The SEL-2245-22 provides extended range dc analog inputs or ac voltage inputs for the SEL Axion®. Within an Axion system, install as many as sixteen SEL-2245-22 modules in any combination you want.

**Front Panel**

![Figure 1 SEL-2245-22 Analog Input Extended Range Module](Image)

**Mechanical Installation**

Each SEL-2242 chassis/backplane has four or ten slots, labeled A–J. Slots B–J support the SEL-2245-22 modules.

![Figure 2 Notch for Module Alignment](Image)

To install an SEL-2245-22 module, tip the top of the module away from the chassis, align the notch on the bottom of the module (shown in Figure 2) with the slot you want on the chassis, and place the module on the bottom lip of the chassis as Figure 3 illustrates. The module is aligned properly when it rests entirely on the lip of the chassis.
Figure 3 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 4). Finally, press the module firmly into the chassis and tighten the chassis retaining screw.

Input Connections

The SEL-2245-22 analog inputs include a plus sign to indicate the positive convention. Refer to Specifications for analog input ratings and to Figure 1 for terminal assignments. Input range is 0–300 Vdc. 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 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. Refer to Section 3: Testing and Troubleshooting in the SEL-2240 Instruction Manual for more information.
Specifications

Compliance
Designed and manufactured under an ISO 9001 certified quality management system

General
Operating Temperature Range:
–40° to +85°C (~40° to +185°F)
Note: Not applicable to UL applications.

Operating Environment
Pollution Degree: 2
Overvoltage Category: II
Insulation Class: 1
Relative Humidity: 5%–95%, noncondensing
Maximum Altitude: 2000 m

Type Test Acceptance Criteria
Level B: Allows temporary degradation or loss of performance during transient events that are self-recovering.

DC Transducer (Analog) Inputs (SEL-2245-22) (DC Mode)
Input Impedance: > 7 MΩ
Input Range (Maximum): 0–300 V
Sampling Rate: 24 kbps

Anti-Alias Filter
Corner Frequency: 5 kHz
Rolloff: 20 dB per decade

Digital Filter
Corner Frequency: Filter A: 16 Hz
Filter B: 10 Hz
Filter C: 0.2 Hz
50 Hz Rejection: Filter A: > 30 dB
Filter B: > 50 dB
Filter C: > 70 dB
60 Hz Rejection: Filter A: > 60 dB
Filter B: > 70 dB
Filter C: > 70 dB

Step Response
Group Delay (Pre-Filter): 5.3 ms
No Filter: 3 ms (10–90% response)
Filter A: 23 ms (10–90% response)
Filter B: 35 ms (10–90% response)
Filter C: 700 ms (10–90% response)

AC Voltage Inputs (SEL-2245-22) (AC Mode)

Typical Accuracy:
• ±0.1% Fundamental@ fNOM and > 20 V
• ±0.1% RMS@ fNOM

Worst Case Accuracy:
• ±2% Fundamental@ fNOM
• ±1% RMS ±0.05 V

Angle
Range: ±180°
Typical Accuracy:
• ±0.1° @ fNOM and > 20 V

Worst Case Accuracy:
• ±2° @ fNOM

Burden: < 0.1 VA

Sequence Components
Values: V0, V1, V2
Typical Accuracy:
• Magnitude: ±0.2% @ fNOM and V > 6.7 V, I > 0.6 A
• Angle: ±0.2% @ fNOM and V > 6.7 V, I > 0.6 A

Worst Case Accuracy:
• Magnitude: ±3% @ fNOM and V > 6.7 V, I > 0.6 A
• Angle: ±0.2% @ fNOM and V > 6.7 V, I > 0.6 A

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
Voltage: VA, VB, VC, VS
Positive-Sequence: V1
Periodic: Frequency and df/dt
Processing Rate: 120 Hz

AC and DC Inputs (SEL-2245-22)

Common Mode Range
±250 Vdc between inputs
±250 Vac all inputs to chassis

Isolation
2500 Vrms between separate inputs
2500 Vrms all inputs to chassis

Accuracy at 25°C
ADC: 16 bit
Inputs: 0.25% of full-scale typical
3% of full scale worst case

Accuracy Variation With Temperature
Inputs: ±0.015% per °C of full scale

Triggered Waveform Recording
Sampling Rate: 1, 2, 4, 8, 24 kHz
Record Duration: 0.1 second increments from 0.5 s to 144 s
Record Pretrigger: 0.05 s minimum to a maximum of (record length minus 0.05) s
### Type Tests

#### Environmental Tests

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Standard</th>
<th>Severity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enclosure Protection:</strong></td>
<td>IEC 60529-2001 + CRGD:2003</td>
<td>IP3X excluding the terminal blocks</td>
</tr>
<tr>
<td><strong>Vibration Resistance:</strong></td>
<td>IEC 60255-21-1:1988</td>
<td>Vibration Endurance, Severity: Class 1; Vibration Response, Severity: Class 1</td>
</tr>
<tr>
<td><strong>Shock Resistance:</strong></td>
<td>IEC 60255-21-2:1988</td>
<td>Bump Test, Severity: Class 1; Shock Withstand, Severity: Class 1; Shock Response, Severity: Class 1</td>
</tr>
<tr>
<td><strong>Seismic:</strong></td>
<td>IEC 60255-21-3:1993</td>
<td>Seismic Quake Response, Severity: Class 2</td>
</tr>
<tr>
<td><strong>Cold:</strong></td>
<td>IEC 60068-2-1:2007</td>
<td>–40°C, 16 hours</td>
</tr>
<tr>
<td><strong>Dry Heat:</strong></td>
<td>IEC 60068-2-2:2007</td>
<td>+85°C, 16 hours</td>
</tr>
<tr>
<td><strong>Damp Heat, Cyclic:</strong></td>
<td>IEC 60068-2-30:2005</td>
<td>25°C to 55°C, 6 cycles, 95% relative humidity</td>
</tr>
</tbody>
</table>

#### Dielectric Strength and Impulse Tests

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Standard</th>
<th>Severity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impulse:</strong></td>
<td>IEC 60255-5-2:2000</td>
<td>0.5 Joule, 5 kV</td>
</tr>
<tr>
<td><strong>Dielectric (HiPot):</strong></td>
<td>IEC 60255-5-2:2000</td>
<td>2500 Vac channel to chassis for 1 minute</td>
</tr>
</tbody>
</table>

#### RFI and Interference Tests

**EMC Immunity**

- **Electrostatic Discharge Immunity:** IEC 60525-2-3:2001; IEC 60525-2-2:2008; IEC 61000-4-2:2008; Severity Level: 8 kV contact discharge; 15 kV air discharge.
- **Radiated RF Immunity:** IEEE C37.90-2004; 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.

**Emissions**

- **Radiated and Conducted Emissions:** IEC 60255-25:2000; Severity Level: Class A.