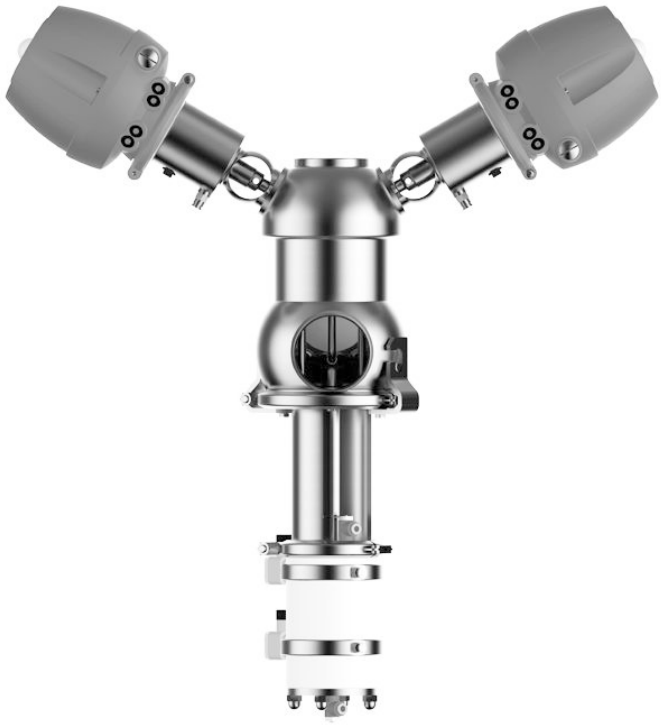

Hygienic components

GEA VARICOVER® Pig Cleaning Station MST 3A

Operating instruction (Translation from the original language)

430BAL009974EN_5

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We kindly request that you answer a few short questions about these Operating Instructions. Use the following QR code or link to access the questionnaire:

https://www.ntgt.de/ra/s.aspx?s=367112X57707125X58087

TABLE OF CONTENTS

1 General Information

1.1 Information on the Document

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

1.1.1 Binding Character of These Operating Instructions

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

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

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

1.1.2 Notes on the Illustrations

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

1.1.3 Symbols and Highlighting

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

Danger

Warning: Fatal Injuries

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

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

Warning: Explosions

Failure to observe the warning can result in severe explosions.

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

⚠ Warning!

Warning: Serious Injuries

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

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

⚠ Caution!

Warning: Injuries

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

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

Notice

Warning: Damage to Property

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

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

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

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

   → Result of the previous operation.

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

Hint!

Further useful information.

1.2 Manufacturer address

GEA Tuchenhagen GmbH
Am Industriepark 2-10
21514 Büchen

1.3 Contact

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

flowcomponents@gea.com
www.gea.com

1.4 EU Declaration of Conformity for Machines

in accordance with the EC Machinery Directive 2006/42/EC, Annex II 1. A

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

We declare under our sole responsibility that the machine

Designation:	Valve with actuator
Type:	VARIVENT®

conforms with all the relevant provisions of this directive and the following directives:

Relevant EC directives:	2006/42/EC	EC Machinery Directive
Applicable harmonized standards, in particular:	DIN EN ISO 12100	Safety of Machines - General design principles - Risk assessment and risk reduction
Other applied standards and technical specifications:	--	

Remarks:	We also declare that the relevant technical documentation for this machine has been prepared 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:	Person authorised to compile the technical file for CE marking GEA Tuchenhagen GmbH Am Industriepark 2-10 21514 Büchen

Büchen, 16/02/2015

Franz Bürmann Managing Director	i.V. Matthias Südel Senior Director Product Development Flow Components

2 Safety

2.1 Intended use

Pig cleaning station MST 3A is installed directly on the product line and is used for the intake of a pig.

When flowing product or cleaning agent through the station, the pig remains fixed in position and the liquid flows around it. You can choose the direction of flow through the station. The pig cleaning position can be circulated with liquid, with or without the pig in place.

During cleaning, the pig surface is also completely cleaned.

Hint!

The manufacturer is not liable for damage caused by improper use of the pig cleaning station. The risk of such misuse lies entirely with the operator of the facility.

2.1.1 Requirements for operation

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

2.1.2 Pressure equipment directive

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

According to the scope of directive 2014/68/EC, article 1, paragraph 2, f) the exception of the directive applies, due to conformity with the machine directive 2006/42/EC.

The nominal diameters DN25 and 1”OD are subject to article 4, paragraph 3 of the Pressure Equipment Directive which specifies sound engineering practice.

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

2.1.3 Improper operating conditions

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

The operation of the component is not permitted if:

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

2.2 Operator’s Duty of Care

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

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

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

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

Hint!

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

2.3 Subsequent changes

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

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

2.4 General safety instructions and dangers

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

Nevertheless, dangers can arise from the component, if:

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

2.4.1 Principles for safe operation

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

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

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

2.4.2 Environmental Protection

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

For environmental protection the following principles apply:

- Substances harmful to the environment must not be discharged into the ground or the sewage system.
- Always observe the pertinent regulations relating to waste avoidance, disposal and utilization.
- Substances harmful to the environment must be collected and stored in suitable containers. Clearly mark the containers.
- Dispose of lubricants as hazardous waste.

2.4.3 Electrical Equipment

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

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

2.5 Supplementary Regulations

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

- pertinent accident prevention regulations,
- generally accepted safety rules,
- national regulations applicable in the country of use,
- work and safety instructions applicable in the facility,

2.6 Qualification of personnel

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

Operating and maintenance personnel must

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

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

The following minimum qualifications are required:

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

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

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

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

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

2.7 Safety equipment

2.7.1 Signage

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

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

Signs on the valve	
Sign	**Meaning**
 Fig.1	General hazard warning
 Fig.2	Warning Crushing
 Fig.3	Explosive atmosphere hazard warning
 Fig.4	Ventilate the product line and actuator prior to disassembly!

2.8 Residual dangers

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

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

2.9 Danger zones

Please observe the following notes:

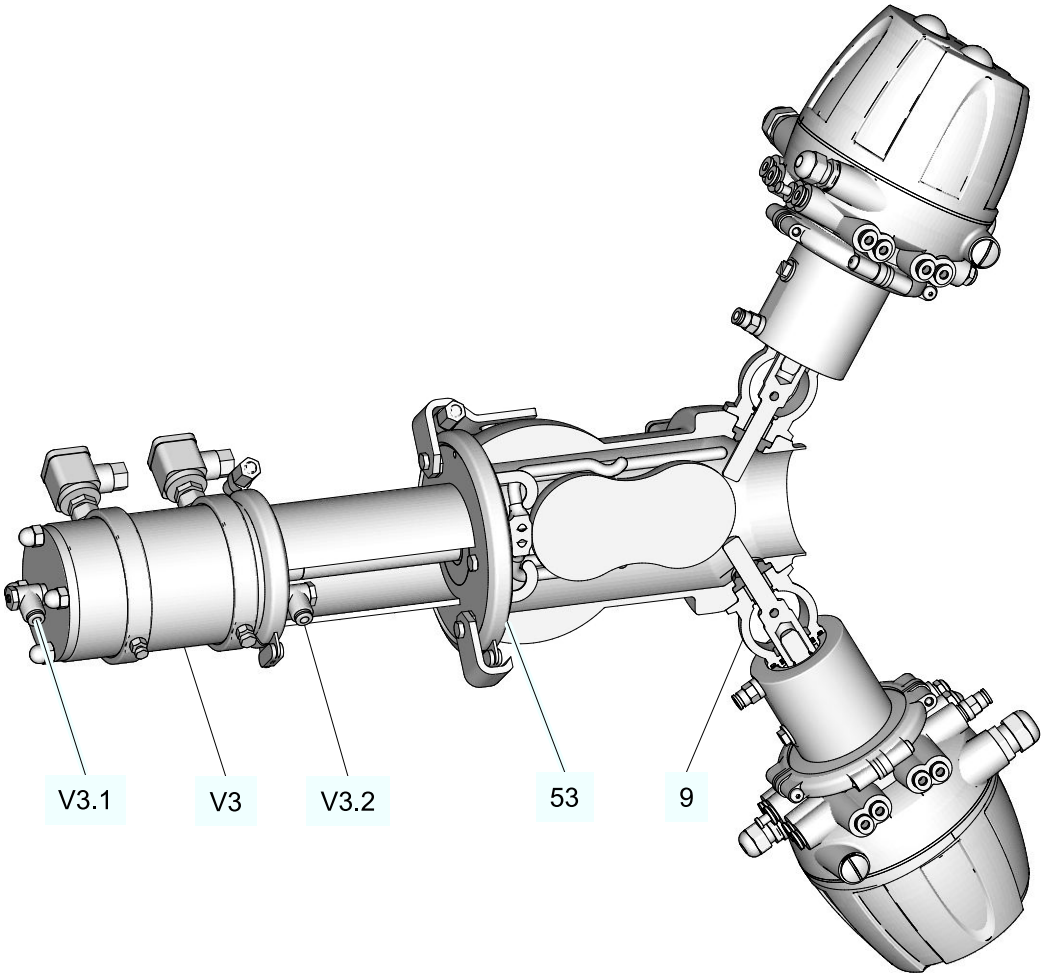

Fig.5

Before undoing the hinged clamps (53) for pig removal, it must be ensured that

- no program is running, such as production, pigging or cleaning,
- no program can be started, such as production, pigging or cleaning,
- the pipe and pig cleaning station are empty,
- the pipe and pig cleaning station are free of overpressure by means of opened vent valves, and
- all air hoses are pulled out of the connections (V3.1, V3.2) on the pig actuator.

Please observe the following notes:

- In the event of malfunctions, shut down the pig cleaning station (disconnect from the power and air supply) and secure it against being used.
- Never reach into the lantern of the pig retainer (9) or into the pig actuator (V3). Fingers can be crushed or cut off.
- Before starting any service, maintenance or repair work, disconnect the pig cleaning station 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.

- Regularly check the electrical equipment of the pig cleaning station. Immediately remedy loose connections and molten cables.
- If work on live parts cannot be avoided, call in a second person, who can operate the main switch in case of an emergency.
- The housing sockets have very sharp edges. Wear suitable protective gloves when transporting and installing the pig cleaning station.
- The rods in the pig station housing can break if the initiators are incorrectly adjusted or if there are errors in the program.

3 Description

3.1 Design

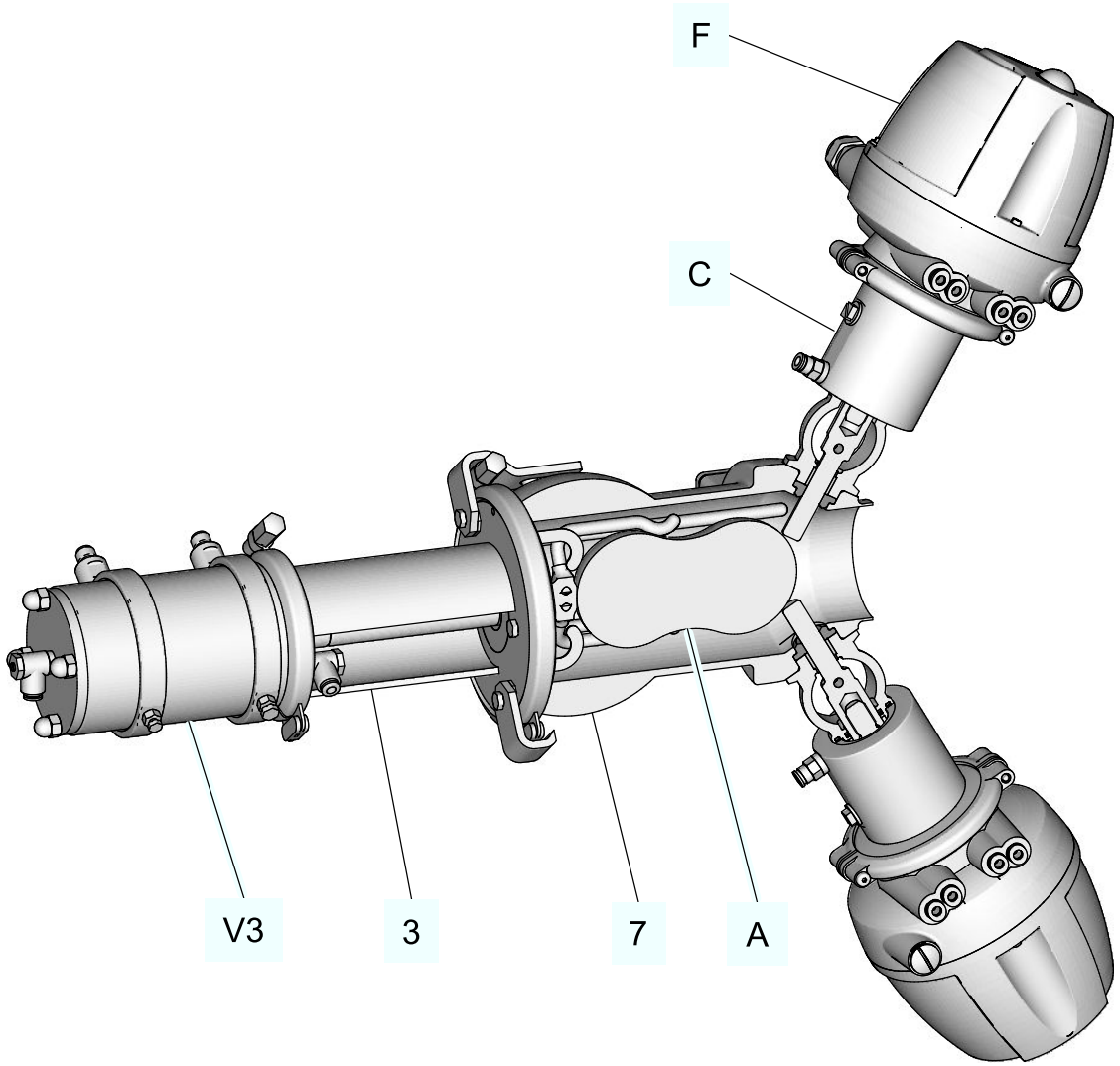

Fig.6

Design	
No.	**Designation**
A	Pig
C	Pig retainer (air-opening/spring-closing)
Q	Control top
3	Lantern
7	Pig station housing
V3	Pig actuator

3.2 Functional description

3.2.1 Pig cleaning station

3.2.1.1 Production

All actuators on the pig cleaning station are in rest position. The pig is held in place in its position in the pig housing where cleaning agent can flow around it. The pig position is continually monitored by a magnetic switch E1.1. Product can flow through the pig cleaning station from A to B and vice-versa.

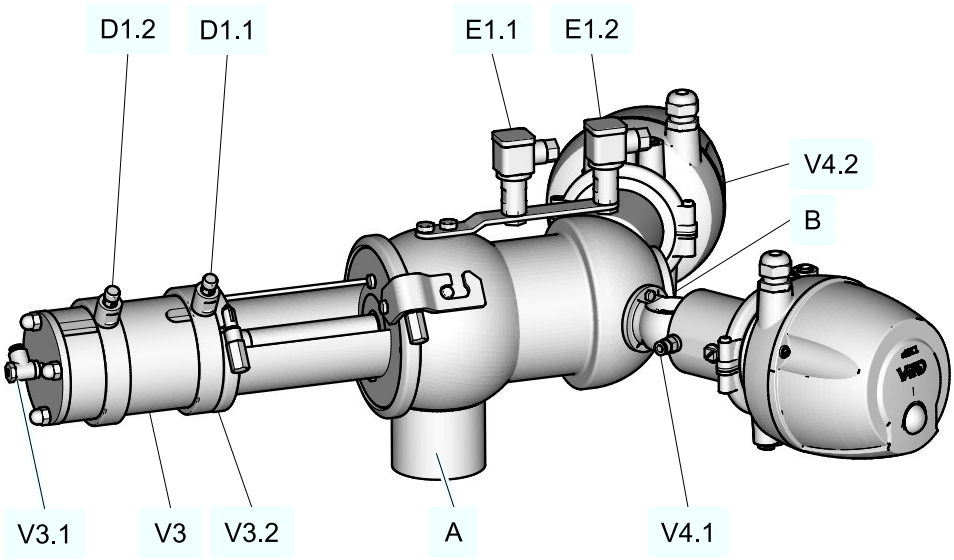

Fig.7

3.2.1.2 Sending the pig

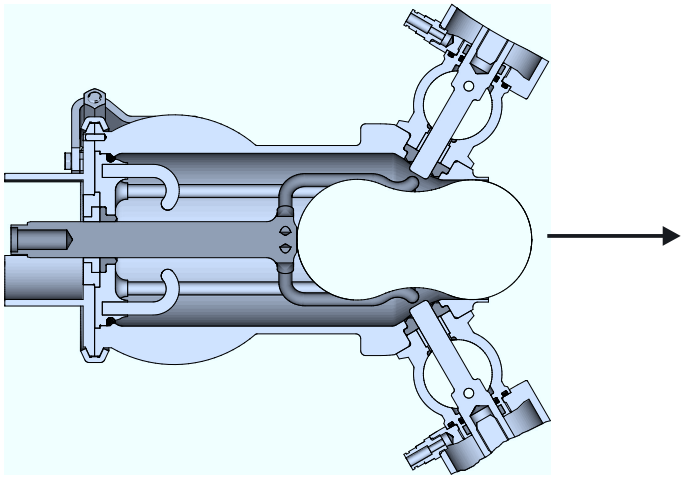

Fig.8: Pig in sending position

Prerequisite:

- Production is complete
- The pig position is detected by means of a magnetic switch E1.1.

Transport pig in sending position

Notice

Danger of damage to pig

Damage to the pig can result in a malfunction.

► The following lock must be carried out for automatic and manual operation: The activation of V3.1 and the feed of the pig propellant via connection A is only be possible when the position feedbacks of the open pig retainers V4.1 and V4.2 are active.

Carry out the following steps:

1. Activate V4.1 and V4.2.

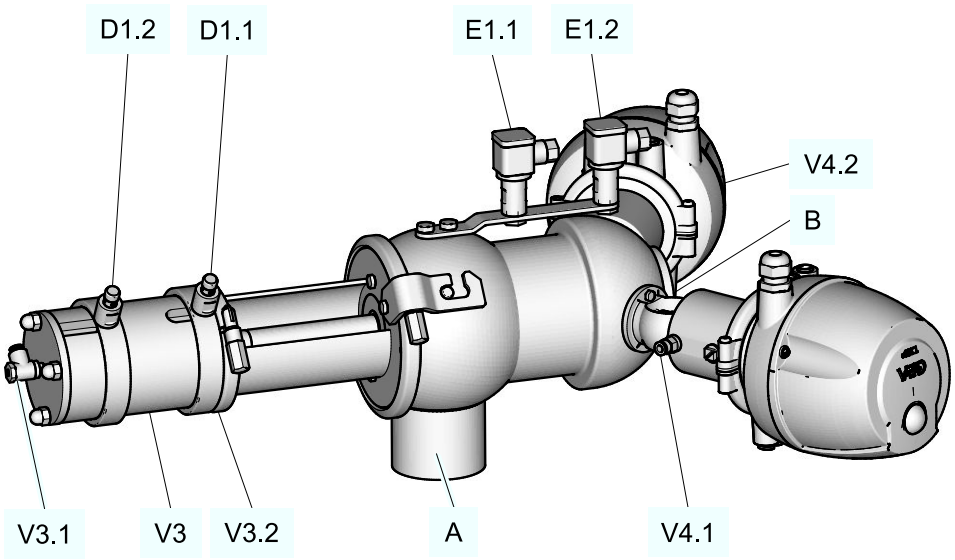

Fig.9

→ Pig retainer is opened.

→ Position feedbacks V4.1 and V4.2 active.

2. Activate V3.1.

→ Pig leaves position E1.1 and magnetic switch E1.1 is inactive.

→ Pig detection via E1.2 is active and the pig is in the sending position.

→ Position feedback D1.1 active (initiator illuminated).

→ Pig is transported in sending position.

Sending the pig

Carry out the following steps:

1. Supply pig propellant via interface A.

→ Pig leaves position E1.2.

→ Magnetic switch E1.2 inactive.

→ The pig travels through the pipe.

→ Pig is sent.

3.2.1.3 Receiving the pig

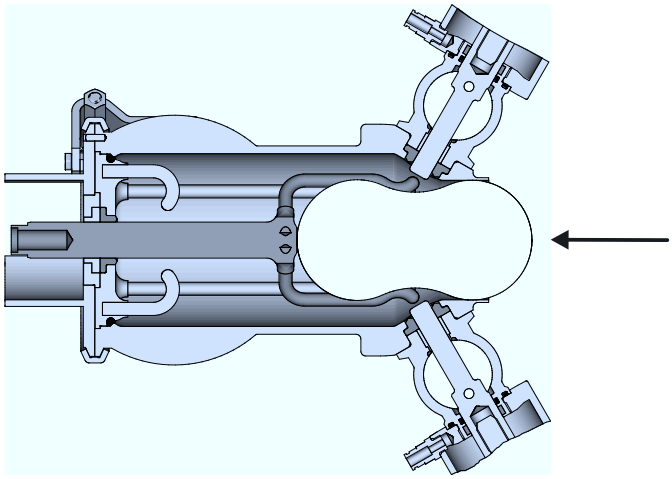

Fig.10: Pig in receiving position

Prerequisite:

- V3.1, V4.1 and V4.2 are still activated or must be activated and the corresponding position feedbacks are active. Only then can the pig be sent from the other pig station.
- The pig position is detected by means of a magnetic switch E1.2.
- The stroke speed when removing the pig must be slow (≤0.3m/s), so that the pig can be safely removed along the full path together with the three-armed pig clamp. At connection V3.2 of the pig actuator there is an adjustable throttle check valve for reducing the inflowing air throughput.

Carry out the following steps:

1. Deactivate V3.1.
2. Activate V3.2.
   - Pig leaves position E1.2. Magnetic switch E1.2 inactive
   - Pig detection via E1.1 active. Pig is in the production/CIP position.
   - Position feedback D1.2 active. (Initiator illuminated).
3. Deactivate V4.1 and V4.2.

   → Pig retainers close.
4. Deactivate the feed for the pig propellant to the opposite pig station.
5. Deactivate V3.2.

   → Air/air actuator V3 is not actuated.

   Position feedback D1.2 inactive. No position feedback active at actuator V3.

   Pig detection via E1.1 must remain active.

→ Done.

3.2.1.4 Cleaning the pig cleaning station

V3.2 is activated in impulse/pause operation during each cleaning step.
Recommended times for each cleaning step:

- Impulse approx. 20% of step time
- Pause approx. 80% of step time

Perform the following work steps for better cleaning of the pig front side.

Prerequisite:

- Cleaning agent can flow through the pig cleaning station from A to B and vice-versa. All actuators on the pig cleaning station are in rest position.
- The pig is held in place in its position in the pig station housing where cleaning agent can flow around it.
- The pig position is continually monitored by a magnetic switch E1.1.

Notice

Cleaning agents can be very aggressive.

They can damage materials!

► Refer to the cleaning agent manufacturer's safety information!
► Only use cleaning agents that do not attack or damage the materials used.

Carry out the following steps:

1. Actuate V3.2 (impulse actuation; approx. 20% during each cleaning step).

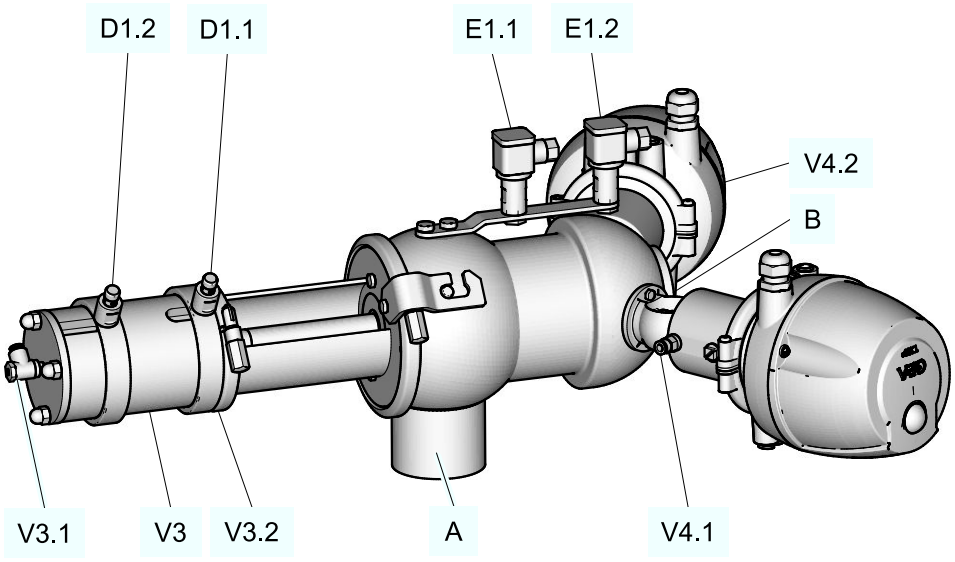

Fig.11

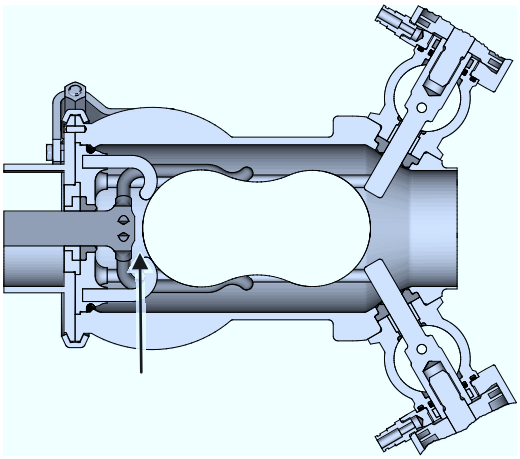

Fig.12

→ Position feedback D1.2 active.

→ Better cleaning of the pig front side by maintaining a gap (see arrow) between the pig front side and the pig stop.

1.a. Actuate V3.2 (pause).

→ Position feedback D1.2 inactive.

→ Pig cleaning station is cleaned.

3.2.2 Pig retainer control tops

The pig retainers are fitted with a T.VIS M-15 control top as standard.

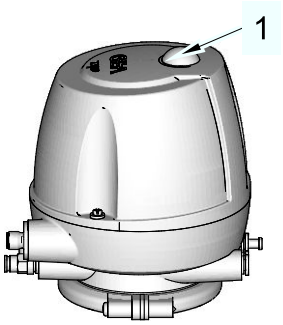

Fig.13: Control Top T.VIS M-15

The pig retainer actuator is spring-closing. It is closed in the rest position.

Identification on the T.VIS M-15 control top once the installation (SET-UP) has been completed:

- Green steady light (1): Pig retainer in rest position (closed)
- Yellow steady light (1): Pig retainer in end position (actuated position, opened)

4 Transport and storage

4.1 Storage conditions

The pig cleaning station or spare parts should be stored in a dry place, free of vibrations and dust. To avoid damage, leave the components in their original packaging if possible.

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

Hint!

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

4.2 Transport

For transport, the following principles apply:

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

4.2.1 Scope of supply

After taking delivery of the component, check if

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

5 Technical data

5.1 Type plate

The type plate clearly identifies the pig cleaning station.

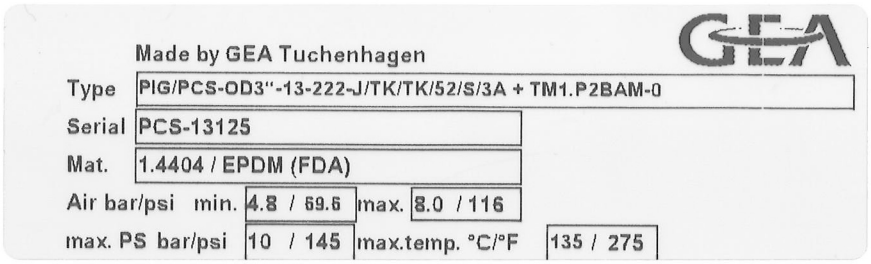

Fig.14: Type plate of the pig cleaning station

The type plate provides the following key data:

Key data for the pig cleaning station	
Type	Pig cleaning station MST 3A
Serial	Serial number
Material	1.4404/EPDM (FDA)
Control air pressure bar/psi	min. 4.8 (69.6); max. 8.0 (116)
max. product pressure bar/psi	10.0 (145)
max. temperature °C/°F	135 (275)

5.2 Technical data

The most important technical data of the pig cleaning station can be found in the following tables:

Technical data: mulch cleaning station	
Designation	**Description**
Size	DN 25 to DN 100 1" to 4" OD
Material of product contact parts	Stainless steel 1.4404
Material of product-contacting seals	EPDM/FKM/HNBR

Technical data: mulch cleaning station	
Designation	**Description**
Fitting position	The fitting position of the pig cleaning station can be vertically standing, overhead, horizontal or slanted. The pig cleaning station must however be set up in such a way that the pig station housing and the pipeline system can be emptied safely, i.e. for horizontal and slanted position the lateral pipe connection socket must be pointing downwards.
Product pressure	DN25 ...DN50: 16 bar (232 psi) DN65 ...DN100: 10 bar (145 psi) optional 16 bar (232 psi) OD 1" ... 2.5": 16 bar (232 psi) OD 3" ... 4": 10 bar (145 psi) optional 16 bar (232 psi)
Flow speed	max. 3 m/s
Pig arrival speed	max. 0.5 m/s

Technical data: Ambient temperatures	
Designation	**Description**
- Pig cleaning station	0 to 45 °C (32 ... 113 °F), standard < 0 °C (32 °F): Use control air with low dew point. Protect the piston rods against icing.
- Proximity switch	-30 to +85 °C (-22 ... +185 °F)
- Control top type T.VIS M-15, A-15	-20 to +50 °C (-4 ... +122 °F)
- Control top type T.VIS P-15	-25 to +70 °C (-13 ... +158 °F)
Product temperature and operating temperature	depending on the sealing material

Technical data: Compressed air supply	
Designation	**Description**
Air hose	
- metric	Material PE-LD Outside Ø 6 mm Inside Ø 4 mm

Technical data: Compressed air supply	
Designation	**Description**
- Inch	Material PA Outside Ø 6.35 mm Inside Ø 4.3 mm
Control air pressure	4.8 bar (69.6 psi) max. 8 bar (116 psi)
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 in 1m^3 air

5.3 Resistance and permitted operating temperature of the sealing materials

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

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

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

Resistance:

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

Table of sealing resistance / permitted operating temperature				
Medium	**Maximum operating temperatures**	**Sealing material**		
		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 up to 5%	up to 80 °C (176°F)	+	–	–
Alkalis more than 5%		o	–	–
Inorganic acids up to 3%	up to 80 °C (176°F)	+	+	+
Inorganic acids up to 5%	up to 80 °C (176°F)	o	+	o
Inorganic acids up to 5%	up to 100 °C (212°F)	–	+	–
Water	up to 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		–	+	+

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

5.4 Pipe Ends

Dimensions for Pipes in DN				
Metric DN	**Outside diameter**	**Wall thickness**	**Inside diameter**	**Outside diameter acc. to DIN 11850**
25	29	1.5	26	x
40	41	1.5	38	x
50	53	1.5	50	x
65	70	2.0	66	x
80	85	2.0	81	x
100	104	2.0	100	x

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

5.5 Tools

List of tools	
Tools	**Material no.**
Open end spanner, a/f 8-10	408-032
Open end spanner, a/f 12-13	408-034
Open end spanner, a/f 14-17	408-045
Open end spanner, a/f 16-18	408-183
Hex key, a/f 8	408-123

5.6 Lubricants

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

5.7 Weights

Weight table for specifications in DN	
Nominal width DN	**Weight [kg]**
25	on request
40	on request
50	16
65	17
80	22.5
100	36

Weight table for specifications in inch OD	
Nominal width inch OD	**Weight [kg]**
1"	on request
1.5"	on request
2"	16
2.5"	17
3"	24
4"	37

6 Assembly and installation

6.1 Safety instructions

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

For installation, the following principles apply:

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

6.2 Notes on installation

The installation position of the valve is upright. Care must be taken to ensure that the valve housing and the pipe system can drain properly.

To prevent damage, make sure that

- the valve is installed in the pipe system free of tension and
- no foreign materials (e.g. tools, bolts, lubricants) are left in the system.

6.3 Valve with Detachable Pipe Connection Elements

This section describes the procedure to fit the valve.

⚠ Caution!

Liquids in pipes

Danger of injury due to liquid spraying out

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

Carry out the following steps:

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

→ Valve is installed.

6.4 Pneumatic connections

6.4.1 Air requirement for opening and closing the pig actuator (V3)

Air requirement pig actuator		
Nominal width	**Actuator Ø (mm)**	**Air requirement (dm^3n/ stroke) dm^3n at 1.01325 bar at 0 °C in accordance with DIN 1343**
DN 50 to DN 80 2" to 3" OD	63	0.5
DN 100 4" OD	100	1.7

6.4.2 Air requirement for opening the pig retainer

Air requirement pig retainer	
Nominal width	**Air requirement (dm^3n/stroke) dm^3n at 1.01325 bar at 0 C in accordance with DIN 1343**
DN 25 to DN 100 1" to 4" OD	0.05

6.4.3 Establishing Hose Connections

An air hose connection must be mounted leading from separate 3/2-way solenoid valves to the connections V3.1, V3.2, V4.1 and V4.2 in each case. To ensure reliable operation, the compressed air hoses must be cut exactly square.

The illustration shows the hosing on the pig cleaning station with two integrated pilot valves in the control tops of the pig retainers V4.1 and V 4.2.

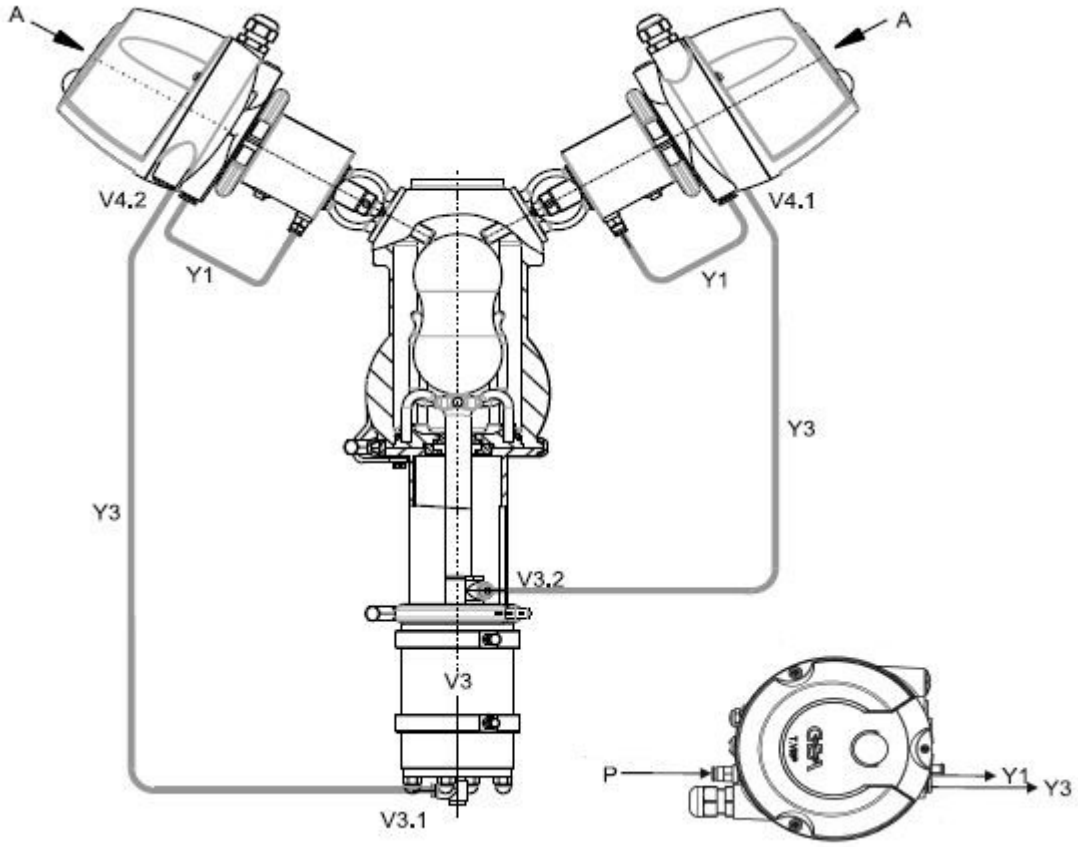

Fig.15: Hose Connection Diagram

P	Air supply
Y1	Outlet
Y3	Outlet

Tools required:

- A hose cutter

Carry out the following steps:

1. Shut off the compressed air supply.
2. Use the hose cutter to cut the pneumatic hoses square.
3. Air hoses in the plug connectors of the control tops and the actuators.
4. Re-open the compressed air supply.

→ Establish a hose connection.

6.5 Electrical connections

6.5.1 General

Danger

Live parts

Electrical shock can result in serious personal injury or death.

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

Carry out the following steps:

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

→ Done

Hint!

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

6.5.2 Adjusting the initiators on the pig actuator

Prerequisite:

- When adjusting the initiators (D1) there must not be no pig in the pig cleaning station.

Carry out the following steps:

1. Screw the threaded bushing (D4) onto the initiator (D1).
2. Screw the initiators (D1) into the proximity switch holder (D).

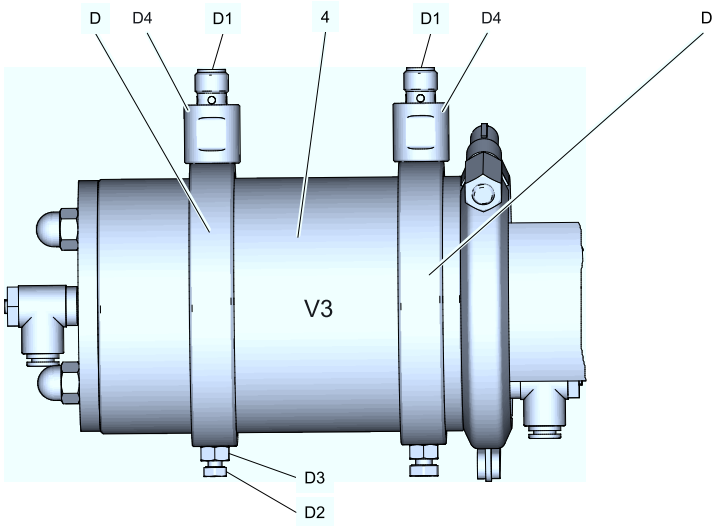

Fig.16

3. Push the proximity switch holder (D) from above or below onto the cylinder pipe (4) and set in accordance with table “Position of proximity switch holder”, see Section 6.5.4, Page 36.
4. Lock the proximity switch holder (D) with the screw (D2) and counter with the nut (D3).
5. Screw the initiators (D1) up to the stop and lock with the counter nut.

   ! No gaps or threads must be visible.

→ Done

6.5.3 Initiator cabling

It must be possible to completely remove the pig actuator from the pig station housing without loosening the initiator cabling. This means that the cable length of the initiators must be dimensioned accordingly.

6.5.4 Position of proximity switch holder

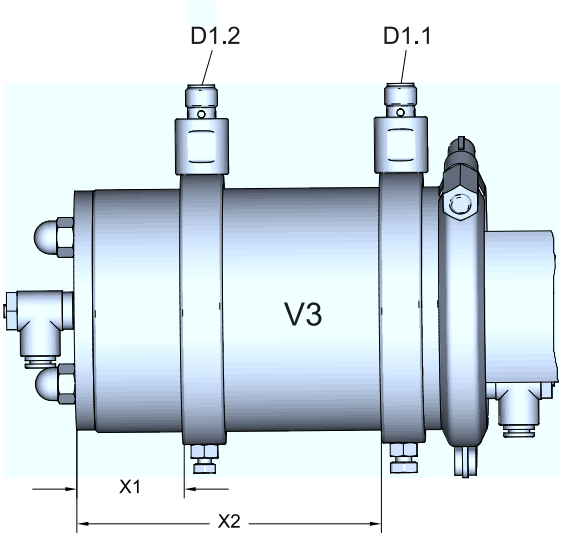

Fig.17

Table nominal width DN		
Nominal width DN	**X1 [mm]**	**X2 [mm]**
25	on request	on request
40	27.5	103.5
50	27.5	103.5
65	27.5	118.5
80	27.5	118.5
100	20.5	137.5

Table nominal width OD		
Nominal width OD	**X1 (mm)**	**X2 [mm]**
1"	on request	on request
1.5"	27.5	95.5
2"	27.5	103.5
2.5"	27.5	113.5
3"	27.5	118.5
4"	20.5	137.5

6.5.5 Assignment of initiators

The assignment of the initiators is indicated by the LED in the housing. The required assignments of the initiators, depending on the activation and reaching the respective end position of the pig drive, are shown in the following table.

Assignment of initiators		
Actuation	**State D1.1**	**State D1.2**
V3.1	assigned	not assigned
V3.2	not assigned	assigned
After actuation of V3.2	not assigned	not assigned

6.5.6 Securing the magnetic switch on the pig station housing

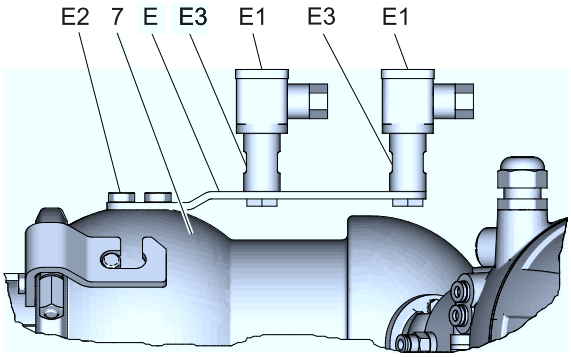

Fig.18

Carry out the following steps:

1. Screw the threaded bushing (E3) onto the magnetic switch (E1).
2. Secure the magnetic switch (E1) onto the magnetic switch holder (E) of the pig station housing (7) from below using a nut.
3. ! No gaps or threads must be visible.

   → Done.

7 Start-up

7.1 Safety notes

Initial commissioning

For initial commissioning, the following principles apply:

- Take protective measures against dangerous contact voltages in accordance with pertinent regulations.
- The component must be fully assembled and properly 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 a modification to the component, a reassessment of residual risks is required.

Commissioning

For commissioning, the following principles apply:

- Only qualified personnel may commission the component.
- Make sure that all connections are functioning properly.
- The safety devices on the component must be completely installed, in working order and function properly. Check the function before starting any work.
- When switching on the component, the danger zones must be clear.
- Remove any liquids that have escaped without leaving residues.

7.2 Notes on commissioning

Before starting commissioning observe the following:

- Make sure that there are no foreign materials in the system.
- If the pig is driven by a gas media, the pig must not be moved in empty and dry pipes or pipes that are just damp with water (Air/air) operation!

  Exception: After the product batch, there is a very lubricated “pig lubrication film” on the inner wall of the pipe.
- The pig speed may be maximum 0.5 m/s.

7.3 Work steps

Prerequisite:

- Before starting commissioning, perform the following work steps:

⚠ Caution!

Spring tension

Fingers can be crushed.

► Do not reach into the open lantern of the pig actuator and the pig retainer.

Carry out the following steps:

1. Switch the actuator on the pig cleaning station by actuating with compressed air and check the corresponding position feedbacks.
2. Clean the pipe system prior to the first product run.
3. During commissioning, regularly check all sealing points for leaks. Replace defective seals.
4. During commissioning, remove the pig from the pig cleaning station after each pig run and check for damage. Replace the pig before the start of production if it was damaged during commissioning.

→ Done.

7.4 Avoiding damage

If damage is detected on the surface of the pig, the cause must be immediately identified and a solution must be found, see Chapter 11, Page 56.

Causes of damage on the pig surface:

- Pig speed too fast
- Sag on welded seam too big and/or sharp-edged welded seam roots
- Misalignment of welded pipes and pipe connecting elements
- Inner sharp-edged pipe connecting elements
- Incorrectly positioned seals on pipe connecting elements
- Dents/buckles in the pipe
- Foreign objects in the pipe system

7.5 Removing the damage

If damage is detected on the surface of the pig, the cause must be immediately identified and a solution must be found.

- Inspect the pipe and if necessary replace sections of pipes using better welded seams (inspection of welded seams from inside via endoscopy)
- Calculation of the pig speed and if necessary a change to the process.

8 Operation and control

8.1 Safety notes

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

For operation, the following principles apply:

- Monitor the component during operation.
- Safety devices must not be changed, removed or taken out of service. Check all safety devices at regular intervals.
- All guards and hoods must be fitted as intended.
- The installation location of the component must always be properly ventilated.
- Structural changes to the component are not permitted. Report any changes to the component immediately to the person in charge.
- Always keep danger zones clear. Do not leave any objects in the danger zone. Only allow persons to enter the danger zone when the machine is de-energized.
- Regularly check that all emergency stop devices are working correctly.
- Regularly check the welded seams in order to avoid uncontrolled leaking of liquids.
- Do not touch the pipes and components. Danger of burns.
- Do not come into contact with detachable connections, as sterile steam may leak out.
- Refer to the cleaning agent manufacturer’s safety information! Only use cleaning agents that do not attack or damage the materials used.

9 Cleaning

9.1 Cleaning

⚠ Caution!

Risk of burning due to hot cleaning agents and sterile steam

The pipes and components can get very hot.

► Do not touch the pipes and components.

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 pig cleaning station. The housing of the pig cleaning station is also circulated with liquid and cleaned.

To carry out cleaning, see Section 3.2.1.4, Page 23.

The component manufacturer can only make a recommendation on the type of cleaning with respect to cleaning agents, temperature, time and intervals, but no binding information can be given. This should be determined or defined by the operating company according to each process. If the pipe is subsequently steamed, it is recommended that you wait around half an hour before performing any pig runs.

The cleaning effect must be checked regularly by the operator!

Notice

Cleaning agents can be very aggressive.

They can damage materials!

► Refer to the cleaning agent manufacturer's safety information!
► Only use cleaning agents that do not attack or damage the materials used.

9.1.1 Cleaning Process Examples

Typical Cleaning Parameters in Dairy Operations

Example of a two-phase cleaning process:

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

Example of a cleaning operation in one cleaning step:

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

Typical Cleaning Parameters in Breweries

- Sodium hydroxide solution and sodium hydroxide based combination products in concentrations of 1% to 4% at about 85 °C (185 °F).

- Phosphoric or nitric acid, and combination products based thereon in the concentrations of 0.3 to 1.5% at 20 °C (68 °F).

9.1.2 Cleaning effect

The cleaning effect depends on the following factors:

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

These factors can be combined in such a way as to make an optimal cleaning result probable.

9.2 Passivation

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

Pig cleaning stations are usually excepted from this.

Passivation is typically performed using nitric acid (HNO_3) at approx. 85 °C (176 °F) at a concentration of 3 % and a contact time of 6 to 8 hours.

10 Maintenance

10.1 Safety instructions

Maintenance and repair

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

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

For maintenance and repair, the following principles apply:

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

Disassembly

For disassembly, the following principles apply:

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

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

10.2 Inspections

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

10.2.1 Product contact seals

Carry out the following steps:

1. Regularly check:
   - Rod seal between the pig station housing and the pig retainer lantern
   - Rod seal between the pig station housing and the pig actuator lantern
   - O-ring between the pig station housing and the pig actuator lantern
   - O-ring of the pipe connections.

→ Done

10.2.2 Pig

Carry out the following steps:

Carry out the following steps:

1. Regularly perform a visual inspection of the pig, see “Maintenance” > “Removing the pig” (page 48) and “Inserting the pig” (page 49).
   - Recommendation: Check the pig for damage, wear and deformation after 20 pig runs and replace if necessary.
2. With each visual inspection, also check the diameter of the pig.
   → If the outer diameter of the pig is less than the inner diameter of the pipe, replace the pig.
3. Log each pig inspection with detailed information regarding the findings.

→ Done

10.2.3 Pneumatic connections

Carry out the following steps:

1. Check the operating pressure at the pressure reducing and filter station.

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

→ Done

10.2.4 Electrical connections

Carry out the following steps:

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

→ Done

10.3 Maintenance intervals

To ensure maximum operational safety of the pig cleaning station, the pig and all seals that come into contact with the product must be replaced at regular intervals.

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

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

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

10.4 Removing and inserting the pig

10.4.1 Preparations

Prerequisite:

- Make sure that during maintenance and repair work no process is running or started in the area concerned.

Carry out the following steps:

1. Clean or rinse all the pipe elements that lead to the pig cleaning station and empty them.
2. Depressurise the pipe system if there is a gas medium inside it under overpressure.
3. Shut off the control air supply.
4. Pull both control air hoses off the pig actuator.
5. Disconnect the power supply.

→ Done

10.4.2 Removing the pig

Prerequisite:

- Make sure that during maintenance and repair work no process is running or started in the area concerned.

Carry out the following steps:

1. Remove the air supply (V3.1 and V3.2) to the actuator.

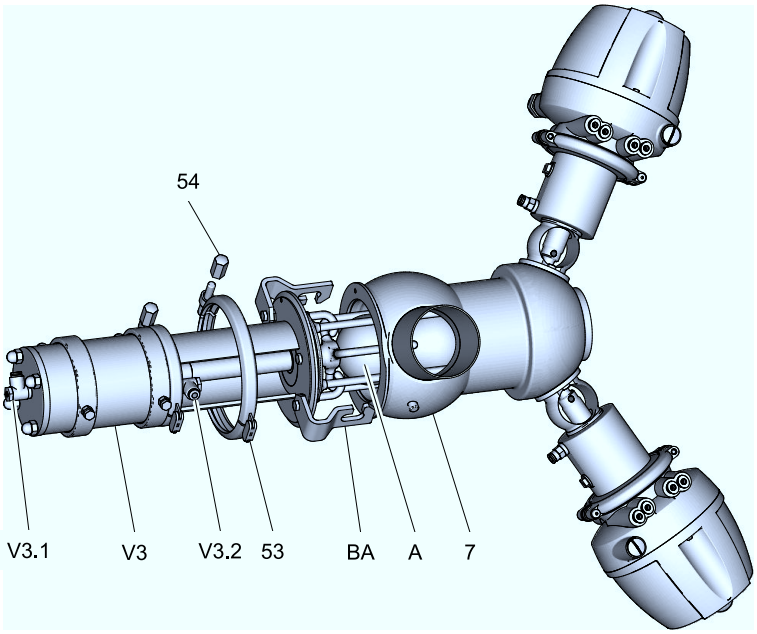

Fig.19

2. Move the housing (7) when depressurised.
3. Undo the hexagon nut (54) and remove the hinged clamp (53).

   ! If there is overpressure, the actuator shoots out; however it is held in place by the bayonet.

4. Remove actuator (V3) from the housing (approx. 12 mm). In doing so, release it from the bayonet (BA) by turning in a clockwise direction and then completely remove it.
5. Pull the pig (A) out of the three-armed pig clamp.

→ Done

Hint!

If a damaged pig is removed, you must immediately mark the direction of movement of the pig using a permanent market pen, i.e. on which side the sending or receiving station is located. This enables you to retrospectively ascertain the cause of the damage.

10.4.3 Inserting the pig

Insert the pig in the reverse order of the sequence for removing the pig.

10.5 Dismantling the pig cleaning station

Prerequisite:

- Make sure that during maintenance and repair work no process is running or started in the area concerned.

Caution!

Risk of burning due to hot cleaning agents and sterile steam

The pipes and components can get very hot.

► Before disassembling the pig cleaning station, allow the pipe to cool down.
► Isolate the pig station housing and pipe.

Carry out the following steps:

1. Clean or rinse all the pipe elements that lead to the pig cleaning station and empty them.
2. Shut off the control air supply.
3. Disconnect the power supply.
4. Remove the pig cleaning station together with the housing and all housing connections from the pipe section.

→ Done

10.6 Disassembling the Valve

10.6.1 Removing the actuator

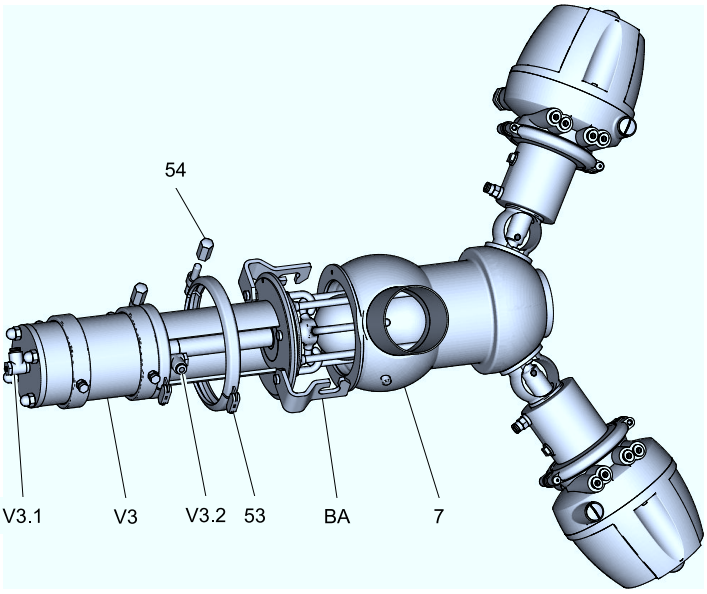

Fig.20

⚠ Caution!

Risk of burning due to hot cleaning agents and sterile steam

The pipes and components can get very hot.

► Before disassembling the pig cleaning station, allow the pipe to cool down.

► Isolate the pig station housing and pipe.

⚠ Caution!

Spring tension

Fingers can be crushed.

► Do not reach into the open lantern.

Carry out the following steps:

1. Remove the air supply (V3.1 and V3.2) to the actuator.
2. Move the housing (7) when depressurised.
3. Undo the hexagon nut (54) and remove the hinged clamp (53).

   → If there is overpressure, the actuator shoots out, however it is held in place by the bayonet.
4. Remove actuator (V3) from the housing (approx. 12 mm). In doing so, release it from the bayonet (BA) by turning in a clockwise direction and then completely remove it.

→ Done

10.6.2 Removing fitted components

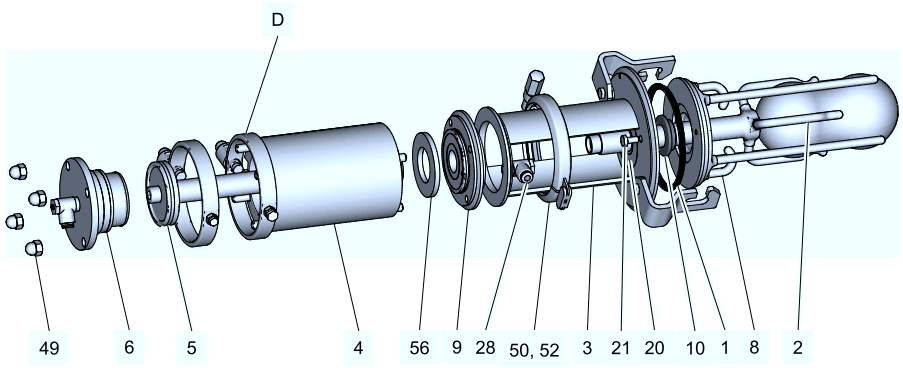

Fig.21

Carry out the following steps:

1. Unscrew the 4 cap nuts (49).
2. Pull the spring package (6) out of the cylinder pipe (4).
3. Hold the pig clamp (2) firmly and loosen the piston (5) with hex socket screw.
4. Pull the pig clamp (2) out of the lantern (3).
5. Undo the proximity switch holder (D) and remove from the cylinder pipe (4).

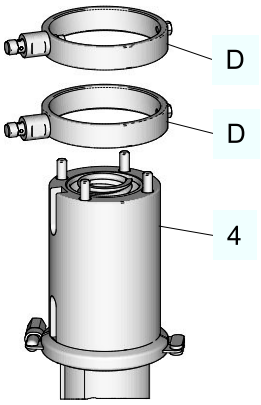

Fig.22

6. Undo the hexagon nut (52) and remove the hinged clamp (50).
7. Rotate the throttle check valve (28) for the air supply towards the piston (5).
8. Separate the cylinder base (9) from the lantern (3).
9. Remove the cylinder pipe (4), piston (5) and spacer (56) from the cylinder base (9).

   → All the seals on the actuator are now accessible!
10. Undo both screws (21) and remove the pig supply (8) from the lantern (3).

    → The sealing ring (10), the bearing disk (20) and the O-ring (1) are now accessible.

→ The pig cleaning station is disassembled.

10.7 Disassembling the pig holder

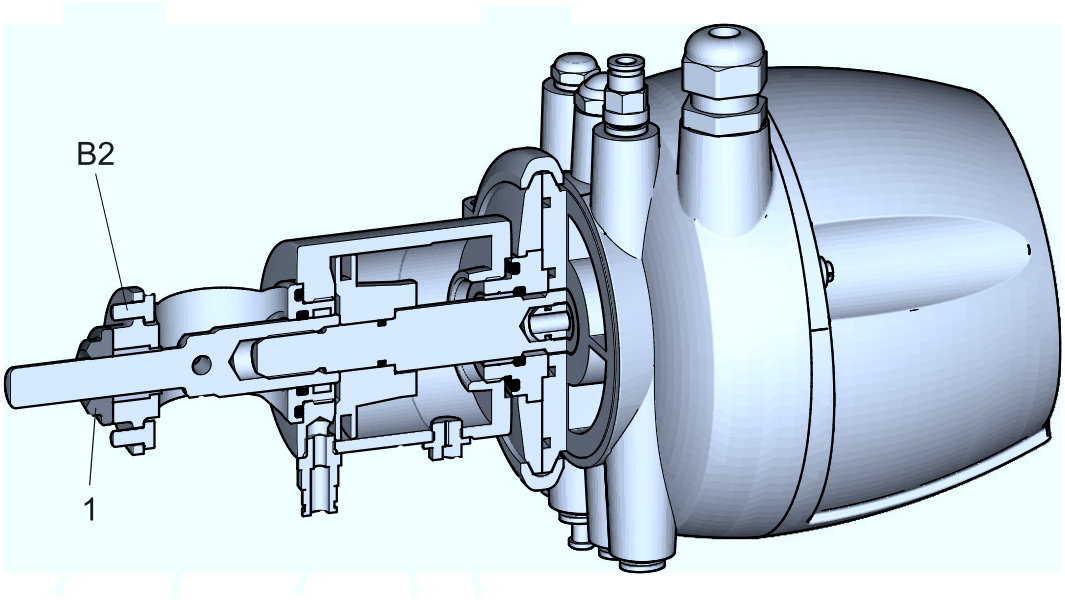

Fig.23

⚠ Caution!

Risk of burning due to hot cleaning agents and sterile steam

The pipes and components can get very hot.

► Before removing the pig retainer, allow the pipe to cool down.

⚠ Caution!

Spring tension

Fingers can be crushed.

► Do not reach into the open lantern.

Carry out the following steps:

1. Remove the air supply (V3.1 and V3.2) to the actuator.
2. Move the housing (7) when depressurised.
3. Loosen the hex head screws (B2) and remove the pig retainer.

   → The gasket (1) is now freely accessible.

→ The pig retainers are disassembled.

10.8 Maintenance

10.8.1 Cleaning the pig cleaning station

Notice

The shaft of the pig clamp (2) and the piston (5) are precision areas.

Damage to these parts can result in a malfunction.

► Handle the pig cleaning station with care!

Notice

Damage to the pig cleaning station

Damage to the pig cleaning station 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.

Notice

The cylinder pipe is made of PVDF

Aggressive cleaning agent can damage the cylinder pipe!

► Choose a suitable cleaning agent
► It is recommended that the cylinder pipe is replaced after 10 years.

Carry out the following steps:

1. Disassemble the pig cleaning station, see “Disassembling the pig actuator“ (Section 10.6, Page 47)
2. Carefully clean the individual parts.
3. Carefully clean all the threads on the initiators and screws.

→ Done

10.8.2 Lubricating Seals and Threads

⚠ Caution!

Damage to seals and threads

Damage to seals and threads can result in a malfunction.

► Ensure that an adequate film of lubricant is applied.
► For product contact seals only use suitable greases and oils
► Observe the safety information sheets issued by the lubricant manufacturer!

Carry out the following steps:

1. Lightly lubricate all threads.
2. Grease all seals – including the O-rings at the top and bottom of the actuator piston rod – very thinly.

→ Done

Hint!

GEA Tuchenhagen recommends Rivolta F.L.G. MD-2 and PARALIQ GTE 703. These lubricants are approved for foodstuff and are resistant to beer froth. They have the NSF-H1 (USDA H1) registration. They do not affect the taste or the consistency of the products and are compatible with the seals in contact with product. PARALIQ GTE 703 can be ordered from GEA Tuchenhagen under material no. 413-064, and Rivolta F.L.G. MD-2 can be ordered under material no. 413-071. Using other types of grease can result in malfunctions or in premature seal failure. The warranty will also become null and void. A Manufacturer's Declaration for these products can be obtained from GEA Tuchenhagen if required. A thin film of grease is required on the seals to ensure the proper function of the fittings. It reduces friction and extends the service life of the seals. This is absolutely harmless from a health and hygienic point of view. Running dry must be avoided!

10.9 Installation

10.9.1 Assembling the pig actuator

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

10.9.1.1 Aligning the throttle check valve

Carry out the following steps:

→ During assembly, align the throttle check valve (28) so that it points out of the lantern (3).

→ Done

10.9.1.2 Inserting the pig clamp

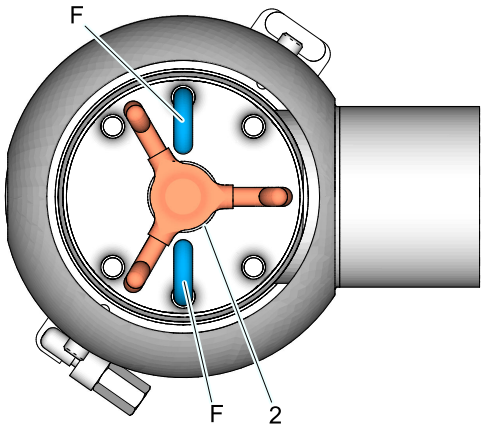

Fig.24

Carry out the following steps:

✳ Insert the pig clamp (2) in accordance with the drawing.

✳ The pig clamp arm must point vertically to the two curved guide rods (F). The guide rods (F) must not come into contact with the pig clamp.

→ Done

10.9.1.3 Assembling the cylinder pipe for pig cleaning station 4" OD

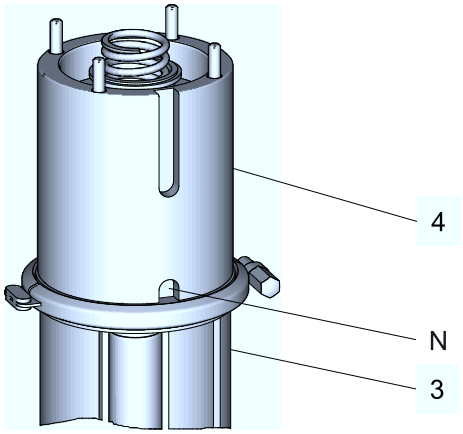

Fig.25

Carry out the following steps:

→ Slide open the cylinder pipe (4) so that the shorter groove (N) is pointing towards the lantern (3).

→ Done

10.9.1.4 Adjusting the initiators on the pig actuator

To adjust the initiators on the pig actuator, see “Adjusting initiators on the pig actuator” on page 35.

10.9.1.5 Torques for the clamps and hinged clamps

Tighten the hinged clamps and clamps on the pig station to the torques specified in the table.

Torques for the hinged clamps and clamps			
Torques		**[Nm]**	**[lbft]**
Clamps on the control top		1	0.7
Hinged clamps cast clamps	M8	22	16.2
Cast clamps	M10	45	33

Screw torques			
Torques		**[Nm]**	**[lbft]**
Bolts	M5	5	3.7
Bolts	M6	9	6.6
Bolts	M8	22	16.2
Bolts	M10	45	33

10.9.1.6 Checking the function of the pig actuator

Setting the Stroke

Prerequisite:

There must be no pig in the pig station.

Carry out the following steps:

1. Actuate the pig actuator with compressed air.
2. Check the pig retainer stroke in accordance with “Table: Pig retainer stroke” (next page).

→ Done

Strokes Depending on Size

Pig retainer stroke	
Nominal width	**Stroke [mm]**
Metric	
25	on request
40	61
50	61
65	76
80	76
100	104
Inch OD	
1"	on request
1.5"	53
2"	61
2.5"	71
3"	76
4"	104

To clean the front surface of the pig, an additional stroke of 10 mm is made for the spring package (6).

10.9.2 Assembling the pig retainer

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

10.9.2.1 Screw torques

Screw torques			
Torques		**[Nm]**	**[lbft]**
Bolts	M5	5	3.7
Bolts	M6	9	6.6
Bolts	M8	22	16.2
Bolts	M10	45	33

10.9.2.2 Checking the function of the pig retainer

Setting the Stroke

Prerequisite:

There must be no pig in the pig cleaning station.

Carry out the following steps:

1. Actuate the pig retainer with compressed air.
2. Check the stroke of the pig retainer in accordance with the following table.

→ Done

Table: Pig retainer stroke	
Nominal width	**Stroke [mm]**
Metric DN	
25	6.5
40	6.5
50	17
65	17
80	24
100	24
Inch OD	
1"	6.5
1.5"	6.5
2"	17
2.5"	17
3"	24
4"	24

11 Alarms

11.1 Malfunctions and remedies

In the event of a malfunction, the pig cleaning station must be switched off immediately and secured against being switched back on. Malfunctions may only be remedied by qualified staff, who must observe the safety instructions.

Malfunction table		
Malfunction	**Cause**	**Remedy**
Pig cleaning station is not working	Fault in the control system	Check the system configuration
	No compressed air or pressure 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
Actuator moves too slowly	O-rings in the actuator are dry (friction losses)	Grease O-rings
Leakage in the area of the pig station housing	Housing O-rings defective	Disassemble the pig cleaning station Replace the housing O-rings
Leakage in the lantern	Sealing ring defective	Replace the sealing ring
Damage to the pig surface	Poor welded seams	Inspection of welded seams from inside via endoscopy Replacement of pipe sections
	Pig speed too fast	Calculation of pig speed Change to process

12 Decommissioning

12.1 Safety instructions

For shutting down, the following principles apply:

- Switch off the compressed air.
- Switch off the component with the main switch.
- Padlock the main switch (if fitted) in the off position to prevent it from being switched back on. The key to the padlock must be deposited with the person responsible until the machine is restarted.
- For longer periods of standstill, observe the storage conditions, see Chapter 4, Page 25.

12.2 Disposal

12.2.1 General notes

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

The component consists of the following materials:

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

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

12.2.2 Disposing of the pig retainer actuator and the spring package of the pig actuator

⚠ Danger

The spring forces in the actuator can be as high as 2000 N.

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

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

Carry out the following steps:

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

→ Done

13 Spare parts list - pig cleaning station MST 3A

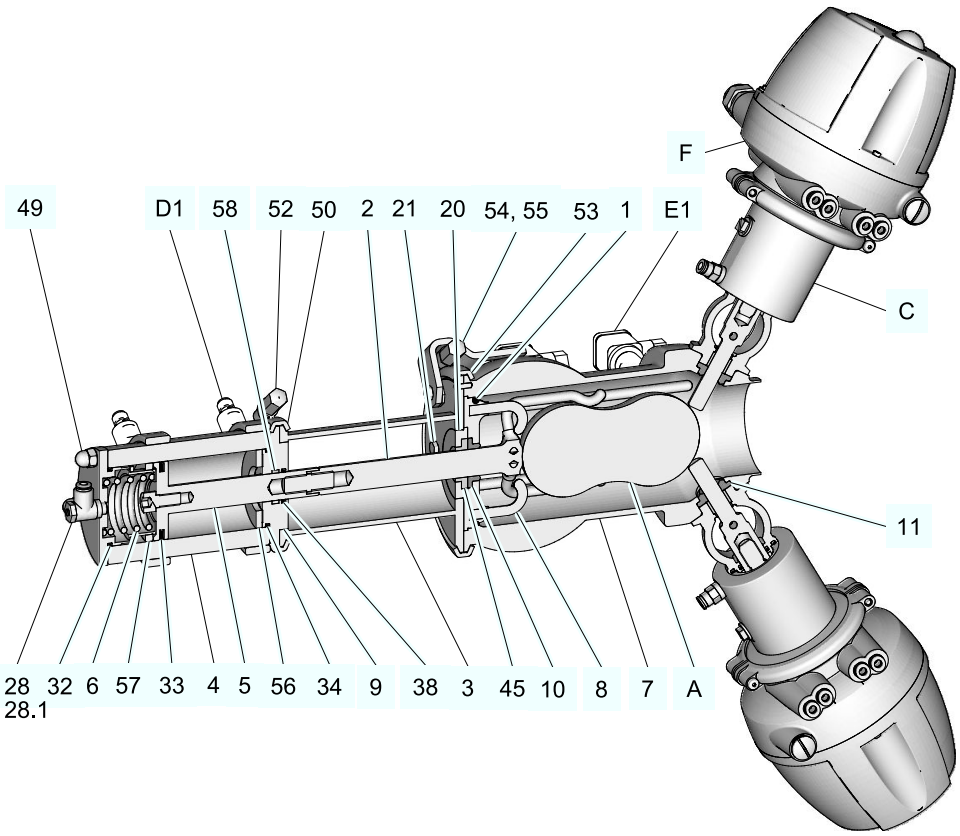

Fig.26

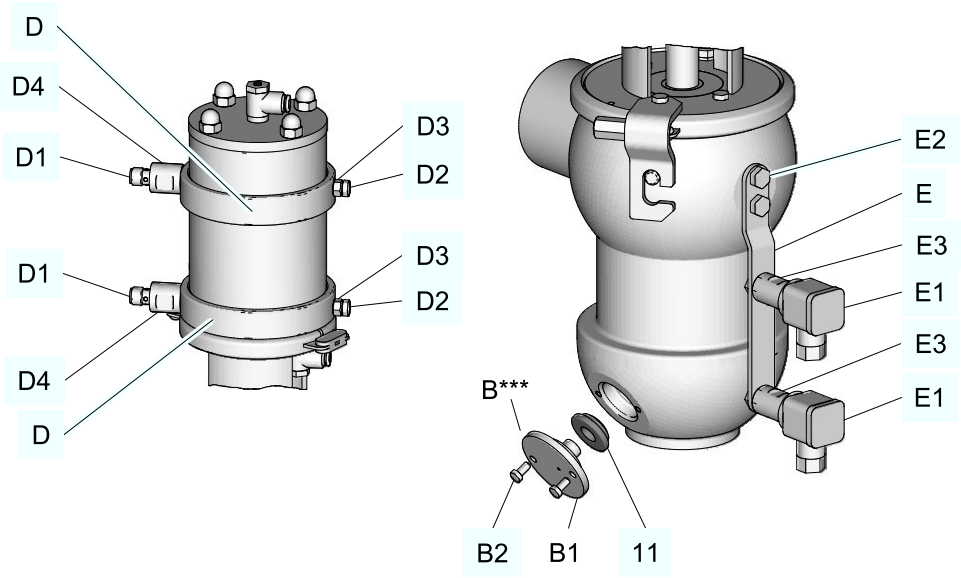

Fig.27

Item	Designation	Material	DN 40	DN 50	DN 65	DN 80	DN 100
Set of seals MST**		EPDM	228-527.36	228-527.25	228-527.28	228-527.42	228-527.34
		FKM	228-527.37	228-527.26	228-527.29	228-527.43	228-527.35
		HNBR	228-527.38	228-527.27	228-527.30	228-527.44	228-527.46
1	O-ring	EPDM	930-266	930-144	930-450	930-451	930-365
		FKM	930-265	930-171	930-527	930-673	930-619
		HNBR	930-061	930-633	930-555	930-660	930-655
2	Gripper MST	1.4404	228-000355	228-000287	228-000288	228-000289	228-000290
3	Lantern, pig station cpl.	1.4301	228-146.04	228-146.04	228-146.08	228-146.01	228-146.15
4	Cylinder pipe MST	PVDF	228-000166	228-000166	228-000166	228-000166	228-000167
5	Piston MST	1.4301	228-000168	228-000168	228-000168	228-000168	228-000203
6	Spring package MST	1.4301	228-000170	228-000170	228-000170	228-000170	228-000212
7	Housing MST	1.4404	228-000352	228-000327	228-000341	228-000342	228-000343
8	Pig guide MST	1.4404	228-000354	228-000291	228-000292	228-000293	228-000294
9	Cylinder bottom MST cpl.	1.4301	228-000207	228-000207	228-000207	228-000207	228-000208
10	Seal ring	EPDM	924-084	924-084	924-084	924-084	924-088
		FKM	924-082	924-082	924-082	924-082	924-087
		HNBR	924-311	924-311	924-311	924-311	924-349
11	Seal ring	EPDM	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312	924-312
20	Bearing disk N	1.4305	221-142.02	221-142.02	221-142.02	221-142.02	221-142.04
21	Hex head screw	A2-70	901-350	901-350	901-350	901-014	901-017
28	Throttle non-return valve G1/8"-DN2.5	Brass, nickel-plated	603-049	603-049	603-049	603-049	603-049
28.1	Elbow screw-in plug connection, metric G1/8"-6.4	Ms CV	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection, imperial G1/8"-6.35	Ms CV	933-173	933-173	933-173	933-173	933-173
32	O-ring	NBR	930-985	930-985	930-985	930-985	930-505
33	K-ring	NBR	930-983	930-983	930-983	930-983	930-679
34	O-ring	NBR	930-985	930-985	930-985	930-985	930-505
38	O-ring	NBR	930-029	930-029	930-029	930-029	930-251
45	Bearing N/3A	SUSTA-PVDF	935-098	935-098	935-098	935-098	935-102
	Bearing N	PTFE	935-001	935-001	935-001	935-001	935-003
49	Cap nut	1.4301	912-004	912-004	912-004	912-004	912-004
50	Hinged clamp	1.4401	701-073	701-073	701-073	701-073	701-077
52	Cap nut	A2-70	912-047	912-047	912-047	912-047	912-047
53	Hinged clamp	1.4401	701-073	701-073	701-076	701-077	--
	Half ring	1.4408	--	--	--	--	701-011
54	Cap nut	A2-70	912-047	912-047	912-047	912-047	912-005
55	Hex head screw	A2-70	--	--	--	--	901-296
56	Space piece	PP	228-151.01	228-151.01	228-151.04	--	--
57	Ring	PP	228-152.01	228-152.01	228-152.01	228-152.01	228-152.02
58	Guide ring	Turcite	935-050	935-050	935-050	935-050	935-059

Item	Designation	Material	DN 40	DN 50	DN 65	DN 80	DN 100
A	Pig	--	See spare parts list for pigs 228ELI009917				
B***	Blanking plate cpl.	--			228-525.01		
B1	Blanking plate	1.4404			228-142.01		
B2	Hex head screw	A2-70			901-334		
C	Pig holder	--	See spare parts list for pig holder 228ELI009918				
D	Proximity switch holder	1.4301	228-000171	228-000171	228-000171	228-000171	228-000172
D1	Initiator	--	505-103	505-103	505-103	505-103	505-103
D2	Screw	--	901-017	901-017	901-017	901-017	901-017
D3	Nut	--	910-013	910-013	910-013	910-013	910-013
D4	Threaded bush	1.4301	228-000251	228-000251	228-000251	228-000251	228-000251
S	Proximity switch holder (magnet)	1.4301	228-000357	228-000351	228-000350	228-000349	228-000348
E1	Magnetic switch	--	505-081	505-081	505-081	505-081	505-081
E2	Screw	--	901-012	901-012	901-012	901-040	901-040
E3	Threaded bush	1.4301	228-000252	228-000252	228-000252	228-000252	228-000252
Q	Control top	--	See spare parts list for Control Top T.VIS M-15 221ELI010733.				

** Items 1, 10 and 11 are included in the MST sealing set
*** Item B consists of items B1 and B2.

Item	Designation	Material	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
Set of seals MST**		EPDM	228-527.39	228-527.25	228-527.28	228-527.31	228-527.34
		FKM	228-527.40	228-527.26	228-527.29	228-527.32	228-527.35
		HNBR	228-527.41	228-527.27	228-527.30	228-527.33	228-527.46
1	O-ring	EPDM	930-364	930-144	930-450	930-549	930-365
		FKM	930-299	930-171	930-527	930-568	930-619
		HNBR	930-977	930-633	930-555	930-556	930-655
2	Gripper MST	1.4404	228-000338	228-000177	228-000178	228-000179	228-000180
3	Lantern, pig station cpl.	1.4301	228-146.04	228-146.04	228-146.10	228-146.13	228-146.15
4	Cylinder pipe MST	PVDF	228-000166	228-000166	228-000166	228-000166	228-000167
5	Piston MST	1.4301	228-000168	228-000168	228-000168	228-000168	228-000203
6	Spring package MST	1.4301	228-000170	228-000170	228-000170	228-000170	228-000212
7	Housing MST	1.4404	228-000340	228-000190	228-000191	228-000192	228-000193
8	Pig guide MST	1.4404	228-000334	228-000186	228-000187	228-000188	228-000189
9	Cylinder bottom MST cpl.	1.4301	228-000207	228-000207	228-000207	228-000207	228-000208
10	Seal ring	EPDM	924-084	924-084	924-084	924-084	924-088
		FKM	924-082	924-082	924-082	924-082	924-087
		HNBR	924-311	924-311	924-311	924-311	924-349
11	Seal ring	EPDM	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312	924-312
20	Bearing disk N	1.4305	221-142.02	221-142.02	221-142.02	221-142.02	221-142.04
21	Hex head screw	A2-70	901-350	901-350	901-350	901-014	901-017
28	Throttle non-return valve G1/8"-DN2.5	Brass, nickel-plated	603-049	603-049	603-049	603-049	603-049
28.1	Elbow screw-in plug connection, metric G1/8"-6.4	Ms CV	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection, imperial G1/8"-6.35	Ms CV	933-173	933-173	933-173	933-173	933-173
32	O-ring	NBR	930-985	930-985	930-985	930-985	930-505
33	K-ring	NBR	930-983	930-983	930-983	930-983	930-679
34	O-ring	NBR	930-985	930-985	930-985	930-985	930-505
38	O-ring	NBR	930-029	930-029	930-029	930-029	930-251
45	Bearing N/3A	SUSTA-PVDF	935-098	935-098	935-098	935-098	935-102
	Bearing N	PTFE	935-001	935-001	935-001	935-001	935-003
49	Cap nut	1.4301	912-004	912-004	912-004	912-004	912-004
50	Hinged clamp	1.4401	701-073	701-073	701-073	701-073	701-077
52	Cap nut	A2-70	912-047	912-047	912-047	912-047	912-047
53	Hinged clamp	1.4401	701-073	701-073	701-076	701-077	--
	Half ring	1.4408	--	--	--	--	701-011
54	Cap nut	A2-70	912-047	912-047	912-047	912-047	912-005
55	Hex head screw	A2-70	--	--	--	--	901-296
56	Space piece	PP	228-151.05	228-151.01	228-151.04	--	--
57	Ring	PP	228-152.01	228-152.01	228-152.01	228-152.01	228-152.02
58	Guide ring	Turcite	935-050	935-050	935-050	935-050	935-059

Item	Designation	Material	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
A	Pig	--	See spare parts list for pigs 228ELI009917				
B***	Blanking plate cpl.	--			228-525.01		
B1	Blanking plate	1.4404			228-142.01		
B2	Hex head screw	A2-70			901-334		
C	Pig holder	--	See spare parts list for pig holder 228ELI009918				
D	Proximity switch holder	1.4301	228-000171	228-000171	228-000171	228-000171	228-000172
D1	Initiator	--	505-103	505-103	505-103	505-103	505-103
D2	Screw	--	901-017	901-017	901-017	901-017	901-017
D3	Nut	--	910-013	910-013	910-013	910-013	910-013
D4	Threaded bush	1.4301	228-000251	228-000251	228-000251	228-000251	228-000251
S	Proximity switch holder (magnet)	1.4301	228-000361	228-000248	228-000249	228-000213	228-000250
E1	Magnetic switch	--	505-081	505-081	505-081	505-081	505-081
E2	Screw	--	901-012	901-012	901-012	901-040	901-040
E3	Threaded bush	1.4301	228-000252	228-000252	228-000252	228-000252	228-000252
Q	Control top	--	See spare parts list for Control Top T.VIS M-15 221ELI010733.				

** Items 1, 10 and 11 are included in the MST sealing set
*** Item B consists of items B1 and B2.

14 Parts list- Pig Cleaning Station MST 3A- DN 25 and 1"OD

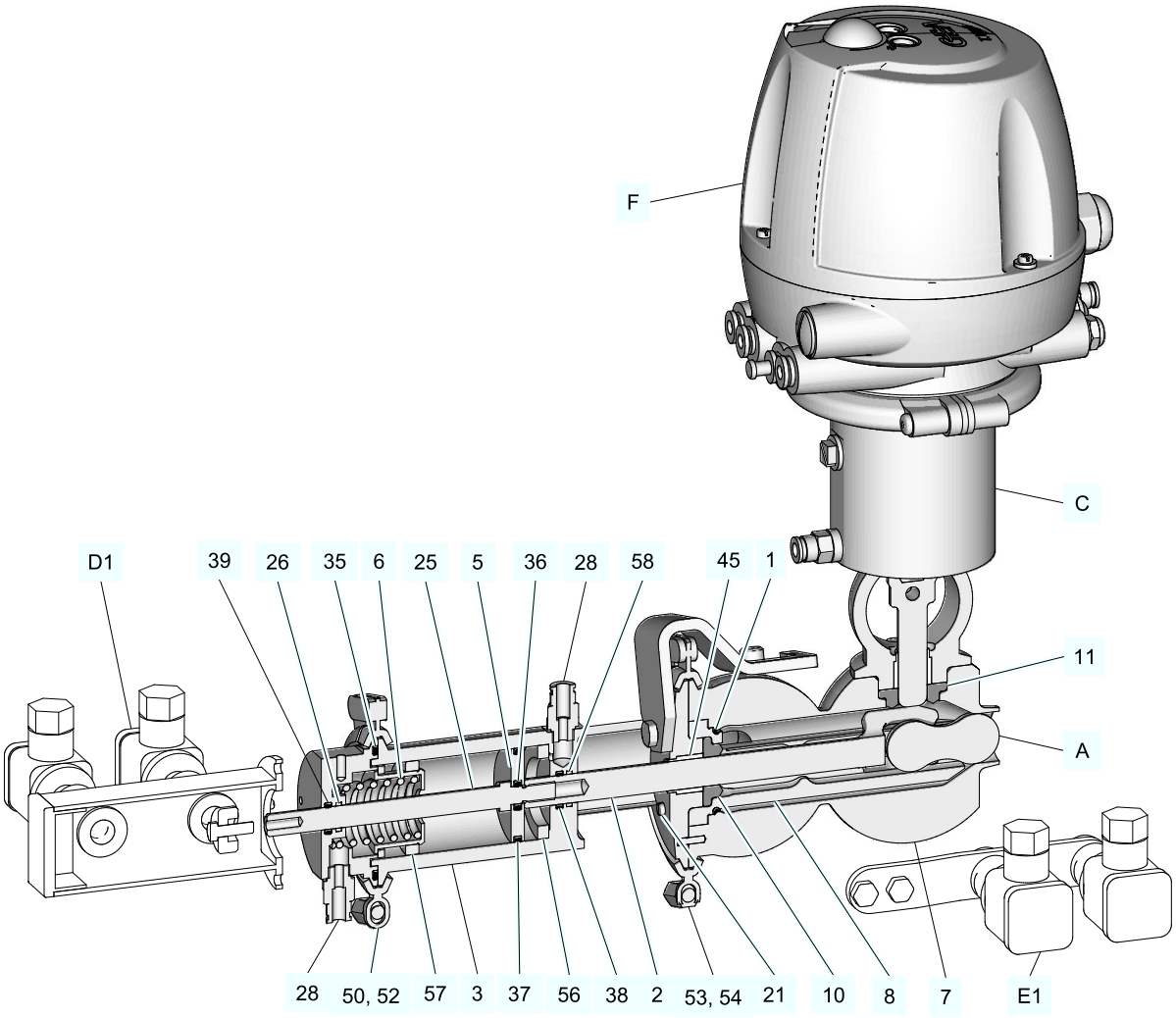

Fig.28

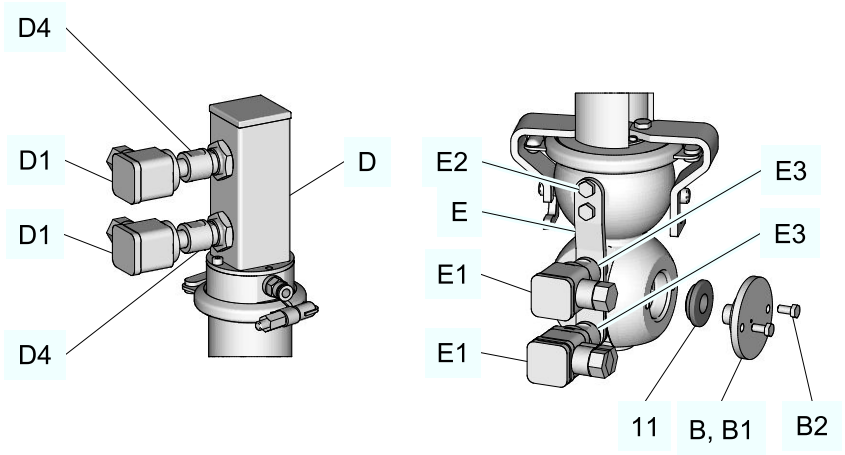

Fig.29

Item	Designation	Material	DN 25	1" OD
Set of seals MST**		EPDM	--	--
		FKM	--	--
		HNBR	--	--
1	O-ring	EPDM	930-356	930-312
		FKM	930-357	930-166
		HNBR	930-060	930-630
2	Gripper MST	1.4404	228-000366	228-000365
3	Lantern, pig station cpl.	1.4301	228-146.21	228-146.21
4	Cylinder pipe MST	PVDF	228-147.03	228-147.03
5	Piston MST	1.4301	228-148.03	228-148.03
6	Spring package MST	1.4301	228-000170	228-000170
7	Housing MST	1.4404	228-000373	228-000368
8	Pig guide MST	1.4404	228-000376	228-000367
10	Seal ring	EPDM	924-255	924-255
		FKM	924-297	924-297
		HNBR	924-312	924-312
11	Seal ring	EPDM	924-255	924-255
		FKM	924-297	924-297
		HNBR	924-312	924-312
21	Cheese head screw	1.4301	904-161	904-161
25	Switch bar ATB-MOL	1.4404	228-158.03	228-158.03
26	Guide ring	Turcite-T51	935-038	935-038
28	Screw-in plug connection G1/8"-6/4	Brass, nickel-plated	933-330	933-330
35	O-ring	NBR	930-302	930-302
36	O-ring	NBR	930-007	930-007
37	O-ring	NBR	930-050	930-050
38	O-ring	NBR	930-011	930-011
39	O-ring	NBR	930-008	930-008
45	Bearing N/3A	SUSTA-PVDF	935-098	935-098
50	Hinged clamp	1.4401	701-074	701-074
52	Hexagon nut	1.4305	912-035	912-035
53	Hinged clamp	1.4401	701-075	701-075
54	Hexagon nut	A2-70	912-035	912-035
55	Hex head screw	A2-70	--	--
56	Space piece	PP	228-151.06	228-151.06
57	Ring	PP	228-152.03	228-152.03
58	Guide ring	Turcite-T51	935-052	935-052
A	Pig	--	See spare parts list for pigs 228ELI009917	
B***	Blanking plate cpl.	--	228-525.01	228-525.01
B1	Blanking plate	1.4404	228-142.01	228-142.01
B2	Hex head screw	A2-70	901-334	901-334
C	Pig holder	--	See spare parts list for pig holder 228ELI009918	

Item	Designation	Material	DN 25	1" OD
D	Pig actuator feedback DK cpl.	--	228-159.15	228-159.13
D1	Initiator	--	505-103	505-103
D4	Threaded bush	1.4301	228-000251	228-000251
S	Proximity switch holder (magnet)	1.4301	228-000390	228-000389
E1	Magnetic switch	--	505-081	505-081
E2	Screw	--	901-012	901-012
E3	Threaded bush	1.4301	228-000252	228-000252
Q	Control top	See spare parts list for Control Top T.VIS M-15 221ELI010733.		
** Items 1 and 11 are included in the MST gasket set *** Item B consists of items B1 and B2.				

15 Parts list – Feedback for MST-DK pig actuator

DN 25 and 1" OD

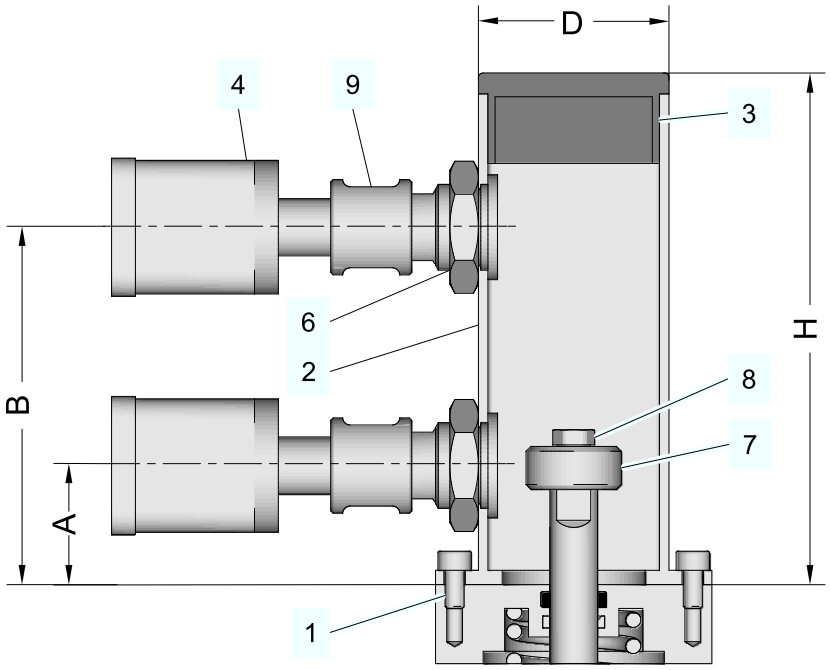

Fig.30

Item	Designation	Material	DN 25		1" OD
Pig actuator feedback DK cpl.		--	228-159.15		228-159.13
1	Cheese head screw	A2-70	902-107		902-107
2	Pig actuator feedback DK	1.4301	228-159.14		228-159.16
3	Square head plug	PE-LD	922-097		922-097
4*	3-wire proximity switch 24V DC	--	505-088		505-088
6	Setting RM	--	228-000098		228-000098
7	Disk	1.4301	228-000099		228-000099
8	Hex head screw	A2-70	901-317		901-317
9*	Threaded bushing	1.4301	228-000251		228-000251
		Dimensions in mm			
A	for pig feedback DK		25		20
B	for pig feedback DK		75		75
R			40		40
I			108		108
* Items 4 and 9 are not included in the complete pig actuator feedback bill of materials and must be ordered separately.					

16 Parts list – Pigs DN and OD

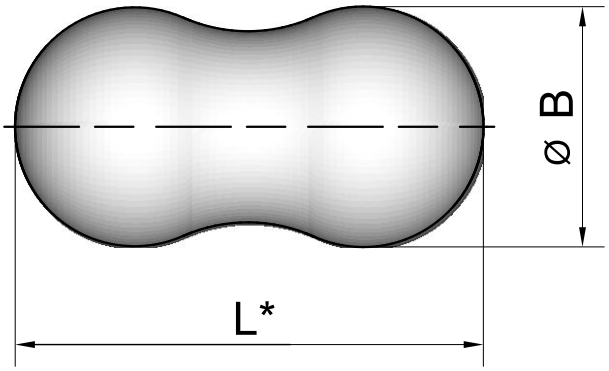

Fig.31

Nominal width	Pig type PK			Pig type PK		
	VMQ dark blue			FKM black		
		Dimensions in mm			Dimensions in mm	
		L*	Ø B		L*	Ø B
DN 25	228-157.09**		>	--		>
DN 40	228-163.24	80	> 38.0	228-163.23	80	> 38.0
DN 50	228-163.27	99	> 50.0	228-163.26	99	> 50.0
DN 65	228-163.30	127	> 66.0	228-163.29	127	> 66.0
DN 80	228-163.33	158	> 81.0	228-163.32	158	> 81.0
DN 100	228-163.36	192	> 100.0	228-163.35	192	> 100.0
1" OD	228-157.11**		>	--		>
1.5" OD	228-263.12	67	> 34.8	228-263.11	67	> 34.8
2" OD	228-263.03	93	> 47.5	228-263.02	93	> 47.5
2.5" OD	228-263.15	119	> 60.2	228-263.14	119	> 60.2
3" OD	228-263.18	144	> 72.9	228-263.17	144	> 72.9
4" OD	228-263.06	181	> 97.38	228-263.05	181	> 97.38

Notes:
Pig type PK: double-ball pig with encapsulated magnets, encapsulation made of stainless steel
* = approx.
** = Pig type PK

17 Parts list – Pig Retainer 3A with T.VIS M-15 and A-15

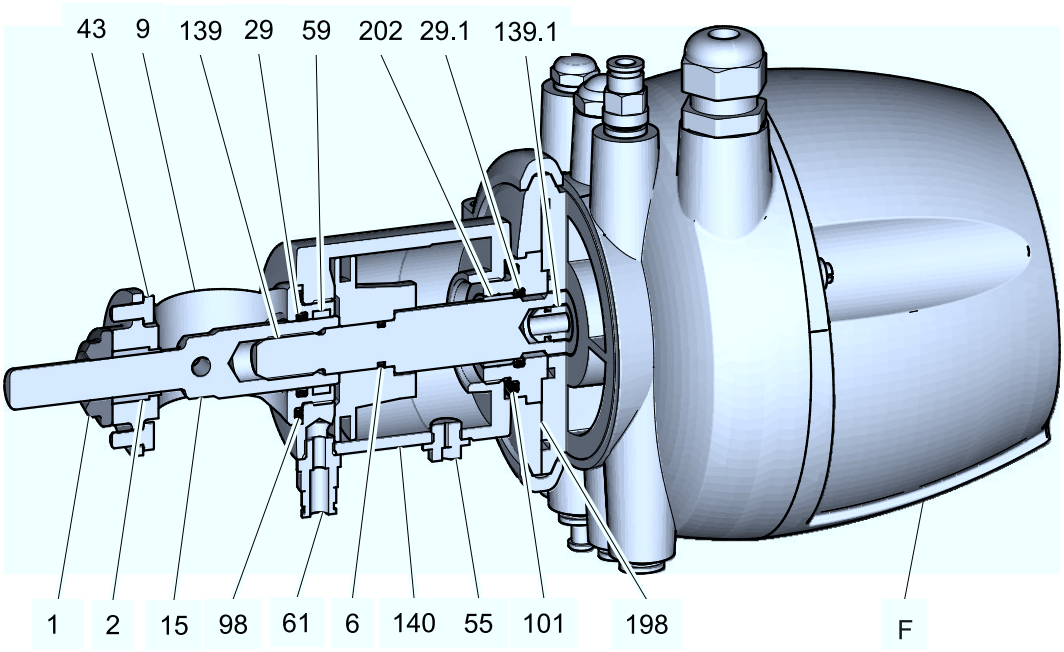

Fig.32

Item	Designation	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312	924-312	924-312
2	Bearing N/3A	SUSTA-PVDF	935-097	935-097	935-097	935-097	935-097	935-097
	Bearing N	PTFE	935-037	935-037	935-037	935-037	935-037	935-037
6	O-ring	NBR	930-693	930-693	930-693	930-693	930-693	930-693
9	Motor stool MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01
15	Valve disk MS	1.4404	228-179.01	228-179.02	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029	930-029	930-029
29.1*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
43	Hex head screw	A2-70	901-334	901-334	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050	935-050	935-050
61	Screw-in plug connection metric (1/8" - 6/4)	Ms CV	933-176	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8" - 6.35)	Ms CV	933-173	933-173	933-173	933-173	933-173	933-173
98	O-ring	NBR	930-046	930-046	930-046	930-046	930-046	930-046
101*	O-ring	NBR	930-251	930-251	930-251	930-251	930-251	930-251
139	Adapter T.VIS MS 60	1.4301	228-624.03	228-624.03	228-624.03	228-624.03	228-624.03	228-624.03
139.1 **	Switch bar T.VIS M-15	PA6/GK30	221-589.80	221-589.80	221-589.80	221-589.80	221-589.80	221-589.80
	Switch bar T.VIS P/A cpl. A-15	PA6/GK30	221-589.75	221-589.75	221-589.75	221-589.75	221-589.75	221-589.75
140	Actuator MS	--	228-181.01	228-181.01	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-589.32	221-589.32	221-589.32	221-589.32
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041	704-041	704-041
Q	Control Top T.VIS M-15	See spare parts list 221ELI010733						
	Control Top T.VIS A-15	See spare parts list 221ELI010725						

* O-rings items 29.1 and 101 are included in the mounting base (item 198).
** The switch bar (item 139.1) is included in the control top.

Item	Designation	Material	1" OD	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312	924-312	924-312
2	Bearing N/3A	SUSTA-PVDF	935-097	935-097	935-097	935-097	935-097	935-097
	Bearing N	PTFE	935-037	935-037	935-037	935-037	935-037	935-037
6	O-ring	NBR	930-693	930-693	930-693	930-693	930-693	930-693
9	Motor stool MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01
15	Valve disk MS	1.4404	228-179.01	228-179.02	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029	930-029	930-029
29.1*	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
43	Hex head screw	A2-70	901-334	901-334	901-334	901-334	901-334	901-334
55	Vent screw	PP/ black	221-004311	221-004311	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite T51	935-050	935-050	935-050	935-050	935-050	935-050
61	Screw-in plug connection metric (1/8" - 6/4)	Ms CV	933-176	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8" - 6.35)	Ms CV	933-173	933-173	933-173	933-173	933-173	933-173
98	O-ring	NBR	930-046	930-046	930-046	930-046	930-046	930-046
101*	O-ring	NBR	930-251	930-251	930-251	930-251	930-251	930-251
139	Adapter T.VIS MS 60	1.4301	228-624.03	228-624.03	228-624.03	228-624.03	228-624.03	228-624.03
139.1 **	Switch bar T.VIS M-15	PA6/ GK30	221-589.80	221-589.80	221-589.80	221-589.80	221-589.80	221-589.80
	Switch bar T.VIS P/A cpl. A-15	PA6/ GK30	221-589.75	221-589.75	221-589.75	221-589.75	221-589.75	221-589.75
140	Actuator MS	--	228-181.01	228-181.01	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-589.32	221-589.32	221-643.03	221-643.03
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041	704-041	704-041
Q	Control Top T.VIS M-15	See spare parts list 221ELI010733						
	Control Top T.VIS A-15	See spare parts list 221ELI010725						

* O-rings items 29.1 and 101 are included in the mounting base (item 198).
** The switch bar (item 139.1) is included in the control top.

18 Parts list – Pig Retainer MSP 3A with T.VIS M-15 and A-15

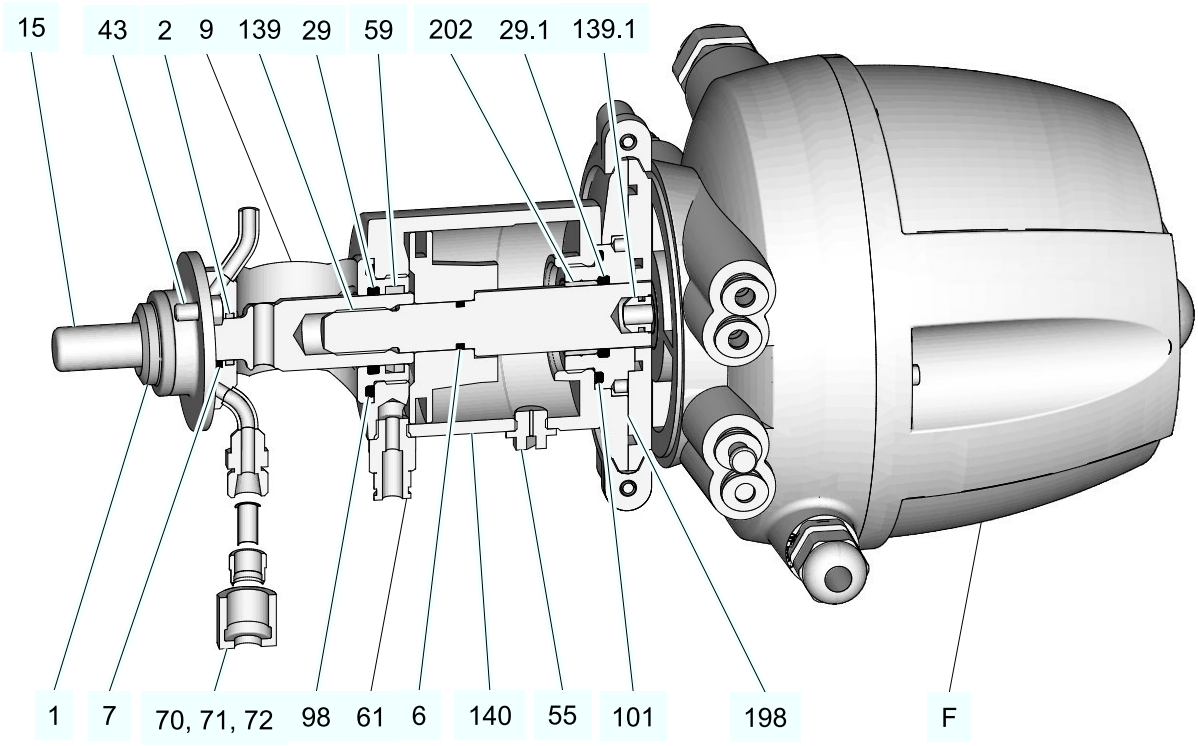

Fig.33

Item	Designation	Material	DN 50	DN 65	DN 80	DN 100
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312
2	Guide ring	Turcite-B10	935-052	935-052	935-052	935-052
6	O-ring	NBR	930-693	930-693	930-693	930-693
7	O-ring	EPDM	930-375	930-375	930-375	930-375
		FKM	930-385	930-385	930-385	930-385
9	Motor stool MSP	1.4301	228-176.02	228-176.02	228-176.02	228-176.02
15	Valve disk MS	1.4404	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029
29.1**	O-ring	NBR	930-026	930-026	930-026	930-026
43	Hex head screw	A2-70	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173
70	Union nut	1.4571	933-456	933-456	933-456	933-456
71	Cutting ring	1.4571	933-455	933-455	933-455	933-455
72	Support sleeve	1.4571	933-382	933-382	933-382	933-382
98	O-ring	NBR	930-046	930-046	930-046	930-046
101**	O-ring	NBR	930-251	930-251	930-251	930-251
139	Adapter T.VIS MS 60	1.4301	228-624.03	228-624.03	228-624.03	228-624.03
	Adapter T.VIS A/P E60	1.4301	228-624.04	228-624.04	228-624.04	228-624.04
139.1***	Switch bar T.VIS M-15	PA6/GK30	221-589.80	221-589.80	221-589.80	221-589.80
	Switch bar T.VIS P/A cpl. A-15	PA6/GK30	221-589.75	221-589.75	221-589.75	221-589.75
140	Actuator MS	--	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-589.32	221-589.32
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041
Q	Control Top T.VIS M-15	See spare parts list 221ELI010733				
	Control Top T.VIS A-15	See spare parts list 221ELI010725				

** O-rings items. 29.1 and 101 are included in the mounting base (item 198).
*** The switch bar (item 139.1) is included in the control top.

Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312
2	Guide ring	Turcite-B10	935-052	935-052	935-052	935-052
6	O-ring	NBR	930-693	930-693	930-693	930-693
7	O-ring	EPDM	930-375	930-375	930-375	930-375
		FKM	930-385	930-385	930-385	930-385
9	Motor stool MSP	1.4301	228-176.02	228-176.02	228-176.02	228-176.02
15	Valve disk MS	1.4404	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029
29.1*	O-ring	NBR	930-026	930-026	930-026	930-026
43	Hex head screw	A2-70	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173
70	Union nut	1.4571	933-456	933-456	933-456	933-456
71	Cutting ring	1.4571	933-455	933-455	933-455	933-455
72	Support sleeve	1.4571	933-382	933-382	933-382	933-382
98	O-ring	NBR	930-046	930-046	930-046	930-046
101*	O-ring	NBR	930-251	930-251	930-251	930-251
139	Adapter T.VIS MS 60	1.4301	228-624.03	228-624.03	228-624.03	228-624.03
	Adapter T.VIS A/P E60	1.4301	228-624.04	228-624.04	228-624.04	228-624.04
139.1**	Switch bar T.VIS M-15	PA6/GK30	221-589.80	221-589.80	221-589.80	221-589.80
	Switch bar T.VIS P/A cpl. A-15	PA6/GK30	221-589.75	221-589.75	221-589.75	221-589.75
140	Actuator MS	--	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-643.32	221-643.32
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041
Q	Control Top T.VIS M-15	See spare parts list 221ELI010733				
	Control Top T.VIS A-15	See spare parts list 221ELI010725				

* O-rings items 29.1 and 101 are included in the mounting base (item 198).
** The switch bar (item 139.1) is included in the control top.

19 Parts list – Connection 0 and Proximity Switch Holder for Pig Retainer

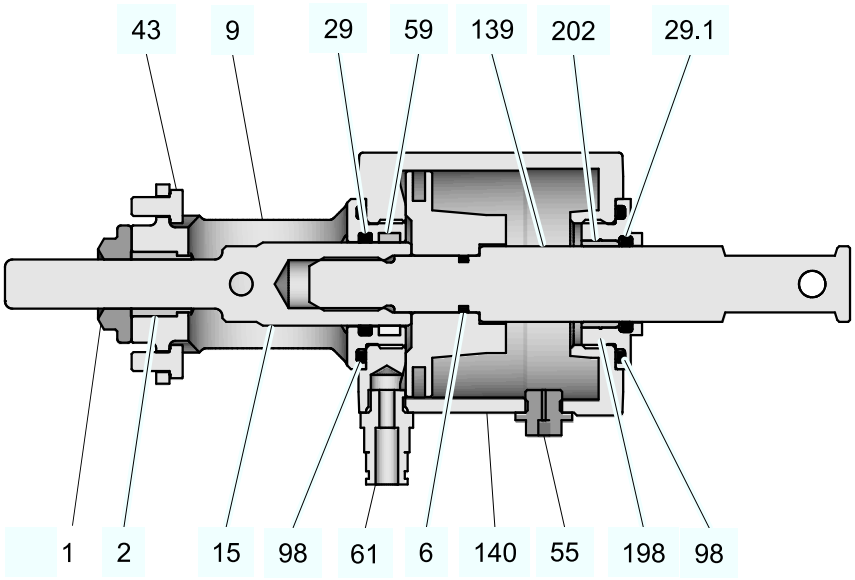

Fig.34

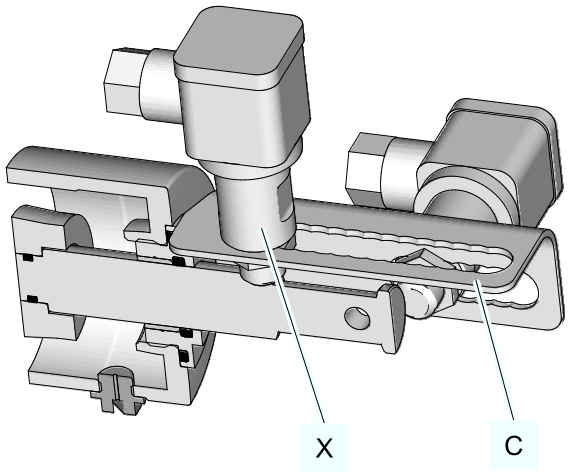

Fig.35

Item	Designation	Material	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312	924-312	924-312
2	Bearing N/3A	SUSTA-PVDF	935-097	935-097	935-097	935-097	935-097	935-097
	Bearing N	PTFE	935-037	935-037	935-037	935-037	935-037	935-037
6	O-ring	NBR	930-693	930-693	930-693	930-693	930-693	930-693
9	Motor stool MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01
15	Valve disk MS	1.4404	228-179.01	228-179.02	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029	930-029	930-029
29.1	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
43	Hex head screw	A2–70	901-334	901-334	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173	933-173	933-173
98	O-ring	NBR	930-046	930-046	930-046	930-046	930-046	930-046
139	Switch bar MS 60	1.4301	228-177.01	228-177.01	228-177.01	228-177.01	228-177.01	228-177.01
140	Actuator MS	--	228-181.01	228-181.01	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base ECO-E	--	221-643.03	221-643.03	221-643.03	221-643.03	221-643.03	221-643.03
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041	704-041	704-041
C	Proximity switch holder IS cpl.	--	221-643.05	221-643.05	221-643.05	221-643.05	221-001464	221-001464
X	Threaded bushing	1.4301	228-000252	228-000252	228-000252	228-000252	228-000252	228-000252

Item	Designation	Material	1" OD	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	2	924-312	924-312	924-312
2	Bearing N/3A	SUSTA-PVDF	935-097	935-097	935-097	935-097	935-097	935-097
	Bearing N	PTFE	935-037	935-037	935-037	935-037	935-037	935-037
6	O-ring	NBR	930-693	930-693	930-693	930-693	930-693	930-693
9	Motor stool MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01	228-176.01
15	Valve disk MS	1.4404	228-179.01	228-179.02	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029	930-029	930-029
29.1	O-ring	NBR	930-026	930-026	930-026	930-026	930-026	930-026
43	Hex head screw	A2–70	901-334	901-334	901-334	901-334	901-334	901-334
55	Vent screw	PP/ black	221-004311	221-004311	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite T51	935-050	935-050	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173	933-173	933-173
98	O-ring	NBR	930-046	930-046	930-046	930-046	930-046	930-046
139	Switch bar MS 60	1.4301	228-177.01	228-177.01	228-177.01	228-177.01	228-177.01	228-177.01
140	Actuator MS	--	228-181.01	228-181.01	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base ECO-E	--	221-643.03	221-643.03	221-643.03	221-643.03	221-643.03	221-643.03
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041	704-041	704-041
C	Proximity switch holder IS cpl.	--	221-643.05	221-643.05	221-643.05	221-643.05	221-001464	221-001464
X	Threaded bushing	1.4301	228-000252	228-000252	228-000252	228-000252	228-000252	228-000252

20 Parts list – Connection 0 / Proximity Switch Holder for Pig Retainer MSP

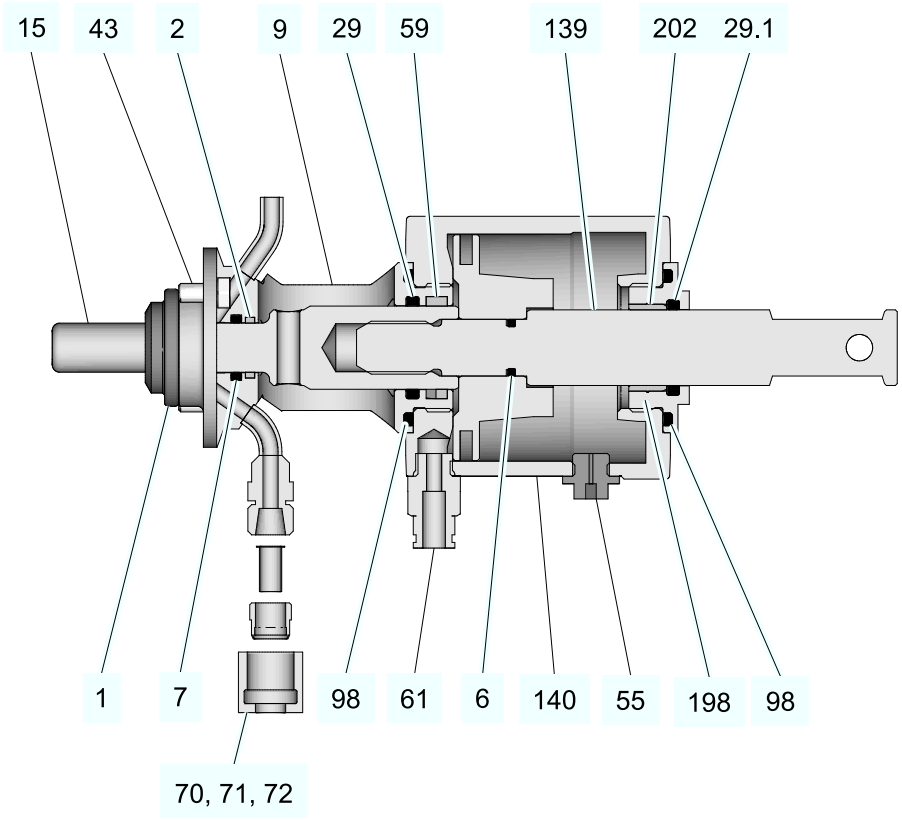

Fig.36

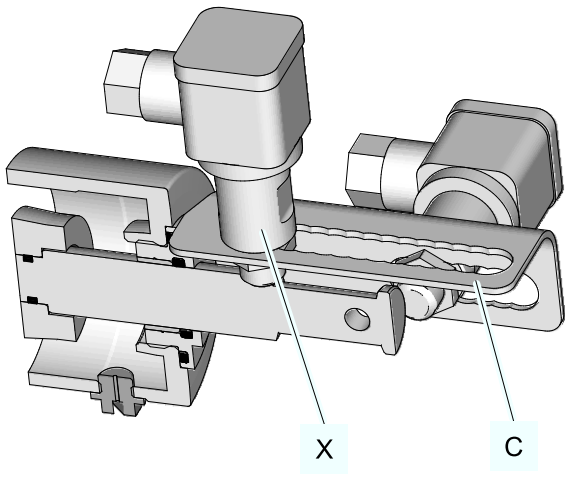

Fig.37

Item	Designation	Material	DN 50	DN 65	DN 80	DN 100
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312
2	Guide ring	Turcite-B10	935-052	935-052	935-052	935-052
6	O-ring	NBR	930-693	930-693	930-693	930-693
7	O-ring	EPDM	930-375	930-375	930-375	930-375
		FKM	930-385	930-385	930-385	930-385
9	Motor stool MSP	1.4301	228-176.02	228-176.02	228-176.02	228-176.02
15	Valve disk MSP	1.4404	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029
29.1	O-ring	NBR	930-026	930-026	930-026	930-026
43	Hex head screw	A2-70	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173
70	Union nut	1.4571	933-456	933-456	933-456	933-456
71	Cutting ring	1.4571	933-455	933-455	933-455	933-455
72	Support sleeve	1.4571	933-382	933-382	933-382	933-382
98	O-ring	NBR	930-046	930-046	930-046	930-046
139	Switch bar MS 60	1.4301	228-177.01	228-177.01	228-177.01	228-177.01
140	Actuator MS	--	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-589.32	221-589.32
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041
C	Proximity switch holder IS cpl.	--	221-643.05	221-643.05	221-001464	221-001464
X	Threaded bushing	1.4301	228-000252	228-000252	228-000252	228-000252

Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
1	Sealing ring	EPDM	924-255	924-255	924-255	924-255
		FKM	924-297	924-297	924-297	924-297
		HNBR	924-312	924-312	924-312	924-312
2	Guide ring	Turcite-B10	935-052	935-052	935-052	935-052
6	O-ring	NBR	930-693	930-693	930-693	930-693
7	O-ring	EPDM	930-375	930-375	930-375	930-375
		FKM	930-385	930-385	930-385	930-385
9	Motor stool MSP	1.4301	228-176.02	228-176.02	228-176.02	228-176.02
15	Valve disk MSP	1.4404	228-179.03	228-179.03	228-179.04	228-179.04
29	O-ring	NBR	930-029	930-029	930-029	930-029
29.1	O-ring	NBR	930-026	930-026	930-026	930-026
43	Hex head screw	A2–70	901-334	901-334	901-334	901-334
55	Vent screw	PP/black	221-004311	221-004311	221-004311	221-004311
59	Guide ring	Turcite-T51	935-050	935-050	935-050	935-050
61	Screw-in plug connection, metric (1/8"-6/4)	Ms CV	933-176	933-176	933-176	933-176
	Screw-in plug connection inch (1/8 "- 6,35)	Ms CV	933-173	933-173	933-173	933-173
70	Union nut	1.4571	933-456	933-456	933-456	933-456
71	Cutting ring	1.4571	933-455	933-455	933-455	933-455
72	Support sleeve	1.4571	933-382	933-382	933-382	933-382
98	O-ring	NBR	930-046	930-046	930-046	930-046
139	Switch bar MS 60	1.4301	228-177.01	228-177.01	228-177.01	228-177.01
140	Actuator MS	--	228-181.02	228-181.02	228-181.03	228-181.03
198	Mounting base T.VIS cpl.	--	221-589.32	221-589.32	221-589.32	221-589.32
202	Plain bearing	IGLIDUR-G	704-041	704-041	704-041	704-041
C	Proximity switch holder IS cpl.	--	221-643.05	221-643.05	221-001464	221-001464
X	Threaded bushing	1.4301	228-000252	228-000252	228-000252	228-000252

21 Dimension sheet: Pig Cleaning Station MST 3A/DN40-DN100/1.5"OD-4"OD

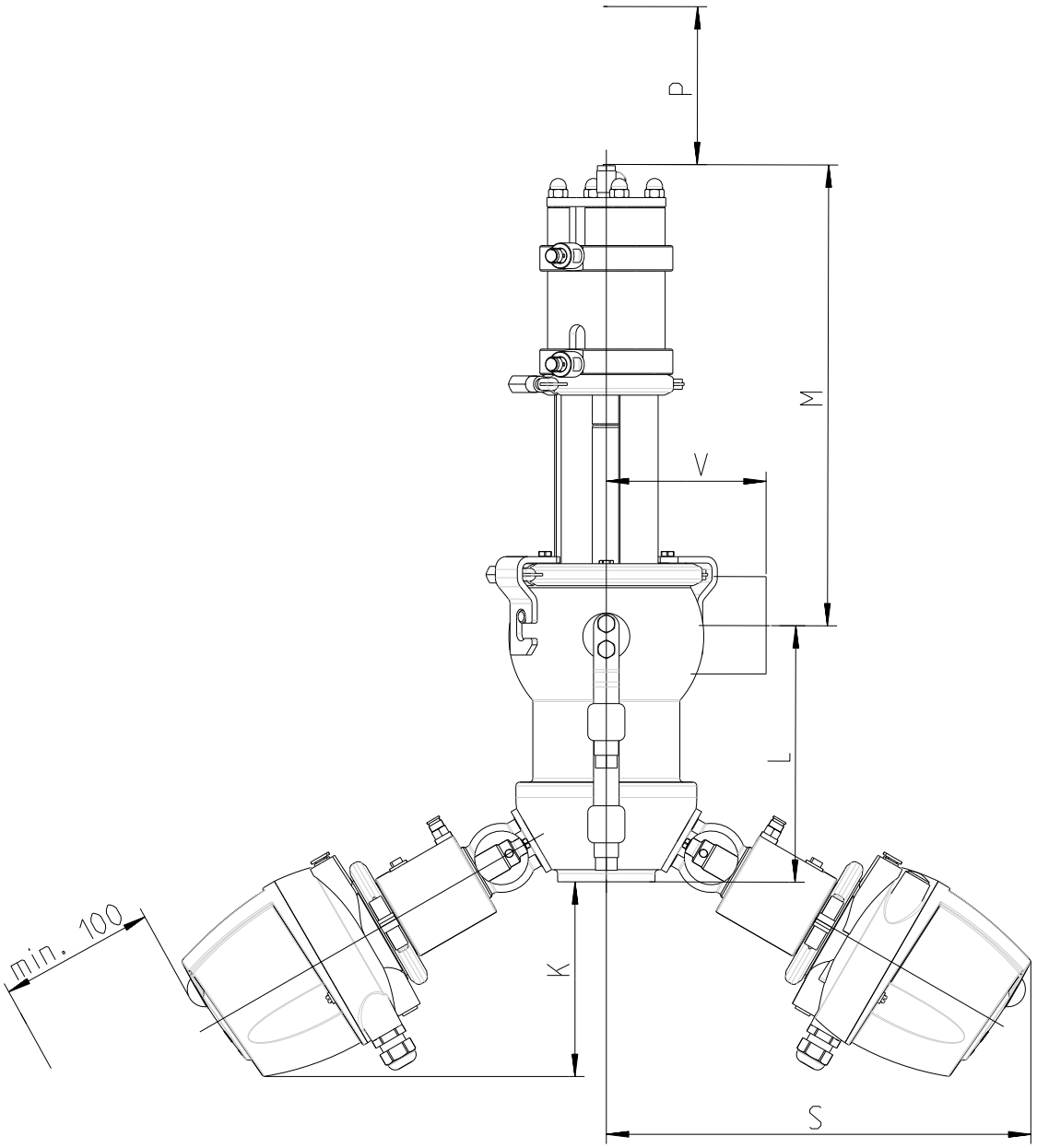

Fig.38: P = clearance

Dimension	DN 40	DN 50	DN 65	DN 80	DN 100
C	33	133	155	158	152
L	135	158	170	194.5	215
M	353	359	367	378	462
P	150	200	230	270	300
S	339	313	323	331	340
V	90	90	90	125	125

Dimension	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
C	33	133	155	155	152
L	125.5	156	170	192	216
M	351.5	358	364	374	461
P	150	200	230	260	300
S	337	313	320	326	340
V	90	90	90	125	125

22 Dimension sheet: Pig Cleaning Station MST 3A – sizes DN25 and 1"OD

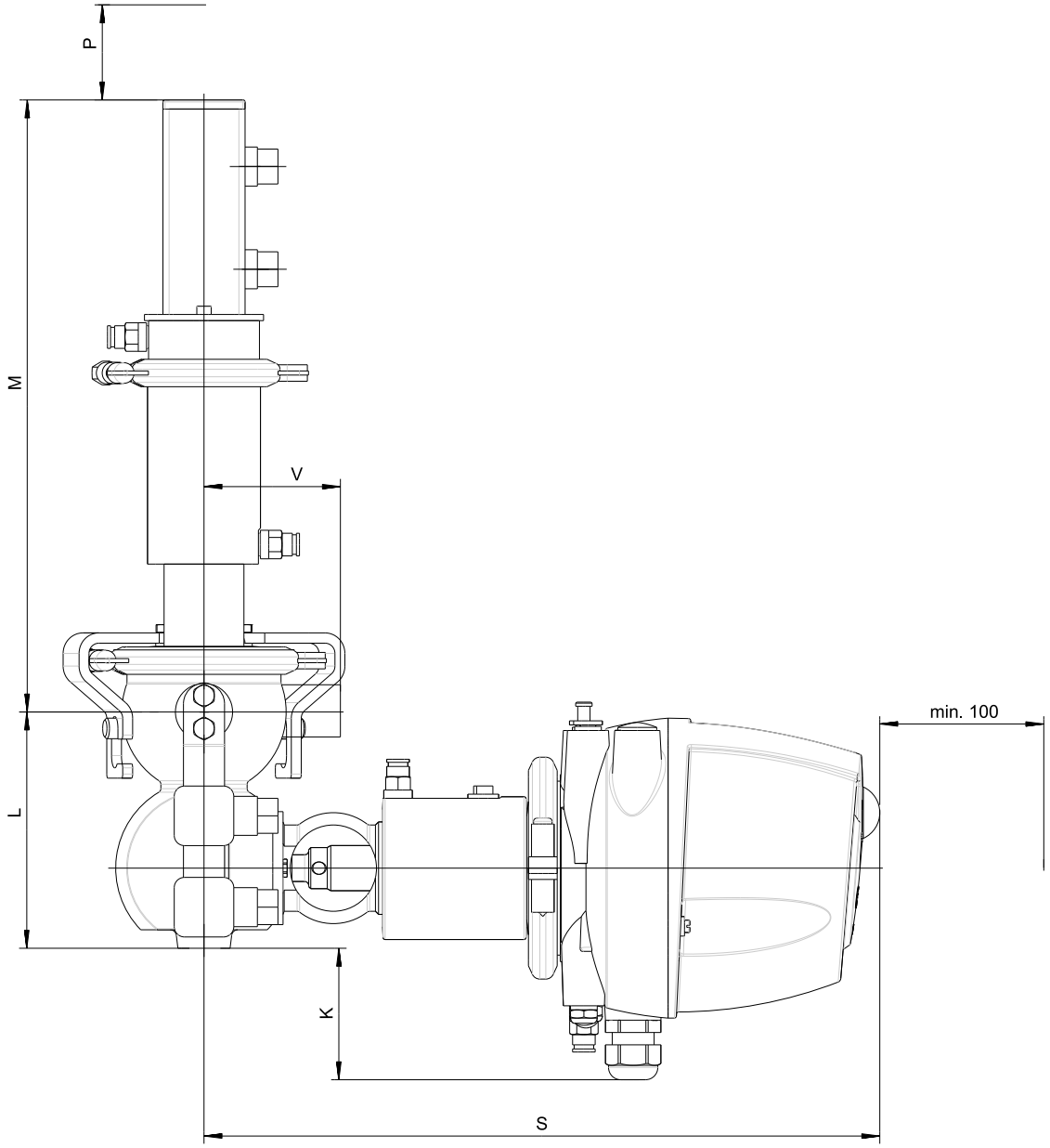

Fig.39: P = clearance

Dimension	DN 25	1" OD
C	64	64
L	118	115
M	300	298
P	150	150
S	329	329
V	60	60

23 Dimension sheet – free cross-sectional area on pig station housing

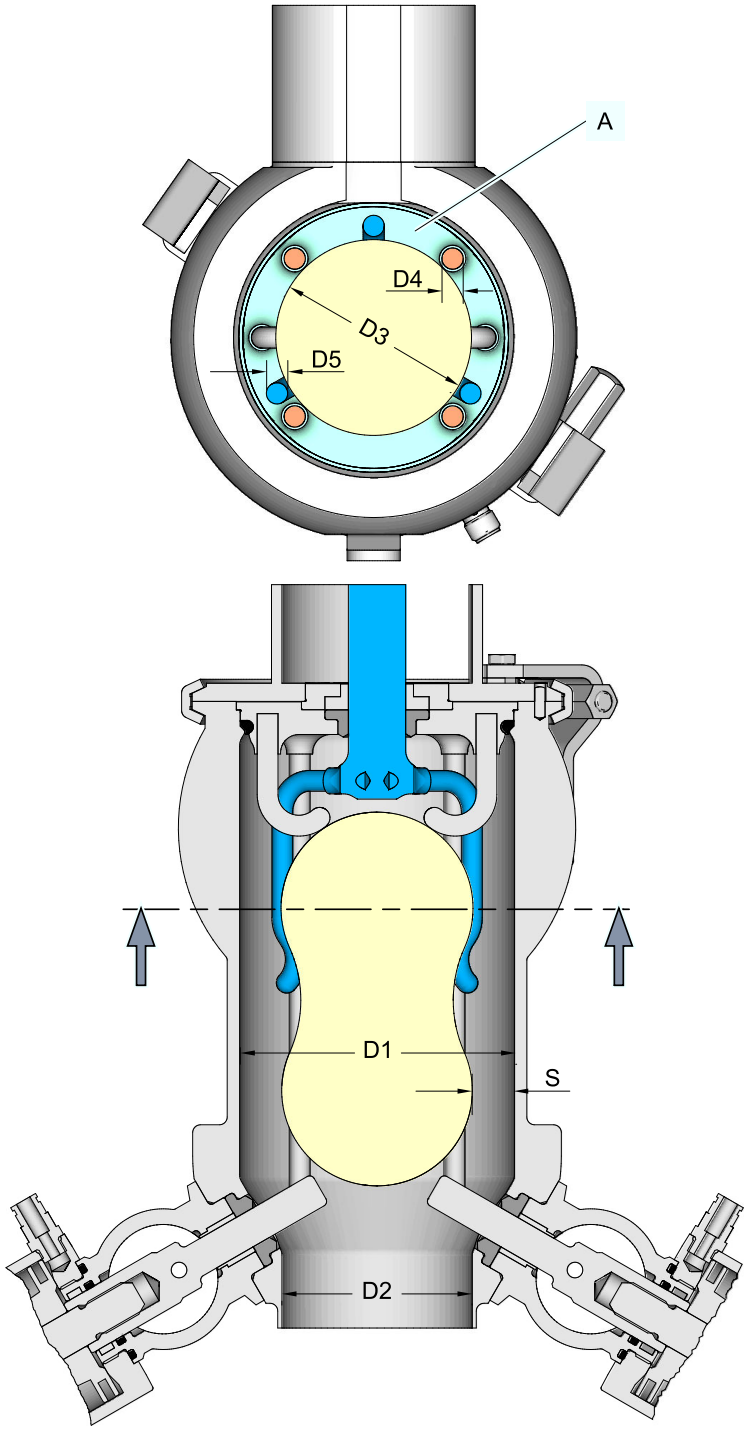

Fig.40: The free cross-sectional area (A) at the narrowest point in the pig station housing is > 100% of the pipe cross-sectional area.

Dimension	DN 40	DN 50	DN 65	DN 80	DN 100
D1 housing	58.0	74.0	96.0	116.5	143.0
D2 pipe	38.0	50.0	66.0	81.0	100.0
D3 pig	38.2	50.3	66.3	81.4	100.5
D4 rod	6.0	6.0	6.0	8.0	8.0
D5 pig clamp rod	6.0	6.0	6.0	8.0	8.0
S gap	9.9	11.9	14.9	17.6	21.3

Dimension	1.5" OD	2" OD	2.5" OD	3" OD	4" OD
D1 housing	53.0	72.0	86.5	105.5	140.5
D2 pipe	34.8	47.5	60.2	72.9	97.4
D3 pig	35.0	47.9	60.9	73.4	98.1
D4 rod	6.0	6.0	6.0	8.0	8.0
D5 pig clamp rod	6.0	6.0	6.0	8.0	8.0
S gap	9.9	12.1	12.8	16.1	21.2

24 Appendix

24.1 Lists

24.1.1 Abbreviations and terms

Abbreviation	Explanation
BS	British Standard
bar	Unit of measurement of pressure [bar] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
approx.	approximately
°C	Unit of measurement of temperature [degree Celsius]
dm^3_n	Unit of measurement of volume [cubic decimetre] Standard volume (standard litre)
DN	DIN nominal width
DIN	German standard issued by DIN (Deutsches Institut für Normung e.V., German Institute for Standardization)
EN	European Standard
EPDM	Material designation Short designation according to DIN/ISO 1629: Ethylene Propylene Diene Rubber
°F	Unit of measurement of temperature [degree Fahrenheit]
FKM	Material designation, short designation according to DIN/ISO 1629: Fluorine rubber
h	Unit of measurement of time [hour]
HNBR	Material designation Short designation according to DIN/ISO 1629: Hydrogenated Acrylonitrile Butadiene Rubber
IP	Protection class
ISO	International standard issued by the International Organisation for Standardisation
kg	Unit of measurement of weight [kilogram]
kN	Unit of measurement of force [kilonewton]
Kv value	Flow coefficient [m³/s] 1 KV = 0,86 x Cv
l	Unit of measurement of volume [litre]
max.	maximum
mm	Unit of measurement of length [millimetre]
µm	Unit of measurement of length [micrometre]

Abbreviation	Explanation
M	Metric
Nm	Unit of measurement of work [newton metre] Specification of torque 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
PA	Polyamide
PE-LD	Low-density polyethylene
PPE	Polytetrafluoroethylene
psi	America measurement for pressure [Pound-forse per square inch] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
PTFE	Polytetrafluoroethylene
SET-UP	Self-learning installation During commissioning and maintenance, the SET-UP procedure carries out all the necessary settings for the generation of messages.
AF	Specifications for the size of spanners width across flats
T.VIS	Tuchenhagen Valve Information System
V AC	Volt alternating current
V DC	Volt direct current
W	Unit of measurement of power [Watt]
TIG	Welding method Tungsten inert gas welding
Inch	Unit of measurement of length in the Anglo-American language area
Inch OD	Pipe measurement according to British Standards (BS), Outside Diameter
Inch IPS	American pipe measure - Iron Pipe Size

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