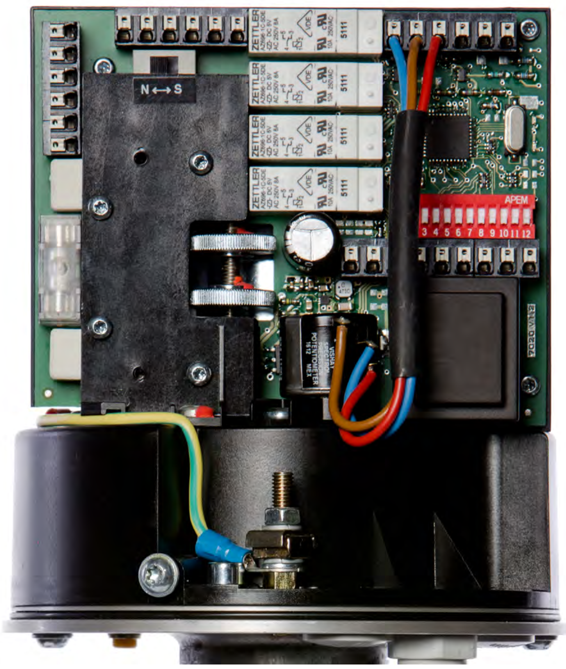
Operating Instructions **BA 7020**

Baelz 7020
Digital Positioner
in a Motorized Linear Actuator



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1. SAFETY

Carefully read these operating Instructions, especially the following safety precautions, prior to installation and operation.

Caution

Caution
Potentially hazardous situation which could result in minor injury.
Also indicates a risk which may cause material damage.

Attention

Attention
Potentially harmful situation which can result in damage to the product or an object in its environment.

Danger

Danger
Imminently hazardous situation which is likely to result in death or serious injury.

Warning

Warning
Potentially hazardous situation which may result in death or serious injury.

Tip: Instructions for use or other useful information.

1.1 Intended use

The digital positioner **Baelz 7020** controls the actuator according to the value of the control signal:
0-10 V, optionally 2-10 V / 0-20 mA, optionally 4-20 mA.
To ensure use for the purpose intended, check that the above type identification corresponds to the name plate on the positioner before starting any activities. The actual technical data of the positioner and the power supply requirements are the specifications indicated on the name plate.
Any use other than the intended use mentioned above, different tasks, and operation with other power sources than those permitted, is considered to be improper use. In case of improper use, the operator shall be solely liable for the risk presented to persons and to the device as well as to other property!
The intended use also comprises compliance with the accident prevention regulations and the DIN VDE standards of the German Institute for Standardization and the Association for Electrical, Electronic & Information Technologies. It also implies working in accordance with the safety requirements when performing all activities described in these operating instructions, under consideration of general technical rules and regulations.

1.2 For the operator

Always keep the operating instructions available and easily accessible at the site of operation of the positioner.
During set-up and operation and when performing maintenance procedures on the device, observe relevant occupational safety regulations, accident prevention regulations and the DIN VDE standards of the German Institute for Standardization and the Association for Electrical, Electronic & Information Technologies. Ensure compliance with any additional regional, local or in-house safety regulations applicable.
Make sure that any person assigned by you to perform the activities described in these operating Instructions has read and understood these instructions.

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1.3 Personnel

Only qualified personnel may operate this positioner or work in its vicinity. Qualified personnel are individuals who are familiar with the set-up, installation, commissioning, operation and maintenance of the positioner and possess the required qualification for their activity. The required or prescribed qualifications include, amongst others:

- Training / instruction and the authorization to switch electric circuits and devices / systems on and off in accordance with EN 60204 (DIN VDE 0100 / 0113) and the technical safety standards.
- Training or instruction in accordance with the technical safety standards for the maintenance and use of appropriate safety equipment and personal protective equipment.
- Explosion-protected versions of this device are to be operated only by personnel having undergone special training or instructions or being authorized to work on explosion-protected devices in hazardous areas.
- First aid training.

Always work safely and never perform any work which might present a hazard to persons or damage the actuator or other property in any way.

1.4 Before starting work

Prior to starting any kind of work, check that the types specified here are identical with the specifications on the name plate of the positioner: **Baelz 7020**

1.5 During operation

Safe operation can only be ensured if transport, storage, assembly, operation and maintenance procedures are performed in compliance with the safety requirements, and are performed properly and competently.

1.5.1 Transport, installation and mounting

Observe the general installation and safety regulations for heating, ventilating, air conditioning and piping. Use tools properly and competently. Wear the required personal and other protective equipment.

1.5.2 Service and maintenance

Prior to maintenance or repair, make sure that the positioner is disconnected from the power supply by qualified personnel in accordance with DIN VDE standards. The positioner requires no maintenance. However, we recommend checking the proper function of the positioner at least once a year.
For maintenance, the cover of the actuator has to be removed. Apart from this, no regular maintenance is necessary.

1.6 Working environment

Please observe the information regarding working environment given in the specifications, chapter 2.2.

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2. PRODUCT DESCRIPTION

2.1 Identification

Each Baelz 7020 positioner has a name plate. This plate includes specifications regarding the operating conditions of the device and the manufacturer’s device and serial number.

Fig. 1: Baelz positioner nameplate

2.2 Specifications

Supply voltage	230 VAC -15 % / +10 %, 50 / 60 Hz, Option: 115 VAC 50 / 60 Hz, 24 VAC 50 / 60 Hz
Fuse	internal 1,6 A/T (slow-blow)
Power consumption	approx. 5 VA
Protection rating	IP 42
Ambient temperature range - in operation	0 to 50 °C
Ambient temperature range - transport / storage	- 25 to +65 °C
Ambient humidity	5 to 90 % relative humidity (non-condensing)
Construction	fitted to actuator E07 (others also possible)
Dimensions of actuator	WxHxD approx. 120x95x60 mm (E07)
DI supply voltage	24 V DC, Imax = 5 mA
Digital input	1 configurable (eg. summer / winter switch), Imax 5mA, low=0...5VDC, high=9...38VDC, Re=5.5kΩ
Digital output	2 potential free auxiliary changeover switches, configurable (max. 250 VAC, 4A)
2 output signals	Output 1: 0/2...10 V / load impedance min. 5kΩ Output 2: 0/4...20 mA / load impedance max. 300Ω Factory setting: 0...10 V and 0...20 mA
Input signal	0/2...10V / Re 63kΩ, 0/4...20mA / Re 200Ω, measurement accuracy 0.1%
Connection	PUSH IN spring terminals stripping length: 8 mm
Wiring	wire size, AWG: min. AWG 24; max. AWG 16 solid wire / stranded wire: min. 0.2 mm²; max. 1.5 mm² with wire ferrule according to DIN 46 228/1: min. 0.25 mm²; max. 1.5 mm² with insulated wire ferrule to DIN 46 228/4: min. 0.25 mm²; max. 0.75 mm²
Operation	12 DIP switches / optional: advanced operation using free software Winbas Tools Par; Modbus mode
Interface	RS485 Modbus RTU, Baud rate 2400...19200, 1 Start, 8 pieces of data, 1 stop-bit, no parity
Memory	non-volatile semiconductor
Weight	0.2 kg

Fig. 2: Table of specifications

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2.3 Accessories and options

- Free parameterisation software (Modbus RTU) - Interface RS 485 required!
- For laptops with USB we recommend our interface convertor (Order №. 5280-051).

2.4 Operating conditions

Attention

Positioners and related actuators are suitable for installation in industrial plants and in waterworks and power plants with a low pollutant concentration.

For use outdoors or in an environment with a high pollutant concentration, such as areas with heavy traffic, industrial areas (chemical plants, sewage plants, etc.), coastal areas and the open sea, the actuators must have external parts made of non-corrosive material and must be provided with a special coating.

When used outdoors, the actuator must be protected with an additional cover against

- rain
- direct sunlight
- strong draughts
- dust

3. TRANSPORT AND STORAGE

Caution

Risk of injury caused by failure to observe the safety regulations!

- Wear the required personal and other protective equipment.
- Protect the positioner from impacts, shock, vibration and similar influences.
- Store the positioner (and, if necessary, the complete actuator/valve assembly) in a dry place.
- Observe transport and storage temperatures: -25°C to +65°C.

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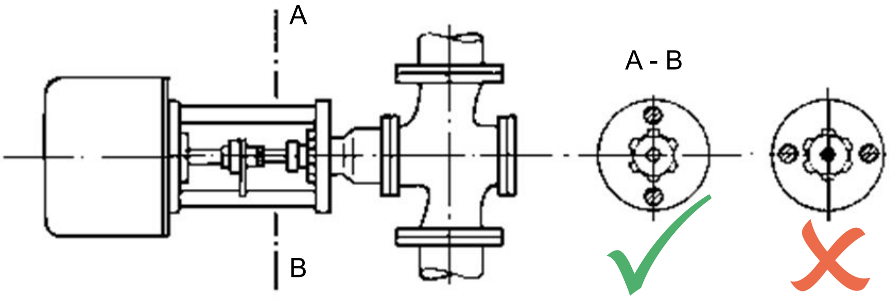
4. MONTAGE

4.1 Installation

If the unit is to be installed in a horizontal position, it should be installed such that the struts of the yoke are vertically aligned.



Installation of the unit with the actuator situated over the valve protects the actuator from soiling.

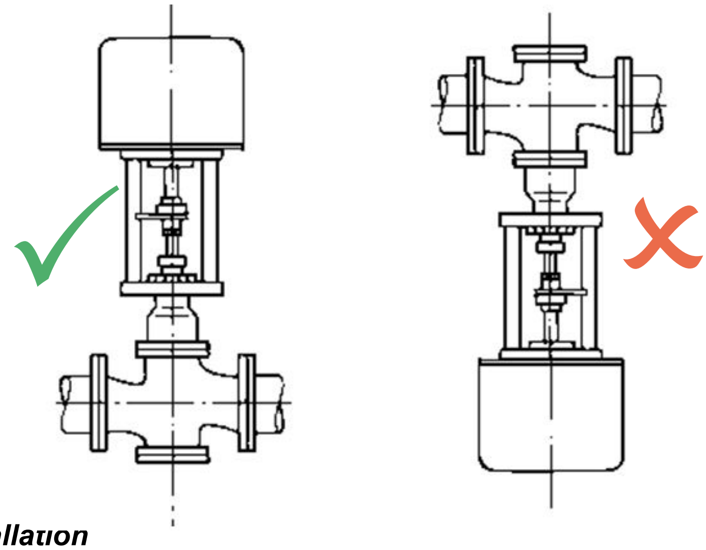


Fig. 3: Correct installation

Attention

ONLY operate actuator with valve fitted! Danger of serious damage to actuator!

- Operating the linear actuator without a valve can lead to the destruction of the actuator due to lack of a limit stop. Only operate the actuator with a valve fitted.
- Ensure that there is a gap of approx. 200 mm to enable removal of the cover if necessary.
- Check the surrounding area before installing and operating the linear actuator.
- Ensure that the valve is fitted correctly. See valve fitting instructions for details.
- Ensure correct positioning of the linear actuator. Linear actuators must not be fitted hanging downwards.

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4.2 Installation of controller

Baelz recommends buying the positioner ready installed.

4.3 Connection to electrical supply

Danger **Risk of electric shock!**

Use a safe electricity supply. Under no circumstances should dangerous voltage reach the equipment!

Safety fuses and cut-off switches must be available on site to protect from short circuiting and for activation of the positioner. The required amperage can be derived from the current consumption of the electric actuator (see name plate).
Only qualified and trained personell may carry out electrical installation.

- Take careful note of the basic instructions in this chapter before connection.
- After connection and before switching on the unit, take note of chapter 5.1 "Switching on the Baelz 7020".
- Ensure that the electrical supply is switched off when connecting to the mains! Safety measures to prevent the supply being switched on unintentionally must be in place.
- For the installation of electrical cables and connections, observe the provisions for the installation of high-voltage systems and the regulations set down by the local electricity provider.
- Check that the supply voltage and frequency match those given on the name plate of the positioner and the name plate of the actuator motor.
- The wire size should always correspond to the power consumption of the linear actuator and the required length of the wiring. The smallest permissible wire cross-sectional area for this linear actuator is 1 mm².

Danger
In case of failure: Dangerous voltage if operated without protective earth connection!
Risk of electric shock!.
→ Only operate with protective earth connection.
Trapped wires can cause short circuiting! Risk of electric shock and malfunction.

4.4 Electrical connection

Danger **Risk of electric shock!**

Dangerous voltage! Risk of electric shock.
→ Disconnect from electricity supply before removing cover.
Connections should be carried out according to the wiring diagram on the inside of the cover, see chapter 10.

Replace dummy plugs with cable glands.

1. Strip end of cable insulation.
2. Strip ends of wires.
3. For flexible cable: Use wire end ferrules according to DIN 46228.
4. Connect cables according to the project-specific circuit diagram supplied.

Protection rating IP 42 is only guaranteed if suitable cable glands are used.
Compare the thrust of the actuator and the set distance of travel with the valve specifications. Overloading can cause serious damage to the valve.
Beware of moving parts during installation and adjustment. Risk of injury and material damage.

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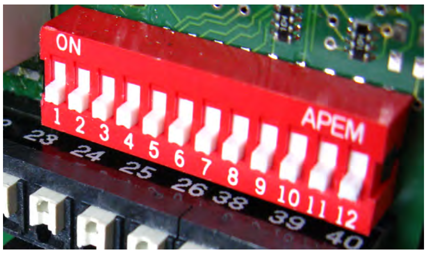
5. QUICK START GUIDE

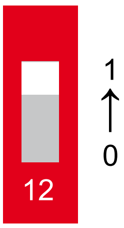
1. Set DIP switches



2. Connect to supply

(see chapter 5.1, below)

3. Start initialization run



(DIP 12 0→1, see chapter 6.4)

4. Ready to go!

5.1 Switching on the Baelz 7020:

Tip: Configure using DIP switches 1-4 and 7-10 before switching on.

For the first two seconds after switching on, the unit cannot be operated and Modbus access is not available. During this period, processes such as the calibration of the measuring modules take place.
During the first two seconds, the function of the LEDs can be checked as green and red are both on.

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6. DETAILED INSTRUCTIONS

6.1 Functions in standard mode:

These operation instructions concern the standard mode. The DIP switches are used to define the most commonly required configurations. In Modbus mode, the user can carry out additional advanced settings. The advanced settings are explained in a separate set of operating instructions: "Baelz 7020 Digital Positioner - Operating Instructions for Modbus Mode"

In standard mode, the following functions are predefined:

- The setpoint actual value is supplied to both analogue outputs (both can be connected).
- DIP switches 7, 8 and 9 are used to define the function of the positioner in standard mode. In standard mode, the positioner is set to heat. In standard mode, cooling can be selected by setting all three DIP switches, 7, 8 and 9, to position 1. Combination with split range or the 11-point characteristic is, however, not possible.
- Values for valve stroke time and switching hysteresis are determined during the initialisation run. These values are used in standard mode.
- Sensor failure at analogue input 1 and analogue input 2 (AI1 and AI2) as well as alarm 3 and alarm 4 are part of the "collective alarm" (only accessible with Modbus RTU).
- In standard mode there are no minimum or maximum limits for the set values at the analogue inputs and analogue outputs. Values from 0% to 100% are possible.
- In case of sensor failure at analogue input AI1 or AI2, the ventil closes.
- In case of a signal to the digital input, e.g. from an antifreeze thermostat, the ventil opens.
- All DIP switches are enabled and kann be operated according to Fig. Fig. 6 page 13.

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6.2 Operating the postioner

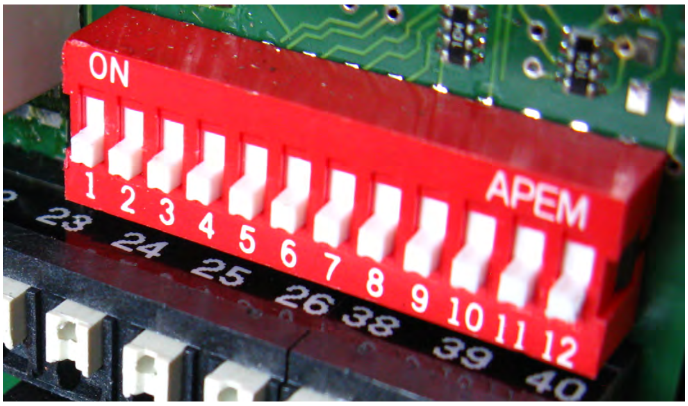

Fig. 4: DIP switches
The ex-works setting of the DIP switches is position 0, as shown.

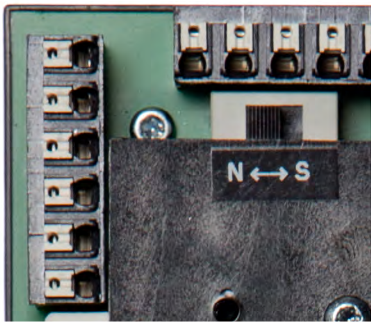

Fig. 5: N↔S switch
switches between rormal and safety mode.

Switch	Function	Position 1 "ON"	Position 0
DIP 1	Set value input: voltage, V or current, mA?	current, mA	voltage, V
DIP 2	Set value input starting at 0 V / 0 mA or 2 V / 4 mA?	2-10 V / 4-20 mA	0-10 V / 0-20 mA
DIP 3	Analogue output starting at 0 V / 0mA or 2 V / 4 mA?	2-10 V and / or 4-20 mA	0-10 V and / or 0-20 mA
DIP 4	Direction of control action: valve closed with drive spindle extended or retracted?	Drive spindle retracted → valve closed	Drive spindle extended → valve closed
DIP 5	Current position of the actuator is saved as additional switching position "2EZ-1". See wiring diagram, chapter 10.		from 0 to 1 → save "2EZ-1" = 2%
DIP 6	Current position of the actuator is saved as second additional switching position "2EZ-1". See wiring diagram, chapter 10.		from 0 to 1 → save "2EZ-2" = 98%
DIP 7, 8, 9	These 3 DIP switches define the function: linear / split range / 11-point / inverted		s. Fig. 9, page 16 = linear
DIP 10	Defines valve characteristic using actuator characteristic, see Fig. 9.	Actuator characteristic inverse equal percentage, valve action linear	Actuator characteristic linear, valve action equal percentage
DIP 11	Selects standard or Modbus mode.	Modbus mode	standard mode
DIP 12	Starts initialisation run. Set back to 0 after initialisation (s. chapter 7.2)		from 0 to 1 → starts initialisation run
N↔S	Selects normal or safety mode	position "S" = safety mode	position "N" = normal mode

Fig. 6: Setting the DIP switches

= ex-works setting

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6.3 Details on DIP switches:

DIP 1 and DIP 2:
are interpreted together
DIP 1: 0 = voltage → DIP 2: 0 = 0-10 V or 1 = 2-10 V.
DIP 1: 1 = current → DIP 2: 0 = 0-20 mA or 1 = 4-20 mA.

Attention

Either a voltage source can be connected to the U-terminal or a current source to the I-terminal. Never connect both at the same time.

DIP 3:
DIP switch 3 configures the analogue outputs AO1 and AO2 (see wiring diagram, chapter 10). DIP switch 3 defines the scaling of the two analogue outputs. When DIP 3 = 0, AO1 is set to 0-10 V and AO2 to 0-20 mA (ex-works setting), when DIP 3 = 1, AO1 is set to 2-10 V and AO2 to 4-20 mA. In Modbus mode AO1 and AO2 can be configured separately.

Tip: *Using 2-10 V / 4-20 mA enables clear identification of a loss of signal (= 0 V / 0 mA).*

DIP 4:
DIP switch 4 changes the direction of operation of the actuator.
The direction of operation can only be changed if the unit has been initialized. Until the unit has been initialized, the following setting applies: Valve closed when actuator spindle extended.
There can also be no change in the direction of operation during an initialisation run, whether or not the unit was already initialized before starting the current initialisation run.
The direction of operation must not be confused with heating/cooling! Heating in standard mode is carried out with DIP switches 7, 8 and 9 set to "0". Cooling in standard mode is carried out with DIP switches 7, 8 and 9 set to "1". Split-range can be combined with heating in standard mode, but not with cooling. In Modbus mode, split-range can be combined with both heating and cooling.

DIP 5:
Saves the current position as switching position "2EZ-1" when switched from 0 to 1. No function is assigned to switching from 1 to 0. Even if DIP 5 is left in position 1 when the 7020 positioner is switched on, the current position will not be saved.

DIP 6:
Saves the current position as switching position "2EZ-2" when switched from 0 to 1. No function is assigned to switching from 1 to 0. Even if DIP 6 is left in position 1 when the 7020 positioner is switched on, the current position will not be saved.

DIP 7, DIP 8 and DIP 9:
These three DIP switches work together to define the split range function at analogue input 2 (AI2), see Fig. 7.

DIP 10:
An actuator characteristic can be used indirectly to change a valve characteristic. If, for example, the valve has an equal percentage characteristic, an inverse equal percentage actuator characteristic can be used to generate a resulting linear characteristic, see Fig. 9.
The actuator characteristic (DIP 10) can also be combined with the characteristics which can be selected using DIPs 7, 8 and 9 (e.g. split range). The microcontroller first processes the characteristic defined by DIPs 7, 8 and 9 and subsequently the characteristic defined by DIP 10.
In Modbus mode, two further actuator characteristics can be selected: equal percentage and quadratic inverse equal percentage.

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DIP 11:
DIP switch 11 defines the mode of operation: 1 = Modbus mode, 0 = standard mode.
Standard mode is used to apply predefined normal settings.

DIP 12:
Starts an initialisation run when switched from 0 to 1. If DIP 12 is left in position 1 when the 7020 positioner is switched on, an initialisation run will not be startet.
As long as DIP 12 is set to 1, errors and alarms occurring during normal positioner operation will not be shown. This enables errors occurring during initialisation to be distinguished from errors during normal positioner operation. Switch DIP 12 back to 0 after the initialisation run (after having analysed possible error codes) to show any errors occurring in normal positioner operation on the red LED. See also chapter 6.4 "Initialisation run".

Function	DIP 7	DIP 8	DIP 9
Linear, 1:1	0	0	0
Split range: split 50%, offset 0%	1	0	0
Split range: split 50%, offset 50%	0	1	0
Split range: split 33.3%, offset 0%	1	1	0
Split range: split 33.3%, offset 33,3%	0	0	1
Split range: split 33.3%, offset 66,6%1	1	0	1
11-point characteristic	0	1	1
Inverted: 0 becomes 100 and 100 becomes 0%	1	1	1

Fig. 7: Selection of function, input signal (AI2).

DIP switches 7, 8 and 9 operate together.

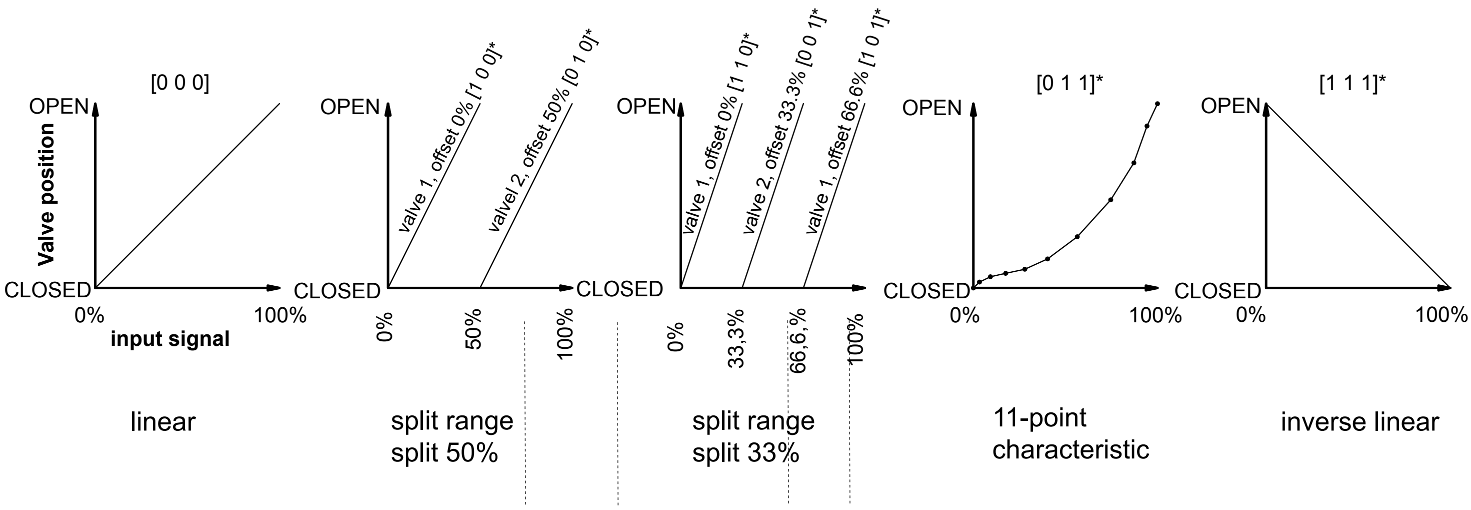

Fig. 8: Graphical illustration of selection of functions by DIP switches 7, 8, und 9

** [0 1 0], for example, means DIP 7 = 0, DIP 8 = 1, DIP 9 = 0 → split range mode, split 50%, offset 50%.*

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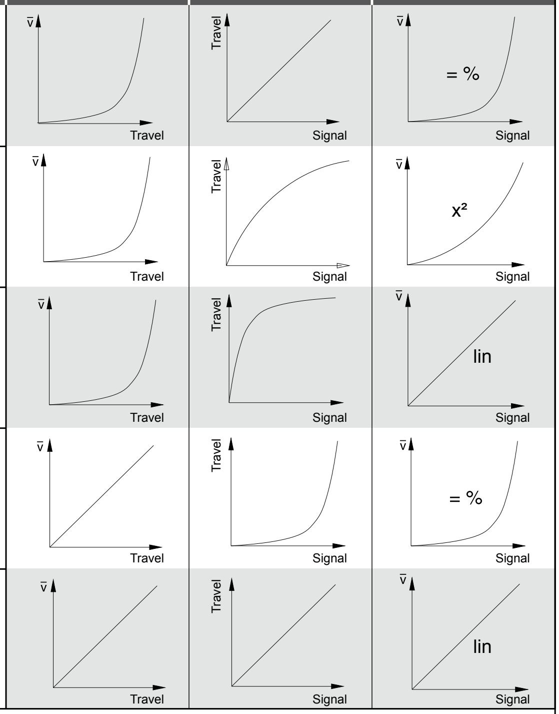
Desired characteristic	DIP switch 10	Valve characteristic	Actuator characteristic	Result at valve
equal percentage	10: 0 (factory setting)			= %
quadratic	Actuator characteristic can only be selected in Modbus mode.			x²
linear	10: 1			lin
equal percentage	Actuator characteristic can only be selected in Modbus mode.			= %
linear	10: 0 (factory setting)			lin



= Factory settings

Fig. 9: Valve characteristics

6.4 Initialisation run

Baelz 7020 positioners which are delivered ready-fitted with actuator, valve and yoke are initialized by the manufacturer and are ready for operation. 2 seconds after switching the unit on, only the green LED is lit.

Attention

The actuator must be fitted to a valve before operation!

If the unit is not initialized, the green LED flashes. The red LED is lit when the position of the potentiometer is not ideal for an initialisation run. (See FigFig. 11 page 17 for meaning of LED signals.) An initialisation run can still be carried out, but it will take approx. 1x valve travel time longer. During a successful initialisation run, the valve is moved to both of its end positions. The potentiometer and the position of the valve are synchronized and values for valve travel time and switching hysteresis are determined.

Switch DIP switch 12 from 0 to 1 to start an initialisation run. The red LED is lit during initialisation.

When initialisation has been successfully completed, only the green LED is lit. For error signals see table "Initialisation error codes", Fig. 1Fig. 14 page 21.

As long as DIP switch 12 is set to 1, errors and alarms occurring during normal positioner operation will not be shown. This enables errors occurring during initialisation to be distinguished from errors during normal positioner operation.

Switch DIP 12 back to 0 after the initialisation run to show any errors occurring in normal positioner operation on the red LED.

(After the first initialisation run (unit not previously initialized), the unit moves to the 50% position upon completion of initialisation.
As soon as DIP 12 is set to 0, the Baelz 7020 follows the set value signal at analogue input 2.)

6.5 Meaning of LED signals

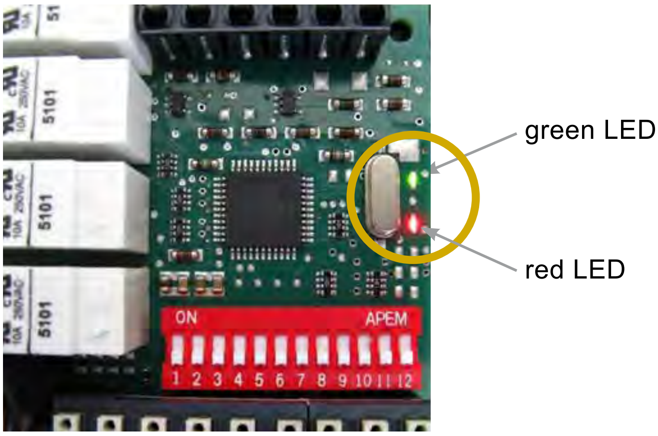


Fig. 10: LED signals

	LED signal	LED signal	Meaning
1		green off red off	Unit is switched off.
2		green off red on	Initialisation run in progress.
3		green flashing red off	Unit is not initialized. Potentiometer in ideal position for initialisation run (between 7.5 and 17.5%).
4		green flashing red on	Unit is not initialized. Potentiometer not in ideal position for initialisation run. Initialisation still possible. (If the red LED is flickering, the position of the potentiometer is at the edge of the optimal range and therefore OK.)
5		green and red flashing	Error during initialisation. Unit is not initialized. The flashing red LED shows the number of the error code: 3 flashes, interval, 3 flashes, interval → error code 3. See also chapter 7.1.
6		green on red off	Unit is initialized. No errors.
7		green on red on	Immediately after the unit is switched on, both LEDs are lit for 2 seconds to show that they are in working order.
8		green on red flashing	Unit is initialized. DIP 12 set to 1 → error after initialisation run, see chapter 7.1 DIP 12 set to 0 → error or alarm during normal positioner operation, see chapter 7.3.

Fig. 11: Meaning of LED signals

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6.6 Connection terminals - labelling and allocation

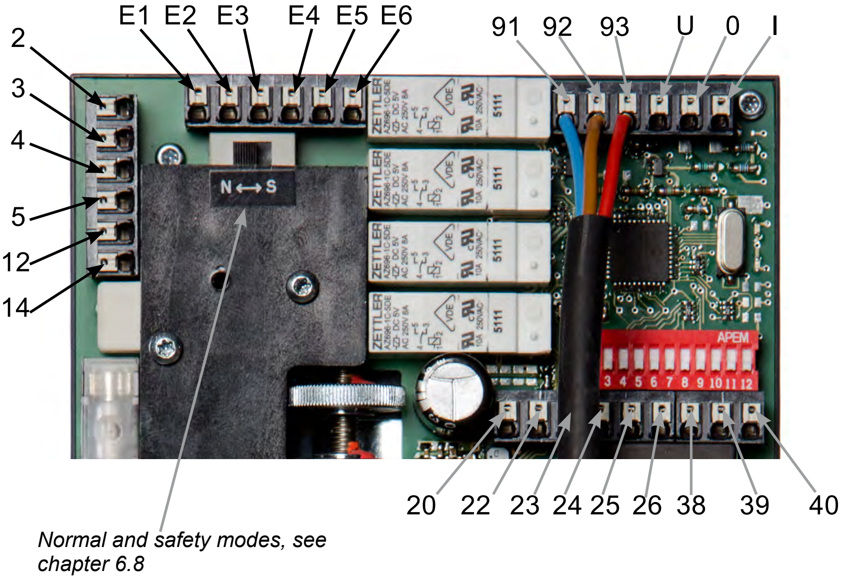

Fig. 12: Labelling of connection terminals

See also "Wiring diagram", chapter 10

Terminal	Allocation	Notes
2, 3	supply terminals	See wiring diagram, chapter 10, for correct allocation.
4, 5, 12, 14	Can be allocated to an overriding external control system (antifreeze, excessive temperatures).	For external control, the N↔S switch must be set to „S“ (safety mode).
20, 22	Digital input for a switch used to select between two conditions, e.g. "Open / Closed" or "Summer / Winter".	
23, 24, 25, 26	Analogue output position indicator using voltage and / or current.	Analogue outputs can be connected simultaneously.
38, 39, 40	Connection terminals Modbus	
91, 92, 93	Connection terminals potentiometer	
U, 0, I	Input set value for valve position	IMPORTANT! Position of DIP switch 1, see chapter 6.3
E1, E2, E3, E4, E5, E6	Terminals for 2 digital outputs	IMPORTANT! Position of DIP switches 5 & 6, see chapter 6.3
97, 98, 99	Connection terminals for motor	Ex-works wiring varies according to type of actuator.

Fig. 13: Allocation of connection terminals

6.7 Operational modes and operating options

6.7.1 Standard operation using DIP switches

The DIP switches can be used to carry out standard configurations and operations (see Fig. 6 page 13).
When DIP switch 11 is set to 0, the 7020 is in the standard operational mode.
In standard mode, all DIP switches are active and the functions of the Baelz 7020 can be individually adapted.
Functions which are predefined and unalterable in standard mode are described in chapter 6.1.

6.7.2 Standard operation using Modbus VT100 or direct addressing

In standard mode, the Baelz 7020 can be operated using Modbus VT100. For this, a virtual 7020 display and a virtual 7020 keypad are transmitted to a user interface. Modbus direct addressing, e.g. from a building automation system, enables access to status information and allows operation and configuration. (See appendix A). The settings given by the DIP switches remain active. Values which are only relevant in Modbus mode can be adjusted in standard mode, but only take effect in Modbus mode.

6.7.3 Modbus mode

When DIP switch 11 is set to 1, the Baelz 7020 is in Modbus mode. In Modbus mode, the 7020 is at its most flexible and can be configured and operated using either a Modbus VT100 or Modbus direct addressing, for example in a building automation system. See separate operating instructions "Baelz 7020 Digital Positioner - Operating Instructions for Modbus mode"

6.8 Normal and safety modes

In normal mode the position of the valve is controlled by the set value at analogue input AI2. The N↔S switch shown in the picture on the right is set to normal mode (N). In normal mode, no external control systems can be connected to terminals 12 and 14.

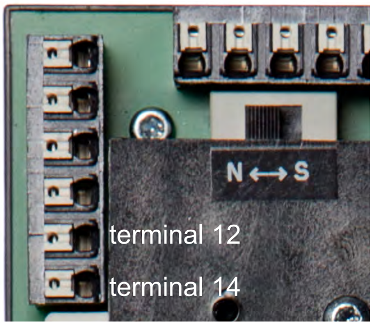

Fig. 14: N↔S Switch

6.8.1 Safety mode: antifreeze und excessive temperature

In safety mode the actuator can be sent to a safe position (extended / retracted, depending on the direction of action of the valve) in case of failure or malfunctioning of the microcontroller.

To operate the Baelz 7020 in connection with an external antifreeze and/or excessive temperature thermostat, set the N↔S switch to safety mode (S).

Connect the antifreeze and/or excessive temperature thermostat according to desired function and priority. Be sure to take the direction of action into account! See wiring diagrams in chapter 10.1.

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6.9 3-point control with a continuous output signal

1. Set the positioner up, wire to power supply and initialize as described.
2. To deactivate the error signal, if desired, set the DIP-switch 11 to 1 ("ON") and change the following values using WinBas Tools (on PC, see chapter A2):
   - AD to 0
   - EFP to 0.0%
   - LA to 1

   (If you don't mind the red LED error signal, step 2 can be left out completely. This has no effect on the function of the positioner.)
3. Set the N↔S switch (Fig. 14) to "S" and wire as shown in Fig. 15 (the positioner must remain connected to the power supply throughout).
4. The required signal can now be picked up on AO1 und AO2

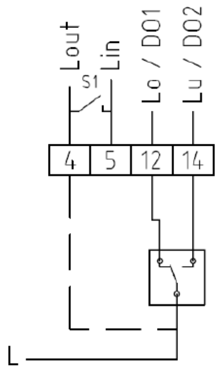

Fig. 15: ***Wiring diagram 3-point signal***

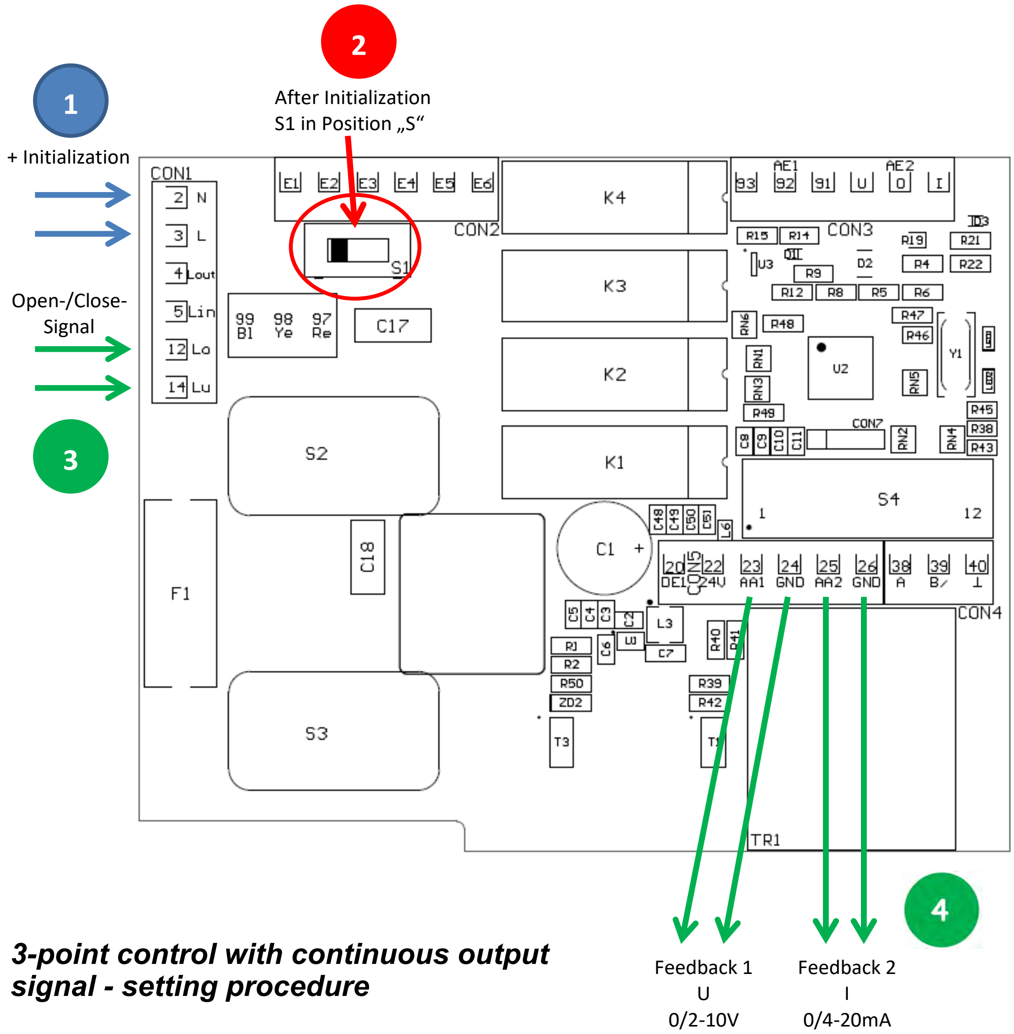

Fig. 16: ***3-point control with continuous output signal - setting procedure***

Attention

Danger of destroying the actuator!
Before re-initializing the actuator, disconnect terminals 12 and 14 and set the N↔S switch to normal mode (N).

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7. ERRORS

7.1 Errors after an initialisation run

Following a successful initialisation run, only the green LED is lit.
If the red LED is flashing, this indicates an error following an unsuccessful initialisation run. The first error to occur during initialisation is shown. If the green LED is lit, the unit had already been initialized before the current initialisation run. If the green LED is flashing, the unit had not been successfully initialized previously.

The red LED shows errors occuring during initialisation as follows:

Error code 1: ✱ interval ✱ interval ✱ etc.

Error code 2: ✱✱ interval ✱✱ interval ✱✱ etc.

etc. up to ...

Error code 8: ✱✱✱✱✱✱✱✱ interval ✱✱✱✱✱✱✱✱ interval ✱✱✱✱✱✱✱✱ etc.

Error code	Error	Corrective action
1 → 1 x ✱	Invalid status of initialisation run. Possible cause: EMI (electromagnetic interference).	Remove source of interference.
2 → 2 x ✱	Sensor malfunction at analogue input AI1: No signal from potentiometer.	Check connection terminals 91, 92, 93 (see wiring diagram chapter 10). Replace potentiometer if necessary.
3 → 3 x ✱	Potentiometer value at AI1 too small. Possible cause: EMI.	Remove source of interference. Replace potentiometer if necessary.
4 → 4 x ✱	Potentiometer value at AI1 too large. Possible cause: EMI.	Remove source of interference. Replace potentiometer if necessary.
5 → 5 x ✱	Wrong direction of travel	Check motor (97, 98, 99) and potentiometer (91, 92, 93) connections (see wiring diagram chapter 10). Remove source of interference.
6 → 6 x ✱	Obstruction: potentiometer or motor not moving.	Check connections, set N↔S switch to "N", remove any obstructions.
7 → 7 x ✱	Stroke too long.	Fit actuator to a valve with nominal stroke length < 22 mm.
8 → 8 x ✱	Stroke too short.	Fit actuator to a valve with nominal stroke length > 8,7 mm, remove any obstructions.

Fig. 17: Initialisation error codes

7.2 Error during initialisation or during normal positioner operation?

Following an initialisation run, the red LED shows only initialisation errors as long as DIP switch 12 is set to 1. This enables a clear differentiation between errors occuring during initialisation and those occuring during normal positioner operation. Setting DIP switch 12 from 1 back to 0 permits the red LED to show any normal operational errors instead of initialisation errors which may have occured.

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7.3 Errors during normal positioner operation

The green LED is lit during normal positioner operation.
A flashing red LED shows an error during normal positioner operation. For this, DIP switch 12 must be set to 0.

The red LED shows errors during positioner operation as follows: (= long flash, = short flash)

Error code 1: interval interval etc.

Error code 2: interval interval etc.

etc. up to ...

Error code 6: interval interval etc.

Multiple error codes can be displayed simultaneously:

Error codes 3 & 5: interval interval

The red LED flashes 10 times between intervals (1.6 s), as a maximum of 10 error codes could be allocated.
The error codes 7 to 10 are not allocated and are reserved for additional alarms.

Error code	Error	Corrective action
1	Sensor malfunction at analogue input AI1: No signal from potentiometer.	Check connection terminals 91, 92, 93 See wiring diagram chapter 10.
2	Sensor malfunction at analogue input AI2: No setpoint signal.	Check connection terminals U, 0, I See wiring diagram chapter 10.
3	Alarm 1: additional switching position (2EZ-1) or other threshold value reached.	Informational alarm: 2EZ-1 is set using DIP 5.
4	Alarm 2: additional switching position (2EZ-2) or other threshold value reached.	Informational alarm: 2EZ-2 is set using DIP 6.
5	Alarm 3: control deviation too large.	Deactivate antifreeze / excessive temp. Re-initialize Baelz 7020.
6	Alarm 4: potentiometer end stops too imprecise or obstruction.	Deactivate antifreeze / excessive temp. Re-initialize Baelz 7020.
7-10	Reserved for as yet undefined alarms 5-8	No error possible.

Fig. 18: Error codes during normal positioner operation

Tip: *In case of errors which cannot be rectified or are not covered in this documentation, please contact Baelz (see footer or contact your nearest Baelz customer service).*

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8. SPARE PARTS

When ordering accessories or spare parts, please refer to the name plate on the positioner. The name plate gives the correct technical specifications and power supply requirements of the unit.

Attention

Faulty or incorrect spare parts cause damage!

Spare parts must comply with the technical requirements supplied by the manufacturer.

Tip: Always use original spare parts!

9. DECOMMISSIONING AND DISPOSAL

Dispose of the positioner in accordance with applicable, country-specific regulations and laws.

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10. WIRING DIAGRAMS BAELZ 7020

This wiring diagram can also be found on the inside of the actuator cover.

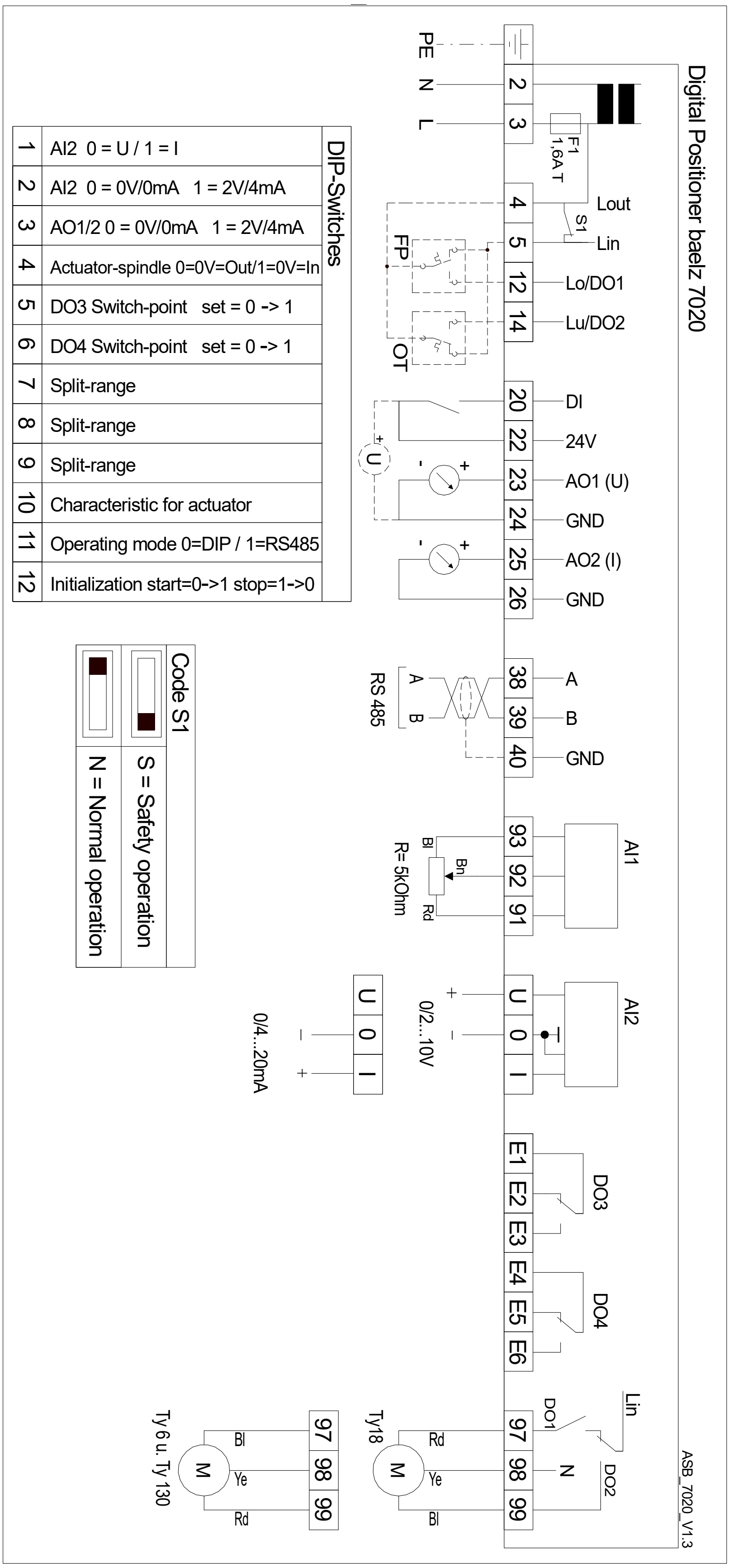
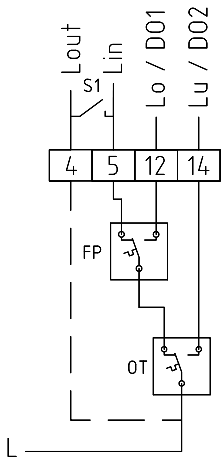


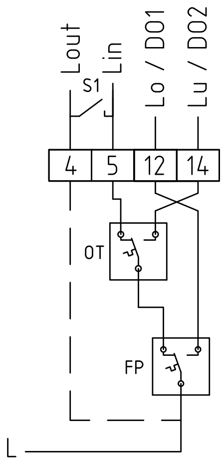
Fig. 19: Wiring diagram baelz 7020

10.1 Wiring diagrams for operation in safety mode

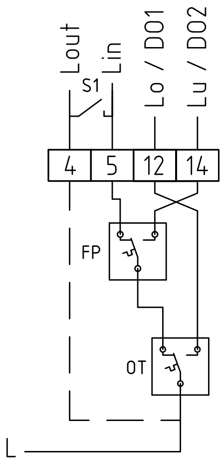
1. Spindle extended = valve closed
excessive temp. (OT) has priority



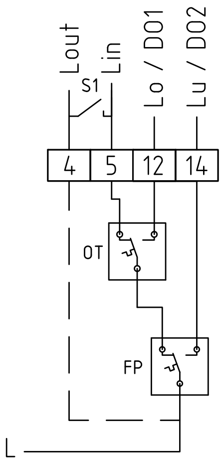
2. Spindle extended = valve closed
antifreeze (FP) has priority



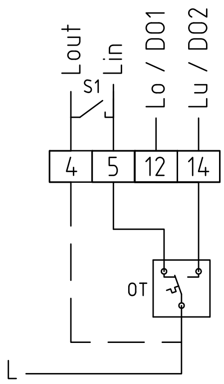
3. Spindle extended = valve open
excessive temp. (OT) has priority



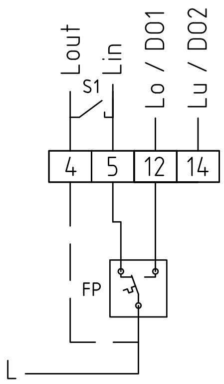
4. Spindle extended = valve open
antifreeze (FP) has priority



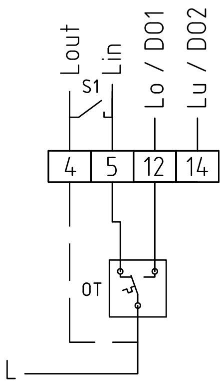
5. Spindle extended = valve closed
only excessive temp. (OT)



6. Spindle extended = valve closed
only antifreeze (FP)



7. Spindle extended = valve open
only excessive temp. (OT)



8. Spindle extended = valve open
only antifreeze (FP)

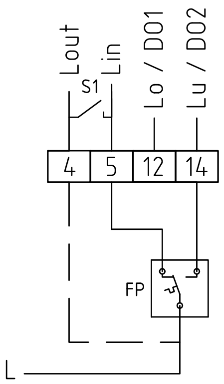


Fig. 20: Wiring diagrams for operation in safety mode

Attention

Before re-initializing the actuator, disconnect terminals 12 and 14 and set the N↔S switch to normal mode (N).

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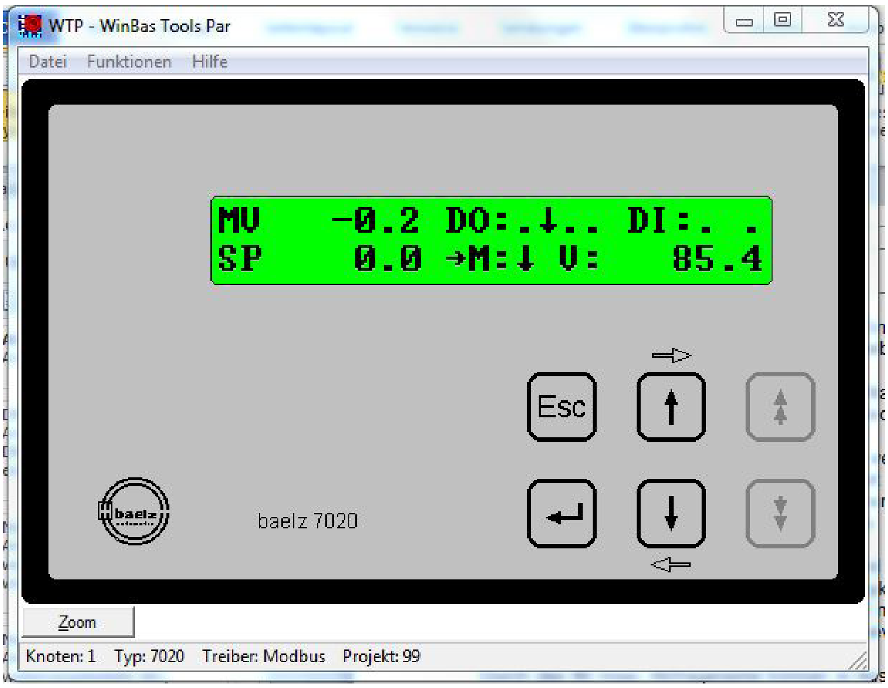
Operating Instructions **BA 7020**

Baelz 7020
Digital Positioner
Appendix A: Instructions for Operation using Modbus



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ANNEX A: INSTRUCTIONS FOR OPERATION USING MODBUS

These instructions describe the extended operating options of the baelz 7020 positioner using Modbus VT100 in standard mode.

Functions that are accessible and configurable in standard mode are described here.

For the required accessories, see Chapter 2.3.

A1. FUNCTIONAL DESCRIPTION

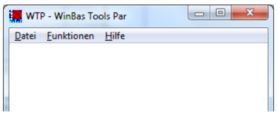
The 7020 can be operated using Modbus VT100. The screen contents and keyboard of the 7020 are transferred to a virtual environment for this purpose. The 7020 can also be configured or operated by a building control system or other system using direct Modbus addressing.

Access using Modbus VT100 or direct addressing is possible in both Modbus and standard mode. However, almost all configurations made using Modbus are not operative in standard mode. These configurations will only be operative when DIP switch 11 is set to 1.

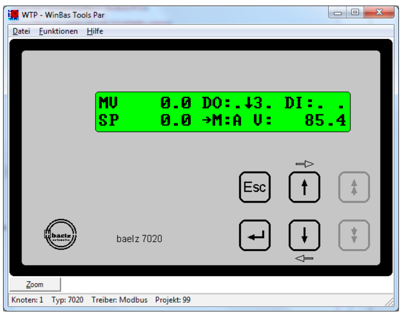
A2. OPERATION USING MODBUS VT100

A2.1 Launch WinBas Tools

Launch the WinBas Tools software.

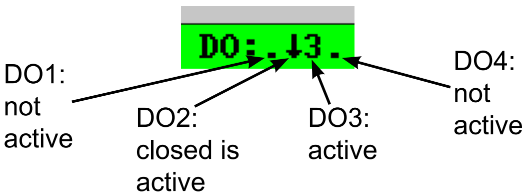


Under "Funktionen" (functions) in the WinBas Tools window, select "MODBUS VT100 / Bedienung starten" (MODBUS VT100/Start Operation)



This display, the IMM menu, appears.

MV = Actual manipulated variable, actual value at analog input 1 (AI1)
DO = Statuses of the 4 digital outputs (DO1 to DO4). For example:



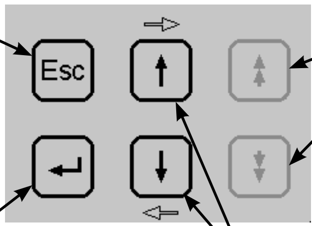
DI = Status of digital input (DI1): Point = not active, 3 = active
SP = Set point
→ = Input cursor, can be placed in front of M or V
M = Generally set to A = Automatic in standard mode
V = Only active in extended Modbus operating mode
Top right of the display:
Point = Collective alarm not active, A = Collective alarm active

Tip: For menu items and WinBas abbreviations, see Chapter A4

A2.2 Functions of keys in WinBas Tools

The buttons in the display are operated by mouse click or with the corresponding keyboard keys.

- Return to main menu.
- In the main menu: send selection arrow to IMM

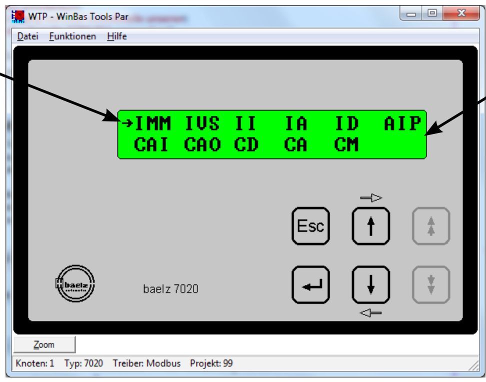


Scroll quickly through menu items/values. Useful for changing percentages, for example. (Keyboard = View ↑- / View ↓-keys)

- Go to submenu highlighted by selection arrow.
- Select parameters to modify (selection arrow blinks)
- Saves change.

- Move selection arrow one place further in the indicated directions.
- In submenus: scroll through parameters.
- With a selected parameter (selection arrow blinks): gradually increase or decrease the value.

Selection arrow



Main menu

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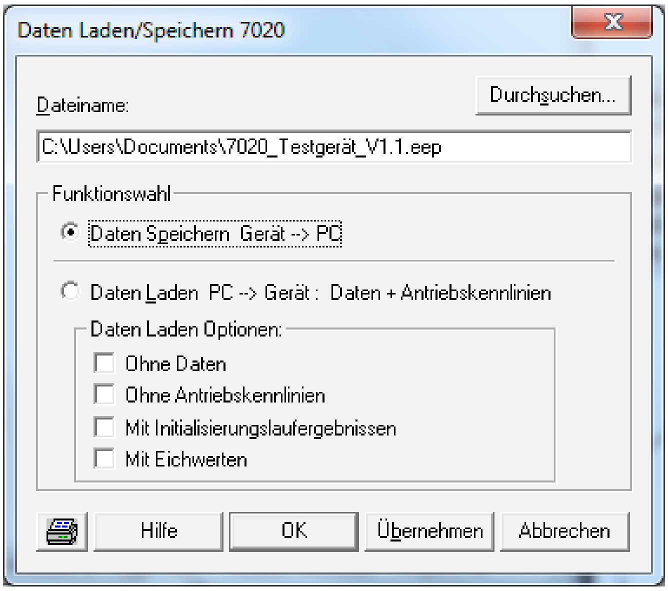
A3. LOAD/SAVE DATA



WinBas Tools includes the function to "Load/Save Data". The "Load/Save Data" function allows a backup copy of the 7020 configurations to be created on the PC (DIP switch positions are excluded). The entire 7020 EEPROM content can thereby be saved in a file on the PC. The backup copy can be loaded from the PC back onto the same or another 7020 device.

To save time, multiple devices can be identically configured.

In the WinBas Tools window (see Chapter A2.1), select "Funktionen" → "Daten Laden/Speichern..." (functions → load/save data)

The following window appears.

A3.1 Save data

- Select "Daten Speichern Gerät --> PC" (save data device --> PC) to create a backup copy of the 7020 configuration.
- Enter the desired storage location under "Dateiname" (file name). This can be done either directly in the input bar or by using the "Durchsuchen..." (search) button.
- Confirm by clicking the "OK" button

A3.2 Load data

- Select "Daten Laden PC --> Gerät: Daten + Antriebskennlinien" (load data PC --> device: data + actuator characteristics)
- Enter the backup copy to be loaded under "Dateiname" (file name). This can be done either directly in the input bar or by using the "Durchsuchen..." (search) button.
- Confirm by clicking the "OK" button

In most cases, the boxes below "Daten Laden Optionen" (data loading options) should not be checked: data and drive characteristics should be loaded and each device only functions optimally with its own individual initialization process results and calibration values.

The Modbus address and baud rate are excluded during loading so that the connection between the 7020 and PC is not ended by modified communication parameters

A4. MENU ITEMS

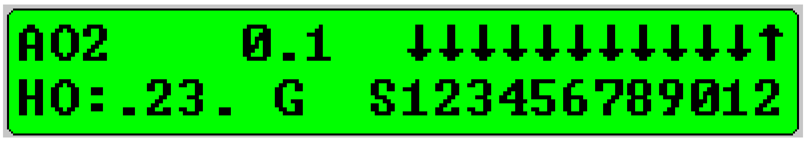
A4.1 IMM menu

Indication Main with Manual operation:
Actual value, setpoint, statuses of digital outputs and inputs, manual/automatic operation.

Abbreviation	Written out	Parameter/Function	Explanation
MV	Manipulated Variable	Manipulated variable, actual value AI1	0%–100% or E = Error from sensor break at analog input 1
SP	SetPoint	Setpoint	0%–100% or E = Error from sensor break I = Initialization in progress S = Stopped, i.e. uninitialized
DO	Digital Outputs	Digital outputs	DO1: Point = Not active, ↑ = Up is active DO2: Point = Not active, ↓ = Down is active DO3: Point = Not active, 3 = DO3 is active DO4: Point = Not active, 4 = DO4 is active
DI	Digital Input	Digital input	DI1: Point = Not active, 1 = DI1 is active
A	Alarm	Collective alarm (see also IA menu)	Point = Not active, A = Collective alarm active
→		Input cursor	Can be placed in front of M or V
M	Manual	Manual operation	Always set to A = Automatic in standard mode
V	Value	Numeric value manual specification	Only active in extended Modbus operating mode

A4.2 IVS menu

Indication Values and Switches:
Various (measured) values, DIP switch and hardware statuses.



Abbr.	Written out	Parameter/Function	Explanation
AI1 AI2 AI3 AI4 SI2 SP MO1 MO2 AO1 AO2	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4 Scaled Analog Input 2 SetPoint Modbus Analog Output 1 Modbus Analog Output 2 Analog Output 1 Analog Output 2	Analog Input 1 (AI1) Analog Input 2 (AI2) Analog Input 3 (AI3) Analog Input 4 (AI4) AI2, scaled Setpoint Modbus AO1 Modbus AO2 Analog Output 1 (AO1) Analog Output 2 (AO2)	Arrow keys (↑↓) scroll from AI1, AI2 etc. to AO2. Values for outputs or inputs are indicated, otherwise: E = Error from failure or no specification
S	(DIP) Switches	DIP switch position	1-9 and 0 (=10), 1 (=11), 2 (=12) ↓ = Switch set to 0, ↑ = Switch set to 1
HO	Hardware Outputs	Real hardware digital output statuses	Example (see above figure): HO: .23. = DO1 & DO4 not active, DO2 & DO3 active
GR	Green / Red (LEDs)	G = Green on, R = Red on	If the LED is off, no letter is displayed

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A4.3 Menu II

Indication Initialisation:
Initialization State/Results Initialization Process

I	Initialization	Initialization	Y = Yes (device is initialized) N = No (device is not initialized) I = Initializing (initialization in progress)
EC	Error Code	Error code after initialization process	0 = no error
TPI THI	Process Time Initialization Three-point Hysteresis Initialization	Valve running time Switching hysteresis of the three-point controller	Valve running time in seconds determined during initialization process Switching hysteresis (in %) determined during initialization process Arrow keys (↑↓) switch between TPI and THI

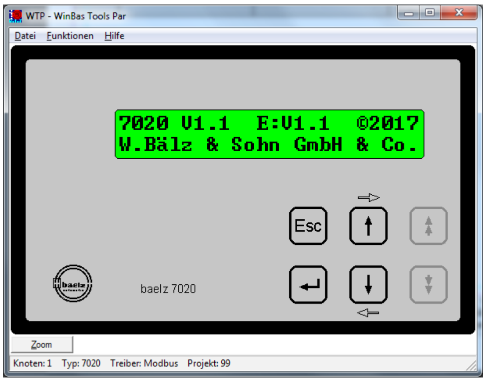
A4.4 IA Menu

Indication Alarms:
Monitoring/Alarms

CA	Collective Alarm	Collective alarm	Point = No alarm, A = Alarm
SB	Sensor Break	Sensor break analog-input 1 (AI1)/analog-input 2 (AI2)	Point = No break Respective AE number 1 or 2 = sensor break
A	Alarms	Alarms	Point = No alarm Respective alarm number 1 to 8 = Alarm (see also Chapter 7.3) Alarms 5 to 8 not allocated

A4.5 Menu ID

Indication Device:
Info display for program version, EEPROM version, and copyright information.



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A4.6 AIP menu

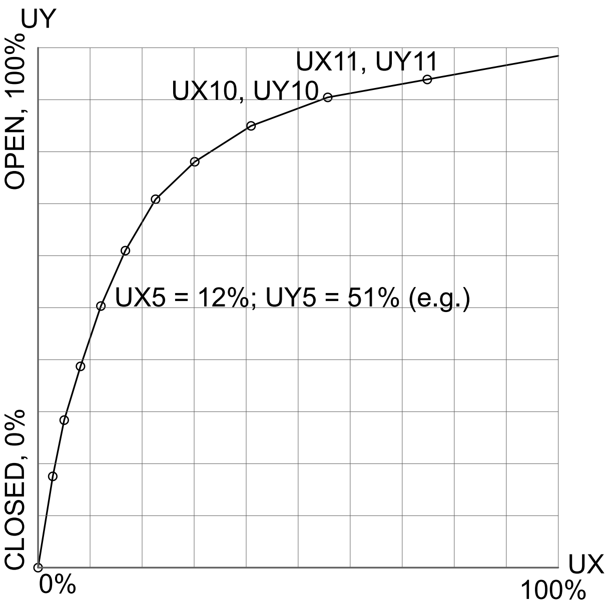
Actions: Initialization and Positions 2EZ:
Action input: Initialization and positions 2EZ

SI	Start (Stop) Initialization	Start/Stop Initialization Process	Function like DIP switch 12: 1: Initialization in progress/start initialization process 0: Stop initialization process
RD	Reset Device	Program restart	1: Restart without switching off 0: No function
FP1	Fix Position 1	Logging of actual potentiometer position 1 (2EZ)	Function like DIP switch 5 Returns automatically to "0" after entering "1". Entering "0" has no function.
FP2	Fix Position 2	Logging of actual potentiometer position 2 (2EZ)	Function like DIP switch 6 Returns automatically to "0" after entering "1". Entering "0" has no function.

A4.7 CAI menu

Configuration Analog Inputs:
Configuration analog inputs Scroll through the values to be configured using the arrow keys.

A4.7.1 11-point characteristic



A freely configurable drive characteristic can be entered and saved. For this, set DIP switch 7 to 0, DIP 8 to 1 and DIP 9 to 1. With other positions of DIP switches 7, 8 and 9, the drive characteristic is chosen according to the table in Fig. 7 page 15.
UX values relate to the value at analog input 2 (AI2). UY values are the corresponding values that are issued as setpoints (SI2). Here, for example, a UX value of 12% at AI2 results in the output of a setpoint of 51%.
It is not necessary to define all 11 points.
If a UX value is not larger than the previous UX value, such as when UX4 ≤ UX3, the end of the characteristic curve is achieved. UY values can rise, fall or remain the same.
The characteristic curve must not necessarily start at 0% or end at 100%.
Endpoints of the characteristic curve do not have to be defined with their own coordinates. The first or last straight segment is extended if X < UX1 or X > largest UX value. In this example, the last straight segment is defined by UX10, UY10 and UX11.

Only menu items relevant to standard operation are outlined here.

UX1 to UY11	User scaling analog input X1 to Y11	Coordinates UX1 to UY11 as part of an 11-point characteristic curve	Set DIP switch 7 to 0, DIP 8 to 1 and DIP 9 to 1 to allow X and Y coordinates of an 11-point characteristic curve to be entered. Otherwise these values will be skipped during scrolling. 11-point characteristic curve: see above.

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A4.8 CAO menu

Configuration Analog Outputs:
Configuration analog inputs.

Not relevant in standard mode because the configuration of analog outputs is predefined.

A4.9 CD menu

Configuration Digital:
Configuration of digital inputs and outputs

Not relevant in standard mode because the configuration of digital inputs and outputs is predefined.

A4.10 CA menu

Configuration Alarms:
Configuration of alarms

Only menu items relevant to standard operation are outlined here.

Abbreviation	Written out	Parameter/Function	Explanation
AL1	Alarm 1	Limiting Value Alarm 1	The configured limiting value AL1 is compared with AI1 (first 2EZ) in standard mode. An alarm is issued when this limiting value is underrun. AL1 is set either with DIP switch 5 (see Chapter 6.3) or by entering 1 for FP1 (see Chapter A4.6). Breakaway end positions, for example, can be reported with limiting values smaller than 0% or larger than 100%. The alarm is suppressed with a value of -22.0% or 122.0% Default: 2.0% Input range: -22.0% to 122.0%.
AL2	Alarm 2	Limiting Value Alarm 2	The configured limiting value AL2 is compared with AI2 (second 2EZ) in standard mode. An alarm is issued when this limiting value is exceeded. AL2 is set either with DIP switch 6 (see Chapter 6.3) or by entering 1 for FP2 (see Chapter A4.6). Breakaway end positions, for example, can be reported with limiting values smaller than 0% or larger than 100%. The alarm is suppressed with a value of -22.0% or 122.0% Default: 98.0% Input range: -22.0% to 122.0%.

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A4.11 CM menu

Configuration Miscellaneous:
Configuration miscellaneous

Only menu items relevant to standard operation are outlined here.

Abbreviation	Written out	Parameter/Function	Explanation
PW	Password	Password input in event that configuration level is disabled. Important! See also "IE" in this table.	The password input only appears when the configuration menus for inputs are disabled. To enable all inputs: ● Enter "1500" for PW. ● Remain in the CM menu and scroll through to "IE". ● Enter "255" for IE.
BD	Baud Rate	Baud rate (communication speed)	0 = 19200 bits per second 1 = 9600 bits per second 2 = 4800 bits per second 3 = 2400 bits per second The connection to the PC is broken if the baud rate is changed using Modbus VT100. The PC must be set to the new baud rate to re-establish a connection. Default = 0
ADR	Address	Modbus slave address	The connection to the PC is broken if the Modbus slave address is changed using Modbus VT100. The PC must be set to the new address to re-establish a connection. Default = 1 Input range = 1 to 247
IE	Input Enable	Enabling of inputs Important! See also "PW" in this table.	252 = All inputs disabled 253 = Only operation enabled 254 = Only configuration enabled 255 = Enable everything Any disabling of the configuration menu only takes effect after the CM menu is exited. Other inputs in the IE menu are not relevant to standard operation.

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