**PROGRAMMABLE RELAYS**

**ZEN Series**

- Relay, Timer, Counter, and Time-Switch Functions
- Weekly Timer and Calendar Timer Functions
- Twin Timer Function (Separate ON/OFF Times)
- Two Analog Input Channels (DC Models Only)
- 8-Digit Timer and 8-Digit Comparator
- Flexible Expansion Enables Up to 44 I/O Points
- 12 to 24 Vdc Operation (DC Models)
- Program from Front Panel or Using Software

**ZEN Programmable Relays**

Ideal for small-scale control applications, the ZEN provides an economical alternative to discrete timers, counters and general-purpose relays. This single unit easily provides relay, timer, counter, and time switch functions. Wiring work is greatly reduced because separate wiring is not required for devices such as timers and counters. Programs can be easily written, saved, and monitored by personal computer. Programs can also be simulated on the personal computer without connecting to the ZEN. Communication models with an RS485 interface allow production line conditions to be remotely monitored by monitoring the ZEN control status.

**Applications**

Designed for use in automation for commercial and industrial sectors, ZEN programmable relays provide the ideal solution for lighting, energy management, industrial control, watering and pump control.
### RATINGS SPECIFICATIONS

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>ZEN-xCxAR-A-V2/ZEN-8E1AR</th>
<th>ZEN-xCxDr-D-V2/ZEN-8E1Dr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RATED SUPPLY VOLTAGE</strong></td>
<td>100 to 240 Vac, 50/60 Hz</td>
<td>12 to 24 Vdc (DC ripple rate: 5% max.)</td>
</tr>
<tr>
<td><strong>OPERATING VOLTAGE RANGE</strong></td>
<td>85 to 264 Vac</td>
<td>10.8 to 28.8 Vdc</td>
</tr>
<tr>
<td><strong>EXPANSION I/O UNITS</strong></td>
<td>ZEN-8E1AR</td>
<td>ZEN-8E1Dr 12/24 Vdc: 2 W max</td>
</tr>
<tr>
<td><strong>INRUSH CURRENT</strong></td>
<td>ZEN-10CxAR-A-V2 4.5 A max ZEN-20CxAR-A-V2 4.5 A max ZEN-8E1AR 4 A max</td>
<td>ZEN-10CxDr-D-V2 12/24 Vdc: 4 W max ZEN-10CxDT-D-V2 12/24 Vdc: 3 W max ZEN-20CxDr-D-V2 12/24 Vdc: 5 W max ZEN-20CxDT-D-V2 12/24 Vdc: 3 W max</td>
</tr>
<tr>
<td><strong>AMBIENT TEMPERATURE</strong></td>
<td>0 to 55°C (-25 to 55°C) for ZEN-xC2xx-x-V2 models</td>
<td>No corrosive gases</td>
</tr>
<tr>
<td><strong>AMBIENT STORAGE TEMPERATURE</strong></td>
<td>-20 to 75°C (-40 to 75°C) for ZEN-xC2xx-x-V2 models</td>
<td></td>
</tr>
<tr>
<td><strong>AMBIENT HUMIDITY</strong></td>
<td>10 to 90% (with no condensation)</td>
<td></td>
</tr>
<tr>
<td><strong>AMBIENT CONDITIONS</strong></td>
<td>No corrosive gases</td>
<td></td>
</tr>
<tr>
<td><strong>MOUNTING METHOD</strong></td>
<td>Surface mounting, DIN track mounting [standard (vertical) installation and horizontal installation]</td>
<td></td>
</tr>
<tr>
<td><strong>TERMINAL BLOCK</strong></td>
<td>Solid-line terminal block (use solid wire or fine-stranded wire)</td>
<td></td>
</tr>
<tr>
<td><strong>TERMINAL SCREW TIGHTENING TORQUE</strong></td>
<td>0.565 to 0.6 N·m (5 to 5.3 in-lb)</td>
<td></td>
</tr>
<tr>
<td><strong>DEGREE OF PROTECTION</strong></td>
<td>IP20 (mounted inside a control panel)</td>
<td></td>
</tr>
</tbody>
</table>
**SPECIFICATIONS**

**Control Method:** Stored program control

**I/O Control Method:** Cyclic scan

**Programming Language:** Ladder diagram

**Program Capacity:** 96 lines (3 input conditions and 1 output per line)

**Max No. of Control I/O Points:**
- **CPU Units with 20 I/O Points:** 44 points
- **Expansion I/O Units:** 4 inputs and 4 outputs each, up to 3 units

**LCD Display:**
- 12 characters x 4 lines, with backlight

**Operation Buttons:**
- 8 (4 cursor buttons and 4 operation buttons)

**User Program Back-Up:** Internal EEPROM, memory cassette (optional)

**Power Interruption Hold:** Internal

**Timer Accuracy:**
- **0.01s Unit:** -0.05%, -10 mS max (rate for set value)
- **0.02 min/s Unit:** -0.05%, -1 s max (rate for set value)
- **0.03 h/min Unit:** -0.05%, -1 min max (rate for set value)

**Maximum Counting Speed:** 150 Hz

**Insulation Resistance:** 20 MΩ (at 500 Vdc) min between power supply terminals and all output terminals, terminals of different output circuits; between all terminals of CPU unit and all terminals of expansion I/O unit

**Insulation:** Reinforced insulation between power supply or input terminals and output terminals; terminals of different output circuits; all terminals of CPU unit and all terminals of expansion I/O unit; no separation between power supply and input terminals of the same unit, power supply terminals of CPU unit and computer connector, battery unit connector, or all expansion unit connectors (all interfaces are live parts)

**Dielectric Strength:** 2300 Vac, 50/60 Hz; 90 to 150 Hz acceleration 9.8 m/s², 10 sweeps each in X, Y, and Z directions (1 octave/min)

**Shock Resistance:** Conforms to IEC60068-2-27, 147 m/s², 3 times each in X, Y, and Z directions

**Vibration Resistance:** Conforms to IEC60068-2-6, 5 to 9 Hz with 3.5 mm single amplitude, 9 to 150 Hz acceleration 9.8 m/s²; 10 sweeps each in X, Y, and Z directions (1 octave/min)

**Weight:**
- **CPU Unit with 10 I/O Points:** Approx 300 g max
- **CPU Unit with 20 I/O Points:** Approx 350 g max
- **Expansion I/O Unit:** Approx 120 g max

**COMMUNICATIONS**

**Communications (Type CPU Units):**
- ZEN-10C4XR-X-V2
- **Communications:** RS485 (2-wire, half duplex)

**Synchronization Method:** Start-stop synchronization

**Baud Rate:**
- 4800, 9600, or 19,200 bps

**Transmission Code:** ASCII

**Data Bit Length:**
- 7 or 8 bits

**Stop Bit Length:**
- 1 or 2 bits

**Error Detection:** Vertical parity (none, even, odd), block check character (BCC)

**Flow Control:** None

**Interface:** RS485

**Retry Function:** None

**Node Number:**
- 0 to 99 (default: 1), XX (broadcasting)
**SAFETY STANDARDS**

- cULus: UL508/CSA C22.2 No.142 Class I Div2 conforms to EN/IEC 61131-2 clause 11, excluding 11.7.2.2 (overvoltage category 2 and pollution degree II conforms to IEC 60664-1)

<table>
<thead>
<tr>
<th>*EMC</th>
<th>Radiation field emission noise terminal voltage emission</th>
<th>Class A, Group 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electrostatic discharge immunity</td>
<td>IEC61000-4-2</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic field immunity</td>
<td>IEC61000-4-3</td>
</tr>
<tr>
<td></td>
<td>Electrical fast transient/burst immunity</td>
<td></td>
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<tr>
<td></td>
<td>Surge immunity</td>
<td>IEC61000-4-5</td>
</tr>
<tr>
<td></td>
<td>Immunity to conducted disturbances induced by radio-frequency fields</td>
<td>IEC61000-4-6</td>
</tr>
<tr>
<td></td>
<td>Momentary power interruption immunity</td>
<td>IEC61131-2</td>
</tr>
</tbody>
</table>

*EMC conforms to EN 61131-2 clause 8 except in the following cases.

When expansion I/O units with DC inputs are connected to a CPU unit with an AC power supply, the burst immunity between power supplies will be 1 kV.

When the signal wire for transistor outputs exceeds 10 m, the surge immunity of DC output signal lines will not conform.

**CPU UNITS SPECIFICATIONS**

**AC INPUTS (NOT ISOLATED)**

- **Input Voltage**: 100 to 240 Vac +10%, -15%, 50/60 Hz
- **Input Impedance**: 680 kΩ
- **Input Current**: 0.15 mA/100 Vac, 0.35 mA/240 Vac
- **ON Voltage**: 80 Vac min
- **OFF Voltage**: 25 Vac max
- **ON Response Time**: 50 or 70 mS at 100 Vac**
- **OFF Response Time**: 100 mS or 120 mS at 240 Vac**

**DC INPUTS 10 TO 13 FOR UNITS WITH 10 I/O POINTS, 10 TO 19 FOR UNITS WITH 20 I/O POINTS (NOT ISOLATED)**

- **Input Voltage**: 12 to 24 Vdc +20%, -10%
- **Input Impedance**: 5.3 kΩ
- **Input Current**: 4.5 mA (typ)/24 Vdc
- **ON Voltage**: 8 Vdc min
- **OFF Voltage**: 5 Vdc max
- **ON Response Time**: 15 or 50 mS**

**ANALOG INPUTS**

- **Input Range**: 0 to 10V
- **External Input Impedance**: 100 kΩ min
- **Resolution**: 0.1V (1/100 FS)
- **Accuracy**: ±1.5% FS (at ambient operating temperature within rated range)
- **AD Conversion Data**: 0 to 10.5V (in increments of 0.1V)

**EXPANSION I/O UNITS SPECIFICATIONS**

**AC INPUTS (NOT ISOLATED)**

- **Input Voltage**: 100 to 240 Vac +10%, -15%, 50/60 Hz
- **Input Impedance**: 680 kΩ
- **Input Current**: 0.15 mA/100 Vac, 0.35 mA/240 Vac
- **ON Voltage**: 80 Vac min
- **OFF Voltage**: 25 Vac max
- **ON Response Time**: 50 or 70 mS
- **OFF Response Time**: 100 or 120 mS at 240 Vac††

**DC INPUTS**

- **ZEN-8E1DR**: Not isolated
- **ZEN-8E1DT**: Photocoupler isolated
- **Input Voltage**: 12 to 24 Vdc +20%, -10%
- **Input Impedance**: 6.5 kΩ
- **Input Current**: 3.7 mA (typ)/24 Vdc
- **ON Voltage**: 8 Vdc min
- **OFF Voltage**: 5 Vdc max
- **ON/OFF Response Time**: 15 or 50 mS†††

†††Can be selected using the input filter settings.
OUTPUT SPECIFICATIONS (CPU UNITS AND EXPANSION I/O UNITS)

UNITS WITH RELAY OUTPUTS
Maximum Switching Capacity:
- 250 Vac/8 A (resistive load; \(\cos = 1\)),
- 24 Vdc/5 A (resistive load) use the following values for the total of all outputs

CPU Units with 10 I/O Points:
- 20 A max (15 A max for communications-type CPU units)

CPU Units with 20 I/O Points:
- 40 A max

Expansion I/O Units: 20 A max

Minimum Switching Capacity:
- 5 Vdc/10 mA (resistive load) (failure level: P, reference value)

Relay Life:
- Electrical: Resistive load; 50,000 times (\(\cos = 1\)),
- Inductive Load: 50,000 times (\(\cos = 0.4\)),
- Mechanical: 10 million times

ON Response Time: 15 mS max
OFF Response Time: 5 mS max

UNITS WITH TRANSISTOR OUTPUTS
Maximum Switching Capacity: 24 Vdc +20%, 500 mA
Leakage Current: 0.1 mA max
Residual Voltage: 1.5V max
ON Response Time: 1 mS max
OFF Response Time: 1 mS max

To Order

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>ZEN-10C3AR-A-V2</td>
<td>LCD display, 6 AC inputs, 4 relay outputs, AC power, no expansion I/O</td>
</tr>
<tr>
<td>ZEN-10C3DR-D-V2</td>
<td>LCD display, 6 DC inputs, 4 relay outputs, DC power, no expansion I/O</td>
</tr>
<tr>
<td>ZEN-10C1AR-A-V2</td>
<td>LCD display, 6 AC inputs, 4 relay outputs, AC power</td>
</tr>
<tr>
<td>ZEN-10C1DR-D-V2</td>
<td>LCD display, 6 DC inputs, 4 relay outputs, DC power</td>
</tr>
<tr>
<td>ZEN-10C1DT-D-V2</td>
<td>LCD display, 6 DC inputs, 4 transistor outputs, DC power</td>
</tr>
<tr>
<td>ZEN-20C3AR-A-V2</td>
<td>LCD display, 12 AC inputs, 8 relay outputs, AC power, no expansion I/O</td>
</tr>
<tr>
<td>ZEN-20C3DR-D-V2</td>
<td>LCD display, 12 DC inputs, 8 relay outputs, DC power, no expansion I/O</td>
</tr>
<tr>
<td>ZEN-20C1AR-A-V2</td>
<td>LCD display, 12 AC inputs, 8 relay outputs, AC power</td>
</tr>
<tr>
<td>ZEN-20C1DR-D-V2</td>
<td>LCD display, 12 DC inputs, 8 relay outputs, DC power</td>
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<tr>
<td>ZEN-20C1DT-D-V2</td>
<td>LCD display, 12 DC inputs, 8 transistor outputs, DC power</td>
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EXPANSION I/O

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<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>ZEN-8E1DT</td>
<td>Expansion I/O, 4 DC inputs, 4 transistor outputs</td>
</tr>
<tr>
<td>ZEN-8E1DR</td>
<td>Expansion I/O, 4 DC inputs, 4 relay outputs</td>
</tr>
<tr>
<td>ZEN-8E1AR</td>
<td>Expansion I/O, 4 AC inputs, 4 relay outputs</td>
</tr>
</tbody>
</table>

SOFTWARE AND ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>ZEN-SOFT01V4</td>
<td>Programming software</td>
</tr>
<tr>
<td>ZEN-CIF01</td>
<td>Programming cable, RS232C, 2 m (6.5')</td>
</tr>
<tr>
<td>ZEN-BAT01</td>
<td>Battery unit, 10 year min battery life</td>
</tr>
<tr>
<td>ZEN-ME01</td>
<td>Memory cassette</td>
</tr>
</tbody>
</table>

Ordering Examples: ZEN-10C3AR-A-V2, programmable relay with 10 I/O, and ZEN-SOFT01V4, programming software, ZEN-CIF01, programming cable.
ZEN-20C3DR-D-V2, programmable relay with 20 I/O, and ZEN-SOFT01V4, programming software, ZEN-CIF01, programming cable.