Hygienic valves

GEA VARIVENT® control valve type S

Operating instruction (Translation from the original language)

430BAL011074EN_5

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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

GEA Tuchenhagen GmbH
Am Industriepark 2-10
21514 Büchen

1.3 Contact

Tel.:+49 4155 49-0
Fax:+49 4155 49-2035

flowcomponents@gea.com
www.gea.com

1.4 EC Declaration of Conformity

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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 actuator
Type:	VARIVENT®

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 draw up in accordance with Annex VII, Part A, and undertake to forward this documentation by means o data medium upon justified request by the national authorities

Person authorised for compilation and handover of technical documentation:

GEA Tuchenhagen GmbH
CE Documentation Officer
Am Industriepark 2-10
21514 Büchen, Germany

Büchen, 24 January 2020

Franz Bürmann
Managing Director

pp. Matthias Südel
Head of Engineering

Fig.1

2 Safety

2.1 Intended use

The control valve S is used to control flow rates and pressures in automated process plants.

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

Hint!

The manufacturer will not accept any liability for damage resulting from any use of the valve which is not in accordance with the designated use of the valve. The risk of such misuse lies entirely with the operator of the facility.

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 component 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 Signage

Dangerous points on the valve are indicated by warning signs, prohibition signs and mandatory signs.

The signs and notes on the valve must always be legible. Any illegible signs must be replaced immediately.

Signs on the valve	
Sign	**Meaning**
 Fig.2	General hazard warning
 Fig.3	Warning Crushing
 Fig.4	Explosive atmosphere hazard warning

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.

Residual dangers on the valve and measures		
Danger	**Cause**	**Measure**
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:

- In the event of malfunctions, shut down the valve (disconnect from the power and air supply) and secure it against being used.
- When the valve is switching, never reach into the valve housing (391), the motor stool (9) or into the valve inlet X (on pneumatic actuators). Fingers can be crushed or cut off.
- When releasing the grooved cap nut (252) of the non-actuated valve (spring-to-close version) there is a risk of the bellows and the round thread of the grooved cap nut being damaged. Before releasing the grooved cap nut (252) therefore relieve the spring tension by pressurizing the actuator with compressed air. The valve is opened.
- The housing sockets have very sharp edges. When transporting and assembling the valve therefore be sure to wear suitable protective gloves.
- Before starting any service, maintenance 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.

3 Description

3.1 Design

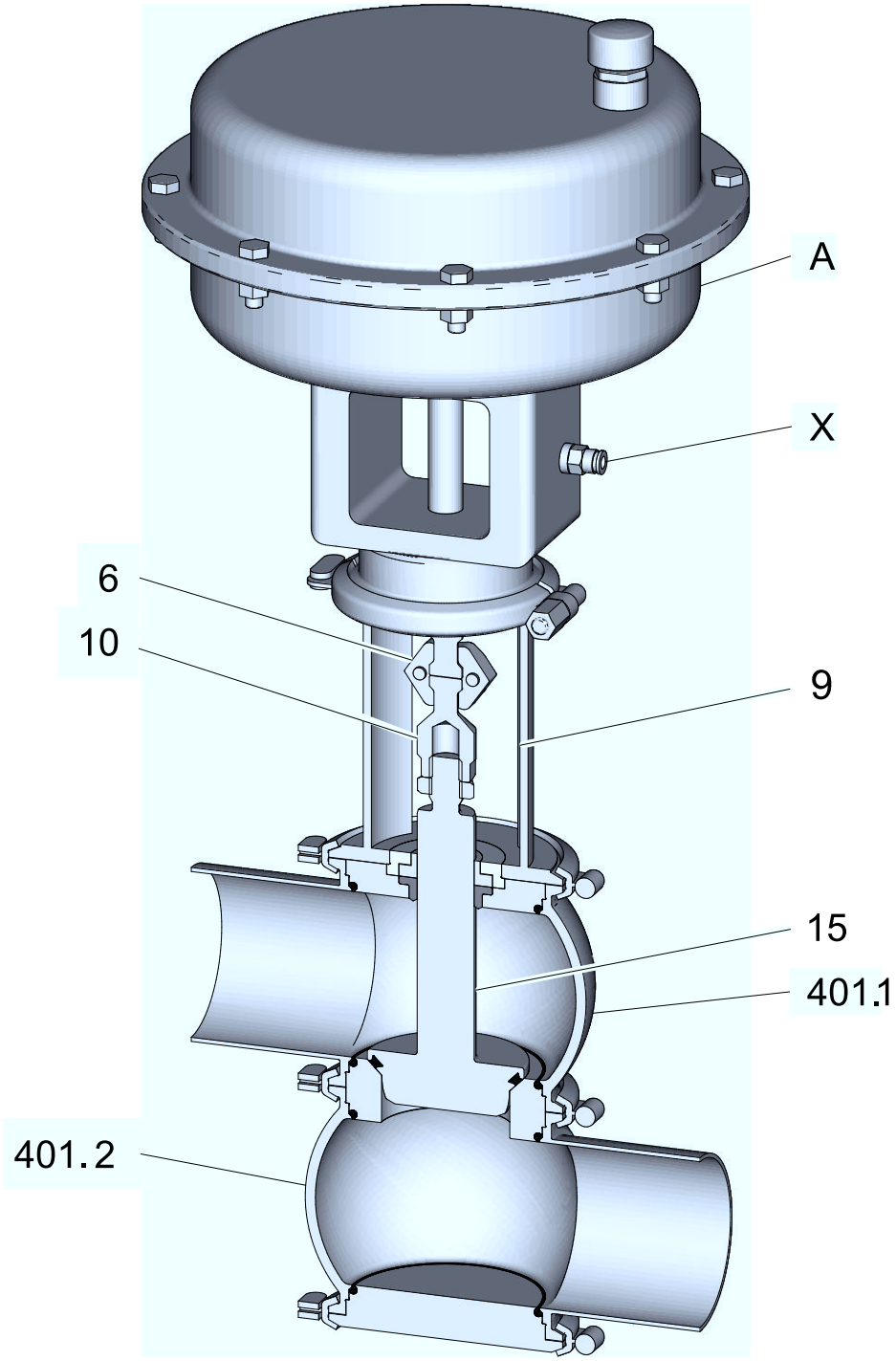

Fig.5

Design	
No.	**Designation**
A	Actuator
X	Air connection
6	Coupling clips
9	Motor stool
10	Adapter
15	Valve disk
401	Valve housing

3.2 Functional description

3.2.1 Spring-to-close actuator (Z)

The valve is closed in the non-actuated position.

In the standard version, the control valve is supplied with a spring-to-close actuator – spring closed in the non-actuated position –, i.e.: If the input signal at the positioner increases, the control valve opens.

3.2.2 Spring-to-open actuator (A)

The valve is open in the non-actuated position.

If the input signal at the positioner increases, the control valve closes.

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

For transport, the following principles apply:

- Only use approved, fully functional means of transport, lifting gear and slings that are suitable for the purpose to transport the package units/valves. Observe the maximum load-bearing capacities.
- 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.
- Only allow qualified staff to transport the valve.
- Movable parts must be properly secured.
- 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.

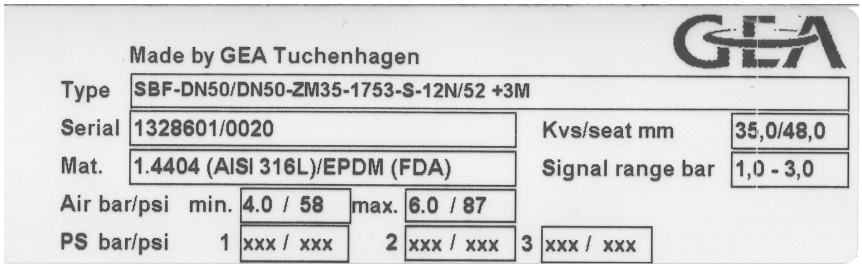

Fig.6

The type plate provides the following key data:

Key data of the valve	
Type	Modulating Control Valve S
Serial	Serial number
Material	1.4404 (AISI316L)/EPDM (FDA)
Control air pressure bar/psi	min. 4 / 58; max. 6 / 87
Product pressure bar/psi	.....
Kvs value / seat diameter mm	35.0 / 48.0
Signal pressure bar	1.0 - 3.0

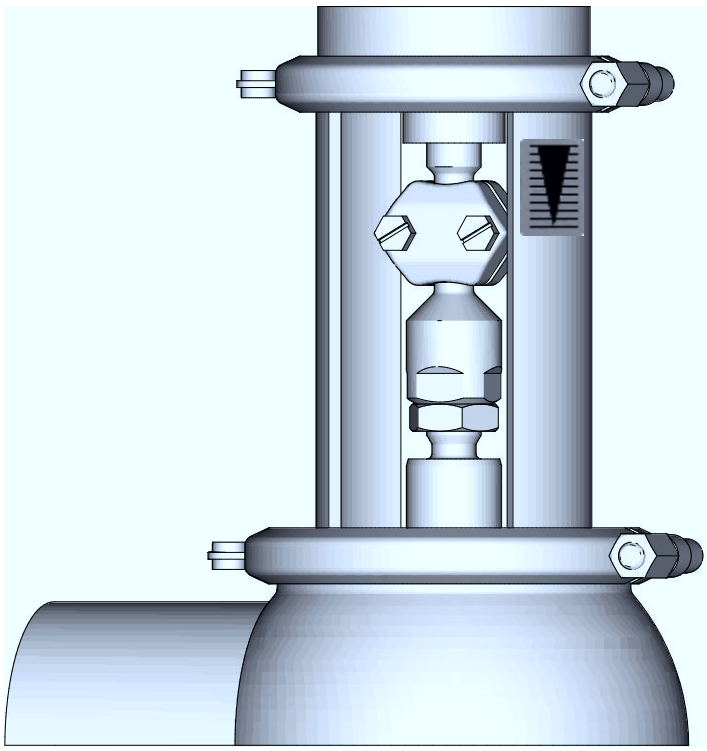

Fig.7: Marking on motor stool - closed position

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 (AISI316L)
Installation position	Any position (if valve and pipe system can drain properly)
Product pressure	DN 25 to 65 = max. 16 bar / 232 psi (standard) DN 80 to 150 = max. 10 bar / 145 psi (standard) DN 25 to 100 = max. 20 bar / 290 psi (special)

Technical data: Ambient temperatures	
Designation	**Description**
Ambient temperature	-15 to 80°C < 0°C: use control air with a low dew point. Protect valve stems against freezing.
Operating temperature	Depending on the sealing material

Technical data: Compressed air supply	
Designation	**Description**
Air hose	
- Metric	Material PE-LD Outside Ø 6 mm Inside Ø 4 mm
- Inch	Material PA Outside Ø 6.35 mm Inside Ø 4.3 mm
Product pressure	5 bar (72.5 psi) standard max. 10 bar (116 psi)
Control air pressure	6 or 7 bar (87 or 101 psi), depending on the type of positioner
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 1m^3 air

5.3 Seat leakage according to DIN EN 60534-4

Herewith we confirm that our hygienic VARIVENT® control valves type S and P meet the requirements according to DIN EN 60534-4.

Examples for the different seat seals:

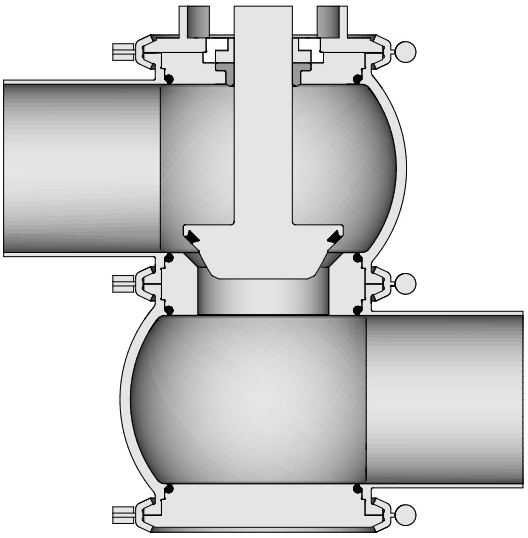

Fig.8: Soft-sealing seat version (VARIVENT® principle with V-ring)

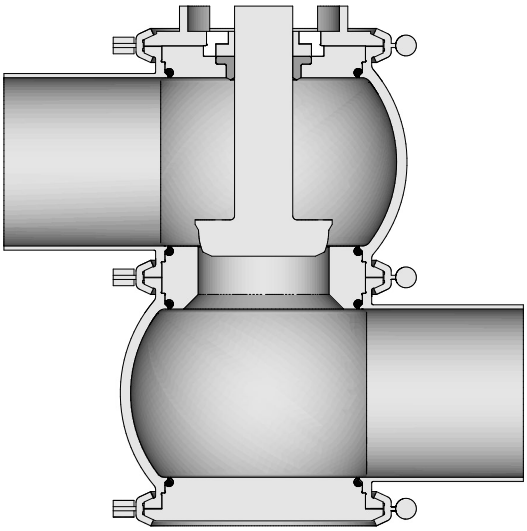

Fig.9: Metallic seat version

The **soft-sealing seat version** is subject to **leakage class VI**. This results in the following exemplary permissible seat leakages for 5 barg (test medium air).

KVS (m^3/h)	**4**	**6.3**	**10**	**16**	**25**	**35**	**40**	**60**	**80**	**100**	**160**	**200**	**260**	**360**
Permissible leakage (air in ml/min)	0.23	0.23	0.23	0.32	0.45	0.68	0.68	0.90	1.35	2.55	2.55	3.24	4.62	6.00

The **metallic seat version** is subject to **leakage class IV** (test procedure 2). This results in the following exemplary permissible seat leakages for 5 barg (test medium air).

KVS (m^3/h)	**4**	**6.3**	**10**	**16**	**25**	**35**	**40**	**60**	**80**	**100**	**160**	**200**	**260**	**360**
Permissible leakage (water in ml/min)	20	20	40	60	90	130	150	220	300	370	590	730	950	1320

5.4 Resistance of Sealing Materials

The resistance of sealing materials depends 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.

Resistance:

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

Sealing resistance table				
Medium	**Temperature**	**Gasket material (general operating temperature)**		
		EPDM -40...+135°C (-40...275°F)	**FKM -10...+200 °C (+14...+392°F)**	**HNBR -25...+140 °C (-13...+284°F)**
Caustics up to 3%	up to 80 °C (176°F)	+	o	+
Caustics up to 5%	up to 40 °C (104°F)	+	o	o
Caustics up to 5%	up to 80 °C (176°F)	+	–	–
Caustics at 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 (302°F)	+	o	–
Fuels/hydrocarbons		–	+	+
Product with a fat content of max. 35%		+	+	+
Product with a fat content of more than 35%		–	+	+
Oils		–	+	+

* Depending on the installation conditions

5.5 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 21.

Dimensions for Pipes in DN				
Metric DN	**Outside diameter**	**Wall thickness**	**Inside diameter**	**Outside diameter acc. 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	**Outside diameter**	**Wall thickness**	**Inside diameter**	**Outside diameter acc. to BS 4825**
1"	25.4	1.65	22.1	x
1.5"	38.1	1.65	34.8	x
2"	50.8	1.65	47.5	x
2.5"	63.5	1.65	60.2	x
3"	76.2	1.65	72.9	x
4"	101.6	2.11	97.38	x
6"	152.4	2.77	146.86	x

Dimensions for Pipes in Inch IPS				
Inch IPS	**Outside diameter**	**Wall thickness**	**Inside diameter**	**Outside 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

5.6 Tools

List of tools	
Tools	**Material no.**
Hex. screwdriver SW 6 (for hex. socket-head screws)	408-124
Screwdriver, crosstip size 2	406-125
Screwdriver, blade width 3.5	406-103
Open end spanner a/f 6x7	408-030
Open end spanner a/f 8x10	408-032
Open end spanner a/f 13x17	408-036
Open end spanner a/f 24x27	408-040
Open end spanner a/f 36x41	408-042
V-ring insertion tool	229-109.088
Socket wrench a/f 8	408-102
Hose cutter	407-065

5.7 Auxiliary equipment

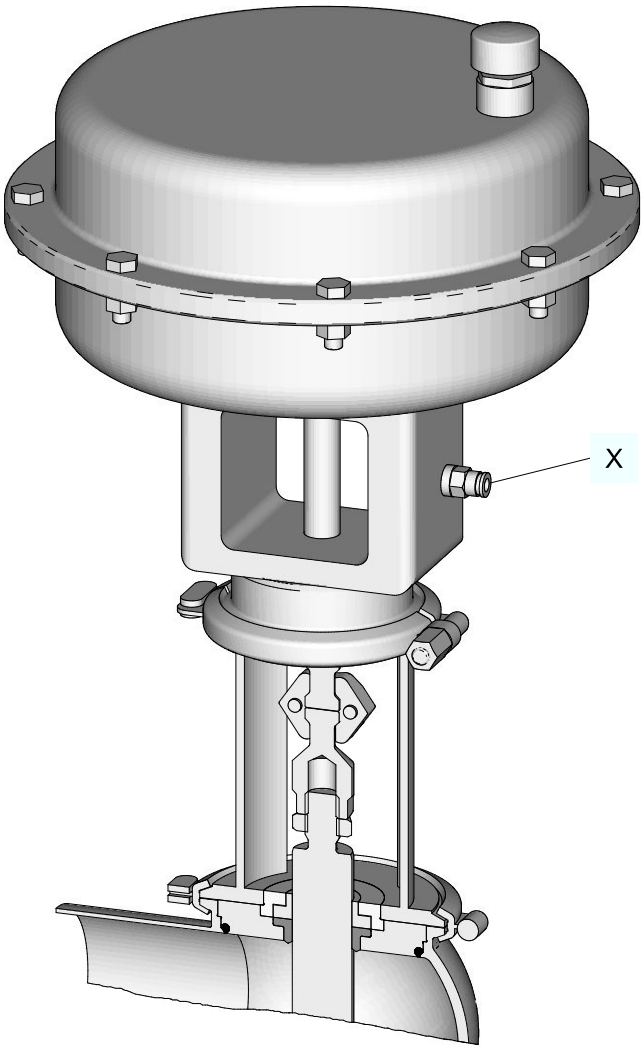

Fig.10

Auxiliary equipment Air connection X		
	Designation	**Material no.**
Metric version	Reducing nipple G1/8-G3/8"	933-048
	Screw-in plug connection G1/8"-6/4	933-176
Inch version	Reducing nipple G1/8-G3/8"	933-048
	Screw-in plug connection G1/8"-6.35	933-173

5.8 Lubricants

Lubricants	
Designation	**Material no.**
Rivolta F.L.G. MD-2	413-071
PARALIQ GTE 703	413-064

5.9 Weights

Weights	
Size	**Weight* [kg]**
DN 25, 1"	approx. 14.0
DN 40, 1.5"	approx. 15.0
DN 50, 2"	approx. 15.5
DN 65, 2.5"	approx. 21.0
DN 80, 3"	approx. 21.0
DN 100, 4"	approx. 24.0
DN 125	approx. 63.0
DN 150, 6"	approx. 66.5

*Weights for housing combination L. Other weights on request.

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

GEA Tuchenhagen recommends that the valve should be installed vertically (actuator up, housing bottom). If the control valve is not installed vertically, the stress on the valve stem seals is higher than when installed vertically. Therefore, regularly check the control valve for leakage.

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.

6.3 Valve with Detachable Pipe Connection Elements

This section describes the procedure to fit the valve.

⚠ Caution!

If pipes contain liquids, these can spurt out when the pipes are opened.

Risk of injury as a result of hot or aggressive liquids.

► Before releasing any pipe or clamp connections, drain and, if necessary, clean or flush the pipe.
► 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.

6.4 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 connection by pressurizing the actuator with compressed air at max. 6 or 7 bar (depending on the type of positioner) or by mechanically adjusting the control cone.

Notice

Welding distortions

The control valve can be damaged by distortion due to welding and when the position of the grooves is altered.

► Before starting any welding work, remove all built-in parts from the valve.
► To ensure that a proper weld is formed when the valve is welded into the pipe, make sure that the root side of the weld is protected against oxidation by forming gas.
► Use welding filler if necessary.

Carry out the following steps:

1. Release the spring tension.
2. Remove the valve insert, see chapter .
3. Weld the housing, without sealing rings, into position, ensuring that the connection is free of stress.
4. Fit the housing into place and tack it.
5. To avoid welding distortions, always seal the housing before welding.
6. Flush the housing with forming gas from the inside to push the oxygen out of the system.
7. Weld the housing into the pipe system; use welding filler if necessary. When technically possible, use the WIG-Orbital welding process with pulse configuration, according to guidelines EHEDG documentation. 35.
8. Passivate the seam after welding.
9. Assemble the valve and depressurize the actuator.
10. Fit the seals.

    → The valve disk is lowered.

→ Install the valve with welded ends.

Hint!

Welding method: we recommend using the TIG welding method.

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

6.5 Pneumatic connections

Prerequisite:

- The control air pressure may be max. 6 or 7 bar. Please observe the max. supply air pressure specified for the positioner used.

Tools required:

- A hose cutter
- Air hoses with a diameter of 6/4 mm

Carry out the following steps:

1. Shut off the compressed air supply.
2. Use the hose cutter to cut the pneumatic hoses square.
3. Establish the pneumatic connections in accordance with the codes on the positioner. Observe the operating instructions for the positioner!

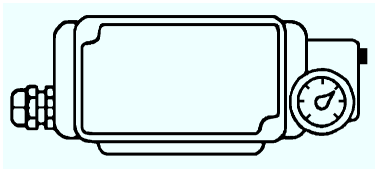

Fig.11

4. Hand-tighten the cap nuts.

→ Done

6.6 Electrical connections

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.

Explosive gases or dusts

An explosion can result in serious personal injury or death.

► Observe the installation and operating regulations for use in potentially explosive areas.

Carry out the following steps:

1. Pass the cable through the cable gland (1) and connect it according to the wiring diagram (in the protection cap of the positioner). Observe the operating instructions for the positioner.

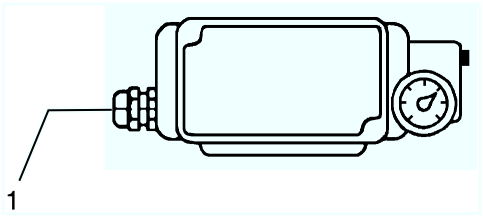

Fig.12

2. Tighten the strain-relief device on the cable gland (1).

→ Done

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. Please define the cleaning parameters yourself in accordance with your product and process and regularly verify the result.

We recommend a flow velocity of at least 2 m/s.

9.2 Passivation

Before commissioning a plant, passivation is commonly 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.

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 20.

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:
   - Regularly check the seals.

→ Done

10.2.2 Pneumatic connections

Carry out the following steps:

1. Check the operating pressure at the pressure reducing and filter station.
2. Clean the air filter at regular intervals.
3. Check that the air hoses sit firmly in the air connections.
4. Check the lines for kinks and leaks.

→ Done

10.2.3 Electrical connections

Carry out the following steps:

1. Check that the proximity switch connections are clean.

→ Done

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)**
Media at temperatures of 60 °C to 130 °C (140 °F to 266 °F)	approx. every 3 months
Media at temperatures of < 60 °C (< 140 °F)	approx. every 12 months

10.4 Prior to disassembly

Prerequisite:

- Make sure that during maintenance and repair 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 the Valve

This section describes disassembly of various components.

10.5.1 Disassembling Valve N

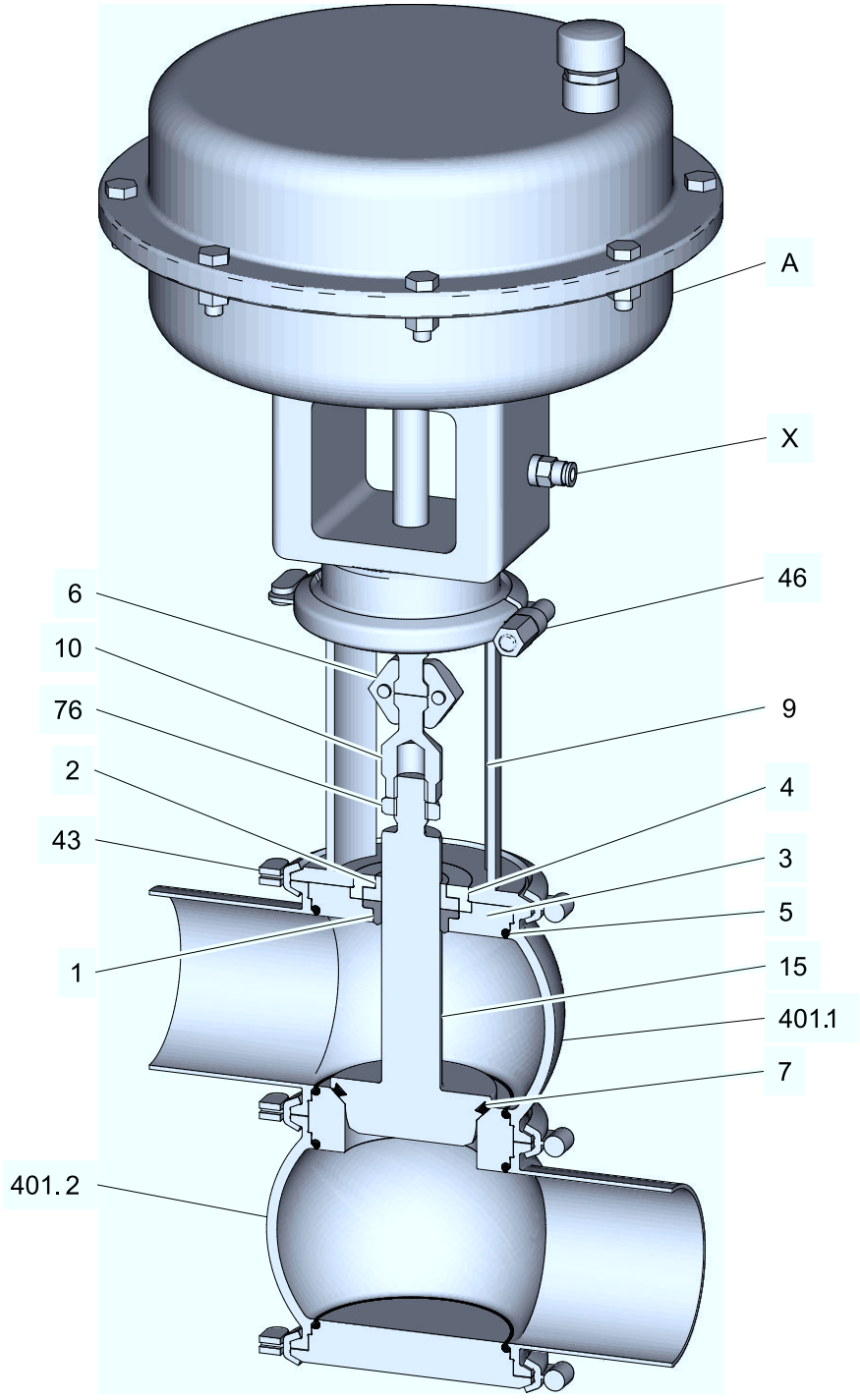

Fig.13

Prerequisite:

- No positioner must be actuated electrically or manually.

⚠ Warning!

Spring tension in the valve (spring-to-close action)

Danger of injury when detaching the clamp connections (43, 46) 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 max. 6 or 7 bar (depending on the type of positioner) or by mechanically adjusting the control cone.

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.
► Do not put the valve insert down on the valve disk
► Work carefully when disassembling the valve.

Carry out the following steps:

1. Pressurize the actuator (A) via connection (X) (spring-to-close action).

   → The valve opens, spring tension has been relieved.

2. Remove the clamp connection (43) between the housing (401.1) and the motor stool (9).
3. Depressurize the actuator (A) and detach the air supply.
4. Unscrew the coupling clips (6).
5. Loosen the nut (76) and the adapter (10) and turn them downwards on the valve disk (15).
6. Remove the clamp connection (46), take off the actuator (A) and the motor stool (9).
7. Unscrew the nut (76) and adapter (10) from the valve disk (15).

   → Sealing ring (1), bearing (2), sealing disk (3), bearing disk (4), O-ring (5) and valve disk (15) with V-ring (7) are accessible.

→ Done

10.5.2 Disassembling Valves W + X

This section describes disassembly of various components.

Disassembly - Valve W

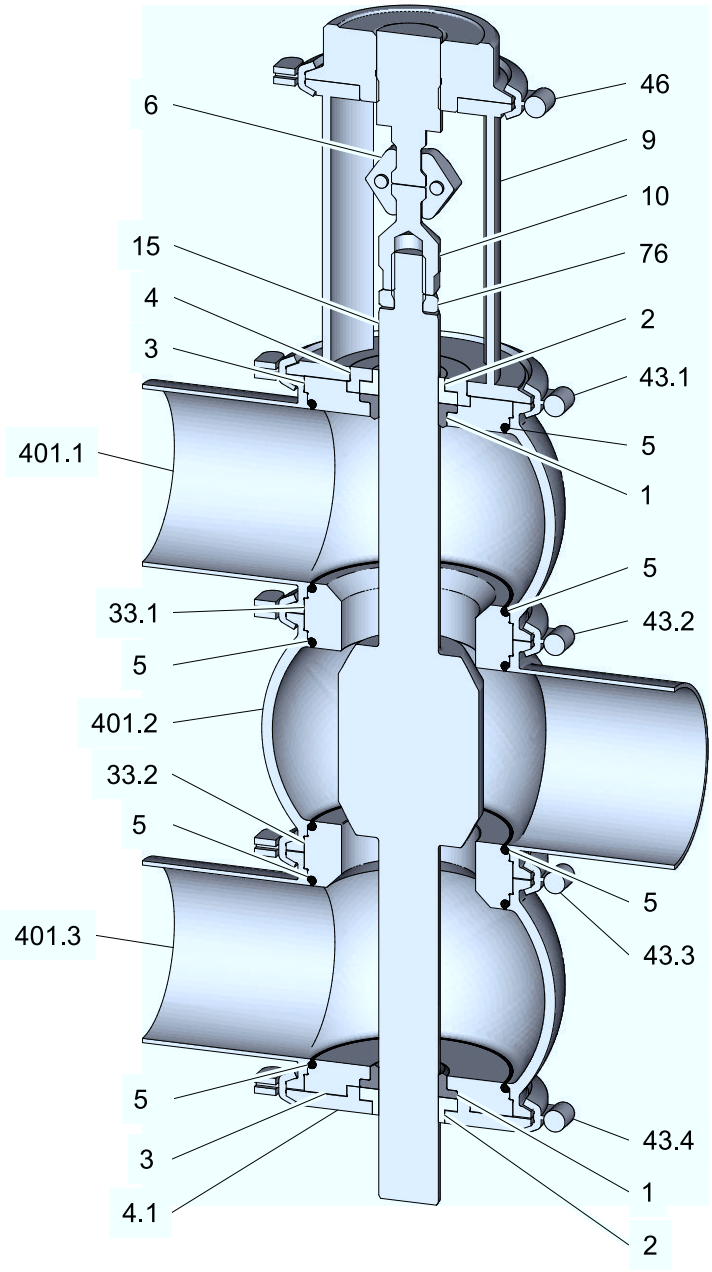

Fig.14

Prerequisite:

- No positioner must be actuated electrically or manually.

⚠ Warning!

Spring tension in the valve (spring-to-close action)

Danger of injury when detaching the clamp connections (43, 46) 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 max. 6 or 7 bar (depending on the type of positioner) or by mechanically adjusting the control cone.

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.
► Do not put the valve insert down on the valve disk
► Work carefully when disassembling the valve.

Carry out the following steps:

1. Remove the clamp connection (43.2).
2. Withdraw the valve from the housings (401.2) and (401.3).

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

   ! Protect the valve parts against impact stress.

   ! The seat ring (33.1) is placed freely in the housing and can hit the valve disk when the valve is moved.
3. Lower the valve disk.

   → Spring-closing valve: Vent the actuator.

   → Spring-opening valve: release the actuator pretension.
4. Unscrew the coupling clip (6).
5. Loosen the nut (76) and the adapter (10) and turn them downwards on the valve disk (15).
6. Remove the clamp connection (46), take off the actuator (A) and the motor stool (9).
7. Pull the valve disk (15) out of the housing (401.1).

   ! Protect the valve parts against impact stress.
8. Unscrew the nut (76) and adapter (10) from the valve disk (15).

   → Sealing ring (1), bearing (2), sealing disk (3), bearing disk (4), O-ring (5) and valve disk (15) with V-ring (7) are accessible.
9. Remove the seat ring (33.1) from the housing (401.1).

→ Valve W has been disassembled.

Disassembly - Valve X

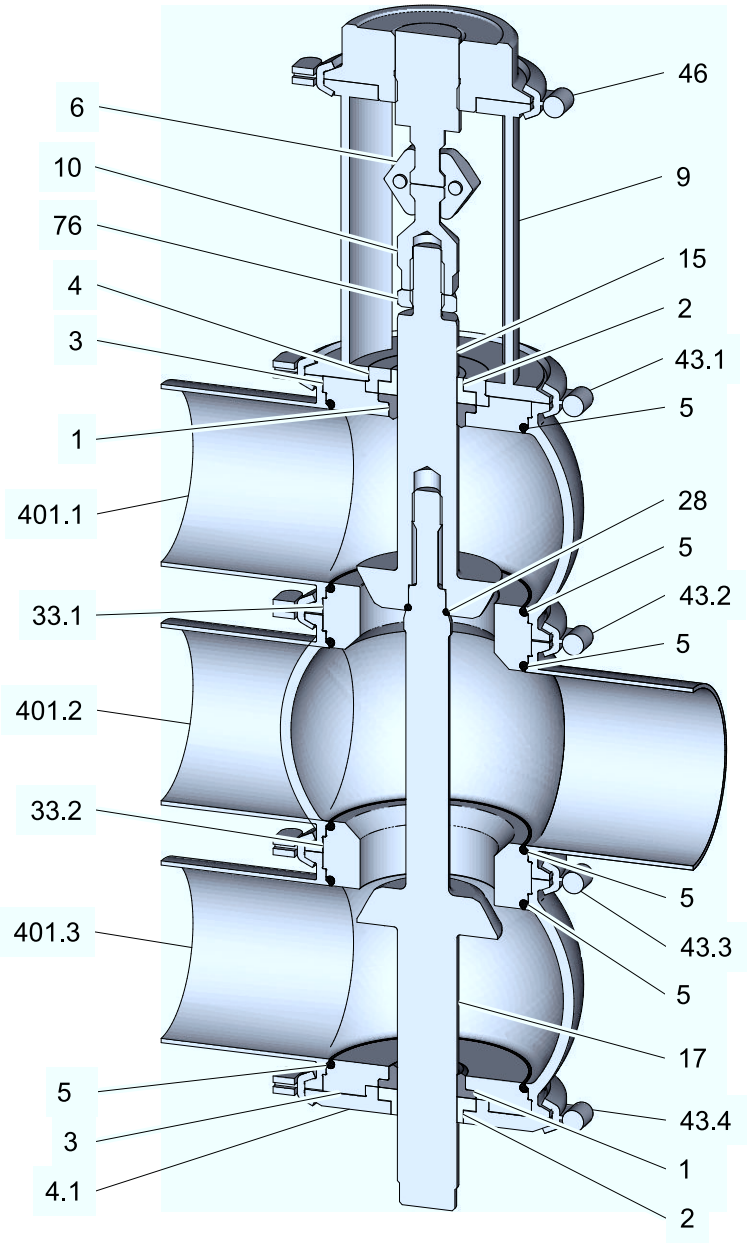

Fig.15

Prerequisite:

- No positioner must be actuated electrically or manually.

⚠ Warning!

Spring tension in the valve (spring-to-close action)

Danger of injury when detaching the clamp connections (43, 46) 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 max. 6 or 7 bar (depending on the type of positioner) or by mechanically adjusting the control cone.

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.
► Do not put the valve insert down on the valve disk
► Work carefully when disassembling the valve.

Carry out the following steps:

1. Raise the valve disk (17).
   → Spring-closing valve: Vent the actuator.
   → Spring-opening valve: pressurize the actuator.
2. Remove the clamp connection (43.3).
3. Pull the valve out of the housing (401.3).

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

   !Protect the valve parts against impact stress.

   ! The seat ring (33.1) is placed freely in the housing and can hit the valve disk when the valve is moved.
4. Lower the valve disk (15).
   → Spring-closing valve: Vent the actuator.
   → Spring-opening valve: pressurize the actuator with compressed air (max. 8 bar).
5. Unscrew the valve disk (17) with an open end spanner.
6. Remove the seat ring (33.1) from the housing.
7. Raise the valve disk (15).
   → Spring-closing valve: Vent the actuator.
   → Spring-opening valve: pressurize the actuator.
8. Remove the clamp connection (43.1) between the motor stool (9) and the housing (401.1).
9. Spring-closing valve: Depressurize the actuator (A) and detach the air supply.

10. Carefully pull the valve insert complete with actuator (A) and motor stool (9) upwards to remove it from the valve housing (401.1).

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

11. Unscrew the coupling clips (6).
12. Loosen the nut (76) and the adapter (10) and turn them downwards on the valve disk (15).
13. Remove the clamp connection (46), take off the actuator (A) and the motor stool (9).
14. Unscrew the nut (76) and adapter (10) from the valve disk (15).

    → Sealing ring (1), bearing (2), sealing disk (3), bearing disk (4), O-ring (5) and valve disk (15) with V-ring (7) are accessible.

→ Valve X has been disassembled.

10.5.3 Disassembling the 3-Stage Seat / Double Stem Guide

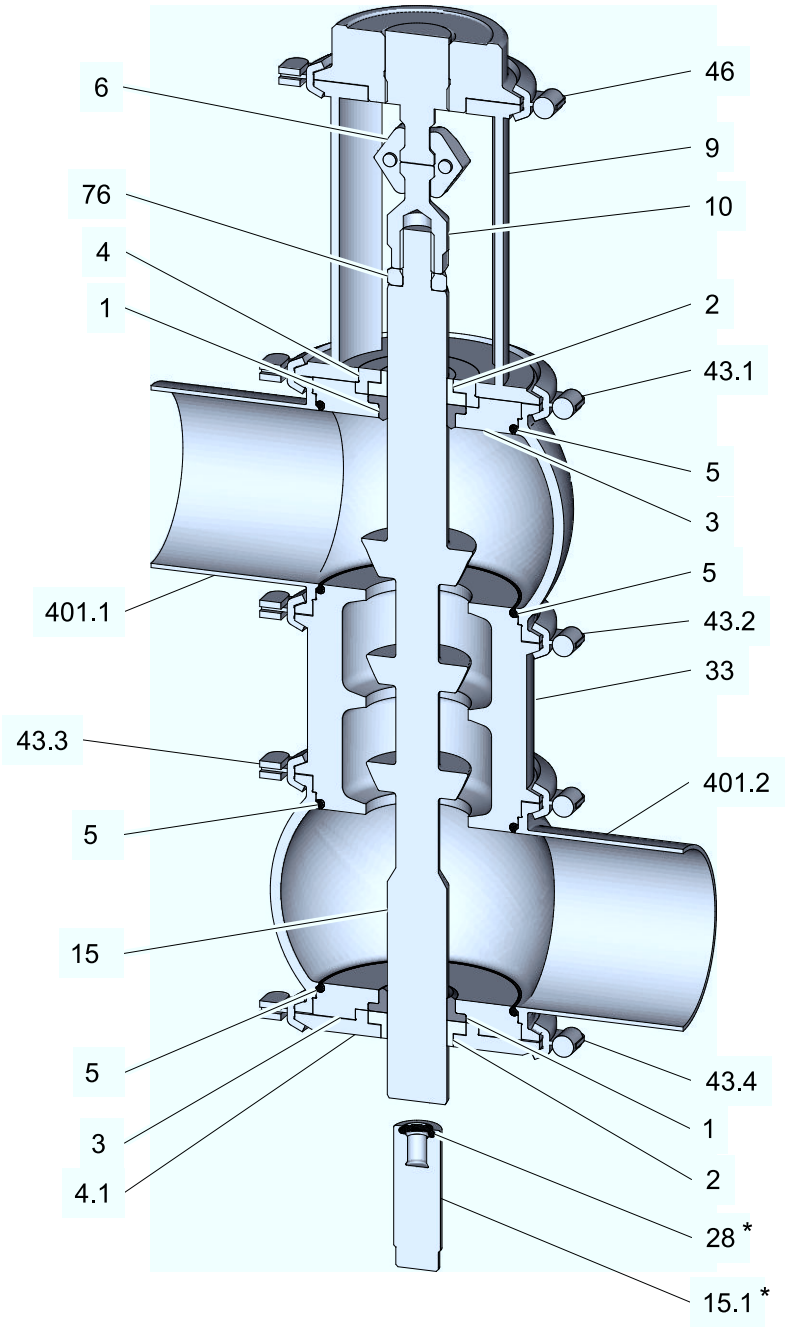

Fig.16

* only valid for DN 25 and 1" OD

Prerequisite:

- No positioner must be actuated electrically or manually.

⚠ Warning!

Spring tension in the valve (spring-to-close action)

Danger of injury when detaching the clamp connections (43, 46) 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 max. 6 or 7 bar (depending on the type of positioner) or by mechanically adjusting the control cone.

Notice

Sensitive valve parts

Damage to valve parts.

► Protect the valve parts against impact stress.
► Do not put the valve insert down on the valve disk
► Work carefully when disassembling the valve.

Carry out the following steps:

1. Pressurize the actuator (A) via connection (X) (spring-to-close action).

   → The valve opens, spring tension has been relieved.

2. Remove the clamp connection (43.1) between the housing (401.1) and the motor stool (9).
3. Depressurize the actuator (A) and detach the air supply.
4. Unscrew the coupling clips (6).
5. Loosen the nut (76) and the adapter (10) and turn them downwards on the valve disk (15).
6. Remove the clamp connection (46), take off the actuator (A) and the motor stool (9).
7. Unscrew the nut (76) and adapter (10) from the valve disk (15).
8. Detach the clamp connection (43.3) on the lower valve housing.

   → Sealing ring (1), bearing (2), sealing disk (3), bearing disk (4.1) and O-ring (5) are accessible.

9. On DN 25/1" OD, also unscrew valve disk (15.1) and O-ring (28) from valve disk (15).

→ Done

10.5.4 Dismantling the Actuator Back Plate

Prerequisite:

- Depending on the type and size of the control valve, prestressed actuators can be fitted with a certain number of over-long screws. If this is not the case, at least 2 opposite short screws must be replaced by long ones.

⚠ Warning!

Spring tension in the valve

Danger of injury when opening the back plate as the released spring pretension will suddenly lift the back plate.

► Therefore never slacken all the screws of the back plate at the same time.

Carry out the following steps:

1. Remove the hex nuts (A.1) of the short screws.

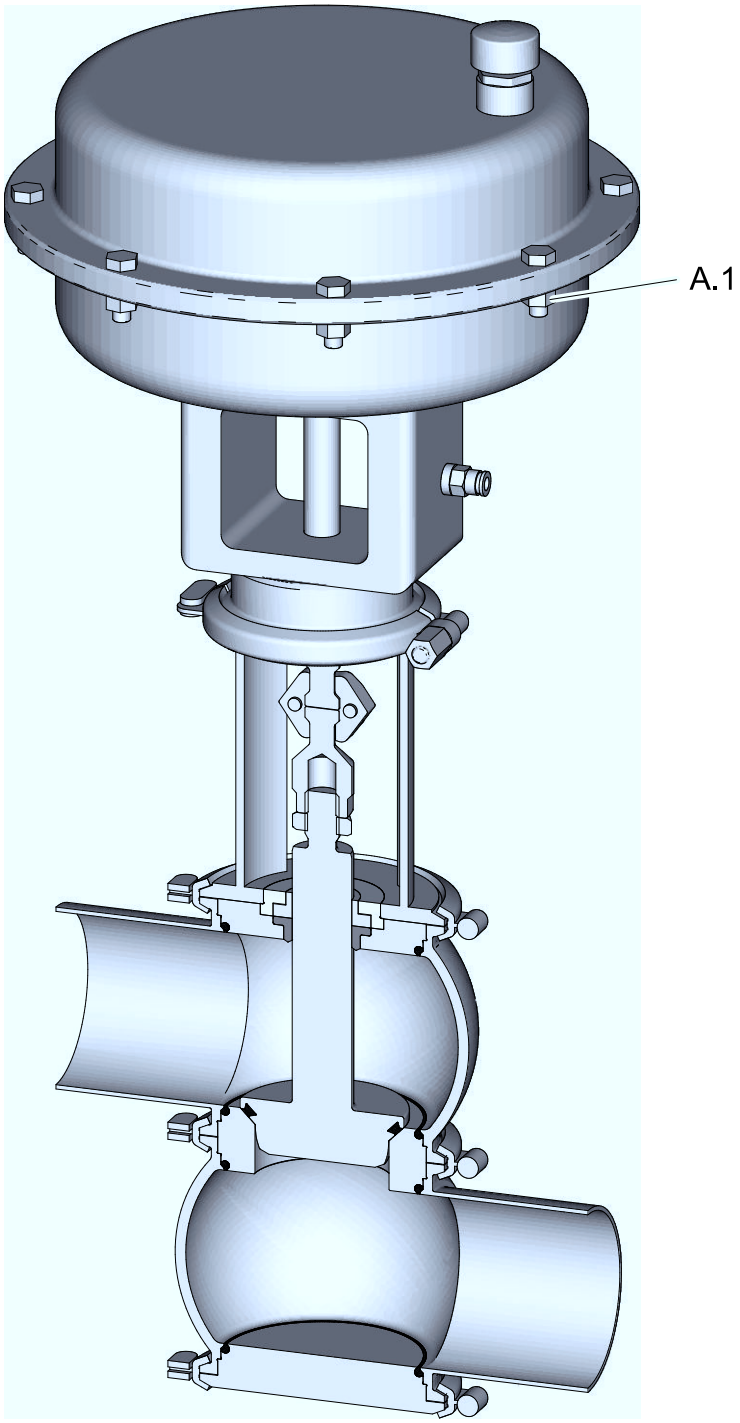

Fig.17

2. Slacken the hex nuts of the long screws slowly and at evenly distributed points along the circumference so that the two housing parts drift apart and the spring pretension is reduced.

→ Done

10.6 Maintenance

10.6.1 Cleaning the Valve

Notice

Sealing grooves and contact surfaces are precision areas.

Damage to the valve can result in a malfunction.

► Observe the safety information sheets issued by the detergent manufacturers!
► Only use detergents which are not aggressive towards the materials of the valve, and which are non-abrasive.

Carry out the following steps:

1. Carefully clean the individual parts.

→ Done

10.6.2 Replacing Seals

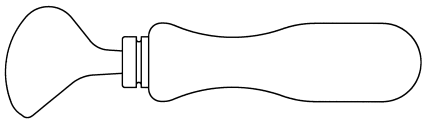

Fig.18: Insertion tool

Prerequisite:

- Use the insertion tool to fit the V-ring.
- Insert V-Ring 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.

Replacing the O-Ring

→ Replace all seals which are identified in the spare parts drawing, but only exchange the housing O-rings if they are defective. Also observe the short instructions enclosed with the sealing kits.

Replacing the V-Ring

⚠ 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.

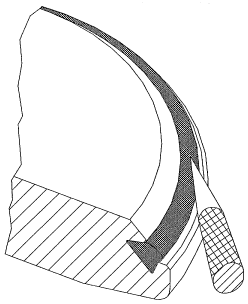

Fig.19

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. Put in the V-ring. Make sure the installation position of the V-ring is correct (see illustration).

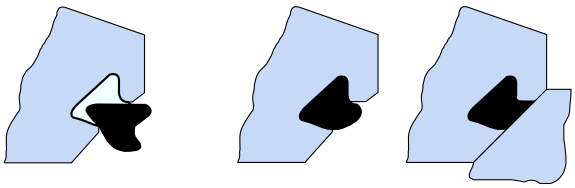

Fig.20

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

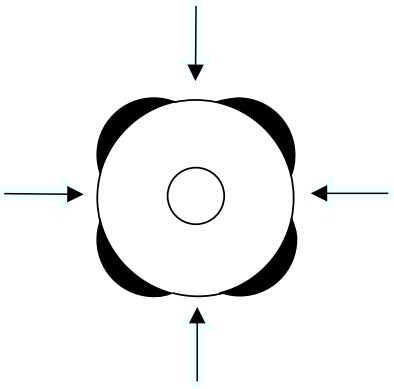

Fig.21

5. Insert the V-ring evenly.

→ Done

Hint!

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

10.6.3 Lubricating Seals and Threads

⚠ Caution!

Damage to seals and threads

Damage to seals and threads can result in a 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 information sheets issued by the lubricant manufacturer!

Carry out the following steps:

1. Lightly grease the valve disk thread.
2. Apply a light film of lubricant to all seals which do not come into contact with product.

   ! Do not grease the V-ring
3. Grease all screws.
4. Grease the balancer.

→ 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!

10.7 Installation

10.7.1 Control valve

Carry out the following steps:

1. Assemble control valve and housing in the reverse order of disassembly.

! Pay attention that the seat rings are positioned correctly: Soft sealing valve disks: inclined seating surface must face the valve disk (A). Metallically sealing valve disks: pointed edge must face the valve disk (B).

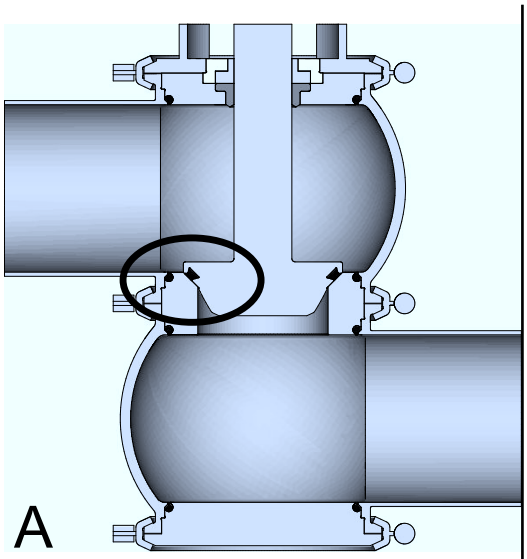

Fig.22

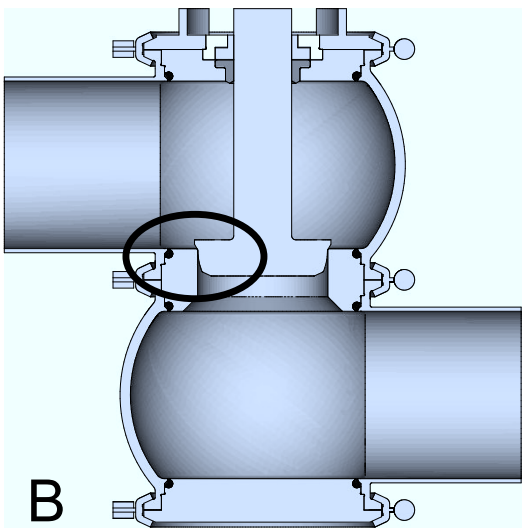

Fig.23

2. Restore the tension of the actuator spring.
3. Check the valve function by actuation using compressed air or signal current.

→ Done

10.8 Checking the function

Setting the valve stroke

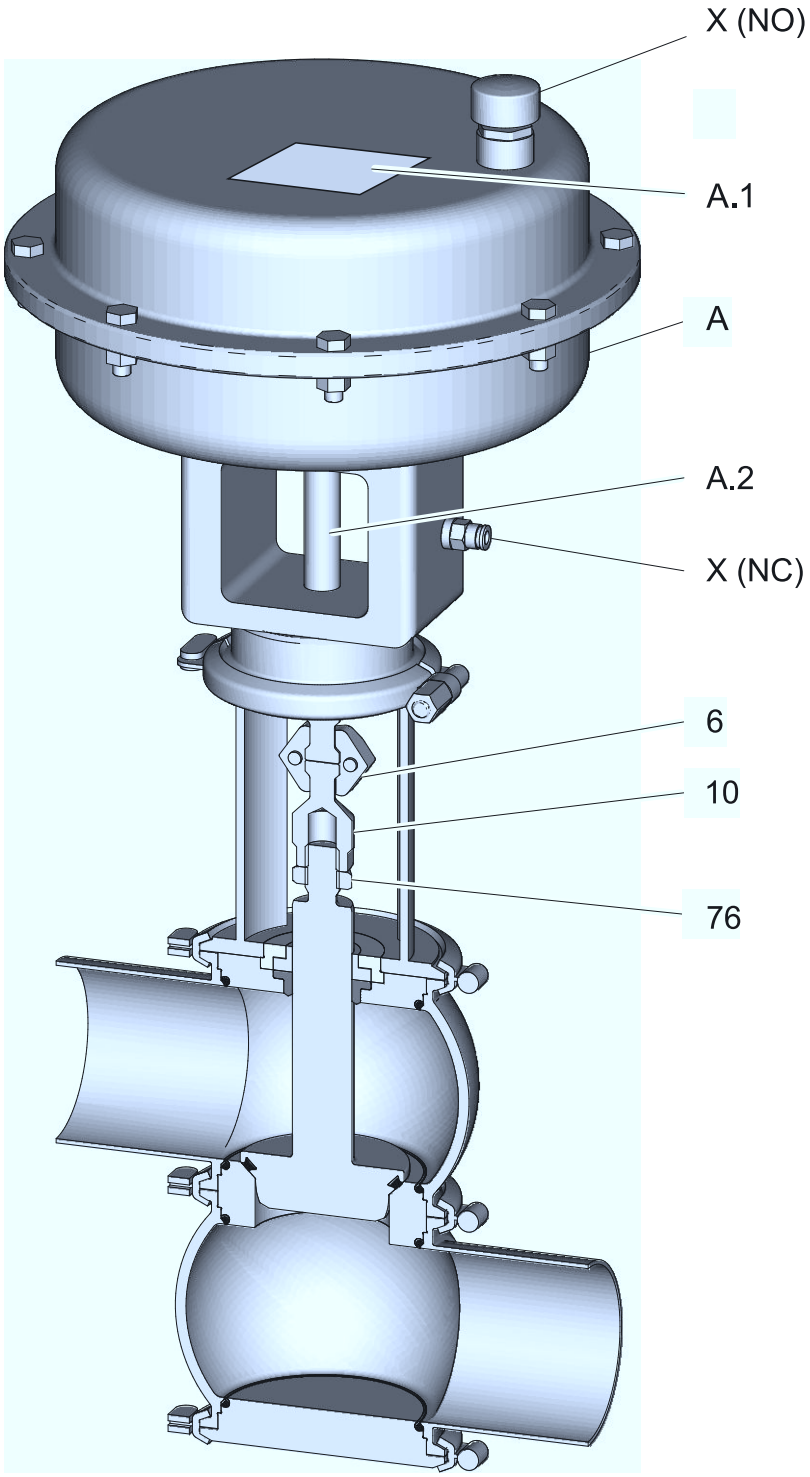

Fig.24

Prerequisite:

- Valve has been completely fitted into the housing.

10.8.1 Setting the valve stroke

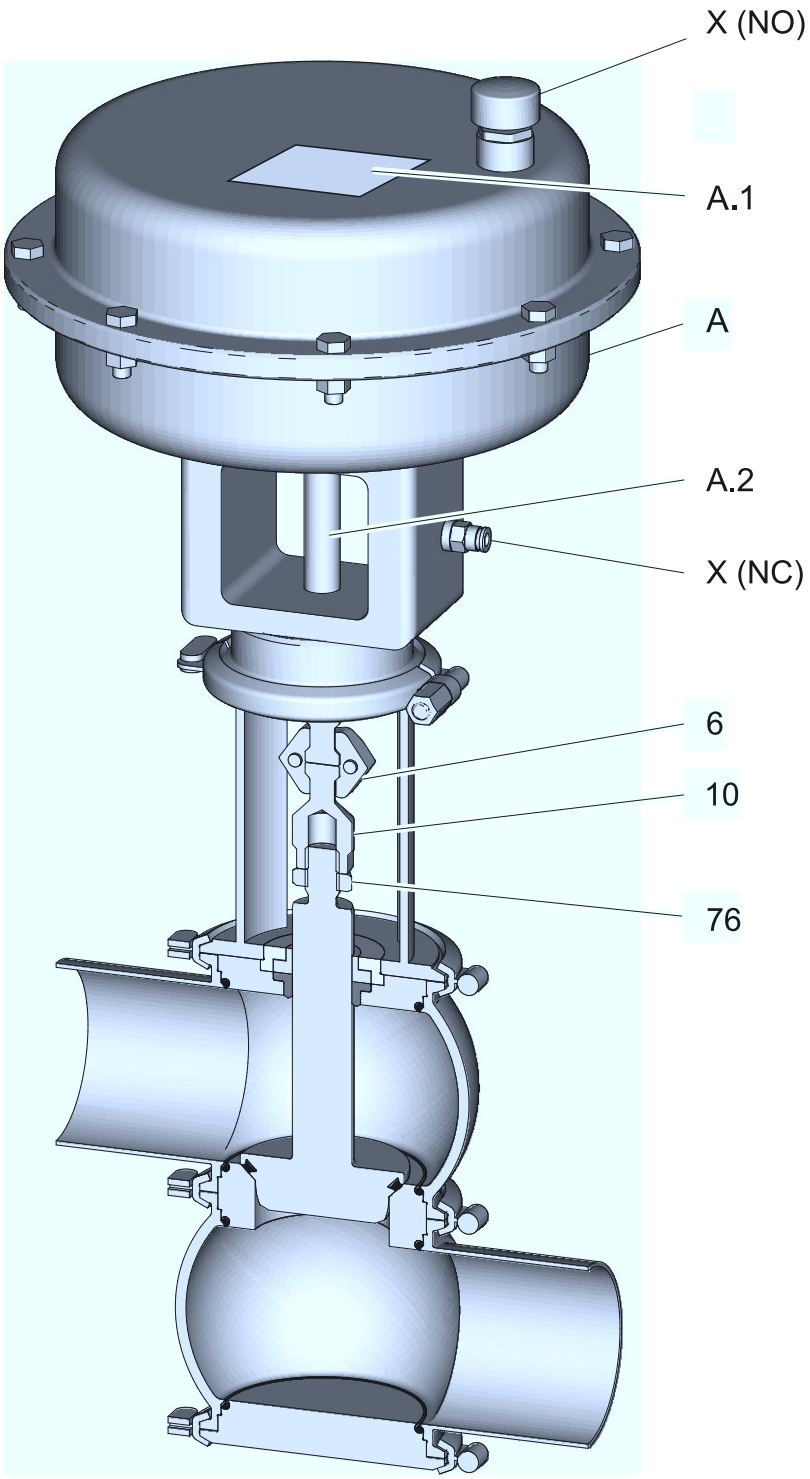

Fig.25

- Valve has been completely fitted into the housing.

10.8.1.1 NC: Valve in closed position

Carry out the following steps:

1. Remove the coupling clips (6).

2. Actuate the valve with compressed air (for data refer to type plate of the actuator):

   → 2.7 bar/39 psi in this case

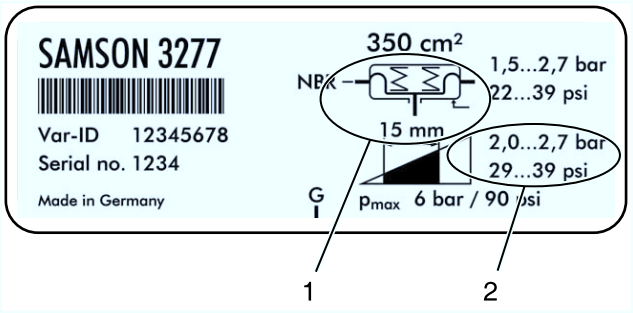

Fig.26

1 stroke

2 air pressure

3. Release the lock nut (76).
4. Set the stroke between the adapter (10) and the actuator stem (A.2), see type plate; here: 15 mm.
5. Continue to turn the adapter (10):

   → metallic seal: one quarter of a turn

   → Soft (V-ring) seal: one turn to one and a half turns
6. Remove compressed air and the compressed air connection.
7. Tighten the lock nut (76).
8. Tighten the coupling clip (6).
9. Check the valve stroke.

   → If the valve stroke is too high or too low, adjust the adapter (10) until the required valve stroke is reached. Also see "Valve stroke table" (page TBD).
10. Perform the SET-UP.

→ Done

10.8.1.2 NO: Valve in open position

Carry out the following steps:

1. Actuate the valve with compressed air via X(NO) (for data refer to type plate of the actuator):

   → 2.7 bar/39 psi in this case

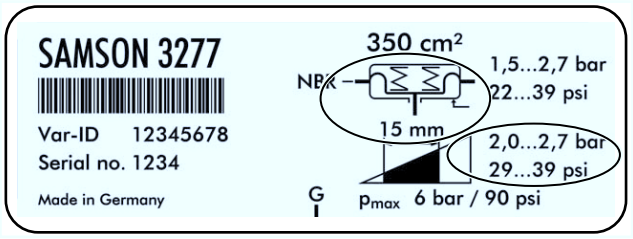

Fig.27

2. Remove the coupling clips (6).
3. Release the lock nut (76).
4. Remove the compressed air.
5. Set the stroke between the adapter (10) and the actuator stem (A.2), see type plate; here: 15 mm.
6. Continue to turn the adapter (10):
   → metallic seal: one quarter of a turn
   → Soft (V-ring) seal: one turn to one and a half turns
7. Actuate the valve with compressed air via X(NO) (for data refer to type plate of the actuator):
   → 2.7 bar/39 psi in this case

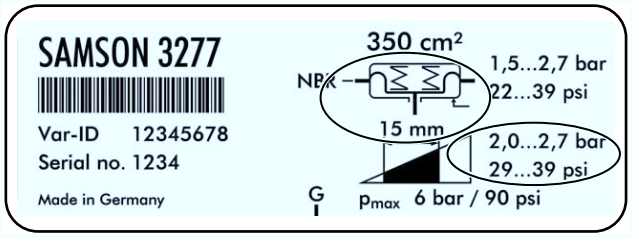

Fig.28

8. Tighten the lock nut (76).
9. Tighten the coupling clips (6).
10. Check valve stroke, see "Valve stroke table" (page 53).
11. Perform the SET-UP.

→ Done

10.8.2 Valve Stroke

Strokes Depending on Size

Valve Stroke	
Actuator type/size	**Valve stroke [mm]**
175	15
350	15
750	15; 30

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
	Valve disk blocked mechanically	Clear the blockage
	Stroke scanning lever has shifted	Readjust the stroke scanning lever
	Actuator not working correctly as a result of the control air being soiled	Check the control air quality Replace the positioner
	Diaphragm defective	Replace the diaphragm
Valve does not close	Dirt/foreign materials in the valve housing	Clean valve housing and valve seat
	Valve stroke too short as air pressure too low	Check the compressed air supply
Leakage at the housings	O-ring/V-ring defective	Disassemble the valve housing. Replace the seals

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 20.

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 - VARIVENT control valve type S S_F/S_J

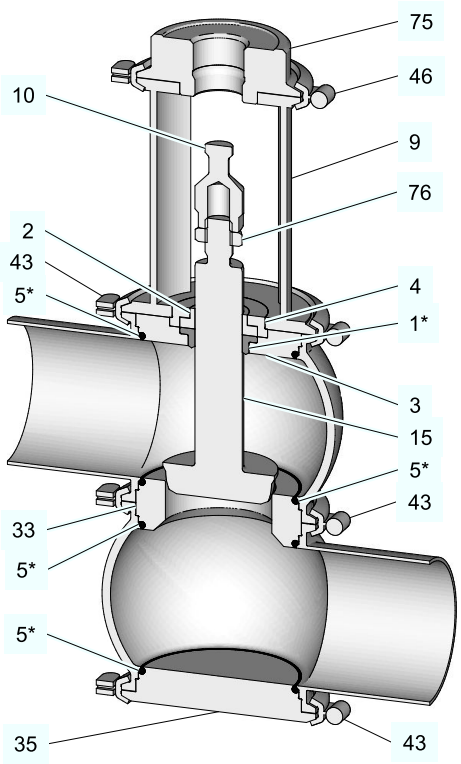

Fig.29: Metallic seal

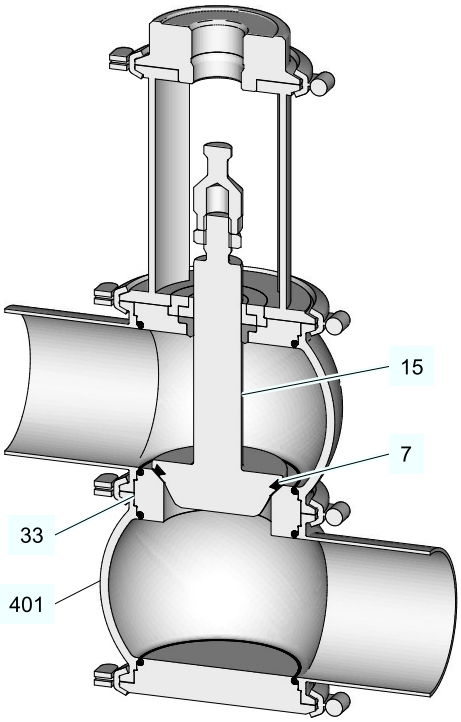

Fig.30: Soft sealing

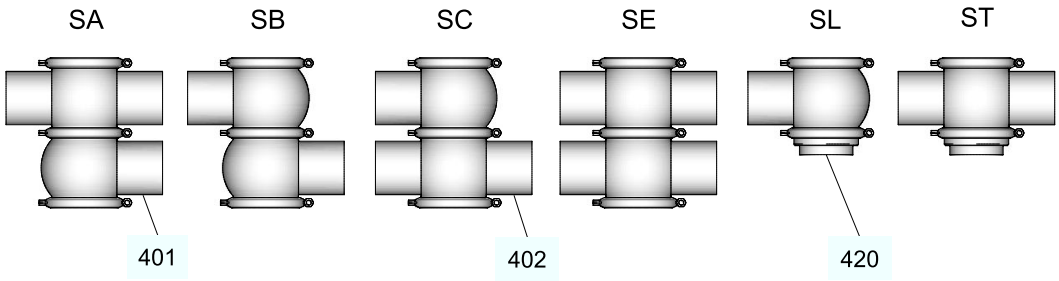

Fig.31: Housing combinations

Spare parts list, item 1-5, metric sizes (DN 25 - DN 65)						
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085
		FKM	924-082	924-082	924-082	924-083
		FFKM	924-340	924-340	924-340	924-341
		HNBR	924-311	924-311	924-311	924-313
2*	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002
	Bearing, 3A	SUSTA-PVDF	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	224-142.02	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
		FFKM	930-873	930-875	930-875	930-876
		HNBR	930-632	930-633	930-633	930-634
Items marked with an * are wearing parts						

Spare parts list, item 1-5, metric sizes (DN 80 - DN 150)						
Item	**Designation**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
1*	Seal ring	EPDM	924-085	924-085	924-088	924-088
		FKM	924-083	924-083	924-087	924-087
		FFKM	924-341	924-341	--	--
		HNBR	924-313	924-313	--	--
2*	Bearing	PTFE/carbon	935-002	935-002	935-003	935-003
	Bearing, 3A	SUSTA-PVDF	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	221-142.04
5*	O-ring	EPDM	930-150	930-156	930-372	930-260
		FKM	930-176	930-178	930-409	930-259
		FFKM	930-876	930-877	--	--
		HNBR	930-634	930-863	--	--
Items marked with an * are wearing parts						

Spare parts list V-ring, metric sizes (DN 25 - DN 65)							
Item	**Designation**	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
7*	V-ring	0.1	EPDM FKM FFKM HNBR	--	--	--	--
		0.16		--	--	--	--
		0.25		932-064	--	--	--
		0.4		932-073	--	--	--
		0.63		932-120	--	--	--
		1		932-083	--	--	--
		1.6		--	--	--	--
		2.5		--	--	--	--
		4		--	--	--	--
		6.3	EPDM	932-017	932-017	--	--
			FKM	932-029	932-029	--	--
			FFKM	932-111	932-111	--	--
			HNBR	932-085	932-085	--	--
		10.0	EPDM	932-017	932-017	932-017	--
			FKM	932-029	932-029	932-029	--
			FFKM	932-111	932-111	932-111	--
			HNBR	932-085	932-085	932-085	--
		16.0	EPDM	--	932-046	932-046	--
			FKM	--	932-030	932-030	--
			FFKM	--	932-110	932-110	--
			HNBR	--	932-087	932-087	--
		25.0	EPDM	--	932-019	932-019	932-019
			FKM	--	932-032	932-032	932-032
			FFKM	--	932-113	932-113	932-113
			HNBR	--	932-084	932-084	932-084
		35.0	EPDM	--	--	932-021	932-021
			FKM	--	--	932-033	932-033
			FFKM	--	--	932-114	932-114
			HNBR	--	--	932-088	932-088
		40.0	EPDM	--	--	932-021	932-021
			FKM	--	--	932-033	932-033
			FFKM	--	--	932-114	932-114
			HNBR	--	--	932-088	932-088
		60.0	EPDM	--	--	--	932-023
			FKM	--	--	--	932-034
			FFKM	--	--	--	932-115
			HNBR	--	--	--	932-089

Spare parts list V-ring, metric sizes (DN 80 - DN 150)							
Item	**Designation**	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
7*	V-ring	35.0	EPDM	932-021	--	--	--
			FKM	932-033	--	--	--
			FFKM	932-114	--	--	--
			HNBR	932-088	--	--	--
		40.0	EPDM	932-021	--	--	--
			FKM	932-033	--	--	--
			FFKM	932-114	--	--	--
			HNBR	932-088	--	--	--
		60.0	EPDM	932-023	932-023	--	--
			FKM	932-034	932-034	--	--
			FFKM	932-115	932-115	--	--
			HNBR	932-089	932-089	--	--
		80.0	EPDM	932-024	932-025	--	--
			FKM	932-035	932-036	--	--
			FFKM	932-116	--	--	--
			HNBR	932-090	(932-101)	--	--
		100	EPDM	--	932-025	932-025	--
			FKM	--	932-036	932-036	--
			FFKM	--	--	--	--
			HNBR	--	(932-101)	(932-101)	--
		160	EPDM	--	932-028	932-028	--
			FKM	--	932-039	932-039	--
			FFKM	--	932-119	932-119	--
			HNBR	--	932-100	932-100	--
		200	EPDM	--	--	932-059	932-059
			FKM	--	--	932-063	932-063
			FFKM	--	--	--	--
			HNBR	--	--	--	--
		260	EPDM	--	--	932-060	932-045
			FKM	--	--	932-062	932-044
			FFKM	--	--	--	--
			HNBR	--	--	--	--
		360	EPDM	--	--	--	932-042
			FKM	--	--	--	932-041
			HNBR	--	--	--	--

Spare parts list, item 9, metric sizes (DN 25 - DN 65)						
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
9	Lantern	1.4301	229-167.02	229-168.11	229-168.07	229-168.08

Spare parts list, item 10, metric sizes (DN 25 - DN 65)							
Item	**Designation**	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	0.1	1.4301	229-322.01	--	--	--
		0.16	1.4301	229-322.01	--	--	--
		0.25	1.4301	229-322.01	--	--	--
		0.4	1.4301	229-322.01	--	--	--
		0.63	1.4301	229-322.01	--	--	--
		1	1.4301	229-322.01	--	--	--
		1.6	1.4301	229-322.01	--	--	--
		2.5	1.4301	229-322.01	--	--	--
		4.0	1.4301	229-322.01	--	--	--
		6.3	1.4301	229-322.01	229-322.02	--	--
		10	1.4301	229-322.01	229-322.02	229-322.02	--
		16	1.4301	--	229-322.01	229-322.02	--
		25	1.4301	--	229-322.01	229-322.02	229-322.25
		35	1.4301	--	--	229-322.02	229-322.25
		40	1.4301	--	--	229-322.02	229-322.25
		60	1.4301	--	--	--	229-322.25
		80	1.4301	--	--	--	--
		100	1.4301	--	--	--	--
		160	1.4301	--	--	--	--
		200	1.4301	--	--	--	--
		260	1.4301	--	--	--	--
		360	1.4301	--	--	--	--

Spare parts list, item 9, metric sizes (DN 80 - DN 150)						
Item	**Designation**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
9	Lantern	1.4301	229-168.08	229-168.09	229-168.10	229-168.31

Spare parts list, item 10, metric sizes (DN 80 - DN 150)							
Item	**Designation**	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	0.1	1.4301	--	--	--	--
		0.16	1.4301	--	--	--	--
		0.25	1.4301	--	--	--	--
		0.4	1.4301	--	--	--	--
		0.63	1.4301	--	--	--	--
		1	1.4301	--	--	--	--
		1.6	1.4301	--	--	--	--
		2.5	1.4301	--	--	--	--
		4.0	1.4301	--	--	--	--
		6.3	1.4301	--	--	--	--
		10	1.4301	--	--	--	--
		16	1.4301	--	--	--	--
		25	1.4301	--	--	--	--
		35	1.4301	229-322.22	--	--	--
		40	1.4301	229-322.22	--	--	--
		60	1.4301	229-322.22	229-322.22	--	--
		80	1.4301	229-322.22	229-322.22	--	--
		100	1.4301	--	229-322.25	229-322.22	--
		160	1.4301	--	229-322.25	229-322.22	--
		200	1.4301	--	--	229-322.22	229-322.22
		260	1.4301	--	--	229-322.22	229-322.22
		360	1.4301	--	--	--	229-322.22

Spare parts list valve disk SFM, equal percentage, metallic seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
15	0.1	1.4404	on request	--	--	--
	0.16	1.4404	on request	--	--	--
	0.25	1.4404	on request	--	--	--
	0.4	1.4404	on request	--	--	--
	0.63	1.4404	on request	--	--	--
	1	1.4404	on request	--	--	--
	1.6	1.4404	221-762.63	--	--	--
	2.5	1.4404	221-762.65	--	--	--
	4.0	1.4404	221-762.67	--	--	--
	6.3	1.4404	221-762.69	221-762.69	--	--
	10	1.4404	221-762.71	221-762.71	221-762.73	--
	16	1.4404	--	221-762.75	221-762.75	--
	25	1.4404	--	221-762.77	221-762.77	221-762.79
	35	1.4404	--	--	221-762.81	221-762.83
	40	1.4404	--	--	221-762.85	221-762.88
	60	1.4404	--	--	--	221-762.01
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--
	200	1.4404	--	--	--	--
	260	1.4404	--	--	--	--
	360	1.4404	--	--	--	--

Spare parts list valve disk SFM, equal percentage, metallic seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4.0	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	--	--	--	--
	35	1.4404	221-762.83	--	--	--
	40	1.4404	221-762.88	--	--	--
	60	1.4404	221-762.01	221-762.02	--	--
	80	1.4404	221-762.91	221-762.94	--	--
	100	1.4404	--	on request	on request	--
	160	1.4404	--	on request	on request	--
	200	1.4404	--	--	on request	on request
	260	1.4404	--	--	on request	on request
	360	1.4404	--	--	--	on request

Spare parts list valve disk SJM, linear, metallic seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
15	0.1	1.4404	on request	--	--	--
	0.16	1.4404	on request	--	--	--
	0.25	1.4404	on request	--	--	--
	0.4	1.4404	on request	--	--	--
	0.63	1.4404	on request	--	--	--
	1	1.4404	on request	--	--	--
	1.6	1.4404	on request	--	--	--
	2.5	1.4404	on request	--	--	--
	4.0	1.4404	on request	--	--	--
	6.3	1.4404	on request	on request	--	--
	10	1.4404	on request	on request	on request	--
	16	1.4404	--	on request	on request	--
	25	1.4404	--	on request	on request	on request
	35	1.4404	--	--	on request	on request
	40	1.4404	--	--	221-762.87	221-762.89
	60	1.4404	--	--	--	221-762.05
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--
	200	1.4404	--	--	--	--
	260	1.4404	--	--	--	--
	360	1.4404	--	--	--	--

Spare parts list valve disk SJM, linear, metallic seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4.0	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	--	--	--	--
	35	1.4404	on request	--	--	--
	40	1.4404	221-762.89	--	--	--
	60	1.4404	221-762.05	221-762.06	--	--
	80	1.4404	221-762.93	221-762.95	--	--
	100	1.4404	--	on request	on request	--
	160	1.4404	--	221-762.97	221-762.99	--
	200	1.4404	--	--	on request	on request
	260	1.4404	--	--	221-762.101	221-762.101
	360	1.4404	--	--	--	on request

Spare parts list valve disk SFW, equal percentage, with V-ring seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
15	0.1	1.4404	on request	--	--	--
	0.16	1.4404	on request	--	--	--
	0.25	1.4404	on request	--	--	--
	0.4	1.4404	on request	--	--	--
	0.63	1.4404	on request	--	--	--
	1	1.4404	on request	--	--	--
	1.6	1.4404	221-762.62	--	--	--
	2.5	1.4404	221-762.64	--	--	--
	4.0	1.4404	221-762.66	--	--	--
	6.3	1.4404	221-762.68	221-762.68	--	--
	10	1.4404	221-762.70	221-762.70	221-762.72	--
	16	1.4404	--	221-762.74	221-762.74	--
	25	1.4404	--	221-762.76	221-762.76	221-762.78
	35	1.4404	--	--	221-762.80	221-762.82
	40	1.4404	--	--	221-762.84	221-762.48
	60	1.4404	--	--	--	221-762.03
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--
	200	1.4404	--	--	--	--
	260	1.4404	--	--	--	--
	360	1.4404	--	--	--	--

Spare parts list valve disk SFW, equal percentage, with V-ring seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4.0	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	--	--	--	--
	35	1.4404	221-762.82	--	--	--
	40	1.4404	221-762.48	--	--	--
	60	1.4404	221-762.03	221-762.04	--	--
	80	1.4404	221-762.90	221-762.49	--	--
	100	1.4404	--	on request	221-762.50	--
	160	1.4404	--	on request	on request	--
	200	1.4404	--	--	on request	on request
	260	1.4404	--	--	on request	on request
	360	1.4404	--	--	--	on request

Spare parts list valve disk SJW, linear with V-ring seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
15	0.1	1.4404	on request	--	--	--
	0.16	1.4404	on request	--	--	--
	0.25	1.4404	on request	--	--	--
	0.4	1.4404	on request	--	--	--
	0.63	1.4404	on request	--	--	--
	1	1.4404	on request	--	--	--
	1.6	1.4404	on request	--	--	--
	2.5	1.4404	on request	--	--	--
	4.0	1.4404	on request	--	--	--
	6.3	1.4404	on request	on request	--	--
	10	1.4404	on request	on request	on request	--
	16	1.4404	--	on request	on request	--
	25	1.4404	--	on request	on request	on request
	35	1.4404	--	--	on request	on request

Spare parts list valve disk SJW, linear with V-ring seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
	40	1.4404	--	--	221-762.86	221-762.51
	60	1.4404	--	--	--	221-762.07
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--
	200	1.4404	--	--	--	--
	260	1.4404	--	--	--	--
	360	1.4404	--	--	--	--

Spare parts list valve disk SJW, linear with V-ring seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4.0	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	--	--	--	--
	35	1.4404	on request	--	--	--
	40	1.4404	221-762.51	--	--	--
	60	1.4404	221-762.07	221-762.08	--	--
	80	1.4404	221-762.92	221-762.52	--	--
	100	1.4404	--	on request	221-762.53	--
	160	1.4404	--	221-762.96	221-762.98	--
	200	1.4404	--	--	on request	on request
	260	1.4404	--	--	221-762.100	221-762.102
	360	1.4404	--	--	--	on request

Spare parts list seat ring S, metric sizes (DN 25 to DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
33	0.1	1.4404	221-107.102			
	0.16	1.4404	221-107.102			
	0.25	1.4404	221-107.102			
	0.4	1.4404	221-107.81			
	0.63	1.4404	221-107.81			
	1	1.4404	221-107.81			
	1.6	1.4404	221-107.24			
	2.5	1.4404	221-107.24			
	4	1.4404	221-107.24			
	6.3	1.4404	221-107.25	221-107.27		
	10	1.4404	221-107.25	221-107.27	221-107.27	
	16	1.4404	--	221-107.28	221-107.28	
	25	1.4404	--	221-107.29	221-107.29	221-107.31
	35	1.4404	--	--	221-107.30	221-107.32
	40	1.4404	--	--	221-107.30	221-107.32
	60	1.4404	--	--	--	221-107.33

Spare parts list seat ring S, metric sizes (DN 80 to DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
33	35	1.4404	221-107.32	--	--	--
	40	1.4404	221-107.32	--	--	--
	60	1.4404	221-107.33	221-107.35	--	--
	80	1.4404	221-107.34	221-107.36	--	--
	100	1.4404	--	221-107.36	221-107.103	--
	160	1.4404	--	221-107.37	221-107.104	--
	200	1.4404	--	--	221-107.89	221-107.40
	260	1.4404	--	--	221-107.39	221-107.41
	360	1.4404	--	--	--	221-107.105

Spare parts list, items 35, 43, 46, 75, 76, 401 and 402, metric sizes (DN 25 - DN 65)						
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
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
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.10	229-322.10**

Spare parts list, items 35, 43, 46, 75, 76, 401 and 402, metric sizes (DN 25 - DN 65)						
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117
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
** in non-actuated position NO the adapter 229-322.60 is required						

Spare parts list, items 35, 43, 46, 75, 76, 401 and 402, metric sizes (DN 80 - DN 150)						
Item	**Designation**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
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
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.21	229-322.21
76	Hexagon nut	1.4301	910-117	910-117	910-117	910-117
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

Spare parts list housing connection S, metallic seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
420	0.1	1.4404	221-407.103	--	--	--
	0.16	1.4404	221-407.103	--	--	----
	0.25	1.4404	221-407.103	--	--	--
	0.4	1.4404	221-131.33	--	--	--
	0.63	1.4404	221-131.33	--	--	--
	1	1.4404	221-131.33	--	--	--
	1.6	1.4404	221-131.20	--	--	--
	2.5	1.4404	221-131.20	--	--	--
	4	1.4404	221-131.20	--	--	--
	6.3	1.4404	221-131.97	221-131.91	--	--
	10	1.4404	221-131.97	221-131.91	221-132.104	--
	16	1.4404	--	221-131.90	221-131.99	--
	25	1.4404	--	221-131.96	221-132.51	221-131.92
	35	1.4404	--	--	221-132.46	221-132.56
	40	1.4404	--	--	221-132.46	221-132.56
	60	1.4404	--	--	--	221-131.28

Spare parts list housing connection S, metallic seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
420	35	1.4404	221-132.105	--	--	--
	40	1.4404	221-132.105	--	--	--
	60	1.4404	221-132.53	221-131.09	--	--
	80	1.4404	221-131.80	221-131.83	--	--
	100	1.4404	--	221-131.83	221-132.108	--
	160	1.4404	--	221-131.81	221-132.109	--
	200	1.4404	--	--	221-407.77	221-132.107
	260	1.4404	--	--	221-004629	221-132.110
	360	1.4404	--	--	--	221-132.111

Spare parts list housing connection S, for V-ring seal, metric sizes (DN 25 - DN 65)						
Item	**K_{VS} value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**
420	0.1	1.4404	221-407.115	--	--	--
	0.16	1.4404	221-407.115	--	--	--
	0.25	1.4404	221-407.115	--	--	--
	0.4	1.4404	221-131.19	--	--	--
	0.63	1.4404	221-131.19	--	--	--
	1	1.4404	221-131.19	--	--	--
	1.6	1.4404	221-131.94	--	--	--
	2.5	1.4404	221-131.94	--	--	--
	4	1.4404	221-131.94	--	--	--
	6.3	1.4404	221-407.97	221-407.99	--	--
	10	1.4404	221-407.97	221-407.99	221-407.104	--
	16	1.4404	--	221-407.60	221-407.61	--
	25	1.4404	--	221-407.63	221-407.56	221-132.16
	35	1.4404	--	--	221-131.95	221-132.92
	40	1.4404	--	--	221-131.95	221-132.92
	60	1.4404	--	--	--	221-407.58

Spare parts list housing connection S for V-ring seal, metric sizes (DN 80 - DN 150)						
Item	**K_{VS} value**	**Material**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
420	35	1.4404	221-407.105	--	--	--
	40	1.4404	221-407.105	--	--	--
	60	1.4404	221-407.59	221-407.81	--	--
	80	1.4404	221-407.57	221-131.02	--	--
	100	1.4404	--	221-131.02	221-407.106	--
	160	1.4404	--	221-131.21	221-407.107	--
	200	1.4404	--	--	221-132.17	221-407.109
	260	1.4404	--	--	221-407.108	221-407.87
	360	1.4404	--	--	--	221-407.111

Spare parts list housing combinations with EPDM seals, metric sizes								
Designation	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**	**DN 125**	**DN 150**
SA	--	--	--	--	--	--	--	--
SB	221-344.20	221-344.22	221-344.02	221-344.23	221-344.24	221-344.25	--	--
SC	--	--	--	--	--	--	--	--
SE	--	--	--	--	--	--	--	--
SL	221-344.07	221-344.09	221-344.10	--	221-344.12	--	--	--
ST	--	--	--	--	--	--	--	--

Spare parts list item 1-5, inch OD									
Item	**Designation**	**Material**	**1"**	**1.5"**	**2"**	**2.5"**	**3"**	**4"**	**6"**
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085	924-085	924-085	924-088
		FKM	924-082	924-082	924-082	924-083	924-083	924-083	924-087
		FFKM	924-340	924-340	924-340	924-341	924-341	924-341	--
		HNBR	924-311	924-311	924-311	924-313	924-313	924-313	--
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002	935-002	935-002	935-003
	Bearing, 3A	SUSTA-PVDF	935-098	935-098	935-098	935-099	935-099	935-099	935-102
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03	221-141.03	221-141.04	221-141.05
4	Bearing disc	1.4301	221-142.01	224-142.02	221-142.02	221-142.03	221-142.03	221-142.03	221-142.04
5*	O-ring	EPDM	930-309	930-144	930-144	930-150	930-150	930-156	930-260
		FKM	930-168	930-171	930-171	930-176	930-176	930-178	930-259
		FFKM	930-873	930-875	930-875	930-876	930-876	930-877	--
		HNBR	930-632	930-633	930-633	930-634	930-634	930-863	--
Items marked with an * are wearing parts									

Spare parts list V-ring, (K_{VS} 0.1- 160), inch OD										
Item	**Designation**	**K_{VS} value**	**Mate-rial**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
7*	V-ring	0.1 0.16 0.25 0.4 0.63 1 1.6 2.5 4	EPDM FKM FFKM HNBR	932-064 932-073 932-120 932-083	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	
		6.3	EPDM	932-017	932-017	--	--	--	--	
			FKM	932-029	932-029	--	--	--	--	
			FFKM	932-111	932-111	--	--	--	--	
			HNBR	932-085	932-085	--	--	--	--	
		10	EPDM	932-017	932-017	932-017	--	--	--	
			FKM	932-029	932-029	932-029	--	--	--	
			FFKM	932-111	932-111	932-111	--	--	--	
			HNBR	932-085	932-085	932-085	--	--	--	
		16	EPDM	--	932-046	932-046	--	--	--	
			FKM	--	932-030	932-030	--	--	--	
			FFKM	--	932-110	932-110	--	--	--	
			HNBR	--	932-087	932-087	--	--	--	
		25	EPDM	--	932-019	932-019	932-019	--	--	
			FKM	--	932-032	932-032	932-032	--	--	
			FFKM	--	932-113	932-113	932-113	--	--	
			HNBR	--	932-084	932-084	932-084	--	--	
		35	EPDM	--	--	932-021	932-021	932-021	--	
			FKM	--	--	932-033	932-033	932-033	--	
			FFKM	--	--	932-114	932-114	932-114	--	
			HNBR	--	--	932-088	932-088	932-088	--	
		40	EPDM	--	--	932-021	932-021	932-021	--	
			FKM	--	--	932-033	932-033	932-033	--	
			FFKM	--	--	932-114	932-114	932-114	--	
			HNBR	--	--	932-088	932-088	932-088	--	
		60	EPDM	--	--	--	932-023	932-023	932-023	
			FKM	--	--	--	932-034	932-034	932-034	
			FFKM	--	--	--	932-115	932-115	932-115	
			HNBR	--	--	--	932-089	932-089	932-089	
		80	EPDM	--	--	--	--	932-024	932-025	

Spare parts list V-ring, (K_{VS} 0.1- 160), inch OD										
Item	**Designation**	**K_{VS} value**	**Mate-rial**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
			FKM	--	--	--	--	932-035	932-036	
			FFKM	--	--	--	--	932-116	--	
			HNBR	--	--	--	--	932-090	(932-101)	
		100	EPDM	--	--	--	--	--	932-025	
			FKM	--	--	--	--	--	932-036	
			FFKM	--	--	--	--	--	--	
			HNBR	--	--	--	--	--	(932-101)	
		160	EPDM	--	--	--	--	--	932-028	
			FKM	--	--	--	--	--	932-039	
			FFKM	--	--	--	--	--	932-119	
			HNBR	--	--	--	--	--	932-100	
		200	EPDM	--	--	--	--	--	--	932-059
			FKM	--	--	--	--	--	--	932-063
			FFKM	--	--	--	--	--	--	--
			HNBR	--	--	--	--	--	--	--
		260	EPDM	--	--	--	--	--	--	932-045
			FKM	--	--	--	--	--	--	932-044
			FFKM	--	--	--	--	--	--	--
			HNBR	--	--	--	--	--	--	--
		360	EPDM	--	--	--	--	--	--	932-042
			FKM	--	--	--	--	--	--	932-041
			HNBR	--	--	--	--	--	--	--

Spare parts list, item 9, inch OD									
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
9	Lantern	1.4301	229-167.02	229-168.16	229-168.17	229-168.14	229-168.14	229-168.15	229-168.31

Spare parts list, item 10, inch OD										
Item	**Designation**	**K_{VS}-Value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	0.1	1.4301	229-167.02	--	--	--	--	--	--
		0.16	1.4301	229-322.01	--	--	--	--	--	--
		0.25	1.4301	229-322.01	--	--	--	--	--	--
		0.4	1.4301	229-322.01	--	--	--	--	--	--
		0.63	1.4301	229-322.01	--	--	--	--	--	--
		1	1.4301	229-322.01	--	--	--	--	--	--
		1.6	1.4301	229-322.01	--	--	--	--	--	--
		2.5	1.4301	229-322.01	--	--	--	--	--	--
		4.0	1.4301	229-322.01	--	--	--	--	--	--
		6.3	1.4301	229-322.01	229-322.02	--	--	--	--	--
		10	1.4301	229-322.01	229-322.02	--	--	--	--	--
		16	1.4301	--	229-322.01	229-322.02	--	--	--	--
		25	1.4301	--	229-322.01	229-322.02	229-322.25	--	--	--
		35	1.4301	--	--	229-322.02	229-322.25	229-322.22	--	--
		40	1.4301	--	--	229-322.02	229-322.25	229-322.22	--	--
		60	1.4301	--	--	--	229-322.25	229-322.22	229-322.22	--
		80	1.4301	--	--	--	--	229-322.22	229-322.22	--
		100	1.4301	--	--	--	--	--	229-322.25	--
		160	1.4301	--	--	--	--	--	229-322.25	--
		200	1.4301	--	--	--	--	--	--	2296-322.22
		260	1.4301	--	--	--	--	--	--	229-322.22
		360	1.4301	--	--	--	--	--	--	229-322.22

Spare parts list valve disk SFM, equal percentage, metallic seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
15	0.1	1.4404	on request	--	--	--	--	--	--
	0.16	1.4404	on request	--	--	--	--	--	--
	0.25	1.4404	on request	--	--	--	--	--	--
	0.4	1.4404	on request	--	--	--	--	--	--
	0.63	1.4404	on request	--	--	--	--	--	--

Spare parts list valve disk SFM, equal percentage, metallic seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
	1	1.4404	on request	--	--	--	--	--	--
	1.6	1.4404	221-762.63	--	--	--	--	--	--
	2.5	1.4404	221-762.65	--	--	--	--	--	--
	4	1.4404	221-762.67	--	--	--	--	--	--
	6.3	1.4404	221-762.69	221-762.69	--	--	--	--	--
	10	1.4404	221-762.71	221-762.71	221-762.73	--	--	--	--
	16	1.4404		221-762.75	221-762.75	--	--	--	--
	25	1.4404	--	221-762.77	221-762.77	221-762.79	--	--	--
	35	1.4404	--	--	221-762.81	221-762.83	221-762.83	--	--
	40	1.4404	--	--	221-762.85	221-762.88	221-762.88	--	--
	60	1.4404	--	--	--	221-762.01	221-762.01	221-762.02	--
	80	1.4404	--	--	--	--	221-762.91	221-762.94	--
	100	1.4404	--	--	--	--	--	on request	--
	160	1.4404	--	--	--	--	--	on request	--
	200	1.4404	--	--	--	--	--	--	on request
	260	1.4404	--	--	--	--	--	--	on request
	360	1.4404	--	--	--	--	--	--	on request

Spare parts list valve disk SJM, linear, metallic seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
15	0.1	1.4404	on request	--	--	--	--	--	--
	0.16	1.4404	on request	--	--	--	--	--	--
	0.25	1.4404	on request	--	--	--	--	--	--
	0.4	1.4404	on request	--	--	--	--	--	--
	0.63	1.4404	on request	--	--	--	--	--	--
	1	1.4404	on request	--	--	--	--	--	--
	1.6	1.4404	on request	--	--	--	--	--	--
	2.5	1.4404	on request	--	--	--	--	--	--
	4	1.4404	on request	--	--	--	--	--	--
	6.3	1.4404	on request	on request	--	--	--	--	--
	10	1.4404	on request	on request	on request	--	--	--	--
	16	1.4404	--	on request	on request	--	--	--	--
	25	1.4404	--	on request	on request	on request	--	--	--
	35	1.4404	--	--	on request	on request	on request	--	--
	40	1.4404	--	--	221-762.87	221-762.89	221-762.89	--	--
	60	1.4404	--	--	--	221-762.05	221-762.05	221-762.06	--
	80	1.4404	--	--	--	--	221-762.93	221-762.95	--
	100	1.4404	--	--	--	--	--	on request	--
	160	1.4404	--	--	--	--	--	221-762.97	--
	200	1.4404	--	--	--	--	--	--	on request
	260	1.4404	--	--	--	--	--	--	221-762.101
	360	1.4404	--	--	--	--	--	--	on request

Spare parts list valve disk SFW, equal percentage, with V-ring seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
15	0.1	1.4404	on request	--	--	--	--	--	
	0.16	1.4404	on request	--	--	--	--	--	
	0.25	1.4404	on request	--	--	--	--	--	
	0.4	1.4404	on request	--	--	--	--	--	
	0.63	1.4404	on request	--	--	--	--	--	
	1	1.4404	on request	--	--	--	--	--	
	1.6	1.4404	221-762.62	--	--	--	--	--	
	2.5	1.4404	221-762.64	--	--	--	--	--	
	4	1.4404	221-762.66	--	--	--	--	--	
	6.3	1.4404	221-762.68	221-762.68	--	--	--	--	
	10	1.4404	221-762.70	221-762.70	221-762.72	--	--	--	
	16	1.4404	--	221-762.74	221-762.74	--	--	--	
	25	1.4404	--	221-762.76	221-762.76	221-762.78	--	--	
	35	1.4404	--	--	221-762.80	221-762.82	221-762.82	--	

Spare parts list valve disk SFW, equal percentage, with V-ring seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
	40	1.4404	--	--	221-762.84	221-762.48	221-762.48	--	
	60	1.4404	--	--	--	221-762.03	221-762.03	221-762.04	
	80	1.4404	--	--	--	--	221-762.90	221-762.49	
	100	1.4404	--	--	--	--	--	on request	
	160	1.4404	--	--	--	--	--	on request	
	200	1.4404	--	--	--	--	--	--	on request
	260	1.4404	--	--	--	--	--	--	on request
	360	1.4404	--	--	--	--	--	--	on request

Spare parts list valve disk SJW, linear with V-ring seal, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
15	0.1	1.4404	on request	--	--	--	--	--	--
	0.16	1.4404	on request	--	--	--	--	--	--
	0.25	1.4404	on request	--	--	--	--	--	--
	0.4	1.4404	on request	--	--	--	--	--	--
	0.63	1.4404	on request	--	--	--	--	--	--
	1	1.4404	on request	--	--	--	--	--	--
	1.6	1.4404	on request	--	--	--	--	--	--
	2.5	1.4404	on request	--	--	--	--	--	--
	4	1.4404	on request	--	--	--	--	--	--
	6.3	1.4404	on request	on request	--	--	--	--	--
	10	1.4404	on request	on request	on request	--	--	--	--
	16	1.4404	--	on request	on request	--	--	--	--
	25	1.4404	--	on request	on request	on request	--	--	--
	35	1.4404	--	--	on request	on request	on request	--	--
	40	1.4404	--	--	221-762.86	221-762.51	221-762.51	--	--
	60	1.4404	--	--	--	221-762.07	221-762.07	221-762.08	--
	80	1.4404	--	--	--	--	221-762.92	221-762.52	--
	100	1.4404	--	--	--	--	--	on request	--
	160	1.4404	--	--	--	--	--	221-762.96	--
	200	1.4404	--	--	--	--	--	--	on request
	260	1.4404	--	--	--	--	--	--	221-762.102
	360	1.4404	--	--	--	--	--	--	on request

Spare parts list seat ring S, inch OD									
Item	**K_{VS} value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
33	0.1	1.4404	221-107.102	--	--	--	--	--	--
	0.16	1.4404	221-107.102	--	--	--	--	--	--
	0.25	1.4404	221-107.102	--	--	--	--	--	--
	0.4	1.4404	221-107.81	--	--	--	--	--	--
	0.63	1.4404	221-107.81	--	--	--	--	--	--
	1	1.4404	221-107.81	--	--	--	--	--	--
	1.6	1.4404	221-107.24	--	--	--	--	--	--
	2.5	1.4404	221-107.24	--	--	--	--	--	--
	4	1.4404	221-107.24	--	--	--	--	--	--
	6.3	1.4404	221-107.25	221-107.27	--	--	--	--	--
	10	1.4404	221-107.25	221-107.27	221-107.27	--	--	--	--
	16	1.4404	--	221-107.28	221-107.28	--	--	--	--
	25	1.4404	--	221-107.29	221-107.29	221-107.31	--	--	--
	35	1.4404	--	--	221-107.30	221-107.32	221-107.32	--	--
	40	1.4404	--	--	221-107.30	221-107.32	221-107.32	--	--
	60	1.4404	--	--	--	221-107.33	221-107.33	221-107.35	--
	80	1.4404	--	--	--	--	221-107.34	221-107.36	--
	100	1.4404	--	--	--	--	--	221-107.36	--
	160	1.4404	--	--	--	--	--	221-107.37	--
	200	1.4404	--	--	--	--	--	--	221-107.40
	260	1.4404	--	--	--	--	--	--	221-107.41
	360	1.4404	--	--	--	--	--	--	221-107.105

Spare parts list items 35, 43, 46, 75, 76, 401 and 402, inch OD									
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03	221-144.03	221-144.04	221-144.05
43	Clamp connection KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09	221-507.09	221-507.11	221-507.14
46	Clamp connection KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.11
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10	229-322.21
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117	910-117	910-117	910-117
401	Housing V1	1.4404	221-101.27	221-101.28	221-101.29	221-101.30	221-101.31	221-101.32	221-101.72
402	Housing V2	1.4404	221-102.52	221-102.53	221-102.54	221-102.55	221-102.56	221-102.57	221-102.58

Spare parts list, housing connection S, metallic seal, inch OD									
Item	**K_{VS}-Value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
420	0.1	1.4404	221-132.114	--	--	--	--	--	--
	0.16	1.4404	221-132.114	--	--	--	--	--	--
	0.25	1.4404	221-132.114	--	--	--	--	--	--
	0.4	1.4404	221-407.95	--	--	--	--	--	--
	0.63	1.4404	221-407.95	--	--	--	--	--	--
	1	1.4404	221-407.95	--	--	--	--	--	--
	1.6	1.4404	221-132.50	--	--	--	--	--	--
	2.5	1.4404	221-132.50	--	--	--	--	--	--
	4	1.4404	221-132.50	--	--	--	--	--	--
	6.3	1.4404	221-407.09	221-132.48	--	--	--	--	--
	10	1.4404	221-407.09	221-132.48	221-132.113	--	--	--	--
	16	1.4404	--	221-407.65	221-131.68	--	--	--	--
	25	1.4404	--	221-131.93	221-132.49	221-407.73	--	--	--
	35	1.4404	--	--	221-131.98	221-407.20	221-407.23	--	--
	40	1.4404	--	--	221-131.98	221-407.20	221-407.23	--	--
	60	1.4404	--	--	--	221-132.112	221-407.74	221-407.86	--
	80	1.4404	--	--	--	--	221-004872	221-132.52	--
	100	1.4404	--	--	--	--	--	221-132.52	--
	160	1.4404	--	--	--	--	--	221-132.106	--
	200	1.4404	--	--	--	--	--	--	221-407.116
	260	1.4404	--	--	--	--	--	--	221-407.117
	360	1.4404	--	--	--	--	--	--	221-407.118

Spare parts list housing connection S for V-ring seal, inch OD									
Item	**K_{VS}-Value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
420	0.1	1.4404	221-407.114	--	--	--	--	--	--
	0.16	1.4404	221-407.114	--	--	--	--	--	--
	0.25	1.4404	221-407.114	--	--	--	--	--	--
	0.4	1.4404	221-407.94	--	--	--	--	--	--
	0.63	1.4404	221-407.94	--	--	--	--	--	--
	1	1.4404	221-407.94	--	--	--	--	--	--
	1.6	1.4404	221-131.24	--	--	--	--	--	--
	2.5	1.4404	221-131.24	--	--	--	--	--	--
	4	1.4404	221-131.24	--	--	--	--	--	--
	6.3	1.4404	221-131.85	221-131.86	--	--	--	--	--
	10	1.4404	221-131.85	221-131.86	221-407.113	--	--	--	--
	16	1.4404	--	221-407.66	221-407.79	--	--	--	--
	25	1.4404	--	221-131.87	221-407.70	221-131.89	--	--	--
	35	1.4404	--	--	221-407.72	221-132.38	221-132.36	--	--
	40	1.4404	--	--	221-407.72	221-132.38	221-132.36	--	--
	60	1.4404	--	--	--	221-131.84	221-407.64	221-407.75	--
	80	1.4404	--	--	--	--	221-407.110	221-131.88	--
	100	1.4404	--	--	--	--	--	221-131.88	--
	160	1.4404	--	--	--	--	--	221-407.112	--
	200	1.4404	--	--	--	--	--	--	221-132.103
	260	1.4404	--	--	--	--	--	--	221-407.119
	360	1.4404	--	--	--	--	--	--	221-407.120

Designation	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**	**6" OD**
SB	221-344.27	--	--	--	--	--	--

Spare parts list items 1-5, inch IPS						
Item	**Designation**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
1*	Seal ring	EPDM	924-084	924-085	924-085	924-088
		FKM	924-082	924-083	924-083	924-087
		FFKM	924-340	924-341	924-341	--
		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	224-142.03	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
		FFKM	930-875	930-876	930-876	--
		HNBR	930-633	930-634	930-863	--
Items marked with an * are wearing parts						

Spare parts list V-ring, inch IPS							
Item	**Designation**	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
7*	V-ring	10	EPDM	932-017	--	--	--
			FKM	932-029	--	--	--
			FFKM	932-111	--	--	--
			HNBR	932-085	--	--	--
		16	EPDM	932-046	--	--	--
			FKM	932-030	--	--	--
			FFKM	932-110	--	--	--
			HNBR	932-087	--	--	--
		25	EPDM	932-019	--	--	--
			FKM	932-032	--	--	--
			FFKM	932-113	--	--	--
			HNBR	932-084	--	--	--
		35	EPDM	932-021	932-021	--	--
			FKM	932-033	932-033	--	--
			FFKM	932-114	932-114	--	--
			HNBR	932-088	932-088	--	--
		40	EPDM	932-021	932-021	--	--
			FKM	932-033	932-033	--	--
			FFKM	932-114	932-114	--	--
			HNBR	932-088	932-088	--	--
		60	EPDM	--	932-023	932-023	--
			FKM	--	932-034	932-034	--
			FFKM	--	932-115	932-115	--
			HNBR	--	932-089	932-089	--
		80	EPDM	--	932-024	932-025	--
			FKM	--	932-035	932-036	--
			FFKM	--	932-116	--	--
			HNBR	--	932-090	(932-101)	--
		100	EPDM	--	--	932-025	--
			FKM	--	--	932-036	--
			FFKM	--	--	--	--
			HNBR	--	--	(932-101)	--
		160	EPDM	--	--	932-028	--
			FKM	--	--	932-039	--
			FFKM	--	--	932-119	--
			HNBR	--	--	932-100	--
		200	EPDM	--	--	--	932-059
			FKM	--	--	--	932-063
			FFKM	--	--	--	--
			HNBR	--	--	--	--
		260	EPDM	--	--	--	932-045
			FKM	--	--	--	932-044
			FFKM	--	--	--	--
			HNBR	--	--	--	--
		360	EPDM	--	--	--	932-042
			FKM	--	--	--	932-041
			HNBR	--	--	--	--

Spare parts list, item 9, inch IPS						
Item	**Designation**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
9	Lantern	1.4301	229-168.18	229-168.12	229-168.13	229-168.06

Spare parts list, item 10, inch OD							
Item	**Designation**	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	0.1	1.4301	--	--	--	--
		0.16	1.4301	--	--	--	--
		0.25	1.4301	--	--	--	--
		0.4	1.4301	--	--	--	--
		0.63	1.4301	--	--	--	--
		1	1.4301	--	--	--	--
		1.6	1.4301	--	--	--	--
		2.5	1.4301	--	--	--	--
		4.0	1.4301	--	--	--	--
		6.3	1.4301	--	--	--	--
		10	1.4301	--	--	--	--
		16	1.4301	229-322.02	--	--	--
		25	1.4301	229-322.02	--	--	--
		35	1.4301	229-322.02	229-322.22	--	--
		60	1.4301	--	229-322.22	229-322.22	--
		80	1.4301	--	229-322.22	229-322.22	--
		100	1.4301	--	--	229-322.25	--
		160	1.4301	--	--	229-322.25	--
		200	1.4301	--	--	--	229-322.23
		260	1.4301	--	--	--	229-322.23
		360	1.4301	--	--	--	229-322.23

Spare parts list valve disk SFM, equal percentage, metallic seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	221-762.73	--	--	--
	16	1.4404	221-762.75	--	--	--
	25	1.4404	221-762.77	--	--	--
	35	1.4404	221-762.81	221-762.83	--	--
	40	1.4404	221-762.85	221-762.88	--	--
	60	1.4404	--	221-762.01	221-762.02	--
	80	1.4404	--	221-762.91	221-762.94	--
	100	1.4404	--	--	on request	--
	160	1.4404	--	--	on request	--
	200	1.4404	--	--	--	on request
	260	1.4404	--	--	--	on request
	360	1.4404	--	--	--	on request

Spare parts list valve disk SJM, linear, metallic seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--

Spare parts list valve disk SJM, linear, metallic seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	on request	--	--	--
	16	1.4404	on request	--	--	--
	25	1.4404	on request	--	--	--
	35	1.4404	on request	on request	--	--
	40	1.4404	221-762.87	221-762.89	--	--
	60	1.4404	--	221-762.05	221-762.06	--
	80	1.4404	--	221-762.93	221-762.95	--
	100	1.4404	--	--	on request	--
	160	1.4404	--	--	221-762.97	--
	200	1.4404	--	--	--	on request
	260	1.4404	--	--	--	221-762.101
	360	1.4404	--	--	--	on request

Spare parts list valve disk SFW, equal percentage, with V-ring seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	221-762.72	--	--	--
	16	1.4404	221-762.74	--	--	--
	25	1.4404	221-762.76	--	--	--
	35	1.4404	221-762.80	221-762.82	--	--
	40	1.4404	221-762.84	221-762.48	--	--
	60	1.4404	--	221-762.03	221-762.04	--
	80	1.4404	--	221-762.90	221-762.49	--
	100	1.4404	--	--	on request	--
	160	1.4404	--	--	on request	--
	200	1.4404	--	--	--	on request
	260	1.4404	--	--	--	on request
	360	1.4404	--	--	--	on request

Spare parts list valve disk SJW, linear with V-ring seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
15	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	on request	--	--	--
	16	1.4404	on request	--	--	--
	25	1.4404	on request	--	--	--
	35	1.4404	on request	on request	--	--
	40	1.4404	221-762.86	221-762.51	--	--
	60	1.4404	--	221-762.07	221-762.08	--
	80	1.4404	--	221-762.92	221-762.52	--
	100	1.4404	--	--	on request	--
	160	1.4404	--	--	221-762.96	--
	200	1.4404	--	--	--	on request
	260	1.4404	--	--	--	221-762.102
	360	1.4404	--	--	--	on request

Spare parts list seat ring S, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
33	10	1.4404	221-107.27	--	--	--
	16	1.4404	221-107.28	--	--	--
	25	1.4404	221-107.29	--	--	--
	35	1.4404	221-107.30	221-107.32	--	--
	40	1.4404	221-107.30	221-107.32	--	--
	60	1.4404	--	221-107.33	221-107.35	--
	80	1.4404	--	221-107.34	221-107.36	--
	100	1.4404	--	--	221-107.36	--
	160	1.4404	--	--	221-107.37	--
	200	1.4404	--	--	--	221-107.40
	260	1.4404	--	--	--	221-107.41
	360	1.4404	--	--	--	221-107.105

Spare parts list items 35, 43, 46, 75, 76, 401 and 402, inch IPS						
Item	**Designation**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
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	221-507.03	221-507.11	221-507.14
46	Clamp join KL	1.4401	221-507.06	221-507.09	221-507.06	221-507.11
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.10	229-322.21
76	Hexagon nut	1.4301	910-142	910-117	910-117	910-117
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

Spare parts list, housing connection S, metallic seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
420	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	221-407.88	--	--	--
	35	1.4404	--	--	--	--
	40	1.4404	--	--	--	--
	60	1.4404	--	--	221-407.102	--
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--

Spare parts list, housing connection S for V-ring seal, inch IPS						
Item	**K_{VS} value**	**Material**	**2" IPS**	**3" IPS**	**4" IPS**	**6" IPS**
420	0.1	1.4404	--	--	--	--
	0.16	1.4404	--	--	--	--
	0.25	1.4404	--	--	--	--
	0.4	1.4404	--	--	--	--
	0.63	1.4404	--	--	--	--
	1	1.4404	--	--	--	--
	1.6	1.4404	--	--	--	--
	2.5	1.4404	--	--	--	--
	4	1.4404	--	--	--	--
	6.3	1.4404	--	--	--	--
	10	1.4404	--	--	--	--
	16	1.4404	--	--	--	--
	25	1.4404	--	--	--	--
	35	1.4404	--	--	--	--
	40	1.4404	--	--	--	--
	60	1.4404	--	--	221-407.101	--
	80	1.4404	--	--	--	--
	100	1.4404	--	--	--	--
	160	1.4404	--	--	--	--
	200	1.4404	--	--	--	221-132.86
	260	1.4404	--	--	--	221-407.80
	360	1.4404	--	--	--	--

14 Spare parts list - VARIVENT control valve type S, divert valve W/X

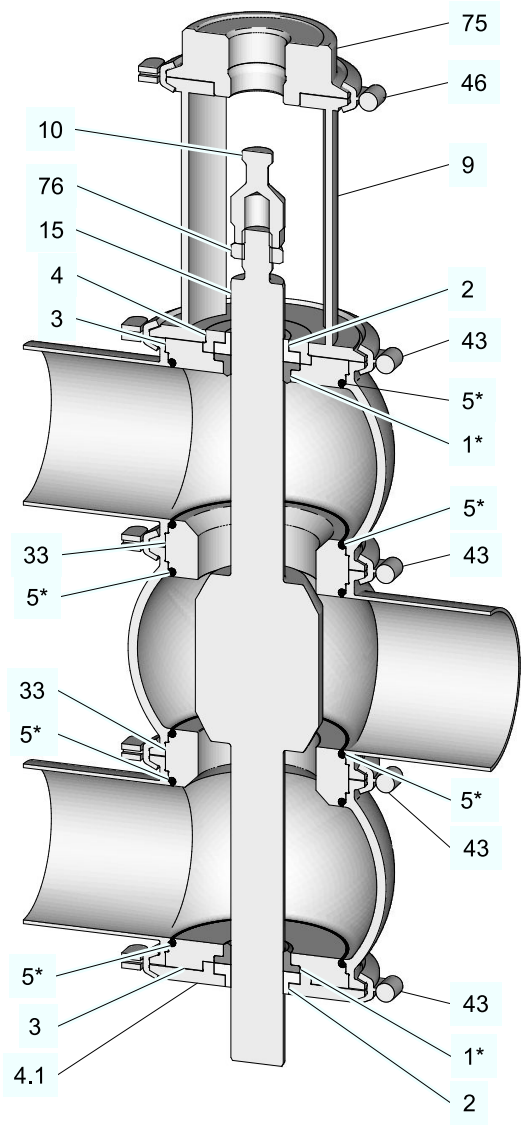

Fig.32: Type W (SWW)

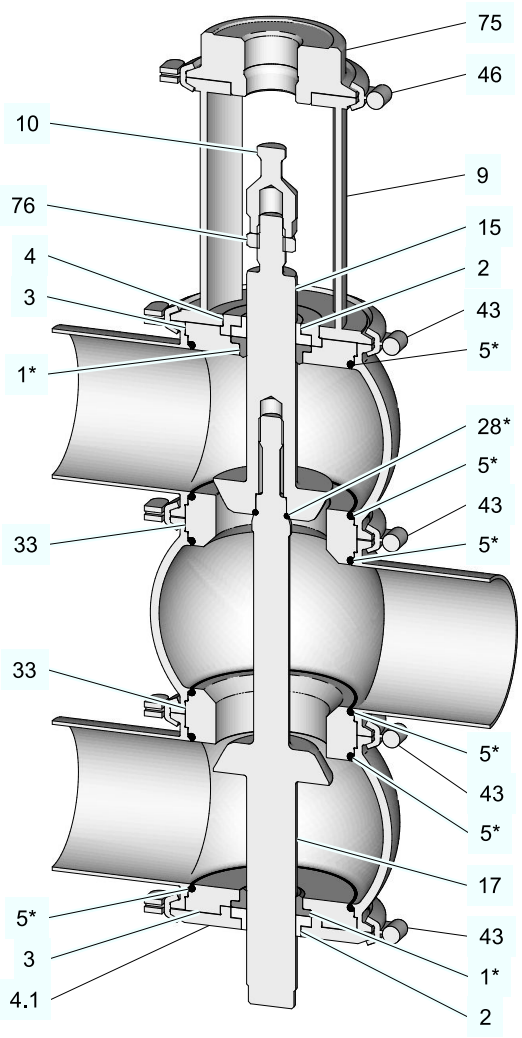

Fig.33: Type X (SXW)

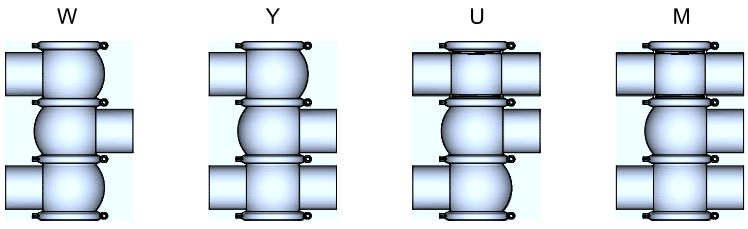

Fig.34: Housing combinations

Spare parts list items 1-9, metric sizes								
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085	924-085	924-085
		FKM	924-082	924-082	924-082	924-083	924-083	924-083
		HNBR	924-311	924-311	924-311	924-313	924-313	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002	935-002	935-002
	Bearing, 3A	SUSTA-PVDF	935-098	935-098	935-098	935-099	935-099	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03	221-141.03	221-141.04
4	Bearing disc	1.4301	221-142.01	224-142.02	221-142.02	221-142.03	221-142.03	221-142.03
4.1	Bearing disc	1.4301	221-142.15	221-142.10	221-142.10	221-142.11	221-142.11	221-142.12
5*	O-ring	EPDM	930-309	930-144	930-144	930-150	930-150	930-156
		FKM	930-168	930-171	930-171	930-176	930-176	930-178
		HNBR	930-632	930-633	930-633	930-634	930-634	930-863
9	Lantern	1.4301	229-167.02	229-168.11	229-168.07	229-168.08	229-168.08	229-168.09
Items marked with an * are wearing parts								

Spare parts list item 10, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	6.3	1.4301	229-322.01	--	--	--	--	--
		16	1.4301	--	229-322.01	--	--	--	--
		25	1.4301	--	--	229-322.02	--	--	--
		35	1.4301	--	--	--	229-322.25	--	--
		60	1.4301	--	--	--	--	229-322.22	--
		100	1.4301	--	--	--	--	--	229-322.22

Spare parts list item 15, valve W, linear, standard, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
15	Valve disk W	6.3	1.4404	221-762.10	--	--	--	--	--
		16	1.4404	--	221-762.12	--	--	--	--
		25	1.4404	--	--	221-762.14	--	--	--
		35	1.4404	--	--	--	221-762.16	--	--
		60	1.4404	--	--	--	--	221-762.18	--
		100	1.4404	--	--	--	--	--	221-762.20

Spare parts list item 15, valve X - valve disk X1, linear, standard, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
15	Valve disk X1	6.3	1.4404	221-762.23	--	--	--	--	--
		16	1.4404	--	221-762.24	--	--	--	--
		25	1.4404	--	--	221-762.25	--	--	--
		35	1.4404	--	--	--	221-762.26	--	--

Spare parts list item 15, valve X - valve disk X1, linear, standard, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
		60	1.4404	--	--	--	--	221-762.27	--
		100	1.4404	--	--	--	--	--	221-762.28

Spare parts list item 17, valve X - valve disk X2, linear, standard, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
17	Valve disk X2	6.3	1.4404	221-762.29	--	--	--	--	--
		16	1.4404	--	221-762.30	--	--	--	--
		25	1.4404	--	--	221-762.31	--	--	--
		35	1.4404	--	--	--	221-762.32	--	--
		60	1.4404	--	--	--	--	221-762.33	--
		100	1.4404	--	--	--	--	--	221-762.34

Spare parts list item 28, valve X, metric sizes								
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
28*	O-ring		13 x 3	13 x 3	15 x 3	15 x 3	15 x 3	15 x 3
		EPDM	930-001	930-001	930-276	930-276	930-276	930-276
		FKM	930-009	930-009	930-277	930-277	930-277	930-277
		HNBR	930-002	930-002	930-627	930-627	930-627	930-627
Items marked with an * are wearing parts								

Spare parts list item 33, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
33	Seat ring	6.3	1.4404	221-107.25	--	--	--	--	--
		16	1.4404	--	221-107.28	--	--	--	--
		25	1.4404	--	--	221-107.29	--	--	--
		35	1.4404	--	--	--	221-107.32	--	--
		60	1.4404	--	--	--	--	221-107.33	--
		100	1.4404	--	--	--	--	--	221-107.36

Spare parts list items 43, 46, 75, 76, 401 and 402, metric sizes								
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09	221-507.09	221-507.11
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06
75	Transition piece	1.4301	229-322.10**	229-322.10**	229-322.10**	229-322.10**	229-322.10**	229-322.10**
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117	910-117	910-117
401	Housing V1	1.4404	221-101.19	221-101.21	221-101.22	221-101.05	221-101.06	221-101.07
402	Housing V2	1.4404	221-102.41	221-102.43	221-102.44	221-102.05	221-102.06	221-102.07
** in non-actuated position NO the adapter 229-322.60 is required								

Spare parts list item 1-9, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
1*	Seal ring	EPDM	924-084	924-084	924-084	924-085	924-085	924-085
		FKM	924-082	924-082	924-082	924-083	924-083	924-083
		HNBR	924-311	924-311	924-311	924-313	924-313	924-313
2	Bearing	PTFE/ carbon	935-001	935-001	935-001	935-002	935-002	935-002
	Bearing, 3A	SUSTA-PVDF	935-098	935-098	935-098	935-099	935-099	935-099
3	Seal disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03	221-141.03	221-141.04
4	Bearing disc	1.4301	221-142.01	224-142.02	221-142.02	221-142.03	221-142.03	221-142.03
4.1	Bearing disc	1.4301	221-142.15	224-142.10	221-142.10	221-142.11	221-142.11	221-142.12
5*	O-ring	EPDM	930-309	930-144	930-144	930-150	930-150	930-156
		FKM	930-168	930-171	930-171	930-176	930-176	930-178
		HNBR	930-632	930-633	930-633	930-634	930-634	930-863
9	Lantern	1.4301	229-167.02	229-168.16	229-168.17	229-168.14	229-168.14	229-168.15
Items marked with an * are wearing parts								

Spare parts list, item 10, inch OD									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	6.3	1.4301	229-322.01	--	--	--	--	--
		16	1.4301	--	229-322.01	--	--	--	--
		25	1.4301	--	--	229-322.02	--	--	--
		35	1.4301	--	--	--	229-322.25	--	--
		60	1.4301	--	--	--	--	229-322.22	--
		100	1.4301	--	--	--	--	--	229-322.22

Spare parts list item 15, valve W, linear, standard, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
15	Valve disk W	6.3	1.4404	221-762.09	--	--	--	--	--
		16	1.4404	--	221-762.11	--	--	--	--
		25	1.4404	--	--	221-762.13	--	--	--
		35	1.4404	--	--	--	221-762.15	--	--
		60	1.4404	--	--	--	--	221-762.17	--
		100	1.4404	--	--	--	--	--	221-762.19

Spare parts list item 15, valve X - valve disk X1, linear, standard, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
15	Valve disk X1	6.3	1.4404	221-762.23	--	--	--	--	--
		16	1.4404	--	221-762.24	--	--	--	--
		25	1.4404	--	--	221-762.25	--	--	--

Spare parts list item 15, valve X - valve disk X1, linear, standard, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
		35	1.4404	--	--	--	221-762.26	--	--
		60	1.4404	--	--	--	--	221-762.27	--
		100	1.4404	--	--	--	--	--	221-762.28

Spare parts list item 17, valve X - valve disk X2, linear, standard, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
17	Valve disk X2	6.3	1.4404	221-762.35	--	--	--	--	--
		16	1.4404	--	221-762.36	--	--	--	--
		25	1.4404	--	--	221-762.37	--	--	--
		35	1.4404	--	--	--	221-762.38	--	--
		60	1.4404	--	--	--	--	221-762.39	--
		100	1.4404	--	--	--	--	--	221-762.40

Spare parts list item 28, valve X, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
28*	O-ring		13 x 3	13 x 3	15 x 3	15 x 3	15 x 3	15 x 3
		EPDM	930-001	930-001	930-276	930-276	930-276	930-276
		FKM	930-009	930-009	930-277	930-277	930-277	930-277
		HNBR	930-002	930-002	930-627	930-627	930-627	930-627
Items marked with an * are wearing parts								

Spare parts list, item 33, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
33	Seat ring	6.3	1.4404	221-107.25	--	--	--	--	--
		16	1.4404	--	221-107.28	--	--	--	--
		25	1.4404	--	--	221-107.29	--	--	--
		35	1.4404	--	--	--	221-107.32	--	--
		60	1.4404	--	--	--	--	221-107.33	--
		100	1.4404	--	--	--	--	--	221-107.36

Spare parts list items 43, 46, 75, 76, 401 and 402, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
43	Clamp join KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09	221-507.09	221-507.11
46	Clamp join KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06
75	Transition piece	1.4301	229-322.10**	229-322.10**	229-322.10**	229-322.10**	229-322.10**	229-322.10**
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117	910-117	910-117
401	Housing V1	1.4404	221-101.27	221-101.28	221-101.29	221-101.30	221-101.31	221-101.32
402	Housing V2	1.4404	221-102.52	221-102.53	221-102.54	221-102.55	221-102.56	221-102.57
** in non-actuated position NO the adapter 229-322.60 is required								

15 Spare parts list - VARIVENT control valve type S 3-stage seat K

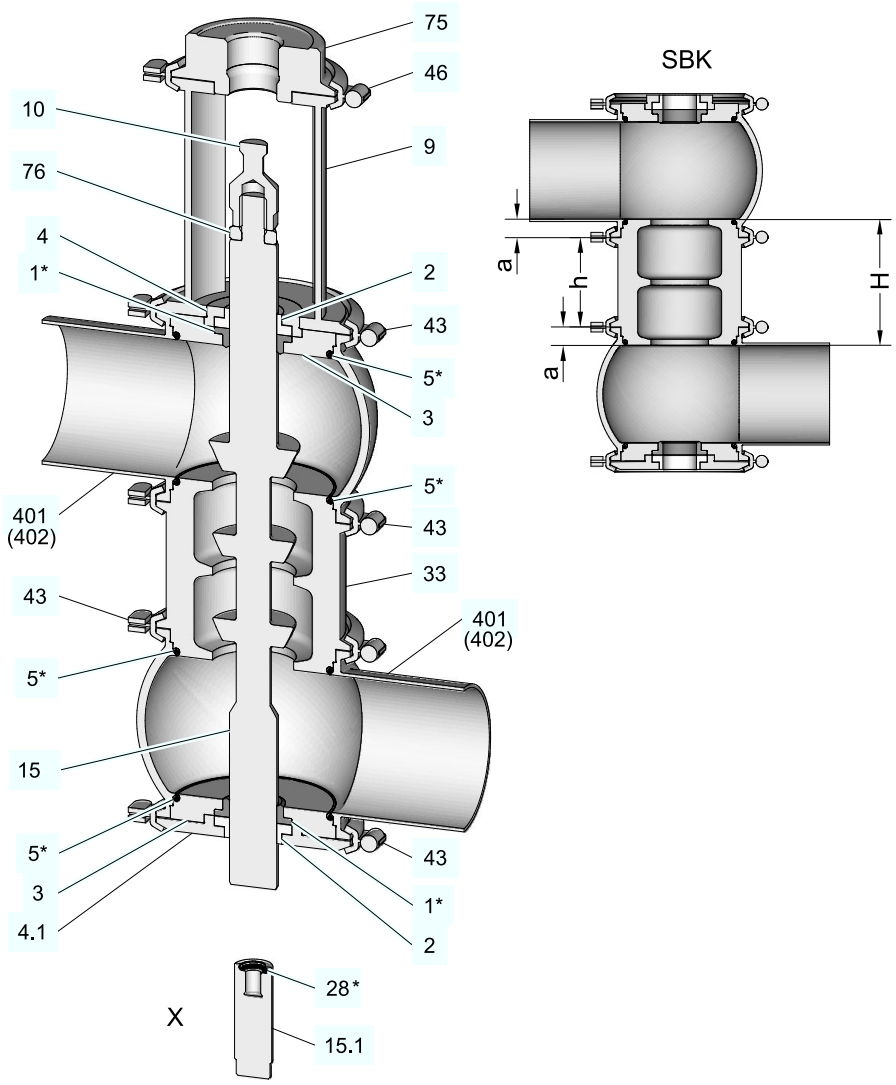

Fig.35: X = only valid for DN 25 and 1" OD

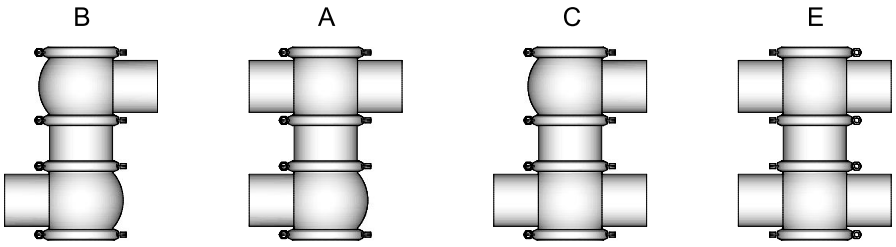

Fig.36: Housing combinations

Metric sizes	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
Inch OD	1" OD	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
a	12	12	12	15	15	15
h	28	51	51	75	75	85
H	52	75	75	105	105	115

Spare parts list items 1-5, metric sizes								
Item	Designation	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
1*	Sealing ring	EPDM	924-084	924-084	924-084	924-085	924-085	924-085
		FKM	924-082	924-082	924-082	924-083	924-083	924-083
		HNBR	924-311	924-311	924-311	924-313	924-313	924-313
2	Bearing	PTFE/carbon	935-001	935-001	935-001	935-002	935-002	935-002
	Bearing, 3A	SUSTA-PVDF	935-098	935-098	935-098	935-099	935-099	935-099
3	Sealing disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03	221-141.03	221-141.04
4	Bearing disk	1.4301	221-142.01	224-142.02	221-142.02	221-142.03	221-142.03	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150	930-150	930-156
		FKM	930-168	930-171	930-171	930-176	930-176	930-178
		HNBR	930-632	930-633	930-633	930-634	930-634	930-863
The items marked with an * are wearing parts								

Spare parts list item 9, metric sizes								
Item	Designation	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
9	Motor stool	1.4301	229-167.02	229-168.11	229-168.07	229-168.08	229-168.08	229-168.09

Spare parts list item 10, metric sizes									
Item	Designation	K_V value	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	2.3	1.4301	229-322.01	--	--	--	--	--
		5.8	1.4301	--	229-322.02	--	--	--	--
		9.2	1.4301	--	--	229-322.02	--	--	--
		14.4	1.4301	--	--	--	229-322.25	--	--
		23.1	1.4301	--	--	--	--	229-322.22	--
		34.6	1.4301	--	--	--	--	--	229-322.22

Spare parts list item 15, 3-stage seat, linear, standard, metric sizes									
Item	Designation	K_V value	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
15	Valve disk SJM-3S	2.3 3x K_V4	1.4404	221-762.41	--	--	--	--	--
		5.8 3x K_V10	1.4404	--	221-762.43	--	--	--	--
		9.2 3x K_V16	1.4404	--	--	221-762.44	--	--	--
		14.4 3x K_V25	1.4404	--	--	--	221-762.45	--	--
		23.1 3x K_V40	1.4404	--	--	--	--	221-762.46	--

Spare parts list item 15, 3-stage seat, linear, standard, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
		34.6 3x K_V60	1.4404	--	--	--	--	--	221-762.47
15.1	Valve disk SJM-3S	2.3 3x K_V4	1.4404	221-762.42	--	--	--	--	--

Spare parts list item 28, valve X, metric sizes								
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
28*	O-ring (11 x 3)	EPDM	930-311	--	--	--	--	--
		FKM	930-335	--	--	--	--	--
		HNBR	930-803	--	--	--	--	--
The items marked with an * are wearing parts								

Spare parts list item 33, 3-stage seat, metric sizes									
Item	**Designation**	**K_V value**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
33	3-stage seat S	2.3 3x K_V4	1.4404	229-168.35		--	--	--	--
		5.8 3x K_V10	1.4404	--	229-168.36	--	--	--	--
		9.2 3x K_V16	1.4404	--	--	229-168.37	--	--	--
		14.4 3x K_V25	1.4404	--	--	--	229-168.38	--	--
		23.1 3x K_V40	1.4404	--	--	--	--	229-168.34	--
		34.6 3x K_V60	1.4404	--	--	--	--	--	229-168.39

Spare parts list items 43, 46, 75, 76, 401 and 402, metric sizes								
Item	**Designation**	**Material**	**DN 25**	**DN 40**	**DN 50**	**DN 65**	**DN 80**	**DN 100**
43	Clamp connection KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09	221-507.09	221-507.11
46	Clamp connection KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117	910-117	910-117
401	Housing V1	1.4404	221-101.19	221-101.21	221-101.22	221-101.05	221-101.06	221-101.07
402	Housing V2	1.4404	221-102.41	221-102.43	221-102.44	221-102.05	221-102.06	221-102.07

Spare parts list item 1-5, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
1*	Sealing ring	EPDM	924-084	924-084	924-084	924-085	924-085	924-085
		FKM	924-082	924-082	924-082	924-083	924-083	924-083
		HNBR	924-311	924-311	924-311	924-313	924-313	924-313
2	Bearing	PTFE/ carbon	935-001	935-001	935-001	935-002	935-002	935-002
	Bearing, 3A	SUSTA-PVDF	935-098	935-098	935-098	935-099	935-099	935-099
3	Sealing disk	1.4404	221-141.01	221-141.02	221-141.02	221-141.03	221-141.03	221-141.04
4	Bearing disk	1.4301	221-142.01	224-142.02	221-142.02	221-142.03	221-142.03	221-142.03
5*	O-ring	EPDM	930-309	930-144	930-144	930-150	930-150	930-156
		FKM	930-168	930-171	930-171	930-176	930-176	930-178
		HNBR	930-632	930-633	930-633	930-634	930-634	930-863
The items marked with an * are wearing parts								

Spare parts list, item 9, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
9	Motor stool	1.4301	229-167.02	229-168.16	229-168.17	229-168.14	229-168.14	229-168.15

Spare parts list, item 10, inch OD									
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
10	Adapter L=40 229-322.01 L=50 229-322.02 L=40 M16 229-322.25 L=50 M16 229-322.22 L=85 M16 229-322.23	2.3	1.4301	229-322.01	--	--	--	--	--
		5.8	1.4301	--	229-322.02	--	--	--	--
		9.2	1.4301	--	--	229-322.02	--	--	--
		14.4	1.4301	--	--	--	229-322.25	--	--
		23.1	1.4301	--	--	--	--	229-322.22	--
		34.6	1.4301	--	--	--	--	--	229-322.22

Spare parts list item 15, 3-stage seat, linear, standard, inch OD									
Item	**Designation**	**K_V value**	**Mate-rial**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
15	Valve disk SJM-3S	2.3 3x K_V4	1.4404	221-762.41	--	--	--	--	--
		5.8 3x K_V10	1.4404	--	221-762.43	--	--	--	--
		9.2 3x K_V16	1.4404	--	--	221-762.44	--	--	--
		14.4 3x K_V25	1.4404	--	--	--	221-762.45	--	--
		23.1 3x K_V40	1.4404	--	--	--	--	221-762.46	--
		34.6 3x K_V60	1.4404	--	--	--	--	--	221-762.47
15.1	Valve disk SJM-3S	2.3 3x K_V4	1.4404	221-762.42	--	--	--	--	--

Spare parts list item 28, valve X, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
28*	O-ring (11 x 3)	EPDM	930-311	--	--	--	--	--
		FKM	930-335	--	--	--		
		HNBR	930-803	--	--	--		
The items marked with an * are wearing parts								

Spare parts list, item 33, 3-stage seat, inch OD								
Item	**Designation**	**K_V value**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
33	3-stage seat K	2.3 3x K_V4	1.4404	229-168.35	--	--	--	--	--
		5.8 3x K_V10	1.4404	--	229-168.36	--	--	--	--
		9.2 3x K_V16	1.4404	--	--	229-168.37	--	--	--
		14.4 3x K_V25	1.4404	--	--	--	229-168.38	--	--
		23.1 3x K_V40	1.4404	--	--	--	--	229-168.34	--
		34.6 3x K_V60	1.4404	--	--	--	--	--	229-168.40

Spare parts list items 43, 46, 75, 76, 401 and 402, inch OD								
Item	**Designation**	**Material**	**1" OD**	**1.5" OD**	**2" OD**	**2.5" OD**	**3" OD**	**4" OD**
43	Clamp connection KL	1.4401	221-507.02	221-507.04	221-507.04	221-507.09	221-507.09	221-507.11
46	Clamp connection KL	1.4401	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06	221-507.06
75	Transition piece	1.4301	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10	229-322.10
76	Hexagon nut	1.4301	910-142	910-142	910-142	910-117	910-117	910-117
401	Housing V1	1.4404	221-101.19	221-101.21	221-101.22	221-101.05	221-101.06	221-101.07
402	Housing V2	1.4404	221-102.41	221-102.43	221-102.44	221-102.05	221-102.06	221-102.07

16 Spare parts list – sterile lock HSP

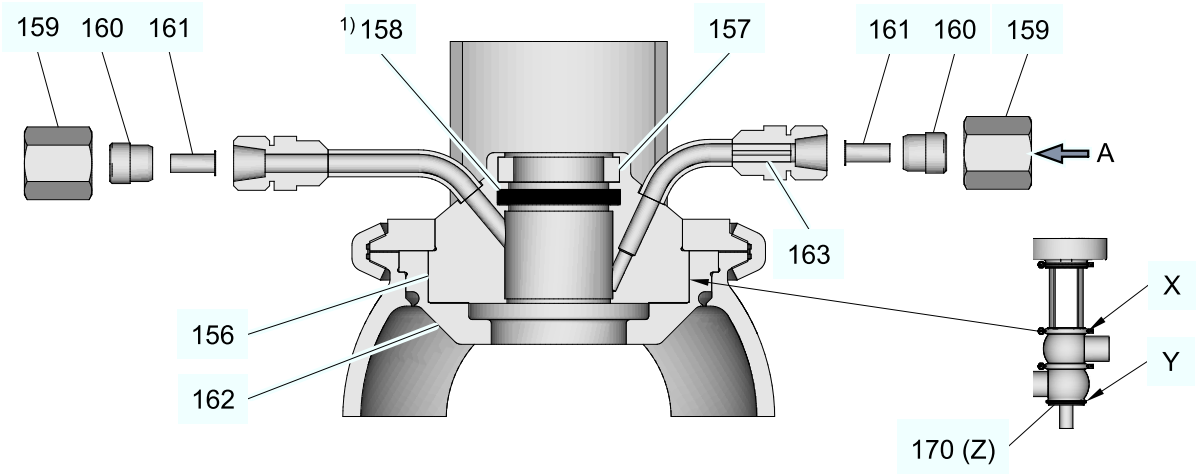

Fig.37: X= sterile lock HSP, top; Y= sterile lock HSP, bottom; (Z)= only for bottom sterile lock

Attention! Primary pressure at "A" max. 1 bar at free outlet							
Item	**Designation**	**Material**	**DN 25 1" OD**	**DN 40 1.5" OD Y-valve without lift**	**DN 40 1.5" OD Y-valve with lift**	**** 1.5" OD 2" OD**	**** DN 50/40 2" IPS**
Sterile lock HSP cpl., top		--	221-601.06	221-601.07	221-601.08	221-601.18	221-601.07
Sterile lock HSP cpl., bottom		--	221-601.06	221-601.14	221-601.14	221-601.18	221-601.07
156	Sterile lock HSP, top	--	221-601.05	221-601.02	221-601.01	221-601.17	221-601.02
	Sterile lock HSP, bottom	--	221-601.05	221-601.13	221-601.13	221-601.17	221-601.02
157	Guide ring, top	Turcite	935-050	935-050	935-051	935-050	935-050
	Guide ring, bottom	Turcite	935-050	935-050	935-050	935-050	935-050
1) 158*	O-ring, top	EPDM	930-268	930-268	930-243	930-268	930-268
		FKM	930-164	930-164	930-244	930-164	930-164
	O-ring, bottom	EPDM	930-268	930-268	930-268	930-268	930-268
		FKM	930-164	930-164	930-164	930-164	930-164
159	Union nut	1.4571	933-459	933-459	933-459	933-459	933-459
160	Cutting ring	1.4571	933-458	933-458	933-458	933-458	933-458
161	Support sleeve	1.4571	933-380	933-380	933-380	933-380	933-380
162	Sealing disk, top	1.4404	221-141.01	221-600.01	221-141.06	221-600.11	221-600.01
	Sealing disk, bottom		221-141.01	221-141.02	221-141.02	221-600.11	221-600.01
163	Plug SPS	PVDF	221-000870	221-000870	221-000870	221-000870	221-000870
170	Locking ring N	1.4301	221-143.01	221-143.02	221-143.02	221-143.02	221-143.02

1) O-ring, item 158, is not included in the sterile lock HSP cpl. and must be ordered separately.
The items marked with an * are wearing parts
** Applies to all valves except double-seat valve with lift DN 50/40; 1.5"OD; 2"OD; 2"IPS; Y-valves with lift DN 40 and 1.5"OD and V-valves without lift DN 40 and 1.5" OD

Attention! Primary pressure at "A" max. 1 bar at free outlet							
Item	**Designation**	**Material**	**DN 50/40 1.5" / 2" OD 2" IPS for all double-seat valves with lift**	**DN 80/65 2.5" / 3" OD 3" IPS**	**DN 100 4" OD 4" IPS**	**DN 125**	**6" IPS**
Sterile lock HSP cpl., top		--	221-601.08	221-601.09	221-601.10	221-601.11	221-601.12
Sterile lock HSP cpl., bottom		--	221-601.07	221-601.09	221-601.10	221-601.11	221-601.12
156	Sterile lock HSP, top	--	221-601.01	221-601.03	221-601.03	221-601.04	221-601.04
	Sterile lock HSP, bottom	--	221-601.02	221-601.03	221-601.03	221-601.04	221-601.04
157	Guide ring, top	Turcite	935-051	935-051	935-051	935-059	935-059
	Guide ring, bottom	Turcite	935-050	935-051	935-051	935-059	935-059
1) 158*	O-ring, top	EPDM	930-243	930-243	930-243	930-356	930-356
		FKM	930-244	930-244	930-244	930-357	930-357
	O-ring, bottom	EPDM	930-268	930-243	930-243	930-356	930-356
		FKM	930-164	930-244	930-244	930-357	930-357
159	Union nut	1.4571	933-459	933-459	933-459	933-459	933-459
160	Cutting ring	1.4571	933-458	933-458	933-458	933-458	933-458
161	Support sleeve	1.4571	933-380	933-380	933-380	933-380	933-380

Attention! Primary pressure at "A" max. 1 bar at free outlet							
Item	**Designation**	**Material**	**DN 50/40 1.5" / 2" OD 2" IPS for all double-seat valves with lift**	**DN 80/65 2.5" / 3" OD 3" IPS**	**DN 100 4" OD 4" IPS**	**DN 125**	**6" IPS**
162	Sealing disk, top	1.4404	221-141.06	221-600.02	221-600.03	221-600.04	221-600.05
	Sealing disk, bottom		221-600.01	221-600.02	221-600.03	221-600.04	221-600.05
163	Plug SPS	PVDF	221-000870	221-000870	221-000870	221-000870	221-000870
170	Locking ring N	1.4301	221-143.02	221-143.03	221-143.04	221-143.06	221-143.05

1) O-ring, item 158, is not included in the sterile lock HSP cpl. and must be ordered separately.

The items marked with an * are wearing parts

** Applies to all valves except double-seat valve with lift DN 50/40; 1.5"OD; 2"OD; 2"IPS; Y-valves with lift DN 40 and 1.5"OD and V-valves without lift DN 40 and 1.5" OD

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 [barg/psig] unless explicitly specified otherwise.
approx.	approximately
°C	Unit of measurement of temperature [degree Celsius]
dm^3_n	Unit of measurement of volume [cubic decimetre] Standard volume (standard litre)
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 issued by the International Organisation for Standardisation
kg	Unit of measurement of weight [kilogram]
kN	Unit of measurement of force [kilonewton]
Kv value	Flow coefficient [m³/s] 1 KV = 0,86 x Cv
l	Unit of measurement of volume [litre]
max.	maximum
mm	Unit of measurement of length [millimetre]
µm	Unit of measurement of length [micrometre]

Abbreviation	Explanation
M	Metric
Nm	Unit of measurement of work [newton metre] Specification of torque 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
PA	Polyamide
PE-LD	Low-density polyethylene
PPE	Polytetrafluoroethylene
psi	America measurement for pressure [Pound-forse 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.
AF	Specifications for the size of spanners width across flats
T.VIS	Tuchenhagen Valve Information System
V AC	Volt alternating current
V DC	Volt direct current
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
Inch OD	Pipe measurement according to British Standards (BS), Outside Diameter
Inch IPS	American pipe measure - Iron Pipe Size

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