



SEL-2243 Power Coupler

Every SEL Axion[®] node requires at least one SEL-2243 Power Coupler module. The SEL-2243 serves two purposes in an Axion system:

- It is the power supply for all modules installed in the node, and;
- It provides two dedicated EtherCAT[®] ports so that multiple Axion nodes can operate together.

Front Panel



Figure 1 SEL-2243 Front Panel With RJ45 Connectors

Power Supply Operation

One SEL-2243 has sufficient power capacity to accommodate an entire Axion node. The terminal strip at the bottom of the unit, as seen in *Figure 1*, is the connection point for incoming power. All Axion modules have a 55-position IEC C-style connector that provides a communications and power interface to the backplane. The SEL-2243 provides power to the node via the backplane connector.

The power coupler module uses the same power supply design that you would find in SEL protective relays. The Axion provides test-proven superior performance and availability, while also allowing for redundant power couplers in a node for applications that need these. If you install two power couplers in a node, both modules actively share load and provide the necessary power for node functions. If one SEL-2243 becomes unavailable, there is zero switching delay or power loss to the node.

EtherCAT Operation

Each SEL-2243 provides two dedicated ports for EtherCAT networks. The ports will either be standard 10/100BASE-T or optional 100BASE-FX Ethernet ports. EtherCAT is a real-time fieldbus protocol (see *Appendix E* in the *ACSELERATOR RTAC SEL-5033 Instruction Manual*) that we can use to connect an RTAC to I/O modules in an Axion system. If the installation has only one node, then the backplane transmits EtherCAT messages. Alternatively, if you use an SEL-3530 RTAC, or if you need more I/O than will fit in a node, then the ports on a power coupler module provide a mechanism for extending the EtherCAT network through the use of dedicated Ethernet wiring. Refer to *EtherCAT* in *Section 2: Communications* in the *ACSELERATOR RTAC SEL-5033 Instruction Manual* to learn more about configuring a network.

If an Axion node contains two SEL-2243 modules, then the EtherCAT ports in both power couplers will operate normally even if one power supply becomes unavailable. The remaining power supply will serve as the source for all I/O modules and communications needs.

Mechanical Installation

Each SEL-2242 chassis/backplane has ten slots, labeled A through J. Only slots A, B, and C support the SEL-2243 Power Coupler module.

To install the power coupler, tip the top of the module away from the chassis, align the notch on the bottom of the module with the slot you have selected in the chassis,

and place the module on the bottom lip of the chassis (*Figure 2*). 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 pin 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

Connections

General

Terminals are not intended for use with bare conductors. Solid or stranded wire can be used with ferrule or spade terminals. The customer is responsible for verifying that wire insulation and temperature ratings are sufficient for their application.

Power

⚠ DANGER

Contact with this circuitry may cause electrical shock that can result in injury or death.

⚠ CAUTION

Capacitors should be safely discharged during decommissioning.

The power terminals on the high-voltage power coupler (1 (+/H) and 2 (-/N)) must connect to 120/240 Vac with the proper polarity or to 125/250 Vdc. The power terminals on the low-voltage power coupler (1 (+/H) and 2 (-/N)) must connect to 24/48 Vdc. The power terminals are isolated from the chassis ground. Use 14 AWG (2.1 mm²) with an external 15 A branch circuit protection device or 12 AWG (3.3 mm²) wire with an external 20 A branch circuit protection device.

Grounding (Earthing)

Connect the ground terminal labeled **GND (3)** on the power coupler to a rack frame or switchgear ground for proper safety and performance. Use 14 AWG (2.5 mm²) wire of sufficient current capacity and insulation voltage ratings that is less than 2 m (6.6 ft) in length for the ground connection.

EtherCAT Ports

⚠ CAUTION

Always ensure that power couplers are not connected to any Ethernet switches or other Ethernet devices, including RJ45-to-fiber-optic converters. The power coupler EtherCAT ports are only for direct connections between power couplers of the same type or to an RTAC EtherCAT port. Connecting a power coupler to any other Ethernet device can cause the EtherCAT network to stop communicating completely or have unpredictable behavior.

The SEL-2243 includes two 10/100BASE-T or 100BASE-FX Ethernet ports dedicated for EtherCAT protocol. Use a standard RJ45 connector for a copper port and an LC connector for a fiber-optic port to connect **PORT 1** or **PORT 2** of the module. Make each connection by using a direct cable to the next device. Use SEL cable SEL-C627 with copper ports. Copper cables for EtherCAT connections should be less than 3 m (10 ft) in length.

Buttons and LEDs

Each power coupler includes a **LAMP TEST** button useful for system testing. When depressed, all module LEDs on the terminal side and front panel (rack mount only) will illuminate.

The green LED labeled **POWER** on the SEL-2243 will illuminate if incoming power is present and the power supply is operating normally. The LEDs labeled **ENABLED** and **ALARM** are related to EtherCAT network operation. The green **ENABLED** LED will illuminate when the module is operating normally on the network. The **ALARM** LED will illuminate 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: II
 Insulation Class: 1
 Relative Humidity: 5%–95%, noncondensing
 Maximum Altitude: 2000 m
 Vibration, Earth Tremors: Class 1

EtherCAT Ports

Ports: 2
 Data Rate: Automatic
 Connector: RJ45 Female or LC Fiber
 Protocols: Dedicated EtherCAT

RJ45 Ports

Cable Length: <3 m

Fiber-Optic Ports (Class 1 LASER/LED)

Wavelength: 1300 nm
 Optical Connector Type: LC
 Multimode Option
 Link Budget: 11 dB
 Min. TX Power: −20 dBm
 Min. RX Sensitivity: −31 dBm
 Fiber Size: 50–200 μm
 Approximate Range: 2 km
 Data Rate: 100 Mbps
 Typical Fiber Attenuation: −2 dB/km

Single-Mode Option

Link Budget: 10 dB
 Min. TX Power: −15 dBm
 Min. RX Sensitivity: −25 dBm
 Fiber Size: 9 μm
 Approximate Range: 15 km
 Data Rate: 100 Mbps
 Typical Fiber Attenuation: −0.4 dB/km

Power Supply

AC Input Voltage (High-Voltage Model)

Note: Single phase.
 Nominal Supply Voltage: 120–240 Vac, 50–60 Hz
 Operational Voltage Range: 85–264 Vac, 40–70 Hz

DC Input Voltage (High-Voltage Model)

Nominal Supply Voltage: 125–250 Vdc
 Operational Voltage Range: 85–300 Vdc

DC Input Voltage (Low-Voltage Model)

Nominal Supply Voltage: 24–48 Vdc
 Operational Voltage Range: 19.1–57.6 Vdc polarity dependent

Note: UL operational voltage range is equal to the nominal voltage range ±10 percent.

Fuse Rating

High-Voltage Model, F1: 3.15 A, high breaking capacity, time lag T, 250 V (5x20 mm, T3.15AH 250 V)
 High-Voltage Model, F2 (Non-Serviceable): 8 A, high breaking capacity, time lag T, 60 Vdc (2.7x6.1 mm, T8A 60 Vdc)
 Low-Voltage Model: 6.30 A, high breaking capacity, time lag T, 250 V (5x20 mm, T6.3AH 250 V)

Power Consumption (See SEL-2240 Instruction Manual for Power Per Module)

Maximum AC Burden: 160 VA
 Maximum DC Burden: 75 W

Interruptions

30 ms @ 24 Vdc
 130 ms @ 48 Vdc
 50 ms @ 125 Vac/Vdc
 100 ms @ 250 Vac/Vdc

The following exceptions for the IEC 61850-3 acceptance criteria for normal equipment functioning regarding ac power dips and interruptions and dc voltage dips are applicable (refer to IEC 61850-3 subclause 7.5.5, Equipment functioning, and 7.5.6, Exceptions).

Power Supply	Requirement	Exception ^a
125 Vac	5 cycles (83,33 ms @ 60 Hz, 100 ms @ 50 Hz)	50 ms
	50 cycles	Not applicable ^b

^a Voltage interruptions that are longer than the specified interruption duration result in a device restart.

^b Equipment is not intended to be connected to power supply ports that are directly connected to a public low-voltage power supply network.

Max Inrush

17 A

Isolation

3100 Vdc

Redundant Installation

Each node may have one or two SEL-2243 modules installed. When two are used, they operate in load sharing mode.

Recommended External Overcurrent Protection

Breaker Type: Standard
 Breaker Rating: 15 A or 20 A at 250 Vdc
 Current Breaking Capacity: 10 kA

Grounded Neutral System:	Device in series with the HOT or energized conductor
DC and Isolated Systems:	Device in series with both conductors

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 min, -40° and +85°C, 5 cycles

Dielectric Strength and Impulse Tests

Impulse:	IEC 60255-5:2000 Severity Level: 0.5 J, 5 kV power supply; 0.5 J, 1.5 kV EtherCAT ports IEEE C37.90-2005 Severity Level: 0.5 J, 5 kV power supply; 0.5 J, 1.5 kV EtherCAT ports
Dielectric (HiPot):	IEC 60255-5:2000 Severity Level: 3.1 kVdc on power supply for 1 min; 2 kVdc on EtherCAT ports for 1 min IEEE C37.90-2005 Severity Level: 3.1 kVdc on power supply for 1 min; 2 kVdc on EtherCAT ports for 1 min
Insulation:	IEC 60255-5:2000 Severity Level: 500 V for greater than 1 min

RFI and Interference Tests

EMC Immunity

EtherCAT Port 1 and Port 2 meet EMC standards if they are fiber optic or their copper cables are <3 meters.	
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: 4 8 kV contact discharge, 15 kV air discharge
Radiated RF Immunity:	IEEE C37.90.2-2004 Severity Level: 35 V/m IEC 61000-4-3:2010 Severity Level: 10 V/m 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 Severity Level: 10 Vrms IEC 61000-4-6:2008 Severity Level: 10 Vrms
Surge Immunity:	IEC 60255-22-5:2008 Severity Level: 1 kV Line to Line, 2 kV Line-to-Earth IEC 61000-4-5:2005 Severity Level: 1 kV Line to Line, 2 kV Line-to-Earth
Fast Transient, Burst Immunity:	IEC 60255-22-4:2008 Severity Level: Class A: 4 kV, 5 kHz; 2 kV, 5 kHz on communications ports IEC 61000-4-4:2011 Severity Level: 4 kV, 5 kHz
Power Supply Immunity:	IEC 61000-4-11:2004 IEC 61000-4-29:2000 IEC 60255-11:2008
Magnetic Field Immunity:	IEC 61000-4-8:2009 Severity Level: 1000 A/m for 3 s, 100 A/m for 1 min IEC 61000-4-10:2001 Severity Level: 100 A/m
Surge Withstand Capability Immunity:	IEEE C37.90.1-2002 2.5 kV oscillatory, 4 kV fast transient
Oscillatory Waves Immunity:	IEC 61000-4-12:2006 Ring Wave: 2 kV common, 1.0 kV differential Oscillatory: 2.5 kV common, 1.0 kV differential
Conducted Common Mode Disturbance Immunity:	IEC 61000-4-16:2016 Frequency: 0 to 150 kHz Severity: 30 Vrms for 60 seconds, 300 Vrms for 1 second

Emissions

Radiated and Conducted Emissions:	IEC 60255-25:2000 Canada ICES-001 (A) / NMB-001 (A)
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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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