

spectron

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User manual  
Valve  
MV3-VCR

02/2023

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# 1 Introduction

This user manual is the original user manual for the Diaphragm valve MV3-VCR from Spectron Gas Control Systems GmbH, referred to as Spectron.

The user manual is intended to facilitate correct and safe operation for the operating firm, and to warn against misuse. It is intended for the qualified personnel and the operator of the facility.



## **WARNING**

### **Incorrect operation**

Incorrect operation of the system, e.g. due to instruction errors, can lead to personal injury or damage to the system.

- a) Access to the user manual by the operating and maintenance personnel must be absolutely ensured at all times.
- b) A copy of the system documentation including the user manual must therefore be kept either on the system or in a suitable and accessible location.

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## 2 Description

### 2.1 Intended use

The intended use of the Diaphragm valves MV3-VCR is to shut off and re-open a gas line.

Diaphragm valves of type MV3-VCR are suitable for flammable gases, non-flammable gases, oxygen as well as for ultra high purity gases from gas quality 6.0.

Depending on the equipment variant, the Diaphragm valves are suitable for the following types of gases:

- inert
- reactive (oxidizing, flammable/self-igniting, toxic/corrosive)

The permissible gas types and pressure ranges are each specified on the label (see "Identification / label").

The equipment versions of the Diaphragm valves without electrical components may be used in an explosion hazard zone as they do not have separate ignition sources (ignition hazard assessment according to DIN EN ISO 80079-36).

To be able to use the Diaphragm valves as intended, all persons working with it must comply with the specifications of the relevant user manual.

The area in which hazards can occur when used as intended is the area around the Diaphragm valves. The danger zone changes depending on the system status and use.

### 2.2 Misuse

Any improper use constitutes misuse. Diaphragm valves may only be used for the specified gases and in the specified pressure range. Diaphragm valves with electrical components without marking according to EU Directive 2014/34/EU may not be used in an explosion hazard zone.

Furthermore, the following operating conditions are regarded as misuse:

- Use for gases in their liquid phase
- Failure to carry out inspection and maintenance work
- Pressurisation in reverse (opposite to the flow direction)
- Operation with gases that are not specified on the label
- Operation outside the permissible technical limit values
- Failure to heed and comply with any applicable legal regulations and other provisions
- Non-observance of the user manual
- Failure to heed the information on the label and in the product data sheet

### 2.3 Identification / label

The label is found on the body of the pneumatic actuator (optional). The valve itself is marked with PN (max. working pressure) and a directional arrow.

The label provides the following details:

| Details          | Example   |
|------------------|-----------|
| Working pressure | 300 bar   |
| Pilot pressure   | 6 - 8 bar |
| Article number   | 71834322  |
| Sealing material | PCTFE     |

## 2.4 Environment

### 2.4.1 Temperatures

Normal temperatures expected in a production area are assumed when operating the system: -20°C to +60°C.

The air humidity must be below 60 % rel. humidity to prevent condensation. The operating temperature depends on the gas used.

### 2.4.2 Degree of cleanliness

Access to the system and to the escape and rescue routes must not be blocked.

The product should be kept clean (dust-free).

A suitable purge gas must be used, taking into account the quality and properties of the process gas.

Compressed air must be used for the control air at least class 5 according to ISO 8573-1.

### 2.4.3 Emissions

The A-rated sound pressure level does not exceed the value of 70 dB(A). It is not necessary to wear hearing protection.

The waste gas line or a burst disc line must not end in areas where the escaping process gas poses a hazard to persons or the environment.

Further emissions in the form of vibrations, radiation, vapours, dusts and waste water do not occur in the regular operation of the product.

## 2.5 Standards and laws

The design and construction of the Diaphragm valve is subject to the following standards and directives:

|                                      |                                 |
|--------------------------------------|---------------------------------|
| 2006/42/EC                           | Machinery Directive             |
| 2014/68/EU                           | Pressure Equipment Directive    |
| 2014/34/EU                           | ATEX directives                 |
| DIN EN ISO 12100:2010                | Safety of Machinery             |
| Safety data sheet for the gases used | Process gas and auxiliary media |

Various **additional** laws, regulations and guidelines must be complied with when handling pressurised gases. Find out about the laws, regulations and guidelines that apply in your location.

|  |  |
|--|--|
| BetrSichV  | Betriebssicherheitsverordnung (Industrial health and safety ordinance)             |
| ProdSG   | Produktsicherheitsgesetz (Product Safety Law)                                      |
| GefStoffV  | Gefahrstoffverordnung (Hazardous Substances Ordinance)                             |
| TRGS 400, 407, 500, 720, 721, 722, 727, 745, 746 | Technische Regeln Betriebssicherheit (Technical Regulations on Operational Safety) |
| TRBS 1111, 2152, 3145, 3146                      | Technische Regeln Betriebssicherheit (Technical Regulations on Operational Safety) |
| DGUV Regulation 1                                | German Trade Association Principles of Prevention                                  |
| DGUV Rule 113-001                                | German Trade Association Rules on Explosion Protection                             |

EIGA documents

## 3 Safety

### 3.1 Basic information on the safety instructions

The product complies with the recognised technical regulations. Nevertheless, knowledge of the media used and their dangers as well as basic knowledge of the pressure control panel are prerequisites for safe and accident-free operation.

The user manual must be read and understood by every user. Instruction must be documented in writing.

The safety instructions are to be regarded as a supplement to the applicable accident prevention regulations and laws. Existing accident prevention regulations and laws must be observed in all cases.



#### NOTICE

Hazards from the operating environment of the system can lead to injuries to persons.

- a) No changes may be made to the system which result in a change in function.
- b) It is not possible to outline and cover in this manual all hazards arising from the environment or unforeseeable operating conditions of the system.

In the Safety Instructions chapter:

- Users are informed regarding hazards, residual risks and measures for risk reduction.
- The presentation of the safety instructions and the symbols is explained.
- Basic safety instructions to be observed in general are listed. Specific safety instructions are listed in the relevant chapters.



#### ⚠ DANGER

**DANGER** indicates an imminent danger. If not avoided, death or extremely serious injuries will result.



#### ⚠ WARNING

**WARNING** indicates a potential imminent danger. If not avoided, death or serious injury could result.



#### ⚠ CAUTION

**CAUTION** indicates a potentially imminent danger. If not avoided, minor or moderate injury could result.



#### NOTICE

**NOTICE** indicates a potentially harmful situation. If not avoided, the system or property in its vicinity could be damaged.

## 3.2 Safety instructions

The safety instructions are to be observed by all persons working on the system. The rules and regulations for accident prevention applicable to the place of use are to be observed. The instruction of the operating and maintenance personnel on system safety must be documented.

Please pay special attention to this chapter to avoid accidents.

All measures and specifications in the safety data sheets must be implemented and observed.



### **DANGER**

#### **Gas leaks**

If gas escapes on the product, contamination of persons, fires or explosions or the displacement of atmospheric oxygen can occur! Serious or fatal injuries are possible.

- a) Do not place pipelines and fittings under mechanical stress. Never use pipelines and components as climbing aid or to secure other parts!
- b) In the event of leaks, immediately secure the affected area!
- c) Smoking and naked flame are strictly prohibited!



### **DANGER**

#### **Intended use**

Operation of the product with gases other than those specified or outside the limits may result in dangerous reactions in the system. Incorrect use poses considerable risks to operating personnel and the environment!

- a) Only use the product for gases for which it was designed.
- b) Only use the product in the specified limit values for pressure and withdrawal quantity.
- c) Usage for another type of gas or outside the limit values is prohibited and constitutes misuse.



### **DANGER**

#### **Defective product**

A defect on the product can result in unforeseeable operating conditions. Persons may be injured.

- a) The product may only be operated in technically perfect condition in compliance with all chapters of the user manual.
- b) Environmental protection laws and safety regulations must be observed.



### **WARNING**

#### **Displacement of atmospheric oxygen**

In the event of inert gas leaks, displacement of atmospheric oxygen may occur. Danger of suffocation!

- a) The operator must ensure adequate ventilation and airing in all rooms with gas installations and monitor the oxygen content.



**⚠ WARNING****Repairs**

If the product is not used as intended, unpredictable operating conditions may occur. Serious personal injuries are possible.

- a) Repairs may not lead to a change in function. The system may not be tampered with or modified.
- b) Before each repair, the system must be depressurised and flushed through.
- c) Repairs are only permitted to be carried out by trained persons.

**⚠ WARNING****Incorrect operation**

Incorrect operation of the system, e.g. due to instruction errors, can lead to personal injury or damage to the system.

- a) Access to the user manual by the operating and maintenance personnel must be absolutely ensured at all times.
- b) A copy of the system documentation including the user manual must therefore be kept either on the system or in a suitable and accessible location.

**⚠ WARNING****Working on the product**

If an accident occurs when working on the product, there is a considerable risk of injury.

- a) Never work on the product unattended or unannounced.
- b) Observe the site safety rules and permission procedure.

**⚠ WARNING****Maintenance**

Incorrect maintenance or maintenance work performed at the incorrect time can result in damage to the system or injury to persons.

- a) To avoid static charges, do not clean the product using dry cloths. Use damp cotton cloths.
- b) The maintenance intervals are to be specified by the system operator as part of its risk assessment.
- c) Observe the maintenance intervals and maintenance guidelines from the manufacturer and the applicable guidelines.
- d) Components may only be replaced by spare parts of the same design. The specifications of the component manufacturers must be complied with during installation.

**⚠ CAUTION****Pressure relief lines**

Discharge of hazardous media at the end of a pressure relief line or exhaust air line.

- a) Pressure relief lines may not end in areas where the escaping process gas poses a hazard to persons or the environment.
- b) The position of the pressure relief line must be carefully checked taking into account the material properties, main wind direction and other conditions.



## NOTICE

### Lighting

Incorrect switching actions or confusion can occur due to inadequate lighting.

- a) Ensure sufficient lighting in accordance with the statutory regulations.

## 3.3 Emergencies and safety devices

The operational local safety regulations of the system operator, such as the alarm plan, fire safety regulations and the escape and rescue plans, apply in all cases for the operation of the Diaphragm valve .

When handling gases, all specifications from the safety data sheets must be followed. Local emergency services should be informed of the gases used at the site of the system.

In the event of mechanical damage, the product must be put into a safe operating condition.

## 3.4 Qualification of the operating and maintenance personnel

The intended user group is the system operator (user of the system) and the system maintenance personnel.

Every person working on the system must be familiar with the functions and dangers associated with the overall system. Instruction on the system is to be documented in writing.

Maintenance and repair work should only be carried out by specially trained personnel.

All operators, as well as personnel who regularly enter the area, must be trained on a minimum of the following topics:

- Alarm rules at the site and conduct in the event of malfunctions and leaks
- Basic functions of the product
- User manual
- System documentation incl. manufacturer documentation
- Position of the safety devices
- Safety data sheets on the process gas used
- Personal protective equipment

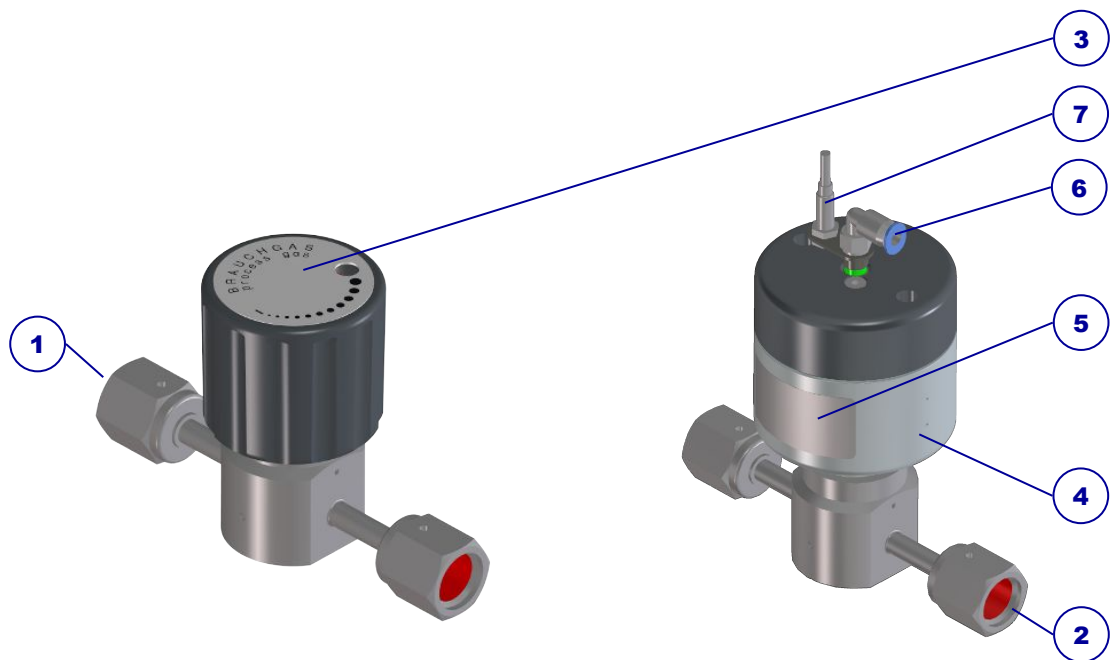
In addition, operators must have the requisite physical and mental skills to operate and maintain the equipment.

Persons who do not meet this requirement (e.g. visitors), must not remain alone in the overall system.

Operating personnel must use appropriate personal protective equipment for the activities to be performed and the associated environmental hazards. The operational instructions and the specifications of the employers' liability insurance associations and the safety data sheets must be complied with.

## 4 Design and function

### 4.1 Design



*Illustration 1: Diaphragm valve design MV3-VCR*

| Item | Description            | Short name | Connection                                 |
|------|------------------------|------------|--|
| 1    | Inlet                  |            | See data sheet or individual configuration |
| 2    | Outlet                 |            |  |
| 3    | Handwheel              | H          |  |
| 4    | Pneumatic actuator     | PN         |  |
| 5    | Label                  |            |  |
| 6    | Pilot air connection   |            |  |
| 7    | Inductive namur switch |            |  |

### 4.2 Functional description

The intended use of the Diaphragm valves MV3-VCR is to shut off and re-open a gas line.

## 4.3 Technical data



### NOTICE

The technical data can be taken from the data sheet for the relevant product. If this is not available, you can view and download it at [www.spectron.de](http://www.spectron.de).

The maximum input and output pressures and the gas type are given on the identification or label.

## 4.4 Boundaries and interfaces

The scope of supply includes the product as described in the "Design" chapter. The transfer points to process gas, exhaust air and auxiliary media (incl. power supply) are the connections on the pressure control panel or product.

The following areas and functions have not been included in the scope of supply from Spectron:

- other systems, lines and installations of the overall system
- Process gas source
- Exhaust air (this applies in particular to foreseeable problems, e.g. failure of the exhaust air system)
- Supply of auxiliary media (compressed air, purge gas)
- Power supply
- Lighting
- Controller

## 5 Installation

### 5.1 General information



#### **⚠ CAUTION**

##### **Injury or damage in the event of incorrect assembly or disassembly**

Special steps are required for assembly and disassembly work on the product. Personal injuries and damage to the product are possible.

- a) Assembly and disassembly work may only be carried out by the installation engineer or appropriately skilled specialist companies and persons.
- b) The product is not permitted to be re-used following disassembly. All components must be disposed correctly.

Depending on the type of gas, different requirements apply to the installation space of gas supply systems. It is essential to observe the legal regulations and trade association regulations, and the information in the safety data sheets.

Familiarise yourself with the necessary work steps (see "Installation work [► 13]") and prepare the necessary tools.

### 5.2 Installation work

#### 5.2.1 Connecting the incoming and outgoing lines

All lines must be connected in accordance with the applicable standards and specifications and tested with purge gas (pressure test and leak test). The specifications on dimensioning of the connections are described in the "Design" chapter.

### 5.3 Checking the armature

Check all connections for leakage.

## 6 Commissioning

### 6.1 Preparations for commissioning

Purge the armature prior to initial commissioning! It is imperative to adhere to the direction of the gas flow when doing this! You must not purge counter to the usual direction of flow (from the tapping point to the process gas source), as this can flush debris resulting from the installation work, for example, back into the armature.

The connecting threads and connecting surfaces of the gas source valves as well as the sealing rings must be checked to ensure that they are in perfect condition.

Always turn shut-off valves as far as the stop when opening or closing them.

Make sure that:

- the fittings are marked for the corresponding gas type,
- all protective caps have been removed,
- the assembly has been correctly carried out and a leak test has been performed,
- all valves are closed (the red marking is visible in the handwheel window)
- the pressure regulator has been depressurised (if possible),
- the purge gas supply (only standard for SP4 and SP6) is in operation,
- the on-site exhaust gas system is functional at all times and is in operation,
- all shut-off armatures are checked for loose connections and
- the controller is in operation.

### 6.2 Procedure for commissioning

Proceed as follows to put a manually operated valve into operation:

Slowly (!) turn the handwheel anti-clockwise and slightly against the end resistance. If the valve is equipped with a position indicator (red-green), the colour of the dot on the display will change from red to green as you open the valve.

To close the valve, turn the handwheel clockwise, slightly but firmly against its end resistance. If the valve is equipped with a position indicator (red-green), the colour of the dot on the display will change from green to red when the valve is closed.

Pneumatically operated valves can only be put into operation via a connected pneumatic controller.

## 7 Maintenance, cleaning and repairs

### 7.1 General information on maintenance



#### **⚠ WARNING**

##### **Noise emission**

When working on pressurised pneumatic supply, significant noise emission can occur. Acute and chronic loss of hearing may result.

- a) Never perform work on the pressurised pneumatic supply without hearing protection.
- b) Only replace the silencers when the supply is unpressurised.



#### **⚠ WARNING**

##### **Incorrect operation**

Incorrect operation of the system, e.g. due to instruction errors, can lead to personal injury or damage to the system.

- a) Access to the user manual by the operating and maintenance personnel must be absolutely ensured at all times.
- b) A copy of the system documentation including the user manual must therefore be kept either on the system or in a suitable and accessible location.



#### **⚠ WARNING**

##### **Working on the product**

If an accident occurs when working on the product, there is a considerable risk of injury.

- a) Never work on the product unattended or unannounced.
- b) Observe the site safety rules and permission procedure.



#### **⚠ WARNING**

##### **Maintenance**

Incorrect maintenance or maintenance work performed at the incorrect time can result in damage to the system or injury to persons.

- a) To avoid static charges, do not clean the product using dry cloths. Use damp cotton cloths.
- b) The maintenance intervals are to be specified by the system operator as part of its risk assessment.
- c) Observe the maintenance intervals and maintenance guidelines from the manufacturer and the applicable guidelines.
- d) Components may only be replaced by spare parts of the same design. The specifications of the component manufacturers must be complied with during installation.



### ⚠ CAUTION

#### Injury or damage in the event of incorrect assembly or disassembly

Special steps are required for assembly and disassembly work on the product. Personal injuries and damage to the product are possible.

- a) Assembly and disassembly work may only be carried out by the installation engineer or appropriately skilled specialist companies and persons.
- b) The product is not permitted to be re-used following disassembly. All components must be disposed correctly.



### NOTICE

#### Lighting

Incorrect switching actions or confusion can occur due to inadequate lighting.

- a) Ensure sufficient lighting in accordance with the statutory regulations.

Correctly performed and timely maintenance increases the service life, ensures availability and helps to avoid undesirable downtimes. Depending on the gas type, the components are subject to different maintenance intervals. Observe the stipulations from the applicable directives.

Servicing and maintenance measures are only permitted to be carried out by competent specialist companies and persons.

Maintenance work should be documented by the operator. The documentation should indicate who carried out which work and when (proof of maintenance).

It is only permitted to use original spare parts or equivalent spare parts as well as suitable tools:

The recommended maintenance and test intervals are to be observed! (Also observe the manufacturer's documents)

The causes of possible defects are to be investigated, e.g. damage, unusual noises, overheating, etc.

Before beginning maintenance work, the pressure control panel must be purged (see "Interruptions to operation for more than 48 hours"). After completing the works, a re-commissioning process must be carried out (see "Commissioning [► 14]").

## 7.2 Regular maintenance work and cleaning

For components in which the tests reveal wear or even malfunctions, repairs or component replacement must be carried out by competent specialist companies and persons.

| Components | Test   | Interval  |
|------------|--|---|
| Filter     | Replace filter   | Replacement with insufficient flow rate                 |
| All        | Visual inspection for corrosion, damage and correct fastening<br>Functional test<br>Leakage test | At least annually and before each commissioning process |
| Earthing   | Visual inspection for damage and correct fastening   | At least annually                                       |

The product should be cleaned on a regular basis. Heavy soiling can lead to malfunctions.

Only clean the product as necessary using a damp, lint-free and clean cloth, without cleaning agent.



## 8 Repair

### 8.1 General information on repair work



#### **⚠ WARNING**

##### **Noise emission**

When working on pressurised pneumatic supply, significant noise emission can occur. Acute and chronic loss of hearing may result.

- a) Never perform work on the pressurised pneumatic supply without hearing protection.
- b) Only replace the silencers when the supply is unpressurised.



#### **⚠ WARNING**

##### **Incorrect operation**

Incorrect operation of the system, e.g. due to instruction errors, can lead to personal injury or damage to the system.

- a) Access to the user manual by the operating and maintenance personnel must be absolutely ensured at all times.
- b) A copy of the system documentation including the user manual must therefore be kept either on the system or in a suitable and accessible location.



#### **⚠ WARNING**

##### **Working on the product**

If an accident occurs when working on the product, there is a considerable risk of injury.

- a) Never work on the product unattended or unannounced.
- b) Observe the site safety rules and permission procedure.



#### **⚠ CAUTION**

##### **Injury or damage in the event of incorrect assembly or disassembly**

Special steps are required for assembly and disassembly work on the product. Personal injuries and damage to the product are possible.

- a) Assembly and disassembly work may only be carried out by the installation engineer or appropriately skilled specialist companies and persons.
- b) The product is not permitted to be re-used following disassembly. All components must be disposed correctly.



#### **NOTICE**

##### **Lighting**

Incorrect switching actions or confusion can occur due to inadequate lighting.

- a) Ensure sufficient lighting in accordance with the statutory regulations.

The objectives of the repair are:

Detect and assess causes of malfunction

Rectify faults and restore operational readiness

Repairs to the product may only be performed by the manufacturer or specialist personnel instructed on the system.

Work on electrical system parts may only be performed by a qualified electrician.

Before beginning work, the pressure control panel must be purged (see "Flushing through to the process"). After completing the works, a re-commissioning process must be carried out (see "Commissioning [► 14]").

## 8.2 Troubleshooting and fault rectification

| <b>Fault</b>  | <b>Possible cause</b>                                    | <b>Remedy</b>   |
|---|--|---|
| Outlet pressure too low   | Process gas source empty                                 | Check inlet pressure on the pressure regulator and change the process gas source if necessary |
| Vibration noises in the pressure regulator  | Pressure regulator faulty                                | Replace pressure regulator  |
| Pressure regulator frozen   | Flow rate too high                                       | Reduce flow rate or use gas preheater if possible   |
| System pressure cannot be set to the desired value                                | Pressure regulator faulty                                | Replace pressure regulator  |
|   | System pressure outside the intended system pressure     | Only operate the system at the intended range   |
| Flow insufficient or fluctuating  | Inlet pressure of the process gas too low                | Increase inlet pressure   |
|   | Valve faulty   | Replace faulty valve  |
|   | Filter loaded  | Change filter   |
| Relief valve, over-pressure valve, safety valve or burst disc are discharging gas | Impermissible pressure rise in the outlet pressure range | Close all valves and check pressure control panel   |
| HPI valve cannot be opened or closed  | Pneumatic pressure too low                               | Check pneumatic pressure  |
|   | Compressed air hose ripped                               | Replace compressed air hose out   |
| Leak  | Connection leaking                                       | Flush pressure control panel clear and perform pressure test and leak test                    |

## 9 Dismantling and disposal

### 9.1 General information on dismantling



#### **⚠ WARNING**

##### **Noise emission**

When working on pressurised pneumatic supply, significant noise emission can occur. Acute and chronic loss of hearing may result.

- a) Never perform work on the pressurised pneumatic supply without hearing protection.
- b) Only replace the silencers when the supply is unpressurised.



#### **⚠ CAUTION**

##### **Injury or damage in the event of incorrect assembly or disassembly**

Special steps are required for assembly and disassembly work on the product. Personal injuries and damage to the product are possible.

- a) Assembly and disassembly work may only be carried out by the installation engineer or appropriately skilled specialist companies and persons.
- b) The product is not permitted to be re-used following disassembly. All components must be disposed correctly.



#### **NOTICE**

##### **Lighting**

Incorrect switching actions or confusion can occur due to inadequate lighting.

- a) Ensure sufficient lighting in accordance with the statutory regulations.

Before dismantling and disposal of the product, it must be taken out of operation and purged. The product must then be disconnected from the auxiliary media supply.

The dismantling process is to be carried out in the following order:

1. Purging of the product and decommissioning.
2. Disconnect the product from the gas supply system.
3. Disconnect the product from the process.
4. Remove the product – to do so, please refer to the "Installation [► 13]" chapter.
5. Seal all ports on the product.
6. Pack the product.

### 9.2 Returns

If products are returned to Spectron for checking, maintenance or repair, it is essential to purge them with inert gas. A check can only be undertaken by Spectron if the repair pre-registration including the decontamination declaration has been duly completed.

## 9.3 Disposal

Dismantling and disposal must be carried out in accordance with the official and legal requirements at the site of the system. The operator must produce a risk assessment and work instructions before dismantling. A piece of equipment may only be disposed of when the decontamination declaration has been provided, completed in full.



## Gas control on a high level

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