# XL4 OCS

## Datasheet for HE-XC1E0, HE-XC1E2, HE-XC1E3, HE-XC1E4, HE-XC1E5 HEXT251C100, HEXT251C112, HEXT251C113, HEXT251C114, HEXT251C115

## 1. Specifications

| General Specifications | |
|---|---|
| **Required Power** (Steady state) | 95 mA @ 24 VDC<br>190 mA @ 12 VDC |
| **Required Power** (Inrush) | 2A for <1 ms @ 24 VDC<br>DC Switched |
| **Primary Power Range** | 10 – 30 VDC |
| **Relative Humidity** | 5 to 95% Non-condensing |
| **Clock Accuracy** | +/- 20 ppm maximum at 25° C (+/- 1 min/month) |
| **Surrounding Air Temp** | -10°C to +60°C |
| **Storage Temp** | -30°C to +70°C |
| **Weight** | 12 oz. (340 g) |
| **UL / CE** | US Certifications<br>Europe Certifications |

| Control & Logic Specifications | | |
|---|---|---|
| **Control Language Support** | Advanced Ladder Logic<br>Full IEC 1131-3 Languages | |
| **Logic Program Size & Logic Scan Rate** | 1MB, maximum<br>0.013mS/K | |
| **Online Programming Changes** | Supported in Advanced Ladder | |
| **I/O Support** | Digital Inputs | 2048 |
| | Digital Outputs | 2048 |
| | Analog Inputs | 512 |
| | Analog Outputs | 512 |
| **General Purpose Registers** | 50,000 (words) Retentive | |
| | 16,384 (bits) Retentive | |
| | 16,384 (bits) Non-retentive | |

| Display Specifications | |
|---|---|
| **Display Type** | 3.5” TFT Transmissive Color |
| **Resolution** | QVGA (320x240) |
| **Color** | 16-bit (65,535) |
| **Screen Memory** | 27MB |
| **User-Programmable Screens** | 1023 |
| **Backlight** | LED – 50,000 hour life |
| **Screen Update Rate** | User Configurable within the scan time.<br>(perceived as instantaneous in many cases) |

| Connectivity | |
|---|---|
| **Serial Ports** | 1 RS232 & 1 RS485 on single Modular Jack |
| **USB mini-B** | USB 2.0 (480MHz) Programming & Data Access |
| **USB A** | USB 2.0 (480MHz) for USB FLASH Drives (2TB) |
| **CAN** | Remote I/O, Peer-to-Peer Comms, Cscape |
| **Ethernet** | 10/100 Mb (Auto-MDX)<br>Modbus TCP C/S, HTTP, FTP, SMTP, Cscape |
| **Remote I/O** | SmartRail, SmartStix, SmartBlock, SmartMod |
| **Removable Memory** | MicroSD, support for >32GB max.<br>Application Updates, Datalogging, more |

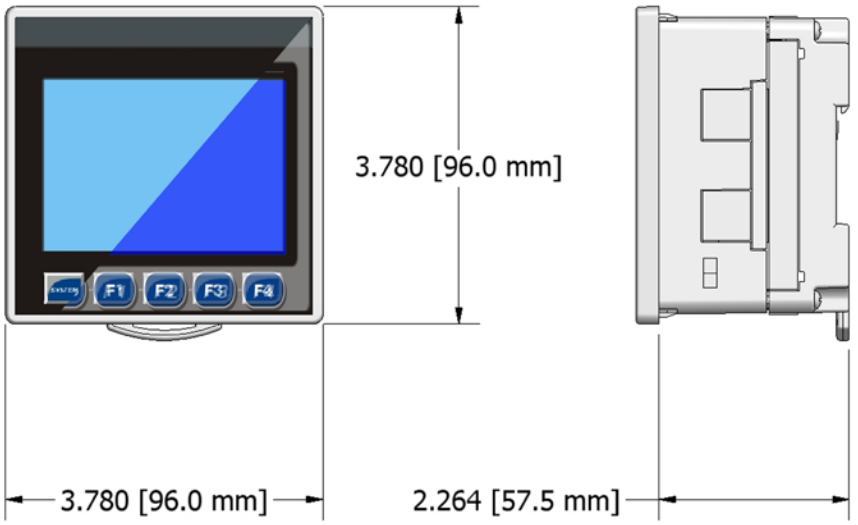
**Input / Output Specifications**

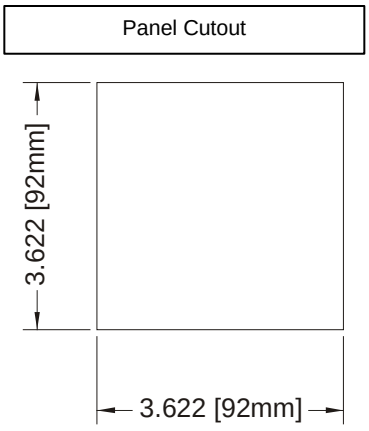
| Model | DC In | DC Out | Relays | HS In | HS Out | mA/V In | mA/V RTD/Tc | mA/V Out |
|---|---|---|---|---|---|---|---|---|
| Model 2 | 12 | | 6 | 4 | | 4 | | |
| Model 3 | 12 | 12 | | 4 | 2 | 2 | | |
| Model 4 | 24 | 16 | | 4 | 2 | 2 | | |
| Model 5 | 12 | 12 | | 4 | 2 | | 2 | 2 |

There are 2 high-speed inputs of the total DC Inputs. There are 2 high-speed outputs of the total DC outputs. Model 2, 3 & 4 feature 12-bit Analog I/O. Model 5 features 14/16-bit Analog I/O. High-speed Outputs can be used for PWM and Pulse Train Outputs, currently limited to <65kHz.

| High-Speed Counters | |
|---|---|
| Number of Counters | 2 |
| Maximum Frequency | >500kHz each |
| Accumulator Size | 32-bits each |
| **Modes Supported** | |
| Totalizer | Quadrature |
| Pulse Meas. | Frequency Meas. |
| 2 Position Controlled Outputs<br>1 ON/OFF Setpoint per Output | |

## 2. Dimensions & Panel Cutout




Cutout tolerance to meet NEMA standards is ±0.005” (0.1mm). Max. Panel Thickness is 5mm.

## 3. Installation Procedures

1. Carefully locate an appropriate place to mount the XL4. Be sure to leave enough room at the top of the unit for insertion and removal of the microSD™ card. Also leave enough room at the bottom for the insertion and removal of USB FLASH drives

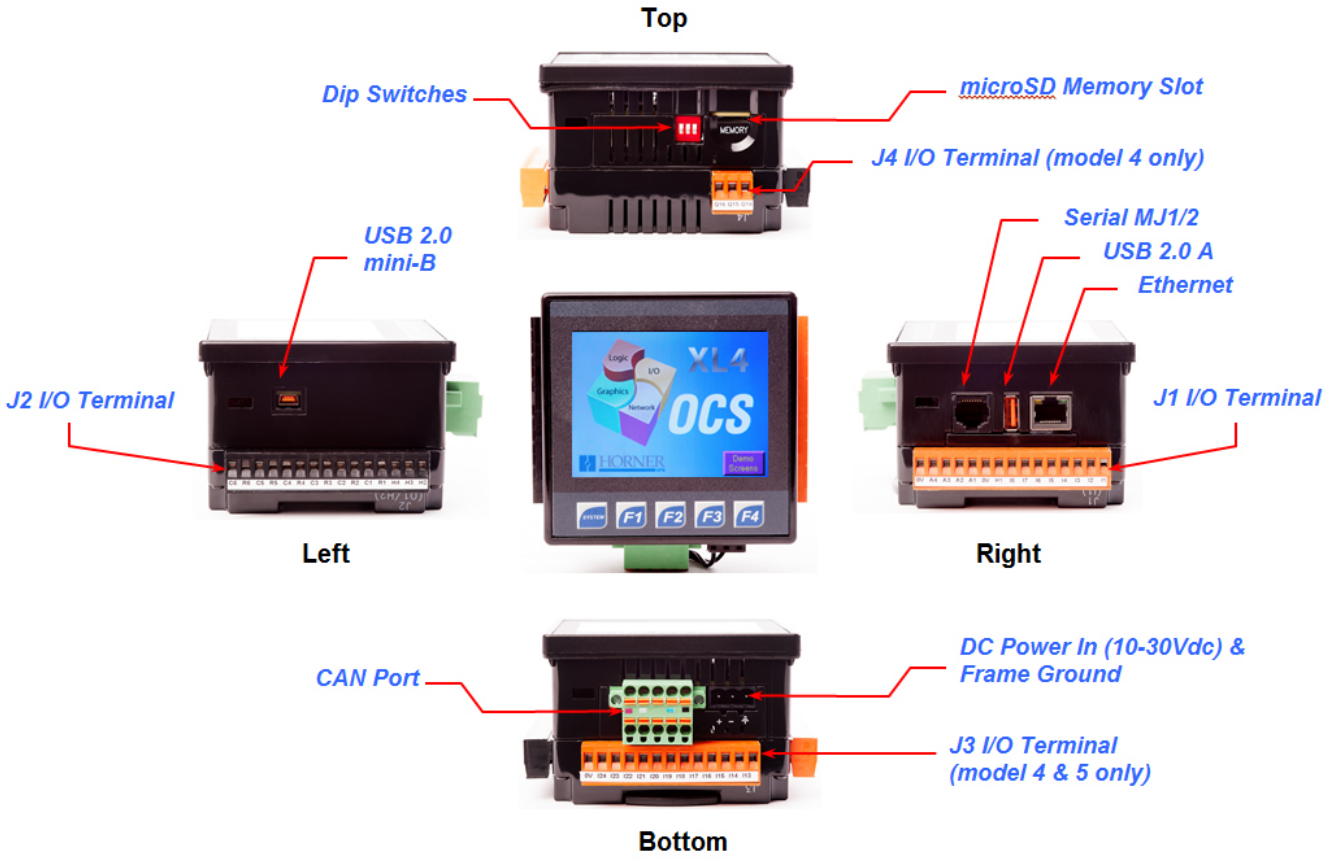
2. Carefully cut the host panel per the diagram on Page 1, creating a 92mm x 92mm ±0.1mm opening into which the XL4 may be installed. If the opening is too large, water may leak into the enclosure, potentially damaging the XL4. If the opening is too small, the OCS may not fit through the hole without damage.

3. Remove all Removable Terminals from the XL4. Insert the XL4 through the panel cutout (from the front). The gasket needs to be between the host panel and the XL4.

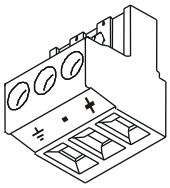
4. Install and tighten the four mounting clips (provided in the box) until the gasket forms a tight seal (max torque 1.5Nm / 13.2Lb-in).

5. Reinstall the XL4 I/O Removable Terminal Blocks. Connect communications cables to the serial port, USB ports, Ethernet port, and CAN port as required.

## 4. Ports & Connectors




*XL4 Connector Locations*

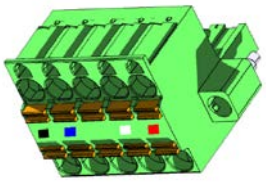


**DC Input / Frame**

Torque rating
4.5 – 7 Lb-In
(0.50 – 0.78 N-m)

DC- is internally connected to I/O V-, but is isolated from CAN V-
A Class 2 power supply must be used.

| Primary Power Port Pins | | |
|---|---|---|
| Pin | Signal | Description |
| 1 | Ground | Frame Ground |
| 2 | DC- | Input Power Supply Ground |
| 3 | DC+ | Input Power Supply Voltage |



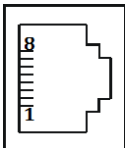
**CAN**

Locking Spring-Clamp,
Two-terminators Per Conductor

Torque rating 4.5 Lb-In
(0.50 N-m)

SHLD and V+ pins are **not** internally connected to XL4

| CAN1 Port Pin Assignments | | | |
|---|---|---|---|
| Pin | Signal | Signal Description | Direction |
| 1 | V- | CAN Ground - Black | – |
| 2 | CN_L | CAN Data Low - Blue | In/Out |
| 3 | SHLD | Shield Ground - None | – |
| 4 | CN_H | CAN Data High - White | In/Out |
| 5 | V+ (NC) | No Connect - Red | – |




**MJ1/2 Serial Ports**

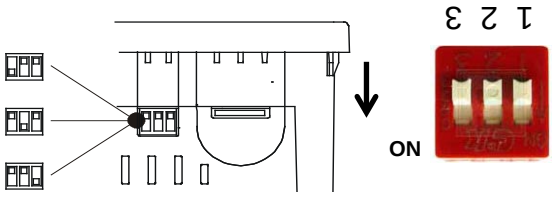
MJ1: RS-232 w/Full Handshaking

MJ2: RS-485 Half-Duplex

*Two Serial Ports on One Modular Jack (8posn)*

| Pin | MJ1 Pins | | MJ2 Pins | |
|---|---|---|---|---|
| | Signal | Direction | Signal | Direction |
| 8 | TXD | OUT | - | - |
| 7 | RXD | IN | - | - |
| 6 | 0 V | Ground | 0 V | Ground |
| 5 | +5V@60mA | OUT | +5V@60mA | OUT |
| 4 | RTS | OUT | - | - |
| 3 | CTS | IN | - | - |
| 2 | - | - | RX- / TX- | IN / OUT |
| 1 | - | - | RX+ / TX+ | IN / OUT |

**DIP Switches**




| Pin | Name | Function | Default |
|---|---|---|---|
| 1 | RS-485 Termination | ON = Terminated | OFF |
| 2 | Spare | Always Off | OFF |
| 3 | Factory Use | Always Off | OFF |

## 5. Safety

**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.
**WARNING**: To avoid the risk of electric shock or burns, always connect the 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 all Power Sources connected to the OCS. 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**: Battery may explode if mistreated. Do Not Recharge, Disassemble or Dispose Of in Fire.
**WARNING**: EXPLOSION HAZARD – BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS
Power input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods of the National Electric Code, NFPA 70 for installations in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction. 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 – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
**WARNING**: EXPLOSION HAZARD – Substitution of components may impair suitability for Class 1, Division 2. Digital outputs shall be supplied from the same source as the Operator Control Station. Jumpers on connector JP1 and others shall not be removed or replaced while the circuit is live unless the area is known to be free of ignitable concentrations of flammable gasses or vapors.

## 6. Technical Support

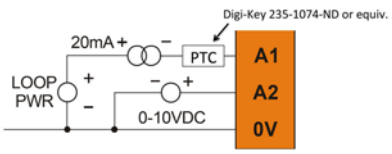
For assistance and manual updates, contact Technical Support at the following locations:

**North America**
(317) 916-4274
877-665-5666
http://www.heapg.com
e-mail: techsppt@heapg.com

**Europe**
(+) 353-21-4321-266
http://www.horner-apg.com
e-mail: techsupport@hornerirl.ie

## 7. Common Cause of Analog Input Tranzorb Failure

A common cause of Analog Input Tranzorb Failure on Analog Inputs Model 2, 3, 4 & 5: If a 4-20mA circuit is initially wired with loop power, but without a load, the Analog input could see 24Vdc. This is higher than the rating of the tranzorb. This can be solved by NOT connecting loop power prior to load connection, or by installing a low-cost PTC in series between the load and Analog input. See SUP0977-01 for additional details.




**NOTE†:** Refers to Model 2 – orange *(pg.4)* Models 3 & 4 – J1 *(pg.5)* and Model 5 – 20mA Analog In *(pg.6.)*

## 8. Built-in I/O (Model 2, 3, 4 & 5)

All XL4 models (except the HE-XCE0) feature built-in I/O. The I/O is mapped into OCS Register space, in three separate areas – Digital/Analog I/O, High-Speed Counter I/O, and High-speed Output I/O. Digital/Analog I/O location is fixed starting at 1, but the High-speed Counter and High-speed Output references may be mapped to any open register location. For more details on using the High-Speed Counter and High-Speed Outputs, see the ***XL4 OCS User's Manual*** *(MAN0964)*.

| Fixed Address | Digital/Analog I/O Function | XL4 Model | | | |
|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 5 |
| %I1 | Digital Inputs | 1-12 | 1-12 | 1-24 | 1-12 |
| | Reserved | 13-32 | 13-31 | 25-31 | 13-31 |
| | ESCP Alarm | n/a | 32 | 32 | 32 |
| %Q1 | Digital Outputs | 1-6 | 1-12 | 1-16 | 1-12 |
| | Reserved | 7-24 | 13-24 | 17-24 | 13-24 |
| %AI1 | Analog Inputs | 1-4 | 1-2 | 1-2 | 1-2 |
| | Reserved | 5-12 | 3-12 | 3-12 | 3-12 |
| %AQ1 | Reserved | n/a | 1-8 | 1-8 | 1-8 |
| | Analog Outputs | n/a | n/a | n/a | 9-10 |
| Reserved areas maintain backward compatibility with other XL Series OCS models | | | | | |

| Default Address* | High-Speed Counter Function | XL4 Models 2-5 |
|---|---|---|
| %I1601 | Status Bits | 1-8 |
| %Q1601 | Command Bits | 1-32 |
| %AI0401 | Accumulator 1 & 2 | 1-8 |
| %AQ0401 | Preload & Match Values | 1-12 |
| *Starting Address locations for %I, %Q, %AI & %AQ may be re-mapped by user | | |

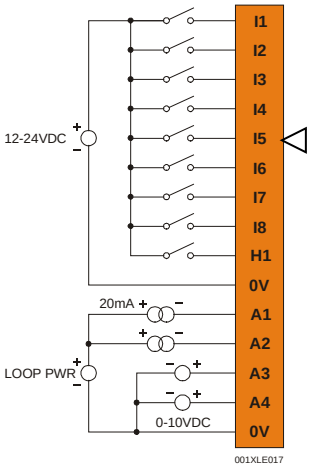
| Default Address* | High-Speed Output Function | XL4 Models 2-5 |
|---|---|---|
| %I1617 | Status Bits | 1-8 |
| %Q1** | Command Bits | 1-2 |
| n/a | n/a | n/a |
| %AQ421 | PWM or Pulse-Train Parameters | 1-20 |
| *Starting Address locations for %I & %AQ may be remapped by user | | |
| **Q1-Q2 are part of the Fixed I/O Map. In High-Speed Output mode they can be used to initiate a Stepper/PTO Move | | |

### Model 2 I/O

The XL4 model 2 (HE-XC1E2) features 12 DC Inputs, 6 Relay outputs, and 4 Analog Inputs. The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Four of the inputs (H1-H4) can be used for high-speed functions up to 500kHz. The 12-bit Analog Inputs can be jumpered for voltage (0-10V) or current (4-20mA) on a channel by channel basis. The Relay outputs are isolated, supporting AC and DC voltages, with output currents of up to 3A/relay, 5A total.

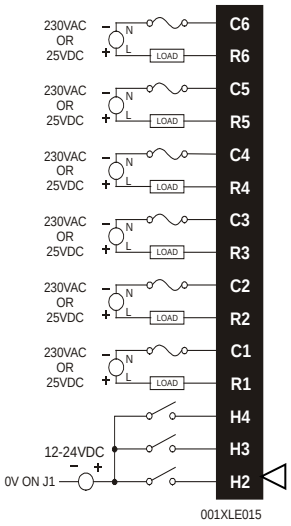
| J1 (Orange) | Name |
|---|---|
| I1 | IN1 |
| I2 | IN2 |
| I3 | IN3 |
| I4 | IN4 |
| I5 | IN5 |
| I6 | IN6 |
| I7 | IN7 |
| I8 | IN8 |
| H1 | HSC1 / N9 |
| 0V | Common |
| A1 | Analog IN1 |
| A2 | Analog IN2 |
| A3 | Analog IN3 |
| A4 | Analog IN4 |
| 0V | Common |

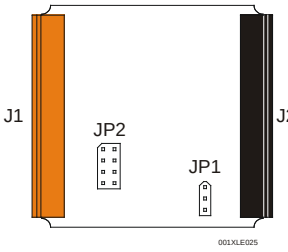
Orange
**Digital In / Analog In**




| J2 (Black) | Name |
|---|---|
| C6 | Relay 6 COM |
| R6 | Relay 6 NO |
| C5 | Relay 5 COM |
| R5 | Relay 5 NO |
| C4 | Relay 4 COM |
| R4 | Relay 4 NO |
| C3 | Relay 3 COM |
| R3 | Relay 3 NO |
| C2 | Relay 2 COM |
| R2 | Relay 2 NO |
| C1 | Relay 1 COM |
| R1 | Relay 1 NO |
| H4 | HSC4 / IN12 |
| H3 | HSC3 / IN11 |
| H2 | HSC2 / IN10 |

Black
**Relay Out / Digital In**

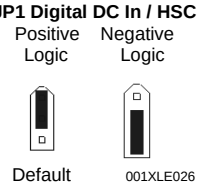


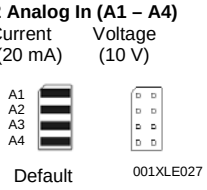

Location of I/O jumpers (**JP1 & JP2**) and wiring connectors **(J1 and J2)** with back cover removed.

**Model 2 Jumper Setting Details**

**JP1 Digital DC In / HSC**

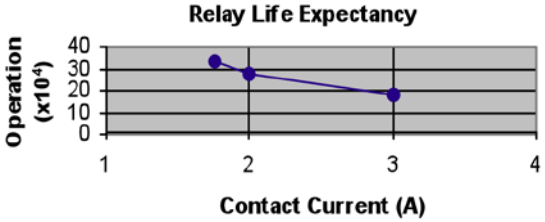



**JP2 Analog In (A1 – A4)**




**Note:** The Cscape Module Setup configuration must match the selected I/O (JP) jumper settings.

**Note:** When using JP2 (A1-A4), each channel can be independently configured.




"**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)

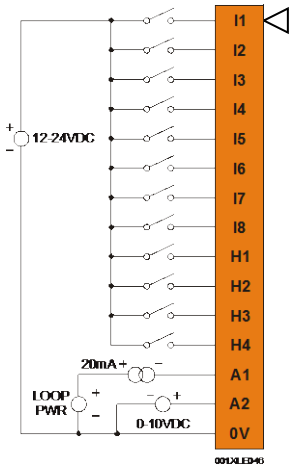
*It is recommended to periodically inspect the relay for any degradation of properties and replace if degradation is found*

## Model 3 & Model 4 I/O

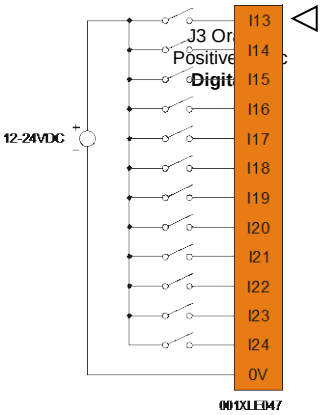
The XL4 model 3 (HE-XC1E3) features 12 DC Inputs, 12 DC outputs, and 2 Analog Inputs. The XL4 model 4 (HE-XC1E4) increases the I/O count up to 24 DC Inputs, and 16 DC Outputs and 2 Analog Inputs. The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Four of the inputs (H1-H4) can be used for high-speed functions up to 500kHz. The 12-bit Analog Inputs can be jumpered for voltage (0-10V) or current (4-20mA) on a channel by channel basis. The 12/24VDC Outputs feature Electronic Short Circuit protection, and support currents up to 0.5A per point, and 4A total. Two of the DC Outputs can be used for high speed functions (PWM or PTO). The output frequency is limited by the switching capability of the output drivers (about 10kHz), although an optional accessory (HE-XHSQ) can be added to provide parallel output drivers supporting frequencies up to 200kHz.

J1 Orange
Positive Logic
**Digital & Analog In**

| J1 (Orange) | Model 3 & 4 Signal Name |
|---|---|
| I1 | IN1 |
| I2 | IN2 |
| I3 | IN3 |
| I4 | IN4 |
| I5 | IN5 |
| I6 | IN6 |
| I7 | IN7 |
| I8 | IN8 |
| H1 | HSC1 / IN9 |
| H2 | HSC2 / IN10 |
| H3 | HSC3 / IN11 |
| H4 | HSC4 / IN12 |
| A1 | Analog IN1 |
| A2 | Analog IN2 |
| 0V | Common |

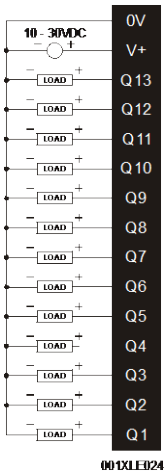



| J3 (Orange) | Model 4 only Signal Name |
|---|---|
| I13 | IN13 |
| I14 | IN14 |
| I15 | IN15 |
| I16 | IN16 |
| I17 | IN17 |
| I18 | IN18 |
| I19 | IN19 |
| I20 | IN20 |
| I21 | IN21 |
| I22 | IN22 |
| I23 | IN23 |
| I24 | IN24 |
| 0V | Common |

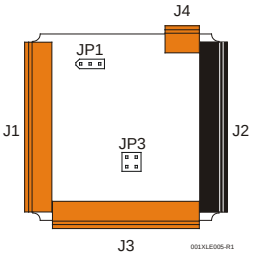



J2 Black
Positive Logic
**Digital Out**

| J2 (Black) | Model 3 Name | Model 4 Name |
|---|---|---|
| 0V | Common | |
| V+ | V+ * | |
| NC | No Connect | OUT13 |
| Q12 | OUT12 | |
| Q11 | OUT11 | |
| Q10 | OUT10 | |
| Q9 | OUT9 | |
| Q8 | OUT8 | |
| Q7 | OUT7 | |
| Q6 | OUT6 | |
| Q5 | OUT5 | |
| Q4 | OUT4 | |
| Q3 | OUT3 | |
| Q2 | OUT2 / PWM2 | |
| Q1 | OUT1 / PWM1 | |
| *V+ Supply for Sourcing Outputs | | |

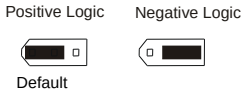



**Jumper Setting Details**




Location of I/O jumpers (**JP1 & JP3**) and wiring connectors **(J1, J2, J3 & J4)** with back cover removed.

**JP1 Digital DC Inputs**



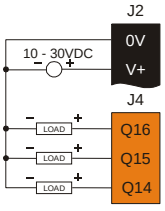

**JP3 Analog Inputs**


**Note:** The Cscape Module Setup configuration must match the selected I/O (JP) jumper settings.

**Note:** When using JP3 (A1-A2), each channel can be independently configured.

J4 Orange
Positive Logic
**Digital Out**

| J4 (Orange) | Model 4 Name |
|---|---|
| Q16 | OUT16 |
| Q15 | OUT15 |
| Q14 | OUT14 |




**<u>Note:</u>**
**Model 3 uses J1 & and J2 only.**

**Model 4 uses J1, J2, J3 & J4.**

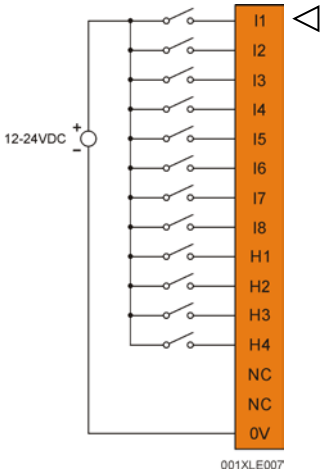
## Model 5 I/O

The XL4 model 5 (HE-XC1E5) features 12 DC Inputs, 12 DC outputs, with high performance, highly configurable Analog Inputs (2) and Analog Outputs (2). , The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Four of the inputs (H1-H4) can be used for high-speed functions up to 500kHz. The 12/24VDC Outputs feature Electronic Short Circuit protection, and support currents up to 0.5A per point, and 4A total. Two of the DC Outputs can be used for high speed functions (PWM or PTO). The output frequency is limited by the switching capability of the output drivers (about 10kHz), although an optional accessory (HE-XHSQ) can be added to provide parallel output drivers supporting frequencies up to 200kHz.

The two high resolution Analog Inputs can be configured for 4-20mA, 0-10V, or 0-100mV at 14-bit resolution. They also can be configured for 16-bit temperature measurement – supporting Thermocouples or RTDs with 0.05°C resolution. The Analog Outputs are sourcing, and can be configured for 4-20mA or 0-10V at 14-bit resolution. Each Analog Input or Output channel can be configured independently for maximum flexibility.

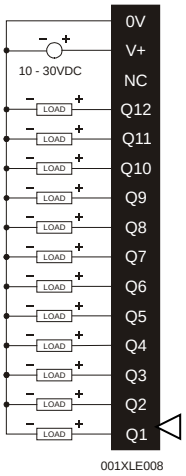
| J1 (Orange) | Name |
|---|---|
| I1 | IN1 |
| I2 | IN2 |
| I3 | IN3 |
| I4 | IN4 |
| I5 | IN5 |
| I6 | IN6 |
| I7 | IN7 |
| I8 | IN8 |
| H1 | HSC1 / IN9 |
| H2 | HSC2 / IN10 |
| H3 | HSC3 / IN11 |
| H4 | HSC4 / IN12 |
| NC | No Connect |
| NC | No Connect |
| 0V | Common |

**J1 Orange**
Positive Logic
**Digital Inputs**

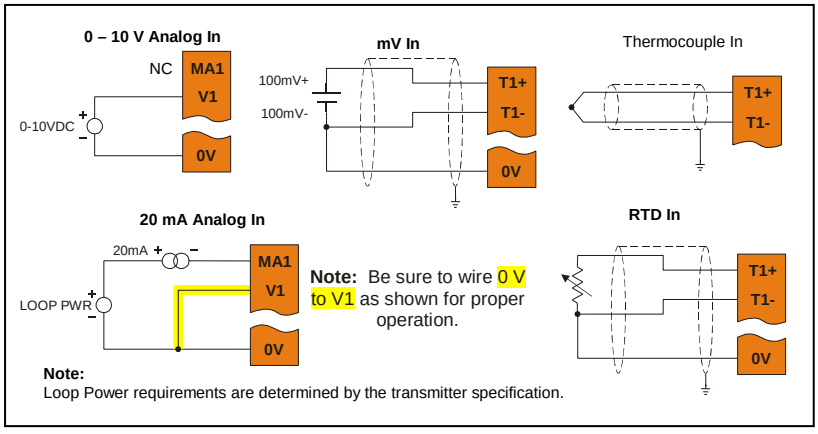


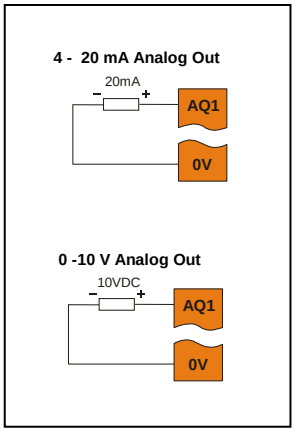

| J2 (Black) | Name |
|---|---|
| 0V | Common |
| V+* | Output Power |
| NC | No Connect |
| Q12 | OUT12 |
| Q11 | OUT11 |
| Q10 | OUT10 |
| Q9 | OUT9 |
| Q8 | OUT8 |
| Q7 | OUT7 |
| Q6 | OUT6 |
| Q5 | OUT5 |
| Q4 | OUT4 |
| Q3 | OUT3 |
| Q2 | OUT2 / PWM2 |
| Q1 | OUT1 / PWM1 |

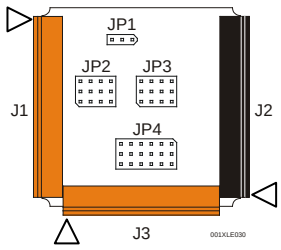
**J2 Black**
Positive Logic
**Digital Outputs**




| J3 (Orange) | Name |
|---|---|
| T1+ | Tc (1 +) or RTD (1+) or 100mV (1+) |
| T1- | Tc (1-) or RTD (1-) or 100mV (1-) |
| T2+ | Tc (2+) or RTD (2+) or 100mV (2+) |
| T2- | Tc (2-) or RTD (2-) or 100mV (2-) |
| AQ1 | 10V or 20mA Out (1) |
| AQ2 | 10V or 20mA Out (2) |
| 0V | Common |
| MA1 | 0-20mA In (1) |
| V1 | 0-10V In (1) |
| 0V | Common |
| MA2 | 0-20mA In (2) |
| V2 | 0-10V In (2) |
| 0V | Common |




Location of I/O jumpers (**JP1-JP4**) and wiring connectors **(J1-J4)** with back cover removed.

**Jumper Setting Details**