Major Features and Benefits

The SEL-2730M Managed Ethernet Switch is designed for the harsh environments commonly found in the energy and utility industries. The SEL-2730M supports communications infrastructures built for engineering access, supervisory control and data acquisition (SCADA), and real-time data communication and offers the same reliability found in SEL protective relays.

➤ Reliable. Increase availability with the SEL-2730M, which is designed, built, and tested to function in harsh environments such as substations. Optional hot-swappable, dual power supplies allow connectivity to primary and backup power sources.

➤ Flexible. Maximize flexibility by using SEL-2730M ordering options to meet different network configurations. Order the SEL-2730M with Ethernet ports in combinations of copper, single-mode fiber, and multimode fiber. Add even more flexibility by using the four small form-factor pluggable (SFP) modules to change port configurations when network designs change.

➤ Ease-of-Use. Simplify configuration and maintenance with a secure web interface that allows convenient setup and management. Configure settings offline by using ACSELERATOR QuickSet® SEL-5030 Software or through an exported settings file that can be imported later on the switch.

➤ Virtual Local Area Networks (VLANs). Segregate traffic and improve network organization and performance. Take advantage of IEEE 802.1Q-2005 VLANs to separate IEC 61850 GOOSE messages from other traffic with as many as 4094 LANs.

➤ Traffic Prioritization. Support critical substation messaging by classifying and prioritizing traffic into one of four priority levels through VLAN-based 802.1Q-2005 Class of Service (CoS) and IP-based DiffServ Differentiated Services Code Points (DSCP).

➤ Rapid Spanning Tree Protocol (RSTP). Use IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP) to speed network recovery and convergence after a topology change caused by a link or device failure.

➤ Bridge Protocol Data Unit (BPDU) Guard. Improve network robustness by enabling BPDU Guard to disable a port when unexpected BPDUs are received.

➤ Port Rate Limiting. Prevent network storms from disabling your network by configuring maximum allowed rates for ingress (incoming) or egress (outgoing) traffic on each port.

➤ Multicast MAC Filtering. Filter multicast traffic to reduce network load on end devices.
➤ **Port-Based MAC Security.** Use port-based MAC security to limit network access to authorized devices.

➤ **Time Synchronization.** Synchronize time by using network time protocol (NTP). Time-align events and user activity across your system.

➤ **Syslog.** Log events for speedy alerts, consistency, compatibility, and centralized collection. Use the switch to forward Syslog system and security logs to as many as three central servers.

➤ **Dynamic Host Configuration Protocol (DHCP).** Easily connect a laptop computer during initial setup by using settings that enable the front-panel 10/100BASE-T Ethernet port to function as a DHCP server.

➤ **Security and Monitoring.** Increase security by taking advantage of SNMPv3 and HTTPS features. SNMPv3 provides secure network management and is interoperable with existing network management systems (NMS). An HTTPS web interface provides secure and intuitive switch management. Map system and security events to configurable alarm contact behavior for alarming through an external system, such as an existing SCADA network.

➤ **Port Mirroring.** Monitor ingress and egress traffic for viewing network statistics and performing troubleshooting.

➤ **User-Based Accounts.** Provide user accountability and separate authorization levels for configuration and maintenance. Use LDAP or RADIUS with two-factor authentication for centralized user authentication.

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**Functional Overview**

The base-model SEL-2730M has four Gigabit Ethernet copper ports and sixteen 10/100 Mbps copper Ethernet ports, built as 4-port modules. You can order each of the 10/100 Mbps copper port modules as single- or multimode 100 Mbps fiber-optic ports to meet the unique requirements of your network. You can also add as many as four fiber-optic Gigabit Ethernet ports via SFP transceivers, for a total of 24 ports.

➤ **Four SFP ports.** Ports 1–4 are compatible with the single- or multimode fiber SFP transceivers orderable from SEL.

➤ **Four Gigabit Ethernet ports.** Ports 5–8 support 10/100/1000 Mbps copper Gigabit Ethernet.

➤ **Sixteen Fast Ethernet ports.** Ports 9–24 can be ordered in combinations of 4-port groups of either copper or fiber.
➤ Redundant, hot-swappable power supplies. Optional redundant power supplies provide failover protection. Connect a separate power source to each power supply. If one source fails, the other continues to keep the switch operational. The power supply has an estimated MTBF of 3000 years.

➤ Reversible mounting. The SEL-2730M comes with reversible mounting ears to support both front- and rear-panel installations.

SEL manufactures the SEL-2730M with the same high standards as those for SEL protective relays and backs it with the same 10-year worldwide warranty.

The SEL-2730M meets or exceeds the IEEE 1613 Class 1, IEC 61850-3, and IEC 60255 industry standards for communications devices in electrical substations for vibration, electrical surges, fast transients, extreme temperatures, and electrostatic discharge.

Front- and Rear-Panel Diagrams

Figure 2 SEL-2730M Front-Panel Diagram

Note: For some port options, a heat sink will be present on the front panel.

Figure 3 SEL-2730M Rear-Panel Diagrams
Dimensions

RACK-MOUNT CHASSIS

Figure 4 SEL-2730M Dimensions
Specifications

Compliance
- Designed and manufactured under an ISO 9001 certified quality management system
- UL Recognized to U.S. and Canadian safety standards (File E231500; NWGQ2, NWGQ8)
- CE Mark
- RCM Mark

General
- Switching Method: Store and Forward
- Switching Latency: <7 µs
- Switch Fabric Throughput: 19.2 Gbps
- Priority Queues: 4
- Maximum VLANs: 4094
- MAC Learning Architecture: Shared VLAN Learning (SVL)
- VLAN ID Range: 1–4094
- MAC Address Table Size: 8192 addresses

Warranty
- 10 Years

Network Management
- HTTPS Web User Interface
- SNMP v1/v2c/v3
- ACSELERATOR QuickSet SEL-5030 Software
- Settings Import/Export
- Third-Party Network Management Systems (NMS)

User-Based Accounts
- Maximum Local Accounts: 256
- Password Length: 8–72 characters
- Password Set: All printable ASCII characters
- User Roles: Administrator, Engineer, User Manager, Monitor

Syslog
- Storage for 60,000 local Syslog messages.
- Support for three remote Syslog destinations.

Processing and Memory
- Processor Speed: 313 MHz
- Memory: 512 MB
- Storage: 512 MB

Communications Ports
- Ethernet Ports
  - Ports: 24 rear, 1 front
  - Data Rate: 10, 100, or 1000 Mbps
  - Front Connector: RJ45 Female
- Rear Connectors: RJ45 female or LC fiber (single-mode or multimode)
- Standard: IEEE 802.3
- IEEE 802.3X

Fiber-Optic Ports
- Multimode Option (to 2 km)
  - Maximum TX Power: –14 dBm
  - Minimum TX Power: –19 dBm
  - RX Sensitivity: –30 dBm
  - System Gain: 11 dB
  - Source: LED
  - Wavelength: 1300 nm
  - Connector Type: LC (IEC 61754-20)
- Single-Mode Option (to 15 km)
  - Maximum TX Power: –8 dBm
  - Minimum TX Power: –15 dBm
  - RX Sensitivity: –25 dBm
  - System Gain: 10 dB
  - Source: Laser
  - Wavelength: 1310 nm
  - Connector Type: LC (IEC 61754-20)
- Supported Simple Form-Factor Pluggable (SFP) Fiber-Optic Ports
  - 1000BASE-SX (300 m)
  - 1000BASE-LX (10 km)
  - 1000BASE-LX (20 km)
  - 1000BASE-LX (30 km)
  - 1000BASE-LX (40 km)
  - 1000BASE-XD (50 km)
  - 1000BASE-ZX (80 km)
- For the most up-to-date list of qualified SFPs, please contact the SEL application engineer in your region. Other SEL qualified SFPs not listed will operate in the SEL-2730M but may have a reduced temperature range.

Digital Output
- Rated Operational Voltage: 24–250 Vdc
- Continuous Carry: 2 A

Power Supply
- 125/250 Volt Power Supply
  - Rated Supply Voltage: 125/250 Vdc; 120/220/240 Vac, 50/60 Hz
  - Input Voltage Range: 88–300 Vdc or 85–264 Vac
  - Maximum Burden: AC: <60 VA
  - DC: <45 W
  - DC Ripple: <15% rated voltage
  - Peak Inrush: 8 A
  - Insulation: 3100 Vdc
  - Power Factor: >75%
  - Isolated from Chassis Ground: Yes
  - Input Voltage Interruptions: 50 ms @ 125 Vac/Vdc
  - 100 ms @ 250 Vac/Vdc
24/48 Volt Power Supply
Rated Supply Voltage: 24/48 Vdc (polarized)
Input Voltage Range: 19.2–60.0 Vdc
Maximum Burden: <42 W
DC Ripple: <15% rated voltage
Peak Inrush: 18 A
Insulation: 3100 Vdc
Isolated from Chassis
Ground: Yes
Input Voltage Interruptions:
50 ms @ 48 Vdc
10 ms @ 24 Vdc

Recommended External Overcurrent Protection
Breaker Type: Standard
Breaker Rating: 15 A at 250 Vdc
Current Breaking Capacity: 10 kA
Grounded Neutral Systems:
Device in series with the HOT or energized conductor
DC and Isolated Systems:
Device in series with both conductors

Fuse Ratings
Power Supply Fuse
SEL-9330-A: 2.5 A, 250 Vdc/300 Vac Time-lag T, 250 Vac/1500 A break rating
SEL-9330-C: 4.0 A, 150 Vdc Time-lag T, 250 Vac/1500 A break rating

Note: Fuses are not user-serviceable.

Alarm Contact Output
Per IEC 255-0-20:1974, Using Simplified Method of Assessment:
Output Type: Relay, Form C, break-before-make
Power Supply Burden: <1 W maximum
Mechanical Life: 2000000 operations
Operational Voltage: 250 Vac/Vdc
Make: 30 A at 250 Vdc
Carry: 6 A continuous at 70°C
1 s Rating: 50 A
MOV Protection: 270 Vac, 23 J
Insulation Voltage: 300 Vdc
Pickup Time: <8 ms
Dropout Time: <8 ms
Breaking Capacity (10,000 Operations):
24 V 0.75 A L/R = 40 ms
48 V 0.50 A L/R = 40 ms
125 V 0.30 A L/R = 40 ms
250 V 0.20 A L/R = 40 ms
Cyclic Capacity (2.5 Cycles/Second):
24 V 0.75 A L/R = 40 ms
48 V 0.50 A L/R = 40 ms
125 V 0.30 A L/R = 40 ms
250 V 0.20 A L/R = 40 ms

Terminal Connections
Compression Screw Terminals
Power Wiring
Insulation: 300 V minimum
Size: 12–18 AWG

Environmental
Operating Temperature
–40° to +85°C (–40° to +185°F)
Relative Humidity
0% to 95% non-condensing
Altitude
2000 m
Atmospheric Pressure
80–110 kPa
Operating Environment
Pollution Degree: 2
Overvoltage Category: II
Insulation Class: I

Green Product
Compliant with the European Union’s RoHS directive
Type Tests

Communication Product Testing

IEEE 1613-2009, Class 1*
IEC 61850-3-2013
IEC 61850-90-4

* With SEL-C627-R or equivalent cables.

Electromagnetic Compatibility Emissions

Generic Emissions:
- EN 60255-26:2013
- EN 61850-3:2014
- 47 CFR Part 15
- ICES-003, Issue 6
- CISPR 11:2009 + A1:2010
- CISPR 22:2008
- EN 55022:2010 + AC:2011
- EN 55023:2012 + AC:2013

Severity Level: Class A

Electromagnetic Compatibility Immunity

Conducted RF Immunity:
- IEC 60255-26:2013
- IEC 61000-4-6:2008

Severity Level: 10 Vrms

Electrostatic Discharge Immunity:
- IEC 60255-26:2013
- IEC 61000-4-2:2008
- IEEE C37.90.3-2001

Severity Level: 2, 4, 8 kV contact; 4, 8, 15 kV air

Fast Transient/Burst Immunity:
- IEC 60255-26:2013
- IEC 61000-4-4:2011

Severity Level: Zone A

Magnetic Field Immunity:
- IEC 60255-26:2013
- IEC 61000-4-8:2009

Severity Level: 1000 A/m for 3 seconds, 100 A/m for 1 minute
- IEC 61000-4-9:2001
- IEC 61000-4-10:2001

Severity Level: 100 A/m

Power Supply Ripple:
- IEC 60255-26:2013
- IEC 61000-4-17:2008

Power Supply Dips and Interruptions:
- IEC 60255-26:2013
- IEC 61000-4-11:2004
- IEC 61000-4-29:2000

Power Supply Gradual Shutdown and Startup:
- IEC 60255-26:2013

Power Supply Discharge Capacitors:
- IEC 60255-27:2013

Power Supply Reverse Polarity and Slow Ramp:
- IEC 60255-27:2013

Radiated RF Immunity:
- IEC 60255-26:2013

Severity Level: 10 V/m unmodulated
80 MHz–1 GHz, 1.4 GHz–2.7 GHz
IEEE C37.90.2-2004

Severity Level: 20 V/m 80% AM, 0.5 s keyed, 80 MHz–1 GHz

Surge Immunity:
- IEC 60255-26:2013
- IEC 61000-4-5:2005

Severity Level: Zone A

Surge Withstand Capability:
- IEC 60255-26:2013

Severity Level: 2.5 kV peak common mode, 1.0 kV peak differential mode
IEEE C37.90.1-2002

Severity Level: 2.5 kV oscillatory, 4 kV fast transient waveform

Environmental

Cold:
- IEC 60255-27:2013
- IEC 60068-2-1:2007

Severity Level: 16 hours at –40°C

Dry Heat:
- IEC 60255-27:2013
- IEC 60068-2-2:2007

Severity Level: 16 hours at +85°C

Damp Heat, Cyclic:
- IEC 60255-27:2013
- IEC 60068-2-30:2005

Severity Level: 25°C to 55°C
Relative Humidity: 93% to 95%
Duration: 6 cycles, 1 cycle/day

Damp Heat, Steady State:
- IEC 60255-27:2013
- IEC 60068-2-78:2002

Severity Level: 40°C
Relative Humidity: 93%
Duration: 4 days

Vibration (Front-Panel Mount Only):
- IEC 60255-27:2013
- IEC 60255-21-1:1988

Severity Level: Class 1 endurance, Class 2 response
- IEC 60255-21-2:1988

Severity Level: Class 1 - shock withstand, bump, and Class 2 - shock response
- IEC 60255-21-3:1993

Severity Level: Class 2 (quake response)

Safety

Dielectric Strength:
- IEC 60255-27:2013
- IEEE C37.90-2005

3600 Vdc on power supply and alarm contact; 2250 Vdc on Ethernet ports
Type tested for 1 minute

IEEE 802.3-2012
2250 Vdc on electrical Ethernet ports
Type tested for 1 minute

Ports 5–8 comply with Environment A requirements between ports
Ports 9–24 comply with Environment B requirements between ports

Impulse:
- IEC 60255-27:2013
- IEEE C37.90-2005

Severity Level:
Common Mode
5 kV power supply, alarm contact
2.4 kV Ethernet ports
Common Mode, Port to Port
5 kV power supply, alarm contact
Zero-Rated, Ethernet ports

Protective Bonding Resistance:
- IEC 60255-27:2013
- IEEE C37.90-2005