# baelz 7020, 7020A
# Digital Positioner in a Motorized Linear Actuator



baelz 7020



baelz 7020A

BA_7020_05_EN_MJ_2125

## Inhaltsverzeichnis


**1. SAFETY** 4

1.1 Intended use 4
1.2 For the operator 4
1.3 Personnel 5
1.4 Before starting work 5
1.5 During operation 5
1.5.1 Transport, installation and mounting 5
1.5.2 Service and maintenance 5
1.6 Working environment 5

**2. PRODUCT DESCRIPTION** 6

2.1 Identification 6
2.2 Specifications 7
2.3 Accessories and options 8
2.4 Operating conditions 8

**3. TRANSPORT AND STORAGE** 8

**4. MONTAGE** 9

4.1 Installation 9
4.2 Installation of controller 10
4.3 Connection to electrical supply 10
4.4 Electrical connection 10

**5. SWITCHING ON THE BAELZ 7020** 11

**6. FUNCTIONS AND OPERATION** 11

6.1 Functions in standard mode: 11
6.2 Operating the postioner 12
6.3 Details on DIP switches: 13
6.4 Initialization run 16
6.5 Meaning of LED signals 17
6.6 Connection terminals - labelling and assignment 18
6.7 Operational modes and operating options 19
6.7.1 Standard operation using DIP switches 19
6.7.2 Standard operation with Modbus VT100 and direct addressing 19
6.7.3 Modbus mode 19
6.8 Normal and safety modes 19
6.8.1 Safety mode: antifreeze und excessive temperature 19
6.9 3-point control with a continuous output signal 20

**7. ERRORS** 21
7.1 Errors after an initialization run 21
7.2 Error during initialization or during normal positioner operation? 21
7.3 Errors during normal positioner operation 22

**8. SPARE PARTS** 23

**9. DECOMMISSIONING AND DISPOSAL** 23

**10. WIRING DIAGRAMS BAELZ 7020** 24
10.1 Wiring diagram baelz 7020 24
10.2 Wiring diagram baelz 7020A 25
10.3 Wiring diagrams for 3-point control 26
10.4 Wiring diagrams for operation in safety mode 26

**APPENDIX A: INSTRUCTIONS FOR OPERATION USING MODBUS**

**A1. FUNCTIONAL DESCRIPTION** A2

**A2. OPERATION USING MODBUS VT100** A2
A2.1 Launch WinBas Tools A2
A2.2 Functions of keys in WinBas Tools A3

**A3. LOAD/SAVE DATA** A4
A3.1 Save data A4
A3.2 Load data A4

**A4. MENU ITEMS** A5
A4.1 IMM menu A5
A4.2 IVS menu A6
A4.3 Menu II A7
A4.4 IA Menu A7
A4.5 Menu ID A7
A4.6 AIP menu A8
A4.7 CAI menu A9
A4.8 CAO menu A10
A4.9 CD menu A10
A4.10 CA menu A10
A4.11 CM menu A11

BA_7020_05_EN_MJ_2125

## 1. SAFETY

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




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




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




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




### 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 positioners **baelz 7020 and baelz 7020A** control the actuator (with the attached **valve or ejector; referred to as 'valve' in these instructions** for the sake of brevity) according to the value of the control signal: 0-10 V, optionally 2-10 V / 0-20 mA, optionally 4-20 mA.
3-point control with a continuous output signal is also possible.
To ensure use for the purpose intended, check that the above type identification corresponds to the nameplate 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 nameplate.
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.

### 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 nameplate of the positioner:

**baelz 7020, baelz 7020A**

See section 2.1 ‘Identification’.

### 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 (section 2.2).

BA_7020_05_EN_MJ_2125

## 2. PRODUCT DESCRIPTION

As the baelz 7020 and baelz 7020A positioners are very similar in their mode of operation, the term “baelz 7020” is used for both variants in these instructions. Differences between the two positioners are described where applicable.

### 2.1 Identification

Each Baelz 7020 positioner has a nameplate. 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,<br>Option: 115 VAC -15 % / +10 % 50 / 60 Hz; 24 VAC -15 % / +10 %, 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 7020 | WxHxD approx. 120x95x60 mm |
| DI supply voltage | 24 V DC (unregulated), Imax = 5 mA |
| Digital input | 1 configurable (eg. summer / winter switch),<br>low=0...5 VDC, high=9...38VDC, Re=5.5 kΩ |
| 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. 5 kΩ<br>Output 2: 0/4...20 mA / load impedance max. 300 Ω<br>Factory setting: 0...10 V and 0...20 mA |
| Input signal | 0/2...10 V / Re 63 kΩ, 0/4...20 mA / Re 200 Ω, measurement accuracy 0.1% |
| Position detection | 5 kΩ potentiometer |
| Connection | PUSH IN spring terminals<br>stripping length: 8 mm |
| Wiring | wire size, AWG: min. AWG 24; max. AWG 16<br>solid wire / stranded wire: min. 0.2 mm²; max. 1.5 mm²<br>with wire ferrule according to DIN 46 228/1: min. 0.25 mm²; max. 1.5 mm²<br>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 software Winbas Tools Par; Modbus mode |
| Interface | RS485 Modbus RTU, Baud rate 2400...19200, 1 Start,<br>8 pieces of data, 1 stop-bit, no parity |
| Memory | non-volatile semiconductor |
| Weight | 0.2 kg |

BA_7020_05_EN_MJ_2125

### 2.3 Accessories and options

- Parameterisation software (Modbus RTU) - Interface RS 485 required!
- For laptops with USB we recommend our interface convertor (Order Nº· 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**

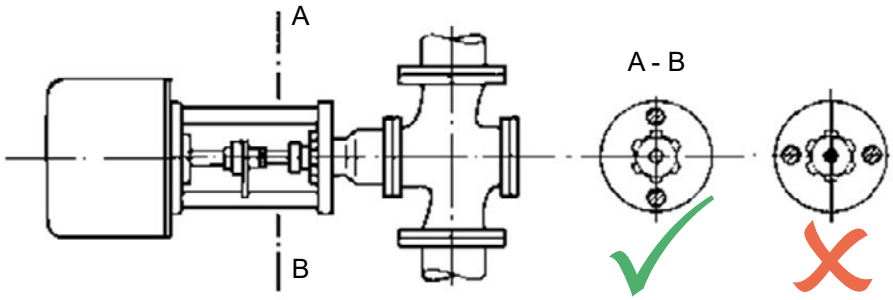
**Risk of injury caused by failure to observe the safety regulations!**

- 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.

## 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.

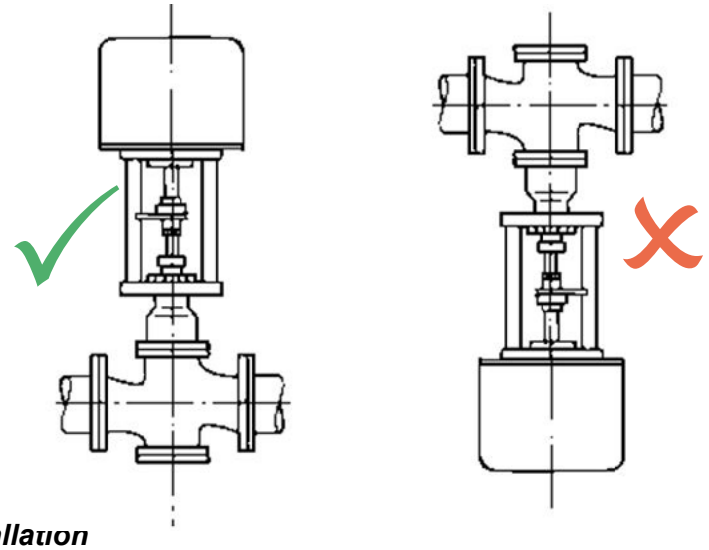


***Fig. 2: Correct installation***

**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.

### 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 and the positioner (see nameplates).
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 section 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 nameplate of the positioner and the nameplate 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.

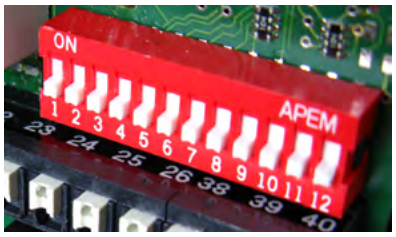
Replace dummy plugs with cable glands.

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.

## 5. SWITCHING ON THE BAELZ 7020

***Tip:*** Configure using DIP switches 1-4 and 7-10 before switching on, see section 6.2.




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.

## 6. FUNCTIONS AND OPERATION

### 6.1 Functions in standard mode:

These operation instructions concern the standard mode (DIP 11 on 0, see section 6.7). 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:

- All DIP switches are enabled and kann be operated according to Fig.Fig. 5 page 12.
- The current setpoint value is supplied to both analogue outputs (both can be connected).
- Values for valve stroke time and switching hysteresis are determined during the initialization 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) and are shown by the red LED, see section 7.3 for error codes.
- 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.
- Output of the pre-assigned or user-defined 2EZ valve position switching points (alarm 1 and 2) on digital output 3 and digital output 4 (DO3 and DO4), with defined undershoot, overshoot, hysteresis and without time-based alarm suppression.
- Alarms 3 and 4 are active.
- Permanent close command for setpoint < 2 %, permanent open command for setpoint > 98 %, with a fixed hysteresis of 0.5 % in each case.
- Always automatic mode, no manual mode and no manual setting of numeric values.
- Filter time constants of the analog inputs on fixed preset values.
- Calibration corrections of the analog inputs are not effective.
- Analog inputs with Modbus are not possible.
- Inversion of digital inputs is not possible.
- Inversion of digital outputs is not possible.

BA_7020_05_EN_MJ_2125

## 6.2 Operating the postioner

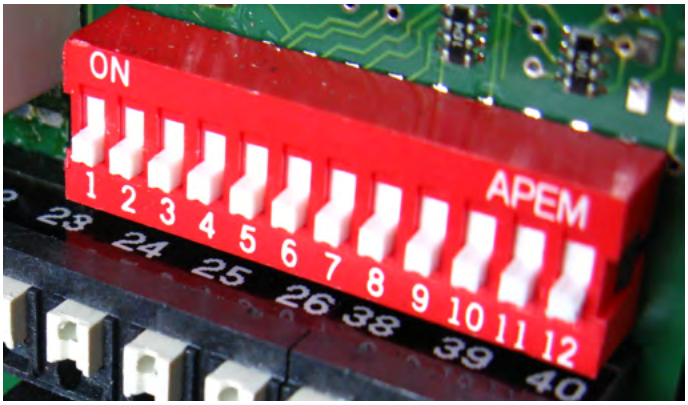



***Fig. 3: DIP switches***
*The ex-works setting of the DIP switches is position 0, as shown.*

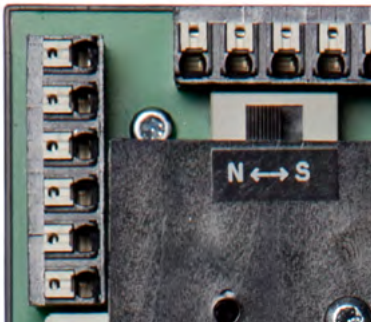



***Fig. 4: N↔S switch***
*switches between rormal and safety mode.*

| 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. 7 page 14 & Fig. 8 page 15 |
| **DIP 10** | Defines valve characteristic using actuator characteristic, see Fig. 8. | Actuator characteristic inverse equal percentage | Actuator characteristic linear |
| **DIP 11** | Selects standard or Modbus mode. | Modbus mode | standard mode |
| **DIP 12** | Starts initialization run. Set back to 0 after initialization (s. section 7.2) | | from 0 to 1 → starts initialization run |
| **Switch** | **Function** | **Position 1 "ON"** | **Position 0** |
| **N↔S** (Fig. 4) | Selects normal or safety mode | position "N" = normal mode | position "S" = safety mode |

***Fig. 5: Setting the DIP switches***

= ex-works setting

### 6.3 Details on DIP switches:

In standard mode (DIP 11 set to 0), all DIP switches are always effective according to the following description. In Modbus mode (DIP 11 set to 1), the DIP switches can be effective, but do not have to be, i.e. the DIP switch configurations can be overridden via higher-priority settings and in some cases also disabled.

**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 initialization run, whether or not the unit was already initialized before starting the current initialization 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 and DIP 6:**
Save the current position as switching position "2EZ-1" (DIP 5) or "2EZ-2" (DIP 6) when switched from 0 to 1. No function is assigned to switching from 1 to 0. Even if DIP 5 and/or DIP 6 is left in position 1 when the 7020 positioner is switched on, the current position will not be saved.
Saving is not possible in the following cases: with an uninitialized 7020; during the initialization run; if the signal source AI1 fails; if DIP 5 / DIP 6 is disabled in Modbus mode; if the alarm signal source AI1 is not configured in Modbus mode.

**DIP 7, DIP 8 and DIP 9:**
These three DIP switches work together act together for a mapping function on analog input 2 (AI2), see Fig. 6 and Fig. 7.
The 11-point characteristic curve can be used in both Modbus and standard mode. This is factory preset with a linear 2-point characteristic curve (0% to 0% and 100% to 100%) and therefore corresponds to DIP 7, 8, 9 = 0.

BA_7020_05_EN_MJ_2125

| 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. 6: Selection of function, input signal (AI2).***

*DIP switches 7, 8 and 9 operate together.*

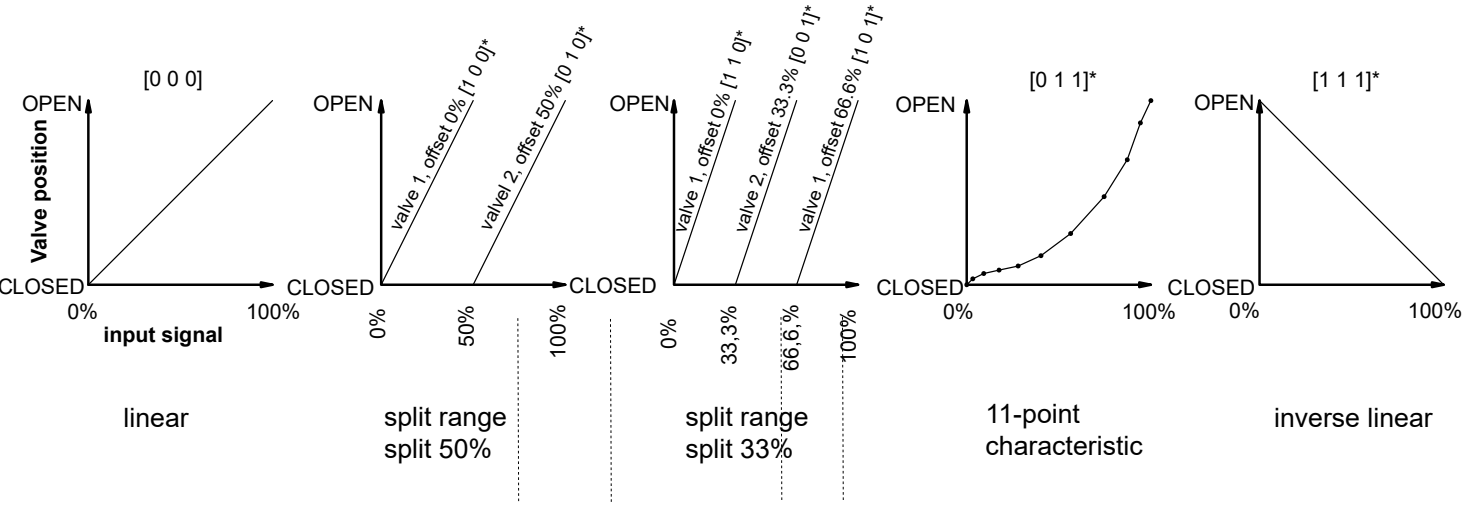



***Fig. 7: Graphical illustration of selection of functions by DIP switches 7, 8, und 9***

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

**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.

| Desired characteristic | DIP switch 10 | Valve characteristic | Actuator characteristic | Result at valve |
|---|---|---|---|---|
| equal percentage | 1 0 10 | v̄ = % Travel | Travel lin Signal | v̄ = % Signal |
| quadratic | Actuator characteristic can only be selected in Modbus mode. | v̄ = % Travel | Travel inv. x² Signal | v̄ x² Signal |
| linear | 1 0 10 | v̄ = % Travel | Travel inv. = % Signal | v̄ lin Signal |
| equal percentage | Actuator characteristic can only be selected in Modbus mode. | v̄ lin Travel | Travel = % Signal | v̄ = % Signal |
| linear | 1 0 10 | v̄ lin Travel | Travel lin Signal | v̄ lin Signal |
| | | | | = Factory settings |

***Fig. 8: Valve characteristics***

**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 initialization run when switched from 0 to 1. If DIP 12 is left in position 1 when the 7020 positioner is switched on, an initialization 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 initialization to be distinguished from errors during normal positioner operation. Switch DIP 12 back to 0 after the initialization run (after having analysed possible error codes) to show any errors occurring in normal positioner operation on the red LED. See also section 6.4 "Initialization run".

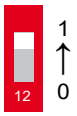
### 6.4 Initialization run

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.
For instructions on mounting a valve with the actuator, see e.g. the operating instructions for the motorized linear actuator baelz 373-E07.

**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 initialization run. (See FigFig. 10 page 17 for meaning of LED signals.) An initialization run can still be carried out, but it will take approx. 1x valve travel time longer. During a successful initialization 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.

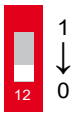



Switch DIP switch 12 from 0 to 1 to start an initialization run. During initialization the red LED is lit and the green LED is off.

An initialization run can be aborted by switching DIP switch 12 from 1 to 0. After an aborted initialization run, the device returns to the same state as before the incomplete initialization run.

After a completed initialization run, the green LED lights up or flashes. If an error has occurred, the red LED flashes. For error signals see table "Initialization error codes", Fig. 15 page 21.

As long as DIP switch 12 is set to 1 (and no restart has been performed since the initialization run), errors and alarms occurring during normal positioner operation will not be shown. This enables errors occurring during initialization to be distinguished from errors during normal positioner operation.




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

After the first initialization run (unit not previously initialized), the unit moves to the 50% position upon completion of initialization. As soon as DIP 12 is set to 0, the Baelz 7020 follows the set value signal at analogue input 2. A manually set 50 % position on a previously uninitialized appliance is also overruled by the change to automatic control mode.

Re-initializing the 7020 can later be used, for example, to recalibrate end positions that have changed over time.

**See chapter 7 for error codes after an initialization run (and during normal operation).**

### 6.5 Meaning of LED signals

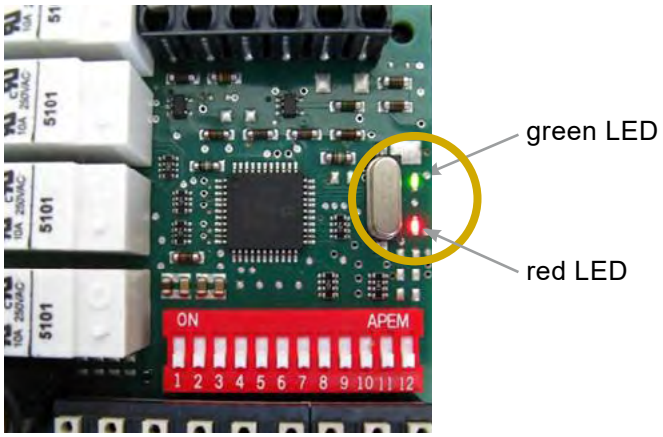



*Fig. 9: LED signals*

| | LED signal | LED signal | Meaning |
|---|---|---|---|
| 1 | | green off<br>red off | Unit is switched off. |
| 2 | | green off<br>red on | Initialization run in progress. |
| 3 | | green flashing*<br>red off | Unit is not initialized. Potentiometer in ideal position for initialization run<br>(for baelz 7020: between 7.5 and 17.5 %; for baelz 7020A: between 3,3 and 6,6 %). |
| 4 | | green flashing*<br>red on | Unit is not initialized. Potentiometer not in ideal position for initialization run.<br>Initialization still possible.<br>(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 initialization. Unit is not initialized. The flashing red LED shows the number of the error code: e.g. 3 flashes, interval, 3 flashes, interval → error code 3. See also section 7.1. |
| 6 | | green on<br>red off | Unit is initialized. No errors. |
| 7 | | green on<br>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<br>red flashing | Unit is initialized. DIP 12 set to 1 → error after initialization run, see section 7.1<br>DIP 12 set to 0 → error or alarm during normal positioner operation (only applies immediately after initialization run, not after controller restart), see section 7.3. |

* Flashing frequency of the green LED: 0.32 seconds ON; 0.32 seconds OFF

*Fig. 10: Meaning of LED signals*

### 6.6 Connection terminals - labelling and assignment

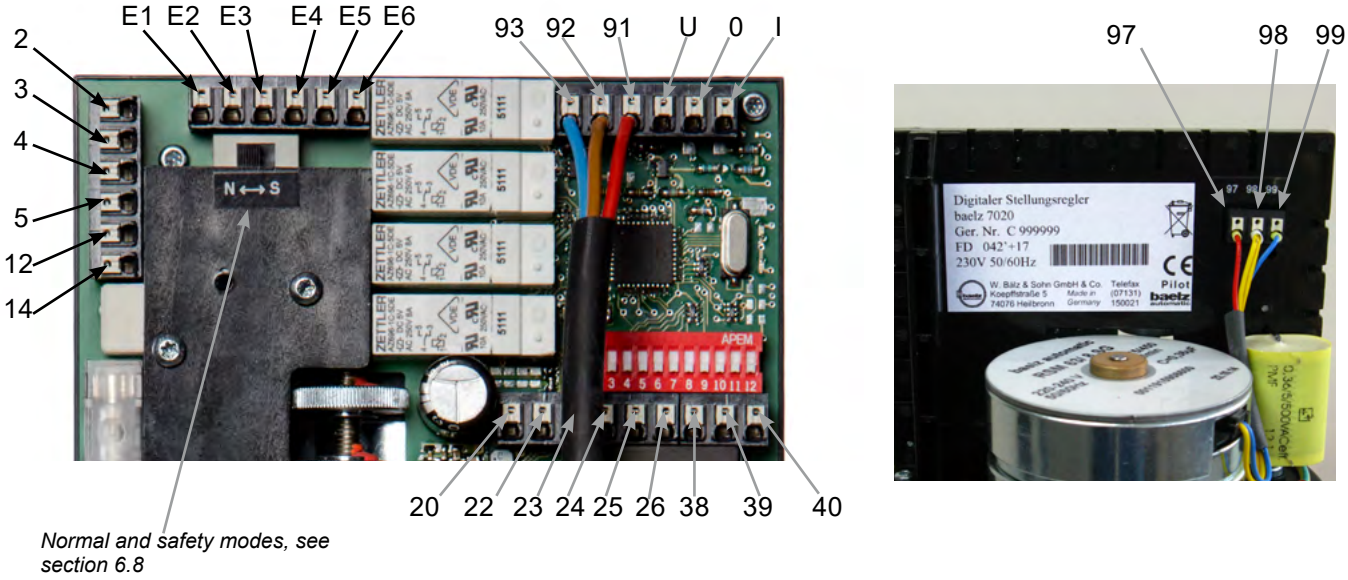



***Fig. 11: Labelling of connection terminals***

**See also "Wiring diagram", chapter 10**

| Terminal | Assignment | Notes |
|---|---|---|
| **2, 3** | supply terminals | See wiring diagram, chapter 10, for correct assignment. |
| **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). See also section 6.9. |
| **20, 22** | Digital input for a switch used to select between two conditions, e.g. "Open / not Open", "Closed / not Closed" or "Heating / Cooling". | |
| **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 section 6.3 |
| **E1, E2, E3, E4, E5, E6** | Terminals for 2 digital outputs | IMPORTANT! Position of DIP switches 5 & 6, see section 6.3 |
| **97, 98, 99** | Connection terminals for motor | Ex-works wiring varies according to type of actuator. |

***Fig. 12: Assignment of connection terminals***

***Tip:*** *For the position of the protective ground connector on the actuator: See, for example, the section on installing a potentiometer in the baelz 373-E07 operating instructions.*

## 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. 5 page 12).
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 section 6.1.

### 6.7.2 Standard operation with Modbus VT100 and direct addressing

In standard mode, some functions of the Baelz 7020 can be set using Modbus VT100 (e.g. 11-point, 2EZ switching points, start/cancel initialization run, interface parameters...). 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 partial 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 fully configured and operated using either a Modbus VT100 or Modbus direct addressing, for example in a building automation system.
Modbus operation is factory pre-configured to correspond to standard operation, which means, for example, that all DIP switches are active.
In Modbus mode, the DIP switches can be overridden with higher-priority settings and some of them can also be disabled.
For details on the individual setting options with their access addresses, please request the separate 7020 Modbus document from Baelz

## 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.

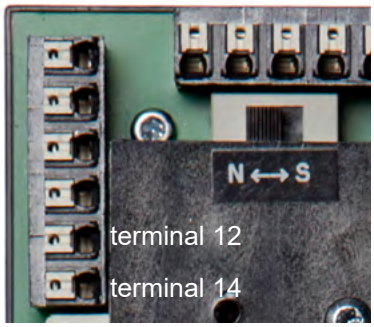



***Fig. 13: N↔S Switch***

### 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.

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).

Phase L may only be fed to one or the other of the two terminals 12 and 14, never to both!

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 section 10.4.

BA_7020_05_EN_MJ_2125

## 6.9 3-point control with a continuous output signal

1. Set the positioner up, wire to power supply and initialize as described.

   If you wish to deactivate all error messages, set DIP switch 11 to 1 (“ON”) and use WinBas Tools (via PC, see section A2) to change the value “LA” in the menu item “CA” to 0.

**See section** 10.3 **for wiring diagrams**

**Tip:** *With “LA=1”, a potentially useful alarm (remote sensor failure on AE1) can still be reported. To do this, do not connect AE2, set DIP 2 to 0.*

(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. The settings “AD=0” and “EFP=0” only affect Modbus VT100 operation and Modbus direct addressing, but not the red LED mentioned, as the “AD” and “EFP” alarms for the red LED are already switched off with “LA=1” or “LA=0”.)

2. Set the N↔S switch (Fig. 13) to "S" and wire as shown in Fig. 15 (the positioner must remain connected to the power supply throughout).
3. The required signal can now be picked up on AO1 und AO2

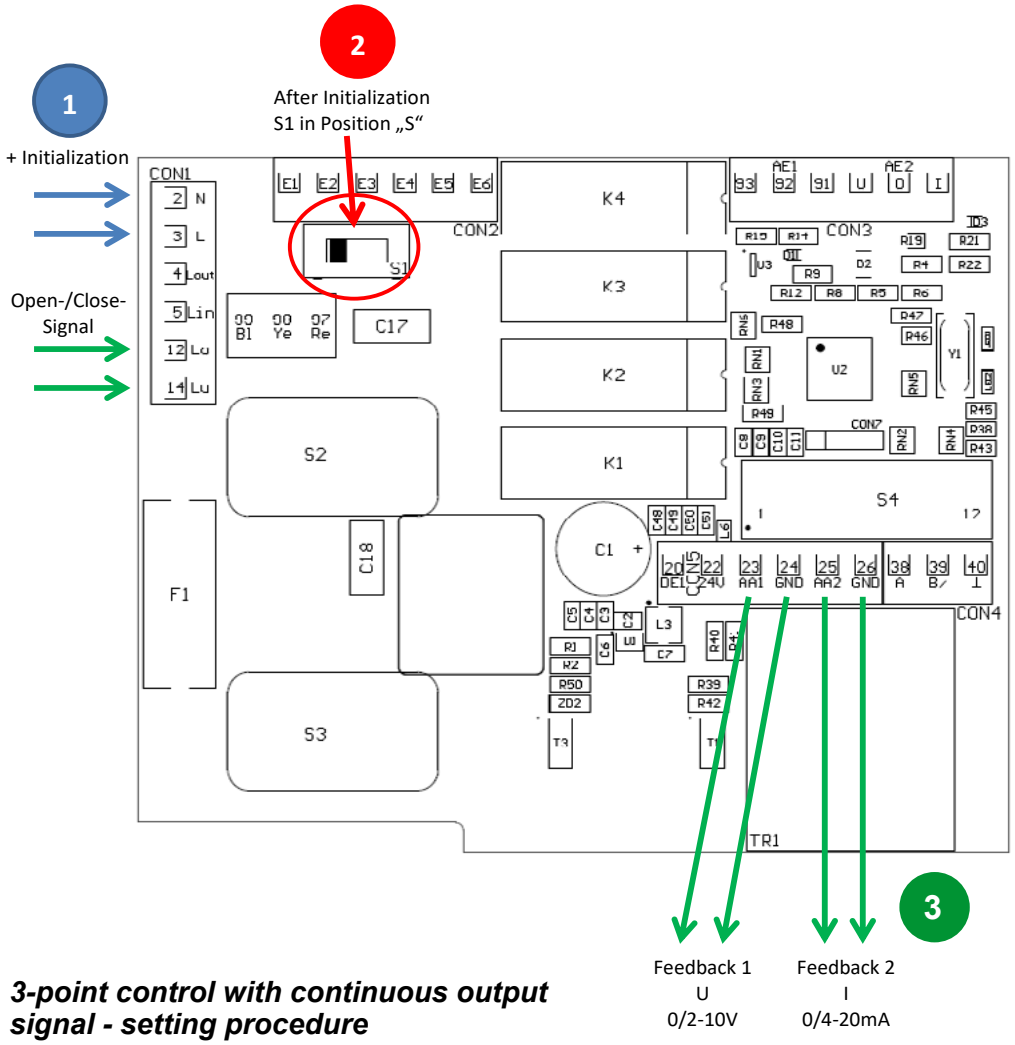



***Fig. 14: 3-point control with continuous output signal - setting procedure***

**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).
Phase L may only be fed to one or the other of the two terminals 12 and 14, never to both!

## 7. ERRORS

### 7.1 Errors after an initialization run

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

The red LED shows errors occuring during initialization as follows (flashing: 0.32 s on/off; pause: 1.6 s off):

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 initialization 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 / wrong potentiometer. | Remove source of interference. Replace potentiometer if necessary. |
| **4** → 4 x ✸ | Potentiometer value at AI1 too large. Possible cause: EMI / wrong potentiometer. | 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 to a valve with shorter stroke length:<br>373-E07 with 7020: stroke < 30 mm<br>373-E45 with 7020A: stroke < 45,5 mm<br>373-E66 with 7020A: stroke < 85 mm |
| **8** → 8 x ✸ | Stroke too short. | Fit to a valve with longer stroke length:<br>373-E07 with 7020: stroke ≥ 8,7 mm<br>373-E45 with 7020A: stroke ≥ 6 mm<br>373-E66 with 7020A: stroke ≥ 11 mm<br>Remove any obstructions. |

***Fig. 15: Initialization error codes***

### 7.2 Error during initialization or during normal positioner operation?

Following an initialization run, the red LED shows only initialization errors as long as DIP switch 12 is set to 1. This enables a clear differentiation between errors occuring during initialization 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 initialization errors which may have occured.

### 7.3 Errors during normal positioner operation

The green LED is lit during normal positioner operation.
A flashing red LED indicates one or more errors during normal positioner operation. (Following an initialization run DIP 12 must be set to 0 for this.)

The red LED shows errors during positioner operation as follows: ( = long flash* = corresponding error code number active, = short flash* = corresponding error code number inactive)

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 (1.8 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:<br>No signal from potentiometer. | Check connection terminals 91, 92, 93<br>See wiring diagram chapter 10. |
| **2♦** | Sensor malfunction at analogue input AI2:<br>No setpoint signal. | Check connection terminals U, 0, I<br>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.<br>Re-initialize Baelz 7020. S. also section 6.9 |
| **6♦** | Alarm 4: potentiometer end stops too imprecise or obstruction. | Deactivate antifreeze / excessive temp.<br>Re-initialize Baelz 7020. Remove obstruction. S. also section 6.9 |
| **7-10** | Reserved for as yet undefined alarms 5-8 | No error possible. |

♦ Enabled in standard mode.

***Fig. 16: 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).*

* long flash ( ) = flashing red LED 1 second On and 0.48 seconds Off; short flash ( ) = flashing red LED 0.16 seconds On and 0.48 seconds Off; interval 0 1,8 seconds red LED Off.

## 8. SPARE PARTS

When ordering accessories or spare parts, please refer to the nameplate on the positioner. The nameplate 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.

BA_7020_05_EN_MJ_2125

## 10. WIRING DIAGRAMS BAELZ 7020

### 10.1 Wiring diagram baelz 7020

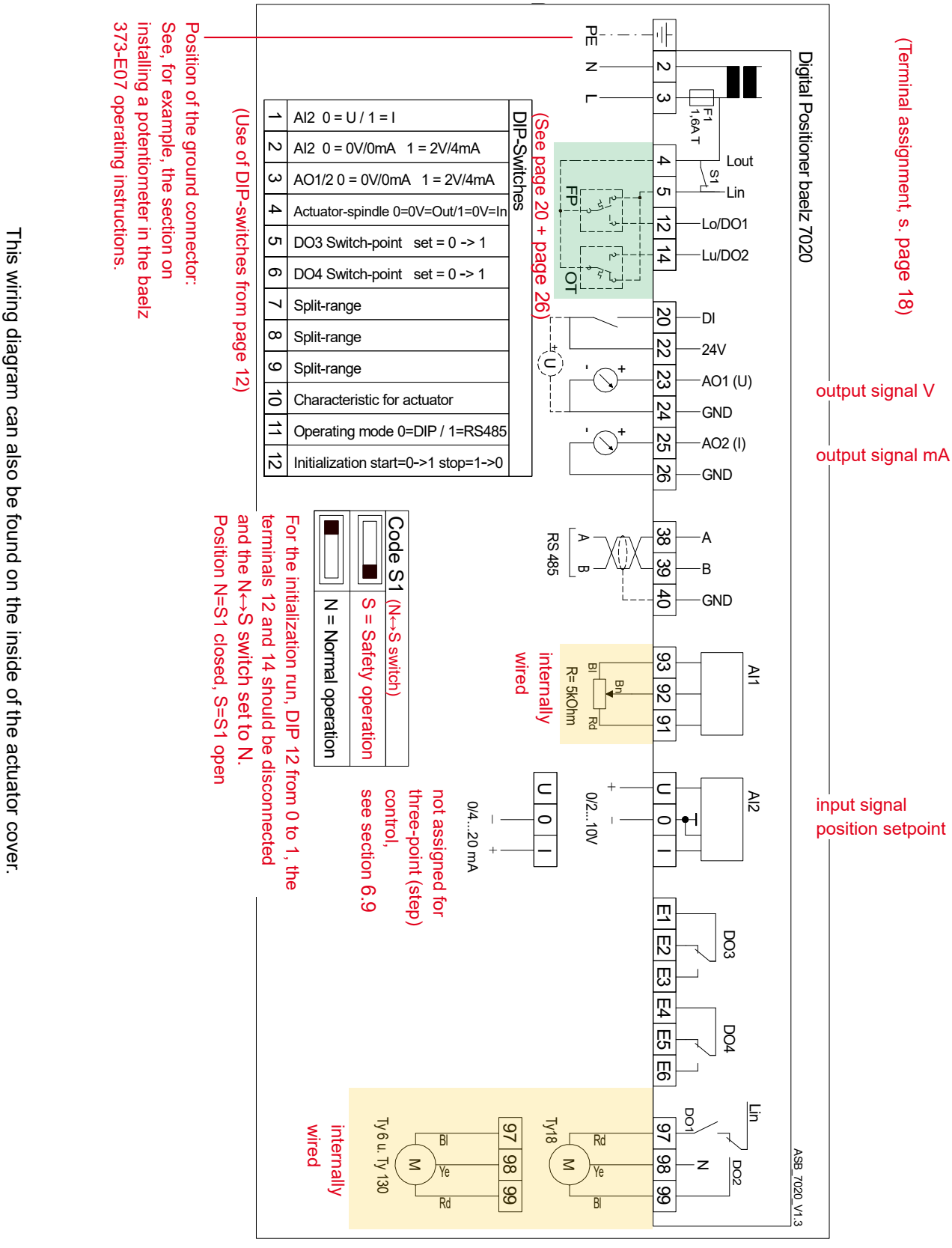



*Fig. 17: Wiring diagram baelz 7020*

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

## 10.2 Wiring diagram baelz 7020A

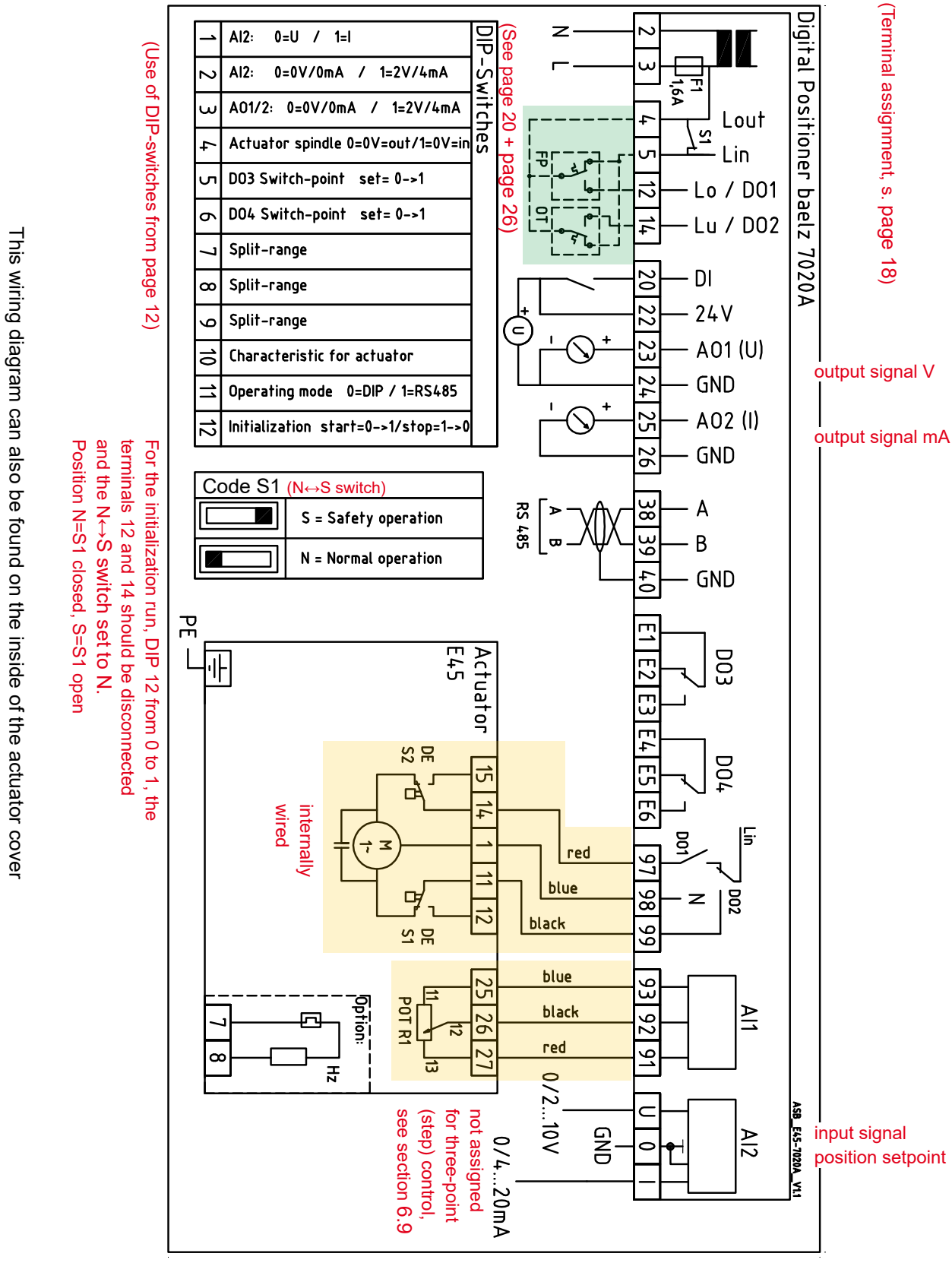
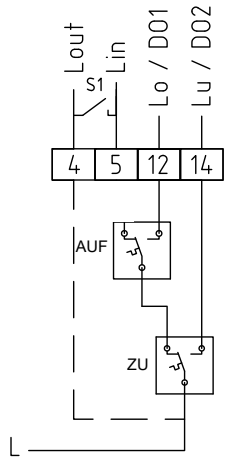


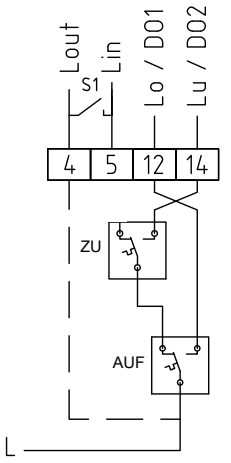

***Fig. 18: Wiring diagram baelz 7020A - Example for motorized linear actuator baelz 373-E45***

### 10.3 Wiring diagrams for 3-point control

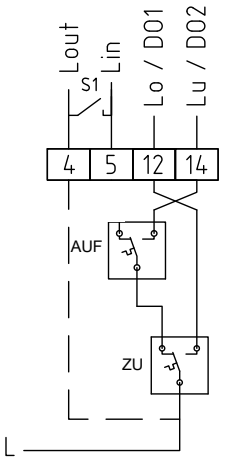
1. Actuator spindle extended = valve closed
Closed (ZU) has priority




2. Actuator spindle extended = valve closed
Open (AUF) has priority




3. Actuator spindle retracted = valve closed
Closed (ZU) has priority




4. Antriebsspindel retracted = valve closed
Open (AUF) has priority

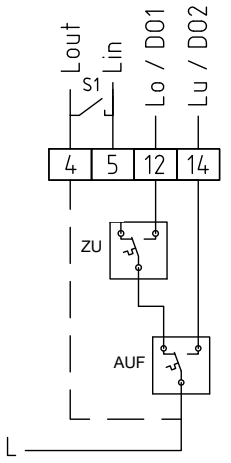
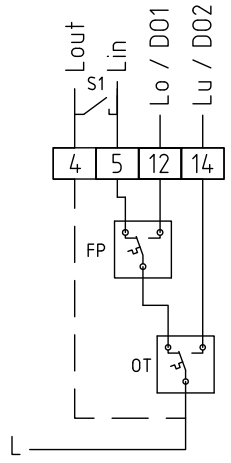



***Fig. 19: Wiring diagrams for operation in safety mode***

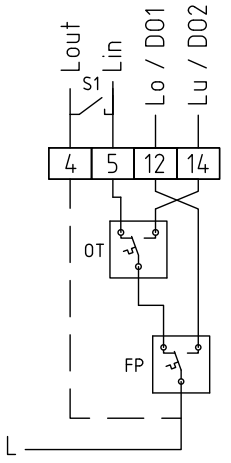
### 10.4 Wiring diagrams for operation in safety mode

Switch S1 (N↔S) is in position S (open).

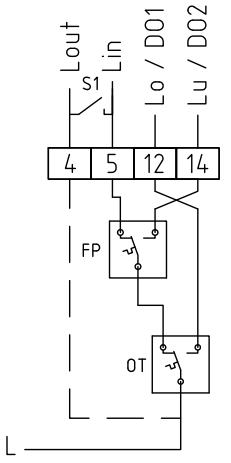
1. Actuator spindle extended = valve closed
excessive temp. (OT) has priority



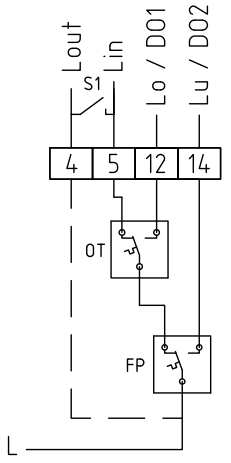

2. Actuator spindle extended = valve closed
antifreeze (FP) has priority



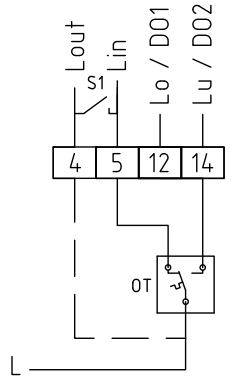

3. Actuator spindle retracted = valve closed
excessive temp. (OT) has priority



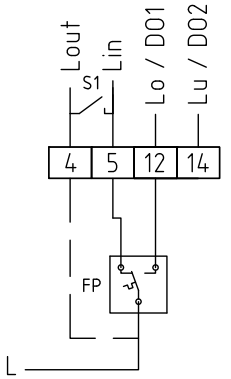

4. Actuator spindle retracted = valve closed
antifreeze (FP) has priority



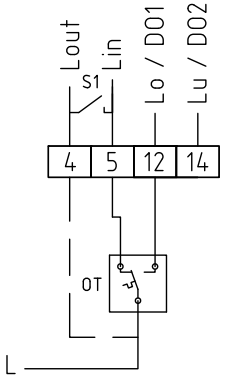

5. Actuator spindle extended = valve closed
only excessive temp. (OT)




6. Actuator spindle extended = valve closed
only antifreeze (FP)




7. Actuator spindle retracted = valve closed
only excessive temp. (OT)




8. Actuator spindle retracted = valve closed
only antifreeze (FP)

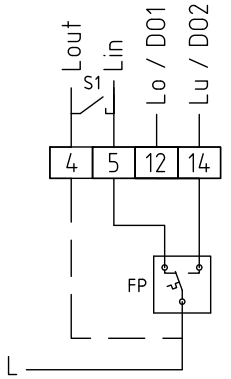


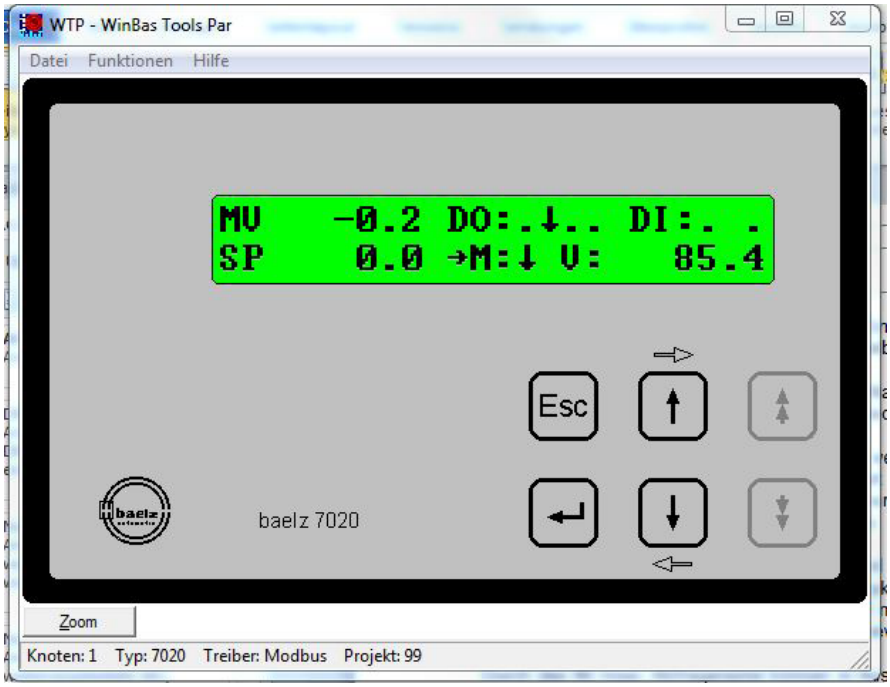

***Fig. 20: Wiring diagrams for operation in safety mode***

**Attention**

Before re-initializing the actuator, disconnect terminals 12 and 14 and set the N↔S switch to normal mode (N).
Phase L may only be fed to one of the two terminals 12 and 14, never to both simultaneously!

# Digital Positioner
# Appendix A: Instructions for Operation using Modbus






Technische Änderungen vorbehalten

Schutzvermerk ISO 16016 beachten

## APPENDIX 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 section 2.3.

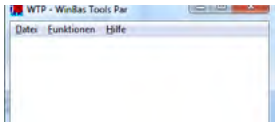
## A1. FUNCTIONAL DESCRIPTION

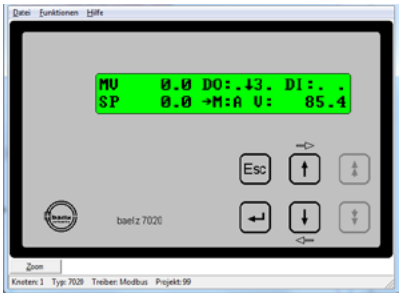
The 7020 can be operated using Modbus VT100. The screen contents and keyboard of the 7020 are transferred to a virtual environment for this purpose. The 7020 can also be configured or operated by a building control system or other system using direct Modbus addressing.
In standard mode, the Baelz 7020 can be operated in parts via Modbus VT100. A virtual 7020 screen content and a virtual 7020 keypad are transmitted. Statuses can also be viewed, partially operated or configured via Modbus direct addressing, e.g. from a building management system. The settings of the DIP switches remain effective. Values that are only used in Modbus mode can also be changed in standard mode, but only take effect in Modbus mode.
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



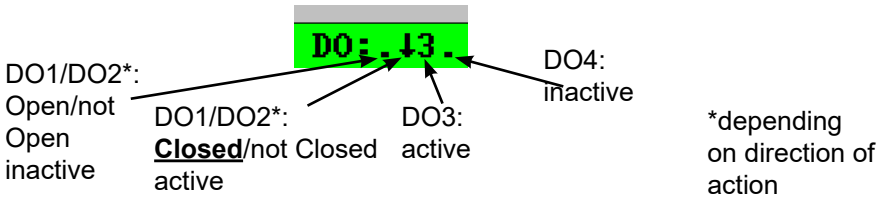



Launch the WinBas Tools software.
If you have not already done so, select “7020/22” in the WinBas Tools menu under “Functions”, “Connection to...”, “Device type” and confirm with “OK”.

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

This display, the IMM menu, appears (s. section A4.1).

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



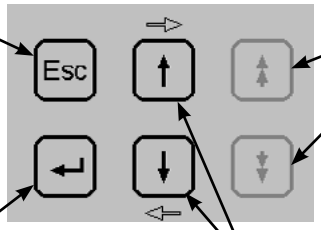

**DI** = Status of digital input (DI1): Point = not active, 3 = active
**SP** = Set point
→ = Input cursor, can be placed in front of M or V
**M** = Can be set as required in standard mode in preparation for Modbus operation. A = Automatic is always active in standard mode.
**V** = Can be set as required in standard mode, but is 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 Tools 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
- Cancel parameter input with return to original value

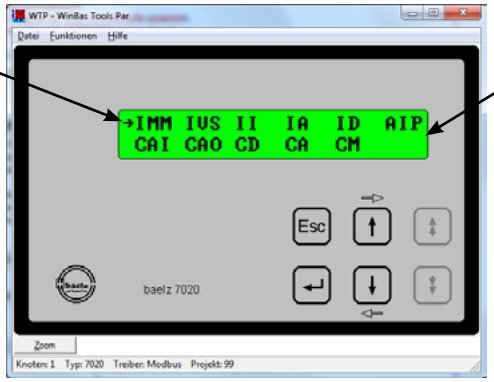



Scroll quickly through values (/menu items). Useful for changing percentages, for example.
(Keyboard = View ↑- / View ↓-keys)
Press the scroll button again to stop fast scrolling.

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

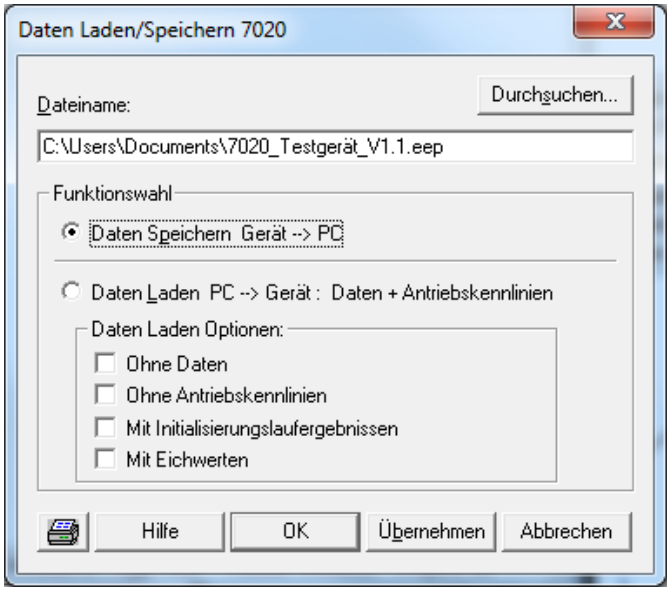
- Move selection arrow one place further in the indicated directions.
- In submenus: scroll through parameters.
- With a selected parameter (selection arrow blinks): gradually increase or decrease the value.

Selection arrow




Main menu

## 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.

If you have not already done so, select “7020/22” in the WinBas Tools menu under “Functions”, “Connection to...”, “Device type” and confirm with “OK”.

In the WinBas Tools window (see section 2.2), select "Funktionen" → "Daten Laden/Speichern..." (functions → load/save data)

The window shown on this page 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.

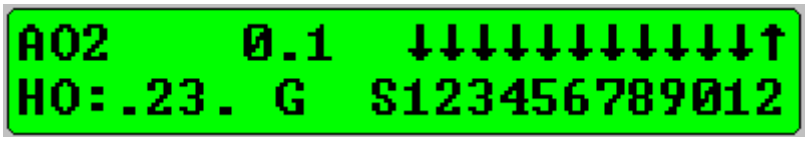
| Abbreviation | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| MV | Manipulated Variable | Manipulated variable, actual value AI1 | ≈ 0%–100% or<br>E = Error from sensor break at analog input 1 |
| SP | Setpoint | Setpoint | ≈ 0%–100% or<br>E = Error from setpoint loss<br>I = Initialization in progress<br>S = Stopped, i.e. uninitialized |
| DO | Digital Outputs | Digital outputs | DO1/DO2*: Point = Not active, ↑ = Up is active<br>DO2/DO1*: Point = Not active, ↓ = Down is active<br>DO3: Point = Not active, 3 = DO3 is active<br>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 A4.4, IA menu) | Point = Not active, A = Collective alarm active |
| → | | Input cursor | Can be placed in front of M or V |
| M | Manual | Manual operation | Can be set as required in standard mode in preparation for Modbus operation. A = Automatic is always active in standard mode |
| V | Value | Manual setting of numeric values | Can be set as required in standard mode, but is only active in extended Modbus operating mode |

*Depending on the configured operating direction (DIP 4), DO1 or DO2 is used as open or close control.

BA_7020_05_EN_MJ_2125

### A4.2 IVS menu

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




| Abbr. | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| AI1<br>AI2<br>AI3<br>AI4<br>SI2<br>SP<br>MO1<br>MO2<br>AO1<br>AO2 | Analog Input 1<br>Analog Input 2<br>Analog Input 3<br>Analog Input 4<br>Scaled Analog Input 2<br>Setpoint<br>Modbus Analog Output 1<br>Modbus Analog Output 2<br>Analog Output 1<br>Analog Output 2 | Analog Input 1 (AI1)<br>Analog Input 2 (AI2)<br>Analog Input 3 (AI3)<br>Analog Input 4 (AI4)<br>AI2, scaled<br>Setpoint<br>Modbus AO1<br>Modbus AO2<br>Analog Output 1 (AO1)<br>Analog Output 2 (AO2) | Arrow keys (↑↓) scroll from AI1, AI2 etc. to AO2.<br><br>Values for outputs or inputs are indicated, otherwise:<br>E = Error from failure or no specification |
| S | (DIP) Switches | DIP switch position | 1-9 and 0 (=10), 1 (=11), 2 (=12)<br>↓ = Switch set to 0, ↑ = Switch set to 1 |
| HO | Hardware Outputs | Real hardware digital output statuses | Example (see above figure): HO: .23.<br>= 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 |

| Abbr. | Notes |
|---|---|
| AI3 | DI1 is generated from AI3. |
| AI4 | Reserve AI, can be set by software for test purposes. |
| SI2 | SI2 = the value for AI2, processed and, if necessary, limited via the 11-point characteristic curve, split range and/or drive characteristic curve. SI2 can (but must not necessarily) become the setpoint. |
| SP | Displayed as in section A4.1 but without the special statuses “I” and “S”. |
| MO1<br>MO2 | The analog outputs AO1/AO2 can be scaled and output indirectly by the data points MO1/MO2 which can be assigned using Modbus. Only in Modbus mode with FO1=12 or 13, or with FO2=14 or 15. |
| GR | The quality of the display of the flashing LEDs on the VT100 screen is dependent on the Modbus baud rate. |

### A4.3 Menu II

**Indication Initialization:**
Initialization State/Results Initialization Process

| Abbr. | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| I | Initialization | Initialization | Y = Yes (device is initialized)<br>N = No (device is not initialized)<br>I = Initializing (initialization in progress) |
| EC | Error Code | Error code after initialization process | 0 = no error<br>(see also error codes, Fig. 15)<br>To reset the error code to 0: set DIP 12 from 1 to 0, switch the 7020 off and on again, or confirm the input value 0 with Return in the AIP menu for the SI parameter. |
| TPI<br><br>THI | Process Time Initialization<br><br>Three-point Hysteresis Initialization | Valve running time<br><br>Switching hysteresis of the three-point controller | Valve running time in seconds determined during initialization process<br>Switching hysteresis (in %) determined during initialization process<br>Arrow keys (↑↓) switch between TPI and THI |

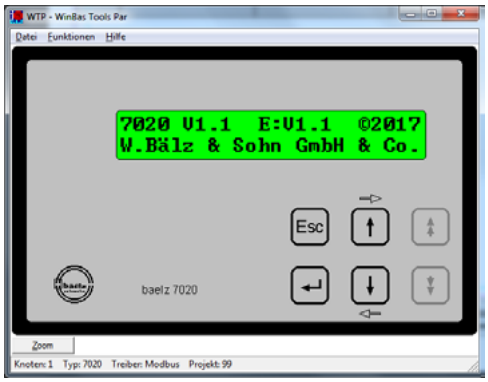
### A4.4 IA Menu

**Indication Alarms:**
Monitoring/Alarms

| Abbr. | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| CA | Collective Alarm | Collective alarm | Point = No alarm, A = Alarm<br>Sensor failures of AI1 and AI2, alarm 3 and 4 |
| SB | Sensor Break | Sensor break analog-input 1 (AI1)/analog-input 2 (AI2) | Point = No break<br>Respective AE number 1 or 2 = sensor break |
| A | Alarms | Alarms | Point = No alarm<br>Respective alarm number 1 to 8 = Alarm<br>(see also section 7.3)<br>Alarms 5 to 8 not allocated<br>See Fig. 16: Alarm 1 for error code 3, to alarm 4 for error code 6. |

### A4.5 Menu ID

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



### A4.6 AIP menu

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

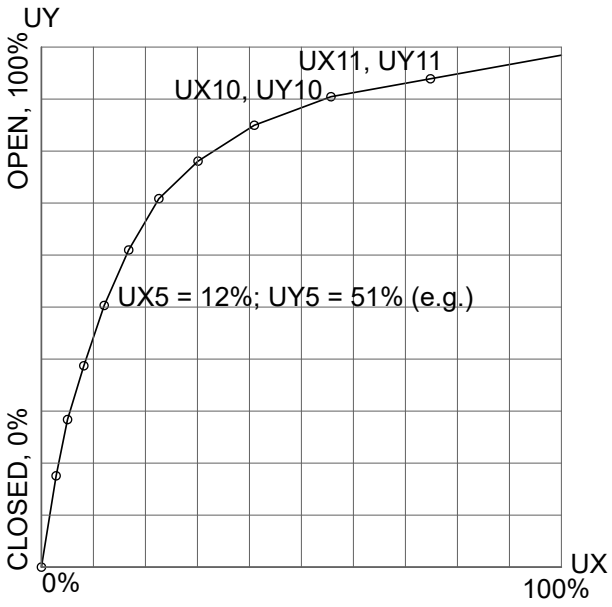
| Abbreviations | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| SI | Start (Stop) Initialization | Start/Cancel Initialization Process | Function like DIP switch 12: 1: Initialization running, 0→1: Start initialization run, 0: Initialization not running, 1→0: Cancel initialization run<br>**Special case for SI=0:** If the input value 0 is confirmed with Return after an initialization run for the SI parameter, the system switches to automatic mode if the 50% delivery status was active; in addition, any error code from the initialization run is reset (EC=0 and red LED) and the error code output for normal operation is enabled again. |
| RD | Reset Device | Program restart | 1: Restart without switching off<br>0: No function<br>The program restart interrupts the Modbus connection, which can only be re-established after a waiting time of 2 seconds. |
| FP1 | Fix Position 1 | Logging of actual potentiometer position 1 (2EZ) | Function like DIP switch 5 (s. also sections 6.2 and 6.3)<br>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 (s. also sections 6.2 and 6.3)<br>Returns automatically to "0" after entering "1". Entering "0" has no function. |

### A4.7 CAI menu

**Configuration Analog Inputs:**
Configuration of analog inputs.

Only menu items relevant to standard operation are outlined here.

#### 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. 6 page 14.
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.

| Abbr. | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| 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.<br>11-point characteristic curve: see above.<br>The inputs UX1 to UY11 can be enabled with US2=6 before they take effect (as an alternative to DIP7 to 0, DIP 8 to 1, DIP9 to 1). |

**Further notes:**

- If only one point is defined (with UX2 <= UX1), UY1 is assigned to each X value (exception: sensor failure on AI2).
- The 11-point characteristic curve is preset at the factory with a linear 2-point characteristic curve: 0% to 0% and 100% to 100%.

BA_7020_05_EN_MJ_2125

### 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.

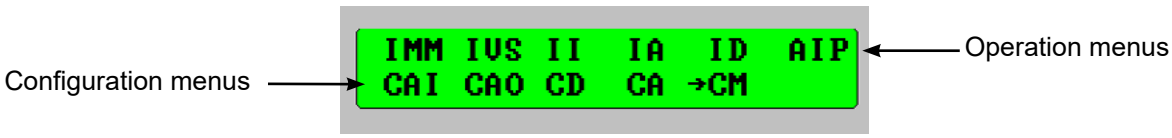
| Abbreviation | Written out | Parameter/Function | Explanation |
|---|---|---|---|
| AL1 | Alarm 1 | Limiting Value Alarm 1 | The configured limiting value AL1 is compared with AI1 (first 2EZ) in standard mode. An alarm is issued when this limiting value is underrun. AL1 is set either with DIP switch 5 (see section 6.3) or by entering 1 for FP1 (see section 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%<br>See also Fig. 16, error code 3.<br>Default: 2.0% (“closed” valve is signaled)<br>Hysteresis: 0,5 % (standard mode)<br>Input range: -22.0% to 122.0%. |
| AL2 | Alarm 2 | Limiting Value Alarm 2 | The configured limiting value AL2 is compared with AI1 (second 2EZ) in standard mode. An alarm is issued when this limiting value is exceeded. AL2 is set either with DIP switch 6 (see section 6.3) or by entering 1 for FP2 (see section 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%<br>See also Fig. 16, error code 4.<br>Default: 98.0% (“fully open” valve is signaled)<br>Hysteresis: 0,5 % (standard mode)<br>Input range: -22.0% to 122.0%. |

### 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.<br>Important! See also "IE" in this table. | The password input only appears when the configuration menus (shown below) for inputs are disabled. To enable all inputs:<br>● Enter "1500" for PW.<br>● Remain in the CM menu and scroll through to "IE".<br>● Enter "255" for IE. |
| BD | Baud Rate | Baud rate (communication speed) | 0 = 19200 bits per second<br>1 = 9600 bits per second<br>2 = 4800 bits per second<br>3 = 2400 bits per second<br>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.<br>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.<br>Default = 1<br>Input range = 1 to 247 |
| IE | Input Enable | Enabling of inputs<br>Important! See also "PW" in this table. | 252 = All inputs disabled<br>253 = Only operation enabled<br>254 = Only configuration enabled<br>255 = Enable everything<br>Any disabling of the configuration menu (shown below) only takes effect after the CM menu is exited.<br>Other inputs in the IE menu are not relevant to standard operation. |




BA_7020_05_EN_MJ_2125