

# SEL SEL-2245-411 Standard Current and Low-Voltage (LEA) Monitoring Module

The SEL-2245-411 provides standard current and low-voltage (LEA) monitoring inputs for the SEL-2240 Axion®. Within an Axion node, install as many as 16 SEL-2245-411 modules per system in any combination.

## Front Panel



Figure 1 SEL-2245-411 4 CT/4 LEA Module

## Mechanical Installation

Each SEL-2242 chassis/backplane has four or ten slots, labeled A–J. Slots B–J support the SEL-2245-411 modules.

To install an SEL-2245-411 Module, tip the top of the module away from the chassis, align the notch on the bottom of the module with the slot you want on the chassis, and place the module on the bottom lip of the chassis as *Figure 2* illustrates. The module is aligned properly when it rests entirely on the lip of the chassis.



Figure 2 Proper Module Placement

Next, carefully rotate the module into the chassis, making sure that the alignment tab fits into the corresponding slot at the top of the chassis (refer to *Figure 3*). Finally, press the module firmly into the chassis and tighten the chassis retaining screw.

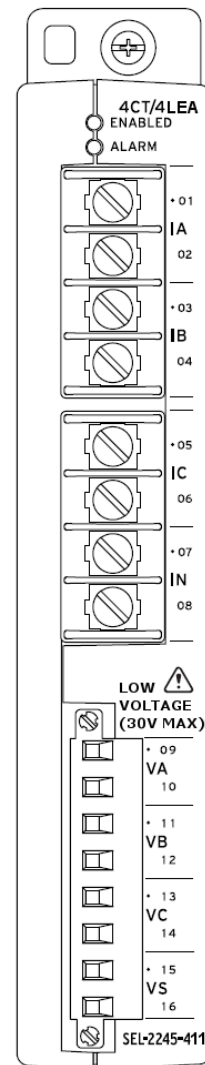


**Figure 3** Final Module Alignment

## Input Connections

The SEL-2245-411 4 CT/4 LEA analog inputs include a dot next to the terminal number to indicate the positive convention. Refer to *Specifications* on page 3 for ac analog input ratings and to *Figure 4* for terminal assignments. You can configure low-voltage or low-energy analog (LEA) inputs for 0–30 V and current transformer (CT) inputs for 0–22 A.

Configure inputs by adding a Fieldbus I/O connection for each module in ACSELERATOR RTAC® SEL-5033 Software. See the EtherCAT® portion in *Section 2: Communications* in the *SEL-5033 Software Instruction Manual* for details.



**Figure 4** 4CT/4LEA Analog Inputs

## LED Indicators

The LEDs labeled **ENABLED** and **ALARM** are related to EtherCAT network operation. The green **ENABLED** LED illuminates when the module is operating normally on the network. The **ALARM** LED illuminates during network initialization or when there is a problem with the network.

### CAUTION

Use supply wires suitable for 60°C (140°F) above ambient. See product or manual for ratings.

### ATTENTION

Utilisez des fils d'alimentation appropriés pour 60°C (140°F) au-dessus ambiante. Voir le produit ou le manuel pour les valeurs nominales.

# Specifications

## Compliance

Designed and manufactured under an ISO 9001 certified quality management system

UL Listed to U.S. and Canadian safety standards (File E220228; NRAQ, NRAQ7)

CE Mark

UKCA Mark

## Product Standards

IEC 60255-26:2013 - Relays and Protection Equipment: EMC  
 IEC 60255-27:2014 - Relays and Protection Equipment: Safety  
 IEC 60825-2:2004 +A1:2007 +A2:2010 for fiber-optic communications  
 IEC 61850-3:2013 - Comm Systems for Power Utility Automation

## General

### Operating and Storage Temperature Range

–40° to +85°C (–40° to +185°F)  
 Units should be stored and transported in their original packaging.  
**Note:** Operating temperature evaluated for UL ambient 0° to 40°C.

### Operating Environment

Pollution Degree: 2  
 Overvoltage Category: II  
 Insulation Class: 1  
 Relative Humidity: 5%–95%, noncondensing  
 Maximum Altitude: 2,000 m  
 Vibration, Earth Tremors: Class 1

## AC Metering Inputs

Frequency: 50/60 Hz  
 Range: 45–65 Hz  
 Typical Accuracy:  $\pm 0.005$  Hz above 500 mV  
 Worst-Case Accuracy:  $\pm 0.01$  Hz above 500 mV  
 Phase Rotation: ABC, ACB  
 Input Configuration: 3-Wire Delta, 4-Wire Wye  
 Update Interval  
 Fundamental Metering: 200 Hz  
 RMS Metering: 5 Hz

### Current Inputs Phase and Neutral

$I_{NOM}$ : 1 A or 5 A (no settings required)  
 Measurement Range: 0.050–22 A Continuous  
 22–100 A Symmetrical for 25 s  
 Thermal Withstand Limit: 500 A for 1 s  
 Typical Accuracy:  $\pm 0.1\%$  fundamental @  $f_{NOM}$  and  $> 0.6$  A  
 $\pm 0.1\%$  rms @  $f_{NOM}$  and  $> 0.6$  A  
 Worst-Case Accuracy:  $\pm 2\% \pm 0.005$  A fundamental  
 $\pm 1\% \pm 0.005$  A rms  
 Angle  
 Range:  $\pm 180^\circ$   
 Typical Accuracy:  $\pm 0.1^\circ$  fundamental @  $f_{NOM}$  and  $> 0.6$  A  
 Worst-Case Accuracy:  $\pm 2^\circ$  @  $f_{NOM}$   
 Burden:  $< 0.1$  VA @  $I_{NOM}$

## Voltage Inputs

$V_{NOM}$ : 1.5 V  
 Measurement Range: 30 Vac peak  
 0.05–22 Vac rms  
 Maximum: 300 VL-N for 10 s (surge)  
 Typical Accuracy:  $\pm 0.1\%$  @  $f_{NOM}$  and  $> 50$  mV rms  
 $\pm 0.1\%$  @  $f_{NOM}$  and  $> 50$  mV fundamental  
 Worst-Case Accuracy:  $\pm 3\% \pm 1$  mV @  $f_{NOM}$  fundamental/rms  
 Angle  
 Range:  $\pm 180^\circ$   
 Typical Accuracy:  $\pm 0.1^\circ$  @  $f_{NOM}$  and  $> 50$  mV  
 Worst-Case Accuracy:  $\pm 2^\circ$  @  $f_{NOM}$   
 Burden:  $< 0.1$  VA

### Power and Power Factor (Per Phase and Three-Phase)

PA, PB, PC, 3P  
 Typical Accuracy: 0.1% @ PF  $\geq 0.5$   
 Worst-Case Accuracy: 2%

QA, QB, QC, 3Q  
 Typical Accuracy: 0.1% @ PF  $\leq 0.98$   
 Worst-Case Accuracy: 2%

SA, SB, SC, 3S  
 Typical Accuracy: 0.1%  
 Worst-Case Accuracy: 2%

PFA, PFB, PFC, 3PF  
 Typical Accuracy: 0.1% @ Unity PF  
 Worst-Case Accuracy: 2%

### Synchrophasor

Conformance: IEEE C37.118.1-2011 as amended by  
 IEEE C37.118.1a-2014  
 IEEE C37.118.2-2011  
 Accuracy: Level 1 as specified by IEEE C37.118  
 Measurements: Software selectable (P or M class)  
 Voltage: VA, VB, VC, VS  
 Current: IA, IB, IC, IN  
 Positive-Sequence: V1, I1  
 Periodic: Frequency and  $df/dt$   
 Processing Rate: 120 Hz  
 Message Rates (60 Hz nominal): 1, 2, 4, 5, 10, 12, 15, 20, 30, 60, and 120\*  
 (messages/second)  
 Message Rates (50 Hz nominal): 1, 2, 5, 10, 25, 50, and 100\*  
 (messages/second)  
 \* Message rates are supported on the SEL-2241-2, SEL-3350, SEL-3555, and SEL-3560.

### Triggered Waveform Recording

Sampling Rates: 1, 2, 4, 8, 24 kHz software selectable  
 Record Duration: 0.1-second increments from 0.5 s to  
 specified maximum for each sample rate  
 Maximum Record Duration:  
 6 s at 24 kHz  
 18 s at 8 kHz  
 36 s at 4 kHz  
 72 s at 2 kHz  
 144 s at 1 kHz

Record Pretrigger:	0.05 s minimum to a maximum of (record length—0.05) s
Waveform File Format:	COMTRADE (IEEE C37.111-1999 compliant)

## Type Tests

### Environmental Tests

Enclosure Protection:	IEC 60529:2001 + CRGD:2003 IP3X excluding the terminal blocks
Vibration Resistance:	IEC 60255-21-1:1988 Vibration Endurance, Severity: Class 2 Vibration Response, Severity: Class 2
Shock Resistance:	IEC 60255-21-2:1988 Bump Withstand, Severity: Class 1 Shock Withstand, Severity: Class 1 Shock Response, Severity: Class 2
Seismic:	IEC 60255-21-3:1993 Quake Response, Severity: Class 2
Cold, Operational and Cold, Storage:	IEC 60068-2-1:2007 –40°C, 16 hours
Dry Heat, Operational and Dry Heat, Storage:	IEC 60068-2-2:2007 +85°C, 16 hours
Damp Heat, Cyclic:	IEC 60068-2-30:2005 25° to 55°C, 6 cycles, 95% relative humidity
Damp Heat, Steady State:	IEC 60068-2-78:2012 93% RH and 55°C for 10 days
Change of Temperature:	IEC 60068-2-14:2009 1 deg. per minute, –40° and +85°C, 5 cycles

### Dielectric Strength and Impulse Tests

Impulse:	IEC 60255-5:2000 IEEE C37.90-2005 Severity Level: 0.5 Joule, 5 kV CT/PT inputs
Dielectric (HiPot):	IEC 60255-5:2000 IEEE C37.90-2005 Severity Level: 2,500 Vac CT/PT inputs for 1 minute

### RFI and Interference Tests

#### EMC Immunity

Slow Damped Oscillatory Waves:	IEC 61000-4-18:2006 + A1:2010 Severity Level: 2.5 kV common mode 1 kV differential mode
Electrostatic Discharge Immunity:	IEEE C37.90.3-2001 IEC 60255-22-2:2008 IEC 61000-4-2:2008 Severity Level: 8 kV contact discharge 15 kV air discharge
Radiated RF Immunity:	IEEE C37.90.2-2004 Severity Level: 35 V/m IEC 61000-4-3:2008 IEC 60255-22-3:2007 Severity Level: 10 V/m
Digital Radio Telephone RF Immunity:	ENV 50204:1995 Severity Level: 10 V/m at 900 MHz and 1.89 GHz
Conducted RF Immunity:	IEC 60255-22-6:2001 IEC 61000-4-6:2008 Severity Level: 10 Vrms

Surge Immunity:	IEC 60255-22-5:2008 IEC 61000-4-5:2005 Severity Level: 1 kV Line to Line, 2 kV Line to Earth (202 ms filter on RMS voltages and frequencies, 33 ms filter on fundamental frequencies; cable length ≤2 m)
Fast Transient, Burst Immunity:	IEC 60255-22-4:2008 IEC 61000-4-4:2011 Severity Level: Class A: 4 kV, 5 kHz; 2 kV, 5 kHz on communications ports (cable length ≤2 m)
Magnetic Field Immunity:	IEC 61000-4-8:2009 Severity Level: 1,000 A/m for 3 seconds, 100 A/m for 1 minute IEC 61000-4-9:2001 Severity Level: 1,000 A/m IEC 61000-4-10:2001 Severity Level: 100 A/m
Surge Withstand Capability Immunity:	IEEE C37.90.1-2002 Severity Level: 2.5 kV Oscillatory 4.0 kV Fast Transient (cable length ≤2 m)
Oscillatory Waves Immunity:	IEC 61000-4-12:2006 Severity Level: Ring Wave: 2 kV common, 1.0 kV differential Oscillatory: 2.5 kV common, 1.0 kV differential (cable length ≤2 m)
Common Mode Disturbance Immunity:	IEC 61000-4-16:2002 Frequency: 0 Hz to 150 Hz Severity Level: Level 4, Segment 4: 30 Vrms open-circuit, 15 kHz–150 kHz (cable length ≤2 m)
Emissions	
Radiated and Conducted Emissions:	IEC 60255-25:2000 Severity Level: Class A Canada ICES-001 (A) / NMB-001 (A)

# Technical Support

---

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

Schweitzer Engineering Laboratories, Inc.  
2350 NE Hopkins Court  
Pullman, WA 99163-5603 U.S.A.  
Tel: +1.509.338.3838  
Fax: +1.509.332.7990  
Internet: [selinc.com/support](http://selinc.com/support)  
Email: [info@selinc.com](mailto:info@selinc.com)

# Notes

---



---

© 2021–2025 by Schweitzer Engineering Laboratories, Inc.

Content subject to change without notice.

Unless otherwise agreed in writing, all SEL product sales are subject to SEL's terms and conditions located here: <https://selinc.com/company/termsandconditions/>.

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

## SCHWEITZER ENGINEERING LABORATORIES, INC.

2350 NE Hopkins Court • Pullman, WA 99163-5603 U.S.A.

Tel: +1.509.332.1890 • Fax: +1.509.332.7990

[selinc.com](https://selinc.com) • [info@selinc.com](mailto:info@selinc.com)



\* P D S 2 2 4 5 - 0 6 \*