Operating Instructions
Hygienic valves

GEA VARIVENT® Shuttle valve type X_R
2023-03
430BAL015128EN

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1 General

This chapter contains basic instructions for using the valve and explanations of illustration conventions. It also contains information about the design and structure.

The term valve in these Operating Instructions refers to GEA VARIVENT® Shuttle valve type X_R.

1.1 Information about the document

1.1.1 Purpose and structure of the document

The objective of these Operating Instructions is to provide information on how to operate the valve. To achieve this, it is divided into several chapters which are oriented on the various life phases of the valve. Compliance with the instructions will enhance the valve's longevity and reliability, and reduce the likelihood of harm to individuals or damage to property. The Operating Instructions also acts as the basis for creating operating instructions.

1.1.2 Design elements

In this document, the following design elements are used as orientation aids.

General orientation aids

- Figure numbers
- Table numbers
- Chapter numbers
- Page numbers
- Headers and footers
- References
- Lists

Lists

Bullet points are shown in lists and do not prescribe a specific sequence.

- Bullet point
- Bullet point
  - Sub-point
  - Sub-point
- Bullet point

Numbered lists

In a sequence of actions, the order of the action steps is specified by a numbered list. Partial results and the result of a sequence of actions are marked by arrows.

1. Action step one
2. Action step two
   2.1 First sub-step two
   2.2 Second sub-step two
   → Partial result
3. Action step three
   → Partial result
4. Action step four

⇒ Result

INFO

Info texts contain additional information about a description or action step.

1.1.3 Reading obligation and storage

Every person who works on or with the valve must have read these Operating Instructions. They must be available to these persons at all times.

1.2 Manufacturer address

GEA Tuchenhagen GmbH

Am Industriepark 2-10

Germany

21514 Büchen

1.3 Customer service

Phone: +49 4155 49-0

Fax: +49 4155 49-2035

flowcomponents@gea.com

www.gea.com

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

Person authorised for compilation and handover of technical documentation:

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

1/1

Translated copy of the EU - Declaration of conformity in accordance with the Pressure Equipment Directive 2006/42/EU

Manufacturer:	GEA Tuchenhagen GmbH Am Industriepark 2-10 21514 Büchen
We hereby declare that the machine named below	
Designation:	Valve with actuator
Type:	VARIVENT®
on the basis of its design and construction, as well as the version that we have put into circulation, corresponds with the relevant fundamental health and safety requirements of the following guide-line:	
Relevant EC directives:	2006/42/EC EC Machinery Directive
Applicable harmonized standards, in particular:	EN ISO 12100: 2010
Remarks:	• This declaration will become invalid if any alter-ations are made to the machine which have not been agreed with us • We also declare that the relevant technical documentation for this machine has been pre-pared in accordance with Annex VII, Part A, and agree to submit the documentation on justified request of national authorities on a data carrier
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	i.V. Matthias Südel Head of Engineering

Engineering for a better world.

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

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 UK legislation:	Supply of Machinery (Safety) Regulations 2008	
Applicable harmonized standards, in particular:	EN ISO 12100: 2010	Safety of machinery - General principles for design - Risk assessment and risk reduction

Remarks:

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

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Büchen, 14 March 2023

Franz Bürmann
Managing Director

i.V. Matthias Südel
Senior Director Engineering

1/1

2 Safety

This chapter describes the minimum requirements for the intended use of the valve. It forms the basis for safe operation of the valve.

2.1 Intended use

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

Proper use of the valve also includes compliance with these Operating Instructions.

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

In a closed pipe system, hydraulic pressure build-up may occur when the valve switches and result in seal damage.

INFO 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 is borne solely by the operating company.

2.1.1 Requirements for the operation

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

2.1.2 Pressure equipment directive

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

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

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 special 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 instruction manual “ATEX version valves”. For details regarding the marking of valves for potentially hazardous areas also refer to the additional instruction manual “ATEX version valves”.

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

2.1.4 Improper operating conditions

The operational reliability of the valve cannot be ensured under improper operating conditions. Therefore avoid improper operating conditions.

Operating the valve 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 valve.
- Damage has been detected on the valve.
- Maintenance intervals have been exceeded.

2.2 Modification

Subsequent alterations of the valve are not permitted. Otherwise you will have to undergo a new conformity process in accordance with the EC Machinery Directive on your own.

In general, only genuine spare parts supplied by GEA Tuchenhagen GmbH should be fitted. This ensures the reliable and economical operation of the valve.

2.3 Structure of warning notices

Warning notices warn of hazards which can occur when certain actions are carried out. The warning notices described below are used in this document. The extent of hazards is classified in risk levels and can be recognised by the respective signal words.

2.3.1 Preceding warning notices

Preceding warning notices are used when there is a hazard during a sequence of actions. Warning notices are colour-highlighted and supplemented by a pictogram in the event of possible personal injury.

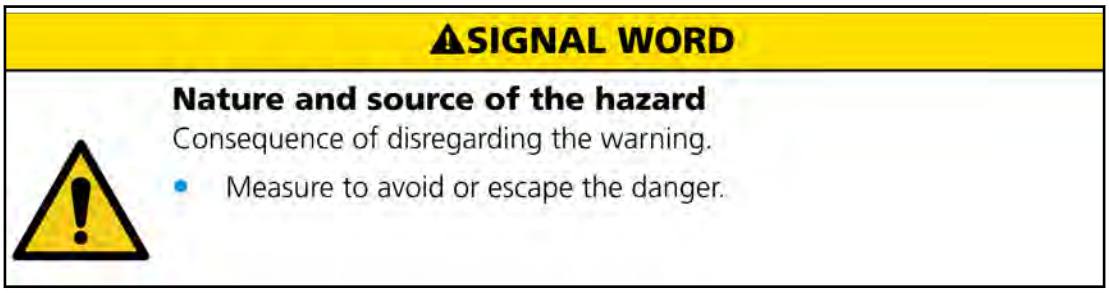


Figure 2-1 - Structure of a preceding warning notice

2.3.2 Integrated warning notices

Integrated warning notices are used when there is a hazard involved in a single action step.

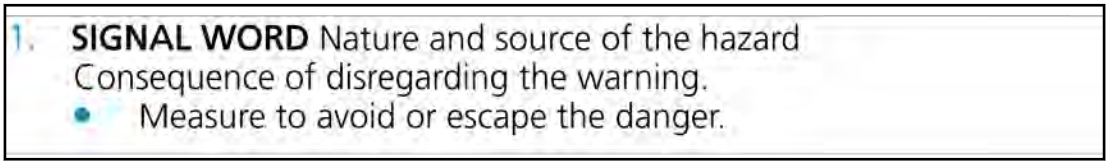


Figure 2-2 - Structure of an integrated warning notice

2.3.3 Signal words

IMPORTANT

The signal word IMPORTANT indicates a hazard that could result in property damage if not avoided.

CAUTION

The signal word CAUTION indicates a hazard with a low risk level which could result in light to medium injuries if not avoided.

WARNING

The signal word WARNING indicates a hazard with a medium risk level which could result in death or severe injury if not avoided.

DANGER

The signal word DANGER indicates a hazard with a high risk level which will result in death or serious injury if not avoided.

2.4 Personnel qualification

The following basic requirements must be fulfilled for all actions carried out on the valve.

- These Operating Instructions have been read and understood.
- Safety tasks in and around the valve are regulated and assigned.
  - Maintaining order
  - Compliance with safety requirements
  - Securing hazard zones

Additionally, the following groups of people must possess the personnel qualifications or skills listed below and be authorised by the operator to perform actions on the valve.

Operating staff

- Trained by the operating company, a qualified customer specialist or a GEA service expert

Customer specialist

- Technical training

Trained customer specialist

- Technical training in a specific field of expertise
- Training by GEA personnel or participation in training courses of the Büchen

GEA service expert

- Personnel from GEA Tuchenhagen, see *1.3 Customer service*

Where necessary, reference is made to the respective group of individuals in these Operating Instructions.

2.5 General safety instructions

The valve was built in accordance with the state of the art and recognised safety regulations at the time of its launch. However, the safety measures stipulated by the operator and listed below must still be adhered to in order to ensure safety.

2.5.1 General hazard

Source	Consequences	Measures
Faulty valve	Injury and damage	Check that the valve is fully functional.
Non-compliance with these Operating Instructions	Injury and damage	Read and familiarise yourself with these Operating Instructions.
Operating materials	Injuries	• Wear personal protective equipment. • Avoid contact with operating materials.

2.5.2 Mechanical hazard

Source	Consequences	Measures
Moving or rotating components	• Being drawn in or caught • Entrapment • Crushing • Impact	• Remove jewellery. • Tie hair back or wear a hair net. • Wear tight-fitting clothing.
• Gravity • Falling objects	• Impact • Crushing	• Do not walk under suspended loads. • Eliminate the stumbling hazards.

2.5.3 Electrical hazard

Source	Consequences	Measures
Electromagnetic processes	Implications for electronic medical implants	People with medical implants must keep their distance.
Electrostatic processes	• Electric shock • Fire • Chemical reaction	• Avoid contact to components. • Check the voltage of components. • Wear personal protective gear. • Eliminate leaked flammable substances.

2.5.4 Thermal hazard

Source	Consequences	Measures
Objects or materials at high or low temperature	• Freezing • Burns • Scalding	• Wear personal protective gear. • Wait for adjustment to room temperature.

2.6 Personal protective equipment

To prevent possible personal injuries, the personal protection equipment must be worn.

In addition, GEA recommends keeping the requirements listed below.

- Locally applicable accident prevention regulations
- Instruction manual from the operator or employer

2.7 Safety devices

No safety devices are attached to this valve.

2.8 Residual hazards

Despite all the measures taken, the following residual hazards can lead to personal injuries and property damage at any time.

- Improper use
- Material fatigue
- Failure of safety devices

Danger zones

Please observe the following notes:

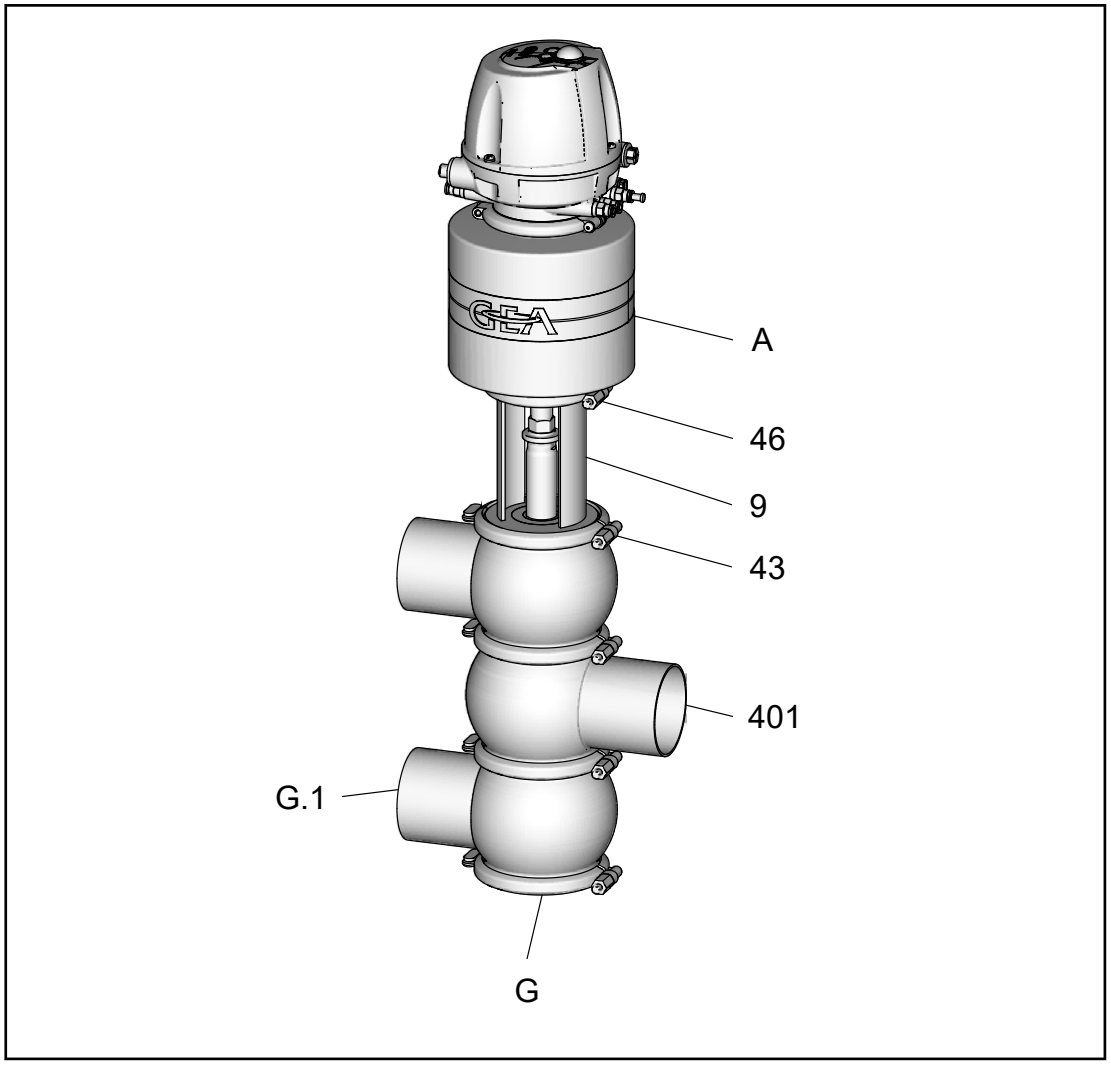


Figure 2-3 - Danger zone at the valve

- In the event of malfunctions, shut down the valve (disconnect from the power and air supply) and secure it against being used.
- Before starting any maintenance, servicing or repair work, disconnect the valve from the power supply and secure it against inadvertently being switched back on again.
- Only allow a qualified electrician to carry out any work on the electrical power supply.
- Check the electrical equipment of the valve at regular intervals. Immediately remedy loose connections and molten cables.
- If work on live parts cannot be avoided, call in a second person, who can operate the main switch in case of an emergency.

- Never reach into the lantern (9), the valve housings (G) or into the sockets of the valve housings (G.1) when the valve is switching. Fingers can be crushed or cut off.
- On a spring-closing valve, there is a risk of injury upon releasing the clamp connection (43) as the released spring pretension will suddenly lift the actuator (A). Therefore, release the spring tension before detaching the clamp connection (43/46) by supplying the actuator (A) with compressed air.
- The housing sockets (401) have very sharp edges. When transporting and installing the valve be sure to wear suitable protective gloves.

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

Danger	Cause	Measure
	Spring tension in the actuator	Danger to life caused by the pressurised spring in the actuator. Do not open the actuator, rather return it to GEA Tuchenhagen for proper disposal.
Risk 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 collecting vessels. • Dispose of lubricants in accordance with the pertinent regulations.

2.9 Safety signs

The safety symbols listed below are attached to the valve.

The position of the applicable safety symbols on the valve are shown in an overview, see *3.1.3 Signs*.

Warning signs

General warning sign

Hazard for persons, conveyed by the additional sign.

Warning, risk of hand injuries

Hazard posed by closing mechanical components on the valve.

Warning, spring tension

Hazard posed by spring tension. Do not open the actuator.

General warning symbol

Hazard for persons as shown by additional symbols.

2.10 Emergency measures

In case of any emergencies on the valve, the operating regulations must be observed and the following actions implemented.

Fire

- Call local specialists
- Use extinguishing agents as outlined in the operating regulations
- Exit the hazard zone
- Warn individuals that are endangered

Injuries

- Administer first aid
- Call local emergency services

3 Description

This chapter contains instructions on how to install the valve and its functions.

3.1 Set-up and function

3.1.1 Design

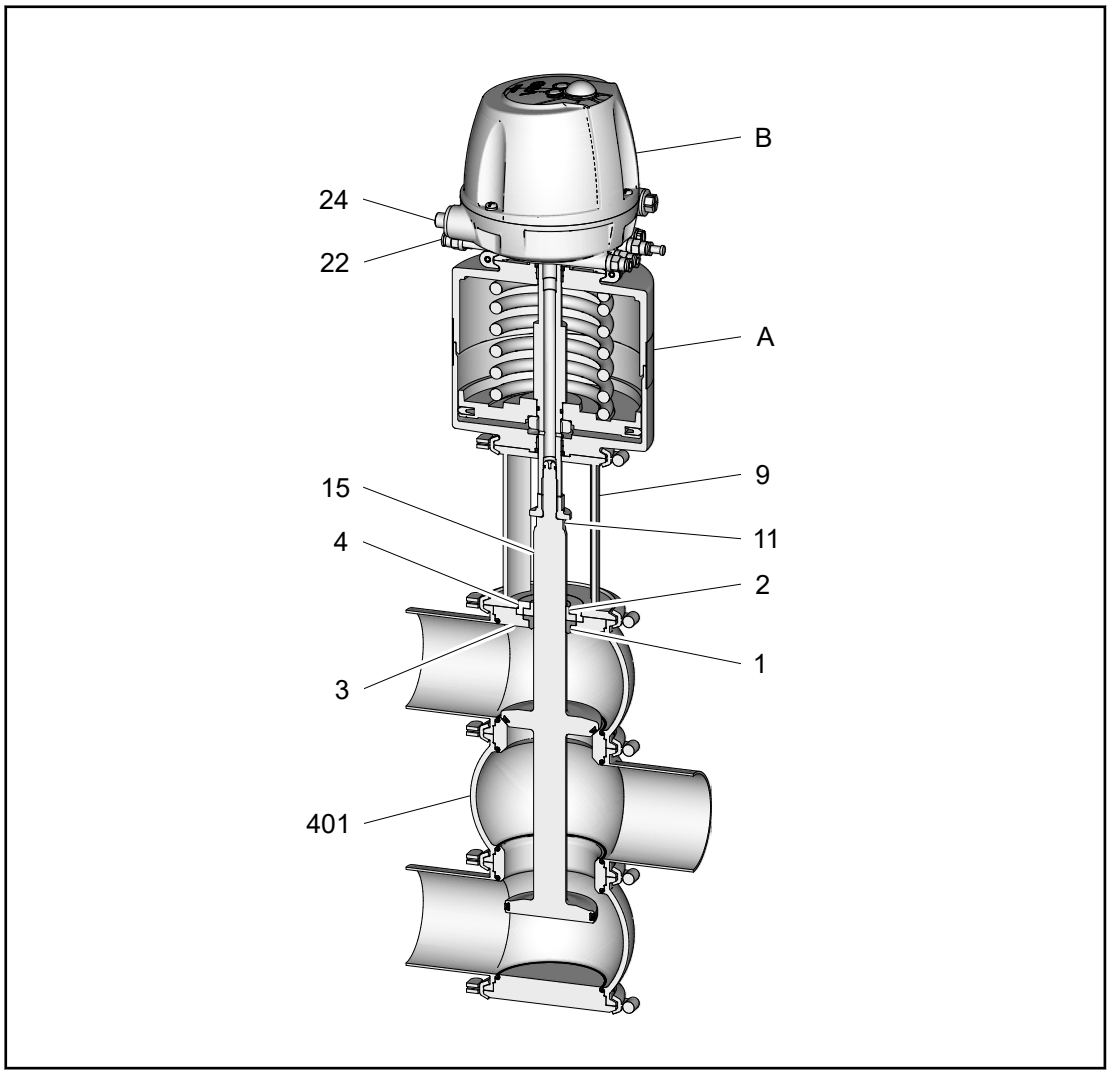


Figure 3-1 - Design of the valve

Design

No.	Designation
A	Actuator
B	T.VIS control top
1	Seal ring

No.	Designation
2	Bearing
3	Seal disk
4	Bearing disk
9	Lantern
11	Radial groove
15	Valve disk
22	Air connection T.VIS
24	Electrical connection
401	Valve housing See spare parts drawings for housing configuration

3.1.2 Functional description

3.1.2.1 Spring-to-close actuator function (NC)

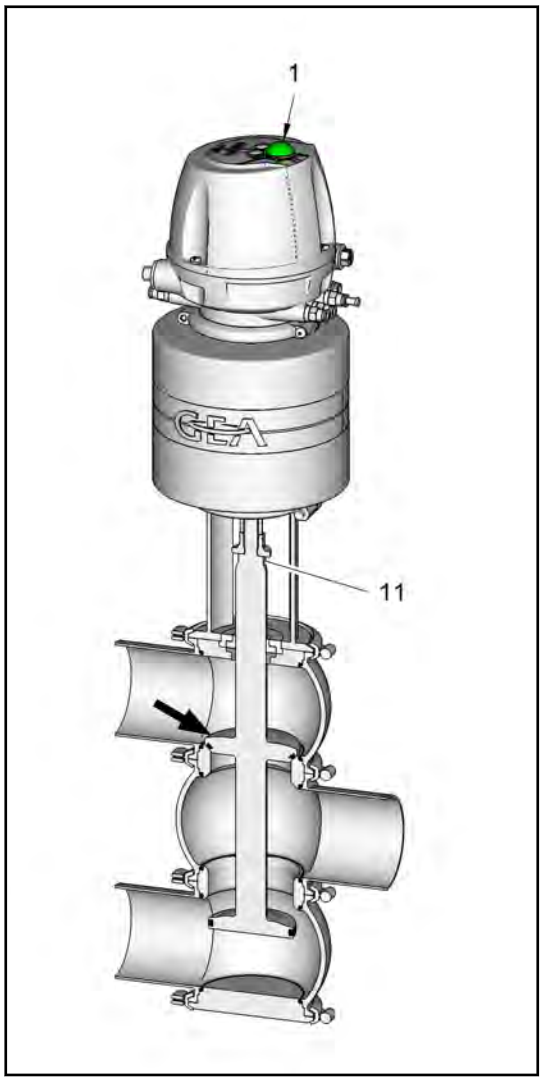


Figure 3-2 - Valve type X_R closed in idle position (NC)

The actuator is of the spring-closing type (NC). The valve is closed in the idle position.
Identification on the spring-to-close upper valve seat:

- Ring groove (11) on the wrench flat surface of the valve disk rod

Identification on the T.VIS control top once the installation (SET-UP) has been completed:

- Permanent light (1) green: valve in idle position
- Permanent light (1) yellow: valve in end position (actuated position)

3.1.2.2 Spring-To-Open actuator function (NO)

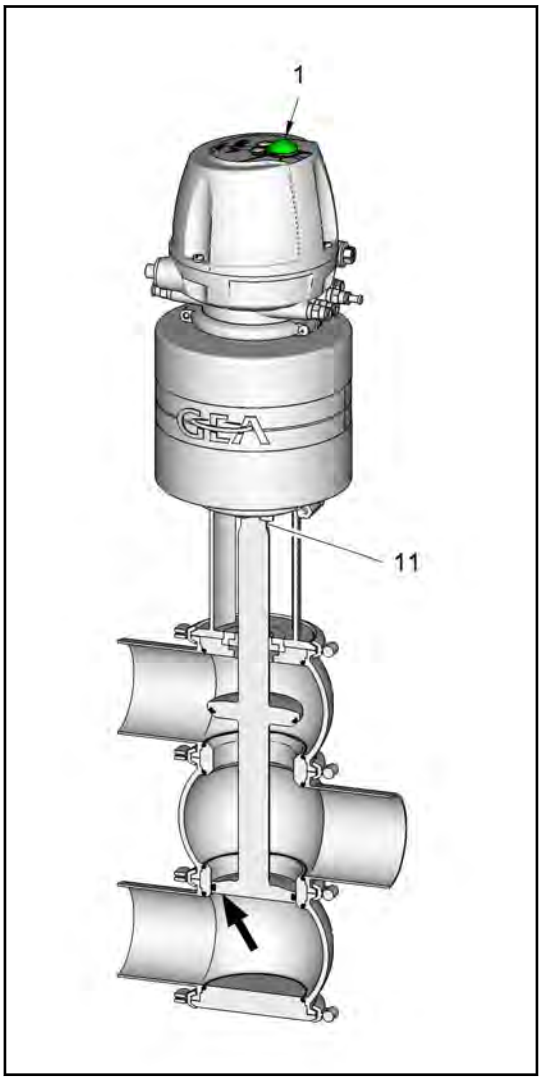


Figure 3-3 - Valve type X_R open in idle position (NO)

The actuator is spring-to-open (NO). The valve is open in the idle position.
Identification on the spring-to-close lower valve seat:

- Ring groove (11) on the wrench flat surface of the valve disk rod.

Identification on the T.VIS control top once the installation (SET-UP) has been completed:

- Permanent light (1) green: valve in idle position
- Permanent light (1) yellow: valve in end position (actuated position)

3.1.2.3 Modifying the actuator closing direction

INFO When the idle position is reversed by turning the actuator, the actuation forces may no longer be sufficient for the application. Therefore, check the actuator size before changing the closing direction.

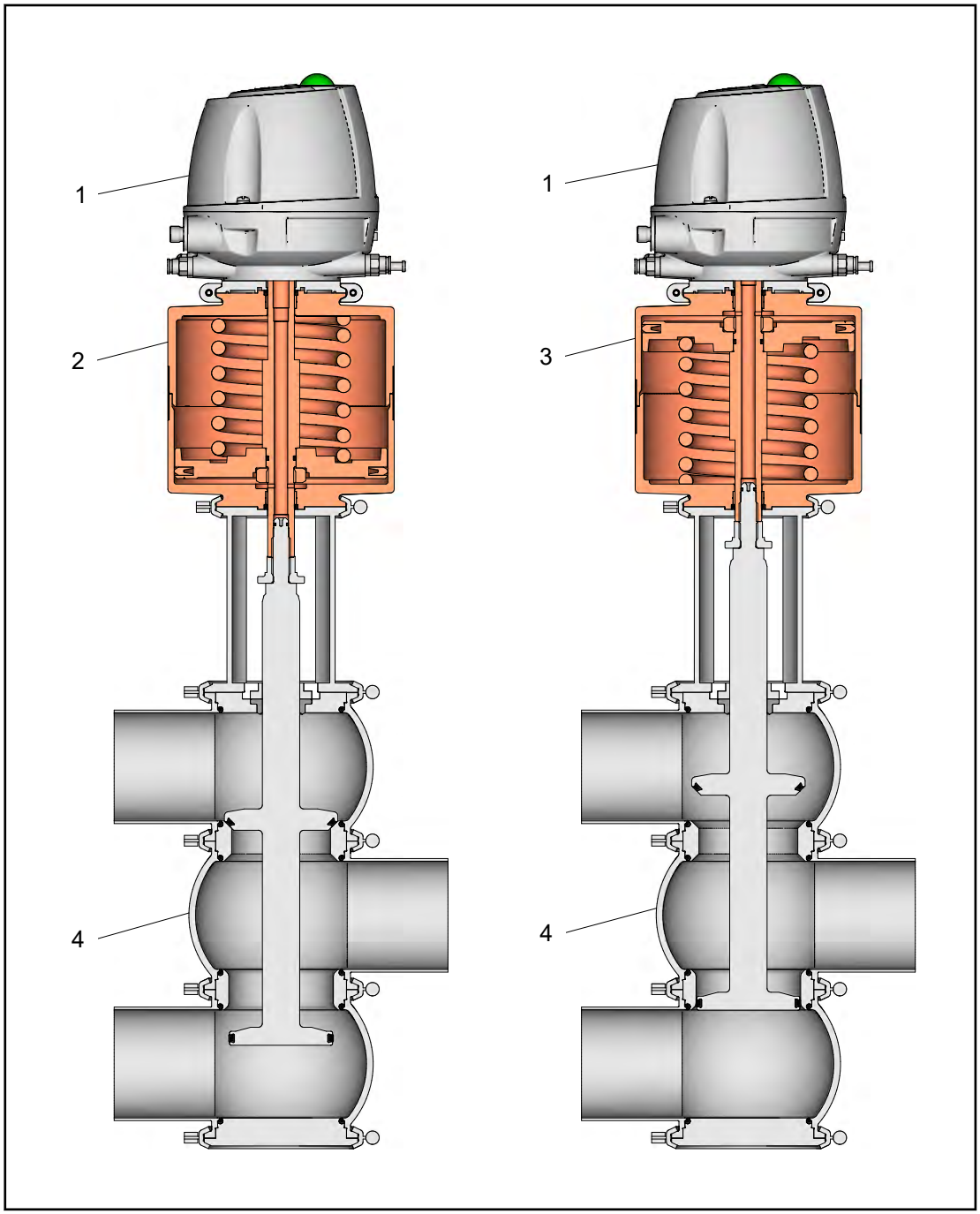


Figure 3-4 - 3.3 Reversing the idle position

No.	Designation
1	Feedback side
2	Installation position spring-to-close actuator (NC), idle position closed
3	Installation position spring-to-open actuator (NC), idle position open
4	Valve side

Reversing the idle position

Prerequisites

- The valve has been removed, see *9.5 Removing the valve*.
- sufficient actuator size for application, check the actuator size if necessary

1. Turn the actuator to reverse the idle position.
2. Remove the valve, see *9.6 Installing the valve*.

⇒ The idle position is reversed.

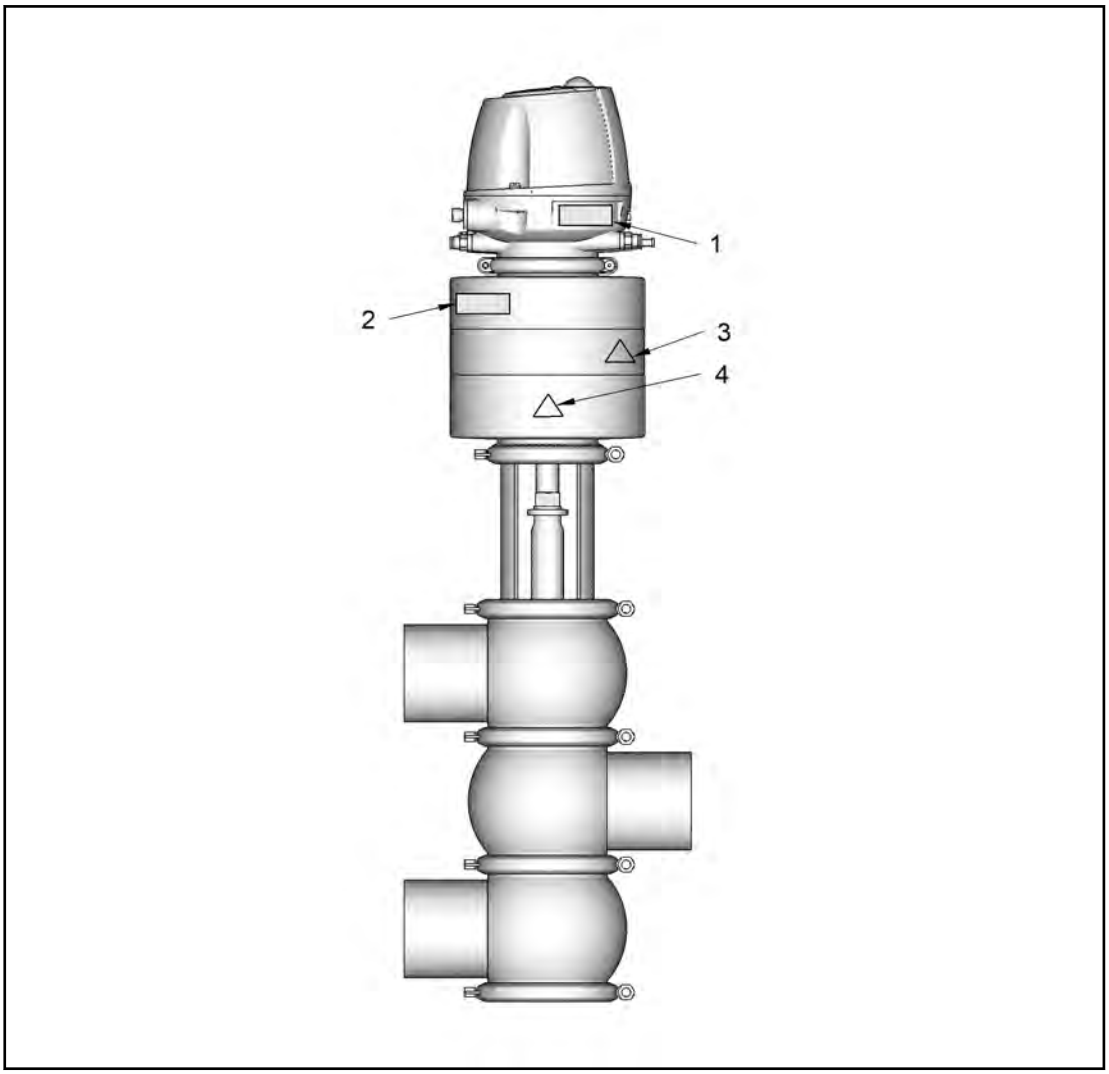
INFO After modification, reset the proximity switches and feedback button!

3.1.3 Signs

Overview and layout

All safety symbols and other signs must meet the following criteria throughout the life-cycle of the valve.

- Complete
- Attached as shown
- Clean and legible



No.	Signs
1	Type plate T.VIS; adhered to T.VIS
2	Type plate valve; adhered to actuator
3	Warning: do not open, taut spring; adhered to actuator
4	Warning: risk of crushing (refers to lantern) adhered to actuator after the lantern

The representation and meaning of the safety symbols used are listed in an overview corresponding to their category, see chapter *2.9 Safety signs*

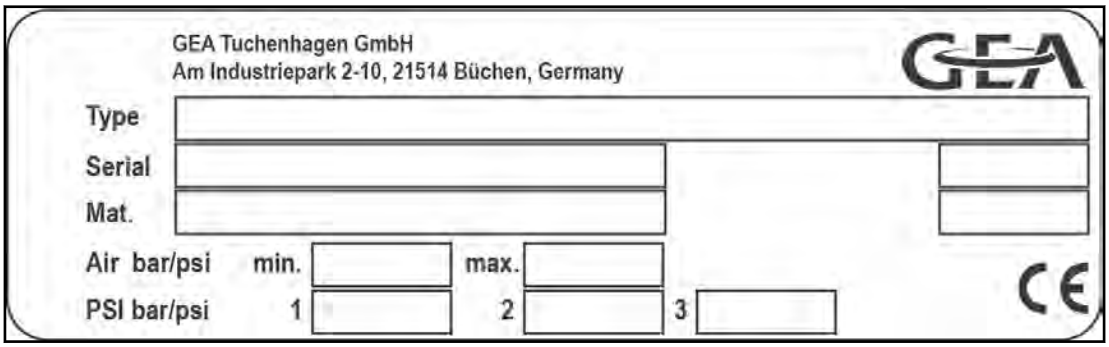
3.1.4 Protective devices

No safety devices are attached to this valve.

3.2 Technical data

3.2.1 Type plate

The type plate clearly identifies the valve.



The type plate provides the following key data:

Key data of the valve

Characteristics	Values
Type	X_R
Serial	Serial number
Material	1.4404(AISI316L) / EPDM
Control air pressure bar/psi	6 (87)
Product pressure bar/psi	5 (72.5)

3.2.2 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 100 1" to 4" OD
Material of product contact parts	Stainless steel 1.4404
Fitting position	Any position, if valve and pipe system can drain properly

Technical data: Ambient temperatures

Designation	Description
Valve	0 to 45 °C (32 to 113 °F), standard < 0 °C (32 °F): Use control air with low dew point. Protect valve rods against freezing. < –15 °C: no solenoid valves in the control top < +50 °C: no solenoid valves in the control top
Proximity switch	-20 to +80 °C (-4 to +176 °F)
Control top T.VIS M-20, M-15, A-15, P-15	-20 to +55 °C (-4 to +131 °F)
Product temperature and operating temperature	depending on the sealing material

Technical data: Compressed air supply, product pressure

Designation	Description
Air hose	
• Metric	Material PE-LD Outside Ø 6 mm Inside Ø 4 mm
• Inch	Material PA Outside Ø 6.35 mm Inside Ø 4.3 mm
Control air	acc. to ISO 8573-1
• Solid particle content:	Quality class 6 Particle size max. 5 µm Particle density max. 5 mg/m^3
• Water content:	Quality class 4 max. dew point +3 °C If the unit is used at higher altitudes or at low ambient temperatures, the dew point must be adapted accordingly.
• Oil content:	Quality class 3 preferably oil free max. 1 mg oil to 1 m^3 air
Control air pressure	6 bar (87 psi), max. 8 bar (116 psi) configuration with standard drive Alternative combinations of product pressure and control air pressure on request
Product pressure	5 bar (72.5 psi) configuration with standard drive max. 10 bar (116 psi) configuration with correspondingly designed actuator > 10 bar (145.0 psi) for static applications and on request

Weights valve type X_R

Size	Weight [kg]
DN 25	9
DN 40	13
DN 50	14
DN 65	24
DN 80	25
DN 100	34
OD 1"	9
OD 1.5"	13
OD 2"	13
OD 2.5"	23
OD 3"	24
OD 4"	33

3.2.3 Resistance of the sealing materials

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

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

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

Resistance:

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

Seal resistance / permissible application temperature of the seal materials

Medium	Maximum operating temperatures	EPDM	FKM	HNBR
Alkalis up to 3%	up to 80 °C (176°F)	+	o	+
Alkalis up to 5%	up to 40 °C (104°F)	+	o	o
Alkalis more than 5%	up to 80 °C (176°F)	+	–	-
Alkalis more than 5%		o	–	-

Medium	Maximum operating temperatures	EPDM	FKM	HNBR
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 100 °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		-	+	+

Temperature resistance of the sealing materials

Sealing materials	General temperature resistance*
EPDM	-40 to +135 °C (-40 °F to 275 °F)
FKM	-10 to +200 °C (+14 °F to +392 °F)
HNBR	-25 to +140 °C (-13 °F to +284 °F)

* The general resistance of the material does not correspond to the maximum operating temperature.

3.2.4 Pipe ends - General table of measurements

INFO Not every valve is available in every size. For information about the available sizes of valves, see *3.2.2 Technical data*.

Dimensions for tubes in DN

Metric DN	Outside diameter	Wall thickness	Inside diameter	Outside diameter acc. to DIN 11850
15	19	1.5	16	X
20	23	1.5	20	X
25	29	1.5	26	X
40	41	1.5	38	X

Metric DN	Outside diameter	Wall thickness	Inside diameter	Outside diameter acc. to DIN 11850
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 tubes in inch OD

Inch OD	Outside diameter	Wall thickness	Inside diameter	Outside diameter acc. to BS 4825
0.5"	12.7	1.65	9.4	X
0.75"	19.05	1.65	15.75	X
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

3.2.5 Lubricants

Lubricants

Lubricant designation	Material no.
Rivolta F.L.G. MD-2 (1000 g)	413-071
Rivolta F.L.G. MD-2 (100 g)	413-136

4 Storage and transport

This chapter contains information about how to transport the valve with and without packaging material. It also describes the minimum requirements for storage after delivery and for any necessary intermediate storage.

It is addressed to all persons who carry out actions related to the transport or storage of the valve.

INFO During all transport, observe chapter *2 Safety* of this Operating Instructions.

4.1 Scope of supply

On receipt of the valve check whether

- 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.

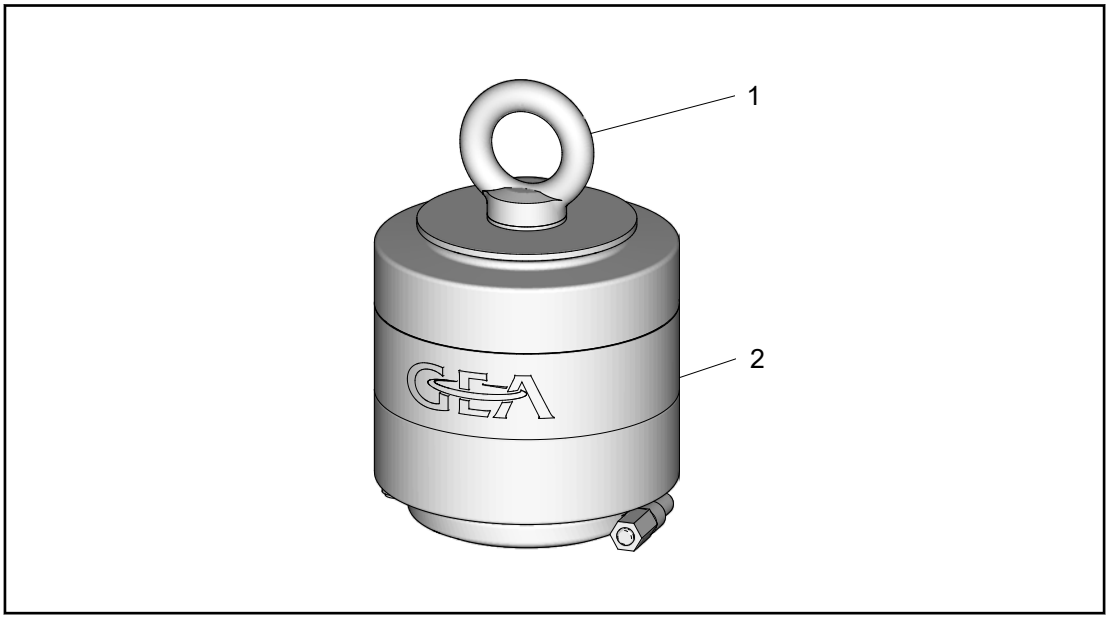
4.2 Storage

The valves, valve inserts or spare parts should be stored in a dry place, free of vibration 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.

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

4.3 Transport



For transport, the following principles apply:

- When transporting the valve be sure to unscrew the control top and the switch bar from the actuator (2) and use the screwed-in eye bolt (1), material no. 221-104.98, to lift the valve.
- Only use suitable hoist and slings for transporting the package units/valves.
- Observe the pictograms on the package.
- Handle valves with care to avoid damage caused by impact or careless loading and unloading. The outside synthetic materials are susceptible to breaking.
- Control tops must be protected from animal and vegetable fats.
- Only allow qualified staff to transport the valve.
- Movable parts must be properly secured.
- Only use approved, fully functional load lifting devices and lifting accessories which are suitable for the intended purpose. Observe the maximum load-bearing capacities.
- Secure the valve against slipping. Take the weight of the valve into account and the position of the point of gravity.
- Under no circumstances should anyone stand under a suspended load.
- Take care when transporting the valve. Do not grip sensitive parts of the unit to lift or push the unit or to support yourself. Avoid jerky movements when putting down the unit.

5 Assembly and installation

This chapter contains information and instructions about the assembly and installation of the valve.

It is addressed to all persons who carry out actions related to the valve.

INFO During assembly and installation, observe chapter *2 Safety* of this Operating Instructions.

5.1 Notes on installation

The valve can be installed in any position. Steps must be taken to ensure that the valve housing and the pipe system can drain properly.

If the valve is installed in the horizontal position, pay attention that the vent hole in the actuator is aligned horizontally on one side.

To avoid damage, ensure that the valve is installed into the pipe system without tension and no objects remain in the system after assembly (e.g. tools, screws, lubrication oils).

If the valve is installed horizontally, the stress on the valve stem seals is higher than in the vertical installation position. Therefore, support the actuator and regularly check the valve for leakage.

5.2 Control top

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

5.3 Install the valve with detachable pipe connection elements

Prerequisites

- The pipe is drained, and cleaned or rinsed, if necessary.
- The pipe section for the valve to be mounted must be separated from the remaining pipe system.

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

⇒ Valve is installed.

5.4 Install valve with welding ends

⚠WARNING

Spring tension in the valve (NC)

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 pressurising the actuator with compressed air at max. 8 bar.

ATTENTION

Welding distortions

An open housing can warp during welding.

- To avoid welding distortions, always seal the housing before welding.

Prerequisites

- The pipe is drained, and cleaned or rinsed, if necessary.
- The pipe section for the valve to be mounted must be separated from the remaining pipe system.
- Valve housing is locked

1. Release the spring tension.
2. Remove the valve insert, see *9.5.5 Disconnecting the valve insert from the housing*.
3. Weld the housing, without gaskets, into position, ensuring that the connection is free of stress.
   - 3.1 Fit the housing into place and tack it.
   - 3.2 To avoid welding distortions, always seal the housing before welding.
   - 3.3 Flush the housing with forming gas from the inside to push the oxygen out of the system.
   - 3.4 Weld the housing into the pipe system; use welding additive, if necessary.

   → When technically possible, use the WIG-orbital welding process with pulse configuration, according to the EHEDG D.35 guideline.
4. Passivate the seam after welding.
5. **INFO**
   When assembling the valve, always replace the housing O-rings to ensure that the valve is tight.

   Insert the seals.
6. Depending on the actuator closing direction:
   - 6.1 Spring-to-close actuator (NC): pressurize the actuator. Assemble the valve. Depressurize the actuator to lower the valve disk.
   - 6.2 Spring-to-open actuator (NO): install the valve.

⇒ Install the valve with welded ends.

INFO Welding method: We recommend using the automatic orbital welding method. All welding work should only be performed by certified welders or machine operators (orbital welders).

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

5.5 Checking the pneumatic connection

5.5.1 Air requirement

Actuator type	Actuator Ø [mm]	Air requirement (dm^3_n/stroke) dm^3_n at 1.01325 bar at 0 °C as per DIN 1343
A...	98	0.16
B...	109	0.26
C...	135	0.42
D...	170	0.7
E...	210	1.1
R...[1]	170	1.6
S...[1]	210	2
T...[1]	210	2.2

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

5.5.2 Establishing hose connections

INFO To ensure reliable operation, the compressed air hoses must be cut exactly at a right angle.

Tools

- Hose cutter

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

⇒ Hose connection has been established.

Hose connection diagram with T.VIS control top

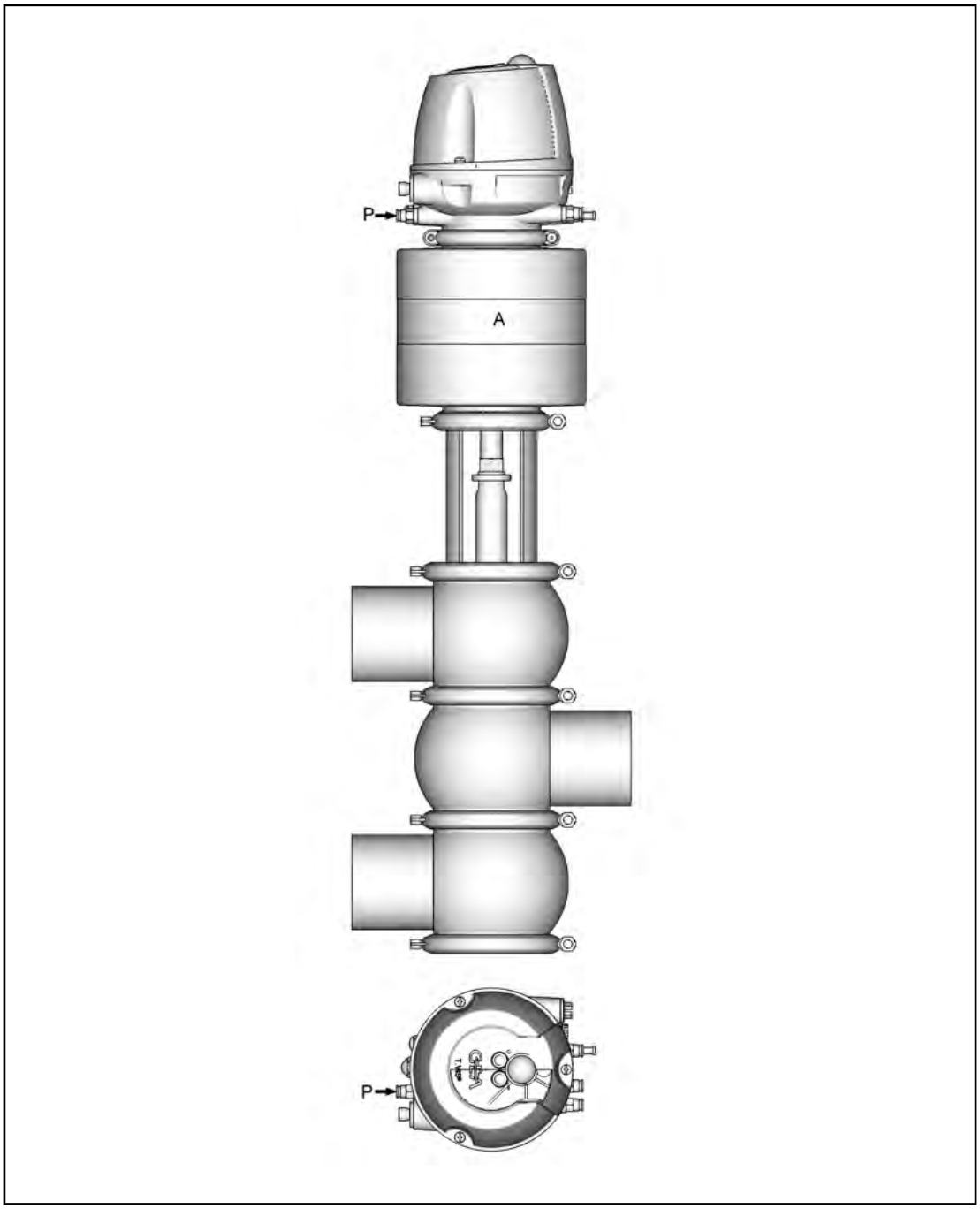


Figure 5-1 - Hose Connection Diagram

Position	Designation
A	Actuator
P	Central air supply
X	Sound absorber
Y	Locking screw
Z	Plug

5.5.3 Electrical connection with T.VIS control top

⚠DANGER

Live parts

Electrical shocks can cause serious personal injuries or death.

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

⚠DANGER

Explosive gases or dusts

An explosion can cause serious personal injuries or death.

- Observe the installation and operating regulations for use in potentially explosive areas!

Prerequisites

- Valve is installed

1. Connect the control top in accordance with the connection diagram and the instructions in the operating instructions for T.VIS control tops.

⇒ Control top is connected.

INFO The proximity switches are set ex-works. Settings can become changed during transport and installation and may need to be reset, see the instruction manual for the control top.

6 Commissioning

This chapter contains information for the initial and any subsequent commissioning of the valve. It also describes the necessary checks and tests.

It is addressed to all persons who carry out actions related to the valve.

INFO During all commissioning, observe the chapter *2 Safety* of this Operating Instructions.

6.1 Preparing 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.

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.

6.2 Restarting

The following principles apply for restarting:

- Only allow properly qualified staff to set the valve into operation.
- Make sure all connections are connected properly.
- 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 Operation and control

This chapter contains information on starting up and shutting down the valve.

It is addressed to the personnel that operate the valve.

INFO During every start-up, observe the chapter *2 Safety* of this Operating Instructions.

7.1 Start-up

7.2 Monitoring operation

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

For operation, the following principles apply:

- Monitor the valve during the 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 mounted as intended.
- The place of installation of the valve must be adequately ventilated at all times.
- Structural alterations of the valve are not permitted. Immediately report any changes on the valve to the person responsible.
- 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.

7.3 Shutdown

The following principles apply for shutdown:

- Switch off the compressed air.
- Switch off the valve.
- 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.
- In case of longer shut-downs, observe the storage conditions, see *4.2 Storage*.

8 Cleaning

This chapter contains information about cleaning the valve. It also contains information about cleaning intervals and the use of cleaning agents.

It is addressed to all persons who carry out actions related to the cleaning the valve.

INFO During all cleaning work, observe chapter *2 Safety* of this Operating Instructions.

8.1 General points

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 operating company!

8.1.1 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

Example of a two-phase cleaning process:

- 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).

8.1.2 Cleaning results

The cleaning result 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.

8.2 Passivation

Before a system with long pipes and tanks is commissioned, it usually needs to be passivated.

Valve blocks are usually excepted from this.

Passivation is usually carried out with nitric acid (HNO_3) at about 80 °C (176 °F) in a concentration of 3 % and a contact time of 6 to 8 hours.

9 Maintenance

This chapter contains information about valve maintenance, inspection and repairs. It also describes the personnel qualifications required for the individual actions.

It is addressed to all persons who carry out actions related to the valve.

INFO During all repair work, observe the chapter *2 Safety* of this Operating Instructions.

9.1 Carrying out inspections

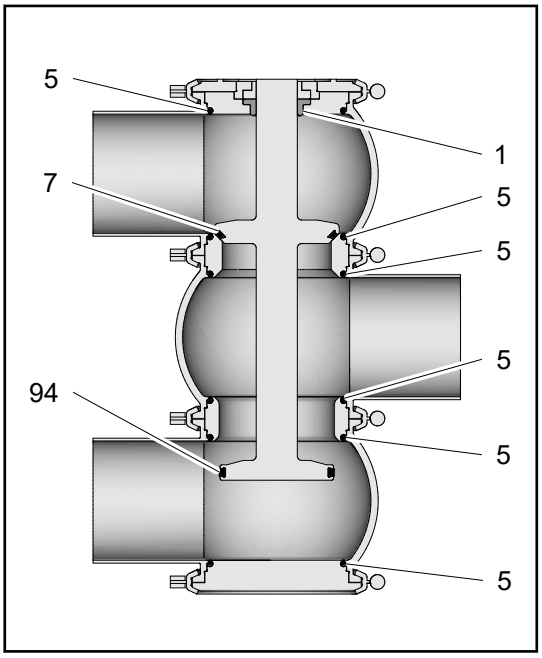
Between the maintenance periods, the valves must be checked for leakage and proper function.

9.1.1 Checking seals that come into contact with the product

Prerequisites

- Access to seals that come into contact with the product

1. Regularly check seals that come into contact with the product:
   - 1.1 Check the seal ring between upper housing and lantern.
   - 1.2 Check the V-ring in the valve disks.
   - 1.3 Check the O-rings between the valve housings.



⇒ Seals that come into contact with the product have been tested.

9.1.2 Checking the pneumatic connection

Prerequisites

- Access to the pneumatic connection

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

⇒ The pneumatic connection has been checked.

9.1.3 Checking the electrical connection

Prerequisites

- Access to the electrical connection

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

⇒ The electrical connection has been checked.

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

9.1.4 Checking the signs on the valve

Prerequisites

- Valve is accessible

1. Check the signs on the valve, see also *2.9 Safety signs*.
2. If necessary, replace damaged or missing labels with new labels.

⇒ The signs on the valve have been checked.

9.2 Servicing intervals

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

The actual servicing intervals can only be determined by the operating company 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

Servicing intervals

Applications	Servicing 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

9.3 List of tools

Tool	Intended purpose	Material no.
Belt wrench	Removing/mounting the actuator	408-142

Tool	Intended purpose	Material no.
Torque screwdriver	Mounting the half-rings/hood T.VIS	408-449
Torque wrench ¼" (2.5-25 Nm)	Mounting the clamp connection	408-424
Torque wrench size 1 (2-10 Nm)	Mounting the switch bar	--
Plug tool extension size 1+2	Mounting the valve disk	408-456
V-ring insertion tool	Mounting the V-rings	229-109.88
Hex key a/f 3	Removing/mounting the half-rings T.VIS	408-121
Philips screwdriver	Removing the hood T.VIS	406-125
Open-end plug tool size 1 a/f13	Mounting the switch bar	408-452
Jaw wrench, a/f 10/11	Removing the clamp connection	408-033
Jaw wrench, a/f 12/13	Removing the clamp connection	408-034
Jaw wrench, a/f 13/17	Removing the switch bar / valve disk DN 25	408-036
Jaw wrench, a/f 24/27		408-040
Jaw wrench, ends ground, a/f 17-19	Removing the valve disk	229-119.01
Jaw wrench, ends ground, a/f 21-23	Removing the valve disk	229-119.05
Jaw wrench, ends ground, a/f 22-24		229-119.03
Pick-Set	Removing the seals	221-007248
Ring wrench double-open size 21x23	Mounting the lock nut / valve disk	408-412
Adjustable plug tool size 1 (1-27)	Mounting the valve disk	--
Slotted screwdriver	Removing/mounting the pilot valve T.VIS	406-102
Vice support	Removing/mounting the V-ring aid	470-001
Socket for wrench ¼" long a/f10	Mounting the clamp connection	407-477
Socket for wrench ¼" a/f13	Mounting the clamp connection	408-425
Tool bit 6.3-PH2 Philips 89 mm	Mounting the hood T.VIS	408-459
Tool bit 6.3-size 3 hex. 89 mm	Mounting the half-rings T.VIS	408-469

Additional tools for valves with control top T.VIS

Tool	Intended purpose	Material no.
Bit 6.3-PH2 Philips 89 mm		408-459
Bit 6.3 size 3 hex 89 mm		408-469
Torque screwdriver 1-5 Nm	Mounting the half-rings/hood T.VIS	408-449
Torque wrench size 1 2-10 Nm	Mounting the switch bar	--
Articulated face spanner with journal 4 mm	Removing/mounting the installation base	--
Allen key 3 mm	Removing/mounting the half-rings T.VIS	408-121
Open end plug tool size 1 a/f 13	Mounting the switch bar	408-452
Screwdriver, slot head 2.5 mm	Removing/mounting the pilot valve T.VIS	406-102
Screwdriver crosstip size 2	Removing/mounting the hood	406-125

9.4 Prior to removal

Prerequisites

- Ensure that no active processes are running in the relevant area during maintenance and servicing work .

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

9.5 Removing the valve

9.5.1 Removing the clamp connection between the housing and lantern

The clamp connection is removed depending on how the valve is configured:

- see section *Spring-to-close valve (NC) with control top T.VIS*
- see section *Spring-to-close valve (NC) without control top T.VIS*
- see section *Spring-to-open valve (NO) with control top T.VIS*
- see section *Spring-to-open valve (NO) without control top T.VIS*

Spring-to-close valve (NC) with control top T.VIS

INFO Removal step: remove the clamp connection between the housing and lantern

Prerequisites

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

Tools

- Philips screwdriver
- Slotted screwdriver
- Jaw wrench a/f 10

- Jaw wrench a/f 13

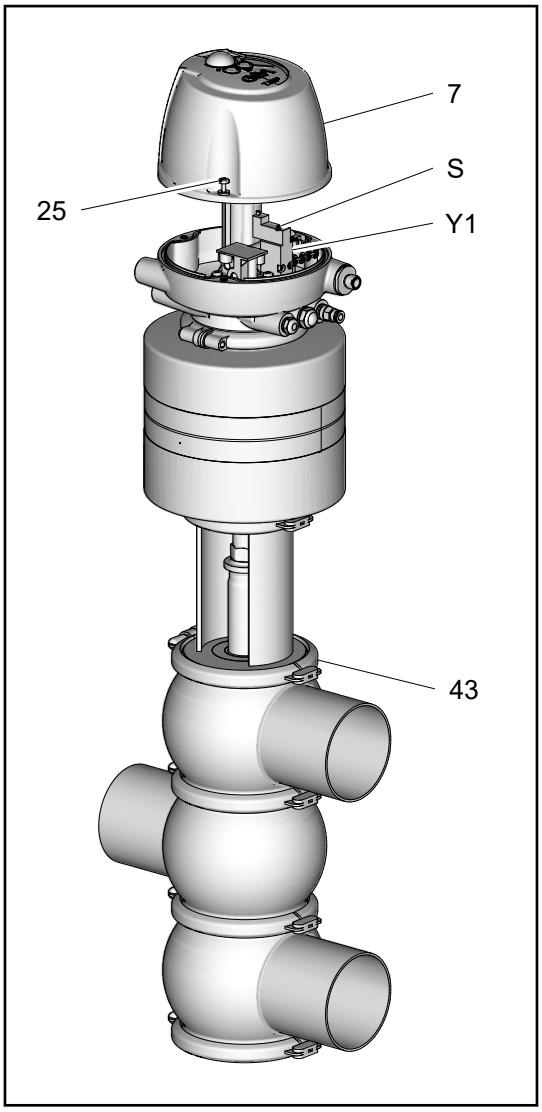
⚠WARNING

Spring tension in the valve (NC)

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 pressurising the actuator with compressed air at max. 8 bar.

1. Release the philips screws (25) and take off the hood (7).
2. Pressurize the actuator – with compressed air (max. 8 bar) - by activating the solenoid valve Y1 at the manual operation element S.
   → The valve disk is raised.



3. Remove the clamp connection (43) between the housing and lantern.
4. Depressurize the actuator by deactivating the solenoid valve Y1 at the manual operation element S.
   → The valve disk is lowered.
   The valve insert is pushed out of the housing.

⇒ The clamp connection between the housing and lantern has been removed.

Spring-to-close valve (NC) without control top T.VIS

INFO Removal step: remove the clamp connection between the housing and lantern

Prerequisites

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

Tools

- Belt wrench
- Jaw wrench, a/f 10/11
- Jaw wrench, a/f 12/13

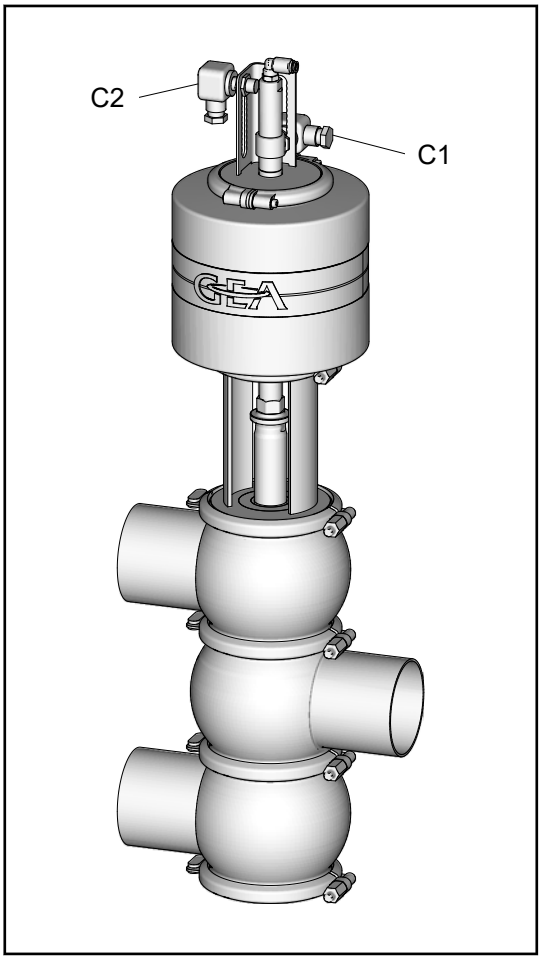
⚠WARNING

Spring tension in the valve (NC)

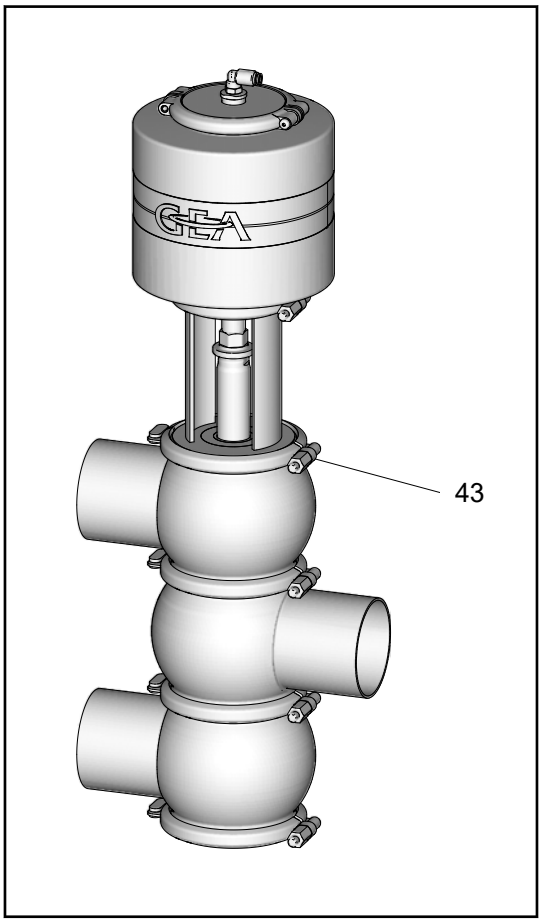
Danger of injury when opening the clamp connections on the actuator or on the housing as the released spring pretension will suddenly lift the actuator.

- Therefore, release the spring tension before detaching the clamp connection by pressurising the actuator with compressed air at max. 8 bar.

1. Remove any mounted proximity switches (C1, C2) (optional version).



2. Pressurize the actuator - with compressed air, max. 8 bar (connection 0).
   → The valve disk is raised.
3. Remove the clamp connection (43) between the housing and lantern.
4. Depressurize actuator (connection 0).
   → The valve disk is lowered.
   The valve insert is pushed out of the housing.



⇒ The clamp connection between the housing and lantern has been removed.

Spring-to-open valve (NO) with control top T.VIS

INFO Removal step: remove the clamp connection between the housing and lantern

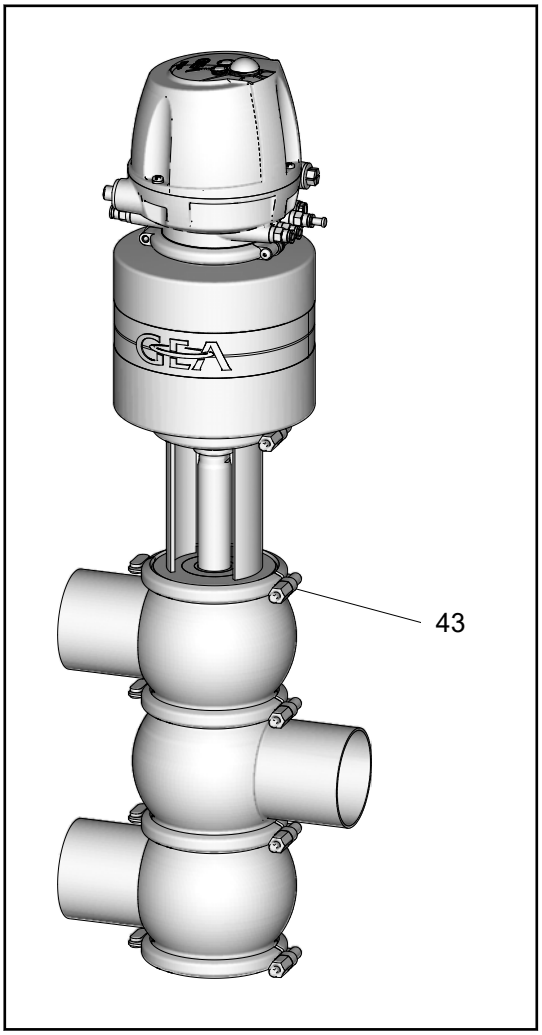
Prerequisites

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

Tools

- Philips screwdriver
- Slotted screwdriver
- Jaw wrench a/f 10
- Jaw wrench a/f 13

1. Depressurize actuator, 0 bar.
2. Remove the clamp connection (43) between the housing and the lantern.



⇒ The clamp connection between the housing and the lantern has been removed.

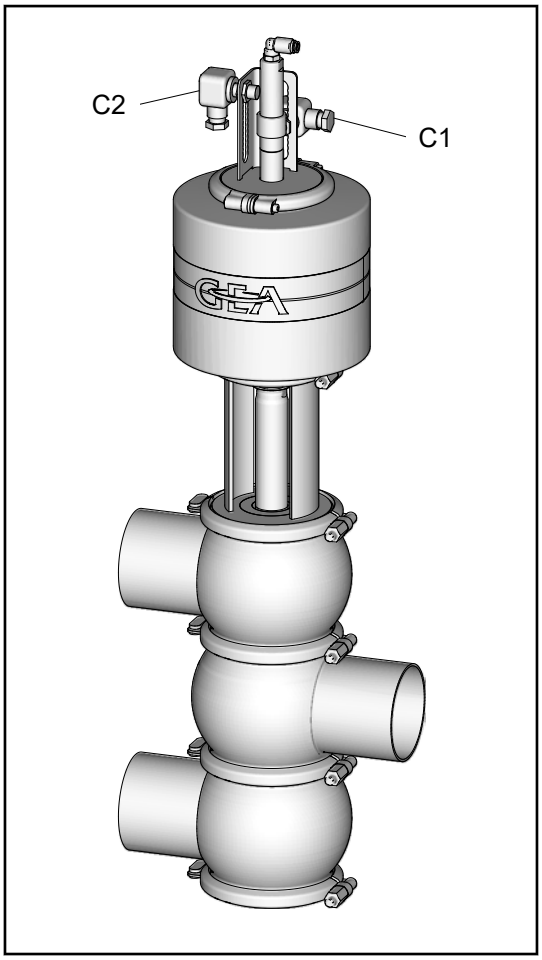
Spring-to-open valve (NO) without control top T.VIS

INFO Removal step: remove the clamp connection between the housing and lantern

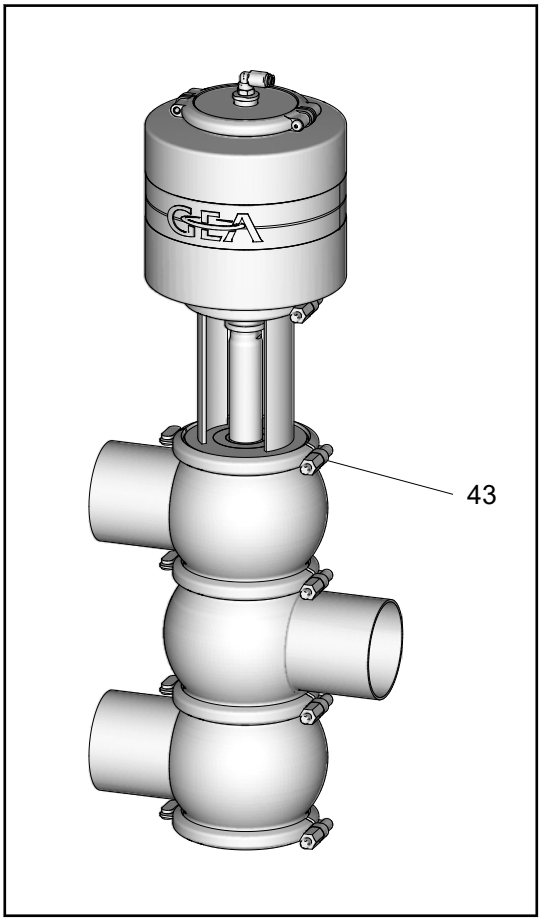
Tools

- Belt wrench
- Jaw wrench, a/f 10/11
- Jaw wrench, a/f 12/13

1. Remove any mounted proximity switches (C1, C2) (optional version).



2. Depressurize actuator (connection 0).
3. Remove the clamp connection (43) between the housing and lantern.



⇒ The clamp connection between the housing and lantern has been removed.

9.5.2 Removing the control top

ATTENTION

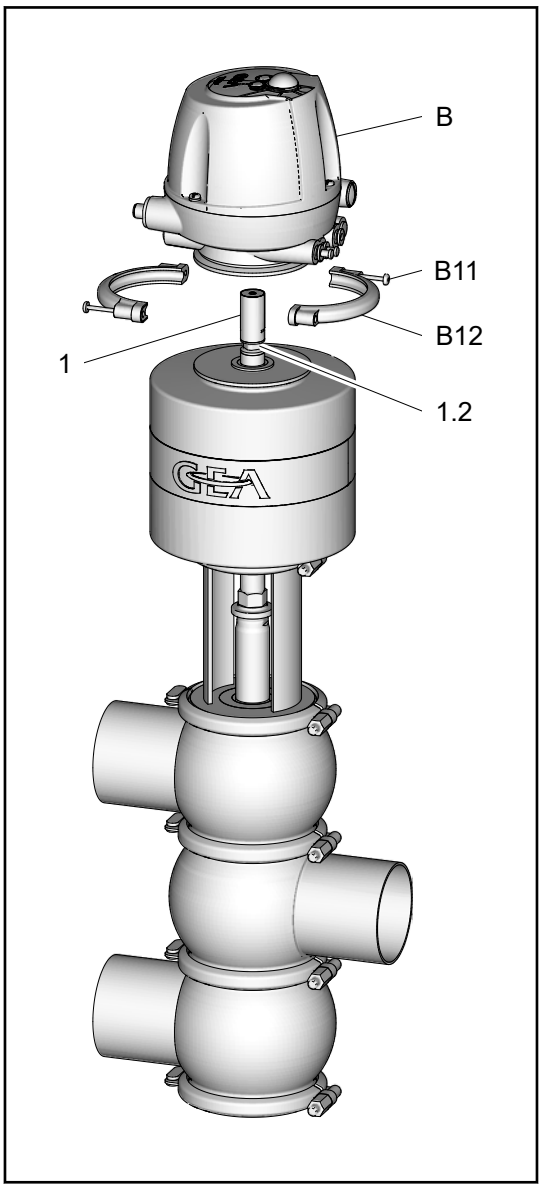
The switch bar is sensitive and must be protected from impact stress.
Damage to switch bar.

- Protect the switch bar against impact stress.

Tools

- Hex key, a/f 3
- Jaw wrench a/f13

1. Unscrew the screws (B11) of the half-rings (B12) using a hex key a/f 3 and remove the half-rings (B12).
2. Lift off the control top (B), also refer to the operating instructions for the "T.VIS control top".



3. Loosen the switch bar (1) with a jaw wrench on the wrench flat surface (1.2) and remove.

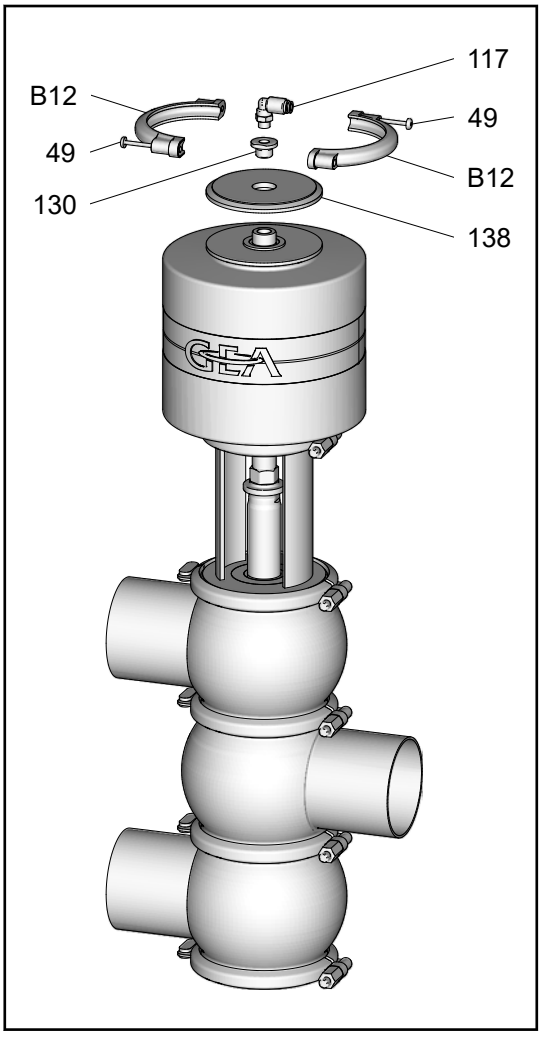
⇒ Control top is removed.

9.5.3 Remove connection 0

Tools

- Hex key, a/f 3
- Jaw wrench a/f13

1. Unscrew the screws (49) of the half-rings (B12) using a hex key a/f 3 and remove the half-rings (B12).
2. Release the air connection (117) and reduction nipple (130) using a jaw wrench and unscrew.
3. Remove the actuator cover (138) from the actuator.



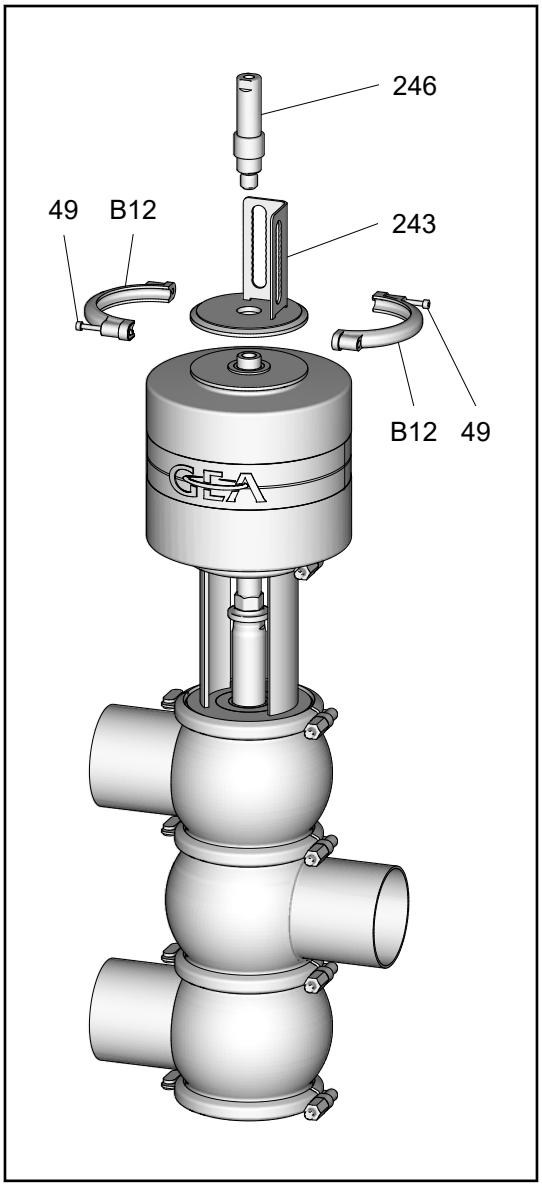
⇒ Connection 0 has been removed.

9.5.4 Remove INI holder

Tools

- Hex key, a/f 3
- Jaw wrench a/f13

1. Unscrew the screws (49) of the half-rings (B12) using a hex key a/f 3 and remove the half-rings (B12).
2. Unscrew and remove the air connection (246) with a jaw wrench.
3. Remove the mounting for proximity switch INA (243) from the actuator.



⇒ INI holder has been removed.

9.5.5 Disconnecting the valve insert from the housing

ATTENTION

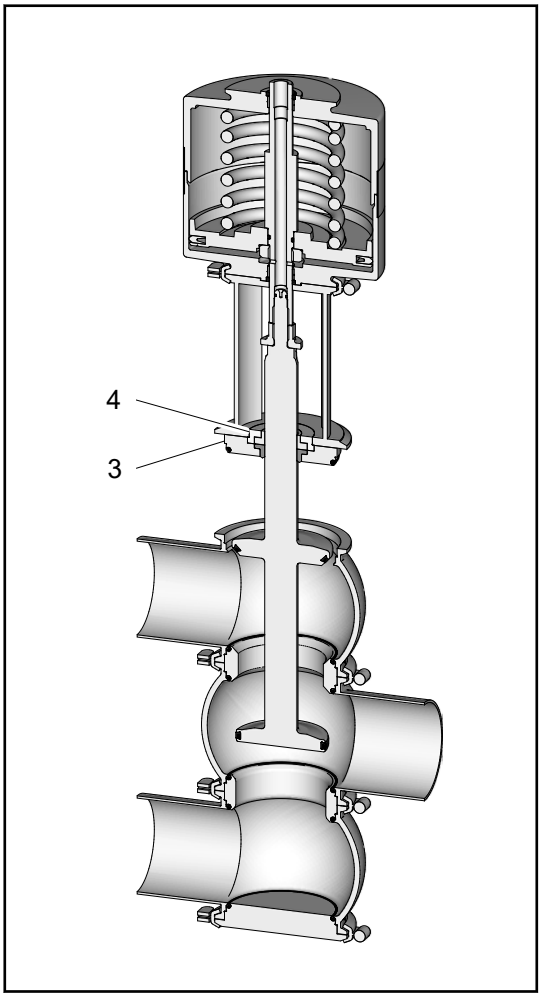
Sensitive valve parts

Damage to the valve parts can lead to a malfunction.

- Protect the valve parts against impact stress.

1. Pull the valve insert out of the housing.

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



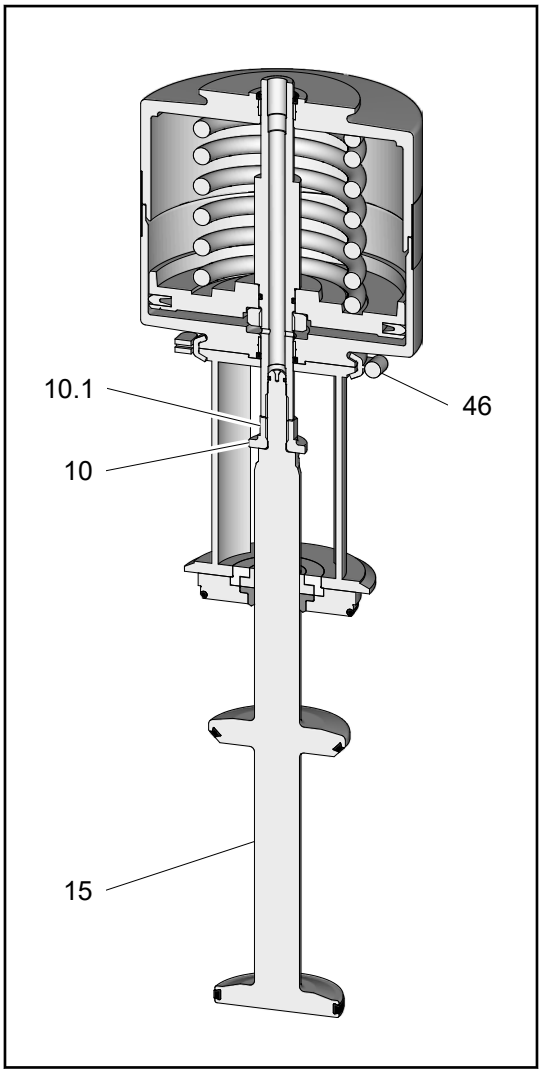
⇒ The valve is now separated from the housing.

9.5.6 Dismantling the valve insert into individual parts

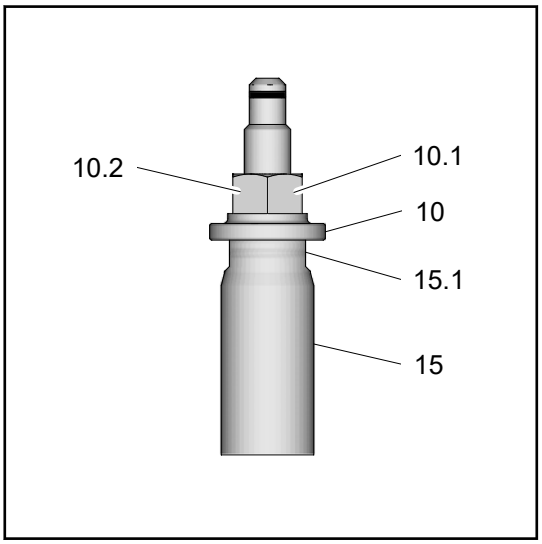
Tools

- Belt wrench
- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Jaw wrench a/f 17
- Jaw wrench a/f 21
- Jaw wrench a/f 23

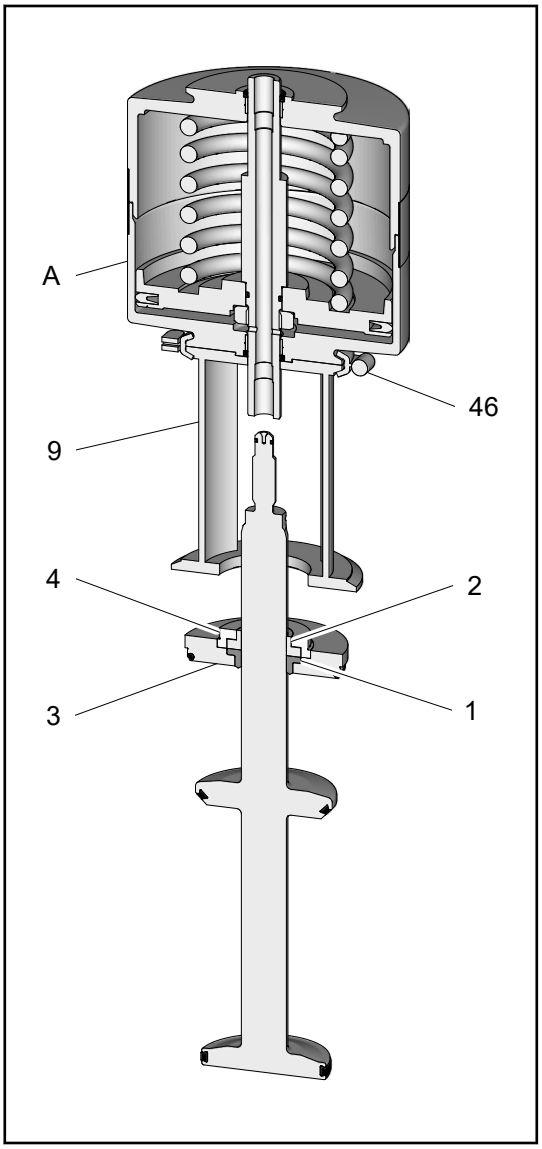
1. Loosen the clamp connection (46) between the actuator and the lantern.
   → The lantern can be turned to allow the jaw wrench to be positioned to release the lock nut (10).
2. Hold the lock nut (10) tight on the wrench flat surface (10.1) with a jaw wrench.
3. Turn the actuator with a belt wrench and release the valve disk (15).



4. Unscrew the valve disk (15) along with the bearing disk (4), the bearing (2), the seal ring (1) and the seal disk (3) from the actuator (A).
5. Release the lock nut (10) using 2 jaw wrenches on the wrench flat surface of the lock nut (10.1) and the wrench flat surface of the valve disk (15.1) from the valve disk (15) and unscrew.
6. Pull off the bearing disk (4) with the bearing (2) and the sealing washer (3) with the gasket (1) from the valve disk.



7. Remove the clamp connection (46) between the lantern (9) and the actuator (A).
8. Remove the lantern (9).



⇒ Valve insert has been dismantled into its individual parts.
All seals are freely accessible.

9.5.7 Dismantling of the housing combination

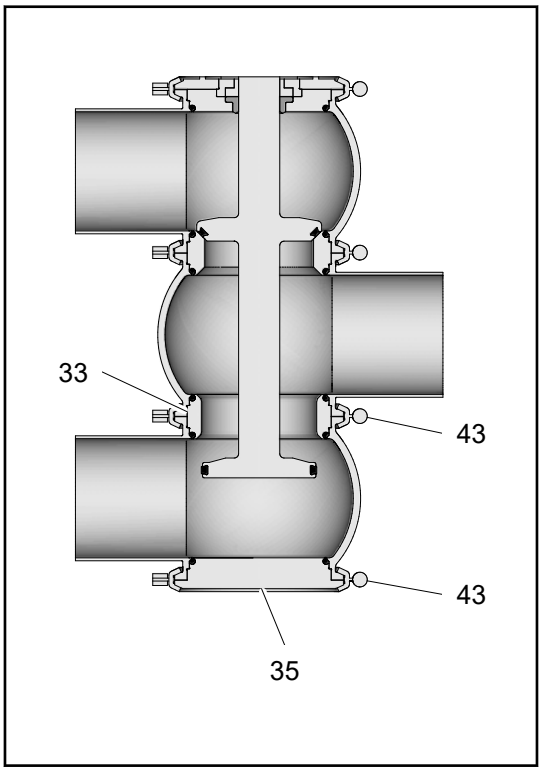
Prerequisites

- This housing combination does not exist for welded housings

Tools

- Jaw wrench a/f10
- Jaw wrench a/f 13

1. Remove the clamp connections (43) on the housing combination.
2. Remove the blanking plate (35).
3. Remove the seat rings (33)



⇒ Housing combination is dismantled.
All seals are freely accessible.

9.6 Installing the valve

9.6.1 Tightening torques

Tighten the following valve connections to the torques specified in the table.

Tightening torques		[Nm]	[lbft]
Valve disk	M14	80	59
Spacer nut	M14	80	59
INI holder	M34	60	44.2
Switch bar	M14	2	1.5
Clamps on the control top	M14	1	0.7
Cap		1	0.7

Tightening torques		[Nm]	[lbft]
Clamp connection (Cast clamps)	M6	9	6.6
	M8	22	16.2
	M10	45	33

9.6.2 Assembling the valve insert from individual parts

⚠WARNING

Risk of injury when mounting sharp-edged parts

- Do not put your hand into the valve housing.

ATTENTION

Sensitive valve parts

Damage to the valve parts can lead to a malfunction.

- Protect the valve parts against impact stress.

Tools

- Belt wrench
- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Jaw wrench a/f 17
- Jaw wrench a/f 21
- Jaw wrench a/f 23
- Ring wrench double-open size 21x23

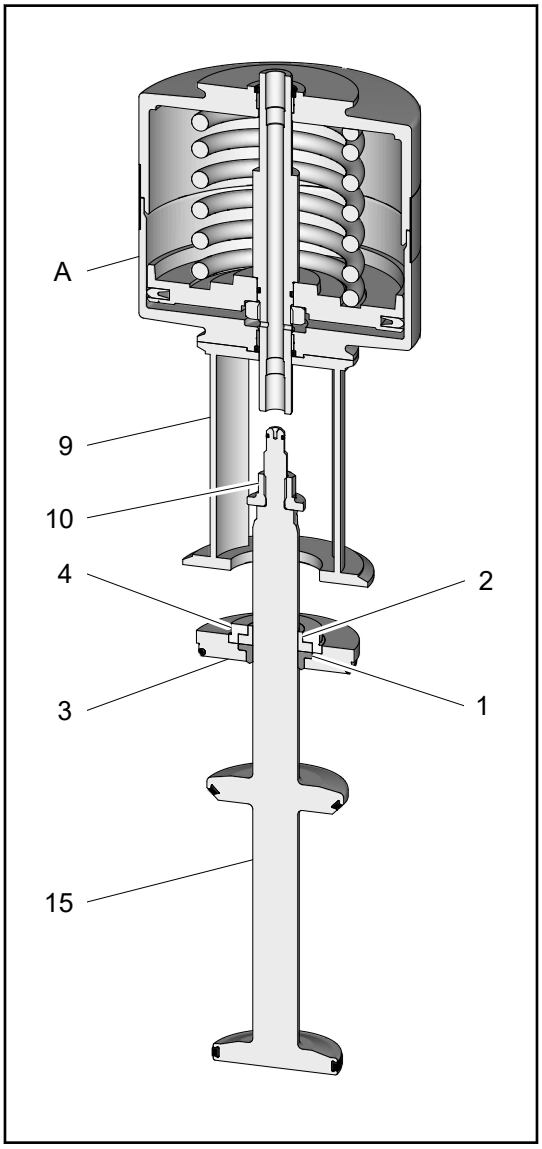
ATTENTION

Sensitive sealing surfaces in the actuator

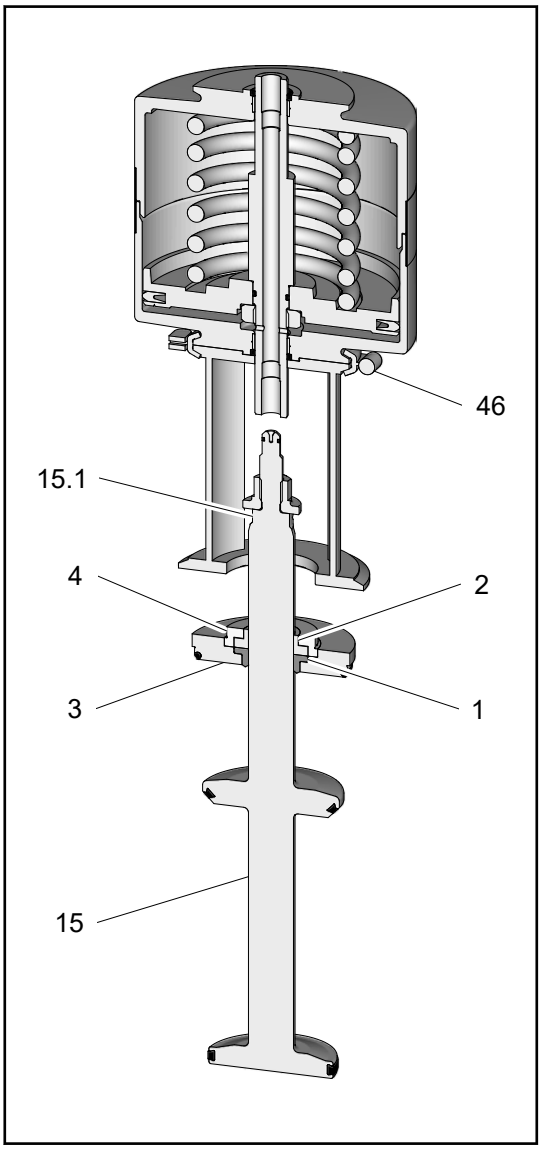
The sealing surfaces on the cylinder can become damaged.

- Take care no dirt enters the actuator.

1. Push the lantern (9) onto the actuator (A).
2. Push the bearing disk (4) with bearing (2) and seal disk (3) with seal ring (1) onto the valve disk (15).
3. Screw the lock nut (10) to the valve disk (15) using 2 jaw wrenches.
   → Observe torques, see table 'Tightening torques'. *9.6.1 Tightening torques*.



4. Screw the valve disk (15) along with the bearing disk (4), the bearing (2), the seal ring (1) and the seal disk (3) into the actuator. Hold tight the valve disk (15) on the wrench flat surface (15.1).
   → Observe torques, see table 'Tightening torques'. *9.6.1 Tightening torques*.
5. Mount the clamp connection (46) between the lantern and the actuator.
   → Observe torques, see table 'Tightening torques'. *9.6.1 Tightening torques*.



⇒ The valve insert is assembled from individual parts.

9.6.3 Assembly of the housing combination

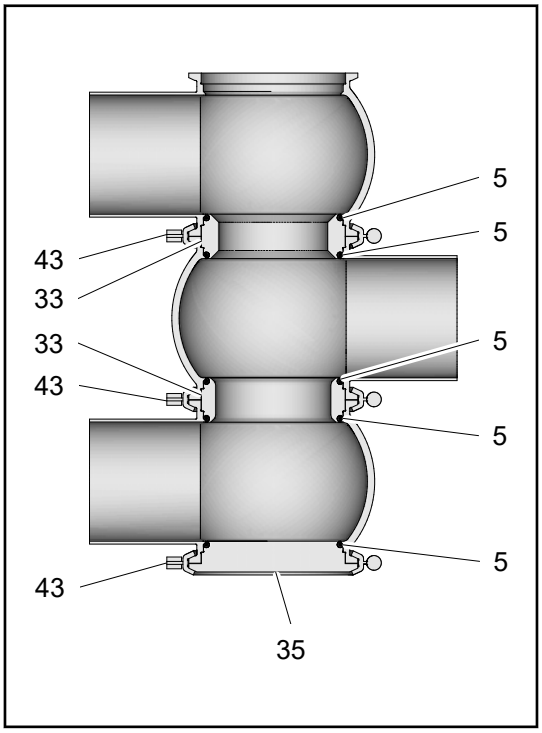
Prerequisites

- loose housing combination available

Tools

- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Torque wrench ¼“ (2.5-25 Nm)
- Socket for wrench ¼" long a/f 10
- Socket for wrench ¼" a/f 13

1. Place the seat rings (33) with the O-ring (5) into the housing and mount the clamp connection (43).
   → Observe torques, see table ‘Tightening torques’. *9.6.1 Tightening torques*.
2. Place the blanking plate (35) with the O-ring (5) into the housing and mount the clamp connection (43).
   → Observe torques, see table ‘Tightening torques’. *9.6.1 Tightening torques*.

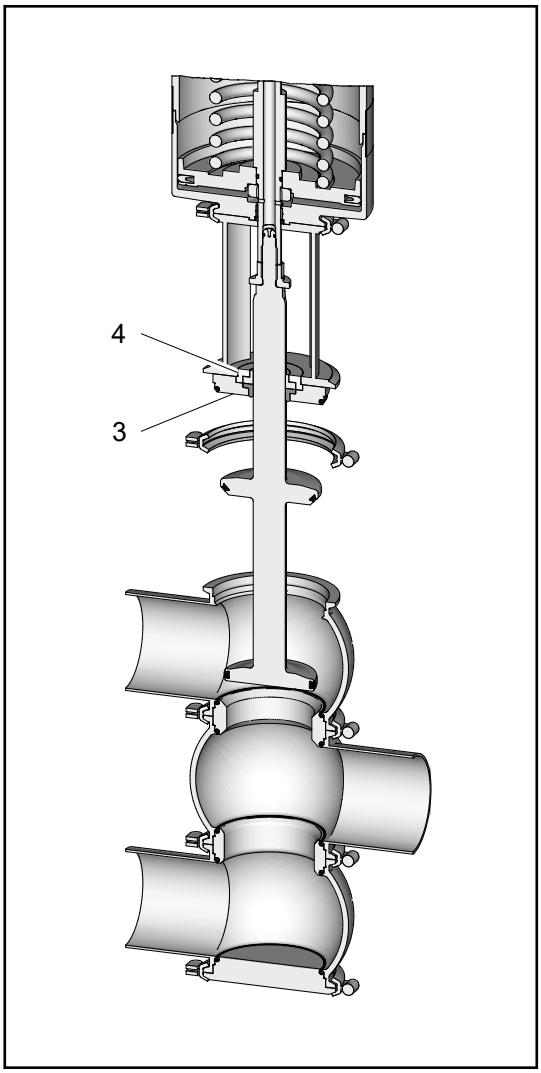


⇒ Housing combination is assembled.

9.6.4 Placing the valve insert in the housing

1. Place the valve insert into the housing.

→ ! The bearing disk (4) and the seal disk (3) may not hit the rod of the valve disk when the valve insert is fitted.



⇒ The valve insert is placed into the housing.

9.6.5 Mounting the control top

ATTENTION

The switch bar is sensitive and must be protected from impact stress.

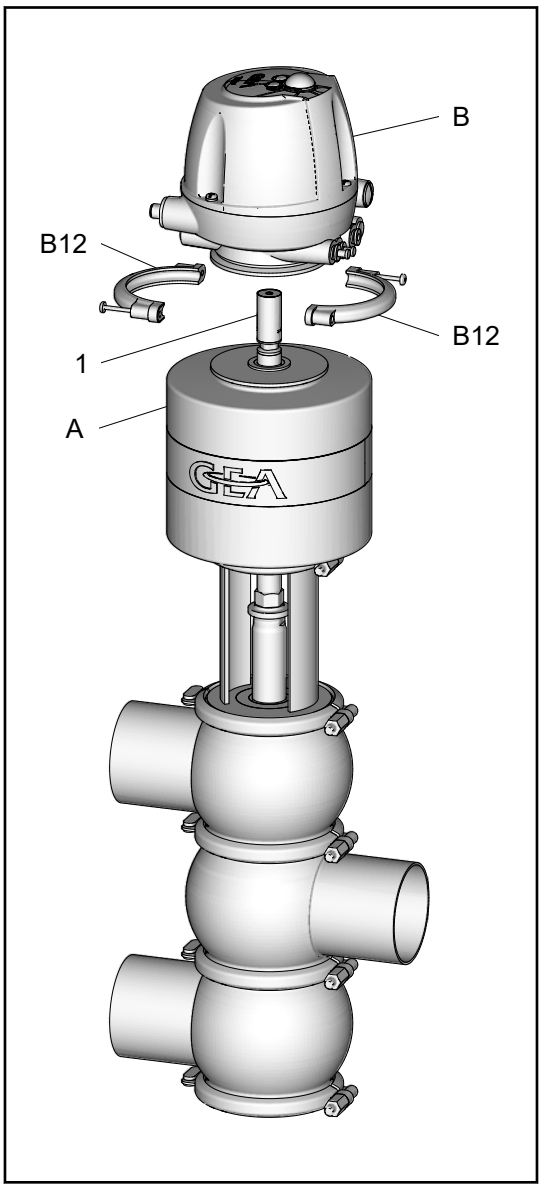
Damage to switch bar.

- Protect the switch bar against impact stress.

Tools

- Hex key, a/f 3
- Jaw wrench a/f13
- Torque screwdriver
- Open-end plug tool size a/f13
- Tool bit 6.3-PH2 Philips
- Tool bit 6.3 size 3 hex

1. Screw the switch bar (1) into the actuator (A) using a jaw wrench.
   → Observe torques, see *9.6.1 Tightening torques*.
2. Place the control top (B) onto the switch bar (1) from above.
3. Mount the half-rings (B12) on the control top (B).
   → Ensure that the half-rings are mounted correctly!
   Observe torques, see *9.6.1 Tightening torques*.



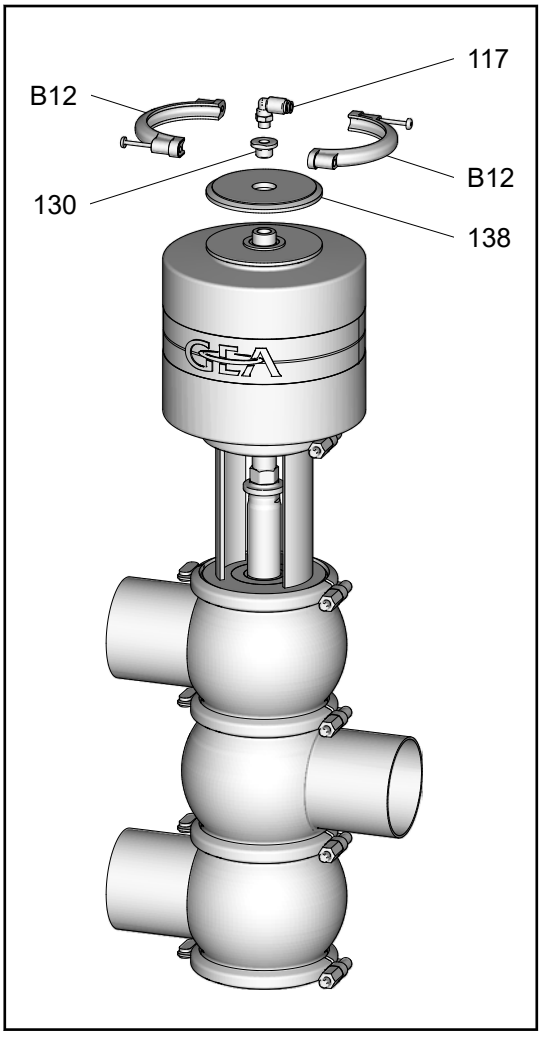
⇒ Control top is fitted.

9.6.6 Mounting connection 0

Tools

- Hex key, a/f 3
- Jaw wrench a/f13

1. Place the actuator cover (138) onto the actuator.
2. Mount the half-rings (B12) onto the actuator cover.
   → Ensure that the half-rings are mounted correctly!
   Observe torques, see *9.6.1 Tightening torques*.
3. Screw the reduction nipple (130) with the air connection (117) into the actuator.
   → Observe torques, see *9.6.1 Tightening torques*.



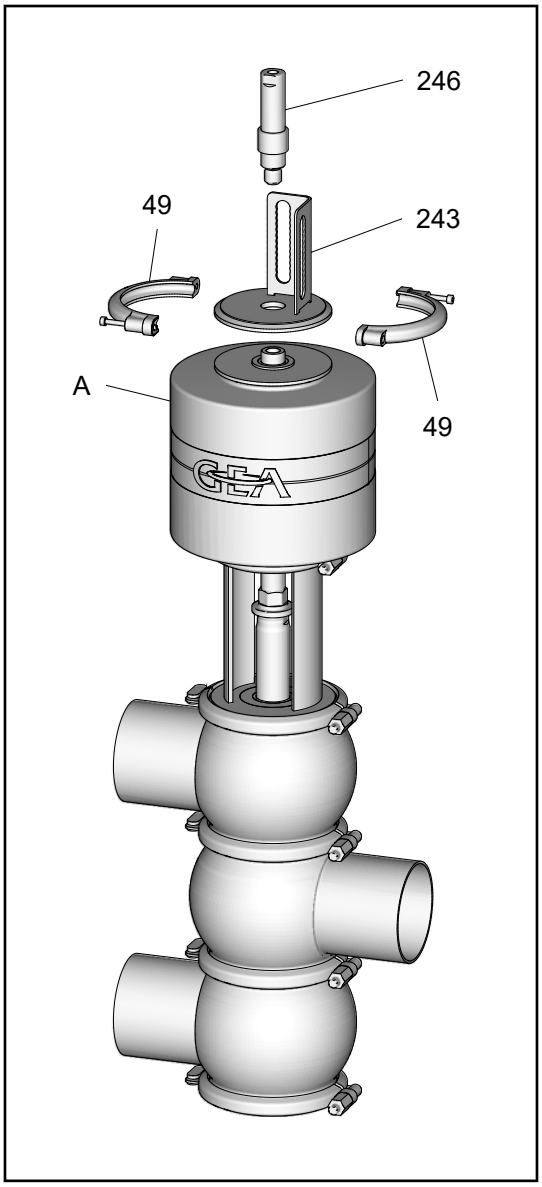
⇒ Connection 0 has been mounted.

9.6.7 Mount INI holder

Tools

- Hex key, a/f 3
- Jaw wrench a/f13

1. Place the mounting for the proximity switch INA (243) onto the actuator (A).
2. Mount the half-rings (49) onto the holder for the proximity switch.
   → Ensure that the half-rings are mounted correctly!
3. Screw the air connection (246) into the actuator using a jaw wrench.
   → Observe torques, see *9.6.1 Tightening torques*.



⇒ INI holder has been mounted.

9.6.8 Mounting the clamp connection between the housing and lantern

ATTENTION

Sensitive valve parts

Damage to the valve parts can lead to a malfunction.

- Protect the valve parts against impact stress.

The clamp connection is mounted depending on how the valve is configured:

- see section *Spring-to-close valve (NC) with control top T.VIS*
- see section *Spring-to-close valve (NC) without control top T.VIS*
- see section *Spring-to-open valve (NO)*

Spring-to-close valve (NC) with control top T.VIS

INFO Mounting step: mount the clamp connection between the housing and lantern

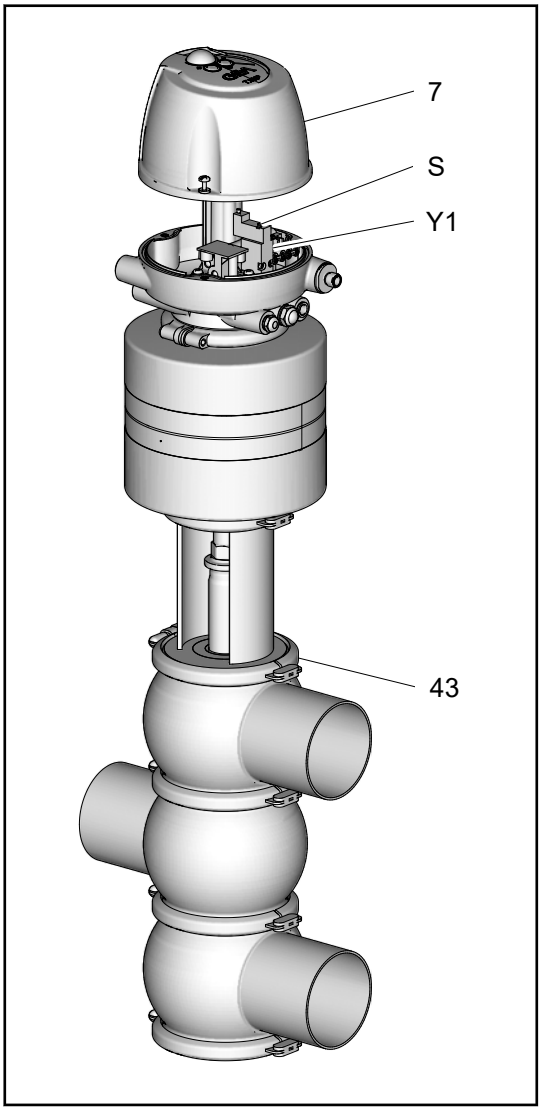
Tools

- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Torque wrench ¼“ 2,5-25 Nm
- Socket for wrench ¼" long a/f10
- Socket for wrench ¼" a/f13

1. Pressurize the actuator with compressed air, max. 8 bar, by activating solenoid valve Y1 at the manual operation element S.
   → Valve disk is raised.
   Valve insert lowers into the seat.
2. Mount the clamp connection (43) between the housing and lantern.
   → Observe torques, see *9.6.1 Tightening torques*.
3. Depressurize the actuator - 0 bar - by deactivating the solenoid valve Y1 at the manual operation element S.
   → The valve disk is lowered.

4. Attach the hood (7) to the control top using a philips screwdriver.

→ Observe torques, see *9.6.1 Tightening torques*.



⇒ The clamp connection is mounted.

Spring-to-close valve (NC) without control top T.VIS

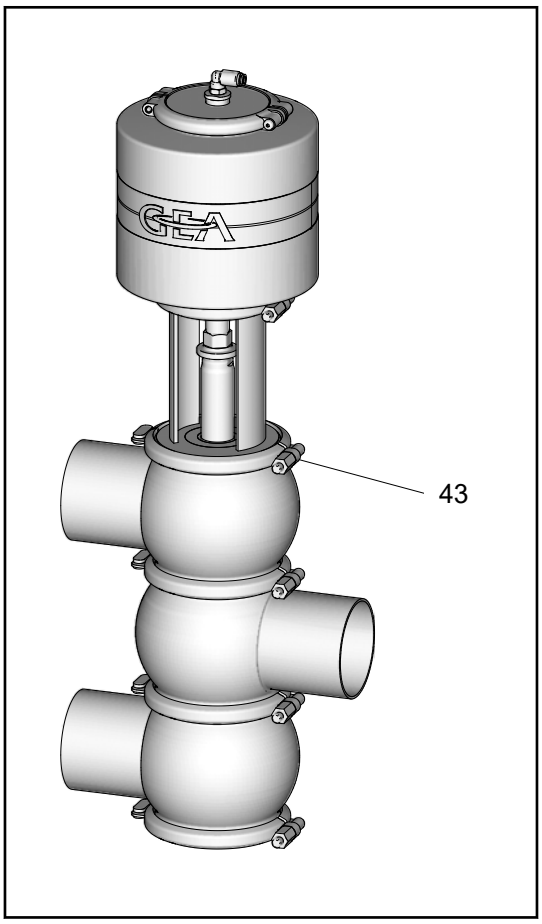
INFO Mounting step: mount the clamp connection between the housing and lantern

Tools

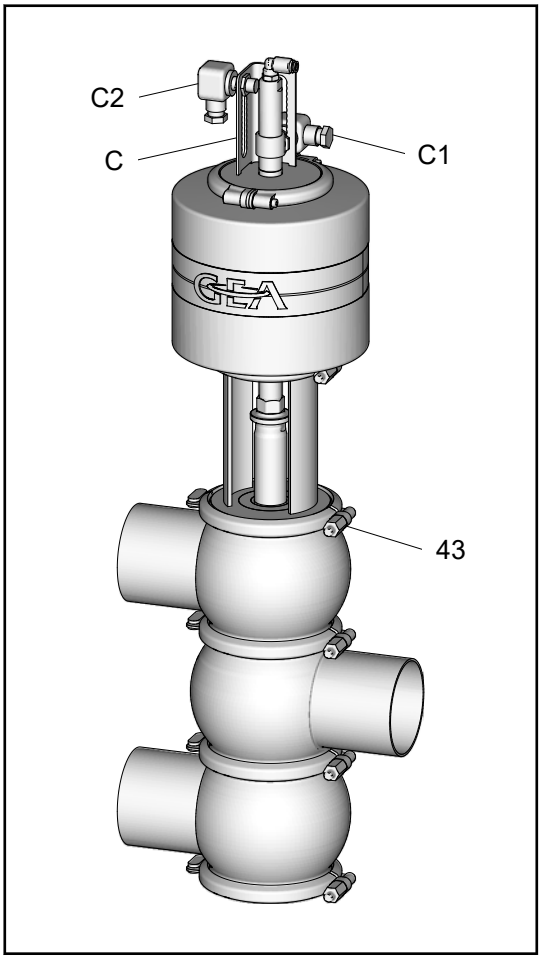
- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Torque wrench ¼“ 2,5-25 Nm
- Socket for wrench ¼" long a/f 10
- Socket for wrench ¼" a/f 13

1. Pressurize the actuator - with compressed air, max. 8 bar - connection 0.
   → Valve disk is raised.
   Valve insert lowers into the seat.
2. Mount the clamp connection (43) between the housing and lantern.
   → Observe torques, see *9.6.1 Tightening torques*.
3. Depressurize actuator (connection 0).

→ The valve disk is lowered.



4. For optional version with proximity switch holder (C): mount the proximity switches (C1, C2)



⇒ The clamp connection is mounted.

Spring-to-open valve (NO)

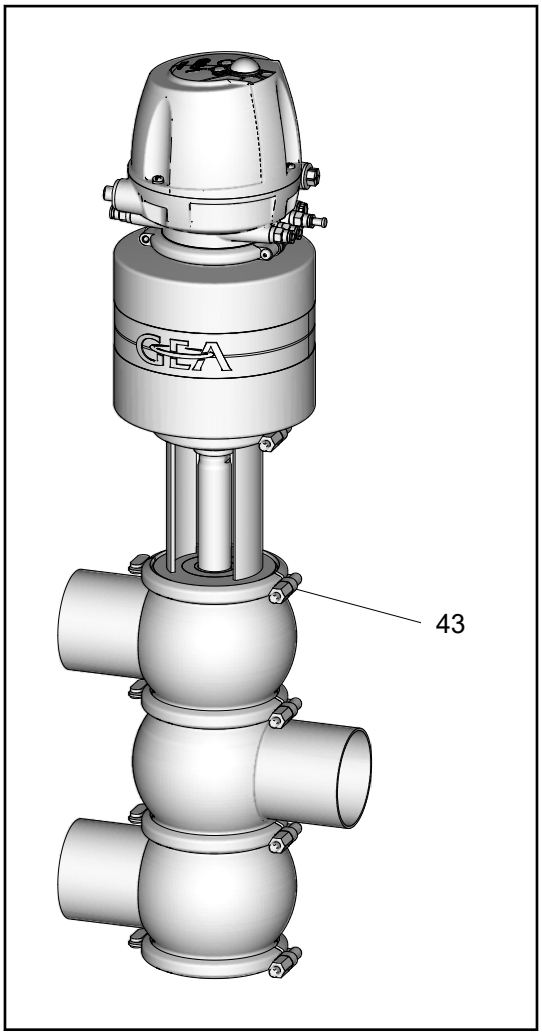
INFO Mounting step: mount the clamp connection between the housing and lantern

Tools

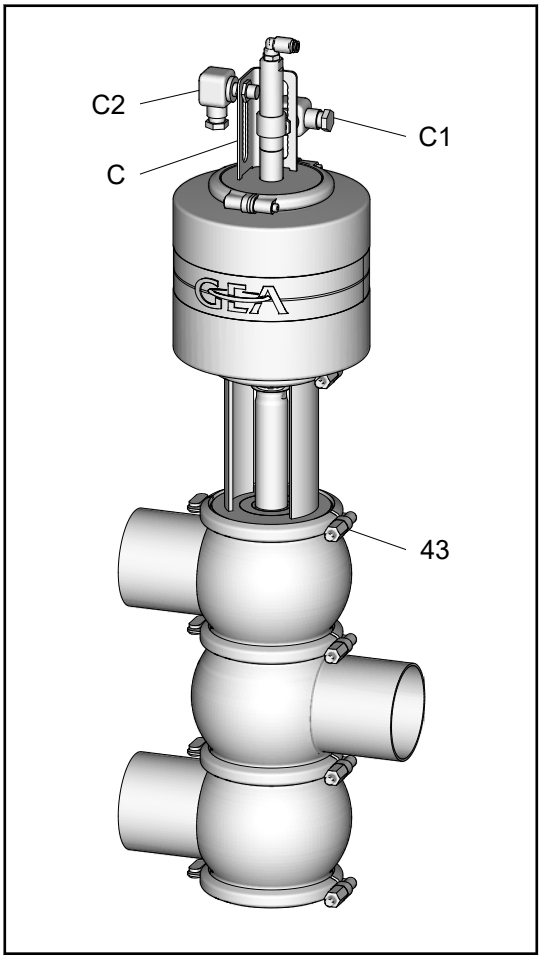
- Jaw wrench a/f 10
- Jaw wrench a/f 13
- Torque wrench ¼“ 2,5-25 Nm
- Socket for wrench ¼" long a/f 10
- Socket for wrench ¼" a/f 13

1. Mount the clamp connection (43) between the housing and lantern.

→ Observe torques, see *9.6.1 Tightening torques*.



2. For optional version with proximity switch holder (C): mount the proximity switches (C1, C2)

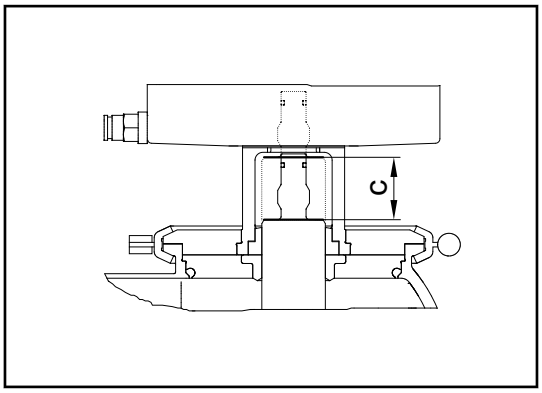


⇒ The clamp connection is mounted.

9.6.9 Checking the function

Check valve stroke and adjust feedback

1. Actuate the valve with compressed air.
2. Check the valve stroke (c), also refer to table *Valve stroke*.



3. **INFO**
   Please take the operating instructions for the respective control top into account for adjustment of the feedbacks.

   If the strokes are correct, the feedback can be adjusted and checked.

⇒ The valve stroke has been tested.

The valve strokes depending on size

Valve stroke

Valve size	Valve stroke [mm]
Metric	
25	16
40	19
50	31
65	30
80	30
100	30
Inch OD	
1"	12
1.5"	19
2"	31
2.5"	31
3"	29
4"	30

9.7 Maintenance

9.7.1 Cleaning the valve

Prerequisites

- The valve has been removed, see *9.5 Removing the valve*.

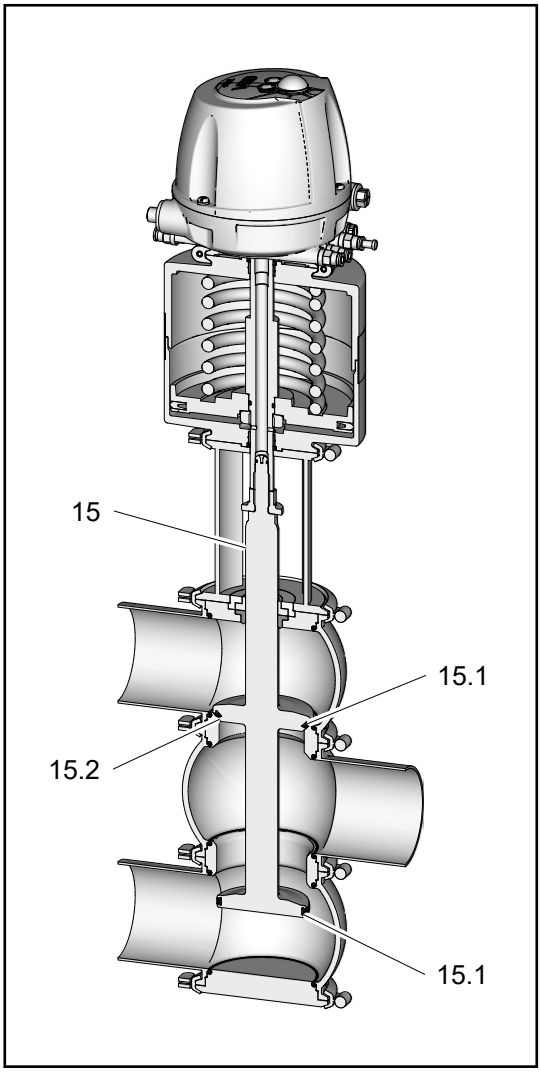
ATTENTION

Damage to the valve

Damage to the valve parts can result in a malfunction.

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

1. Carefully clean the individual parts.

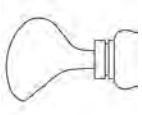


⇒ The valve has been cleaned.

INFO Observe the safety data sheets supplied by the detergent manufacturers. Only use detergents which are non-abrasive and not aggressive towards stainless steel.

9.7.2 Replacing the V-ring

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



V-ring insertion tool

Prerequisites

- The valve has been removed, see *9.5 Removing the valve*.
- Insert V-ring without grease. To facilitate fitting, use water with a drop of washing-up liquid to remove the surface tension. To ensure that no rust is transferred, the washing-up liquid solution must be mixed in a ceramic, plastic, or stainless steel container.

Tools

- V-ring insertion tool

⚠CAUTION

Sharp-edged tool

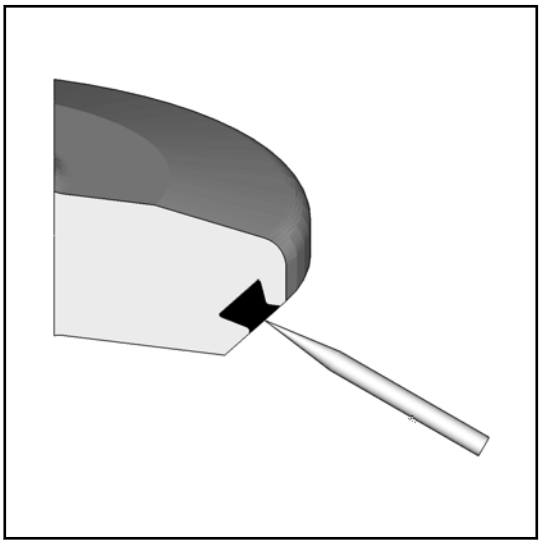
Risk of injury if the pickset tool slips when removing the V-ring.

- Clamp the valve disk with the vice mount into the vice.

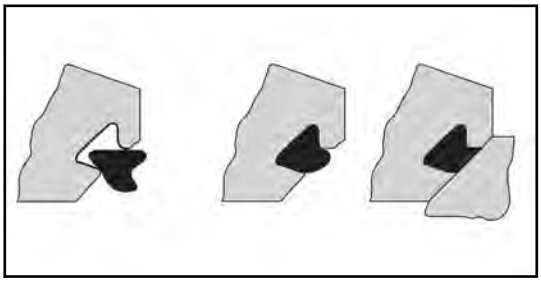
INFO Functional and running surfaces of the valves may not be damaged.

INFO Do not grease the V-ring.

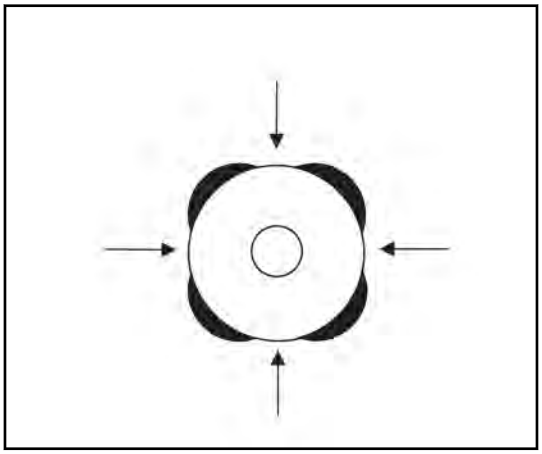
1. Put a tool from the pickset into the V-ring and take it out.



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



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



6. Insert the V-ring evenly.

⇒ V-ring has been exchanged.

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

9.7.3 Replacing the V-ring RA on the valve disk

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

Replacing the V-ring RA valve disk

Prerequisites

- The valve has been removed, see *9.5 Removing the valve*.
- Insert V-ring without grease. To facilitate fitting, use water with a drop of washing-up liquid to remove the surface tension. To ensure that no rust is transferred, the washing-up liquid solution must be mixed in a ceramic, plastic, or stainless steel container.

Tools

- V-ring insertion tool
- Pickset
- Vice support

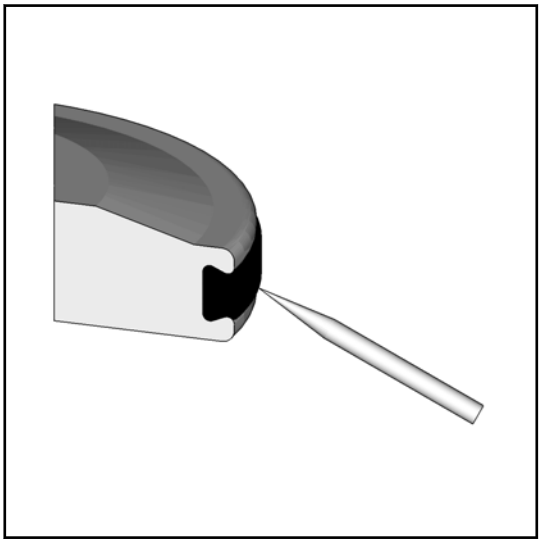
⚠CAUTION

Sharp-edged tool

Risk of injury if the scriber slips when removing the V-ring.

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

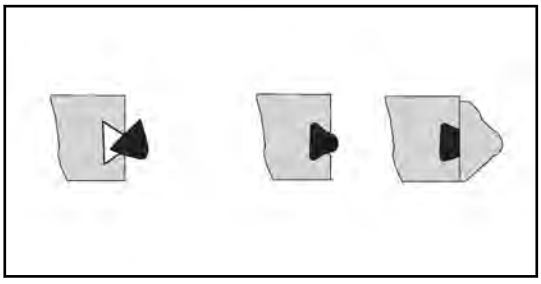
1. Use a scriber to puncture the V-ring and take it out.



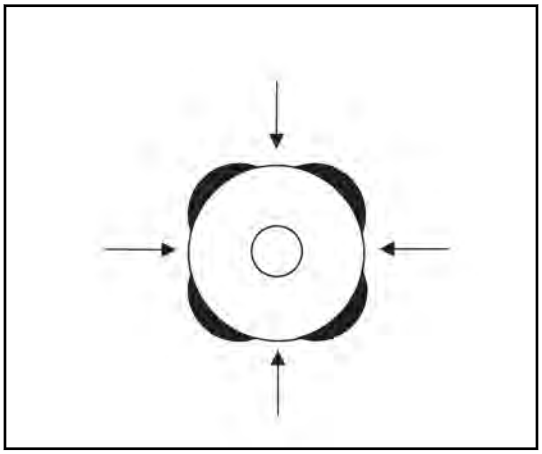
2. Before mounting, wet the V-ring RA on the side not in contact with product (rear side). Ensure that water does not drip into the V-ring groove on the valve disk.

3. **INFO**
   Ensure that the installation position of the V-ring is correct.

   Insert the V-ring RA.



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



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

⇒ V-ring has been exchanged.

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

9.7.4 Lubricating seals and threads

Prerequisites

- The valve has been removed, see *9.5 Removing the valve*.

Tools

- Lubricants Rivolta F.L.G. MD-2 and PARALIQ GTE

ATTENTION

Damage to seals and threads

Stainless steel threads tend to seize and stick, and must be greased. Damage to seals and threads can result in malfunction.

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

1. Apply a light film of lubricant to all threads.
2. Grease all seals – including the O-rings at the top and bottom of the actuator piston stem – very thinly.
   → Do not grease the V-ring.
3. Grease the inside of the seal ring (1) (contact surface).

⇒ Seals and threads have been lubricated.

INFO 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. Rivolta F.L.G. MD-2 can be ordered from GEA Tuchenhagen. 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 Faults

This chapter contains information about how to rectify problems with the valve. It also describes the personnel qualifications required for the individual actions.

It is addressed to all persons who carry out actions related to the valve.

INFO During all troubleshooting, observe the chapter *2 Safety* of this Operating Instructions.

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 precautions.

Fault	Cause	Remedy
Valve does not work	Fault in the controller	Check the system configuration
	No compressed air or compressed air too low	Check compressed air supply and check air hoses for free passage and air tightness
	Fault in the electrical system	Check actuation / external controller and routing of electrical lines
	Solenoid valve defective	Replace the solenoid valve
Valve does not close	Dirt/foreign material between valve seat and valve disk	Clean valve housing and valve seat
Valve closes too slowly	O-rings in the actuator and control top are dry (friction losses)	Grease O-rings
Leakage in the area of the valve housing	Housing O-rings defective	Remove the valve, change the housing O-rings
Leakage in the lantern	Seal ring defective	Replace the gasket
Leakage in the leakage cavity	V-rings defective	Replace the V-rings

11 Decommissioning, dismantling and disposal

This chapter contains information about decommissioning the valve. It also describes the removal and disposal processes. It is addressed to all persons who carry out actions related to the valve.

INFO During all decommissioning, observe the chapter *2 Safety* of this Operating Instructions.

11.1 Decommissioning

The following principles apply for decommissioning:

- 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 *4.2 Storage*.

11.2 Dismantling

Prerequisites

- Ensure that no active processes are running in the relevant area during dismantling.

1. Empty all pipe elements that lead to the valve.
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.
   → The valve has been dismantled.

11.3 Disposal

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

The valve is made 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 instruction manual for the individual components.

⚠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 the proper disposal free of charge.

Prerequisites

- The valve should be disposed of

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

⇒ The valve actuator has been disposed of.

12 Spare parts

This chapter contains information about how to order spare parts for the valve.

It is addressed to the personnel that operate the valve.

12.1 Order information

Only original spare parts from GEA may be used. All spare parts are packed in GEA original packaging and marked accordingly.

The spare parts are not included in the scope of supply of the machine.

The specifications listed below must be cited on every spare part order.

- Machine type: see nameplate
- Serial number: see type plate
- Part number: see parts list
- Name: see spare parts list

12.2 Spare parts lists

Spare parts list - shuttle valve X_R

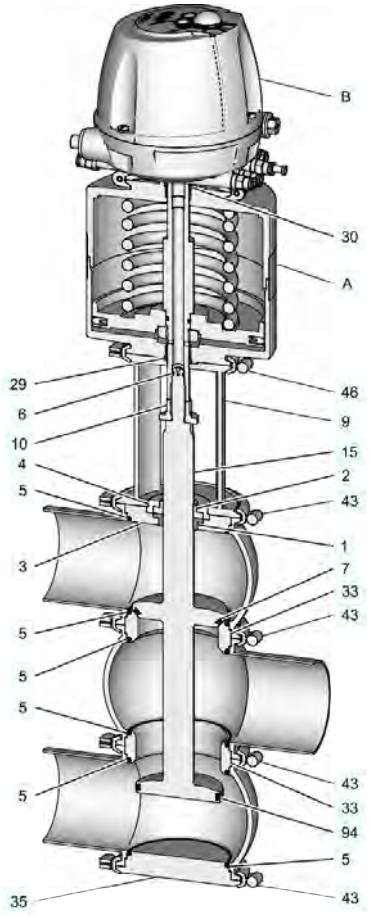


Fig.1

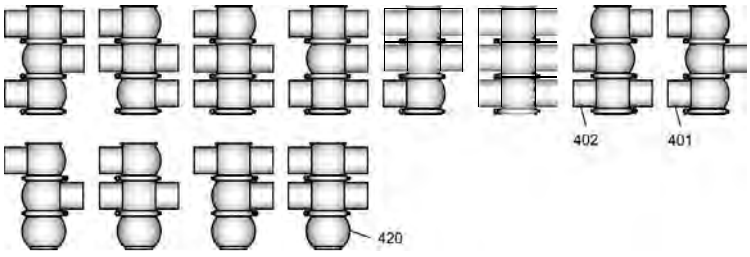


Fig.2

Spare parts list - shuttle valve X_R

Pos.	Designation	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
Sealing set complete 1)		EPDM	221-304.45	221-304.46	221-304.46	221-304.47	221-304.47	221-304.48
		FKM	221-511.108	221-511.109	221-511.109	221-511.110	221-511.110	221-511.111
		HNBR	221-519.101	221-519.102	221-519.102	221-519.103	221-519.103	221-519.104
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	PEEK	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	221-142.02	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
6*	O-ring	NBR	930-004	930-004	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024	932-024	932-028
		FKM	932-030	932-033	932-033	932-035	932-035	932-039
		HNBR	932-087	932-088	932-088	932-090	932-090	932-100
9	Lantern	1.4301	221-121.01	221-121.02	221-121.02	221-121.03	221-121.03	221-121.04
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01	221-147.01	221-147.01
15	Valve disk X_R	1.4404	221-700.08	221-700.09	221-700.10	221-700.11	221-700.12	221-700.13
29*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
33	Seat ring X_R	1.4404	221-699.12	221-699.13	221-699.13	221-699.14	221-699.14	221-699.15
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03	221-144.03	221-144.04
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
94*	V-ring RA	EPDM	221-365.13	221-365.07	221-365.07	221-365.08	221-365.08	221-365.09
		FKM	221-365.21	221-365.10	221-365.10	221-365.11	221-365.11	221-365.12
		HNBR	221-365.24	221-365.18	221-365.18	221-365.20	221-365.20	221-365.19
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
420	Housing connection X	1.4404	221-672.16	221-672.17	221-672.18	221-672.19	221-672.20	221-672.21
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator					
B	Control top S		See spare parts list for control head S					
	Control top T.VIS®		See parts list for control top T.VIS®					
Grease RIVOLTA F.L.G. 100 g tube not included with sealing set.					413-136			

1) The sealing set includes items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7
*** Enclosure also available as welded enclosure to be configured; pos. 33, 401 and 402 omitted; pos. 5 and 43 also omitted for enclosure connection

Spare parts list - shuttle valve X_R

Item.	Designation	Material	1" OD	1,5" OD	2" OD	2,5" OD	3" OD	4" OD
Sealing set complete 1)		EPDM	221-304.45	221-304.46	221-304.46	221-304.47	221-304.47	221-304.48
		FKM	221-511.108	221-511.109	221-511.109	221-511.110	221-511.110	221-511.111
		HNBR	221-519.101	221-519.102	221-519.102	221-519.103	221-519.103	221-519.104
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	PEEK	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	221-142.02	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
6*	O-ring	NBR	930-004	930-004	930-004	930-004	930-004	930-004
**7*	V-ring	EPDM	932-046	932-021	932-021	932-024	932-024	932-028
		FKM	932-030	932-033	932-033	932-035	932-035	932-039
		HNBR	932-087	932-088	932-088	932-090	932-090	932-100
9	Lantern	1.4301	221-121.01	221-121.07	221-121.07	221-121.08	221-121.08	221-121.09
10	Spacer nut	1.4305	221-147.02	221-147.02	221-147.02	221-147.01	221-147.01	221-147.01
15	Valve disk X_R	1.4404	221-700.14	221-700.15	221-700.16	221-700.17	221-700.18	221-700.19
29*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
30*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
33	Seat ring X_R	1.4404	221-699.12	221-699.13	221-699.13	221-699.14	221-699.14	221-699.15
35	Blanking plate	1.4404	221-144.01	221-144.02	221-144.02	221-144.03	221-144.03	221-144.04
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
94*	V-ring RA	EPDM	221-365.13	221-365.07	221-365.07	221-365.08	221-365.08	221-365.09
		FKM	221-365.21	221-365.10	221-365.10	221-365.11	221-365.11	221-365.12
		HNBR	221-365.24	221-365.18	221-365.18	221-365.20	221-365.20	221-365.19
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
420	Housing connection X	1.4404	221-672.06	221-672.03	221-672.04	221-672.01	221-672.02	221-672.05
A	Actuator VARIVENT®		See parts list/dimensions sheet for VARIVENT® actuator					
B	Control top S		See spare parts list for control head S					
	Control top T.VIS®		See parts list for control top T.VIS®					
Grease RIVOLTA F.L.G. 100 g tube not included with sealing set.					413-136			

1) The sealing set includes items 1, 5, 6, 7, 28, 29 and 30
* Items marked with an * are wearing parts
** Do not grease Item 7
*** Enclosure also available as welded enclosure to be configured; pos. 33, 401 and 402 omitted; pos. 5 and 43 also omitted for enclosure connection

Spare parts list - shuttle valve X_R

Sealing sets for shuttle valve X_R							
Item	**Qty**	**Designation**	**Material**	**DN 25 1"**	**DN 40/50 1,5"/2"**	**DN 65/80 2,5"/3"**	**DN 100 4"**
1	1	Seal ring	Ø	22	22	28	28
			EPDM	924-084	924-084	924-085	924-085
			FKM	924-082	924-082	924-083	924-083
			HNBR	924-311	924-311	924-313	924-313
5	6	O-ring	Ø	42 x 3	60 x 3	85 x 4	113 x 4
			EPDM	930-309	930-144	930-150	930-156
			FKM	930-168	930-171	930-176	930-178
			HNBR	930-632	930-633	930-634	930-863
6	1	O-ring	Ø	8 x 1,6	8 x 1,6	8 x 1,6	8 x 1,6
			NBR	930-004	930-004	930-004	930-004
**7	1	V-ring	Ø	35-5	52-6	76-6	104-6
			EPDM	932-046	932-021	932-024	932-028
			FKM	932-030	932-033	932-035	932-039
			HNBR	932-087	932-088	932-090	932-100
29	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3
			NBR	930-026	930-026	930-026	930-026
30	1	O-ring	Ø	20 x 3	20 x 3	20 x 3	20 x 3
			NBR	930-026	930-026	930-026	930-026
94	1	V-ring RA/I	Ø	DN25	DN50/40	DN80/65	DN100
			EPDM	221-365.13	221-365.07	221-365.08	221-365.09
			FKM	221-365.21	221-365.10	221-365.11	221-365.12
			HNBR	221-365.24	221-365.18	221-365.20	221-365.19
Sealing set complete			EPDM	221-304.45	221-304.46	221-304.47	221-304.48
			FKM	221-511.108	221-511.109	221-511.110	221-511.111
			HNBR	221-519.101	221-519.102	221-519.103	221-519.104
Grease RIVOLTA F.L.G. 100g tube not included in the seal kit **do not grease item 7						413-136	
Storage information: Store according to DIN 7716 / relative humidity approx. 65%, temperature 15-25°C and protected from light When replacing seals, observe the instructions in the instruction manual! **429-060**							

13 Annex

13.1 Dimension sheet

Dimension sheet - VARIVENT® Shuttle valve X_R

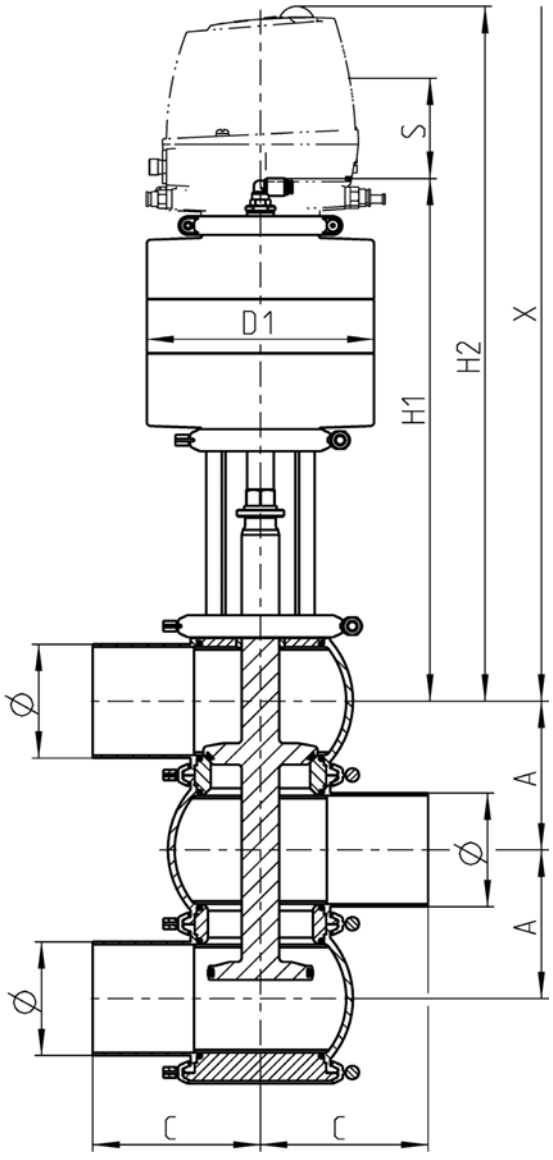


Fig.1

Dimension sheet - VARIVENT® Shuttle valve X_R

Nominal width	Pipe	Housing		Actuator	Size			Valve	
	Ø [mm]	A [mm]	C [mm]	D 1 [mm]	H 1 [mm]	H 2 [mm]	Expansion X [mm]	Stroke S [mm]	Weight [kg]
DN 25	29.0 x 1.50	50.0	90	99	294	423	551	16	9
DN 40	41.0 x 1.50	62.0	90	110	335	464	619	19	13
DN 50	53.0 x 1.50	74.0	90	110	341	470	661	31	14
DN 65	70.0 × 2.00	96.0	125	135	382	511	748	30	24
DN 80	85.0 × 2.00	111.0	125	135	390	519	786	30	25
DN 100	104.0 × 2.00	130.0	125	170	399	528	833	30	34
OD 1"	25.4 × 1.65	46.0	90	99	292	421	537	12	9
OD 1.5"	38.1 × 1.65	59.0	90	110	337	466	615	19	13
OD 2"	50.8 × 1.65	71.5	90	110	343	472	658	31	13
OD 2.5"	63.5 × 1.65	90.0	125	135	386	515	741	31	23
OD 3"	76.2 × 1.65	103.0	125	135	393	522	772	29	24
OD 4"	101.6 × 2.11	127.5	125	170	401	530	830	30	33

13.2 List of abbreviations

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]
dm3n	Unit of measurement of volume [cubic decimetre] standard volume (standard litres)
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 Brief 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: Hydrated nitrile butadiene rubber
IP	Protection class
ISO	International Standard of the International Organization for Standardization
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]
M	Metric

Abbreviation	Explanation
NC	Normally Closed; actuator is spring-to-close, valve is closed in idle position
Nm	Unit of measurement of work [newton metre] SPECIFICATION FOR THE TORQUE: 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
NO	Normally Open; actuator is spring-to-open, valve is open in idle position
PA	Polyamide
PE-LD	Low-density polyethylene
PPE	Polytetrafluoroethylene
psi	Anglo-American unit of measurement for pressure [pound-force per square inch] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
PTFE	Polytetrafluoroethylene
SET-UP	Self-learning installation During commissioning and maintenance, the SET-UP procedure carries out all the necessary settings for the generation of messages.
AF	Indicates 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	Tube measurement according to British Standard (BS), outside diameter
Inch IPS	American pipe measurement, iron pipe size

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