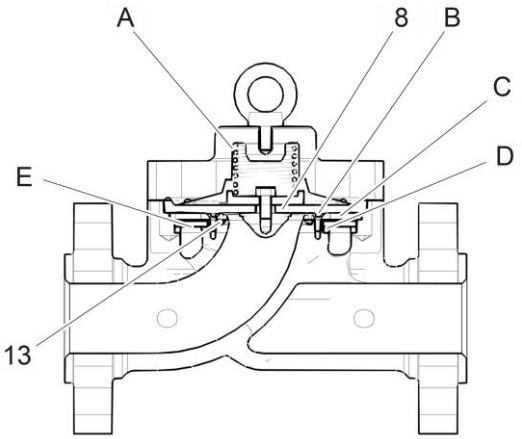
Maintenance and servicing parts for pilot

No.	Name	Part no.			
		Imperial HON 640a with diaphragm measuring unit	Imperial HON 640a with metal bellows measuring unit	Metric HON 640a with diaphragm measuring unit	Imperial HON 642a with diaphragm measuring unit
20	PISTON PRE-ASSEMBLED	18356625	18356625	10000186	18356625
21	NOZZLE, 3.0	10000061	10000061	10000061	10000061
32	Locking ring	19186	19186	19186	19186
41	FILTER INSERT	28418	28418	28418	28418
42	O-RING A 18 X 22	18688	18688	18688	18688
60	Diaphragm, convoluted	10000191 (2 units)	10000191	10000191 (2 units)	10000191 (2 units)
61	STEM SEAL	10000066 (2 units)	10000066	10000066 (2 units)	10000066 (2 units)
62	O-RING W1.78 D 44.17	100331-RMK	100331-RMK	20293-RMK	100331-RMK
63	O-RING W1.78 D 14.00	100992-RMK	100992-RMK	20332-RMK	100992-RMK
64	O-RING, W2.40 D 6.30	100444-RMK	100444-RMK	20225-RMK	100444-RMK
65	O-RING W1.78 D 3.68	100990-RMK	100990-RMK	20283-RMK	100990-RMK
66	O-RING W1.78 D 17.17	101464-RMK	101464-RMK	-	101464-RMK
67	O-RING W1.78 D 34.65	-	100449-RMK	-	-
68	O-RING W1.78 D 41.00	-	101299	-	-
70	Compression spring for the following specific setpoint ranges:				
	▪ W_{ds}= 0.5 - 2 bar	10000156	-	10000156	10000156
	▪ W_{ds}= 1 - 5 bar	10009671	-	10009671	10009671
	▪ W_{ds}= 2 - 10 bar	10000139	-	10000139	10000139
	▪ W_{ds}= 5 - 20 bar	10000115	-	10000115	10000115
	▪ W_{ds}= 10 - 40 bar	10000064-RMK	-	10000064-RMK	10000064-RMK
	▪ W_{ds}= 10 - 50 bar	-	10000149	-	-
	▪ W_{ds}= 20 - 90 bar	-	10010444	-	-
81	SPRING PLATE, upper, for the following setpoint ranges:				
	▪ 0.5 to 20 bar	10000114	-	10000114	10000096
	▪ 10 to 40 bar	10000148	-	10000148	10000097
	▪ 10 to 50 bar	-	10011774	-	-
	▪ 20 to 90 bar	-	10011774	-	-
82	Spring plate, lower, for the following setpoint ranges:				
	▪ 0.5 to 20 bar	10000114	-	10000114	10000114
	▪ 10 to 40 bar	10000148	-	10000148	10000148
	▪ 10 to 50 bar	-	19084000	-	-
	▪ 20 to 90 bar	-	10011774	-	-

No.	Name	Part no.			
		Imperial HON 640a with diaphragm measuring unit	Imperial HON 640a with metal bellows measuring unit	Metric HON 640a with diaphragm measuring unit	Imperial HON 642a with diaphragm measuring unit
100	Protection against overpressure for setpoint ranges with a limit of up to 20 bar:				
	▪ For W_d= 1 - 5 bar	-	-	10023336	-
	▪ For W_d= 2 - 10 bar	-	-	10023337	-
	▪ For W_d= 5 - 20 bar	-	-	10023338	-
110	PRESSURE GAUGE, inlet:				
	▪ 0-16 bar	-	-	26890	-
	▪ 0-25 bar	-	-	100418-RMK	-
	▪ 0-40 bar	-	-	26282	-
	▪ 0-60 bar	-	-	26283	-
	▪ 0-100 bar	-	-	26285	-
120	PRESSURE GAUGE, outlet:				
	▪ 0-6 bar	-	-	26891	-
	▪ 0-16 bar	-	-	26890	-
	▪ 0-25 bar	-	-	100418-RMK	-
	▪ 0-40 bar	-	-	26282	-

10.7 Spare parts drawing for HON 5020 actuator assembly

Drawing



10.8 Maintenance and servicing parts for the actuator assemblies

Spare parts kits

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

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

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

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

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

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

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

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

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

Maintenance and servicing parts for actuator assembly

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

Nominal size	No. / Letter	Qty	Name	Part no.
2″	C	1		
			Flow restrictor, 100%	202/MZ/011
			Flow restrictor, 75%	202/MZ/019
			Flow restrictor, 50%	202/MZ/013
			Flow restrictor 25%	202/MZ/020
2″	D	1	Carrier plate	202/MN/001
2″	E	1	Metal foam	202/MF/001
3″	8	1	Diaphragm, up to 50 bar DP	203/MJ/013
3″	8	1	Diaphragm, up to 70 bar DP	203/MJ/014
3″	13	1	O-ring	730ODVN238
3″	A	1	Closing spring	SS1293
3″	B	6	Screws	710BCFE03010
3″	C	1		
			Flow restrictor, 100%	203/MZ/010
			Flow restrictor, 75%	203/MZ/018
			Flow restrictor, 50%	203/MZ/012
			Flow restrictor 25%	203/MZ/019
3″	D	1	Carrier plate	203/MN/001
3″	E	1	Metal foam	203/MF/001
4″	8	1	Diaphragm, up to 50 bar DP	204/MJ/003
4″	8	1	Diaphragm, up to 70 bar DP	204/MJ/004
4″	13	1	O-ring	730ODVN244
4″	A	1	Closing spring	10024055
4″	B	6	Screws	710BCFE03010
4″	C	1		
			Flow restrictor, 100%	204/MZ/010
			Flow restrictor, 75%	204/MZ/016
			Flow restrictor, 50%	204/MZ/012
			Flow restrictor 25%	204/MZ/017
4″	D	1	Carrier plate	204/MN/002
4″	E	1	Metal foam	204/MF/001
6″	8	1	Diaphragm 50/70 bar DP	10011307
6″	13	1	O-ring	730ODVN261
6″	A	1	Closing spring	10011249
6″	B	6	Screws	710BCFE03010

Nominal size	No. / Letter	Qty	Name	Part no.
6″	C	1		
			Flow restrictor, 100%	206/MZ/002
			Flow restrictor, 75%	206/MZ/010
			Flow restrictor, 50%	206/MZ/006
			Flow restrictor 25%	206/MZ/011
6″	D	1	Carrier plate	206/MN/001
6″	E	1	Metal foam	206/MF/001

10.9 Lubricants, threadlockers, and special tools

Lubricants

Important! All parts must be slightly greased.

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

Application	Remark	Lubricant	Part no.
O-rings Stationary and moving		**Standard model:**	
Flat gaskets		Silicone grease (jar)	27 079
Diaphragms	Grease the diaphragm grip body on all sides	Silicone grease (tube)	27 081
	Do NOT grease the flat grip		
Valve rod sliding surfaces	Grease film only	**Low-temperature model:**	
Sliding guides		Silicone grease (jar)	27 993
Guide bushings			
Control balls and control rollers		**High-temperature model:**	
Ball bearing		PFPE grease	102 389
Setpoint set screws Power screws		Assembly paste	27 091
Thread material combination: Al/Al			
Screw-in fittings and fastening screws			

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

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

Threadlocker

Important! All parts must be coated slightly.

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

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

Special tools

You will need the following special tools for maintenance purposes:

Application	Special tools	Part no.
Maintaining the pilot (see page 64)	Assembly aid	19 083 319

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