



SEL-2245-42 AC Protection Module

The SEL-2245-42 provides ac analog inputs for the SEL Axion[®]. Install as many as nine SEL-2245-42 modules within an Axion node and as many as sixteen SEL-2245-42 modules per system in any combination. Configurations with an SEL-2245-42 as the right-most module in a backplane should have the backplane installed in a metal enclosure to meet Radiated RF Immunity Type Test requirements.

Front Panel



Figure 1 SEL-2245-42 AC Protection Module

Mechanical Installation

Each SEL-2242 chassis/backplane has four or ten slots, labeled A-J. Slots B-J support the SEL-2245-42 modules.

To install an SEL-2245-42 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 chas-

sis, and place the module on the bottom lip of the chassis, as *Figure* 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*). Finally, press the module firmly into the chassis and tighten the chassis retaining screw.



Figure 3 Final Module Alignment

Input Connections

The SEL-2245-42 CT/PT analog inputs include a dot next to the terminal number to indicate the positive connection. Refer to *Specifications* for ac analog input ratings and to *Figure 4* for terminal assignments. You can configure potential transformer (PT) inputs for 6–300 V and current transformer (CT) inputs for 0–20 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.

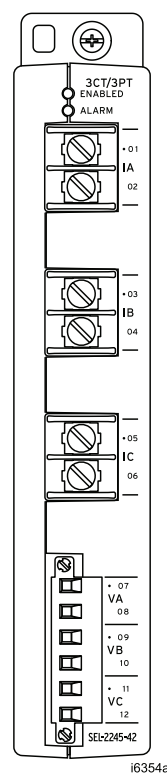


Figure 4 CT/PT Analog Inputs

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.

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: III
 Insulation Class: 1
 Relative Humidity: 5–95%, noncondensing
 Maximum Altitude: 2000 m
 Vibration, Earth Tremors: Class 1

AC Analog Input Channels

Frequency
 Rated: 50/60 Hz
 Range: 40–90 Hz
 Typical Accuracy: ±0.005 Hz above 20 V
 Worst Case Accuracy: ±0.01 Hz above 20 V (±0.1 Hz for < 2.5 cycles during transients)
 Phase Rotation: ABC, ACB
 Input Configuration: 3-Wire Delta, 4-Wire Wye

Update Intervals

Fundamental Metering:	250 Hz
RMS:	250 Hz, 1 cycle window

AC Current Channels

Nominal Current:	1 A _{RMS} or 5 A _{RMS} (no setting required)
Current Range Rating (With DC offset at X/R = 10, 1.5 cycles):	0.1–91 A
Operational Range:	0.1–300 A _{RMS}
Measurement Range:	0.1–20 A _{RMS}
Thermal Withstand Limit:	15 A _{RMS} continuous 500 A _{RMS} for one second
Fundamental Measurement Accuracy	
Magnitude:	±0.1%, typical, ±0.001 A ±2%, worst case, ±0.001 A
Phase:	±0.1°, typical at f _{NOM} and current > 0.4 A ±1°, over full rated temperature range ±2°, worst case
RMS Measurement Accuracy	
Magnitude:	±0.1%, typical, ±0.001 A ±2%, worst case, ±0.001 A
Burden:	<0.1 VA @ 67 V Impedance >500 kΩ

AC Voltage Channels

Rated Range:	67–240 V _{L-N}
Note: Rated Range refers to the IEEE C37.118 rating system.	
Operational Range:	0–300 V _{L-N}
Accuracy Range:	6.7–300 V _{L-N}
Rated Insulation Voltage:	300 V _{L-N} continuous 600 V _{L-N} for ten seconds
Galvanic Isolated Channels	
Channel-to-Ground and Channel-to-Channel:	2.5 kV _{RMS} for one minute
Fundamental Measurement Accuracy	
Magnitude:	±0.1%, typical, plus ±0.05 V ±3%, worst case, plus ±0.05 V
Phase:	±0.1° @ f _{NOM} , typical ±1° @ f _{NOM} , over full rated temperature range ±2° @ f _{NOM} , worst case
RMS Measurement Accuracy	
Magnitude:	±0.1%, typical, plus ±0.05 V ±3%, worst case, plus ±0.05 V
Burden:	<0.01 VA @ 67 V Impedance > 500 kΩ

Sequence Components

Values:	I0, I1, I2, V0, V1, V2
Note: Sequence components are of the fundamental frequency.	
Accuracy	
Magnitude:	±1%, typical
Angle:	±0.5°, typical

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

Values:	PA, PB, PC, PAB, PBC, PCA QA, QB, QC, QAB, QAC, QCA SA, SB, SC, SAB, SBC, SCA PFA, PFB, PFC, P3, Q3, S3, PF3
Accuracy:	±1%, typical

THD and Noise (Accuracy)

±5% of measurement plus ±0.25%

Synchrophasors

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
Current:	IA, IB, IC
Positive-Sequence:	V1, I1
Periodic:	Frequency and df/dt
Processing Rate:	120 Hz

Triggered Waveform Recording

Sampling Rates:	1, 2, 4, 8, 24 kHz software selectable
Transient Fault Record Length	
Individual Records as Long as:	24 seconds for 24 kHz 72 seconds for 8 kHz 144 seconds for 4 kHz 288 seconds for 2 kHz 576 seconds for 1 kHz
Prefault Time:	0.05 s to (max. event length – 0.05 s)
Data Format:	IEEE C37.111-2013 COMTRADE
File Naming:	IEEE C37.232 COMNAME

Fuse Rating

Non-Serviceable:	2.5 A, 125 V, time lag T
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Type Tests**Environmental Tests**

Enclosure Protection:	IEC 60255-27:2013 (Type 1 enclosure required for full compliance to IEC 60255-27) IEC 60529:1989 + A1:1999 + A2:2013 IP4X, 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

Power Supply Immunity

Voltage Dips and Interruptions:	IEC 60255-26:2013 IEC 61000-4-11:2004 IEC 61000-4-29:2000
Ripple:	IEC 60255-26:2013 IEC 61000-4-17:1999 + A1:2001 + A2:2008

Gradual Shutdown and Startup:	IEC 60255-26:2013
Discharge of Capacitors:	IEC 60255-27:2013
Reverse Polarity and Slow Ramp:	IEC 60255-27:2013

Emissions

Radiated and Conducted Emissions:	IEC 60255-26:2013 EN 55011:2009 for below 1 GHz EN 55022:2010 for above 1 GHz Severity Level: Class A Canada ICES-001 (A) / NMB-001 (A)
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Dielectric Strength and Impulse Tests

Impulse:	EN 60255-27:2013 Impulse Severity: 5 kV IEEE C37.90-2005 Severity Level: 0.5 J, 5 kV
Dielectric (HiPot):	IEC 60255-27:2013 IEEE C37.90-2005 Dielectric Withstand Severity: 2.5 kV _{RMS} 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:	IEC 60255-26:2013 IEC 61000-4-2:2008 Severity Level: 6 kV contact discharge 8 kV air discharge IEEE C37.90.3-2001 Severity Level: 8 kV contact discharge 15 kV air discharge
Conducted RF Immunity:	IEC 60255-26:2013 IEC 61000-4-6:2008 Severity Level: 10 Vrms
Radiated RF Immunity:	IEC 60255-26:2013 IEC 61000-4-3:2006 + A1:2007 + A2:2010 Severity Level: 10 V/m unmodulated IEEE C37.90.2-2004 Severity Level: 20 V/m unmodulated
Surge Immunity:	IEC 60255-26:2013 Severity Level: Zone A IEC 61000-4-16:1998 + A2:2009 Severity Level: Zone 4
Fast Transient, Burst Immunity:	IEC 60255-26:2013 IEC 61000-4-4:2012 Severity Level: Zone A, 4 kV
Magnetic Field Immunity:	EN 61000-4-8:2010 Severity Level 5: 1 minute, 100 A/m Axion Applications: 3 seconds, 1000 A/m ($\pm 2.7^\circ$ deg and ± 50 mA trip threshold on current channels) TiDL Applications: 3 seconds, 1000 A/m (50SQ1P = 0.07, ± 50 mA trip threshold on instantaneous current elements) Severity Level 4: 3 seconds, 300 A/m Note: Performance evaluated with 1 A nominal current for both applications. EN 61000-4-9:1994 + A1:2001 Severity Level: 1000 A/m, Level 5 EN 61000-4-10:2001 Severity Level: 100 A/m at 100 kHz and 1 MHz, Level 5
Surge Withstand Capability Immunity:	IEEE C37.90.1-2002 Severity Level: 2.5 kV oscillatory 4.0 kV fast transient

Technical Support

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

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Notes

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This product is covered by the standard SEL 10-year warranty. For warranty details, visit selinc.com or contact your customer service representative.

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