# AX561

Analog Input/Output Module

## 1 Ordering Data

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Product Life Cycle Phase *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1TNE 968 902 R1301</td>
<td>AX561, analog input/output module, 4 AI, 2 AO, U/I</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3101</td>
<td>Terminal block TA563-9, 9 pins, screw front, cable side, 6 pieces per unit</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3102</td>
<td>Terminal block TA563-11, 11 pins, screw front, cable side, 6 pieces per unit</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3103</td>
<td>Terminal block TA564-9, 9 pins, screw front, cable front, 6 pieces per unit</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3104</td>
<td>Terminal block TA564-11, 11 pins, screw front, cable front, 6 pieces per unit</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3105</td>
<td>Terminal block TA565-9, 9 pins, spring front, cable front, 6 pieces per unit</td>
<td>Active</td>
</tr>
<tr>
<td>1TNE 968 901 R3106</td>
<td>Terminal block TA565-11, 11 pins, spring front, cable front, 6 pieces per unit</td>
<td>Active</td>
</tr>
</tbody>
</table>

*) For planning and commissioning of new installations use modules in Active status only.
2 Dimensions

The dimensions are in mm and in brackets in inch.

3 Technical Data

The System Data of AC500-eCo apply to Chapter 4 “System Data AC500-eCo” on page 5

Only additional details are therefore documented below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process supply voltage L+</td>
<td>Terminal 19 for L+ (+24 VDC) and terminal 20 for M (0 V)</td>
</tr>
<tr>
<td>Connections</td>
<td>Terminal 19 for L+ (+24 VDC) and terminal 20 for M (0 V)</td>
</tr>
<tr>
<td>Rated value</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Current consumption via L+ terminal</td>
<td>0.14 A + output load</td>
</tr>
<tr>
<td>Inrush current (at power-up)</td>
<td>0.05 A</td>
</tr>
<tr>
<td>Max. ripple</td>
<td>5 %</td>
</tr>
<tr>
<td>Protection against reversed voltage</td>
<td>Yes</td>
</tr>
<tr>
<td>Protection fuse for L+</td>
<td>Recommended</td>
</tr>
<tr>
<td>Current consumption from 24 VDC power supply at the terminals UP/L+ and ZP/M of the CPU/Bus Module</td>
<td>Ca. 5 mA</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>No</td>
</tr>
<tr>
<td>Surge-voltage (max.)</td>
<td>35 VDC for 0.5 s</td>
</tr>
</tbody>
</table>
### Technical Data of the Analog Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. power dissipation within the module</td>
<td>On request</td>
</tr>
<tr>
<td>Weight</td>
<td>Ca. 120 g</td>
</tr>
<tr>
<td>Mounting position</td>
<td>Horizontal or vertical</td>
</tr>
<tr>
<td>Cooling</td>
<td>The natural convection cooling must not be hindered by cable ducts or other parts in the switchgear cabinet.</td>
</tr>
</tbody>
</table>

### NOTICE!
**Attention:**
All I/O channels (digital and analog) are protected against reverse polarity, reverse supply, short circuit and continuous overvoltage up to 30 VDC.

#### 3.1 Technical Data of the Analog Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels per module</td>
<td>4 individually configurable voltage or current inputs</td>
</tr>
<tr>
<td>Distribution of channels into groups</td>
<td>1 (4 channels per group)</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
</tr>
<tr>
<td>Unipolar Voltage:</td>
<td>0 V...+5 V; 0 V...+10 V: 12 bits</td>
</tr>
<tr>
<td>Current 0 mA...20 mA; 4 mA...20 mA: 12 bits</td>
<td></td>
</tr>
<tr>
<td>Bipolar Voltage:</td>
<td>-2.5 V...+2.5 V; -5 V...+5 V: 11 bits plus sign</td>
</tr>
<tr>
<td>Connection of the signals I0- to I3-</td>
<td>Terminals 3, 6, 9, 12</td>
</tr>
<tr>
<td>Connection of the signals I0+ to I3+</td>
<td>Terminals 2, 5, 8, 11</td>
</tr>
<tr>
<td>Input type</td>
<td>Differential</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>No galvanic isolation between the inputs and the I/O bus</td>
</tr>
<tr>
<td>Common mode input range</td>
<td>Signal voltage plus common mode voltage must be within ±12 V</td>
</tr>
<tr>
<td>Indication of the input signals</td>
<td>No</td>
</tr>
<tr>
<td>Channel input resistance</td>
<td>Voltage: 1 MΩ</td>
</tr>
<tr>
<td>Conversion error of the analog values</td>
<td>Typ. ±0.5 % of full scale (voltage)</td>
</tr>
<tr>
<td>values caused by non-linearity, adjustment</td>
<td>±0.5 % of full scale (current 0 mA...20 mA)</td>
</tr>
<tr>
<td>error at factory and resolution within the</td>
<td>±0.7 % of full scale (current 4 mA...20 mA)</td>
</tr>
<tr>
<td>normal range</td>
<td>at 25 °C</td>
</tr>
<tr>
<td>Max.</td>
<td>±2 % of full scale (all ranges)</td>
</tr>
<tr>
<td>Time constant of the input filter</td>
<td>Voltage: 300 µs</td>
</tr>
<tr>
<td>Relationship between input signal and hex</td>
<td>Current: 300 µs</td>
</tr>
<tr>
<td>code</td>
<td></td>
</tr>
</tbody>
</table>
3.2 Technical Data of the Analog Outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels per module</td>
<td>2 configurable voltage or current outputs</td>
</tr>
<tr>
<td>Distribution of channels into groups</td>
<td>1 (2 channels per group)</td>
</tr>
<tr>
<td>Connection of the signals O0U- and O1U+</td>
<td>Terminals 13 and 15</td>
</tr>
<tr>
<td>Connection of the signals O0I+ and O1I+</td>
<td>Terminals 14 and 16</td>
</tr>
<tr>
<td>Output type</td>
<td>Bipolar with voltage, unipolar with current</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bits or 11 bits plus sign</td>
</tr>
<tr>
<td>Indication of the output signals</td>
<td>No</td>
</tr>
<tr>
<td>Output resistance (load) as current output</td>
<td>0 Ω...500 Ω</td>
</tr>
<tr>
<td>Output load ability as voltage output</td>
<td>2 mA max.</td>
</tr>
<tr>
<td>Relationship between input signal and hex code</td>
<td>Table Output Ranges</td>
</tr>
<tr>
<td>Conversion error of the analog values caused by</td>
<td>Typ. ±0.5 % of full scale (voltage)</td>
</tr>
<tr>
<td>non-linearity, adjustment error at factory and</td>
<td>±0.5 % of full scale (current 0 mA...20 mA)</td>
</tr>
<tr>
<td>resolution within the normal range</td>
<td>±0.7 % of full scale (current 4 mA...20 mA)</td>
</tr>
<tr>
<td></td>
<td>at 25°C</td>
</tr>
<tr>
<td></td>
<td>Max. ±2 % of full scale (all ranges)</td>
</tr>
<tr>
<td></td>
<td>at 0 °C...60 °C or EMC disturbance</td>
</tr>
<tr>
<td>Unused outputs</td>
<td>Can be left open and should be configured as &quot;unused&quot;</td>
</tr>
<tr>
<td>Output data length</td>
<td>4 bytes</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>Yes, up to 30 VDC</td>
</tr>
<tr>
<td>Max. cable length (conductor cross section &gt; 0.14 mm²)</td>
<td>Unshielded wire 10 m</td>
</tr>
<tr>
<td></td>
<td>Shielded wire 100 m</td>
</tr>
</tbody>
</table>
4 System Data AC500-eCo

4.1 Environmental Conditions

Table 1: Process and Supply Voltages

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VDC</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>24 V (-15 %, +20 %)</td>
</tr>
<tr>
<td>Protection against reverse polarity</td>
<td>Yes</td>
</tr>
<tr>
<td>100 VAC</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>100 V (-15 %, +10 %)</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz (-6 %, +4 %)</td>
</tr>
<tr>
<td>230 VAC</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>230 V (-15 %, +10 %)</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz (-6 %, +4 %)</td>
</tr>
<tr>
<td>100...240 VAC wide range supply</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>100 V...240 V (-15 %, +10 %)</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz (-6 %, +4 %)</td>
</tr>
<tr>
<td>Allowed interruptions of power supply, according to EN 61131-2</td>
<td></td>
</tr>
<tr>
<td>DC supply</td>
<td>Interruption &lt; 10 ms, time between 2 interruptions &gt; 1 s, PS2</td>
</tr>
<tr>
<td>AC supply</td>
<td>Interruption &lt; 0.5 periods, time between 2 interruptions &gt; 1 s</td>
</tr>
</tbody>
</table>

NOTICE!

Exceeding the maximum power supply voltage (> 30 VDC) for process or supply voltages could lead to unrecoverable damage of the system. The system could be destroyed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>0 °C...+60 °C (horizontal mounting of modules)</td>
</tr>
<tr>
<td></td>
<td>0 °C...+40 °C (vertical mounting of modules and output load reduced to 50 % per group)</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 °C...+70 °C</td>
</tr>
<tr>
<td>Transport</td>
<td>-40 °C...+70 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Max. 95 %, without condensation</td>
</tr>
<tr>
<td>Air pressure</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>&gt; 800 hPa / &lt; 2000 m</td>
</tr>
<tr>
<td>Storage</td>
<td>&gt; 660 hPa / &lt; 3500 m</td>
</tr>
</tbody>
</table>

4.2 Creepage Distances and Clearances

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.
### 4.3 Insulation Test Voltages, Routine Test

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 V...240 V circuits against other circuitry</td>
<td>2500 V</td>
<td>100 V...127 V circuits against other circuitry</td>
<td>1500 V</td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V...240 V circuits against other circuitry</td>
<td>2500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V circuits (supply, 24 V inputs/outputs, analogue inputs/outputs), if they are electrically isolated against other circuitry</td>
<td>500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM interfaces, electrically isolated</td>
<td>500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM interfaces, electrically not isolated</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBP interface</td>
<td>500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCNET</td>
<td>500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2/50 μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 V...240 V circuits against other circuitry</td>
<td>1350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V circuits against other circuitry</td>
<td>820 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V...240 V circuits against other circuitry</td>
<td>1350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V circuits (supply, 24 V inputs/outputs, analogue inputs/outputs), if they are electrically isolated against other circuitry</td>
<td>350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM interfaces, electrically isolated</td>
<td>350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM interfaces, electrically not isolated</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBP interface</td>
<td>350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCNET</td>
<td>350 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 2 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.4 Power Supply Units

For the supply of the modules, power supply units according to PELV specifications must be used.
### 4.5 Electromagnetic Compatibility

<table>
<thead>
<tr>
<th>Immunity</th>
<th>According to IEC 61000-4-2, zone B, criterion B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immunity against electrostatic discharge (ESD):</strong></td>
<td>8 kV</td>
</tr>
<tr>
<td>Electrostatic voltage in case of air discharge</td>
<td>4 kV, in a closed switch-gear cabinet 6 kV ¹)</td>
</tr>
<tr>
<td>Electrostatic voltage in case of contact discharge</td>
<td></td>
</tr>
<tr>
<td>ESD with communication connectors</td>
<td>In order to prevent operating malfunctions, it is recommended, that the operating personnel discharge themselves prior to touching communication connectors or perform other suitable measures to reduce effects of electrostatic discharges.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunity against the influence of radiated (CW radiated):</th>
<th>According to IEC 61000-4-3, zone B, criterion A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test field strength</td>
<td>10 V/m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunity against transient interference voltages (burst):</th>
<th>According to IEC 61000-4-4, zone B, criterion B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage units (DC)</td>
<td>2 kV</td>
</tr>
<tr>
<td>Supply voltage units (AC)</td>
<td>2 kV</td>
</tr>
<tr>
<td>Digital inputs/outputs (24 VDC)</td>
<td>1 kV</td>
</tr>
<tr>
<td>Digital inputs/outputs (120 VAC...2400 VAC)</td>
<td>2 kV</td>
</tr>
<tr>
<td>Analog inputs/outputs</td>
<td>1 kV</td>
</tr>
<tr>
<td>CS31 system bus</td>
<td>1 kV</td>
</tr>
<tr>
<td>Serial RS-485 interfaces (COM)</td>
<td>1 kV</td>
</tr>
<tr>
<td>Serial RS-232 interfaces (COM, not for PM55x and PM56x)</td>
<td>1 kV</td>
</tr>
<tr>
<td>ARCNET</td>
<td>1 kV</td>
</tr>
<tr>
<td>FBP</td>
<td>1 kV</td>
</tr>
<tr>
<td>Ethernet</td>
<td>1 kV</td>
</tr>
<tr>
<td>I/O supply, DC-out</td>
<td>1 kV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunity against the influence of line-conducted interferences (CW conducted):</th>
<th>According to IEC 61000-4-6, zone B, criterion A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test voltage</td>
<td>3 V zone B, 10 V is also met.</td>
</tr>
<tr>
<td>High energy surges</td>
<td>According to IEC 61000-4-5, zone B, criterion B</td>
</tr>
<tr>
<td>Power supply AC</td>
<td>2 kV CM / 1 kV DM ²)</td>
</tr>
<tr>
<td>Power supply DC</td>
<td>1 kV CM / 0.5 kV DM ²)</td>
</tr>
<tr>
<td>DC I/O supply, add. DC-supply-out</td>
<td>0.5 kV CM / 0.5 kV DM ²)</td>
</tr>
<tr>
<td>Buses, shielded</td>
<td>1 kV CM ²)</td>
</tr>
<tr>
<td>AC I/O unshielded</td>
<td>2 kV CM / 1 kV DM ²)</td>
</tr>
<tr>
<td>I/O analog, I/O DC unshielded</td>
<td>1 kV CM / 0.5 kV DM ²)</td>
</tr>
<tr>
<td>Radiation (radio disturbance)</td>
<td>According to IEC 55011, group 1, class A</td>
</tr>
</tbody>
</table>

¹) High requirement for shipping classes are achieved with additional specific measures (see specific documentation).

²) CM = Common Mode, DM = Differential Mode
4.6 Mechanical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 20 (if all terminal screws are tightened)</td>
</tr>
<tr>
<td>Housing</td>
<td>According to UL 94</td>
</tr>
<tr>
<td>Vibration resistance acc. to EN 61131-2</td>
<td>all three axes (DIN rail mounting)</td>
</tr>
<tr>
<td></td>
<td>5 Hz...11.9 Hz, continuous 3.5 mm</td>
</tr>
<tr>
<td></td>
<td>11.9 Hz...150 Hz, continuous 1 g</td>
</tr>
<tr>
<td>Shock test</td>
<td>All three axes</td>
</tr>
<tr>
<td></td>
<td>15 g, 11 ms, half-sinusoidal</td>
</tr>
<tr>
<td>Mounting of the modules:</td>
<td></td>
</tr>
<tr>
<td>DIN rail according to DIN EN 50022</td>
<td>35 mm, depth 7.5 mm or 15 mm</td>
</tr>
<tr>
<td>Mounting with screws</td>
<td>Screws with a diameter of 4 mm</td>
</tr>
<tr>
<td>Fastening torque</td>
<td>1.2 Nm</td>
</tr>
</tbody>
</table>

4.7 Approvals and certifications

Information on approvals and certificates can be found in the corresponding chapter of the Main catalog, PLC Automation.