



## Operating Instructions

### **VARICOVER® Pig Cleaning Station MST 3A**

Edition 26/03/2014  
English

**Product** Pig Cleaning Station MST 3A

**Document** Operating Instructions  
Edition 26/03/2014  
English

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## Notes for the Reader

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

### Binding Character of These Operating Instructions

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

Carefully read these Operating Instructions before starting any work on or using the pig cleaning station. Your personal safety and the safety of the pig cleaning station 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 pig cleaning station. When the location is changed or the pig cleaning station is sold make sure you also provide the Operating Instructions.

### Notes on the Illustrations

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

## 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 cause serious damage to health, or even death.

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



### WARNING

**Warning: Serious Injuries.**

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

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

### IMPORTANT NOTE

**Warning: Damage to Property.**

Non-observance of the warning note can cause serious damage to the pig cleaning station or in the vicinity of the pig cleaning station.

→ 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.

**NOTE**

Further useful information.

## 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 <sup>3</sup> <sub>n</sub>	Unit of measurement of volume [cubic decimetre] Volume (litre) at standard temperature and pressure
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 Organization for Standardization
kg	Unit of measurement of weight [kilogram]
kN	Unit of measurement of force [kilonewton]
Kv value	Flow coefficient [m³/s] 1 KV = 0.86 x Cv
l	Unit of measurement of volume [litre]
max.	maximum
mm	Unit of measurement of length [millimetre]
µm	Unit of measurement of length [micrometre]
M	metric
Nm	Unit of measurement of work [newton metre] UNIT OF TORQUE 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
PA	Polyamide
PE-LD	Low-density polyethylene



Abbreviation	Explanation
psi	British and American unit of measurement [Pound force per square inch] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
SET-UP	Self-learning installation During commissioning and maintenance, the SET-UP procedure carries out all the necessary settings for the generation of messages.
a/f	Indicates the size of spanners width across flats
T.VIS	Tuchenhagen Valve Information System
V AC	Volt alternating current
V DC	Volt direct current
W	Unit of measurement of power [Watt]
TIG	Welding method Tungsten inert gas welding
Inch	Unit of measurement of length In the Anglo-American language area
Inch OD	Pipe dimension acc. to British standard (BS), Outside Diameter
Inch IPS	US pipe dimension Iron Pipe Size

# Safety

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## Safety Note

The pig cleaning station is operationally reliable. It was built according to state-of-the art standards.

Nevertheless, the pig cleaning station can pose dangers, especially if

- the pig cleaning station is not used in accordance with its intended use,
- the pig cleaning station is not used correctly,
- the pig cleaning station is operated under impermissible operating conditions.

## Operator's Duties

In your capacity as operator of the facility you bear a particular responsibility for the proper and safe handling of the pig cleaning station in your facility. Only use the pig cleaning station when it is in perfect condition to prevent danger to persons and property.

These Operating Instructions contain the information you and your staff need for the safe and reliable operation during the entire service life of the pig cleaning station. 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 allow qualified staff to work on the pig cleaning station.
- The operator must authorize the staff to carry out the relevant tasks.
- Working areas and the entire environment of the pig cleaning station must be neat and clean.
- The staff must wear suitable work clothing and personal protective equipment. As the operator of the facility make sure that work clothing and personal protective equipment are used.
- Instruct the staff with regard to any properties of the product which might pose a health risk and the preventative measures to be taken.
- Have a qualified first-aid-er on call during the operation, who can initiate the necessary first-aid measures in case of an emergency.
- Clearly define processes, lines of authority and responsibilities associated with the pig cleaning station. Everybody must know what to do in case of an emergency. Instruct the staff in this respect at regular intervals.
- The signs relating to the pig cleaning station must always be complete and legible. Check, clean and replace the signs as necessary at regular intervals.

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**NOTE**

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

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## Qualification of Staff

This section contains information about the qualifications that staff working on the pig cleaning station must have.

Operating and maintenance staff 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:

- Vocational training as a specialist who can work on the pig cleaning station independently.
- Sufficient instruction to work on the pig cleaning station under the supervision and direction of a qualified specialist.

Each member of staff must meet the following requirements to be allowed to work on the pig cleaning station:

- Personal qualification for the relevant task.
- Sufficient professional qualification for the relevant task.
- Instructed with regard to the function of the pig cleaning station.
- Instructed with regard to the operating sequences of the pig cleaning station.
- 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.

For work to be carried out on the pig cleaning station the following user groups are distinguished:

#### User groups

Staff	Qualifications
Operating staff	<p>Adequate instruction and sound knowledge in the following areas:</p> <ul style="list-style-type: none"> <li>• Function of the pig cleaning station</li> <li>• Operating sequences on the pig cleaning station</li> <li>• What to do in case of an emergency</li> <li>• Lines of authority and responsibilities with respect to the task</li> </ul>
Maintenance staff	<p>Adequate instruction as well as sound knowledge of the design and function of the pig cleaning station.</p> <p>Sound knowledge in the following areas:</p> <ul style="list-style-type: none"> <li>• Mechanical equipment</li> <li>• Electrical equipment</li> <li>• Pneumatic system</li> </ul> <p>Authorization with regard to safety engineering standards to carry out the following tasks:</p> <ul style="list-style-type: none"> <li>• Setting devices into operation</li> <li>• Earthing of devices</li> <li>• Marking of devices</li> </ul>

## 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,

## Instructions for the Safe Operation

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

### General Principles

To ensure the safe operation of the pig cleaning station the following principles apply:

- The Operating Instructions must be kept ready to hand at the pig cleaning station's place of use. They must be complete and in clearly legible form.
- Only use the pig cleaning station for its intended use.
- The pig cleaning station must be functional and in good working order. Check the condition of the pig cleaning station before starting work and at regular intervals.
- Wear tight-fitting work clothing for all work on the pig cleaning station.
- Ensure that nobody can get hurt on the parts of the pig cleaning station.
- Immediately report any faults or noticeable changes on the pig cleaning station to the person responsible.
- Observe the accident prevention regulations and all local regulations.

### Installation

For installation, the following principles apply:

- Only properly qualified staff is allowed to install, assemble and set the pig cleaning station into operation.
- 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.
- During assembly, the safety devices of the pig cleaning station might not be working effectively.
- Reliably secure machine parts which have already been connected against inadvertently being switched on.

## Commissioning/Setup Mode

For commissioning, the following principles apply:

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

## Setting into Operation

For setting into operation, the following principles apply:

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

## Operation

For operation, the following principles apply.

- Monitor the pig cleaning station during the operation.
- Safety devices must not be changed, removed or taken out of service. Check all safety devices at regular intervals.
- All guards and hoods must be fitted as intended.
- The place of installation of the pig cleaning station must be adequately ventilated at all times.
- Structural alterations of the pig cleaning station are not permitted. Immediately report any changes on the pig cleaning station to the person responsible.
- Always keep danger zones clear. Do not leave any objects in the danger zone. Only allow persons to enter the danger zone when the machine is de-energized.
- Regularly check that all emergency stop devices are working correctly.
- Check all welds at regular intervals to prevent uncontrolled leakage of liquids.
- Do not touch pipes and components. Risk of burns.
- No contact with detachable connections, sterile steam may escape.
- Observe the safety data supplied by the cleaning agent manufacturers! Only use cleaning agents which are not aggressive towards or do not cause damage to the materials used.

## Shutting Down

For shutting down, the following principles apply:

- Switch off the compressed air.
- Switch off the pig cleaning station via 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 "Storage" (Page 22).

## Maintenance and Repair

Before starting any maintenance and repair work on the electrical devices of the pig cleaning station, carry out 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 allow qualified staff to carry out maintenance or repair work on the pig cleaning station.
- Before starting any maintenance or repair work, the pig cleaning station must be switched off and secured against being switched back on. 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 pig cleaning station. 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 pig cleaning station 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 allow qualified staff to disassemble the pig cleaning station.
- Before starting disassembly, the pig cleaning station must be switched off and secured against being switched back on. 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 pig cleaning station. 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 "Storage" (Page 22).

## 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.

## 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.







## Signage

Dangerous points on the pig cleaning station are indicated by warning signs, prohibition signs and mandatory signs.

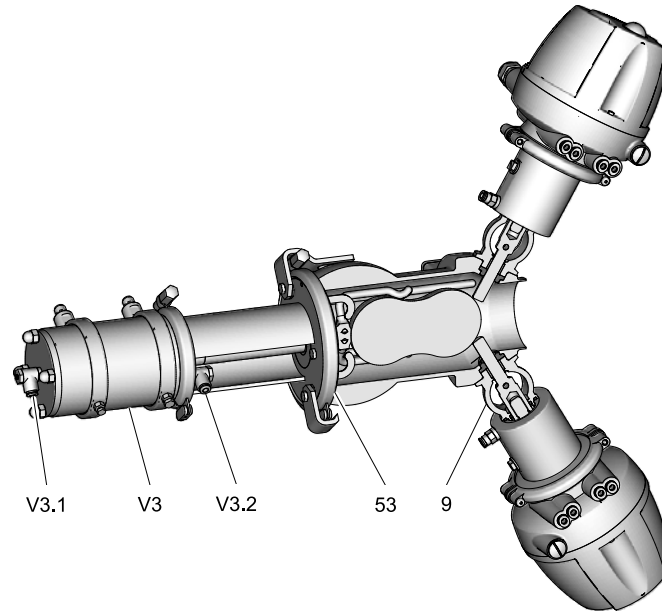
The signs and notes on the pig cleaning station must always be legible. Any illegible signs must be replaced immediately.

### Signs on the pig cleaning station

Sign	Meaning
	General hazard warning
	Warning Crushing
	Do not open! Spring tension!
	Depressurize the product pipe and the actuator prior to disassembly!

## Residual Risk

### Hazard Areas



Before detaching the hinged clamp (53) in order to remove the pig, make sure that

- no program is running (production, pigging, cleaning),
- no program can be started (production, pigging, cleaning),
- the pipe and the pig cleaning station are empty,
- the pipe and the pig cleaning station are free from overpressure due to opened venting valves,
- all air hoses are removed from the connections (V3.1, V3.2) at 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 put your hand into the lantern (9) of the pig retainers (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.
- Check the electrical equipment of the pig cleaning station at regular intervals. Immediately remedy loose connections and molten cables.
- If work on live parts cannot be avoided, call in a second person, who can operate the main switch in case of an emergency.
- The housing sockets have very sharp edges. When transporting and assembling the pig cleaning station be sure to wear suitable protective gloves.
- If the proximity switches are not adjusted correctly or if there are errors in the program, the rods in the pig station housing can break.

## 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 pig cleaning station and measures

Danger	Cause	Measure
Danger to life	Inadvertent switch-on of the pig cleaning station	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 (spring package)	Danger to life caused by compression spring in the actuator. Do not open the actuator but return it to GEA Tuchenhausen for proper disposal.

Residual dangers on the pig cleaning station and measures (Cont.)

Danger	Cause	Measure
Danger of injury	Danger presented by moving or sharp-edged parts	<p>The operator must exercise caution and prudence.</p> <p>For all work:</p> <ul style="list-style-type: none"> <li>• Wear suitable work clothing.</li> <li>• Never operate the machine if the cover panels are not correctly fitted.</li> <li>• Never open the cover panels during the operation.</li> <li>• Never reach into openings.</li> </ul> <p>As a precautionary measure, wear personal protective equipment in the vicinity of the pig cleaning station:</p> <ul style="list-style-type: none"> <li>• Protective gloves</li> <li>• Safety shoes</li> </ul>
Environmental damage	Operating materials with properties which are harmful to the environment	<p>For all work:</p> <ul style="list-style-type: none"> <li>• Collect lubricants in suitable containers.</li> <li>• Dispose of lubricants in accordance with the pertinent regulations.</li> </ul>

## Declaration of Incorporation

## Declaration of Incorporation

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in accordance with the EC Machinery Directive 2006/42/EC

We herewith declare that this consignment contains the subsequently identified – but incomplete – machine and that putting into service is not permitted until it has been established that the machinery into which this machine is to be incorporated is in conformity with the provisions of the EC Machinery Directive.

We declare that the incomplete machine identified here complies with the "Essential Health and Safety Requirements" defined in Annex I, section 1 and section 2.1. The technical documentation is compiled in accordance with Annex VII, part B. In response to a reasoned request the relevant information will be transmitted to the appropriate national authorities.

This declaration will become invalid if any alterations are made to the machine which have not been agreed with us.

Designation of the machine:	Pig Cleaning Station MST 3A
Machine type:	VARICOVER®
Relevant EC directives:	2006/42/EC
Applicable harmonized standards:	DIN EN ISO 12100

Büchen, 11/07/2013

Franz Bürmann  
Managing Director

i.V. Peter Fahrenbach  
Head of Development and Design

# Transport and Storage

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## Scope of Supply

On receipt of the pig cleaning station check whether

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

## Transport

For transport, the following principles apply:

- Only use suitable lifting gear and slings for transporting the package units/pig cleaning stations.
- Observe the pictograms on the package.
- Handle the pig cleaning station with care to avoid damage caused by impact or careless loading and unloading. The outside synthetic materials are susceptible to breaking.
- The control modules must be protected from animal and vegetable fats.
- Only allow qualified staff to transport the pig cleaning station.
- 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 pig cleaning station against slipping. Take the weight of the pig cleaning station 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 pig cleaning station. 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.

## Storage

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  $\leq 0^{\circ}\text{C}$ , it must be dried and suitable measures must be taken to protect it from damage.

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**NOTE**

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

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## Intended Purpose

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### Designated Use

The pig cleaning station MST 3A is installed directly in the product pipe and receives a pig.

While product or cleaning medium flows through the station, the pig is fixed in position and the product/medium flows around it. Flow through the station can be in any direction. The flow can also pass through the pig cleaning station without there being a pig in it.

The pig's surface is completely cleaned during the cleaning operation.

#### **NOTE**

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

### Requirements for the Operation

The prerequisite for the reliable and safe operation of the pig cleaning station 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.

### Pressure Equipment Directive

The pig cleaning station MST 3A is a piece of pressure equipment (without safety function) in the sense of the pressure equipment directive: Directive 97/23/EC. It is classified according to Annex II, article 3, section 3. In the event of any deviations, GEA Tuchenhausen GmbH will supply a special Declaration of Conformity.



## Improper Operating Conditions

The operational reliability of the pig cleaning station cannot be ensured under improper operating conditions. Therefore avoid improper operating conditions.

Operating the pig cleaning station 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 pig cleaning station.
- Damage has been detected on the pig cleaning station.
- Maintenance intervals have been exceeded.

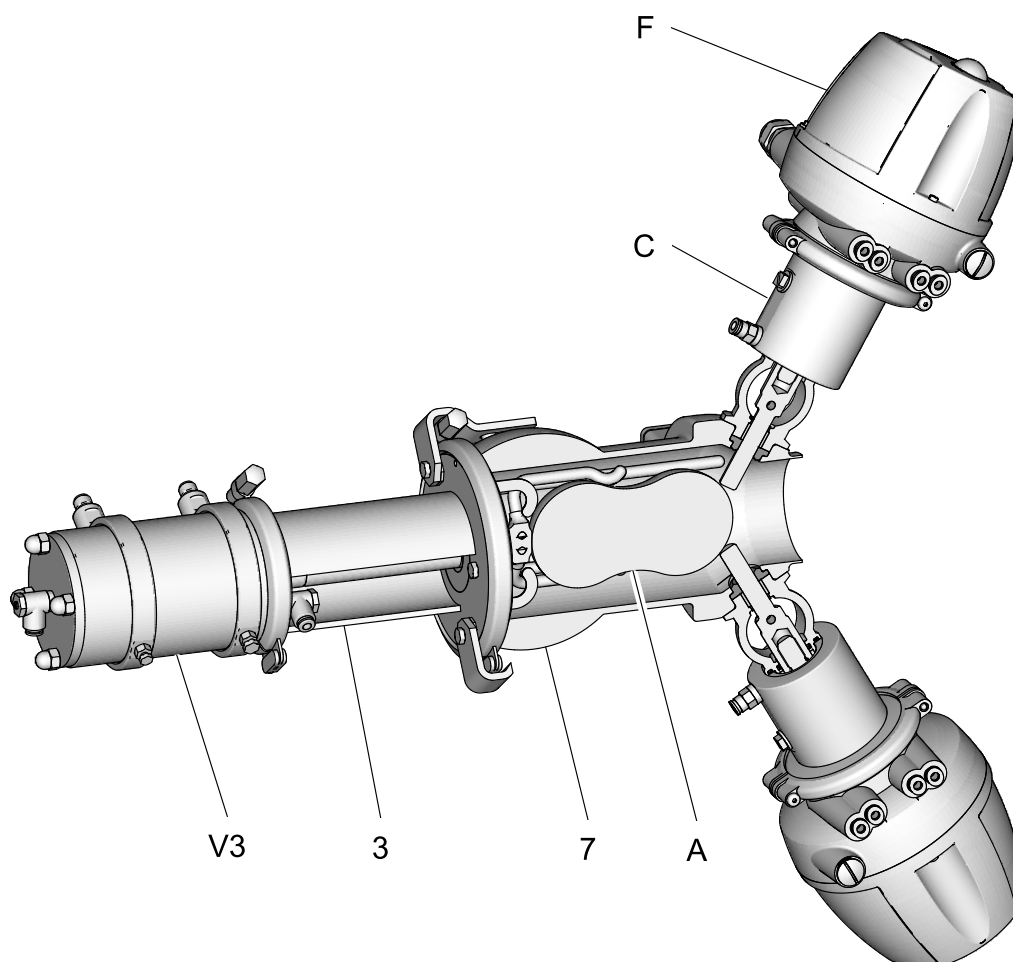
## Conversion Work

You should never make any technical modifications to the pig cleaning station. 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 Tuchenhausen GmbH should be fitted. This ensures the reliable and economical operation of the pig cleaning station.

## Design and Function

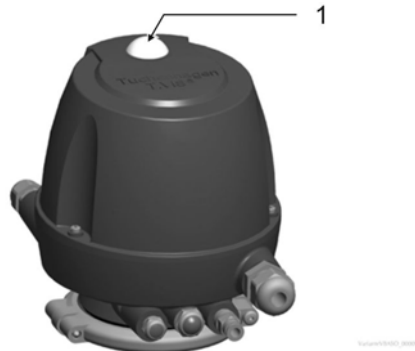
### Design



No.	Designation
A	Pig
C	Pig retainer (air-to-open / spring-to-close actuator)
F	Control module
3	Lantern
7	Pig station housing
V3	Pig actuator

## Control Modules for Pig Retainers

The pig retainers are equipped with a T.VIS M-1 control module as standard.



Control module type T.VIS M-1

The actuator of the pig retainer is of the spring-to-close type. It is closed in the non-actuated position.

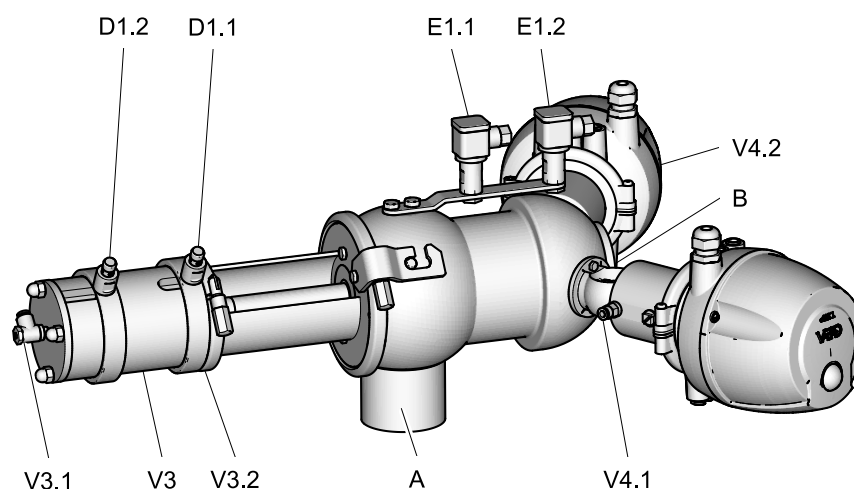
Identification on the T.VIS M-1 control module once the installation (SET-UP) has been completed:

- Green steady light (1): pig retainer in non-actuated position (closed)
- Yellow steady light (1): pig retainer in end position (actuated position, open)

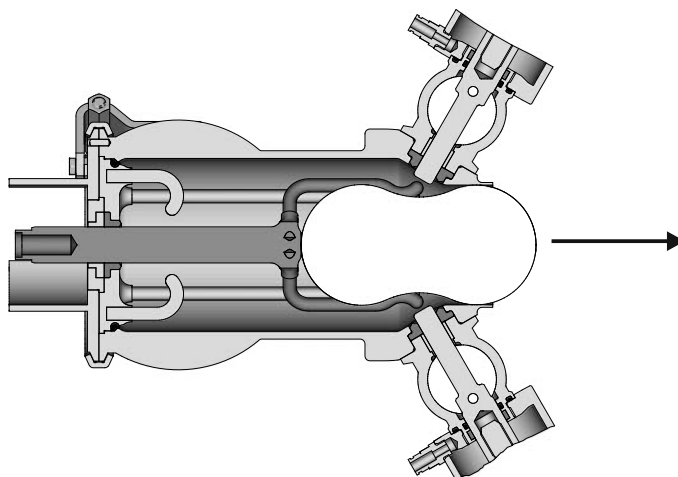
## Function of the Pig Cleaning Station

### Production

All actuators in the pig cleaning station are in the non-actuated position. The pig is firmly held in its position in the pig housing where fluid can flow around it. The position of the pig is continuously monitored by magnetic switch E1.1. Product can flow through the pig cleaning station from A to B and vice versa.



### Launching the pig



Pig in the launching position

#### Requirement

- Production is finished.
- The position of the pig is detected by magnetic switch E1.1.

Moving the pig into the launching position



### IMPORTANT NOTE

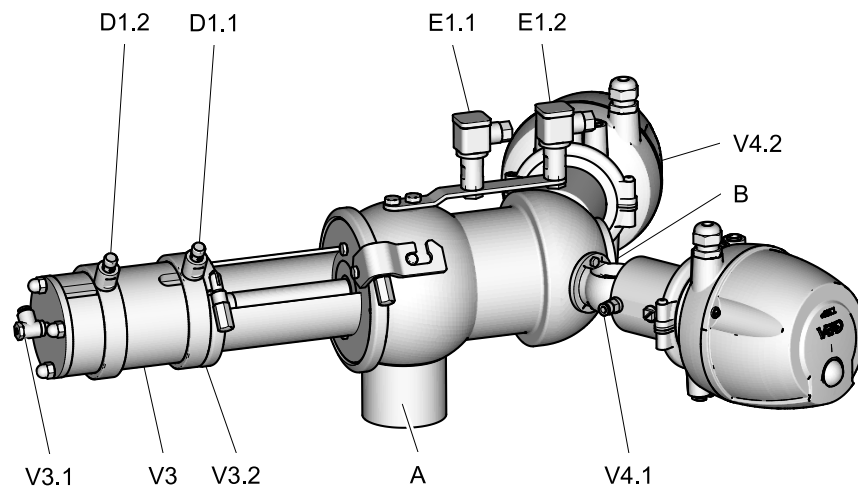
#### Danger of damage to the pig

Damage to the pig can result in a malfunction.

- ➔ The following interlock must exist for automatic and manual operation: it must only be possible to actuate V3.1 and supply pig driving medium via connection A if the position feedback switches for the open pig retainers V4.1 and V4.2 are sending an 'activated' signal.

Carry out the following steps:

#### 1. Actuate V4.1 and V4.2.



- ➔ Pig retainer is opened.
- ➔ Position feedback switches V4.1 and V4.2 are activated.

#### 2. Actuate V3.1.

- ➔ Pig leaves position E1.1 and magnetic switch E1.1 is not activated.
- ➔ Pig detection via E1.2 is active and the pig is in the launching position.
- ➔ Position feedback switch D1.1 activated (proximity switch is lit).

Launching the pig

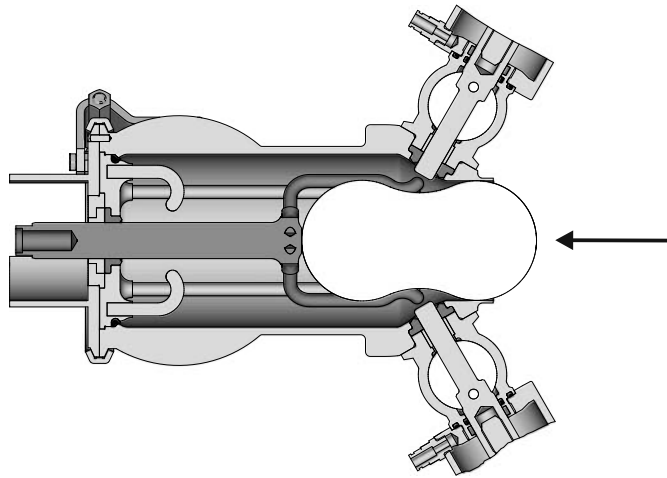


Carry out the following steps:

- ➔ Supply pig driving medium via port A.
- ➔ Pig leaves position E1.2.
- ➔ Magnetic switch E1.2 not activated.
- ➔ The pig moves through the pipe.

✓ Done.

## Receiving the pig



Pig in the receiving position

### Requirement

- V3.1, V4.1 and V4.2 are still actuated or must be actuated, and the corresponding position feedback switches are activated. Only if these conditions are met may the pig be launched from the other pig station.
- The position of the pig is detected by magnetic switch E1.2.
- The stroke speed when retracting the pig must be low ( $\leq 0.3\text{m/s}$ ) to ensure that the pig reliably moves all the way to the limit stop in the station together with the three-arm pig clamp. An adjustable throttle non-return valve is provided at connection V3.2 of the pig actuator to reduce the air inflow.

Carry out the following steps:

1. Deactivate V3.1.
2. Actuate V3.2.

Pig leaves position E1.2. Magnetic switch E1.2 not active.

Pig detection via E1.1 active. Pig is in the production/CIP position.

Position feedback switch D1.2 activated (proximity switch is lit).

3. Deactivate V4.1 and V4.2.
    - The pig retainers close.
  4. Shut off the supply of pig driving medium at the opposite pig station.
  5. Deactivate V3.2.
    - Air/air actuator V3 is not actuated.
    - Position feedback signal D1.2 not active. No position feedback switch 'activated' signal on actuator V3.
    - Pig detection via E1.1 must remain active.
- ✓ Done.

### Cleaning the pig cleaning station

V3.2 is actuated in pulse/pause mode during each cleaning step.

Recommended duration for each cleaning step:

- Pulse approx. 20% of the step time
- Pause approx. 80% of the step time

More effective cleaning of the face of the pig can be achieved by performing the following steps.

#### Requirement

- Cleaning medium can flow through the pig cleaning station from A to B and vice versa. All actuators in the pig cleaning station are in the non-actuated position.
- The pig is firmly held in its position in the pig station housing where fluid can flow around it.
- The position of the pig is continuously monitored by magnetic switch E1.1.

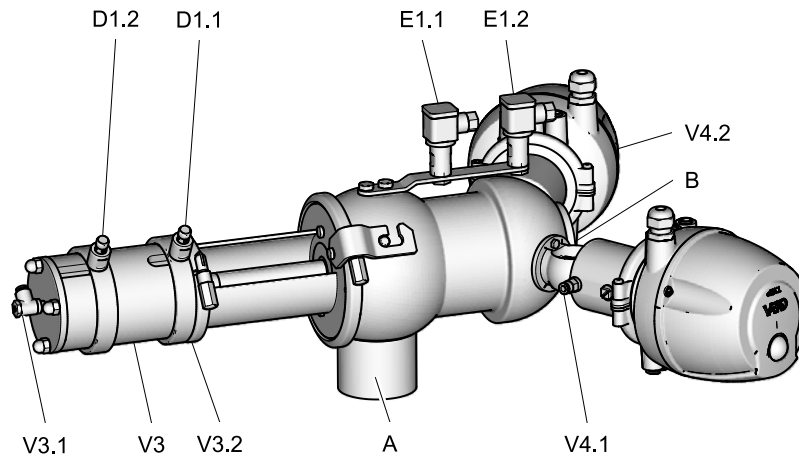
### IMPORTANT NOTE

**Cleaning agents can be very aggressive.**

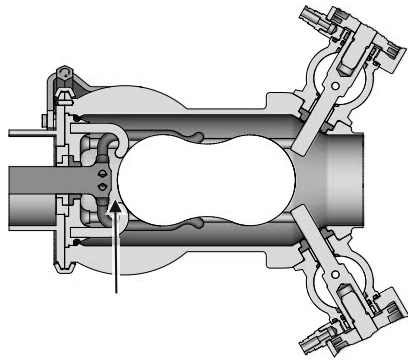
Materials can be damaged!

- ➔ Observe the safety data supplied by the cleaning agent manufacturers!
- ➔ Only use cleaning agents which are not aggressive towards or do not cause damage to the materials used.

Carry out the following steps:



1. Activate V3.2 (pulsed activation; approx. 20% during each cleaning step).



- Position feedback switch D1.2 activated.
  - Improved cleaning of the face of the pig by maintaining a gap (see arrow) between the face of the pig and the pig stop.
- 2.** Deactivate V3.2 (pause).
- Position feedback switch D1.2 not activated.



# Installation and Commissioning

## Notes on Installation

The installation position of the pig cleaning station can be vertical, upside down, horizontal or slanted. The pig cleaning station must, however, be arranged in such a way that the pig station housing and the pipe system can be reliably drained, i.e. in case of a horizontal or slanted installation position, the lateral pipe connection must point downwards.

To prevent damage, make sure that

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

## Pig Cleaning Station with Detachable Pipe Connection Elements

This section describes the procedure to install the pig cleaning station.



### CAUTION

#### Liquids in pipes

Danger of injury due to liquid spraying out

- ➔ Therefore, before releasing any pipe connections or hinged clamps: clean the pipe or rinse and drain it.
- ➔ Separate the pipe section in which the pig cleaning station is to be fitted from the rest of the piping system to prevent medium entering again.

Carry out the following steps:

- ➔ Fit the pig cleaning station with detachable pipe connection elements – using suitable connection fittings – directly into the pipe system.

✓ Done

## Pneumatic Connections

### Air Requirement for Opening and Closing the Pig Actuator (V3)

Nominal width	Actuator diameter (mm)	Air requirement (dm <sup>3</sup> <sub>n</sub> /stroke) dm <sup>3</sup> <sub>n</sub> at 1.01325 bar at 0°C as per DIN 1343
2", 2.5" 3" OD	63	0.5
4" OD	100	1.7

### Air Requirement for Opening the Pig Retainers

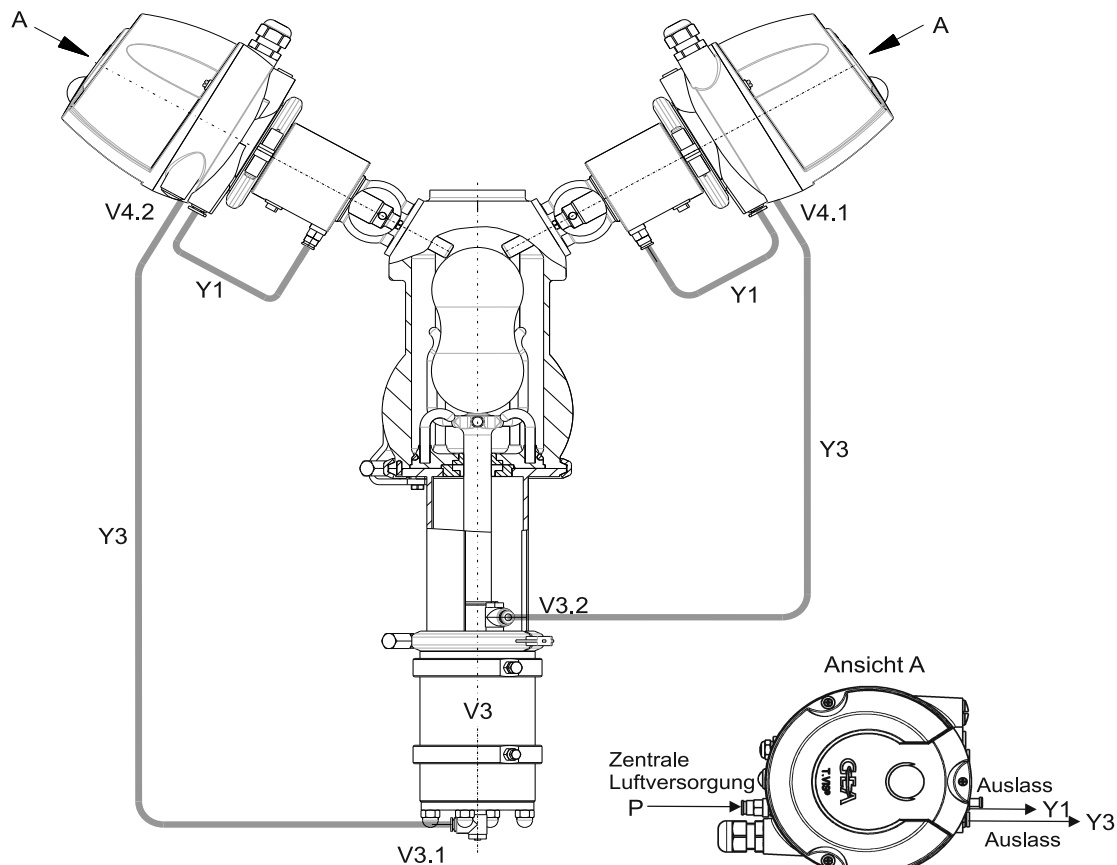
Nominal width	Air requirement (dm <sup>3</sup> <sub>n</sub> /stroke) dm <sup>3</sup> <sub>n</sub> at 1.01325 bar at 0°C as per DIN 1343
2", 2.5" 3", 4" OD	0.05

### Establishing the hose connection

An air hose connection must be fitted to each of the connections V3.1, V3.2, V4.1 and V4.2, starting from separate 3/2-way-solenoid valves.

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

The illustration shows the hose system at the pig cleaning station for control modules with 2 integrated solenoid valves on pig retainers V4.1 and V4.2.



Hosing Diagram

Tools required:

- A hose cutter.

Carry out the following steps:

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

✓ Done

## Electrical Connections

### 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:

- Connect in accordance with the connection diagram and the instructions in the corresponding operating instructions for the control module and in the data sheets for the magnetic switches and proximity switches.

✓ Done

#### NOTE

The proximity switches in the control module 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 module.

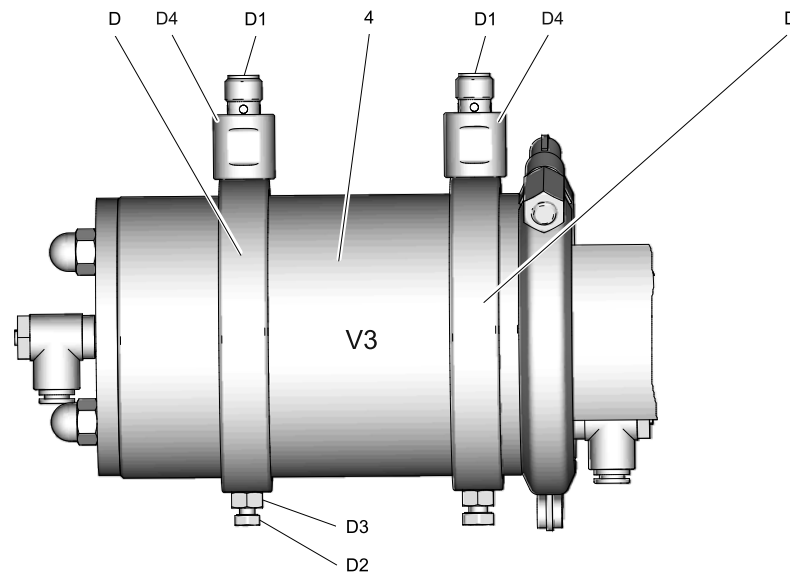
### Adjusting the Proximity Switches at the Pig Actuator

#### Requirement

- Before adjusting the proximity switches (D1) make sure there is no pig in the pig cleaning station.

Carry out the following steps:

1. Screw the threaded bushing (D4) onto the proximity switch (D1).
2. Screw the proximity switches (D1) into the proximity switch holders (D).



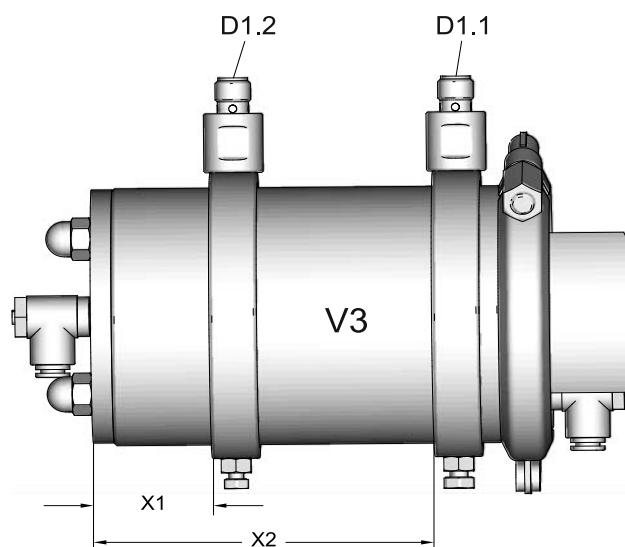
3. Push the proximity switch holders (D) onto the cylinder pipe (4) from the top or bottom and set them in accordance with the table in the section entitled "Position of the Proximity Switch Holders" (Page 38).
4. Secure the proximity switches (D) with the screw (D2) and lock them into place with the nut (D3).
5. Screw in the proximity switches (D1) as far as they will go and secure them with the lock nut.
  - ➔ No gaps and threads may be visible.

✓ Done

### Cabling of the Proximity Switches

It must be possible to completely withdraw the pig actuator from the pig station housing without the need to detach the proximity switch cabling. This means the length of the proximity switch cables must be selected accordingly.

## Position of the Proximity Switch Holders



Nominal width	X1	X2
2"	27.5	103.5
2.5"	27.5	113.5
3"	27.5	118.5
4"	20.5	137.5

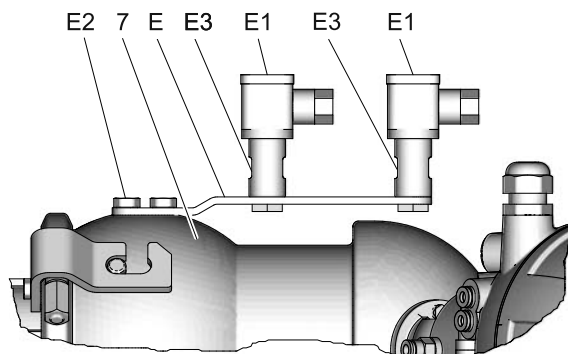
## State of Proximity Switches

The LED in the housing indicates whether the proximity switches are covered or not. The following table shows which proximity switches should be covered in accordance with the actuation signals and after the pig actuator has reached the required actuated position.

### State of Proximity Switches

Actuation	State of D1.1	State of D1.2
V3.1	covered	not covered
V3.2	not covered	covered
After deactivation of V3.2	not covered	not covered

## Securing the Magnetic Switches to the Pig Station Housing



Carry out the following steps:

1. Screw the threaded bushing (E3) onto the magnetic switch (E1).
2. Fix the magnetic switches (E1) to the magnetic switch holder (E) on the pig station housing (7) with a nut from the bottom side.  
→ No gaps and threads may be visible.

✓ Done

## Commissioning

### Notes

Before starting commissioning observe the following:

- Make sure that there are no foreign materials in the system.
- Pigs must not be moved through empty and dry pipes or pipes just wetted with water if the pig is driven by a gaseous medium (air/air operation)! Exception: There is a "pig lubricating film" with very good gliding properties on the inside wall of the pipe after pushing out the product.
- The speed of the pig may not exceed 0.5 m/s.

## Steps

### Requirement

- Before starting commissioning carry out the following steps:



### CAUTION

#### Spring tension

Your fingers can be crushed.

→ Do not put your hand into the open lantern of the pig actuator and the pig retainers.

Carry out the following steps:

1. Activate the actuators for the pig cleaning station once by applying compressed air and check the relevant position feedback signals/switches.
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 it for damage. Replace the pig before starting production if it was damaged during commissioning.

✓ Done

## Avoiding Damage

If the surface of the pig shows signs of damage, the cause must be determined immediately and remedied, see "Malfunctions" (Page 43).

Causes of damage to the pig's surface:

- Speed of the pig too high
- Excessive sagging of the weld and/or sharp-edged seam roots
- Pipes welded eccentrically or misalignment of pipe connection elements
- Pipe connection elements have sharp edges on the inside
- Seals in pipe connection elements are incorrectly placed
- Dents in the pipe
- Foreign materials in the pipe system

## Remedying Damage

If the surface of the pig shows signs of damage, the cause must be determined immediately and remedied.

- Examination of the pipe system, replacement of pipe sections by pipes with better welds (inspection of the welds from the inside using endoscopy).
- Determination of the pig speed and modification of the process if necessary.



# Cleaning and Passivation

## Cleaning



### CAUTION

#### **Risk of burns due to hot cleaning media and sterile steam**

The pipes and components can become very hot.

→ Do not touch 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. When the pipe is cleaned, the cleaning medium also flows through and cleans the housing of the pig cleaning station.

For details how to perform cleaning refer to "Design and Function" > "Cleaning the pig cleaning station" (Page 31).

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

If the pipe is steamed as a final step, we recommend waiting for about 30 minutes before starting another pig run.

The cleaning effect must be checked regularly by the operator!

### IMPORTANT NOTE

#### **Cleaning agents can be very aggressive.**

Materials can be damaged!

→ Observe the safety data supplied by the cleaning agent manufacturers!

→ Only use cleaning agents which are not aggressive towards or do not cause damage to the materials used.

## Cleaning Process Examples

### Typical Cleaning Parameters in Dairy Operations

Example of a two-phase cleaning process:

- Sodium hydroxide and combination products based on sodium hydroxide in concentrations from 0.5% to 2.5% at 75°C to 80°C.
- Phosphoric acid or nitric acid and combination products based on these acids in concentrations from 0.3 to 1.5% at approx. 65°C.

Example of a cleaning operation in one cleaning step:

- Formic acid and combination product based on formic acid at 85°C.

### Typical Cleaning Parameters in Breweries

Example of a two-phase cleaning process:

- Sodium hydroxide and combination products based on sodium hydroxide in concentrations from 1% to 4% at approx. 85°C.
- Phosphoric acid or nitric acid and combination products based on these acids in concentrations from 0.3 to 1.5% at 20°C.

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.

### 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<sub>3</sub>) at approx. 85°C at a concentration in the 4 to 6% range and a contact time of 6 to 8 hours.

## Malfunctions

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

Malfunction	Cause	Remedy
Pig cleaning station does not work	Fault in the control system	Check the system configuration
	No compressed air or pressure too low	Check the compressed air supply 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 moving too slowly	O-rings in the actuator 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
Damaged pig surface	Poor welds	Inspection of welds from the inside using endoscopy Replacement of pipe sections
	Speed of the pig too high	Measuring pig speed Modification of the process

# Maintenance

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## Inspections

Between the maintenance periods, the pig cleaning station must be checked for leakage and proper function.

### Product Contact Seals

Carry out the following steps:

- ➔ Regularly check:
  - ➔ Stem seal between the pig station housing and the lantern of the pig retainers
  - ➔ Stem seal between the pig station housing and the lantern of the pig actuator
  - ➔ O-ring between the pig station housing and the lantern of the pig actuator
  - ➔ O-rings on the pipe connections.

✓ Done

### Pig

Carry out the following steps:

1. Carry out regular visual inspections of the pig, see "Maintenance" > "Removing the Pig" (Page 47) and "Inserting the Pig" (Page 47).
  - ➔ Recommendation  
After 20 pig runs, check the pig for damage, signs of wear and deformation and replace it if necessary.
2. When carrying out a visual inspection also check the diameter of the pig.
  - ➔ If the pig's outside diameter is smaller than the inside diameter of the pig, replace the pig.
3. Document every pig inspection and note down the details about the findings.

✓ Done

### 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

## Electrical Connections

Carry out the following steps:

1. Check that the cap nut on the cable gland is tight.
2. Check that the cable connections are firmly secured.
3. Check that the magnetic and proximity switches are connected correctly.
4. Check the solenoid valves for proper function.

✓ Done

## Maintenance Intervals

To ensure the highest operational reliability of the pig cleaning station, the pig and all product contact seals should 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

## Removing and Inserting the Pig

### Preparations

#### Requirement

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

Carry out the following steps:

1. Clean all pipe system elements that lead to the pig cleaning station or rinse and drain them.
2. Depressurize the pipe system if there could be a gaseous medium under overpressure inside.
3. Shut off the control air supply.
4. Remove both control air hoses from the pig actuator.
5. Disconnect the power supply.

✓ Done

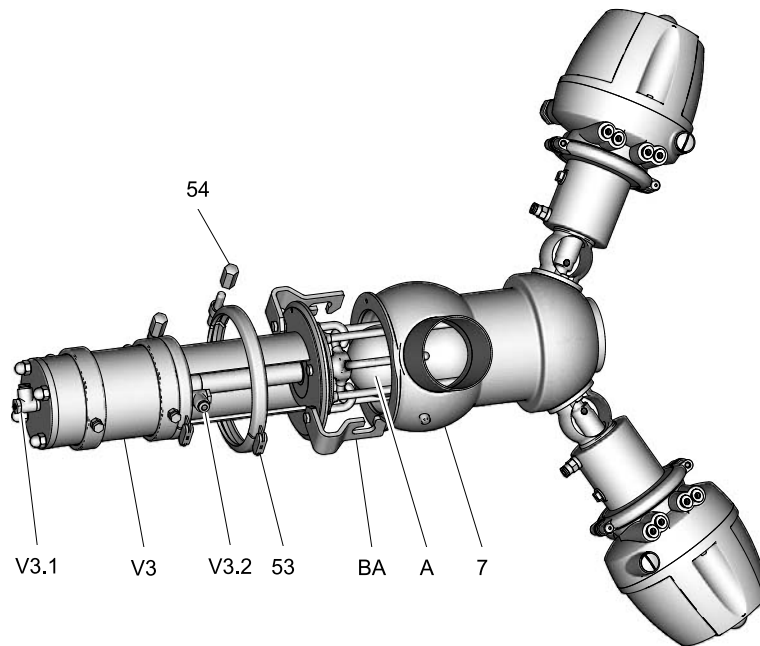
## Removing the Pig

### Requirement

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

Carry out the following steps:

1. Detach the air supply (V3.1 and V3.2) from the actuator.



2. Depressurize the housing (7).
3. Release the hex nut (54) and remove the hinged clamp (53).
  - ➔ If an overpressure is present, the actuator will shoot out, it will, however, be retained by the bayonet.
4. Pull the actuator (V3) out of the housing (approx. 12 mm), releasing it from the bayonet (BA) in clockwise direction, finally take it out completely.
5. Pull the pig (A) out of the three-arm pig clamp.

✓ Done

### NOTE

If you are removing a damaged pig, immediately mark the pig running direction on the pig with a permanent pen, i.e. on which side the launching station was and on which side the receiving station. This can help to identify the cause for the damage afterwards.

## Inserting the Pig

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

## Removing the Pig Cleaning Station

### Requirement

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



### CAUTION

#### **Risk of burns due to hot cleaning media and sterile steam**

The pipes and components can become very hot.

- Allow the pipe to cool before removing the pig cleaning station.
- Shut-off the pig station housing and the pipe.

Carry out the following steps:

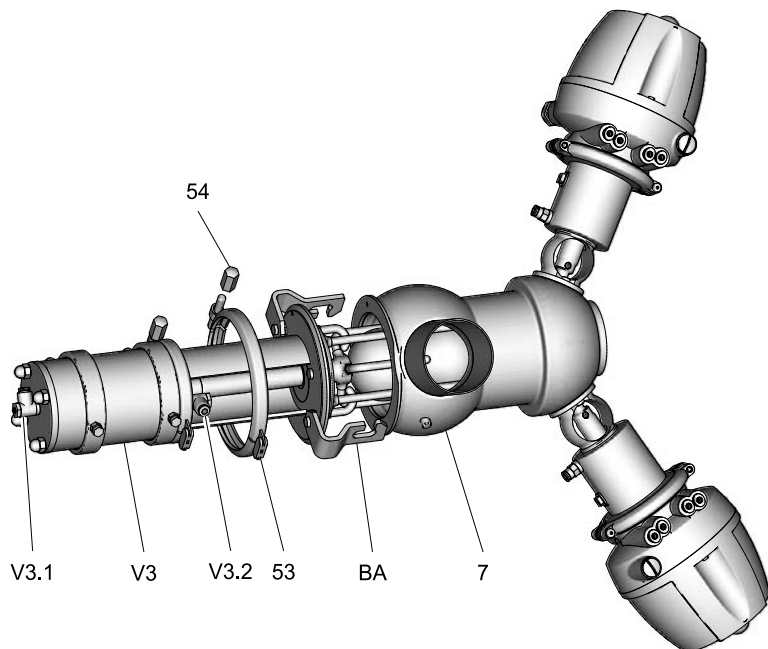
1. Clean all pipe system elements that lead to the pig cleaning station or rinse and drain them.
2. Shut off the control air supply.
3. Disconnect the power supply.
4. Remove the pig cleaning station from the pipe section, together with the housing and all housing connections.

✓ Done



## Disassembling the Pig Actuator

### Dismantling the Actuator



#### CAUTION

##### **Risk of burns due to hot cleaning media and sterile steam**

The pipes and components can become very hot.

- Allow the pipe to cool before removing the pig cleaning station.
- Shut-off the pig station housing and the pipe.



#### CAUTION

##### **Spring tension**

Your fingers can be crushed.

- Do not put your hand into the open lantern.

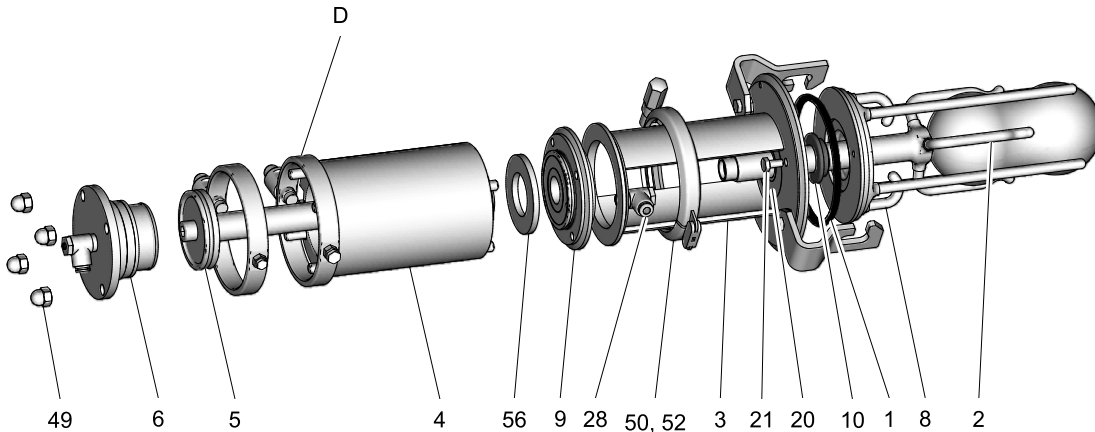
Carry out the following steps:

1. Detach the air supply (V3.1 and V3.2) from the actuator.
2. Depressurize the housing (7).
3. Release the hex nut (54) and remove the hinged clamp (53).
  - If an overpressure is present, the actuator will shoot out, it will, however, be retained by the bayonet.

4. Pull the actuator (V3) out of the housing (approx. 12 mm), releasing it from the bayonet (BA) in clockwise direction, finally take it out completely.

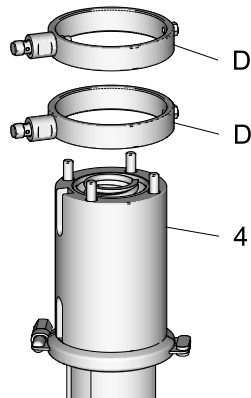
✓ Done

### Dismantling Individual Parts



Carry out the following steps:

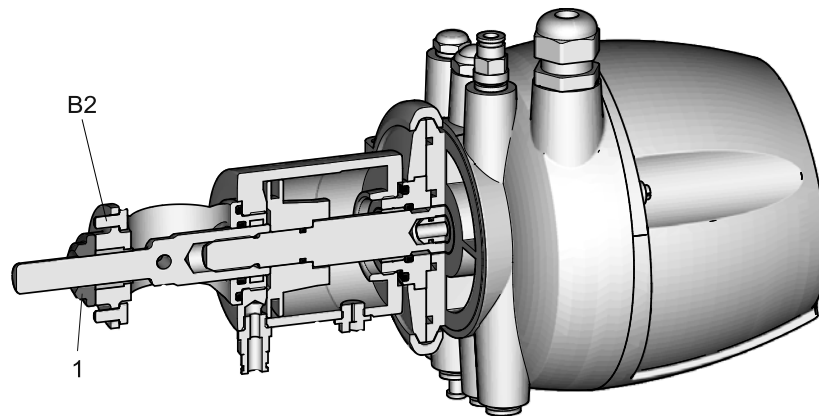
1. Unscrew the 4 cap nuts (49).
2. Pull the spring package (6) out of the cylinder pipe (4).
3. Hold the pig clamp (2) and release the piston (5) using a hex key.
4. Pull the pig clamp (2) out of the lantern (3).
5. Release the proximity switch holder (D) and slide it off from the cylinder pipe (4).



6. Release the hex nut (52) and remove the hinged clamp (50).
7. Turn the throttle non-return valve (28) for the air supply towards the piston (5).
8. Detach the cylinder bottom (9) from the lantern (3).
9. Take off the cylinder pipe (4), piston (5), spacer (56) from the cylinder bottom (9).  
→ All seals on the actuator are now accessible!

- 10.** Release the two screws (21) and remove the pig guideway (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.

## Disassembling the Pig Retainers



### CAUTION

#### **Risk of burns due to hot cleaning media and sterile steam**

The pipes and components can become very hot.

➔ Allow the pipe to cool before removing the pig retainers.



### CAUTION

#### **Spring tension**

Your fingers can be crushed.

➔ Do not put your hand into the open lantern.

Carry out the following steps:

- 1.** Detach the air supply (V3.1 and V3.2) from the actuator.
- 2.** Depressurize the housing (7).
- 3.** Release the hex screws (B2) and remove the pig retainers.  
 ➔ The sealing ring (1) is now accessible.

✓ The pig retainers have been disassembled.

## Maintenance

### Cleaning the Pig Cleaning Station

#### IMPORTANT NOTE

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

Damage to these parts can result in malfunctions.

→ Handle the pig cleaning station with care!

#### IMPORTANT NOTE

**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.

#### IMPORTANT NOTE

**The cylinder pipe is made of PVDF.**

Aggressive cleaning agents can damage the cylinder pipe!

→ Select a suitable cleaning agent.

→ It is recommended to replace the cylinder pipe after 10 years.

Carry out the following steps:

1. Remove the pig cleaning station, see "Disassembling the Pig Actuator" (Page 49).
2. Carefully clean the individual parts.
3. Carefully clean all threads on proximity switches and screws.

✓ Done

## 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. Apply a light film of lubricant to all threads.
2. Grease all seals – including the O-rings at the top and bottom of the actuator piston rod – very thinly.

✓ Done

#### NOTE

GEA Tuchenhausen 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. PARALIQ GTE 703 can be ordered from GEA Tuchenhausen under part no. 413-064, and Rivolta F.L.G. MD-2 can be ordered under part no. 413-071. A Manufacturer's Declaration for these products can be obtained from GEA Tuchenhausen 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.

## Assembling the Pig Actuator

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

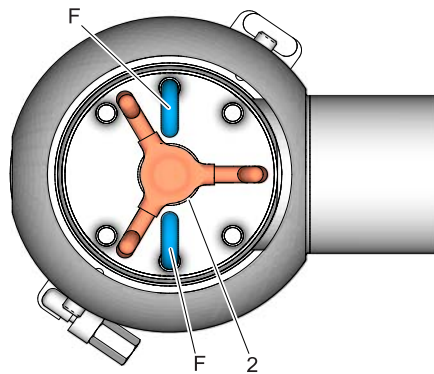
### Aligning the Throttle Non-Return Valve

Carry out the following steps:

- To fit the throttle non-return valve (28), align it so that it protrudes from the lantern (3).

✓ Done

### Inserting the Pig Clamp

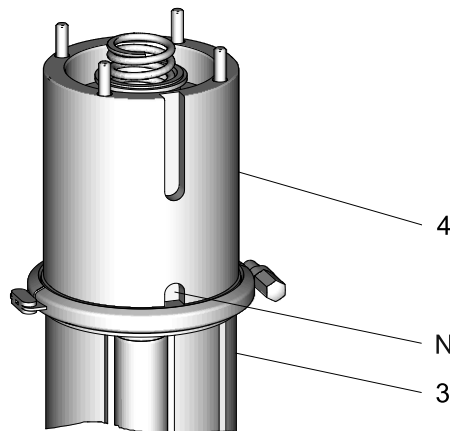


Carry out the following steps:

- ➔ Fit the pig clamp (2) in accordance with the drawing.
  - ➔ One arm of the pig clamp must be vertical to the two curved guide rods (F). The pig clamp must not be in contact with the guide rods (F).

✓ Done

### Fitting the Cylinder Pipe for the 4" OD Pig Cleaning Station



Carry out the following steps:

- ➔ Push on the cylinder pipe (4) so that the shorter groove (N) points towards the lantern (3).

✓ Done

### Adjusting the Proximity Switches at the Pig Actuator

For details on how to adjust the proximity switches at the pig actuator see "Adjusting the Proximity Switches at the Pig Actuator" (Page 36).

## Torques for the Clamps and Hinged Clamps

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

Torques for the clamps and hinged clamps

Torques		Nm	lbft
Clamps on the control module		1	0.7
Hinged clamps Cast clamps	M8	22	16.2
Cast clamps	M10	45	33

Torques for the Screws

Torques		Nm	lbft
Screws	M5	5	3.7
Screws	M6	9	6.6
Screws	M8	22	16.2
Screws	M10	45	33

## Checking the Function of the Pig Actuator

### Setting the Stroke

Requirement

- There must be no pig in the pig cleaning station.

Carry out the following steps:

1. Activate the pig actuator with compressed air.
2. Check the stroke of the pig actuator in accordance with the "Pig Actuator Stroke Table" (Page 55).

✓ Done

### Strokes Depending on Size

Pig Actuator Stroke Table

Nominal width	Stroke (mm)
Inch OD	
2"	61
2.5"	71
3"	76
4"	104

To clean the face of the pig, an additional 10 mm stroke of the spring package (6) is initiated.

## Assembling the Pig Retainers

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

### Torques for the Screws

Torques for the Screws

Torques		Nm	lbft
Screws	M5	5	3.7
Screws	M6	9	6.6
Screws	M8	22	16.2
Screws	M10	45	33

### Checking the Function of the Pig Retainers

#### Setting the Stroke

Requirement

- There must be no pig in the pig cleaning station.

Carry out the following steps:

1. Activate the pig retainer with compressed air.
2. Check the stroke of the pig retainer in accordance with the "Pig Retainer Stroke Table" (Page 56).

✓ Done

#### Strokes Depending on Size

Pig Retainer Stroke Table

Nominal width	Stroke (mm)
Inch OD	
2"	17
2.5"	17
3"	24
4"	24



## Disposal

### General Notes

Dispose of the machine at the end of its life cycle in an environmentally friendly manner. Observe the statutory waste disposal regulations applicable at the place of installation.

The pig cleaning station is made of the following materials:

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

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

### Disposing of the Pig Retainers and the Spring Package of the Pig Actuator



#### **DANGER**

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

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

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

Carry out the following steps:

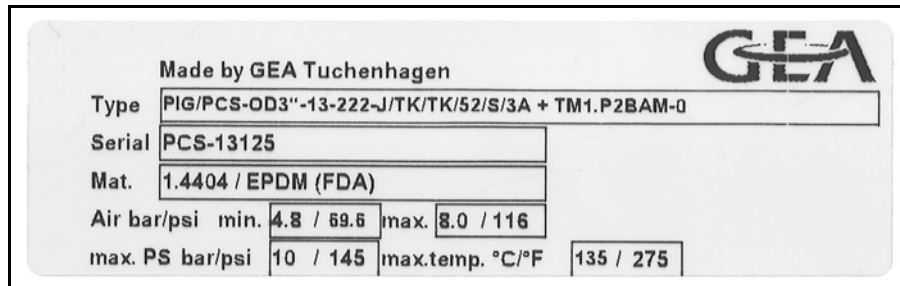
1. Remove the actuator.
2. Safely pack the actuator and send it to GEA Tuchenhausen GmbH.

✓ Done

## Technical Data

### Type Plate

The type plate clearly identifies the pig cleaning station.



Type plate of the pig cleaning station

The type plate provides the following key data:

#### Key data of 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)

### Technical Data

Refer to the following tables for the key technical data of the pig cleaning station:

#### Technical data: Pig cleaning station

Designation	Description
Size	2 to 4" OD
Material of product contact parts	Stainless steel 1.4404
Material of product contact seals	EPDM/FKM/HNBR
Installation position	The installation position of the pig cleaning station can be vertical, upside down, horizontal or slanted. The pig cleaning station must, however, be arranged in such a way that the pig station housing and the pipe system can be reliably drained, i.e. in case of a horizontal or slanted installation position, the lateral pipe connection must point downwards.

**Technical data: Pig cleaning station (Cont.)**

Designation	Description
Product pressure	up to 2.5"OD: max. 16 bar (232 psi) from 3"OD: max. 10 bar (145 psi)
Flow velocity	max. 3 m/s
Pig impact velocity	max. 0.5 m/s

**Technical data: Ambient temperatures**

Designation	Description
- Pig cleaning station	0 to 45 °C (32 to 113°F), standard < 0 °C (32°F): use control air with a low dew point. Protect piston rods against freezing.
- Proximity switch	-30 to +85 °C (-22...185°F)
- Cylinder pipe on the pig actuator	-20 to +50 °C (-4...122°F)
- Magnetic switch	-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 dia. 6 mm Inside dia. 4 mm
- Inch	Material PA Outside dia. 6.35 mm Inside dia. 4.3 mm
Control air pressure	4.8 bar (69.6 psi) max. 8 bar (116 psi)
Control air	acc. to ISO 8573-1:2001
- Solid particle content:	Quality class 6 Particle size max. 5µm Particle density max. 5 mg/m <sup>3</sup>
- 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 <sup>3</sup> air

## Resistance of Sealing Materials

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

Resistance:

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

Table of resistance of seals

Medium	Temperature	Sealing material (general operation temperature)		
		EPDM -40...+135 °C* -40...275 °F	FKM -10...+200 °C* +14...+392 °F	HNBR -25...+140 °C* -13...+284 °F
Caustics up to 3%	up to 80 °C (176°F)	+	o	+
Caustics up to 5%	up to 40 °C (104°F)	+	o	o
Caustics up to 5%	up to 80 °C (176°F)	+	–	–
Caustics at more than 5%		o	–	–
Inorganic acids up to 3%	up to 80 °C (176°F)	+	+	+
Inorganic acids up to 5%	up to 80 °C (176°F)	o	+	o
Inorganic acids up to 5%	up to 100 °C (212°F)	+	+	–
Water	up to 80 °C (176°F)	+	+	+
Steam	up to 135 °C (275°F)	+	o	o
Steam, approx. 30 min	up to 150 °C (302°F)	+	o	–
Fuels/hydrocarbons		–	+	+
Product with a fat content of max. 35%		+	+	+
Product with a fat content of more than 35%		–	+	+
Oils		–	+	+
* depending on the installation conditions				

## Pipe Ends

Dimensions for Pipes in Inch OD

Inch OD	Outside diameter	Wall thickness	Inside diameter	Outside diameter acc. to BS 4825 Part 1
2"	50.8	1.65	47.6	x

#### Dimensions for Pipes in Inch OD

Inch OD	Outside diameter	Wall thickness	Inside diameter	Outside diameter acc. to BS 4825 Part 1
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

## Tools

Tools	Part 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	408-125

## Lubricants

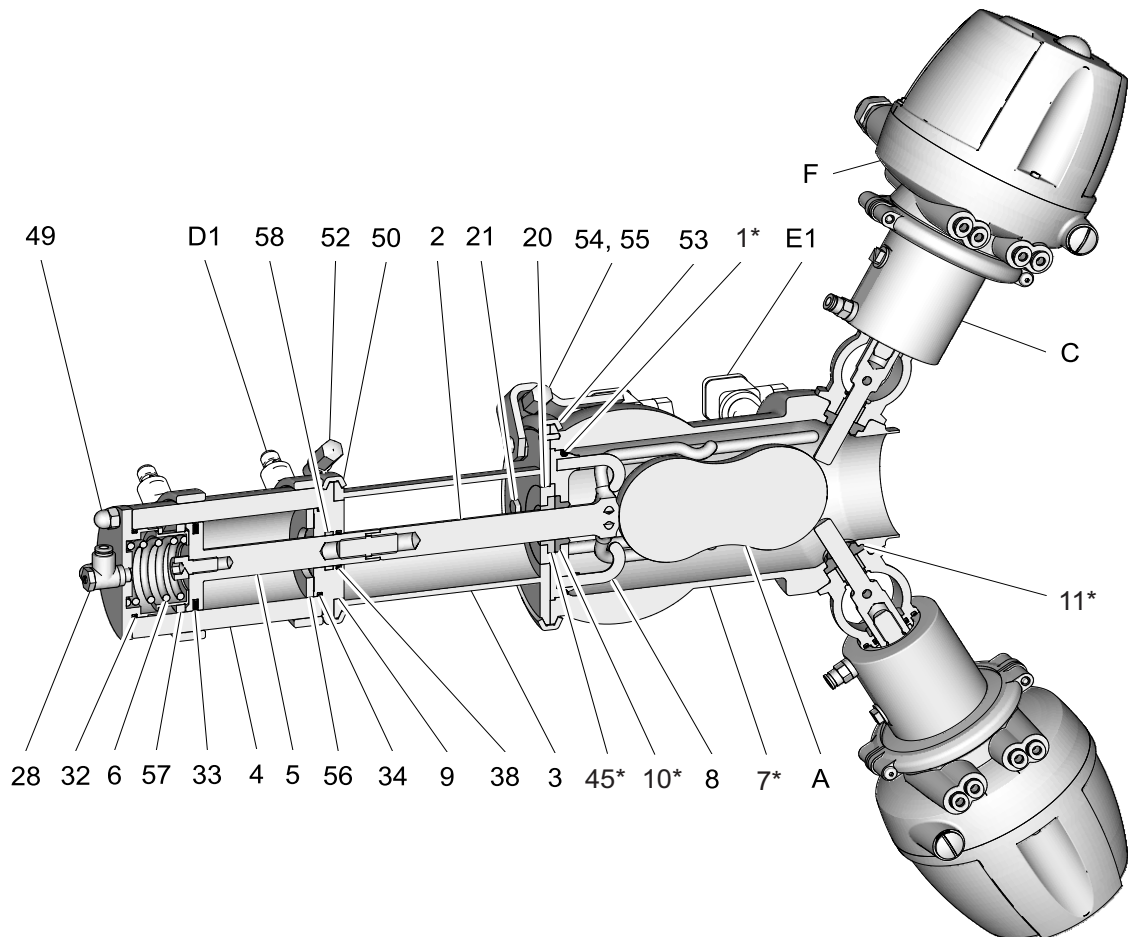
Lubricants	Part no.
Rivolta F.L.G. MD-2	413-071
PARALIQ GTE 703	413-064

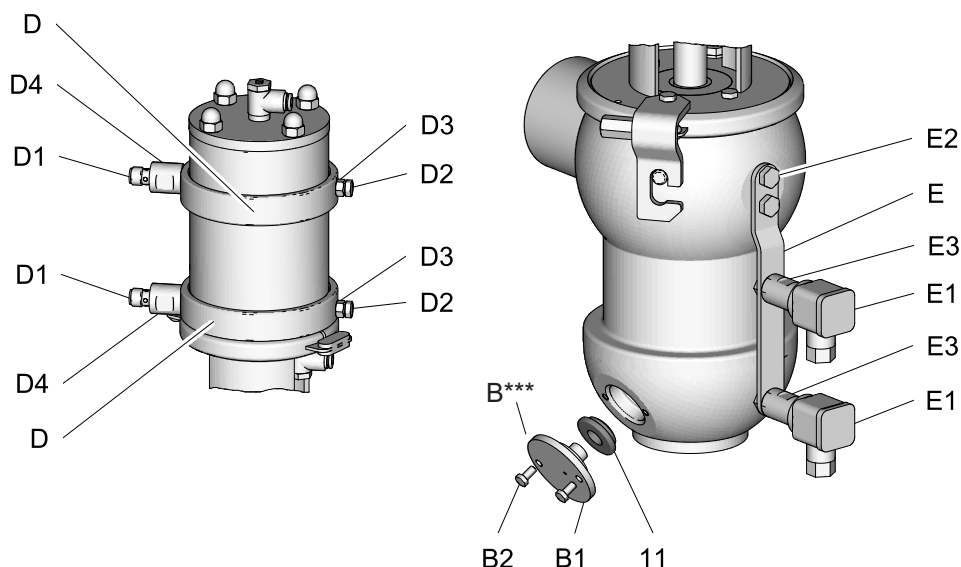
## Weights

Size	Weight (kg)
2" OD	16
2.5" OD	18
3" OD	22.5
4" OD	36

## Spare Parts Lists

### Pig Cleaning Station MST 3A





Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
	Pig actuator MST		228-000211	228-000210	228-000209	228-000242
	Sealing set MST **	EPDM FKM HNBR	228-527.25 228-527.26 228-527.27	228-527.28 228-527.29 228-527.30	228-527.31 228-527.32 228-527.33	228-527.34 228-527.35 --
1 *	O-ring	EPDM FKM HNBR	930-144 930-171 930-633	930-450 930-527 930-555	930-549 930-568 930-556	930-365 930-619 930-655
2	Pig clamp MST	1.4404	228-000177	228-000178	228-000179	228-000180
3	Lantern, pig station cpl.	1.4301	228-146.04	228-146.10	228-146.13	228-146.15
4	Cylinder pipe MST	PVDF	228-000166	228-000166	228-000166	228-000167
5	Piston MST	1.4301	228-000168	228-000168	228-000168	228-000203
6	Spring package MST	1.4301	228-000170	228-000170	228-000170	228-000212
7 *	Housing MST	1.4404	228-000190	228-000191	228-000192	228-000193
8	Pig guideway MST	1.4404	228-000186	228-000187	228-000188	228-000189
9	Cylinder bottom MST cpl.	1.4301	228-000207	228-000207	228-000207	228-000208
10 *	Sealing ring	EPDM FKM HNBR	924-084 924-082 924-311	924-084 924-082 924-311	924-084 924-082 924-311	924-088 924-087 --
11 *	Sealing ring	EPDM FKM HNBR	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312
20	Bearing disk N	1.4305	221-142.02	221-142.02	221-142.02	221-142.04
21	Hex screw	A2-70	901-350	901-350	901-014	901-017



Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
28	Throttle non-return valve	Brass, nickel-plated	603-036	603-036	603-036	603-036
32	O-ring	NBR	930-985	930-985	930-985	930-505
33	K-ring	NBR	930-983	930-983	930-983	930-679
34	O-ring	NBR	930-985	930-985	930-985	930-505
38	O-ring	NBR	930-029	930-029	930-029	930-251
45 *	Bearing N/3A	SUSTA- PVDF	935-098	935-098	935-098	935-102
49	Cap nut	1.4301	912-004	912-004	912-004	912-004
50	Hinged clamp	1.4401	701-073	701-073	701-073	701-077
52	Hex nut	A2-70	912-047	912-047	912-047	912-047
53	Hinged clamp Clamp	1.4401 1.4408	701-077 --	701-077 --	701-077 --	-- 701-011
54	Hex nut	A2-70	912-047	912-047	912-047	912-005
55	Hex screw	A2-70	--	--	--	901-296
56	Spacer	PP	228-151.01	228-151.04	--	--
57	Ring	PP	228-152.01	228-152.01	228-152.01	228-152.02
58	Guide ring	Turcite	935-050	935-050	935-050	935-059
A	Pig	--	See spare parts list for pigs 228ELI009917			
B ***	Cover cpl.	--	228-525.01			
B1	Cover	1.4404	228-142.01			
B2	Hex screw	A2-70	901-334			
C	Pig retainer	--	See spare parts list for pig retainer 228ELI009918			
D	Proximity switch holder	1.4301	228-000171	228-000171	228-000171	228-000172
D1	Proximity switch	--	505-103	505-103	505-103	505-103
D2	Screw	--	901-017	901-017	901-017	901-017
D3	Nut	--	910-013	910-013	910-013	910-013
D4	Threaded bushing	1.4301	228-000251	228-000251	228-000251	228-000251
E	Proximity switch holder (magnet)	1.4301	228-000248	228-000249	228-000213	228-000250
E1	Magnetic switch	--	505-081	505-081	505-081	505-081
E2	Screw	--	901-012	901-012	901-040	901-040





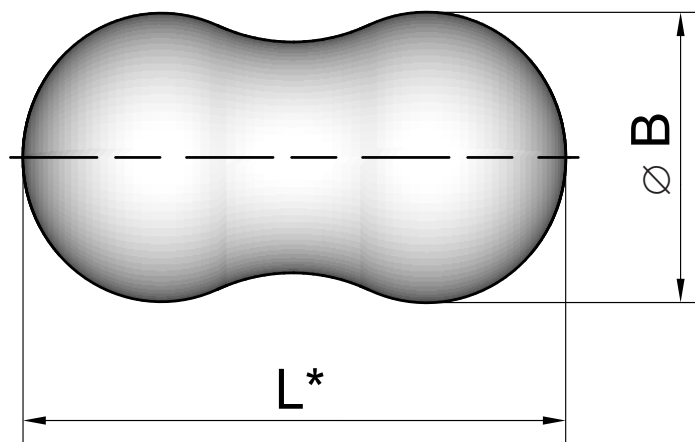
Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
E3	Threaded bushing	1.4301	228-000252	228-000252	228-000252	228-000252
F	Control module	--	See spare parts list for control module type T.VIS M-1 228ELI004046G			

\* Items 1, 7, 10, 11 and 45 are not included in the pig actuator MST and must be ordered separately.

\*\* Items 1, 10 and 11 are included in the MST sealing set.

\*\*\* Item B consists of items B1 and B2.

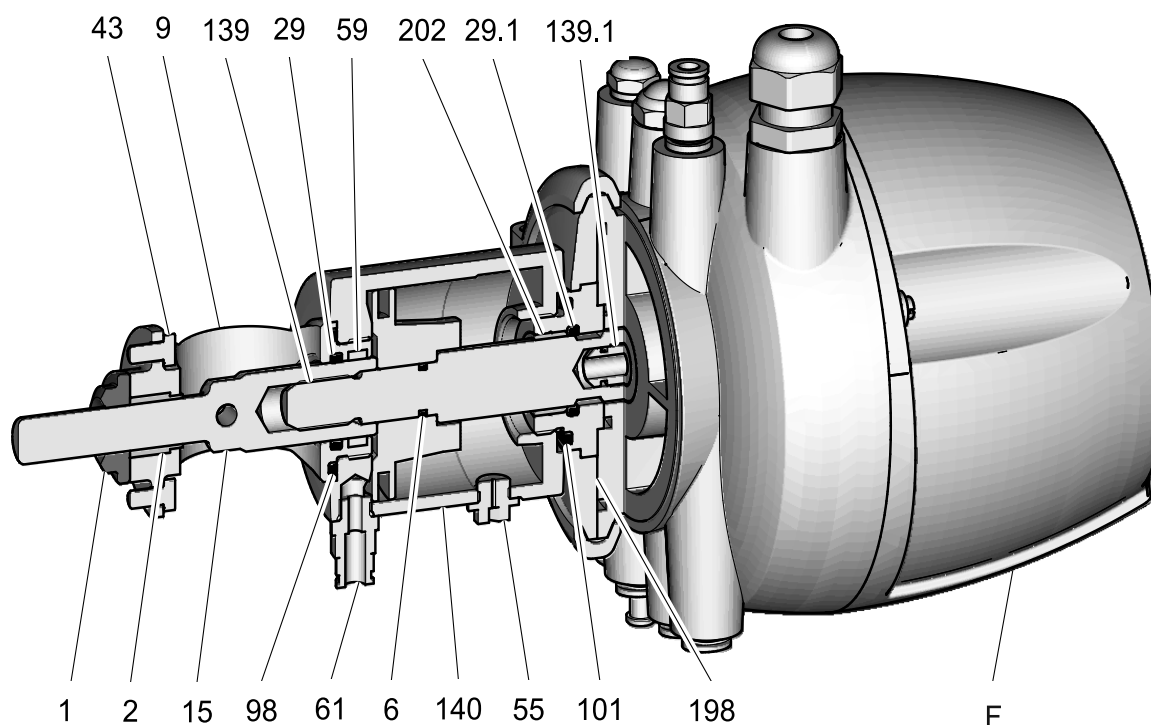
## Pigs acc. to Inch OD



Pig type PK

Nominal width	Pig type PK			Pig type PK		
	VMQ dark blue			FKM black		
		Dimensions in mm			Dimensions in mm	
		$L^*$	$\varnothing B$		$L^*$	$\varnothing B$
2" OD	228-263.03	93	$\geq 47.6$	228-263.02	93	$\geq 47.6$
2.5" OD	228-263.15	119	$\geq 60.3$	228-263.14	119	$\geq 60.3$
3" OD	228-263.18	144	$\geq 73.0$	228-263.17	144	$\geq 73.0$
4" OD	228-263.06	181	$\geq 97.6$	228-263.05	181	$\geq 97.6$
Notes						
Pig type PK: double-ball pig with encapsulated magnets, encapsulation made of stainless steel						
* = approx.						

## Pig Retainer 3A with T.VIS M-1 and A8



Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
1	Sealing ring	EPDM FKM HNBR	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312
2	Bearing N / 3A	SUSTA- PVDF	935-097	935-097	935-097	935-097
6	O-ring	NBR	930-693	930-693	930-693	930-693
9	Lantern MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01
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 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 G1/8"- 6/4	Brass, nickel-plated	933-330	933-330	933-330	933-330
	Screw-in plug connection G1/8"- 6.35/4.31	Brass, nickel-plated	933-144	933-144	933-144	933-144
98	O-ring	NBR	930-046	930-046	930-046	930-046

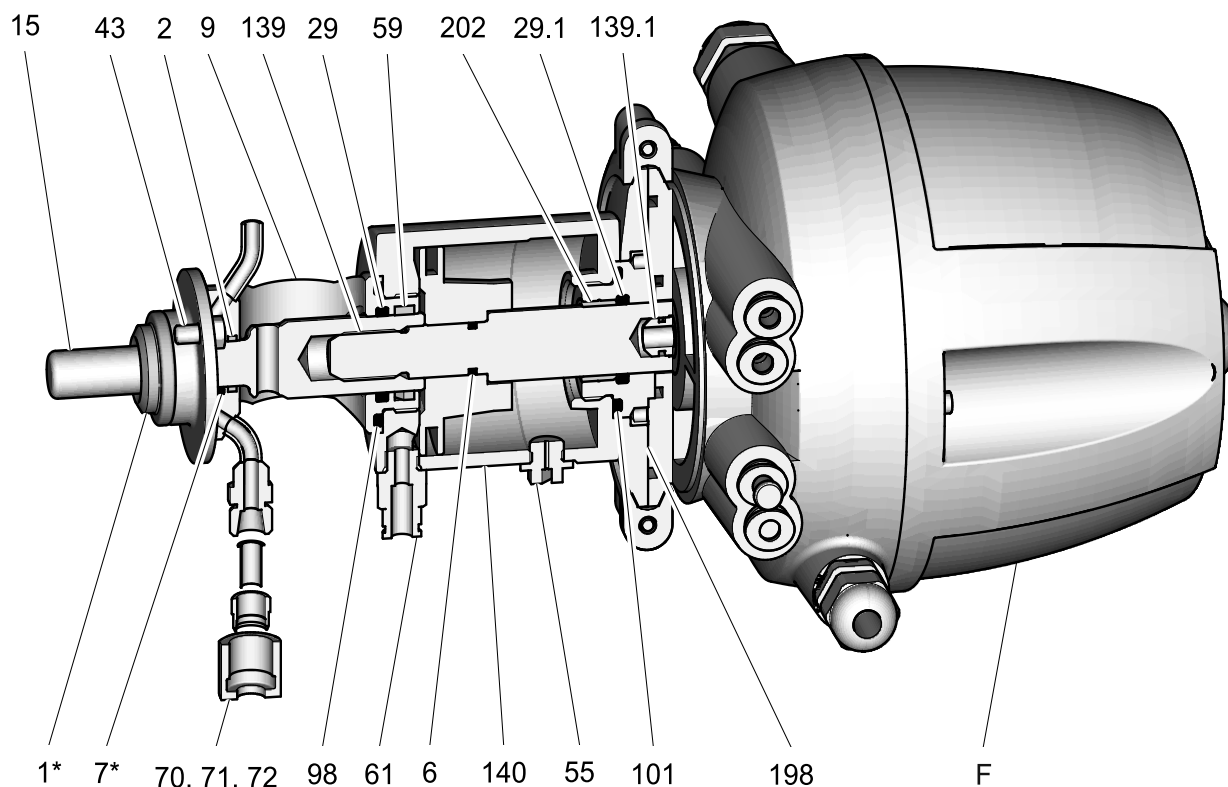


Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
101 *	O-ring	NBR	930-251	930-251	930-251	930-251
139	Adapter T.VIS MS60	1.4301	221-624.03	221-624.03	221-624.03	221-624.03
	Adapter T.VIS A/P E60 A8	1.4301	221-624.04	221-624.04	221-624.04	221-624.04
139.1**	T.VIS switch bar	PA6/GK30	221-589.01	221-589.01	221-589.01	221-589.01
	Switch bar T.VIS P/A cpl. A8	--	221-589.39	221-589.39	221-589.39	221-589.39
140	Actuator MS	--	221-181.02	221-181.02	221-181.03	221-181.03
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
F	Control module, T.VIS M-1	See spare parts list 221ELI004046G				
	Control module type T.VIS A8	See spare parts list 221ELI007861G				

\* 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 module.

## Pig Retainer MSP 3A

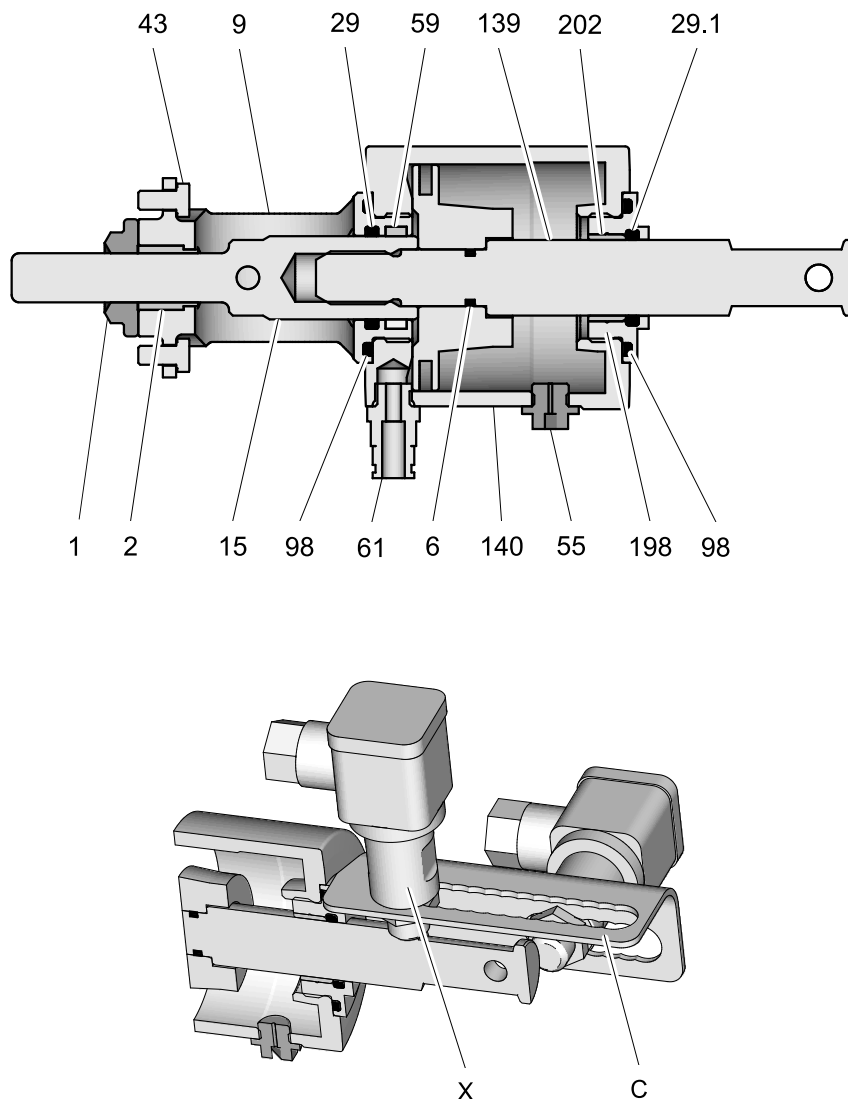


Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
1*	Sealing ring	EPDM FKM HNBR	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312	924-255 924-297 924-312
2	Guide ring	Turcite-B10	935-052	935-052	935-052	935-052
6	O-ring	NBR	930-693	930-693	930-693	930-693
7*	O-ring	EPDM FKM	930-375 930-385	930-375 930-385	930-375 930-385	930-375 930-385
9	Lantern 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 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



Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
61	Screw-in plug connection G1/8" - 6/4	Brass, nickel-plated	933-330	933-330	933-330	933-330
	Screw-in plug connection G1/8" - 6.35/4.31	Brass, nickel-plated	933-144	933-144	933-144	933-144
70	Cap 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	T.VIS adapter	1.4301	221-624.03	221-624.03	221-624.03	221-624.03
139.1	T.VIS switch bar	PA6/GK30	221-589.01	221-589.01	221-589.01	221-589.01
140	Actuator MS	--	221-181.02	221-181.02	221-181.03	221-181.03
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
B	Control module, T.VIS M-1	See spare parts list 221ELI004046G				

## Connection 0 and Proximity Switch Holder for Pig Retainer



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	Bearing N / 3A	SUSTA-PVDF	935-097	935-097	935-097	935-097
6	O-ring	NBR	930-693	930-693	930-693	930-693
9	Lantern MS	1.4301	228-176.01	228-176.01	228-176.01	228-176.01
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



Item	Designation	Material	2" OD	2.5" OD	3" OD	4" OD
29.1	O-ring	NBR	930-026	930-026	930-026	930-026
43	Hex 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 G1/8"- 6/4	Brass, nickel-plated	933-330	933-330	933-330	933-330
	Screw-in plug connection G1/8"- 6.35/4.31	Brass, nickel-plated	933-144	933-144	933-144	933-144
98	O-ring	NBR	930-046	930-046	930-046	930-046
139	T.VIS adapter	1.4301	228-177.01	228-177.01	228-177.01	228-177.01
140	Actuator MS	--	221-181.02	221-181.02	221-181.03	221-181.03
198	Mounting base ECO-E	--	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
C	Proximity switch holder IS cpl.	--	221-001464	221-001464	221-001464	221-001464
X	Threaded bushing	1.4301	228-000253	228-000253	228-000253	228-000253



## Dimension Sheets

### Pig Cleaning Station MST 3A

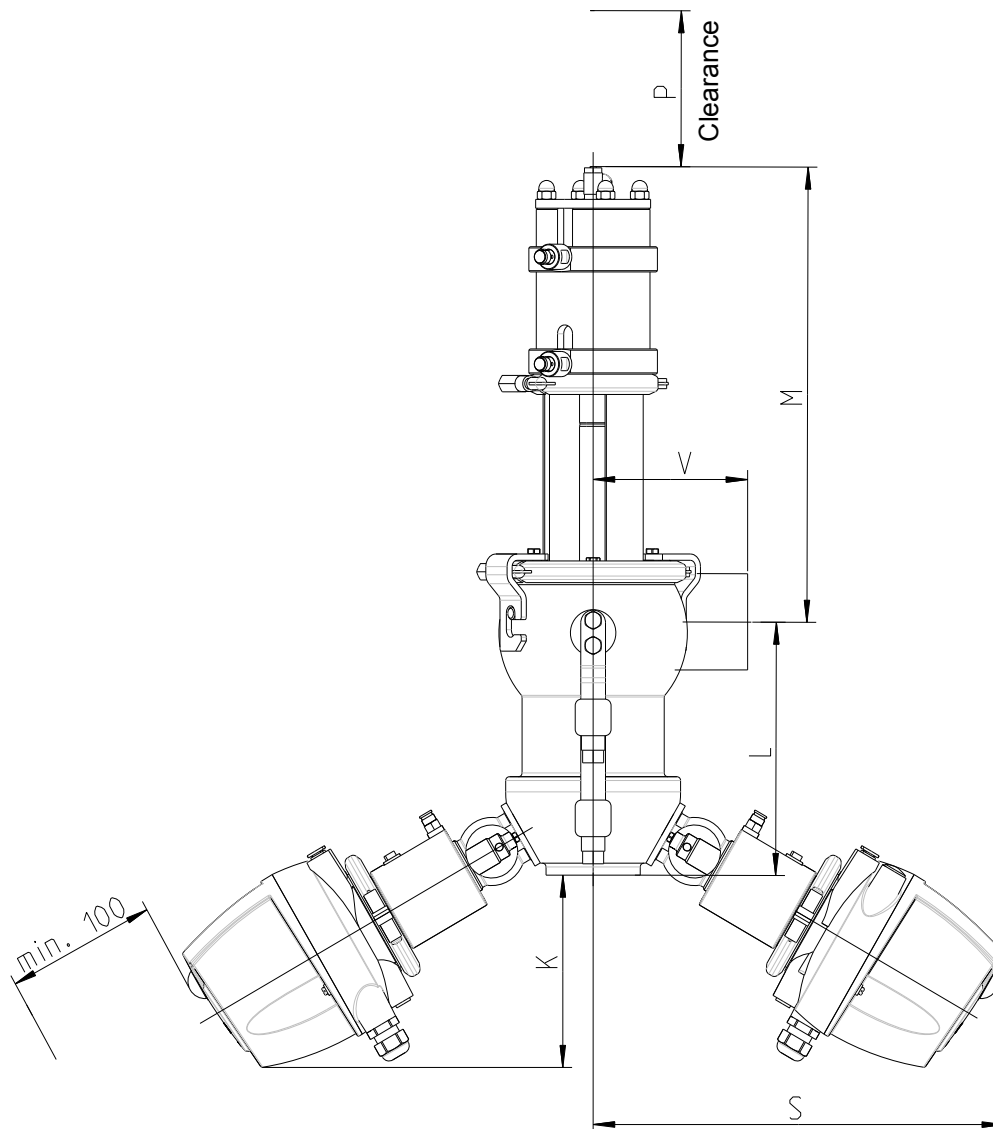


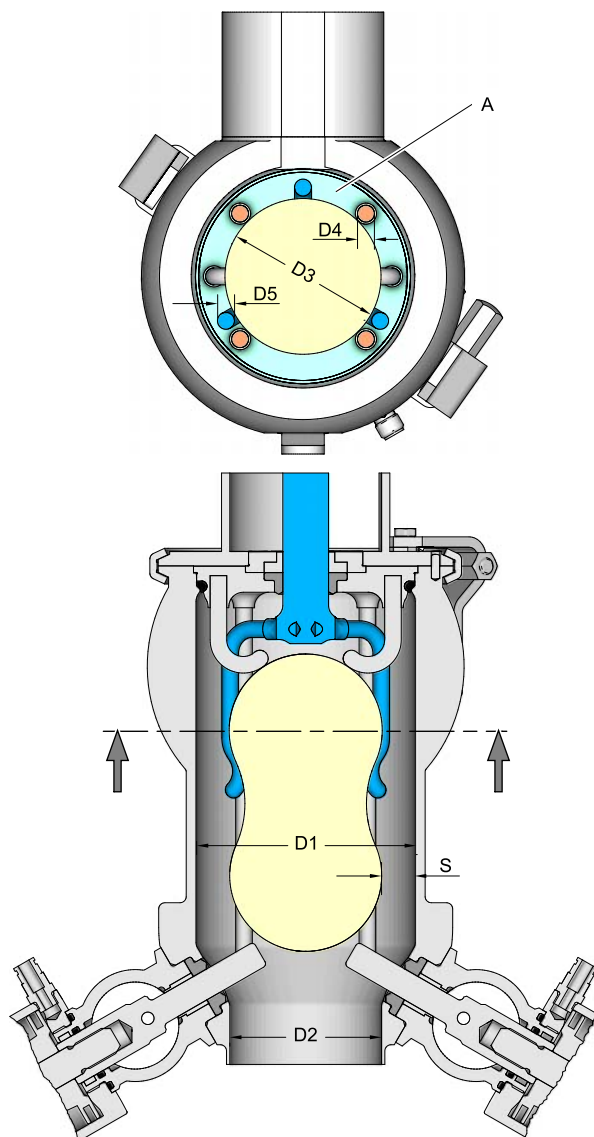
Table of dimensions

Dimension	2" OD	2.5" OD	3" OD	4" OD
K	133	155	155	152
L	156	170	192	216
M	358	364	374	461

Table of dimensions

Dimension	2" OD	2.5" OD	3" OD	4" OD
P	200	230	260	300
S	313	320	326	340
V	90	90	125	125

## Free cross-sectional area in the pig station housing



The free cross-sectional area (A) at the narrowest point in the pig station housing is  $\geq 100\%$  of the cross-sectional area of the pipe for all nominal widths.



Nominal width	Housing	Pipe	Pig	Rod	Pig clamp rod	Gap
	D1	D2	D3	D4	D5	S
2" OD	72.0	47.5	47.9	6.0	6.0	12.1
2.5" OD	86.5	60.2	60.9	6.0	6.0	12.8
3" OD	105.5	72.9	73.4	8.0	8.0	16.1
4" OD	140.5	97.4	98.1	8.0	8.0	21.2



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