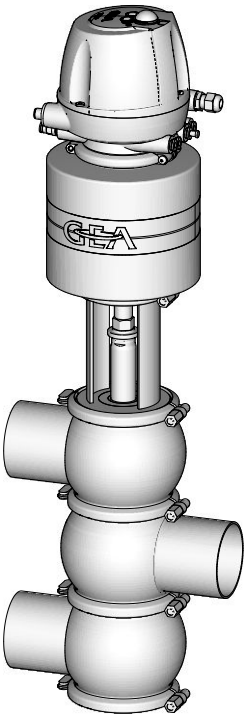
OPERATING INSTRUCTIONS

Translation from the original language



Hygienic valves

GEAVARIVENT® shuttle valve type X and W, X_V and W_V

GEA Tuchenhagen GmbH
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1 General Information

1.1 Information on the Document

The present Operating Instructions are part of the user information for the product. The Operating Instructions contain all the information you need to transport, install, commission, operate and carry out maintenance for the product.

1.1.1 Binding Character of These Operating Instructions

These Operating Instructions contain the manufacturer's instructions to the operator of the product and to all persons who work on or use the product regarding the procedures to follow.

Carefully read these Operating Instructions before starting any work on or using the product. Your personal safety and the safety of the product can only be ensured if you act as described in the Operating Instructions.

Store the Operating Instructions in such a way that they are accessible to the operator and the operating staff during the entire life cycle of the product. When the location is changed or the product is sold make sure you also provide the Operating Instructions.

1.1.2 Notes on the Illustrations

The illustrations in these Operating Instructions show the product in a simplified form. The actual design of the product can differ from the illustration. For detailed views and dimensions of the product please refer to the design documents.

1.1.3 Symbols and Highlighting

In these Operating Instructions, important information is highlighted by symbols or special formatting. The following examples illustrate the most important types of highlighting.

Danger

Warning: Fatal Injuries

Failure to observe the warning can result in serious damage to health, or even death.

► The arrow identifies a precautionary measure you have to take to avoid the hazard.

Warning: Explosions

Failure to observe the warning can result in severe explosions.

► The arrow identifies a precautionary measure you have to take to avoid the hazard.

⚠ Warning!

Warning: Serious Injuries

Failure to observe the warning can result in serious damage to health.

► The arrow identifies a precautionary measure you have to take to avoid the hazard.

⚠ Caution!

Warning: Injuries

Failure to observe the warning can result in minor or moderate damage to health.

► The arrow identifies a precautionary measure you have to take to avoid the hazard.

Notice

Warning: Damage to Property

Failure to observe the warning can result in serious damage to the component or in the vicinity of the component.

► The arrow identifies a precautionary measure you have to take to avoid the hazard.

Carry out the following steps: = Start of a set of instructions.

1. First step in a sequence of operations.
2. Second step in a sequence of operations.

   → Result of the previous operation.

→ The operation is complete, the goal has been achieved.

Hint!

Further useful information.

1.2 Manufacturer address

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Engineering for a better world.

EU Declaration of conformity within the meaning of the EC machine directive 2006/42/EC

Manufacturer: **GEA Tuchenhagen GmbH**
Am Industriepark 2-10
21514 Büchen, Germany

Hereby, we declare that the machine designated in the following

---

Designation:	Valve with acutator
Type:	VARIVENT® / ECOVENT®

---

by virtue of its design and construction and in the versions placed on the market by us, complies with the essential health and safety requirements of the following directive:

Relevant EC directives:	2006/42/EC	EC Machinery Directive
Applicable harmonized standards, in particular:	EN ISO 12100: 2010	

Remarks:

- In the event of a modification to the machine that was not agreed with us, this declaration loses its validity
- Furthermore, we declare that the specific technical documentation for this machine has been drawn up in accordance with Annex VII, Part A, and undertake to forward this documentation by means of data medium upon justified request by the national authorities

---

Person authorised for compilation and handover of technical documentation:

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Büchen, 18 July 2025

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i.V. Stephan Dirks
Senior Director Product Engineering & Development
Business Line Hygienic Valves/ BU Valves & Pumps

Engineering for a better world.

UK- Declaration of conformity by Supply of Machinery (Safety) Regulations 2008

Manufacturer: **GEA Tuchenhagen GmbH**
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21514 Büchen, Germany

Hereby, we declare that the machine designated in the following

Designation:	Valve with actuator
Type:	VARIVENT® / ECOVENT®

by virtue of its design and construction and in the versions placed on the market by us, complies with the essential health and safety requirements of the following directive:

Relevant UK legislation:	Supply of Machinery (Safety) Regulations 2008
Applicable harmonized standards, in particular:	EN ISO 12100: 2010

Remarks:

- In the event of a modification to the machine that was not agreed with us, this declaration loses its validity
- Furthermore, we declare that the specific technical documentation for this machine has been drawn up in accordance with Annex VII, Part A, and undertake to forward this documentation by means of data medium upon justified request by the national authorities

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2 Safety

2.1 Intended use

The valve is intended only for the described purpose. Using the device for any other purpose is considered contrary to its designated use. GEA Tuchenhagen will not accept any liability for damage resulting from improper setting: the risk lies entirely with the operator of the facility. The prerequisite for the reliable and safe operation of the valve is proper transportation and storage as well as professional installation and assembly. Operating the unit within the limits of its designated use also involves adhering to the operating, maintenance and servicing instructions.

2.1.1 Requirements for operation

The prerequisite for reliable and safe operation of the component is proper transportation and storage as well as professional installation and assembly. Operating the unit within the limits of its designated use also involves adhering to the operating, inspection and maintenance instructions.

2.1.2 Pressure equipment directive

The valve is a piece of pressure equipment (without safety function) in the sense of the pressure equipment directive 2014/68/EU: Classified according to Annex II in category 1.

According to the scope of directive 2014/34/EC, article 1, paragraph 2, f, the exception of the directive applies, due to conformity with the machine directive 2006/42/EU.

The nominal diameters smaller than DN 25 are subject to article 4, paragraph 3 of the Pressure Equipment Directive which specifies sound engineering practice.

Nominal diameters ≥ IPS 4“; DN 125 valid for the fluid group II.

In the event of any deviations, GEA Tuchenhagen GmbH will supply a specific Declaration of Conformity.

2.1.3 ATEX directive

In areas with an explosive atmosphere, only valves suitable for use in such areas may be used.

Refer to and observe the additional operating instructions “ATEX version valves”. For details regarding the marking of valves for potentially hazardous areas also refer to the additional operating instructions “ATEX version valves”.

If these valves are used in areas with a potentially explosive atmosphere, you must absolutely comply with directive 2014/34/EC with respect to all ignition hazards.

2.1.4 Improper operating conditions

The operational safety of the component can not be guaranteed under improper operating conditions. Therefore avoid improper operating conditions.

The operation of the component is not permitted if:

- Persons or objects are in the danger zone.
- Safety devices are not working or were removed.
- Malfunctions have been detected on the component.
- Damage to the component has been detected.
- Maintenance intervals have been exceeded.

2.2 Operator’s Duty of Care

The operating company of the component has a special responsibility for the proper and safe handling of the component within their company. Only use the component when it is in perfect operating condition in order to prevent danger to persons and property.

This operating manual contains information that you and your employees need for safe operation over the life of the component. Be sure to read these Operating Instructions carefully and ensure that the measures described here are observed.

The operator's duty of care includes planning the necessary safety measures and monitoring that these measures are observed. The following principles apply:

- Only qualified personnel may work on the component.
- The operating company must authorize personnel to carry out the relevant tasks.
- Order and cleanliness must be maintained at the work stations and in the entire area surrounding the component.
- Personnel must wear suitable work clothing and personal protective equipment. As the operating company must ensure that work clothing and personal protective equipment are used.
- Inform personnel regarding any properties of the product which might pose a health risk and the preventative measures to be taken.
- Have a qualified first-aid representative on call during the operation. This person must be able to initiate any necessary first-aid measures in case of an emergency.
- Clearly define procedures, competences and responsibilities for those working in the area of the component. Everybody must know what to do in case of an emergency. Instruct the staff in this respect at regular intervals.
- The signs on the component must always be complete and easy to read. Check, clean and replace the signs as necessary at regular intervals.
- Observe the Technical Data specified and the limits of use!

Hint!

Carry out regular checks. This way you can ensure that these measures are actually observed.

2.3 Subsequent changes

No technical modifications should ever be made to this component. Otherwise you will have to undergo a new conformity process in accordance with the EC Machinery Directive on your own.

In general, only original spare parts supplied by GEA Tuchenhagen GmbH should be fitted. This ensures that the component is always operating properly and efficiently.

2.4 General safety instructions and dangers

The component is safe to operate. It was built according to state-of-the-art science and technology.

Nevertheless, dangers can arise from the component, if:

- the component is not used as intended
- the component is used improperly
- the component is operated under impermissible conditions

2.4.1 Principles for safe operation

Dangerous situations during operation can be avoided by safety-conscious and proactive behaviour of the staff.

To ensure safe operation of the valve the following principles apply:

- The Operating Instructions must be kept ready to hand at the valve's place of use. They must be complete and in clearly legible form.
- Only use the valve for its intended use.
- The valve must be functional and in good working order. Check the condition of the valve before starting work and at regular intervals.
- Wear tight-fitting work clothing for all work on the valve.
- Ensure that nobody can get hurt on the parts of the valve.
- Immediately report any faults or noticeable changes on the valve to the person responsible.
- Never touch the pipes and the valve when these components are hot! Avoid opening the valve unless the process plants have been emptied and depressurised.
- Observe the accident prevention regulations and all local regulations.

2.4.2 Environmental Protection

Harm to the environment can be avoided by safety-conscious and proactive behaviour of the staff.

For environmental protection the following principles apply:

- Substances harmful to the environment must not be discharged into the ground or the sewage system.
- Always observe the pertinent regulations relating to waste avoidance, disposal and utilization.

- Substances harmful to the environment must be collected and stored in suitable containers. Clearly mark the containers.
- Dispose of lubricants as hazardous waste.

2.4.3 Electrical Equipment

For all work on electrical equipment, the following principles apply:

- Access to electrical equipment should only be allowed to qualified electricians. Always keep unattended switch cabinets locked.
- Modifications of the control system can affect the safe and reliable operation. Modifications are only permitted with the express permission of the manufacturer.
- After completion of all work, check that the protective devices are fully functional.

2.5 Supplementary Regulations

In addition to the instructions in this documentation the following also has to be observed:

- pertinent accident prevention regulations,
- generally accepted safety rules,
- national regulations applicable in the country of use,
- work and safety instructions applicable in the facility,
- installation and operating regulations for use in potentially explosive areas.

2.6 Qualification of personnel

This section provides information on how the personnel working on the component must be trained.

Operating and maintenance personnel must

- have the necessary qualification to carry out their tasks,
- be instructed with regard to possible dangers,
- know and observe the safety instructions given in the documentation.

Only allow qualified electricians to carry out work on the electrical equipment or have a qualified electrician supervise the work.

Only allow specially trained personnel to carry out work on an explosion-protected system. When working on explosion-protected equipment observe the standards DIN EN 60079-14 for gases and DIN EN 50281-1-2 for dusts.

The following minimum qualifications are required:

- Training as a specialist for working independently on the component.
- Adequate instruction to work on the component under the supervision and guidance of a trained specialist

Each employee must meet the following requirements to work on the component:

- Personal suitability for the respective task.
- Sufficient professional qualification for the respective task.
- Received instruction about the functionality of the component.
- Received instruction about operating sequences on the component.
- Familiar with the safety devices and their function.
- Familiar with these Operating Instructions, especially with the safety instructions and the information which is relevant for the task on hand.
- Familiar with the basic regulations with regard to occupational health and safety and accident prevention.

When working with the component, a distinction is made between the following user groups:

User groups	
Staff	**Qualifications**
Operating personnel	Adequate instruction and sound knowledge in the following areas: • Functionality of the component • Operating sequences on the pump • What to do in case of an emergency • Lines of authority and responsibilities with respect to the task
Maintenance personnel	Appropriate training and a sound knowledge of the structure and functionality of the component. Sound knowledge in the following areas: • Mechanical equipment • Electrical equipment • Pneumatic system Authorization with regard to safety engineering standards to carry out the following tasks: • Setting devices into operation • Earthing of devices • Marking of devices The relevant certificates of qualification must be submitted before work can be carried out on ATEX certified machines.

2.7 Safety equipment

2.7.1 Signs

Hazardous locations on the component are marked by warning labels, prohibition signs and mandatory signs.

The signs and instructions on the component must always be legible. Any illegible signs must be replaced immediately.

Signs on the valve	
Sign	**Meaning**
 Fig.1	General hazard warning
 Fig.2	Warning Crushing
 Fig.3	Warning of spring tension
 Fig.4	Bleed product line and actuator prior to disassembly

2.8 Residual dangers

Dangerous situations can be avoided by safety-conscious and proactive behaviour of the staff and by wearing personal protective equipment.

Residual dangers on the valve and measures		
Danger	**Cause**	**Measure**
Danger to life	Inadvertent switch-on of the valve	Effectively disconnect all components, effectively prevent switch-on.
	Electric power	Observe the following safety rules: 1. Isolate from the power supply. 2. Take appropriate measures to prevent switch on. 3. Test absence of voltage. 4. Earthing and short-circuiting. 5. Cover or safeguard any adjacent live parts.
	Spring tension in the actuator	Danger to life caused by compression spring in the actuator. Do not open the actuator but return it to GEA Tuchenhagen for proper disposal.
Danger of injury	Danger presented by moving or sharp-edged parts	The operator must exercise caution and prudence. For all work: • Wear suitable work clothing. • Never operate the machine if the cover panels are not correctly fitted. • Never open the cover panels during the operation. • Never reach into openings. As a precautionary measure, wear personal protective equipment in the vicinity of the valve: • Protective gloves • Safety shoes
Environmental damage	Operating materials with properties which are harmful to the environment	For all work: • Collect lubricants in suitable containers. • Dispose of lubricants in accordance with the pertinent regulations.

2.9 Danger zones

Please observe the following notes:

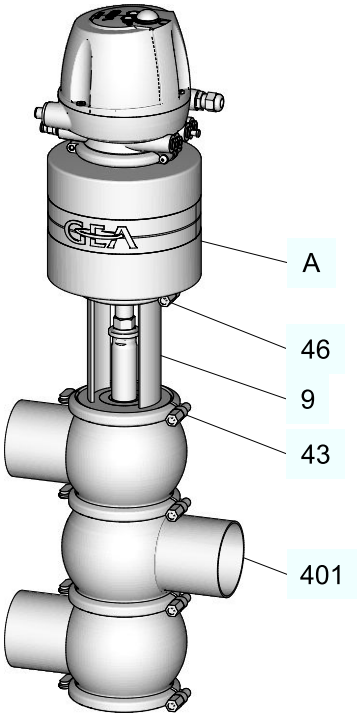


Fig.5

- In the event of malfunctions, shut down the valve (disconnect from the power and air supply) and secure it against being used.
- Never reach into the lantern (9) or the valve housing (401) when the valve is switching. Fingers can be crushed or cut off.
- On a spring-closing valve, there is a risk of injury upon releasing the clamp connection (43/46) as the released spring pretension will suddenly lift the actuator (A). Therefore, release the spring tension before detaching the clamp connection (43) by supplying the actuator (A) with compressed air.
- Before starting any maintenance, servicing or repair work, disconnect the valve from the power supply and secure it against inadvertently being switched back on again.
- Only allow a qualified electrician to carry out any work on the electrical power supply.
- Check the electrical equipment of the valve at regular intervals. Immediately remedy loose connections and molten cables.
- If work on live parts cannot be avoided, call in a second person, who can operate the main switch in case of an emergency.
- The housing sockets have very sharp edges. When transporting and installing the valve be sure to wear suitable protective gloves.

3 Description

3.1 Design

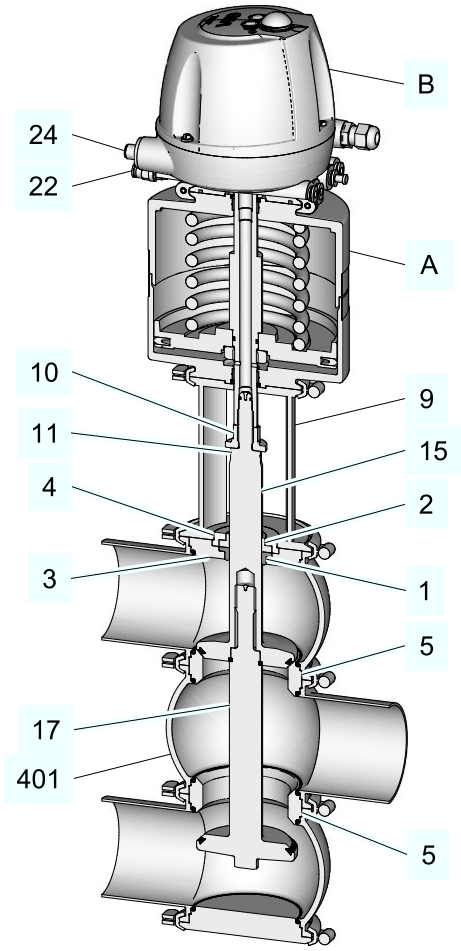


Fig.6

Design	
No.	**Designation**
A	Actuator
B	Control top S or control top T.VIS
1	Gasket
2	Bearing
3	Sealing washer
4	Bearing disc
5	Seat ring
9	Lantern
10	Spacer nut
11	Radial groove
15	Valve disk X1
17	Valve disk X2
22	Air connection

Design	
No.	**Designation**
24	Electrical connection
401	Valve housing

The valve X can be distinguished from its radial seal (11) by the valve disk.

3.2 Functional description

3.2.1 Spring-to-close actuator (Z)

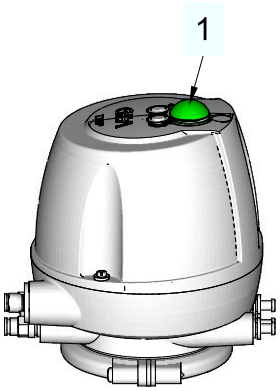


Fig.7: Distinguishing Feature of Spring-To-Close Actuator (Z)

Valve is closed in the non-actuated position.

Identification on the T.VIS control top:

- Green steady light (1): valve in non-actuated position
- Yellow steady light (1): valve in end position (actuated position)

3.2.2 Spring-to-open actuator (A)

The valve is open in the non-actuated position.

Identification on the T.VIS control top:

- Green steady light (1): valve in non-actuated position
- Yellow steady light (1): valve in end position (actuated position)

3.3 Intended Purpose

Shuttle Valve Type X is used for the distribution of streams of liquid within a section of a pipe.

Shuttle Valve Type W is used for change-over of streams of liquid within a section of a pipe.

The shuttle valves X and W are pressure-keeping equipment (without safety function) in the sense of the pressure equipment directive: Directive 97/23/EG. They are classified according to Annex II, article 3, section 3. A special declaration of conformity will be supplied in the event of any deviations.

The medium should preferably flow in the opening direction of the valve disk to avoid pipe hammers when the valve is opened or closed.

4 Transport and storage

4.1 Storage conditions

The valves, valve inserts or spare parts should be stored in a dry place, free of vibrations and dust, and protected from light. To avoid damage, leave the components in their original packaging if possible.

If, during transport or storage, the valve is going to be exposed to temperatures ≤ 0°C, it must be dried beforehand and suitable measures must be taken to protect it from damage.

Hint!

We recommend that the valve should be stored at a temperature of ≥ 5 °C for a period of 24 hours prior to any handling (disassembling the housings / activation of actuators) so that any ice crystals formed by condensation water can melt.

4.2 Transport

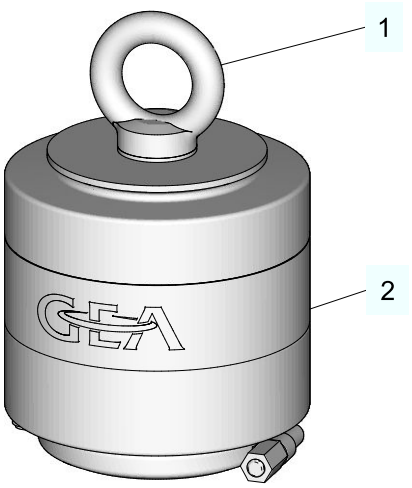


Fig.8

For transport, the following principles apply:

- When transporting the valve be sure to unscrew the control top and the switch bar from the actuator (2) and use the screwed-in eye bolt (1), material no. 221-104.98, to lift the valve.
- Only use suitable lifting gear and slings for transporting the package units/ valves.
- Observe the pictograms on the package.
- Handle valves with care to avoid damage caused by impact or careless loading and unloading. The outside synthetic materials are susceptible to breaking.
- Control tops must be protected from animal and vegetable fats.
- Only allow qualified staff to transport the valve.
- Movable parts must be properly secured.

- Only use approved, fully functional load lifting devices and lifting accessories which are suitable for the intended purpose. Observe the maximum load-bearing capacities.
- Secure the valve against slipping. Take the weight of the valve into account and the position of the point of gravity.
- Under no circumstances should anyone stand under a suspended load.
- Take care when transporting the valve. Do not grip sensitive parts of the unit to lift or push the unit or to support yourself. Avoid putting the unit down with a jerk.

4.2.1 Scope of supply

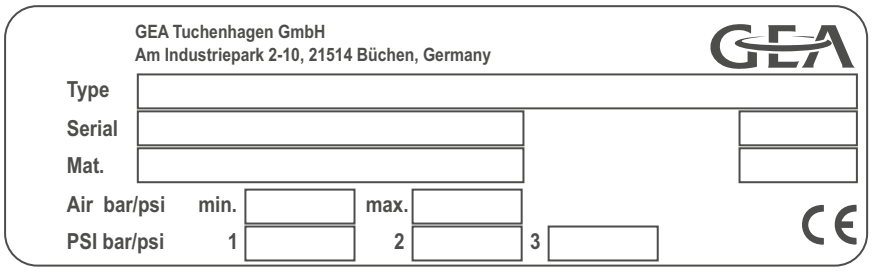
After taking delivery of the component, check if

- the details on the type plate correspond to the data in the order and delivery documents,
- the equipment is complete and all components are in good order.

5 Technical data

5.1 Type plate

The type plate clearly identifies the valve.



The type plate provides the following key data:

Key data of the valve	
Type	Shut-off valve X, W
Serial	Serial number
Material	1.4404 (AISI 316L) / EPDM
Control air pressure bar/psi	6.0 / 87
Product pressure bar/psi	5.0 / 72.5

5.2 Technical data

Refer to the following tables for the key technical data of the valve:

Technical data: Valve	
Designation	**Description**
Size	DN 25 to DN 150 1" to 6" OD 2" to 6" IPS
Material of product contact parts	Stainless steel 1.4404
Fitting position	Any position, if valve and pipe system can drain properly

Technical data: Ambient temperatures	
Designation	**Description**
Valve	0 to 45 °C (32 ... 113 °F), standard < 0 °C (32 °F): Use control air with low dew point. Protect valve rods against freezing. < −15 °C: no solenoid valves in the control top < +50 °C: no solenoid valves in the control top
Proximity switch	-20 to +80 °C (-4 ... +176 °F)
Control top T.VIS M-20, M-15, A-15, P-15	-20 to +50 °C (-4 ... +122 °F)
Product temperature and operating temperature	depending on the sealing material

Technical data: Compressed air supply, product pressure	
Designation	**Description**
Air hose	
• Metric	Material PE-LD Outer-Ø 6 mm +/- 0.1 mm Inside Ø 4 mm
• Inch	Material PA outer-Ø 6.35 mm +/- 0.1 mm Inside Ø 4.3 mm
Control air	acc. to ISO 8573-1
• Solid particle content:	Quality class 6 Particle size max. 5 µm Particle density max. 5 mg/m^3
• Water content:	Quality class 4 max. dew point +3 °C If the unit is used at higher altitudes or at low ambient temperatures, the dew point must be adapted accordingly.
• Oil content:	Quality class 3, preferably oil free max. 1 mg oil to 1 m^3 air

Technical data: Compressed air supply, product pressure	
Designation	**Description**
Control air pressure	6 bar (87 psi), max. 8 bar (116 psi) configuration with standard drive Alternative combinations of product pressure and control air pressure on request
Product pressure	5 bar (72.5 psi) configuration with standard drive max. 10 bar (116 psi) configuration with correspondingly designed actuator > 10 bar (145.0 psi) for static applications and on request

5.3 Resistance and permitted operating temperature of the sealing materials

The resistance and permitted operating temperature of the sealing materials depend on the type and temperature of the medium conveyed. The exposure time can adversely affect the service life of the seals. The sealing materials comply with the regulations of FDA 21 CFR 177.2600 or FDA 21 CFR 177.1550.

The maximum operating temperature is defined by the sealing type and its mechanical load.

Due to the versatile conditions of use (e.g. usage duration, switching frequency, type and temperature of product and cleaning agents as well as usage environment), GEA Tuchenhagen recommends that the user carries out resistance tests.

Resistance:

- \+ = good resistance
- o = reduced resistance
- – = no resistance

Table of sealing resistance / permitted operating temperature					
Medium	**Maximum operating temperatures**	**Sealing materials**			
		EPDM	**FKM**	**HNBR**	**TEFASEP gold**
Alkalis up to 3%	up to 80 °C (176°F)	+	o	+	+
Alkalis up to 5%	up to 40 °C (104°F)	+	o	o	+
Alkalis up to 5%	up to 80 °C (176° F)	+	–	–	+
Alkalis more than 5%		o	–	–	+
Inorganic acids up to 3%	up to 80 °C (176°F)	+	+	+	+
Inorganic acids up to 5%	up to 80 °C (176°F)	o	+	o	+
Inorganic acids up to 5%	up to 100 °C (212°F)	–	+	–	+
Water	up to 80 °C (176°F)	+	+	+	+
Steam	up to 135 °C (275° F)	+	o	o	+
Steam, approx. 30 min	up to 150 °C (320°F)	+	o	–	+
Steam, approx. 30 min	up to 160 °C (320°F)	–	o	–	+
Fuels/hydrocarbons		–	+	+	+
Product with a fat content of max. 35%		+	+	+	+
Product with a fat content of more than 35%		–	+	+	+
Oils		–	+	+	+

Table sealing materials - temperature resistance	
Sealing materials	**General temperature resistance***
EPDM	-40...+135 °C (-40...275 °F)
FKM	-10...+200 °C (+14...+392 °F)
HNBR	-25...+140 °C (-13...+284 °F)
* The general resistance of the material does not correspond to the maximum operating temperature.	

5.4 Pipe ends - General table of measurements

Hint!

Not every valve is available in every size. Particulars of available sizes of valves see Chapter 5, Page 23.

Dimensions for Pipes in DN				
Metric DN	**Outer diameter**	**Wall thickness**	**Inner diameter**	**Outer diameter according to DIN 11850**
25	29	1.5	26	x
40	41	1.5	38	x
50	53	1.5	50	x
65	70	2.0	66	x
80	85	2.0	81	x
100	104	2.0	100	x
125	129	2.0	125	x
150	154	2.0	150	x

Dimensions for Pipes in Inch OD				
Inch OD	**Outer diameter**	**Wall thickness**	**Inner diameter**	**Outer diameter according to**
1"	25.4	1.65	22.1	x
1 ½"	38.1	1.65	34.8	x
2"	50.8	1.65	47.5	x
2 ½"	63.5	1.65	60.2	x
3"	76.2	1.65	72.9	x
4"	101.6	2.11	97.38	x

Dimensions for Pipes in Inch IPS				
Inch IPS	**Outer diameter**	**Wall thickness**	**Inner diameter**	**Outer diameter according to DIN EN ISO 1127**
2"	60.3	2	56.3	x
3"	88.9	2.3	84.3	x
4"	114.3	2.3	109.7	x
6"	168.3	2.77	162.76	x

5.5 Tool

Tool	Material no.
Manual emergency actuator	221.310.74
Belt wrench	408-142
Hose cutter	407-065
O-ring cutter, heatable	0980.50022
Oven (not microwave, min. temp. 140°C)	0981.50016
Protective gloves, heat-resistant	
V-ring insertion tool	229-109.88
Open-ended wrench, ends ground, a/f 17-19	229-119.01
Open-ended wrench, ends ground, a/f 21-23	229-119.05
Open-ended wrench, ends ground, a/f 22-24	229-119.03
Open-ended wrench a/f 10	408-033
Open-ended wrench a/f 13	408-034
Open-ended wrench a/f 14	408-045
Open-ended wrench a/f 28	408-268
Open-ended wrench, a/f 30-32	408-041
Hexagon socket Ø 3 mm	408-121

5.6 Lubricants

Lubricants	Material no.
Rivolta F.L.G. MD-2 (1 kg tin)	413-071
Rivolta F.L.G. MD-2 (100g tube)	413-136

5.7 Weights

Size	Valve X	Valve X_V	Valve W	Valve W_V
DN 25	about 10 kg	--	about 8 kg	--
DN 40	about 18 kg	--	about 12 kg	--
DN 50	about 18 kg	--	about 12.5 kg	--
DN 65	about 25 kg	--	about 20.5 kg	about 30 kg
DN 80	about 25 kg	--	about 21 kg	about 31.5 kg
DN 100	about 34 kg	--	about 29.5 kg	about 38.5 kg
DN 125	about 82 kg	--	about 57 kg	--
DN 150	about 86 kg	--	about 72 kg	--
1"	about 10 kg	--	about 8 kg	--
1.5"	about 18 kg	--	about 12 kg	--
2"	about 18 kg	--	about 12.5 kg	--
2.5"	about 25 kg	about 23.5 kg	about 20.5 kg	about 30 kg
3"	about 25 kg	about 24 kg	about 21 kg	about 31.5 kg
4"	about 34 kg	about 36 kg	about 29.5 kg	about 38.5 kg
6"	about 86 kg	--	about 72 kg	--

6 Assembly and installation

6.1 Safety instructions

Hazardous situations during installation can be avoided by safety-conscious and proactive behaviour of the personnel.

For installation, the following principles apply:

- Only qualified personnel are allowed to set-up, install and commission the component.
- Ensure that adequate working and traffic areas are available at the place of installation.
- Observe the maximum load-bearing capacity of the installation surface.
- Observe the transport instructions and markings on the part(s) to be transported.
- Remove any nails protruding from transport crates immediately after opening the crate.
- Under no circumstances should anyone stand under a suspended load.
- Safety devices of the component may not work effectively during installation.
- Reliably secure sections of the plant which have already been connected against inadvertently being switched on.

6.2 Notes on installation

The valve can be installed in any position. Care must be taken to ensure that the valve housing and the pipe system can drain properly. If the valve is installed in the horizontal position, pay attention that the vent hole in the actuator is aligned horizontally on one side.

To prevent damage, make sure that

- the valve is installed in the pipe system free of tension and
- no foreign materials (e.g. tools, bolts, lubricants) are left in the system.
- If the valve is installed horizontally, the stress on the valve stem seals is higher than in the vertical installation position. Therefore, support the actuator and regularly check the valve for leakage.

6.3 Control head

If external valves are connected in a control top with several solenoid valves, make sure that the control air pressure in the main actuator does not fall below the operating pressure.

6.4 Valve with Detachable Pipe Connection Elements

This section describes the procedure to fit the valve.

⚠ Caution!

Liquids in pipes

Danger of injury due to liquid spraying out

► Therefore, before releasing any pipe connections or clamp connections: drain the pipe and, if necessary, clean or rinse it.
► Separate the pipe section in which the valve is to be fitted from the rest of the piping system to prevent product entering again.

Carry out the following steps:

1. Fit valves with detachable pipe connection elements – using suitable connection fittings – directly into the pipe system.

→ Valve is installed.

6.5 Valve with welded ends

This section describes the welding procedure for the valve housing.

⚠ Warning!

Spring tension in the valve

Danger of injury when opening the clamp connections on the actuator or on the housing as the released spring pretension will suddenly lift the actuator.

► Therefore, release the spring tension before detaching the clamp connections by pressurizing the actuator with compressed air at maximum 8 bar.

Notice

Seals are wearing parts

Old seals will cause malfunction of the valve

► When fitting the valve be sure to fit new housing O-rings.

Carry out the following steps:

1. Release the spring tension.
2. Remove the valve insert, see Section 10.5, Page 41 and Section 10.6, Page 49.
3. Install housing without gaskets
4. Flush the housing with forming gas from the inside to push the oxygen out of the system.
5. Fit the housing into place and tack it.
6. Weld the housing into the pipe system; use welding filler if necessary.
7. Passivate the seam after welding.
8. Remove the housing.

9. Fit the seals.
10. Assemble the valve and vent the actuator.
    → The valve disk is lowered.

→ Install the valve with welded ends.

Hint!

We recommend using the automatic orbital welding method.

Housing-O-rings: When assembling the valve always replace the housing O-rings to ensure that the valve is tight.

6.6 Pneumatic connections

6.6.1 Air Requirement

The air requirement for the switching operation depends on the actuator type (identification marking on the cover of the actuator).

Actuator type	Actuator Ø [mm]	Air requirement (dm^3_n/ Stroke)
A...	98	0.16
B...	109	0.26
C...	135	0.42
D...	170	0.70
E...	210	1.10
R...[1]	169	1.60
S...[1]	210	2
T...[1]	210	3.10
D...6	170	1.30
E...6	210	2
S...6	261	3.20
T...6[1]	210	4
U...6[1]	261	5.10

[1] Actuators with booster cylinder for increasing the pneumatic actuating force when lower control air pressures are used

dm^3_n at 1.01325 bar at 0 °C according to DIN 1343.

6.6.2 Establishing Hose Connections

To ensure reliable operation, the compressed air hoses must be cut exactly square.

Tools required:

- A hose cutter

Carry out the following steps:

1. Shut off the compressed air supply.
2. Use the hose cutter to cut the pneumatic hoses square.
3. Push the air hose into the air connector on the control top.
4. Re-open the compressed air supply.

→ Establish a hose connection.

6.7 General

Danger

Live parts

Electrical shock can result in serious personal injury or death.

► Only allow properly qualified staff to carry out work on the electrical equipment.
► Prior to establishing electrical connections check the maximum permissible operating voltage.

Carry out the following steps:

1. Connect in accordance with the connection plan and the information in the corresponding instruction manual of the control top or in the data sheets of the magnetic switch and initiators.

→ Done

Hint!

The proximity switches in the control top are factory set. During transport and installation it can happen that the settings are changed, so that readjustment may be required (see the Operating Instructions for the control top).

7 Start-up

7.1 Safety instructions

Initial commissioning

For initial commissioning, the following principles apply:

- Take protective measures against dangerous contact voltages in accordance with pertinent regulations.
- The valve must be completely assembled and correctly adjusted. All screw connections must be securely tightened. All electrical cables must be installed correctly.
- Reliably secure machine parts which have already been connected against inadvertently being switched on.
- Relubricate all lubricating points.
- Make sure lubricants are used properly.
- After conversion of the valve, residual risks must be reassessed.

Setting into Operation

For commissioning, the following principles apply:

- Only allow properly qualified staff to set the valve into operation.
- Establish all connections correctly.
- The safety devices for the valve must be complete, fully functional and in perfect condition. Check the function before starting any work.
- When the valve is switched on, the danger zones must be free.
- Remove any liquids that have escaped without leaving residues.

7.2 Notes on commissioning

Before starting commissioning observe the following:

- Make sure that there are no foreign materials in the system.
- Actuate the valve once by applying compressed air.
- Clean the pipe system prior to the first product run.
- During commissioning, regularly check all sealing points for leaks. Replace defective seals.

8 Operation and control

8.1 Safety instructions

Dangerous situations during operation can be avoided by safety-conscious and proactive behaviour of the personnel.

For operation, the following principles apply:

- Monitor the component during operation.
- Safety devices must not be changed, removed or taken out of service. Check all safety devices at regular intervals.
- All guards and hoods must be fitted as intended.
- The installation location of the component must always be properly ventilated.
- Structural changes to the component are not permitted. Report any changes to the component immediately to the person in charge.
- Always keep danger zones clear. Do not leave any objects in the danger zone. Only allow persons to enter the danger zone when the machine is de-energized.
- Regularly check that all emergency stop devices are working correctly.

9 Cleaning

9.1 Cleaning

All parts in contact with product must be cleaned at regular intervals. Always observe the safety data sheets issued by the cleaning agent manufacturers. Only use cleaning agents which do not cause damage to the seals and the inner parts of the valve. When the pipe is cleaned, the cleaning medium also flows through and cleans the valve housings.

With respect to the cleaning method and parameters like detergents, temperatures, times, and intervals, the component manufacturer can merely make recommendations but cannot provide any generally applicable details. Method and parameters should be determined and defined by the operator in accordance with the relevant process and product.

The cleaning effect must be checked regularly by the operator!

9.1.1 Cleaning Process Examples

Typical Cleaning Parameters in Dairy Operations

Example of a two-phase cleaning process:

- Sodium hydroxide solution and sodium hydroxide based combination products in concentrations from 0.5% to 2.5% at 75 °C (167 °F) to 80 °C (176 °F).
- Phosphoric or nitric acid, and combination products based thereon in the concentrations of 0.3 to 1.5% at approx. 65 °C (149 °F).

Example of a cleaning operation in one cleaning step:

- Formic acid and formic acid-based combination products at up to 85 °C (185 °F).

Typical Cleaning Parameters in Breweries

- Sodium hydroxide solution and sodium hydroxide based combination products in concentrations of 1% to 4% at about 85 °C (185 °F).
- Phosphoric or nitric acid, and combination products based thereon in the concentrations of 0.3 to 1.5% at 20 °C (68 °F).

9.1.2 Cleaning effect

The cleaning effect depends on the following factors:

- Temperature
- Time
- Mechanics
- Chemicals
- Degree of soiling

These factors can be combined in such a way as to make an optimal cleaning result probable. Depending on the cleaning method (medium, concentration, temperature and contact times), the seals are affected to different degrees. This can impair the function and the service life.

9.2 Passivation

Before commissioning a plant, passivation is usually carried out for long pipes and tanks.

Valve blocks are usually excepted from this. Passivation is typically performed using nitric acid (HNO_3) at approx. 80 °C (176 °F) at a concentration of 3 % and a contact time of 6 to 8 hours.

Hint!

TEFASEP® gold valve seat seals achieve optimum sealing only after an initial CIP or SIP cleaning Operating conditions CIP or SIP cleaning:

- Medium: Lye, hot water or saturated steam

- Temperature: >80 °C (176 °F)

- Holding time: 20 … 30 min

The valve must be brought to the closed position for a brief period (min. 5 seconds) immediately after CIP or SIP cleaning. During commissioning, regularly check all sealing points for leaks. Exchange defective seals and repeat the CIP or SIP process.

10 Maintenance

10.1 Safety instructions

Maintenance and repair

Before carrying out maintenance and repair work on the component's electrical equipment, perform the following steps in accordance with the "5 safety rules":

- Isolate from the power supply
- Take appropriate measures to prevent switch on
- Test absence of voltage
- Earthing and short-circuiting
- Cover or safeguard any adjacent live parts.

For maintenance and repair, the following principles apply:

- Observe the intervals specified in the maintenance schedule.
- Only qualified personnel may carry out maintenance or repair work on the component.
- The component must be switched off and secured against being switched back on before maintenance or repair work. Work may only be started once any residual energy has been discharged.
- Block access for unauthorized persons. Put up notice signs which draw attention to the maintenance or repair work going on.
- Do not climb on the component. Use suitable access aids and working platforms.
- Wear suitable protective clothing.
- Only use suitable and undamaged tools to carry out maintenance work.
- When replacing parts only use approved, fully functional load lifting devices and lifting accessories which are suitable for the intended purpose.
- Before setting the unit back into operation, refit all safety devices as originally provided in the factory. Then check that all safety devices are working correctly.
- Make sure lubricants are used properly.
- Check pipes are firmly secured, also check for leaks and damage.
- Check that all emergency stop devices are working correctly.

Disassembly

For disassembly, the following principles apply:

- Only qualified personnel are allowed to dismantle the component.
- The component must be switched off and secured against being switched back on before it is dismantled. Work may only be started once any residual energy has been discharged.

- Disconnect all power and utility lines.
- Markings, e.g. on lines, must not be removed.
- Do not climb on the component. Use suitable access aids and working platforms.
- Mark the lines (if unmarked) prior to disassembly to ensure they are not confused when re-assembling.
- Protect open line ends with blind plugs against ingress of dirt.
- Pack sensitive parts separately.
- For longer periods of standstill, observe the storage conditions, see Section 4.1, Page 21.

10.2 Inspections

Between the maintenance periods, the valves must be checked for leakage and proper function.

10.2.1 Product contact seals

Carry out the following steps:

1. Regularly check:
   - Stem seal between upper housing and lantern
   - V-ring and O-ring (TEFASEP gold valve seat seal) in the valve disks
   - O-rings between the valve housings

→ Done

10.2.2 Pneumatic connections

Carry out the following steps:

1. Check the operating pressure at the pressure reducing and filter station.
2. Regularly clean the air filter in the filter station.
3. Check that the air hoses sit firmly in the air connections.
4. Check the lines for kinks and leaks.
5. Check the solenoid valves for proper function.

→ Done

10.2.3 Electrical connections

Carry out the following steps:

1. Check that the union nut on the cable gland is tight
2. Check that the cable connections are firmly secured.
3. Check the solenoid valves for proper function.
4. Check that the proximity switch connections are clean.

→ Done

Hint!

The electrical cable must be long enough to allow the control top to be removed via the switch bar.

10.3 Maintenance intervals

To ensure the highest operational reliability, all wearing parts should be replaced at longer intervals.

The actual maintenance intervals can only be determined by the user since they depend on the operating conditions, for instance:

- daily period of use,
- switching frequency,
- type and temperature of the product,
- type and temperature of the cleaning solution,
- ambient conditions.

Maintenance intervals		
Applications	**Maintenance Intervals (Guideline Values) Elastomers**	**Maintenance Intervals (Guideline Values) TEFASEP gold (hard seal)**
Media at temperatures of 60 °C to 130 °C (140 °F to 266 °F)	approx. every 3 months	approx. every 12 months
Media at temperatures of < 60 °C (< 140 °F)	approx. every 12 months	approx. every 12 months

10.4 Prior to disassembly

Requirement:

- Make sure that during maintenance and servicing work no process is in operation in the area concerned.

Carry out the following steps:

1. Drain all pipe system elements that lead to the valve and, if necessary, clean or rinse them.
2. Shut off the control air supply.
3. Disconnect the power supply.
4. Take the valve out of the pipe section, with all housings and housing connections if possible.

→ Done

10.5 Disassembling Valve X

10.5.1 Manually lift valve X

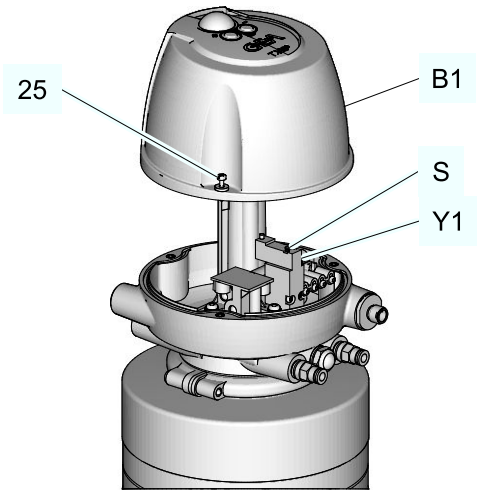


Fig.9

Requirement:

- No solenoid valve must be actuated electrically or manually.
- The pneumatic and electrical connections on the plant side can remain on the control top.

Spring-closing valve

⚠ Warning!

Spring tension in the valve

Danger of injury when opening the clamp connections at the actuator (46) or at the housing (43) as the released spring pretension will suddenly lift the actuator.

► Therefore, release the spring tension before detaching the clamp connections by supplying the actuator with compressed air at max. 8 bar.

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Carry out the following steps:

1. Release three cheese head screws (25) and take off the cap (B1).
2. Pressurize the actuator with compressed air, max. 8 bar, by activating the solenoid valve (Y1) at the manual operation element (S).

   → The valve disk (15, 17) is raised.
3. Vent the actuator.

Spring-opening valve

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Carry out the following steps:

1. Release three cheese head screws (25) and take off the cap (B1).
2. Depressurise the actuator by deactivating the solenoid valve (Y1) at the manual operation element (S).

→ The valve disk (15, 17) is raised.

10.5.2 Exposing the Lower Valve Disk

Valve with 3 housings

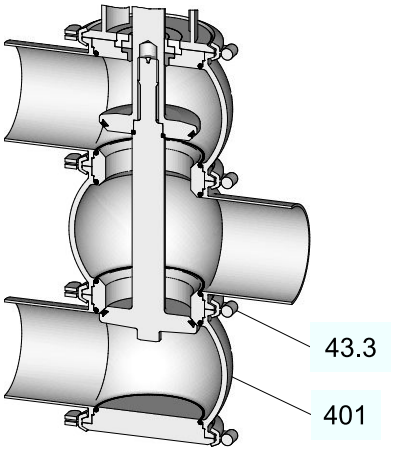


Fig.10

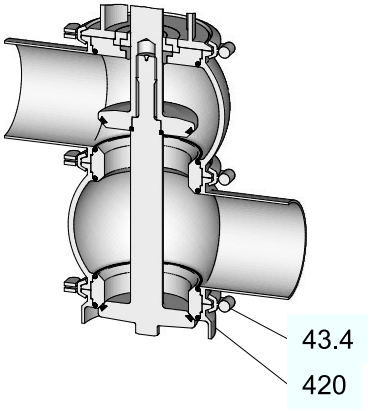


Fig.11

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Carry out the following steps:

1. Remove the clamp connection (43.3).
2. Withdraw the valve from the housing (401) or take the housing off.

→ This completes removal of the valve disk.

Valve with housing connection U

1. Remove the clamp connection (43.3).
2. Withdraw the valve disk from the housing connection U.

→ This completes removal of the valve disk.

10.5.3 Removing the Lower Valve Disk

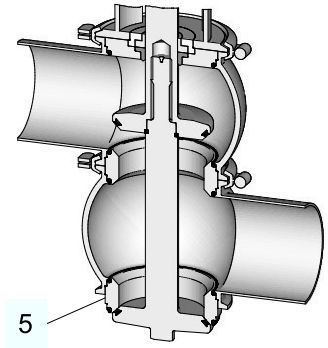


Fig.12

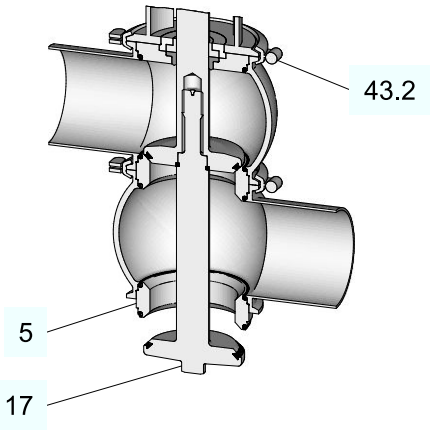


Fig.13

Notice

Loose seat ring

Damage to sealing surfaces

► Do not hit the seat (5) onto the lower valve disk when the valve is moved.

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Spring-closing valve

Carry out the following steps:

1. Vent the actuator.
   → The valve disk is lowered.
2. Unscrew the valve disk (17) with an open end spanner.
3. Remove the seat ring (5) from the housing.
4. Pressurize the actuator with compressed air, max. 8 bar.
5. Remove the clamp connection (43.2) between the lantern and the housing.
6. Vent the actuator.

→ This completes removal of the valve disk.

Spring-opening valve

Carry out the following steps:

1. Pressurize the actuator with compressed air, max. 8 bar.
   → The valve disk is lowered.
2. Unscrew the valve disk (17) with an open end spanner.
3. Remove the seat ring (5) from the housing.
4. Vent the actuator.
5. Remove the clamp connection (43.2) between the lantern and the housing.

→ This completes removal of the valve disk.

10.5.4 Removing the Control Top

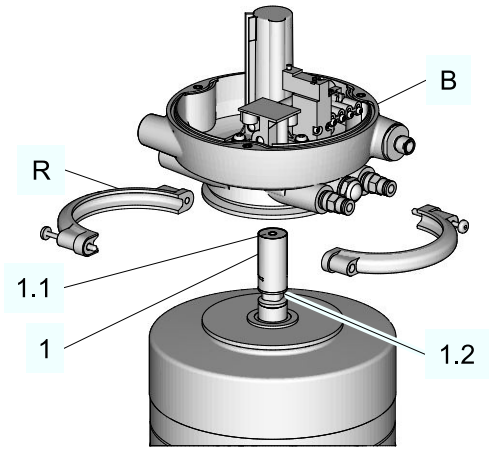


Fig.14

Requirement:

- The pneumatic and electrical connections on the plant side can remain on the control top.

Notice

The permanent magnet on the switch bar is fragile.

Damage to the permanent magnet.

► Protect the permanent magnet against impact stress.

Carry out the following steps:

1. Remove the clamps (R) between control top and actuator.
2. Pull off the control top (B) upwards.
3. Loosen and unscrew the T.VIS switch bar (1) with a hex key for (1.1) or an a/f 13 open-ended wrench for (1.2).

→ The control top has been taken off.

10.5.5 Disconnecting the Valve from the Housing

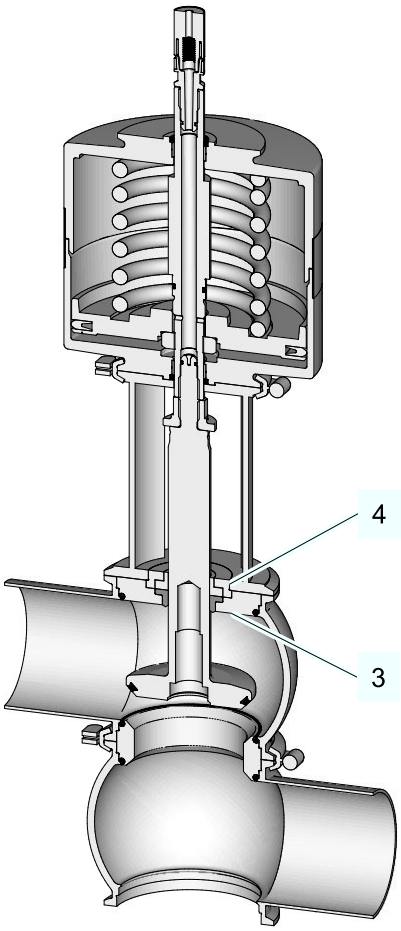


Fig.15

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.

► *!* The bearing disk (4) and the sealing washer (3) must not hit the stem of the valve disk when the valve insert is withdrawn.

Carry out the following steps:

1. Withdraw the valve from the housing.

→ The valve is separated from the housing.

10.5.6 Removing the Upper Valve Disk

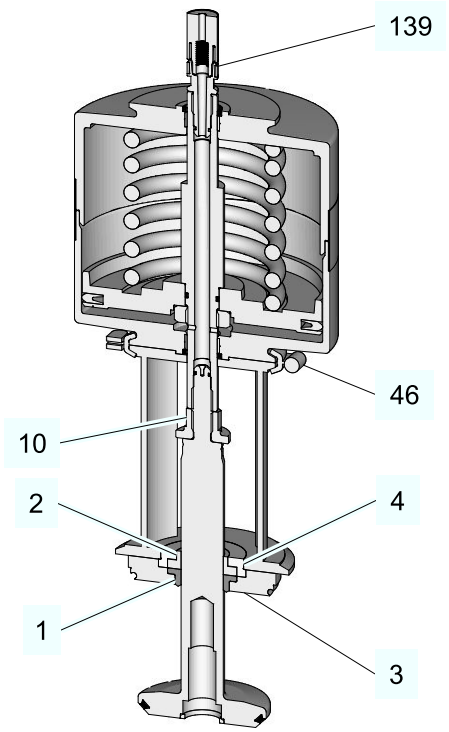


Fig.16

Carry out the following steps:

1. Unscrew the switch bar (139).
2. Release the clamp connection (46) but do not remove it.
3. Place an open end spanner on the spacer nut (10), use a strap wrench to turn the actuator and release the valve disk.
4. Unscrew the valve disk together with the bearing disk (4), bearing (2), gasket (1) and sealing washer (3).
5. Unscrew the spacer nut (10) from the valve disc using 2 open-ended wrenches.
6. Slide off the bearing disk with bearing and the sealing disk with sealing ring from the valve disk.
7. Remove the clamp connection (46) between the lantern and the actuator.
8. Remove the lantern.

10.6 Disassembling Valve W

10.6.1 Manually lift valve W

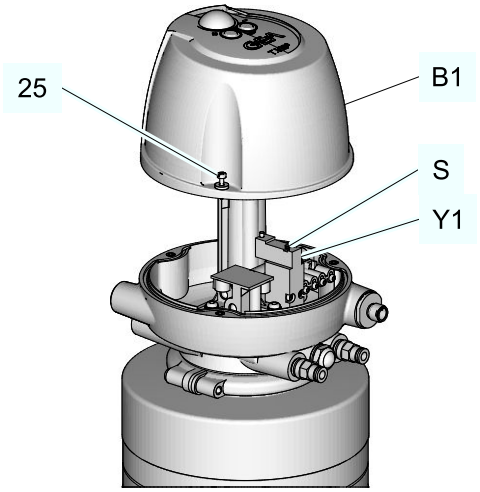


Fig.17

Requirement:

- No solenoid valve must be actuated electrically or manually.
- The pneumatic and electrical connections on the plant side can remain on the control top.

Spring-closing valve

Carry out the following steps:

1. Release three cheese head screws (25) and take off the cap (B1).
2. Pressurize the actuator with compressed air, max. 8 bar, by activating the solenoid valve (Y1) at the manual operation element (S).

   → The valve disk is raised.
3. Vent the actuator.

Spring-opening valve

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Carry out the following steps:

1. Release three cheese head screws (25) and take off the cap (B1).

2. Depressurize the actuator by deactivating the solenoid valve (Y1) at the manual operation element (S).

→ The valve disk is raised.

10.6.2 Removing the Control Top

Removing the control top, see Section 10.5.4, Page 46.

- The pneumatic connections on the plant side can remain on the control top.

Notice

The permanent magnet on the switch bar is fragile.

Damage to the permanent magnet.

► Protect the permanent magnet against impact stress.

10.6.3 Disconnecting valve W from the housing

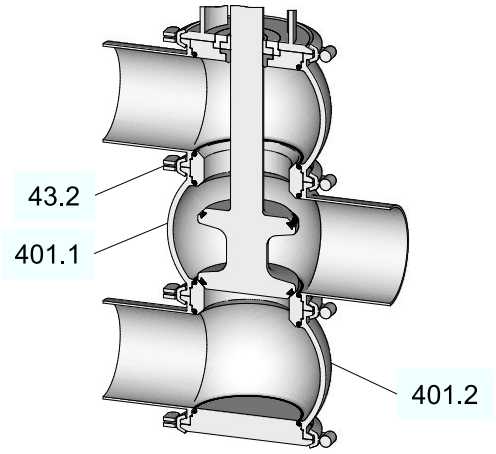


Fig.18

Notice

Sensitive valve parts

Sensitive parts

► Do not set the valve insert down on the valve disk but lay it down.

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!

► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.

► Do not set the valve insert down on the valve disk but lay it down.

Carry out the following steps:

1. Remove the clamp connection (43.2).

2. Withdraw the valve from both housings (401.1, 401.2).

→ The valve is separated from the housing.

10.6.4 Releasing the Valve Disk

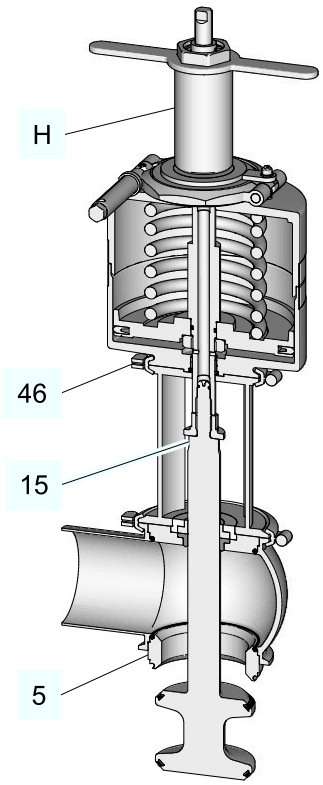


Fig.19

Requirement:

- No solenoid valve must be actuated electrically or manually.
- The pneumatic and electrical connections on the plant side can remain on the control top.

Spring-opening valve (NO)

⚠ Warning!

Spring tension in the valve

There is a risk of injury when dismantling a spring-closing valve as the released spring tension will suddenly lift the actuator.

► Do not put your hand into the valve housing.
► Before releasing the clamp connection (46), pre-tension the actuator with an emergency manual actuator (H) (material no. 221.310.74).

Notice

The permanent magnet on the switch bar is fragile.

Damage to the permanent magnet.

► Protect the permanent magnet against impact stress.

Carry out the following steps:

1. Remove the clamps (R) between control top and actuator.

2. Pull off the control top (B) upwards.
3. Release the T.VIS switch bar (1) by applying a hex key at (1.1) or an a/f 13 open-ended wrench at (1.2) and remove it.
4. Pre-tension the actuator with an emergency manual actuator (H) (material no. 221.310.74).
5. Remove the clamp connection (46) between actuator and lantern.
6. Loosen the spacer nut (10) using an open-ended wrench.
7. Grip the valve disk at the width across flats (15.1) and loosen the actuator (A) with approx. 3 turns using a belt wrench.
8. Remove the emergency manual actuator (H).

Spring-closing valve (NC)

Carry out the following steps:

1. Vent the actuator.

   → The valve disk is lowered.
2. Remove the clamp connection (46) between drive and lamp.
3. Loosen the spacer nut (10) using an open-ended wrench.
4. Grip the valve disk at the width across flats (15.1) and loosen the actuator (A) with approx. 3 turns using a belt wrench.
5. Remove the clamps (R) between control top and actuator.

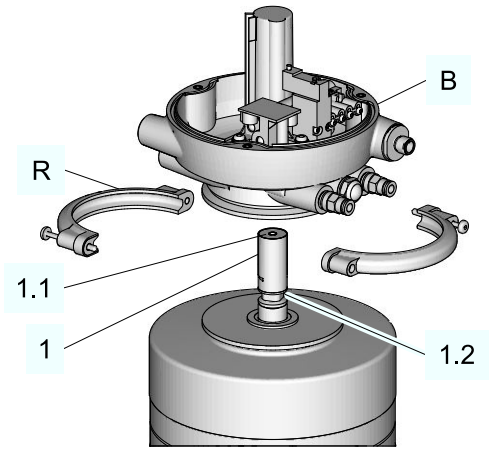


Fig.20

6. Pull off the control top (B) upwards.
7. Loosen and unscrew the T.VIS switch bar (1) with a hex key for (1.1) or an a/f 13 open-ended wrench for (1.2).

   → Done

Removing the Valve Disk

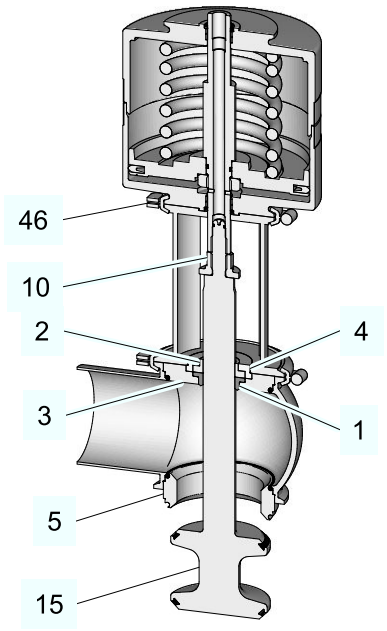


Fig.21

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.

Carry out the following steps:

1. Remove the clamp connection (43.3) and the cover (35).
2. Grip the valve disk at the width across flats (15.1) and unscrew the actuator (A) manually and remove it.
3. Unscrew the spacer nut (10) from the valve disk.

   *!*After the spacer nut (10) is unscrewed, the valve disk could fall out and become damaged. For this reason, grip the valve disk while removing the spacer nut (10).
4. Remove the valve disk (15) downwards.

   *!*The stem of the valve disk is a sealing surface. It must not become damaged during removal.
5. Remove the clamp connection (43.1).

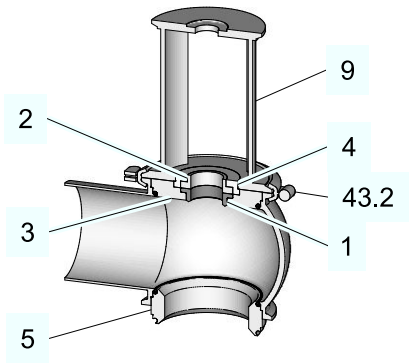


Fig.22

6. Remove the lantern (9).
7. Remove the sealing washer (3), gasket (1), bearing disk (4), and bearing (2) from the housing.
8. Remove the housing.

→ This completes removal of the valve disk.

10.7 Maintenance

10.7.1 Cleaning the Valve

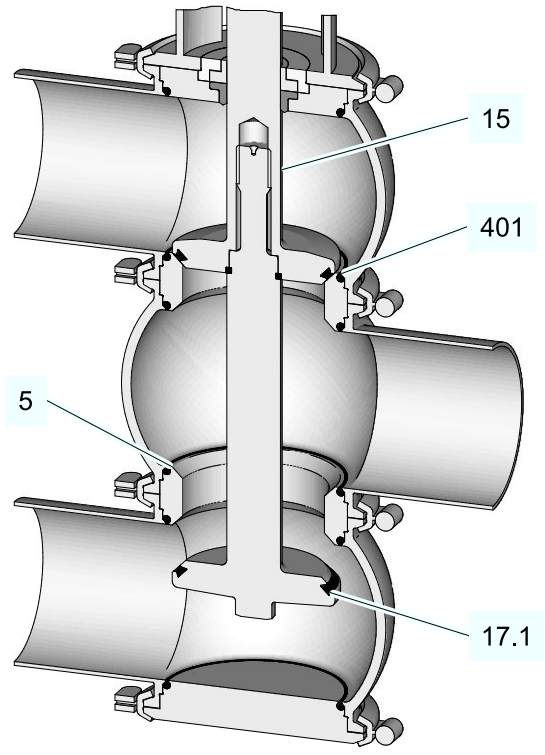


Fig.23

Notice

The valve disk, the bearing disk and the sealing washer are sensitive parts.

Damage to these parts can result in malfunction.

► When the shaft of the valve disc is pulled out, the stem of the valve disc must not hit the valve housing!
► The bearing disk and the sealing washer must not hit the stem of the valve disk when the valve insert is withdrawn.
► Do not set the valve insert down on the valve disk but lay it down.

Notice

Damage to the valve

Damage to these parts can result in malfunction.

► Observe the safety information sheets issued by the detergent manufacturers!
► Only use detergents which are non-abrasive and not aggressive towards stainless steel.
► Use only cleaning mediums which do not damage the materials of the control top (PPE, PA).

Carry out the following steps:

1. Disassemble the valve, see , Section 10.5, Page 41 and Section 10.6, Page 49.
2. Carefully clean the individual parts.

→ Done

10.7.2 Replacing the V-Ring

Hint!

Replace defective seals, but always fit new housing O-rings to ensure the tightness of the valve. Always use original spare parts.

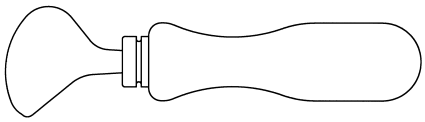


Fig.24: V-ring insertion tool

Prerequisite:

- Insert V-rings without grease. To facilitate fitting, use water with a drop of washing-up liquid to remove the surface tension. In order that no rust is transferred, the washing-up liquid solution must be made up in a ceramic, plastic, or stainless steel container.

Tools required:

- V-ring insertion tool

⚠ Caution!

Danger of injury!

The scriber can slip off when the V-ring is removed

► Grip the valve disk in a vice with protected jaws.
► Unscrew the curved side of the scriber.

Carry out the following steps:

1. Put a scriber into the V-ring and take it out.

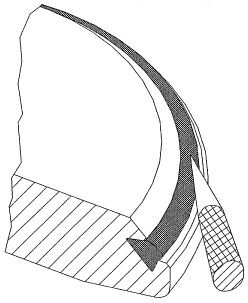


Fig.25

2. Before fitting, wet the V-ring on the side not in contact with product (rear side). Pay attention that water does not drip into the V-ring groove on the valve disk.
3. Air out the valve upon connection (22).
4. Put in the V-ring. Make sure the installation position of the V-ring is correct (see illustration).

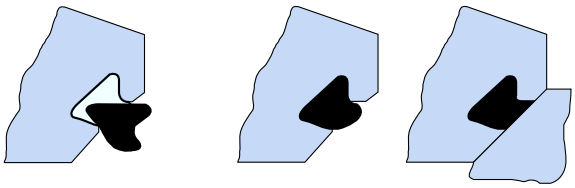


Fig.26

5. Use the insertion tool to press in the V-ring – evenly press in at several opposite points along the circumference.

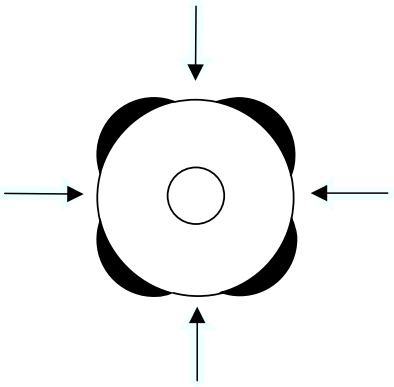


Fig.27

6. Insert the V-ring evenly.
7. Replace all the other seals identified in the spare parts lists.

→ Done

Hint!

Used seals must not be used again, since the proper function of the seal can then no longer be ensured.

10.7.3 Exchanging the O-ring (TEFASEP gold)

Tools required:

- O-ring cutter
- Heat-resistant protective gloves
- Oven (no microwave)

⚠ Caution!

Health hazard due to toxic fumes!

The O-ring cutter cuts the seal with a hot metal tip. At temperatures of more than 300 °C, toxic fumes can be released.

► Avoid directly inhaling the fumes.

⚠ Caution!

Risk of injury due to hot and sharp-edged parts!

The O-ring cutter cuts the seal with a hot metal tip. This process heats up the seal and possibly also metal parts of the valve.

► When removing the valve seat seal always wear heat-resistant protective gloves.

Carry out the following steps:

1. Place the heated metal tip of the O-ring cutter at right angles on the valve seat seal to be removed.
2. Cut through the valve seat seal at one point using the O-ring cutter.
   ! Pay attention not to damage the edge of the radial groove.

Fig.28

3. Take out the cut valve seat seal.
4. Warm a new O-ring (TEFASEP gold valve seat seal) in the oven.
   Temperature . . . . . 140 °C (guideline value)

Time . . . . . 3 - 5 minutes (guideline value)

! It must be ensured that the circumference of the seal can be deformed without major effort. The required warming-up time depends on the individual oven and can vary accordingly.

Fig.29

5. Use both thumbs to press the heated O-ring (TEFASEP gold valve seat seal) into the radial groove at one point.

Fig.30

6. Then use both palms to press the valve seat seal in place in the radial groove.

   ! When pressing in, pay attention to the “engaging” of the valve seat seal into the radial groove. Th generated clicking sound is proof of correct installation.

   ! After fitting a new TEFASEP gold valve seat seal, it could be that the valve might not be leak-proof yet. Only after the first CIP or SIP cleaning (see) the valve seat seal will adjust itself optimally to the sealing surfaces and will ensure perfect sealing up to the maximum closing pressure or vacuum.

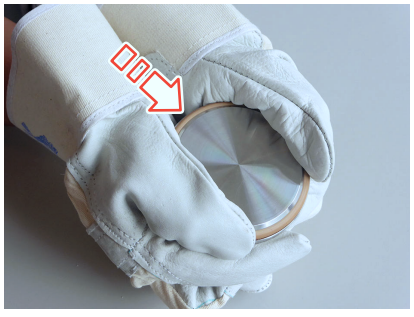


Fig.31

***?** The valve seat seal is still too rigid and cannot be mounted?*

→ Heat the valve seat seal again as described in the first step.

***?** When mounting the valve seat seal, the seal does not "click" into place any more?*

The valve seat seal has been overheated and can no longer be used.

→ Repeat the operation with a new valve seat seal.

→ Observe the data specified for heating the valve seat seal.

→ The valve seat seal has been removed.

10.7.4 Lubricating Seals and Threads

⚠ Caution!

Damage to seals and threads

Damage to seals and threads can result in malfunction.

► Ensure that an adequate film of lubricant is applied. No grease residues must be visible once the valve has been assembled completely.
► For product contact seals only use suitable greases and oils.
► Observe the safety data sheets issued by the lubricant manufacturer!

Carry out the following steps:

1. Lightly grease the valve disk thread.
2. Grease all seals – including the O-rings at the top and bottom of the actuator piston rod – very thinly.

   ! Do not grease V-ring and O-ring (TEFASEP gold valve seat seal).

→ Done

Hint!

GEA Tuchenhagen recommends Rivolta F.L.G. MD-2 and PARALIQ GTE 703. These lubricants are approved for foodstuff and are resistant to beer froth. They have the NSF-H1 (USDA H1) registration. They do not affect the taste or the consistency of the products and are compatible with the seals in contact with product.

PARALIQ GTE 703 can be ordered from GEA Tuchenhagen under material no. 413-064, and Rivolta F.L.G. MD-2 can be ordered under material no. 413-071. Using other types of grease can result in malfunctions or in premature seal failure. The warranty will also become null and void.

A Manufacturer's Declaration for these products can be obtained from GEA Tuchenhagen if required.

A thin film of grease is required on the seals to ensure the proper function of the fittings. It reduces friction and extends the service life of the seals. This is absolutely harmless from a health and hygienic point of view.

Running dry must be avoided!

10.8 Installation

Assemble the valve in reverse order of disassembly. Observe the notes and instructions given in the following sections when doing so.

10.8.1 Installing the valve

⚠ Caution!

Danger of injury due to spring force

You can injure your fingers.

► Pre-tension the actuator with an emergency manual actuator (H) (material no. 221.310.74) before screwing in the valve disk.

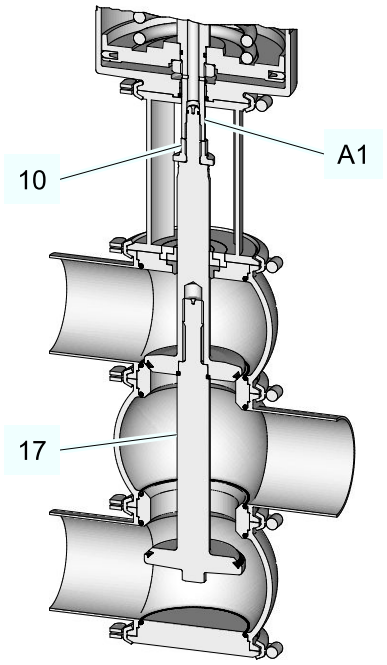


Fig.32

Lock the spacer nut (10) against the actuator rod (A1).

10.8.2 Tightening torques for the semi-rings and clamp connections

Tighten the clamp connections and semi-rings on the valve to the torques specified in the table.

Tightening torques			
Tightening torques		**[Nm]**	**[lbft]**
Clamps on the control top		1	0.7
Clamp connection cast half rings	M6	9	6.6
Clamp connection cast half rings	M8	22	16.2
Cast clamps	M10	45	33
Lower valve disk (17) of valve X	DN 25- 50.1" - 2"	24	17.7
	DN 65-100, 2 ½"- 4"	58	42.8
	DN125+150.6"	70	51.6

10.8.3 Check stroke

Set valve stroke- control top T.VIS

Carry out the following steps:

1. Actuate the valve with compressed air.
2. Check the stroke of the valve in accordance with the table “Valve stroke”.

→ The stroke is set.

Strokes depending on size

Valve Stroke				
Valve size	**Valve stroke [mm]**			
	X	**X_V**	**W**	**W_V**
Metric				
25	8	--	11	--
40	13	--	25	--
50	14	--	25	--
65	25	--	25	50
80	25	--	25	50
100	25	--	25	55
125	55.5	--	55	--
150	55.5	--	55	--
Inch OD				
1"	7	--	7	--
1.5"	16	--	22	--
2"	16.5	--	22.5	--
2.5"	25	40	19	44
3"	18	40	17	42
4"	27.5	55	22.5	53
Inch IPS				
2"	20	--	25	--
3"	21	--	25	--
4"	25	--	25	--
6"	55.5	--	55	--

Check the function of the proximity switches, adjust if necessary (see instruction manual control top).

11 Alarms

11.1 Malfunctions and remedies

In the event of malfunctions immediately deactivate the valve and secure it against inadvertent reactivation. Malfunctions may only be remedied by qualified staff, who must observe the safety instructions.

Malfunction	Cause	Remedy
Valve does not work	Fault in the control system	Check the system configuration
	No compressed air or compressed air too low	Check compressed air supply and check air hoses for free passage and air tightness
	Fault in the electrical system	Check actuation / external controller and routing of electrical lines
	Solenoid valve defective	Replace the solenoid valve
Valve does not close	Dirt/foreign material between valve seat and valve disk	Clean valve housing and valve seat
	Spring defective	Replace the actuator
Valve closes too slowly	O-rings in actuator and control top are dry (friction losses)	Grease O-rings
Leakage in the area of the valve housing	Housing O-rings defective	Valve disassembly - Housing Replace the O-Ring
Leakage in the lantern	Sealing ring defective	Replace the sealing ring
The TEFASEP gold valve seat seal is indicating a leak following commissioning or maintenance.	The valve seat seal is not properly installed or has been damaged during assembly or disassembly. In case of a new seal: No valve switching performed during/ immediately following CIP or SIP cleaning.	Perform valve switching during/immediately following CIP or SIP cleaning.

12 Decommissioning

12.1 Safety instructions

For shutting down, the following principles apply:

- Switch off the compressed air.
- Switch off the component with the main switch.
- Padlock the main switch (if fitted) in the off position to prevent it from being switched back on. The key to the padlock must be deposited with the person responsible until the machine is restarted.
- For longer periods of standstill, observe the storage conditions, see Chapter 4, Page 21.

12.2 Disposal

12.2.1 General notes

Dispose of the component in an environmentally safe manner. Observe the statutory waste disposal regulations applicable at the place of installation.

The component consists of the following materials:

- Metals
- Synthetic materials
- Electronic parts
- Lubricants containing oil and grease

Separate the different materials and dispose of them correctly sorted. Also observe the instructions regarding disposal in the operating instructions for the individual components.

12.2.2 Valve Actuator Disposal

⚠ Danger

The spring forces in the actuator can be as high as 24 kN.

The pre-stressed spring can cause serious personal injury or death.

► Never open the actuator.
► GEA Tuchenhagen accepts unopened actuators and arranges for proper disposal free of charge.

Carry out the following steps:

1. Remove the actuator.
2. Pack the actuator safely and send it to GEA Tuchenhagen GmbH.

→ Done

13 Spare parts list - shuttle valve X

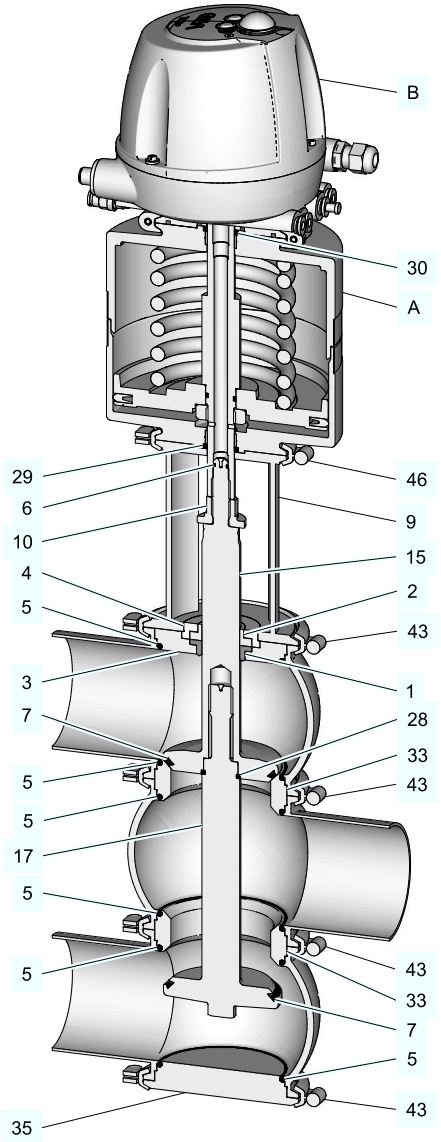


Fig.33

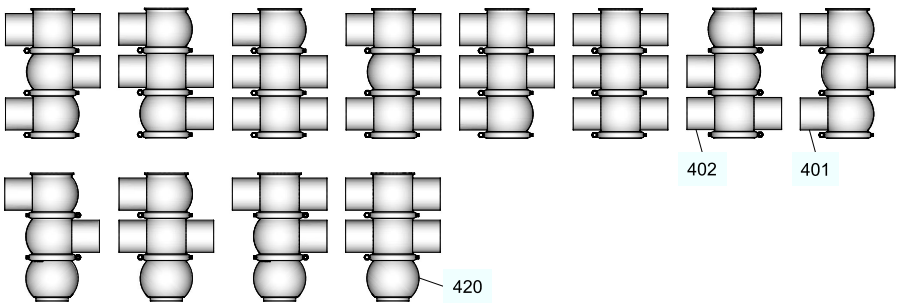


Fig.34

Item	Designation	Material	DN 25	DN 40	DN 50	DN 65
Seal set complete 1)		EPDM	221-304.24	221-304.25	221-304.25	221-304.26
		FKM	221-511.93	221-511.94	221-511.94	221-511.95
		HNBR	221-519.65	221-519.65	221-519.66	221-519.67
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		HNBR	924-311	924-311	924-311	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	PEEK	935-098	935-098	935-098	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03
4	Bearing disc	1.4301	221-142.01	221-142.02	221-142.02	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150
		FKM	930-168	930-171	930-171	930-176
		HNBR	930-632	930-633	930-633	930-634
6*	O-ring	NBR	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024
		FKM	932-030	932-033	932-033	932-035
		HNBR	932-087	932-088	932-088	932-090
9	Lantern	1.4301	221-121.01	221-121.02	221-121.02	221-121.03
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01
15	Valve disk X1	1.4404	221-113.01	221-113.02	221-113.02	221-113.03
17	Valve disk X2	1.4404	221-117.01	221-117.03	221-117.04	221-117.05
28*	O-ring	EPDM	930-276	930-276	930-276	930-350
		FKM	930-277	930-277	930-277	930-269
		HNBR	930-627	930-627	930-627	930-628
29*	O-ring	NBR	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.01	221-107.02	221-107.02	221-107.03
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06
401	Housing V1	1.4404	221-101.19	221-101.21	221-101.22	221-101.05
402	Housing V2	1.4404	221-102.41	221-102.43	221-102.44	221-102.05
420	Housing connection X	1.4404	221-672.16	221-672.17	221-672.18	221-672.19
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	DN 80	DN 100	DN 125	DN 150
Seal set complete 1)		EPDM	221-304.26	221-304.27	221-304.28	221-304.29
		FKM	221-511.95	221-511.96	221-511.97	221-511.98
		HNBR	221-519.67	221-004164	--	--
1*	Seal ring	EPDM	924-085	924-085	924-088	924-088
		FKM	924-083	924-083	924-087	924-087
		HNBR	924-313	924-313	--	--
2	Bearing	PTFE/carbon	935-002	935-002	935-003	935-003
	Bearing, 3A	PEEK	935-099	935-099	935-102	935-102
3	Seal disk	1.4404	221-141.03	221-141.04	221-141.07	221-141.05
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.04	221-142.03
5*	O-ring	EPDM	930-150	930-156	930-372	930-260
		FKM	930-176	930-178	930-409	930-259
		HNBR	930-634	930-863	--	--
6*	O-ring	NBR	930-004	930-004	930-007	930-007
**7*	V-ring	EPDM	932-024	932-028	932-060	932-042
		FKM	932-035	932-039	932-062	932-041
		HNBR	932-090	932-100	--	--
9	Lantern	1.4301	221-121.03	221-121.04	221-121.06	221-121.22
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.06	221-147.06
15	Valve disk X1	1.4404	221-113.04	221-113.05	221-113.07	221-113.08
17	Valve disk X2	1.4404	221-117.06	221-117.07	221-117.09	221-117.36
28*	O-ring	EPDM	930-350	930-350	930-373	930-373
		FKM	930-269	930-269	930-383	930-383
		HNBR	930-628	930-628	--	--
29*	O-ring	NBR	930-026	930-026	930-035	930-035
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.03	221-107.04	221-107.18	221-107.06
35	Blanking plate	1.4404	221-144.03	221-144.04	221-144.06	221-144.05
43	Clamp join KL	1.4401	221-507.09	221-507.11	221-507.13	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.11	221-507.11
401	Housing V1	1.4404	221-101.06	221-101.07	221-101.18	221-101.66
402	Housing V2	1.4404	221-102.06	221-102.07	221-102.29	221-102.09
420	Housing connection X	1.4404	221-672.20	221-672.21	--	--
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	1" OD	1.5" OD	2" OD	2.5" OD
Seal set complete 1)		EPDM	221-304.24	221-304.25	221-304.25	221-304.26
		FKM	221-511.93	221-511.94	221-511.94	221-511.95
		HNBR	221-519.65	221-519.65	221-519.66	221-519.67
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		HNBR	924-311	924-311	924-311	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	PEEK	935-098	935-098	935-098	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03
4	Bearing disc	1.4301	221-142.01	221-142.02	221-142.02	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150
		FKM	930-168	930-171	930-171	930-176
		HNBR	930-632	930-633	930-633	930-634
6*	O-ring	NBR	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024
		FKM	932-030	932-033	932-033	932-035
		HNBR	932-087	932-088	932-088	932-090
9	Lantern	1.4301	221-121.01	221-121.07	221-121.07	221-121.08
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01
15	Valve disk X1	1.4404	221-113.01	221-113.02	221-113.02	221-113.03
17	Valve disk X2	1.4404	221-117.12	221-117.03	221-117.04	221-117.11
28*	O-ring	EPDM	930-276	930-276	930-276	930-350
		FKM	930-277	930-277	930-277	930-269
		HNBR	930-627	930-627	930-627	930-628
29*	O-ring	NBR	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.01	221-107.02	221-107.02	221-107.03
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06
401	Housing V1	1.4404	221-101.27	221-101.28	221-101.29	221-101.30
402	Housing V2	1.4404	221-102.52	221-102.53	221-102.54	221-102.55
420	Housing connection X	1.4404	221-672.06	221-672.03	221-672.04	221-672.01
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	3" OD	4" OD	6" OD
Seal set complete 1)		EPDM	221-304.26	221-304.27	221-304.29
		FKM	221-511.95	221-511.96	221-511.98
		HNBR	221-519.67	221-004164	--
1*	Seal ring	EPDM	924-085	924-085	924-088
		FKM	924-083	924-083	924-087
		HNBR	924-313	924-313	--
2	Bearing	PTFE/carbon	935-002	935-002	935-003
	Bearing, 3A	PEEK	935-099	935-099	935-102
3	Seal disk	1.4404	221-141.03	221-141.04	221-141.05
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.03
5*	O-ring	EPDM	930-150	930-156	930-260
		FKM	930-176	930-178	930-259
		HNBR	930-634	930-863	--
6*	O-ring	NBR	930-004	930-004	930-007
**7*	V-ring	EPDM	932-024	932-028	932-042
		FKM	932-035	932-039	932-041
		HNBR	932-090	932-100	--
9	Lantern	1.4301	221-121.08	221-121.09	221-121.22
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.06
15	Valve disk X1	1.4404	221-113.04	221-113.05	221-113.08
17	Valve disk X2	1.4404	221-117.05	221-117.07	221-117.36
28*	O-ring	EPDM	930-350	930-350	930-373
		FKM	930-269	930-269	930-383
		HNBR	930-628	930-628	--
29*	O-ring	NBR	930-026	930-026	930-035
30*	O-ring	NBR	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.03	221-107.04	221-107.06
35	Blanking plate	1.4404	221-144.03	221-144.04	221-144.05
43	Clamp join KL	1.4401	221-507.09	221-507.11	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.11
401	Housing V1	1.4404	221-101.31	221-101.32	221-101.66
402	Housing V2	1.4404	221-102.56	221-102.57	221-102.09
420	Housing connection X	1.4404	221-672.02	221-672.05	221-672.12
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator		
B	Control head S		See spare parts list for control head S		
	Control top T.VIS®		See parts list for control top T.VIS®		
Grease RIVOLTA F.L.G. 100g tube not included with seal set.				413-136	

1) The seal set includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	2" IPS	3" IPS	4" IPS	6" IPS
Seal set complete 1)		EPDM	221-304.25	221-304.26	221-304.27	221-304.29
		FKM	221-511.94	221-511.95	221-511.96	221-511.98
		HNBR	221-519.66	221-519.67	221-004164	--
1*	Seal ring	EPDM	924-084	924-085	924-085	924-088
		FKM	924-082	924-083	924-083	924-087
		HNBR	924-311	924-313	924-313	--
2	Bearing	PTFE/carbon	935-001	935-002	935-002	935-003
	Bearing, 3A	PEEK	935-098	935-099	935-099	935-102
3	Seal disk	1.4404	221-141.02	221-141.03	221-141.04	221-141.05
4	Bearing disc	1.4301	221-142.02	221-142.03	221-142.03	221-142.04
5*	O-ring	EPDM	930-144	930-150	930-156	930-260
		FKM	930-171	930-176	930-178	930-259
		HNBR	930-633	930-634	930-863	--
6*	O-ring	NBR	930-004	930-004	930-007	930-007
**7*	V-ring	EPDM	932-021	932-024	932-028	932-042
		FKM	932-033	932-035	932-039	932-041
		HNBR	932-088	932-090	930-100	--
9	Lantern	1.4301	221-121.12	221-121.10	221-121.11	221-121.05
10	Spacer nut	1.4305	221-147.02	221-147.01	221-147.01	221-147.06
15	Valve disk X1	1.4404	221-113.02	221-113.04	221-113.05	221-113.08
17	Valve disk X2	1.4404	221-117.14	221-117.06	221-117.13	221-117.10
28*	O-ring	EPDM	930-276	930-350	930-350	930-373
		FKM	930-277	930-269	930-269	930-383
		HNBR	930-627	930-628	930-628	--
29*	O-ring	NBR	930-026	930-026	930-026	930-035
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.02	221-107.03	221-107.04	221-107.06
35	Blanking plate	1.4404	221-144.02	221-144.03	221-144.04	221-144.05
43	Clamp join KL	1.4401	221-507.04	221-507.09	221-507.11	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.11
401	Housing V1	1.4404	221-101.37	221-101.35	221-101.36	221-101.17
402	Housing V2	1.4404	221-102.62	221-102.59	221-102.60	221-102.17
420	Housing connection X	1.4404	--	--	--	--
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

sealing sets for shuttle valve X									
Item	**Qty.**	**Designation**	**Material**	**DN 25 1"**	**DN 40/50 1.5"/2"**	**DN 65/80 2.5"/3"**	**DN 100 4"**	**DN 125**	**DN 150 6"**
1	1	Seal ring	Ø	22	22	28	28	35	35
			EPDM	924-084	924-084	924-085	924-085	924-088	924-088
			FKM	924-082	924-082	924-083	924-083	924-087	924-087
			HNBR	924-311	924-311	924-313	924-313	--	--
5	6	O-ring	Ø	42 x 3	60 x 3	85 x 4	113 x 4	138 x 4	158 x 5
			EPDM	930-309	930-144	930-150	930-156	930-372	930-260
			FKM	930-168	930-171	930-176	930-178	930-409	930-259
			HNBR	930-632	930-633	930-634	930-863	--	--
6	1	O-ring	Ø	8 x 1.6	8 x 1.6	8 x 1.6	8 x 1.6	9 x 3	9 x 3
			NBR	930-004	930-004	930-004	930-004	930-007	930-007
**7	2	V-ring	Ø	35-5	52-6	76-6	104-6	128-6	148-6
			EPDM	932-046	932-021	932-024	932-028	932-060	932-042
			FKM	932-030	932-033	932-035	932-039	932-062	932-041
			HNBR	932-087	932-088	932-090	932-100	--	--
28	1	O-ring	Ø	15 x 3	15 x 3	23 x 3	23 x 3	29 x 3	29 x 3
			EPDM	930-276	930-276	930-350	930-350	930-373	930-373
			FKM	930-277	930-277	930-269	930-269	930-383	930-383
			HNBR	930-627	930-627	930-628	930-628	--	--
29	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3	25 x 3	25 x 3
			NBR	930-026	930-026	930-026	930-026	930-035	930-035
30	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3	20 x 3	20 x 3
			NBR	930-026	930-026	930-026	930-026	930-026	930-026
Seal set complete			EPDM	221-304.24	221-304.25	221-304.26	221-304.27	221-304.28	221-304.29
			FKM	221-511.93	221-511.94	221-511.95	221-511.96	221-511.97	221-511.98
			HNBR	221-519.65	221-519.65	221-519.67	221-004164	--	--
Grease RIVOLTA F.L.G. 100 g tube not included in the seal kit (413-136) /** do not grease items 7 and 8									
Storage information: Store according to DIN 7716 / relative humidity approx. 65%, temperature 15-25°C and protected from light When replacing seals, observe the instructions in the instruction manual! **429-008**									

14 Spare parts list - shuttle valve X_V

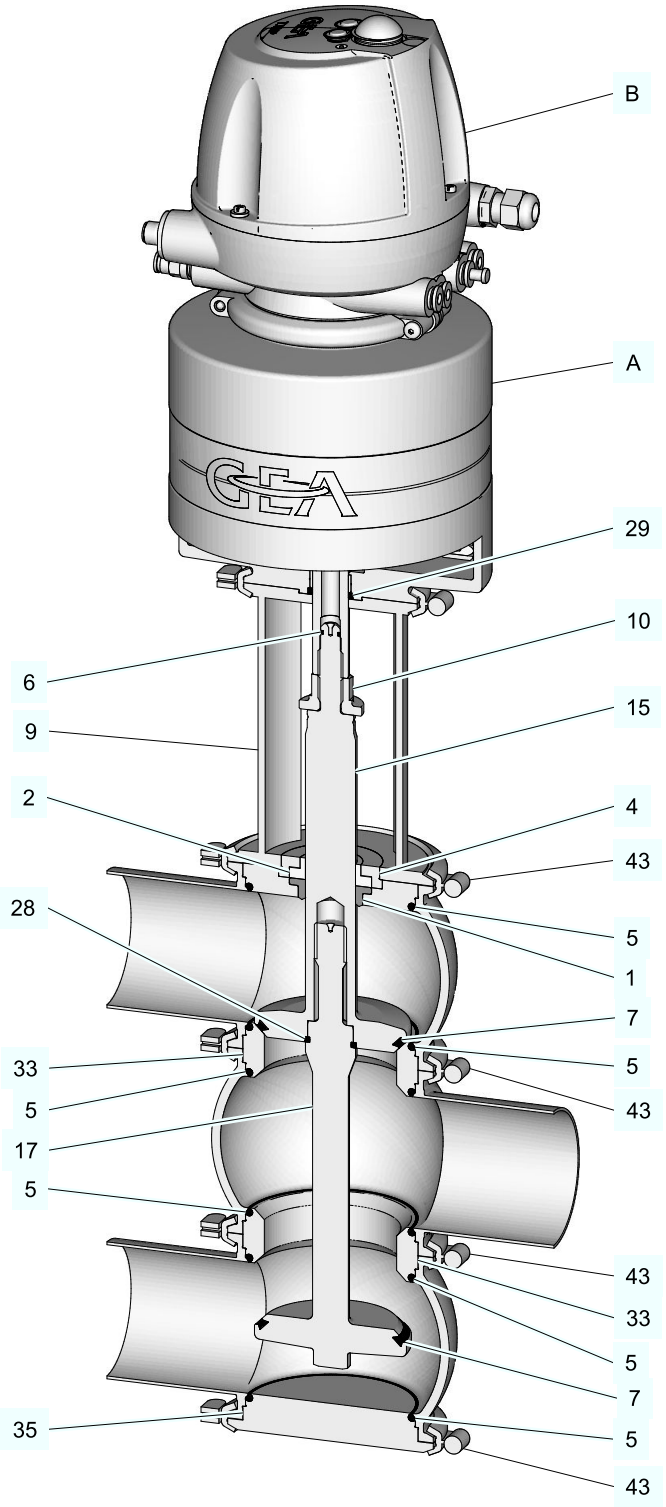


Fig.35

Item	Designation	Material	1" OD	1.5" OD	2" OD	2.5" OD
Seal set complete 1)		EPDM	221-304.24	221-304.25	221-304.25	221-304.26
		FKM	221-511.93	221-511.94	221-511.94	221-511.95
		HNBR	221-519.65	221-519.66	221-519.66	221-519.67
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		HNBR	924-311	924-311	924-311	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	PEEK	935-098	935-098	935-098	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03
4	Bearing disc	1.4301	221-142.01	221-142.02	221-142.02	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150
		FKM	930-168	930-171	930-171	930-176
		HNBR	930-632	930-633	930-633	930-634
6*	O-ring	NBR	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024
		FKM	932-030	932-033	932-033	932-035
		HNBR	932-087	932-088	932-088	932-090
9	Lantern	1.4301	221-121.01	221-121.07	221-121.07	221-121.08
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01
15	Valve disk X1	1.4404	221-113.01	221-113.02	221-113.02	221-113.03
17	Valve disk X2	1.4404	221-117.12	221-117.03	221-117.04	221-117.32
28*	O-ring	EPDM	930-276	930-276	930-276	930-350
		FKM	930-277	930-277	930-277	930-269
		HNBR	930-627	930-627	930-627	930-628
29*	O-ring	NBR	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.01	221-107.02	221-107.02	221-107.03
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06
401	Housing V1	1.4404	221-101.27	221-101.28	221-101.29	221-101.30
402	Housing V2	1.4404	221-102.52	221-102.53	221-102.54	221-102.55
420	Housing connection flange U	1.4404	221-149.01	221-149.02	221-149.02	221-149.03
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes the items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	3" OD	4" OD	6" OD
Seal set complete 1)		EPDM	221-304.26	221-304.26	221-304.27
		FKM	221-511.95	221-511.95	221-511.96
		HNBR	221-519.67	221-519.67	221-004164
1*	Seal ring	EPDM	924-085	924-085	924-085
		FKM	924-083	924-083	924-083
		HNBR	924-313	924-313	924-313
2	Bearing	PTFE/carbon	935-002	935-002	935-002
	Bearing, 3A	PEEK	935-099	935-099	935-099
3	Seal disk	1.4404	221-141.03	221-141.03	221-141.04
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.03
5*	O-ring	EPDM	930-150	930-150	930-156
		FKM	930-176	930-176	930-178
		HNBR	930-634	930-634	930-863
6*	O-ring	NBR	930-004	930-004	930-004
**7*	V-ring	EPDM	932-024	932-024	932-028
		FKM	932-035	932-035	932-039
		HNBR	932-090	932-090	932-100
9	Lantern	1.4301	221-186.04	221-186.04	221-121.09
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.01
15	Valve disk X1	1.4404	221-113.04	221-113.20	221-113.08
17	Valve disk X2	1.4404	221-117.33	221-117.31	221-117.36
28*	O-ring	EPDM	930-350	930-350	930-350
		FKM	930-269	930-269	930-269
		HNBR	930-628	930-628	930-628
29*	O-ring	NBR	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.03	221-107.03	221-107.04
35	Blanking plate	1.4404	221-144.03	221-144.03	221-144.04
43	Clamp join KL	1.4401	221-507.09	221-507.09	221-507.11
401	Housing V1	1.4404	221-101.30	221-101.31	221-101.32
402	Housing V2	1.4404	221-102.55	221-102.56	221-102.57
A	Actuator		221-183.01	221-183.01	221-603.01
B	Control head S		See spare parts list for control head S		
	Control top T.VIS®		See parts list for control top T.VIS®		
Grease RIVOLTA F.L.G. 100g tube not included with seal set.				413-136	

1) The seal set includes items 1, 5, 6, 7, 28 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

sealing sets for shuttle valve X_V									
Item	**Qty.**	**Designation**	**Material**	**DN 25 1"**	**DN 40/50 1.5"/2"**	**DN 65/80 2.5"/3"**	**DN 100 4"**	**DN 125**	**DN 150 6"**
1	1	Seal ring	Ø	22	22	28	28	35	35
			EPDM	924-084	924-084	924-085	924-085	924-088	924-088
			FKM	924-082	924-082	924-083	924-083	924-087	924-087
			HNBR	924-311	924-311	924-313	924-313	--	--
5	6	O-ring	Ø	42 x 3	60 x 3	85 x 4	113 x 4	138 x 4	158 x 5
			EPDM	930-309	930-144	930-150	930-156	930-372	930-260
			FKM	930-168	930-171	930-176	930-178	930-409	930-259
			HNBR	930-632	930-633	930-634	930-863	--	--
6	1	O-ring	Ø	8 x 1.6	8 x 1.6	8 x 1.6	8 x 1.6	9 x 3	9 x 3
			NBR	930-004	930-004	930-004	930-004	930-007	930-007
**7	2	V-ring	Ø	35-5	52-6	76-6	104-6	128-6	148-6
			EPDM	932-046	932-021	932-024	932-028	932-060	932-042
			FKM	932-030	932-033	932-035	932-039	932-062	932-041
			HNBR	932-087	932-088	932-090	932-100	--	--
28	1	O-ring	Ø	15 x 3	15 x 3	23 x 3	23 x 3	29 x 3	29 x 3
			EPDM	930-276	930-276	930-350	930-350	930-373	930-373
			FKM	930-277	930-277	930-269	930-269	930-383	930-383
			HNBR	930-627	930-627	930-628	930-628	--	--
29	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3	25 x 3	25 x 3
			NBR	930-026	930-026	930-026	930-026	930-035	930-035
Seal set complete			EPDM	221-304.24	221-304.25	221-304.26	221-304.27	221-304.28	221-304.29
			FKM	221-511.93	221-511.94	221-511.95	221-511.96	221-511.97	221-511.98
			HNBR	221-519.65	221-519.66	221-519.67	221-004164	--	--
Grease RIVOLTA F.L.G. 100 g tube not included in the seal kit (413-136) /** do not grease item 7									
Storage information: Store according to DIN 7716 / relative humidity approx. 65%, temperature 15-25°C and protected from light When replacing seals, observe the instructions in the instruction manual!									

15 Spare parts list - Shuttle valve W

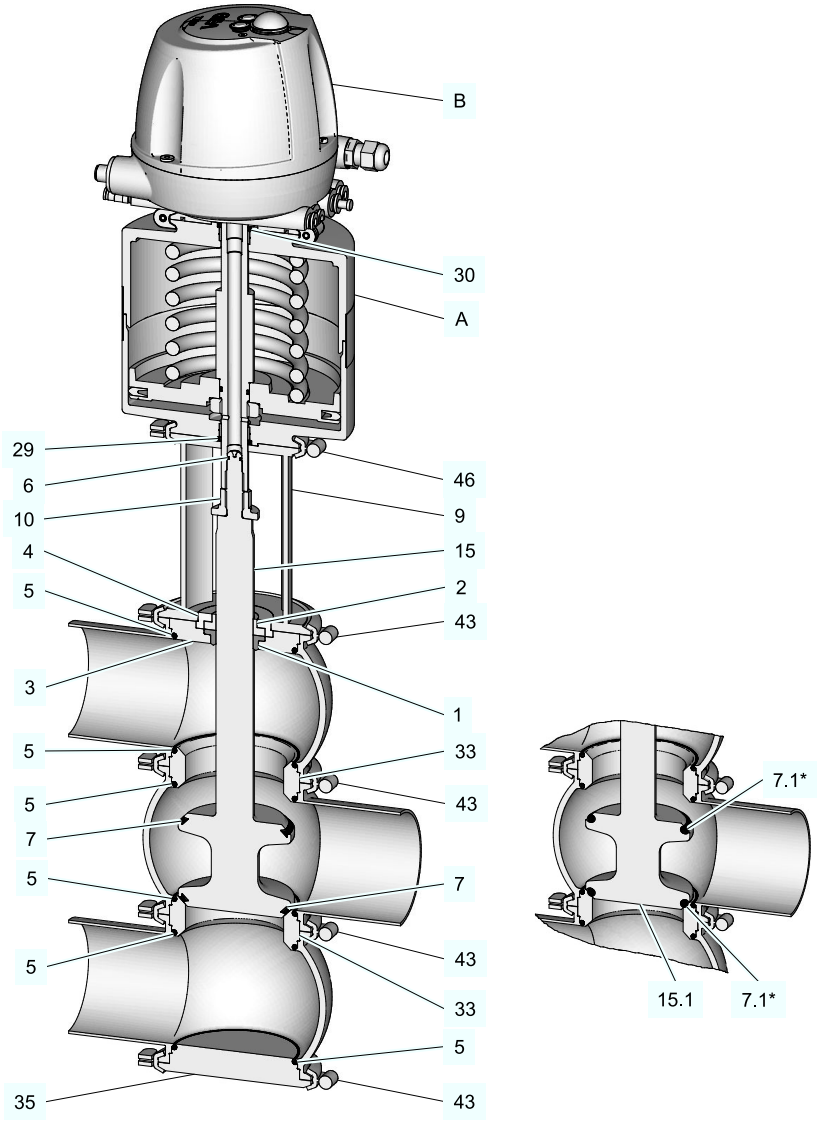


Fig.36

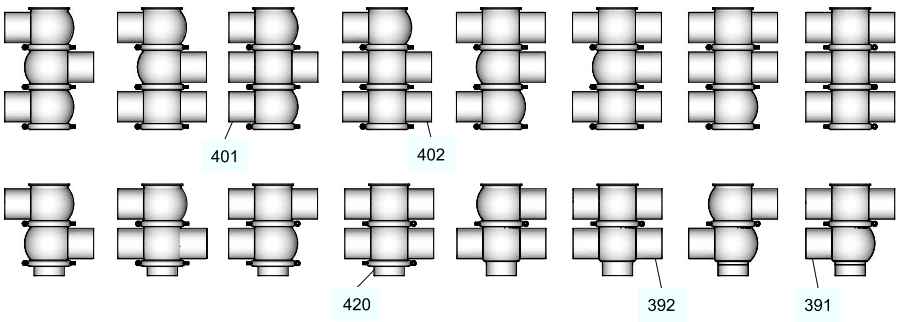


Fig.37

Item	Designation	Material	DN 25	DN 40	DN 50	DN 65
Seal set complete 1)		EPDM	221-304.18	221-304.19	221-304.19	221-304.20
		FKM	221-511.87	221-511.88	221-511.88	221-511.89
		HNBR	221-519.82	221-519.83	221-519.83	221-519.84
		TEFASEP gold/EPDM	221-304.74	221-304.75	221-304.75	221-304.76
		TEFASEP gold/FKM	221-511.104	221-511.105	221-511.106	221-511.106
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		HNBR	924-311	924-311	924-311	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	PEEK	935-098	935-098	935-098	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03
4	Bearing disc	1.4301	221-142.01	221-142.02	221-142.02	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150
		FKM	930-168	930-171	930-171	930-176
		HNBR	930-632	930-633	930-633	930-634
6*	O-ring	NBR	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024
		FKM	932-030	932-033	932-033	932-035
		HNBR	932-087	932-088	932-088	932-090
7.1*	O-ring	TEFASEP gold	930-100	930-101	930-101	930-102
9	Lantern	1.4301	221-121.01	221-121.02	221-121.02	221-121.03
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01
15	Valve disc W (V-ring)	1.4404	221-116.01	221-116.11	221-116.12	221-116.05
15.1*	Valve disc W-TS (O-ring)	1.4404	221-116.40	221-116.41	221-116.42	221-116.43
29*	O-ring	NBR	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.01	221-107.02	221-107.02	221-107.03
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06
391	Housing NL	1.4404	221-636.01	221-636.02	221-636.03	221-636.04
392	Housing NT	1.4404	221-637.01	221-637.02	221-637.03	221-637.04
401	Housing V1	1.4404	221-101.19	221-101.21	221-101.22	221-101.05
402	Housing V2	1.4404	221-102.41	221-102.43	221-102.44	221-102.05
420	Housing connection flange N	1.4404	221-570.02	221-570.04	221-570.06	221-570.09
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	DN 80	DN 100	DN 125	DN 150
Seal set complete 1)		EPDM	221-304.20	221-304.21	221-304.22	221-304.23
		FKM	221-511.89	221-511.90	221-511.91	221-511.92
		HNBR	221-519.84	221-001348	--	--
		TEFASEP gold/EPDM	221-304.76	221-304.77	--	--
		TEFASEP gold/FKM	221-511.106	221-511.107	--	--
1*	Seal ring	EPDM	924-085	924-085	924-088	924-088
		FKM	924-083	924-083	924-087	924-087
		HNBR	924-313	924-313	--	--
2	Bearing	PTFE/carbon	935-002	935-002	935-003	935-003
	Bearing, 3A	PEEK	935-099	935-099	935-102	935-102
3	Seal disk	1.4404	221-141.03	221-141.04	221-141.07	221-141.05
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.04	221-142.03
5*	O-ring	EPDM	930-150	930-156	930-372	930-260
		FKM	930-176	930-178	930-409	930-259
		HNBR	930-634	930-863	--	--
6*	O-ring	NBR	930-004	930-004	930-007	930-007
**7*	V-ring	EPDM	932-024	932-028	932-060	932-042
		FKM	932-035	932-039	932-062	932-041
		HNBR	932-090	932-100	--	--
7.1*	O-ring	TEFASEP gold	930-102	930-103	--	--
9	Lantern	1.4301	221-121.03	221-121.04	221-121.06	221-121.22
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.06	221-147.06
15	Valve disc W (V-ring)	1.4404	221-116.06	221-116.07	221-116.10	221-116.30
15.1*	Valve disc W-TS (O-ring)	1.4404	221-116.44	221-116.45	--	--
29*	O-ring	NBR	930-026	930-026	930-035	930-035
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.03	221-107.04	221-107.18	221-107.06
35	Blanking plate	1.4404	221-144.03	221-144.04	221-144.06	221-144.05
43	Clamp join KL	1.4401	221-507.09	221-507.11	221-507.13	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.11	221-507.11
391	Housing NL	1.4404	221-636.05	221-636.14	221-193.36	221-193.45
392	Housing NT	1.4404	221-637.05	221-637.14	221-194.31	221-194.35
401	Housing V1	1.4404	221-101.06	221-101.07	221-101.18	221-101.66
402	Housing V2	1.4404	221-102.06	221-102.07	221-102.29	221-102.09
420	Housing connection flange N	1.4404	221-570.11	221-570.14	221-570.16	221-570.20
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	1" OD	1.5" OD	2" OD	2.5" OD
Seal set complete 1)		EPDM	221-304.18	221-304.19	221-304.19	221-304.20
		FKM	221-511.87	221-511.88	221-511.88	221-511.89
		HNBR	221-519.82	221-519.83	221-519.83	221-519.84
		TEFASEP gold/EPDM	221-304.74	221-304.75	221-304.75	221-304.76
		TEFASEP gold/FKM	221-511.104	221-511.105	221-511.106	221-511.106
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		HNBR	924-311	924-311	924-311	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	PEEK	935-098	935-098	935-098	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03
4	Bearing disc	1.4301	221-142.01	221-142.02	221-142.02	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150
		FKM	930-168	930-171	930-171	930-176
		HNBR	930-632	930-633	930-633	930-634
6*	O-ring	NBR	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024
		FKM	932-030	932-033	932-033	932-035
		HNBR	932-087	932-088	932-088	932-090
7.1*	O-ring	TEFASEP gold	930-100	930-101	930-101	930-102
9	Lantern	1.4301	221-121.01	221-121.07	221-121.07	221-121.03
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01
15	Valve disc W (V-ring)	1.4404	221-116.01	221-116.11	221-116.12	221-116.05
15.1*	Valve disc W-TS (O-ring)	1.4404	221-116.40	221-116.41	221-116.42	221-116.43
29*	O-ring	NBR	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.01	221-107.02	221-107.02	221-107.03
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06
391	Housing NL	1.4404	221-636.06	221-636.07	221-636.08	221-636.09
392	Housing NT	1.4404	221-637.06	221-637.07	221-637.08	221-637.09
401	Housing V1	1.4404	221-101.27	221-101.28	221-101.29	221-101.30
402	Housing V2	1.4404	221-102.52	221-102.53	221-102.54	221-102.55
420	Housing connection flange N	1.4404	221-570.01	221-570.03	221-570.05	221-570.08
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	3" OD	4" OD	6" OD
Seal set complete 1)		EPDM	221-304.20	221-304.21	221-304.22
		FKM	221-511.89	221-511.90	221-511.92
		HNBR	221-519.84	221-001348	--
		TEFASEP gold/EPDM	221-304.76	221-304.77	--
		TEFASEP gold/FKM	221-511.106	221-511.107	--
1*	Seal ring	EPDM	924-085	924-085	924-088
		FKM	924-083	924-083	924-087
		HNBR	924-313	924-313	--
2	Bearing	PTFE/carbon	935-002	935-002	935-003
	Bearing, 3A	PEEK	935-099	935-099	935-102
3	Seal disk	1.4404	221-141.03	221-141.04	221-141.05
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.03
5*	O-ring	EPDM	930-150	930-156	930-260
		FKM	930-176	930-178	930-259
		HNBR	930-634	930-863	--
6*	O-ring	NBR	930-004	930-004	930-007
**7*	V-ring	EPDM	932-024	932-028	932-042
		FKM	932-035	932-039	932-041
		HNBR	932-090	932-100	--
7.1*	O-ring	TEFASEP gold	930-102	930-103	--
9	Lantern	1.4301	221-121.08	221-121.09	221-121.22
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.06
15	Valve disc W (V-ring)	1.4404	221-116.06	221-116.07	221-116.34
15.1*	Valve disc W-TS (O-ring)	1.4404	221-116.44	221-116.45	--
29*	O-ring	NBR	930-026	930-026	930-035
30*	O-ring	NBR	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.03	221-107.04	221-107.06
35	Blanking plate	1.4404	221-144.03	221-144.04	221-144.05
43	Clamp join KL	1.4401	221-507.09	221-507.11	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.11
391	Housing NL	1.4404	221-636.10	221-636.13	221-636.48
392	Housing NT	1.4404	221-637.10	221-637.13	221-637.36
401	Housing V1	1.4404	221-101.31	221-101.32	221-101.72
402	Housing V2	1.4404	221-102.56	221-102.57	221-102.58
420	Housing connection flange N	1.4404	221-570.10	221-570.13	221-570.17
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator		
B	Control head S		See spare parts list for control head S		
	Control top T.VIS®		See parts list for control top T.VIS®		
Grease RIVOLTA F.L.G. 100g tube not included with seal set.				413-136	

1) The seal set includes items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

Item	Designation	Material	2" IPS	3" IPS	4" IPS	6" IPS
Seal set complete 1)		EPDM	221-304.19	221-304.20	221-304.21	221-304.23
		FKM	221-511.88	221-511.89	221-511.90	221-511.92
		HNBR	221-519.83	221-519.84	221-001348	--
1*	Seal ring	EPDM	924-084	924-085	924-085	924-088
		FKM	924-082	924-083	924-083	924-087
		HNBR	924-311	924-313	924-313	--
2	Bearing	PTFE/carbon	935-001	935-002	935-002	935-003
	Bearing, 3A	SUSTA-PVDF	935-098	935-099	935-099	935-102
3	Seal disk	1.4404	221-141.02	221-141.03	221-141.04	221-141.05
4	Bearing disc	1.4301	221-142.02	221-142.03	221-142.03	221-142.04
5*	O-ring	EPDM	930-144	930-150	930-156	930-260
		FKM	930-171	930-176	930-178	930-259
		HNBR	930-633	930-634	930-863	--
6*	O-ring	NBR	930-004	930-004	930-007	930-007
**7*	V-ring	EPDM	932-021	932-024	932-028	932-042
		FKM	932-033	932-035	932-039	932-041
		HNBR	932-088	932-090	930-100	--
9	Lantern	1.4301	221-121.12	221-121.10	221-121.11	221-121.05
10	Spacer nut	1.4305	221-147.02	221-147.01	221-147.01	221-147.06
15	Valve disk W	1.4404	221-116.19	221-116.16	221-116.18	221-116.09
29*	O-ring	NBR	930-026	930-026	930-026	930-035
30*	O-ring	NBR	930-026	930-026	930-026	930-026
33	Seat ring N	1.4404	221-107.02	221-107.03	221-107.04	221-107.06
35	Blanking plate	1.4404	221-144.02	221-144.03	221-144.04	221-144.05
43	Clamp join KL	1.4401	221-507.04	221-507.09	221-507.11	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.11
391	Housing NL	1.4404	221-636.11	221-636.12	221-636.15	221-636.35
392	Housing NT	1.4404	221-637.11	221-637.12	221-637.15	221-637.30
401	Housing V1	1.4404	221-101.37	221-101.35	221-101.36	221-101.17
402	Housing V2	1.4404	221-102.62	221-102.59	221-102.60	221-102.17
420	Housing connection flange N	1.4404	221-570.07	221-570.12	221-570.15	221-570.18
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator			
B	Control head S		See spare parts list for control head S			
	Control top T.VIS®		See parts list for control top T.VIS®			
Grease RIVOLTA F.L.G. 100g tube not included with seal set.					413-136	

1) The seal set includes items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

sealing sets for shuttle valve W									
Item	**Qty.**	**Designation**	**Material**	**DN 25 1"**	**DN 40/50 1.5"/2"**	**DN 65/80 2.5"/3"**	**DN 100 4"**	**DN 125**	**DN 150 6"**
1	1	Seal ring	Ø	22	22	28	28	35	35
			EPDM	924-084	924-084	924-085	924-085	924-088	924-088
			FKM	924-082	924-082	924-083	924-083	924-087	924-087
			HNBR	924-311	924-311	924-313	924-313	--	--
5	6	O-ring	Ø	42 x 3	60 x 3	85 x 4	113 x 4	138 x 4	158 x 5
			EPDM	930-309	930-144	930-150	930-156	930-372	930-260
			FKM	930-168	930-171	930-176	930-178	930-409	930-259
			HNBR	930-632	930-633	930-634	930-863	--	--
6	1	O-ring	Ø	8 x 1.6	8 x 1.6	8 x 1.6	8 x 1.6	9 x 3	9 x 3
			NBR	930-004	930-004	930-004	930-004	930-007	930-007
**7	2	V-ring	Ø	35-5	52-6	76-6	104-6	128-6	148-6
			EPDM	932-046	932-021	932-024	932-028	932-060	932-042
			FKM	932-030	932-033	932-035	932-039	932-062	932-041
			HNBR	932-087	932-088	932-090	932-100	--	--
7.1	1	O-ring	Ø	30.5 x 5	48 x 5	69.5 x 6	94.8 x 6	--	--
			TEFASEP gold	930-100	930-101	930-102	930-103	--	--
29	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3	25 x 3	25 x 3
			NBR	930-026	930-026	930-026	930-026	930-035	930-035
30	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3	20 x 3	20 x 3
			NBR	930-026	930-026	930-026	930-026	930-026	930-026
Seal set complete			EPDM	221-304.18	221-304.19	221-304.20	221-304.21	221-304.22	221-304.23
			FKM	221-511.87	221-511.88	221-511.89	221-511.90	221-511.91	221-511.92
			HNBR	221-519.82	221-519.83	221-519.84	221-001348	--	--
			TEFASEP gold/EPDM	221-304.74	221-304.75	221-304.76	221-304.77	--	--
			TEFASEP gold/FKM	221-511.104	221-511.105	221-511.106	221-511.107	--	--
Grease RIVOLTA F.L.G. 100 g tube not included in the seal kit (413-136) /** do not grease item 7									
Storage information: Store according to DIN 7716 / relative humidity approx. 65%, temperature 15-25°C and protected from light When replacing seals, observe the instructions in the instruction manual! **429-008**									

16 Spare parts list - shuttle valve X_V

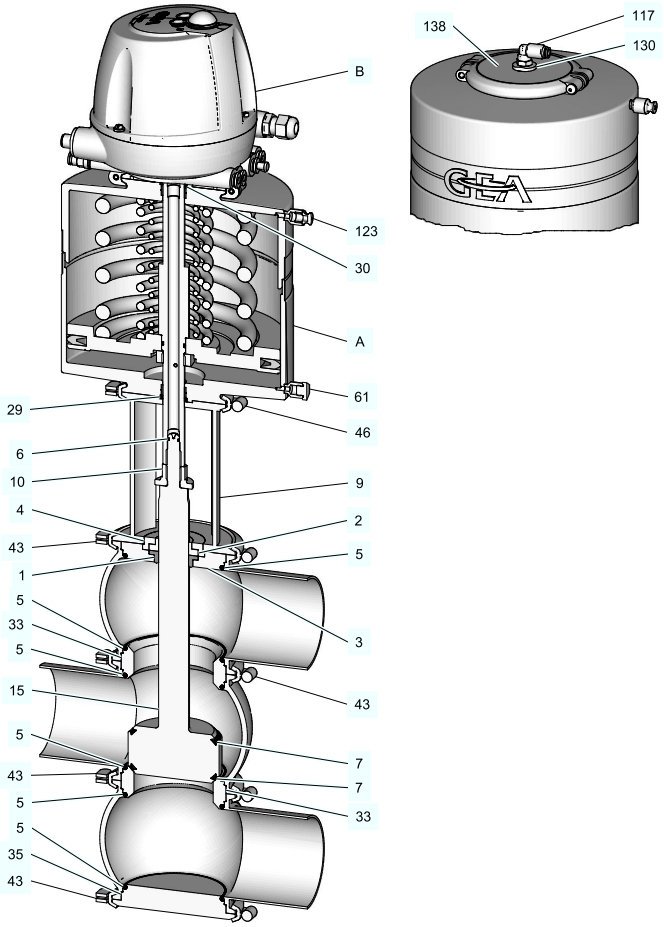


Fig.38

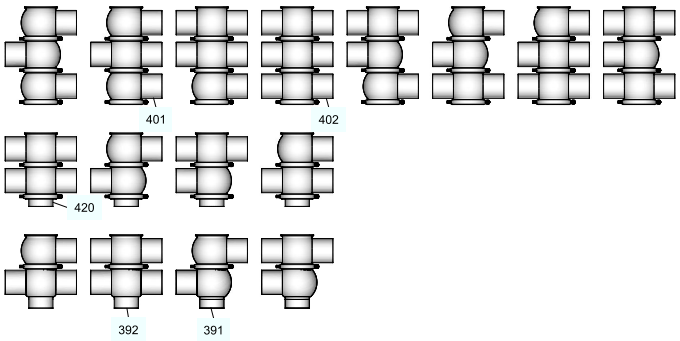


Fig.39

Item	Designation	Material	DN 65	DN 80	DN 100	2.5" OD	3" OD	4" OD
Sealing set complete 1)		EPDM	221-304.20	221-304.20	221-304.21	221-304.20	221-304.20	221-304.21
		FKM	221-511.89	221-511.89	221-511.90	221-511.89	221-511.89	221-511.90
		HNBR	221-519.84	221-519.84	221-001348	221-519.84	221-519.84	221-001348
1*	Seal ring	EPDM	924-085	924-085	924-085	924-085	924-085	924-085
		FKM	924-083	924-083	924-083	924-083	924-083	924-083
		HNBR	924-313	924-313	924-313	924-313	924-313	924-313
2	Bearing	PTFE/ carbon	935-002	935-002	935-002	935-001	935-002	935-002
	Bearing, 3A	PEEK	935-099	935-099	935-099	935-099	935-099	935-099
3	Seal disk	1.4404	221-141.03	221-141.03	221-141.04	221-141.02	221-141.03	221-141.04
4	Bearing disc	1.4301	221-142.03	221-142.03	221-142.03	221-142.02	221-142.03	221-142.03
5*	O-ring	EPDM	930-150	930-150	930-156	930-144	930-150	930-156
		FKM	930-176	930-176	930-178	930-171	930-176	930-178
		HNBR	930-634	930-634	930-863	930-634	930-634	930-863
6*	O-ring	NBR	930-004	930-004	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-024	932-024	932-028	932-046	932-024	932-028
		FKM	932-035	932-035	932-039	932-030	932-035	932-039
		HNBR	932-090	932-090	932-100	932-090	932-090	932-100
9	Lantern	1.4301	221-121.03	221-121.03	221-121.04	221-121.08	221-121.08	221-121.09
10	Spacer nut	1.4305	221-147.01	221-147.01	221-147.01	221-147.01	221-147.01	221-147.01
15	Valve disk W_V	1.4404	221-116.21	221-116.22	221-116.26	221-116.21	221-116.22	221-116.26
29*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
33	Seat ring	1.4404	221-107.03	221-107.03	221-107.04	221-107.03	221-107.03	221-107.04
35	Blanking plate	1.4404	221-144.03	221-144.03	221-144.04	221-144.03	221-144.03	221-144.04
43	Clamp join KL	1.4401	221-507.09	221-507.09	221-507.11	221-507.09	221-507.09	221-507.09
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06
61	Lock screw	1.4571	922-003	922-003	922-003	922-003	922-003	922-003
117	Angled screw-in connector G1/8"-6/4	Brass nickel-plated	933-475	933-475	933-475	933-475	933-475	933-475
	Angled screw-in connector G1/8"-6.35		933-979	933-979	933-979	933-979	933-979	933-979
123	Plug	PP	221-133.14	221-133.14	221-133.14	221-133.14	221-133.14	221-133.14
130	Reducing nipple	Brass nickel-plated	933-992	933-992	933-992	933-992	933-992	933-992
138	Actuator cover	1.4301	221-469.01	221-469.01	221-469.01	221-469.01	221-469.01	221-469.01
391	Housing EL	1.4404	221-193.08	221-193.09	221-193.10	221-636.09	221-193.13	221-193.14
392	Housing ET	1.4404	221-194.08	221-194.09	221-194.10	221-194.12	221-194.13	221-194.14
401	Housing V1	1.4404	221-101.05	221-101.06	221-101.07	221-101.30	221-101.31	221-101.32
402	Housing V2	1.4404	221-102.05	221-102.06	221-102.07	221-102.55	221-102.56	221-102.57
420	Housing connection N	1.4404	221-570.09	221-570.11	221-570.14	221-570.08	221-570.10	221-570.13
	Housing connection T	1.4404	221-409.08	221-409.08	221-409.09	221-409.08	221-409.08	221-409.09

Item	Designation	Material	DN 65	DN 80	DN 100	2.5" OD	3" OD	4" OD
	Housing connection U	1.4404	221-149.03	221-149.03	221-149.04	221-149.03	221-149.03	221-149.04
A	Actuator ZEF/V	--	221-603.01	221-603.01	221-603.01	221-603.01	221-603.01	221-603.01
B	Control top T.VIS®		See parts list for control top T.VIS®					
Grease RIVOLTA F.L.G. 100g tube not included with sealing set.							413-136	

1) The sealing set includes the items 1, 5, 6, 7, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7

17 Appendix

17.1 Lists

17.1.1 Abbreviations and terms

Abbreviation	Explanation
BS	British Standard
bar	Unit of measurement of pressure [bar] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [bar_g/psi_g] unless explicitly specified otherwise.
approx.	approximately
°C	Unit of measurement of temperature [degree Celsius]
CIP	Cleaning in place
°C	Unit of measurement of temperature [degree Celsius]
C_v	valve coefficient, non-metric flow coefficient, see K_v
D-tec	Stem diaphragm technology
DN	DIN nominal width
DIN	German standard issued by DIN (Deutsches Institut für Normung e.V., German Institute for Standardization)
EN	European Standard
EPDM	Material designation Short designation according to DIN/ISO 1629: Ethylene Propylene Diene Rubber
°F	Unit of measurement of temperature [degree Fahrenheit]
FKM	Material designation, short designation according to DIN/ISO 1629: Fluorine rubber
h	Unit of measurement of time [hour]
HNBR	Material designation Short designation according to DIN/ISO 1629: Hydrogenated Acrylonitrile Butadiene Rubber
IP	Protection class
ISO	International standard of the International Organisation for Standardisation
kg	Unit of measurement of weight [kilogram]
kN	Unit of measurement of force [kilonewton]
K_v value	Flow coefficient [m^3/s] $1K_v = 0.86 \times C_v$
l	Unit of measurement of volume [litre]
max.	maximum

Abbreviation	Explanation
mm	Unit of measurement of length [millimetre]
mm	Unit of measurement of length [micrometre]
M	Metric
NC	normally closed Air-to-close/spring-to-open action
Nm	Unit of measurement of work [newton metre] TORQUE SPECIFICATION: 1 Nm = 0.737 lb-ft Pound-Force (lb)× Feet (ft)
NO	normally open Spring-to-close/air-to-open action
PA	Polyamide
PE-LD	Low-density polyethylene
psi	Anglo-American unit of measurement for pressure [pound-force per square inch] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
PTFE	Polytetrafluoroethylene
SET-UP	Self-learning installation During commissioning and maintenance, the SET-UP procedure carries out all the necessary settings for the generation of messages.
SIP	Sterilization in place
SW	Indicates the size of spanners [width across flats]
TEFASEP gold	Sealing material for the valve seat seal
T.VIS	Tuchenhagen Valve Information System
V AC	Volt alternating current
V DC	Volt direct current
VMQ	Material specification Short designation according to DIN/ISO 1629: Vinyl-methyl-silicone-rubber
W	Unit of measurement of power [Watt]
TIG	Welding method Tungsten inert gas welding
Inch	Unit of measurement of length in the Anglo-American language area

Abbreviation	Explanation
Inch OD	Tube measurement according to British Standard (BS), outside diameter
Inch IPS	American pipe measurement, iron pipe size

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