



SEL-2245-4 AC Metering Module

The SEL-2245-4 provides ac metering inputs for the SEL Axion[®]. Within an Axion node, install as many as sixteen SEL-2245-4 modules per system in any combination you want.

Front Panel



Figure 1 SEL-2245-4 AC Metering Module

Mechanical Installation

Each SEL-2242 chassis/backplane has four or ten slots, labeled A–J. Slots B–J support the SEL-2245-4 modules.

To install an SEL-2245-4 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-2245-4 CT/PT analog inputs include a dot next to the terminal number to indicate the positive convention. Refer to *Specifications* on page 2 for ac analog input ratings and to *Figure 4* for terminal assignments.

You can configure potential transformer (PT) inputs for 5–400 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.

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.

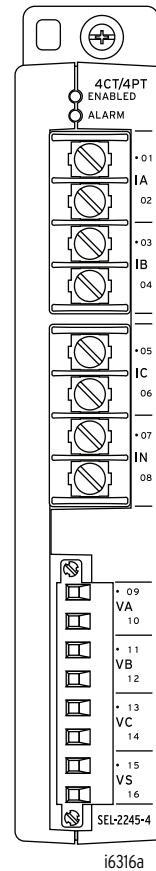


Figure 4 CT/PT Analog Inputs

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: 2000 m
- Vibration, Earth Tremors: Class 1

AC Metering Inputs (SEL-2245-4)

- Frequency: 50/60 Hz
- Range: 45–65 Hz
- Typical Accuracy: ±0.005 Hz above 20 V
- Worst-Case Accuracy: ±0.01 Hz above 20 V
- 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: ±0.1% Fundamental@ f_{NOM} and > 0.6 A
±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} :	300 V
Measurement Range:	5–400 L-N, 9–693 L-L Vac Fundamental/RMS 5–300 L-N, 9–520 L-L Vac Fundamental/RMS (UL)
Maximum:	600 L-N, 1039 L-L Vac Fundamental/RMS for 10 s
Typical Accuracy:	$\pm 0.1\%$ Fundamental @ f_{NOM} and > 20 V $\pm 0.1\%$ RMS @ f_{NOM}
Worst-Case Accuracy:	$\pm 2\%$ Fundamental @ f_{NOM} $\pm 1\%$ RMS ± 0.05 V
Angle	
Range:	$\pm 180^\circ$
Typical Accuracy:	$\pm 0.1^\circ @ f_{NOM}$ and > 20 V
Worst-Case Accuracy:	$\pm 2^\circ @ f_{NOM}$
Burden:	< 0.1 VA

Sequence Components

Values:	I0, I1, I2, V0, V1, V2
Typical Accuracy	
Magnitude:	$\pm 0.2\% @ f_{NOM}$
Angle:	$\pm 0.2^\circ @ f_{NOM}$ and $V > 6.7$ V, $I > 0.6$ A
Worst-Case Accuracy	
Magnitude:	$\pm 3\% @ f_{NOM}$ and $V > 6.7$ V, $I > 0.6$ A
Angle:	$\pm 0.2^\circ @ f_{NOM}$ and $V > 6.7$ V, $I > 0.6$ A

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

PA, PB, PC, 3P	
Typical Accuracy:	0.1% @ PF > 0.1
Worst-Case Accuracy:	2%
QA, QB, QC, 3Q	
Typical Accuracy:	0.1% @ PF < 0.9
Worst-Case Accuracy:	2%
SA, SB, SC, 3S	
Typical Accuracy:	0.1%
Worst-Case Accuracy:	2%
PFA, PFB, PFC, 3PF	
Typical Accuracy:	0.1% @ PF > 0.1
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
Frequency Resolution:	± 1.25 mHz*
Calculated Power Resolution:	$\pm 0.1\%*$
* Resolution values tested with 69 V voltage inputs, 0.6 A to 1 A current inputs, and 49.5 to 50.5 Hz frequency range.	
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-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 $+85^\circ\text{C}$, 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 $+85^\circ\text{C}$, 5 cycles

Dielectric Strength and Impulse Tests

Impulse:	IIEC 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: 2500 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)
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

Magnetic Field Immunity:	IEC 61000-4-8:2009 Severity Level: 1000 A/m for 3 seconds, 100 A/m for 1 minute IEC 61000-4-9:2001 Severity Level: 1000 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
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
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
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:

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