GEMÜ 1435 ePos

Intelligent electro-pneumatic positioner

EN **Operating instructions**

further information
webcode: GW-1435

1 Quick commissioning

⚠ CAUTION

Hazardous situation

- ► Risk of injury or damage possible.
- For correct commissioning, the product must be calibrated to the process valve via the initialization process.
- During this commissioning, the valve is automatically opened and closed several times. It must therefore be ensured in advance that this does not lead to a dangerous situation.

NOTICE

Incorrect initialization

- Always carry out initialization without operating medium pressure on the process valve. Carry out initialization of the process valve in neutral position (NO/NC).

NOTICE

- For delivery of the product assembled on a valve at the factory, the complete construction is already ready for operation at a control pressure of 5.5 to 6 bar without operating pressure. A reinitialization is recommended if the plant is operated with a different control pressure or if the mechanical end positions have been changed (e.g. seal replacement on the valve or actuator replacement). The initialization is retained even in the event of voltage cutoff.

NOTICE

- For delivery of the product without default setting (e.g. for delivery without valve) initialization must be carried out once for correct operation. This initialization must be repeated every time that the process valve is changed (e.g. seal replacement or actuator replacement).

NOTICE

Operating errors

- Prior to commissioning, familiarize yourself with the operation of the product.

The initialization is absolutely essential for the correct operation of the positioner and must be carried out once.

For delivery of the product pre-assembled on a valve at the factory, the complete construction is already ready for operation at a control pressure of 5.5 to 6 bar without operating pressure - the positioner is in automatic operation. A reinitialization is recommended if the plant is operated with a different control pressure or if the mechanical end positions have been changed (e.g. seal replacement on the valve or actuator replacement).

The initialization is retained even in the event of voltage cutoff.

Prerequisites:

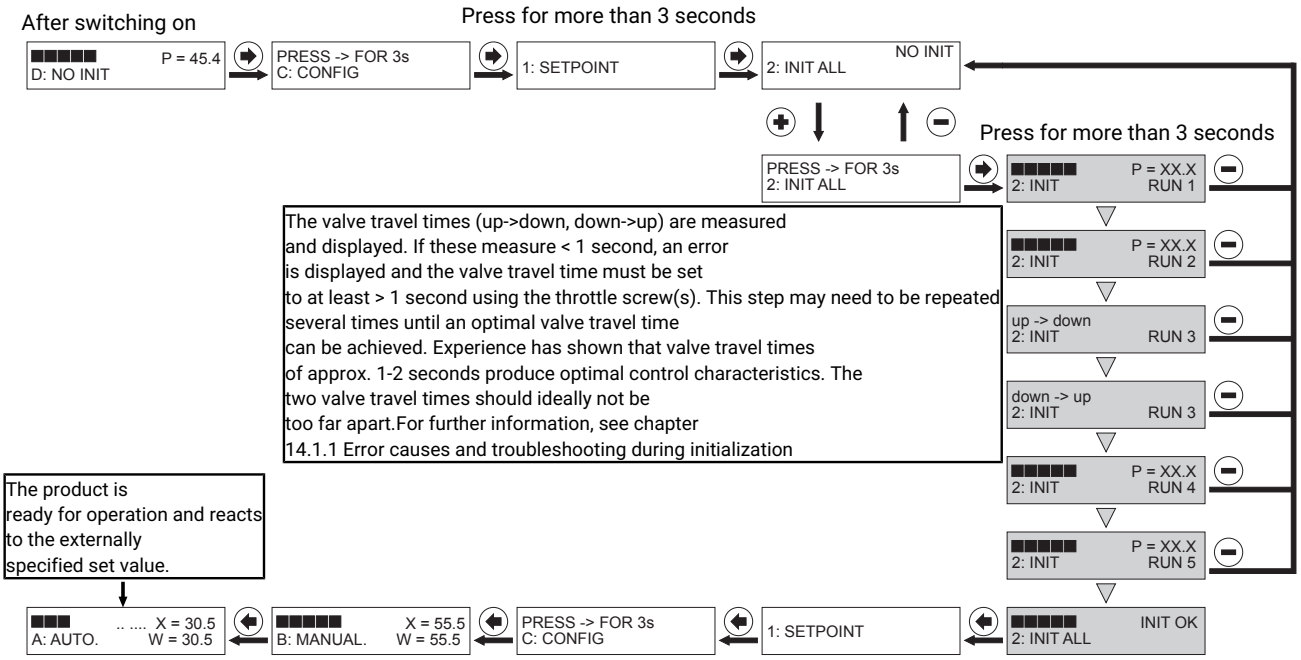
- Mounted to the valve.
- Air supply, max. 6 bar, connected.
- 24 V DC supply voltage connected.
- Set value and actual value signals need not be connected.
- For correct commissioning proceed as described in the following flow chart:

NOTICE

Tip for use

- ► During automatic initialization of actuators whose movement profiles are not continuous (i.e. with undefined stopping or stalling, e.g. with large size butterfly valves), it may not be possible to clearly detect the end positions and unjustified error messages may appear (for example LEAKAGE).
- ► Manual initialization with sequential movement through the menu by the operator or, if possible, acknowledging the error message to repeat the step may help here (see “Carrying out initialization“, page 51).

Menu sequence for quick initialization of the positioner



Automatic quick initialization

The positioner adapts to the valve when automatic initialization is started (via the 2: INIT ALL parameter). All parameters are independently and automatically retrieved. This procedure can take a few minutes, depending on the valve.

If the message "**INIT OK**" appears, the product is ready for operation and can be set to the desired operating mode.

– Operating mode **A: AUTO** – reacts to the externally specified set value.

– Operating mode **B: MANUAL** – the valve position can be specified manually using the keys.

Contents

2 General information

2.1 Information

- The descriptions and instructions apply to the standard versions. For special versions not described in this document the basic information contained herein applies in combination with any additional special documentation.
- Correct installation, operation, maintenance and repair work ensure faultless operation of the product.
- Should there be any doubts or misunderstandings, the German version is the authoritative document.
- Contact us at the address on the last page for staff training information.

2.2 Symbols used

The following symbols are used in this document:

Symbol	Meaning
●	Tasks to be performed
▶	Response(s) to tasks
–	Lists

2.3 Definition of terms

Working medium

The medium that flows through the GEMÜ product.

Control function

The possible actuation functions of the GEMÜ product.

Control medium

The medium whose increasing or decreasing pressure causes the GEMÜ product to be actuated and operated.

Speed-^{AP}function

Speed Assembly and Programming, a particularly user-friendly commissioning function for fast mounting, automated setting and initialization of GEMÜ products. Dependent on type, activation uses an external impulse signal or existing precautions on the device (magnetic or housing switch). Changeover to normal operating mode takes place automatically after successful completion.

2.4 Warning notes

Wherever possible, warning notes are organised according to the following scheme:

SIGNAL WORD	
Possible symbol for the specific danger	Type and source of the danger ▶ Possible consequences of non-observance. ● Measures for avoiding danger.

Warning notes are always marked with a signal word and sometimes also with a symbol for the specific danger.

The following signal words and danger levels are used:

⚠ DANGER

Imminent danger!

▶ Non-observance can cause death or severe injury.

⚠ WARNING

Potentially dangerous situation!

▶ Non-observance can cause death or severe injury.

⚠ CAUTION

Potentially dangerous situation!

▶ Non-observance can cause moderate to light injury.

NOTICE

Potentially dangerous situation!

▶ Non-observance can cause damage to property.

The following symbols for the specific dangers can be used within a warning note:

Symbol	Meaning
	Danger of explosion
	Danger - high voltage!
	Corrosive chemicals!
	Hot plant components!

3 Safety information

The safety information in this document refers only to an individual product. Potentially dangerous conditions can arise in combination with other plant components, which need to be considered on the basis of a risk analysis. The operator is responsible for the production of the risk analysis and for compliance with the resulting precautionary measures and regional safety regulations.

The document contains fundamental safety information that must be observed during commissioning, operation and maintenance. Non-compliance with these instructions may cause:

- Personal hazard due to electrical, mechanical and chemical effects.
- Hazard to nearby equipment.
- Failure of important functions.
- Hazard to the environment due to the leakage of dangerous substances.

The safety information does not take into account:

- Unexpected incidents and events, which may occur during installation, operation and maintenance.
- Local safety regulations which must be adhered to by the operator and by any additional installation personnel.

Prior to commissioning:

1. Transport and store the product correctly.
2. Do not paint the bolts and plastic parts of the product.
3. Carry out installation and commissioning using trained personnel.
4. Provide adequate training for installation and operating personnel.
5. Ensure that the contents of the document have been fully understood by the responsible personnel.
6. Define the areas of responsibility.
7. Observe the safety data sheets.
8. Observe the safety regulations for the media used.

During operation:

9. Keep this document available at the place of use.
10. Observe the safety information.
11. Operate the product in accordance with this document.
12. Operate the product in accordance with the specifications.
13. Maintain the product correctly.
14. Do not carry out any maintenance work and repairs not described in this document without consulting the manufacturer first.

In cases of uncertainty:

15. Consult the nearest GEMÜ sales office.

4 Product description

4.1 Construction

Item	Name	Materials
1	Housing	Base: Aluminium, epoxy coated, black Cover: Aluminium, powder coated, silver
2	Display with cover	PMMA
3	Operating elements with cover	PMMA

4.2 Description

The GEMÜ 1435 ePos digital electro-pneumatic positioner is used to control pneumatically operated process valves with single acting or double acting linear or quarter turn actuators, and detects the position of the valve using an external travel sensor. It has a robust aluminium housing with protected operating keys and an LCD display which allows the product to be individually adapted to the control task. The travel times can be set using integrated throttles. Connection and mounting to NAMUR is also possible. Therefore, the GEMÜ 1435 ePos is an optimal solution for control tasks with high requirements, especially in applications with harsh environmental conditions.

4.3 Function

The product is an intelligent electro-pneumatic positioner for mounting to pneumatic linear and quarter turn actuators.

The positioner can be directly mounted to the actuator using a suitable mounting kit. The mounting kit contains both the mounting bracket and adapter and the appropriate travel sensor with the corresponding fixing screws.

Remote mounting is also possible. The mounting bracket/adapter are not required for this.

The travel sensor measures the current position of the valve and reports it to the product's electronic system. The electronic system then compares the actual value of the valve with the set value specified and readjusts the valve in the event of a system deviation.

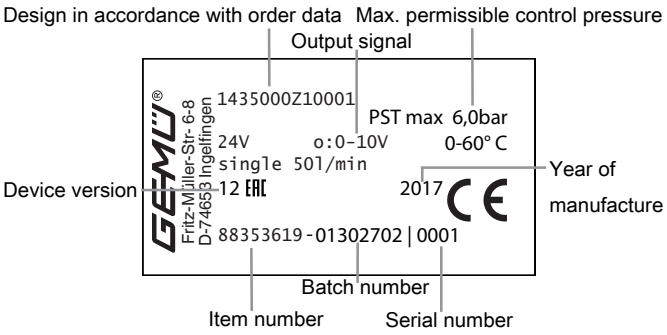
The information required can be called up on the two-line display of the product. Self-explanatory help texts that explain the meaning of the parameters called-up are also displayed. Operation is carried out using the four keys.

4.4 Fail safe function

The product has a fail safe function which ensures that the outlets are controlled during a pneumatic and electrical power supply failure. The behaviour depends on the design. A safety reaction also ensures that the valve is controlled in the event of a signal error. This fail safe function is not a substitute for specific plant safety requirements. The product is not a safety control system.

Error	Output 2	Output 4
Failure of the electrical power supply	Single acting: vented Double acting: vented	Single acting: non existent Double acting: pressurized
Pneumatic supply failure	Single acting: vented Double acting: undefined, dependent on the operating conditions of the actuator	Single acting: non existent Double acting: undefined, dependent on the operating conditions of the actuator
Set value < 4.0 mA*	Single acting: vented Double acting: vented	Single acting: non existent Double acting: pressurized
Set value > 20 mA / 10 V	Single acting: vented Double acting: vented	Single acting: non existent Double acting: pressurized
* Only when using the 4–20 mA type of set value (parameter setting)		
This fail safe function is not a substitute for specific plant safety requirements.		

4.5 Product label



NOTICE

Device version

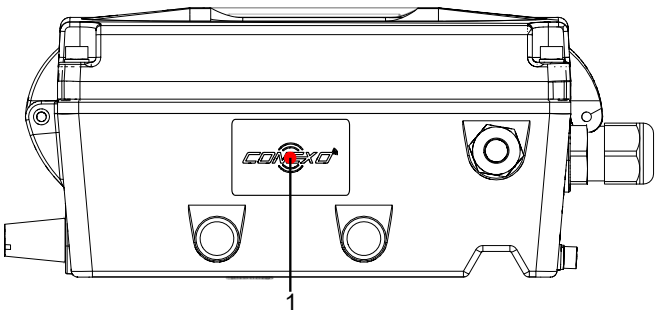
- ► These instructions are valid for devices from device version 10. It is possible to determine which firmware has been used on the basis of the device version. For older devices (device version older than 10), different operating instructions with potentially different operating specifications are used.
- ► A change to the device version can also be due to technical changes to the hardware, which is why several device versions can contain the same firmware version.

Device version	Firmware version	Effective from	Changes
10	V2.0.0.0	09/2013	
11	V2.0.0.2	02/2014	Bugfix, error output
12	V2.0.0.4	03/2014	Bugfix, incorrect actual value output for normally open valves
12 / 13	V2.0.0.5	06/2015	Optimization of actuation behaviour of small-volume linear actuators with low stroke
14	V2.0.0.6	09/2018	Adaptation to the new display controller

5 GEMÜ CONEXO

Order variant

In the corresponding design with CONEXO, this product has an RFID chip (1) for electronic identification purposes. The position of the RFID chip can be seen below. The CONEXO pen helps read out information stored in the RFID chips. The CONEXO app or CONEXO portal is required to display this information.



For further information please read the operating instructions for CONEXO products or the CONEXO datasheet.

Products such as the CONEXO app, the CONEXO portal and the CONEXO pen are not included in the scope of delivery and need to be ordered separately.

6 Intended use

⚠ DANGER

Danger of explosion

- ► Risk of severe injury or death.
- ● Do **not** use the product in potentially explosive zones.
- ● The product can control valves in potentially explosive areas using special wiring (installation of the positioner outside the EX area).

⚠ WARNING

Improper use of the product!

- ► Risk of severe injury or death
- ► Manufacturer liability and guarantee will be void
- ● Only use the product in accordance with the operating conditions specified in the contract documentation and in this document.

The product is not intended for use in potentially explosive areas.

The product with integrated pilot valves is designed for linear actuators and quarter turn actuators. The product works with microprocessor controlled intelligent position control by means of an analogue travel sensor (potentiometer). This is connected in a force-locking way with the actuator spindle or shaft by means of a mounting kit (spring, operating bush). The valve position and the integrated travel sensor can be monitored via the electrical connections. The pneumatic actuator is directly operated and controlled by means of the pilot valves.

- ● Use the product in accordance with the technical data.

7 Order data

The order data provide an overview of standard configurations.

Please check the availability before ordering. Other configurations available on request.

Note: Pneumatic connecting components (union and compressed air tube) for the connection between the process valve and positioner are included with each positioner.

Note: A valve specific mounting kit is required for assembly. For designing the mounting kit, the valve type, nominal size, control function and actuator size must be stated.

Order codes

1 Type	Code
Electro-pneumatic positioner ePos	1435

2 Fieldbus	Code
Without	000

3 Accessory	Code
Accessory	Z

4 Action	Code
Single acting	1
Double acting	3

5 Explosion-proof class	Code
Without explosion-proof rating	0

6 Option	Code
Without	0
Electrical connections M12, 5-pin	1
4–20 mA, actual value output	2
4- 20 mA, actual value output, electrical connections M12, 5-pin	3
4 - 20 mA, actual value output, heating element	4

6 Option	Code
Electrical connections M12, 5-pin, heating element	5
Heating element	6
4 - 20 mA, actual value output, electrical connections M12, 5-pin, heating element	7

7 Flow rate	Code
Electro-pneumatic, 50 l/min	01
Electro-pneumatic, 90 l/min (Booster)	02

8 Special specification	Code
Without	
Dead zone presetting 2%	2442
Dead zone presetting 5%	2443
Inversed direction, for quarter turn valves control function NO (2)	6960

9 CONEXO	Code
Without	
Integrated RFID chip for electronic identification and traceability	C

Order example

Ordering option	Code	Description
1 Type	1435	Electro-pneumatic positioner ePos
2 Fieldbus	000	Without
3 Accessory	Z	Accessory
4 Action	1	Single acting
5 Explosion-proof class	0	Without explosion-proof rating
6 Option	0	Without
7 Flow rate	01	Electro-pneumatic, 50 l/min
8 Special specification		Without
9 CONEXO		Without

8 Technical data

8.1 Medium

Working medium: Compressed air and inert gases

Dust content: Class 3, max. particle size 5 µm, max. particle density 5 mg/m³

Pressure dew point: Class 4, max. pressure dew point +3 °C

Oil content: Class 3, max. oil concentration 1 mg/m³

Quality classes to DIN ISO 8573-1

Note: Filter strainers are installed in the pneumatic connectors of the positioner to protect against rough dirt particles. They can be ordered as spare parts with order number 1435 SFI. Each kit contains 3 filter strainers. These filter strainers are meant as an additional protection and do not replace the requirement to filter all site compressed air.

8.2 Temperature

Ambient temperature: 0 — 60 °C (standard, Option code 0, 1, 2, 3)
-20 — 60 °C (with heating element, Option code 4, 5, 6, 7)

≤ 5 °C (heating active)
≥ 15 °C (heating inactive)

Storage temperature: 0 — 60 °C

8.3 Product compliance

EMC Directive: 2014/30/EU

RoHS Directive: 2011/65/EU

8.4 Pressure

Operating pressure: 0 — 6 bar

The applied pressure must not exceed the maximum control pressure of the process valve.

Flow rate: 50 Nl/min (Flow rate code 01)
90 Nl/min (Flow rate code 02)

Air consumption: 0 Nl/min (when idle)

8.5 Mechanical data

Installation position: Optional

Protection class: IP 65 acc. to EN 60529

Weight: 1.7 kg

Travel sensor:

	Linear design			Quarter turn design
Detection range:	1–29 mm	1.5–48.5 mm	2.0–73 mm	Angle of rotation 5–90°
Operating range:	0–30 mm	0–50 mm	0–75 mm	Angle of rotation 0 - 93°
Resistance R:	3 kΩ	5 kΩ	5 kΩ	3 kΩ
Minimum travel sensor change:	10% (only relevant for initialization)			
Connection:	Pre-fitted cable (max. 20 m)			
Installation:	external			
Correlation - Travel sensor [1] **spindle/valve position**	Retracted (top) ≙ 100% (valve open)			90° ≙ 100% (valve open)
	Extended (bottom) ≙ 0% (valve closed)			0° ≙ 0% (valve closed)

1) Type of design code 6960: Inversed mode of action compared with description (Travel sensor signal inversed). For valves with inverted correlation.

8.6 Electrical data

8.6.1 Power supply

Supply voltage: 24 V DC (-5/+10%)

Power consumption:
Single acting: ≤ 6.5 W
Double acting / Booster: ≤ 9.8 W
plus in each case: max. 36 W for active digital outputs with max. on-load current
max. 25 W for operation with heating element

Reverse battery protection: Yes

Duty cycle: Continuous duty

Electrical protection class: III

8.6.2 Analogue input

Set value input: 0/4 - 20 mA; 0 - 10 V

Input type: passive

Input load:
0/4–20 mA:
50 Ω + approx. 0.7 V voltage drop due to reverse battery protection
0–10 V:
100 kΩ

Accuracy/linearity: ≤ ±0.3% of full flow

Temperature drift: ≤ ±0.5% of full flow

Resolution: 12 bit

Reverse battery protection: yes

Overload proof: Yes (up to ± 24 V DC)

8.6.3 Analogue output

Note:	The analogue output 4-20 mA must be ordered using the ordering option "Option".
Actual value output:	0 - 10 V 4 - 20 mA (optional)
Output type:	Active
On-load current:	0–10 V: Max. 10 mA
Load resistor:	4 – 20 mA: max. 600 Ω (for ordering option "Option" code 2, 3, 4, 7)
Accuracy/linearity:	≤ ±1% of full flow
Temperature drift:	≤ ±0.5% of full flow
Resolution:	12 bit
Short-circuit proof:	Yes
Overload proof:	Yes (up to ± 24 V DC)

8.6.4 Digital output signals

Switching outputs:	Alarm output 1 Alarm output 2 Error message output
Switching voltage:	Supply voltage
Drop voltage:	Max. 2.5 V DC at 0.5 A
Short-circuit proof:	yes
Overload proof:	Yes (up to ± 24 V DC)
Type of contact:	PNP
Pull-Down resistance:	120 kΩ
On-load current:	max. 0.5 A

8.6.5 Travel sensor input

Supply voltage UP+:	Typically 10 V DC
Resistance range of remote potentiometers:	1 to 10 kΩ
Input voltage range:	0 to U_{P+}
Input resistance:	330 kΩ
Accuracy/linearity:	≤ ±0.3% of full flow
Temperature drift:	≤ ±0.3% of full flow
Resolution:	12 bit

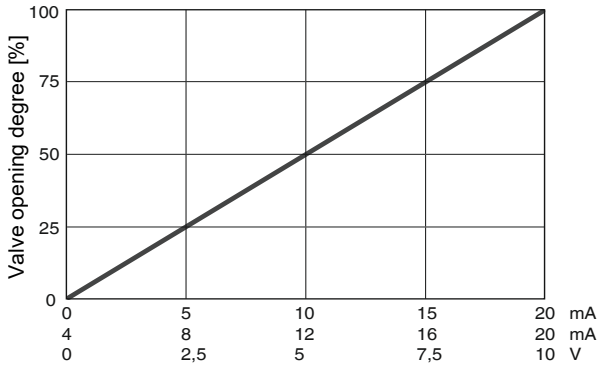
8.6.6 Positioner specifications

Note:

The following diagram is valid for valves with a standard assignment of the spindle position to the valve position.
(See section "Mechanical data, correlation between travel sensor spindle/valve position")

Control diagram:

Default setting / The control characteristic is adjustable.



Set value input (mA / V)

During initialization, the 1435 ePos positioner automatically detects the control function of the valve and adjusts itself by default so that the valve is closed when the signal is 0/4 mA or 0 V.*
The assignment can be changed subsequently by means of parameters.
* with double acting actuators dependent on pneumatic actuator

System deviation (dead zone):

1 % default setting
≥ 0.1 % (adjustable)
≤ 2.0 % (preset, K-no. 2442)
≤ 5.0 % (preset, K-no. 2443)

Initialization:

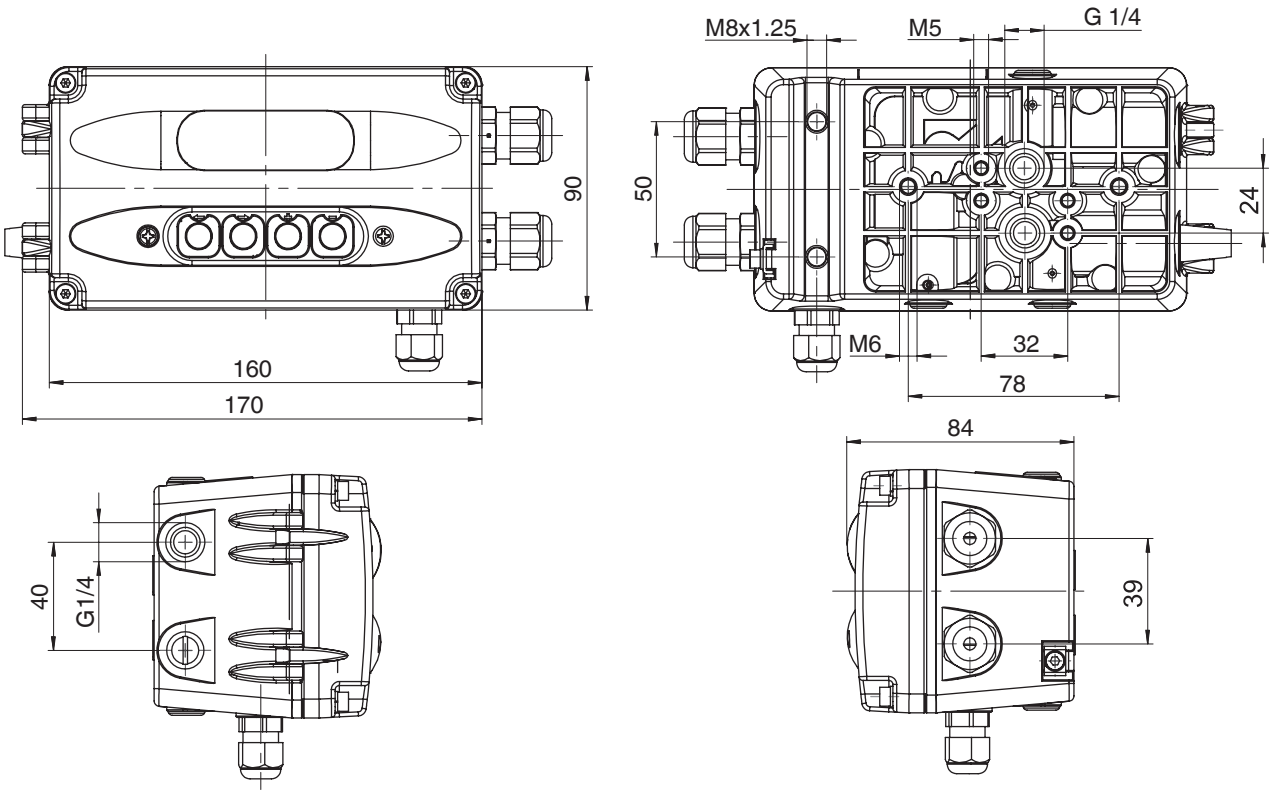
automatic (manual possible in ADVANCED system mode)

Close tight function:

option

9 Dimensions

9.1 Positioner dimensions



Dimensions in mm

9.2 Dimensions of the travel sensor, mounting options and mounting facilities

For dimensions of travel sensors 4231 and 4232, which are used to measure the travel from the process valve, as well as the mounting bracket for wall mounting the 1435, see the 1435 ePos datasheet.

10 Manufacturer's information

10.1 Delivery

- Check that all parts are present and check for any damage immediately upon receipt.

The product's performance is tested at the factory. The scope of delivery is apparent from the dispatch documents and the design from the order number.

10.2 Transport

1. Only transport the product by suitable means. Do not drop. Handle carefully.
2. After the installation dispose of transport packaging material according to relevant local or national disposal regulations / environmental protection laws.

10.3 Storage

1. Store the product free from dust and moisture in its original packaging.
2. Avoid UV rays and direct sunlight.
3. Do not exceed the maximum storage temperature (see chapter "Technical data").
4. Do not store solvents, chemicals, acids, fuels or similar fluids in the same room as GEMÜ products and their spare parts.

11 Assembly

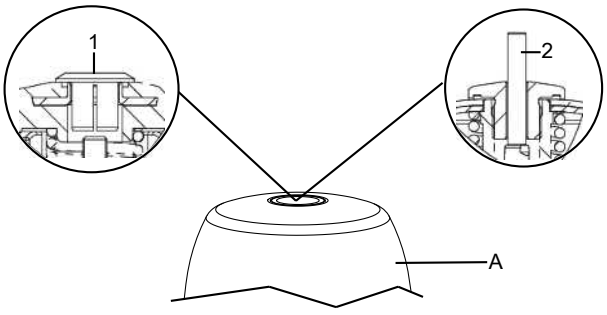
11.1 Information for use in damp conditions

1. The product must not be used outdoors without a heating element. The version with heating element may only be used outdoors in a rain-protected area.
2. The product must be protected from the direct influence of rain water.

11.2 Assembly on linear actuators

11.2.1 Preparations for assembly to the valve

1. Move the actuator **A** into zero position (actuator vented).
2. Remove optical position indicator **2** and / or protective cap **1** from the actuator top.



11.2.2 Linear travel sensor mounting kit assembly for remote mounting

⚠ CAUTION

Pretensioned spring!

► Damage to the device.

- Slowly release the tension in the spring.

⚠ CAUTION

Do not scratch the spindle!

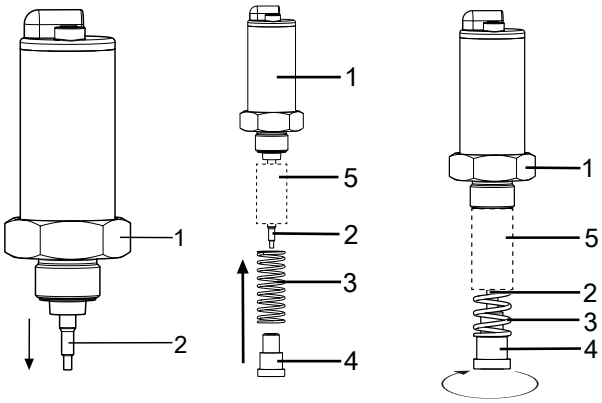
► A damaged spindle surface may cause failure of the travel sensor.

Item	Name
1	Travel sensor
2	Spindle
3	Spring
4	Operating bush
5	Guide bush*
6	Threaded adapter**

*Included depending on version

**If a threaded adapter is included, it must be screwed into the actuator top of the process valve

The process described below refers to the mounting kit mounting for direct and remote mounting.



1. Pull the spindle **2** out of the travel sensor **1**.
2. If included, push the guide bush **5** taper over the spindle **2** first.
3. Push the spring **3** over the spindle **2** and secure with the operating bush **4**.
4. Tighten the operating bush **4** by turning it clockwise.
5. Push in the spindle **2** as far as it will go on the spring **3** and then slowly release the pressure on the spring **3**.

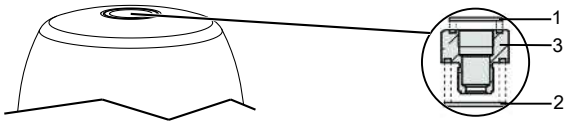
11.2.3 Installing the adapter

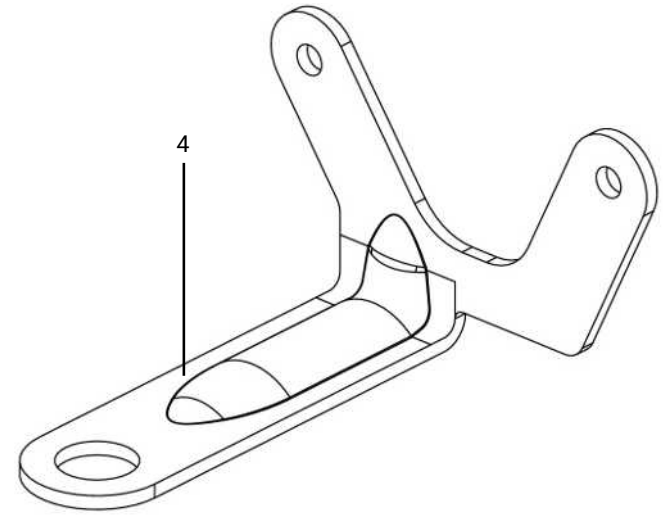
With some mounting kits it is necessary to install an adapter as well. These adapters are included with the required mounting kits. Valves with a normally open and double acting control function (code 2+3) also include additional O-rings (1+2).

NOTICE

- The adapter only needs to be mounted if included.
- There are two variants for mounting the adapter.

- **One adapter included with or without mounting bracket.**
- **Two adapters included (identical or different design) with mounting bracket.**





1. Move the actuator to the closed position.
2. Place O-rings **1** and **2** into adapter **3**.

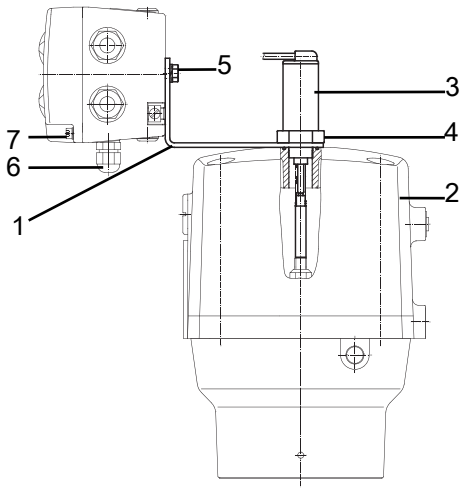
If one adapter is included:

3. Screw the adapter **3** into the actuator opening as far as it will go and tighten.
   ⇨ In some cases, if included, a mounting bracket may also need to be mounted under the adapter (see chapter 10.6, Direct mounting with mounting bracket type 2). Otherwise, the mounting bracket included is mounted later.

If two adapters are included with mounting bracket:

4. The mounting bracket **4** is fixed through the travel sensor later.
5. Screw the appropriate adapter **3.1** into the actuator opening as far as it will go and tighten.
   ⇨ The mounting bracket is mounted later with the second adapter (see chapter 10.6, Direct mounting with mounting bracket type 4).

11.2.4 Direct mounting



Item	Name
1	Mounting bracket
2	Actuator
3	Travel sensor
4	Hexagon
5	M6 screws
6	M12 cable gland
7	M4 screws

1. Mount the travel sensor mounting kit.
2. Move the actuator to the open position.
3. Depending on the version, attach the mounting bracket **1** to the actuator **2** or adapter and guide the travel sensor **3** through the mounting bracket as far as it will go into the actuator opening and screw in place in the clockwise direction against the initial spring tension.

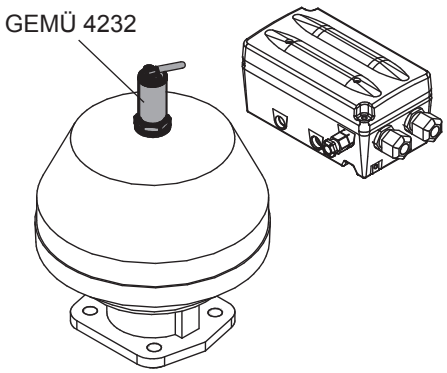
NOTICE

Wrong mounting kit

- ► If no initial spring tension can be felt, it may be the case that the wrong mounting kit with too short an operating bush has been used.
- ► If the spring locks and the positioner cannot be correctly mounted on the valve, it may be the case that the wrong mounting kit with too long an operating bush has been used or that a required adapter has not been used.
- ● In both cases, check that the mounting kit parts are being used correctly and in their entirety.

4. Tighten the travel sensor **3** using a suitable open-end wrench **WAF 27**.
5. Attach the positioner to the mounting bracket **1** with two M6 screws **5**.
6. Loosen the M4 screws **7** on the housing cover and swing the cover open.
7. Feed the connection cable of the travel sensor into the cable gland **6** of the positioner and connect to the terminal board as shown in the wiring diagram.
8. Then tighten the cable gland. The cable must be held firmly on all sides.
9. Connect the pneumatic supply to the positioner and connect to the process valve.

11.2.5 Remote mounting



1. Mount the travel sensor mounting kit.
2. Move the actuator to the open position.
3. Guide the travel sensor **3** as far as it will go into the actuator opening and screw it in clockwise against the initial spring tension.
4. Fit the positioner in a suitable location.

NOTICE

Mounting bracket

- ► The GEMÜ 1445 000 ZMP mounting bracket, which is available separately, can be used for this.

NOTICE

Wrong mounting kit

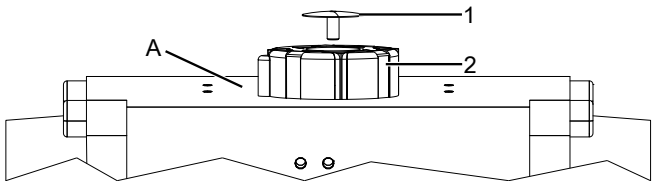
- ► If no initial spring tension can be felt, it may be the case that the wrong mounting kit with too short an operating bush has been used.
- ► If the spring locks and the positioner cannot be correctly mounted on the valve, it may be the case that the wrong mounting kit with too long an operating bush has been used or that a required adapter has not been used.
- ● In both cases, check that the mounting kit parts are being used correctly and in their entirety.

5. Tighten the travel sensor **3** using a suitable open-end wrench **WAF 27**.
6. Connect the travel sensor **3** to the positioner electrically.
7. Loosen the M4 screws **7** on the housing cover and swing the cover open.
8. Feed the connection cable of the travel sensor into the cable gland **6** of the positioner and connect to the terminal board as shown in the wiring diagram.
9. Then tighten the cable gland. The cable must be held firmly on all sides.
10. Connect the pneumatic supply to the positioner and connect to the process valve.

11.3 Assembly on quarter turn actuators

11.3.1 Preparations for assembly to the valve (quarter turn actuator)

1. Move the actuator **A** into zero position (actuator vented).



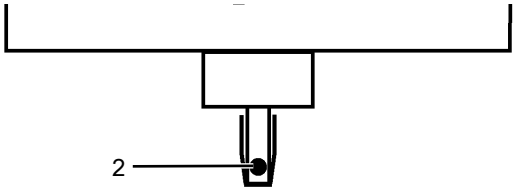
2. Remove the screw **1** from the trigger cam **2**.

11.3.2 Rotary travel sensor mounting kit assembly

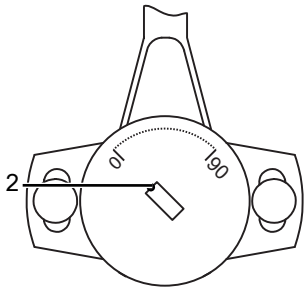
NOTICE

Determining the rotational direction of the actuator

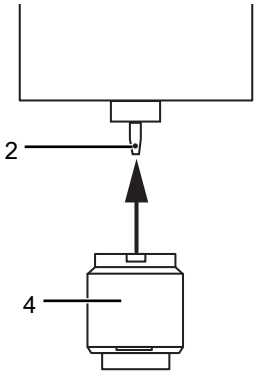
► When viewed from above, the rotational direction of the actuator must be anticlockwise, when the actuator moves from the CLOSED to the OPEN position. In cases where the actuator turns in a clockwise direction, the travel sensor's end position, contrary to given instructions, needs to be in the opposite direction.



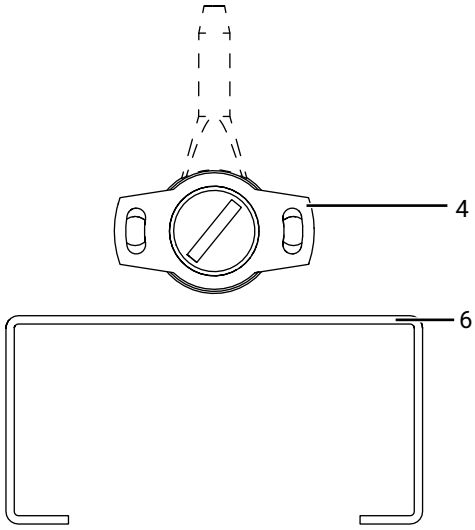
1. The shaft of the rotary travel sensor is provided with a marking **2**.



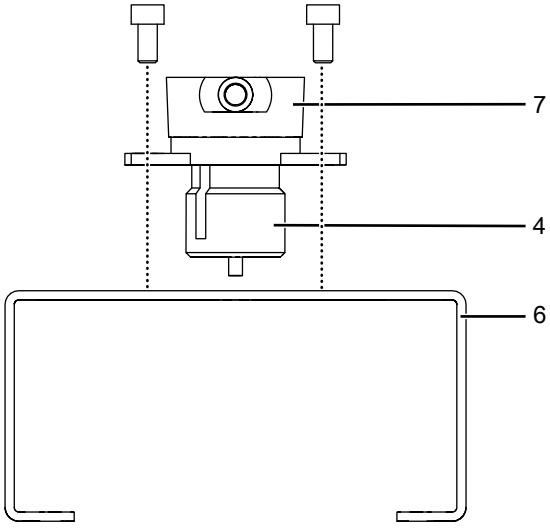
2. Set the marking **2** so that it is correctly aligned with the 0° position on the underside of the travel sensor housing. The 0° position is located on the left-hand side of the cable exit (the electrical operating range is located in the travel range between the 0° and 90° positions).



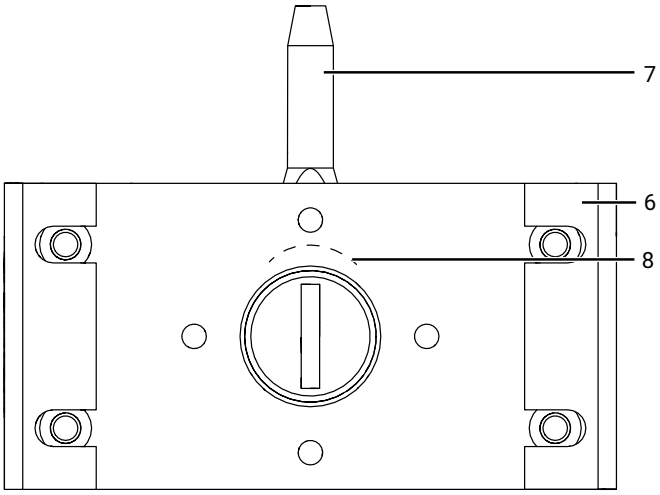
3. Place the adapter **4** onto the shaft of the rotary travel sensor **2** without twisting the shaft.



4. Mount the black housing of the rotary travel sensor **4** in parallel to the mounting bracket **6** in a longitudinal direction.



5. Mount the external rotary travel sensor **7** with the adapter **4** on the mounting bracket **6**.



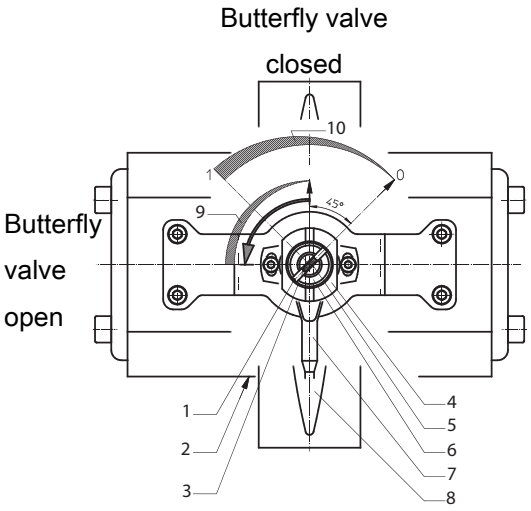
6. Note the direction of the scale **8**.

⇨ View from below of the travel sensor **7** with mounting bracket **6**.

11.3.3 Direct mounting

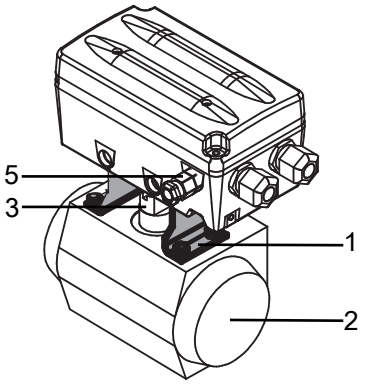
NOTICE

► Before mounting the travel sensor on the actuator, make sure that the shaft height and the hole pattern in the actuator match the dimensions of the mounting bracket **6**.

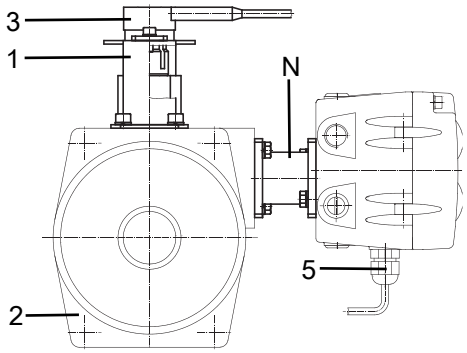


Item	Name
1	Adapter marking
2	Pneumatic connection
3	Potentiometer shaft marking
4	Actuator shaft (from above)
5	Rotary potentiometer shaft
6	Adapter
7	Rotary potentiometer connection
8	Butterfly disc: Closed
9	Actuator
10	Rotary potentiometer

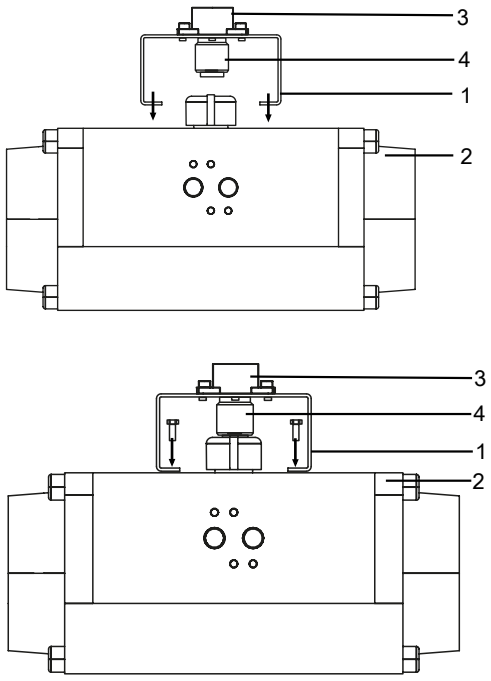
1. Positioner positioned above:



2. b) Positioner flanged onto NAMUR control air connectors:



Item	Name
1	Mounting bracket
2	Quarter turn actuator
3	Rotary travel sensor
N	NAMUR adapter
5	Cable gland



3. Mount the travel sensor mounting kit (see “Rotary travel sensor mounting kit assembly“, page 19).
4. Place the travel sensor **3** with adapter **4** and mounting bracket **1** on the actuator **2**.

NOTICE

► The adapter lug **4** must engage in the actuator shaft groove.

NOTICE

Installation position

► Observe the correct orientation of the operating range of the rotary travel sensor (see “Checking the mechanical mounting“, page 22).

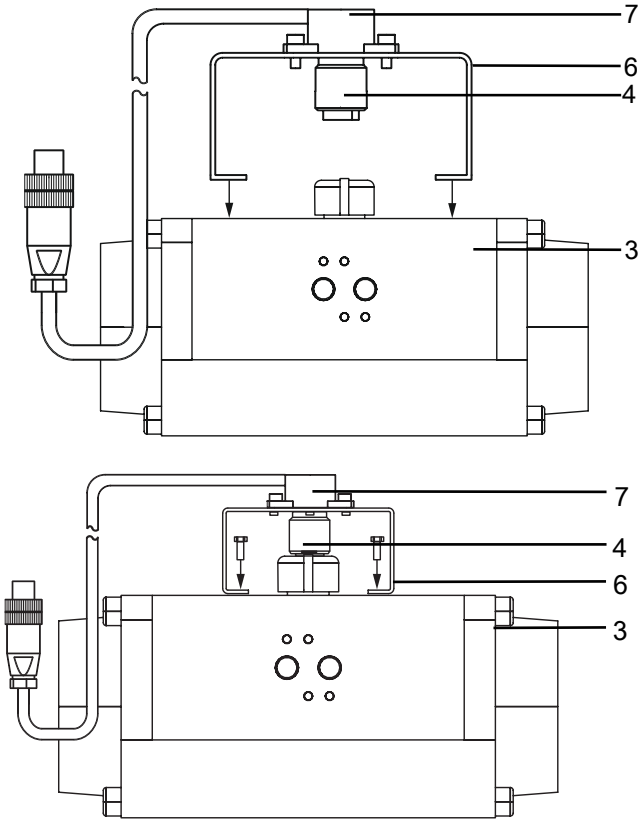
5. Mount the mounting bracket **1** on the actuator **2** using the screws, washers and spring washers provided.
6. Depending on the mounting variant, mount the positioner on the mounting bracket **1** or flange it directly onto the control air connector of the quarter turn actuator **2** with the **NAMUR** adapter.
7. Connect the travel sensor **3** to the positioner electrically.
8. Loosen the screws **7** on housing cover and swing the cover open.
9. Feed the connection cable of the travel sensor into the M12 cable gland **6** of the positioner and connect to the terminal board as shown in the wiring diagram.
10. Tighten the M12 cable gland.

    ⇨ The cable must be held firmly on all sides.
11. Connect the pneumatic supply to the positioner and connect to the quarter turn actuator **2** (not in the case of mounting variant b).

11.3.4 Remote mounting

NOTICE

► The travel sensor's cable exit protective coating is not UV-resistant and must therefore be protected against direct exposure to weather.



1. Fit the positioner **1** somewhere suitable.

NOTICE

Mounting bracket

► The GEMÜ 1445 000 ZMP mounting bracket, which is available separately, can be used for this.

2. Mount the travel sensor mounting kit (see “Rotary travel sensor mounting kit assembly“, page 19).
3. Place the travel sensor **7** with adapter **4** and mounting bracket **6** on the actuator **3**.

NOTICE

► The adapter lug **4** must engage in the actuator shaft groove.

4. Mount the mounting bracket **6** on the actuator **3** using the screws, washers and spring washers provided.
5. Connect the travel sensor **7** to the positioner electrically.
6. Loosen the screws on the housing cover and swing the cover open.
7. Feed the connection cable of the travel sensor into the M12 cable gland of the positioner and connect to the terminal board as shown in the wiring diagram.
8. Tighten the M12 cable gland.

⇨ The cable must be held firmly on all sides.

9. Connect the pneumatic supply to the positioner and connect to the quarter turn actuator **3**.

11.4 Checking the mechanical mounting

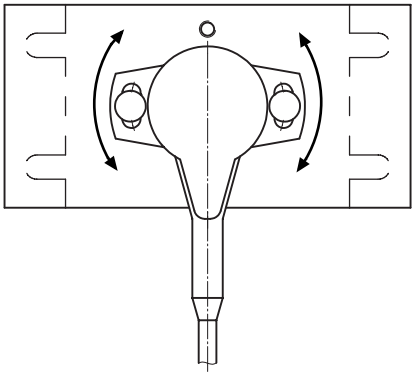
1. Connect the product to the power and air supply (see electrical connection and pneumatic connection).
2. The following message is displayed:

3. By pressing the ⊞ and ⊟ keys, the mounted actuator can be moved to the OPEN and CLOSED position.
4. **Important:** The displayed valve position must be between 2% and 98%. If the display leaves this area, check the mechanical mounting again and, if necessary, readjust the orientation of the rotary travel sensor. In the case of linear travel sensors, check the mounting parts used for compatibility.

NOTICE

Note for the rotary travel sensor

► The slotted holes should be positioned in the centre on the screws. If the travel range is incorrect (determined by checking the attachment), loosen the two screws slightly and twist the travel sensor. Set the travel up correctly and tighten the screws again.



12 Electrical connection

⚠ CAUTION

Danger - high voltage!

► Electric shock.

● Before performing any work on the GEMÜ product switch off power and protect circuit from being switched on again.

12.1 Version with terminals (standard)

1. Loosen the screws (7) on the housing cover and swing the cover open (see “Assembly“, page 16).
2. Feed the connection cable of the travel sensor into the M12 cable gland of the positioner and connect to the terminal board as shown in the wiring diagram (see “Electrical connection with cable gland“, page 24).
3. Feed the connection cable for the electrical supply and signal transmission into the M16 cable gland(s) of the positioner and connect to the terminal board as shown in the wiring diagram (see “Electrical connection“, page 23).
4. Connect the 24 V DC supply voltage and potential earth.
5. Connect analogue input 0-20 mA, 4-20 mA or 0-10 V to the appropriate terminals for the specification of set values.
6. Then tighten all cable glands.

   ⇨ The cables must be held firmly on all sides.

NOTICE

Malfunctions caused by differences in potential

► In order to compensate for differences in potential due to plant-specific malfunctions, a jumper can be placed between terminals **GND** and **Iw-**.

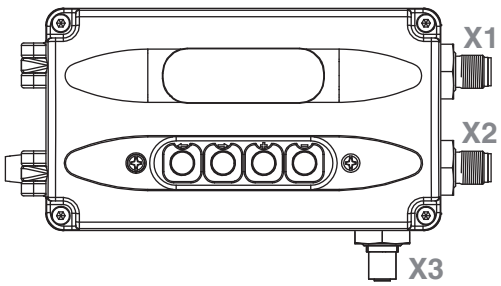
12.2 Version with connector (optional)

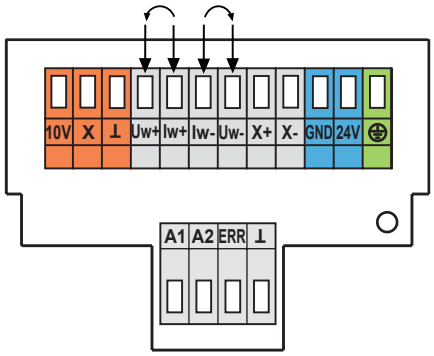
NOTICE

► GEMÜ 4231 and 4232 travel sensors with the M12 plug connection can be used for this version.

1. Connect the connection cable with the appropriate travel sensor connector to the **X3** M12 built-in socket on the side of the positioner.
2. Connect the connection cable with the appropriate connector for electrical supply and signal transmission to the X1 and X2 M12 plugs of the positioner as shown in the layout (see “Electrical connection“, page 23).
3. Connect the 24 V DC supply voltage and potential earth.
4. Connect analogue input 0-20 mA, 4-20 mA or 0-10 V * as appropriate for the specification of set values.

   ⇨ * Internal rewiring required for set value signal 0-10 V





NOTICE

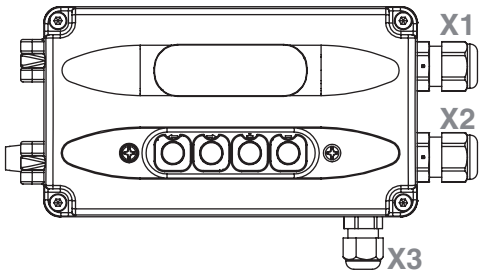
Set value input 0-10 V

► For a set value input signal of 0-10 V DC, the positioner must be opened and the two stranded wires of the set value input must be re-wired from terminals **Iw+** and **Iw-** to terminals **Uw+** and **Uw-**.

12.3 Electrical connection with cable gland

Note: Ordering option Option code 0, 2, 4, 6

Position of the connections



Connection X1/X2: M16 cable gland

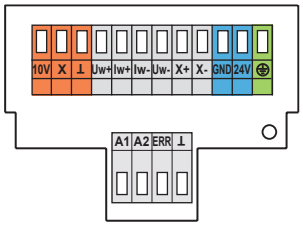
Connection X3: M12 cable gland

Recommended cable diameter: X1 / X2: 4 - 10 mm
X3: 3.5 – 7 mm

Terminals: Wago 236

Cross section of wire: 0.5...2.5 mm² / AWG 20…12

Internal wiring:



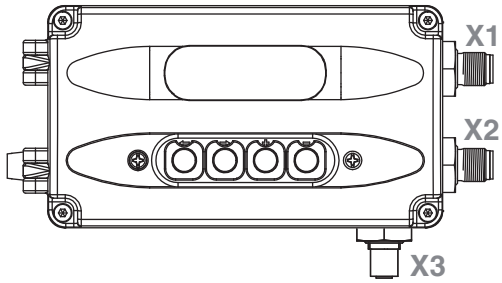
		Key
10 V	green [1]	Connection of external travel sensor
X	brown [1]	
⊥	white [1]	
I_W+		Set value input 0 / 4-20 mA
I_W-		
U_W+		Set value input 0 - 10 V
U_W-		
X+		Actual value output 0 - 10 V 4-20 mA (optional) - internal supply
X-		
GND		Supply voltage 24 V DC
24 V		
⏚		Potential earth
A1		Alarm 1
A2		Alarm 2
ERR		Error message output
⊥		GND out

1) Core colours when using an external travel sensor GEMÜ 4231 or 4232. Connect in the specified order. Other external travel sensors may have different core colours.

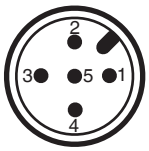
12.4 Electrical connection with M12

Note: Ordering option Option code 1, 3, 5, 7

Position of the connectors

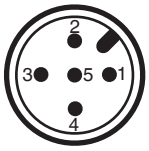


Connection X1



Pin	Signal name
1	Uv, 24 V DC supply voltage
2	Uo, error message output, 24 V DC
3	Uv, GND supply voltage
4	Uo, alarm output 1, 24 V DC
5	Uo, alarm output 2, 24 V DC

Connection X2



Pin	Signal name
1	Iw+, set value input 0/4–20 mA *
2	Iw-, set value input 0/4–20 mA *
3	X+, actual value output 0 - 10 V / 4-20 mA
4	X-, actual value output 0 - 10 V / 4-20 mA
5	n.c.

* For set value input Uw = 0 - 10 V on-site rewiring is required

Connection X3 (for travel sensor connection)

Pin	Signal name
1	UP+, actual value supply 10 V DC
2	UPsig, actual value input 0–10 V DC
3	UP-, actual value supply GND
4	n.c.
5	n.c.

13 Pneumatic connection

⚠ CAUTION

Flailing broken pneumatic lines.

► Risk of injury.

● Comply with the general safety measures when handling compressed air.

NOTICE

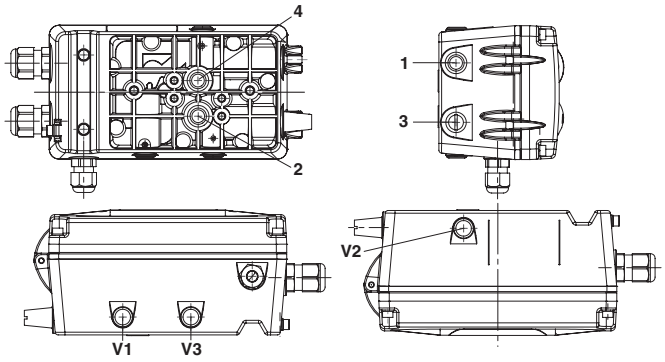
Coarse dirt particles

► Filter strainers are installed in the pneumatic connectors of the positioner to protect against rough dirt particles. They can be ordered as replacement items with order number **1435 SFI**.

1. Make the connection between the pneumatic positioner outlet **2** (single acting) or **2** and **4** (double acting) and the pneumatic actuator control air inlet.
2. Connect the auxiliary power (air supply) to the air supply connection **1** (max. 6 bar or 90 psi).

NOTICE

► In the case of valves that behave significantly differently with regard to the necessary travel times (for example the normally open control function, code 2) it may be necessary to fit an additional supply air throttle to the supply connection **P**. This enables the travel times to be set evenly.

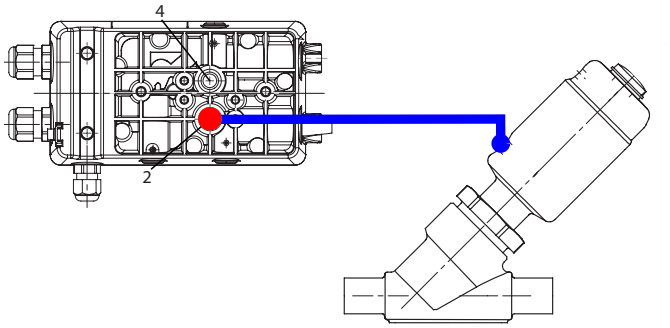


Connection in accordance with DIN ISO 1219-1	Designation	Size
1	Air supply connection P	G1/4
3	Venting connection with silencer	G1/4
V1	Exhaust air throttle for 2	-
V2	Exhaust air throttle for 4*	-
V3	Check valve	-
2	Working connection for process valve	-
4	Working connection for process valve*	-

* Only with double acting action (code 3)

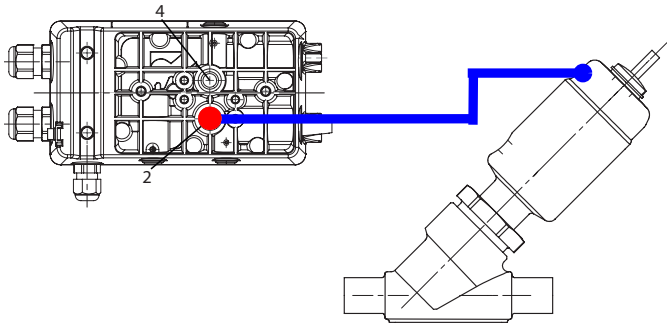
13.1 Connection diagram for linear valves

13.1.1 Connection diagram for NC valves (Normally Closed)



● Fit tubing from **2** to the **lower connection of the process valve**.

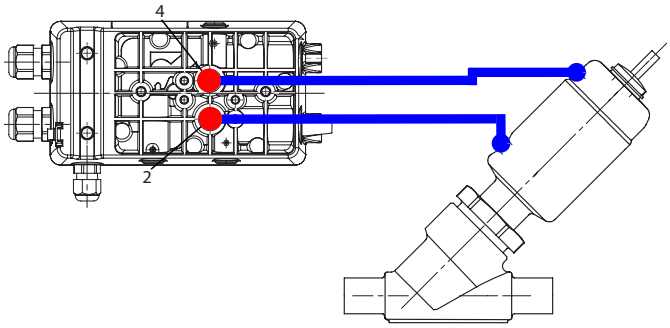
13.1.2 Connection diagram for NO valves (Normally Open)



● Fit tubing from **2** to the **upper connection of the process valve**.

⇨ The throttle only needs to be assembled if it is included.

13.1.3 Connection diagram for double acting valves



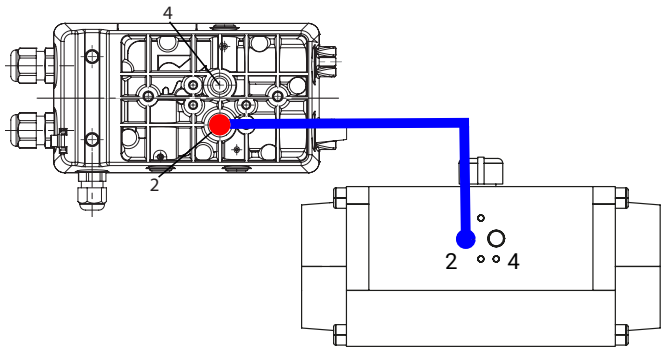
● Fit tubing from **2** to **the lower connection of the process valve** and **4** to the **upper connection of the process valve**.

13.2 Connection diagram for quarter turn actuators

13.2.1 Connection diagram for NC/NO valves (Normally Closed/Normally Open)

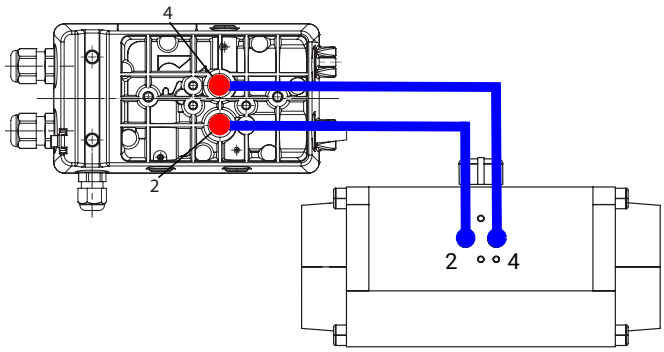
NOTICE

► The control function can be adjusted via the butterfly disc or by turning the shaft.



Fit tubing from **2 to connector 2** of the quarter turn actuator.

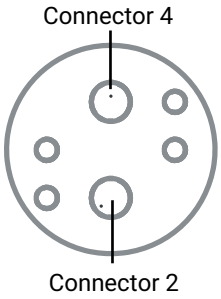
13.2.2 Connection diagram for double acting valves



Fit tubing from **2 to connector 2** of the quarter turn actuator and **4 to connector 4** of the quarter turn actuator.

13.2.3 Note for vertical pneumatic connections

In the case of a vertical connection, please observe the following pneumatic connection assignment:



13.3 Replacing the filter strainers

1. Switch off the pneumatic control air supply.
2. Remove the connection cables.
3. Carefully remove the filter strainers from holes 1, 2 and 3 (only double acting version).
4. Assemble the new filter strainers (1435 SFI).
5. Re-connect the connection cables.
6. Supply pneumatic control air.

14 Commissioning

NOTICE

- For delivery of the product assembled on a valve at the factory, the complete construction is already ready for operation at a control pressure of 5.5 to 6 bar without operating pressure. A reinitialization is recommended if the plant is operated with a different control pressure or if the mechanical end positions have been changed (e.g. seal replacement on the valve or actuator replacement). The initialization is retained even in the event of voltage cutoff.

⚠ WARNING

Corrosive chemicals!

► Risk of caustic burns
- Wear appropriate protective gear.
- Completely drain the plant.

⚠ CAUTION

Leakage

► Emission of dangerous materials.
- Provide precautionary measures against exceeding the maximum permitted pressures caused by pressure surges (water hammer).

⚠ CAUTION

Cleaning agent

► Damage to the GEMÜ product.
- The plant operator is responsible for selecting the cleaning material and performing the procedure.

1. Commission the product.
2. Use suitable connectors.
3. Connect the control medium lines tension-free and without any bends or knots.

14.1 Without default setting (when supplied without a valve)

⚠ CAUTION

Risk of injury or damage possible

- For correct commissioning, the product must be calibrated to the process valve via the initialization process.
- During this commissioning, the valve is automatically opened and closed several times. It must therefore be ensured in advance that this does not lead to a dangerous situation.

The product has 2 control medium connectors.

1. Connect the pneumatic tubes and activate the pneumatic control air supply of max. 6 bar.
2. Connect the connection cable tension-free and without any bends or knots.
3. Switch on supply voltage.
4. Use the corresponding keys to navigate to the **Init ALL** parameter in the menu, use the **red** key to select **Init ALL** and press and hold the **green** key for 3 seconds.
5. Initialization is carried out.

NOTICE

Valve travel times (up-down, down-up)

► The valve travel times are measured and displayed. If these measure < 1 second, an error is displayed and the valve travel time must be set to at least > 1 second using the throttle screw(s). This step may need to be repeated several times until an optimal valve travel time can be achieved. Experience has shown that valve travel times of approx. 1-2 seconds produce optimal control characteristics. The two valve travel times should ideally not be too far apart.

NOTICE

► It may be necessary to close the internal positioner throttle screws a little (D1 for single acting actuators, D1 and D2 for double acting actuators) if the actuator volume is low in order to increase the valve travel times. The travel times must measure > 1 second, otherwise this may result in vibration behaviour of the positioner.

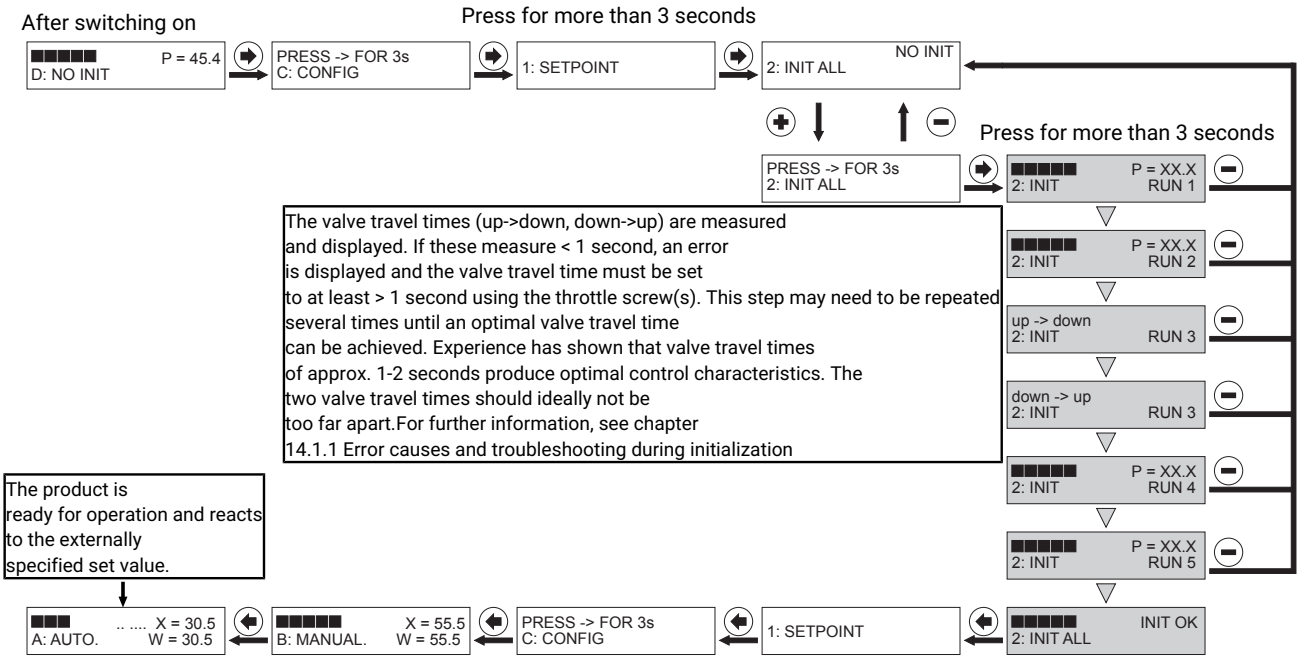
NOTICE

Tip for use

► During automatic initialization of actuators whose movement profiles are not continuous (i.e. with undefined stopping or stalling, e.g. with large size butterfly valves), it may not be possible to clearly detect the end positions and unjustified error messages may appear (e.g. LEAKAGE).

► Manual initialization with sequential movement through the menu by the operator* or, if possible, acknowledging the error message to repeat the step may help here.

*Only possible in the Advanced system mode



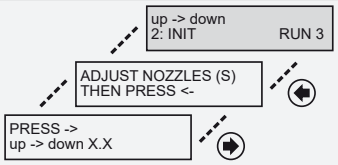
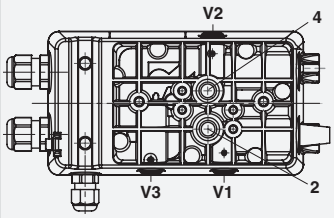
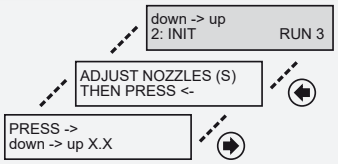
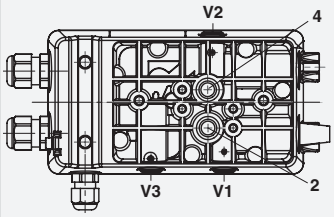
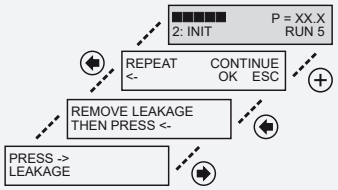
If the message "INIT OK" appears, the product is ready for operation and can be set to the desired operating mode.

- Operating mode A: AUTO – reacts to the externally specified set value.
- Operating mode B: MANUAL – the valve position can be specified manually using the keys.

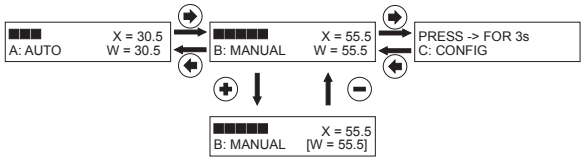
14.1.1 Error causes and troubleshooting during initialization

If an error message appears during the initialization process, proceed as described below:

Display	Error cause	Troubleshooting
PRESS <- ERROR RUN 1	Actuator's direction cannot be established. Cause: a) No compressed air supply b) Compressed air supply too low c) Travel sensor wrongly connected d) Valve stroke < 3 mm	- Press the ← key a) Check compressed air supply (max. 6 bar) b) Check compressed air supply (max. 6 bar) and correct pneumatic connection c) Check connection assignment d) Check valve stroke
PRESS <- ERROR RUN 2.1	Zero point adjustment cannot be carried out. Cause: a) Incorrect travel sensor / mounting kit b) Adjust quarter turn travel sensor	- Press the ← key Adjust valve manually, display value P must be > 2.0 in CLOSED position. a) Check order no. b) Turn quarter turn travel sensor (only on quarter turn actuators) until value P > 2.0
PRESS <- ERROR RUN 2.2	Zero point adjustment cannot be carried out. Cause: a) Incorrect travel sensor / mounting kit b) Adjust quarter turn travel sensor	- Press the ← key Adjust valve manually, display value P must be < 98.0 in CLOSED position. a) Check order no. b) Turn quarter turn travel sensor (only on quarter turn actuators) until value P < 98.0

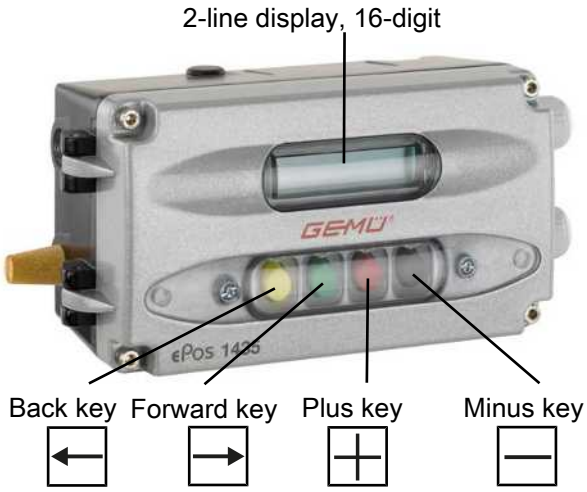
Display	Error cause	Troubleshooting
PRESS <- Stroke Error	Actuator does not move. Cause: a) No compressed air supply b) Compressed air supply too low c) Mechanical design faulty	- Press the ← key a+b) Check compressed air supply (max. 6 bar) c) Check mechanical design
	Travel time (CLOSED – OPEN) of valve less than 1 second 	- Press the → key - Turn throttle D1 clockwise to increase the travel time of the valve. To reduce the travel time, throttle D1 must be turned anticlockwise. (throttles D1 and D2 in the case of double acting actuators)  - Press the ← key - Repeat if necessary until travel time > 1 second
	Travel time (OPEN – CLOSED) of valve less than 1 second 	- Press the → key - Turn throttle D1 clockwise to increase the travel time of the valve. To reduce the travel time, throttle D1 must be turned anticlockwise (throttles D1 and D2 in the case of double acting actuators)  - Press the ← key - Repeat if necessary until travel time > 1 second
	Leakage in the system	- Press the → key - Remove leakage - Press the ← key - Press the ← key for another test - Press the + key to skip the leakage test CAUTION! Skipping the leakage test may lead to bad control characteristics and increased wear.

14.2 With default setting (positioner supplied mounted to the valve)



1. If the positioner is supplied ready for operation, **A: AUTO** appears on the display and the positioner reacts to the externally specified set value.
2. To manually adjust the valve, press → once. **B: MANUAL** appears.
3. Press the + key. A bracket appears around the preset value.
4. Press the ← key until you reach the digit of the value to be changed and adjust using the + or − key.
5. Press the → key until the cursor reaches the right-hand bracket and confirm the set value by pressing the + key.

15 Switching the operator interface



The product offers you the choice between two different operator interfaces. These can be selected in the **System mode** parameter.

In order to switch the operator interface from **[CLASSIC]** to **[ADVANCED]**, proceed as follows:

1. Select parameter **50: SYSTEMMODE**.
2. Switch from **[CLASSIC]** to **[ADVANCED]** and do not exit the parameter.
3. Switch off the supply voltage (for longer than 3 seconds).
4. Switch on supply voltage.

In order to switch the operator interface from **[ADVANCED]** to **[CLASSIC]**, proceed as follows:

5. Select parameter **SYSTEMMODE** in the **SetBasics** menu.
6. Switch from **[ADVANCED]** to **[CLASSIC]** and confirm with "OK". Do not exit the parameter.
7. Switch off the supply voltage (for longer than 3 seconds).
8. Switch on supply voltage.

System mode CLASSIC

NOTICE

Voltage cutoff

► After a voltage cutoff, the product always starts in operating mode **A: AUTO** (if an initialization has already been carried out) and reacts directly to the external set value signal.

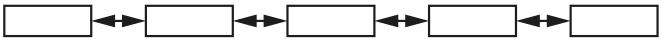
System mode ADVANCED

NOTICE

Voltage cutoff

► After a voltage cutoff, the product always starts in the operating mode which was previously set in the **Mode** parameter.

16 System mode CLASSIC



The **CLASSIC** system mode offers simple basic functions and all available parameters are arranged in the form of a chain.

NOTICE

Voltage cutoff

► After a voltage cutoff, the product always starts in operating mode **A: AUTO** (if an initialization has already been carried out) and reacts directly to the external set value signal.

16.1 Operating modes

16.1.1 Automatic operation (A:) AUTO)

Automatic operation is the normal operating mode. The initialized product reacts independently to set value changes and readjusts the valve. Keys + and − have no function here.

The current position **x** is shown as a percentage at the top of the display and also as a bar chart.

The lower line shows the current operating mode on the left and the current set value **w** in percent on the right.

Press the → key to switch to the **B: Manual** operating mode.

16.1.2 Manual operation (B: MANUAL)

In manual mode, the valve can be operated manually. By pressing the + key a bracket opens around the set value.Use the ← key to select the digit of the value to be

changed and adjust this using the ⊞ and ⊟ keys. Then move the cursor to the right-hand bracket using the → key and confirm the set value by pressing the ⊞ key.

Press the → key to switch to the **C: CONFIG** operating mode.

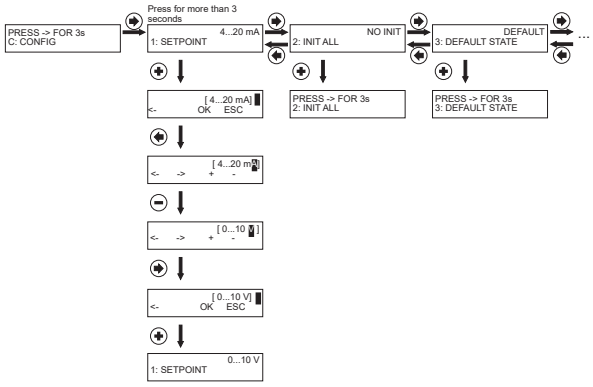
16.1.3 Configuration (C: CONFIG)

Various parameter values of the product can be changed in the configuration menu. To switch to the configuration menu, select parameter C: CONFIG and then press and hold the → key for longer than 3 seconds.

The parameter value is displayed in the top line, the number and name of the parameter appear in the bottom line.

Operation is as shown in the picture below.

Parameter setting:



16.2 Parameter table

Display	Function	Value range	Unit	Default setting
1:SETPOINT	Type of set value	0..10 V 0..20 mA 4..20 mA	V mA mA	4..20 mA
2:INIT ALL	Starting automatic initialization	NO INIT Init OK	-	NO INIT
3:DEFAULT STATE	Return to default setting	NO DEFAULT DEFAULT	-	DEFAULT
11:X-DIRECTION	Direction of X display and actual value output	RISE FALL		RISE
12:ALARM FUNCT	Defines the function of the alarm outputs (ALARM1 and ALARM 2)	OFF min/max min/min max/max		OFF
13:LEVEL ALARM1	Switch point of alarm 1	0.0...100.0		10.0
14:LEVEL ALARM2	Switch point of alarm 2	0.0...100.0		90.0
15:ERROR FUNCTN	Defines the function of the error message output (ERROR)	ERROR ERROR+ INACTIVE RANGE ERROR+RANGE ERR+RANGE+INAC		ERROR+RANGE
16:ERROR TIME	Valve travel time monitoring (Error message output)	auto 0...100	s	auto
17:ERROR LEVEL	Maximum system deviation (Error message output)	auto 0.0...100.0	%	auto
18:RANGE FUNCTN	Range monitoring of set value input	< 4 mA > 20 mA < 4 mA or > 20 mA	mA	< 4 mA or > 20 mA
21:MIN POSITION	Limits the CLOSED position of the valve min. position	0.0...100	%	0.0
22:MAX POSITION	Limits the OPEN position of the valve max. position	0.0...100	%	100.0
23:CLOSETIGHT	Defines the function of the close tight function	no min max min & max		no
24:SETP DIRECTN [1)]	Direction of set value	NORMAL INVERSE		NORMAL
25:SETP RAMP	Ramp function - set value	auto 0...400	s	0
26:SPLIT START	Split range (set value range) start	0.0 ... 90	%	0.0
27:SPLIT END	Split range (set value range) end	10 ... 100	%	100
28:SETP FUNCTN	Defines the function of the control characteristic	Linear 1:25 1:50 free		Linear

Display	Function	Value range	Unit	Default setting
30:FREE 0% 31:FREE 10% 32:FREE 20% 33:FREE 30% 34:FREE 40% 35:FREE 50% 36:FREE 60% 37:FREE 70% 38:FREE 80% 39:FREE 90% 40:FREE 100%	Definition of the freely programmable characteristic curve 11 calibration points	0...100	%	2 3 4.4 6.5 9.6 14.1 20.9 30.9 45.7 67.6 100
42:DEADBAND	Size of dead band	auto 0.0...10.0	%	1.0%, K-no. 2442: 2.0% K-no. 2443: 5.0%
43:PROP GAIN [1)]	Proportional amplification (PD controller)	Kp = 0.1...100.0		1.0
44:DERIV TIME	Differential time constant (PD controller)	Tv = 0.00 s...10.00 s	s	0.1
45:FIELDBUS		SETP.ANALOG FIELDBUS		SETP.ANALOG
46:RELEASE VXX	Software release	V X.X.X.X		
50:SYSTEMMODE	Defines the type of operator interface	CLASSIC ADVANCED		CLASSIC

1) Parameter value is automatically calculated and set by the positioner during initialisation. A manual change may have to be repeated after each initialisation process

16.3 Explanation of parameters

1: Set Point
Range of analogue set value input (Voltage: 0-10 V or power: 0/4-20 mA).

2: Init All
Initialization

Press ⊞ and press and hold the key (> 3 sec) to start the automatic initialization. The progress of the initialization is shown with RUN 1 to RUN 5 in the display.

During the initialization process, the positioner optimizes its control parameters for controlling the valve concerned.

NOTICE

- ► This process must be carried out in order to be able to select automatic or manual operation and should be repeated after every change to the mechanical end positions (e.g. seal replacement on the valve/operator replacement).

3: Default State
Default setting

Return to default setting and reset initialization. Press ⊞ and press and hold the → key (> 3 sec) to set the controller to **Default**.

NOTICE

Setting to default

- ► After setting to **Default**, the product must be reinitialized. All actuation parameters established so far are deleted. **The parameters D.Refresh and the New Code 1-3 are not taken into account.**

11: X-Direction
Correcting variable direction

Here the display direction (rising or falling) and the position feedback can be adjusted.

X-DIRECTION	Valve position	Displayed value	Allocated actual position x
CLOSED	RISE	0%	0%
OPEN		100%	100%
CLOSED	FALL	100%	100%
OPEN		0%	0%

12: Alarm Functn
Activates or deactivates the alarm function

The reaction of the alarms (limiting contacts) relates to the **position** measurement (mechanical distance).

x = current actual value

Min/Max:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	24 V	0 V
Level Alarm1 < x < Level Alarm2	0 V	0 V
Level Alarm1 < Level Alarm2 < x	0 V	24 V

Min/Min:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	24 V	24 V
Level Alarm1 < x < Level Alarm2	0 V	24 V
Level Alarm1 < Level Alarm2 < x	0 V	0 V

Max/Max:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	0 V	0 V
Level Alarm1 < x < Level Alarm2	24 V	0 V
Level Alarm1 < Level Alarm2 < x	24 V	24 V

13: Level Alarm 1
Switch point for Alarm 1. When the switch point has been reached, digital output A1 (24 V DC output) is switched.

14: Level Alarm 2
Switch point for Alarm 2. When the switch point has been reached, digital output A2 (24 V DC output) is switched.

15: Error Functn
Function of the error message output (24 V DC output)
The table shows which functions are relevant to the setting of the output at which setting value.

Setting	Error Time	Error Level	Range Functn	C: Config
Error	X	X		
Error+ Inactive	X	X		X
Range			X	
Error+ Range	X	X	X	
Error+ Range+ Inactive	X	X	X	X

16: Error Time

Monitoring time for setting the error messages (10 x travel time). The set value (s) serves as a specified value for the time within which the positioner must have reached the idle state. The associated trigger threshold is specified with parameter 17. When the set time has been exceeded, the error message output **ERR** is set at 24 V DC.

17: Error Level

Error Level:

Trigger threshold of the error message
Here, a value (%) can be set for the permissible size of system deviation for triggering the error message.
If parameters 16 and 17 are both set to **AUTO**, the error message is set if the slow-travel zone has not been reached within a set time. This time is 10x (parameter value AUTO) the initialization travel time.

18: Range Function

Range Functn:

Range monitoring of the set value signal
Here, it is possible to set whether the **Range** error signal is triggered when it falls below 4 mA (cable break monitoring) or exceeds 20 mA (short-circuit monitoring).

- **21: Min Position**

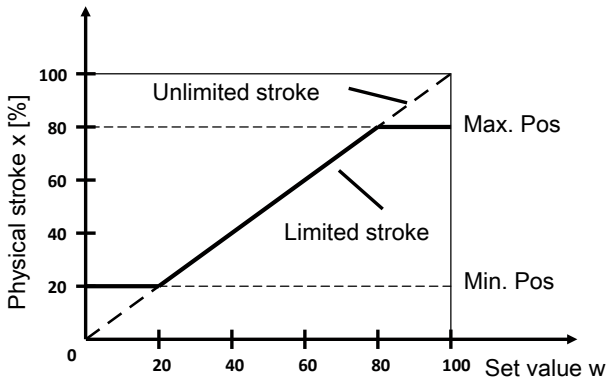
Limits the **CLOSED** position of the valve

This function is equivalent to a mechanical seal adjuster.

- **22: Max Position**

Limits the **OPEN** position of the valve

This function is equivalent to a mechanical stroke limiter.



NOTICE

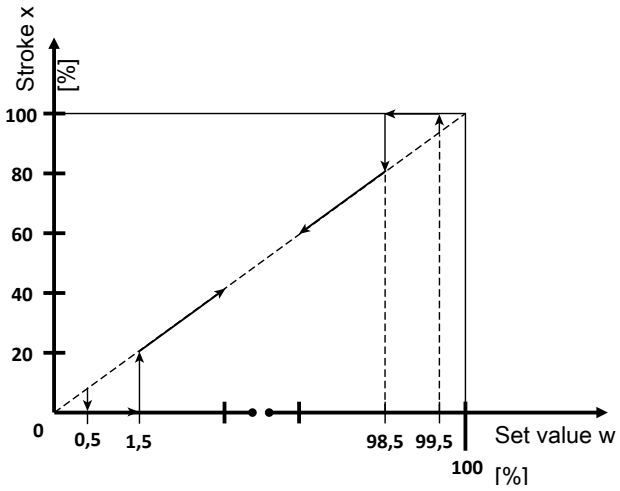
Min/Max Position

► The mechanical regulating distance (from limit stop to limit stop) is limited to the set values with the parameters **Min Position** and **Max Position**. This way, the actuator's mechanical positioning range can be limited.

23: Closetight

If parameter **23: Closetight** is activated, the actuator is vented at a set value of < 0.5%, even if there is a set **Min Position** of, for example, 10%. With a set value of > 1.5% the actuator is moved back to 10%.

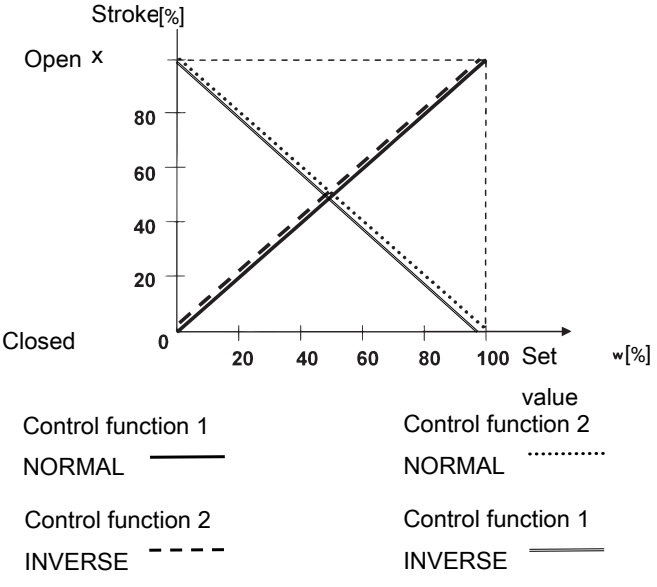
With a set value of > 99.5%, the actuator is opened completely, even if the **Max Position** is set, for example, to 90%. With a set value of < 98.5%, the actuator is moved back to 90%.



24: SetP Direction

Set value direction

Setting the set value direction serves to reverse the direction of the set value. It is mainly required for split-range operation and for single acting actuators with the fail safe **OPEN** setting (control function 2).



NOTICE

► The intended direction of action is that a 0% set value signal is always assigned to the closed valve position (0% stroke). In order to achieve this, the setting is automatically adjusted if an inverted direction of action (e.g. control function 2) is identified during initialization.

25: SetP Ramp

Set value ramp

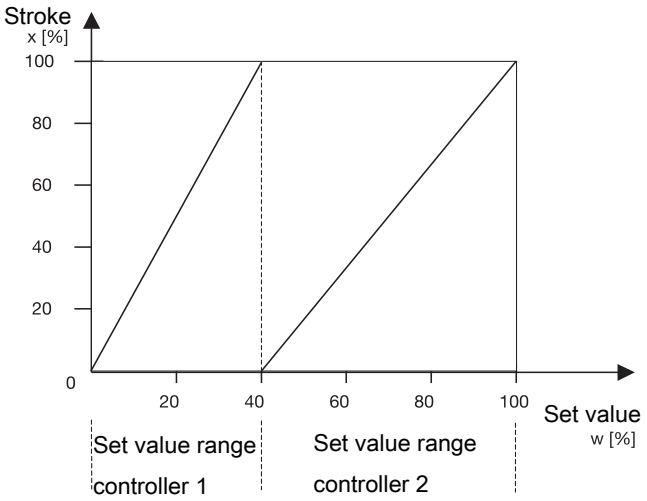
The set value ramp is effective during automatic operation and limits the speed of change of the effective set value. When switching over from manual to automatic operation, the effective set value is matched to the set value on the device via the set value ramp.

In the position **SetP Ramp** = **AUTO**, the slower of the two travel times which have been established during initialization is used for the set value ramp.

26: Split Start

Set value split range start

27: Split End



Set value split range end

Parameters 26 and 27 in conjunction with parameter 24 serve to limit the effective set value range. In this way split range tasks with the curves

- rising / falling
- falling / rising
- falling / falling
- rising / rising

are resolved.

NOTICE

Difference between Split Start/End

► The difference between the **Split Start** and **Split End** values must be > 10%.

28: SetP Function

Set value function

With this function, non-linear valve characteristics can be "linearised" and, with linear valve characteristics, any flow characteristics can be reproduced.

Four valve characteristics are stored in the unit:

1. equal-percentage 1 : 25 (in **CLOSED** position valve remains 4% open)
2. equal-percentage 1 : 50 (in **CLOSED** position valve remains 2% open)
3. Linear
4. free

When free is selected at **30:** a characteristic with 11 calibration points can be entered.

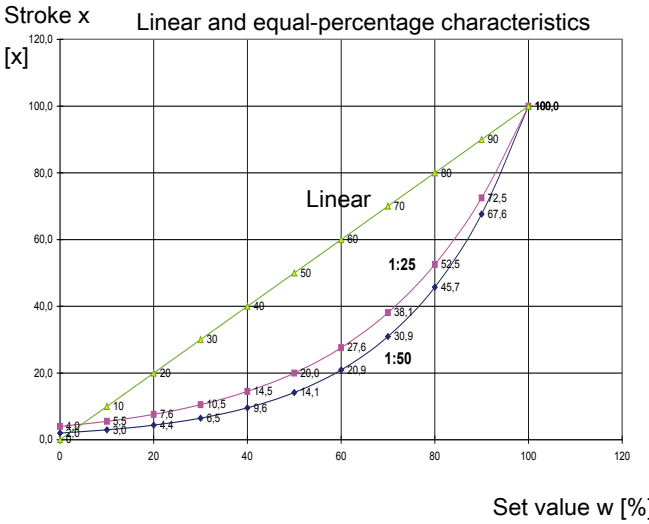
30: FREE 0 %

.

.

.

40: FREE 100 %



At gaps of 10%, a flow characteristic value can be allocated to the set value calibration point concerned. These points make a traverse with 10 straight lines, which then provides a pattern of the valve characteristic.

NOTICE

Entering set value calibration points

► Set value calibration points can only be entered with **28: SetP Function = free**.

42: Deadband

Positioner's dead band

The dead band shows the maximum permissible system deviation between actual value and set value.

With **DeadBand = AUTO**, the dead band is matched to the requirements of the control circuit during initialization. In the other discrete settings, the fixed value for the dead band is used.

NOTICE

Increased wear due to low value

- The level of the system deviation should always correspond to the requirements of the valve and the control circuit. A value of < 1.0% is not recommended, since this could cause oscillating control characteristics (e.g. for actuators with discontinuous movement profiles). This could put a great deal of stress on the internal pilot valves.
- The following principle applies: The smaller the set value, the greater the wear and the shorter the service life. Therefore, the value should only be set to the exact value required.

43: Prop Gain

Proportional amplification

Adjusting the proportional amplification **Kp**

Kp = 0.1...100.0

The level of amplification should always correspond to the requirements of the valve and the control circuit. The optimum setting is determined during automatic initialization but must be moved out of adjustment later if necessary.

The behaviour of the positioner is influenced as follows:

Prop Gain	
Set value > determined value	**Set value < determined value**
The positioner controls faster (but tends to oscillate).	The positioner controls slower.
The set value is achieved in larger steps by increasing the correcting variable.	The set value is achieved in smaller steps by decreasing the correcting variable.
Control is less accurate.	Control is more accurate.

44: Deriv Time

Derivative action time

Adjusting the derivative action time **Tv** (time by which a specific correcting variable is reached earlier because of the D component than with a pure P-positioner)

Tv = 0.00 s...10.00 s

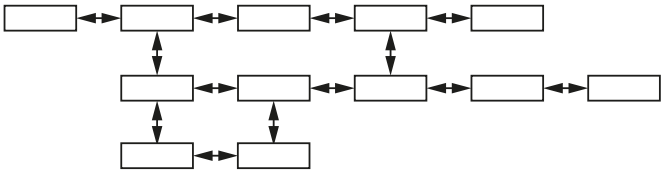
46: Release VXX

Status of the current software version V X.X.X.X

Selection of operator interface:

- **CLASSIC:**
  Menu configuration as described in chapter CLASSIC system mode (see “System mode CLASSIC“, page 31).
- **ADVANCED:**
  Menu configuration as described in chapter ADVANCED system mode (see “System mode ADVANCED“, page 38).

17 System mode ADVANCED



The **ADVANCED** system mode offers extended diagnostic facilities. All available parameters are divided into various categories and stored in various submenus. A large number of additional parameters are also available, providing additional information and settings.

NOTICE

Voltage cutoff

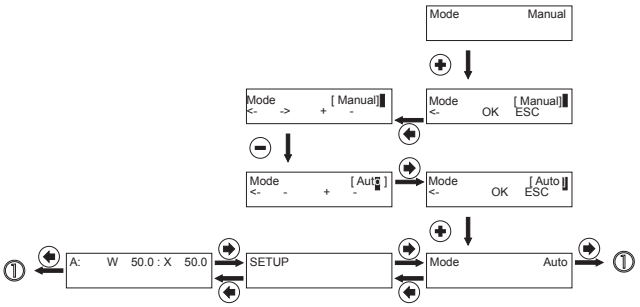
- After a voltage cutoff, the product always starts in the operating mode which was previously set in the **Mode** parameter.

17.1 Menu level

17.1.1 Select operating mode (Mode)

In this parameter, the **AUTO** or **MANUAL** operating mode is selected.

Press the ⊞ key to jump to the change to the set value. This is indicated by two brackets. Then use the ← key to move the cursor below the value to be changed and adjust the value using the ⊞ or ⊟ key. Then move the cursor below the right-hand bracket using the → key. The message **OK** now appears in the bottom line of the display. This is now confirmed with the ⊞ key. Alternatively, the change can be discarded by pressing the ⊟ (ESC) key.



Display	Function	Value range	Default setting	Active level	
				Read	Edit
Mode [1)]	Select operating mode	AUTO, MAN, OFF	AUTO	0	3

1) Only available after initialization has been carried out

17.1.2 Automatic operation (AUTO)

Automatic operation is the normal operating mode. The initialized positioner reacts to set value changes and adjusts the valve accordingly.

Keys ⊞ or ⊟ have no function in this operating mode.

The current position (**x**) is shown in the top right of the display and in the middle is the applied set value signal (**w**) as a percentage.

In the bottom line a help text is shown describing the currently selected parameter.

Press the → key to switch to the **SETUP** menu.

Press the → key again to switch to the **Mode** parameter.

17.1.3 Manual operation (MANUAL)

With manual mode, the valve can be adjusted manually. Press the ⊞ and ⊟ keys to set the desired set value.

Press the → key to switch to the SETUP menu.

17.1.4 Pause mode (OFF)

In pause mode, the valve remains in the last position and the positioner does not react to external signals.

Press the → key to switch to the SETUP menu.

17.1.5 Configuration (SETUP)

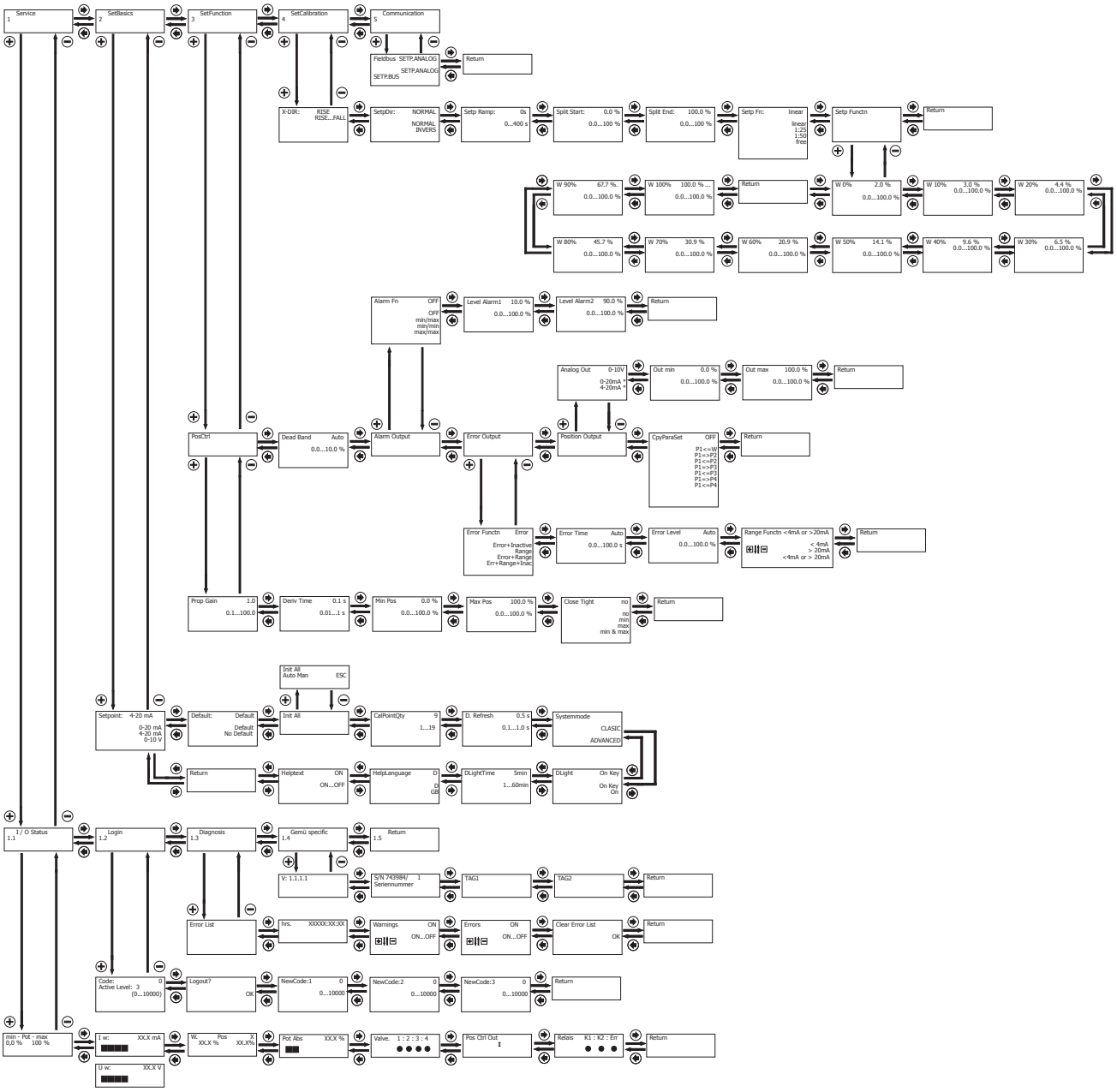
Various parameter values of the positioner can be changed in the configuration menu. To reach the configuration menu, the **SETUP** parameter must be selected in the working level and then the ⊞ key must be pressed.

17.2 Configuration menu (SETUP)

The configuration menu consists of five submenus with the following functions:

1. Service	This menu is used to read out all information/diagnostics regarding the positioner, the connected signals and errors that occur.
2. SetBasics	SetBasics is used to set the basic settings for the positioner such as the initialization, selection of input signals and resetting to default settings.
3. SetFunction	The special positioner functions are switched on or off here and the control parameters are set.
4. SetCalibration	SetCalibration is used to set the directions of action, characteristic curves, stroke limiter and seal adjuster.
5. Communication	No function

17.2.1 Menu structure overview



17.2.2 Parameter overview

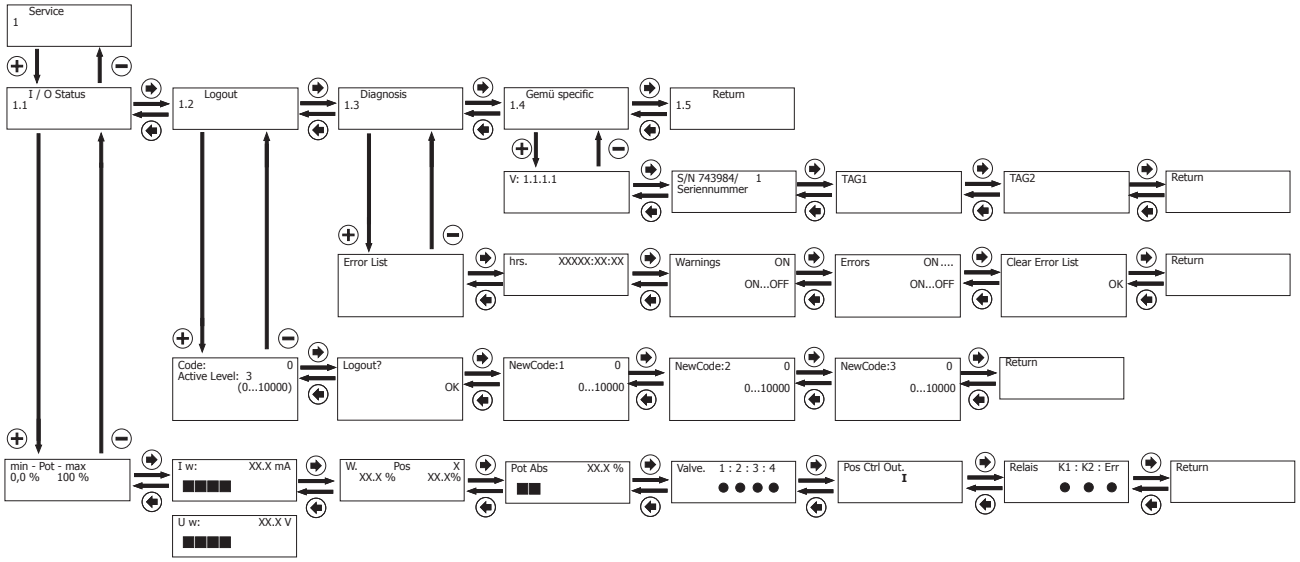
Menu levels	Submenu	Display	Function	Value range	Default setting
		Mode	Select operating mode	AUTO	AUTO
				MAN	
				OFF	
1 Service	**I/O status**	**Submenu for displaying inputs and outputs**			
		min-Pot-max	Displays travel sensor position in percent		
		I w / U w	Value of set value signal in mA / V		
		W Pos X	Comparison of set value and valve position		
		Pot Abs	Travel sensor position		
		Valve	Displays the current position of the internal pilot valves		
		Pos Ctrl Out	Deviation between set value and actual value (positioner)		
		Relais K1:K2:Err	Displays the current position of the internal outputs		
	Login	**Submenu for setting access authorisations**			
		Code	Password entry	0 ... 10000	0
		Logout	Block access	OK	
		New Code: 1	Release the lowest priority	0 ... 10000	0
		New Code: 2	Release the medium priority	0 ... 10000	0
		New Code: 3	Release the top priority	0 ... 10000	0
	Diagnosis	**Submenu for displaying diagnostic messages**			
		Error List	Displays error messages		
		hrs	Displays operating hours		
		Warnings	Display warnings during operation	ON / OFF	ON
		Errors	Display errors during operation	ON / OFF	ON
		Clear Error List	Delete error list	OK	
	1435 specific	**Submenu for displaying the tool identification**			
		Release	Shows the current software release		
		S/N	Displays current serial number		
		TAG1	11-digit ID number can be set		
		TAG2	11-digit ID number can be set		
2 SetBasics					
		Setpoint	Type of set value signal	4–20 mA / 0–20 mA / 0–10 V	4–20 mA
		Default	Reset to default settings	Yes / No	Yes

Menu levels	Submenu	Display	Function	Value range	Default setting
	Init All	**Submenu for carrying out the initialization**			
		GoClose	Scanning the closed position		
		GoOpen	Scanning the open position		
		AdjTime	Scanning the travel times		
		FindCoefficent	Optimization of control characteristics		
		Init Pilot	Setting the minimum travel times for internal pilot valves		
		CalPointQty	Quantity of calibration points when initializing	1 ... 19	2
		D.Refresh	Time for display refresh	0.1 ... 1.0 s	0.5 s
		Systemmode	Type of operator interface	Classic / Advanced	Classic
		DLight	Setting the display lighting	OnKey / On	OnKey
		DLightTime	Time for switching off display lighting with the OnKey setting	1 ... 60 min	5 min
		HelpLanguage	Text language	D / GB	D
		HelpText	Display the help text	ON / OFF	ON
3 SetFunction	**PosCtrl**	**Submenu for setting positioner parameters**			
		Prop Gain	P amplification of the positioner	0.1 ... 100.0	X.X
		Deriv Time	Decay time of the D component of the positioner	0.0 ... 10.0 s	0.1 s
		MinPos	Closing limit = lower position of control range	0 ... 100 %	0.0 %
		MaxPos	Stroke limitation = upper position of control range	0 ... 100 %	100 %
		CloseTight	Close tight function	no, Min/Max, Max, Min	no
		DeadBand	Permissible system deviation	0 ... 100 %, auto	1.0%, K-no. 2442: 2.0%, K-no. 2443: 5.0%
	AlarmOutput	**Submenu for setting the alarm outputs**			
		Alarm Fn	Defines the function of the alarm output	OFF, min/max, min/min, max/man	OFF
		Level Alarm 1	Switch point of alarm 1	0.0 ... 100 %	10.0 %
		Level Alarm 2	Switch point of alarm 2	0.0 ... 100 %	90.0%
	ErrorOutput	**Submenu for setting the error output**			
		Error Functn	Defines the function of the error output (Error)	Error. Error+Inactive, Range, Error+Range, Error+Range+Inactive	Error+Range
		Error Time	Valve travel time monitoring (error output)	AUTO, 0.0 to 100.0 s	AUTO

Menu levels	Submenu	Display	Function	Value range	Default setting
		Error Level	Maximum system deviation (error output)	AUTO, 0.0 ... 100,0 %	AUTO
		Range Functn	Range monitoring of set value input	< 4 mA > 20 mA < 4 mA or > 20 mA	< 4 mA or > 20 mA
	Position Output	**Submenu for setting the actual value output**			
		Analog Out	Defines the function of the actual value output	0–10 V, 0–20 mA*, 4–20 mA*	0–10 V
		Out min	Valve position on actual value output signal 0 V (0/4 mA*)	0.0 ... 100.0 %	0,0 %
		Out max	Valve position on actual value output signal 10 V (20 mA*)	0.0 ... 100.0 %	100 %
		CpyParaSet	Copies parameters to various working memories (P1/P2/P3/P4)		
4 SetCalibration		X-DIR	Direction of X display and actual value output	RISE, FALL	RISE
		Setp Dir	Direction of set value	NORMAL, INVERSE	NORMAL
		Setp Ramp	Ramp function - set value	AUTO, 0 to 400 s	0 s
		Split Start	Split range (set value range) start	0.0 ... 90.0 %	0,0 %
		Split End	Split range (set value range) end	10 ... 100 %	100 %
		Setp Fn	Defines the function of the control characteristic	Linear/ free / 1:25 / 1:50	Linear
	Setp Functn	**Submenu for setting the set value calibration points (only possible with "Setp Fn: free")**			
		W 0 %	10 control characteristic points can be programmed as desired	0 ... 100.0 %	2.0 %
		W 10 %		0 ... 100.0 %	3.0 %
		W 20 %		0 ... 100.0 %	4.4 %
		W 30 %		0 ... 100.0 %	6.5 %
		W 40 %		0 ... 100.0 %	9.6 %
		W 50 %		0 ... 100.0 %	14.1 %
		W 60 %		0 ... 100.0 %	20.9 %
		W 70 %		0 ... 100.0 %	30.9 %
		W 80 %		0 ... 100.0 %	45.7 %
		W 90 %		0 ... 100.0 %	67.6 %
		W 100 %		0 ... 100.0 %	100.0 %

*Only available on version with optional current output

17.2.3 Menu 1 Service



17.2.3.1 Parameter table for 1 Service

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

17.2.3.1.1 I/O status

Submenu for displaying inputs and outputs

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Display	Function	Value range	Default setting	Active level	
				Read	Edit
min-Pot-max	Displays travel sensor position in percent			0	o.r.* [1]
Iw / Uw	Value of set value signal in mA / V			0	o.r.* [1]
W Pos X	Comparison of set value and valve position			0	o.r.* [1]
Pot Abs	Travel sensor position			0	o.r.* [1]
Valve	Displays the current position of the internal pilot valves			0	o.r.* [1]
Pos Ctrl Out	Deviation between set value and actual value (positioner)			0	o.r.* [1]
Relay K1:K2:Err	Displays the current position of the internal outputs			0	o.r.* [1]

1) o.r. = only readable

17.2.3.1.2 LogIn

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting access authorisations

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Code	Password entry	0...10000	0	0	0
Logout	Block access	OK		0	0
New Code: 1	Release the lowest priority	0...10000	0	1	1
New Code: 2	Release the medium priority	0...10000	0	2	2
New Code: 3	Release the top priority	0...10000	0	3	3

17.2.3.1.3 Diagnosis

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for displaying diagnostic messages

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Error List	Displays error messages			0	o.r.* [1)]
hrs	Displays operating hours			0	o.r.* [1)]
Warnings	Display warnings during operation	ON/OFF	ON	0	3
Errors	Display errors during operation	ON/OFF	ON	0	3
Clear Error List	Delete error list	OK		0	3

1) o.r. = only readable

17.2.3.1.4 1435 specific

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

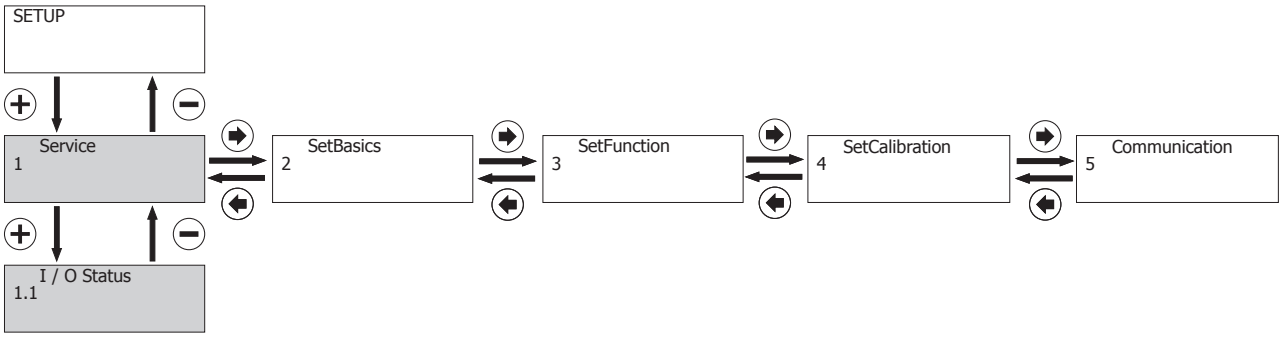
Submenu for displaying the tool identification

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Release	Displays current software release		V2.X.X.X	0	o.r.* [1)]
S/N	Displays current serial number			0	o.r.* [1)]
TAG1	A TAG number can be entered			0	3
TAG2	A TAG number can be entered			0	3

1) o.r. = only readable

17.2.3.2 Explanation of parameters for 1 Service

17.2.3.2.1 Scanning the input and output signals



Min-Pot-Max:

Displays the minimum and maximum travel sensor position in percent. To ensure correct function, this value must lie between 2% and 98%.

Iw / Uw:

Displays the value of the current set value signal compared to the current valve position in %.

W Pos X:

Displays the current travel sensor position **(Caution, this value may be different to the Pos x value as the valve does not make full use of the full 0-100% range of the travel sensor).**

Valve:

Displays the current position of the internal pilot valves (valve open = ●)

Pos Ctrl Out:

Displays the speed at which the valve should move.

NOTICE

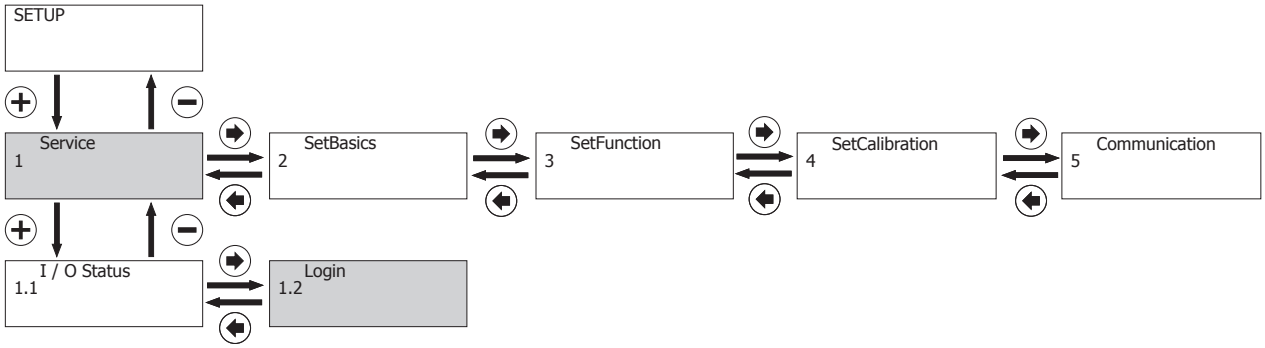
Excessive system deviation

► If the deviation is too large, this is shown by a dot on the left-hand side or right-hand side of the display. In this case, the valve must move at maximum speed.

Relay:

Displays the current position of internal relays A1, A2 and Error (relay switched = ●).

17.2.3.2.2 Activating or deactivating user access



The configuration level of the product is protected in certain areas by various codes against unauthorised changing of parameters.

The operating levels are pre-defined and intended for three different user groups:

- Level 3: All customer settings available and alterable, including the option of defining the physical (e.g. system installer, operator, manager).
- Level 2. Reduced customer settings available and alterable, specially reduced to the most important parameters for fault clearance. Option of adaptation within the set physical (e.g. system manager or machine manager).
- Level 1. Customer settings are not available or alterable, only status information is shown.

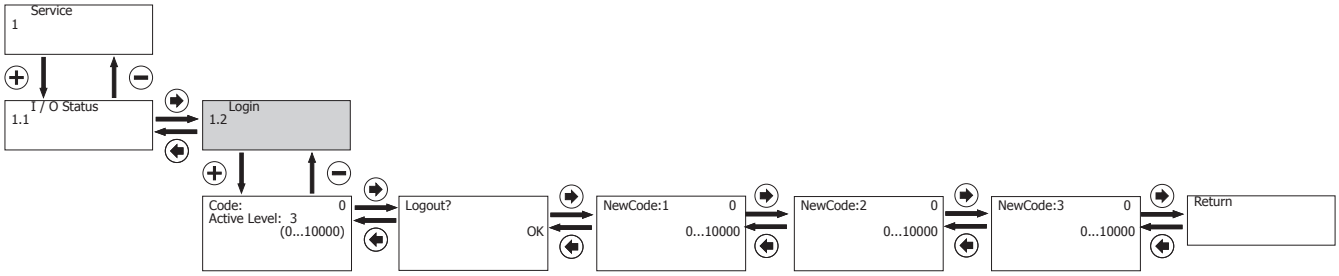
All menu items are marked by symbols indicating their write and read protection.

Configuration level	Display	Function	Value range	Default setting	Active level	
					Read	Edit
	Mode	Select operating mode	AUTO MAN	AUTO	0	3
1 Service	New Code: 1	Lowest priority released	0…10000	0	1	1

The following Active Level codes apply:

Active Level 0	No release required for reading and writing
Active Level 1	The lowest priority release, code 1, is required for reading and writing
Active Level 2	The medium priority release, code 2, is required for reading and writing
Active Level 3	The highest priority release, code 3, is required for reading and writing (default state)

The codes can be changed or activated in the following menu:



Code:

Enter code for user access. The currently released user level is displayed at **Active Level**.

Example: In **Active Level 0**, the positioner is disabled in all three user levels.Only the parameters marked by the symbol **r0w0** can be read and changed.

Logout:

Used for logging out of write-protected and read-protected areas in the menu. This function disables various menus depending on the user level activated. User level 0 is displayed in parameter **Active Level**.

New Code 1:

Enter the new code for the lowest user level (user level 1) (default setting 0).

New Code 2:

Enter the new code for the medium user level (user level 2) (default setting 0).

New Code 3:

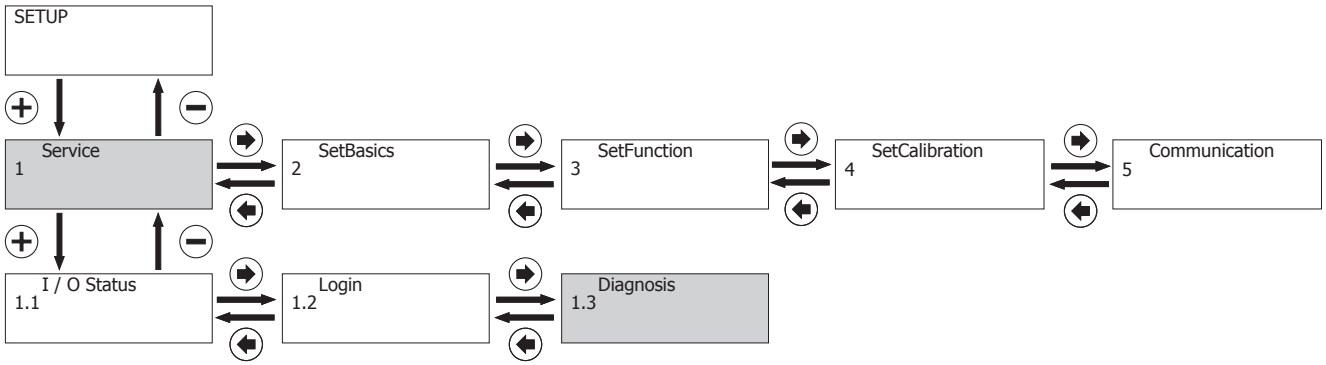
Enter the new code for the highest user level (user level 3) (default setting 0).

NOTICE

► Default setting 0 means that all three codes are assigned 0. This means that all parameter menus are released.

Example: If user level 2 is to be disabled, user level 2 and also user level 3 must be assigned a code.

17.2.3.2.3 Reading out, deleting and deactivating error messages



Error List:

The positioner stores the last 100 error messages in this menu. The errors are also stored in the error memory in the operator interface during operation.

hrs:

The operating hours of the positioner are counted here.

Warnings:

The warning messages can be masked or displayed here.The positioner continues normal operation when a warning is given. Messages are stored in **ErrorList**.

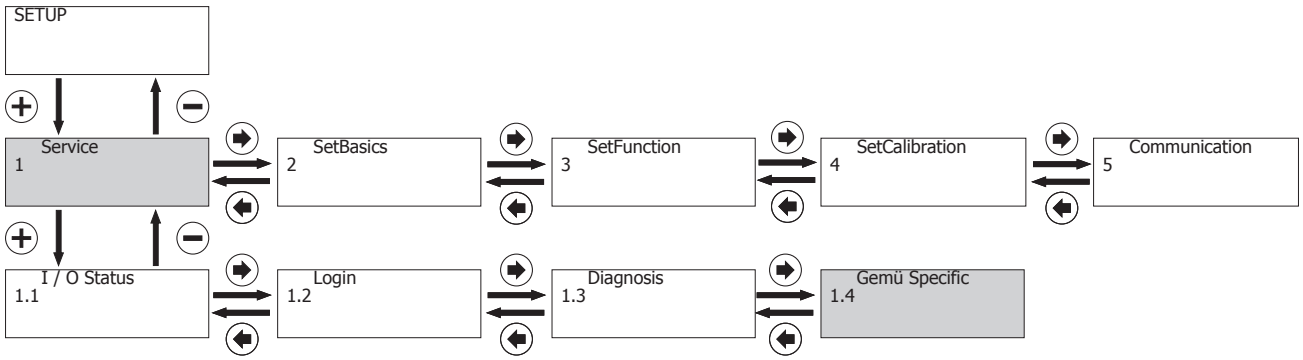
Errors:

The error messages can be masked or displayed here.Messages are stored in **ErrorList**.

Clear Error List:

Press the ⊞ key here to delete the error list for the positioner.

17.2.3.2.4 Displaying the serial number and software version, entering the TAG number



V:X.X.X.X:

Displays the current software release

S/N:

Displays the positioner serial number

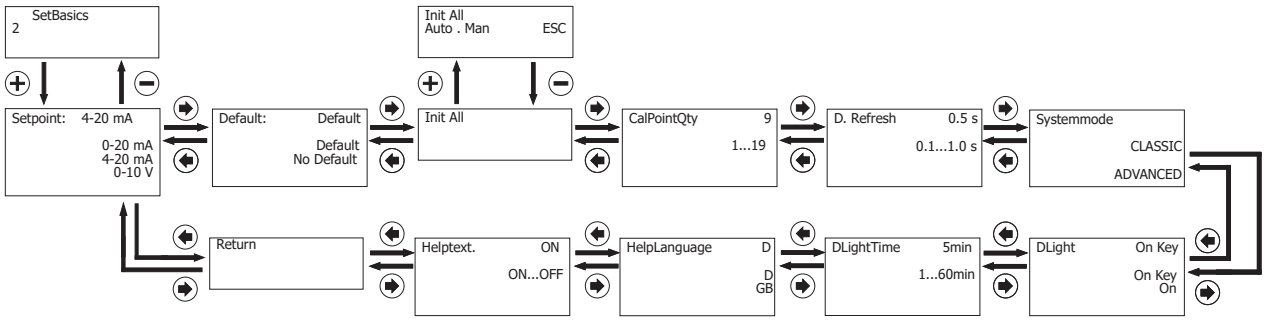
TAG1:

An 11-digit TAG number can be entered for identification of the positioner.

TAG2:

An 11-digit TAG number can be entered for identification of the positioner.

17.2.4 Menu 2 SetBasics



17.2.4.1 Parameter table for 2 SetBasics

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Setpoint	Type of set value signal	4–20 mA 0–20 mA 0–10 V	4–20 mA	0	3
Default	Reset to default settings	Yes / No	Yes	3	3

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Init All	Submenu for carrying out the initialization (see “Init All“, page 50)				
CalPointQty	Quantity of calibration points when initializing	1...19	2	3	3
D.Refresh	Time for display refresh	0.1...1.0 s	0.5 s	0	1
System mode	Type of operator interface	CLASSIC / ADVANCED	CLASSIC	0	3
DLight	Setting the display lighting	OnKey / On	OnKey	0	2
DLightTime	Time for switching off display lighting during adjustment [OnKey]	1...60 min	5 min	0	2
HelpLanguage	Text language	D / GB	D	0	1
HelpText	Display the help text	ON/OFF	ON	0	1

17.2.4.1.1 Init All

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for carrying out the initialization

Display	Function	Value range	Default setting	Active level	
				Read	Edit
goClose	Scanning the closed position			3	3
GoOpen	Scanning the open position			3	3
AdjTime	Scanning the travel times			3	3
findCoefficent	Optimization of control characteristics			3	3
InitPilot	Setting the minimum travel times for internal pilot valves			3	3

17.2.4.2 Explanation of parameters for 2 SetBasics

17.2.4.2.1 Definition of set value input

Set Point

Range of analogue set value input (Voltage: 0-10 V or power: 0/4-20 mA).

17.2.4.2.2 Reset

NOTICE

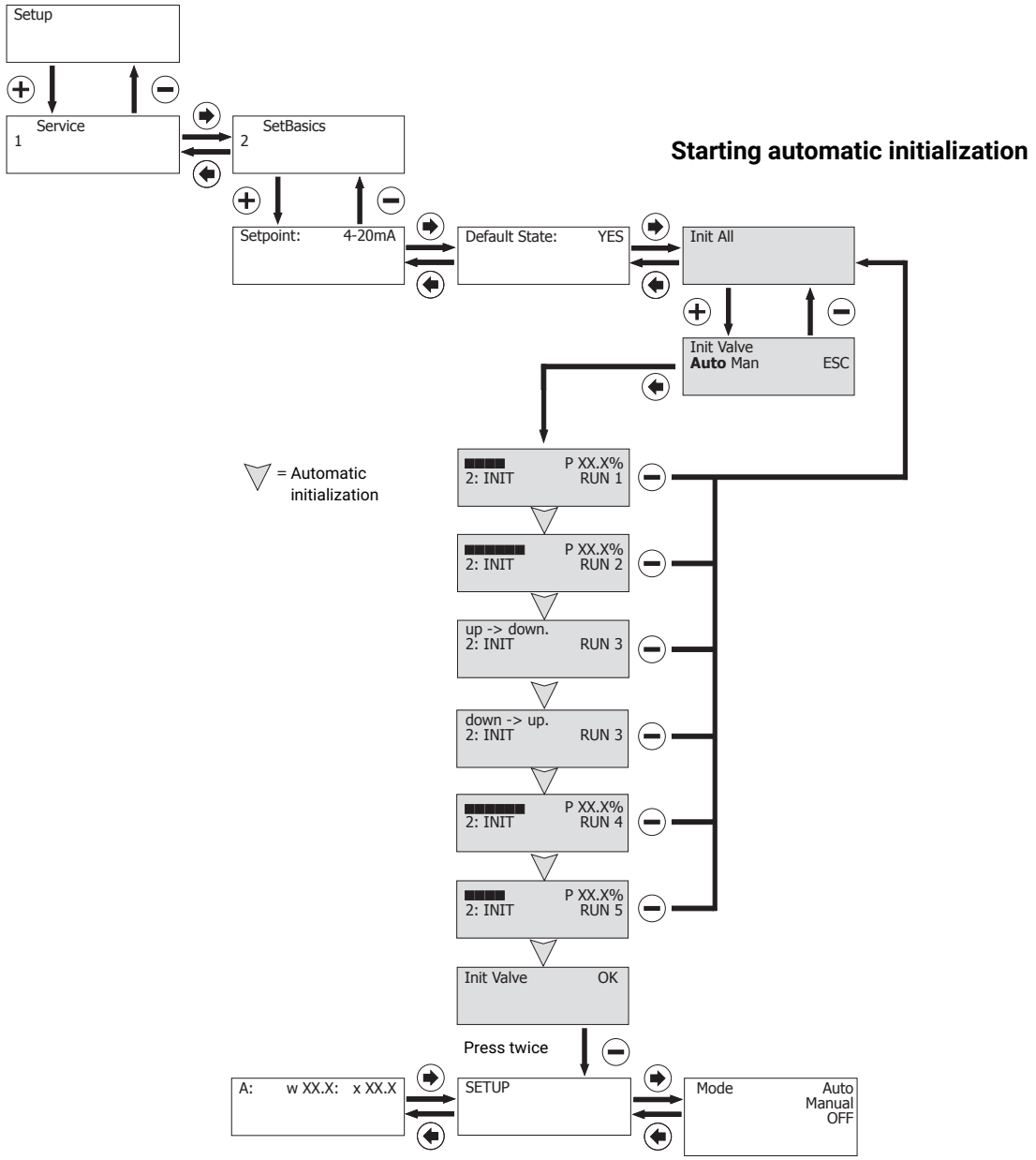
Setting to default

► After setting to **Default**, the product must be reinitialized. All actuation parameters established so far are deleted. . **The parameters D.Refresh and the New Code 1-3 are not taken into account.**

17.2.4.2.3 Carrying out initialization

Init All

Automatic or manual initialization (adaptation of the positioner to the valve) is started.



The positioner adapts to the valve when automatic initialization is started (via the Start Init Valve parameter). Relevant parameters are independently and automatically retrieved. This procedure can take a few minutes, dependent on the valve. The initialization can alternatively be started via the **Init Valve** parameter in the Set Basics menu item.

If the message **Init Valve Ok** appears, the product is ready for operation and can be set to the desired operating mode. Further information.

If an error message appears during the initialization process.

NOTICE

Valve travel times (up-down, down-up)

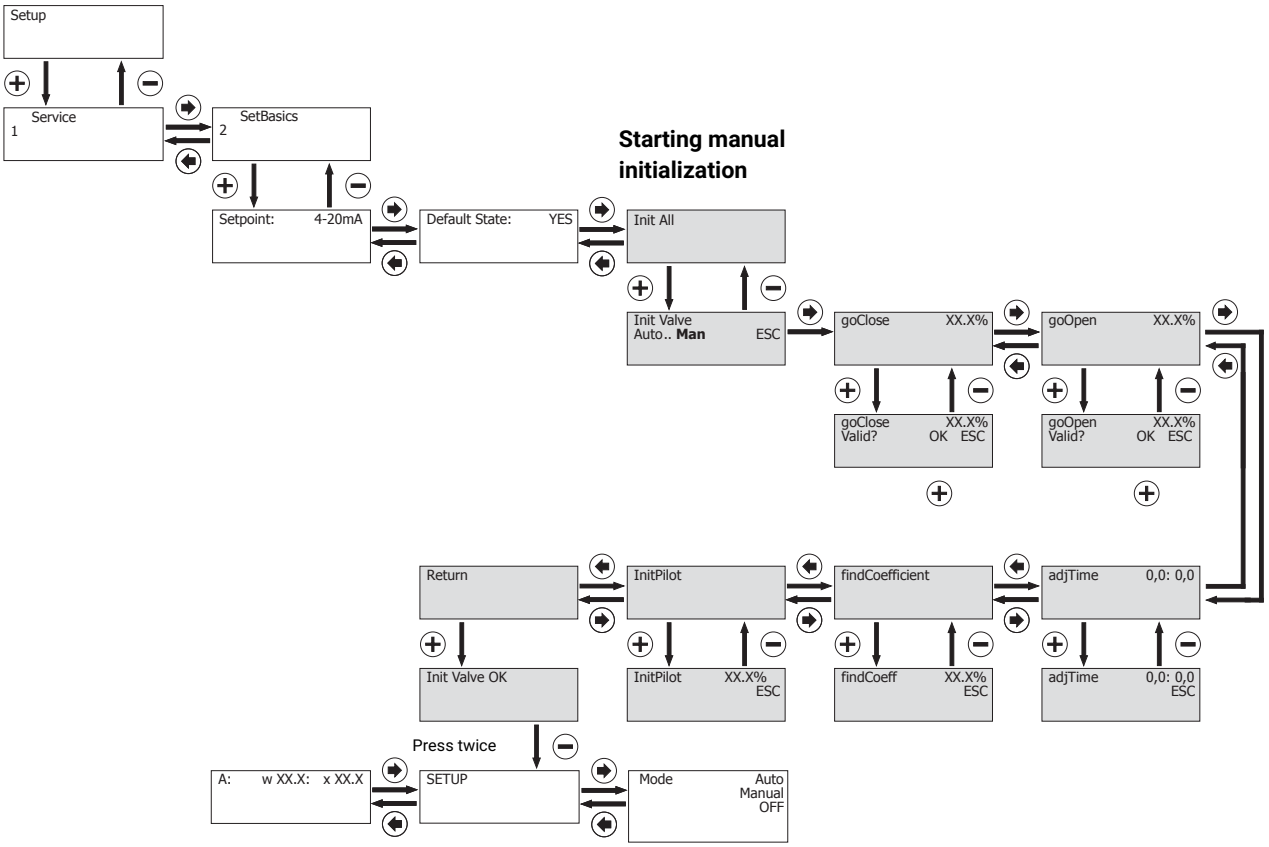
► The valve travel times are measured and displayed. If these measure < 1 second, an error is displayed and the valve travel time must be set to at least > 1 second using the throttle screw(s). This step may need to be repeated several times until an optimal valve travel time can be achieved. Experience has shown that valve travel times of approx. 1-2 seconds produce optimal control characteristics. The two valve travel times should ideally not be too far apart.

NOTICE

Tip for use

► During automatic initialization of actuators whose movement profiles are not continuous (i.e. with undefined stopping or stalling, e.g. with large size butterfly valves), it may not be possible to clearly detect the end positions and unjustified error messages may appear (for example LEAKAGE).

► Manual initialization with sequential movement through the menu by the operator or, if possible, acknowledging the error message to repeat the step may help here.



Init All = Man: Manual initialization

When manual initialization is started, the positioner runs through an initialization program that is similar to the automatic initialization. The various program steps must, however, be started and confirmed during manual initialization by pressing the ⊞ key.

- Manual initialization should only be used if automatic initialization does not achieve satisfactory positioning.
- The menu items **goClose** and **goOpen** should be executed several times for very small valve strokes in order to ensure an optimum adaptation of the positioner to the valve.

- In order to prevent incorrect operation, the parameters from manual initialization are only accepted when they comply with the requirements for correct function.

Go Close:

The closed valve position is scanned during initialization.

In the case of manual initialization, this must be confirmed with the key  .

Go Open:

The open valve position is scanned during initialization.

In the case of manual initialization, this must be confirmed with the key  .

AdjTime:

Wird nur angezeigt, wenn **goOpen** und **goClose** durchgeführt wurden.

Die minimalen Stellzeiten des Ventils werden während der Initialisierung abgefragt.

Bei der manuellen Initialisierung muss diese mit der Taste  bestätigt werden.

Find Coefficient:

Only displayed if **adjTime** was carried out.

The valve is checked for control features at various positions between the end positions.

Init Pilot:

The minimum travel times for the internal pilot valves are adjusted to the process valve.

In the case of manual initialization, this function must be started by pressing the key  .

Call Point Qty:

The quantity of calibration points when initializing can be changed.

Example: **QtyCalPoint=9** means: The valve will be examined for control features between the end position stops in 9 positions (10% steps here).

17.2.4.2.4 Making the display settings

D.Refresh:

The time for display refresh can be changed.

System mode:

Selection of operator interface:

- **CLASSIC:**
  Menu configuration as described in chapter CLASSIC system mode (see “System mode CLASSIC“, page 31).
- **ADVANCED:**
  Menu configuration as described in chapter ADVANCED system mode (see “System mode ADVANCED“, page 38).

DLight:

The features of the display lighting can be switched between the following settings:

- **OnKey** – Display lighting is activated by pressing a key. The display lighting remains activated after the last key is pressed for the period set using **DLightTime**.
- **On** – The display lighting is permanently activated.

DLightTime:

Time for automatically shutting off the display lighting when the parameter **DLight** is set to **OnKey**

HelpLanguage:

The help text language can be selected between **D-German** and **GB-English**.

HelpText:

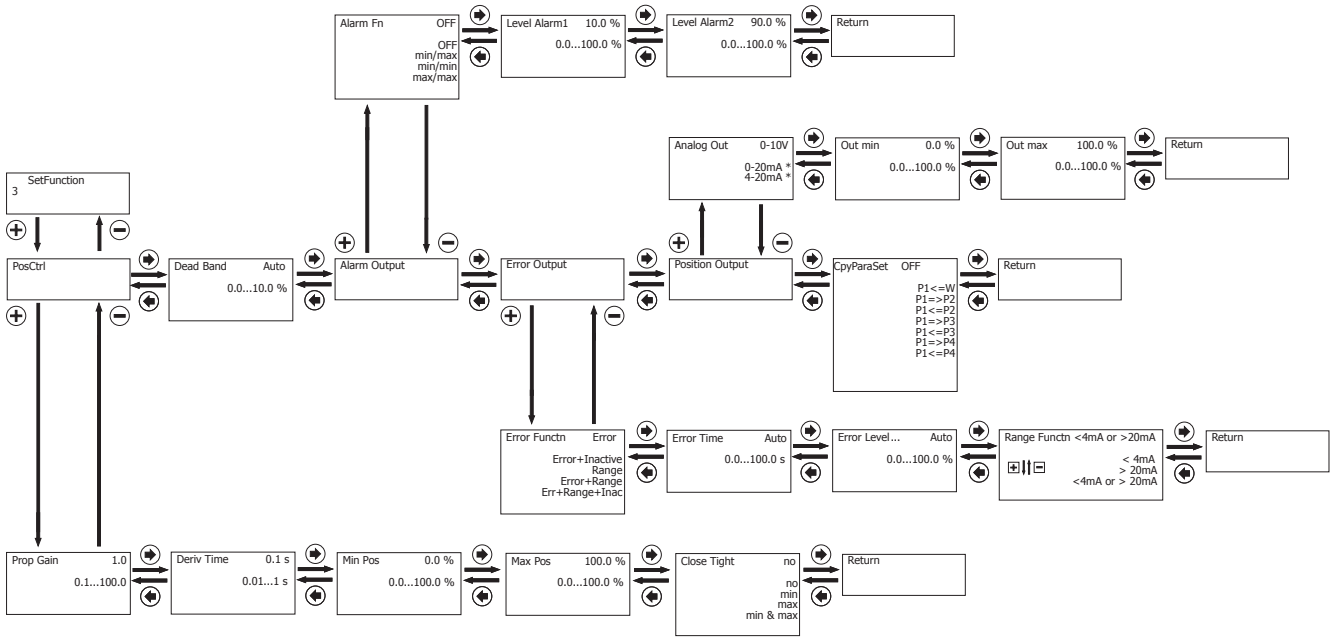
The help texts that appear as a default in the second line of the display can be masked.

If the help texts are masked, the key assignment is displayed.

17.2.4.3 Changing the default setting for 2 SetBasics

Display	Function	Default setting
SetPoint	Type of set value signal	4–20 mA
D.Refresh	Time for display refresh	0.5 s
System mode	Type of operator interface	Classic
DLight	Setting the display lighting	OnKey
DLightTime	Time for switching off display lighting during adjustment [On-Key]	5 min
HelpLanguage	Text language	D
HelpText	Display the help text	ON

17.2.5 Menu 3 SetFunction



17.2.5.1 Parameter table for 3 SetFunction

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Display	Function	Value range	Default setting	Active level	
				Read	Edit
PosCtrl	Submenu for setting positioner parameters (see “PosCtrl“, page 55)				
DeadBand	Permissible system deviation	0.0...10% auto	1.0%, K-no. 2442: 2.0% K-no. 2443: 5.0%	0	2
AlarmOutput	Submenu for setting the alarm outputs (see “AlarmOutput“, page 56)				

Display	Function	Value range	Default setting	Active level	
				Read	Edit
ErrorOutput	Submenu for setting the error output (see “ErrorOutput“, page 56)				
PositionOutput	Submenu for setting the actual value output (see “PositionOutput“, page 56)				
CpyParaSet	Copies parameters to the working memories (P1/P2/P3/P4)			3	3

17.2.5.1.1 PosCtrl

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting positioner parameters

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Prop Gain [1)]	P amplification of the positioner	0.1...100.0	X.X	0	3
DerivTime	Decay time of the D component of the positioner	0.00...10.00 s	0.1 s	0	3
MinPos	Seal adjuster = lower pos. control ranges	0...100%	0.0%	0	3
MaxPos	Stroke limiter = upper pos. control ranges	0...100%	100%	0	3
CloseTight	Close tight function	no Min / Max Max. Min.	no	0	3

1) Parameter value is automatically calculated and set by the positioner during initialisation. A manual change may have to be repeated after each initialisation process

17.2.5.1.2 AlarmOutput

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting the alarm outputs

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Alarm Fn	Defines the function of the alarm output	OFF Min / max Min / min Max / max	OFF	0	2
Level Alarm 1	Switch point of alarm 1	0.0...100.0%	10.0%	0	1
Level Alarm 2	Switch point of alarm 2	0.0...100.0%	90.0%	0	1

17.2.5.1.3 ErrorOutput

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting the error output

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Error Functn	Defines the function of the error message output	Error Error+Inactive Range ERROR + RANGE Err+Range+Inac	ERROR + RANGE	0	3
Error Time	Valve travel time monitoring	AUTO 0.0...100.0 s	AUTO	0	3
Error Level	Maximum system deviation	AUTO 0.0...100.0%	AUTO	0	3
Range Functn	Range monitoring of set value input	< 4 mA > 20 mA < 4 mA or > 20 mA	< 4 mA or > 20 mA	0	3

17.2.5.1.4 PositionOutput

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting the actual value output

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Analog Out	Defines the function of the actual value output	0–10 V 0–20 mA [1)] 4–20 mA [1)]	0–10 V	0	2

Display	Function	Value range	Default setting	Active level	
				Read	Edit
Out min	Valve position on actual value output signal 0 V (0/4 mA) [1)]	0.0...100.0%	0.0%	0	2
Out max	Valve position on actual value output signal 10 V (20 mA) [1)]	0.0...100.0%	100.0%	0	2

1) Only available on version with optional current output

17.2.5.2 Explanation of parameters for 3 SetFunction

17.2.5.2.1 Setting the positioner parameters

Proportional amplification

Adjusting the proportional amplification **Kp**

Kp = 0.1...100.0

The level of amplification should always correspond to the requirements of the valve and the control circuit. The optimum setting is determined during automatic initialization but must be moved out of adjustment later if necessary.

The behaviour of the positioner is influenced as follows:

Prop Gain	
Set value > determined value	**Set value < determined value**
The positioner controls faster (but tends to oscillate).	The positioner controls slower.
The set value is achieved in larger steps by increasing the correcting variable.	The set value is achieved in smaller steps by decreasing the correcting variable.
Control is less accurate.	Control is more accurate.

Deriv Time

Derivative action time

Adjusting the derivative action time **Tv** (time by which a specific correcting variable is reached earlier because of the D component than with a pure P-positioner)

Tv = 0.00 s...10.00 s

Min/Max Position

- **21: Min Position**

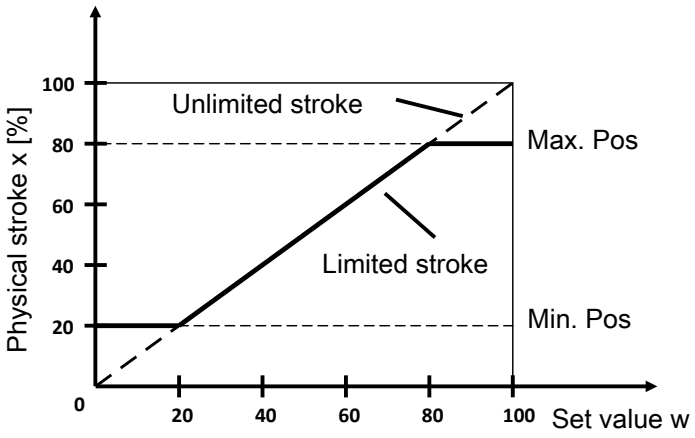
Limits the **CLOSED** position of the valve

This function is equivalent to a mechanical seal adjuster.

- **22: Max Position**

Limits the **OPEN** position of the valve

This function is equivalent to a mechanical stroke limiter.



NOTICE

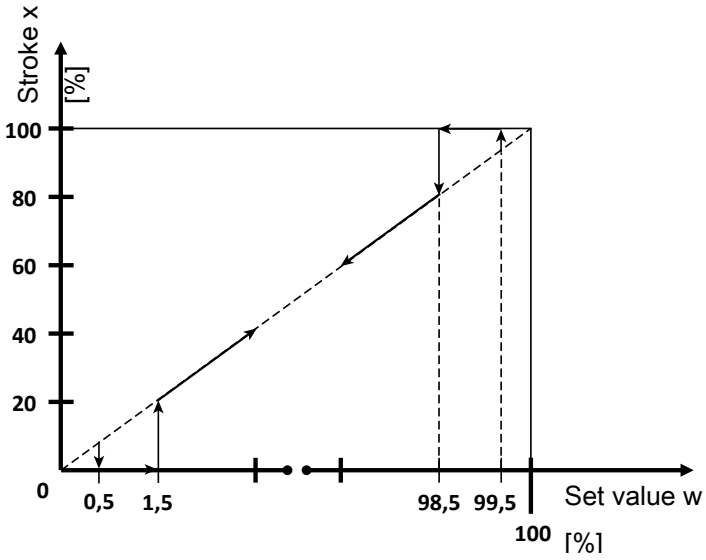
Min/Max Position

► The mechanical regulating distance (from limit stop to limit stop) is limited to the set values with the parameters **Min Position** and **Max Position**. This way, the actuator's mechanical positioning range can be limited.

Closetight:

If parameter **23: Closetight** is activated, the actuator is vented at a set value of < 0.5%, even if there is a set **Min Position** of, for example, 10%. With a set value of > 1.5% the actuator is moved back to 10%.

With a set value of > 99.5%, the actuator is opened completely, even if the **Max Position** is set, for example, to 90%. With a set value of < 98.5%, the actuator is moved back to 90%.



17.2.5.2.2 Setting the dead zone

DeadBand

Positioner's dead band

The dead band shows the maximum permissible system deviation between actual value and set value.

With **DeadBand = AUTO**, the dead band is matched to the requirements of the control circuit during initialization. In the other discrete settings, the fixed value for the dead band is used.

NOTICE

Increased wear due to low value

► The level of the system deviation should always correspond to the requirements of the valve and the control circuit. A value of < 1.0% is not recommended, since this could cause oscillating control characteristics (e.g. for actuators with discontinuous movement profiles). This could put a great deal of stress on the internal pilot valves.

► The following principle applies: The smaller the set value, the greater the wear and the shorter the service life. Therefore, the value should only be set to the exact value required.

17.2.5.2.3 Setting alarm output functions and switch points

Alarm Output:

Submenu for setting the alarm outputs.

Activates or deactivates the alarm function

The reaction of the alarms (limiting contacts) relates to the **position** measurement (mechanical distance).

x = current actual value

Min/Max:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	24 V	0 V
Level Alarm1 < x < Level Alarm2	0 V	0 V
Level Alarm1 < Level Alarm2 < x	0 V	24 V

Min/Min:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	24 V	24 V
Level Alarm1 < x < Level Alarm2	0 V	24 V
Level Alarm1 < Level Alarm2 < x	0 V	0 V

Max/Max:

Item	State output A1	State output A2
x < Level Alarm1 < Level Alarm2	0 V	0 V
Level Alarm1 < x < Level Alarm2	24 V	0 V
Level Alarm1 < Level Alarm2 < x	24 V	24 V

Switch point for Alarm 1. When the switch point has been reached, digital output A1 (24 V DC output) is switched.

Switch point for Alarm 2. When the switch point has been reached, digital output A2 (24 V DC output) is switched.

17.2.5.2.4 Setting error output functions

Error Output:

Submenu for setting the error output.

Function of the error message output (24 V DC output).

The table shows which functions are relevant to the setting of the output at which setting value.

Setting	Error Time	Error Level	Range Functn	Mode [OFF]
Error fn	X	X		
Error+ Inactive	X	X		X
Range			X	
Error+ Range	X	X	X	
Error+ Range+ Inactive	X	X	X	X

Error Time:

Monitoring time for setting the error messages (10 x travel time). The set value (s) serves as a specified value for the time within which the positioner must have reached the idle state. The associated trigger threshold is specified with parameter 17. When the set time has been exceeded, error message output **ERR** is set to 24 V DC.

Error Level:

Trigger threshold of the error message
Here, a value (%) can be set for the permissible size of system deviation for triggering the error message.
If parameters 16 and 17 are both set to **AUTO**, the error message is set if the slow-travel zone has not been reached within a set time. This time is 10x (parameter value AUTO) the initialization travel time.

Range Functn:

Range monitoring of the set value signal
Here, it is possible to set whether the **Range** error signal is triggered when it falls below 4 mA (cable break monitoring) or exceeds 20 mA (short-circuit monitoring).

17.2.5.2.5 Setting position feedback function and limiting values

Position Output:

Submenu for setting the actual value output.

Analog Out:

Defines the function of the actual value output.

- 0–10 V
- 0–20 mA, only on version with optional current output
- 4–20 mA, only on version with optional current output

Out Min:

Defines the valve position at which an output signal of 0 V / 0 mA / 4 mA is emitted.

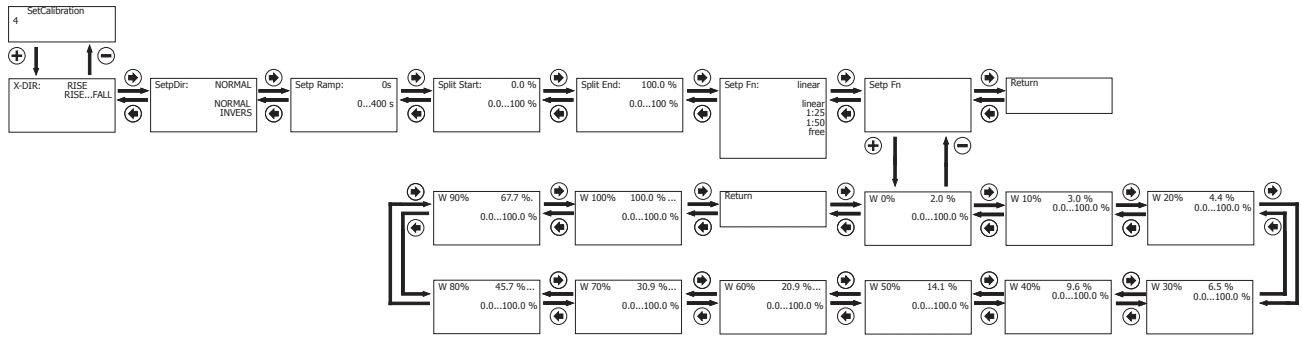
Out Max:

Defines the valve position at which an output signal of 10 V / 20 mA is emitted

17.2.5.3 Changing the default setting for 3 SetFunction

Display	Function	Default setting
Prop Gain	P amplification of the positioner	X.X
Deriv Time	Decay time of the D component of the positioner	1.00 s
Min Pos	Closing limit = lower position of control range	0.0%
Max Pos	Stroke limitation = upper position of control range	100%
CloseTight	Lower close tight function	no
DeadBand	Permissible system deviation	1.0% K-no. 2442: 2.0% K-no. 2443: 5.0%
Alarm Functn	Defines the function of the alarm output	OFF
Level Alarm 1	Switch point of alarm 1	10.0%
Level Alarm 2	Switch point of alarm 2	90.0%
Error Functn	Defines the function of the error message output (ERROR)	ERROR + RANGE
Error Time	Valve travel time monitoring (error message output)	AUTO
Error Level	Maximum system deviation (error message output)	AUTO
Range Functn	Range monitoring of set value input	< 4 mA or > 20 mA
Analog Out	Defines the function of the actual value output	0–10 V (4–20 mA)
Out min	Valve position on actual value output signal 0 V (0/4 mA)	0.0%
Out max	Valve position on actual value output signal 10 V (20 mA)	100.0%

17.2.6 Menu 4 SetCalibration



17.2.6.1 Parameter table for 4 SetCalibration

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Display	Function	Value range	Default setting	Active level	
				Read	Edit
X-DIR	Direction of X display and actual value output	RISE FALL	RISE	0	3
Setp Dir [1)]	Direction of set value	NORMAL INVERSE	NORMAL	0	3
Setp Ramp	Ramp function - set value	AUTO 0...400 s	0 s	0	3
Split Start	Split range (set value range) start	0.0...90%	0.0%	0	3
Setp Fn	Defines the function of the control characteristic	Linear / free / 1:25 / 1:50	Linear	0	3
Setp Functn	Submenu for setting the set value calibration points (only possible with Setp Fn: free) (see “Setp Functn“, page 61)				

1) Parameter value is automatically calculated and set by the positioner during initialisation. A manual change may have to be repeated after each initialisation process

17.2.6.1.1 Setp Functn

NOTICE

► Certain Active Levels are required (see “Activating or deactivating user access“, page 47) in order to read and edit the parameters.

Submenu for setting the set value calibration points (only possible with Setp Fn: free)

Display	Value range	Default setting	Active level	
			Read	Edit
W 0%	0...100%	2.0%	0	3
W 10%	0...100%	3.0%	0	3
W 20%	0...100%	4.4%	0	3
W 30%	0...100%	6.5%	0	3

Display	Value range	Default setting	Active level	
			Read	Edit
W 40%	0...100%	9.6%	0	3
W 50%	0...100%	14.1%	0	3
W 60%	0...100%	20.9%	0	3
W 70%	0...100%	30.9%	0	3
W 80%	0...100%	45.7%	0	3
W 90%	0...100%	67.6%	0	3
W 100%	0...100%	100.0%	0	3

17.2.6.2 Explanation of parameters for 4 SetCalibration

17.2.6.2.1 Setting the direction of action of actual values

X-Direction

Correcting variable direction

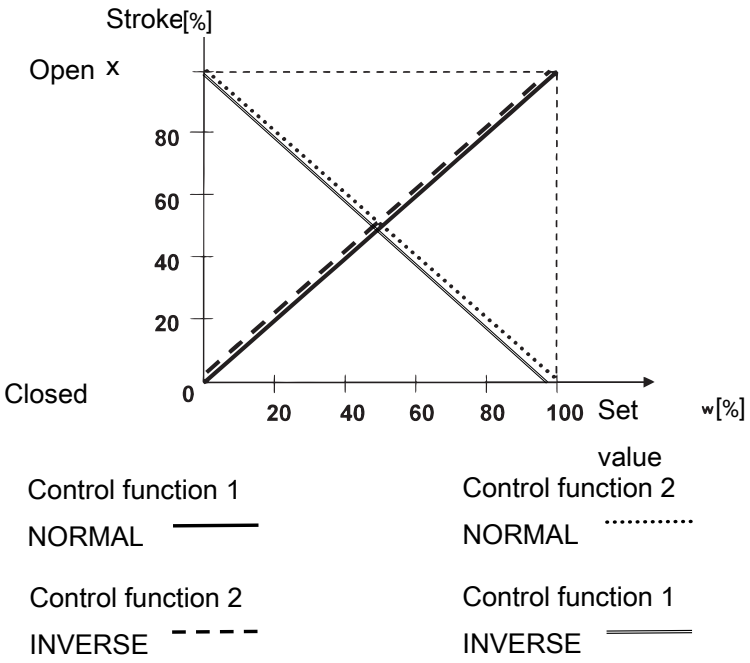
Here the display direction (rising or falling) and the position feedback can be adjusted.

X-DIRECTION	Valve position	Displayed value	Allocated actual position x
CLOSED	RISE	0%	0%
OPEN		100%	100%
CLOSED	FALL	100%	100%
OPEN		0%	0%

SetP Direction

Set value direction

Setting the set value direction serves to reverse the direction of the set value. It is mainly required for split-range operation and for single acting actuators with the fail safe **OPEN** setting (control function 2).



NOTICE

- The intended direction of action is that a 0% set value signal is always assigned to the closed valve position (0% stroke). In order to achieve this, the setting is automatically adjusted if an inverted direction of action (e.g. control function 2) is identified during initialization.

SetP Ramp

Set value ramp

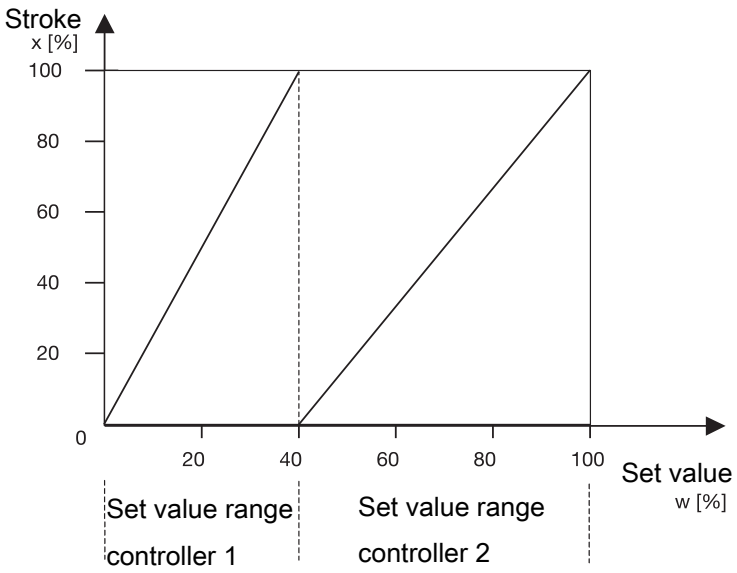
The set value ramp is effective during automatic operation and limits the speed of change of the effective set value. When switching over from manual to automatic operation, the effective set value is matched to the set value on the device via the set value ramp.

In the position **SetP Ramp** = **AUTO**, the slower of the two travel times which have been established during initialization is used for the set value ramp.

Split Start

Set value split range start

Split End



Set value split range end

Parameters 26 and 27 in conjunction with parameter 24 serve to limit the effective set value range. In this way split range tasks with the curves

- rising / falling
- falling / rising
- falling / falling
- rising / rising

are resolved.

NOTICE

Difference between Split Start/End

► The difference between the **Split Start** and **Split End** values must be > 10%.

SetP Function

NOTICE

Entering set value calibration points

► Set value calibration points can only be entered with **28: SetP Function = free**.

Set value function

With this function, non-linear valve characteristics can be "linearised" and, with linear valve characteristics, any flow characteristics can be reproduced.

Four valve characteristics are stored in the unit:

1. equal-percentage 1 : 25 (in **CLOSED** position valve remains 4% open)
2. equal-percentage 1 : 50 (in **CLOSED** position valve remains 2% open)
3. Linear
4. free

When free is selected at **30:** a characteristic with 11 calibration points can be entered.

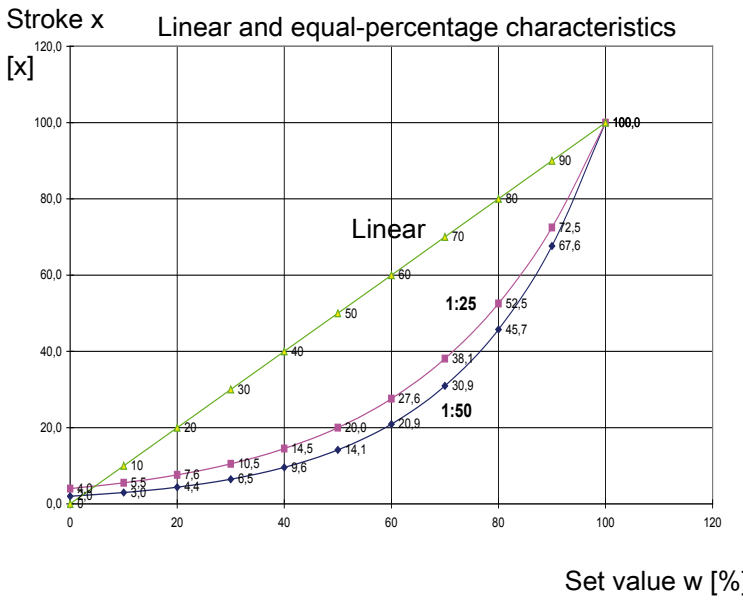
30: FREE 0 %

.

.

.

40: FREE 100 %



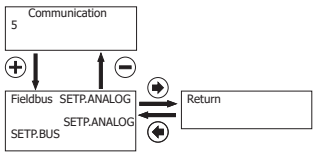
At gaps of 10%, a flow characteristic value can be allocated to the set value calibration point concerned. These points make a traverse with 10 straight lines, which then provides a pattern of the valve characteristic.

17.2.6.3 Changing the default setting for 4 SetCalibration

Display	Function	Default setting
X-Direction	Direction of X display and actual value output	RISE
Setp Direction	Direction of set value	NORMAL
Setp Ramp	Ramp function - set value	0 s
Split Start	Split range (set value range) start	0.0%
Split End	Split range (set value range) end	100%
Setp Function	Defines the function of the control characteristic	Linear
W 0%		2.0
W 10%		3.0
W 20%		4.4
W 30%		6.5
W 40%		9.6
W 50%		14.1
W 60%		20.9
W 70%		30.9
W 80%		45.7
W 90%		67.6
W 100%		100

17.2.7 Menu 5 Communication

The Communication menu has no function.



18 Troubleshooting

Display	Causes of errors	Troubleshooting
SetP.Range	The set value signal is outside the defined range.	Check set value signal
Error Run 1	No compressed air supply	Check and connect the compressed air supply (max. 6 bar) and make sure the pneumatic connection is correct
	Control pressure too low	
	Travel sensor wrongly connected	Check the connection assignment
	Valve stroke < 3 mm	Check the valve stroke
Error Run 2.1	Zero point adjustment could not be carried out.	Move the valve to the **CLOSED** position by hand, display value must be > 2.0.
	Incorrect travel sensor/mounting kit	Check the order number
	Quarter turn travel sensor incorrectly adjusted	Twist the quarter turn travel sensor until P > 2.0
Error Run 2.2	Zero point adjustment could not be carried out.	Move the valve to the **OPEN** position by hand, display value must be < 98.0.
	Incorrect travel sensor/mounting kit	Check the order number
	Quarter turn travel sensor incorrectly adjusted	Twist the quarter turn travel sensor until P < 98.0
AD Nozzle (s)	Valve travel time less than 1 second.	Adjust throttles D1 and D2 depending on the control function of the actuator until the travel time is > 1 second. Clockwise = travel time longer. Then press the yellow key.
Leakage Run 4	Leakage in the pneumatic system.	Check the external pneumatic system connections for leakage (tighten the fittings).
Error Drive	Actuator does not move.	Check the pneumatic system.
		Check the mechanical design.
Stroke Error	Actuator does not move.	Check the pneumatic system.
		Check the mechanical design

19 Inspection and maintenance

⚠ WARNING

The equipment is subject to pressure!

► Risk of severe injury or death

● Depressurize the plant.

● Completely drain the plant.

⚠ CAUTION

Use of incorrect spare parts!

► Damage to the GEMÜ product

► Manufacturer liability and guarantee will be void

● Use only genuine parts from GEMÜ.

⚠ CAUTION

Hot plant components!

► Risk of burns

● Only work on plant that has cooled down.

NOTICE

Exceptional maintenance work!

► Damage to the GEMÜ product

● Any maintenance work and repairs not described in these operating instructions must not be performed without consulting the manufacturer first.

19.1 Cleaning the product

- Clean the product with a damp cloth.
- Do **not** clean the product with a high pressure cleaning device.

20 Disassembly

1. Disassemble in reverse order to assembly.
2. Unscrew the electrical wiring.
3. Deactivate the control medium.
4. Disconnect the control medium line(s).
5. Disassemble the product. Observe warning notes and safety information.

21 Disposal

1. Pay attention to adhered residual material and gas diffusion from penetrated media.
2. Dispose of all parts in accordance with the disposal regulations/environmental protection laws.

22 Returns

Legal regulations for the protection of the environment and personnel require that the completed and signed return delivery note is included with the dispatch documents. Returned goods can be processed only when this note is completed. If no return delivery note is included with the product, GEMÜ cannot process credits or repair work but will dispose of the goods at the operator's expense.

1. Clean the product.
2. Request a return delivery note from GEMÜ.
3. Complete the return delivery note.
4. Send the product with a completed return delivery note to GEMÜ.

Keyword index

Numerical

A

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

V

W

X

23 EU Declaration of Conformity in accordance with 2014/30/EU (EMC Directive)

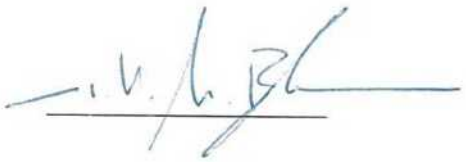
EU Declaration of Conformity

in accordance with 2014/30/EU (EMC Directive)

We, the company	GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG Fritz-Müller-Strasse 6–8 74653 Ingelfingen-Criesbach, Germany

hereby declare under our sole responsibility that the below-mentioned product complies with the regulations of the above-mentioned Directive.

Product:	GEMÜ 1435
Product name:	Intelligent electro-pneumatic positioner
The following harmonized standards (or parts thereof) have been applied:	EN 61800-3:2004/A1:2012; EN 61326-1:2013; EN 61000-6-2:2005/AC:2005



M. Barghoorn
Head of Global Technics

Ingelfingen, 29/06/2023

24 EU Declaration of Conformity In accordance with 2011/65/EU (RoHS Directive)

EU Declaration of Conformity

In accordance with 2011/65/EU (RoHS Directive)

We, the company	GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG Fritz-Müller-Strasse 6–8 74653 Ingelfingen-Criesbach, Germany

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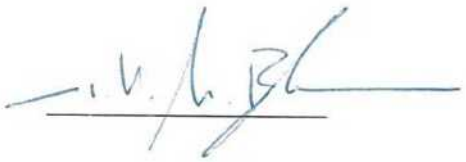
Product:	GEMÜ 1435
Product name:	Intelligent electro-pneumatic positioner
The following harmonized standards (or parts thereof) have been applied:	EN IEC 63000:2018



M. Barghoorn
Head of Global Technics

Ingelfingen, 29/06/2023

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Subject to alteration

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