GEMÜ 1436 cPos

Intelligent positioner and integrated process controller

EN **Operating instructions**



webcode: GW-1436

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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:

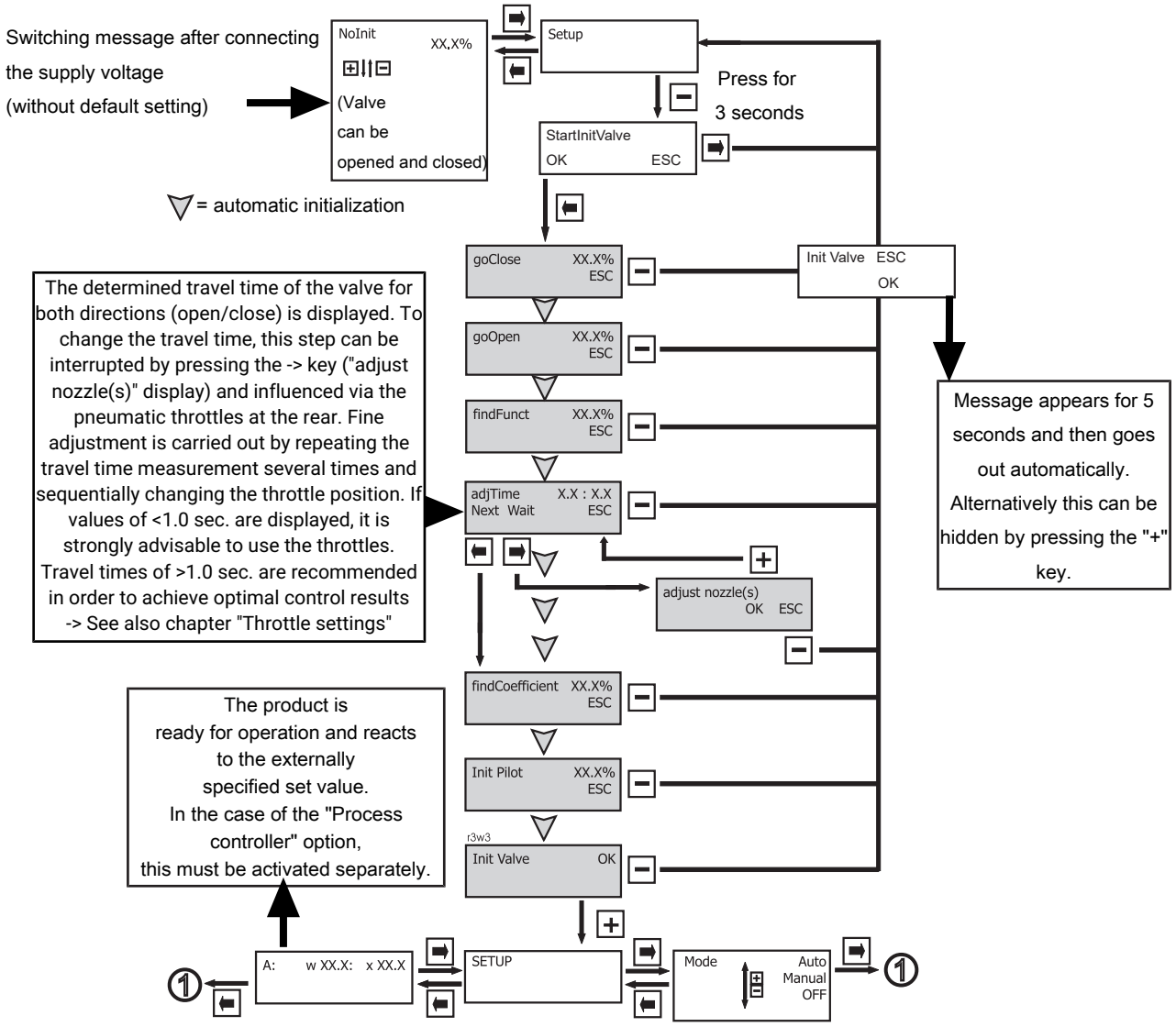
- Mounted to the valve.
- Air supply, max. 7 bar, connected.
- 24 V DC supply voltage connected.
- Set value and actual value signals need not be connected.
- For correct commissioning proceed as described in the following flow chart:

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 “Manual initialization“, page 32).

Menu sequence for quick initialization of the positioner



Automatic quick initialization:

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 (see “Working level (Mode)“, page 39).

If an error message appears during the initialization process (see “Error messages during initialization“, page 35).

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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 organized according to the following scheme:

SIGNAL WORD	
Possible symbol for the specific danger	Type and source of the danger ▶Possible consequences in case of non-compliance ●Measures for avoiding danger

Warning notes are always labelled 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
	Exhaust air and cycle duties generate noise
	Corrosive chemicals!
	Leakage!
	The equipment is subject to pressure!

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 materials

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:

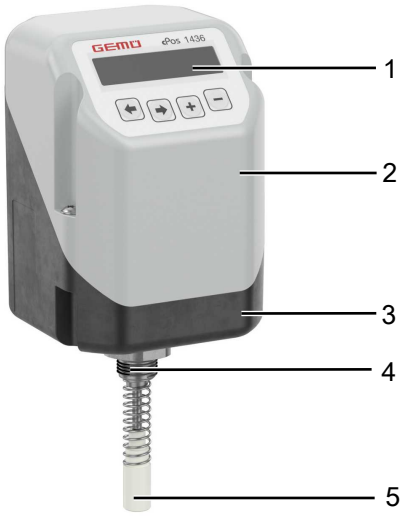
1. Keep this document available at the place of use.
2. Observe the safety information.
3. Operate the product in accordance with this document.
4. Operate the product in accordance with the specifications.
5. Maintain the product correctly.
6. Do not carry out any maintenance work and repairs not described in this document without consulting the manufacturer first.

In cases of uncertainty:

1. Consult the nearest GEMÜ sales office.

4 Product description

4.1 Construction



Item	Name	Materials
1	Operating unit with display	Polyester film with acrylic glass
2	Housing cover	PSU
3	Housing base	PP 30% glass fibre reinforced
4	Travel sensor (integrated linear potentiometer, integrated rotary potentiometer or connector for external travel sensor depending on version)	
5	Mounting kit, valve-specific	Materials/parts, valve-specific

4.2 Description

The GEMÜ 1436 cPos digital electro-pneumatic positioner has an optional integrated process controller to control pneumatically operated process valves with single acting or double acting linear or quarter turn actuators. When using the optional process controller, the signals from the sensors (e.g. flow, level, pressure, temperature) are detected and the media adjusted according to the specified set value. GEMÜ 1436 cPos has a robust aluminium housing with protected operating keys and an LCD display which allows the product to be individually adapted to complex control tasks.

4.3 Function

The product is an intelligent electro-pneumatic positioner for mounting to pneumatic actuators. It can be operated as a positioner or a process controller depending on the design.

The product is directly mounted on the actuator as standard. The travel sensor is already integrated in the positioner (the product can be optionally ordered with an M12 connector for remote mounting of the travel sensor).

The travel sensor measures the current position of the valve and reports it to the electronic system of the product, which correlates the actual value of the valve with the set value and adjusts the valve if necessary.

If the positioner is ordered with an additional process controller (optional), a current actual value signal (e.g. level, pressure, temperature, flow) is evaluated and the positioner adopts the function of a process controller.

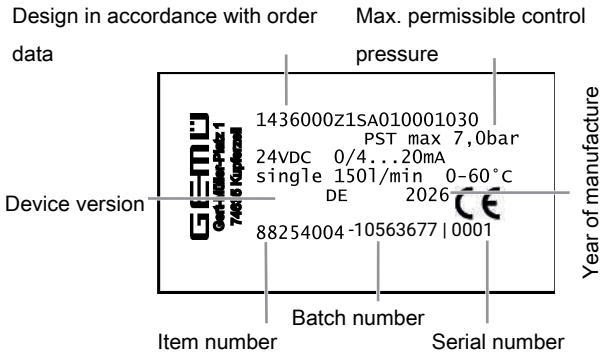
The information required can be called up on the two-line display of the product. Self-explanatory help texts that explain the meaning of the parameters called-up are also displayed.

The product is operated locally using four keys.

4.4 Fail safe function

The product has a fail safe function, which switches the outputs in a controlled manner if the pneumatic air supply or the electrical supply voltage fails (see “Fail safe function“, page 28). This fail safe function does not replace the required plant-specific safety devices. The product is not a safety control system.

4.5 Product label



NOTICE

Device version

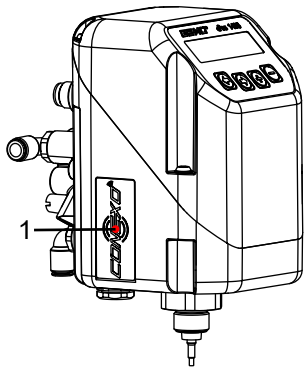
- ▶ These instructions are valid for devices from device version 10. It is possible to determine which firmware has been used on the basis of the device version. For older devices (device version older than 10), different operating instructions with potentially different operating specifications are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

Device version	Firmware version	Effective from	Changes
10	V2.0.0.0	05/2014	
11	V2.0.3.5	11/2018	Adaptation to the new display controller
12	V2.0.3.5	12/2018	No change to the firmware
13	V2.0.3.6	05/2019	Expansion of Error-Action "Safe" selection option

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, has a microprocessor-controlled intelligent position control as well as an analogue travel sensor system (potentiometer) and is connected in a force-locking way with the actuator spindle 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
Positioner, electro-pneumatic cPos	1436

2 Fieldbus	Code
Without	000

3 Accessory	Code
Accessory	Z

4 Action	Code
Single acting	1
Double acting	3

5 Device version	Code
Positioner	SA01
Positioner and process controller	PA01

6 Option	Code
Without	00
2 additional digital inputs 24 V DC	01
Pneumatic connections for ¼" tube	US

7 Flow rate	Code
150 l/min	01
200 l/min	02
300 l/min (Booster)	03

8 Travel sensor length	Code
Potentiometer, 30 mm length	030
Potentiometer, 50 mm length	050
Potentiometer, 75 mm length	075
Potentiometer, 90° travel	090
Remote potentiometer, M12 connector	S01

9 Type of design	Code
Standard	
Dead zone presetting 2%	2442
Dead zone presetting 5%	2443
Inversed direction, for quarter turn valves control function NO (2)	6960

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

Order example

Ordering option	Code	Description
1 Type	1436	Positioner, electro-pneumatic cPos
2 Fieldbus	000	Without
3 Accessory	Z	Accessory
4 Action	1	Single acting
5 Device version	SA01	Positioner
6 Option	00	Without
7 Flow rate	01	150 l/min
8 Travel sensor length	030	Potentiometer, 30 mm length
9 Type of design		Standard
10 CONEXO		Without

8 Technical data

8.1 Medium

Working medium: Compressed air and inert gases

Dust content: ≤ 10 mg/m³/particle size ≤ 40 µm (class 7)

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

Oil content: Class 4, max. oil concentration 5 mg/m³
Quality classes to DIN ISO 8573-1

8.2 Temperature

Ambient temperature: 0 — 60 °C

Storage temperature: 0 — 60 °C

8.3 Product conformity

EMC Directive: 2014/30/EU
Technical standards used:
Interference emission: DIN EN 61000-6-4 (09/2011)
DIN EN 61326-1(industry) (01/2006)
Interference resistance: DIN EN 61000-6-2 (03/2006)
DIN EN 61326-1(industry) (10/2006)

8.4 Pressure

Operating pressure: 1.5 — 7 bar
The applied pressure must not exceed the maximum control pressure of the process valve.

Flow rate:

Flow rate (code)	Specification l / min [1]	Specification Nl / min [2]
Code 01	150 l/min	84 Nl/min
Code 02	200 l/min	100 Nl/min
Code 03 (Booster)	300 l/min	172 Nl/min

1) Reference condition: 6 → 0 bar at 25 °C

2) Reference condition: 6 → 5 bar at 25 °C

Air consumption: 0 Nl/min (when idle)

8.5 Mechanical data

Installation position: Optional

Protection class: IP 65 acc. to EN 60529

Weight: 600 g

Travel sensor: Integrated for direct mounting

	Linear design			Quarter turn design
Detection range:	0–30 mm	0–50 mm	0–75 mm	Angle of rotation 0 - 93°
Operating range:	0–30 mm	0–50 mm	0–75 mm	Angle of rotation 0 - 93°
Minimum travel sensor change:	≥ 3 % (only relevant for initialization)			
Resistance R:	3 kΩ	5 kΩ	5 kΩ	3 kΩ
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 Acoustic data

Noise emission: > 80 dB (A)

8.7 Electrical data

8.7.1 Power supply

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

Power consumption:

Single acting:	≤ 4.5 W
Double acting / Booster:	≤ 6.2 W
plus in each case:	max. 24 W for active digital outputs with max. on-load current

Reverse polarity protection: Yes

Duty cycle: Continuous duty

Electrical protection class: III

8.7.2 Analogue inputs

Set value / actual value:
- Set value and actual value input are galvanically isolated from the supply voltage
- Set value and actual value input are **not** galvanically isolated from the actual value output
- Set value and actual value input are **not** galvanically isolated from each other

Set value input: 0/4 - 20 mA (adjustable)

Process actual value input: 0/4 - 20 mA (adjustable)
Only for device version code PA01

Input type: passive

Input resistance: 120 Ω (+ approx. 0.7 V voltage drop due to reverse battery protection)

Accuracy/linearity: ≤ ±0.3% of full scale value

Temperature drift: ≤ ±0.3% of full scale value

Resolution:	12 bit
Reverse polarity protection:	Yes
Overload proof:	Yes (up to ± 24 V DC)

8.7.3 Analogue output

Actual value output:	4–20 mA
Output type:	Active
Load resistor:	Max. 600 Ω
Accuracy:	≤ ±1% of full scale value
Temperature drift:	≤ ±0.5% of full scale value
Resolution:	12 bit
Short-circuit proof:	Yes
Overload proof:	Yes (up to ± 24 V DC)

8.7.4 Digital input

Note:	The additional digital inputs 1 / 2 must be ordered via the ordering option "Option".
Inputs:	1 / 2
Function:	selectable via software (DigIn 1; DigIn2; DigInW; DigInX) (reference: GND X1:3)
Input voltage:	24 V DC
Input current:	2.5 mA DC at 24 V DC
High level:	>14 V DC
Low level:	< 8 V DC

8.7.5 Digital output

Switching outputs:	K1 / K2
Function:	Can be selected using software
Switching voltage:	Supply voltage max. 0.5 A
Drop voltage:	Max. 2.5 V DC at 0.5 A
Type of contact:	PNP
Pull-Down resistance:	120 kΩ
Short-circuit proof:	Yes
Overload proof:	Yes (up to ± 24 V DC)

8.7.6 Travel sensor input (for travel length code S01 – remote potentiometer)

Note: Travel sensor input galvanically isolated from supply voltage, not galvanically isolated from the set value/actual value inputs and actual value output.

Input voltage range: 0 to U_{P+}

Supply voltage UP+: Typically 10 V DC

Resistance range of remote potentiometers: 1 to 10 kΩ

Input resistance: 620 kΩ

Accuracy/linearity: ≤ ±0.3% of full scale value

Temperature drift: ≤ ±0.3% of full scale value

Resolution: 12 bit

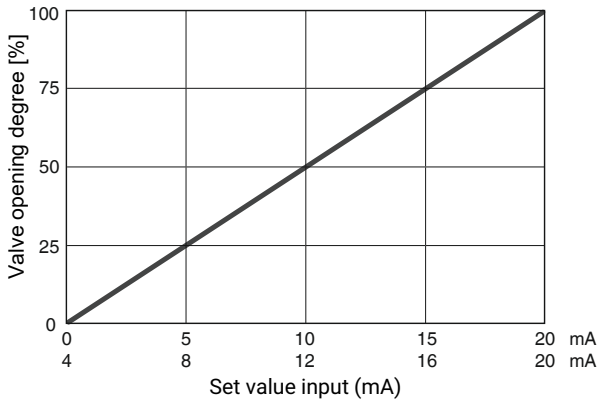
Short-circuit proof: Yes

Overload proof: Yes (up to ± 24 V DC)

8.7.7 Positioner data

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.



During initialization, the 1436 cPos 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.*
The assignment can subsequently be changed using parameters.
* For double-acting actuators, depends on the pneumatic actuator

8.7.7.1 Positioner

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

Parameterisation: adjustable

Initialization: automatic or manual

Close tight function: option

8.7.7.2 Process controller

Option only for device version code PA01

Controller type: Continuous controllers

PID parameters: adjustable

Process actual value input: 0/4 - 20 mA (adjustable)

8.7.8 Interfaces

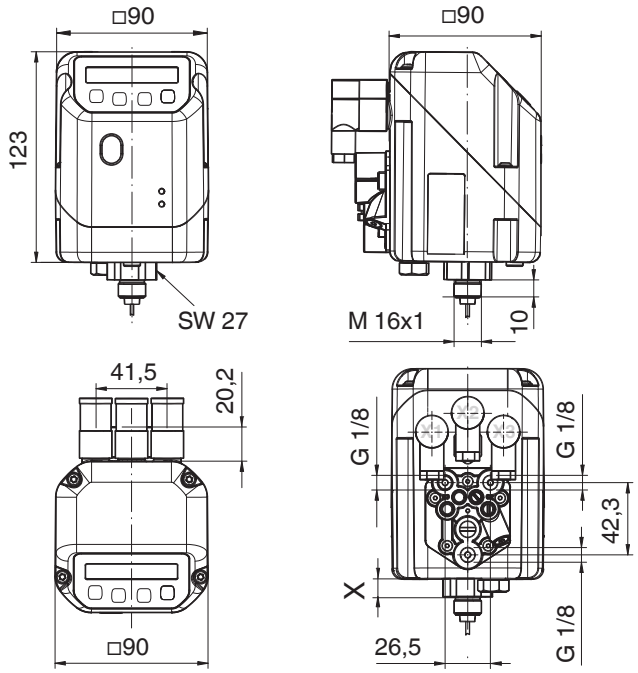
	RS232
Function	Parameterization via web browser
Transmission rates	-

** Auto Baud: The device has an Auto Baud function and therefore automatically adjusts to the bus-side configuration of the transmission rate.

*** Two switches are connected in series internally between connection X1 and X3.
Communication lead time during operation in line structure (connection X1 and X3) therefore double that of a "standard two-port device".

9 Dimensions

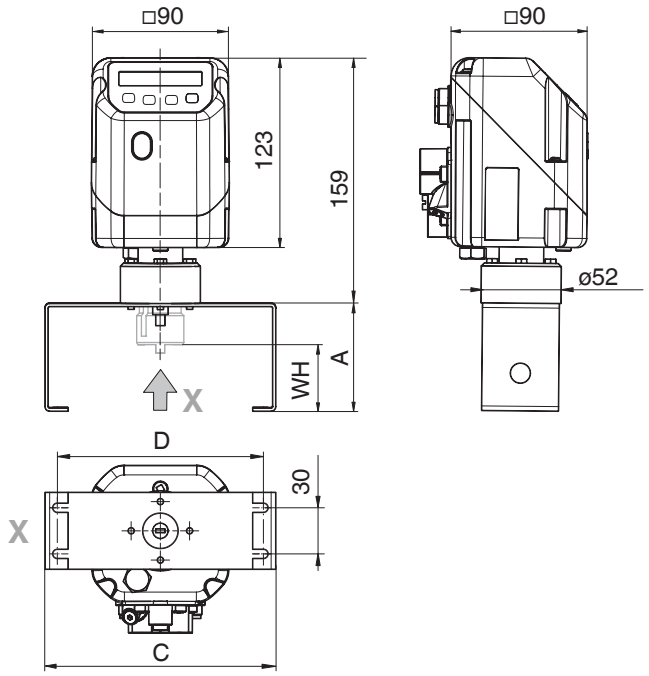
9.1 Positioner dimensions



Travel sensor length Code	X
030	10.3
050	32.5
075	57.5

Dimensions in mm

9.2 Direct mounting to quarter turn actuators



Shaft height WH	Hole spacing D	A	C
20.0	80.0	40.0	100.0
30.0	80.0	50.0	100.0
50.0	130.0	70.0	150.0

Dimensions in mm

9.3 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 and the external mounting option with the corresponding mounting bracket for quarter turn actuators of the 1436, see the 1436 cPos 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.

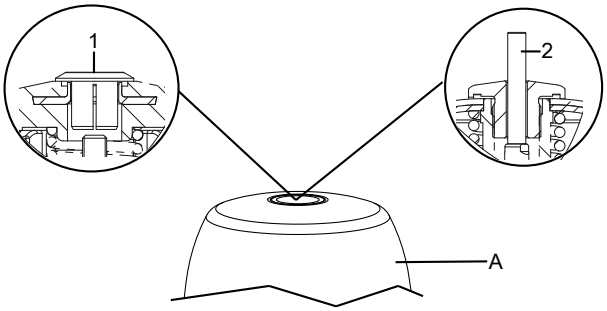
10.3 Storage

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.
5. Close the compressed air connections with protection caps or sealing plugs.

11 Assembly

11.1 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 Linear travel sensor mounting kit assembly for remote mounting

NOTICE

Pre-tensioned spring!

▶ Damage to the device.

● Slowly release the spring.

NOTICE

Do not scratch the spindle!

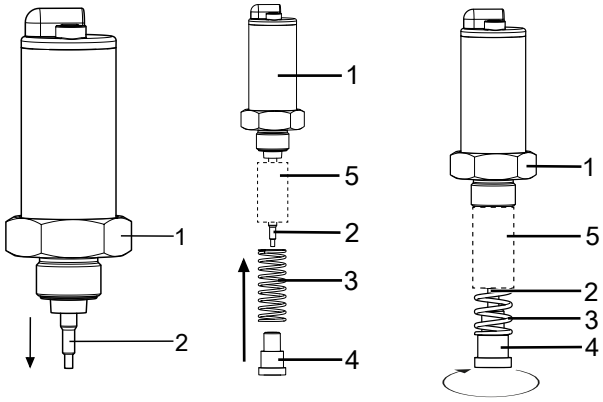
▶ Damage to the spindle surface can lead to failure of the position sensor.

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

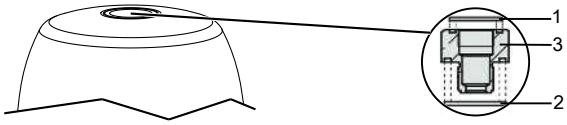
The process described below refers to the mounting kit assembly for direct and remote mounting. For direct mounting, the travel sensor that is shown is integrated in the housing of the positioner.



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**.

11.3 Threaded adapter assembly (linear actuator)

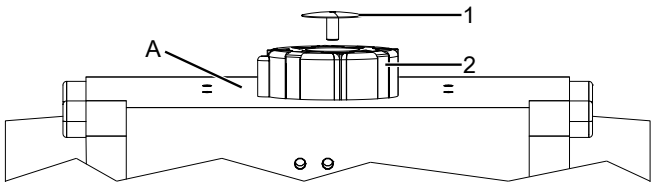
With some mounting kits, it is necessary to install a threaded adapter as well. This threaded adapter is enclosed with the required mounting kits. Valves with a normally open and double acting control function (code 2+3) also include additional O-rings (1+2).



1. Move the actuator to the closed position.
2. Place O-rings **1** and **2** into threaded adapter **3**.
3. Screw threaded adapter **3** into the actuator opening as far as it will go and tighten.

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

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



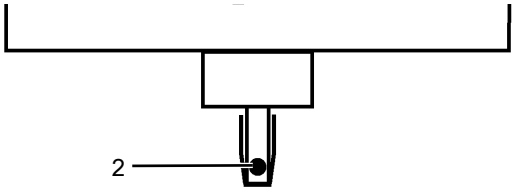
2. Remove the screw **1** from the trigger cam **2**.

11.5 Rotary travel sensor mounting kit assembly

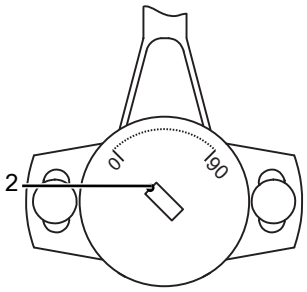
NOTICE

Determining the rotational direction of the actuator

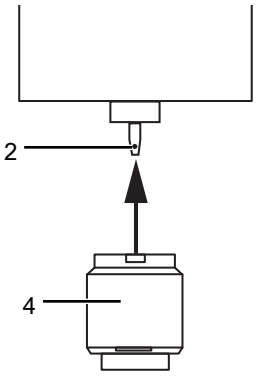
- When viewed from above, the rotational direction of the actuator must be anticlockwise, when the actuator moves from the CLOSED to the OPEN position. In cases where the actuator turns in a clockwise direction, the travel sensor's end position, contrary to given instructions, needs to be in the opposite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



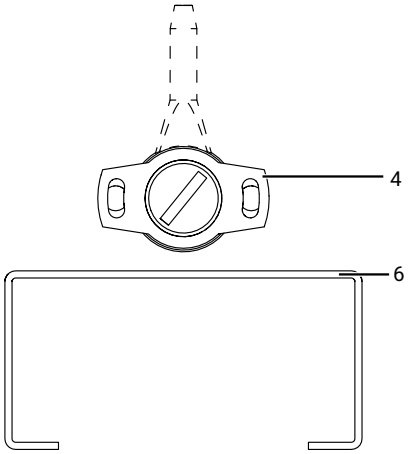
1. The shaft of the rotary travel sensor is provided with a marking **2**.



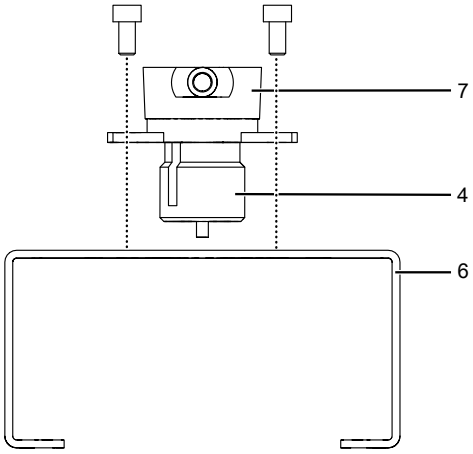
2. Set the marking **2** so that it is correctly aligned with the 0° position on the underside of the travel sensor housing. The 0° position is located on the left-hand side of the cable exit (the electrical operating range is located in the travel range between the 0° and 90° positions).



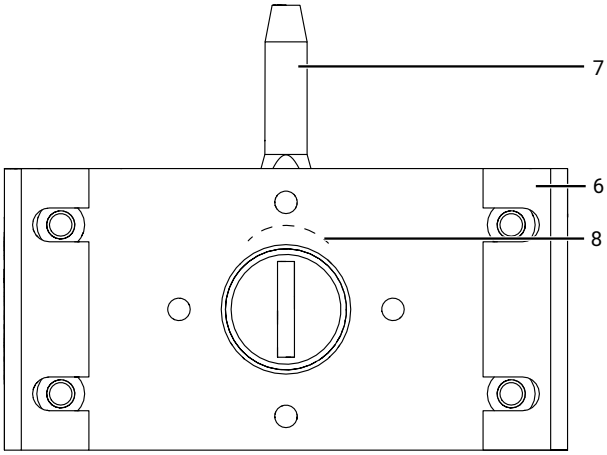
3. Place the adapter **4** onto the shaft of the rotary travel sensor **2** without twisting the shaft.



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



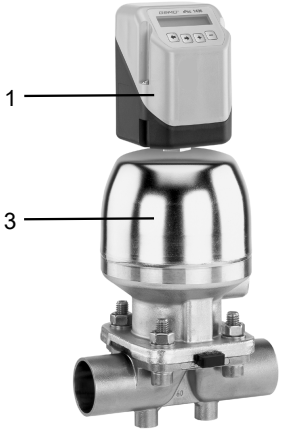
5. Mount the external rotary travel sensor **7** with the adapter **4** on the mounting bracket **6**.



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

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

11.6 Direct mounting on linear actuators



1. Mount (see “Linear travel sensor mounting kit assembly for remote mounting“, page 18)the travel sensor mounting kit.
2. Move the actuator **3** to the open position.
3. Guide the product **1** as far as it will go into the actuator opening or the adapter, and screw it in in a clockwise direction against the initial spring tension, and tighten it using a suitable **WAF27** open-ended spanner.
4. Connect the product's pneumatic supply and connect the product to the process valve.

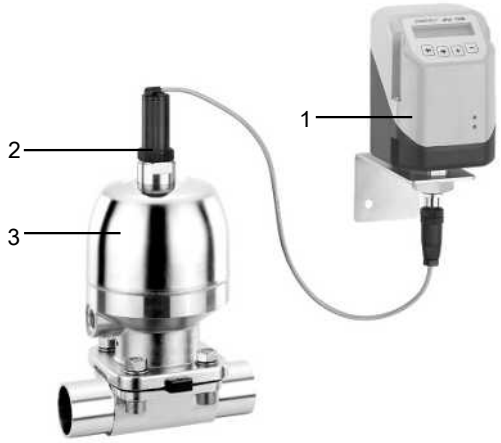
NOTICE

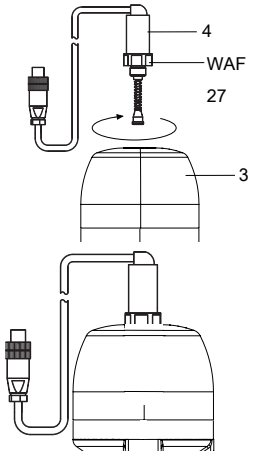
Damage to internal stop

▶ Do not turn the internal stop when assembling the product.

If correctly mounted to the corresponding valve, the product can be turned 320°.

11.7 Remote mounting on linear actuators





1. Mount (see “Linear travel sensor mounting kit assembly for remote mounting“, page 18)the travel sensor mounting kit.
2. Move the actuator **3** to the open position.
3. Guide the travel sensor **4** as far as it will go into the actuator opening or the adapter, and screw in in a clockwise direction against the initial spring tension, and tighten it using a suitable **WAF27** open-ended spanner.
4. Secure the product **1** in a suitable position.

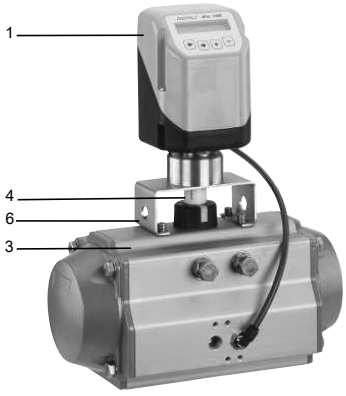
NOTICE

Mounting bracket

► The GEMÜ 1436 000 ZMP mounting bracket, which is available separately, can be used for this.

5. The 5-pin M12 travel sensor connector must be connected to the 5-pin M12 socket on the base of the product.
6. Connect the product's pneumatic supply and connect the product to the process valve.

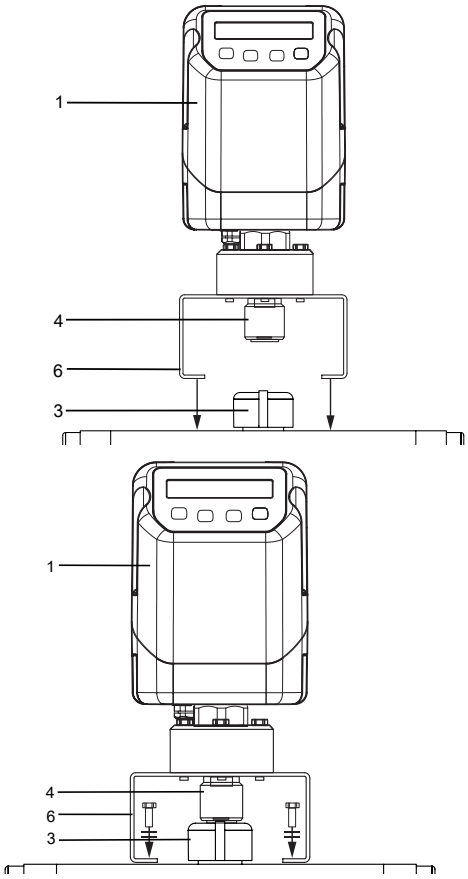
11.8 Direct mounting to quarter turn actuators



1. Place the product **1** with adapter **4** and mounting bracket **6** on the actuator **3**.

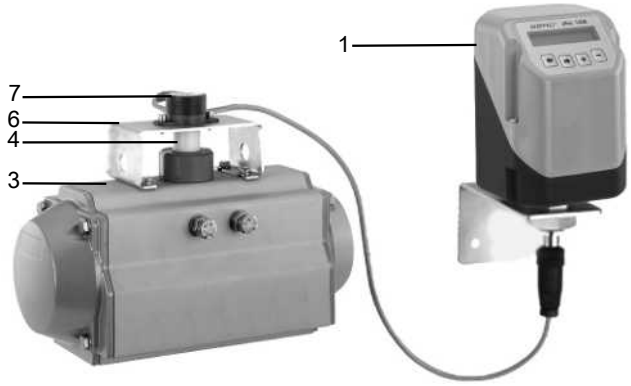
NOTICE

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



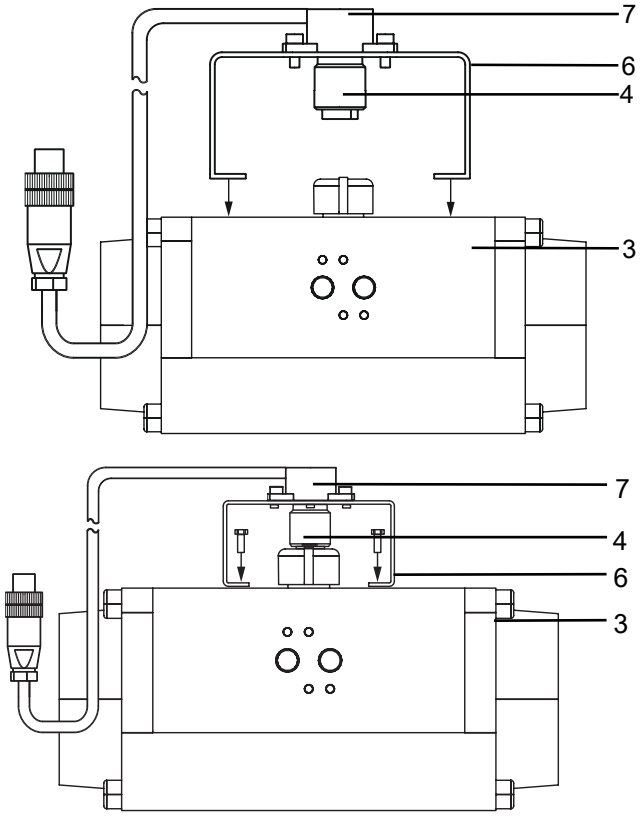
2. Mount the mounting bracket **6** on the actuator **3** using the screws, washers and spring washers provided.

11.9 Remote mounting to quarter turn actuators



NOTICE

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



1. Fix the positioner **1** somewhere suitable.

NOTICE

Mounting bracket

- The GEMÜ 1436 000 ZMP mounting bracket, which is available separately, can be used for this.

2. Mount (see “Rotary travel sensor mounting kit assembly“, page 19)the travel sensor mounting kit.

NOTICE

Installation position

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

3. Place the travel sensor **7** with adapter **4** and mounting bracket **6** on the actuator **3**.

NOTICE

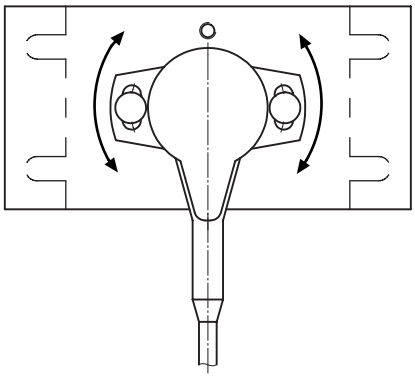
- The adapter lug **4** must engage in the actuator shaft groove.

4. Mount the mounting bracket **6** on the actuator **3** using the screws, washers and spring washers provided.
5. The 5-pin M12 rotary travel sensor connector must be connected to the 5-pin M12 socket on the base of the product.
6. Connect the pneumatic supply to the positioner and connect to the quarter turn actuator **3**.

NOTICE

Note for the rotary travel sensor

- The slotted holes should be positioned in the centre on the screws. If the travel is not correctly set (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.



11.10 Checking the mechanical mounting

1. Connect the product to the power (see “Electrical connection“, page 25) and air supply (see “Pneumatic connection“, page 23) (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.

11.11 Mounting the mounting bracket

NOTICE

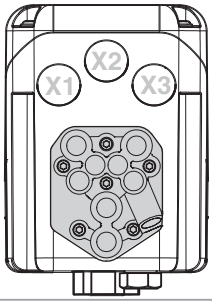
- Ensure adequate stability of the base used for attachment.
- The product must be protected against mechanical stress by the operator.
- Do not use the product as a foothold.

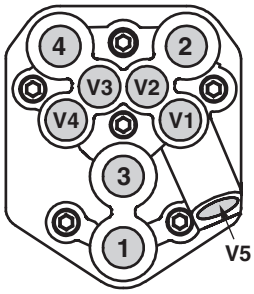
1. Push the product connection adapter through the hole in the mounting bracket and fix it with the enclosed nut.
2. Use the bolt holes and appropriate fixings to attach the mounting bracket securely.

12 Pneumatic connection

⚠ CAUTION

▶ Observe the maximum control pressure of the actuator.

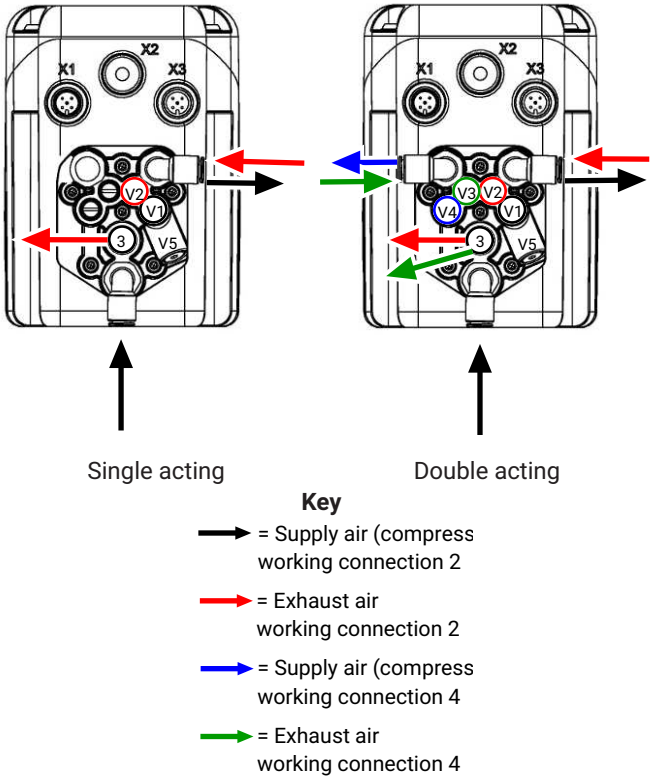




Connection in accordance with DIN ISO 1219-1	Designation	Size
1	Air supply connection	G1/8
3	Venting connection with silencer	G1/8
V1	Supply air throttle for connector 2	-
V2	Exhaust air throttle for connector 2	-
V3	Exhaust air throttle for connector 4*	-
V4	Supply air throttle for connector 4*	-
V5	Check valve	-
2	Working connection for process valve (control function 1 and 2)	G1/8
4	Working connection for process valve (control function 3)	G1/8

* only double acting type (code 3)

1. Establish a connection between pneumatic positioner outlet 2 (single acting) or connector 4 (double acting) and the pneumatic control air inlet (control air inlets) of the actuator.
2. Connect the auxiliary power (supply air) to air supply connection 1 (max. 7 bar or 101 psi).

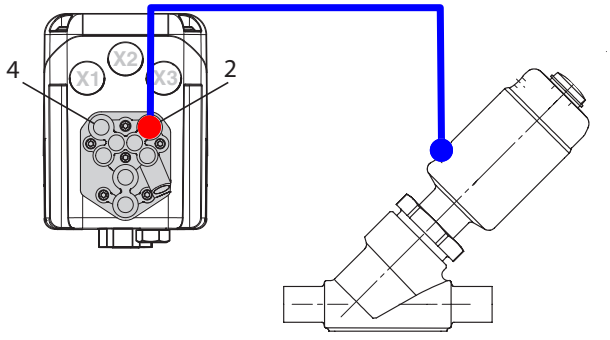


In order to regulate the flow rate and thereby the speed, throttle screws (V1 and V2 single acting, V3 and V4 double acting) are installed at the rear. See chapter "Setting the throttle screws" for further information.

The connections to be used are fitted with push-in fittings for tubes (outside diameter 6 mm) at the factory.

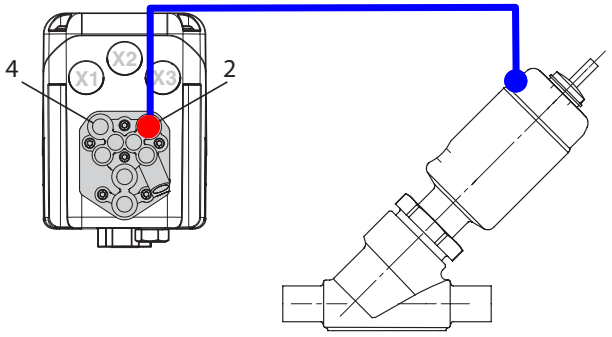
12.1 Connection diagram for linear actuators

12.1.1 Connection diagram for NC valves (Normally Closed)



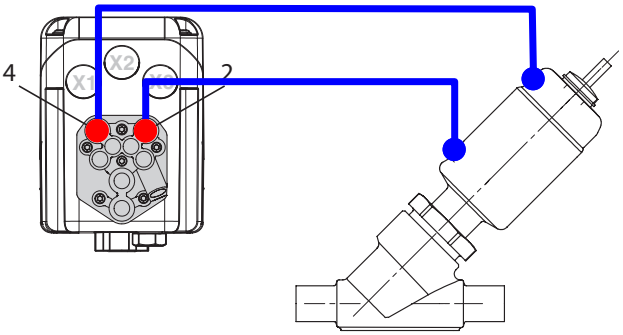
- Fit tubing from **2** to the **lower connection of the process valve**.

12.1.2 Connection diagram for NO valves (Normally Open)



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

12.1.3 Connection diagram for double acting valves



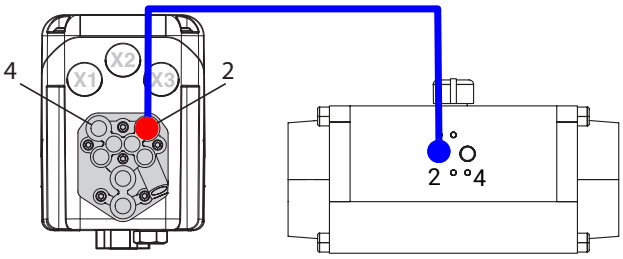
- Fit tubing from **2** to **the lower connection of the process valve** and **4** to the **upper connection of the process valve**.

12.2 Connection diagram for quarter turn actuators

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

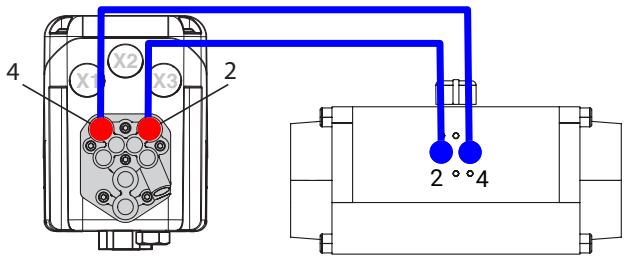
NOTICE

► 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.

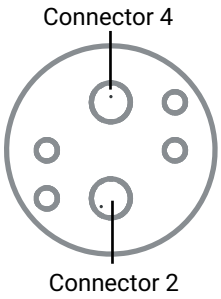
12.2.2 Connection diagram for double acting valves



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

12.2.3 Note for vertical pneumatic connections

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



12.3 General information

⚠ CAUTION



Exhaust air and cycle duties generate noise

- ▶ Hearing damage
- ● Wear hearing protection

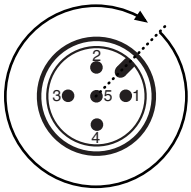
The exhaust air connection is equipped with a silencer as standard to reduce noise emissions. Other commercially available silencers with G1/8 male thread can also be fitted. Alternatively, the recessed G1/8 thread can be used to attach commercially available pneumatic screw connections in order to be able to discharge the exhaust air in a targeted manner.

13 Electrical connection

NOTICE

Risk of cable break

- ▶ Overtightening can result in damage to the internal cables.
- ● Turn electrical connections once by max. 360°.

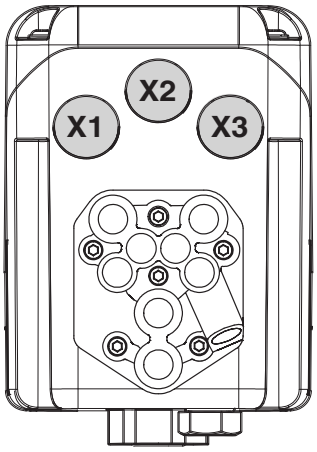


NOTICE

Voltage cutoff

- ▶ To ensure safe start-up of the positioner following interruption of the power supply, the power interruption must be longer than three seconds.

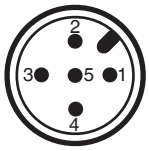
Position of the connectors



13.1 24 V, ordering option Fieldbus, code 000

Position of the connectors

Connection X1

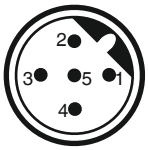


5-pin M12 plug, A-coded

Pin	Signal name
1	U_v, 24 V DC supply voltage
2	Switching output K1, 24 V DC (switches Uv [1])
3	GND, (supply voltage, DigIn1+2+W +X; K1+2)
4	Switching output K2, 24 V DC (switches Uv [1])
5	Digital input 1 (only for Option code 01)

1) Switching output switches device supply voltage U_v - drop voltage

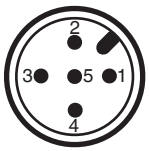
Connection X2



5-pin M12 plug, B-coded

Pin	Signal name	
1	I+, actual value output	4-20 mA internal supply; active
2	I-, actual value output	
3	RxD, Receive Data, TxD-P	
4	TxD, Transmit Data, RS 232	
5	GND, RS 232	

Connection X3

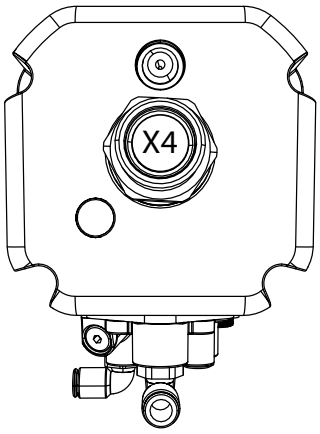


5-pin M12 plug, A-coded

Pin	Signal name	
1	W+, set value input	
2	W-, set value input / Digital In W (only for Option code 01)	
3	X+, process actual value input	Working as a process controller
4	X-, process actual value input / Digital In X (only for Option code 01)	
5	Digital input 2 (only for Option code 01)	

13.2 Order option with external actual value potentiometer, code S01

Position of the connectors



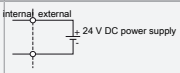
Connection X4



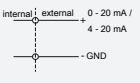
Five-pin M12 built-in socket, A-coded

Pin	Signal name
1	UP+, potentiometer output, supply voltage (+)
2	UP, potentiometer input, wiper voltage
3	UP-, potentiometer output, supply voltage (-)
4	n.c.
5	n.c.

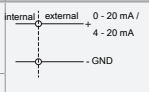
13.3 Supply voltage

Plug	Pin	Signal name	Wiring
X1	1	24 V DC supply voltage	
	3	GND	

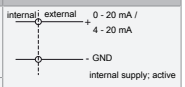
13.4 Set value input (AUTO operating mode)

Plug	Pin	Signal name	Wiring
X3	1	W+, set value input	
	2	W-, set value input	

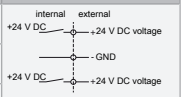
13.5 Actual value input (sensor signal for process controller)

Plug	Pin	Signal name	Wiring
X3	3	X+, process actual value input	
	4	X -, process actual value input	

13.6 Actual value output

Plug	Pin	Signal name	Wiring
X2	1	I+, actual value output	
	2	I-, actual value output	

13.7 Relay outputs

Plug	Pin	Signal name	Wiring
X1	2	Output K1	
	3	GND	
	4	Output K2	

NOTICE

- The mode of operation of the outputs can be changed over from NO (make contact) to NC (break contact) in the **3 SetFunction – K1 Switch/K2 Switch** menu item.

13.8 Digital inputs

The product offers the option of using digital inputs for certain functions. It is also available to order with two exclusively digital inputs.
In addition to this, it provides the option of using the analogue actual value and set value input as a digital input under certain conditions as standard. The special wiring of the analogue inputs in the following chapter only applies if the product is delivered without an optional digital input card.
The option of two additional digital inputs describes "normal" wiring of the inputs (see “Optional digital inputs“, page 28).

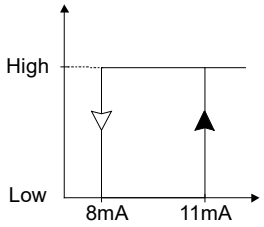
The digital inputs facilitate the use of different functions to control the positioner in addition to the analogue control signals.

- Up to four parameter sets with different settings (including valve positions) can be stored and called up by two digital inputs through a logical connective (ParmSet Bx function).
- The positioner can be stopped by the signal from a digital input (automatic control system deactivated, current valve position is maintained) or by moving the valve to the safety position defined under ErrorAction (function OFF/ON or Safe/On).
- The output source of the analogue actual value output can also be controlled externally (function Poti/Ix).

13.8.1 Use of actual value and set value inputs as digital inputs

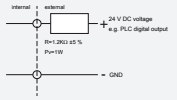
The actual value and set value input can be used as a digital input under the following conditions:

Control system	Operating mode	Set value input as digital input "in W"	Actual value input as digital input "in X"
Positioner	AUTO		X
Positioner	MANUAL	X	X
Process controller	AUTO		
Process controller	MANUAL	X	

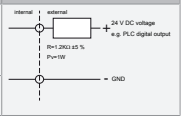


In order to address the two digital inputs "In W" and "In X" a resistor (R=1.2KΩ±5 %) must be connected in series with the input according to the circuit diagram. The switching levels are > 11 mA for a High-Signal and < 8 mA for a Low-Signal.

Special wiring – Use of set value input as digital input "In W"

Plug	Pin	Signal name	Wiring
X3	1	W+, set value input	
X3	2	W-, set value input	

Special wiring – Use of actual value input as digital input "In X"

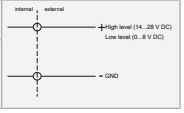
Plug	Pin	Signal name	Wiring
X3	3	X+, actual value input	
X3	4	X-, actual value input	

13.8.2 Optional digital inputs

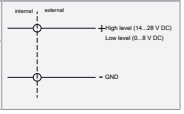
In the design with the option of two additional digital inputs, the product has a total of four digital inputs, whereby the set value and actual value input can continue to process analogue signals.
The actual value and set value input can be used as a digital input under the following circumstances:

Control system	Operating mode	Set value input as digital input "in W"	Actual value input as digital input "in X"
Positioner	AUTO		X
Positioner	MANUAL	X	X
Process controller	AUTO		
Process controller	MANUAL	X	

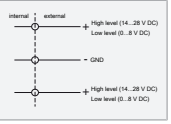
Use of set value input as digital input "In W"

Plug	Pin	Signal name	Wiring
X3	2	I-, set value input	
X1	3	GND	

Use of actual value input as digital input "In X"

Plug	Pin	Signal name	Wiring
X3	4	I-, actual value input	
X1	3	GND	

Digital input 1 and 2

Plug	Pin	Signal name	Wiring
X1	5	Digital input 1	
X1	3	GND	
X3	5	Digital input 2	

14 Fail safe function

Fail safe function:

No.	Error	Outlet A1	Outlet A2
1	Power supply failure	Single acting: vented Double acting: vented	Single acting: non existent Double acting: pressurized
2	Compressed air supply failure	Single acting: vented Double acting: not defined	Single acting: non existent Double acting: Closed
This fail safe function is not a substitute for specific plant safety requirements.			

Adjustable safety reactions:

No.	Error	Outlet A1	Outlet A2
1	Set value < 4.0 mA (range below I Min W can be adjusted from 0...22 mA)	Single acting: adjustable function Double acting: adjustable function (Open, Close*, Hold, Safe)	Single acting: - Double acting: adjustable function (Open, Close*, Hold, Safe)
2	Set value > 20.0 mA (range below I Max W can be adjusted from 0...22 mA)		
3	Actual value < 4.0 mA (range below I Min X can be adjusted from 0...22 mA)		
4	Actual value > 20.0 mA (range below I Max X can be adjusted from 0...22 mA)		
*Close = default setting. The valve is moved to the CLOSED position No. 3 and 4 only available for device version code PA01			

15 Commissioning

- Prior to commissioning, familiarize yourself with the operation (see “Operation“, page 39) of the product.

⚠ WARNING



Corrosive chemicals!

▶ Risk of caustic burns

● Wear appropriate protective gear.

● Completely drain the plant.

⚠ CAUTION



Leakage!

▶ Emission of dangerous materials

● Provide for precautionary measures against exceeding the maximum permissible pressure that may be 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.

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

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

▶ In the case of the **Process controller** option, this must be activated separately.

When the supply voltage is connected, the product emits one of the following two messages in its display after a short software check:

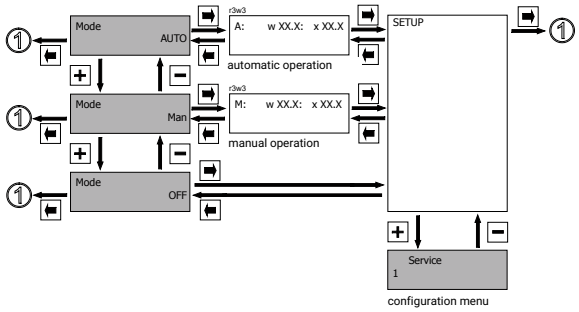
A: w XX.X: x XX.X

A: The positioner is in automatic operation and reacts to the externally specified set value.

M: w XX.X: x XX.X

M: The positioner is in manual operation and the valve position can be specified manually using the keys.

The operating mode can be selected as follows:



15.2 Without default setting (when supplied without a valve)

NOTICE

Initialization failure

- It may be necessary to close the internal positioner throttles a little (**V1** and **V2** for **single acting** actuators and **V1**, **V2**, **V3** and **V4** for **double acting** actuators) if the actuator volume is very low, in order to increase the valve travel time. This should be done only during initialization in the **adjTime** program step. A modification to the throttle setting independent of initialization may lead to error messages and/or poor control results. It is therefore recommended to carry out initialization again after every change of throttles

NOTICE

- Experience has shown that valve travel times of approx. 1–2 seconds produce optimal positioner results. It may not be possible to reach this operating time range for large-volume actuators.

NOTICE

- For valves with control function 8 (double acting with opening spring), for which automatic control function recognition has not worked, the parameter **CtrlFn** must be converted to **DNO** in the manual initialization sequence.

After assembly and all electrical and pneumatic connections, the positioner must be initialised.

While doing this, it is possible to choose between **automatic initialization** and **manual initialization**.

Automatic initialization can be started as follows via quick commissioning:

15.2.1 Automatic initialization

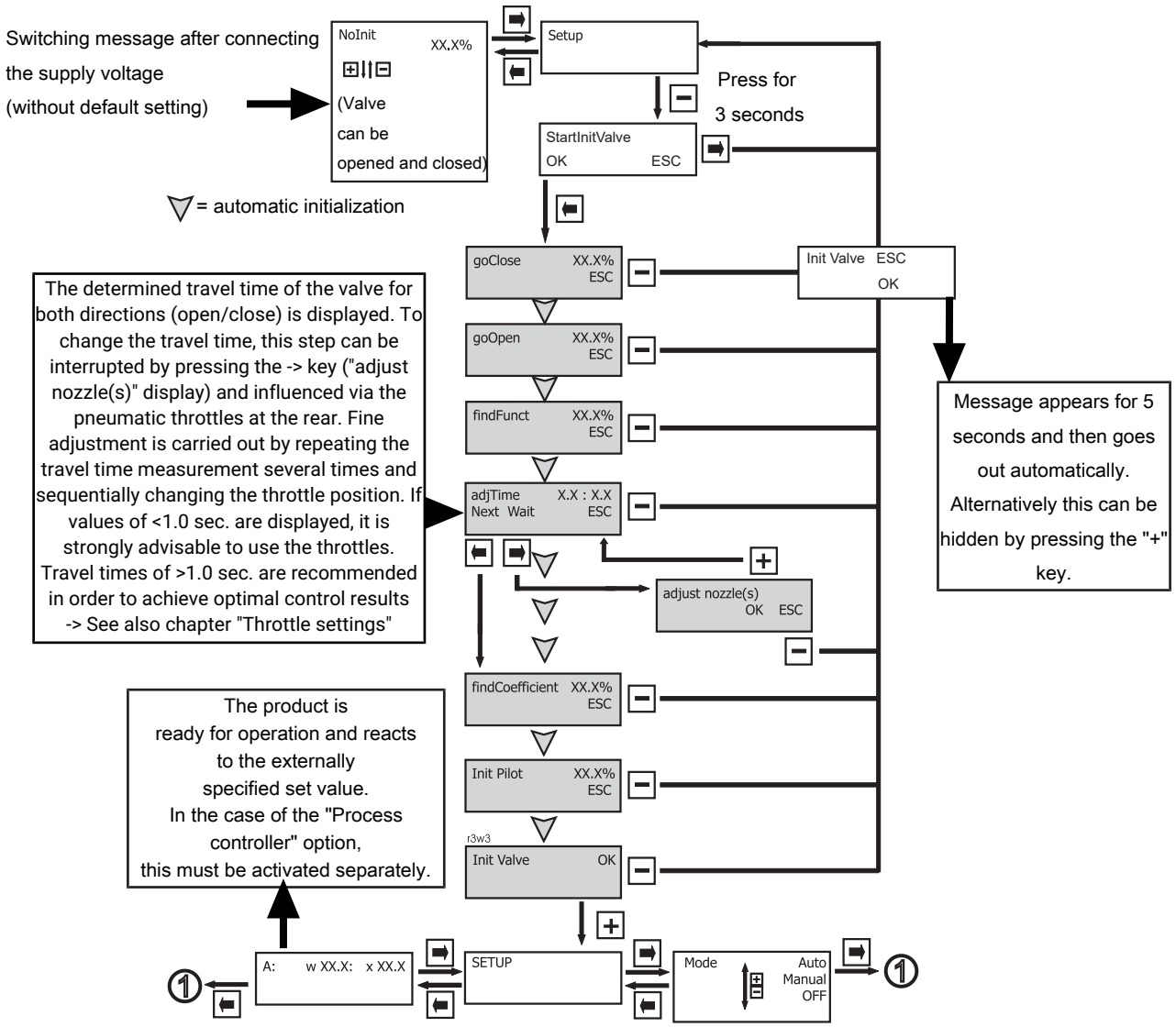
NOTICE

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 “Manual initialization“, page 32).

NOTICE

- ▶ The initialization can alternatively be started via the **Init Valve** parameter.



Automatic quick initialization:

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 (see “Working level (Mode)“, page 39).

If an error message appears during the initialization process (see “Error messages during initialization“, page 35).

15.2.2 Manual initialization

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

Manual initialization should only be applied if the automatic initialization does not achieve satisfactory control characteristics or in case of problems (e.g. leakage).

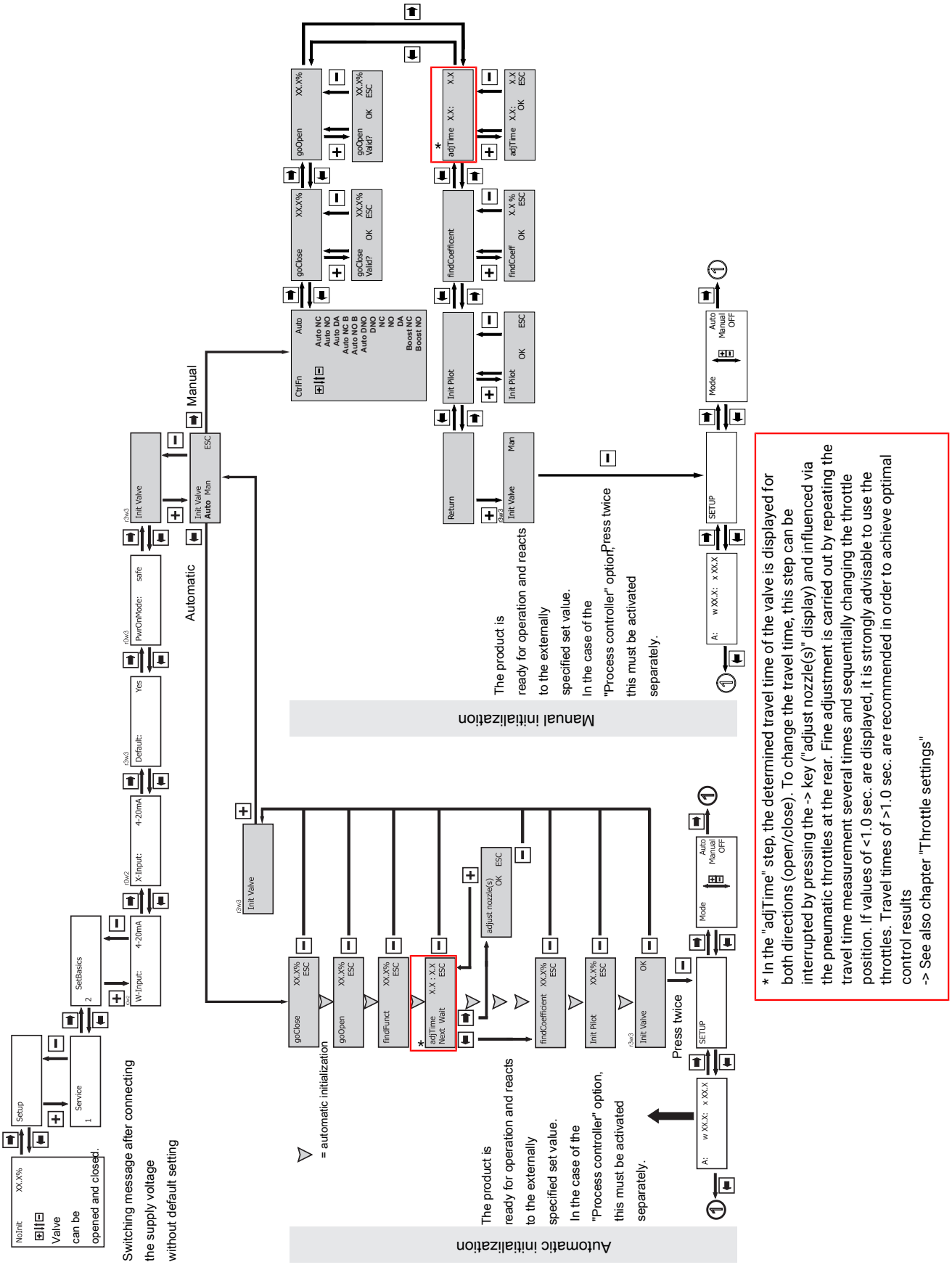
The menu items **goClose** and **goOpen** should be executed several times for very small valve strokes in order to ensure an optimum adaptation of the positioner to the valve.

Emergency operation of the automatic control system is possible if at least the **goClose** and **goOpen** menu items are carried out.

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

- For manual initialization proceed as described on the next page.

15.2.3 Menu structure – automatic and manual initialization



15.2.4 Initialization parameters

InitValve:

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

CtrlFn:

The control function type for the valve can be selected during manual initialization. This setting also influences subsequent automatic initializations.

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  .

FindFnct:

The valve control function is determined (only in the case of automatic initialization).

AdjTime:

Only displayed if **goOpen** and **goClose** were carried out.

The minimum travel times for the valve are determined during initialization. With an automatic initialization process, the measured travel time is displayed for 5 seconds and the procedure is then continued with these values without pressing a key. Within this time, the procedure can be continued directly by pressing the arrow key .

Pressing the arrow key  pauses the procedure ("adjust nozzle(s)" display) so that the travel times can be changed.

During manual initialization, this step must be confirmed with the displayed values by pressing the  key.

Travel times between 1...2 seconds are recommended in order to achieve optimal control results. In the case of display values of <1.0 seconds, adaptations should be made (see chapter "xy throttle settings"). The times for the two directions should ideally coincide (<±50%).

Find Coefficient:

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

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

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).

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  .

After initialization, various messages may appear in the display depending on the status determined at initialization:

Init Valve OK:

The initialization was carried out successfully.

No errors were determined during initialization.

The positioner is ready for operation.

Init Valve Man:

The initialization was carried out manually.

The end positions were determined successfully.

Any other possible errors are not taken into consideration for manual initialization.

The positioner is ready for operation.

Init Valve Error:

An error was determined during initialization.

Operation is not possible.

Check the mechanical mounting and the pneumatic system.

Then carry out the initialization again.

Carrying out manual initialization enables emergency operation.

Init Valve ESC:

The initialization was aborted by the user.

Emergency operation of the automatic control system is possible if at least the **goClose** and **goOpen** menu items were carried out.

15.2.5 Error messages during initialization

No.	Error message	Description	Condition for the occurrence of the error	Error cause
020	Pot wrong dir Error	The potentiometer has recognised the wrong control function during initialization.	Parameter "CtrlFn" is set to AUTO and a valve with control function 3 is recognised, from which the actuator has moved in the wrong direction. Parameter "CtrlFn" is set for a fixed control function. This set control function is not in accordance with the control function determined during initialization.	The pneumatic connections for "CLOSED" and "OPEN" on the valve have been switched or the parameter "Pot Dir" is set on "fall". The wrong control function is set.
021	Wrong function Error	An incorrect control function was recognised during automatic initialization.	Parameter "CtrlFn" is set for a fixed control function. This set control function is not in accordance with the control function determined during initialization.	The wrong control function is set in the "CtrlFn" parameter. If the parameter is set to AUTO, the product determines the corresponding control function and stores it (not for control function 8 - in this case carry out manual initialization or set the "CtrlFn" parameter to "DNO").
022	Pneumatic Error	During automatic initialization of the valve a pneumatic error was detected.	The minimum stroke was undershot End positions cannot be reached Leakage in the system	Check the pneumatic system for stroke, leakage and end positions.
023	Leakage error	During automatic initialization of the valve leakage was detected.	The positioner is in initialization mode.	Check the pneumatic system for leakage and carry out initialization again.
060	TrvlSensErr error	A cable break or short-circuit in the sensor connection (travel sensor) was detected.		Cable break or short-circuit in the sensor connection (travel sensor) detected.
	In 1 no Signal	No signal at digital input In 1	Parameter In 1 is set to OFF / ON or Safe / ON	Connect signal to digital input In 1
	In 2 no Signal	No signal at digital input In 2	Parameter In 2 is set to OFF / ON or Safe / ON	Connect signal to digital input In 2
	In W no Signal	No signal at digital input In W	Parameter In W is set to OFF / ON or Safe / ON	Connect signal to digital input In W
	In X no Signal	No signal at digital input In X	Parameter In X is set to OFF / ON or Safe / ON	Connect signal to digital input In X

15.2.6 CtrlFn initialization parameters

Parameters	Value	Description	Automatic initialization function	Manual initialization function4)
CtrlFn	Auto	Automatic search of the control function during automatic initialization. Complies with manual initialization of control function 1 (NC).	Automatic detection of the control function	Complies with NC[2)] setting. If the valve control function differs, do not use this setting.
	Auto NC	Control function 1 (closed by spring force) with automatic adaptation/modification for automatic initialization	Automatic detection and modification of the control function	Control function 1 (Closed by spring force)
	Auto NO	Control function 2 (opened by spring force) with automatic adaptation/modification for automatic initialization	Automatic detection and modification of the control function	Control function 2 (Opened by spring force)
	Auto DA	Control function 3 (double acting) with automatic adaptation/ modification for automatic initialization	Automatic detection and modification of the control function	Control function 3 (double acting)
	Auto NC B[3)]	Control function 2 (opened by spring force) – for increased controller air output (only 300 l/min) with automatic adaptation/modification during automatic initialization	Automatic detection and modification of the control function	Control function 2 (opened by spring force) – with increased controller air output (only 300 l/min)
	Auto NO B[3)]	Control function 2 (opened by spring force) – for increased controller air output (only 300 l/min) with automatic adaptation/modification during automatic initialization	Automatic detection and modification of the control function	Control function 2 (opened by spring force) – with increased controller air output (only 300 l/min)
	Auto DNO[1)]	Control function 8 (double acting with opening spring) – with automatic adaptation/ modification for automatic initialization	Automatic detection and modification of the control function[1)]	Control function 8 (double acting with opening spring)
	DNO[1)]	Control function 8 (double acting with opening spring)	Control function 8 (double acting with opening spring)	Control function 8 (double acting with opening spring)
	NC[2)]	Control function 1 (Closed by spring force)	Control function 1 (normally closed)	Control function 1 (normally closed)
	NO[2)]	Control function 2 (Opened by spring force)	Control function 2 (opened by spring force)	Control function 2 (opened by spring force)
	DA[2)]	Control function 3 (Double acting)	Control function 3 (double acting)	Control function 3 (double acting)

Parameters	Value	Description	Automatic initialization function	Manual initialization function4)
	Boost NC[2)3)]	Control function 1 (closed by spring force) – with increased controller air output (only 300 l/min)	Control function 1 (closed by spring force) – with increased controller air output	Control function 1 (closed by spring force) – with increased controller air output (only 300 l/min)
	Boost NO[2)3)]	Control function 2 (opened by spring force) – with increased controller air output (only 300 l/min)	Control function 2 (opened by spring force) – with increased controller air output	Control function 2 (opened by spring force) – with increased controller air output (only 300 l/min)

[1)]The fixed control function setting "DNO" should be used for valves with control function 8 (double acting with opening spring). When using the "Auto DNO" setting, a deviating control function may be incorrectly detected during an automatic initialization, and the initialization cannot be completed. The "Wrong Function" error message appears.

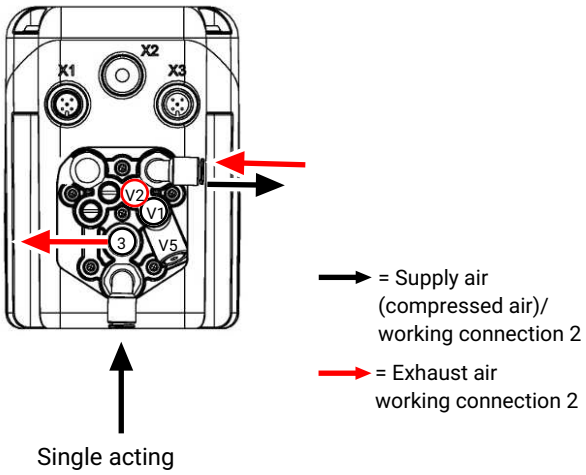
[2)]Fixed control functions (NC, NO, DA, Boost NC and Boost NO) must match in terms of the actuator's control function. An incorrect assignment may lead to faults and/or inverted action, and should therefore only be used if the correct control function is known. In case of doubt, give preference to an "auto" detection.

[3)]On versions with 300 l/min flow capability (booster), double the number of pilot valves are installed and connected in parallel. If, in these versions, a control function is set for simple pilot valves, this leads to a reduction in the flow capability.

[4)]A manual initialization should only ever be carried out if you have not achieved satisfactory control characteristics with the automatic initialization or this was aborted due to an error message.

15.3 Setting the throttle screws

For all designs:



Throttle screw **V1** regulates the flow rate flowing out of working connection **2** toward the connected process valve actuator.

Throttle screw **V2** regulates the flow rate flowing back from the process valve actuator connected to working connection **2** toward venting connection **3** (silencer).

Function and adjustment of the throttles

The flow rate and thereby the speed are reduced/throttled by screwing in clockwise. Opening anticlockwise increases the flow rate. In both directions, a mechanical stop marks the max. setting.

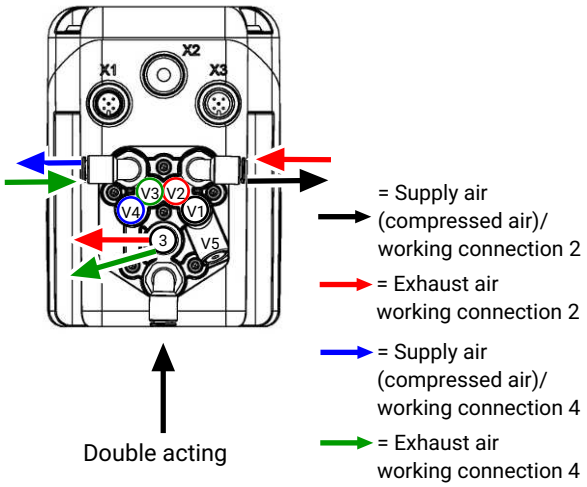
Screwed all the way in = 100% throttle effect and thereby lowest air flow.

The throttle settings should only be changed during initialization in the **AdjustTime** step. In this step, the currently measured travel times for both directions (open/close) are displayed next to one another for around 5 seconds. If these times do not meet expectations, the initialization process must be paused by pressing the → **Wait** key in order to carry out throttle adjustment. If the key is not pressed, the initialization process is automatically continued after around 5 seconds – if necessary even if the travel times are unfavourable. The process can, provided that the travel times are acceptable, also be continued directly by pressing the ← **Next** key.

The throttles should be set in such a way that a constant travel profile is achieved at the desired speeds. Travel times of <1.0 seconds are not generally recommended. Experience has shown that travel times in the range between 1…2 seconds lead to optimal control results. The times for the two directions should ideally coincide (< ± 50 %).

If the throttles are adjusted during operation, a new initialization should be carried out so that the device can perform an updated self-calibration with any conditions that have changed. Otherwise this could result in negative control results and incorrect error messages.

Additionally for double-acting design:



V3 regulates the flow rate flowing back from the process valve actuator connected to working connection **4** toward venting connection **3** (silencer).

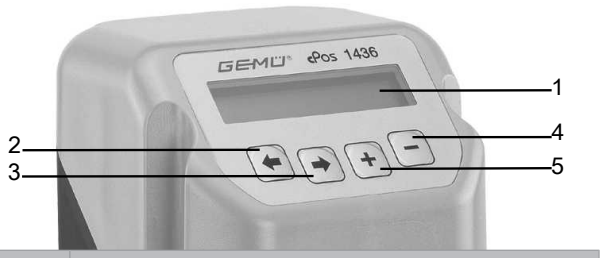
V4 regulates the flow rate flowing out of working connection **4** toward the connected process valve actuator.

15.3.1 Travel time measurement during initialization

The determined travel time of the valve for both directions (open/close) is displayed. To change the travel time, this step can be interrupted by pressing a key ("adjust nozzle(s)" display) and influenced via the pneumatic throttle screws at the rear. Fine adjustment is carried out by repeating the travel time measurement several times and sequentially changing the throttle position. If values of <1.0 second are displayed, it is strongly advisable to use the throttles. Travel times of >1.0 second are recommended in order to achieve optimal control results. (see “Setting the throttle screws“, page 38)

16 Operation

16.1 Operating and display elements



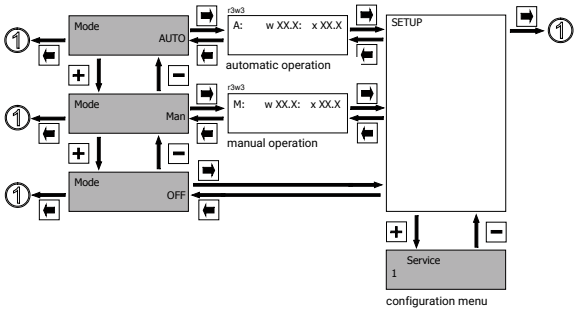
Item	Name
1	Display, 2-line
2	Back key
3	Forwards key
4	Plus key
5	Minus key

16.2 Menu levels

The product contains two menu levels. These are the working level (Mode) and the configuration level (Setup). The working level for selecting the operating mode is only available after successful initialization.

16.2.1 Selection of the operating mode

Selection of the operating mode and entering the configuration menu is carried out as follows:



16.2.2 Working level (Mode)

Mode:

The product is automatically at this level (Mode) after the supply voltage is switched on.

Display	Function	Value range	Default setting
Mode	Select operating mode	AUTO MAN MAN-FLEX TEST OFF	AUTO

The Mode menu item can be used to select between the operating modes **A (Auto)**, **M (Manual)**, **F (Manual-Flex)**, **T (Test)** and **OFF (pause mode)**.

A (AUTO):

The positioner is triggered by an external set value signal when using the **AUTO** operating mode.

The positioner also processes an external actual value signal when operated as a process controller.

M (MANUAL):

If **MANUAL** is selected together with operation as a positioner, the valve can be opened and closed manually using the ⊞ and ⊟ keys.

If **MANUAL** is selected together with operation as a process controller, the set value can be changed manually using the ⊞ and ⊟ keys.

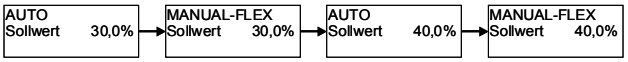


When switching from **AUTO** to **MANUAL** the last set value input when **MANUAL** was last selected is adopted. On first use, 50.0% is selected.

F (MANUAL-FLEX):

If **MANUAL-FLEX** is selected together with operation as a positioner, the valve can be opened and closed manually using the ⊞ and ⊟ keys.

If **MANUAL-FLEX** is selected together with operation as a process controller, the set value can be changed manually using the ⊞ and ⊟ keys.



When switching from **AUTO** to **MANUAL-FLEX** the last set value connected under **AUTO** is adopted.

T (Test):

In **TEST** mode in the standard setting as positioner the device may be operated manually for test purposes. It does not process any external input signals

and works as a mere positioner.

OFF (pause mode):

If switched to **OFF** the positioner is in pause mode and then does not react to any changes to the input signals. The valve pauses in the last position.

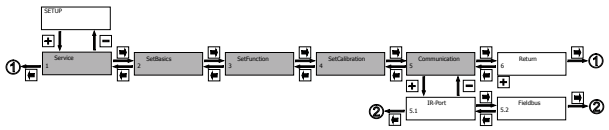
16.2.3 Configuration level (Setup)

Various parameter values of the product can be changed in the configuration menu. The parameter name appears in the top left line of the display and the parameter value in the top right.
In order to enable immediate use of the product, the most common values were entered as factory settings.

NOTICE

- The submenus which are only required for the process controller are only available for the design with integrated process controller (PA01).

The relevant submenus are highlighted in grey.



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

Service	The **Service** menu is used to read out all information/diagnostics regarding the positioner, the connected signals and errors that occur. User management via password protection can also be set up here, whereby only certain access rights exist in various levels.
SetBasics	The **SetBasics** menu is used to set the basic settings for the product such as the initialization, selection of input signals and resetting to default settings.
SetFunction	The **SetFunction** menu is used to activate or deactivate special functions of the positioner and set the control parameters. The optional process controller (only available in the design with integrated process controller (PA01)) can also be activated and adapted to the process.
SetCalibration	The **SetCalibration** menu is used to set the directions, characteristic curves, stroke limiters and seal adjusters as well as error limit values.
Communication	The **Communication** menu is used to set the various options for communication with the product.

16.2.3.1 Changes in the configuration menu

Changes can be made to the factory settings according to the menu overview below.

Before changes to the configuration menu, familiarize yourself with the operation (see “Operation“, page 39) of the product.

In this case, the small squares ←, →, +, and − represent the product keys that must be pressed to reach the next menu item or within the menu to get to the various settings.

16.2.3.2 Change of parameters

Using the ←, →, +, and − keys, the various menus in accordance with the

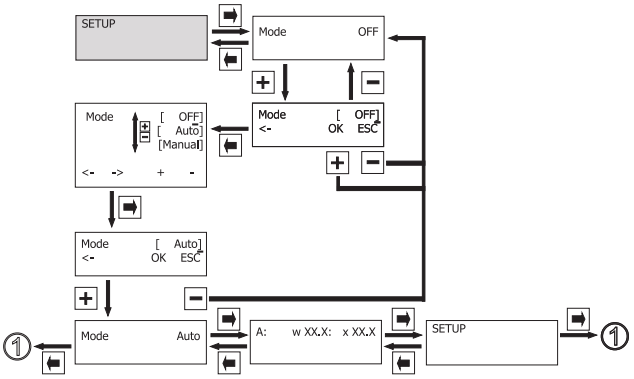
Configuration menu chapter are selected for the product.

The changes to the parameters required are made using brackets that are put round the respective parameters.

The ← or → keys can be used to move the cursor to the relevant parameter, and the + or − keys can then be used to change the parameter.

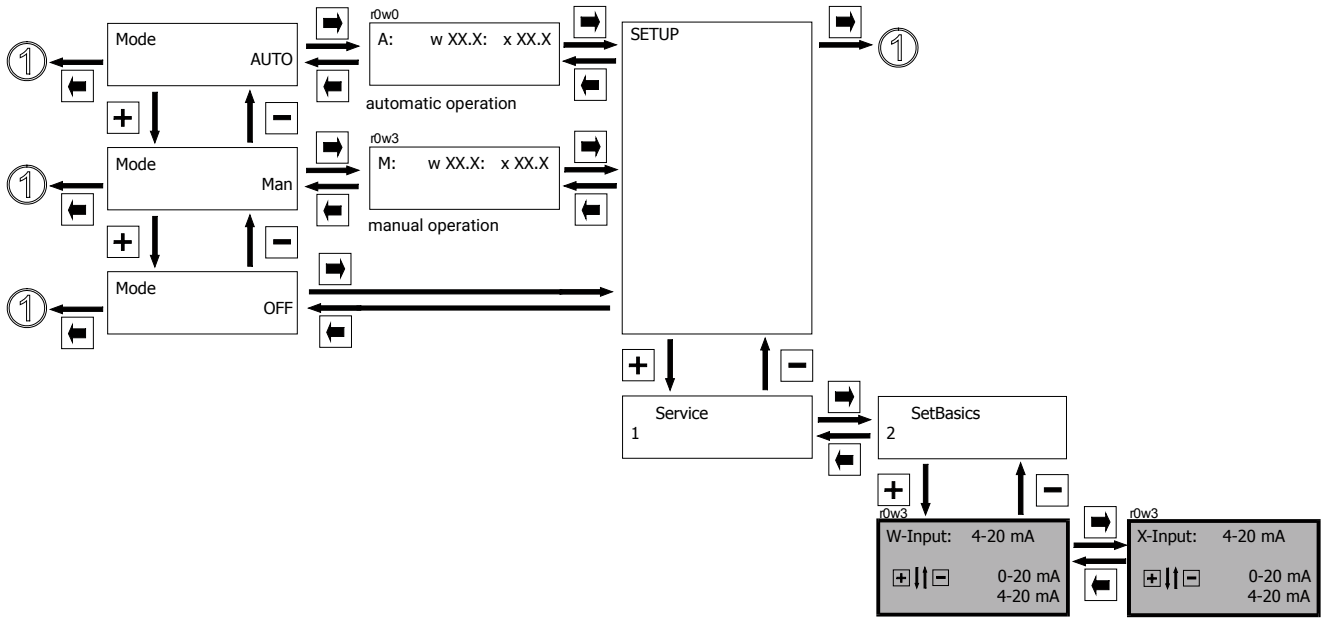
Example:

The operating mode is to be changed from **OFF** to **Auto**.

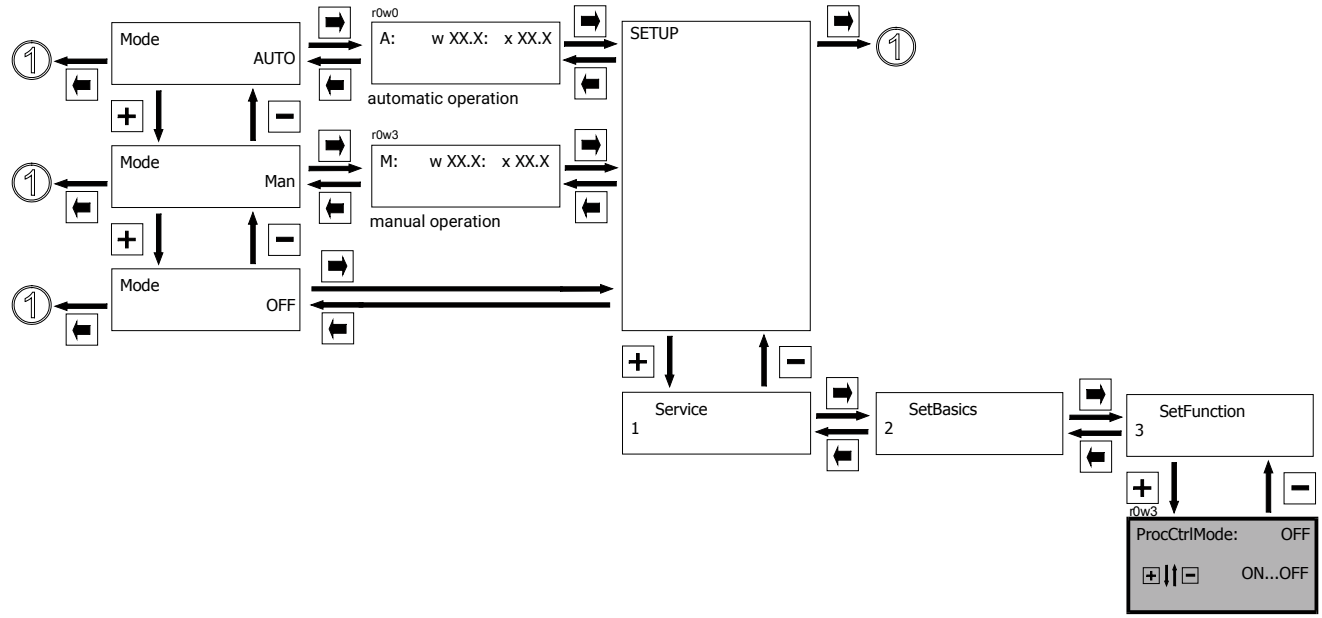


16.2.3.2.1 Quick guide to control settings

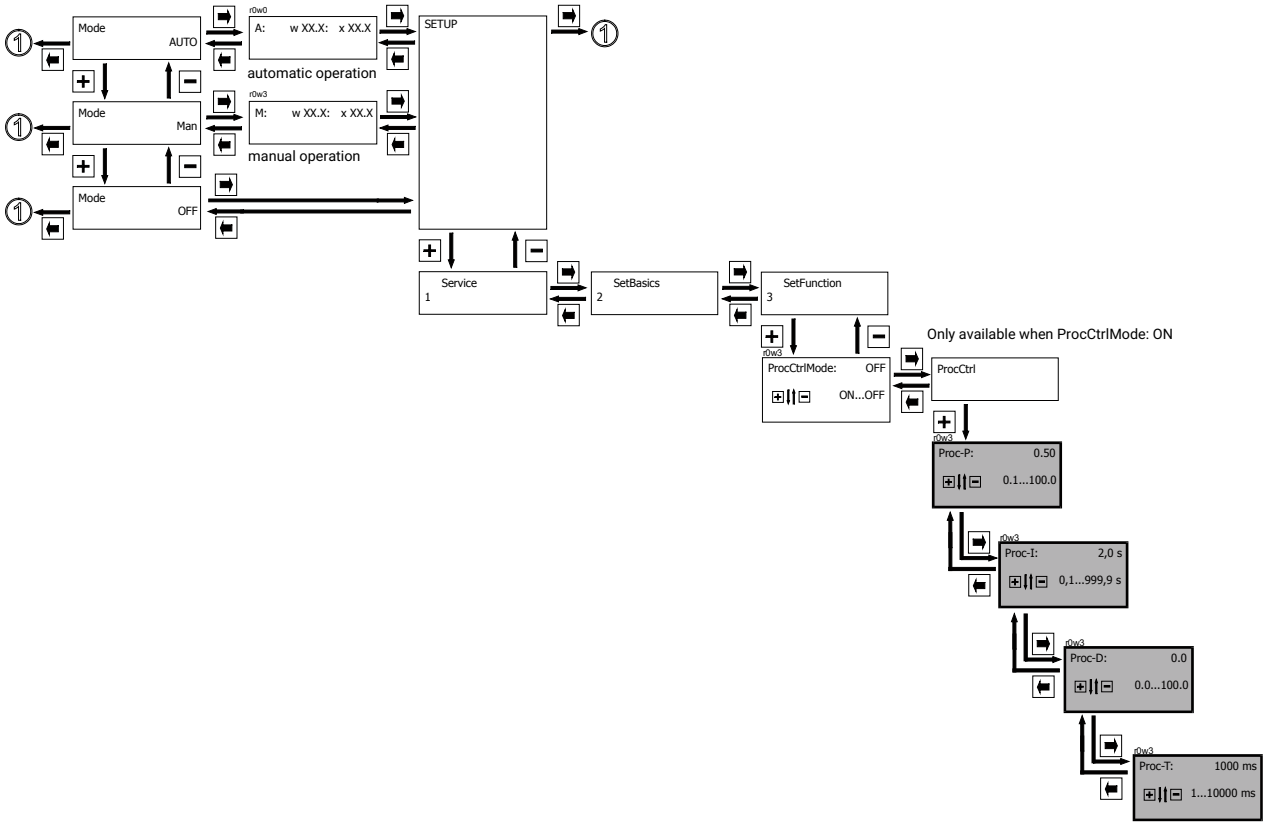
16.2.3.2.1.1 Changing the set value signal and actual value signal



16.2.3.2.1.2 Switching the process controller on or off (optional)



16.2.3.2.1.3 Changing the control parameters (Proc P, Proc I, Proc D and Proc T)



16.2.3.3 Access authorization in the configuration menu

In order to hinder unwanted changes to the parameter values, the configuration level of the product is secured with three different access codes.

The factory code setting is as follows:

Code 1: Password **0** → (New Code: 1)
Code 2: Password **0** → (New Code: 2)
Code 3: Password **0** → (New Code: 3)

After entering the factory codes, these codes can be changed by the operator at any time.

The access priorities needed are marked in the configuration menu.

The way in which access codes can be changed is described under "Activation or deactivation of user access". (see “Activating/ deactivating user access“, page 51)

16.2.3.4 Parameter overview

Menu levels	Submenu	Display	Function	Value range	Default setting
		Mode	Select operating mode	AUTO	AUTO
				MAN	
				OFF	
				TEST	
				OFF	
1 Service	**I/O status**	**Submenu for displaying inputs and outputs**			
		ActiveParaSet	Displays the current active parameter set	P1 ... P4	P1
		min-Pot-max	Displays travel sensor position in percent		
		I w	Value of set value signal in mA		
		I x*	Value of actual value signal in mA as a process controller		
		I Out	Value of actual value output in mA		
		W Proc X*	Value of set value signal in relation to actual value signal		
		W Pos X	Comparison of set value and valve position		
		Pot Abs	Travel sensor position		
		Valve 1:2:3:4	Displays the current position of the internal pilot valves		
		Proc Ctrl In*	Deviation between set value and actual value (process controller) (%)		
		Proc Ctrl Out*	Deviation between set value and actual value (process controller)		
		Pos Ctrl In	Deviation between set value and actual value (positioner) (%)		
		Pos Ctrl Out	Deviation between set value and actual value (positioner)		
		In w:x:1:2	Displays the current signals of the digital inputs		
		Relais K1:K2	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

Menu levels	Submenu	Display	Function	Value range	Default setting
		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
		SensTest	Switch sensor test on or off	Disable / Enable1	Disable
		Clear Error List	Delete error list	OK	
	1436 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					
		W-Input	Type of set value signal	4 - 20 mA / 0 - 20 mA	4 - 20 mA
		X-Input*	Type of actual value signal	4 - 20 mA p / 0 - 20 mA	4 - 20 mA p
		Default	Reset to default settings	Yes / No	Yes
	Init All	**Submenu for carrying out the initialization**			
		GoClose	Scanning the closed position		
		GoOpen	Scanning the open position		
		FindFunct	Valve control function is determined		
		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	9
		D.Refresh	Time for display refresh	0,1 ... 1,0 s	0,1 s
		DLight	Setting the display lighting	OnKey / On	OnKey
		AutoReturn	Time for an automatic return to the working level – Setup	1 ... 60 min	5 min
		HelpLanguage	Text language	D / GB / N	D
		HelpText	Display the help text	ON / OFF	ON
3 SetFunction					

Menu levels	Submenu	Display	Function	Value range	Default setting
		ProcCtrlMode*	Switch process controller on or off	ON / OFF	OFF
	ProcCtrl*	**Submenu for setting process controller parameters**			
		Proc-P	KP amplification of the process controller	0,0 ... 100,0	0,5
		Proc-I	Ti reset time for the process controller	0,0 ... 999,9 s	2,0 s
		Proc-D	KD component of the process controller	0,0 ... 100,0	0,0
		Proc-T	Process controller Tv time	1 ... 10000 ms	1000 ms
		IxType	Defines the type of actual value filter	OFF / RC / avr	OFF
		IxTime	Filter time for actual value input	0,10 ... 20,00 s	0,10 s
	PosCtrl	**Submenu for setting positioner parameters**			
		Pos P	P amplification of the positioner	0.0 ... 100,0**	1.0
		Pos D	D amplification of the positioner	0,0 ... 100,0	0.0
		Pos T	Decay time of the D component of the positioner	1 ... 5000 ms	100 ms
		MinPos	Closing limit = lower position of control range	0 ... 100 %	0.0 %
		MaxPos	Stroke limitation = upper position of control range	0 ... 100 %	100 %
		CloseTight	Lower close tight function	0 ... 20 %	0 %
		OpenTight	Upper close tight function	80 ... 100 %	100 %
		DeadBand	Permissible system deviation	0.1 ... 25 %	1,0 %, K-Nr. 2442: 2,0 %, K-Nr. 2443: 5,0 %
	Digital input	**Submenu for setting the digital inputs**			
		In W	Determines the function of the digital input "In W"	OFF / ON	OFF
				Safe / ON	
				ParmSetB0	
				ParmSetB1	
				Poti / Ix	
		In X	Determines the function of the digital input "In X"	OFF / ON	OFF
				Safe / ON	
				ParmSetB0	
				ParmSetB1	
				Poti / Ix	
		In 1	Determines the function of the digital input "In 1"	OFF / ON	OFF
				Safe / ON	
				ParmSetB0	
				ParmSetB1	
				Poti / Ix	

Menu levels	Submenu	Display	Function	Value range	Default setting
		In 2	Determines the function of the digital input "In 2"	OFF / ON	OFF
				Safe / ON	
				ParmSetB0	
				ParmSetB1	
				Poti / Ix	
	Digital output	**Submenu for setting the digital outputs**			
		K1 Switch	Defines the type of output	NC / NO	NO
		K1 Fn	Determines the function of output K1	no	no
				P min	
				P max	
				P min/max	
				W min	
				W max	
				W min/max	
				X min	
				X max	
				X min/max	
				SSE min	
				SSE max	
				SSE min/max	
				Active	
				Error	
				Warning	
		AlarmMaxK1	Switch point that switches after K1 is exceeded	0.2 ... 99.8 %	10.0 %
		AlarmMinK1	Switch point that switches after K1 is undershot	0.2 ... 99.8 %	90.0 %
		SSE1Time	Delay time between error detection and error message to K1	0,1 … 100,0 s	5,0 s
		K2 Switch	Defines the type of output	NC / NO	NO
		K2 Fn	Determines the function of output K2	no	no
				P min	
				P max	
				P min/max	
				W min	
				W max	
				W min/max	
				X min	
				X max	
				X min/max	
				SSE min	
				SSE max	
				SSE min/max	

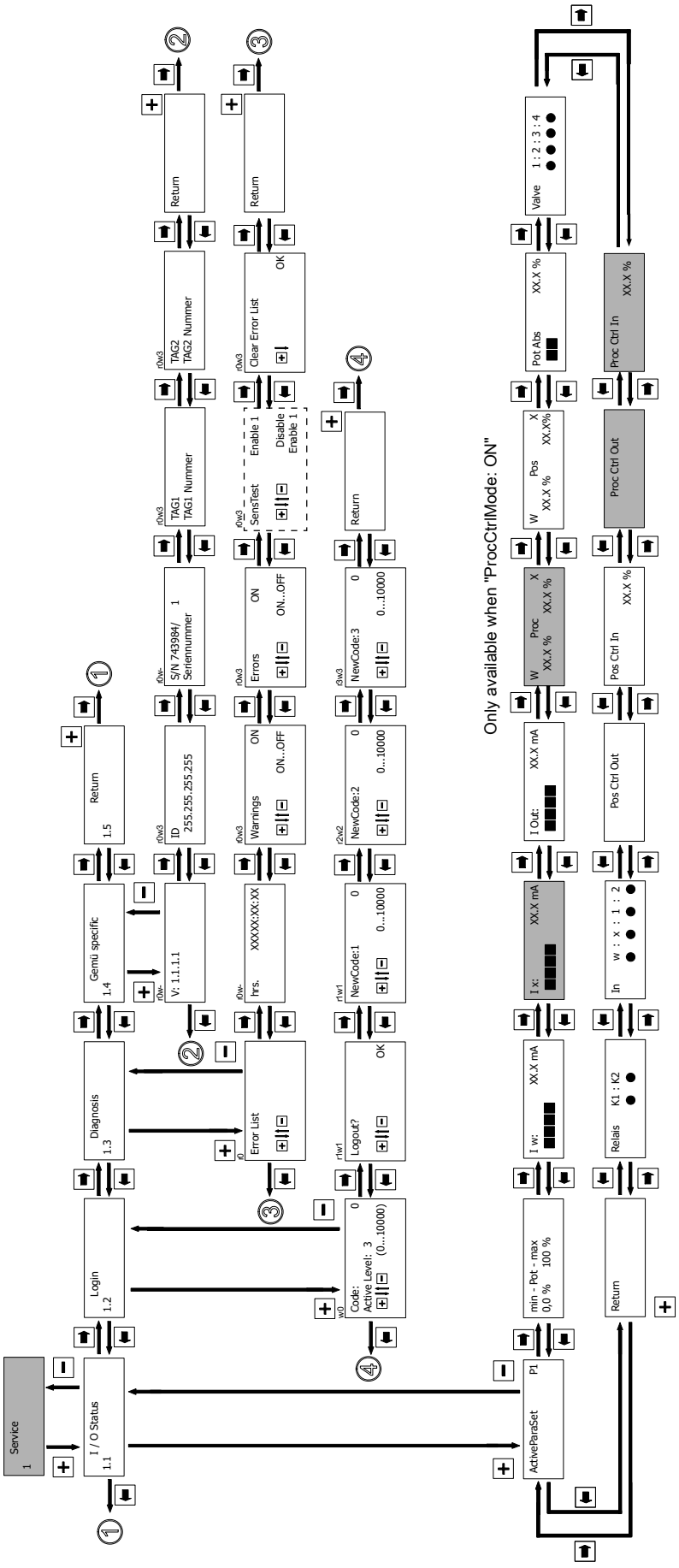
Menu levels	Submenu	Display	Function	Value range	Default setting
				Active	
				Error	
				Warning	
		AlarmMaxK2	Switch point that switches after K2 is exceeded	0.2 ... 99.8 %	10.0 %
		AlarmMinK2	Switch point that switches after K2 is undershot	0.2 ... 99.8 %	90.0 %
		SSE2Time	Delay time between error detection and error message to K2	0,1 … 100,0 s	5,0 s
		ErrorTime	Delay time between error detection and error message	0,5 ... 100 s	0,2 s
		ErrorAction	Function of the process valve if there is an error message	Close / Open / Hold / Safe	Close
		Warn. Time	Delay time between detection and output of warning	0,0 ... 100,0 s	0,0 s
		CpyParaSet	Copies parameters to various working memories (P1/P2/P3/P4)		
		AnalogOut	Function of analogue output	Poti / Ix	Poti
4 SetCalibration		X-Direction*	Determines the direction of the actual value signal (rising/falling)	rise / fall	rise
		W-Direction	Determines the direction of the set value signal (rising/falling)	rise / fall	rise
		W-Function	The control characteristic is defined	Lin./1:25/1:50/free	lin.
		Set W-free	10 control characteristic points can be programmed as desired	W 0 % 0 ... 100 %	0.0 %
				W 10 % 0 ... 100 %	10.0 %
				W 20 % 0 ... 100 %	20.0 %
				W 30 % 0 ... 100 %	30.0 %
				W 40 % 0 ... 100 %	40.0 %
				W 50 % 0 ... 100 %	50.0 %
				W 60 % 0 ... 100 %	60.0 %
				W 70 % 0 ... 100 %	70.0 %
				W 80 % 0 ... 100 %	80.0 %
				W 90 % 0 ... 100 %	90.0 %
				W 100 % 0 ... 100 %	100.0 %
		Y-Direction*	Determines the direction of the process controller output (rising/falling)	rise / fall	rise
		OutMinPos	Valve position at actual value output signal 0/4 mA	0 ... 100 %	0.0 %

Menu levels	Submenu	Display	Function	Value range	Default setting
		OutMaxPos	Valve position at actual value output signal 20 mA	0 ... 100 %	100.0 %
		I Min W	Switch-off limit for cable break recognition of the set value	0,0 ... 22,0 mA	3,5 mA
		I Max W	Switch-off limit for excess current recognition of the set value	0,0 ... 22,0 mA	20,5 mA
		I Max X	Switch-off limit for excess current recognition of the actual value	0,0 ... 22,0 mA	20,5 mA
	Scaling	**Submenu for scaling the actual value and set value display**			
		Scaling	Switches the scaled display on	ON / OFF	OFF
		Decimalpoint	Determines the number of digits displayed after the decimal point	0 ... 2	1
		4 mA ≙	Defines the display which corresponds to a 0/4 mA signal		0 %
		20 mA ≙	Defines the display which corresponds to a 20 mA signal		100 %
5 Communication	**Fieldbus**	**Submenu for setting the fieldbus connection**			
		Fieldbus**	Submenu for setting the fieldbus connection	OFF	OFF
	Web server	**Submenu for setting the server connection**			
		RS 232	Defines the type of RS 232 connection	Auto	Auto
				Serial	
		Bdrate RS	Defines the baud rate of the RS 232 connection	38400	115200
				57600	
				115200	

*Only for activated process controllers

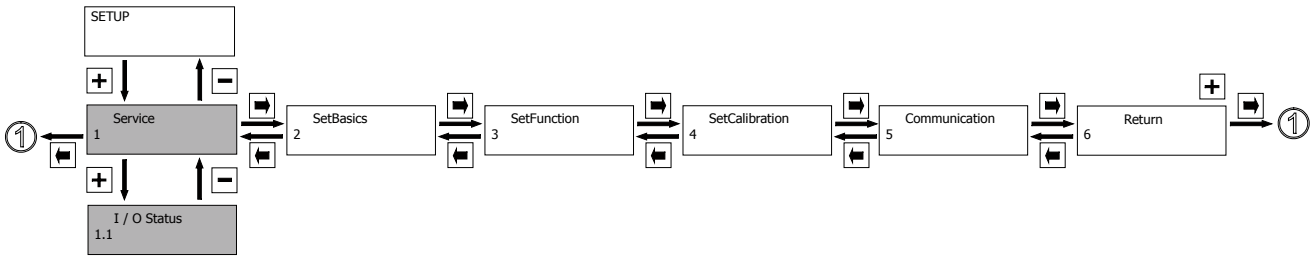
**Parameter value is automatically calculated and set by the positioner during initialization

16.2.3.5 Menu 1 Service



16.2.3.5.1 Explanation of parameters for 1 Service

16.2.3.5.1.1 Scanning the input and output signals



ActiveParaSet:

Displays the current active memory which is read off.

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:

Displays the value of the current set value signal in mA.

Ix:

Displays the value of the current actual value signal (when operated as a process controller).

W Proc X:

Displays the value of the current set value signal compared to the current actual value signal (when operated as a process controller).

W Pos X:

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

Pot Abs:

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).

Proc Ctrl In:

Displays the deviation between set value and actual value (when operated as a process controller) in %.

Proc Ctrl Out:

Displays the deviation between set value and actual value (when operated as a process controller).

NOTICE

- 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 positioner can no longer work. All parameters on the control system route must be checked.

Pos Ctrl In:

Displays the deviation between set value and actual value (when operated as a positioner) in %.

Pos Ctrl Out:

Displays the deviation between set value and actual value (when operated as a positioner).

NOTICE

- 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 positioner can no longer work. All parameters on the control system route must be checked.

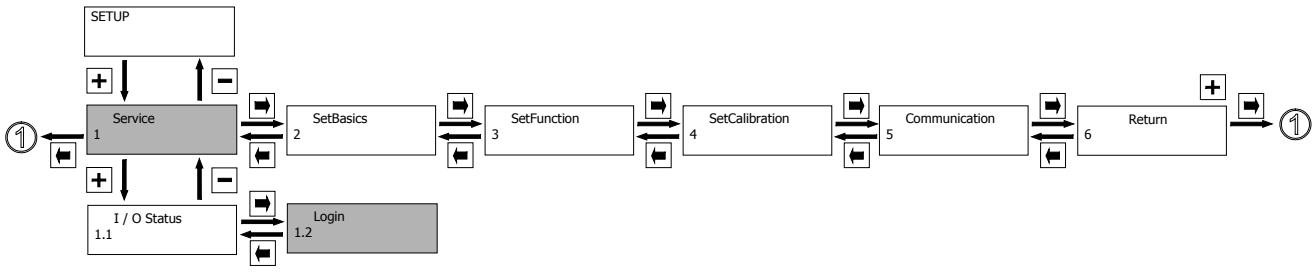
In w:x:1:2

Displays the current conditions of the digital inputs (= Signal High).

Relay:

Displays the current position of the internal relays K1 and K2 (= Relay switched).

16.2.3.5.1.2 Activating/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.

Example based on r0w2 (read 0, write 2):

r0w2

X-Input:	4-20 mA
⊞ ⇅ ⊟	0-20 mA 4-20 mA

The following symbols are used for this purpose:

r0: no release required for reading

w0: no release required for writing

r1: lowest priority release code 1 required for reading

w1: lowest priority release code 1 required for writing

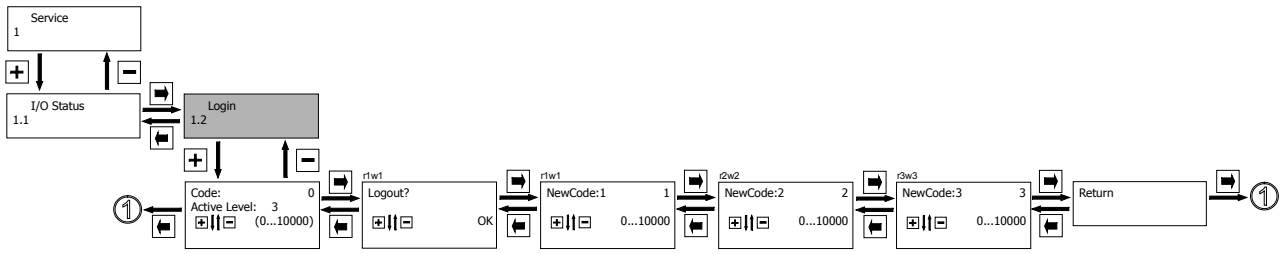
r2: medium priority release code 2 required for reading

w2: medium priority release code 2 required for writing

r3: top priority release code 3 required for reading

w3: top priority release code 3 required for writing

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:

Serves to log 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.

NewCode1:

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

NewCode2:

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

NewCode3:

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

NOTICE

- Factory setting 0 means that all three codes are assigned 0. This means that all parameter menus are released.

Example:

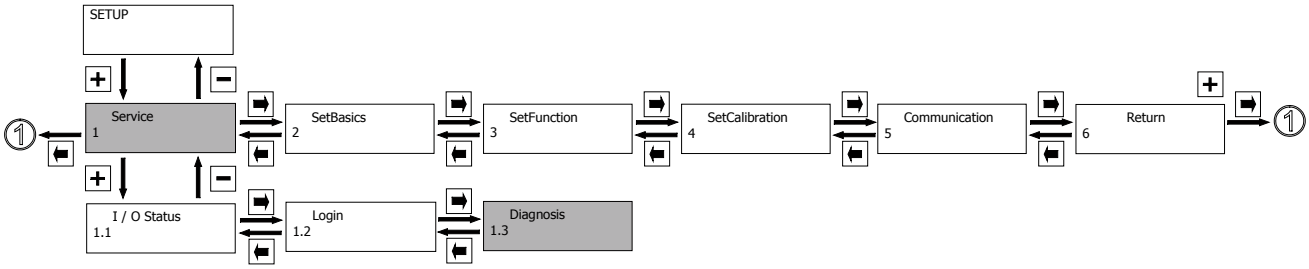
If user level 2 is to be disabled, user level 2 and also user level 3 must be assigned a code.

NOTICE

- During activation or deactivation of the user levels via the RS232-interface, other codes can be assigned in the same way as the direct input of codes via the product keypad.
- This ensures specific disabling of the use of the positioner either directly via the positioner or via the RS232-interface depending on the type of operation.

The codes for operation via the RS232-interface can only be assigned, activated or deactivated via the RS232-interface. The codes for direct operation via the product keypad can only be assigned, activated or deactivated via the keypad on the device itself.

16.2.3.5.1.3 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**.

SensTest:

Switches the monitoring of the sensor (travel sensor) ON or OFF.

The positioner goes to the error mode when there is an error message and moves to the position defined under **ErrorAction**.

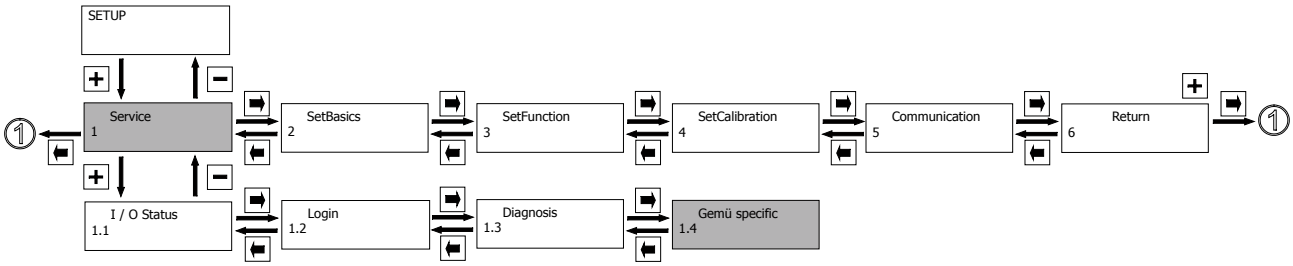
Messages are stored in **ErrorList**.

- **Enable1:** Sensor monitoring activated
- **Disable:** Sensor monitoring deactivated

Clear Error List:

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

16.2.3.5.1.4 Display serial number, software version and ID, enter TAG number



V:X.X.X.X:

Displays the current software release.

S/N:

Displays the positioner serial number

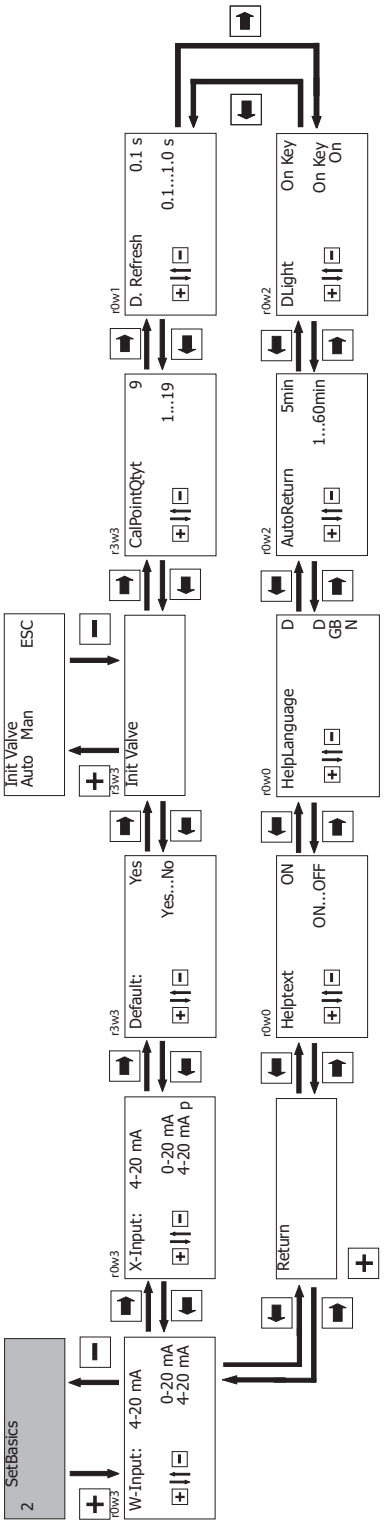
TAG1:

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

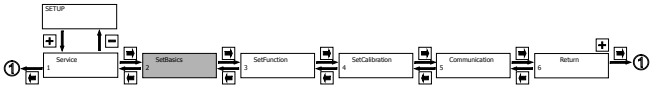
TAG2:

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

16.2.3.6 Menu 2 SetBasics



16.2.3.6.1 Explanation of parameters for 2 SetBasics



16.2.3.6.1.1 Definition of actual value and set value inputs

W-Input:

Defines the type of set value input signal 0-20mA / 4-20mA.

X-Input:

Defines the type of actual value input signal 0-20mA / 4-20mA.

16.2.3.6.1.2 Reset

Default:

Serves to reset the positioner to the default settings. All values changed by the operator are consequently deleted. An initialization that has already taken place will also be deleted.

Only the parameter set currently stored in the working memory is reset, however. Stored parameter sets remain unchanged.

16.2.3.6.1.3 Carrying out initialization

InitValve:

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

16.2.3.6.1.4 Making the display settings

D.Refresh:

The time for display refresh can be changed.

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 **AutoReturn**.
- **On** – The display lighting is permanently activated.

AutoReturn:

The time for the automatic return to the working level after last activating a key can be set. This time setting is also effective for the display lighting (**DLight**).

HelpLanguage:

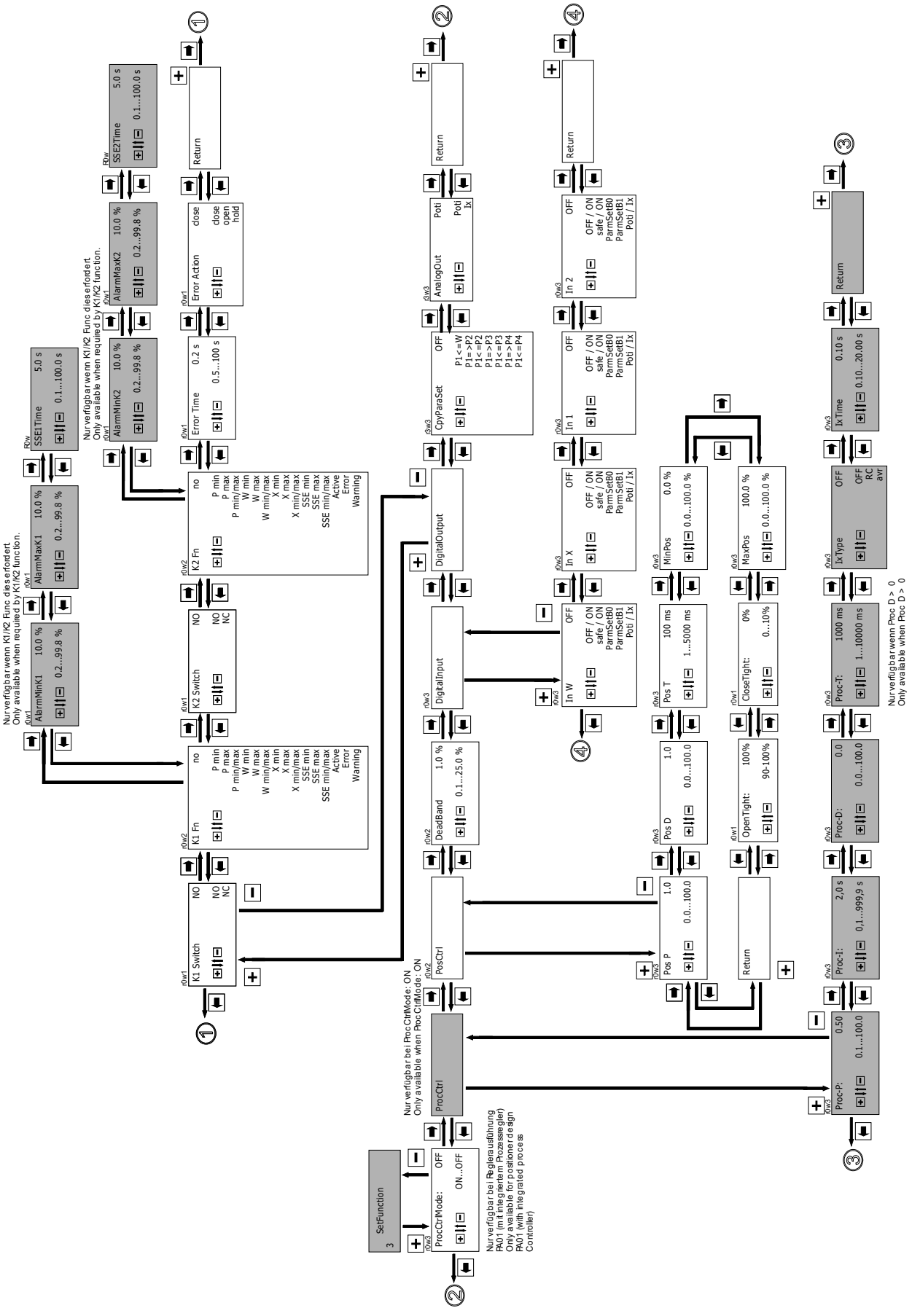
For the text language, you can choose between D-German, GB-English and N-Norwegian.

HelpText:

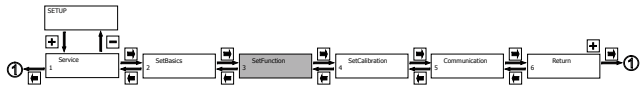
The help texts that appear as a default in the second line of the display can be masked.

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

16.2.3.7 Menu 3 SetFunction



16.2.3.7.1 Explanation of parameters for 3 SetFunction



16.2.3.7.1.1 Setting the process controller parameters (optional)

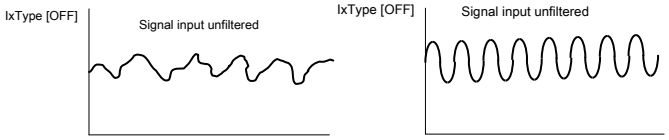
The following menus are only available for the design with integrated process controller (PA01).

ProcCtrlMode:

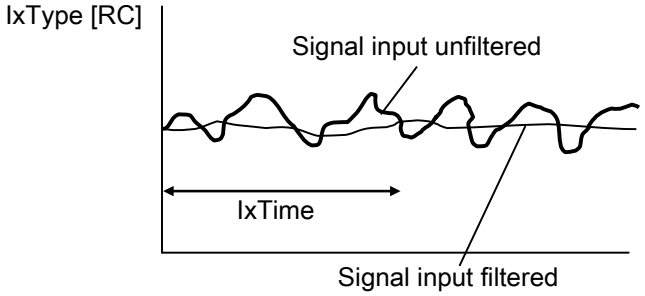
Switches the process controller on or off.

ProcCtrl: Submenu for setting process controller parameters. Only available when **ProcCtrlMode:** is **ON**.

- **Proc-P:** Indicates the KP amplification of the process controller.
- **Proc-I:** Indicates the Ti reset time for the process controller.
- **Proc-D:** Indicates the Kd process controller differential component.
- **Proc-T:** Indicates the Tv delay time for the process controller. Only available if Proc-D > 0.
- **IxType:** Defines the type of actual value input filter.
- **OFF:** Actual value input filter deactivated.

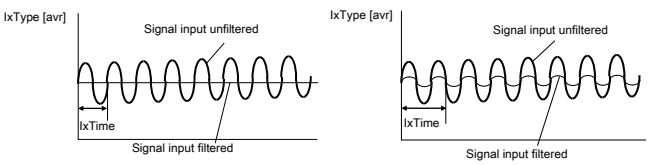


RC: The actual value input signal is filtered via a low pass filter.



Avr: The actual value input signal is calculated by averaging.

IxTime: Defines the filter time for the actual value input.

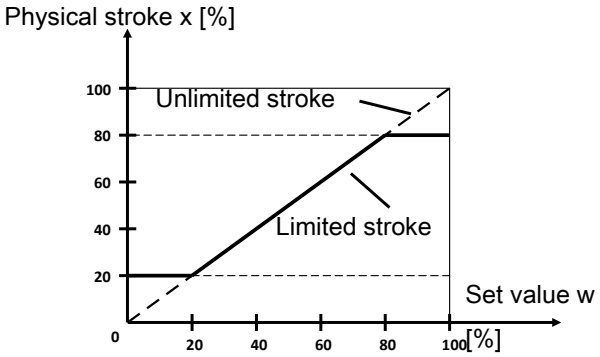


16.2.3.7.1.2 Setting the positioner parameters

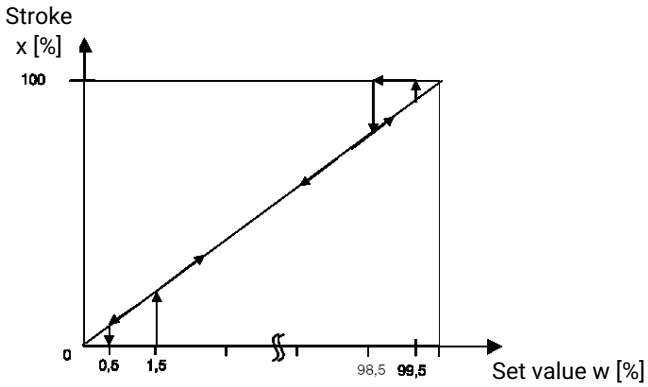
PosCtrl:

Submenu for setting positioner parameters.

- **Pos P:** Corresponds to the positioner's KP amplification. The optimum value is determined by the controller during initialization.
- **Pos D:** Corresponds to the positioner's D amplification.
- **Pos T:** Corresponds to the decay time for the positioner's D component.
- **MinPos:** Defines the lower position of the control range (serves as a closing limit).
- **MaxPos:** Defines the upper position of the control range (serves as a stroke limit).



OpenTight and **CloseTight**: Determines the close tight function areas (complete pressurization or ventilation of the actuator).
With this function the valve can be moved into the seat using the maximum possible actuator force. The close tight function can be activated for one end or both end positions.
Example:
If the setting CloseTight 0.5 % and OpenTight 99.5 % is made, the valve closes or opens fully according to the following diagram.
The hysteresis is 1 %.



If the control characteristic curve is changed to the values 1:25 or 1:50, the value for CloseTight should be set at >2.0 (if the characteristic curve is 1:50) or >4.0 (if the characteristic curve is 1:25) in order to close the valve fully.

16.2.3.7.1.3 Setting the dead zone

DeadBand:

Defines the permissible control deviation (dead zone) between set value and actual value.

Effects both the positioner and the process controller.

NOTICE

- ▶ The level of the system deviation should always correspond to the requirements of the valve and the control circuit. It is recommended that you do not set a value of < 1.0%, since this could cause oscillating control characteristics (especially for actuators with discontinuous movement profiles). This could put a great deal of stress on the internal pilot valves and cause them to reach the end of their service life more quickly.
- ▶ 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.

16.2.3.7.1.4 Setting the optional digital input parameters

Digital Input:

Submenu for setting the digital inputs.

- **In W:** Defines the functions of the High signal at digital input In W (connection at set value input, only effective for manual operation).
- **In X:** Defines the functions of the High signal at digital input In X (connection at actual value input, only effective when operating as a positioner).
- **In 1:** Defines the functions of the High signal at digital input 1.
- **In 2:** Defines the functions of the High signal at digital input 2.

Parameters	Function	Function at low signal level	Function at high signal level
OFF	Digital inputs deactivated		
OFF/ON	Sets the positioner to the pause mode	OFF: Positioner in pause mode	ON: Positioner active
Safe/ON	Moves the positioner into the safety position	Safe: Positioner moves to the position defined under Error Action	ON: Positioner active
ParmSetB0	Loads parameter sets into the working memory	See following table	
ParmSetB1	Loads parameter sets into the working memory		

Parameters	Function	Function at low signal level	Function at high signal level
Poti / Ix	Defines the function of the actual value output	Poti: Valve position	Ix: Process actual value

Current signal for ParmSetB1	Current signal for ParmSetB0	Memory which is read out
0	0	P1
0	1	P2
1	0	P3
1	1	P4

NOTICE

- ▶ Before loading another parameter set, this must be loaded into the relevant memory.

If a digital input (In W, In X, In 1 or In 2) is set to the OFF / ON or Safe / ON function and the digital signal "High" is not connected, the following messages will be displayed:

- **In 1 no Signal:** The positioner moves to the safe position or is stopped.
- **In 2 no Signal:** The positioner moves to the safe position or is stopped.
- **In W no Signal:** The positioner moves to the safe position or is stopped.
- **In X no Signal:** The positioner moves to the safe position or is stopped.

16.2.3.7.1.5 Setting output functions and switch points

DigitalOutput:

Submenu for setting relay outputs K1 and K2.

- **K1 Switch:** Defines the output contact type.
  NO – make contact or NC – break contact
- **K1 fn:** Determines the function of output K1.

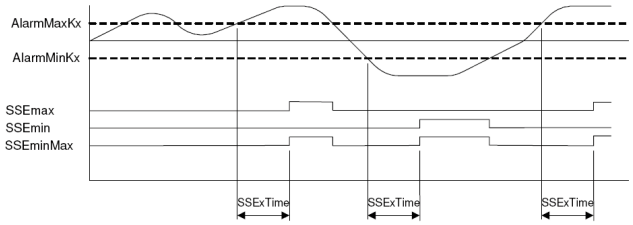
(no)	No function
(P min)	Below the valve position preset under **AlarmMinK1**
(P max)	Above the valve position preset under **AlarmMaxK1**
(P min/max)	Above or below the preset valve positions
(W min)	Below the set value preset under **AlarmMinK1**
(W max)	Above the set value preset under **AlarmMaxK1**
(W min/max)	Above or below the preset set value
(X min)	Lower than the actual value preset under **AlarmMinK1**
(X max)	Above the actual value preset under **AlarmMaxK1**

(X min/max)	Above or below the preset actual value
(SSE min)	Below the control deviation preset under **AlarmMinK1**
(SSE max)	Above the control deviation preset under **AlarmMaxK1**
(SSE min/max)	Above or below the preset actual value
Active	Active if the controller is in the OFF-mode
Error	Error message
Warning	Warning message

- **AlarmMinK1:** Sets the switch point in % under which output K1 is switched.
- **AlarmMaxK1:** Sets the trigger threshold in % over which output K1 is switched.
- **SSE1Time:** Determines the delay time for output K1 between error detection and error message for a permanent system deviation.
- **K2 Switch:** Defines the output contact type.
  NO – make contact or NC – break contact
- **K2 fn:** Determines the function of output K2.

(no)	No function
(P min)	Below the valve position preset under **AlarmMinK2**
(P max)	Above the valve position preset under **AlarmMaxK2**
(P min/max)	Above or below the preset valve positions
(W min)	Below the set value preset under **AlarmMinK2**
(W max)	Above the set value preset under **AlarmMaxK2**
(W min/max)	Above or below the preset set value
(X min)	Lower than the actual value preset under **AlarmMinK2**
(X max)	Above the actual value preset under **AlarmMaxK2**
(X min/max)	Above or below the preset actual value
(SSE min)	Below the control deviation preset under **AlarmMinK2**
(SSE max)	Above the control deviation preset under **AlarmMaxK2**
(SSE min/max)	Above or below the preset actual value
Active	Active if the controller is in the OFF-mode
Error	Error message
Warning	Warning message

- **AlarmMinK2:** Sets the switch point in % under which output K2 is switched.
- **AlarmMaxK2:** Sets the trigger threshold in % over which output K2 is switched.
- **SSE2Time:** Determines the delay time for output K2 between error detection and error message for a permanent system deviation.



16.2.3.7.1.6 Setting the error time and error action

ErrorTime:

Determines the delay time between error detection and error message.

ErrorAction: Defines the behaviour of the valve if there is an error message.

- **Close**: The valve is moved to the CLOSED position.
- **Open**: The valve is moved to the OPEN position.
- **Hold**: Valve remains at its current position.
- **Safe**: The valve is vented and thereby moved to its safety position.

16.2.3.7.1.7 Storing parameter sets

CpyParaSet:

The current positioner settings can be copied and read out in different memories.

It is not possible to load all changed control parameters into the programme memories. Please refer to chapter 16.4 for an overview of the parameters which can be stored. If a parameter cannot be stored, it is active in all memories.

(P1 <= W)	Write from W to P1
(P1 => P2)	Write from P1 to P2
(P1 <= P2)	Read from P2 to P1
(P1 => P3)	Write from P1 to P3
(P1 <= P3)	Read from P3 to P1
(P1 => P4)	Write from P1 to P4
(P1 <= P4)	Read from P4 to P1
(OFF)	Storage function deactivated
P1	Memory 1
P2	Memory 2
P3	Memory 3
P4	Memory 4
W	Default setting

The product automatically stores all parameters in working memory P1.

16.2.3.7.1.8 Defining the actual value output

AnalogOut:

Defining the function of the 4-20 mA actual value output

Poti:

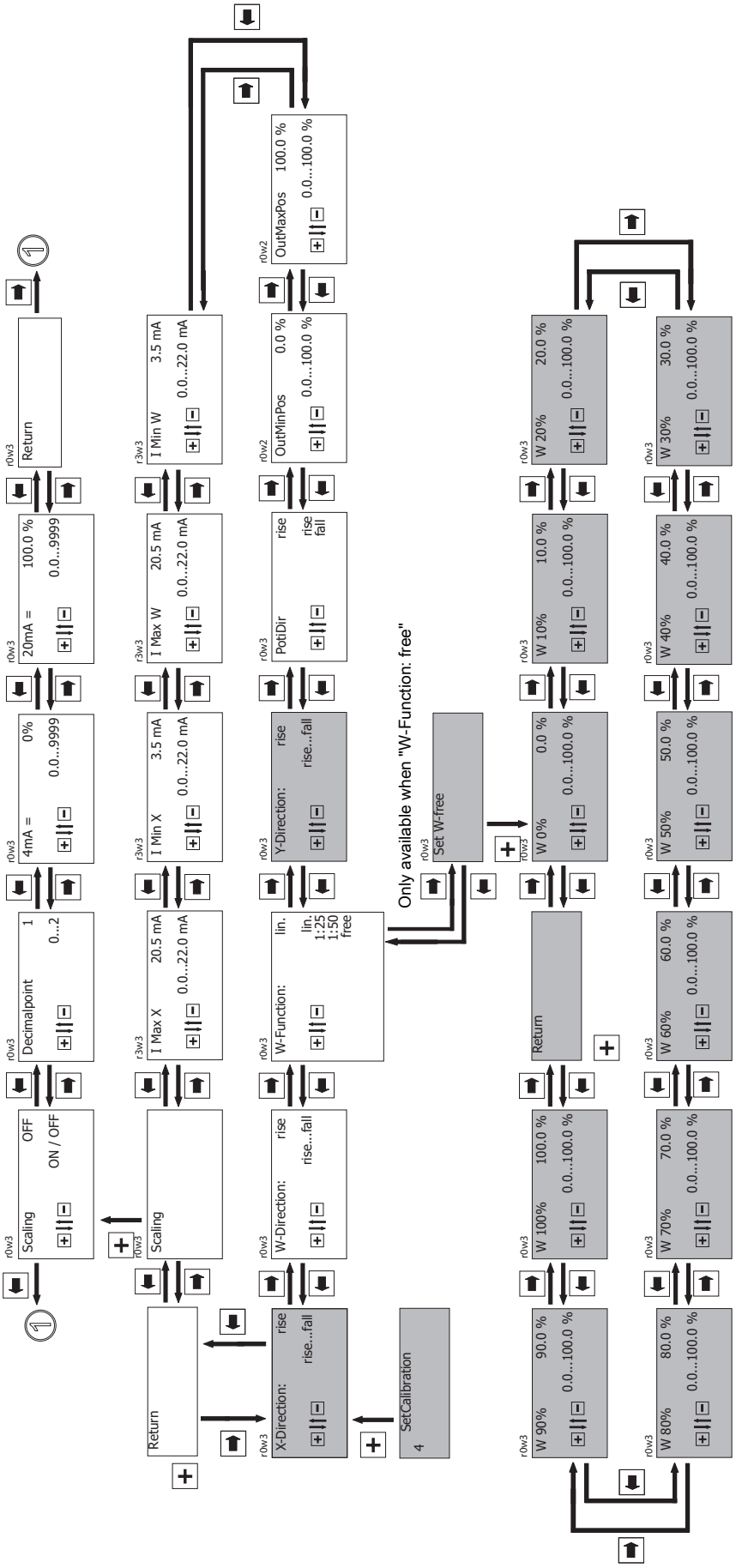
The actual valve position is emitted at the 4-20 mA output.

Ix:

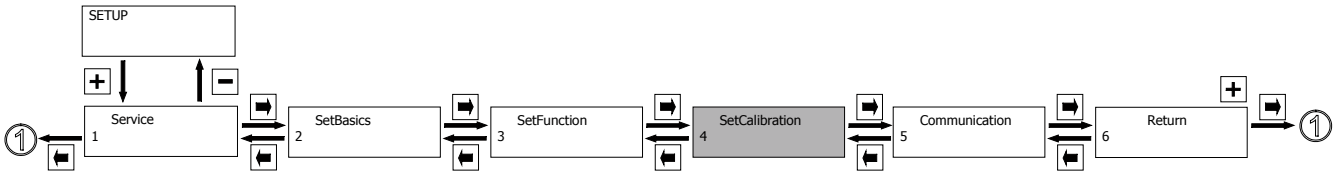
The current actual value is displayed at the 4–20 mA output

(only available in the version with integrated process controller)

16.2.3.8 Menu 4 SetCalibration



16.2.3.8.1 Explanation of parameters for 4 SetCalibration



16.2.3.8.1.1 Determining the direction of actual value and set value

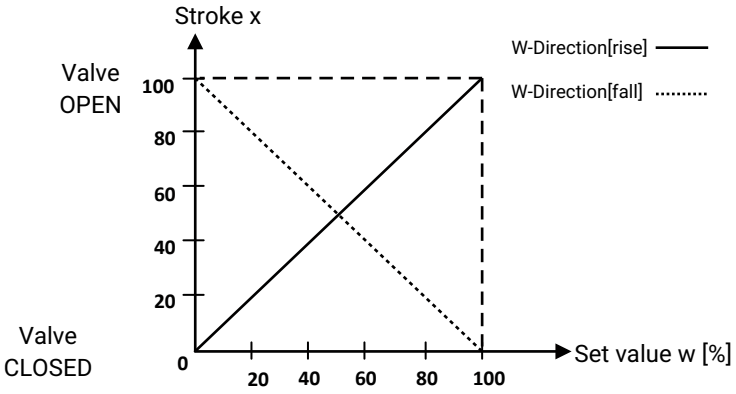
W-Direction:

Defines the direction of the set value signal (rising/falling).

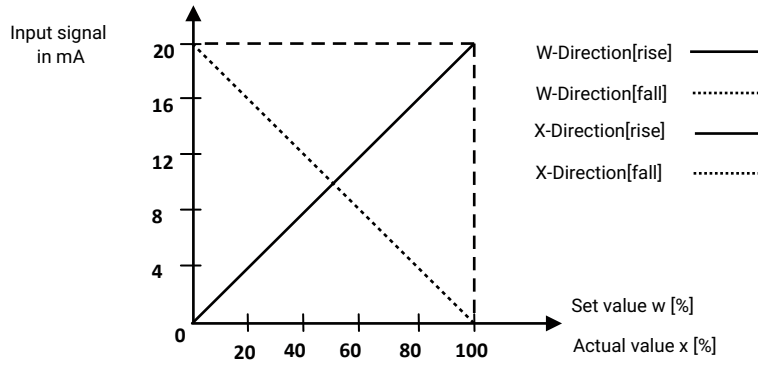
X-Direction:

Defines the direction of the actual value signal (rising / falling). Only available when positioner is working as a process controller.

Working as a positioner:



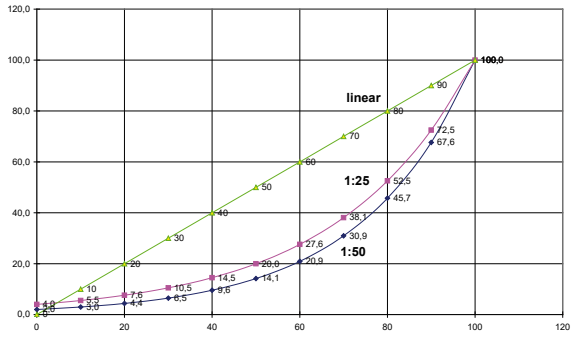
Working as a process controller:



16.2.3.8.1.2 Defining the characteristics of the control curve

W-Function:

The characteristics of the control characteristic can be defined (linear/ 1:25 / 1:50 / free).



In order to be able to close the valve fully at a characteristic selection of 1:25 or 1:50, the close tight function must be set to the value >2.0 (for characteristic 1:50) or >4.0 (for characteristic 1:25).

SetW-free:

Eleven calibration points on the control characteristic can be programmed as required.

Display	Function	P1	P2	P3	P4	Default setting
Set W-free	0 %					0 %
	10 %					10 %
	20 %					20 %
	30 %					30 %
	40 %					40 %
	50 %					50 %
	60 %					60 %
	70 %					70 %
	80 %					80 %
	90 %					90 %
	100 %					100 %

Y-Direction:

Defines the direction of the process controller output (rising / falling). An inverted process control system can be realized.

16.2.3.8.1.3 Defining the direction of the travel sensor

Pot Dir:

The direction of the actual value potentiometer can be defined.

Rise: For valves with rising direction of action

- Linear actuators: Valve spindle rises when valve opens
- Quarter turn actuators: Viewed from above, shaft turns anti-clockwise when valve opens.

Fall: For valves with falling direction of action

- Linear actuators: Valve spindle falls when valve opens
- Quarter turn actuators: Viewed from above, shaft turns clockwise when valve opens.

In combination with the respective direction of the valve, these settings mean that the valve opens when the signal rises and the display and output values have the same direction of action. If valves are operated in reverse (rising signal closes valve), the W-Direction parameter must be reset, otherwise the display and the output signal would be inversed.

16.2.3.8.1.4 Defining the actual value output signal

NOTICE

▶ If a higher value is entered for OutMinPos than for OutMaxPos, the direction of the output signal is inverted.

OutMinPos:

Defines the valve position at which an actual value signal of 4 mA is emitted at the output.

OutMaxPos:

Defines the valve position at which an actual value signal of 20 mA is emitted at the output.

16.2.3.8.1.5 Determining switch points for error monitoring

I Min W:

Defines the point below which the set value signal activates an error message.

I Max W:

Defines the point above which the set value signal activates an error message.

I Min X:

Defines the point below which the actual value signal activates an error message.

I Max X:

Defines the point above which the actual value signal activates an error message.

16.2.3.8.1.6 Scaling the actual value and set value display

Scaling:

Submenu for scaling the actual value and set value display, which defines whether the actual value and set value display is to be displayed as a scaled variable or in percent.

ON: display as scaled variable; OFF: display in percent

This setting point can be used to adapt the display to the physical variable of the controlled system to be regulated.

This means that the variable to be regulated can be entered and read directly.

With the control of process variables (ProcCtrl Mode: ON), the setting must correspond to the signal output of the process sensor.

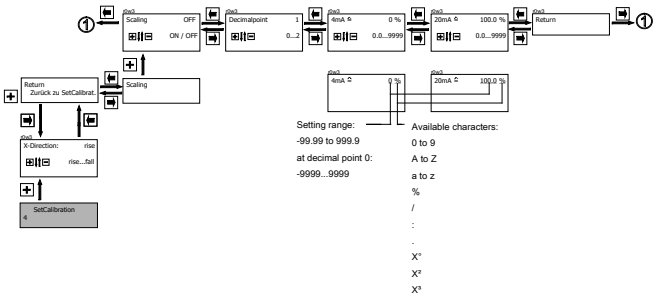
The physical unit is entered separately from the value in the same context.

Typical setting values:

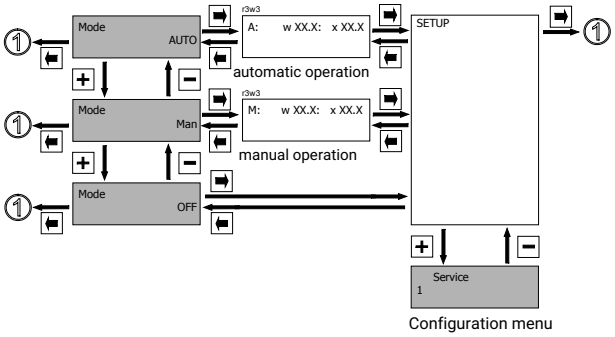
- xx °C / °F → temperature control
- xx bar / psi → pressure control
- xx l/h / m³/h → flow control

- **Decimalpoint:** Determines the number of digits displayed after the decimal point.
- **4 mA ≙:** Defines the value which is displayed when there is a 0/4 mA signal.
- **20 mA ≙:** Defines the value which is displayed when there is a 20 mA signal.

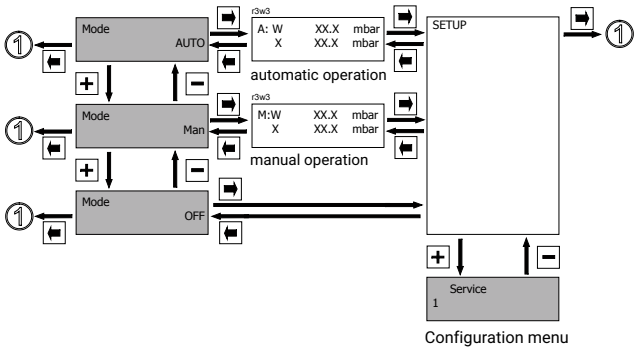
Possible setting values for the freely scalable actual and set value inputs:



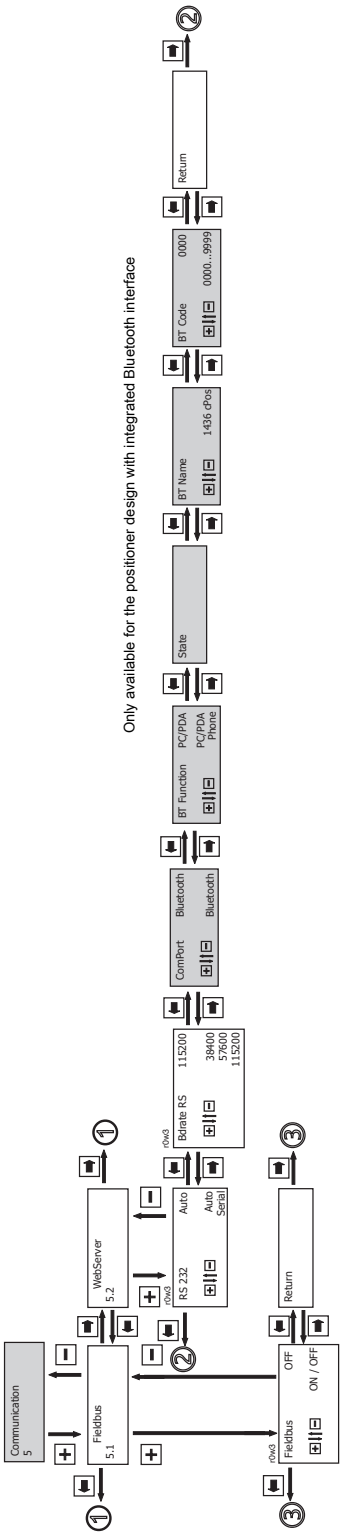
Display when Scaling OFF is set:



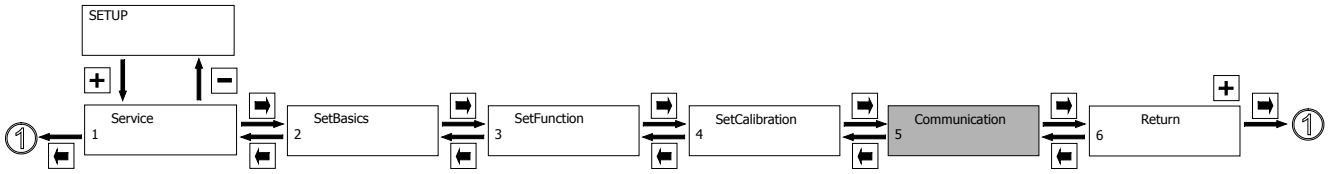
Display when Scaling ON (e.g. mbar) is set:



16.2.3.9 Menu 5 Communication



16.2.3.9.1 Explanation of parameters: 5 Communication



16.2.3.9.1.1 13.5.1. Setting the fieldbus parameters

Fieldbus:

Only available in fieldbus version

For details see separate operating instructions.

16.2.3.9.1.2 13.5.2. Setting the communication parameters

NOTICE

▶ For details on how to use the GEMÜ e.sy-com interface and operating the browser see separate operating instructions.

WebServer:

Submenu for setting the communication parameters

RS 232:

Defines the type of RS 232 connection

Auto	with connection to a PC/laptop or industrial modem
Serial	with connection to a PC/laptop

Bdrate RS:

Defines the transmission rate of the serial connection.

Bdrate RS	38400 baud
	57600 baud
	115,200 baud (default setting)

17 Troubleshooting

No.	Error message	Description	Condition for the occurrence of the error	Error cause
000	NO ERROR	There are no errors	-	-
010	Iw < 4 mA **Error**	The set value signal is lower than 4 mA	The controller is in automatic mode	A cable break at the set value input
011	Iw > 20 mA **Error**	The set value signal is higher than 20 mA	The controller is in automatic mode	The set value signal is higher than 20 mA
012	Ix < 4 mA **Error**	The actual value signal is lower than 4 mA	The process controller is active	A cable break at the actual value input
013	Ix > 20 mA **Error**	The actual value signal is higher than 20 mA	The process controller is active	The actual value signal is higher than 20 mA

No.	Error message	Description	Condition for the occurrence of the error	Error cause
020	Pot wrong dir **Error**	The potentiometer has recognised the wrong control function during initialization.	Parameter “CtrlFn” is set to AUTO and a valve with control function 3 is recognized, from which the actuator has moved in the wrong direction. Parameter “CtrlFn” is set for a fixed control function. This set control function is not in accordance with the control function determined during initialization.	The pneumatic connections for “CLOSED” and “OPEN” on the valve have been switched or the parameter “Pot Dir” is set on “fall”. The wrong control function is set.
021	Wrong function **Error**	An incorrect control function was recognized during automatic initialization.	Parameter “CtrlFn” is set for a fixed control function. This set control function is not in accordance with the control function determined during initialization.	The wrong control function is set in parameter “CtrlFn”. If the parameter is set to AUTO, the product determines the corresponding control function and stores it (not for control function 8 – in this case, carry out manual initialization or set parameter “CtrlFn” to “DNO”).
022	Pneumatic Error **Error**	During automatic initialization of the valve, a pneumatic error was detected	- Control air failed - Throttle screw(s) completely screwed in or screwed in too far - The minimum stroke was undershot - End positions cannot be reached - Leakage in the system	Check the stroke of the pneumatic system. Check the position of the throttle screw(s), leakage and end positions. Observe the min. control pressure of the valve.
023	Leakage **Error**	During automatic initialization of the valve, a leakage was detected.	The controller is in initialization mode.	Check the pneumatic system for leakage and carry out initialization again
030	Air missing **Warning**	A failure of the compressed air was discovered.	The product tries to change the valve position, but it changes in the wrong direction. **Please note:** Depending on the positioner’s set value reaction time, the error may be acknowledged in the meantime. It then recurs.	- Leakage in the system - No compressed air - Failure of the internal pilot valves - Valve mechanically locked
060	TrvlSensErr **Error**	A cable break, short-circuit or exceeded range in the travel sensor connection or in the travel sensor was detected.		- Wrong mounting kit - Incorrect mounting - Faulty travel sensor - Faulty travel sensor connection
200	Error EEPROM **Error**	An error has occurred with the external EEPROM.	This error is generated if the calibration data from the IO card EEPROM could not be read.	The error is only displayed for one minute when the controller is switched on and then disappears automatically. The automatic control system still operates correctly, but the controller must be sent to GEMÜ for examination.

No.	Error message	Description	Condition for the occurrence of the error	Error cause
201	Intern.Error **Information**	An error has occurred with an EEPROM.	This information is displayed if an error has occurred while attempting to access an EEPROM.	The message is generated if an EEPROM could not be read from or written to. Send the controller to GEMÜ for repair.

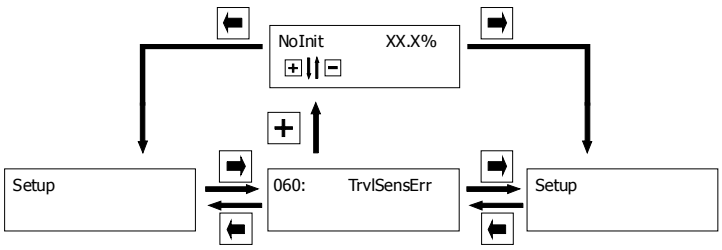
	Error message	Description	Condition for the occurrence of the error	Error cause
	In 1 no Signal	No signal at digital input In 1	Parameter In 1 is set to OFF/ON or Safe/ON	Connect signal to digital input In 1
	In 2 no Signal	No signal at digital input In 2	Parameter In 2 is set to OFF/ON or Safe/ON	Connect signal to digital input In 2
	In W no Signal	No signal at digital input In W	Parameter In W is set to OFF/ON or Safe/ON	Connect signal to digital input In W
	In X no Signal	No signal at digital input In X	Parameter In X is set to OFF/ON or Safe/ON	Connect signal to digital input In X

All error messages can be read in the menu item ErrorList (**1 Service/1.3 Diagnosis**).

The menu item ClearErrorList (**1 Service/1.3 Diagnosis**) can be used to clear the internal error memory.

Occurrence of the error in the “NoInit” menu:

The error message is displayed in the “NoInit” menu. Pressing the ⊞ or ⊟ key switches off the display of the error, and “NoInit” appears with the display of the current valve position. The valve can be moved by pressing the ⊞ and ⊟ keys. The error message is displayed again when the action is complete. To end the action, the menu must be exited by pressing the ← or → key.



18 Inspection and maintenance

⚠ WARNING

The equipment is subject to pressure!

- ▶ Risk of severe injury or death
- ● Depressurize the plant or plant component.
- ● Completely drain the plant or plant component.

NOTICE

Use of incorrect spare parts!

- ▶ Damage to the GEMÜ product
- ▶ The manufacturer liability and guarantee will be void.
- ● Use only genuine parts from GEMÜ.

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.

The operator must carry out regular visual examinations of the products, depending on the operating conditions and the potentially hazardous situations, in order to prevent leakage and damage.

1. Have servicing and maintenance work performed by trained personnel.
2. Wear appropriate protective gear as specified in the plant operator's guidelines.
3. Disconnect from power supply.
4. Shut off plant or plant component.
5. Secure plant or plant component against recommissioning.
6. Depressurize the plant or plant component.
7. Actuate products that are always in the same position four times a year.

18.1 Spare parts

No spare parts are available for this product. If it is faulty, please return it to GEMÜ for repair.

18.2 Cleaning the product

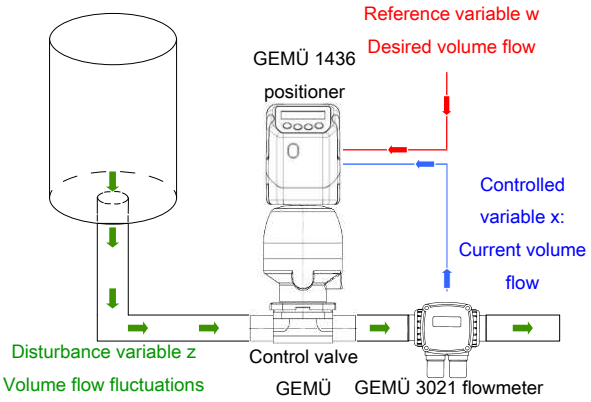
- Clean the product with a damp cloth.
- Do **not** clean the product with a high pressure cleaning device.

19 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.

20 General information regarding control engineering

20.1 The control circuit



20.2 Control engineering terminology

Reference variable (see Glossary)
Controlled variable (see Glossary)
Control difference (see Glossary)
Correcting variable y (see Glossary)
Disturbance variable z (see Glossary)

20.3 Control parameters

Explanation of product parameters:

Proc P: K_p
Proc I: T_n
Proc D: K_d
Proc T: T_v
Proportional band Xp (see Glossary)
Proportional action factor Kp (see Glossary)
Derivative action time Tv (see Glossary)
Differential component (D component) (see Glossary)
Integral-action component (I component) Ki (see Glossary)
Reset time Tn (see Glossary)

20.4 Adaptation of the controller to the controlled system

Optimisation of the controller:

In order to achieve good behaviour of the control circuit, it is necessary to adapt the positioner to the process. Good valve behaviour, for instance, can be quick adjustment of maximum power for pre-shooting or non-overshooting-free adjustment of maximum power if the adjustment of power takes longer. The optimum control parameters must be determined "manually" by trial and error through experimentation or rule of thumb.

Explanation of product parameters:

Proc P: K_p

Proc I: T_n

Proc D: K_d

Proc T: T_v

Interpretation of the controller parameters according to Ziegler-Nichols:

The following process is intended to help to adapt the controller to the controlled system (however this process can only be implemented on controlled systems where it is possible to let the controlled variable oscillate of its own accord).

- Set the values for **Kp (Proc P)** and **Tv (Proc T)** to their minimum and the value for **Tn (Proc I)** to 0 (this leads to the smallest possible effect of the positioner).
- Enter the desired set value manually in manual mode.
- Slowly increase **Kp (Proc P)** (decrease **Xp**), until the controlled variable starts to oscillate harmoniously. Ideally, the control circuit should be stimulated to oscillate by erratic set value changes during the **Kp** adjustment.
- Note the **Kp** value thus obtained as a critical proportional action factor **Kp,krit**.
- Following this, determine the duration of an oscillation as **Tkrit**. If possible, use a stopwatch to measure several oscillations and use the arithmetic mean as **Tkrit**.
- Use the values thus determined for **Kp,krit** and **Tkrit** to calculate the missing **Kp**, **Tn** and **Tv** parameters according to the following table.

	Kp = Proc P	**Tn = Proc I**	**Proc D**	**Tv = Proc T**
P	0.50 x Kp,krit	0	0	0
PI	0.45 x Kp,krit	0.85 x Tkrit	0	0
PID	0.59 x Kp,krit	0.50 x Tkrit	0.59 x Kp,krit	0.12 x Tkrit

- If necessary, re-adjust the **Kp** and **Tn** values a little until the control system shows satisfactory behaviour

20.5 Differential equation of the product

$$y = \mathrm{ProcP} * \left[x_d + \frac{1}{\mathrm{ProcI}} * \int x_d \, dt \right] + \mathrm{ProcD} * \left[\frac{dx_d}{dt} - \mathrm{ProcTv} * \frac{dy}{dt} \right]$$

20.6 Effects of the positioner parameters on the automatic control system

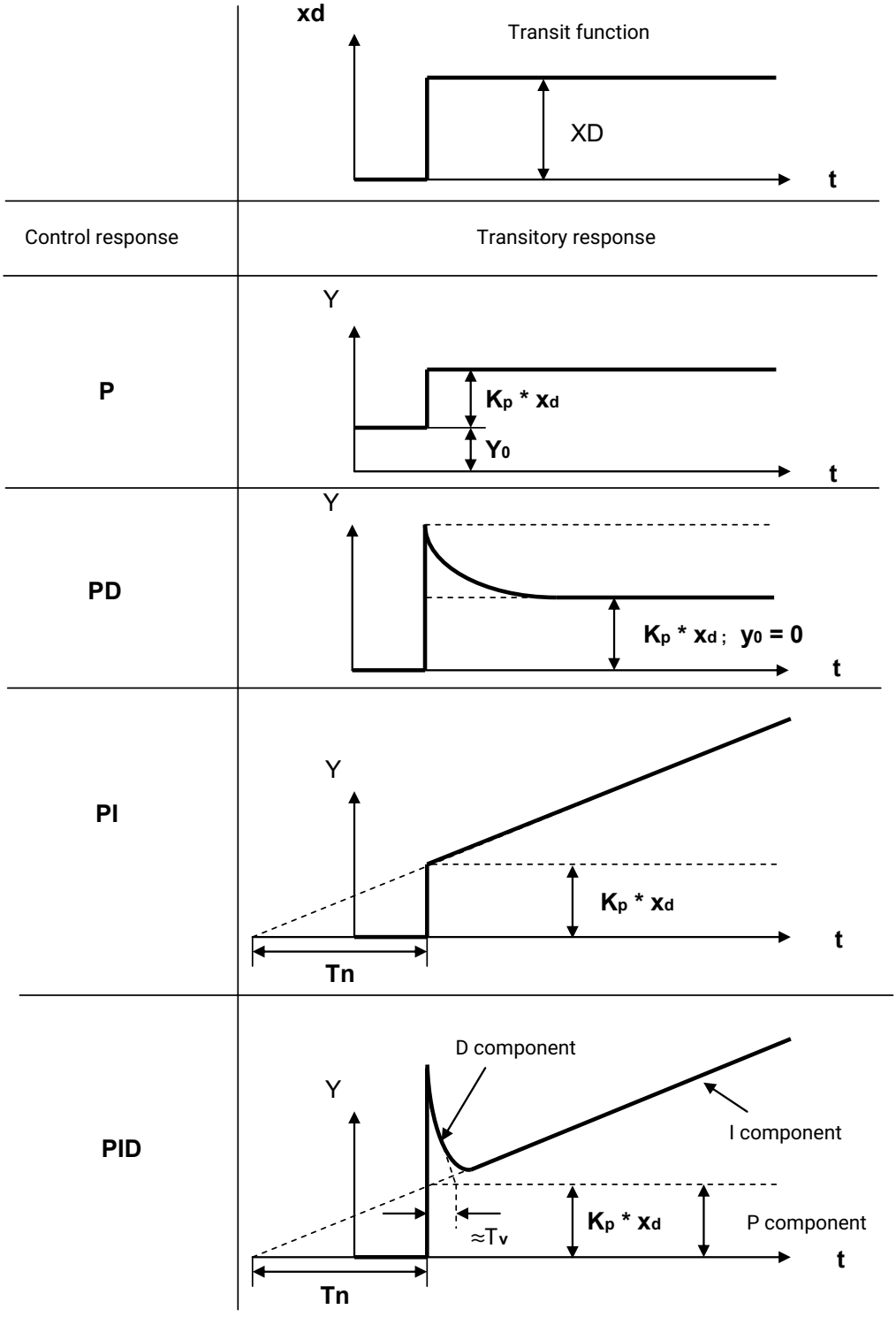
Proc P:	
Larger:	The controller controls more quickly but tends to oscillate and is less precise in its control. The set value is achieved in larger steps by increasing the manipulated variable
Smaller:	The controller controls more slowly as the set value is achieved in smaller steps by reducing the correcting variable. Control is more accurate.

Proc I:	
Larger:	The positioner reacts more slowly to changes to actual values. Proc I should be increased for actual value sensors with relatively slow output signals.
Smaller:	The controller reacts more quickly to changes to actual values.

Proc D:	
Larger:	Slows down the manipulated variable y when moving to the set value. Control is slower.
Smaller:	Set value is achieved faster.

Proc T:	
Larger:	The system deviation has a longer effect although set value = actual value

20.7 Control characteristics and transitory responses



Control difference
The control difference is the difference between the reference variable and the controlled variable. It is labelled with xd. The controlled variable is calculated as follows: xd = w - x.

Controlled variable
The controlled variable is the actual value and is labelled with x. The controlled variable represents the currently measured volumetric flow.

Correcting variable y
Input variable for the controlled system. The process controller guidance to the positioner regarding the position in which the triggered control valve must be driven in order to achieve the desired volumetric flow.

Derivative action time Tv
It is used to set the intensity of the D component.

Differential component (D component)
For an inverse controller (heating) the D component has the following effects: If the controlled variable is reduced due to a disturbance in the controlled system, the D component counteracts the change by creating a positive regulation ratio. If the controlled variable increases due to a disturbance in the controlled system, the D component counteracts this change by creating a negative regulation ratio. The higher the derivative action time Tv is set, the stronger the dampening reaction.

Disturbance variable z
An external variable that influences the controlled system that normally cannot be influenced (e.g. volume flow fluctuations).

Integral-action component (I component) Ki
The I component Ki changes the controller regulation ratio continuously until the actual value reaches the set value. The regulation ratio will be integrated upwards or downwards as long as a system deviation exists. The influence of the I component will become larger the longer a system deviation exists. The shorter the reset time Tn and the larger the system deviation, the stronger (faster) the effect of the I component. The I component hinders a constant system deviation.

Proportional action factor Kp
Instead of the designation proportional band, the expression proportional-action factor Kp is used frequently. Conversion of Xp to Kp is: Xp = 100[%]/Kp or Kp = 100[%]/Xp The Kp value indicates how much the controlled variable x changes if the correcting variable y is adjusted. Kp = Δx/Δy = x2 – x1/y2 – y In order to obtain a unit-independent relationship in the equation above, x and y must be divided by their respective maximum values (100%). In this case, a high Kp value results in smaller deviation. However, if the Kp value is set too high, it leads to an increased tendency for the control circuit to oscillate.

Proportional band Xp
The proportional band tells us the extent to which the controlled variable x changes when the manipulated variable y is adjusted. Xp can be used to adapt the controller amplification to the controlled system. If a small proportional band is selected, it has a large manipulated variable y (e.g. 20 mA) as a result, i.e. the positioner reacts faster and harder with a small proportional band. If a too small proportional band is chosen, this leads to oscillation of the control circuit.

Reference variable
The reference variable is the set value and labelled with w. The reference variable is the input variable of the control circuit. The reference variable must follow the controlled variable in the specified dependence.

Reset time Tn
The reset time Tn determines the duration how long a system deviation is adjusted. If a high value is preset for the reset time Tn this means a small influence of the I component and vice-versa. During the reset time Tn the controlled variable change caused by the P component is added again. Thus there is a fixed relationship between the P component and the I component. If the P component is thus changed, the time response changes too if the Tn value remains constant. Ki = 1/Tn

22 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.

23 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.

24 Declaration of Incorporation according to 2006/42/EC (Machinery Directive)

EU Declaration of Incorporation

according to the EC Machinery Directive 2006/42/EC, Annex II B

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 relevant essential health and safety requirements in accordance with Annex I of the above-mentioned Directive.

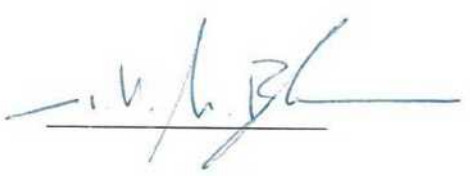
Product:	GEMÜ 1436
Product name:	Intelligent positioner and integrated process controller
The following essential health and safety requirements of the EC Machinery Directive 2006/42/EC, Annex I have been applied or adhered to:	1.1.2.; 1.1.3.; 1.1.5.; 1.3.2.; 1.3.4.; 1.5.1.; 1.5.4.; 1.5.8.; 1.6.1.; 1.7.1.; 1.7.2.; 1.7.3.; 1.7.4.; 1.7.4.1.; 1.7.4.2.; 1.7.4.3.
The following harmonized standards (or parts thereof) have been applied:	EN ISO 12100:2010

We also declare that the specific technical documents have been created in accordance with part B of Annex VII.

The manufacturer undertakes to transmit relevant technical documents on the partly completed machinery to the national authorities in response to a reasoned request. This communication takes place electronically.

This does not affect the industrial property rights.

The partly completed machinery may be commissioned only if it has been determined, if necessary, that the machinery into which the partly completed machinery is to be installed meets the provisions of the Machinery Directive 2006/42/EC.



M. Barghoorn
Head of Global Technics

Ingelfingen, 24/07/2023

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

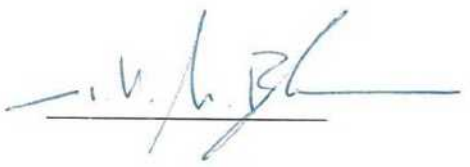
EU Declaration of Conformity

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 1436
Product name:	Intelligent positioner and integrated process controller
The following harmonized standards (or parts thereof) have been applied:	EN 61326-1:2013; EN 61000-6-4:2007/A1:2011; EN 61000-6-2:2005/AC:2005



M. Barghoorn
Head of Global Technics

Ingelfingen, 24/07/2023

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

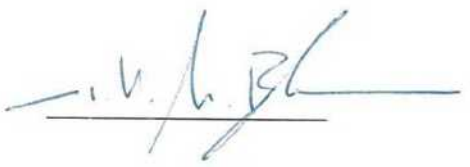
EU Declaration of Conformity

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

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

Product:	GEMÜ 1436
Product name:	Intelligent positioner and integrated process controller
The following harmonized standards (or parts thereof) have been applied:	EN IEC 63000:2018



M. Barghoorn
Head of Global Technics

Ingelfingen, 24/07/2023

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Subject to alteration

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