OPERATING INSTRUCTION

Control and feedback systems

GEA FLOWVENT Control Top

GEA Flow Components India
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1 General Information

1.1 Information on the Document

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

1.1.1 Binding Character of These Operating Instructions

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

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

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

1.1.2 Notes on the Illustrations

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

1.1.3 Symbols and Highlighting

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

Danger

Warning: Fatal Injuries

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

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

Warning: Explosions

Failure to observe the warning can result in severe explosions.

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

Warning!

Warning: Serious Injuries

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

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

Caution!

Warning: Injuries

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

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

Notice

Warning: Damage to Property

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

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

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

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

   → Result of the previous operation.

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

Hint!

Further useful information.

1.2 Herstelleranschrift

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India

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2 Safety

2.1 Intended use

With the FLOWVENT Control Top, all FLOWVENT valves from GEA Flow Components India can be connected pneumatically and electrically. Using the device for any other purpose is considered contrary to its designated use.

The FLOWVENT Control Top is available as

- without solenoid valve as position indicator
- with solenoid valve as control top

The FLOWVENT Control Top is completely installed on the dedicated actuator/ adapter of the process valve by means of a clamp connection. The control air is routed to the valve by an external hose.

The FLOWVENT Control Top with FLOWVENT VALVES can:

- monitor the non-actuated position of the valve disk,
- monitor the actuated position of the valve disk,
- make the position and status of the valve visible in colour via the illuminated dome fitted on the control top.

The FLOWVENT Control Top must not be used in areas where approvals are necessary for use in areas with a potentially explosive atmosphere.

Hint!

The manufacturer will not accept any liability for damage resulting from any use of the valve which is not in accordance with the designated use of the valve. The risk is borne solely by the operating company.

2.1.1 Requirements for operation

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

2.1.2 Improper operating conditions

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

The operation of the component is not permitted if:

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

2.2 Operator’s Duty of Care

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

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

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

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

Hint!

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

2.3 Subsequent changes

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

Only original spare parts from GEA Flow Components should be installed. This ensures that the component is always operating properly and efficiently.

2.4 IP Protection classes

In its standard version, the FLOWVENT Control Top fulfils the requirements of protection class IP66 and IP67 (DIN EN 60529).

IP classes provide information about the degree of protection an electrical device housing provides against the ingress of solids (first digit) or humidity (second digit). They attempt to reproduce common kinds of failure and assign so-called IP codes to the protected systems. The letters IP stand for 'International Protection' and are prefixed to the code numbers.

First digit *		**Meaning**	
ISO 20653	**DIN EN 60529**	**Protection against contact**	**Protection against solids**
6k	6	Complete contact protection	Complete protection against dust ingression (dustproof)
Second digit *		**Meaning**	
ISO 20653	**DIN EN 60529**	**Protection against humidity**	
5	5	Protected against water jet (nozzle) from any angle	
6	6	Protected against powerful water jets	
6k		Protected against powerful water jets under increased pressure	
7	7	Protected against temporary immersion	
	9	Protected against high pressure spray downs	
9k		Protected against high pressure spray downs	
* For additional digits and more detailed descriptions please refer to the pertinent standard.			

Digits not to be mentioned can be replaced by the letter x (e. g. IPx6). Concerning the ingress of humidity, IPx6 includes all lower IP classes. This is, however, not the case for the higher protection class IPx7!

When detergents with high surface tension reduction and/or when using high-pressure cleaners are used, we recommend the use of devices of protection class IP69k. If this protection class is necessary, a T.VIS® control top or a position indicator must be purchased and used.

Hint!

The specified protection classes only apply if the connectors are used for their intended use, if the cable gland is properly sealed and if the control top is fitted on the valve, see Chapter 6, Page 35.

2.5 General safety instructions and dangers

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

Nevertheless, dangers can arise from the component, if:

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

2.5.1 Principles for safe operation

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

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

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

2.5.2 Environmental Protection

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

For environmental protection the following principles apply:

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

2.5.3 Electrical Equipment

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

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

2.6 Supplementary Regulations

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

- pertinent accident prevention regulations,

- generally accepted safety rules,
- national regulations applicable in the country of use,
- work and safety instructions applicable in the facility,
- installation and operating regulations for use in potentially explosive areas.

2.7 Qualification of personnel

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

Operating and maintenance personnel must

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

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

Only allow specially trained personnel to carry out work on an explosion-protected installation. When working on explosion-protected installation observe the standards DIN EN 60079-14 for gases and DIN EN 50281-1-2 for dusts.

The following minimum qualifications are required:

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

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

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

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

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

2.8 Safety equipment

2.8.1 Signs

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

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

Signs on the control top	
Sign	**Meaning**
 Fig.1	General hazard warning
 Fig.2	Warning Crushing

2.9 Residual dangers

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

Residual dangers on the control top and measures		
Danger	**Cause**	**Measure**
Danger to life	Inadvertent switch-on of the control top	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.
Damage to property	Welding can cause damage to the electronics or result in data loss.	Do not carry out any welding work in the vicinity of the control top or make sure electronics are properly protected.

2.9.1 Electrostatically Endangered Components and Modules

The control top contains electronic components that are sensitive to electrostatic discharge (ESD). Contact with electrostatically-charged persons or objects can endanger these components. In the worst case they are destroyed immediately or fail after being put into operation.

To minimize or prevent the possibility of damage resulting from sudden electrostatic discharge,

- observe the requirements of DIN EN 61340-5-1 and 5-2,
- be careful not to touch the electronic components,
- also take care not to touch electronic components when supply voltage is present.

Use ESD-compliant packaging when returning electronic components. (Should you have any questions, please contact GEA Flow Components India.)

2.9.2 Instructions for the Safe Handling of Electronic Components During Welding Work

Notice

Stray welding currents during welding

Can cause damage to electronic components

► Follow the steps below to prevent this.

1. Before starting welding work, carry out the following preparations:
   1.a. Ensure the device is switched off and no electrical connections are active.
   1.b. Disconnect the device from the power supply.
   → This protects the electronic components from potential damage caused by stray welding currents.
2. Establish a correct grounding connection:
   2.a. Place the ground connection of the welding machine as close as possible to the welding point.
   → This minimises the risk of stray welding currents and helps protect nearby electronic components from damage.
3. After completing the welding work, proceed as follows:
   3.a. Remove the welding machine's ground connection.
   3.b. Reconnect the device to the power supply.
   3.c. Perform a function test.

2.10 Danger zones

Please observe the following notes:

- In the event of malfunctions, shut down the control top (disconnect from the power and air supply) and secure it against being used.
- Before starting any service, maintenance or repair work, disconnect the control top 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 control top at regular intervals. Immediately remedy loose connections and molten cables.
- If work on live parts cannot be avoided, call in a second person, who can operate the main switch in case of an emergency.

3 Description

3.1 Design

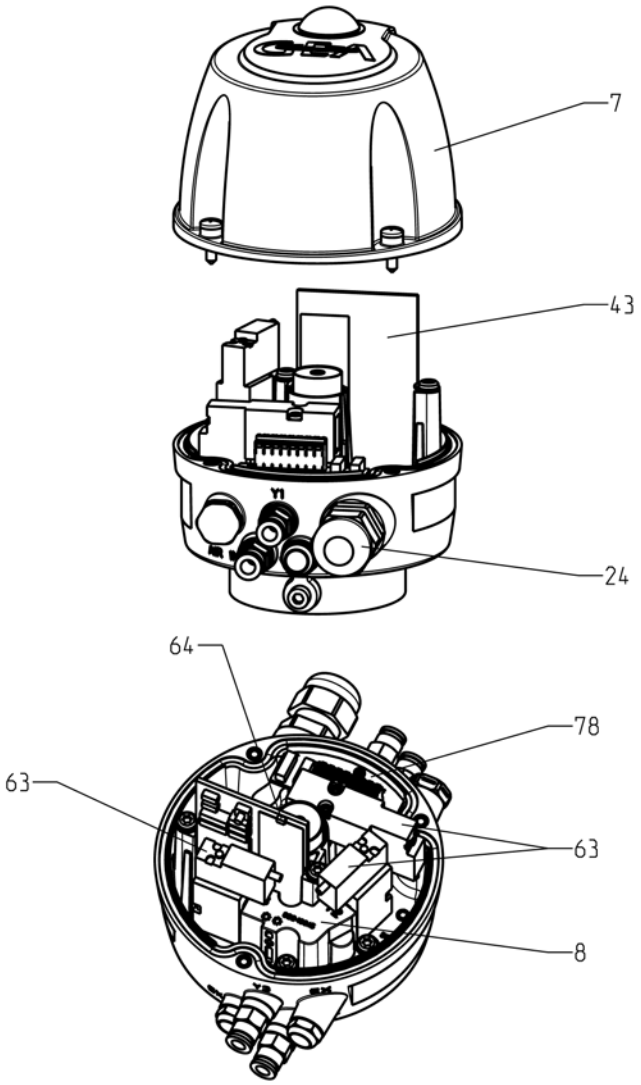

Fig.3

No.	Designation	No.	Designation
7	Cap	63	Solenoid valves
8	Pneumatic block	64	Status light-emitting diode
24	Cable gland	78	Terminal strip unit (optional)
43	Evaluation electronics		

The FLOWVENT Control Top is made up of:

- a 24 V DC or AS interface evaluation electronics with a position measuring system for the detection of the two valve end positions,
- an additional terminal strip unit for the switch-on type 24 V DC (optional),

- a maximum of three solenoid valves for the actuation of the main stroke and the lift strokes,
- an exhaust air throttle (optional) for the infinitely adjustable setting of the closing velocity of the main stroke,
- a supply air throttle (optional) for the infinitely adjustable setting of the opening velocity of the main stroke (with 3 solenoid valve variant: also reduces the lift strokes).

Sensor module structure

Printed circuit board switch-on type 24 VDC

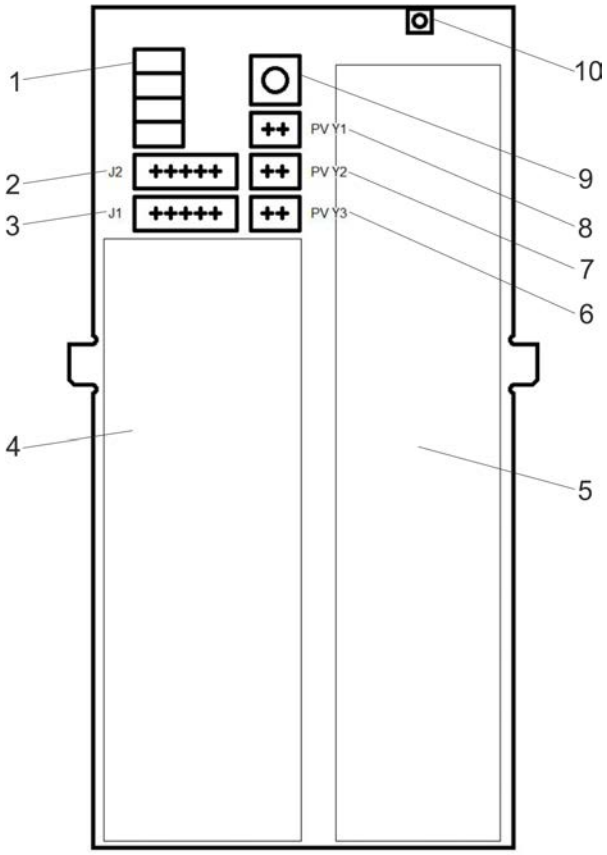

Fig.4: Printed circuit board switch-on type 24 VDC

Item	Designation	Function	Connector type	Pos. in spare parts list
1	DIP switch	DIP switch to change the tolerances		
2	J2	Signals	Plug connector Pico-Blade 5-pin / 3 wires	24.5
3	J1	Signals and power supply	Plug connector Pico-Blade 5-pin / 5 wires	24.1
4	Electronics			
5	Measuring track			
6	PV Y3	Control of pilot valve 3	Plug connector Pico-Blade 2-pin / 2 wires	63
7	PV Y2	Control of pilot valve 2	Plug connector Pico-Blade 2-pin / 2 wires	63 or 64
8	PV Y1	Control of pilot valve 1	Plug connector Pico-Blade 2-pin / 2 wires	63
9	Reset	Button to trigger reset		
10	LED	LED to signal the state		

Printed circuit board switch-on type AS interface

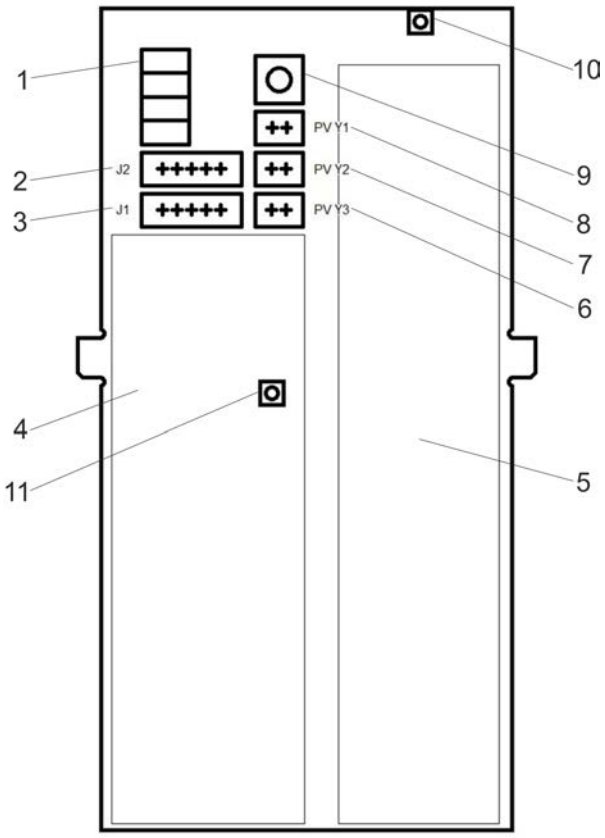

Fig.5: Printed circuit board switch-on type 24 VDC

Item	Designation	Function	Connector type	Pos. in spare parts list
1	DIP switch	DIP switch to change the tolerances		
2	J2	not assigned		
3	J1	Signals and power supply	Plug connector Pico-Blade 5-pin / 2 wires	24.3
4	Electronics			
5	Measuring track			
6	PV Y3	Control of pilot valve 3	Plug connector Pico-Blade 2-pin / 2 wires	63
7	PV Y2	Control of pilot valve 2	Plug connector Pico-Blade 2-pin / 2 wires	63 or 64
8	PV Y1	Control of pilot valve 1	Plug connector Pico-Blade 2-pin / 2 wires	63
9	Reset	Button to trigger reset		
10	LED	LED to signal the state		
11	ASi state LED	LED to signal the state according to ASi specification		

3.2 Functional description

3.2.1 Operation Principle

The FLOWVENT Control Top works with a microprocessor that contains the software for operation, visualization and intelligent position detection. The valve stroke is detected by a contactless position measuring system integrated in the control top and the information is supplied to the microprocessor.

Pneumatic and electronic modules are located inside the control top. The pneumatic modules in this case are solenoid valves, the number of which varies between 0 and 3, depending on the intended purpose. Control air is supplied to the relevant control air chambers via air connections at the outside of the control top.

The main control air is supplied to the actuator via a separate air connection on the control top through a hose. The exhaust air of the main actuator is discharged via an air connection with sound absorber or optionally via an adjustable exhaust air throttle. The exhaust air from the optional lifting actuators is discharged via separate air connections with sound absorber.

If the FLOWVENT Control Top is used only as a position indicator without a pilot valve, the control air supply must be connected directly to the air connection of the main actuator.

Due to the illuminated dome integrated in the cap of the control top the light emitting diode arranged on the evaluation electronics can be seen even if the hood is closed. The light-emitting diode allows visualization of the main functions of the valve, see Section 6.5, Page 45

3.2.2 Control top without solenoid valves

The FLOWVENT Control Top, without pilot valves, functions as a position indicator During and after SETUP it indicates the status of the process valve locally by a coloured LED under the illuminated dome so that it is visible over a long distance.

The position feedback signals are supplied to the user in one of the following ways, depending on the communication method selected:

- 24V DC PNP switching output
- AS interface data bit

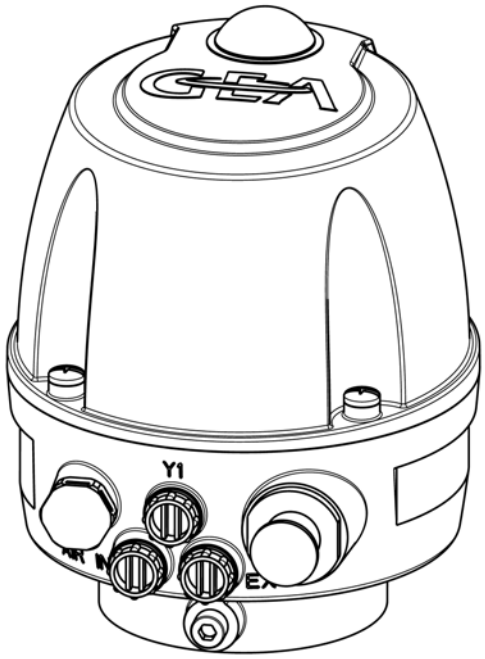

Fig.6

3.2.3 Control Top with Solenoid Valves

The control top with solenoid valves acts as a control top. During and after SETUP it indicates the status of the process valve locally by coloured LEDs under the illuminated dome so that it is visible over a long distance. The position feedback signals are supplied to the user in one of the following ways, depending on the communication method selected:

• 24V DC PNP switching output

• AS interface data bit

with the difference being that the solenoid valve integrated in the base is operated in accordance with the control signals. Depending on the design of the process valve, up to 3 solenoid valves can be installed in the control top.

An NO solenoid valve can be used as compressed air support for the actuator spring (only 2 solenoid valve variants possible).

The control signals are given by the user's process control system or by operating the solenoid valves manually. To do this, use a screwdriver to turn the screw (S) from 0 to 1, see figure.

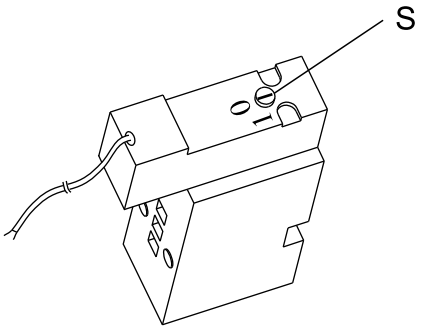

Fig.7

3.2.4 Control Top with Cap

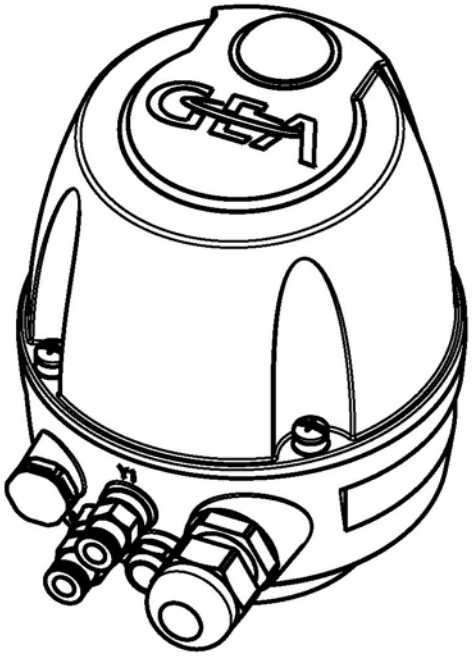

Fig.8: Control Top with Cap

The FLOWVENT Control Top is suitable for use in accordance with protection class IP66 and IP67 (EN 60529) in this design and with proper installation of the electric and pneumatic connections.

Observe the general instructions regarding ESD protection.

3.2.5 Safety Air Exhaust/Installation Position

To provide protection against excess pressure which can build up inside the FLOWVENT Control Top, a venting screw (52) with pressure compensation membrane is fitted in the base

In the unlikely event of a damaged solenoid valve or in case of sealing problems, pressure relief is ensured through this.

Hint!

After excess pressure has occurred in the control top, the venting screw (52) must be replaced in order to further guarantee the IP protection class.

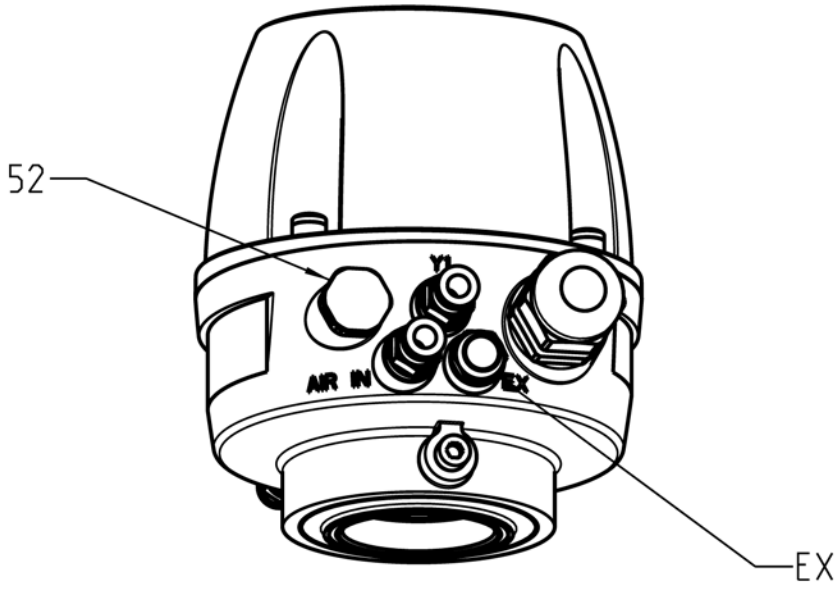

Fig.9: Control Top with Cap

This venting screw (52) is a safety device that must be handled as such and must not be covered. When fitting the control top note that the installation position of the further venting screws (Ex) must never be pointing vertically upwards.

3.2.6 Reset Function / Activating Automatic Programming Mode

In order to change saved positions (e.g. after seal replacement), the saved positions have to be deleted (reset). The reset button must be pressed for 3 – 7 sec. for this.

- Reset function is possible live.
- After the button has been pressed for 3 seconds, the reset is initiated and the LED goes off.
- The actual reset is carried out as soon as the button is released. This must take place within 4-7 seconds of pressing.
- If the reset switch is not released after 7 seconds, no reset takes place and the previously learnt actuated and non-actuated positions are retained and/or normal mode is resumed. It is irrelevant how long the reset switch is pressed.
- The learning process starts automatically 1-2 seconds after reset

→ Red steady light for 1-2 seconds. The LED flashes red until the signal of the non-actuated position is recorded.

- Learning process for non-actuated position completed.

→ Steady light green (with DIP1=0) with additional flashing of the yellow LED (green 750 ms/ yellow 250 ms) or yellow steady light (with DIP1=1) with additional flashing of the green LED (yellow 750 ms/ green 250 ms)

Position of the non-actuated position within the tolerance is signalled with the LED as steady light in accordance with Section 5.5.2, Page 31 and Section 5.5.3, Page 32! As long as the actuated position has not been saved, the position of the non-actuated position is signalled within the tolerance with the LED as steady light and additional flashing of the LED

To set the end position, activate pilot valve Y1 for the main stroke (activate it by using the manual operation or preferably by controlling it through the superimposed control). Learning is completed when actuated and non-actuated position have been detected and learnt. If voltage is only switched off with one learnt position, the position already learnt is discarded. If the actuated and non-actuated positions have been detected and learnt, the saved positions are retained when the device is switched back on again following disconnection of the voltage supply. If the positions of the non-actuated and actuated position are saved, the detection of every position outside the position tolerance is signalled by the yellow or green LED flashing, see Section 5.5.2, Page 31 and Section 5.5.3, Page 32.

Observe the general instructions regarding ESD protection!

Hint!

For process valves with air-assisted actuator spring, manual operation must be performed using a screwdriver on both pilot valves, Y1 (NC) and Y2 (NO).

If there is no manual operation available on pilot valve Y2 (NO), the end position must be activated through the superimposed control!

4 Transport and storage

4.1 Storage conditions

You must first dry and preserve the control top to prevent damage if the control top is exposed to temperatures ≤ 0°C during transport or storage.

Hint!

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

4.2 Transport

For transport, the following principles apply:

- Only use suitable lifting gear and slings for transporting the package units/ control tops.
- Observe the pictograms on the package.
- The synthetic materials of the control tops are susceptible to breaking. Take care when transporting the control top. Do not grip sensitive parts of the unit to lift or push the unit or to support yourself.
- The switch bar is fragile and must therefore be protected against mechanical impact.

4.2.1 Scope of supply

After taking delivery of the component, check if

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

5 Technical data

5.1 Type plate

The type plate is used to uniquely identify the control top.

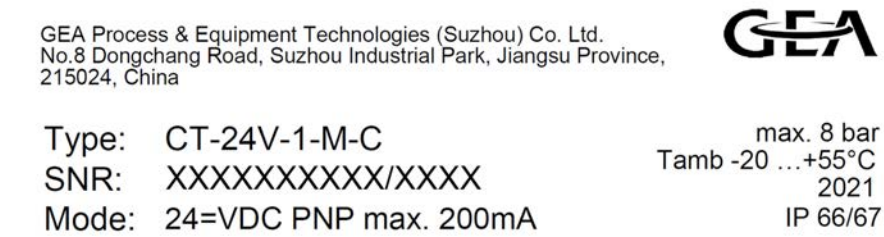

Fig.10

Code/Type	CT	24V	3	M	T	S
Item in the order code	1	2	3	4	5	6

Explanation of the items in the order code		
Item in the order code	**Designation**	**Explanation**
1	**Feedback location**	
	CT	FLOWVENT Control Top
2	**Type of interface/mode**	
	24V	24VDC (PNP) communication (max. 200 mA)
	ASi	AS interface BUS communication (max. 150 mA)
3	**Solenoid valves**	
	0	without solenoid valve
	1	1 solenoid valve (Y1=NC)
	2	2 solenoid valves (Y1=NC and Y2=NO)
	3	3 solenoid valves (Y1, Y2 and Y3=NC)
4	**Air connection**	
	M	Metric connections
	N	Imperial connections
5	**Cable connection**	
	C	M12 connector 24VDC= 5- or 8-pole M12 connector ASi= 5-pole M12 connector
	T	Terminal strip (24V version only)

Explanation of the items in the order code		
Item in the order code	**Designation**	**Explanation**
6	**Options (multiple selection possible)**	
	A	ASi junction box on cable 1m with M12 junction box for
	S	Supply air throttle: regulates the opening speed of the valves
	S	Exhaust air throttle: regulates the closing speed of the valves
	5	5-pole M12 connection box (material no. 508-963)
	8	8-pole M12 connection box (material no. 508-061)

5.2 Technical data

Refer to the following tables for the key technical data of the control top:

Technical data: temperatures and compressed air supply	
Designation	**Description**
Ambient temperature	-20 to +55 °C
Control air	acc. to ISO 8573-1:2010
- Solid particle content:	Quality class 6 (recommended) Particle size max. 5 µm Particle density max. 5 mg/m^3
- Water content:	Quality class 4 max. dew point +3 °C If the unit is used at higher altitudes or at low ambient temperatures, the dew point must be adapted accordingly.
- Oil content:	Quality class 3 preferably oil free, max. 1 mg oil to 1 m^3 air
Air hose	
- metric	Material PE-LD Outside Ø 6 mm +/ -0.1 mm Inside Ø 4 mm
- Inch	Material PA Outside Ø 6.35 mm +/ -0.1 mm Inside Ø 4.3 mm

Technical data: temperatures and compressed air supply	
Designation	**Description**
Control air pressure	max 8 bar, min 2 bar
Sound pressure level using sound absorber	max. 73 dB

Technical data: materials	
Designation	**Description**
Housing	PA 12/L
Seals	EPDM, FKM and NBR

Technical data: electrical specifications	
Designation	**Description**
Protection class EN 60529	Standard: IP66 - powerful water jet Standard: IP67 - immersion
Fitting position	any position
EC EMC directives	2014/30/EU
Immunity for industrial environments	EN 61000-6-2: 2005
Radio frequency interference	EN ISO 61000-6-4:2007 + A1: 2011
EC Low Voltage Directive	73/23/EEC
Electrical wiring configuration	– 5-pole M12 round connector or – 8-pole M12 round connector only with version 24 V with 3 solenoid valves – Terminal strip

Hint!

Switching point tolerances, see Section 5.5, Page 31

5.3 Specification for Evaluation Electronics 24V DC Version

Type designation: 221-007105

Technical data: supply	
Designation	**Description**
Supply voltage UV	24 V DC (+20 % … -15 %)
Current consumption	
– No-load current	≤ 30 mA

Technical data: supply	
Designation	**Description**
– per solenoid valve NC	35...45 mA
– per solenoid valve NO	65...75 mA
– Max. load of the feedback	50 mA
Total	approx. 200 mA

Technical data: outputs	
Designation	**Description**
Output voltage	High = UV - ≤ 1 V Low = ≤ 5 V
Fuse protection of the outputs	100 mA short circuit proof
Switching frequency (ohmic + inductive loads ≤ 25 mH)	2 Hz

5.4 Specification for AS-Interface Adapter Module

Type designation: 221-007106

Technical data: supply	
Designation	**Description**
Operating voltage U_V	21…31.6 V DC
Current consumption - No-load current	 ≤ 30 mA
- one solenoid valve NC	35...45 mA
- one solenoid valve NO (air support for variant with 2 solenoid valves)	65...75 mA
Total	approx. 150 mA
ASi specification	V3.0 (max. 62 slaves with master V3.0)
Configuration (ASi profile)	7.A.7.E
Reverse voltage protection	yes
When using an A/B slave with a version 2.0 ASI master, it must be ensured that parameter P3 = 1 and output DO3 = 0 are set.	

Technical data: inputs as seen from the AS-interface master		
Bit	**Function**	**Signal**
DI0*	Feedback Main stroke	1 = valve in non-actuated position 0 = valve outside tolerance for non-actuated position
DI1*	Feedback Main stroke	1 = valve in actuated position 0 = valve outside tolerance for actuated position
DI2		not assigned
DI3		not assigned
* Assignment for green colour variant		

Technical data: outputs as seen from the AS-interface master		
Bit	**Function**	**Signal**
DO0	**PV Y1** Activation of solenoid valve Y1	1 = solenoid valve activated 0 = solenoid valve not activated
DO1	**PV Y2** Activation of solenoid valve Y2	1 = solenoid valve activated 0 = solenoid valve not activated
DO2	**PV Y3** Activation of solenoid valve Y3	1 = solenoid valve activated 0 = solenoid valve not activated
DO3	Reserved for A/B identification	

ASi light-emitting diode

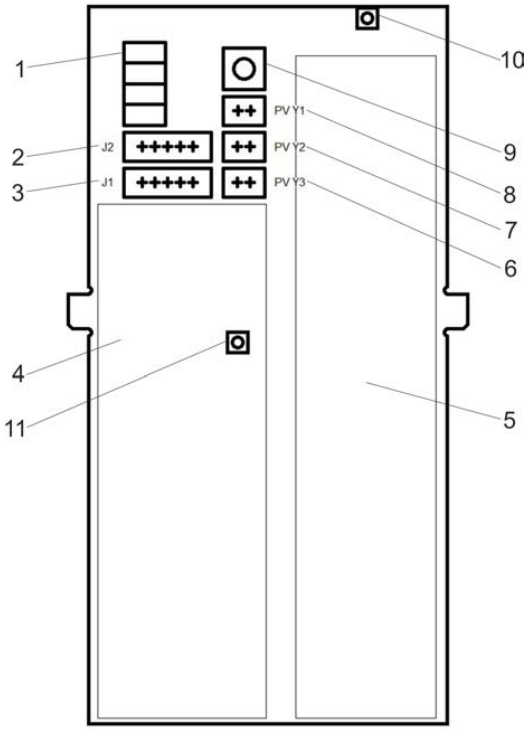

Fig.11

Light-emitting diode (LED)

- Colour green, status: steady light - data exchange active
- Colour red, status: steady light - no data exchange
- Colour red, status: flashing - peripheral device fault
- Colour: red / yellow, status: flashing - no data exchange / address 0.
- Colour: red / green, status: flashing - peripheral device fault.

5.5 Switching point tolerances and signal output

5.5.1 Switching point tolerances

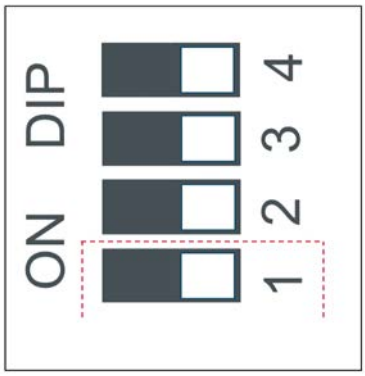

Fig.12: DIP switch setting for valves without air support.

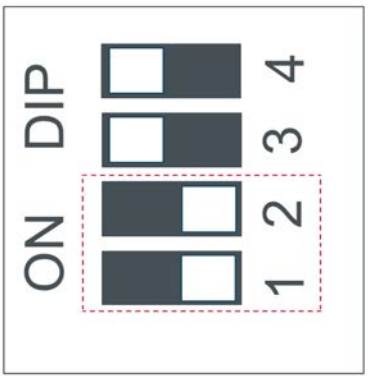

Fig.13: DIP switch setting for valves with air support.

Signal processing				
DIP 2	**DIP 3**	**DIP 4**	**Tolerance**	**Valve type**
0	0	0	0.7 mm	Seat valve*
0	1	1	1.0 mm	Valves with air support (D33+L)
* Factory setting				

Hint!

Only use the DIP switch configurations shown. Further positions lead to non-intended use.

5.5.2 Signal output

Main stroke - signal output								
Pilot valve actuation			**Valve position**	**DIP switch**	**Illumination**		**Feedback**	
PV Y1	**PV Y2**	**PV Y3**		**1**	**Green**	**Yellow**	**S1**	**S2**
0	0	0	not actuated	0	1	0	1	0
1	0	0	Main stroke / stroke in S1 tolerance	0	1	0	1	0
1	0	0	Main stroke / stroke movement	0	0	1Hz	0	0
1	0	0	main stroke / stroke in S2 tolerance	0	0	1	0	1
0	0	0	main stroke / stroke in S2 tolerance	0	0	1	0	1
0	0	0	Main stroke / stroke movement	0	1Hz	0	0	0
0	0	0	not actuated	0	1	0	1	0

Lower lift stroke - signal output								
Pilot valve actuation			**Valve position**	**DIP switch**	**Illumination**		**Feedback**	
PV Y1	**PV Y2**	**PV Y3**		**1**	**Green**	**Yellow**	**S1**	**S2**
0	1	0	lower lift stroke actuated	0	1	0	1	0

Upper lift stroke - signal output								
Pilot valve actuation			Valve position	DIP switch	Illumination		Feedback	
PV Y1	PV Y2	PV Y3		1	Green	Yellow	S1	S2
0	0	1	lower lift stroke actuated	0	1	0	1	0

5.5.3 Signal output inverted

Main stroke - signal output inverted								
Pilot valve actuation			Valve position	DIP switch	Illumination		Feedback	
PV Y1	PV Y2	PV Y3		1	Green	Yellow	S1	S2
0	0	0	not actuated	1	0	1	0	1
1	0	0	Main stroke / stroke in S2 tolerance	1	0	1	0	1
1	0	0	Main stroke / stroke movement	1	1Hz	0	0	0
1	0	0	Main stroke / stroke in S1 tolerance	1	1	0	1	0
0	0	0	Main stroke / stroke in S1 tolerance	1	1	0	1	0
0	0	0	Main stroke / stroke movement	1	0	1Hz	0	0
0	0	0	not actuated	1	0	1	0	1

Lower lift stroke - signal output inverted								
Pilot valve actuation			Valve position	DIP switch	Illumination		Feedback	
PV Y1	PV Y2	PV Y3		1	Green	Yellow	S1	S2
0	1	0	lower lift stroke actuated	1	0	1	0	1

Upper lift stroke - signal output inverted								
Pilot valve actuation			Valve position	DIP switch	Illumination		Feedback	
PV Y1	PV Y2	PV Y3	1	1	Green	Yellow	S1	S2
0	0	1	lower lift stroke actuated	1	0	1	0	1

5.6 Accessories

Accessories must be ordered separately.

Accessories	Part no.
Cable socket, angular – M12; 5-pole: A coded	508-963
Cable socket, straight – M12; 8-pole: A-coded	508-061
Cable socket, straight – M12; with 1 m cable and ASI insulation displacement terminal	508-027
Supply air throttle for reducing the opening speed of the main stroke (connection Air IN with screw-in plug connection item 6)	603-042
Supply air throttle for reducing the closing speed of the main stroke (exhaust air outlet EX Y1 with sound absorber item 21)	603-042

5.7 Lubricants

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

5.8 Equipment

Technical data - equipment	
Equipment	**Material no.**
Solenoid valve • 24 V DC/NO (+15% / -12.5%), 1.8 W • Ambient temperature: -10...+50°C • Protection class IP 51 • Pressure range: 1.5...10 bar	512-168
Solenoid valve • 24 V DC/NC (+20% / -12.5%), 0.85 W • Ambient temperature: -20...+60°C • Protection class IP 51 • Pressure range: 2.0...8.0 bar	512-169
Sound absorber G 1/8" • Filter material: stainless steel wool • Ambient temperature: -20...+150°C • Volume flow rate: 900 l/min • max. pressure 10 bar	933-175

Technical data - equipment	
Equipment	**Material no.**
Supply/exhaust air throttle G 1/8" • Filter material: sintered stainless steel • Pressure range: 0.2 ... 10 bar • Gradually adjustable flow at Δp 6 bar: 310 dm^3 / min_n • Ambient temperature: -10 ... +70 °C • Flow rate setting at 0 ... +70 °C	603-042
Venting screw MIV M12 x 1.5 • with membrane • Material: polyamide • Volume flow rate: 2,000 ml/min (dp=70 mbar)	933-181

6 Assembly and installation

6.1 Safety instructions

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

For installation, the following principles apply:

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

6.2 Establishing hose connections

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

Tools required:

- Hose cutter

Carry out the following steps:

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

→ Done.

Hint!

Avoid kinks in the pneumatic hoses!

6.3 Pneumatic connections

6.3.1 Control top without solenoid valves

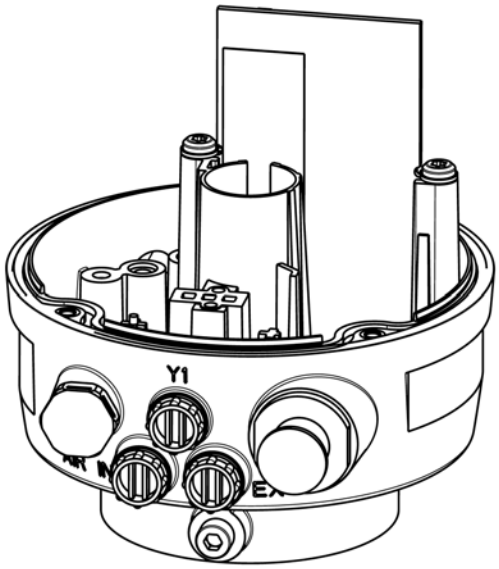

Fig.14: Connect the control air supply directly to the air connection of the main actuator

The FLOWVENT Control Top, without pilot valves, functions as a position indicator During and after SETUP it indicates the status of the process valve locally by a coloured LED under the illuminated dome so that it is visible over a long distance.

The position feedback signals are supplied to the user in one of the following ways, depending on the communication method selected:

- 24V DC PNP switching output
- AS interface data bit

6.3.2 Control top with 1 solenoid valve

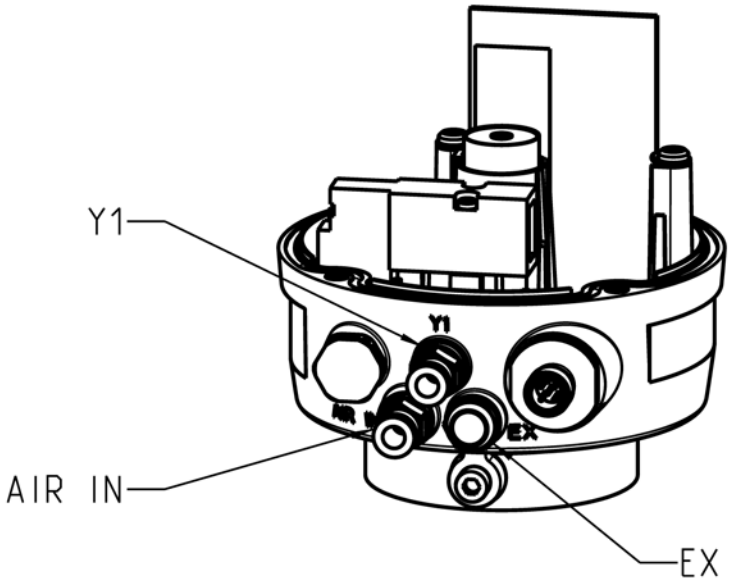

Fig.15

Ex	Exhaust air of the main stroke Y1 with sound absorber optional: exhaust air throttle - reduces the closing speed of the main stroke The Ex connection must not be closed!
Air In	Central air supply with integrated filter optional: supply air throttle - reduces the opening speed of the main stroke
Y1	Air connection for main stroke connection on the actuator

6.3.3 Control top with 2 solenoid valves

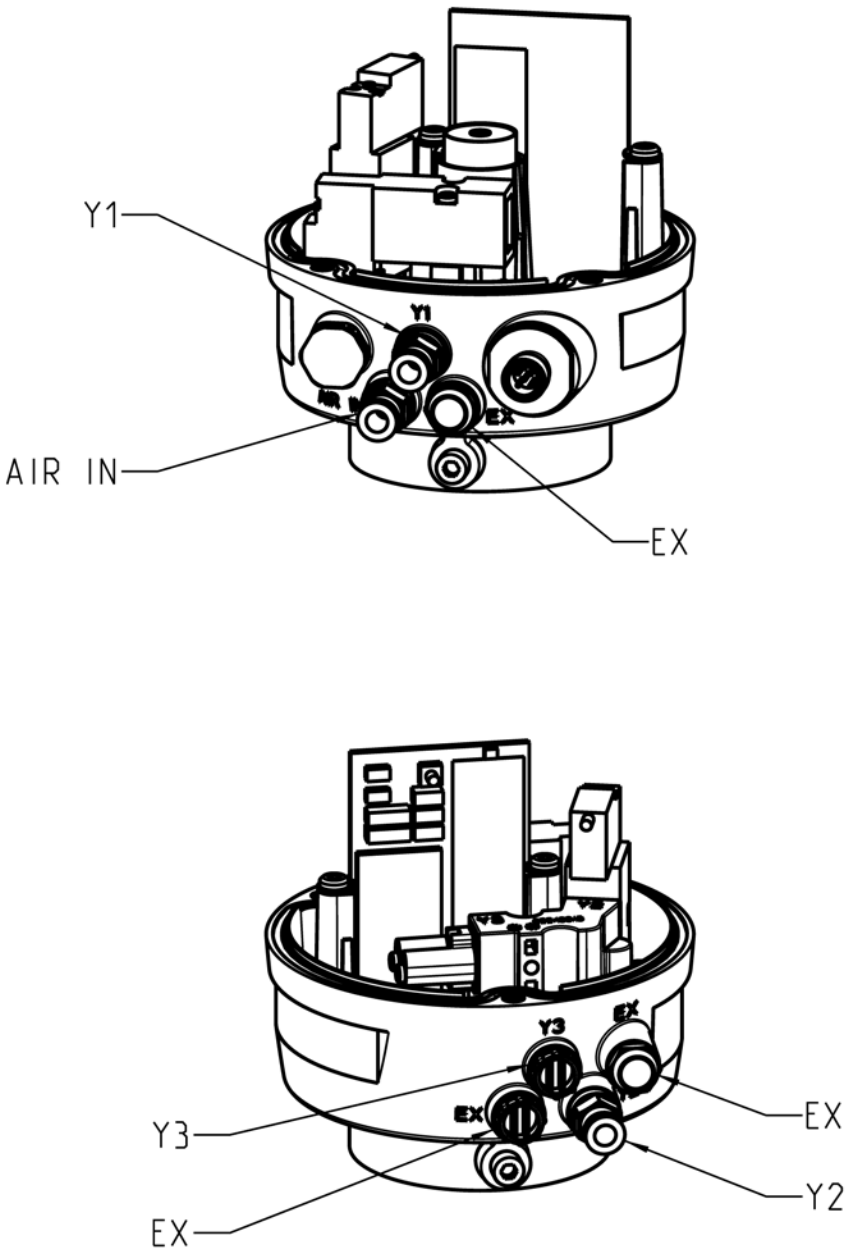

Fig.16

Ex	Exhaust air of the main stroke Y1 with sound absorber optional: exhaust air throttle The Ex connection must not be closed!
Air In	Central air supply with integrated filter optional: supply air throttle
Y1	Air connection for main stroke connection on the actuator

Y2	Air connection for spring-side air admission on the actuator
Ex	Exhaust air of the spring-side actuator: the Ex connection must not be closed!
Y3	Closed with locking screw
Ex	Closed with locking screw

6.3.4 Control top with 3 solenoid valves

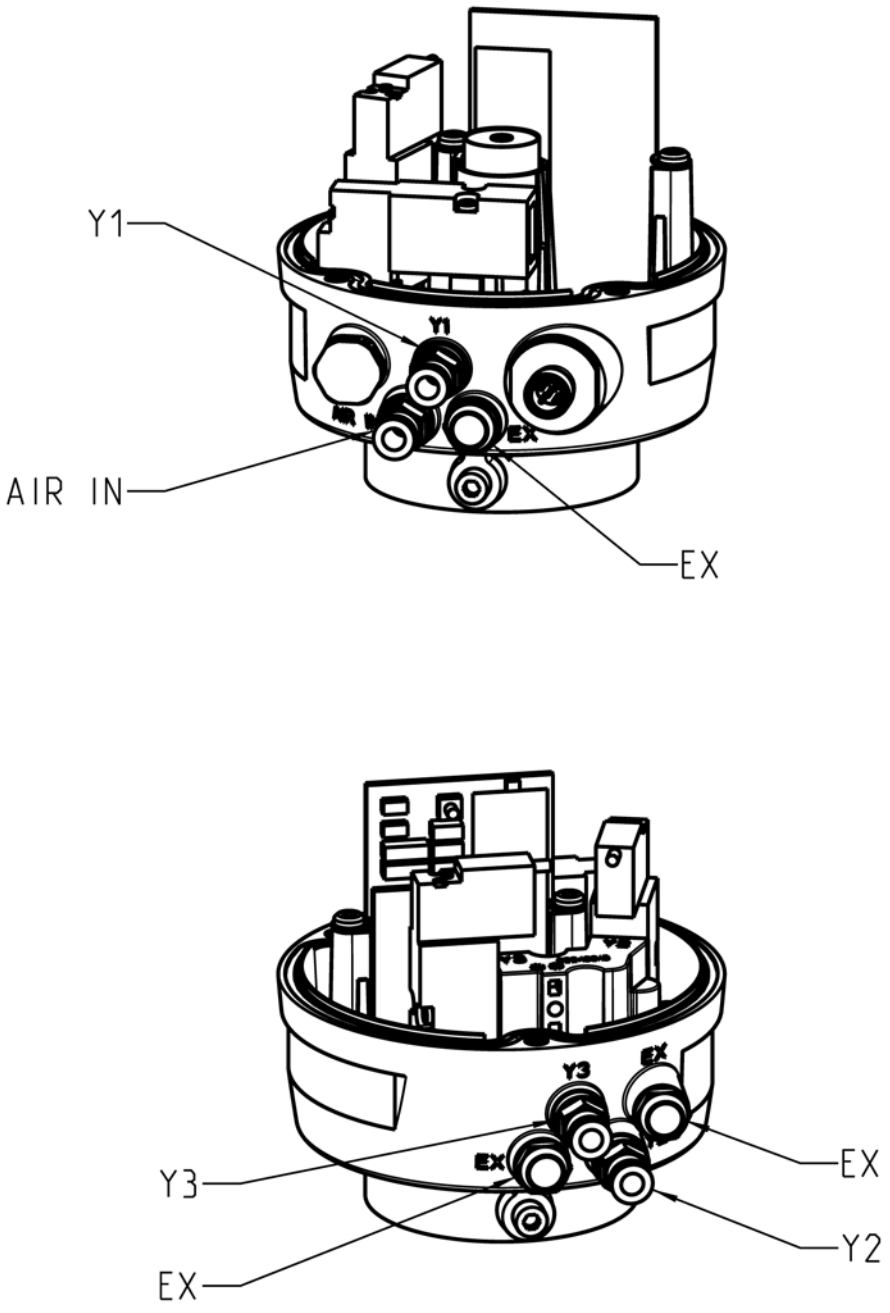

Fig.17

Ex	Exhaust air of the main stroke Y1 with sound absorber optional: exhaust air throttle - reduces the closing speed of the main stroke The Ex connection must not be closed!
Air In	Central air supply with integrated filter optional: supply air throttle - reduces the opening speed of the main stroke but also of the lift strokes.
Y1	Air connection for external main stroke connection
Y2	For FLOWVENT valves with lift: air connection for lifting the valve disk
Y3	For FLOWVENT valves with lift: air connection for lifting the double disk
Ex	Exhaust air of the lift actuator: the Ex connection must not be closed!
Ex	Exhaust air of the lift actuator: the Ex connection must not be closed!

6.4 Electrical connections

6.4.1 Overview

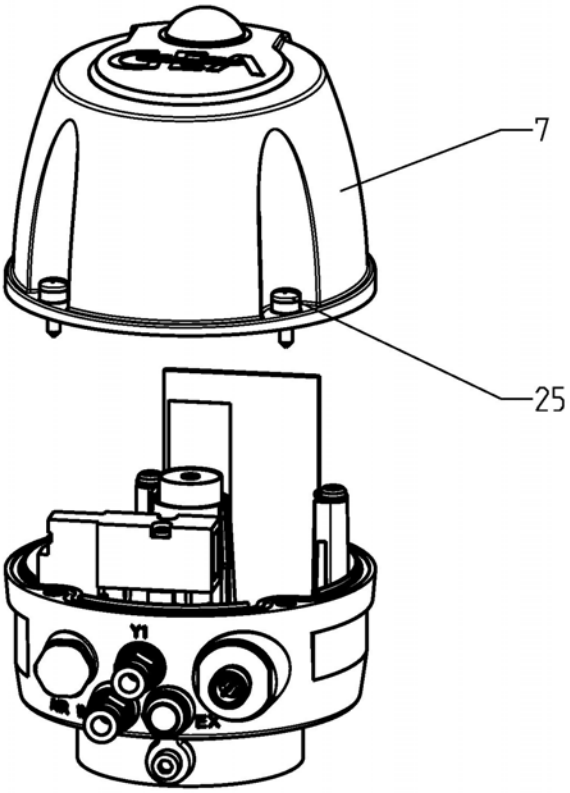

Fig.18

Danger

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

►

Carry out the following steps:

1. Release the cheese head screws (25) and take off the cap (7).

Hint!

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

The cables must be suitable for use in the required temperature range!

6.4.2 Electrical 24 V DC Wiring

6.4.2.1 Connector M12/5-pin (68.1)

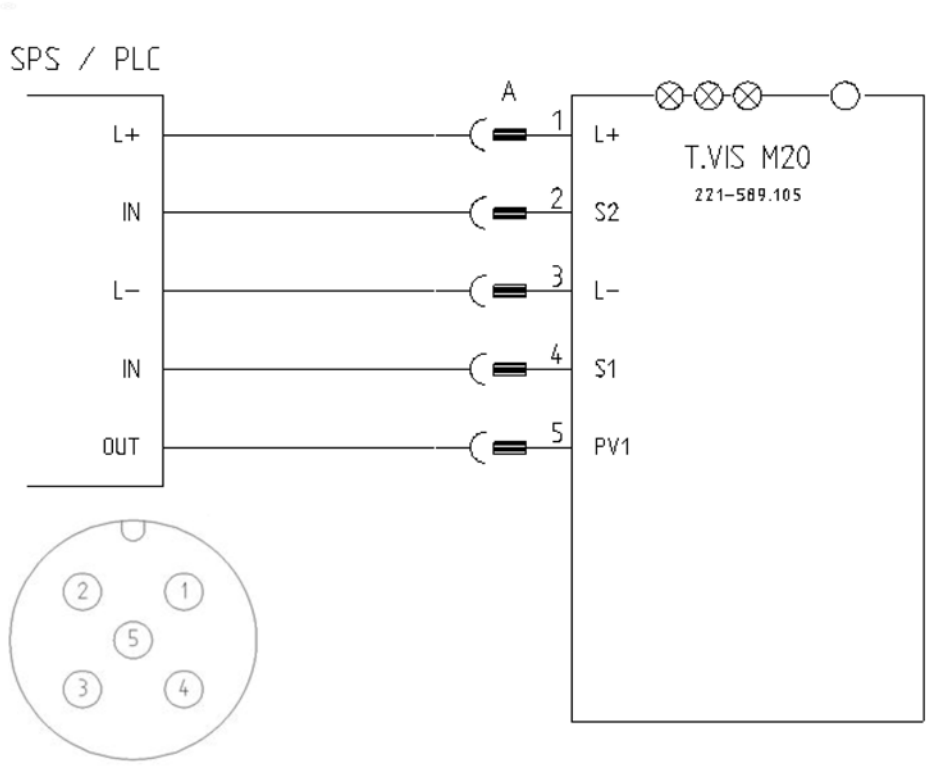

Fig.19: 5-pin M12 plug-in connector A-coded: device connector and view of pin strip

Corresponding cable socket part no. 508-963.

1	L+	U_V L+24 V DC supply voltage
2	S2	Feedback of actuated position*
3	L-	U_V L- reference potential
4	S1	Feedback of non-actuated position*
5	PV1	Actuation of solenoid valve Y1
*Assignment for colour variant green, see "Colour changeover" (Table signal output/ illumination inverted), see Section 5.5, Page 31		

Carry out the following steps:

1. Connect cable via air connector M12/5-pin.

→ Done.

6.4.2.2 Plug M12 / 8-pin (68.2)

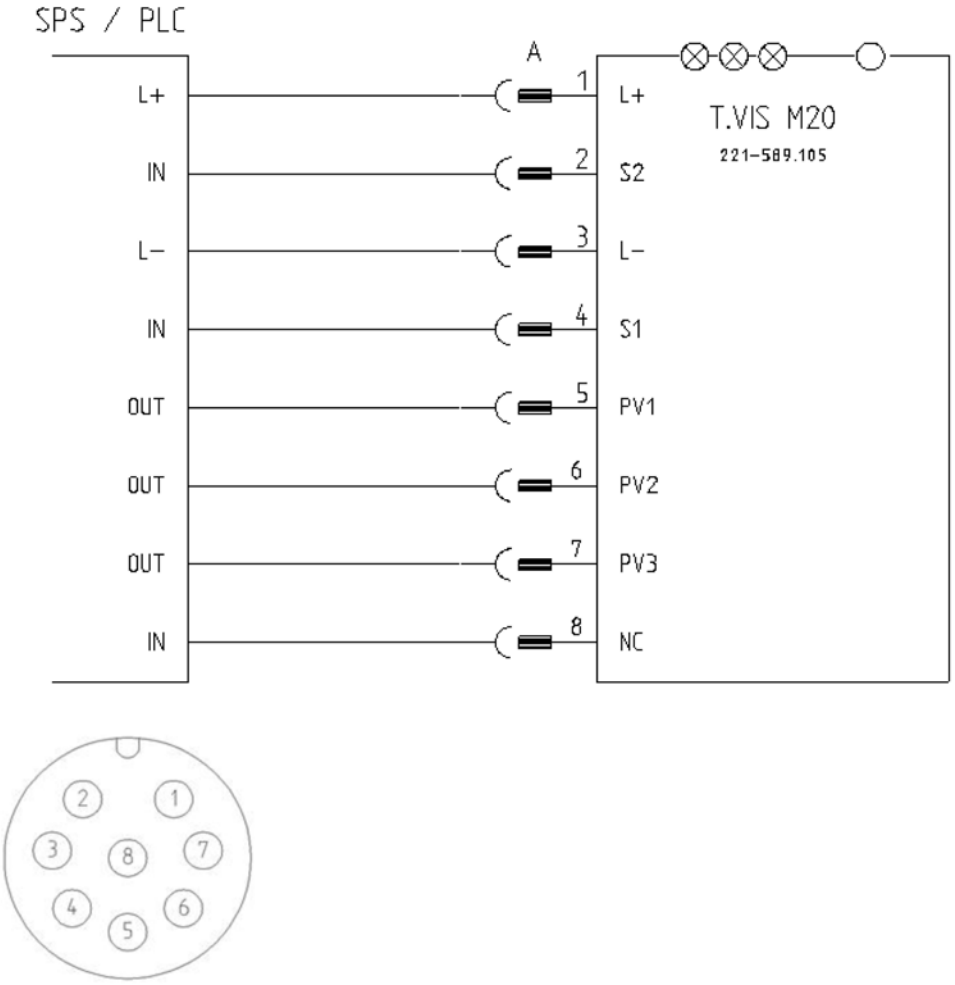

Fig.20: 8-pin M12 plug-in connector A-coded: device connector and view of pin strip

Corresponding cable socket part no. 508-061

1	L+	U_V L+24V DC supply voltage
2	S2	Feedback of actuated position*
3	L-	U_V L- reference potential
4	S1	Feedback of non-actuated position*
5	PV1	Actuation of solenoid valve Y1
6	PV2	Actuation of solenoid valve Y2
7	PV3	Actuation of solenoid valve Y3
*Assignment for colour variant green, see "Colour changeover" (Table signal output/ illumination inverted), see Section 5.5, Page 31		

Carry out the following steps:

1. Connect cable via air connector M12/8-pin.

→ Done.

6.4.2.3 Cable gland (24)

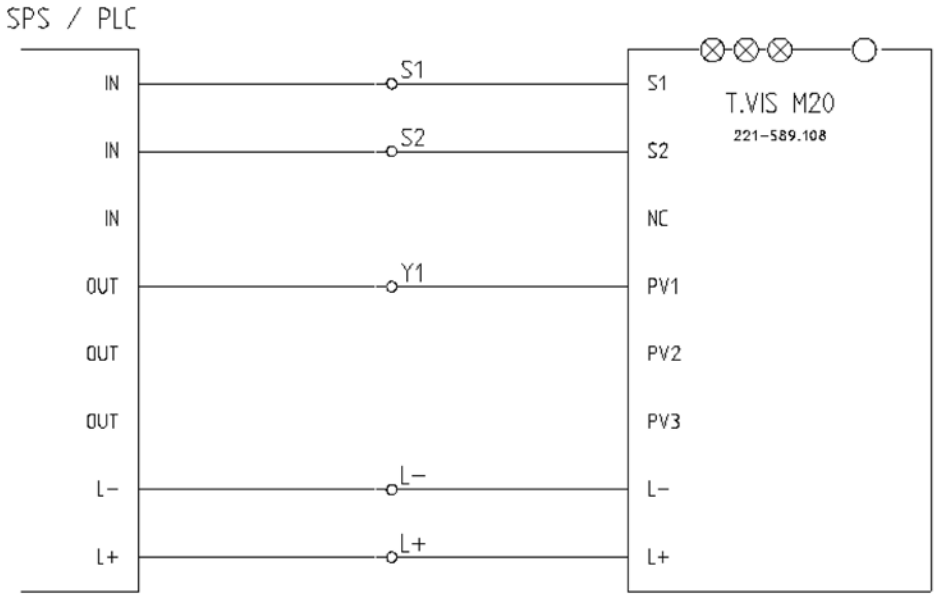

Fig.21: Terminal assignment of the terminal strip unit 24VDC (50)

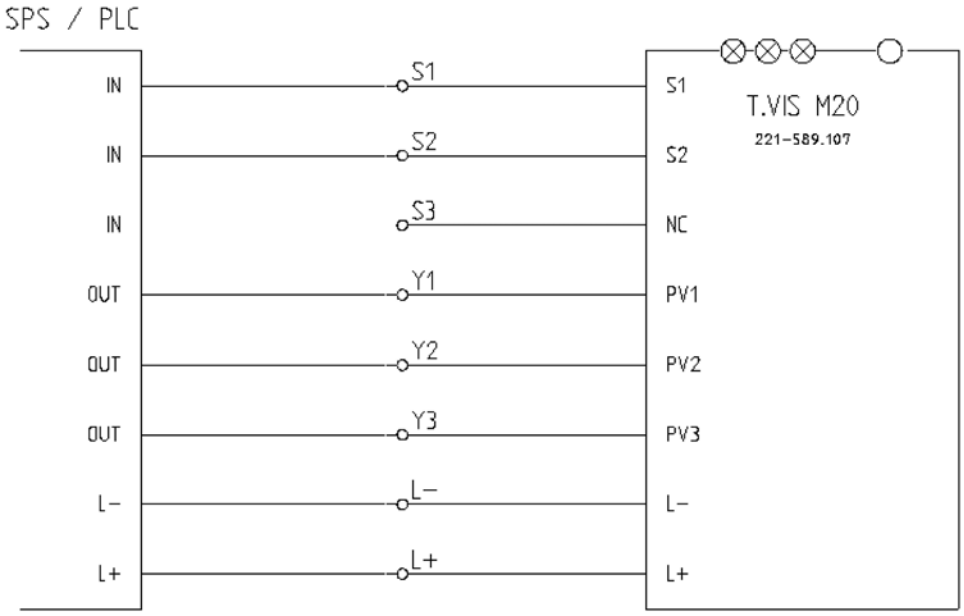

Fig.22: Terminal assignment of the terminal strip unit 24VDC (50)

Carry out the following steps:

1. Insert the cable (diameter 6-12 mm) through the cable gland (24) and connect to the terminal strip unit (78) in the control top according to the connection diagram.
   Use wires with ferrules, max. 1.5 mm².
2. Secure the cable in the cable gland at a torque of 2.5 Nm.

→ Done.

6.4.3 Electrical Wiring of AS-Interface

6.4.3.1 Connector M12 / 2-pin (24.3)

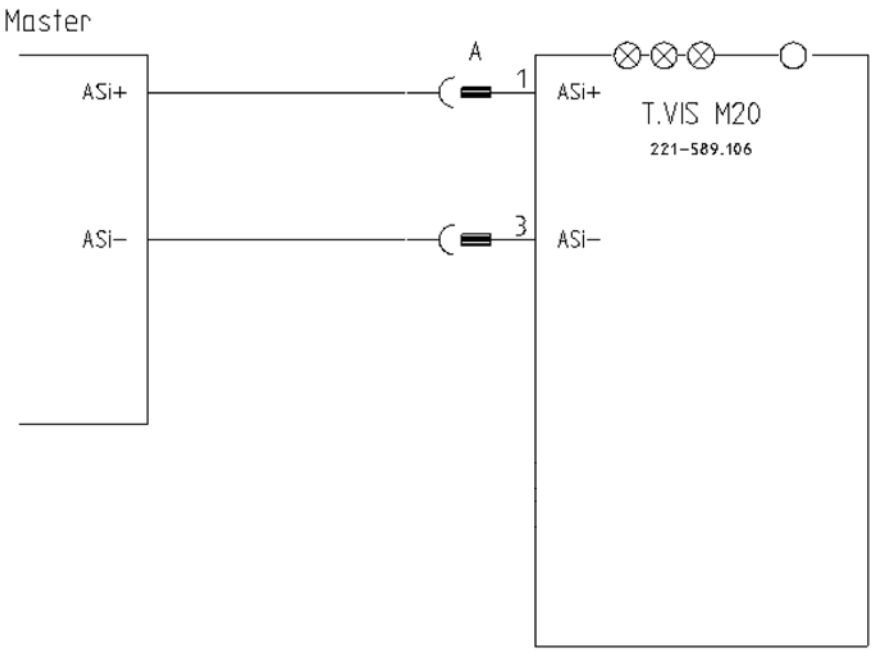

Fig.23

Corresponding cable sockets part no. 508-027 and 508-936.

1	AS-I+
2	Not connected
3	AS-I-
4	Not connected
5	Not connected

Carry out the following steps:

1. Connect cable via air connector M12/2-pin.

→ Done.

6.5 Visual Display

6.5.1 Colour Changeover

The "colour changeover" function allows you to swap the colour from green to yellow or yellow to green for the following visualizations: valve in non-actuated position, valve in actuated position and travel

Carry out the following steps:

1. Disconnect the control top from the power supply.
   Switch DIP 1 from position 0 to position 1.
   Switch the power supply back on.

→ Done.

Hint!

When the colours are swapped, the feedback signals are also swapped!

6.5.2 Illuminated dome

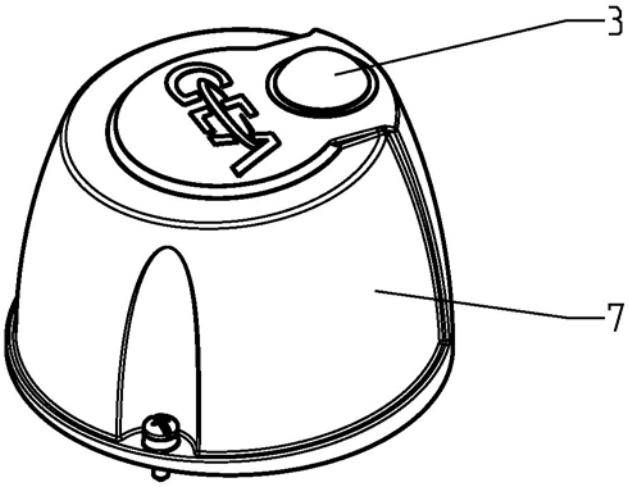

Fig.24

Key	
Position	**Description**
1	Cap
3	Illuminated dome

The following statuses are visualized by the illuminated dome:

- LED green, steady light: non-actuated position of the non-actuated process valve reached.
- LED green, steady light with yellow flashing light: non-actuated position saved or actuated position not yet reached after main stroke (green 750 ms/ yellow 250 ms).

- LED green, flashing: position between non-actuated and actuated position for movement towards the actuated position visualised by the green steady light (starting from the position previously visualised with yellow steady light).
- LED yellow, steady light: actuated position of the actuated process valve reached.
- LED yellow, flashing: position between non-actuated and actuated position for movement towards the actuated position visualised by the yellow steady light (starting from the position previously visualised with green steady light).
- LED red, flashing: fault/setup.
- LED red, flashing for 1 sec. / pause for 1 sec. / .... Default.
- There is a tolerance of 10% for all flashing cycles.

There is a power failure if no signal is displayed for more than 5 seconds!

6.6 Mounting the Control Top to FLOWVENT actuators

This chapter describes how the control top is mounted to and removed from FLOWVENT actuators. Observe the following notes when doing so.

Notice

The vent plug EX is a safety element.

If the element is not installed correctly or if the vent is covered, the safety function is no longer guaranteed.

► The installation position of the vent plug EX must never be pointing vertically upwards.
► The vent plug EX must never be covered.

6.6.1 Fitting to FLOWVENT Valves

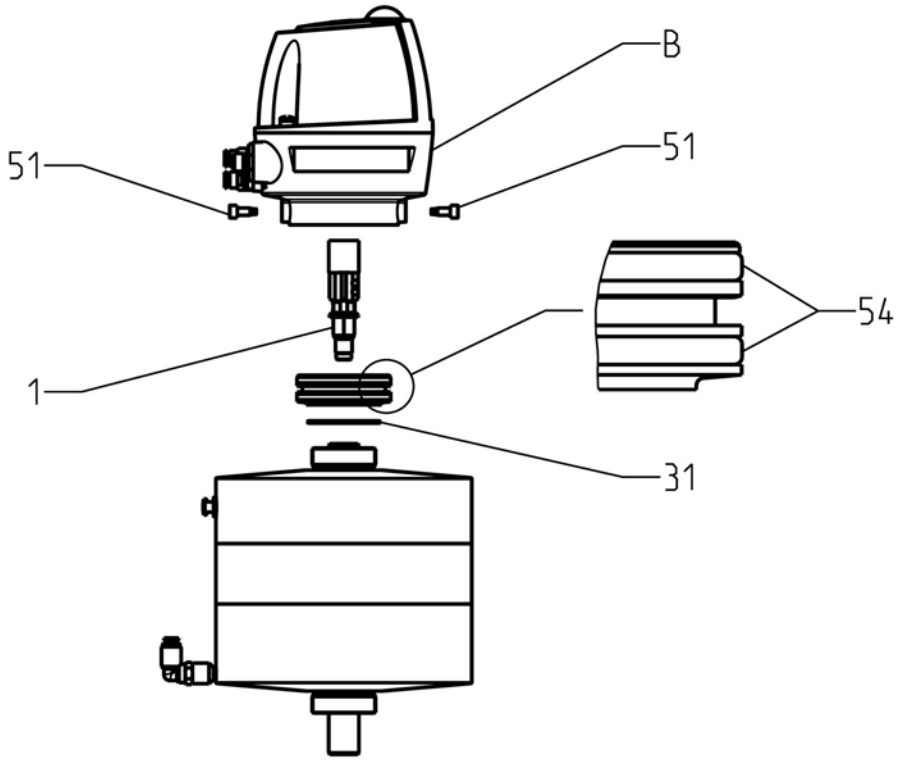

Fig.25

Requirement:

- Pay attention not to kink the air hoses when mounting the control top.

Carry out the following steps:

1. Insert the O-rings (54) into the upper and lower O-ring groove of the installation base.
2. Insert the O-ring (31) on the underside (thread side facing actuator) of the installation base
3. Lightly grease the O-rings (54, 31) and the inner thread of the installation base and then screw the installation base onto the actuator and tighten using a pin-face spanner and a torque of 20 Nm. When setting the torque heed the correction factor of the plug tool. If the plug tool (408-451) is used, the torque to be set is 15 Nm.
4. Screw switch bar (1) into the actuator and tighten with SW 13, torque 2 Nm (1.4 lbft).
5. Fit the control top (B) over the switch bar (1) onto the installation base and push until stop. For optimum assembly the O-rings (54) should be slightly greased.
6. Turn the control top into the required position and tighten the two hexagon socket screws (51) at the side to 3 Nm (base/ installation base).

7. Use an air hose (L) to connect the air connection (Y1) on the control top with the connection Y1 on the valve actuator. In the case of a FLOWVENT valve and control tops with lift stroke, connect the air connections Y2 and Y3 to the connections Y2 and Y3 of the valve actuator. In the case of valves with air assist, connect Y2 to connection Y2 of the valve actuator.
8. Fit the hood (7) and tighten the screws to 1 Nm.
9. Carry out commissioning, see Chapter 7, Page 50.

→ Done.

7 Start-up

7.1 Safety precautions

Initial commissioning

For initial commissioning, the following principles apply:

- Take protective measures against dangerous contact voltages in accordance with pertinent regulations.
- The control top 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.
- After conversion of the control top, residual risks must be reassessed.

Commissioning

For commissioning, the following principles apply:

- Only allow properly qualified staff to set the control top into operation.
- Make sure all connections are properly established.
- The safety devices for the control top must be complete, fully functional and in perfect condition. Check the function before starting any work.
- When the control top is switched on, the danger zones must be free.

7.2 Commissioning – Control Top without Solenoid Valves

Commissioning can take place if the control top has been mounted correctly on the valve and if the electrical and pneumatic connections have been established correctly.

Requirement:

- The process valve must be in the safety position, i.e. an external solenoid valve must not be actuated.

Carry out the following steps:

1. Check the function of the external solenoid valve.
2. Switch on the power supply.
3. (If already programmed) activate automatic programming mode (keep reset key pressed for 3 - 7 sec.), see Section 3.2.6, Page 22
4. The learning process starts automatically 1 - 2 seconds after reset.

→ Red steady light for 1 - 2 seconds.

As long as the actuated position has not been saved, the position of the non-actuated position is signalled within the tolerance with the LED as steady light and additional flashing of the LED, see Section 6.5.1, Page 46.

→ Steady light green (with DIP1=0) with additional flashing of the yellow LED or yellow steady light (with DIP1=1) with additional flashing of the green LED

If necessary, activate the external solenoid valve until the process valve has reliably reached its actuated end position.

Learning is completed when actuated and non-actuated position have been detected and learnt. If voltage is only switched off with one learnt position, the position already learnt is discarded. After the voltage supply has been disconnected, the saved positions remain when switched back on again!

5. Deactivate external solenoid valve.

→ Actuated position programming completed.

Hint!

When the colours are swapped, the feedback signals are also swapped!

Checking the Control Top

Carry out the following steps:

6. Activate and deactivate the external solenoid valve in order to check the proper function of the T.VIS feedback signals.

→ This completes commissioning.

7.3 Commissioning - Control Top with Solenoid Valves

Hint!

Commissioning can take place if the control top has been mounted correctly on the valve and if the electrical and pneumatic connections have been established correctly.

Activating the Control Top

Carry out the following steps:

1. Switch on the control air supply.
2. Check the valve functions by activating the solenoid valves:

→ Switch all of the solenoid valves on and off again one after the other in the order Y1, Y2 and Y3 – if fitted.

→ Use a screwdriver to turn the screw (S) 0 in direction 1.

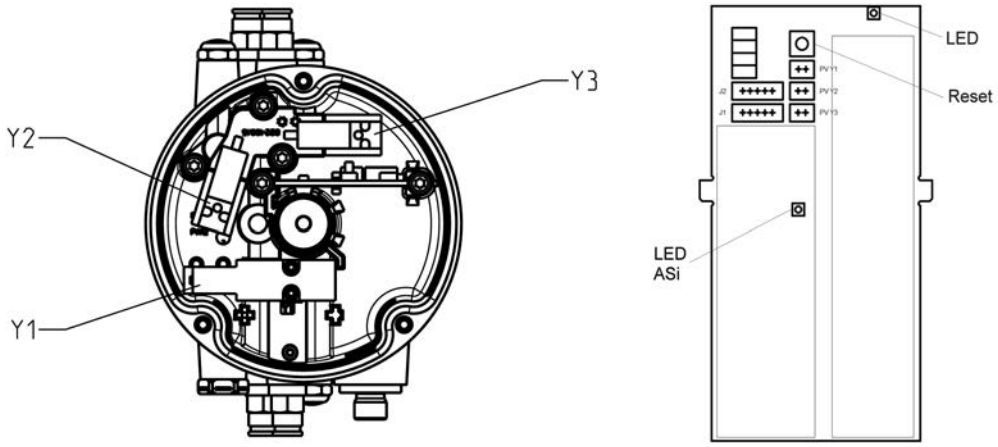

Fig.26

3. Switch on the power supply.
4. Activate automatic programming mode (keep reset key pressed for 3 - 7 sec.), see Section 3.2.6, Page 22.
5. The learning process starts automatically 1 - 2 seconds after reset.

→ Red steady light for 1 - 2 seconds.

As long as the actuated position has not been saved, the position of the non-actuated position is signalled within the tolerance with the LED as steady light and additional flashing of the LED, see Section 6.5.1, Page 46 .

6. Activate solenoid valve Y1 (activate by operating the manual override device or by actuation of the higher-order control).

   Learning is completed when actuated and non-actuated position have been detected and saved. If voltage is only switched off with one learnt position, the position already learnt is discarded.

   If the actuated and non-actuated positions have been detected and learnt, the saved positions are retained when the device is switched back on again following disconnection of the voltage supply. If the positions of the non-actuated and actuated position are saved, the detection of every position outside the position tolerance is signalled by the yellow or green LED flashing, see Section 6.5.1, Page 46.

7. Deactivate the solenoid valve.

→ After completion of end position programming, the colours in the illuminated dome change cyclically. After stable positioning, after main stroke travel, illumination see Section 6.5.1, Page 46

→ Steady light green (with DIP1=0) with additional flashing of the yellow LED or yellow steady light (with DIP1=1) with additional flashing of the green LED, see Section 5.5, Page 31.

→ The control top is activated.

Hint!

When the colours are swapped, the feedback signals are also swapped!

Checking the Control Top

Carry out the following steps:

8. Activate the solenoid valves in succession via the PLC in order to check the proper function of the FLOWVENT Control Top feedback signals.
9. The I/O test can take place parallel to commissioning.

→ This completes commissioning.

7.4 Service Function

Caution!

Spring tension on the process valve

When disassembling spring-closing process valves, there is a risk of injury as the released spring preload raises the actuator abruptly.

► Release the spring tension.

If maintenance must be conducted on a process valve that is fitted with a control top FLOWVENT Control Top, the valve core must be pulled out of the housing. For this purpose, the valve disk pretension of the process valve must be relieved by actuating the main actuator through the PLC control.

Another option, when the cover is removed, is manual operation at the pilot valve, see Section 3.2.3, Page 20

Hint!

For process valves with air-assisted actuator spring, both pilot valves (NC and NO) must be manually operated using a screwdriver to release the valve disc preload!

If there is no manual operation at the pilot valve Y2 (NO), the end position must be activated by the superimposed control!

8 Operation and control

8.1 Safety instructions

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

For operation, the following principles apply:

- Monitor the component during operation.
- Safety devices must not be changed, removed or taken out of service. Check all safety devices at regular intervals.
- All guards and hoods must be fitted as intended.
- The installation location of the component must always be properly ventilated.
- Structural changes to the component are not permitted. Report any changes to the component immediately to the person in charge.
- Always keep danger zones clear. Do not leave any objects in the danger zone. Only allow persons to enter the danger zone when the machine is de-energized.
- Regularly check that all emergency stop devices are working correctly.

9 Cleaning

9.1 Cleaning

Observe the safety data sheets supplied by the detergent manufacturers.

Only use detergents which are not aggressive towards synthetic materials and the sealing materials used and which are non-abrasive.

Hint!

After all cleaning work, make sure that the control top still complies with all safety instructions in this operating manual and thus that intended use is still given.

10 Maintenance

10.1 Safety precautions

Maintenance and repair

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

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

For maintenance and repair, the following principles apply:

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

Disassembly

For removal, the following principles apply:

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

- Disconnect all power and utility lines.
- Markings, e.g. on lines, must not be removed.
- Do not climb on the component. Use suitable access aids and working platforms.
- Mark the lines (if unmarked) prior to disassembly to ensure they are not confused when re-assembling.
- Protect open line ends with blind plugs against ingress of dirt.
- Pack sensitive parts separately.
- For longer periods of standstill, observe the storage conditions, see Section 4.1, Page 24.

10.2 Inspections

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

10.2.1 Checking parts are firmly secured

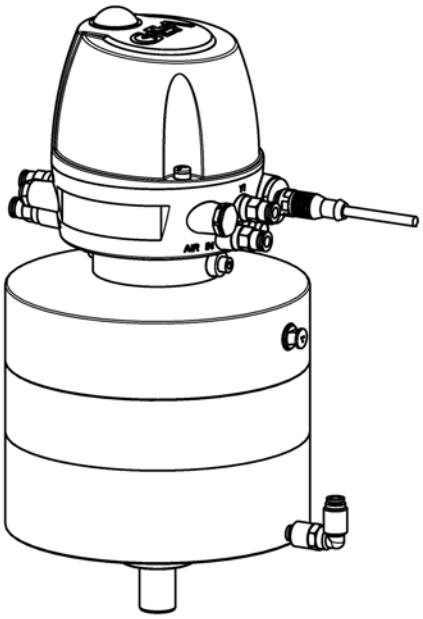

Fig.27

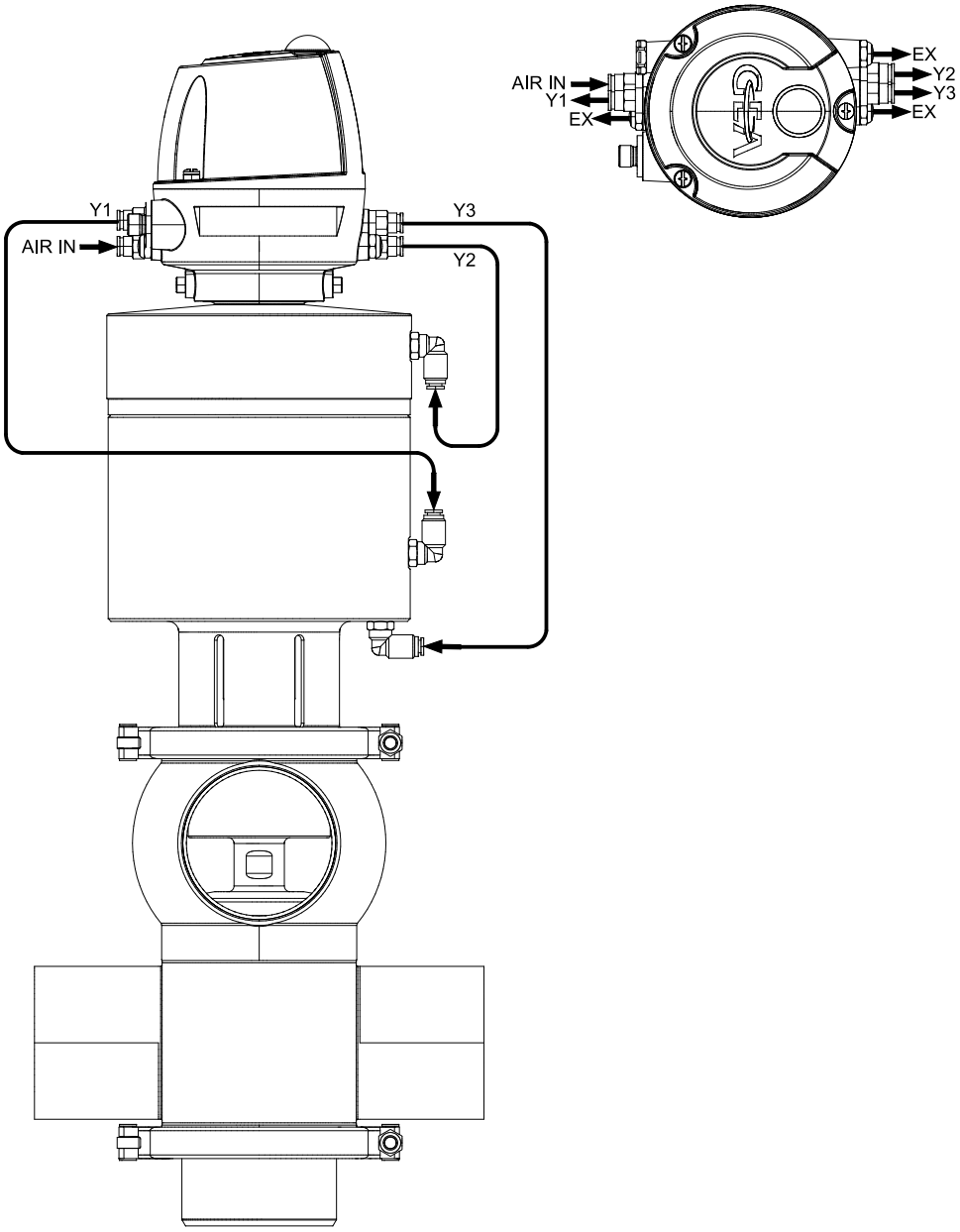

Fig.28

Carry out the following steps:

1. Check that the electrical connectors are properly secured.
2. Check that the air hose connections are firmly secured.
3. Check the hexagon socket screws on the control top for a tight fit.
4. Check the sound absorber, filter, non-return valve and the exhaust air throttle for soiling.
5. Check the housing for mechanical damage.
6. Check the union nut for the cable glands for a tight fit.
7. Check the solenoid valves for pressure-sealed seat.

8. Check hood and base for firm screws. Tighten all three screws to 1 Nm if necessary.

10.2.2 Servicing intervals

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

The actual servicing intervals can only be determined by the 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.

Servicing intervals	
Applications	**Servicing Intervals (Guideline Values)**
Media at temperatures 60 °C to 130 °C (140 °F to 266 °F)	approx. every 3 months
Media at temperatures < 60 °C (< 140 °F)	approx. every 12 months

10.2.3 Signs on the control top

Carry out the following steps:

1. Check signs on the control top. See also Section 2.8.1, Page 12.
2. Replace damaged or missing labels by new labels.

→ Done

10.3 Tool

List of tools	
Tool	**Material no.**
Jaw plug-in tool 2-24 mm	408-433
Socket for wrench 3/8" 17 mm	408-444
Face spanner, adjustable 80/5 for torque wrench	408-448
Torque wrench bit D 6.3 1-5 Nm	408-449
Torque wrench plug-in 2.5 2.5 - 25 Nm	408-450
Plug-in tool square 1-1/2"	408-451
Jaw plug-in tool 1-13 mm	408-452

List of tools	
Tool	**Material no.**
Adapter square 1/2"-3/4"	408-453
Connecting shank D 6.3-3/8"	408-454
Torque wrench bit D 6.3 0.4-2 Nm	408-455
Adapter plug-in type 1-2	408-456
Tool bit 6.3-multi-tooth spanner socket	408-457 / 406-467
Socket for wrench long 1/4" SW 12 mm	408-458
Tool bit 6.3-PH 2-cross 89 mm	408-459
Tool bit 6.3-10 IP TORX Plus 50 mm	408-460
Tool bit 6.3-20 IP TORX Plus 50 mm	408-461
Tool bit 6.3-8 IP TORX Plus 50 mm	408-462
Tool bit 6.3-size4-hex. 89 mm	408-463
Tool bit 6.3-size 3 hex. 89 mm	408-469
Socket for wrench 3/8" 16 mm	408-470

10.4 Removing the Control Top from the Valve

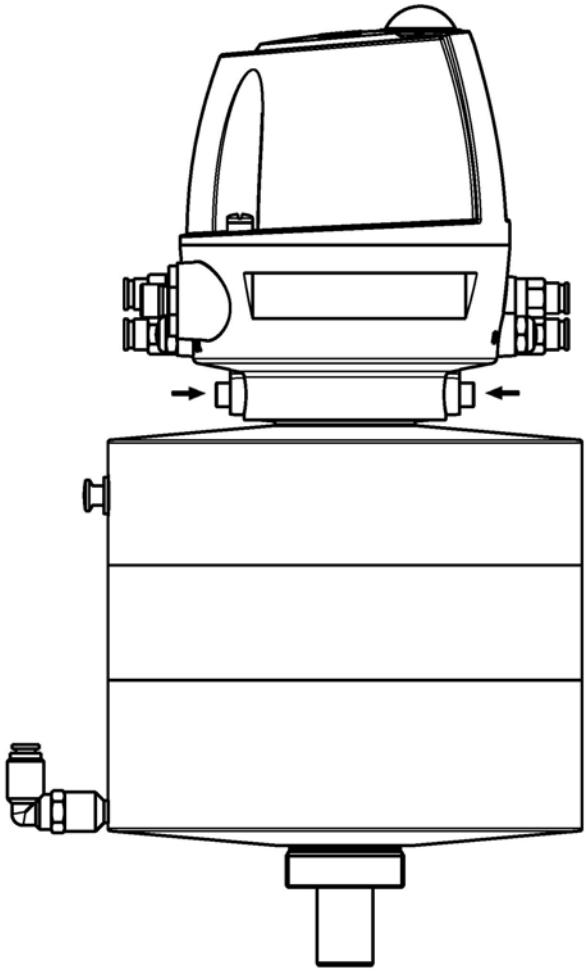

Fig.29

Requirement:

- Make sure that the solenoid valve is not actuated.

Hint!

The pneumatic and electrical connections can remain on the control top.

Carry out the following steps:

1. Undo the two hexagon socket screws.
2. Pull the control top vertically off the valve or installation base.

   → The green light goes off and is replaced with a yellow flashing light.

Hint!

When the colours are swapped, the feedback signals are also swapped!

→ Done

10.5 Dismantling the Control Top into its Components

10.5.1 Variants of the Control Top

The control top can be fitted with:

- 1 NC solenoid valve or
- 2 solenoid valves (1x NC and 1x NO) or
- 3 NC solenoid valves

10.5.2 Removing the Cap

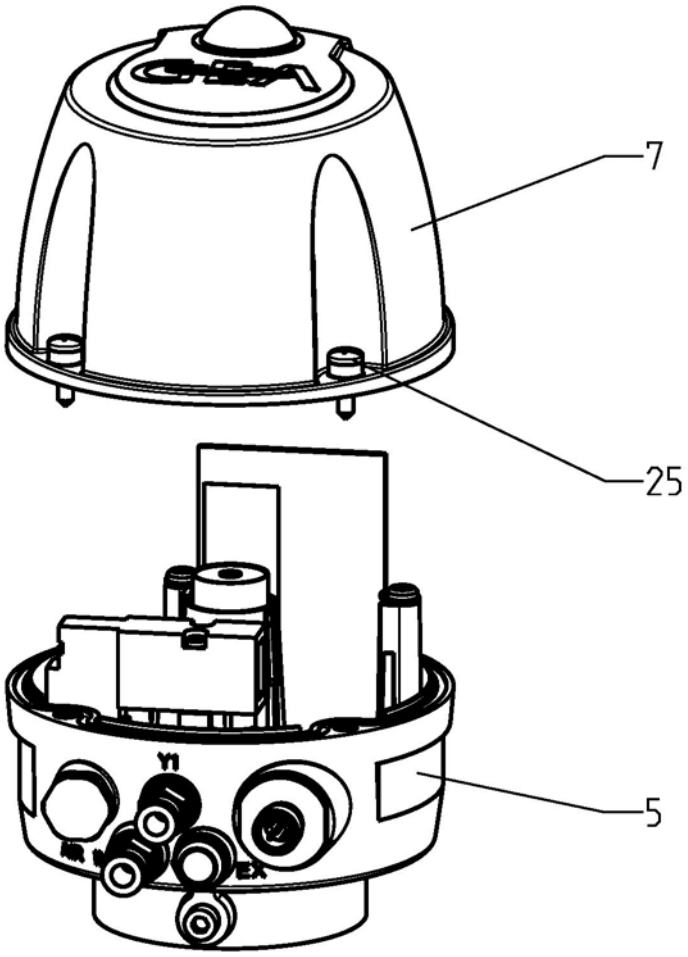

Fig.30

Danger

Electrical voltage

Danger to life

► Switch off the voltage supply and the control air before removing the control top.

Carry out the following steps:

1. Undo the 3 screws (25) of the cap (7) and remove the cap (7) from the base (5).

→ Done

10.5.3 Removing the Solenoid Valve from the Base (1-PV variant)

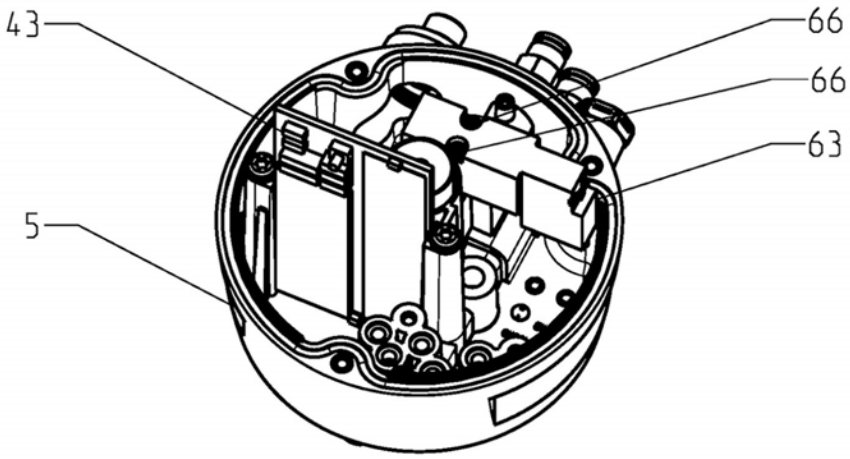

Fig.31

Requirement:

- Only use solenoid valves specified in chapter “Technical data”.

Hint!

In order to avoid or minimize the possibility of damage from electrostatic discharge:

- Observe the requirements of DIN EN 61340-2-1 and 5-2.

- Be careful not to touch the electronic components!

⚠ Caution!

Risk of burns from the solenoid valve as a result of long switch-on time and high ambient temperature

Risk of burns from the solenoid valve

► Allow to cool before dismantling.

Carry out the following steps:

1. Undo the connector of the solenoid valve at the evaluation electronics (43)
2. Undo the screws (66) and separate the solenoid valve (63) from the base (5).

→ Done

Hint!

Fit the solenoid valves and valve plate in reverse order.

Tighten the screws (66) to a max. tightening torque of 1 Nm.

10.5.4 Removing the Solenoid Valves and the Control Plate (2-PV variant)

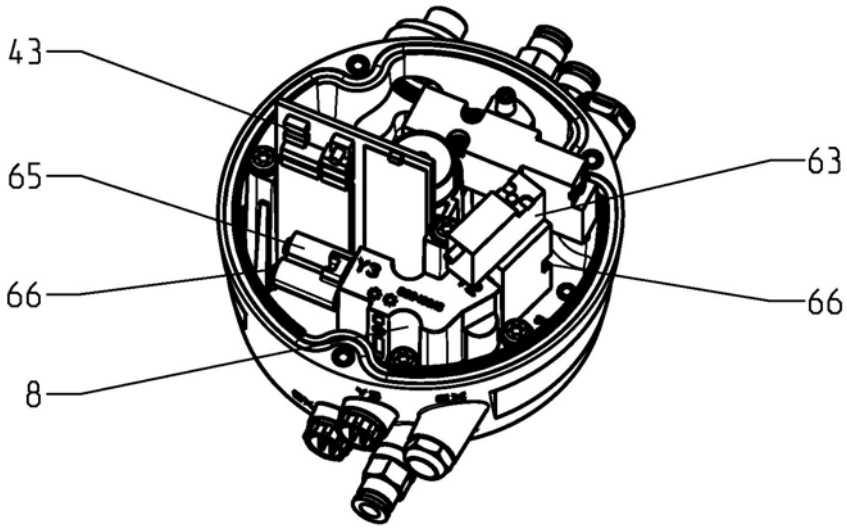

Fig.32

Requirement:

- Only use solenoid valves specified in chapter “Technical data”.

Hint!

In order to avoid or minimize the possibility of damage from electrostatic discharge:

- Observe the requirements of DIN EN 61340-2-1 and 5-2.

- Be careful not to touch the electronic components!

⚠ Caution!

Risk of burns from the solenoid valve as a result of long switch-on time and high ambient temperature

Risk of burns from the solenoid valve

► Allow to cool before dismantling.

Carry out the following steps:

1. Undo the connector of the solenoid valves at the evaluation electronics (43)
2. Undo the screws (66) and separate the solenoid valve (63) from the pneumatic block (8).
3. Undo the screws (66) and, if present, separate the valve plate (65) from the pneumatic block (8).

→ Done

Hint!

Fit the solenoid valves and valve plate in reverse order.

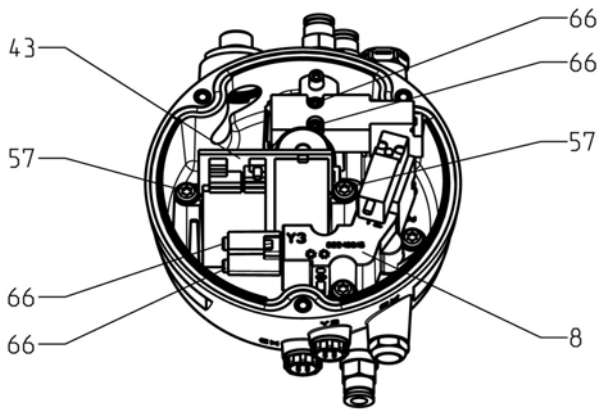

Fig.33: Pneumatic block (8) for max. 2 solenoid valves

Tighten the screws (66) to a max. tightening torque of 1 Nm.

10.5.5 Removing the Solenoid Valves (3-PV variant)

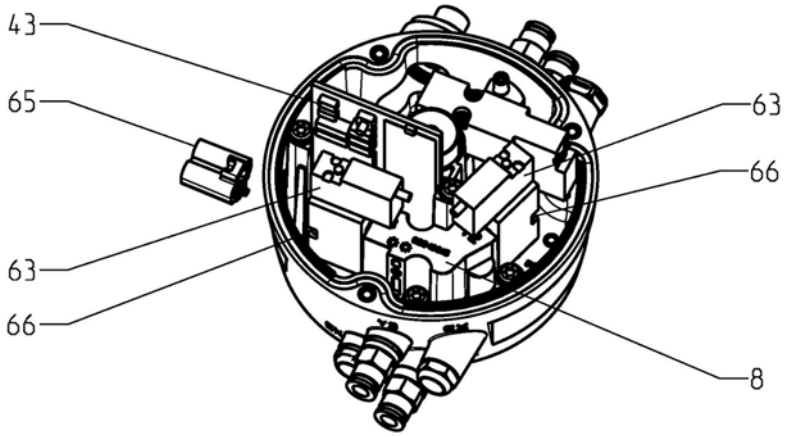

Fig.34

Requirement:

- Only use solenoid valves specified in chapter “Technical data”.

Hint!

In order to avoid or minimize the possibility of damage from electrostatic discharge:

- Observe the requirements of DIN EN 61340-2-1 and 5-2.

- Be careful not to touch the electronic components!

Caution!

Risk of burns from the solenoid valve as a result of long switch-on time and high ambient temperature

Risk of burns from the solenoid valve

► Allow to cool before dismantling.

Carry out the following steps:

1. Undo the connector of the solenoid valves at the evaluation electronics (43)
2. Undo the screws (66) and separate the solenoid valves (63) from the pneumatic block (8).
3. Undo the screws (66) and, if present, separate the valve plate (65) from the pneumatic block (8).

→ Done

Hint!

Fit the solenoid valves and valve plate in reverse order.

Tighten the screws (66) to a max. tightening torque of 1 Nm.

10.5.6 Removing the Evaluation Electronics

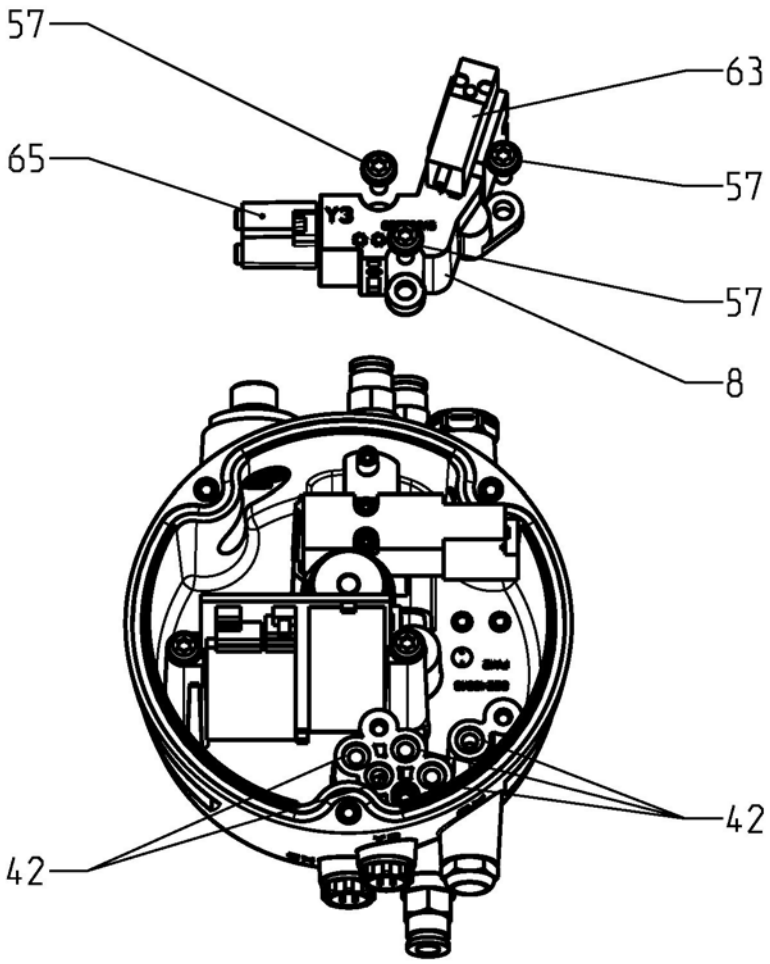

Fig.35

Carry out the following steps:

1. Loosen all the cables and connectors on the evaluation electronics and remove them.
2. Unscrew and remove the screws (57).
3. Grip the evaluation electronics (43) by the top edges and take out of the base (5). Ensure ESD-compliant handling.

→ Done

Hint!

In order to avoid or minimize the possibility of damage from electrostatic discharge:

- Observe the requirements of DIN EN 61340-2-1 and 5-2.

- Be careful not to touch the electronic components!

Hint!

Fit the evaluation electronics in reverse order. Observe the wiring diagrams, see Section 6.4.1, Page 41

10.5.7 Dismantling the Pneumatic Block for 2PV and 3PV variant

Requirement:

- If only O-rings (42) are to be changed, solenoid valves (63)/valve plate (65) can remain on the pneumatic block (8).

Carry out the following steps:

1. Unscrew the three screws (57).

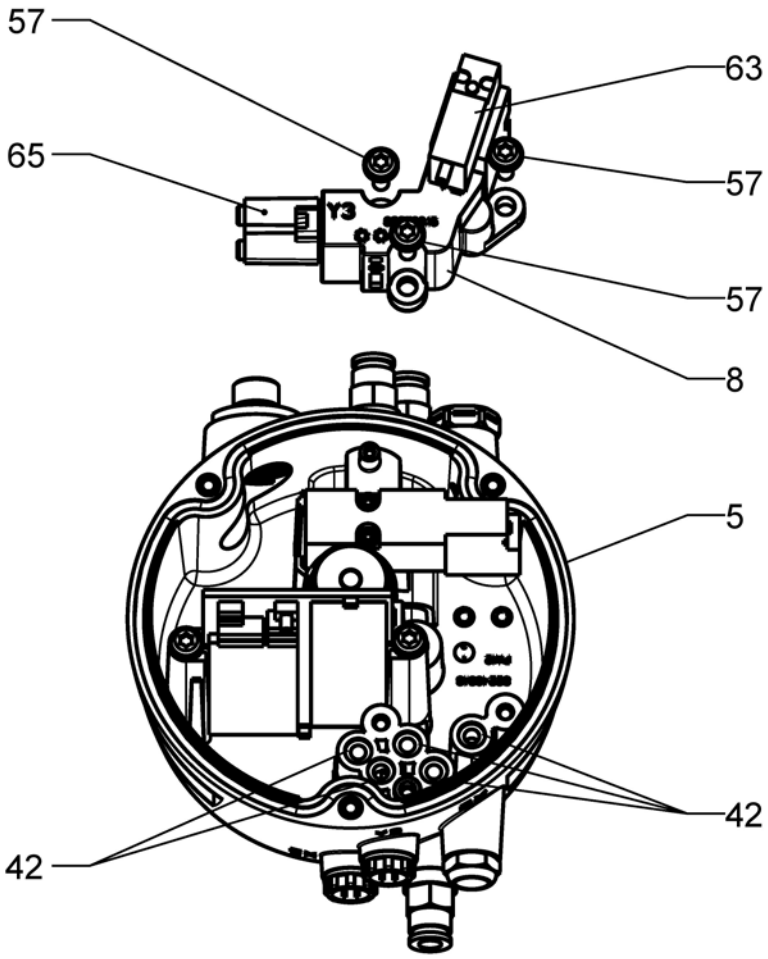

Fig.36

2. Remove the pneumatic block (8) from the base (5).

→ Done

10.5.8 Fitting the Pneumatic Block for 2PV and 3PV variant

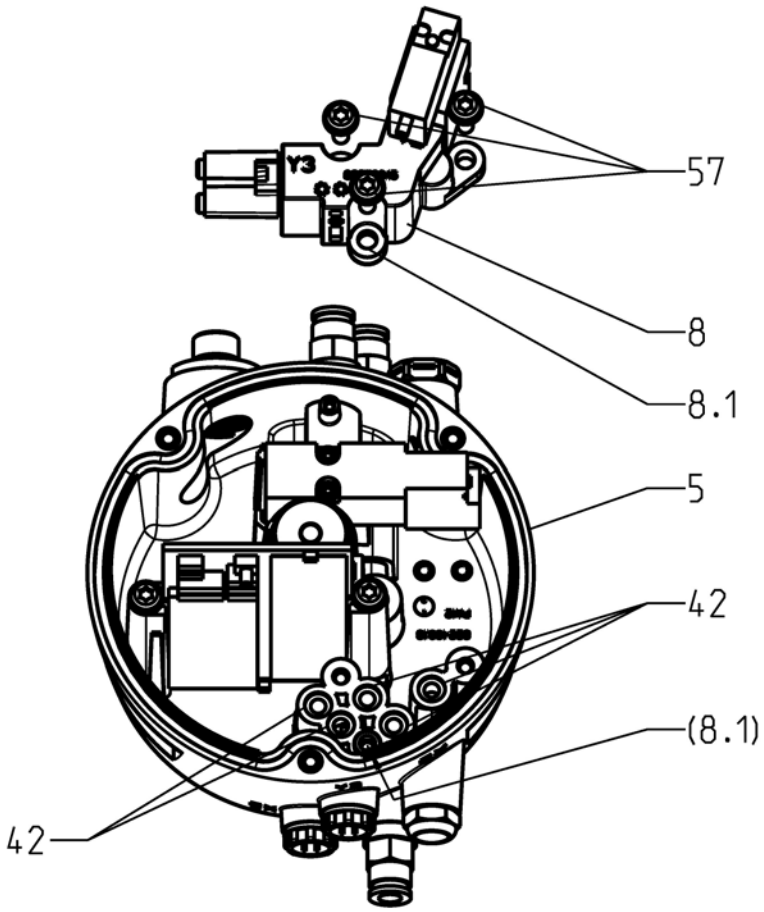

Fig.37

Carry out the following steps:

1. Change the five O-rings (42) of the base (5).
2. To fit the pneumatic block:

   - for version 2PV (1x solenoid valve 24VDC/NO to Y2 and 1x valve plate to Y3), see Figure 31

   - for version 3PV (1x solenoid valve each 24VDC/NC to Y2 and Y3), see Figure 32
3. Insert the pneumatic block (8) in the base (5) and heed the positioning aid on the screw dome (8.1).
4. Tighten the pneumatic block (8) using 3x screws (57) in the base (5): tightening torque 1.5 Nm (1.0 lbft)

→ Done

10.5.9 Install pneumatic connections

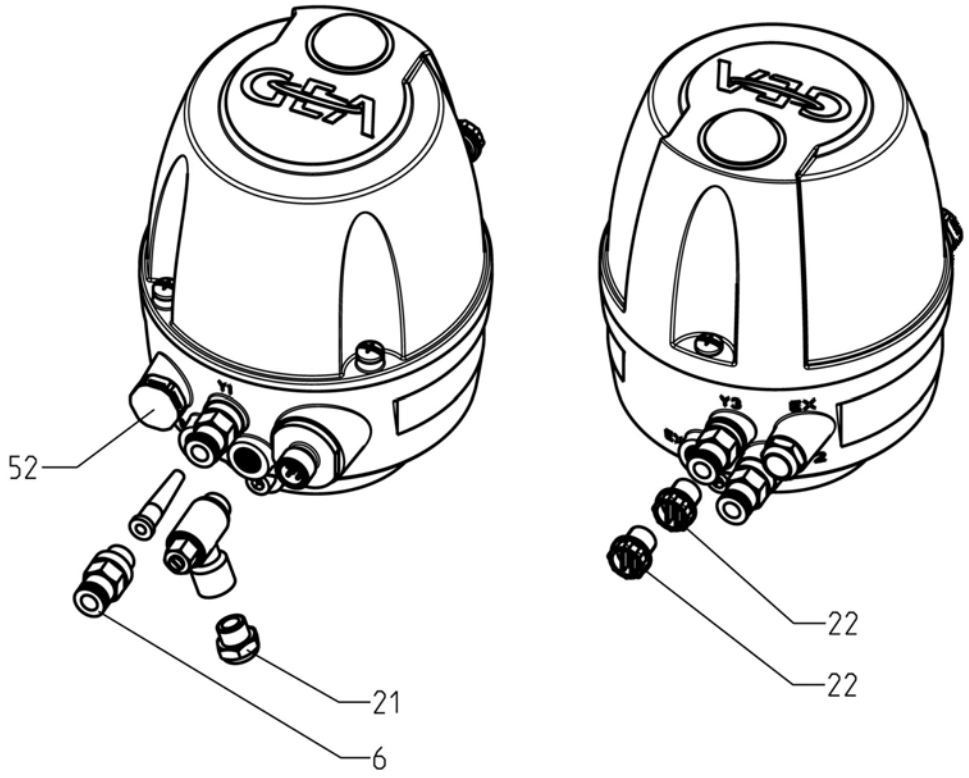

Fig.38

No.	Designation	Tightening torques
6	Screw-in plug connection	2.0 Nm
21	Sound absorber	2.0 Nm
22	Locking screw	0.5 Nm
52	Vent screw	0.5 Nm

Carry out the following steps:

1. Fit the pneumatic connections in accordance with the codes on the control top, see Section 6.3, Page 35

→ Done

10.6 Maintenance

10.6.1 Replacing the Seals on the Base

Only use sound absorber (21), venting screw (52) or exhaust air throttle (21.1) types specified in the chapter “Technical data” . Do not grease these spare parts before fitting them.

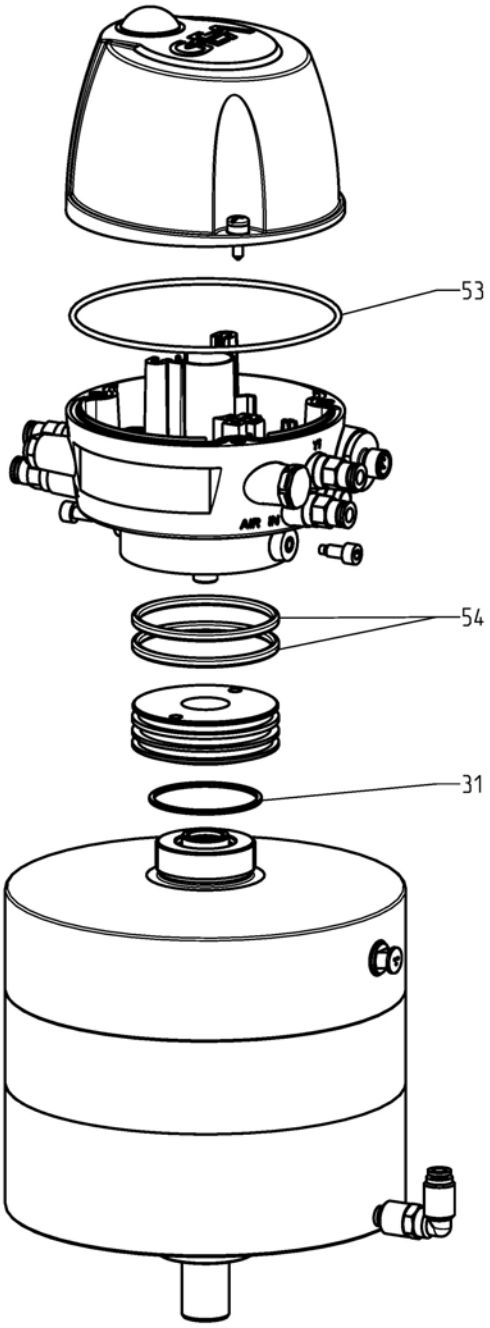

Fig.39

Carry out the following steps:

1. Take out the O-rings (31, 53, 54) and replace them with new ones.
2. Check that the control air can exit freely from the sound absorber (21), filter (5.1) and exhaust air throttle (21.1) and replace the parts if necessary.
3. Inspect the venting screw with an enclosed diaphragm for signs of free air leakage or mechanical damage, and if necessary, replace it.

→ Done

10.6.2 Maintenance of Sound Absorber, Filter, Supply and Exhaust Air Throttle

Only use sound absorber (21), filter (5.1) venting screws (52) or exhaust air throttle (21.1) types specified in the chapter “Technical data”. Do not grease these spare parts before fitting them.

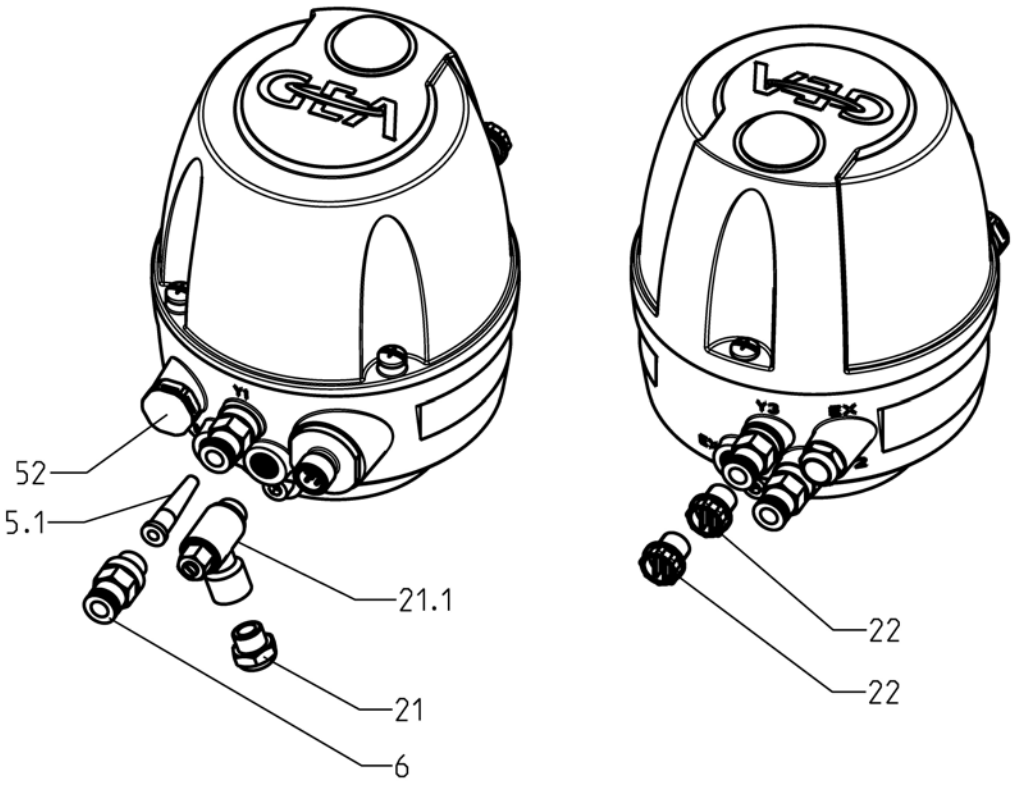

Fig.40

Carry out the following steps:

1. Take out the O-rings (31, 53, 54) and replace them with new ones (see Fig. 31).
2. Check that the control air can exit freely from the sound absorbers (21, 26), filter (5.1) and exhaust air throttle (21.1) and replace the parts if necessary.

→ Done

10.6.3 Mounting hood

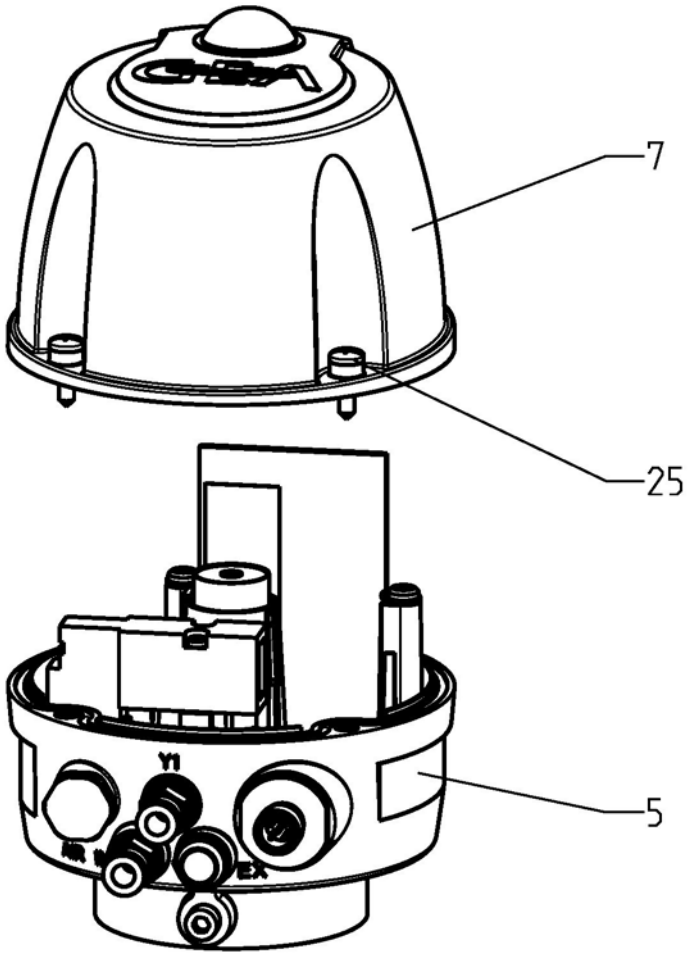

Fig.41

Carry out the following steps:

1. Use three screws (25) to fasten the hood (7) on the base (5) to tightening torque 1 Nm.

→ Done

11 Alarms

11.1 Malfunctions and remedies

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

Malfunction, signalling, cause, remedy			
Malfunction	**Signalling**	**Cause**	**Remedy**
Activating the solenoid valves is not possible after connecting the power supply	No LED is lit	Connecting terminals for the power supply mixed up.	Check the electrical connections for correct wiring.
After connecting the power supply, the valve in end position status (yellow) is indicated immediately.	Yellow	Actuation via process control system or the manual override device on the solenoid valve activated.	Cancel the actuation.
After connecting the power supply, the valve position is indicated by a yellow flashing light.	Flashing red	SETUP not valid.	Carry out reset, see Section 3.2.6, Page 22
		Switch bar not fitted correctly.	Control and tightening of the switch bar, see “Installation of the control top on different valves”
No signal for the non-actuated or actuated position is pending at the PLC although one of the end positions has been reached.	Green or yellow	Feedback signals for the non-actuated and actuated positions to the PLC not connected.	Correct wiring.
No reset possible with voltage supply connected	Green	Solenoid valve Y2 or/and solenoid valve Y3 switched on.	Switch all solenoid valves off.

12 Decommissioning

12.1 Safety precautions

For shutting down, the following principles apply:

- Switch off the compressed air.
- Switch off the component with the main switch.
- Padlock the main switch (if fitted) in the off position to prevent it from being switched back on. The key to the padlock must be deposited with the person responsible until the machine is restarted.
- For longer periods of standstill, observe the storage conditions, see Section 4.1, Page 24.

12.2 Disposal

12.2.1 General notes

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

The component consists of the following materials:

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

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

13 Spare Parts List - Control Top FLOWVENT Control Top (FLOWVENT-CT)

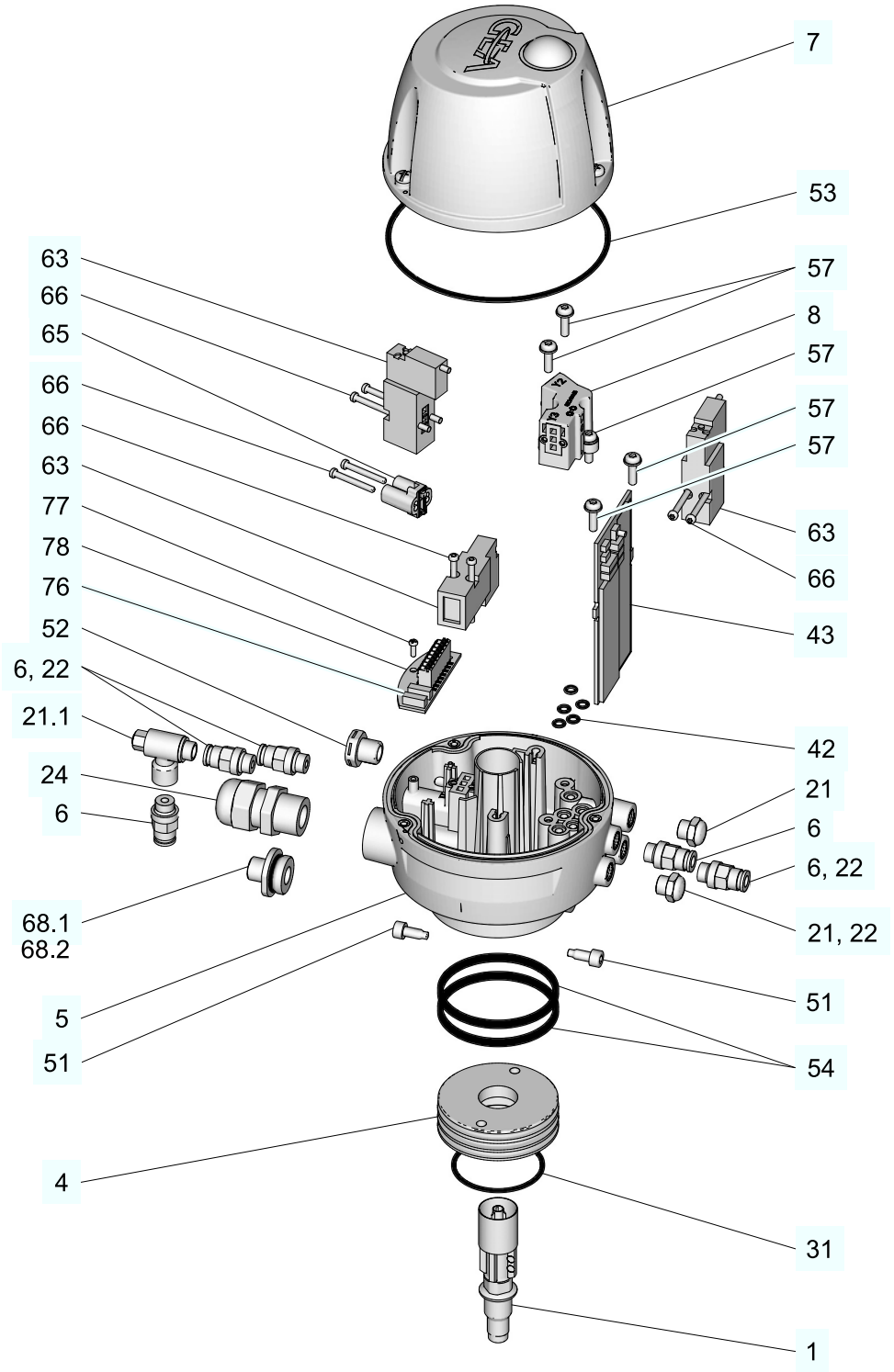

Fig.42

Item	Designation	Material	Material no.
1	Switch bar, standard	PA6	221-589.104
4	Installation base FLOWVENT-CT	VA	822-100.11
5	Base FLOWVENT-CT 1PV incl. filter	PA12	822-100.19
	Base FLOWVENT-CT 3PV incl. filter	PA12	822-100.18
6	Screw-in plug connection G1/8"	MS CV	933-176
7	Hood FLOWVENT-CT incl. screws	PA12	822-100.20
8	Pneumatic block FLOWVENT-CT 3PV	PA12	822-100.15
21	Sound absorber G1/8"	MS CV	933-175
21.1	Throttle valve G1/8"	Brass, nickel-plated	603-042
22	Locking screw G1/8"	PE-HD	922-369
24	Cable gland M20 x 1.5	PA	508-995
31	O-ring	NBR	930-095
42	O-ring	FKM	930-169
43	Evaluation electronics 24 VDC	--	221-007105
	Evaluation electronics AS interface	--	221-007106
51	Cylinder screw with journal	A2-70	902-145
52	Venting screw MIV	PA	933-181
53	O-ring	NBR	930-094
54	O-ring	NBR	930-073
57	Self-tapping form screw EJOT DELTA	galv. steel	514-750
63	Solenoid valve 3/2 way/NC 24VDC	PBT	512-169
	Solenoid valve 3/2 way/NO 24VDC	PBT	512-168
65	Valve plate	NORYL/GFN2	221-589.27
66	Self-tapping form screw EJOT DELTA	A2	514-761
68.1	Connector M20/M12 5-pole	Brass, nickel-plated	508-946
68.2	Connector M20/M12 8-pole	Brass, nickel-plated	508-948
76	Cable assembly FLOWVENT-CT	--	221-007033
77	Self-tapping form screw EJOT DELTA	galv. steel	514-763
78	Terminal strip unit 24VDC	--	822-101.05

Complete assemblies: Control top FLOWVENT Control top (FLOWVENT-CT) with switch bar (pos. 1) without installation base (pos. 4) and without gaskets (pos. 31 and 54)									
Code:	CT-24V-1-M-C 1PV_NC	CT-24V-2-M-C 1PV_NC/ 1PV_NO	CT-24V-3-M-C 3PV_NC	CT-24V-1-M-T 1PV_NC	CT-24V-2-M-T 1PV_NC/ 1PV_NO	CT-24V-3-M-T 3PV_NC	CT-ASi-1-M-C 1PV_NC	CT-ASi-2-M-C 1PV_NC/ 1PV_NO	CT-ASi-3-M-C 3PV_NC
Air connection metric	822-110.10	822-110.16	822-110.12	822-110.14	822-110.18	822-110.15	822-110.11	822-110.17	822-110.13
Code:	CT-24V-1-I-C 1PV_NC	CT-24V-2-I-C 1PV_NC/ 1PV_NO	CT-24V-3-I-C 3PV_NC	CT-24V-1-I-T 1PV_NC	CT-24V-2-I-T 1PV_NC/ 1PV_NO	CT-24V-3-I-T 3PV_NC	CT-ASi-1-I-C 1PV_NC	CT-ASi-2-I-C 1PV_NC/ 1PV_NO	CT-ASi-3-I-C 3PV_NC
Air connection imperial	822-110.20	822-110.26	822-110.22	822-110.24	822-110.28	822-110.25	822-110.21	822-110.27	822-110.23
Code:	CT-24V-0-M/I-C OPV	CT-ASi-0-M/I-C OPV	CT-24V-0-M/I-T OPV	CT-ASi-0-M/I-T OPV					
Air connection metric / imperial	822-110.40	822-110.41	822-110.42	822-110.43					

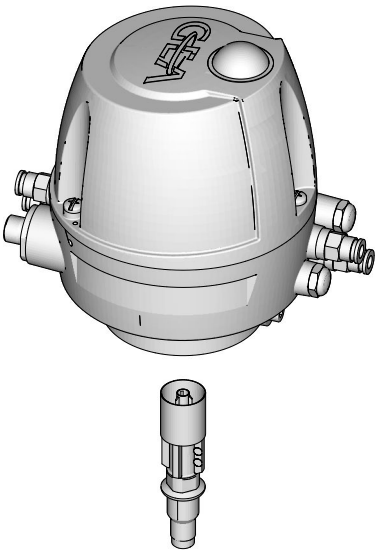

Fig.43

Complete assembly: Mounting base (pos. 4) and gaskets (pos. 31 and 54)	
Code:	822-110.19

Fig.44

Options (to be ordered separately)	Material	Material no.	Application
Throttle valve G1/8"	Brass, nickel-plated	603-042	To reduce the closing speed of the main stroke (exhaust air outlet EX Y1 with sound absorber item 21)
Throttle valve G1/8"	Brass, nickel-plated	603-042	To reduce the opening speed of the main stroke (and lift stroke) (Air In connection with screw-in plug connection item 6)
Angular cable socket M12 / 5-pole / A-coded / 24VDC	PA66	508-963	Electrical connection to connector Item 68.1
Straight cable socket M12 / 8-pole / A-coded / 24VDC	PBT	508-061	Electrical connection to connector Item 68.2
Straight cable socket M12 with 1.0 m cable and ASi insulation displacement connector	PA	508-027	Electrical connection to connector Item 68.1

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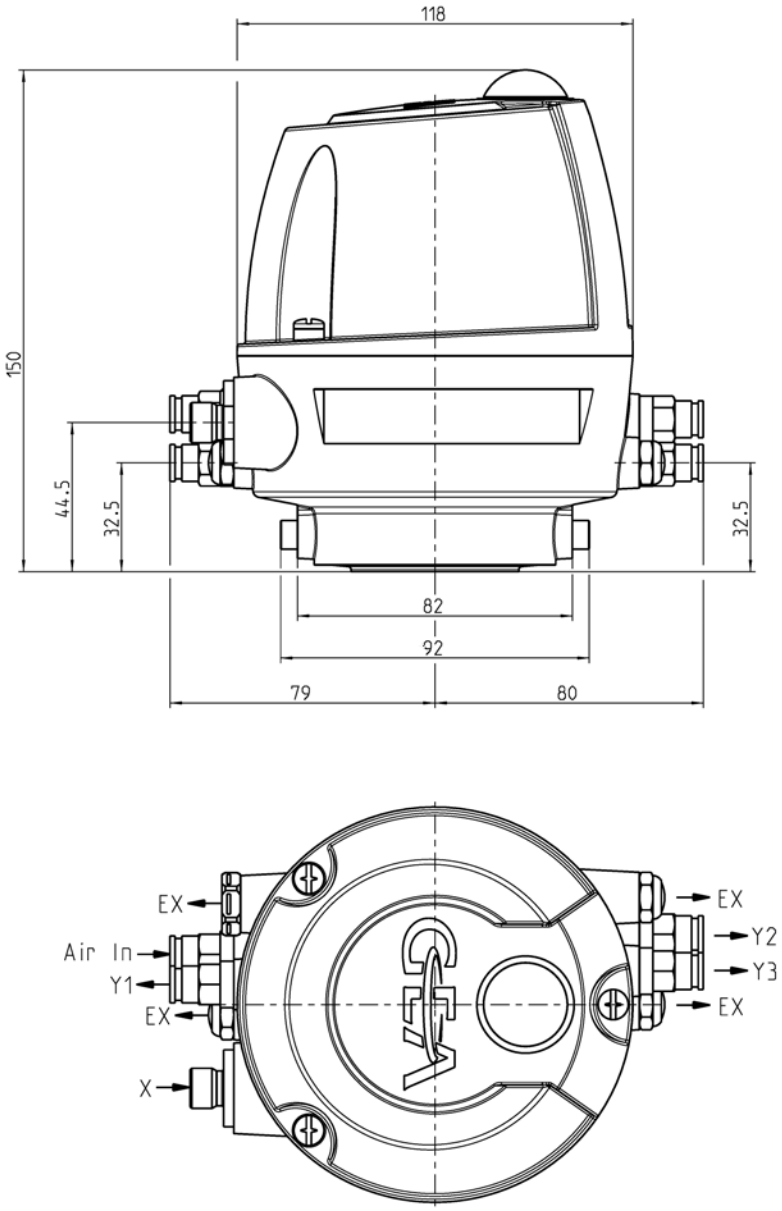

Fig.45

Assignment: Y1, Y2, Y3 and Air In, refer to the Operating Instructions FLOWVENT Control Top

X= supply voltage, electric actuation and feedback

EX = waste air of the base

15 Appendix

15.1 Lists

15.1.1 Abbreviations and terms

Abbreviation	Explanation
BS	British Standard
bar	Unit of measurement of pressure [bar] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
approx.	approximately
°C	Unit of measurement of temperature [degree Celsius]
DI	Divert valve
dm^3_n	Unit of measurement of volume [cubic decimetre] standard volume (standard litres)
DN	DIN nominal width
DIN	German standard issued by DIN (Deutsches Institut für Normung e.V., German Institute for Standardization)
EN	European Standard
EPDM	Material designation Brief designation according to DIN/ISO 1629: Ethylene-propylene-diene- rubber
°F	Unit of measurement of temperature [degree Fahrenheit]
FVCT	FLOWVENT Control Top
FKM	Material designation, short designation according to DIN/ISO 1629: Fluorine rubber
h	Unit of measurement of time [hour]
HNBR	Material designation short designation according to DIN/ISO 1629: Hydrated nitrile butadiene rubber
IP	Protection class
ISO	International Standard of the International Organization for Standardization
kg	Unit of measurement of weight [kilogram]
kN	Unit of measurement of force [kilonewton]
Kv value	Flow coefficient [m^3/s] 1 KV = 0.86 x Cv
l	Unit of measurement of volume [litre]
max.	maximum

Abbreviation	Explanation
mm	Unit of measurement of length [millimetre]
µm	Unit of measurement of length [micrometre]
M	Metric
NC	Idle state closed
Nm	Unit of measurement of work [newton metre] SPECIFICATION FOR THE TORQUE: 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
NO	Idle state open
PA	Polyamide
PE-LD	Low-density polyethylene
PPE	Polytetrafluoroethylene
psi	Anglo-American unit of measurement for pressure [pound-force per square inch] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
PTFE	Polytetrafluoroethylene
SET-UP	Self-learning installation During commissioning and maintenance, the SET-UP procedure carries out all the necessary settings for the generation of messages.
SV	Seat valve
AF	Indicates the size of spanners [width across flats]
V AC	Volt alternating current
V DC	Volt direct current
W	Unit of measurement of power [Watt]
TIG	Welding method Tungsten inert gas welding
Inch	Unit of measurement of length in the Anglo-American language area
Inch OD	Tube measurement according to British Standard (BS), outside diameter
Inch IPS	American pipe measurement, iron pipe size

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