



XL4 OCS DATASHEET

MODEL 5

12 DC In, 12 DC Out, 2 - 14/16-bit Analog In (mA/V/Tc/mV/RTD), 2 - 12-bit Analog Out

1 TECHNICAL SPECIFICATIONS

1.1 General

| | |
|-------------------------------|---|
| Typical Power-Backlight 100% | 442mA @ 10V (4.42W), 221mA @ 24V (5.30W) |
| Power Backlight Off | -24mA @ 24VDC (.58W) |
| Power Backlight @50% | -18mA @ 24VDC (0.43W) |
| Required Power (Steady State) | 221mA @ 24VDC (2.21W) 442mA @ 10VDC (4.42W) |
| Heater Option | 355mA with heater operating (24VDC) 520mA with heater operating (12VDC) *Heater option (Model# plus "-22") requires VDC for -40° |
| Required Power (Inrush) | 2A for < 1ms @ 24VDC, DC switched |
| Primary Power Range | 10 - 30VDC 10 - 24VDC (with Heater Option) |
| Relative Humidity | 5 to 95% non-condensing |
| Real Time Clock | Battery Backed, lithium coin cell CR2450 |
| Clock Accuracy | + / - 20 ppm maximum at 25°C (+/- 1 min/month) |
| Operating Temperature | -10°C to +60°C (-22 Heater Option range is -40°C to +60°C) |
| Storage Temperature | -20°C to +60°C |
| Weight | 12 oz / 340g (without I/O) |
| Certifications (UL/CE) | North America: https://hornerautomation.com/certifications/ Europe: http://www.horner-apg.com/en/support/certification.aspx |

1.2 User Interface

| | |
|-----------------------|--|
| Display Type | 3.5" TFT Color |
| Screen Brightness | 640cd/m ² (nits) |
| Resolution | QVGA (320 x 240) |
| Color | 16-bit (65,535) |
| User-Program. Screens | 1023 max pages; 1023 objects per page |
| Backlight | LED - 50,000 hour life |
| Brightness Control | 0-100% via System Register %SR57 |
| Screen Update Rate | User Configurable within the scan time |
| Number of Keys | 5 |

1.3 Connectivity

| | |
|------------------------|---|
| Serial Ports | 1 RS-232 and 1 RS-485 on singular Modular Jack (MJ) |
| USB mini-B | USB 2.0 (480MHz) Programming & Data Access |
| USB A | USB 2.0 (480 MHz) for USB flash drives (2TB) |
| CAN Port Isolated 1 kV | Remote I/O, Peer-to-peer Comms, Cscape |
| CAN Protocols | CsCAN, CANopen, DeviceNet, J1939 |
| Ethernet | 10/100 Mb (Auto-MDX) |
| Ethernet Protocols | TCP/IP, Modbus TCP, FTP, SRTCP, EGD, ICMP, ASCII |
| Remote I/O | SmartRail, SmartStix, SmartBlock, SmartMod |
| Removable Memory | microSD, SDHC, SDXC IN FAT32 format, support for 32GB max. Application Updates, Datalogging, and more |

1.4 Control & Logic

| | |
|--------------------------|--|
| Control Language Support | Advanced Ladder Logic Full IEC 61131-3 Languages |
| Logic Program Size | 1 MB, maximum |
| Logic Scan Rate | 0.013ms/kB |
| Digital Inputs | 2048 |
| Digital Outputs | 2048 |
| Analog Inputs | 512 |
| Analog Outputs | 512 |
| Gen. Purpose Registers | 50,000 (words) Retentive 16,384 (bits) Retentive 16,384 (bits) Non-retentive |

1.5 High-Speed Inputs

| | |
|--------------------|---|
| Number of Counters | 4 |
| Maximum Frequency | 1MHz each |
| Accumulator Size | 32-bits each |
| Modes Supported | Totalizer, quadrature, pulse measurement, frequency measurement, set-point controlled outputs |

1.6 High-Speed Outputs

| | |
|------------------|--------------|
| Modes Supported | Stepper, PWM |
| Output Frequency | 500kHz |

technical specifications continued...

1.7 Digital DC Inputs

| Inputs per Module | 12 Including 4 Configurable HSC Inputs | |
|------------------------------|--|----------------|
| Commons per Module | 1 | |
| Input Voltage Range | 12VDC / 24VDC | |
| Absolute Max. Voltage | 35VDC Max. | |
| Input Impedance | 10kΩ | |
| Input Current | Positive Logic | Negative Logic |
| Upper Threshold | 0.8mA | -1.6mA |
| Lower Threshold | 0.3mA | -2.1mA |
| Max. Upper Threshold | 8VDC | |
| Min. Lower Threshold | 3VDC | |
| OFF to ON Response | 1ms | |
| ON to OFF Response | 1ms | |
| High Speed Counter Max Freq* | 1MHz | |

*See I/O info below for detail regarding HSC and PWM

1.8 Digital DC Outputs

| | |
|------------------------------------|---|
| Outputs per Module | 16 Including 2 Configurable PWM Outputs |
| Commons per Module | 1 |
| Output Type | Sourcing / 10kΩ Pull-Down |
| Output Frequency | 500kHz |
| Absolute Max. Voltage | 28VDC Max. |
| Output Protection | Short Circuit |
| Max. Output Current/Point | 0.5A |
| Max. Total Current | 4A Continuous |
| Max. Output Supply Voltage | 30VDC |
| Min. Output Supply Voltage | 10VDC |
| Max. Voltage Drop at Rated Current | 0.25VDC |
| Max. Inrush Current | 650mA per Channel |
| Min. Load | None |
| OFF to ON Response | 1ms |
| ON to OFF Response | 1ms |
| Output Characteristics | Current Sourcing (Pos. Logic) |
| PWM Out | ~ 5kHz |
| Rise Time | 50 - 115μs |
| Fall Time | 8-20μs |

1.9 Analog Inputs, High Resolution

| | | | |
|---|---|---|--|
| Number of Channels | 2 | Thermocouple: B / R / S E T J K / N | Temperature Range: 32°F to 2,912°F (0°C to 1,600°C) -328°F to 1,652°F (-200°C to 900°C) -400°F to 752°F (-240°C to 400°C) -346°F to 1,382°F (-210°C to 750°C) -400°F to 2,498°F (-240°C to 1,370°C) |
| Input Ranges (Selectable) | 0-10VDC; 0-20mA; 4-20mA; 100mV PT100; and J, K, N, T, E, R, S, B Thermocouples | Thermocouple Common Mode Range | +/- 10V |
| Safe Input Voltage Range | 10VDC: -0.5V to +15V 20mA: -0.5V to +6V RTD / T/C: +/- 24VDC | Converter Type | Delta Sigma |
| Nominal Resolution | 10V, 20mA, 100mV: 14 Bits RTD, Thermocouple: 16 Bits | Max. Error at 25°C (*excluding zero) | *4-20mA +/- 0.10% of full scale *0-20mA +/- 0.10% of full scale *0-10VDC +/- 0.10% of full scale RTD (PT100) +/- 1.0 °C of full scale 0-100mV +/- 0.05% of full scale (*excluding zero) |
| Input Impedance (Clamped @ -0.5 Vdc to 12 Vdc) | Current Mode: 100Ω, 35mA Max. Continuous Voltage Mode: 500kΩ, 25mA Max. Continuous | Max. Thermocouple Error (After Warm up Time of One Hour) | +/-0.2% (+/-0.3% below -100°C) of full scale |
| %AI Full Scale | 10V, 20mA, 100mV: 32,000 counts full scale RTD / T/C: 20 Counts / °C | Conversion Speed, Both Channels Converted | 10V, 20mA, 100mV: 30 Times/Second RTD Thermocouple: 7.5 Times/Second |
| Max. Over-Current | 35mA | Conversion Time per Channel | 10V, 20mA, 100mV: 16.7 ms RTD, Thermocouple: 66.7 ms |
| Open Thermocouple Detec Current | 50nA | RTD Excitation Current | 250μA |
| | | Conversion Speed | Once per ladder scan |

1.10 Analog Outputs

| | | | |
|------------------------------------|--|--|--|
| Number of Channels | 2 | Minimum 10V Load | 1kΩ |
| Output Ranges | 0-10VDC , 0-20mA | Minimum Resistance Load | 500Ω |
| Nominal Resolution | 12 Bits | Analog Outputs; Output Points Required | 2 |
| Update Rate | Once per PLC scan | Addtnl. Error for Temp. Other Than 25°C | 20mA 0.000143%/ °C 0 -10V 0.000151%/ °C |
| Max. Error at 25°C (Exluding Zero) | 20mA 0.1% of full scale 0 -10V 0.1% of full scale | | |

2 CONTROLLER OVERVIEW

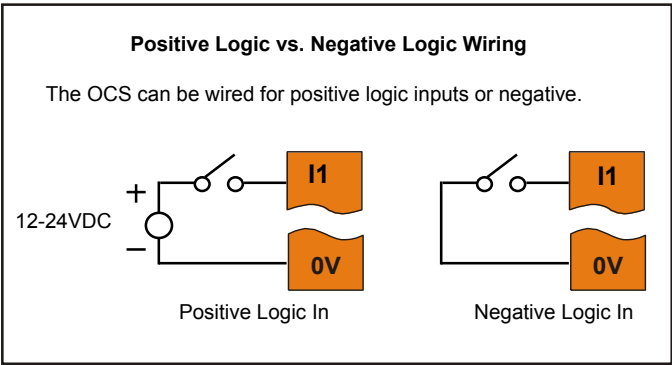
3 WIRING: INPUTS AND OUTPUTS

2.1 - Overview of XL4



1. Touchscreen
2. Function Keys
3. High Capacity microSD Slot
4. Configuration Switch
5. USB Mini-B Port
6. Wide-Range DC Power CAN Port
7. Ethernet LAN Port
8. USB A Port
9. RS232/RS485 Serial Port

3.1 - Digital Input & Output Information



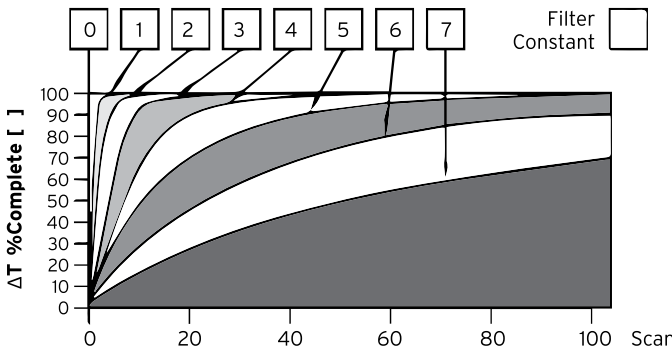
Digital inputs may be wired in either a Positive Logic or Negative Logic fashion as shown. The setting in the Cscape Hardware Configuration for the Digital Inputs must match the wiring used in order for the correct input states to be registered. When used as a normal input and not for high speed functions, the state of the input is reflected in registers %I1 - %I12.

Digital inputs may alternately be specified for use with High Speed Counter functions, also found in the Hardware Configuration for Digital Inputs. Refer to the XL4 User Manual [MANO964] for full details.

3.2 - Analog Input Information

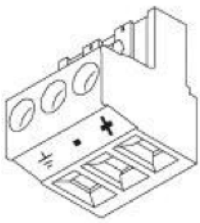
Raw input values for channels 1-4 are found in the registers as Integer-type data with a range from 0 - 32000.

Analog inputs may be filtered digitally with the Filter Constant found in the Cscape Hardware Configuration for Analog Inputs. Valid filter values are 0 - 7 and act according to the following chart.



| Data Values | |
|----------------|--|
| INPUT MODE: | DATA FORMAT, 12-bit INT: |
| 0-20mA, 4-20mA | 0-32000 |
| 0-10V | 0-32000 |
| T/C & RTD | Temperature in °C or °F to 1 decimal place (xxx.y) NOTE: °C or °F may be selected in the Hardware Configuration section in Cscape. The value is an integer, so the user should divide by 10. |

2.2 - Power Wiring



| Primary Power Port Pins | | |
|-------------------------|--------|----------------------------|
| PIN | SIGNAL | DESCRIPTION |
| 1 | Ground | Frame Ground |
| 2 | DC- | Input Power Supply Ground |
| 3 | DC+ | Input Power Supply Voltage |

DC Input / Frame
Solid/Stranded Wire: 12-24 awg (2.5-0.2mm).
Strip Length: 0.28" (7mm).
Torque Rating: 4.5 - 7 in-lbs (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.

XL4 User Manual [MANO964]

- The User Manual includes extensive information on:
- Built-in I/O
 - Common %S & %SR Registers
 - HSC/PWM/Totalizer/Quadrature & Accumulator Registers
 - Resource Limits

wiring: I-O continued...

3.3- Jumper Setting Details

JP1 Digital DC Inputs

Positive Logic Negative Logic

Default

Location of I/O jumpers (JP1 - JP4) and wiring connectors (J1 - J3) with back cover removed.

JP2 & J3 - Analog Input Settings

T/C / 100mV JP3

T1 T2

RTD (PT100) JP3

T1 T2

10V / 20mA JP3

MA1/V1 MA2/V2

Default

JP4 - Analog Output Setting

CURRENT (20mA)

AQ2 AQ1

VOLTAGE (10V)

AQ2 AQ1

Default

Wiring Details:
 Solid/Stranded Wire: 12-24 awg (2.5-0.2 mm²).
 Strip Length: 0.28" (7 mm).
 Torque Rating: 4.5 - 7 in-lbs (0.50 - 0.78 N-m).

3.4 - Digital In & Out Wiring

J1 - Orange

Positive Logic / Digital Inputs

| 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 |
| OV | Common |

J2 - Black

Positive Logic / Digital Outputs

| J2 (Black) Name | |
|-----------------|--------------|
| OV | Common |
| V+ | V+ |
| NC | No Connect |
| Q12 | OUT 12 |
| Q11 | OUT 11 |
| Q10 | OUT 10 |
| Q9 | OUT 9 |
| Q8 | OUT 8 |
| Q7 | OUT 7 |
| Q6 | OUT 6 |
| Q5 | OUT 5 |
| Q4 | OUT 4 |
| Q3 | OUT 3 |
| Q2 | OUT 2 / PWM2 |
| Q1 | OUT 1 / PWM1 |

J3 Specifications

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

0-10V Analog In

mV In

Thermocouple In

4 - 20 mA Analog Out

20mA Analog In

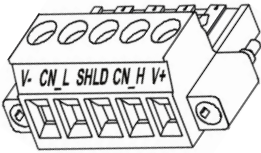
RTD In

0 - 10V Analog Out

NOTE: Loop power requirements are determined by the transmitter specification.
NOTE: Be sure to wire OV to V1 as shown for proper operation.

4 COMMUNICATIONS

4.1 - CAN Communications



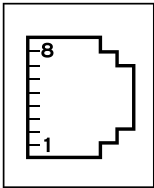
| CAN Pin Assignments | | |
|---------------------|---------|-----------------------|
| PIN | SIGNAL | DESCRIPTION |
| 1 | V- | CAN Ground - Black |
| 2 | CN L | CAN Data Low - Blue |
| 3 | SHLD | Shield Ground - None |
| 4 | CN H | CAN Data High - White |
| 5 | V+ (NC) | No Connect - Red |

CAN

Solid/Stranded Wire: 12-24 awg (2.5-0.2mm)
 Strip Length: 0.28" (7mm).
 Locking spring-clamp, two-terminators per conductor.
 Torque Rating: 4.5 in-lbs (0.50 N-m).

V+ pin is not internally connected, the SHLD pin is connected to Earth ground via a 1 MΩ resistor and 10nF capacitor.

4.2 - Serial Communications



MJ1/2 SERIAL PORTS

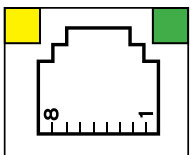
Two Serial Ports on One Module Jack (8posn)

MJ1: RS-232 w/Full Handshaking

MJ2: RS-485 Half-Duplex

| MJ1 PINS | | | MJ2 PINS | |
|----------|------------|-----------|------------|-----------|
| PIN | SIGNAL | DIRECTION | SIGNAL | DIRECTION |
| 8 | TXD | OUT | -- | -- |
| 7 | RXD | IN | -- | -- |
| 6 | OV | GROUND | OV | GROUND |
| 5 | +5V @ 60mA | OUT | +5V @ 60mA | OUT |
| 4 | RTS | OUT | -- | -- |
| 3 | CTS | IN | -- | -- |
| 2 | -- | -- | RX- / TX- | IN / OUT |
| 1 | -- | -- | RX+ / TX+ | IN / OUT |

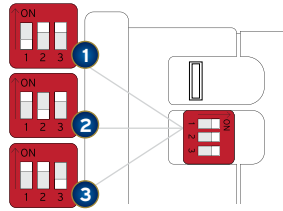
4.3 - Ethernet Communications



Green LED indicates link - when illuminated, data communication is available.

Yellow LED indicates activity - when flashing, data is in transmission.

4.4 - Dip Switches



The DIP switches are used to provide a built-in termination to the MJ2 port if needed. The termination for these ports should only be used if this device is located at either end of the multidrop/daisy-chained RS-485 network.

DIP SWITCHES

| PIN | NAME | FUNCTION | DEFAULT |
|-----|------------------------|-----------------|---------|
| 1 | MJ1 RS-485 Termination | ON = Terminated | OFF |
| 2 | Spare | Always OFF | OFF |
| 3 | Factory Use | Always OFF | OFF |

5 BUILT-IN I/O

5.1 Digital and Analog I/O Function for Model 5

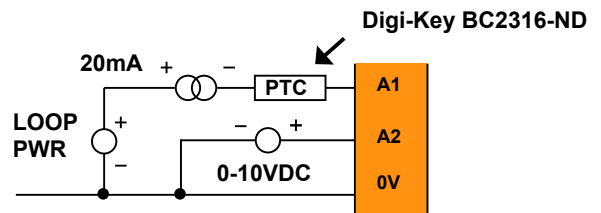
All XL4 models (except the Model 0) feature built-in I/O. The I/O is mapped into OCS Register space, in three separate areas - Digital/Analog I/O, High-Speed Counter I/O, and High-Speed Output I/O. Digital/Analog I/O location is fixed starting at 1, but the high-speed counter and high-speed output references may be mapped to any open register location. For more details, see the XL4 OCS User's Manual (MAN0964).

| Digital and Analog I/O Functions | |
|----------------------------------|---------|
| Digital Inputs | %I1-12 |
| Reserved | %I13-31 |
| ESCP Alarm | %I32 |
| Digital Outputs | %Q1-12 |
| Reserved | %Q13-24 |
| Analog Inputs | %AI1-2 |
| Reserved | %AI3-12 |
| Analog Outputs | %AQ9-10 |
| Reserved | %AQ1-8 |

6 ANALOG IN TRANZORB FAILURE

6.1 - Tranzorb Failure Solutions

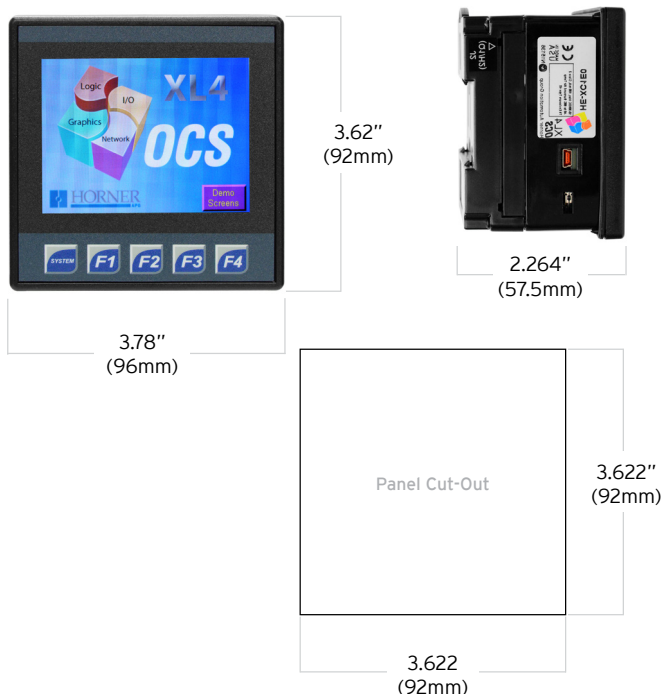
A common cause of Analog Input Tranzorb Failure on Analog Inputs Model 2, 3, 4 & 5: If a 4- 20mA circuit is initially wired with loop power, but without a load, the Analog input could see 24VDC. This is higher than the rating of the tranzorb. This can be solved by NOT connecting loop power prior to load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



communications continued on next page...

7 DIMENSIONS & INSTALLATION

7.1- Dimensions



7.2 - Installation Procedure

The XL4 utilizes a clip installation method to ensure a robust and watertight seal to the enclosure. Please follow the steps below for the proper installation and operation of the unit.

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.
2. Carefully cut the host panel per the diagram, creating a 92 mm x 92 mm +/-0.1 mm opening into which the XL4 may be installed. If the opening is too large, water may leak into the enclosure, potentially damaging the unit. If the opening is too small, the OCS may not fit through the hole without damage.
3. Remove any burrs and or sharp edges and ensure the panel is not warped in the cutting process.
4. Remove all Removable Terminals from the XL4. Insert the XL4 through the panel cutout (from the front). The gasket must be between the host panel and the XL4T
5. Install and tighten the four mounting clips (provided in the box) until the gasket forms a tight seal (**NOTE: Max torque 0.8 to 1.13 N m, or 7-10 in-lbs.**)
6. Reinstall the XL4 I/O Removable Terminal Blocks. Connect communications cables to the serial port, USB ports, Ethernet port, and CAN port as required.

8 BATTERY

8.1 Battery Maintenance

The XL4 has an advanced battery system that uses a rechargeable lithium battery. The battery powers the real time clock when power is removed, and it is needed for register data retention. Please reference the XL4 User Manual [MAN0964] which provides instructions on how to replace the battery.

NOTE: For detailed rechargeable battery information, refer to the Battery Manual [MAN1142].

9 SAFETY

9.1 - WARNINGS

1. To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.
2. 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.
3. Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.
4. In the event of repeated failure, do NOT replace the fuse again as repeated failure indicates a defective condition that will NOT clear by replacing the fuse.
5. 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.

9.2 - FCC COMPLIANCE

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

9.3 - PRECAUTIONS

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:

1. Connect the safety (earth) ground on the power connector first before making any other connections.
2. When connecting to the electric circuits or pulse-initiating equipment, open their related breakers.
3. Do NOT make connection to live power lines.
4. Make connections to the module first; then connect to the circuit to be monitored.
5. Route power wires in a safe manner in accordance with good practice and local codes.
6. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
7. Ensure hands, shoes, and floor are dry before making any connection to a power line.
8. Make sure the unit is turned OFF before making connection to terminals.
9. Make sure all circuits are de-energized before making connections.
10. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
11. Use copper conductors in Field Wiring only, 60/75°C.

10 PART NUMBER

10.1 - Part Number Builder

GLOBAL MODEL NUMBERS

| HE-XC1E | I/O |
|----------|----------------------|
| | <input type="text"/> |
| 0 | (model 0) |
| 2 | (model 2) |
| 3 | (model 3) |
| 4 | (model 4) |
| 5 | (model 5) |
| 6 | (model 6) |

EUROPEAN MODEL NUMBERS

| HEXT251C1 | I/O |
|-----------|----------------------|
| | <input type="text"/> |
| 00 | (model 0) |
| 12 | (model 2) |
| 13 | (model 3) |
| 14 | (model 4) |
| 15 | (model 5) |
| 16 | (model 6) |

11 TECHNICAL SUPPORT

11.1 - Contact Information

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

North America
 (317) 916-4274
www.hornerautomation.com
techsppt@heapg.com

Europe
 (+) 353-21-4321-266
www.horner-apg.com
technical.support@horner-apg.com