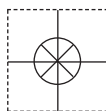


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HE-XE103

**12 Digital DC Inputs,
12 Digital Outputs,
2 Analog Inputs
(Medium Resolution)**

HE-XE104

**24 Digital DC Inputs,
16 Digital Outputs,
2 Analog Inputs
(Medium Resolution)**



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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.

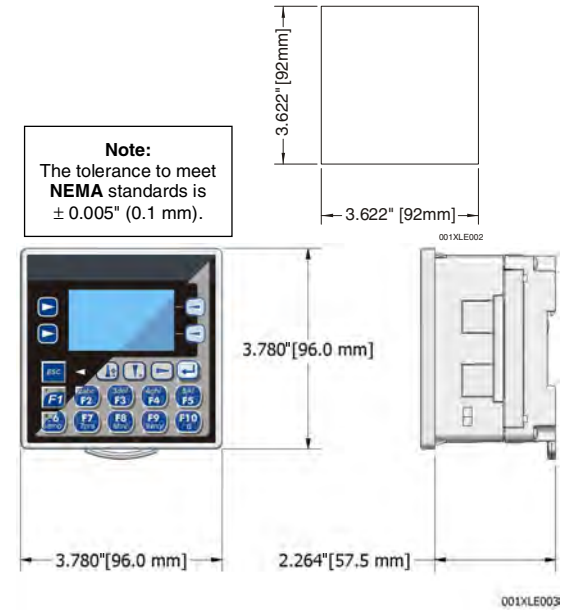
1 Specifications

Specifications									
Digital DC Inputs	XLE103		XLE104		Digital DC Outputs	XLE103		XLE104	
Inputs per Module	12 including 4 configurable HSC inputs		24 including 4 configurable HSC inputs		Outputs per Module	12 including 2 configurable PWM outputs		16 including 2 configurable PWM outputs	
Commons per Module	1				Commons per Module	1			
Input Voltage Range	12 VDC / 24 VDC				Output Type	Sourcing / 10 K Pull-Down			
Absolute Max. Voltage	35 VDC Max.				Absolute Max. Voltage	28 VDC Max.			
Input Impedance	10 kΩ				Output Protection	Short Circuit			
Input Current	Positive Logic	Negative Logic		Max. Output Current per point	0.5 A				
Upper Threshold	0.8 mA		-1.6 mA		Max. Total Current	4 A Continuous			
Lower Threshold	0.3 mA		-2.1 mA		Max. Output Supply Voltage	30 VDC			
Max Upper Threshold	8 VDC				Minimum Output Supply Voltage	10 VDC			
Min Lower Threshold	3 VDC				Max. Voltage Drop at Rated Current	0.25 VDC			
OFF to ON Response	1 ms				Max. Inrush Current	650 mA per channel			
ON to OFF Response	1 ms				Min. Load	None			
HSC Max. Switching Rate	10 kHz Totalizer/Pulse, Edges 5 kHz Frequency/Pulse, Width 2.5 kHz Quadrature				OFF to ON Response	1 ms			
ON to OFF Response	1 ms				ON to OFF Response	1 ms			
Analog Inputs, Medium Resolution	XLE103		XLE104		Output Characteristics	Current Sourcing (Pos logic)			
Number of Channels	2		2		General Specifications				
Input Ranges Safe input voltage range Input Impedance (Clamped @ -0.5 VDC to 12 VDC)	0 - 10 VDC 0 - 20 mA 4 - 20 mA -0.5 V to +12V Current Mode: 100 Ω Voltage Mode: 500 k Ω				Required Power (Steady State)	130 mA @ 24 VDC			
Nominal Resolution %AI full scale Max. Over-Current	10 Bits 32,000 counts 35 mA				Required Power (Inrush)	30 A for 1 ms @ 24 VDC			
Conversion Speed	All channels converted once per ladder scan				Primary Power Range	10 - 30 VDC			
Max. Error at 25°C (excluding zero)	4-20 mA		1.00%		Relative Humidity	5 to 95% Non-condensing			
Additional error for temperatures other than 25°C	0-20 mA		1.00%		Operating Temperature	0°C to +50°C			
	0-10 VDC		0.50%		Terminal Type	Screw Type, 5 mm Removable			
Filtering	160 Hz hash (noise) filter 1-128 scan digital running average filter				CE	If you require a Compliance Table: 1-888-556-6342			
	TBD				UL				
					Weight	12.5 oz. (354.36 g)			
					Clock Accuracy	+/- Seven Minutes/Month at 20C			

Note: Highest usable frequency for PWM output is 65 KHz

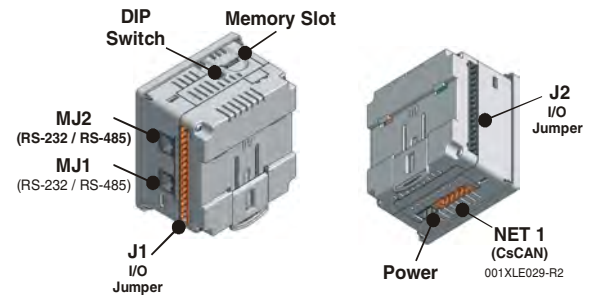
2 Panel Cut-Out and Dimensions

Note: Max. panel thickness: 5 mm.



3 Ports / Connectors / Cables

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

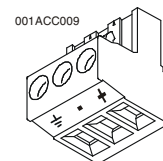


To Remove Back Cover:
Unscrew 4 screws located on the back of the unit and remove back cover.

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

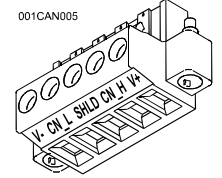
I/O Jumpers (Not Shown): I/O Jumpers (JP) are located internally. To access, remove back cover of unit.

Wiring Connectors (J1 - J4), I/O Jumpers (JP1-3), and External Jumpers (RS-485) are described in the *Wiring and Jumpers* section of this document.



Power Connector

Power Up:
Connect to Earth Ground.
Apply 10 - 30 VDC.
Screen lights up.
Torque rating 4.5 - 7 Lb-In
(0.50 - 0.78 N-m)



CAN Connector

Use the CAN Connector when using CsCAN network.
Torque rating 4.5 - 7 Lb-In
(0.50 - 0.78 N-m)

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.

MJ2: (RS-232 / RS-485) Use for Application-Defined Communications.

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

* +5Vdc 60mA Max on XLe Rev E and later

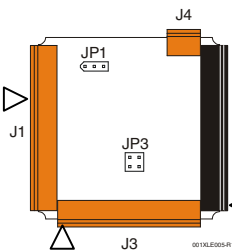
4 Wiring and Jumpers

- Wire according to the type of inputs / outputs used and select the appropriate jumper option. Use Copper Conductors in Field Wiring Only, 60/75°C

Wiring Specifications

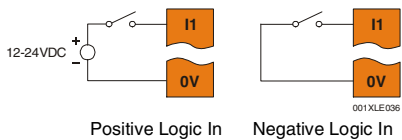
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG (0.8 mm²) or larger.
- For shielded Analog I/O wiring, use the following wire type or equivalent: Belden 8441, 18 AWG (0.8 mm²) or larger.
- For CAN wiring, use the following wire type or equivalent: Belden 3084,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

Location of I/O jumpers (JP) and wiring connectors (J1 – J4).



Positive Logic vs. Negative Logic Wiring

The XLe can be wired for Positive Logic inputs or Negative Logic inputs.



4.2 External DIP Switch Settings (or Jumpers Settings)

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

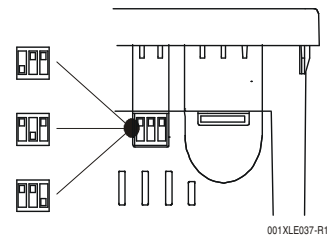
The External Jumpers or DIP Switches are used for termination of the RS-485 ports. The XLe is shipped un-terminated.

To terminate, select one of the jumpers shipped with the product and insert it based upon the option that is desired or, **select the switch** (as shown in the illustration) and configure based upon the option that is desired.

DIPSW3: FACTORY USE ONLY (tiny bootloader firmware downloading). NOT TO BE USED FOR NORMAL OCS OPERATION.

DIPSW2: MJ2 Termination (Default – none)

DIPSW1: MJ1 Termination (Default – none)



4.3 Wiring Examples

Note: The wiring examples show **Positive Logic** input wiring.

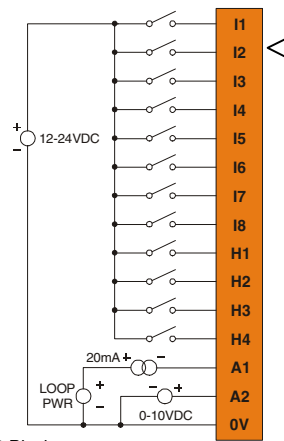
J1 Orange	XE103 / XE104 Name
I1	IN1
I2	IN2
I3	IN3
I4	IN4
I5	IN5
I6	IN6
I7	IN7
I8	IN8
H1	HSC1 / IN9
H2	HSC2 / IN10
H3	HSC3 / IN11
H4	HSC4 / IN12
A1	Analog IN1
A2	Analog IN2
0V	Ground

J2 Black	XE103	XE104
0V	Ground	
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

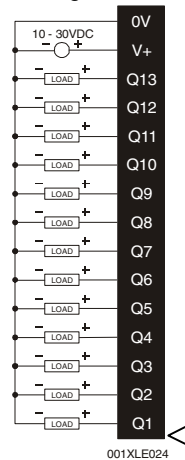
J3 Orange	XE104
I13	IN13
I14	IN14
I15	IN15
I16	IN16
I17	IN17
I18	IN18
I19	IN19
I20	IN20
I21	IN21
I22	IN22
I23	IN23
I24	IN24
0V	Ground

J1 Orange Positive Logic Digital In



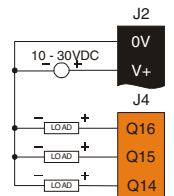
Note: Loop Power requirements are determined by the transmitter specification.

J2 Black Positive Logic Digital Out



XE104 J4 Orange Positive Logic Digital Out

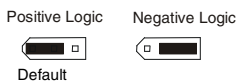
J4 Orange	XE104
Q16	OUT16
Q15	OUT15
Q14	OUT14



4.1 I/O Jumpers Settings (JP1 – JP3)

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

JP1 Digital DC Inputs



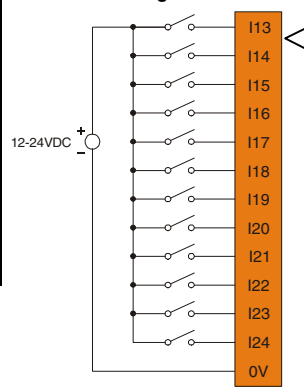
JP3 CURRENT OR VOLTAGE INPUTS



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

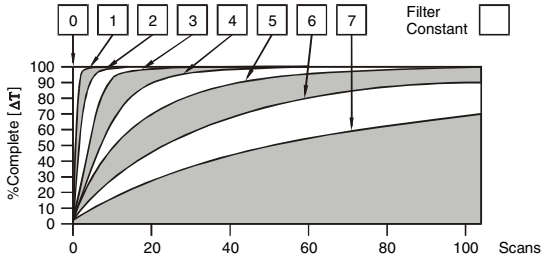
As seen when looking at the top of the XLe unit:

J3 Orange Positive Logic Digital In



5 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.

6 I/O Register Map

Registers	Description
%I1 to %I24	Digital Inputs
%I32	Output Fault
%I25 to %I31	Reserved
%Q1 to %Q16	Digital outputs
%Q17	Clear HSC1 accumulator to 0
%Q18	Totalizer: Clear HSC2 Quadrature 1-2: Accumulator 1 Reset to max - 1
%Q19	Clear HSC3 Accumulator to 0
%Q20	Totalizer: Clear HSC4 Quadrature 3-4: Accumulator 3 Reset to max - 1
%Q21 to %Q32	Reserved
%AI1 to %AI4	Analog inputs
%AI5, %AI6	HSC1 Accumulator
%AI7, %AI8	HSC2 Accumulator
%AI9, %AI10	HSC3 Accumulator
%AI11, %AI12	HSC4 Accumulator
%AQ1, %AQ2	PWM1 Duty Cycle
%AQ3, %AQ4	PWM2 Duty Cycle
%AQ5, %AQ6	PWM Prescale
%AQ7, %AQ8	PWM Period
%AQ9 to %AQ14	Analog outputs

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

Registers	PWM	HSC	Stepper
%AQ1	PWM1 Duty Cycle (32 bit)	HSC1 Preset Value	Start Frequency
%AQ2			Run Frequency
%AQ3	PWM2 Duty Cycle (32 bit)	HSC2 Preset Value	Accel Count (32 bit)
%AQ4			Run Count (32 bit)
%AQ5	PWM Prescale (32 bit)		Run Count (32 bit)
%AQ6			Decel Count (32 bit)
%AQ7	PWM Period (32 bit)		Run
%AQ8			Ready/Done
%Q1			Error
%I30			
%I31			

7 MJ2 Pinouts in Full and Half Duplex Modes

Pin	MJ2 Pins	
	Signal	Direction
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5*	+5 60mA	OUT
4	TX-	OUT
3	TX+	OUT
2	RX-	IN
1	RX+	IN

* +5 on XLe Rev E and later

Full Duplex Mode

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

* +5 on XLe Rev E and later

Half Duplex Mode

8 Safety

When found on the product, the following symbols specify:



Warning: Electrical Shock Hazard.



Warning: Consult user documentation.

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 floor 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



WARRANTY/DISCLAIMER

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.

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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
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