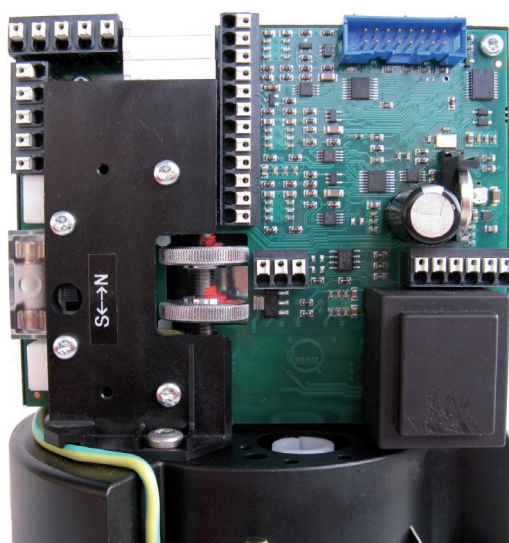
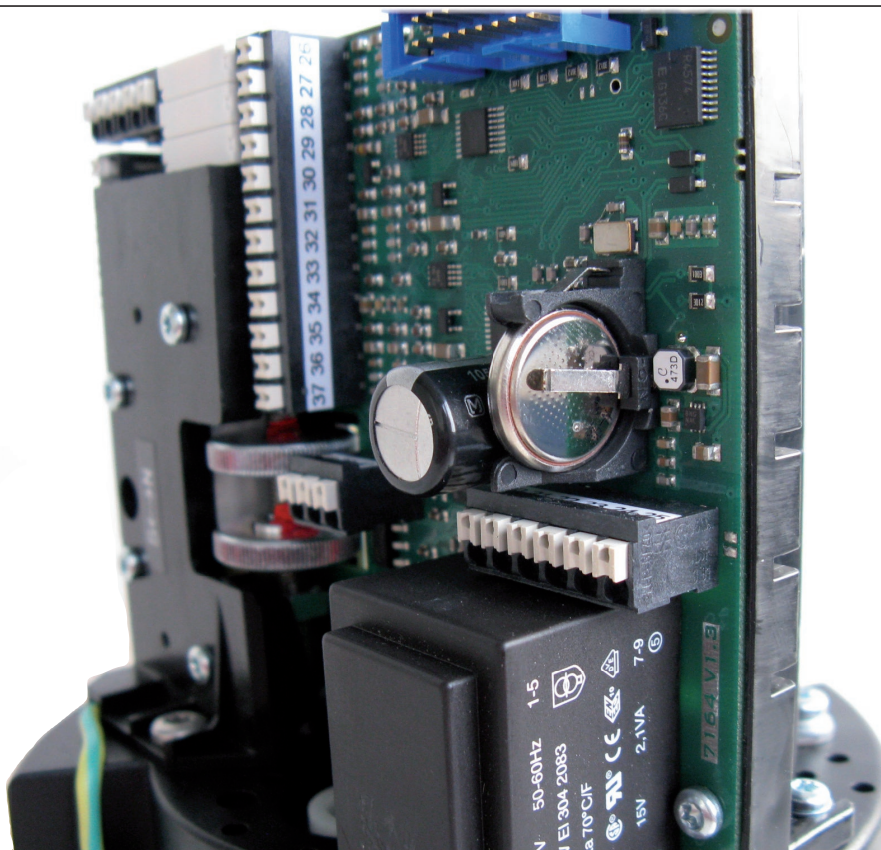


**Operating Instructions for microprocessor-based controller  
μClimatron baelz 7164  
installed in 373-E07 for heating systems**



BA\_7164\_02\_DEF\_MJ\_1418

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**Operating Instructions****OI 7164****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 will result in death or serious injury.

**Warning**

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

**1.1 Intended use**

µClimatron baelz 7164 microprocessor-based controllers are used to control the flow temperature depending on the outdoor temperature as required. The microprocessor-based controller is intended for installation in a Baelz 373-E07 actuator.

To ensure its intended use, make sure that the above type identification complies with the identification label of the controller before starting any activities. The actual technical data of the integrated controller and the power supply requirements are the specifications indicated on the identification label.

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 the device as well as 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 the present Operating Instructions, under consideration of general technical rules and regulations.

**1.2 For the operator**

Make sure the Operating Instructions are kept permanently available and easily accessible at the site of operation of the controller!

During set-up, operation and when performing maintenance procedures on the device, observe the applicable 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. Observe compliance with any possibly applicable additional regional, local or in-house safety regulations.

Make sure that any person assigned by you to perform the activities described in the present Operating Instructions, has read and understood these instructions.

**Operating Instructions****OI 7164****1.3 Personnel**

Only qualified personnel may operate this integrated controller or work in its vicinity. Qualified persons are persons who are familiar with the set-up, installation, commissioning, operation and maintenance of the controllers 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.
- First aid training.

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

**1.4 Before starting work**

Prior to starting any kind of work, check if the types specified here are identical with the specifications on the identification label on the controller:  
baelz 7164

**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 controller is disconnected from power by qualified personnel in accordance with DIN VDE standards. The controller is maintenance-free. We recommend, however, to check the proper function of the integrated controller at least once a year. This requires removal of the actuator cover. Apart from this, the device does not require any other routine or periodic maintenance.

**1.6 Work environment**

Please observe the information regarding the work environment in the Specifications.

## 2. PRODUCT DESCRIPTION

### 2.1 Identification

Each controller 7164 has an identification label. This label includes specifications regarding the operating conditions of the device and a unique, order-related serial number (Ger. Nr.).



Figure 1: Baelz controller identification label



**Operating Instructions**
**OI 7164**
**2.2 Specifications**

Mains voltage	230 VAC -15% / +10% , 50 / 60 Hz, optional: 115 VAC 50 / 60 Hz, 24 VAC 50 / 60 Hz	
Fuse	internal 1.6 A slow-blow fuse	
Power consumption	approx. 5 VA	
Protection level	corresponds to the protection level of actuator Baelz 373-E07	
Ambient temperature –Operation	0 to 50°C	
Ambient temperature –Transport / storage	- 25° to + 65°C	
Ambient humidity	5 to 90% r.h.	
Design	installation in actuator E07	
Dimensions	WxHxD approx. 120x95x55 mm	
DI and transducer supply voltage	24V DC, I <sub>max</sub> = 20 mA	
Digital input	Re = 4 kΩ, (low = 0 VDC ; high = 15 ... 24 VDC)	
Analogue output	0 / 2 to 10 V , I <sub>max</sub> = 5 mA, measuring accuracy 0.3% of the measuring range	
Analogue inputs	4, connection with spring-loaded terminals	
Measuring ranges	for AI 1 – 3	<b>selectable</b>
	NTC	3.11 ( –40°C to +60°C )
		3.12 ( 0°C to +60°C )
		3.13 ( 0°C to +140°C )
	PT100	2.49 ( –40°C to +120°C )
	special use	sonder* (0 to 100%)
	Current	7.1 (0 to 20 mA), 7.2 (4 to 20 mA) Re = 134 Ω
	Voltage	8.1 (0 to 10 V), 8.2 (2 to 10 V) Re = 77 kΩ
	Remote transmitter	4.2 5 kΩ
	for AI4	<b>fixed</b>
	PT100	2.49 ( –40°C to +120°C )
Display	LCD with 2x24 characters (optional)	
Keyboard	4 keys (optional)	
Relay	4 ( 2x for free assignment) with floating contact Rating 250 VAC / 3 A Spark quencher 4.7nF + 120 Ω	
Interface	RS 485 Modbus-RTU	
Data backup	Non-volatile semiconductor memory	
Time buffering	Lithium battery 3.0 V	
Weight	0.5 kg	

\* for special applications only

Figure 2: Table of specifications

2.3 Accessories and options

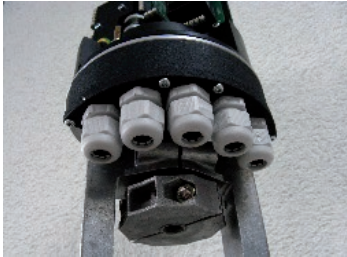

Controller options	
<p>5/3 cable gland adapter</p> 	<p>If the 3 standard cable glands of the E07 actuator are not sufficient for the number of cables, an optional 5/3 cable gland adapter can be installed.</p> <p>5/3 cable gland adapter for 7164 for extension of connection options on the housing of the E07.</p>
<p>Plug-type manual operation unit</p> 	<p>Plug-type external manual operation unit for operation and commissioning, with 4 keys and LC display (2x24 characters). If required, it is plugged onto the printed circuit board by means of a cable (remove the cover of the E07 for connection). This permits operation, setting parameters, commissioning and correction of faults.</p> <p>Cable with connector, 1 m Dimensions: (W x H x D) 149 x 99 x 22 mm</p>

Figure 3: Table of accessories and options

2.4 Operating conditions



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

For use outdoors or in an environment with a high pollutant concentration, such as heavy traffic areas, 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 drafts
- dust

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### 3. TRANSPORT AND STORAGE



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

**Caution**

- Wear the required personal and other protective equipment.
- Protect the controller from impacts, shock, vibration and similar influences.
- Store the controller (and, if necessary, the complete actuator) in a dry place.
- Observe the transport and storage temperature.

### 4. FITTING

#### 4.1 Fitting position

When fitting with the connecting rod in horizontal position, mount the linear actuator such that the two rods of the yoke are positioned on top of each other in the vertical plane (Fig. 4).



**Damage caused by operation without a valve!**

**Caution**

- If the linear actuator is operated without a valve, the missing stop may cause damage to the actuator. The actuator must therefore never be operated without a valve.
- Allow for about 145 mm space above the cover at the site of installation.
- Check the work environment before mounting the actuator and before putting it into operation:
- Make sure that the valve is correctly installed. For detailed information, refer to the valve's installation instructions.
- Determine the mounting position of the linear actuator. Do not mount linear actuators in downward position.

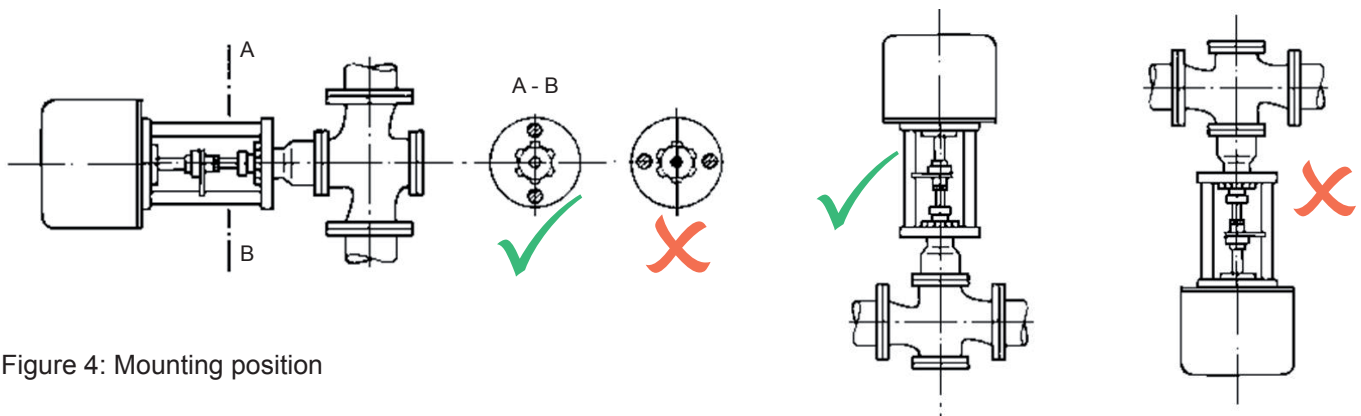


Figure 4: Mounting position

#### 4.2 Fitting the controller

Baelz recommends purchasing the controller pre-assembled in the actuator.



### 4.3 Electrical connection

**Danger****Risk of electric shock!**

***Make sure to use an appropriate power supply to ensure that no dangerous voltage will enter the device during normal operation or in the event of a system failure or failure of system components.***

***Failure to heed this warning may result in death, serious injury or substantial material damage.***

For short-circuit protection and disconnection of the integrated controller from the power supply, fuses and switch disconnectors must be provided on site. The current values for the rating depend on the operating current of the actuator motor (refer to the identification label).

The electrical connection may only be made by trained, qualified personnel.

- Prior to connection, observe the basic information provided in this chapter.
- When making the electrical connection, make sure that the power supply is turned OFF! Ensure protection against unintentional reconnection to power!
- For wiring and connection, observe the regulations for the erection of electric power installations and the regulations of the local energy supplier!
- Check compliance of the line voltage and the line frequency with the specifications on the identification label of the controller and on the identification label of the actuator motor.
- Always select the line cross section so as to match the actuator's power consumption and the required line length. Minimum cross section of the cable for this linear actuator: 1 mm<sup>2</sup>.

Under fault conditions: Dangerous voltage if protective earth conductor is **NOT** connected! Risk of electric shock.

→ Do not put the device into operation if the protective earth conductor is not connected.

Short-circuit due to jammed lines! Risk of electric shock and malfunction.

### 4.4 Carrying out electrical connection work

**Danger****Risk of electric shock!**

Dangerous voltage! Risk of electric shock.

→ Disconnect the device from power before removing the cover.

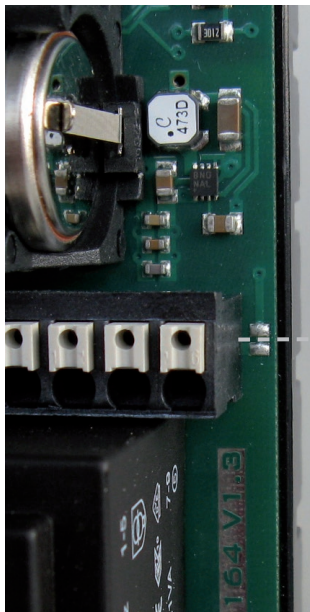
Always use the wiring diagram which is attached or adhered to the inside of the cover.

Replace the dummy plugs with cable glands.

1. Strip the wires.
2. Remove the insulation from the conductors.
3. For flexible wires: Use wire end ferrules as specified in DIN 46228.
4. Connect the wires as specified in the customized wiring diagram.

The protection level IP ... shown on the identification label is only ensured if suitable cable glands are used.

#### 4.5 Supply of digital inputs with a separate 24 V power source



If the digital inputs are to be connected to a separate 24 V supply, the trace adjacent to Push-in terminal 25 must be cut (Fig. 5) if galvanic isolation is necessary. The trace in question is marked with "LA1" in the wiring diagram (see "Wiring diagram", section 7.2, page 14).



Figure 5: Galvanic isolation for separate supply 24 V at digital inputs

## 5. DESCRIPTION OF FUNCTIONS

µClimatron baelz 7164 microprocessor-based controllers are used to control the flow temperature depending on the outdoor temperature as required. The resulting flow setpoint is controlled by the motorized valve. The microprocessor-based controller has been optimized for installation in a Baelz 373-E07 actuator. The short length of the cables between controller and sensor reduces susceptibility to interference. The elimination of the signal cabling between actuator and controller reduces the amount of time and work required for mounting as well as costs for installation. Less space is required for control cabinet and PLC as the controller's hardware is located in the actuator. The control loop as a module reduces the total expenditure for planning/commissioning in the PLC. Signal testing on site is not required, as the microprocessor-based controller is integrated and wired at the factory. Operation is done via an optional plug-type manual operation unit, which can be connected if required by means of a connection cable and a connector, or via an RS 485/Modbus RTU connection. This permits operation, setting of parameters, commissioning and correction of faults. If the 3 standard cable glands of the E07 actuator are not sufficient for the number of cables, an optional 5/3 cable gland adapter can be installed.

- Max. 1 control loop
- With/without room temperature compensation by adjustable flow temperature adaptation
- With/without limitation of the minimum and maximum return flow temperature by adjustable flow temperature adaptation, fixed or sliding
- Heating curve with a max. of 5 vertexes, permits any curve shape
- Times of use with 3x switch-on and 3x switch-off days per weekday
- Max. 16 public holidays, 4 special times, 10 vacation periods
- Correction potentiometer for flow temperature adaptation
- Summer/winter mode, i.e. heating system switched on and off based on the variation of the outdoor temperature
- Automatic change from daylight savings time to standard time and vice versa
- Pump blocking protection while installation is switched off, for temporary pump start each day
- DHW tank temperature control via thermostat, one or two temperature sensors, via valve or loading pump
- DHW tank priority circuit by increasing the flow to a value which can be entered, above DHW temperature
- Scheduler program for circulation pump
- Sensor monitoring with alarm message
- Overview with manual operation via keyboard
- Analogue outputs as a copy of the measured value or total setpoint
- Adjustable delay for outdoor temperature adaptation
- DHW tank disinfection when loading via sensor
- Block programming of switching times
- Adaptation of switching times depending on outdoor temperature



### Attention

The manual operation unit may only be connected when the integrated controller is disconnected from power to prevent indication errors on the display of the manual operation unit.

## 6. OPERATION

### Differences compared with controller baelz 6164

Please also refer to the Operating Instructions OI 6164 starting with section A5 List of parameters, as the software is fully compatible. This additional description only applies in conjunction with the Instruction OI 6164 and covers the different functions and features compared with the baelz 6164 controller as described below:

#### Hardware:

- Elimination of measurement module jumpering.
- 12 bit instead of 10 bit AD converter.
- New RS485 interface for up to 247 devices per bus line instead of previously 32.
- Interface (RS485) fixed on the baseboard instead of previously used additional plug-type board.
- Power failure detection circuit for permanent storage of meter readings.
- Improved EMC characteristics.
- More cost-effective setup.
- Change of programmes facilitated by the flash technology of the microcontroller.

#### Software:

- Measuring modules can be switched by software within seconds.
- Volume or pulse counting via a digital input.
- Calculation and indication of a virtual variable in three-step control mode.
- Relay switch-off function for actuators without limit switches, e.g. with magnetic friction clutches.
- Operating level can now be completely locked.
- Variants for loading setpoint of the DHW tank charge.
- Jet control extensions.
- Heater pump behaviour can now be selected for "DI Closed": On or Off, instead of previously only On.
- Temperature transfer via bus without PC (e.g. for outdoor temperature).
- Programme change / update also possible via bus.
- Separate indication of programme and EEPROM version.
- Special programme Modbus master for individual transfer of up to 5 outdoor temperatures to up to 247 Modbus slaves with communication monitoring and error indication.
- The electrical wiring diagram has changed, see 6. Connection example



#### Attention

Compare the thrust of the actuator and the set travel with the valve data. Overload can result in severe damage to the valve.

Pay attention to moving parts during mounting and adjustment. Risk of injury and or substantial material damage.

## Operating Instructions

**OI 7164**

### 6.1 Normal and safety modes

In normal mode the position of the valve is controlled by the set value at one or more of the analogue inputs, depending upon the configuration. 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.

### 6.2 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).

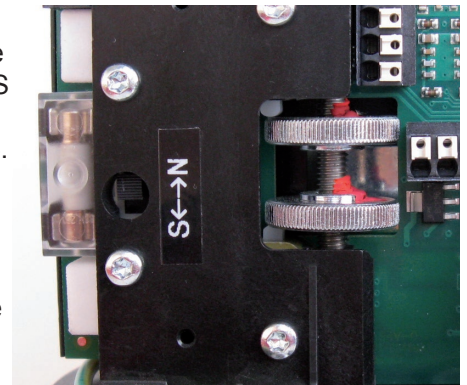


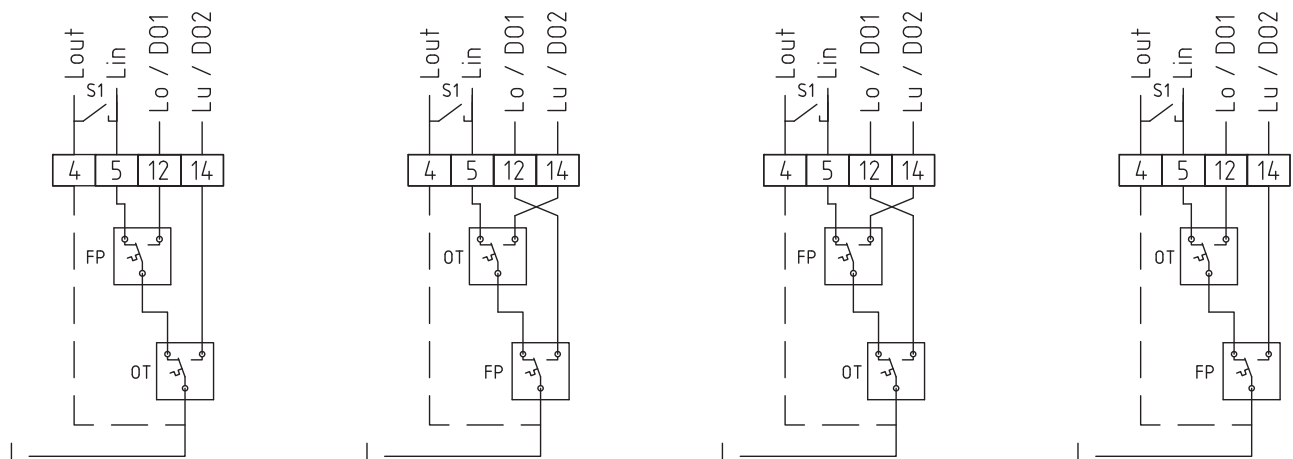
Figure 6: N↔S-Schalter

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 7.1 (below).

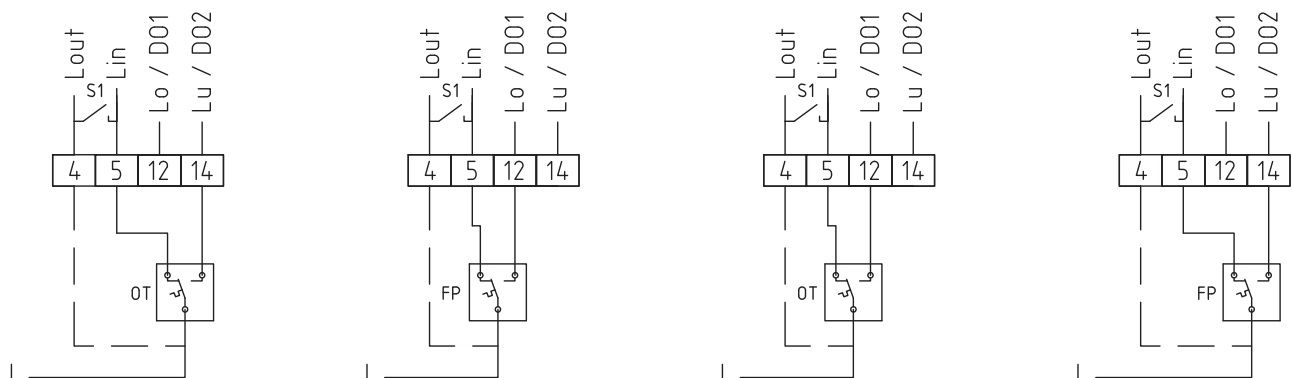
## 7. WIRING DIAGRAMS

### 7.1 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)



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Figure 7: Wiring diagrams for operation in safety mode

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## 7.2 Wiring diagram baelz 7164 with options antifreeze excessive temperature and sequence

This wiring diagram is only an example and is intended for general information. Always use the wiring diagram enclosed with the actuator.

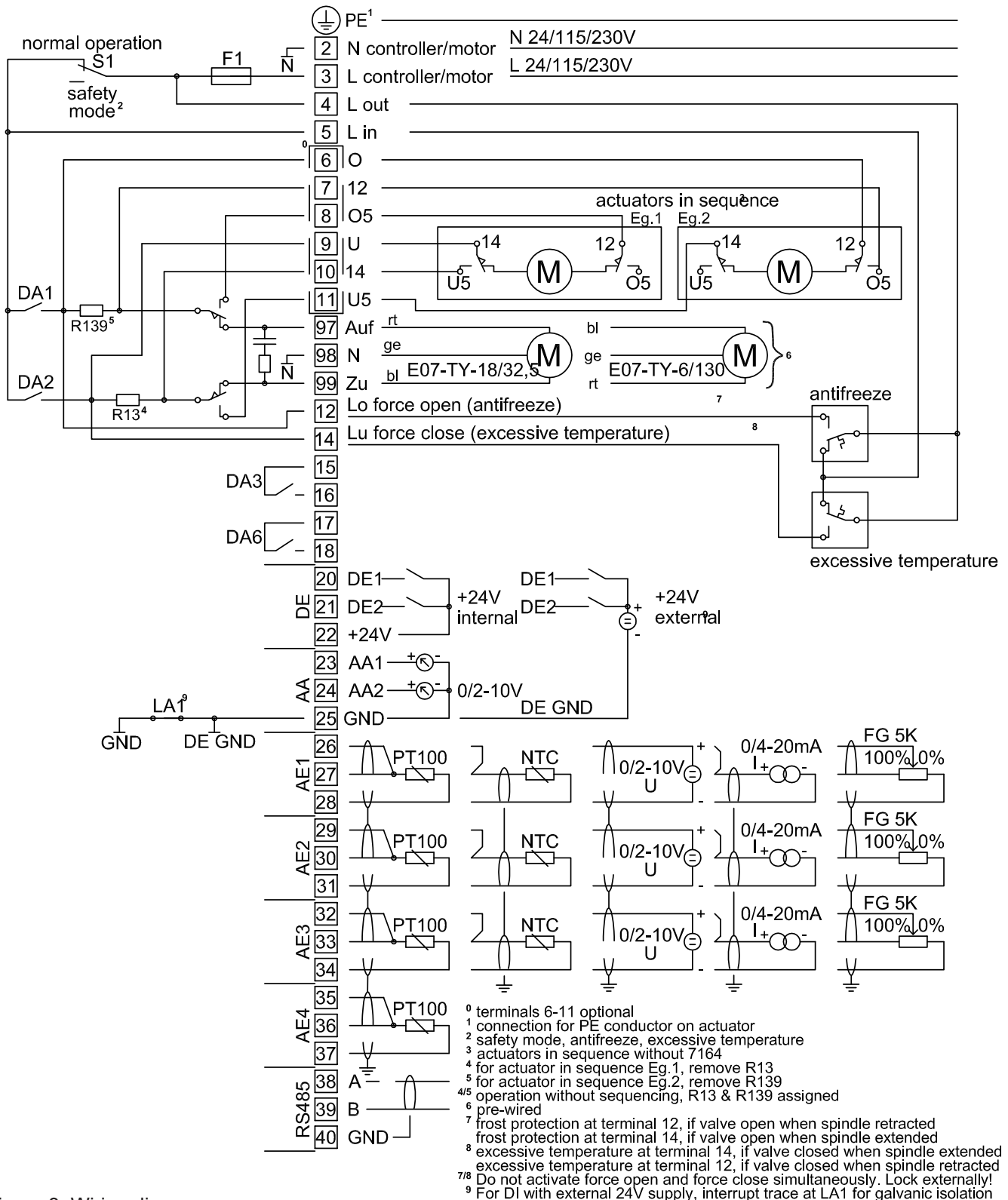


Figure 8: Wiring diagram



**Operating Instructions**
**OI 7164**
**7.3 Connection of inputs and outputs**

Digital output (relay)	Digital input
R1 Open, loop 1 <sup>5)</sup>	DI1 free <sup>4)</sup>
R2 Closed, loop 1 <sup>5)</sup>	DI1 free <sup>4)</sup>
R3 free <sup>1)</sup>	
R6 free <sup>1)</sup>	
Analogue output	Analogue input
AO1 free <sup>3)</sup>	AI1 Flow temperature, loop 1
AO2 free <sup>3)</sup>	AI2 free <sup>2)</sup>
	AI3 Outdoor temperature
	AI4 free <sup>2)</sup>

- 1) Heater/circulation/loading pump/alarm (switch-over valve) selectable, however max. 1 circulation/loading pump (switch-over valve)
- 2) Room/return/DHW temperature/ correction potentiometer selectable
- 3) Copy of AI 1 ... 4 selectable
- 4) Open/close/nominal operation/DHW tank thermostat selectable
- 5) Fixed internal connection to the actuator motor

**8. SPARE PARTS**

When ordering accessories or spare parts, make sure to observe the specifications on the identification label of your integrated controller. The actual technical data of the integrated controller and the power supply requirements are the specifications indicated on the identification label.



**Use of non-compliant spare parts may cause damage to the device!**

**Attention**

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

Always use original spare parts.

**8.1 Changing the battery**

The battery for storage of date and time should last for approximately 10 years. Should it be necessary to replace it, please note the following specifications:

Lithium button cell 3V, 125mAh  
 Manufacturer: Renata Batteries  
 Part number: CR1632

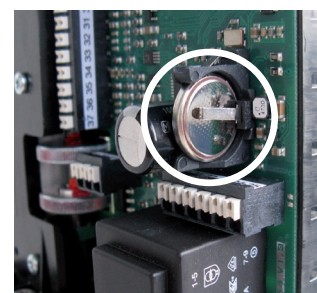


Figure 9: Battery

**9. DECOMMISSIONING AND DISPOSAL**

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