guth ventile
FLUID PROCESS GROUP

Operating instructions

- Translation of the original -

Elektropneumatic positioner

DigiPos

for diaphragm, piston and rotary actuators

English **GBR**

17.7.17

Guth Ventiltechnik GmbH
Im Niedersand 52
D - 76877 Offenbach an der Queich

☎ +49 (0) 6348 23 801 - 0 ◆ Fax: +49 (0) 6348 23 801 - 85
www.guth-vt.de ◆ sales@guth-vt.de

List of contents

Availability and Completeness

These operating instructions constitute part of the valve delivery and must be kept available so that they can be referred to by authorised personnel at any time. No sections may be removed from these instructions. Should the operating instructions or individual pages be missing, they must be replaced at once.

Change Service

This documentation is subject to the Change Service of Guth Ventiltechnik GmbH. Changes may be made to this documentation without notice of such changes being given.

Copyright

Guth Ventiltechnik GmbH
Im Niedersand 52
D - 76877 Offenbach an der Queich
☎ +49 (0) 6348 23 801 - 0 ◆ Fax: +49 (0) 6348 23 801 - 85
www.guth-vt.de ◆ sales@guth-vt.de

1. General information

1.1 Information for your safety

We are pleased that you have decided for a high-class GUTH product. With correct application and adequate maintenance, our products provide long time and reliable operation.

Before installation and initiation, please carefully read this instruction manual and the security advices contained in it. This guarantees reliable and safe operation of this product and your plant respectively. Please note that an incorrect application of the process components may lead to great material damages and personal injury.

In case of damages caused by non observance of this instruction manual, incorrect initiation, handling or external interference, guarantee and warranty will lapse!

Our products are produced, mounted and tested with high diligence. However, if there is still a reason for complaint, we will naturally try to give you entire satisfaction within the scope of our warranty. We will be at your disposal also after expiration of the warranty. In addition, you will also find all necessary instructions and spare part data for maintenance in this instruction manual. If you don't want to carry out the maintenance by yourself, our GUTH service team will naturally be at your disposal.

1.2 Marking of security instructions in the operating manual

Hints are available in the chapter "safety instructions" or directly before the respective operation instruction. The hints are highlighted with a danger symbol and a signal word. Texts beside these symbols have to be read and adhered to by all means. Please continue with the text and with the handling at the valve only afterwards.

Symbol	Signal word	Meaning
	**DANGER**	Imminent danger which will result severe personal injury or death.
	**WARNING**	Imminent danger which may result severe personal injury or death.
	**CAUTION**	Dangerous situation which may cause slight personal injury or material damages.
	**ATTENTION**	An harmful situation which may result in damages of the product itself or of adjacent vicinity.
	**NOTICE**	Marks application hints and other information which is particularly useful.

1.3 Designated use

The fitting is designed exclusively for the purposes described below. Using the fitting for purposes other than those mentioned is considered contrary to its designated use. GUTH cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user. The prerequisite for the reliable and safe operation of the fitting is proper transportation and storage as well as competent installation and assembly.

Operating the fitting within the limits of its designated use also involves observing the operating, inspection and maintenance instructions.

1.4 Personnel

Personnel entrusted with the operation and maintenance of the tank safety system must have the suitable qualification to carry out their tasks. They must be informed about possible dangers and must understand and observe the safety instructions given in the relevant manual. Only allow qualified personnel to make electrical connections.

1.5 Modifications, spare parts, accessories

Unauthorized modifications, additions or conversions which affect the safety of the fitting are not permitted. Safety devices must not be bypassed, removed or made inactive. Only use original spare parts and accessories recommended by the manufacturer.

1.6 General instructions

The user is obliged to operate the fitting only when it is in good working order. In addition to the instructions given in the operating manual, please observe the relevant accident prevention regulations, generally accepted safety regulations, regulations effective in the country of installation, working and safety instructions effective in the user's plant.

2. Safety instructions

NOTICE

- Before commencing installation, commissioning or other work on the control valve please read this manual. The manual is only valid for the described valve actuators and the DigiPos positioner.

2.1 Intended use

The DigiPos positioner is only approved for the applications which we have specified.

These have been developed and manufactured in accordance with applicable safety standards. For this reason they do not constitute a potential hazard when used according to their intended purpose.

2.2 Notes on the guarantee

All obligations arising in connection with the guarantee are contained in the General Terms and Conditions of Guth Ventiltechnik GmbH.

2.3 Safety instructions

➤ **The positioner may only be fitted and commissioned by qualified personnel.**

Based on the definition laid down in EN 60204-1. Qualified personnel:

A person who, on the basis of his or her specialist training, has acquired knowledge and experience as well as knowledge of the relevant standards and can evaluate the work entrusted to him or her and any possible hazards.

CAUTION

- The valve may only be used for approved purposes.
- The unit is only designed for connection to safety extra-low voltage.
- The GUTH company shall accept no liability for damage and operational malfunctions resulting from failure to observe these instructions.
- Technical modifications resulting in deviations from the illustrations and information contained in these instructions may be made without prior notice being given.
- The pneumatic actuators contain strongly pre-tensioned springs.
- This means that there is a risk of death if actuators are opened. Therefore the actuators may only be opened by qualified personnel that has been trained by the GUTH company.
- Pneumatic actuators exert large positioning forces. Therefore moving parts may only be touched when not under tension or pressure.
- The device may only be fitted and commissioned in accordance with these operating instructions.
- The manufacturing process did not take account of safety precautions in respect of external fire.

3. General information on the positioner

The DigiPos is an electronic positioner for pneumatically operated modulating valves. It is suitable for membrane, piston and rotary actuators.

The DigiPos is adjusted in accordance with the respective valve during final assembly at the works via an RS232 interface.

A commissioning software is used to this purpose for PCs with a serial interface.

This software can also be used when the system is taken into operation. During operation a recorder function can be used to examine the behaviour of the control valve and optimise this directly.

ATTENTION

- The software parameter settings on the DigiPos may only be made by trained personnel.
- Use of the software is not mandatory for commissioning.

3.1 Basic functions

- Electronic positioner for pneumatic actuators
- 24 V DC, connection with 3 or 4 conductor technology
- Setpoint 4-20 mA
  (can be set with setpoint potentiometer in manual operation)
- Position signalling 4-20 mA, 2-conductor technology (opto-decoupled)
- Position indication with LED display
- 2 external LEDs for indication of the end positions
- Automatic stroke alignment
- Variable control accuracy
- RS232 interface

3.2 Extended settings via the RS232 interface

- Recorder function for set and actual position value

➤ **only authorized people:**

- Loading of firmware into the positioner, no exchange of the program memory necessary
- Access to all setting parameters
- Valve stroke characteristic curve can be defined by the user

3.3 Mounting on diaphragm actuator

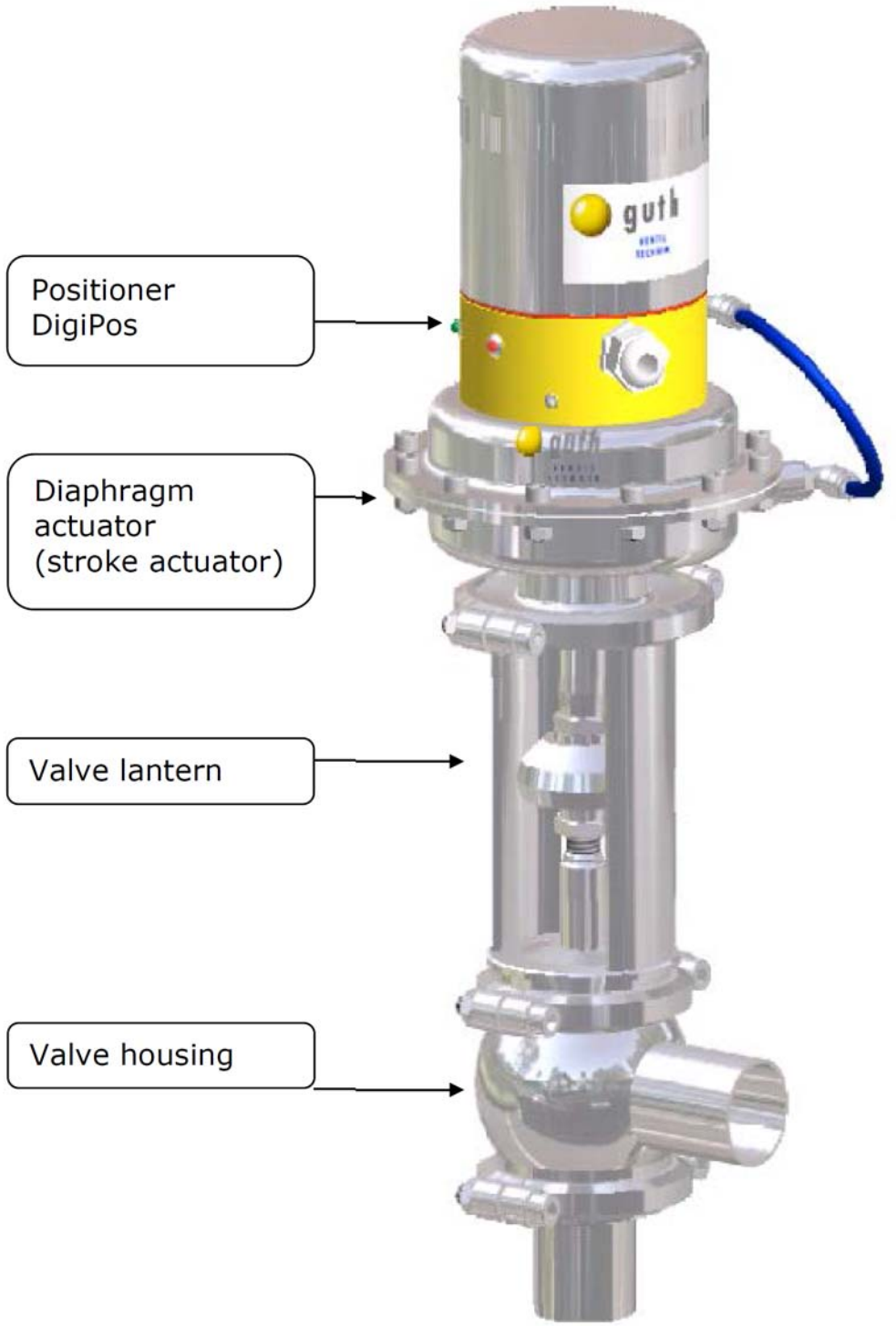

Fig. 1 VSR modulating valve with diaphragm actuator and DigiPos positioner

3.4 Mounting on piston actuator

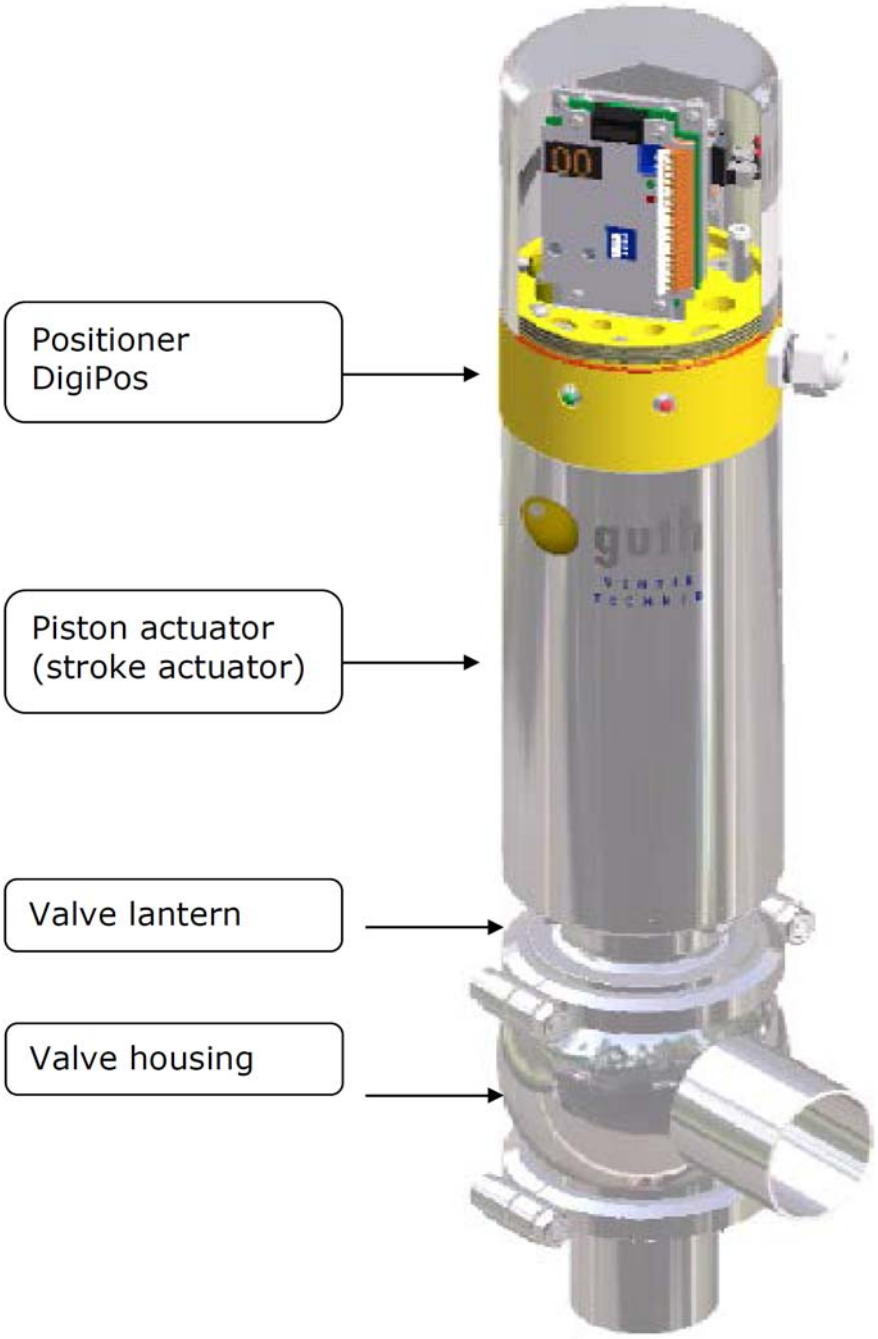

Fig. 2 VSR modulating valve with piston actuator (stroke actuator) and DigiPos positioner

3.5 Mounting on rotary actuator

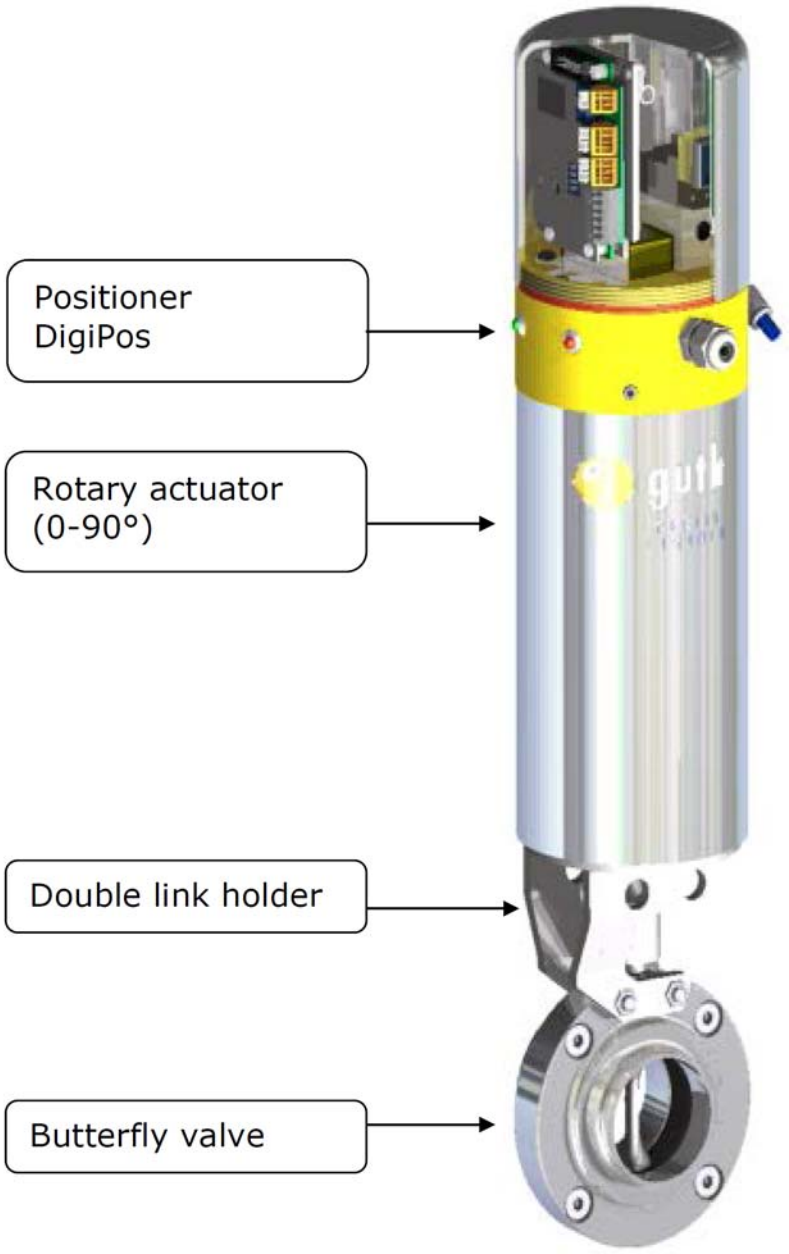

Fig. 3 Modulating butterfly valve with rotary actuator and DigiPos positioner

4. Design of the positioner

4.1 Unit design of the various versions

4.1.1 Unit design of DigiPos for diaphragm actuators

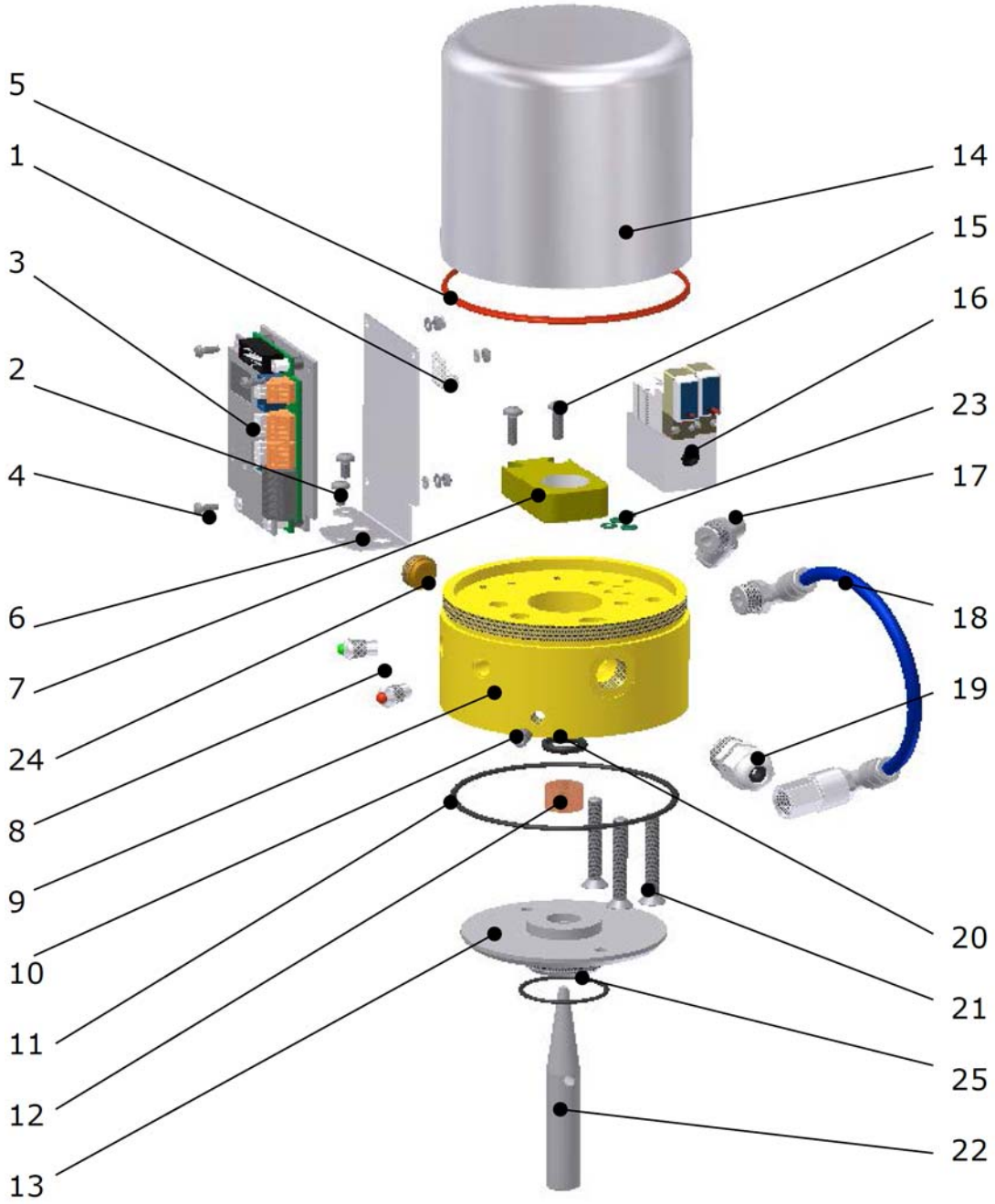

Fig. 4 DigiPos for diaphragm actuators

4 . 1 . 2 Unit design of DigiPos for piston actuators

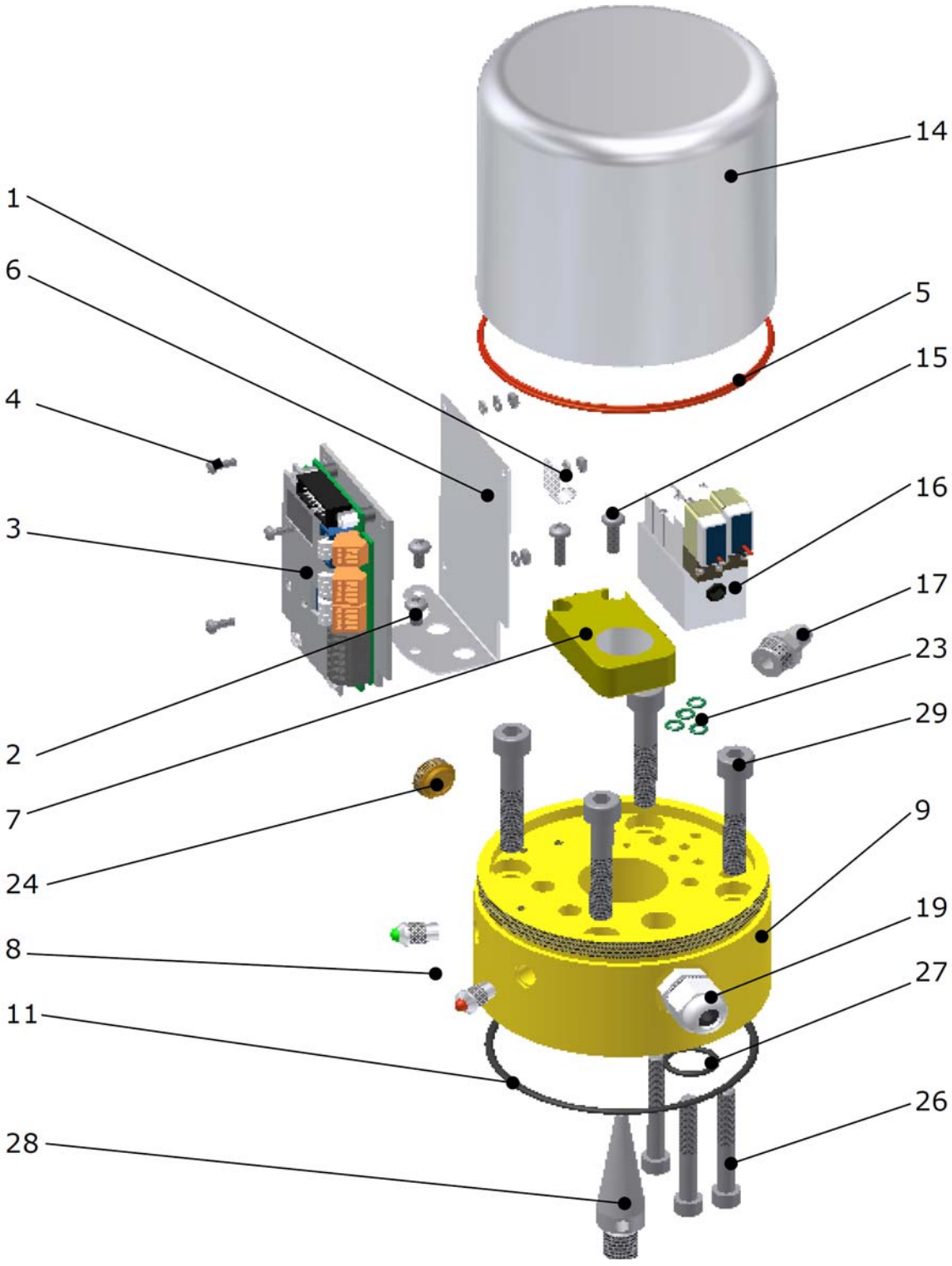

Fig. 5 DigiPos for piston actuators

4 . 1 . 3 Unit design of DigiPos for rotary actuators

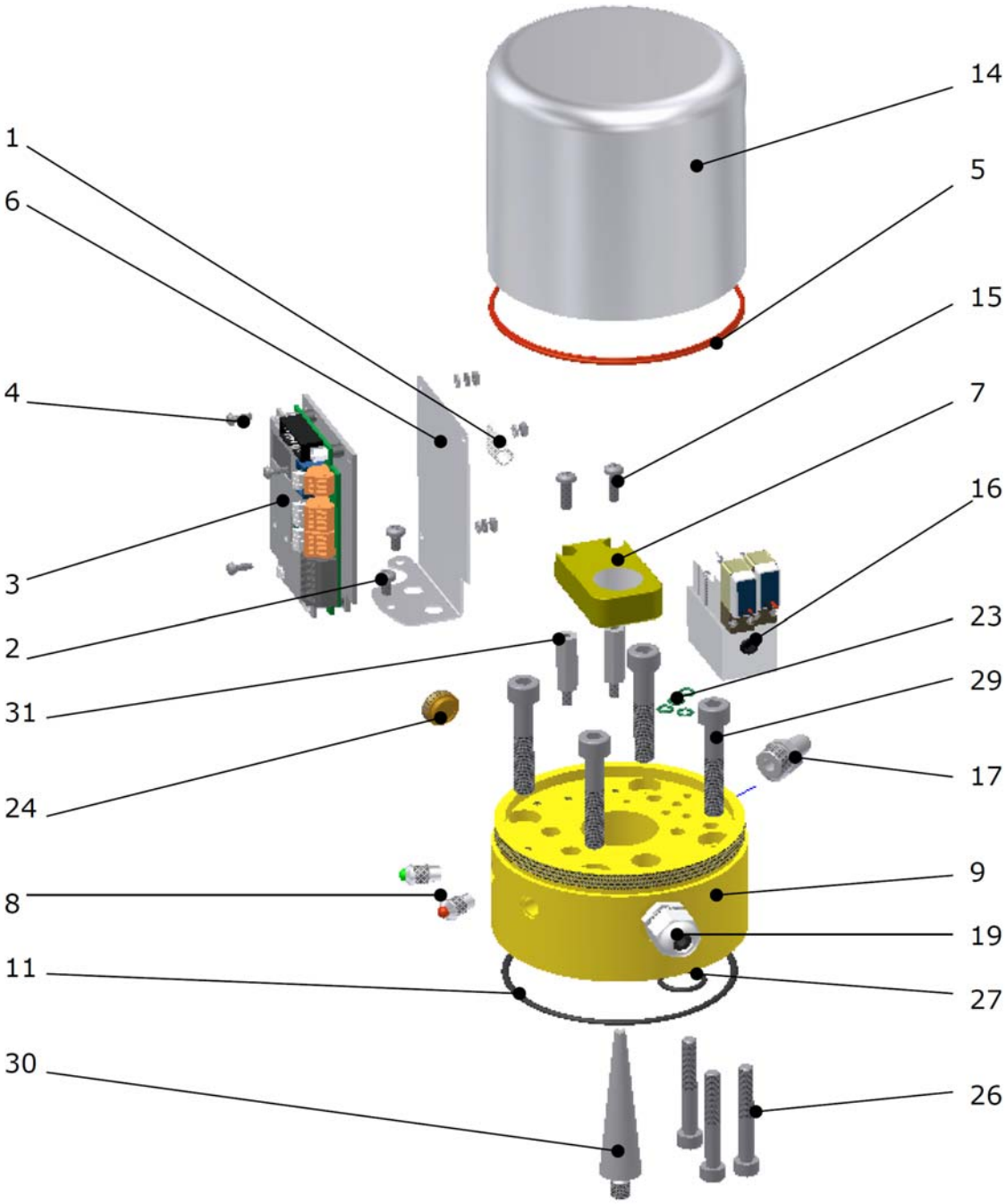

Fig. 6 DigiPos for rotary actuators

4 . 1 . 4 Component table

Pos	Component	Function
1	Cable clamp	Sensor cable fixture
2	Round recessed head screw M4x14	Fixture of holding plate for electrical circuit board
3	DigiPos electronic circuit board with metal plate console	
4	M3x8 hexagonal screw with split washer and M3 hexagonal nut	Electrical circuit board fixture
5	O-ring 90x2.5	Seal between stainless steel protective cover (14) and basic body (9)
6	Holding plate	For securing electronic circuit board (3)
7	Inductive circular sensor	Position recording of the liner (22) (spindle tracking)
8	LED red and green	For display of operating status and errors
9	Basic body	Carrier for all electrical and pneumatic components. Fixture of positioner with actuator.
10	Threaded pin M6	Fixture of basic body
11	O-ring 88x2.5	External seal between basic body and actuator
12	DUB 1415 bushing	Liner guide
13	Clamping ring	Adaptation: Basic body / Actuator
14	Protective cover	Protection of the positioner
15	Round head screw with M4X14 recessed head	Fixture of circular sensor
16	Valve assembly	Air distribution
17	L-quick-fit screw connection	Air inlet
18	Air connection	- L quick-fit screw connection - PU4 air hose - Ermeto screw connection
19	Cable screw connection M20x1.5	Cable seal
20	O-ring 14x3	Liner seal
21	Countersunk screw with recessed head M6x40	Fixture of valve assembly
22	Liner, long	Measuring liner for circular sensor
23	O-ring 4x1.5	Seal
24	Silencer	Noise reduction of the exhaust air
25	O-ring 34x2	Seal on adaption
26	Hexagon socket screw M6x45	Fixture of valve assembly
27	O-ring 15x2,5	Seal on air passage
28	Liner, short	Measuring liner for circular sensor
29	Hexagon socket screw M8x45	Fixture of valve assembly
30	Liner, long	Measuring liner for circular sensor
31	Distance bolts M4x25	Fixture of circular sensor

Tab. 1_Component table

4.2 Electrical and pneumatic connections

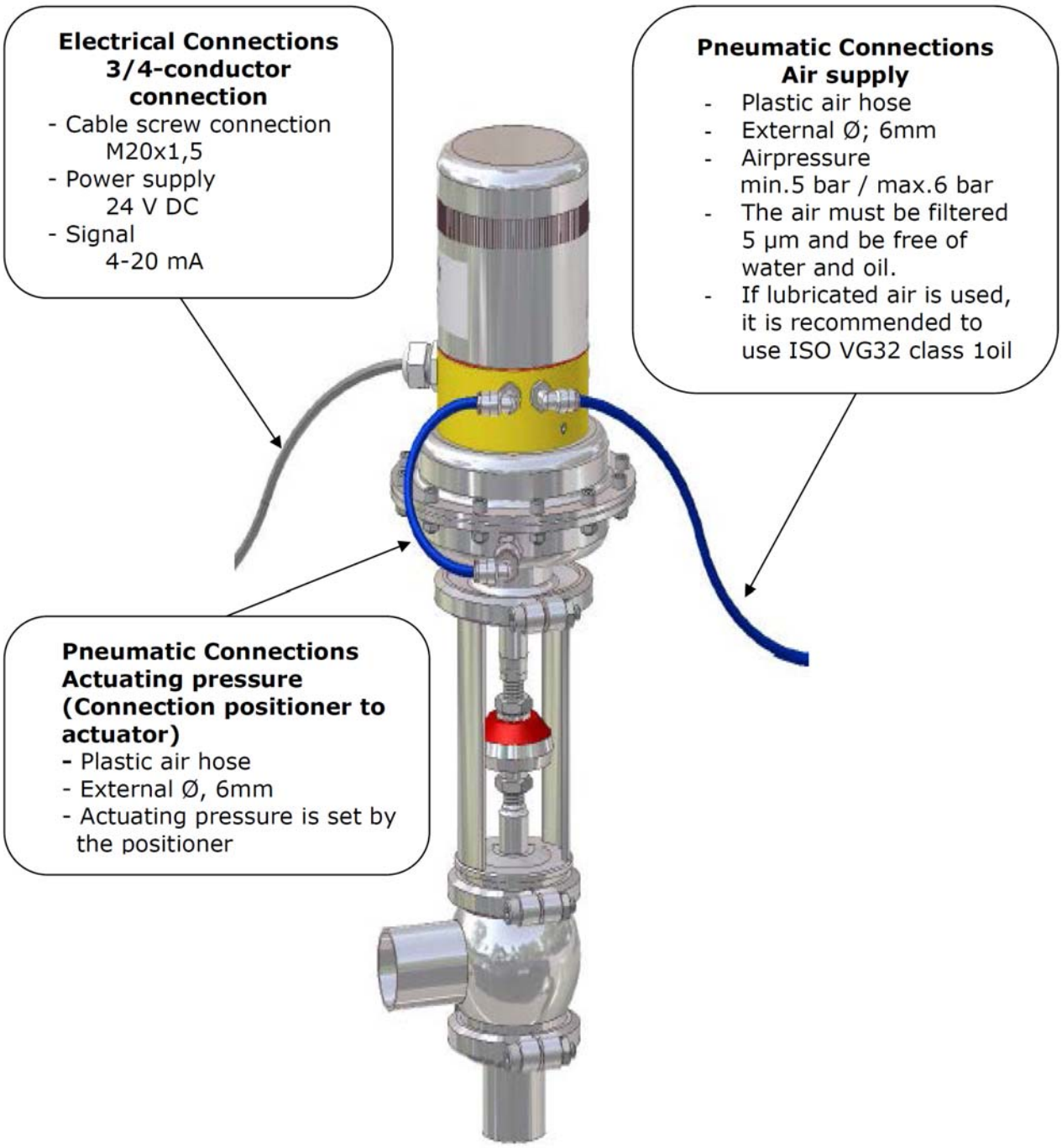

Fig. 7 Modulating valve type VSR with diaphragm actuator and DigiPos

4.3 Electrical connections

	Type	Designation	Conductor colour
Path measurement	Output	Voltage output +24V DC	brown (circular sensor)
	Input	Sensor Input +10V DC	black
	Input	Sensor Ground	blue
Display LEDs	Output	Green LED, anode (+)	red
	Output	Green LED, cathode (-)	black
	Output	Red LED, anode (+)	red
	Output	Red LED, cathode (-)	black
Control valves	Output	Supply air (+)	red
	Output	Supply air (-)	black
	Output	Vent air (+)	red
	Output	Vent air (-)	black
Supply line	Output	Position signal, 4-20 mA (+)	
	Output	Position signal, 4-20 mA (-)	
	Input	Setpoint 4-20 mA (+)	
	Input	Setpoint 4-20 mA (-)	
	Supply	+24V DC	
	Supply	Ground	

Tab. 2 Electrical connections

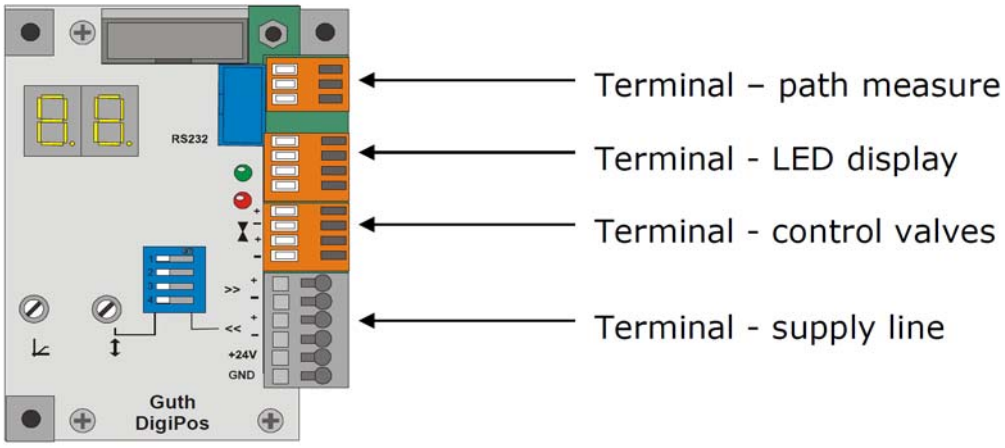

Fig. 8 Electrical connections; Positioner circuuit board

NOTICE

- The path measurement, LED display and control valve terminals are already connected at the works. The supply line terminal must be connected in the system.

4 . 3 . 1 Terminal - path measurement

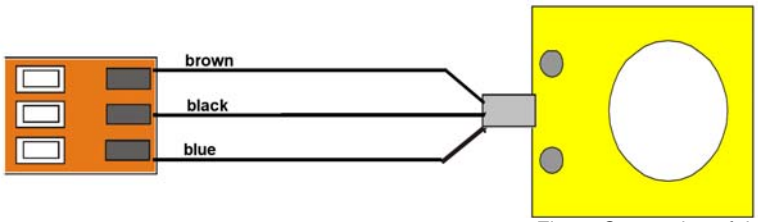

Fig. 9 Connection of the circular sensor

4 . 3 . 2 Terminal - LED display

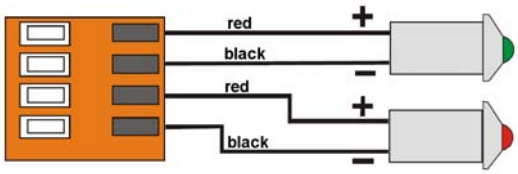

Fig. 10 Connection of the external LEDs

4 . 3 . 3 Terminal - control valves (solenoid valves)

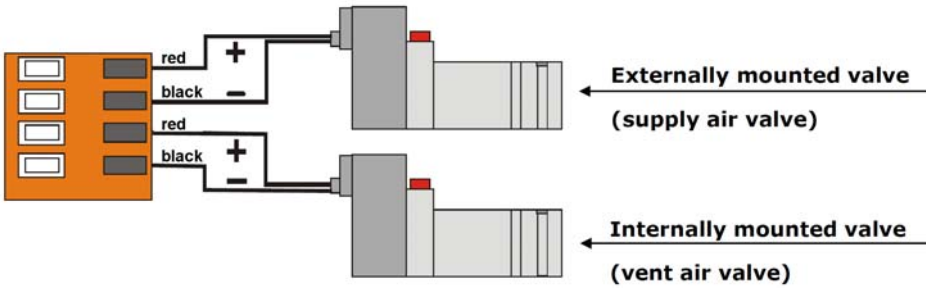

Fig. 11 Connection of the control valves (pilot valves)

4 . 3 . 4 Terminal supply line

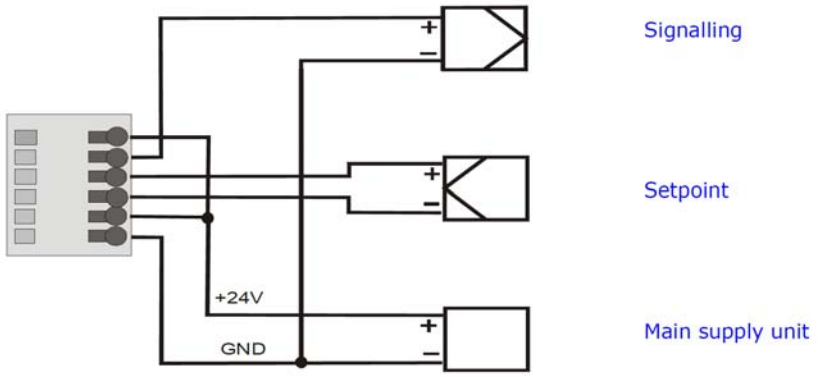

Fig. 12 Signalling connection with only one voltage supply

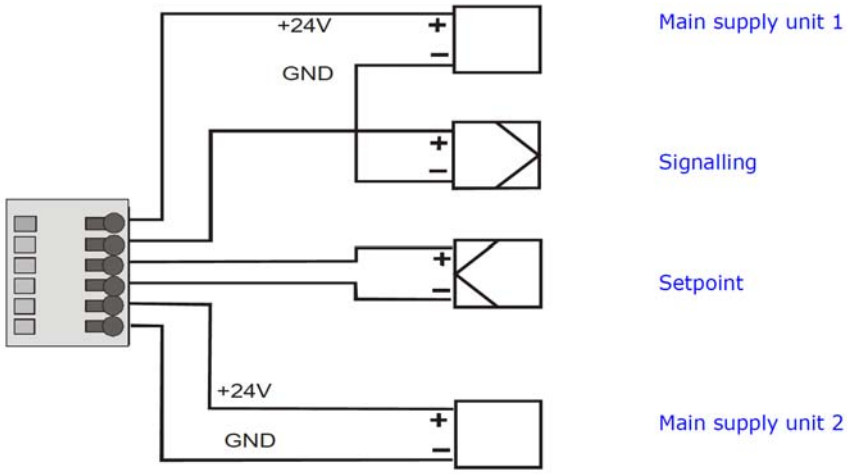

Fig. 13 Connection of signalling with electrical isolation and two mains supply units

Terminal Supply line	Output	Position signal, 4-20 mA +
	Output	Position signal, 4-20 mA -
	Input	Setpoint 4-20 mA +
	Input	Setpoint 4-20 mA -
	Supply	+24 V DC
	Supply	Ground

Tab. 3 Anschluss der Klemme Zuleitung

NOTICE

- It is not necessary to use the signalling unit.

4.4 Principle of operation

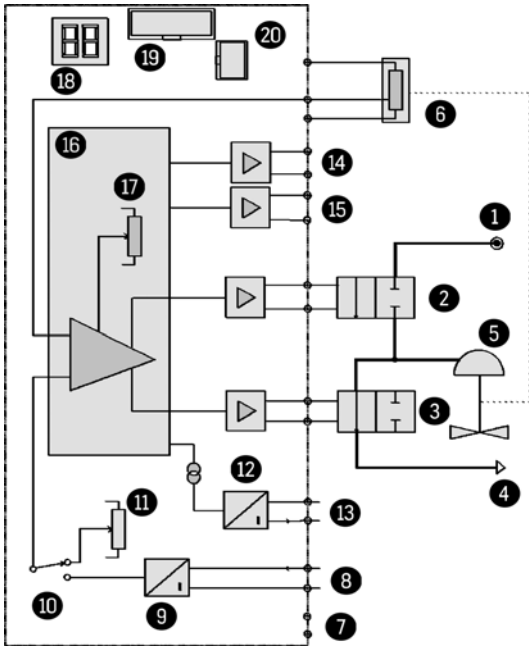

Fig. 14 Block diagram

1	Supply air
2	Supply air solenoid valve
3	Vent air solenoid valve
4	Vent air
5	Pneumatic actuator
6	Path measurement
7	Supply voltage
8	Setpoint 4-20 mA
9	Current input
10	Setpoint switchover
11	Potentiometer; internal setpoint
12	Current output stage
13	Position signalling
14	Green LED
15	Red LED
16	Mikroprocessor
17	Potentiometer; Control accuracy
18	Position indication
19	Extension connector
20	RS232 interface

Tab. 4 Block diagram

With a periodical path measurement (6) the microprocessor (16) determines the current position of the pneumatic actuator (5). The target position of the actuator is specified with a setpoint signal (8) or optionally the internal setpoint potentiometer (11). If, for example, the current position is lower than the setpoint, the supply air valve (2) is opened and the actuating pressure in the pneumatic actuator (5) increased. This then moves to the open position until the setpoint is reached. If the current position is too high, the actuating pressure is lowered with the vent valve (3) (depressurisation). The control valve then moves towards the closed position until the setpoint is reached. The switching valves (2 and 3) are then permanently open. For slight changes in the path the switching valves (2 and 3) are activated with short pulses. When the setpoint is reached both switching valves (2 and 3) are closed. The positioner therefore does not consume any air itself in the adjusted state. Compressed air is therefore only used for opening the actuator. The current position is shown on the display (18) and indicated by the current output of the position signalling unit (13). The position is shown as a percentage and is based on the full stroke of the valve.

5. Installation

5.1 Replacement of positioners mounted by Namur with DigiPos

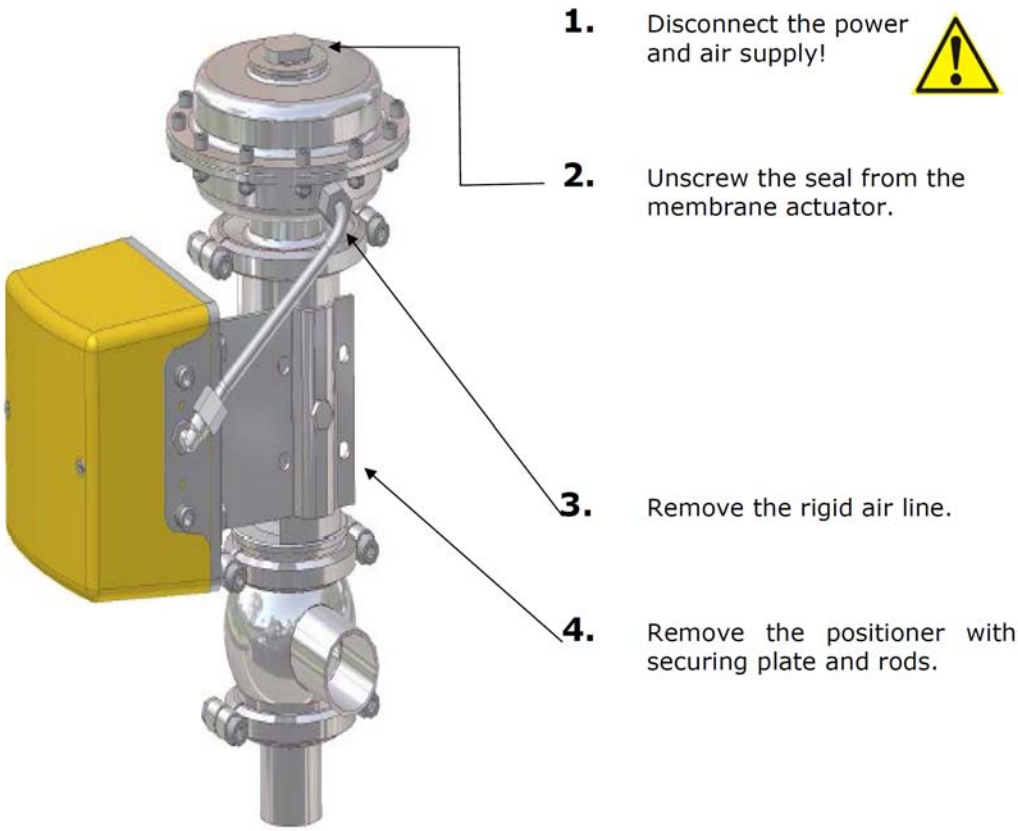

Fig. 15 Control valve type VSR with positioner mounted by Namur

5.2 Mounting on a diaphragm actuator

Fig. 16 Mounting on a diaphragm actuator

➤ **6.**

- Connect the supply air line
- Establish the electrical connections
- Apply compressed air
- Screw on the protective cover
- Start commissioning - Chapter 5

➤ **5.**

Secure the air connection to the actuator and positioner. (For actuators M1-M4 unscrew the ERMETO-fitting from the adapter to the drive and attach the L screw directly.

➤ **4.**

Tighten both stud bolts on the side of the basic body equally with a hexagon socket screw key.

CAUTION!
Do not overturn the thread by using excessive force.

➤ **3.**

Place the DigiPos without the protective cover onto the actuator and align the control air connection of the basic body with the air connection of the actuator.

Scope of supply:

Air supply connection: >> without air hose

Actuating air connection: >> already prepared with air hose

➤ **2.**

Apply M50 securing cement (Omnifit) to the inner thread of the liner. (Apply thinly!)

Insert the liner through the clamping ring and screw onto the actuator spindle (in the actuator) with a suitable tool.

On all actuators except M02 the housing sections of the actuator must be centred together. To this purpose all peripheral screws must be released slightly in order to centre the sections. It may be necessary to use a plastic hammer for alignment. Subsequently tighten the screws once more.

➤ **1.**

Replace the M10/M12 securing nut with the nut (flat version).

Screw the clamping ring into the membrane actuator and tighten with a face spanner.

5.3 Mounting on piston and rotary actuator

Fig. 17 Mounting on piston and rotary actuator

➤ **4.**

- Connect the supply air line
- Establish the electrical connections
- Apply compressed air
- Screw on the protective cover
- Start commissioning - Chapter 5

➤ **3.**

Secure the basic body with the four M8 securing screws with a hexagon socket screw key to the actuator.

➤ **2.**

Place DigiPos without protective cover on actuator and align. The hole on the top of the actuator (air connection) must be aligned with the hole on the underside of the basic body (control air duct).

CAUTION!
Ensure correct position of the O-rings.

➤ **1.**

On the thread of the liner apply M50 securing cement (Omnifit). (Apply thinly!)

Screw the liner into the piston rod of the actuator and tighten with a suitable tool.

5.4 Connection of the electric lines

During assembly or during the welding of valves with factory-assembled DigiPos in pipes, make sure that the electrical connection is made only after the assembly and welding operations. During assembly work on existing valves with mounted DigiPos this principle must be de-energized.

5.5 Connection of th pneumatic lines

There are two air connections on the DigiPos positioner (also refer to Figure7; page 13).

Only the air supply line requires connection after installation. The control line is mounted at the works. As quick-fit plug connections are used, no tools are required to connect or disconnect the air lines.

CAUTION

- The air must be filtered 5 µm and be free of water and oil. If lubricated air is used, it is recommended to use ISO VG32 class 1 oil.

5.6 Installation recommendations

➤ Minimum spacing

The distance to the next devices or the ceiling should be at least 100 mm. The positioner can therefore be easily accessed for servicing and also easily dismantled.

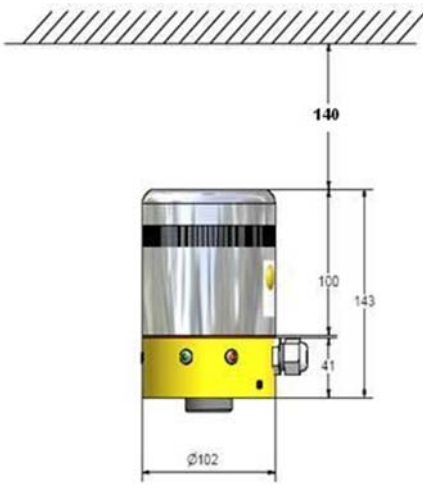

Fig. 18 DigiPos positioner with external dimensions

6. Commissioning

➤ **Operating elements on the positioner**

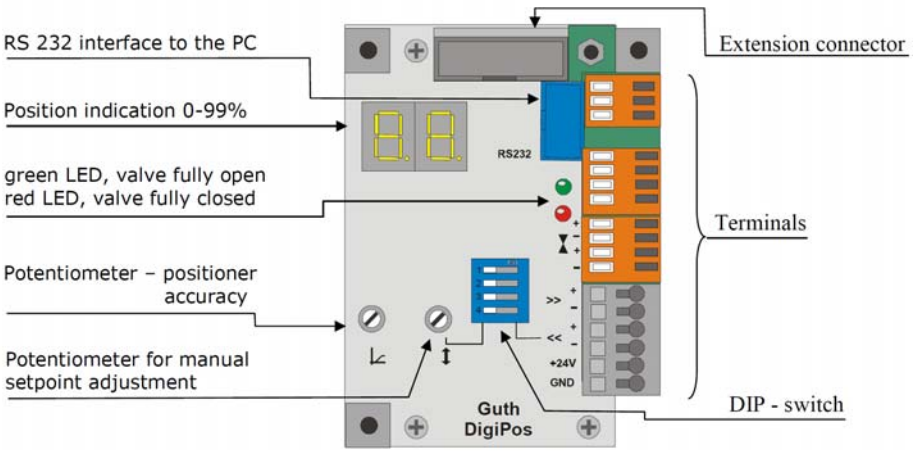

Fig. 19 Positioner (Circuit board with connection terminals)

DIP	Off	On
DIP 1		Firmware upload
DIP 2	Standard target value: 4mA closed, 20mA open	Target value inversion: 4mA open, 20mA closed
DIP 3		Automatic stroke adjustment
DIP 4	Target value from internal potentiometer	Target value from current receiver 4-20mA

Tab. 5 DIP Switches

6.1 Operation

Setpoint programming can be switched with DIP4 switch from the 4-20 mA input to an internal potentiometer.

The effective range of the setpoint input can be reversed by signal inversion with switch DIP2 (4 mA=open, 20 mA=closed).

6.2 Zero point setting and stroke alignment

(only necessary for dismounting the valve)

Stroke alignment is started by setting the DIP3 switch to "on". The valve is fully closed. It then opens fully and closes completely once more. The end positions of the position encoder are then measured and permanently programmed in the DigiPos. During stroke alignment a flashing "**A**." appears on the position display. When alignment has been completed a permanent "**A0**" appears on the position display. The DIP3 switch can then be switched off again.

6.3 Positioner accuracy

The positioning accuracy can be adjusted with the left-hand potentiometer. At the left end stop the accuracy is +/-0.4%. At the right end stop the accuracy is +/-2.9%. The positioner is set at the works to an accuracy of +/-1%. To this purpose the potentiometer is set at an angle of 45 degrees away from the left-hand end stop. The higher the accuracy, the more often the DigiPos must readjust. Generally a setting of +/-1% is completely sufficient.

6.4 Software Programming/Characteristic Curve Adjustment

Adjustment of the DigiPos with the commissioning software may only be performed by trained personnel. For this reason procedures are described in a separate manual.

6.5 Maintenance and Care

- Always observe the technical data given in this manual.
- The steel protective cover of the DigiPos must always be screwed firmly in place. If this is not the case, protection class IP 65 cannot be guaranteed and the positioner can suffer damage resulting from penetrating media.

6.6 Faults

6 . 6 . 1 Electronic error codes

If the positioner detects an error, the red LED flashes, irrespective of the position. At the same time an error code is shown on the display which alternates with the position indication.

Display	Error
C 1	The setpoint input receives a signal current of below 3.5 mA.
C 2	It was not possible to perform stroke alignment.
C 3	The supply voltage is below 18 V.

Tab. 6 Electronic error codes

6 . 6 . 2 Other faults

The positioner no longer reacts:

- Check the supply voltage for 24 V DC
- Check the cable for interruption and correct terminal connection
- Check the supply air connection; check the supply air pressure
- Check the position of the DIP switches on the circuit board
- Inspect the valve spindle and actuator to ensure that no mechanical blockage is responsible for the fault. Always disconnect the system from the voltage, pressure and media beforehand.

ATTENTION

- If it is not possible to remedy the faults, please contact Guth Ventiltechnik GmbH immediately.

7. Technical Data

7.1 Mechanical Data

External dimensions (diameter x height)	Ø102 x 143mm
Housing material	PA 6
Protective hood material	Stainless steel 1.4301
Weight	1600 g
Protection class	IP 65
Ambient temperature	Min. 0° C - Max. 70° C
Installation position	Vertical

Tab. 7 Mechanical Data

7.2 Pneumatic Data

Supply air pressure	6 bar recommended. At low pressure this must be above the maximum actuating pressure (necessary actuator pressure).
Air quality	Compressed air filtered 5 µm, dry and oil-free. If the compressed air is oiled, the quality must comply with ISO VG32 class 1.
Litre capacity supply air valve (unrestricted)	98 Liter / min
Litre capacity vent air valve (unrestricted)	98 Liter / min
Supply air connection	Quick-fit air screw connection ¼“: Suitable for plastic air hoses, - inside Ø 4mm - outside Ø 6mm

Tab. 8 Pneumatic Data

7.3 Elektric Data

➤ Input:

Connection	3 oder 4- conductor connection possible
Voltage supply	24 V DC +/- 10%
Current consumption	70 mA min. 40 / max. 110
Max. power consumption	2,7 W
Setpoint	4-20 mA
Setpoint input, resistance (load)	220 Ohm
Max. wire size	0,5mm²

Tab. 9 Elektric Data

➤ Output:

Position indication output, range	4-20 mA

➤ Path measurement:

Inductive circular sensor	0-10 V
Service life	10 years

➤ Miscellaneous Data:

Control accuracy, variable	0,4-2,9 % (1% default setting)
Adjustment time	0,5 – 4 sek.
Solenoid valves, switching time	10 ms
Solenoid valves, current	20 mA max. 100 mA
Solenoid valves, service life	10 million cycles

Tab. 10 Miscellaneous Data

8. Type key

D - 1.21 — M02 – S (example)

Optional-modules

S	Standard positioner

Actuator types

M02	diaphragm act.	20mm stroke
M1 / M2	diaphragm act.	20mm stroke
M3 / M4	diaphragm act.	30mm stroke
M9 / M10	diaphragm act.	60mm stroke
K1	piston actuator	25mm stroke
D1	rotary actuator	90° stroke

Firmware version

digit 1	Main program
digit 2+3	Index of revision

(version 1.21/rev. Sept.2008)

Positioner type

D	DigiPos