<table>
<thead>
<tr>
<th>Power supply</th>
<th>12VDC or 24VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible range</td>
<td>10.2VDC to 28.8VDC with less than 10% ripple</td>
</tr>
<tr>
<td>Maximum current consumption</td>
<td>180mA@24VDC (pnp inputs)</td>
</tr>
<tr>
<td></td>
<td>260mA@24VDC (nfnp inputs)</td>
</tr>
<tr>
<td></td>
<td>220mA@12VDC (pnp inputs)</td>
</tr>
<tr>
<td></td>
<td>330mA@12VDC (nfnp inputs)</td>
</tr>
<tr>
<td>Digital inputs</td>
<td></td>
</tr>
<tr>
<td>Nominal input voltage</td>
<td>12VDC or 24VDC.</td>
</tr>
<tr>
<td></td>
<td>See Note 2 and 3.</td>
</tr>
<tr>
<td>Input voltages for pnp (source):</td>
<td></td>
</tr>
<tr>
<td>For 12VDC</td>
<td>0-3VDC for Logic ‘0’</td>
</tr>
<tr>
<td>For 24VDC</td>
<td>8-15.6VDC for Logic ‘0’</td>
</tr>
<tr>
<td></td>
<td>0-5VDC for Logic ‘1’</td>
</tr>
<tr>
<td>Input voltages for nfnp (sink):</td>
<td></td>
</tr>
<tr>
<td>For 12VDC</td>
<td>8-15.6VDC&lt;1.2mA for Logic ‘0’</td>
</tr>
<tr>
<td>For 24VDC</td>
<td>0-3VDC&lt;3mA for Logic ‘1’</td>
</tr>
<tr>
<td>Input current</td>
<td>4mA@12VDC</td>
</tr>
<tr>
<td>Input impedance</td>
<td>3kΩ</td>
</tr>
<tr>
<td>Response time</td>
<td>10ms Typical</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>None</td>
</tr>
<tr>
<td>Input cable length</td>
<td>Up to 100 meters, unshielded</td>
</tr>
<tr>
<td>High-speed counter</td>
<td>Specifications below apply when inputs are wired for use as a high-speed counter input/shaft encoder. See Notes 4 and 5.</td>
</tr>
<tr>
<td>Resolution</td>
<td>16-bit</td>
</tr>
<tr>
<td>Input freq.</td>
<td>10kHz max.</td>
</tr>
<tr>
<td>Minimum pulse</td>
<td>40μs</td>
</tr>
</tbody>
</table>

Notes:
1. All 10 inputs can be set to pnp (source) or nfnp (sink) via a single jumper and appropriate wiring.
2. All 10 inputs can function in 12VDC or 24VDC; set via a single jumper and appropriate wiring.
3. nfnp (sink) inputs use voltage supplied from the controller's power supply.
4. Inputs #0, #2 and #4 can each function as either high-speed counter or as part of a shaft encoder. In each case, high-speed input specifications apply. When used as a normal digital input, normal input specifications apply.
5. Inputs #1, #3 and #5 can each function as either counter reset, or as a normal digital input; in either case, specifications are those of a normal digital input. These inputs may also be used as part of a shaft encoder. In this case, high-speed input specifications apply.

⚠️ Warnings:
- Unused pins should not be connected. Ignoring this directive may damage the controller.
- Improper use of this product may severely damage the controller.
- Refer to the controller's User Guide regarding wiring considerations.
- Before using this product, it is the responsibility of the user to read the product's User Guide and all accompanying documentation.
**Analog Input**
- 10-bit, multi-range input: 0-10V, 0-20mA, 4-20mA
- Conversion method: Successive approximation
- Input impedance: >1Mohm for voltage, 5000 Ohm for current
- Galvanic isolation: None
- Resolution (except 4-20mA): 10-bit (1024 units)
- Resolution at 4-20mA: 204 to 1023 (820 units)
- Conversion time: Synchronized to scan time
- Absolute max. rating: ±15V
- Full scale error: ±2 LSB
- Linearity error: ±2 LSB
- Status indication: Yes, see Note

Note:
The analog value can also indicate when the input is functioning out of range. If an analog input deviates above the permissible range, its value will be 1024.

**Voltage connection**

![Voltage connection diagram]

Notes:
- Shields should be connected at the signals' source.
- The 0V signal of the analog input must be connected to the controller's 0V.

**Current connections**

![Current connections diagram]

Notes:
- Shields should be connected at the signals' source.
- The 0V signal of the analog input must be connected to the controller's 0V.

**Digital outputs**
- 6 relay outputs, 230VAC/12/24VDC
- Output type: SPST-NO relay
- Type of relay: Takamisawa (Fujitsu) JY-12H-K, or NAIS (Matsushita) JQ1A-12V or OMRON G6B-114P-12VDC
- Isolation: by relay
- Output current: 5A max. (resistive load), 1A max. (inductive load)
- Max. frequency: 10Hz
- Contact protection: External precautions required

**Relay Outputs**

![Relay Outputs diagram]

**Display**
- STN, LCD display
- Illumination: LED yellow-green backlight
- Display size: 1 line, 16 characters long
- Character size: 5 x 7 matrix, 3.07 x 5.73mm

**Keypad**
- Sealed membrane
- Number of keys: 15

**PLC program**
- Ladder Code Memory (virtual): 24K
- Memory Bits ( coils): 256
- Memory Integers ( Registers): 256
- Timers: 64
- Execution time: 12μsec. for bit operations
- Database: 1024 integers ( indirect access)
- HMI displays: 80 user-designed displays
- HMI variables: 50 HMI variables are available to conditionally display and modify text, numbers, dates, times & timer values. The user can also create a list of up to 120 variable text displays, totaling up to 2K.

**RS232/RS485 serial port**
- Used for:
  - Application Download/Upload
  - Application Testing (Debug) mode
  - Connect to GSM or standard telephone modem:
    - Send/receive SMS messages
    - Remote access programming
  - RS485 Networking
- RS232 (see note): 1 port
- Galvanic isolation: None
- Voltage limits: ±20V
- RS485 (see note): 1 port
- Input voltage: -7 to +12V differential max.
- Cable type: Shielded twisted pair, in compliance with EIA RS485
- Galvanic isolation: None
- Baud rate: 110 – 57600 bps
- Nodes: Up to 32

Note:
RS232/RS485 is determined by jumper settings and wiring, as described in the document “M91 RS485 Port Settings” packaged with the controller.

**I/O expansion port**
- Up to 64 additional I/Os, including digital & analog I/Os, RTD & more.

**Miscellaneous**
- Clock (RTC): Date and time-year 2000 compliant.
- Battery back-up: 7 years typical battery back-up for RTC and system data.
- Weight: 310g (10.9 oz.)
- Storage temperature: -20 to 60°C (-4 to 140°F)
- Relative Humidity (RH): 5% to 95% (non-condensing)
- Mounting method: DIN-rail mounted (IP20/NEMA1) Panel mounted (IP65/NEMA4X)
The tables below show how to set a specific jumper to change the functionality of the controller. To open the controller and access the jumpers, refer to the directions at the end of these specifications.

**Important:**
Incompatible jumper settings and wiring connections may severely damage the controller.

### JP1  
**Digital inputs type**

<table>
<thead>
<tr>
<th>To use as</th>
<th>JP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>npn (sink)</td>
<td>A</td>
</tr>
<tr>
<td>pnp (source)*</td>
<td>B</td>
</tr>
</tbody>
</table>

*Default factory setting

### JP5, JP6  
**Power supply voltage**

<table>
<thead>
<tr>
<th>Range</th>
<th>JP5</th>
<th>JP6</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.2 to 15.6VDC</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>15.6 to 28.8VDC*</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

### JP2  
**Digital inputs voltage**

<table>
<thead>
<tr>
<th>To use as</th>
<th>JP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>A</td>
</tr>
<tr>
<td>24VDC*</td>
<td>B</td>
</tr>
</tbody>
</table>

### JP3  
**Analog input type**

<table>
<thead>
<tr>
<th>To use as</th>
<th>JP3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage input*</td>
<td>A</td>
</tr>
<tr>
<td>Current input</td>
<td>B</td>
</tr>
</tbody>
</table>

In this figure, the jumper settings will cause the controller to function as follows:
- Digital inputs: npn, 24VDC inputs
- Analog input: Voltage input
- Power supply: 24VDC

Opening the controller enclosure

1. Locate the 4 slots on the sides of the enclosure
2. Using the blade of a flat-bladed screwdriver, gently pry off the back of the controller as shown in the figure below, exposing the controller’s board.

Unitronics reserves the right to revise this publication from time to time and to amend its contents and related hardware and software at any time.

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