### Power supply
- **12VDC or 24VDC**
- **Permissible range:** 10.2VDC to 28.8VDC with less than 10% ripple
- **Maximum current consumption:**
  - 70mA @ 24VDC (npn inputs)
  - 130mA @ 12VDC (npn inputs)
  - 170mA (npn inputs)

### Digital inputs
- 12 npn (source) or npn (sink) inputs. See Notes 1 and 2.
- **Nominal input voltage:** 12VDC or 24VDC. See Notes 3 and 4.
  - **Input voltages for npn (source):**
    - For 12VDC: 0-3VDC for Logic ‘0’
    - 8-15.6VDC for Logic ‘1’
  - **Input voltages for npn (sink):**
    - For 12VDC: 8-15.6VDC<1.2mA for Logic ‘0’
    - 0-3VDC>3mA for Logic ‘1’
    - 17-28.4VDC<2mA for Logic ‘0’
    - 0-5VDC>6mA for Logic ‘1’
- **Input current:**
  - 4mA @ 12VDC
  - 8mA @ 24VDC
- **Input impedance:** 3KΩ
- **Response time (except high-speed inputs):** 10mS typical
- **Galvanic isolation:** None
- **Input cable length:** Up to 100 meters, unshielded

### High-speed counter
- Specifications below apply when inputs are wired for use as a high-speed counter input/shaft encoder. See Notes 5 and 6.
- **Resolution:** 16-bit
- **Input freq.:** 10kHz max.
- **Minimum pulse:** 40µs

Notes:
1. All 12 inputs can be set to npn (source) or npn (sink) via a single jumper and appropriate wiring.
2. Inputs #10 and #11 can function as either digital inputs or as analog inputs, via a single jumper and appropriate wiring.
3. All 12 inputs can function in 12 VDC or 24 VDC; set via a single jumper and appropriate wiring.
4. npn (sink) inputs use voltage supplied from the controller’s power supply.
5. Inputs #0, #2 and #4 can each function as 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.
6. 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.

### Shaft encoder

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**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 Inputs
Two 10-bit, multi-range inputs:
0-10V, 0-20mA, 4-20mA
See Note 2
Conversion method
Successive approximation
Input impedance
>1MΩ for voltage
243Ω 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 8

Note 8:
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 / Current connection

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
24K words
Bits/Coils
256
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)
• Connect to GSM or standard telephone modem:
  - Send/receive SMS messages
  - Remote access programming
• RS485 Networking

RS232 (See Note 11) 1 port
Galvanic isolation
None
Voltage limits
±20V
RS485 (See Note 11) 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 11:
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 and more.

CANbus port
Up to 63 nodes
Baud rate range
10Kbps - 1Mbps
Cable length
Up to 150m for 12VDC network
Up to 1000m for 24VDC network

CANbus connection

Digital outputs
12 pnp (source) outputs
12VDC or 24VDC
Output type
P-MOSFET (open drain)
Isolation
None
Output current
0.5A max.
Max. frequency for normal outputs
50Hz (resistive load)
0.5Hz (inductive load)
High speed output maximum frequency
2kHz (resistive load)
See Note 10.
Short circuit protection
Yes
Short indication
by software
On voltage drop
0.5VDC maximum
Power supply for outputs
Operating voltage
10.2 to 28.8VDC
Nominal operating voltage
12VDC or 24VDC

Note 10:
Output #0 and Output #1 may be used as high-speed outputs.

Outputs connection

Miscellaneous
Clock (RTC)
Real-time clock functions. (Date and Time)
Battery back-up
7 years typical battery back-up for RTC and system data.
Weight
230g (8.11 oz.)
Operational temperature
0 to 50°C (32 to 122°F)
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)
## Jumper Settings

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.

<table>
<thead>
<tr>
<th>JP1</th>
<th>JP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Inputs type</td>
<td>Inputs voltage</td>
</tr>
<tr>
<td><strong>To use as</strong></td>
<td><strong>To use as</strong></td>
</tr>
<tr>
<td>npn (sink)</td>
<td>12VDC</td>
</tr>
<tr>
<td>pnp (source)*</td>
<td>24VDC*</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

### JP3, JP4
Analog inputs type

<table>
<thead>
<tr>
<th><strong>To use as</strong></th>
<th><strong>JP3</strong> for analog input #0</th>
<th><strong>JP4</strong> for analog input #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage input*</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Current input</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

### JP5, JP6
Digital/Analog inputs

<table>
<thead>
<tr>
<th><strong>Range</strong></th>
<th><strong>JP5</strong> for AN0 / In#11</th>
<th><strong>JP6</strong> for AN1 / In#10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs*</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Analog inputs</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

*Default factory setting

In this figure, the jumper settings will cause the controller to function as follows:
- Digital inputs: npn, 24VDC inputs
- Analog input #0: Voltage input
- Analog input #1: Current input

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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.

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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. Technical updates (if any) may be included in subsequent editions (if any).

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