

# Montageanleitung / Operating Instructions

## Type 024.16.710

Elektropneumatischer Stellungsregler  
Electropneumatic position controller



**SED**  
FLOW CONTROL

# Type 024.16.710

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Technische Änderungen vorbehalten.

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Operating Instructions / BA11 0003 Rev. a

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## EC Declaration of Conformity

### 1. EC DECLARATION OF CONFORMITY

As dealer we hereby declare that the products with the designation:

**Type 024.16.710**

satisfy requirements which are specified in the following Directives of the European Council:

<b>2006/95/ EC</b>	<b>Low Voltage Directive</b>
<b>2004/108/EC</b>	<b>Electromagnetic Compatibility Directive</b>
<b>97/23/EC</b>	<b>Pressure Equipment Directive</b>
<b>94/9/EC</b>	<b>ATEX-Directive</b>

The products have been subjected to the following conformity assessment procedure:

#### **Module A Internal production control**

The Pressure Equipment Directive for products with a nominal voltage < 50V is applied to the CE mark only for equipment which has a nominal width > 25 mm and controls gases belonging to Group 1 or vapour or equipment which has a nominal width > 32 mm and controls gases belonging to Group 2 and the product is within the range > 1,000 and < 3,500 for the calculation nominal pressure x nominal width.

The products with a nominal voltage  $\geq 50V$  with respect to Pressure Equipment Directive (97/23/EC) are assessed in Article 1 Paragraph 3.6 of this directive, according to which the equipment is measured by the Low Voltage Directive and therefore does not drop below the scope of the Pressure Equipment Directive.

The units are designed and built in a way that

- there will not be an ignition source in normal use and
- the maximal surface temperature is less than the limit of the given temperature code on the unit.

#### **SED Flow Control GmbH**

Am Schafbaum 2

D - 74906 Bad Rappenau

Bad Rappenau, 01. June 2011

(This document was issued electronically and is therefore valid without signature)



## Operating Instructions

### 2. OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the device. Keep these instructions in a location which is easily accessible to every user, and make these instructions available to every new owner of the device.

#### **WARNING!**

**The operating instructions contain important safety information!**

Failure to observe these instructions may result in hazardous situations.

- The operating instructions must be read and understood.

#### 2.1. Symbols

##### **DANGER!**

**Warns of an immediate danger!**

- Failure to observe the warning will result in a fatal or serious injury.

##### **WARNING!**

**Warns of a potentially dangerous situation!**

- Failure to observe the warning may result in serious injuries or death.

##### **CAUTION!**

**Warns of a possible danger!**


- Failure to observe this warning may result in a moderate or minor injury.

#### **NOTE!**

**Warns of damage to property!**

- Failure to observe the warning may result in damage to the device or the equipment.

 Indicates important additional information, tips and recommendations.

 refers to information in these operating instructions or in other documentation.

→ Designates a procedure which you must carry out.

## Authorized use

### 3. AUTHORIZED USE

**Non-authorized use of the positioner Type 024.16.710 may be a hazard to people, nearby equipment and the environment.**

- The device is designed to be mounted on pneumatic actuators of process valves for the control of media.
- Do not expose the device to direct sunlight.
- Use according to the authorized data, operating conditions and conditions of use specified in the contract documents and operating instructions. These are described in the chapter entitled “7. *Technical Data*”.
- The device may be used only in conjunction with third-party devices and components recommended and authorized by SED Flow Control.
- In view of the large number of options for use, before installation, it is essential to study and if necessary to test whether the positioner is suitable for the actual use planned.
- Correct transportation, correct storage and installation and careful use and maintenance are essential for reliable and faultless operation.
- Use the positioner Type 024.16.710 only as intended.

#### 3.1. Restrictions

If exporting the system/device, observe any existing restrictions.

#### 3.2. Predictable Misuse

- Do not feed any aggressive or flammable media into the pressure supply connection.
- Do not feed any liquids into the pressure supply connection.
- Do not put any loads on the body (e.g. by placing objects on it or standing on it).
- Do not make any external modifications to the device bodies. Do not paint the body parts or screws.

## Basic Safety Instructions

### 4. BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any

- contingencies and events which may arise during the installation, operation and maintenance of the devices.
- local safety regulations – the operator is responsible for observing these regulations, also with reference to the installation personnel.

#### **DANGER!**

##### **Danger – high pressure!**

- Before dismounting pneumatic lines and valves, turn off the pressure and vent the lines.

##### **Risk of electric shock!**

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

##### **General hazardous situations.**

To prevent injury, ensure:

- that the system cannot be activated unintentionally.
- Installation and repair work may be carried out by authorized technicians only and with the appropriate tools.
- After an interruption in the power supply or pneumatic supply, ensure that the process is restarted in a defined or controlled manner.
- The device may be operated only when in perfect condition and in consideration of the operating instructions.
- The general rules of technology apply to application planning and operation of the device.

#### **NOTE!**

##### **Electrostatic sensitive components / modules!**

- The device contains electronic components, which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects is hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after start-up.
- Observe the requirements in accordance with EN 100 015 - 1 and 5 - 2 to minimize or avoid the possibility of damage caused by sudden electrostatic discharge!
- Also ensure that you do not touch electronic components when the power supply is on!



The positioner Type 024.16.710 was developed with due consideration given to the accepted safety rules and is state-of-the-art. Nevertheless, dangerous situations may occur.

Failure to observe this operating manual and its operating instructions as well as unauthorized tampering with the device release us from any liability and also invalidate the warranty covering the devices and accessories!

## General Information

### 5. GENERAL INFORMATION

#### 5.1. Scope of Supply

Check immediately upon receipt of the delivery that the contents are not damaged and that the type and scope agree with the delivery note and packing list.

Generally this consists of:

Pneumatically actuated valve with attached positioner, the operating instructions for the positioner and for the valve with pneumatic actuator.



For the multipole version of the positioner we will provide you with cable connectors as suitable accessories.

If there are any discrepancies, please contact us immediately.

#### 5.2. Contact Addresses

##### **SED Flow Control GmbH**

Am Schafbaum 2

D - 74906 Bad Rappenau

P.O. Box 1306

D - 74900 Bad Rappenau

Phone: +49(0)7264/921-0

Fax: +49(0)7264/921-21

E-Mail: [info@sed-flowcontrol.com](mailto:info@sed-flowcontrol.com)

Web: [www.sed-flowcontrol.com](http://www.sed-flowcontrol.com)

#### 5.3. Warranty

This document contains no promise of guarantee. Please refer to our general terms of sales and delivery. The warranty is only valid if the positioner Type 024.16.710 is used as intended in accordance with the specified application conditions.



The warranty extends only to defects in the positioner Type 024.16.710 and its components. We accept no liability for any kind of collateral damage which could occur due to failure or malfunction of the device.

# Type 024.16.710

## General Information

### 5.4. Trademarks

Brands and trademarks listed below are trademarks of the corresponding companies / associations / organizations

Loctite      Henkel Loctite Deutschland GmbH

### 5.5. Information on the Internet

The operating instructions and data sheets for Type 024.16.710 can be found on the Internet at:

[www.sed-flowcontrol.com](http://www.sed-flowcontrol.com)

## System Description

### 6. SYSTEM DESCRIPTION

#### 6.1. Intended Application Area

The positioner Type 024.16.710 is designed to be mounted on pneumatic actuators of process valves for the control of media.

#### 6.2. Function of the positioner and combination with valve types

Positioner Type 024.16.710 is an electropneumatic position controller for pneumatically actuated control valves with single-acting actuators.

Together with the pneumatic actuator, the positioner forms a functional unit.

The control valve systems can be used for a wide range of control tasks in fluid technology and, depending on the application conditions, different process valves from the SED range can be combined with the positioner. Angle-seat valves, diaphragm valves or ball valves fitted with a control cone are suitable.

"Fig. 1:" shows an overview of the possible combinations of positioner and different pneumatically actuated valves. Different actuator sizes and valve nominal widths, not illustrated here, are available for each type. More precise specifications can be found on the respective data sheets. The product range is being continuously expanded.



Fig. 1: Overview of possible combinations

## System Description

The position of the actuator is regulated according to the position set-point value. The position set-point value is specified by an external standard signal.

Pneumatically actuated piston actuators and rotary actuators can be used as an actuator. Single-acting actuators are offered in combination with the positioner.

For single-acting actuators, only one chamber is aerated and deaerated in the actuator. The generated pressure works against a spring. The piston moves until there is an equilibrium of forces between compressive force and spring force.

### 6.3. Features of the valve types

	Angle seat control valves / straight seat control valves	Diaphragm valves
Features	<ul style="list-style-type: none"> <li>• incoming flow under seat</li> <li>• no closing impact</li> <li>• straight flow path of the medium</li> <li>• self-adjusting stuffing box for high leak-tightness</li> </ul>	<ul style="list-style-type: none"> <li>• medium is hermetically separated from the actuator and environment</li> <li>• cavity-free and self-draining body design</li> <li>• any flow direction with low-turbulence flow</li> <li>• steam-sterilizable</li> <li>• CIP-compliant</li> <li>• no closing impact</li> <li>• actuator and diaphragm can be removed when the body is installed</li> </ul>
Typical media	<ul style="list-style-type: none"> <li>• water, steam and gases</li> <li>• alcohols, oils, propellants, hydraulic fluids</li> <li>• salt solutions, lyes (organic)</li> <li>• solvents</li> </ul>	<ul style="list-style-type: none"> <li>• neutral gases and liquids</li> <li>• contaminated, abrasive and aggressive media</li> <li>• media of higher viscosity</li> </ul>

Table 1: Features of the valve types

# Type 024.16.710

## System Description

### 6.4. Model for Control of Third-party Devices

A special model enables the positioner Type 8696 to be attached to third-party devices.

This model has a different pneumatic connection module so that the pilot air ports can be connected to the outside of the actuator.

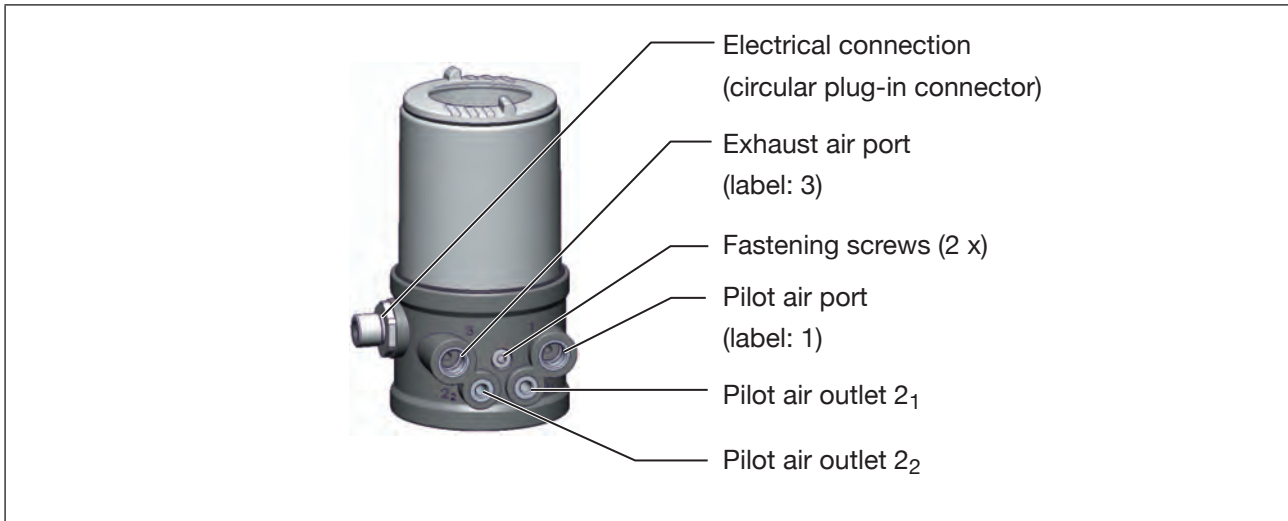


Fig. 2: Model for Third-party Devices

#### NOTE!

##### Damage or malfunction due to ingress of dirt and moisture!

- To comply with protection class IP65 / IP67, connect the pilot air outlet (only for CFA or CFB) which is not required to the free pilot air port of the third-party device or seal with a plug.



“In rest position” means that the pilot valves of the positioner Type 024.16.710 are isolated or not actuated.



If the ambient air is humid, a hose can be connected between pilot air outlet 22 of the positioner and the unconnected pilot air port of the third-party device for control function A or control function B. As a result, the spring chamber of the third-party device is supplied with dry air from the vent duct of the positioner.

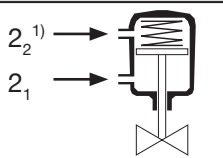
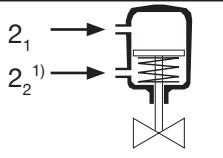
Control function (CF)		Pneumatic connection Type 024.16.710 with third-party device
<b>A</b>	Process valve closed in rest position (by spring force)	Pilot air outlet $2_2^{1)}$ → 
<b>B</b>	Process valve open in rest position (by spring force)	Pilot air outlet $2_1$ → 

Table 2: Pneumatic connection to third-party device

<sup>1)</sup> Connection optionally, see note.



## System Description

### 6.5. Structure of the Positioner

The positioner Type 024.16.710 consists of the micro-processor controlled electronics, the position measuring system and the control system. The device is designed using three-wire technology. The positioner is operated via 2 keys and a 4-pole DIP switch. The pneumatic control system for single-acting actuators consists of 2 solenoid valves.

#### 6.5.1. Representation

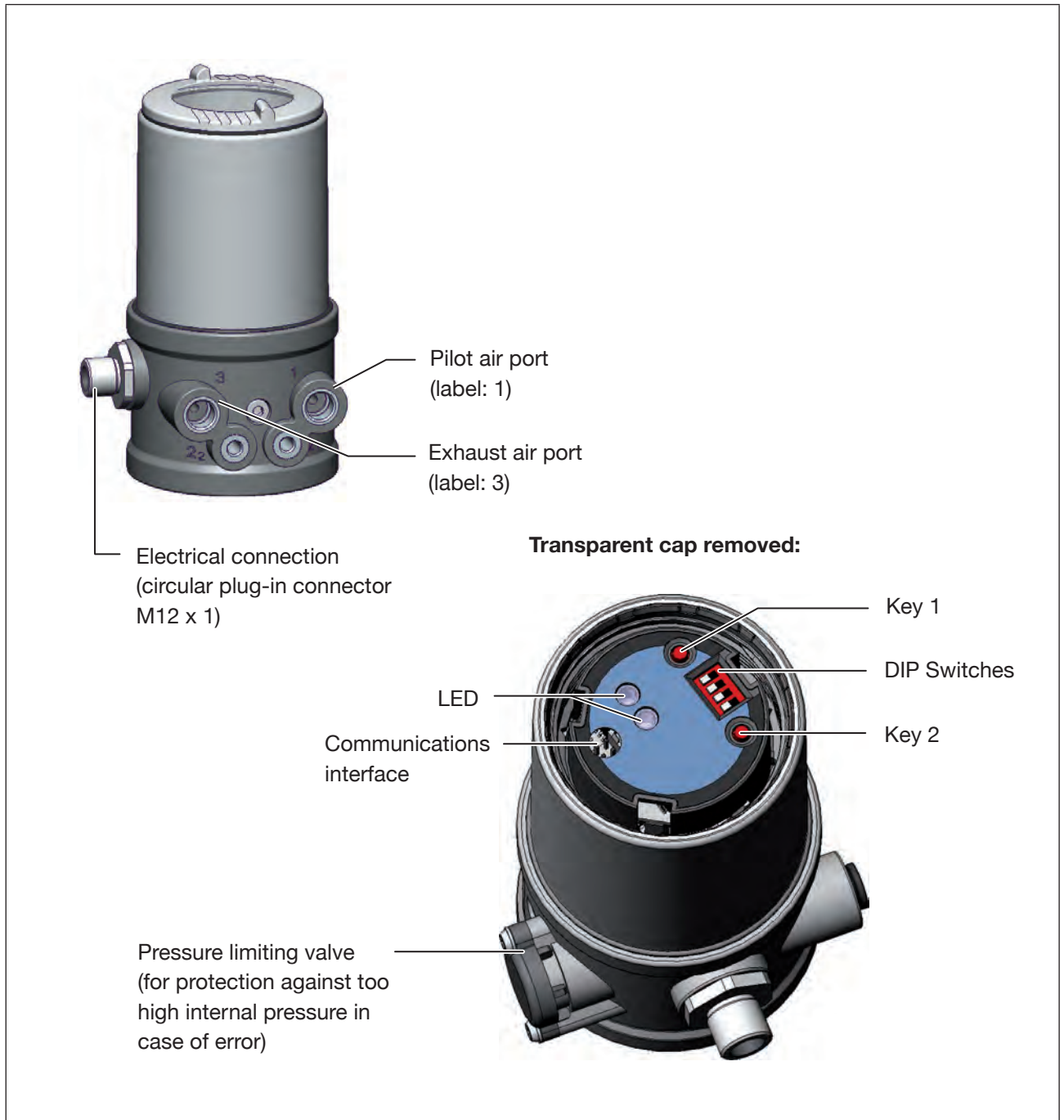


Fig. 3: Structure

## System Description

### 6.5.2. Features

- **Models**

for single-acting valve actuators.

- **Position measuring system**

Contactless and therefore wear-free position measuring system.

- **Microprocessor-controlled electronics**

for signal processing, control and valve control.

- **Control module**

The device is controlled via 2 buttons and a 4-pole DIP switch. 2x 2-colored LEDs indicate different statuses of the device.

- **Control system**

The control system consists of 2 solenoid valves. One valve is used to aerate and another to deaerate the pneumatic actuator. The solenoid valves operate according to the rocker principle and are controlled with a PWM voltage via the controller. Doing so achieves a higher flexibility with regard to actuator volume and final control speed. The direct-action model has an orifice of DN 0.6. In larger pneumatic actuators the solenoid valves feature diaphragm amplifiers to increase the maximum flow and therefore to improve the dynamics (DN 0,6).

- **Position feedback (optional)**

The position of the valve can be transmitted to the PLC via an analog 0/4-20 mA output.

- **Binary input**

If a voltage > 10 V is applied, *SAFE POSITION* is activated, i.e. the valve is moved to the safety position (factory setting, can be changed with communications software).

- **Pneumatic interfaces**

1/4" connections with different thread forms (G, NPT)  
hose plug-in connection

- **Electrical interfaces**

Circular plug-in connector or cable gland



- **Body**

The body of the positioner is protected from excessively high internal pressure, e.g. due to leaks, by a pressure limiting valve.

- **Communications interface**

For configuration and parameterization.

# Type 024.16.710

## System Description

### 6.5.3. Function diagram of the positioner with single-acting actuator

The illustrated function diagram describes the function of the positioner (Type 024.16.710).

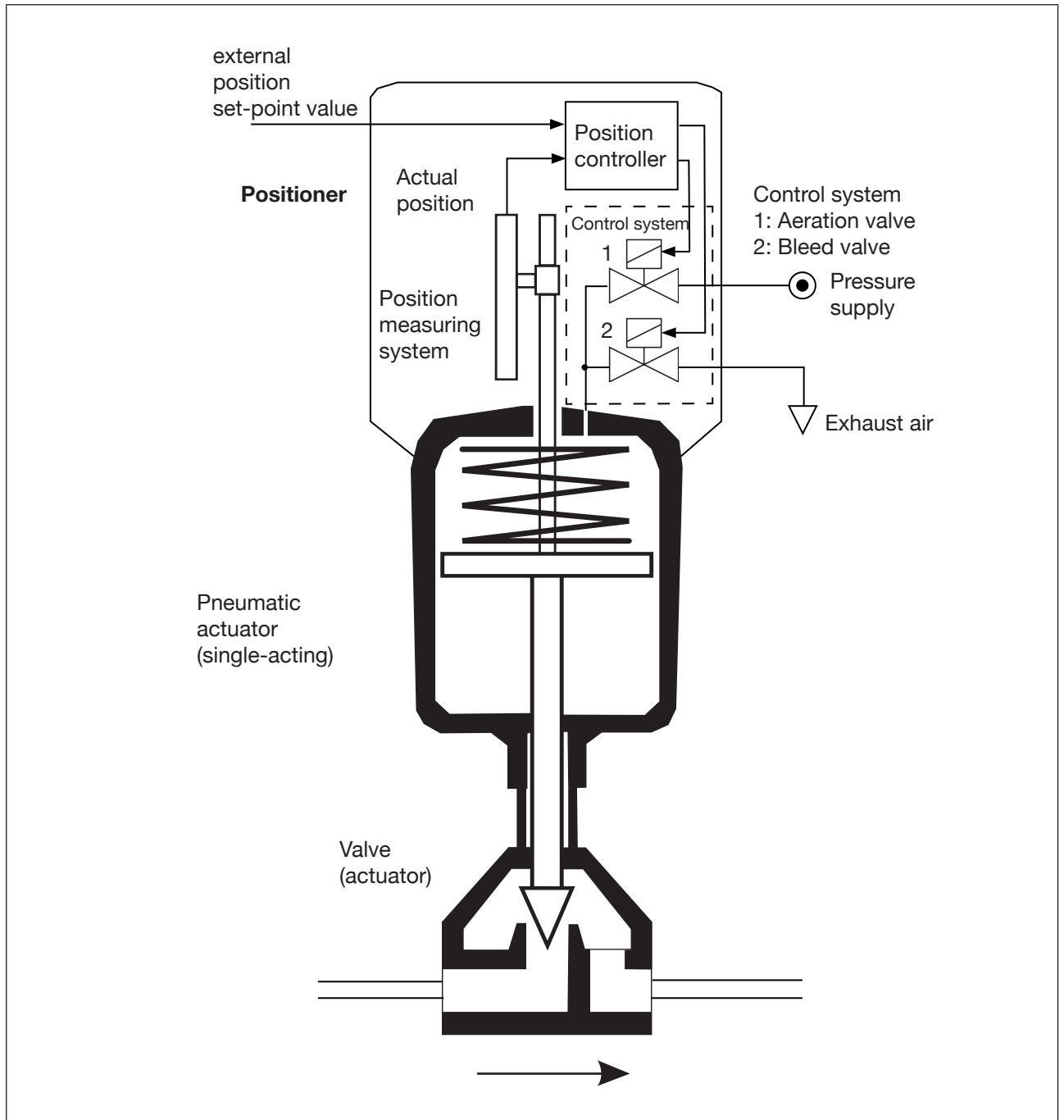


Fig. 4: Function diagram

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## System Description

### 6.6. Type 024.16.710 Positioner with position controller

The position measuring system records the current position (POS) of the pneumatic actuator. The position controller compares this actual position value with the set-point value (CMD) which is definable as standard signal. In case of a control deviation ( $X_{d1}$ ), a pulse-width modulated voltage signal is sent to the control system as a manipulated variable. If there is a positive control difference in single-acting actuators, the air inlet valve is controlled via output B1. If the control difference is negative, the bleed valve is controlled via output E1. In this way the position of the actuator is changed until control difference is 0.  $Z_1$  represents a disturbance variable.

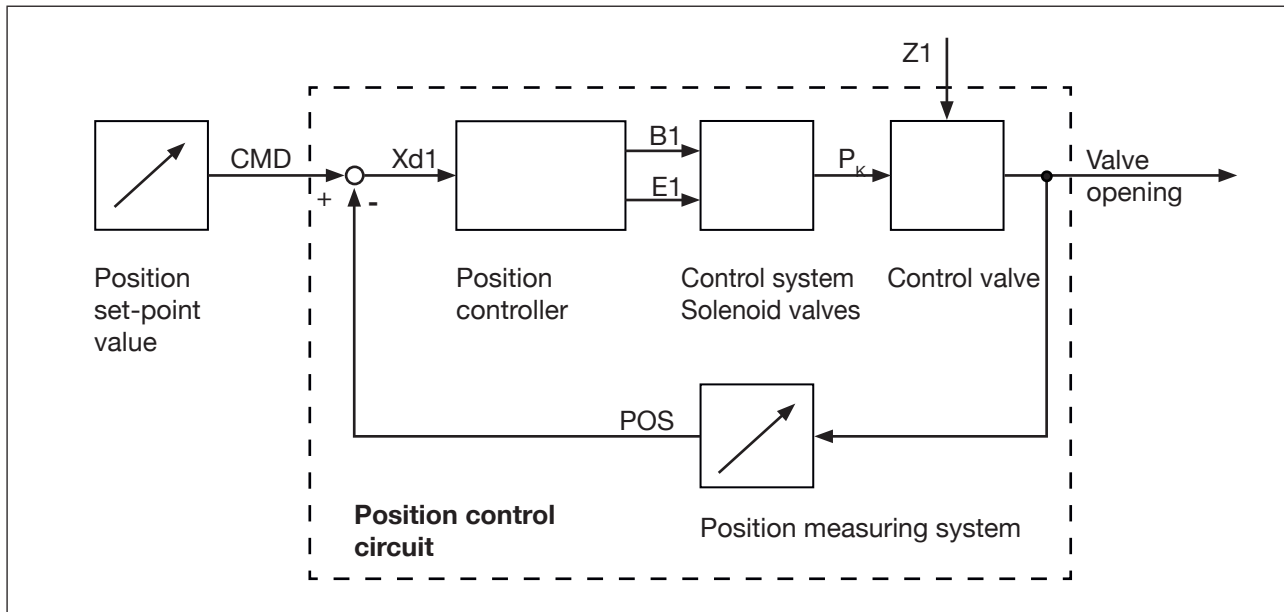


Fig.5: Signal flow plan of position controller

#### 6.6.1. Schematic representation of the position control Type 024.16.710

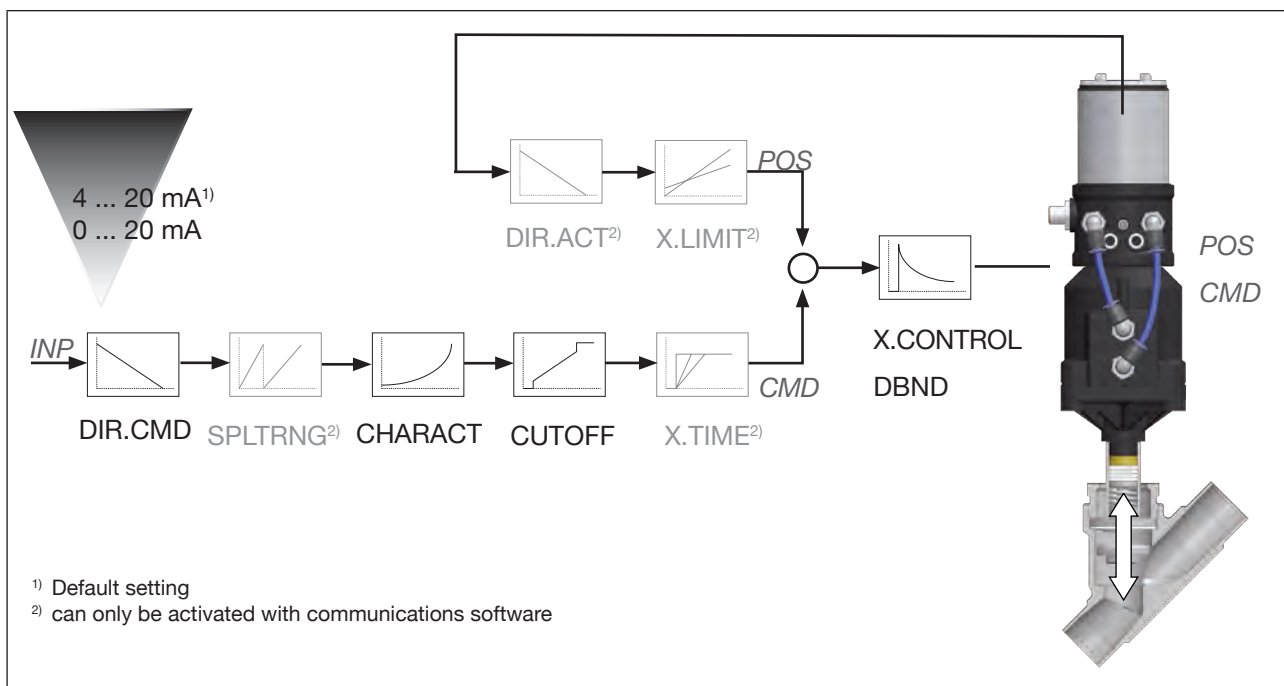


Fig. 6: Schematic representation of position control

## System Description

### 6.6.2. Properties of the position controller software

#### Functions I

- Activation via DIP switches
- Parameter setting via communications software

Additional function	Effect
Sealing function <i>CUTOFF</i>	Valve closes tight outside the control range. Specification of the value (as %), from which the actuator is completely deaerated (when 0 %) or aerated (when 100 %) (see Chapter "8.4. Function of the DIP switches").
Correction line to adjust the operating characteristic <i>CHARACT</i>	Linearization of the process characteristic can be implemented (see Chapter "8.4. Function of the DIP switches").
Effective direction of the controller set-point value <i>DIR.CMD</i>	Reversal of the effective direction of the set-point value (see Chapter "8.4. Function of the DIP switches").

Table 3: Functions I

# Type 024.16.710

## System Description

### Functions II

- Activation and parameter setting via communications software

Additional function	Effect
Standard signal for set-point value <i>INPUT</i>	Select set-point value standard signal
Effective direction of the actuator <i>DIR.ACTUATOR</i>	Assignment of the aeration status of the actuator chamber to the actual position.
Signal split range <i>SPLITRANGE</i>	Standard signal as % for which the valve runs through the entire mechanical stroke range.
Mechanical stroke range limit <i>X.LIMIT</i>	Limit the mechanical stroke range
Opening and closing time <i>X.TIME</i>	Limit the control speed
Position controller <i>X.CONTROL</i>	Parameterize the position controller
Safety position <i>SAFE POSITION</i>	Definition of the safety position
Signal level fault detection <i>SIGNAL ERROR</i>	Configuration of signal level fault detection
Binary input <i>BINARY INPUT</i>	Configuration of the binary input
Analog output <i>OUTPUT</i>	Configuration of the analog output (optional)
Reset <i>RESET</i>	Reset to factory settings

Table 4: Functions II

### 6.7. Interfaces of the positioner

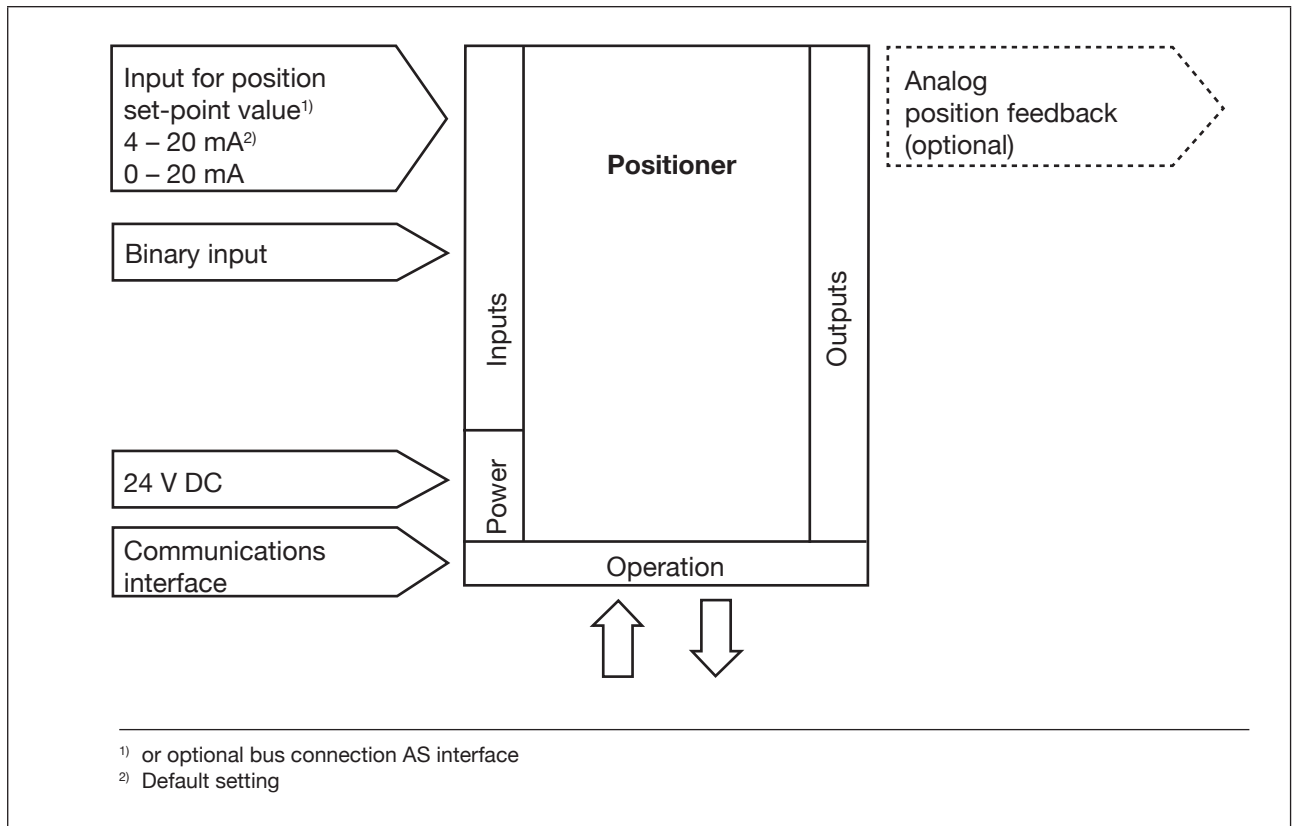


Fig. 7: Interfaces



The positioner Type 024.16.710 is a 3-wire device, i.e. the power (24 V DC) is supplied separately from the set-point value signal.

- Input for position set-point value (4 – 20 mA corresponds to 0 – 100 % (depending on position of DIP switch 1)).
- Binary input  
If a voltage > 10 V is applied, *SAFE POSITION* is activated, i.e. the valve is moved to the safety position (factory setting, can be changed with communications software).
- Analog position feedback (optional)  
The position of the valve can be transmitted via an analog 4 – 20 mA output to the PLC (4 – 20 mA corresponds to 0 – 100 %).

## Technical Data

### 7. TECHNICAL DATA

#### 7.1. Operating Conditions



#### WARNING!

**Solar radiation and temperature fluctuations may cause malfunctions or leaks.**

- If the device is used outdoors, do not expose it unprotected to the weather conditions.
- Ensure that the permitted ambient temperature does not exceed the maximum value or drop below the minimum value.

Ambient temperature	0 ... +60 °C
Protection class:	IP65 / IP67 according to EN 60529 (only if cables, plugs and sockets have been connected correctly and in compliance with the exhaust air concept in chapter "10.3. <i>Pneumatic connection of the positioner</i> ")

#### 7.2. Conformity

CE mark conforms to EMC Directive 2004/108/EC  
(only if cables, plugs and sockets connected correctly).

#### 7.3. Mechanical data

Dimensions	See data sheet
Body material	exterior: PPS, PC, VA, interior: PA 6; ABS
Sealing material	EPDM / FKM
Stroke range of valve spindle:	3 ... 28 mm



# Type 024.16.710

## Technical Data

### 7.4. Pneumatic data

Control medium		neutral gases, air Quality classes in accordance with DIN ISO 8573-1
Dust content	Class 5	max. particle size 40 µm, max. particle density 10 mg/m <sup>3</sup>
Water content	Class 3	max. pressure dew point - 20 °C or min. 10 °C below the lowest operating temperature
Oil content	Class 5	max. 25 mg/m <sup>3</sup>
Temperature range of the compressed air		0 ... +60 °C
Pressure range		3 ... 7 bar
Air output of control valve		7 l <sub>N</sub> / min (for aeration and deaeration) (Q <sub>Nn</sub> - value according to definition for pressure drop from 7 to 6 bar absolute)
Connections		Plug-in hose connector Ø6 mm / 1/4" Socket connection G1/8 with M5 connection for connecting to the valve actuator

### 7.5. Adhesive labels

#### 7.5.1. Label (example)

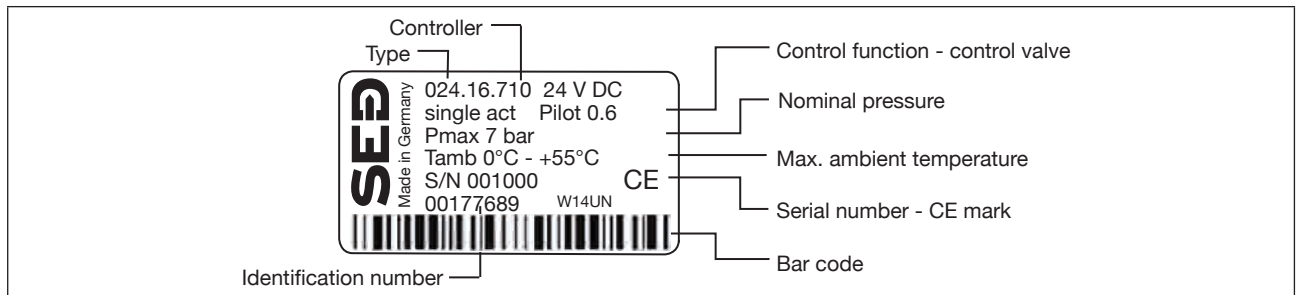


Fig. 8: Example of label

# Type 024.16.710

## Technical Data

### 7.6. Electrical Data

#### 7.6.1. Electrical data without bus control 24 V DC

Connections	Circular plug-in connector (M12 x 1, 8-pole)
Control valve	
Power supply	24 V DC $\pm$ 10% - max. residual ripple 10 %
Power input	$\leq$ 3.5 W
Input resistance for set-point value signal	180 $\Omega$ at 0/4 - 20 mA / 12 bit resolution
Protection class	3 in accordance with VDE 0580
Analogue position feedback max. load for current output 0/4 – 20 mA	560 $\Omega$
Binary input	not galvanically isolated 0 – 5 V = log “0”, 12 - 30 V = log “1” inverted input in reverse order
Communications interface RS232	Direct connection to PC via RS232 adapter with integrated interface driver, communication with communications software based on FDT/DTM technology, see “ <i>Table 26: Accessories</i> ”.

## Technical Data

### 7.7. Factory settings of the positioner

Functions can be activated via DIP switches:

Function	Parameter	Value
<i>CUTOFF</i>	Sealing function below Sealing function above	2 % 98 %
<i>CHARACT</i>	Select characteristic	FREE <sup>1)</sup>
<i>DIR.CMD</i>	Effective direction set-point value	rise

Table 5: Factory settings - Functions I

Functions can be activated via communications software:

Function	Parameter	Value
<i>INPUT</i>	Set-point value input	4 ... 20 mA
<i>DIR.ACTUATOR</i>	Effective direction actual value	rise
<i>SPLITRANGE</i> Function deactivated	Signal split range below Signal split range above	0 % 100 %
<i>X.LIMIT</i> Function deactivated	Stroke limit below Stroke limit above	0 % 100 %
<i>X.TIME</i> Function deactivated	Actuating time Open Actuating time Closed	(1 s) values determined by <i>X.TUNE</i> (1 s) values determined by <i>X.TUNE</i> After implementation of <i>RESET</i> : 1 s
<i>X.CONTROL</i>	Deadband Open amplification factor Close amplification factor	1,0 % (1) values determined by <i>X.TUNE</i> (1) values determined by <i>X.TUNE</i> After implementation of <i>RESET</i> : 1
<i>SAFE POSITION</i>	Safety position	0 %
<i>SIGNAL ERROR</i> Function deactivated	Sensor break detection set-point value	OFF
<i>BINARY INPUT</i>	Binary input function Operating principle of binary input	Safety position Normally open
<i>OUTPUT</i> (optional)	Norm signal output: Parameter Norm signal output: Type	Position 4 – 20 mA

Table 6: Factory settings Functions II

<sup>1)</sup> without change to the settings via the communications software a linear characteristic is stored in *FREE*.

## Control and display elements

### 8. CONTROL AND DISPLAY ELEMENTS

The following chapter describes the operating statuses as well as the control and display elements of the positioner.

Further information on the operation of the positioner can be found in the chapter entitled “12. Start-Up”.

#### 8.1. Operating status

##### AUTOMATIC (AUTO)

Normal controller mode is implemented and monitored in AUTOMATIC operating status.

→ LED 1 flashes green.

##### MANUAL

In MANUAL operating status the valve can be opened and closed manually via the keys.

→ LED1 flashes red / green alternately.

DIP switch 4 can be used to switch between the two operating statuses AUTOMATIC and MANUAL.

#### 8.2. Control and display elements of the positioner

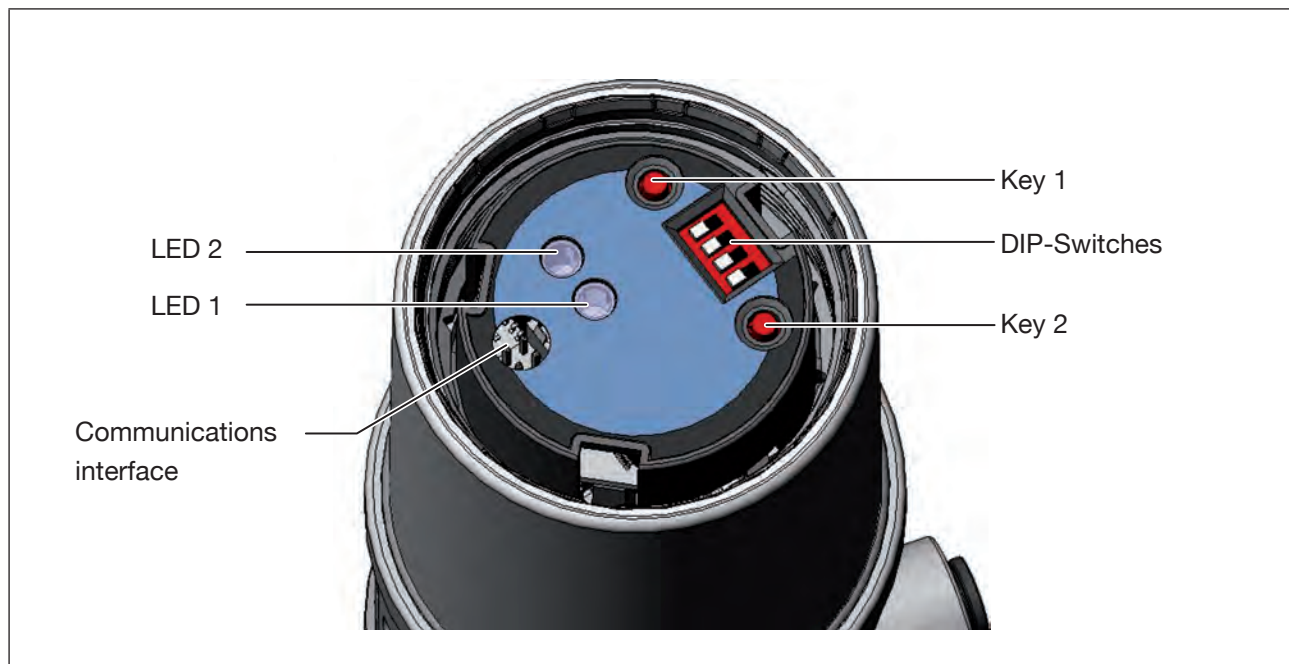


Fig. 9: Description of control elements

The positioner features 2 buttons, 4-pole DIP switches and 2x 2-colored LEDs as a display element.

→ To operate the buttons and DIP switches, for  
Version 1: unscrew the body casing  
Version 2: unscrew the transparent cap

## Control and display elements

### 8.3. Configuration of the keys

The configuration of the 2 keys varies depending on the operating status (AUTOMATIC / MANUAL).

The description of the operating statuses (AUTOMATIC / MANUAL) can be found in the chapter entitled “8.1. Operating status”.

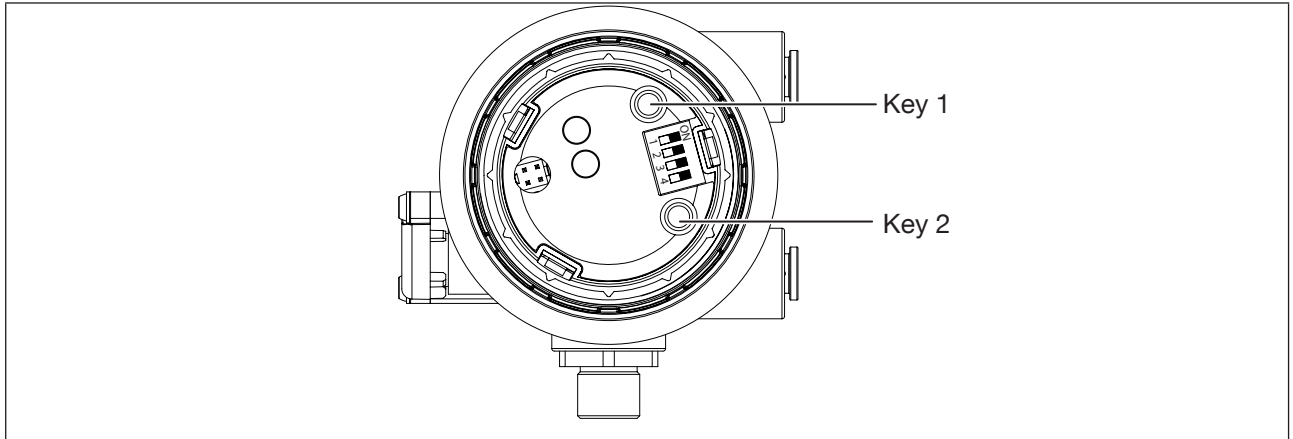


Fig. 10: Description of the buttons

→ To operate the buttons, for

Version 1: unscrew the body casing

Version 2: unscrew the transparent cap

MANUAL operating status (DIP switch 4 set to ON):

Key	Function
1	Aerate <sup>1)</sup> (manually open / close the actuator) <sup>2)</sup>
2	Deaerate <sup>1)</sup> (manually open / close the actuator) <sup>2)</sup>

Table 7: Configuration of the keys for MANUAL operating status

AUTOMATIC operating status (DIP switch 4 set to OFF):

Key	Function
1	Press for 5 seconds to start the X.TUNE function
2	-

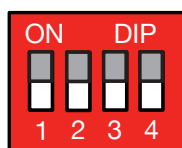
Table 8: Configuration of the keys for AUTOMATIC operating status

<sup>1)</sup> No function if the binary input was activated with the “Manual/Auto change-over” via the communications software

<sup>2)</sup> depending on the operating principle of the actuator.

## Control and display elements

### 8.4. Function of the DIP switches



→ To operate the DIP switches, for  
 Version 1: unscrew the body casing  
 Version 2: unscrew the transparent cap


DIP Switches	Position	Function
1	ON	Reversal of the effective direction of the set-point value ( <i>DIR.CMD</i> ) (set-point value 20 – 4 mA corresponds to position 0 – 100 %), descending
	OFF	Normal effective direction of the set-point value (set-point value 4 – 20 mA corresponds to position 0 – 100 %), ascending
2	ON	Sealing function active. The valve completely closes below 2 % <sup>1)</sup> and opens above 98 % of the set-point value ( <i>CUTOFF</i> )
	OFF	No sealing function
3	ON	Correction characteristic for adjustment of the operating characteristic (linearization of the process characteristic <i>CHARACT</i> ) <sup>2)</sup>
	OFF	Linear characteristic
4	ON	Operating status MANUAL (BY HAND)
	OFF	Operating status AUTOMATIC (AUTO)

Table 9: DIP Switches

#### Information about the communications software:

The switching position of the DIP switch has priority over the settings via the communications software!

If the values of the sealing function (*CUTOFF*) or the correction characteristic (*CHARACT*) are changed via the communications software, the corresponding function must be active (DIP switches set to ON). The effective direction of the set-point value (*DIR.CMD*) can be changed via the DIP switches only. If the correction characteristic (*CHARACT*) is not changed via the communications software, a linear characteristic is saved when DIP switch 3 is set to ON.

 A detailed description of the functions can be found in the chapter entitled “13.1. Basic functions” and in the operating instructions for the communications software.

<sup>1)</sup> Factory setting, can be changed via communications software.

<sup>2)</sup> The characteristic type can be changed via communications software

## Control and display elements

### 8.5. Display of the LEDs

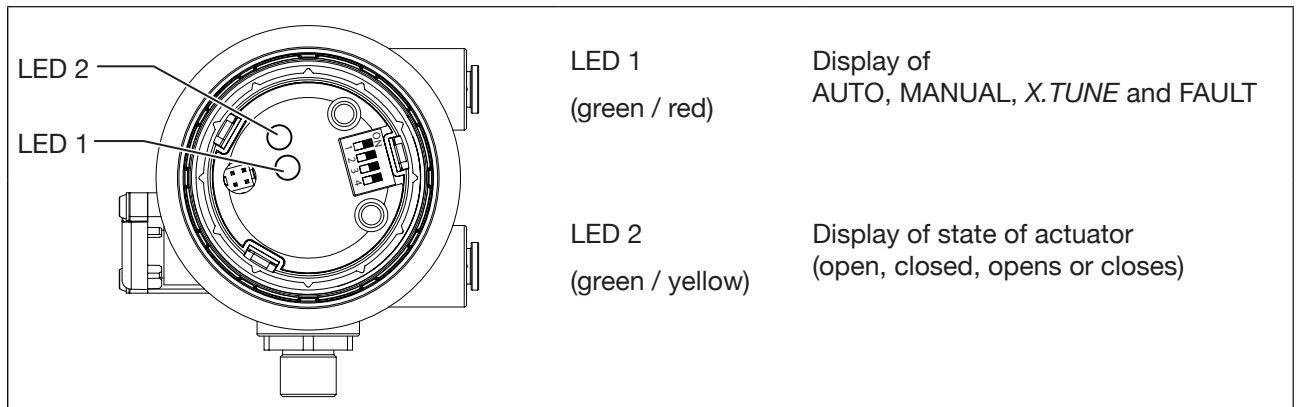


Fig. 11: LED display

#### LED 1 (green / red)

LED States		Display
green	red	
on	off	Acceleration phase when Power ON
flashes slowly	off	Operating status AUTO (AUTOMATIC)
flashing alternating	flashing	MANUAL operating status
flashes quickly	off	X.TUNE function
off	on	ERROR (see chapter entitled "8.6. Error Messages")
flashing slow	flashing	AUTO operating status for sensor break detection

Table 10: Display LED 1

#### LED 2 (green / yellow)

LED States		Display
green	yellow	
on	off	Actuator closed
off	on	Actuator open
flashes slowly	off	remaining control deviation (actual value > set-point value)
off	flashes slowly	remaining control deviation (actual value < set-point value)
flashes quickly	off	Closing in MANUAL operating status
off	flashes quickly	Opening in MANUAL operating status

Table 11: Display LED 2

## Control and display elements

### 8.6. Error Messages

#### 8.6.1. Error messages in MANUAL and AUTOMATIC operating statuses

Display	Cause of fault	Remedial action
LED 1 (red) on	Checksum error in data memory → Data memory defective → The device automatically switches to an older (possibly not current) data record.	Not possible, device defective

Table 12: Error messages in the operating statuses

#### 8.6.2. Error messages while the X.TUNE function is running

Display	Cause of fault	Remedial action
LED 1 (red) on	No compressed air connected	Connect compressed air
	Compressed air failure while the X.TUNE function was running	Check compressed air supply
	Actuator or control system deaeration side leaking	Not possible, device defective
	Control system aeration side leaking	Not possible, device defective

Table 13: Error messages for the X.TUNE function



## Installation

### 9. INSTALLATION

#### 9.1. Safety instructions



##### **DANGER!**

###### **Risk of injury from high pressure!**

- Before dismounting pneumatic lines and valves, turn off the pressure and vent the lines.

###### **Risk of electric shock!**

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!



##### **WARNING!**

###### **Risk of injury from improper installation!**

- Installation may be carried out by authorized technicians only and with the appropriate tools!

###### **Risk of injury from unintentional activation of the system and an uncontrolled restart!**

- Secure system from unintentional activation.
- Following assembly, ensure a controlled restart.

# Type 024.16.710

## Installation

### 9.2. Installing the positioner Type 024.16.710 on SED process valves

Procedure:

#### 1. Install switch spindle

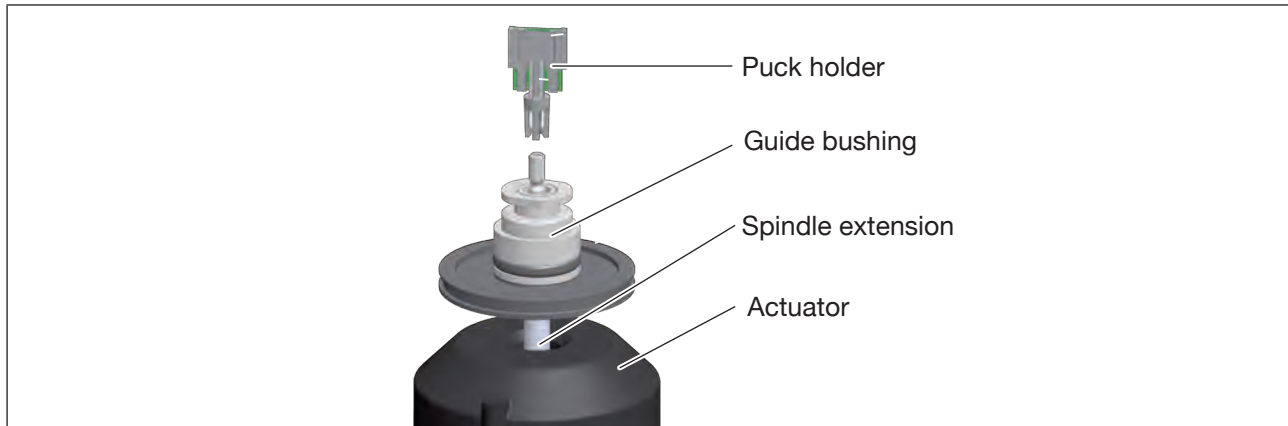


Fig. 12: Installing the switch spindle

## Installation

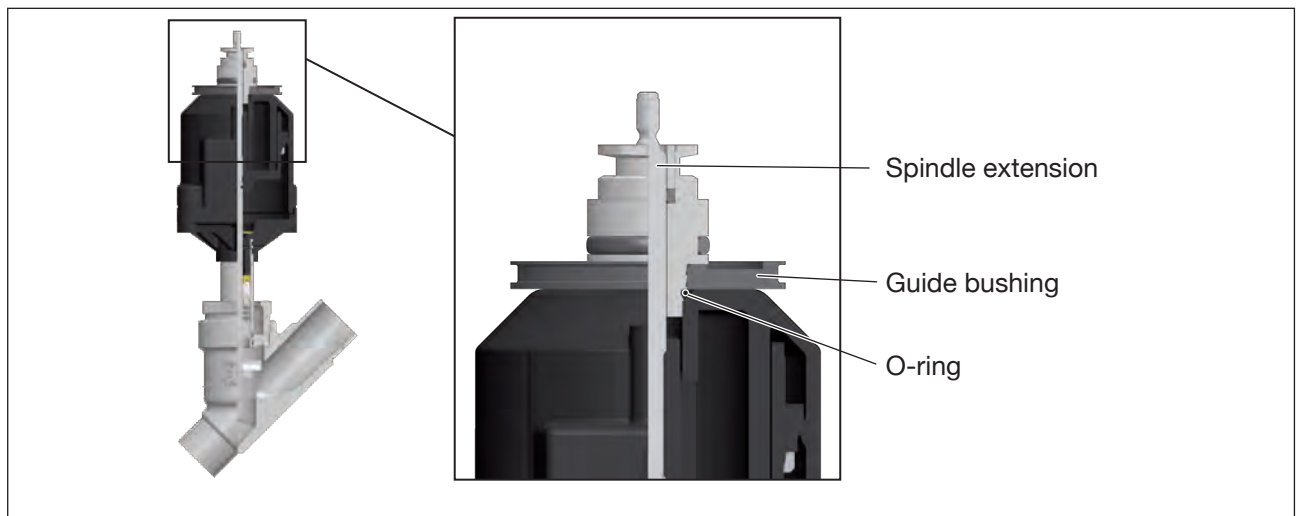


Fig. 13: Installing the switch spindle

- Press the O-ring downwards into the cover of the actuator.
- Screw the guide piece into the cover of the actuator using a face wrench<sup>1)</sup> (torque: 8.0 Nm).
- To secure the switch spindle, apply some screw locking paint (Loctite 290) to the thread of the switch spindle.
- Push the puck holder onto the switch spindle until it engages.

<sup>1)</sup> journal Ø: 3 mm; journal gap: 23.5 mm

### 2. Install positioner

- Push the positioner onto the actuator. The puck holder must be aligned in such a way that it is inserted into the guide rail of the positioner.

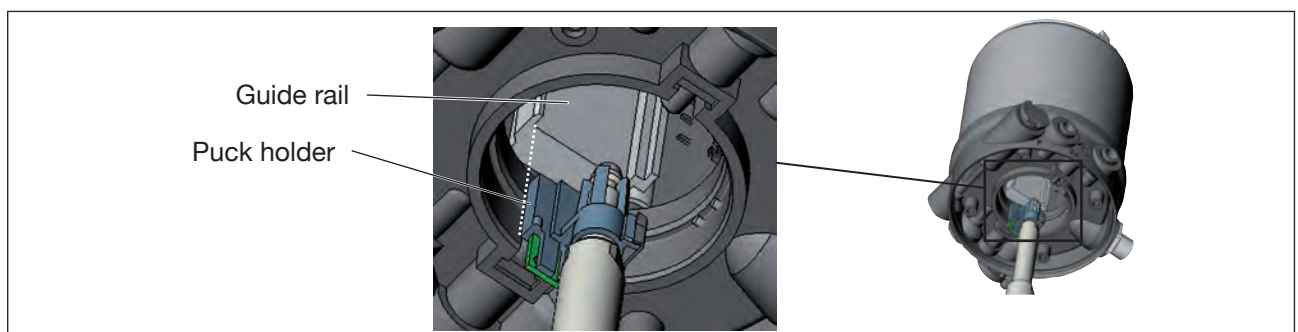


Fig. 14: Aligning the puck holder

- Press the positioner all the way down as far as the actuator and turn it into the required position.

# Type 024.16.710

## Installation

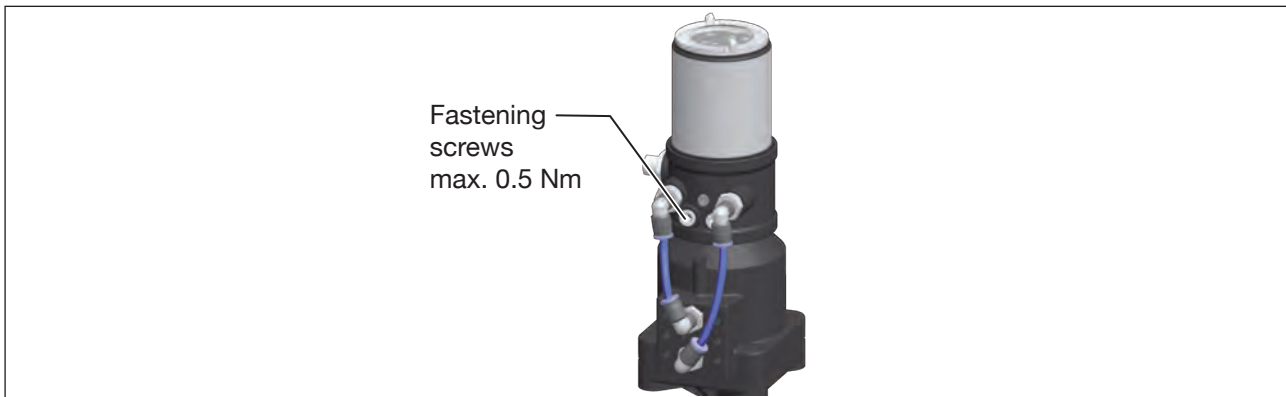


Fig. 15: Installing the positioner

**!** Ensure that the pneumatic connections of the positioner and those of the valve actuator are situated preferably vertically one above the other.

### NOTE!

**Too high torque when screwing in the fastening screw does not ensure protection class IP65 / IP67!**

- The fastening screws may be tightened to a maximum torque of 0.5 Nm only.

→ Attach the positioner to the actuator using the two side fastening screws. In doing so, tighten the fastening screws hand-tight only (maximum torque: 0.5 Nm).

### 3. Install pneumatic connection between positioner and actuator

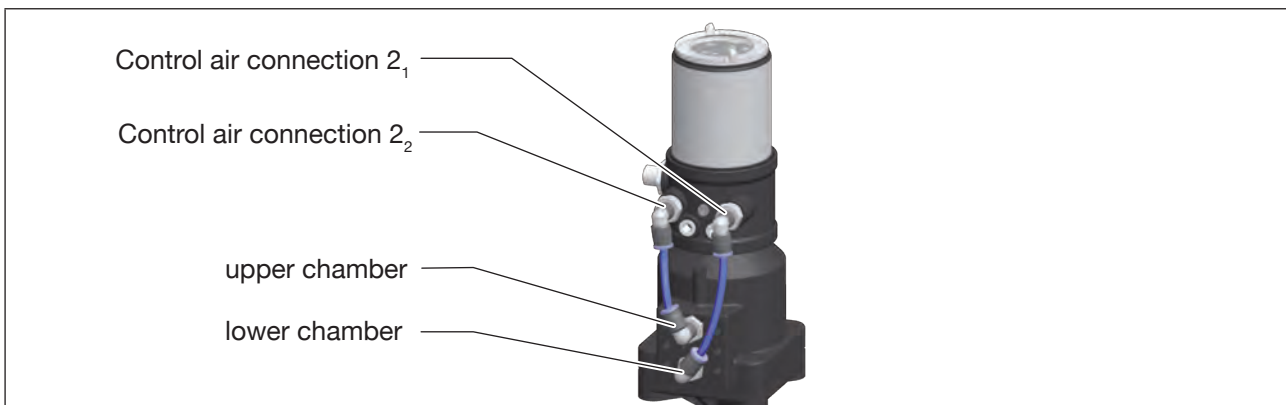


Fig. 16: Installing the positioner

→ Screw the plug-in hose connectors onto the positioner and the actuator.

→ Using the hoses supplied in the accessory kit, make the pneumatic connection between the positioner and actuator with the following “Table 14: Pneumatic connection to actuator”.

### NOTE!

**Damage or malfunction due to ingress of dirt and moisture!**

- To comply with protection class IP65 / IP67, connect the control air connection which is not required to the free chamber of the actuator or seal with a plug.

# Type 024.16.710

## Installation

Control function		Pneumatic connection Type 024.16.710 with actuator	
		Control air connection Type 024.16.710	Actuator input
A	Process valve closed in rest position (by spring force)	2 <sub>1</sub>	lower chamber of the actuator
		2 <sub>2</sub>	should be connected to the upper chamber of the actuator
B	Process valve open in rest position (by spring force)	2 <sub>1</sub>	upper chamber of the actuator
		2 <sub>2</sub>	should be connected to the lower chamber of the actuator

Table 14: Pneumatic connection to actuator



"In rest position" means that the control valves of the positioner Type 024.16.710 are isolated or not actuated.



If the ambient air is humid, a hose can be connected between control air connection 2<sub>2</sub> of the positioner and the unconnected chamber of the actuator for control function A or control function B. As a result, the spring chamber of the actuator is supplied with dry air from the vent duct of the positioner.

## Installation

### 9.3. Rotating the positioner for process valves

If the connecting cables or hoses cannot be fitted properly following installation of the process valve, the positioner can be rotated contrary to the actuator.

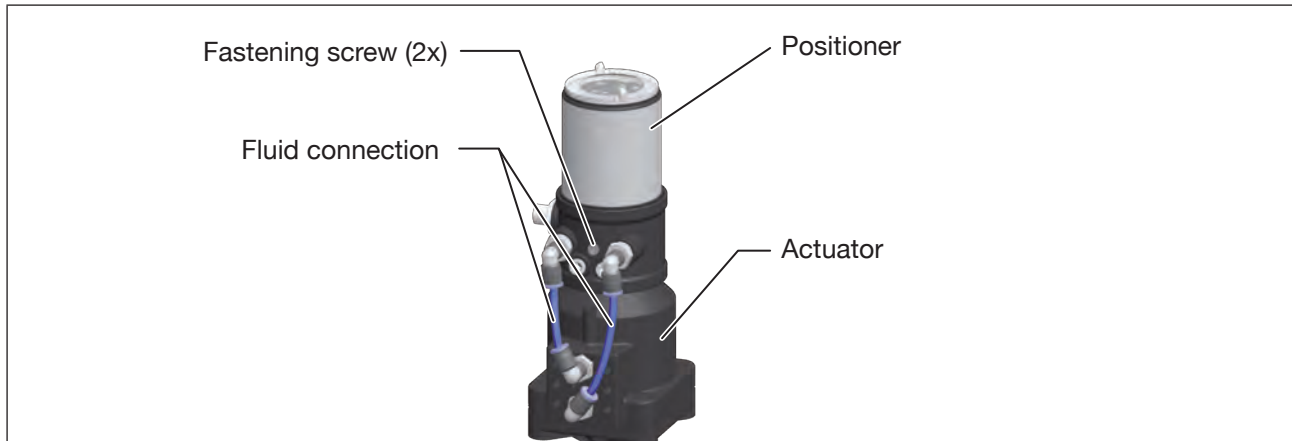


Fig. 17: Rotating the positioner

#### Procedure

- Loosen the fluid connection between the positioner and the actuator.
- Loosen the fastening screws countersunk in the side of the body (hexagon socket wrench size 2.5).
- Rotate the positioner into the required position.

#### NOTE!

**Too high torque when screwing in the fastening screw does not ensure protection class IP65 / IP67!**

- The fastening screw may be tightened to a maximum torque of 0.5 Nm only.

- Tighten the fastening screws hand-tight only (maximum torque: 0.5 Nm).
- Re-attach the fluid connections between the positioner and the actuator. If required, use longer hoses.

## Fluid Installation

### 10. FLUID INSTALLATION

The dimensions of the positioner and the different complete device models, consisting of positioner, actuator and valve, can be found in the relevant data sheets.

#### 10.1. Safety instructions



##### **DANGER!**

###### **Risk of injury from high pressure!**

- Before dismounting pneumatic lines and valves, turn off the pressure and vent the lines.

###### **Risk of electric shock!**

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!



##### **WARNING!**

###### **Risk of injury from improper installation!**

- Installation may be carried out by authorized technicians only and with the appropriate tools!

###### **Risk of injury from unintentional activation of the system and an uncontrolled restart!**

- Secure system from unintentional activation.
- Following installation, ensure a controlled restart.

#### 10.2. Installing the Process Valve

Thread type and dimensions can be found in the corresponding data sheet.

→ Connect the valve according to the operating instructions for the valve.

## Fluid Installation

### 10.3. Pneumatic connection of the positioner

#### **DANGER!**

##### **Risk of injury from high pressure!**

- Before loosening the lines and valves, turn off the pressure and vent the lines.

##### **Procedure:**

- Connect the control medium to the pilot air port (1)  
(3 – 7 bar; instrument air, free of oil, water and dust).
- Attach the exhaust airline or a silencer to the exhaust air port (3).

#### **Important information for the problem-free functioning of the device:**

- The installation must not cause back pressure to build up.
- Select a hose for the connection with an adequate cross-section.
- The exhaust air line must be designed in such a way that no water or other liquid can get into the device through the exhaust air port.

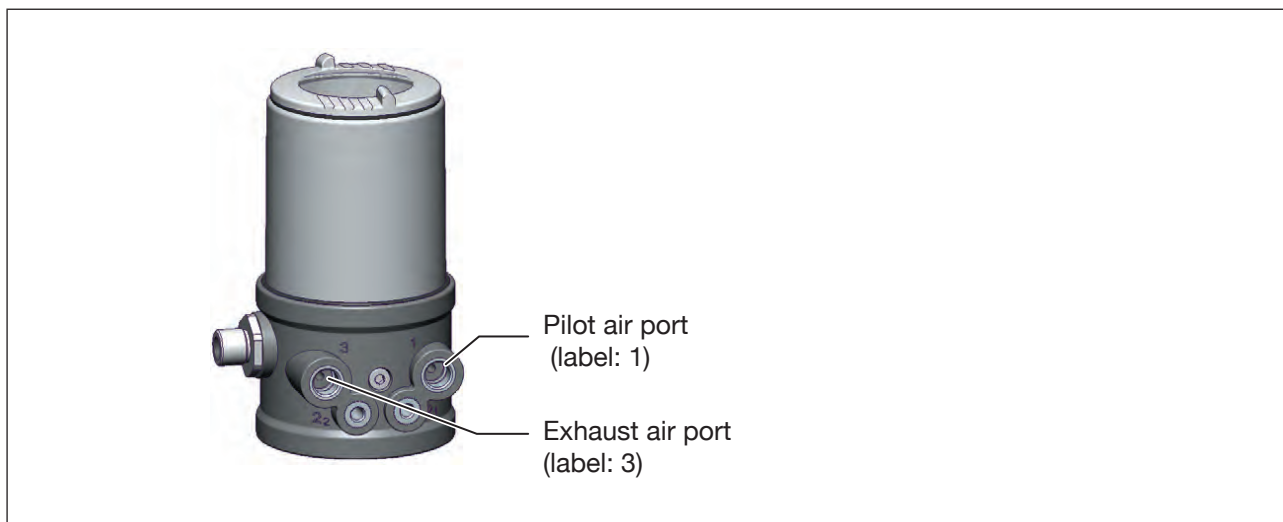


Fig. 18: Pneumatic connection

#### **Caution:**(Exhaust air concept):

In compliance with protection class IP67, an exhaust air line must be installed in the dry area.

Keep the adjacent supply pressure **always** at least 0.5 – 1 bar above the pressure which is required to move the actuator to its end position. This ensures that the control behavior is not extremely negatively affected in the upper stroke range on account of too little pressure difference.

During operation keep the fluctuations of the pressure supply as low as possible (max.  $\pm 10\%$ ). If fluctuations are greater, the control parameters measured with the *X.TUNE* function are not optimum.



## Electrical Installation 24 V DC

### 11. ELECTRICAL INSTALLATION 24 V DC

The kind of connection is used for the electrical bonding of the positioner:

- **Multi-pole**  
with circular plug-in connector M12 x 1, 8-pole

#### 11.1. Safety instructions

##### **DANGER!**

###### **Risk of electric shock!**

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

##### **WARNING!**

###### **Risk of injury from improper installation!**

- Installation may be carried out by authorized technicians only and with the appropriate tools!

###### **Risk of injury from unintentional activation of the system and an uncontrolled restart!**

- Secure system from unintentional activation.
- Following installation, ensure a controlled restart.

# Type 024.16.710

## Electrical Installation 24 V DC

### 11.2. Electrical installation with circular plug-in connector



**DANGER!**

#### Risk of electric shock!

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

#### 11.2.1. Designation of the contacts Type 024.16.710

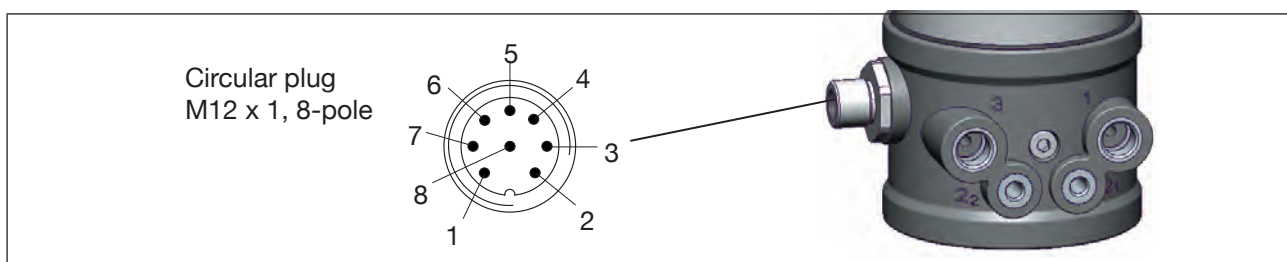


Fig. 19: Circular plug M12 x 1, 8-pole

#### 11.2.2. Connection of the positioner Type 024.16.710

→ Connect the pins according to the model (options) of the positioner.

##### Input signals of the control center (e.g. PLC) - circular plug M12 x 1, 8-pole

Pin	Wire color <sup>13)</sup>	Configuration	external circuit / signal level
1	white	Set-point value + (0/4 – 20 mA)	1 — + (0/4 ... 20 mA) not galvanically isolated
2	brown	Set-point value GND	2 — GND
5	grey	Binary input +	5 — + — 0 ... 5 V (log. 0) 10 ... 30 V (log. 1)
6	pink	Binary input -	

Table 15: Pin assignment - input signals of the control center - circular plug M12 x 1, 8-pole

##### Output signals to the control center (e.g. PLC) - circular plug M12 x 1, 8-pole (required for analogue output option only)

Pin	Wire color <sup>13)</sup>	Configuration	external circuit / signal level
8	red	Analogue position feedback +	8 — + (0/4 ... 20 mA) not galvanically isolated
7	blue	Analogue position feedback GND	7 — GND

Table 16: Pin assignment - output signals of the control center - circular plug M12 x 1, 8-pole

<sup>13)</sup> The indicated colors refer to the connecting cable available as an accessory (919061)

# Type 024.16.710

## Electrical Installation 24 V DC

Supply voltage (circular plug M12 x 1, 8-pole)

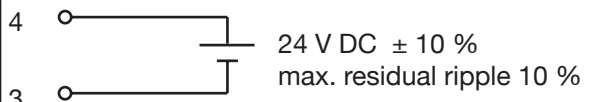
Pin	Wire color <sup>10)</sup>	Configuration	External circuit
4	yellow	+ 24 V	
3	green	GND	

Table 17: Pin assignment - power supply (circular plug M12 x 1, 8-pole)

<sup>14)</sup> The indicated colors refer to the connecting cable available as an accessory (919061)

When the power supply is applied, the positioner is operating.

→ Make the required basic settings and actuate the automatic adjustment of the positioner, as described in the chapter entitled "12. Start-Up".

## Start-Up

### 12. START-UP

#### 12.1. Safety instructions



##### **DANGER!**

###### **Danger – high pressure in the equipment!**

There is a serious risk of injury when reaching into the equipment.

- Before dismounting the lines and valves, turn off the pressure and vent the lines.



##### **WARNING!**

###### **Risk of injury from improper operation!**

Improper operation may result in injuries as well as damage to the device and the area around it.

- Before start-up, ensure that the operating personnel are familiar with and completely understand the contents of the operating instructions.
- Observe the safety instructions and intended use.
- Only adequately trained personnel may operate the equipment/the device.

#### 12.2. Specifying the standard settings

The basic settings of the positioner are implemented at the factory.



To adjust the positioner to local conditions, the *X.TUNE* function must be run following installation.

## Start-Up

### 12.2.1. Running the automatic adjustment *X.TUNE*:

#### **WARNING!**

**While the *X.TUNE* function is running, the valve automatically moves from its current position!**

- Never run *X.TUNE* while a process is running!
- Take appropriate measures to prevent the equipment from being accidentally actuated!

#### **NOTE!**

**Avoid maladjustment of the controller due to an incorrect compressed air supply or applied operating medium pressure!**

- Run *X.TUNE* **whenever** the compressed air supply (= pneumatic auxiliary energy) is available during subsequent operation.
- Run the *X.TUNE* function preferably **without** operating medium pressure to exclude interference caused by flow forces.



To run *X.TUNE*, the positioner must be in the AUTOMATIC operating status (DIP switch 4 = OFF).

→ Screw off the transparent cap of the positioner to operate the keys and DIP switches.

→ Start the *X.TUNE* by pressing key 1<sup>15)</sup> for 5 s.

While the *X.TUNE* is running, LED 1 flashes quickly (green).

When the automatic adjustment is complete, LED 1 flashes slowly (green)<sup>16)</sup>.

The changes are automatically transferred to the memory (EEPROM) provided the *X.TUNE* function is successful.

#### **NOTE!**

**Damage or malfunction due to penetration of dirt and humidity!**

- To observe protection class IP65 / IP67, screw the transparent cap in all the way.

→ Close the device (assembly tool: 674078<sup>17)</sup>).

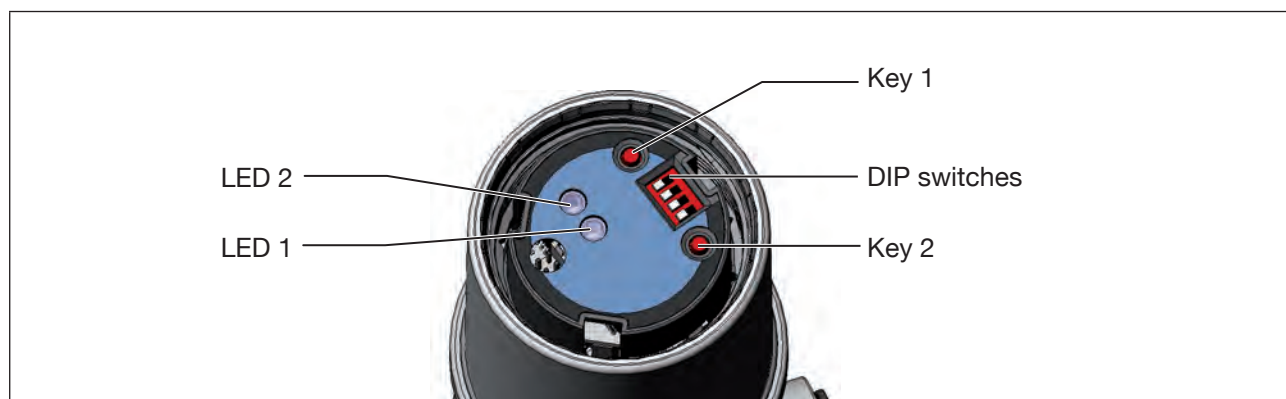


Fig. 20: Starting *X.TUNE*

<sup>15)</sup> The *X.TUNE* can also be started via communications software.

<sup>16)</sup> if a fault occurs, LED 1 is lit red.

<sup>17)</sup> The assembly tool (674078) is available from your SED Flowcontrol sales office

# Type 024.16.710

## Operation and function

### 13. OPERATION AND FUNCTION

The positioner Type 024.16.710 has different basic and additional functions which can be configured and parameterized via the DIP switches or the communications software.

#### 13.1. Basic functions

The following basic functions can be activated via the DIP switches (*CUTOFF* and *CHARACT*) or changed (*DIR.CMD*).

Function	Description	DIP Switches	OFF	ON
<i>DIR.CMD</i>	Effective direction between input signal and set-point position	1	Rise	fall
<i>CUTOFF</i>	Sealing function for positioner	2	Sealing function off	Sealing function on
<i>CHARACT</i>	Selection of the Transfer Characteristic between Input Signal and Stroke (Correction Characteristic)	3	Linear characteristic	Correction characteristic

Table 18: Basic functions of DIP switches

→ Screw off the transparent cap of the positioner to operate the DIP switches.

#### NOTE!

##### Damage or malfunction due to penetration of dirt and humidity!

- To observe protection class IP65 / IP67, screw the transparent cap in all the way.

→ Close the device (assembly tool: 674078).

The following basic function can be changed via the communications software only.

Function	Description	Factory setting
<i>INPUT</i>	Entry of the standard signal input for the set-point value	4 ... 20 mA

Table 19: Basic function of communications software

The *INPUT*, *CUTOFF* and *CHARACT* functions can be parameterized via the communications software.



The operating instructions for the communications software describe in detail the individual functions, as well as parameterization and configuration.

These instructions can be found on the Internet at [www.sed-flowcontrol.com](http://www.sed-flowcontrol.com)

## Operation and function

### 13.1.1. *DIR.CMD* - Effective Direction of the Position Controller Set-Point Value

You can use this function to adjust the effective direction between the input signal (*INPUT*) and the nominal position of the actuator.

Factory setting: DIP switch set to OFF (ascending)

DIP Switches	Position	Function
1	ON	Reversal of the effective direction of the set-point value ( <i>DIR.CMD</i> ) (set-point value 20 – 4 mA corresponds to position 0 – 100 %), fall
	OFF	Normal effective direction of the set-point value (set-point value 4 – 20 mA corresponds to position 0 – 100 %), rise

Table 20: *DIP switch 1*



The effective direction (*DIR.CMD*) can only be changed via DIP switch 1 in the positioner.

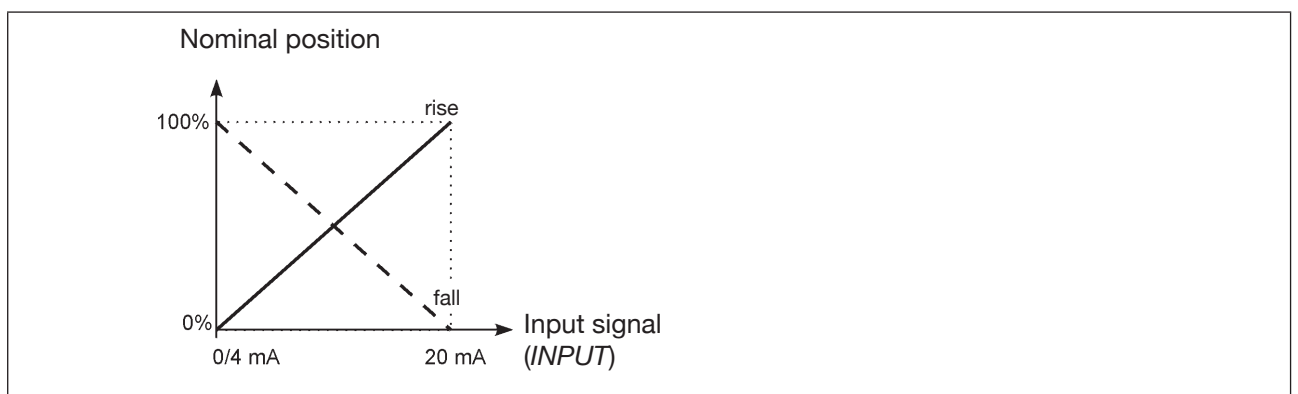


Fig. 21: *DIR.CMD graph*

## Operation and function

### 13.1.2. CUTOFF - Sealing Function for the Position Controller

This function causes the valve to be sealed outside the control range.

Control mode resumes at a hysteresis of 1%.

Factory setting: DIP switch 2 set to OFF (no sealing function)

DIP Switches	Position	Function
2	ON	Sealing function active. The valve completely closes below 2 % <sup>6)</sup> and opens above 98 % of the set-point value ( <i>CUTOFF</i> )
	OFF	No sealing function

Table 21: DIP switch 2

The communications software can be used to change the limits for the position set-point value as a percentage.

**!** The switching position of the DIP switches in the positioner has priority over the communications software, i.e. settings of the sealing function (*CUTOFF*) which are modified via the communications software are only active if DIP switch 2 in the positioner is set to ON.

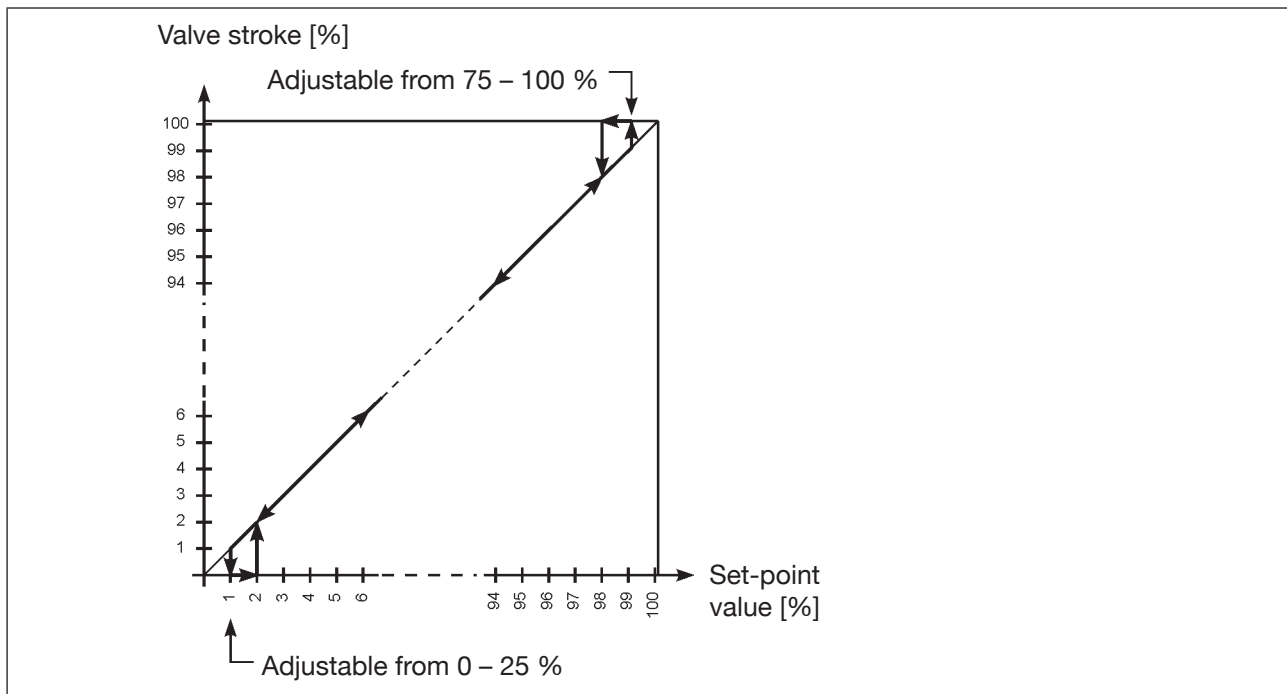


Fig. 22: CUTOFF graph

<sup>6)</sup> Factory setting can be changed via communications software.



## Operation and function

### 13.1.3. **CHARACT** - Select the transfer characteristic between input signal (position set-point value) and stroke

Characteristic (customer-specific characteristic)

This function can be used to activate a transfer characteristic with respect to set-point value (set-point position) and valve stroke for correction of the flow-rate or operating characteristic.



The transfer characteristic can be changed via the communications software only.

Factory setting: DIP switch 3 set to OFF (linear)

DIP Switches	Position	Function
3	ON	Correction characteristic for adjustment of the operating characteristic (linearization of the process characteristic <i>CHARACT</i> ) <sup>7)</sup>
	OFF	Linear characteristic

Table 22: DIP switch 3



The switching position of the DIP switches in the positioner has priority over the communications software, i.e. settings of the correction characteristic (*CHARACT*) which are modified via the communications software are only active if DIP switch 3 in the positioner is set to ON.

Characteristics which can be selected via the communications software:

Characteristic	Description
linear	Linear characteristic
1 : 25	Equal percentage characteristic 1 : 25
1 : 33	Equal percentage characteristic 1 : 33
1 : 50	Equal percentage characteristic 1 : 50
25 : 1	Inversely equal percentage characteristic 25 : 1
33 : 1	Inversely equal percentage characteristic 33 : 1
55 : 1	Inversely equal percentage characteristic 55 : 1
FREE	User-defined characteristic, freely programmable via nodes

Table 23: Selection of characteristics



A detailed description of the characteristics can be found in the operating instructions for the communications software for positioners.

<sup>7)</sup> The characteristic type can be changed via the communications software only.

# Type 024.16.710

## Operation and function

### 13.2. Auxiliary Functions

The following additional functions can be configured and parameterized via the communications software:

Function	Description
<i>DIR.ACTUATOR</i>	Assignment of the aeration status of the actuator chamber to the actual position
<i>SPLITRANGE</i>	Signal split range; input signal as a % for which the valve runs through the entire stroke range.
<i>X.LIMIT</i>	Limit the mechanical stroke range
<i>X.TIME</i>	Limit the control speed
<i>X.CONTROL</i>	Parameterize the position controller
<i>SAFE POSITION</i>	Input the safety position
<i>SIGNAL ERROR</i>	Configuration of signal level fault detection
<i>BINARY INPUT</i>	Activation of the binary input
<i>OUTPUT</i>	Configuration of the outputs (only with auxiliary board for analogue feedback signal or binary outputs)

Table 24: Auxiliary Functions



The operating instructions for the communications software describe in detail the individual functions, as well as parameterization and configuration.

These instructions can be found on the Internet at [www.sed-flowcontrol.com](http://www.sed-flowcontrol.com)

## Safety Positions

### 14. SAFETY POSITIONS

#### 14.1. Safety positions after failure of the electrical or pneumatic auxiliary power

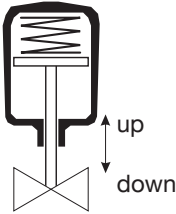
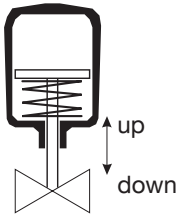
Actuator System	Designation	Safety positions after failure of the auxiliary power	
		electrical	pneumatic
	single-acting control function A	down	not defined
	single-acting control function B	up	not defined

Table 25: Safety Positions

### 15. MAINTENANCE

The positioner Type 024.16.710 is maintenance-free when operated according to the instructions in this manual.

## Disassembly

### 16. DISASSEMBLY

#### 16.1. Safety instructions



#### **DANGER!**

##### **Risk of injury from high pressure!**

- Before dismantling pneumatic lines and valves, turn off the pressure and vent the lines.

##### **Risk of electric shock!**

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!



#### **WARNING!**

##### **Risk of injury from improper disassembly!**

- Disassembly may be carried out by authorized technicians only and with the appropriate tools!

##### **Risk of injury from unintentional activation of the system and an uncontrolled restart!**

- Secure system from unintentional activation.
- Following disassembly, ensure a controlled restart.

#### 16.2. Disassembly the Positioner

Procedure:

##### 1. Pneumatic connection



#### **DANGER!**

##### **Risk of injury from high pressure!**

- Before dismantling lines and valves, turn off the pressure and vent the lines.

→ Loosen the pneumatic connection.

## Disassembly

### 2. Electrical connection

#### **DANGER!**

##### **Risk of electric shock!**

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

→ Loosen the circular plug-in connector.

### 3. Mechanical connection

→ Loosen the fastening screws.

→ Remove the positioner upwards.

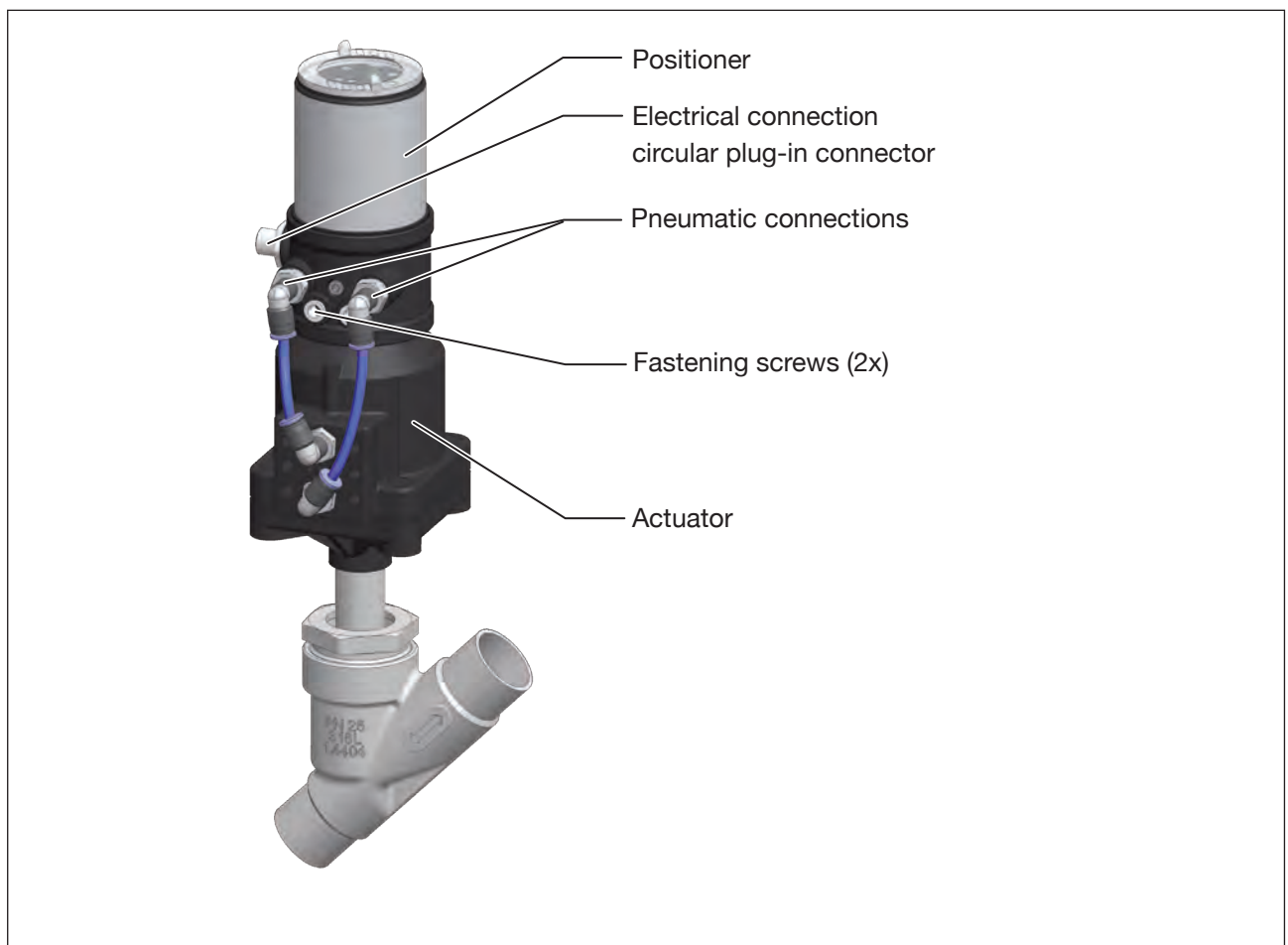


Fig. 23: Disassembly the positioner

## Accessories

### 17. ACCESSORIES

Designation	Order no.
RS232 adapter for connection to a PC in conjunction with an extension cable	659457
Communications software based on FDT/DTM technology (Information see chapter entitled “17.1. Communications software (PC SOFTWARE based on FDT/DTM technology):”)	Information at <a href="http://sed-flowcontrol.com">sed-flowcontrol.com</a>
Connection cable M12 x 1, 8-pole	919061
Assembly tool	647078

Table 26: Accessories

#### 17.1. Communications software (PC SOFTWARE based on FDT/DTM technology):

The communications software consists of the SED Flowcontrol DTM devices (configuration and parameterization software) and an associated frame application, e.g. PACTware 3.6.



The DTMs can only run in conjunction with an FDT frame application such as PACTware.

The PC operating program is designed for communication with the devices from the SED Flowcontrol positioner family (basic models without display).



A detailed description and precise schedule of the procedure for the installation and operation of the software can be found in the associated documentation.

##### 17.1.1. PACTware 3.6

Frame program of the PACTware Consortium e. V. for the recording and operation of FDT 1.2 or FDT 1.2.1 compliant DTMs of any manufacturers.



Microsoft .NET Framework 1.1 + .NET Framework 1.1 SP1 must be installed.

##### 17.1.2. Serial interface RS 232

The PC requires an RS 232 serial interface for communication with the positioners as well as an additional adapter with interface driver (see “Table 26: Accessories”).

The RS232 data transfer must be according to HART specification; the HART communications DTM, also installed during the installation of PACTware, can be used for this.

##### 17.1.3. Download

Download the software (DTM and PACTware) at: [www.sed-flowcontrol.com](http://www.sed-flowcontrol.com)

The latest version of the communications software is always available by means of the download function.

## Packaging and Transport

### 18. PACKAGING AND TRANSPORT

#### NOTE!

##### Transport damages!

Inadequately protected equipment may be damaged during transport.

- During transportation protect the device against wet and dirt in shock-resistant packaging.
- Avoid the action of heat and cold which can lead to temperatures above or below the admissible storage temperature.

### 19. STORAGE

#### NOTE!

##### Incorrect storage may damage the device.

- Store the device in a dry and dust-free location!
- Storage temperature: -20 – +65°C.

### 20. DISPOSAL

→ Dispose of the device and packaging in an environmentally friendly manner.

#### NOTE!

##### Damage to the environment caused by device components contaminated with media.

- Observe the relevant disposal and environmental protection regulations.



#### Note:

Observe national waste disposal regulations.

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