HE-XE102
12 Digital DC Inputs, 4 Analog Inputs (Medium Resolution), 6 Digital Relay Outputs
Servicing North America:

U.S.A.: Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047 USA
Toll Free: 1-800-826-6342   TEL: (203) 359-1660
FAX: (203) 359-7700      e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec), Canada H7L 5A1
Toll-Free: 1-800-826-6342   TEL: (514) 856-6928
FAX: (514) 856-6886      e-mail: info@omega.ca

For immediate technical or application assistance:

U.S.A. and Canada: Sales Service: 1-800-826-6342/1-800-TC-OMEGA®
Customer Service: 1-800-622-2378/1-800-BEST®
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

Mexico: En Español: 001 (203) 359-7803
info@omega.com.mx      e-mail: espanol@omega.com

Servicing Europe:

Benelux: Managed by the United Kingdom Office
Toll-Free: 0800 099 3344     TEL: +31 20 347 21 21
FAX: +31 20 463 46 43      e-mail: sales@omega.nl

Czech Republic: Frystatska 184
733 01 Karviná, Czech Republic
Toll-Free: 0800-1-66342        TEL: +420-59-6311899
FAX: +420-59-6311114        e-mail: info@omegashop.cz

France: Managed by the United Kingdom Office
Toll-Free: 0800 466 342         TEL: +33 (0) 161 37 29 00
FAX: +33 (0) 130 57 54 27      e-mail: sales@omega.fr

Germany/Austria: Daimlerstrasse 26
D-75392 Deckenpfronn, Germany
Toll-Free: 0 800 6397678        TEL: +49 (0) 7059 9398-0
FAX: +49 (0) 7056 9398-29      e-mail: info@omega.de

United Kingdom: OMEGA Engineering Ltd.
ISO 9001 Certified
One Omega Drive, River Bend Technology Centre, Northbank
Irlam, Manchester M44 5BD England
Toll-Free: 0800-488-488 TEL: +44 (0)161 777-6611
FAX: +44 (0)161 777-6622      e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.
1 Specifications

### Specifications

**Digital DC Inputs**

- **Inputs per Module**: 12 including 4 configurable HSC inputs
- **Commons per Module**: 1
- **Input Voltage Range**: 12 VDC / 24 VDC
- **Absolute Max. Voltage**: 35 VDC Max.
- **Input Impedance**: 10 kΩ
- **Input Current**
  - **Positive Logic**: 0.8 mA - 1.6 mA
  - **Negative Logic**: 0.3 mA - 2.1 mA
- **Max Upper Threshold**: 8 VDC
- **Min Lower Threshold**: 3 VDC
- **OFF to ON Response**: 1 ms
- **ON to OFF Response**: 1 ms
- **HSC Max. Switching Rate**
  - Totalizer/Pulse, Edges: 10 kHz
  - Frequency/Pulse, Width: 5 kHz
  - Quadrature: 2.5 kHz

**Digital Relay Outputs**

- **Outputs per Module**: 6 relay
- **Commons per Module**: 6
- **Max. Output Current per Relay**: 3 A at 250 VAC, resistive
- **Max. Total Output Current**: 5 A continuous
- **Max. Output Voltage**: 275 VAC, 30 VDC
- **Max. Switched Power**: 1250 VA, 150 W
- **Contact Isolation to XLe ground**: 1000 VAC
- **Max. Voltage Drop at Rated Current**: 0.5 V
- **Expected Life**
  - No load: 5,000,000
  - Rated load: 100,000
- **Max. Switching Rate**
  - 300 CPM at no load
  - 20 CPM at rated load
- **Type**: Mechanical Contact
- **Response Time**: One update per ladder scan plus 10 ms

**Analog Inputs, Medium Resolution**

- **Number of Channels**: 4
- **Input Ranges**: 0 - 10 VDC
- **Input Impedance**
  - **Current Mode**: 0 - 20 mA
  - **Voltage Mode**: 0 - 500 kΩ
- **Nominal Resolution**: 10 bits
- **% A full scale**: 32,000 counts
- **Max. Over-Current**: 35 mA
- **Conversion Speed**: All channels converted once per ladder scan
- **Max. Error at 25°C**
  - (excluding zero)
  - 4-20 mA: 1.00%
  - 0-20 mA: 1.00%
  - 0-10 VDC: 1.50%
- **Additional error for temperatures other than 25°C**: TBD
- **Filtering**: 160 Hz hash (noise) filter
  - 1-128 scan digital running average filter

**General Specifications**

- **Input Power (Steady State)**: 130 mA @ 24 VDC
- **Input Power (Inrush)**: 30 A for 1 ms @ 24 VDC
- **Primary Power Range**: 10 – 30 VDC
- **Relative Humidity**: 5 to 95% Non-condensing
- **Clock Accuracy**: +/- Seven Minutes/ Month at 20°C

Note: Highest usable frequency for PWM output is 65 KHz

### General Specifications continued

- **Operating Temperature**: 0°C to +50°C
- **Terminal type**: Screw type, 5 mm Removable
- **Weight**: 12 oz. (340.19 g)

2 Panel Cut-Out and Dimensions

Note: Max. panel thickness: 5 mm.

Refer to the XLe/XLt User Manual for panel box information and a handy checklist of requirements.

Note: The tolerance to meet NEMA standards is ± 0.005" (0.1 mm).

3 Ports / Connectors / Cables

Note: The case of the XLe is black, but for clarity, it is shown in a lighter gray color.

To Remove Back Cover: 

Unscrew 4 screws located on the back of the unit. 
Remove cover.

**CAUTION**: Do not over tighten screws when replacing the back cover.

**I/O Jumpers**: (Not Shown): I/O Jumpers (JP) are located internally. To access, remove back cover of unit.

**Wiring Connectors (J1 / J2)**: I/O Jumpers (JP1 / JP2), and External Jumpers (RS-485) are described in the Wiring and Jumpers section of this document.

**Memory Slot**: Uses Removable Memory for data logging, screen captures, program loading and recipes.

**Horner Part No.**: HE-MC1

**Serial Communications**

**MJ1**: (RS-232 / RS-485) Use for Cscape programming and Application-Defined Communications.


**Power Connector**

Use the CAN Connector when using CsCAN network.

Torque Rating: 4.5 – 7 Lb-In (0.50 – 0.78 N-m)
5 Wiring and Jumpers

Wire according to the type of inputs / outputs used, and select the appropriate jumper option.

### Wiring Specifications

- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG (0.8 mm²) or larger.
- For shielded Analog I/O wiring, use the following wire type or equivalent: Belden 3084, 24 AWG (0.2 mm²)
- For CAN wiring, use the following wire type or equivalent: Belden 8441, 18 AWG (0.8 mm²) or larger.

Use copper conductors in field wiring only, 60/75°C

### External DIP Switch Settings (or Jumpers Settings)

Some XLes have jumpers to set RS-485 port termination, though most use DIP switches.

The External Jumpers or DIP switches are used for termination of the RS-485 ports. The XLE is shipped un-terminated.

To terminate, select one of the jumpers shipped with the product and insert it based upon the option that is desired.

As seen when looking at the top of the XLE unit: Refer to Section 3.3 for the location of the DIP switches (or external jumpers).
6 MJ2 Pinouts in Full and Half Duplex Modes

<table>
<thead>
<tr>
<th>Pin</th>
<th>MJ2 Pins</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>TXD</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RXD</td>
<td>IN</td>
<td></td>
</tr>
<tr>
<td>6*</td>
<td>0 V</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>5*</td>
<td>+5 60mA</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TX-</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>IN</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TX+/RX+</td>
<td>IN/OUT</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TX-/RX-</td>
<td>IN/OUT</td>
<td></td>
</tr>
</tbody>
</table>

MJ2 Half Duplex Mode

<table>
<thead>
<tr>
<th>Pin</th>
<th>MJ2 Pins</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>TXD</td>
<td>OUT</td>
<td></td>
</tr>
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<td>IN</td>
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</tr>
<tr>
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<td>+5 60mA</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TX-</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TX+</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TX+/RX+</td>
<td>IN/OUT</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TX-/RX-</td>
<td>IN/OUT</td>
<td></td>
</tr>
</tbody>
</table>

MJ2 Full Duplex Mode

7. Filter

Filter Constant sets the level of digital filtering according to the following chart.

Digital Filtering: The illustration above demonstrates the effect of digital filtering (set with Filter Constant) on module response to a temperature change.

8. Derating

Relay Life Expectancy

9 I/O Register Map

<table>
<thead>
<tr>
<th>Registers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%I1 to %I24</td>
<td>Digital Inputs</td>
</tr>
<tr>
<td>%I25 to %I31</td>
<td>Reserved</td>
</tr>
<tr>
<td>%Q1 to %Q16</td>
<td>Digital Outputs</td>
</tr>
<tr>
<td>%Q17</td>
<td>Clear HSC1 accumulator to 0</td>
</tr>
<tr>
<td>%Q18</td>
<td>Totallizer: Clear HSC2 Quadrature 1-2, Accumulator 1 Reset to max – 1</td>
</tr>
<tr>
<td>%Q19</td>
<td>Clear HSC3 Accumulator to 0</td>
</tr>
<tr>
<td>%Q20</td>
<td>Totallizer: Clear HSC4 Quadrature 3-4: Accumulator 3 Reset to max – 1</td>
</tr>
<tr>
<td>%Q21 to %Q32</td>
<td>Reserved</td>
</tr>
<tr>
<td>%A11 to %A14</td>
<td>Analog Inputs</td>
</tr>
<tr>
<td>%A15, %A16</td>
<td>HSC1 Accumulator</td>
</tr>
<tr>
<td>%A17, %A18</td>
<td>HSC2 Accumulator</td>
</tr>
<tr>
<td>%A19, %A10</td>
<td>HSC3 Accumulator</td>
</tr>
<tr>
<td>%A11, %A12</td>
<td>HSC4 Accumulator</td>
</tr>
<tr>
<td>%AQ1, %AQ2</td>
<td>PWM1 Duty Cycle</td>
</tr>
<tr>
<td>%AQ3, %AQ4</td>
<td>PWM2 Duty Cycle</td>
</tr>
<tr>
<td>%AQ5, %AQ6</td>
<td>PWM Prescale</td>
</tr>
<tr>
<td>%AQ7, %AQ8</td>
<td>PWM Period</td>
</tr>
<tr>
<td>%AQ9 to %AQ14</td>
<td>Analog Outputs</td>
</tr>
</tbody>
</table>

Note: Not all XLe units contain the I/O listed in this table.

10 Safety

When found on the product, the following symbols specify:


This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or Non-hazardous locations only

WARNING – EXPLOSION HAZARD – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - RISQUE D’EXPLOSION – LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE 1, DIVISION 2

WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT - RISQUE D’EXPLOSION - AVANT DE DECONNECTER L’EQUIPMENT, COUPER LE COURANT OU S’ASSURER QUE L’EMPLACEMENT EST DESIGNE NON DANGEREUX.

WARNING: To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.
- All applicable codes and standards need to be followed in the installation of this product.
- Adhere to the following safety precautions whenever any type of connection is made to the module.
- Connect the safety (earth) ground on the power connector first before making any other connections.
- When connecting to electric circuits or pulse-initiating equipment, open their related breakers.
- Do not make connections to live power lines.
- Make connections to the module first; then connect to the circuit to be monitored.
- Route power wires in a safe manner in accordance with good practice and local codes.
- Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
- Ensure hands, shoes, and floors are dry before making any connection to a power line.
- Make sure the unit is turned OFF before making connection to terminals.
- Make sure all circuits are de-energized before making connections.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Use Copper Conductors in Field Wiring Only, 60/75°C

**WARNING: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE Tyco relay PCJ**

Cover / case & base: Mitsubishi engineering Plastics Corp. 5010GN6-30 or 5010GN6-30 M8 (PBT)
Sealing Material: Kishimoto 4616-50K (I part epoxy resin)

It is recommended to periodically inspect the relay for any degradation of properties and replace if degradation is found.
OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a “Basic Component” under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA’S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:
1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA’s policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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