SEL

2022 Product and Solution Guide

2022 HIGHLIGHTS

CONTENTS

Trending Topics in Electric Power Systems

CYBERSECURITY

Security has been a top priority at SEL for nearly 40 years. From products to services, we are ready to be a partner in securing your critical infrastructure.

Regulatory and Framework Compliance

SEL Engineering Services experts have extensive experience securing industrial control system (ICS) and operational technology (OT) environments while leveraging industry best practices and regulatory standards, such as those outlined in NERC CIP, the NIST Cybersecurity Framework, and IEC 62443. Visit selinc.com/products/security/regulatory-compliance to learn more about related products.

Cyber Services

From system assessment and baselining to cyber-defense solution development and ongoing system management, our full suite of security services from SEL Engineering Services helps strengthen your defenses and streamline the demands of maintenance and compliance. Learn more at selinc.com/engineering-services/cybersecurity.

Supply Chain Risk Management

SEL prioritizes supply chain security to ensure the quality and trustworthiness of our products and solutions. We employ a five-part approach to evaluating the supply chain risk—we build trusted supply networks, ensure component integrity and availability, verify security of software and firmware, protect operations and control access, and monitor for quality and security vulnerabilities. Listen to the Schweitzer Drive podcast "Supply Chain Management: Getting Parts to Make Parts" at selinc.com/company/podcast/supply-chain to learn more.

WILDFIRE MITIGATION

SEL offers solutions to support your wildfire mitigation efforts and to ensure the availability and reliability of electric power. Visit the Transmission Protection and Distribution Protection and Control sections of this guide to learn more about related products.

MICROGRID CONTROL SYSTEMS

With SEL's POWERMAX® family of microgrid control systems, you can operate an independent power system with a wide variety of conventional and renewable energy sources to provide uninterrupted power, optimize operational costs, and protect people and equipment during short-circuit events. SEL ranked as the top vendor of microgrid control systems in the Guidehouse Insights 2021 leaderboard report. Learn more at selinc.com/solutions/microgrid-control.

RETROFIT SOLUTIONS

From individual device upgrades to system-wide modernization projects, SEL is here to help simplify your retrofit programs and integrate advanced protection, control, automation, and communications technologies into your existing infrastructure. We offer mounting adapters and direct-replacement assemblies for a variety of existing equipment, as well as comprehensive services to support you throughout the entire retrofit process. Visit the Engineering Services and Configure-to-Order Panels and Retrofit Plates sections of this guide to learn more.

Our Mission: Making Electric Power Safer, More Reliable, and More Economical

SEL invents, designs, manufactures, and supports a complete line of products and services for the protection, monitoring, control, automation, and metering of electric power systems.

Our solutions range from comprehensive generator and transmission protection to distribution automation and control systems.

Our Engineering Services division partners with customers globally to create turnkey solutions and services that help protect and control critical electrical infrastructure worldwide. We also offer education and full product support.

SEL products are in 167 countries and support industries from petrochemical to transportation to electric utilities.

VERDELER SPS

Dr. Edmund O. Schweitzer, III
Inventor of the world's-first digital
protective relay—the SEL-21.

Industries We Serve

- Electric power generation
- Power transmission and distribution
- Oil, gas, and petrochemical
- Renewable energy
- Metals and mining
- Water and wastewater
- Pulp and paper
- Mission-critical power systems
- Government
- Education and healthcare
- Consumer product manufacturing
- Transportation

Looking Back, Moving Forward

SEL Founder, President, and Chief Technology Officer Dr. Edmund O. Schweitzer, III, invented the first microprocessor-based digital protective relay, the SEL-21, in 1982. The SEL-21 revolutionized the electric power industry by providing reliable transmission line protection with fault locating at a much lower cost than traditional electromechanical relays.

In the decades since, SEL has launched power industry innovations including the load-encroachment element in a transmission relay, synchrophasors as a standard feature in protective relays, and MIRRORED BITS® relay-to-relay communications.

In 2020, we added the SEL-T401L Ultra-High-Speed Line Relay to our family of protective relays, automation controllers, digital secondary system solutions, recloser controls, and more. The SEL-T401L is the first relay in the world to combine traveling-wave and incremental-quantity elements with phasor-based protection.

In 2021, we released our newest overcurrent protection relay, the SEL-851 Feeder Protection Relay, as well as our operational technology (OT) application platform, Blueframe, and its first application suite, SEL Data Management and Automation (DMA).

We're excited to make even more introductions in the future, including the SEL-2240 Axion® bay controller, for comprehensive monitoring and reliable control of substation bays, and SEL Fault Location, Isolation, and Service Restoration (FLISR), a wide-area control application that operates on our Blueframe application platform to locate and isolate faults and automatically restore power to healthy portions of affected lines or feeders.

Quality in Manufacturing

We design and manufacture all our electronic devices in the U.S.A. This allows for direct collaboration and short feedback loops between our research and development and manufacturing divisions as well as world-class supply chain security. We manufacture our own critical components, like metal cabinets and magnetic devices, in our secure, SEL-owned and -operated facilities in Washington, Idaho, Illinois, and Indiana.

SEL exceeds industry quality standards, requirements, and customer expectations. We test our products thoroughly and verify that they will perform under demanding and harsh conditions.

Our quality practices include:

- Monitoring and controlling processes to exceed the ISO 9001:2015 Quality Management Systems Standard.
- Developing robust, repeatable, and scalable manufacturing processes to address process errors.
- Ensuring that our test and calibration laboratories use the latest equipment and follow National Institute of Standards and Technology (NIST) traceable standards for accuracy and maintenance.
- Partnering with our suppliers for the highest possible quality and value.

"As an engineering company, we work every day to invent, design, and support products that monitor, control, and protect power systems installed all over the world. Serving our industry is a tremendous privilege and responsibility that we take very seriously. Listening to our customers' requirements and needs, we strive to make our solutions innovative, reliable, easy to use, and secure. We invest in our people, tools, and facilities in order to produce designs that exceed our customers' requirements. Engineering is our middle name, and it's what we love to do."

Dave Whitehead
Chief Executive Officer

Warranty, Service, and Support

We back our products with a ten-year warranty, no-charge diagnostic and repair services, local support, and a variety of test procedures and certifications.

Our dedicated support teams are stationed in regional offices around the globe and staffed with SEL application engineers who are experts in our products and in power system applications. We offer free, 24/7 emergency technical support for the life of your SEL products.

Many support questions may also be answered by visiting our video portal at video.selinc.com, where you'll find how-to and support videos ranging from product set up and configuration to report retrieval and resource management.

Learn More

Read more about our history, products, and practices in our Corporate Overview Brochure, found at selinc.com/quality.

SEL Power System Solutions

SEL creates digital products and systems that protect, control, automate, and secure power systems. Our devices help keep power flowing, prevent widespread blackouts, reduce outage durations, improve reliability and safety, and secure equipment, substations, and critical infrastructure.

Generation Systems

Our generation solutions provide primary and backup protection from stator and rotor faults in salient pole and round rotor generators. These devices help prevent equipment damage and failures while maintaining system performance and increasing availability.

Transmission Systems

SEL transmission solutions protect high-voltage power lines, transformers, busbars, switchgear, and more. Our devices help reduce outages, speed up restoration times, and pinpoint a fault's location.

Distribution Systems

Our distribution solutions combine protective relays, recloser controls, communications, automation, and power quality devices. They protect equipment, integrate distributed energy resources, improve reliability metrics, reduce outages, and more.

Industrial and Commercial Systems

For petrochemical, metals and mining, and water and wastewater facilities as well as data centers, hospitals, and universities, SEL offers a wide range of solutions for low- and medium-voltage systems. Our devices protect infrastructure, keep processes online, increase efficiency, and keep workers safe.

Transmission
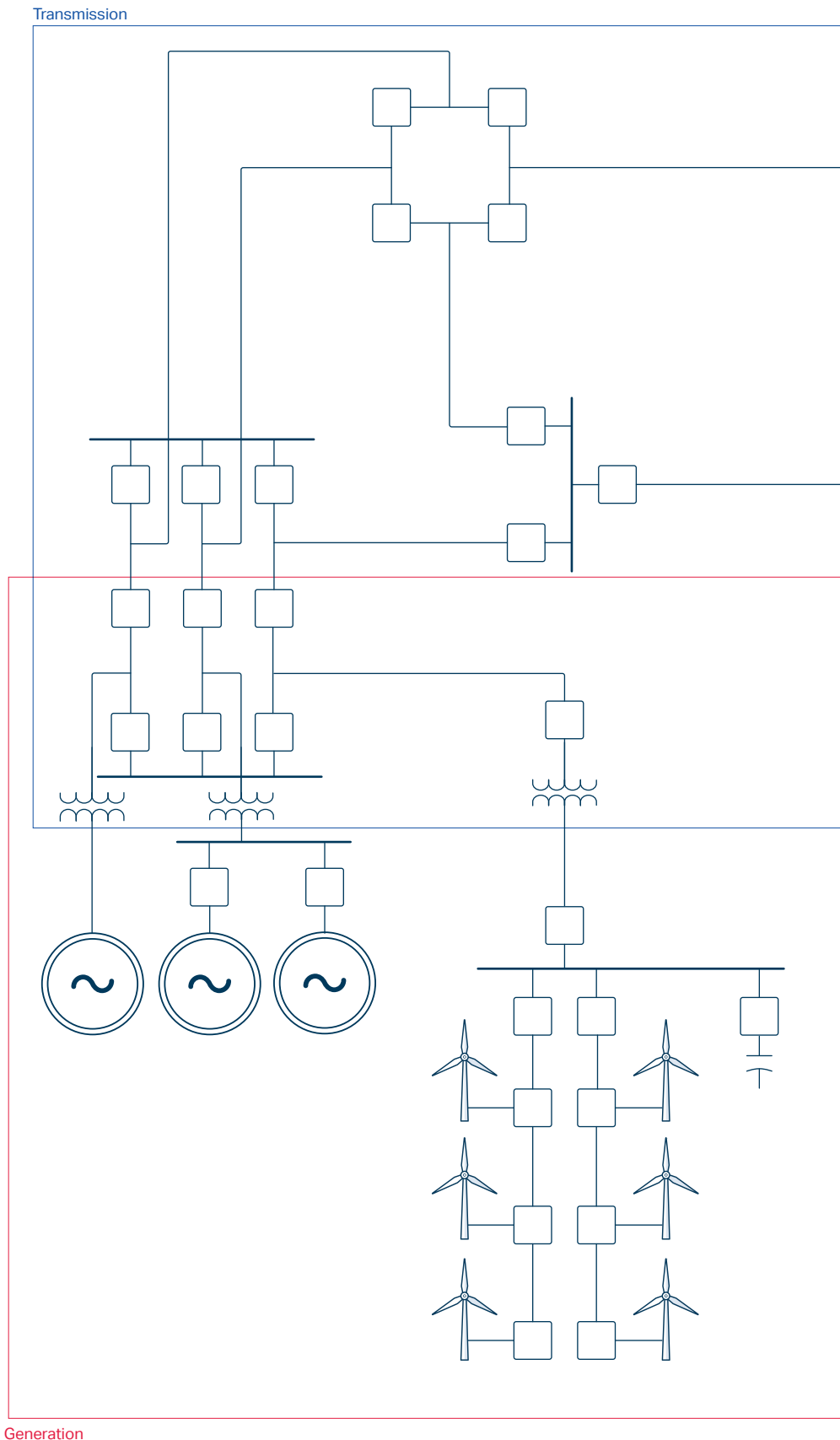
Generation
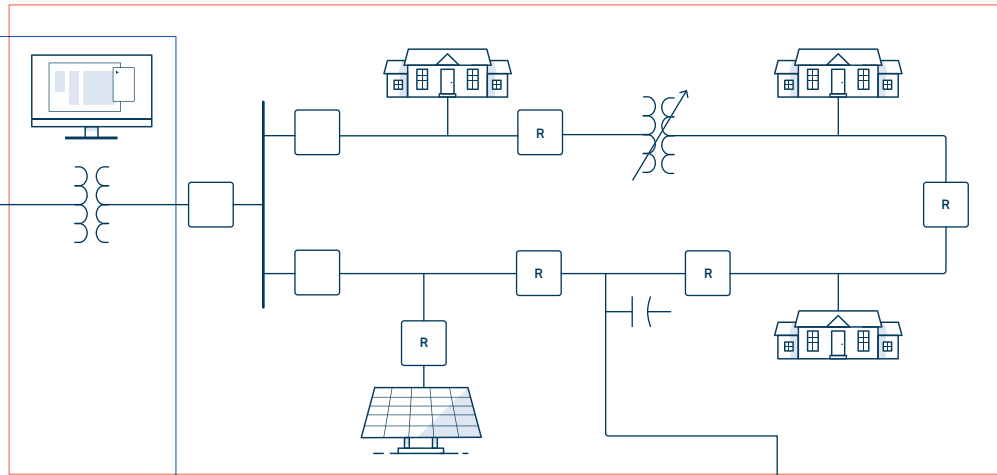
Learn More

Visit selinc.com/company/
our-part/electric-journey
to read more about the
journey of electric power.
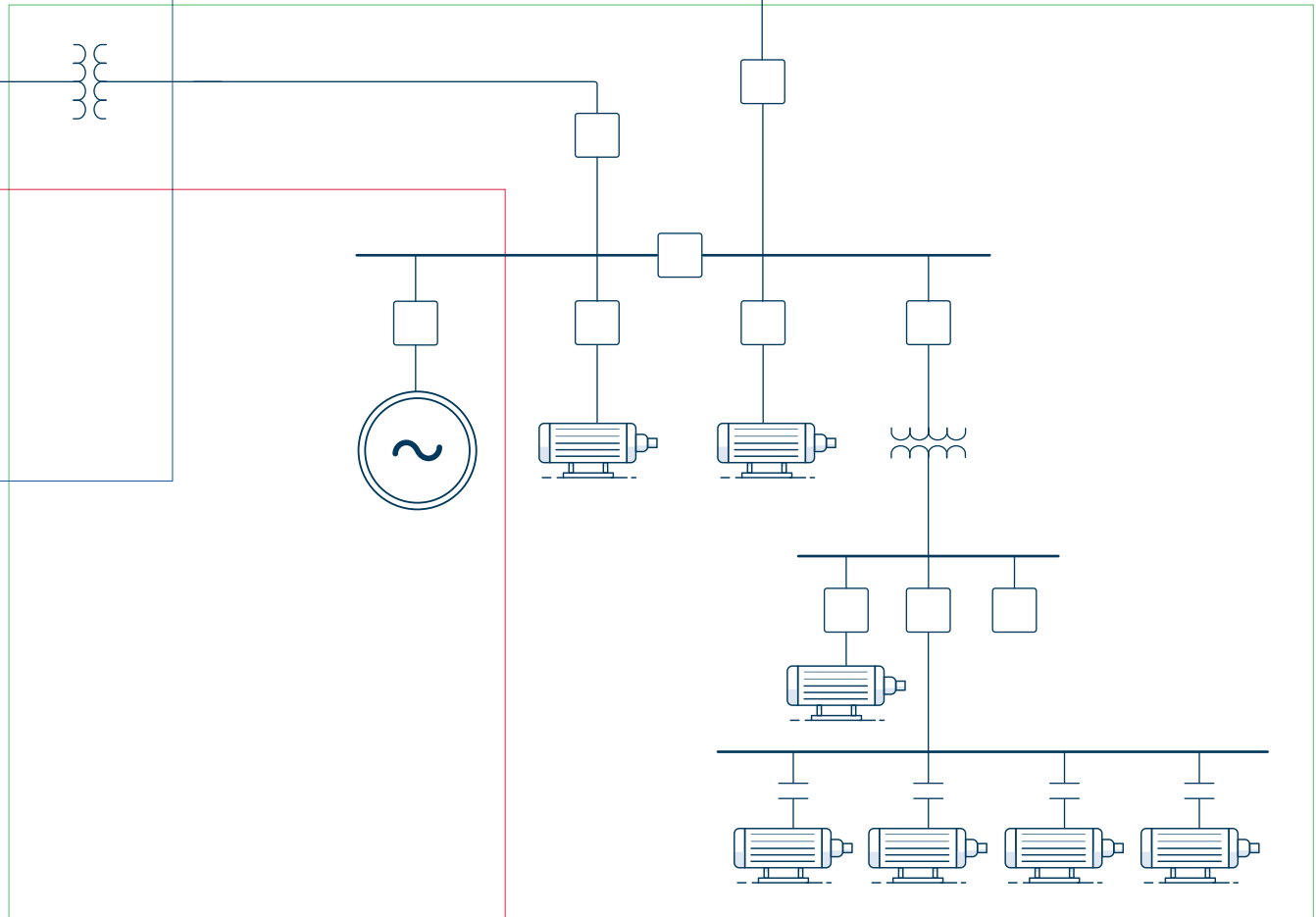
SEL Network Communications

SEL offers a simple, reliable communications architecture to tie together the protection, automation, control, and monitoring devices in a power system network.

Remote Substation

SEL-411L

IEEE C37.94

TDM

SEL ICON

SEL ICON

SEL ICON

Remote Engineering Access and Monitoring

SCADA and Operations

SEL-3620

Ethernet Security Gateway

SEL-3355

Automation Controller as Blueframe™ Platform

SEL-3355

Remote Dial-Up Engineering Access

SEL-3025

Serial Shield®

SEL-9192

USB Modem

SEL-651R

Recloser Control

SEL-3061

Cellular Router

Antenna

Substation

SEL-9192

SEL-3025

SEL ICON

SEL-3061

IEEE C37.94

SEL-411L

Satellite-Synchronized Clock

SEL-2488

Process Bus

SEL-3620

Local Engineering Access and Monitoring

Switches

SDN and Traditional Ethernet Switches

Switches

Ethernet

Port Server

SEL-3610

Station Bus

Serial

SEL Relays

SEL-3555 ⊹**RTAC**

SEL Relays/ Merging Units

Parallel Redundancy Protocol (supported but not shown)

Real-Time Automation Controller

⊹**RTAC**

SEL-3530

SEL-2240 Axion

EtherCAT®

SEL-2240 Axion

Recloser Control

SEL-651R

Security Gateway
SEL-3622

GPS Clock
SEL-2401

Cellular Router
SEL-3061

Distributed Control System
SEL-2814

Serial Communications

SEL-3061

Ethernet
Security Gateway
SEL-3620

✦ RTAC
SEL-3350

SEL-2814

SEL-2812

Annunciator
SEL-2533

SEL-3025

Satellite-
Synchronized Clock
SEL-2407

SEL-387

SEL-2411

SEL-2812

SEL-2800

SEL-700G

SEL-710-5

SEL-2824

SEL-587Z

SEL-2440 DPAC

SEL-2600

SEL-2664

SEL-2600

RTD Module

IRIG-B
Distribution Module
SEL-3400

Field Ground
Module

SEL-2440 DPAC

Transformer
Monitor
SEL-2414

Automation
Controller
SEL-2411

EIA-485 to Fiber-
Optic Transceiver
SEL-2824

Multidrop Network

SEL-500
Series Relays
SEL Relays

SEL-300
Series Relays
SEL Relays

SEL-700
Series Relays

System Configuration
and Device Management

SEL-3025

Serial Shield

Generator Protection

selinc.com/solutions/generation

Advanced measurement, security, and control features are built into every SEL product to ensure that generators are protected, properly metered, and connected to the grid without interruption. SEL generator protection relays are applied in various industrial and commercial settings, such as for standby, emergency, or co-generation.

Applications

- Hydropower
- Steam and thermal generation
- Combustion and combined-cycle generation
- Wind power generation
- Solar power generation
- Electrical balance-of-plant
- Power management (microgrids)
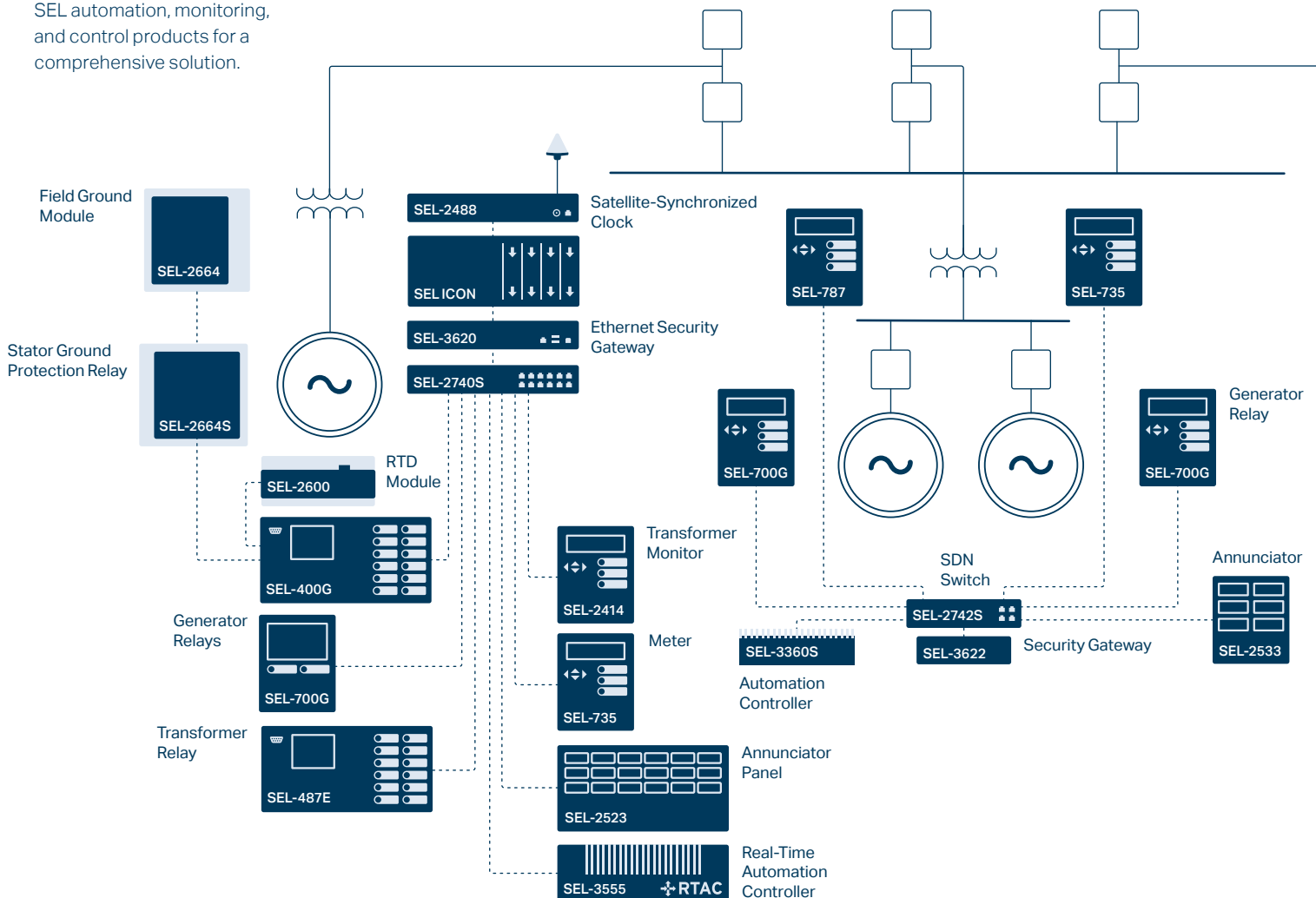- Remedial action schemes (POWERMAX®)
- Load shedding

Customer Story

Belgium Integrates Offshore Wind Power Into European Grid

selinc.com/featured-stories/elia

Example System Diagram

Combine SEL generator protection relays with other SEL automation, monitoring, and control products for a comprehensive solution.

Field Ground Module — SEL-2664

Stator Ground Protection Relay — SEL-2664S

SEL-2600 — RTD Module

SEL-400G

Generator Relays — SEL-700G

Transformer Relay — SEL-487E

SEL-2488 — Satellite-Synchronized Clock

SEL ICON

SEL-3620 — Ethernet Security Gateway

SEL-2740S

SEL-2414 — Transformer Monitor

SEL-735 — Meter

SEL-2523 — Annunciator Panel

SEL-3555 — RTAC — Real-Time Automation Controller

SEL-787

SEL-735

SEL-700G

SEL-700G — Generator Relay

SEL-3360S — Automation Controller

SEL-2742S — SDN Switch

SEL-3622 — Security Gateway

SEL-2533 — Annunciator

Webinar

Protection Advancements to Benefit
Generators of All Sizes and Types

selinc.com/events/on-demand-
webinar/130607

Related Material

POWERMAX Solutions

selinc.com/api/download/106293

Technical Papers

Wind Farm Volt/VAR Control Using
a Real-Time Automation Controller

selinc.com/api/download/99167

Leveraging Digital Relays for Protection
of Pumped Storage Hydro

selinc.com/api/download/121666

Capability Curve-Based Generator
Protection Minimizes Generator
Stress and Maintains Power
System Stability

selinc.com/api/download/124333

Stator Ground Protection for
Multiple High-Impedance Grounded
Generators Sharing a Common Bus

selinc.com/api/download/124321

Understanding Generator Stator
Ground Faults and Their Protection
Schemes

selinc.com/api/download/111667
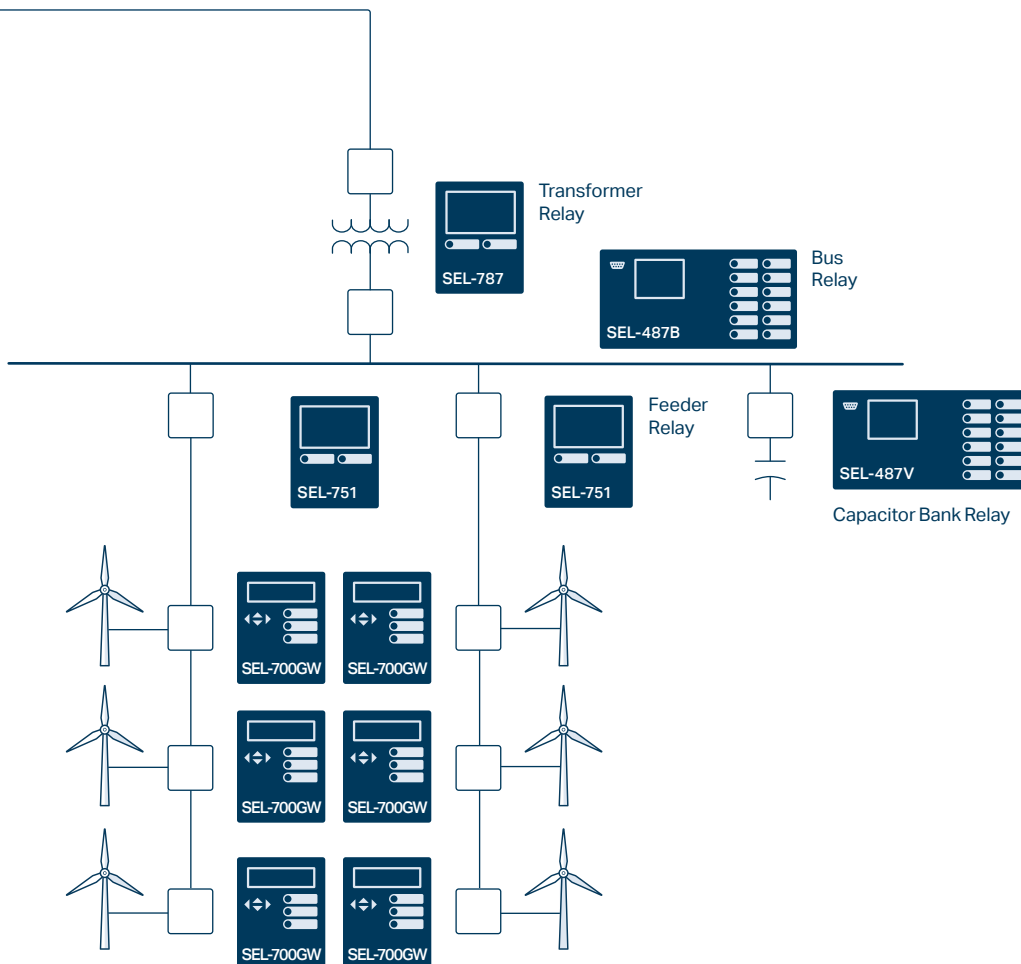
SEL-400G Advanced Generator Protection System

Starting at $12,540 USD

Combine generator, bus, and step-up transformer protection in one package, and achieve complete protection for generators of all sizes and types.

SEL-700G Generator Protection Relay

Starting at $2,710 USD

Provide utility and industrial generator protection with an autosynchronizer, flexible I/O, and advanced communications.

SEL-300G Generator Relay

Starting at $3,360 USD

Implement primary and backup protection for utility and industrial generators to IEEE turbine protection standards.

SEL-2664S Stator Ground Protection Relay

Starting at $9,740 USD

Protect high-impedance grounded generators from ground faults at standstill, during startup, and while running.

SEL-2664 Field Ground Module

Starting at $1,640 USD

Combine the SEL-2664 with other SEL generator protection devices to continuously monitor field-to-ground resistance and protect critical components, including rotor and stator windings.

SEL-2600 RTD Module

Starting at $857 USD

Measure and transmit data from up to 12 resistance temperature detector (RTD) inputs and one contact input over a single fiber-optic link.

Applications

	SEL-400G	SEL-300G	SEL-700G	SEL-700GT	SEL-700GW
Generator Protection	■	■	■	+	■[1]
Unit/Overall (Generator + Generator Step-Up [GSU]) Differential Protection	■	+	■		
Independent GSU Transformer Protection	■				
Pumped-Storage Hydro Protection	■				
Integrated Synchronizer	+		+	+	
Breaker Failure Protection	■	ƒ	■	■	■
Equipment Thermal Monitoring	■	+	+	+	+
Generator Intertie Protection					■

Instrumentation and Control

	SEL-400G	SEL-300G	SEL-700G	SEL-700GT	SEL-700GW
SELogic® Control Equations/Remote Control Switches	■	■	■	■	■
Nonvolatile Latch Control Switches	■	■	■	■	■
Multiple Settings Groups	■	■	■	■	■
Station Battery Monitor	■	■			
Breaker Wear Monitor	■	■	■	■	■
Event Report (Multicycle Data)/Sequential Events Recorder	■	■	■	■	■
Disturbance Recording up to 300 seconds	■				
Demand Meter	■	■	■	■	■
Load Profile Report	■		■	■	■
RTD (Resistance Temperature Detector) Inputs	+	+	+	+	+
Ethernet	+		+	+	+
Built-In Web Server	+		+	+	+
EtherNet/IP			+	+	+
IEEE 1588 Precision Time Protocol (PTP)	+		+	+	+
IEC 61850 Edition 2	+		+	+	+
IEC 60870-5-103			+	+	+
Parallel Redundancy Protocol (PRP)	+		+	+	+
DNP3 Serial	■		+	+	+
DNP3 LAN/WAN	+		+	+	+
Simple Network Time Protocol (SNTP)	+		+	+	+
Modbus TCP	+		+	+	+
Modbus RTU Outstation		■	■	■	■
IEEE C37.118 Synchrophasors (With Protocol Edition)	■ 2011		■ 2005	■ 2005	■ 2005
Mirrored Bits® Communications	■		■	■	■

Miscellaneous

	SEL-400G	SEL-300G	SEL-700G	SEL-700GT	SEL-700GW
Dual Frequency Zones (Generator and System)	■				
Frequency Tracking Range	5–120 Hz	20–70 Hz	15–70 Hz	15–70 Hz	15–70 Hz
Accepts Wye or Open-Delta Voltage Transformers	■	■	■	■	■
Connectorized® (Quick Disconnect) Available	+	+			

Protection

	SEL-400G	SEL-300G	SEL-700G	SEL-700GT	SEL-700GW
21C Compensator Distance		■	+		
21P Phase Mho Distance	■	■			
24 Overexcitation (Volts/Hertz)	■	■	■	+	
25 Synchronism Check	■	+	+	■	
27/59 Under-/Overvoltage	■	■	■	■	
27I/59I Inverse-Time Undervoltage/Overvoltage	■		■	■	
32 Directional Power	■	■	■	■	
40 Impedance-Based Loss of Field	■	■	■	+	
40 Capability-Based Loss of Field	■				
46 Current Unbalance	■	■	■	+	
46 Harmonic Current Unbalance	■				
49 Thermal Model	■		■	+	
49R Thermal Overload (RTD)	■	■	■	■	■
50 (P,N,G) Overcurrent (Phase, Neutral, Ground)	■	■	■	■	■
50Q Negative-Sequence Overcurrent	■	+	■	■	■
51 (N,G) Time Overcurrent (Neutral, Ground)	■	■	■	■	■
51 (P,Q) Time Overcurrent (Phase, Neg. Seq.)	■	■		■	■
60 Loss of Potential	■	■	■	■	
60 Voltage Balance Loss of Potential	■				
60 (P,N) Independent Split-Phase (Phase, Neutral)	■				
64G 100 Percent Stator Ground	■	■	+		
64G Intermittent Ground Fault Detection	■				
64F Field Ground	■	■	■	+	■
67 (N,G) Directional Overcurrent (Neutral, Ground)	■		■	+	
67Q Negative-Sequence Directional Overcurrent	■			■	
78 Out of Step	■	■	+		
78 Dual Zone (Generator and System) Out of Step With Pole Slip Counters	■				
78VS Vector Shift			■	■	
81 Over-/Underfrequency	■	■	■	■	
81R Rate-of-Change of Frequency	■		■	■	
87 Stator Differential	■	+	+		
Transformer Differential	■				
REF Restricted Earth Fault	■		■	+	
Inadvertent Energization	■	■	■	+	
Flashover Protection	■	ƒ	ƒ		

■ Standard feature   + Model option   ƒ May be created using settings

[1] For wind power generation

Industrial and Commercial Protection

selinc.com/solutions/industrial

SEL power management, protection, automation, and control solutions are hard at work in heavy industries and commercial-scale facilities around the world. These solutions protect low- and medium-voltage equipment and help improve system performance, availability, and process efficiency.

Applications

- Asynchronous (induction) and synchronous motor protection
- Variable-frequency drive protection
- Motor bus transfer systems
- Motor control centers
- Arc-flash mitigation
- Power quality and revenue metering
- Power management and control systems (POWERMAX®)
- Centralized motor management systems (MOTORMAX®)
- Microgrid control systems
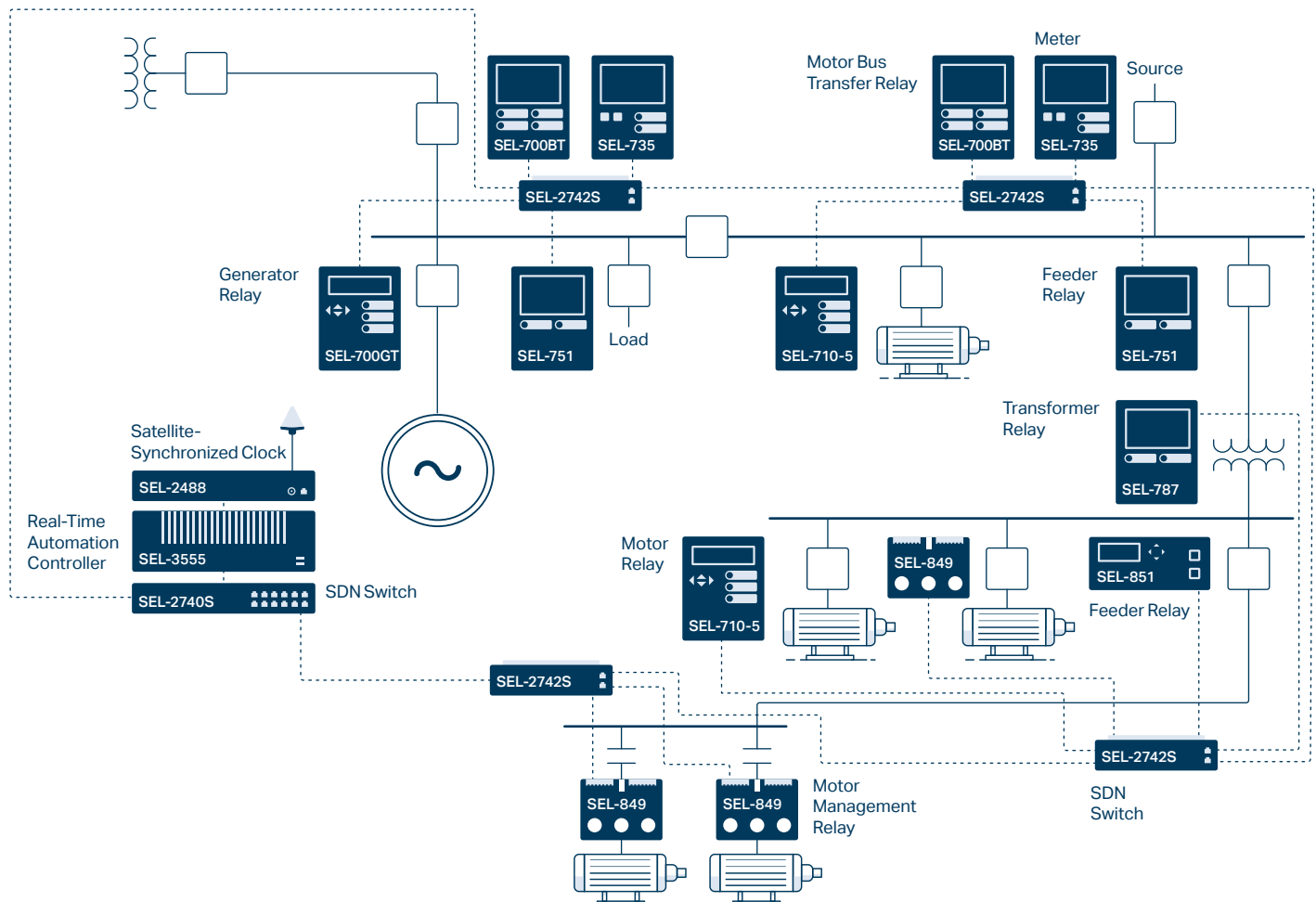- Wide-area protection and remedial action schemes

Customer Story

Microgrid Solution Plays Big on Campus

selinc.com/featured-stories/msu

Example System Diagram

Combine SEL's low- and medium-voltage protective relays with other SEL automation, monitoring, and control products for a comprehensive solution.

Webinars

Improving Process Reliability With Motor Bus Transfer

selinc.com/events/webinar/131910

SEL POWERMAX Commercial Microgrids—Sustainable, Economic, and Resilient

selinc.com/events/on-demand-webinar/133374

SEL POWERMAX Power Management and Control System for Industrial Applications (Part 1)

selinc.com/events/on-demand-webinar/132490

Technical Papers

Best Practices for Motor Control Center Protection and Control

selinc.com/api/download/102532

Case Study: Turbine Load-Sharing and Load-Shedding System for an Australian LNG Facility

selinc.com/api/download/128554

Making My Paper Mill Safer: An Arc-Flash Energy Reduction Story

selinc.com/api/download/126387

Case Study: Adaptive Load Shedding in Critical Industrial Facilities

selinc.com/api/download/130119

White Paper

Purpose-Engineered, Active-Defense Cybersecurity for Industrial Control Systems

selinc.com/api/download/121044

Videos

How a Data Center Achieves Utility-Grade Metering

video.selinc.com/detail/videos/case-studies/video/5747812817001

Engineer a Better Network—It Starts With SDN

video.selinc.com/detail/videos/software-defined-networking

SEL-751 Feeder Protection Relay

Starting at $1,040 USD

The SEL-751 offers feeder protection, an intuitive color touchscreen, fast and secure arc-flash detection, flexible I/O, and advanced communications.

SEL-851 Feeder Protection Relay NEW

Starting at $910 USD

The SEL-851 is a compact relay that provides overcurrent, voltage, and arc-flash protection as well as versatile communications.

SEL-700BT Motor Bus Transfer Relay

Starting at $6,480 USD

Ensure motor bus system process continuity by allowing the quick transfer of load to an auxiliary feeder during primary feeder line faults.

SEL-710-5 Motor Protection Relay

Starting at $3,250 USD

Provide protection, including optional arc-flash detection, for a full range of medium-voltage, three-phase induction, and synchronous motors.

SEL-849 Motor Management Relay

Starting at $763 USD

Provide current-, voltage-, and thermal-based protection; arc-flash detection; and power metering in low-voltage to medium-voltage motor protection applications.

SEL-700G Generator Protection Relay

Starting at $2,710 USD

Provide standby, emergency, and co-generator protection with an autosynchronizer, flexible I/O, and advanced communications.

SEL-787-2/-3/-4 Transformer Protection Relay

Starting at $3,200 USD

Apply advanced protection and monitoring with flexible communications to two-, three-, and four-terminal transformers.

SEL-587Z High-Impedance Differential Relay

Starting at $4,270 USD

Use the economical SEL-587Z to combine high-impedance analog technology with the advantages of microprocessor technology.

SEL-735 Power Quality and Revenue Meter

Starting at $1,640 USD

SEL meters offer bidirectional, full four-quadrant, and high-accuracy energy metering as well as precise and reliable power quality measurements.

SEL-2411TM Temperature Monitor Digital Data Logger   NEW

Starting at $1,570 USD

The SEL-2411TM works in tandem with any commercial refrigerator, freezer, or ultra-cold freezer as a primary or secondary system to monitor and record cold chain storage temperatures and alert of excursions.

SEL-2600 RTD Module

Starting at $857 USD

Measure and transmit data from up to 12 resistance temperature detector (RTD) inputs and one contact input over a single fiber-optic link.

SEL-GFD Underground Ground Fault Detector

Starting at $230 USD

Apply the SEL-GFD over a three-phase cable bundle at ground potential in switchgear to identify faults on circuits feeding medical facilities, mining equipment, and other industrial equipment.
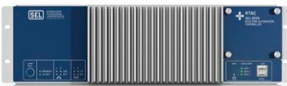
SEL-3555 Real-Time Automation Controller (RTAC)

Starting at $7,910 USD

The SEL-3555 provides powerful processing for large-scale automation projects.

SEL-3350 Automation Controller

Starting at $2,620 USD

The SEL-3350 is ideal for limited-space, dedicated embedded applications that require midlevel I/O and computation. It can be configured as an a Real-Time Automation Controller (RTAC), as a computer, or with the SEL Blueframe™ application platform.

SEL-2742S Software-Defined Network Switch

Starting at $2,300 USD

The SEL-2742S is a 12-port, DIN-rail mount software-defined networking (SDN) switch. It combines with SEL-5056 Flow Controller software to simplify network engineering and improve LAN security.

POWERMAX Power Management and Control Systems

For industrial facilities, an SEL POWERMAX system increases process uptime by protecting against blackouts with advanced high-speed protection and control technology. A commercial-scale POWERMAX microgrid control system helps keep the lights on, seamlessly islanding and reconnecting with the bulk electric system.

MOTORMAX Low-Voltage Motor Management and Protection System

MOTORMAX provides comprehensive control, protection, analysis, and monitoring for original equipment manufacturer motor control centers.

Applications	SEL-751	SEL-851	SEL-700BT	SEL-710-5	SEL-849	SEL-700G	SEL-787-2/-3/-4	SEL-587Z
Generator Protection	+					■		
Motor Protection				■	■			
Motor Bus Transfer Protection			■					
Feeder Protection	■	■	■		■	+		
Transformer Protection							■	
Bus Differential Protection							■	■

Protection

	SEL-751	SEL-851	SEL-700BT	SEL-710-5	SEL-849	SEL-700G	SEL-787-2/-3/-4	SEL-587Z
24 Overexcitation (Volts/Hertz)						■	+	
27/59 Under-/Overvoltage	+	+	■	■	+	■	+	
32 Directional Power	+	+			+	■	+	
37 Underpower				■	+			
46 Current Unbalance			■	■	■	■		
47 Phase Reversal				■	■			
49 Thermal	■			■	■	■	■	
49R Thermal Overload (Resistance Temperature Detector [RTD])	+		■	+		■		
50 Overcurrent	■	■	■	■	■	■	+	■
51 Time Overcurrent	■	■	■	■	■	■	+	■
55 Power Factor	+	+		■	+	ƒ		
60 Loss of Potential	+	+	■	■	+	■		
64F Field Ground						■		
67 (N,G) Directional Overcurrent (Neutral, Ground)	+		■			■		

Protection, Continued	SEL-751	SEL-851	SEL-700BT	SEL-710-5	SEL-849	SEL-700G	SEL-787-2/-3/-4	SEL-587Z
81 Over-/Underfrequency	+	+	■	■	+	■	+	
87 Current Differential			+		+		■	
87Z High-Impedance Differential								■
REF Restricted Earth Fault							■	+
Arc-Flash Detection	+	+		+	■			
Separate Neutral Overcurrent	■	■	■	■	■	■	+	
Broken Rotor Bar Detection				■				

Instrumentation and Control

	SEL-751	SEL-851	SEL-700BT	SEL-710-5	SEL-849	SEL-700G	SEL-787-2/-3/-4	SEL-587Z
Breaker Wear Monitoring	■		■	■		■	■	
RTD Inputs	+		+	+		+	+	
IEC 61850 Edition 2	+	+	+	+		+	+	
Parallel Redundancy Protocol (PRP)	+		+	+	■	+	+	
DNP3 Serial	+	+	+	+	+	+	+	
DNP3 LAN/WAN	+	+	+	+	+	+	+	
Simple Network Time Protocol (SNTP)	+	■	+	+	■	+	+	
Built-In Web Server	■	■	■	+	■	+	■	
IEEE 1588 Precision Time Protocol (PTP)	+		+	+		+	+	
EtherNet/IP	+		+	+	+	+	+	
Modbus TCP	+	■	+	+	+	+	+	
Modbus RTU Outstation	■	■	■	■	■	■	■	■

■ Standard feature   + Model option   ƒ May be created using settings

Transmission Protection

SEL transmission line protection relays provide reliable subcycle line current differential and multizone distance protection. Their fault-locating capabilities allow you to efficiently dispatch line crews to quickly isolate line problems and restore service faster.

Applications

- Directional and/or distance pilot protection
- Differential protection
- Time-domain line protection
- Step distance protection
- Single-pole tripping
- Series-compensated lines
- Dual-breaker terminals
- Bay control and substation integration

Customer Stories

Lighting Up the Desert Nation
selinc.com/featured-stories/toua

Spain Achieves Superior Transmission Protection and Monitoring
selinc.com/Solutions/Success-Stories/Superior-Transmission-Protection

Example System Diagram
Combine SEL transmission protection relays with other SEL automation, monitoring, and control products for a comprehensive solution.

SEL-2488

SEL ICON

SEL-3620

SEL-2740S

SEL-3555 RTAC
Real-Time
Automation
Controller

SEL-487B

SEL-411L

SEL-T401L

SEL-2240 Axion
Bay Controller

SEL-411L

SEL-311L

SEL-2240 Axion

Line Relays

SEL-421

SEL-411L

SEL-2240 Axion
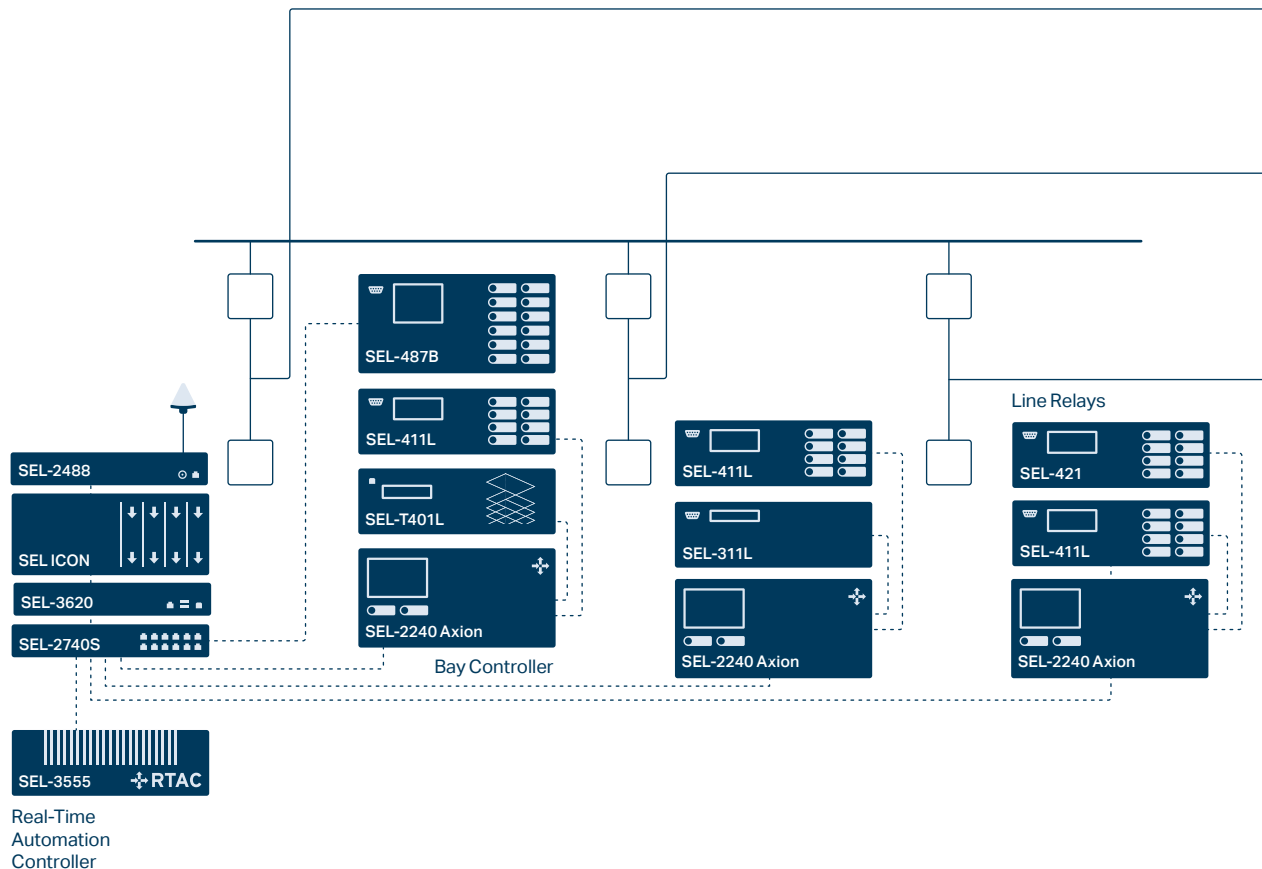
Webinars

Time-Domain Relay Functions—Looking Beyond Protection

selinc.com/events/on-demand-webinar/132232

No Test Set? No Problem—Event Playback Simplifies Testing of Ultra-High-Speed Relays

selinc.com/events/on-demand-webinar/133622

Technical Papers

Locating Faults by the Traveling Waves They Launch

selinc.com/api/download/102562

Line Protection: Redundancy, Reliability, and Affordability

selinc.com/api/download/8483

Experience With Subcycle Operating Time Distance Elements in Transmission Line Digital Relays

selinc.com/api/download/8507

Locating Faults Before the Breaker Opens—Adaptive Autoreclosing Based on the Location of the Fault

selinc.com/api/download/121662

Real-World Event Reports

Field Experiences With Traveling-Wave Protection and Fault Locating

selinc.com/mktg/122973

SEL-411L

SEL-T401L

SEL-411L

SEL-311L

Meter

SEL-735

SEL-3555 ✧ RTAC

SEL-411L

SEL-311C

Security Gateway

SEL-2742S

SEL-487B

SEL-411L

Time-Domain Link (TiDL®) Technology Relays

SEL-421

SEL-TMU

SEL-487E

SEL-451

SEL-411L

SEL-TMU

SEL-TMU

SEL-TMU

TiDL Merging Unit

SEL-TMU

SEL-TMU
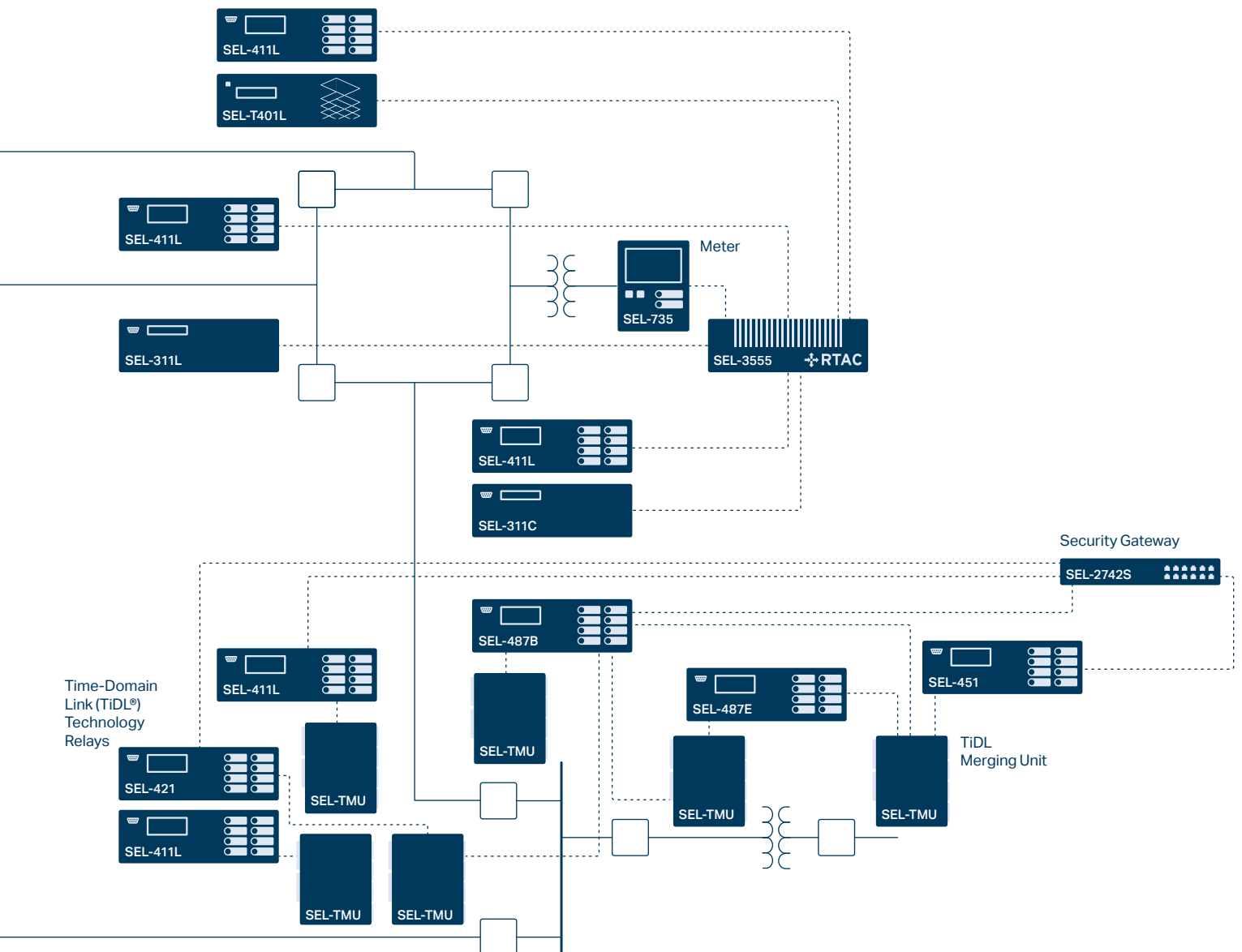
SEL-T401L Ultra-High-Speed Line Relay

Starting at $15,680 USD

Apply the SEL-T401L, which was built on the field experience of the SEL-T400L, for its unprecedented operating speed and complete suite of primary and backup line protection functions. Use the SEL-T401L as a redundant protection system with other SEL relays without concerns for common-mode failures.

SEL-T400L Time-Domain Line Protection

Starting at $12,540 USD

Apply the SEL-T400L for ultra-high-speed protection of transmission lines. With breakthrough traveling-wave and incremental-quantity technologies, the SEL-T400L trips in as fast as 1 ms, records events with a 1 MHz sampling rate, and locates faults to the nearest tower.

SEL-411L Advanced Line Differential Protection, Automation, and Control System

Starting at $9,225 USD

Apply the SEL-411L for subcycle single- or three-pole line current differential, distance, and directional overcurrent protection. Optional traveling-wave fault locating pinpoints faults to the nearest tower span.

SEL-421 Protection, Automation, and Control System

Starting at $7,510 USD

Employ the SEL-421 for distance and directional protection and control of a two-breaker bay.

SEL-311L Line Current Differential Protection and Automation System

Starting at $5,420 USD

Use the SEL-311L for comprehensive, easy-to-apply line differential and four-zone distance protection.

SEL-311C Transmission Protection System

Starting at $4,890 USD

Apply the SEL-311C-1 for three-pole distance protection, reclosing, monitoring, and control of breakers on transmission lines. Apply the SEL-311C-2/-3 for single-pole tripping.

SEL-387L Line Current Differential Relay

Starting at $3,190 USD

Use the SEL-387L for easy-to-apply line differential protection with zero settings.

SEL-T4287 Traveling-Wave Test System

Starting at $4,480 USD

Test traveling-wave fault locators and line protective relays (e.g., the SEL-T400L, SEL-T401L, and SEL-411L) using the SEL-T4287, a simple and compact secondary pulse injection test set.

Applications	SEL-T401L	SEL-411L	SEL-421	SEL-311C	SEL-311L	SEL-387L	SEL-T400L
Distance Protection	■	■	■	■	■		■
Line Current Differential		■			■	■	
Breaker Failure Protection	f	■	■	■	f		
Undervoltage Load Shedding	f	f	f	f	f		
Series-Compensated Lines	■	+	+				■

Protection	SEL-T401L	SEL-411L	SEL-421	SEL-311C	SEL-311L	SEL-387L	SEL-T400L
Subcycle Distance Elements	■	+	+	+			■
21G Mho Ground Distance	■	■	■	■	■		
21G Quad Ground Distance	■	■	■	■	■		
21P Mho Phase Distance	■	■	■	■	■		
21P Quad Phase Distance	■	■	■				
TD21 Incremental-Quantity Distance (Phase and Ground)	■						■
TD32 Incremental-Quantity Directional	■						■
TW32 Traveling-Wave Directional	■						■
TW87 Traveling-Wave Differential	■						■
87L Line Current Differential		■			■	■	
25 Synchronism Check		■	■	■	■		
27/59 Under-/Overvoltage	■	■	■	■	■		
49 Thermal		■	■				
50 (N,G) Overcurrent (Neutral, Ground)	■	■	■	■	■		
50P Phase Overcurrent	■	■	■	■	■		
50Q Negative-Sequence Overcurrent	■	■	■	■	■		
51 (N,G) Time Overcurrent (Neutral, Ground)	■	■	■	■	■		
51P Phase Time Overcurrent	■	■	■	■	■		
51Q Negative-Sequence Time Overcurrent	■	■	■	■	■		
67 (N,G) Directional Overcurrent (Neutral, Ground)	■	■	■	■	■		
67P Phase Directional Overcurrent	■	■	■	■	■		
67Q Negative-Sequence Directional Overcurrent	■	■	■	■	■		
81 Under-/Overfrequency		■	■	■	■		
Programmable Analog Math		■	■				
Out-of-Step Block and Trip	■	■	■	■	■		
Load-Encroachment Supervision	■	■	■	■	■		
Switch-Onto-Fault	■	■	■	■	■		
Single-Pole Trip	■	■	■	+	+		■
Zone/Level Timers	■	■	■	■	■		
Pilot Protection Logic	■	■	■	■	■		■

Instrumentation and Control	SEL-T401L	SEL-411L	SEL-421	SEL-311C	SEL-311L	SEL-387L	SEL-T400L
79 Automatic Reclosing		■	■	■	■		
Number of Controlled Breakers	2	2	2	1	1	1	2
Fault Locating	■	■	■	■	■		■
Single-Ended Traveling-Wave Fault Locating	■						■
Double-Ended Traveling-Wave Fault Locating	■	+					■
Adaptive Autoreclose Cancel Logic for Hybrid Lines	■						■
Line Monitor	■						■
SELOGIC® Control Equations	■	■	■	■	■		
Nonvolatile Latch Control Switches	■	■	■	■	■		
SELOGIC Remote Control Switches	■	■	■	■	■		
SELOGIC Local Control Switches	■	■	■	■	■		
Display Points		■	■	■	■		
MIRRORED BITS® Communications	■	■	■	■	■		■
Substation Battery Monitor		■	■	■		■	
Breaker Wear Monitor		■	■	■	■		
Trip Coil Monitor	f	f	f	f	f		
Event Records (Multicycle Data)	■	■	■	■	■	■	■
1 MHz Sampling Event Records	■						■
Sequential Events Recorder	■	■	■	■	■	■	■
Instantaneous Metering	■	■	■	■	■	■	■
DNP3 Level 2 Outstation	■	■	■	■	+	+	■
Parallel Redundancy Protocol (PRP)		■	■	+			
IEEE 1588 Precision Time Protocol Version 2 (PTPv2)		+	+				
IEC 61850-9-2 Sampled Values Technology		+	+				
Time-Domain Link (TiDL®) Technology		+	+				
IEC 61850 Communications		+	+	+	+		
Synchrophasors		■	■	■	■		
Built-In Event Playback Testing	■						■
SEL Fast Time-Domain Values	■						■

Miscellaneous	SEL-T401L	SEL-411L	SEL-421	SEL-311C	SEL-311L	SEL-387L	SEL-T400L
Accepts Delta Voltage Transformers			+	■			
Connectorized® (Quick Disconnect) Available		+	+	+		+	
Configurable Labels		■	+	+			
Custom Labels	■						■

■ Standard feature   + Model option   f May be created using settings

Substation Protection

selinc.com/products/transmission/protection | selinc.com/products/distribution/protection

SEL devices protect, monitor, and control critical assets located in all types of generation, transmission, and distribution substations.

Applications

- Transformer protection and monitoring
- Bus protection
- Breaker failure protection
- Capacitor bank protection
- Digital secondary systems that use Time-Domain Link (TiDL®) or IEC 61850 technologies

Webinars

From Copper to Fiber—Four Keys to Successful Substation Modernization
selinc.com/events/webinar/131893

Technical Papers

Considerations for Using High-Impedance or Low-Impedance Relays for Bus Differential Protection
selinc.com/api/download/5562

Beyond the Nameplate—Selecting Transformer Compensation Settings for Secure Differential Protection
selinc.com/api/download/114458

A Practical Guide to Substation Testing Using IEC 61850 Mode and Behavior
selinc.com/api/download/130035

Redundant Bus Protection Using High-Impedance Differential Relays
selinc.com/api/download/121745

Principles of Shunt Capacitor Bank Application and Protection
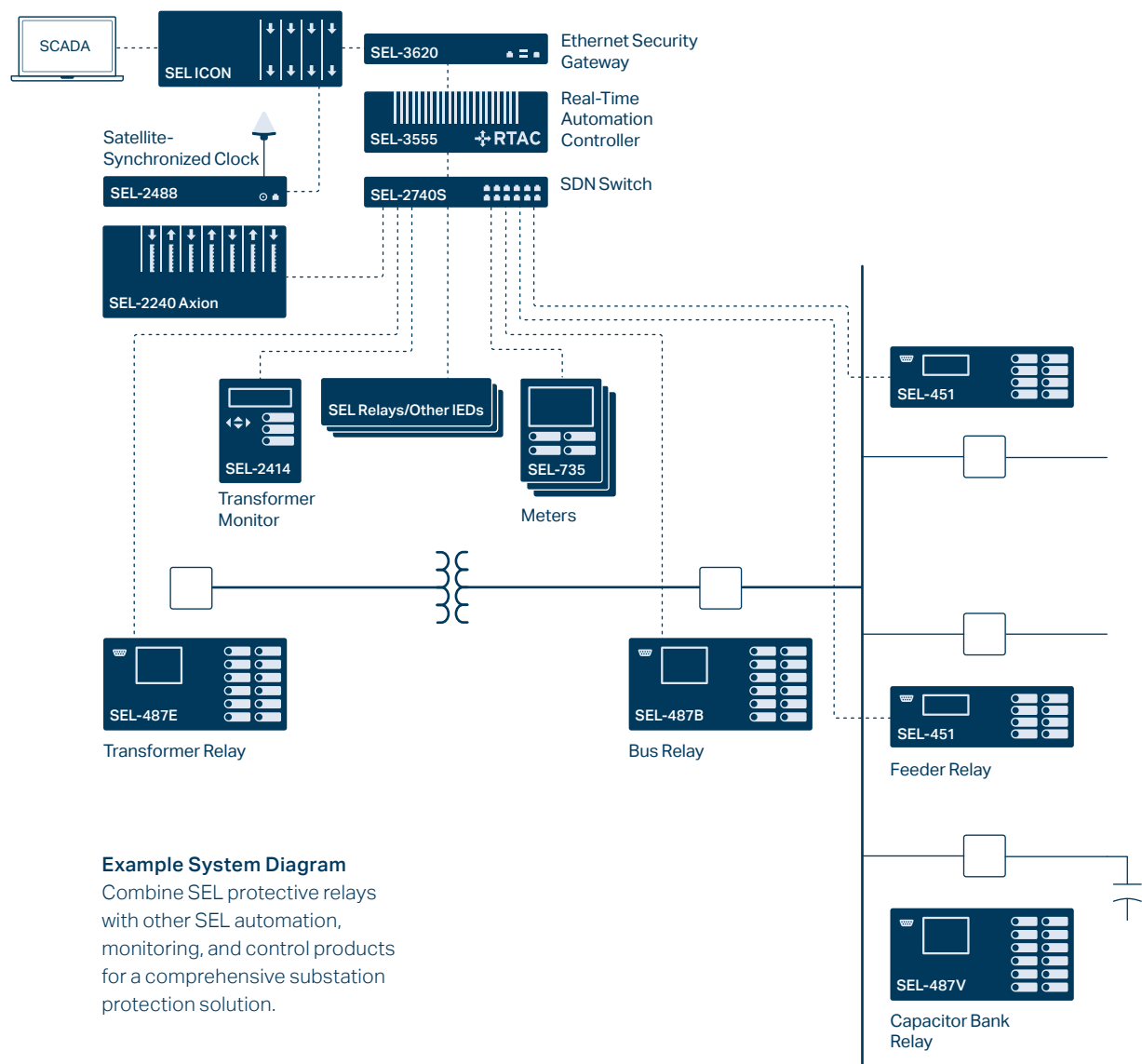selinc.com/api/download/6395

Customer Stories

Caribbean Utility Thwarts Island-Wide Power Outages
selinc.com/featured-stories/cuc

Busbar Protection Made Simpler and Safer With Innovative TiDL Technology
selinc.com/solutions/success-stories/enel

SCADA

SEL ICON

SEL-3620 — Ethernet Security Gateway

SEL-3555 ⊹RTAC — Real-Time Automation Controller

SEL-2740S — SDN Switch

Satellite-Synchronized Clock

SEL-2488

SEL-2240 Axion

SEL-2414 — Transformer Monitor

SEL Relays/Other IEDs

SEL-735 — Meters

SEL-451

SEL-487E — Transformer Relay

SEL-487B — Bus Relay

SEL-451 — Feeder Relay

SEL-487V — Capacitor Bank Relay

Example System Diagram

Combine SEL protective relays with other SEL automation, monitoring, and control products for a comprehensive substation protection solution.

SEL-787-2/-3/-4 Transformer Protection Relay
Starting at $3,200 USD

Apply advanced protection and monitoring with flexible communications to two-, three-, and four-terminal transformers.

SEL-TMU TiDL Merging Unit NEW
Starting at $3,048 USD

Employ the SEL-TMU for remote data acquisition in substations with Time-Domain Link (TiDL) technology systems. It can share data with up to four SEL-400 series TiDL relays.

SEL-401 or SEL-421 Protection, Automation, and Control Merging Units
Starting at $4,850 USD

Apply these merging units in substations with IEC 61850-9-2 Sampled Values (SV) systems. The SEL-401 is a standalone merging unit with phase overcurrent and breaker failure protection. The SEL-421 provides complete line protection, including five zones of subcycle mho and quadrilateral distance elements.

SEL-487V Capacitor Protection and Control System
Starting at $4,550 USD

Protect and control grounded and ungrounded, single- and double-wye capacitor bank configurations.

SEL-487E Transformer Protection Relay
Starting at $7,310 USD

Provide high-speed transformer differential protection for up to five terminals as well as advanced monitoring, metering, automation, and control.

SEL-2414 Transformer Monitor
Starting at $1,260 USD

Provide standalone or distributed monitoring and control for new and existing transformers. Soon, the SEL-2414 will be available with a color touchscreen display.

SEL-487B Bus Differential and Breaker Failure Relay
Starting at $7,390 USD

Provide bus differential and breaker failure protection, automation, and control in applications with up to seven terminals per relay.

SEL-587Z High-Impedance Differential Relay
Starting at $4,270 USD

Use the economical SEL-587Z to combine high-impedance analog technology with the advantages of microprocessor technology.

SEL-352 Breaker Failure Relay
Starting at $3,870 USD

Provide breaker failure protection and breaker control and monitoring with unparalleled flexibility.

Transformer Protection and Monitoring

Applications

Applications	SEL-487E	SEL-387E	SEL-387	SEL-387A	SEL-787	SEL-787-2X/-2I/-2E	SEL-787-3E/-3SI/-4X	SEL-587	SEL-2414
Breaker Failure Protection	■	ƒ	ƒ	ƒ	■	■	■	ƒ	ƒ
Transformer and Machine Current Differential	■	■	■	■	■	■	■	■	
Low-Impedance Bus Differential	■	■	■		■	■	■		
Underfrequency Load Shedding	■	ƒ			+	+	+		
Undervoltage Load Shedding	■	ƒ			+	+	+		
Three-Phase Current Inputs	5	3	4	2	2	2*	3 or 4	2	3*
Three-Phase Voltage Inputs	2	1			1*	1*	1*		1*

Protection

Protection	SEL-487E	SEL-387E	SEL-387	SEL-387A	SEL-787	SEL-787-2X/-2I/-2E	SEL-787-3E/-3SI/-4X	SEL-587	SEL-2414
24 Overexcitation (Volts/Hertz)	■	■			+	+	+		
25 Synchronism Check	■						+		
27/59 Under-/Overvoltage	■	■			+	+	+		
32 Directional Power	■				+	+	+		
46 Current Unbalance	■								
49 Equipment Thermal Monitoring	■	+	■	■	■	■	■		
50FO Flashover Protection	ƒ	ƒ			ƒ	ƒ	ƒ		
50 (N,G) Overcurrent (Neutral, Ground)	■	■	■	■	■	■	■	■	
50P Phase Overcurrent, 50Q Negative-Sequence Overcurrent	■	■	■	■	■	■	■	■	
51 (N,G) Time Overcurrent (Neutral, Ground)	■	■	■	■	■	■	■	■	
51P Phase Time Overcurrent	■	■	■	■	■	■	■	■	
51Q Negative-Sequence Time Overcurrent	■	■	■	■	■	■	■	■	
67 (P,G,Q) Directional Overcurrent (Phase, Ground, Negative Sequence)	■								
81 Under-/Overfrequency	■	■			+	+	+		
81R Rate-of-Change of Frequency	ƒ								
87 Current Differential	■	■	■	■	■	■	■	■	
REF Restricted Earth Fault	■	■	■	+	+	+	■		

Instrumentation and Control

Instrumentation and Control	SEL-487E	SEL-387E	SEL-387	SEL-387A	SEL-787	SEL-787-2X/-2I/-2E	SEL-787-3E/-3SI/-4X	SEL-587	SEL-2414
SELOGIC® Control Equations	■	■	■	■	■	■	■	■	■
Voltage Check on Closing	ƒ	ƒ			ƒ	ƒ	ƒ		
Transformer Cooling Fan Control	ƒ				ƒ	ƒ	ƒ		■
Nonvolatile Latch Control Switches	■	■	■	■	■	■	■		■
SELOGIC Remote Control Switches	■	■	■	■	■	■	■	■	■
SELOGIC Local Control Switches	■	■	■	■	■	■	■		■
Display Points	■	■	■	■	■	■	■		■
Multiple Settings Groups	■	■	■	■	■	■	■		
Substation Battery Monitor	■	■	■	■		+	+		ƒ
Breaker Wear Monitor	■	■	■	■		■	■		
Event Report (Multicycle Data)	■	■	■	■	■	■	■	■	■
Sequential Events Recorder	■	■	■	■	■	■	■		■
Instantaneous and Demand Meter	■	■	■	■	■	■	■	■	■
Load and Temperature Profile Report	■				■	■	■		■
RTD (Resistance Temperature Detector) Inputs					+	+	+		+
Built-In Web Server	■	■				+	+		
Software-Invertible Polarities	■								
IEC 60255-Compliant Thermal Model	■								
IEEE C37.118 Synchrophasors	■				■	■	■		
IEC 61850	+	+			+	+	+		+
IEC 61850-9-2 Sampled Values Technology	+								
Simple Network Time Protocol (SNTP)	■				+	+	+		
Parallel Redundancy Protocol (PRP)	■					+	+		
IEEE 1588 Precision Time Protocol Version 2 (PTPv2)	+					+	+		
EtherNet/IP						+	+		
Time-Domain Link (TiDL) Technology	+								
Through-Fault Monitor	■	■	+	■	■	■	■		■
Thermal Model/SEL-2600 RTD Module Communications	■		+	■	■	■	■		■

■ Standard feature + Model option

ƒ May be created using relay elements, device word bits, analog quantities, and timers

Bus Protection

Applications	SEL-387	SEL-487B	SEL-487E	SEL-587Z
Breaker Failure Protection	ƒ	■	■	ƒ
Bus Differential	ƒ	■	■	■
Transformer and Machine Current Differential	■		■	
High-Impedance Bus Differential				■
Low-Impedance Bus Differential	■	■	■	
Three-Phase Current Inputs	4	7/10/21[‡]	5	Common
Three-Phase Voltage Inputs		1	2	

Protection	SEL-387	SEL-487B	SEL-487E	SEL-587Z
27/59 Under-/Overvoltage		■	■	
46 Current Unbalance		ƒ	■	
47 Voltage Unbalance			ƒ	
50 (N,G) Overcurrent (Neutral, Ground)	■		■	■
50P Phase Overcurrent	■	■	■	■
50Q Negative-Sequence Overcurrent	■		■	■
51 (N,G) Time Overcurrent (Neutral, Ground)	■		■	■
51P Phase Time Overcurrent	■	■	■	■
51Q Negative-Sequence Time Overcurrent	■		■	■
87 Current Differential	■	■	■	
87Z High-Impedance Differential				■
Single-Pole Trip/Close		■		
Three-Phase Differential Bus Zones	1	2/3/6[‡]	1	1
Check Zones		3		

Instrumentation and Control	SEL-387	SEL-487B	SEL-487E	SEL-587Z
79 Automatic Reclosing		ƒ	ƒ	
Dynamic Zone Selection		■		
SELogic Control Equations	■	■	■	■
Nonvolatile Latch Control Switches	■	■	■	
SELogic Remote/Local Control Switches	■	■	■	■
Display Points	■	■	■	■
Multiple Settings Groups	■	■	■	
Substation Battery Monitor	■	■	■	
Breaker Wear Monitor	■		■	
Event Report (Multicycle Data)	■	■	■	■
Sequential Events Recorder	■	■	■	■
Instantaneous Meter	■	■	■	■
Demand Meter	■		■	■
Through-Fault Monitor	■		■	
Software-Invertible Polarities			■	
IEC 60255-Compliant Thermal Model			■	
IEEE C37.118 Synchrophasors			■	
Synchrophasor Real-Time Control			■	
IEC 61850		+	+	
IEC 61850-9-2 Sampled Values Technology		+	+	
Built-In Web Server		■	■	
Simple Network Time Protocol (SNTP)		■	■	
Mirrored Bits® Communications		■	■	
Parallel Redundancy Protocol (PRP)		■	■	
IEEE 1588 Precision Time Protocol Version 2 (PTPv2)		+	+	
Time-Domain Link (TiDL) Technology		+	+	

Miscellaneous Features

	SEL-387	SEL-487B	SEL-487E	SEL-587Z
Connectorized® (Quick Disconnect) Available	+	+	+	

■ Standard feature   + Model option   [‡] 1/2/3 relay application

ƒ May be created using settings

Breaker Failure and Capacitor Bank Protection

Applications	SEL-352	SEL-451	SEL-487B	SEL-487V
Breaker Failure Protection, Number of Three-Phase Breakers	*1*	*2*	*7*	*1*
Bus Differential			■	
Shunt Capacitor Bank Protection		*f*		■
Underfrequency Load Shedding		*f*		*f*
Undervoltage Load Shedding	*f*	*f*	*f*	*f*

Protection	SEL-352	SEL-451	SEL-487B	SEL-487V
25 Synchronism Check	■	■		
27/59 Under-/Overvoltage	■	■	■	■
32/37 Power Elements	■	*f*	*f*	■
46 Current Unbalance	■	*f*	*f*	■
47 Voltage Unbalance		*f*	*f*	*f*
49 Equipment Thermal Monitoring	+	*f*		*f*
50FO Flashover Protection	■	■		■
50 (N,G) Overcurrent (Neutral, Ground)	■	■		■
50P Phase Overcurrent	■	■	■	■
50Q Negative-Sequence Time Overcurrent		■		■
51 (N,G) Time Overcurrent (Neutral, Ground)		■		■
51P Phase Time Overcurrent		■	■	■
51Q Negative-Sequence Time Overcurrent		■		■
60 (N,P) Current Unbalance (Neutral, Phase)				■
67 Directional Overcurrent		■		■
81 Under-/Overfrequency		■		■
81R Rate-of-Change of Frequency				■
87 Current Differential			■	
87V Voltage Differential	■	*f*		■
Single-Pole Trip/Close	■		■	

Instrumentation and Control	SEL-352	SEL-451	SEL-487B	SEL-487V
Open-Pole Detection		*f*	*f*	■
79 Automatic Reclosing	*f*	■	*f*	*f*
SELogic Control Equations	■	■	■	■
Voltage Check on Closing		■		
Nonvolatile Latch Control Switches	■	■	■	■
SELogic Remote/Local Control Switches	■	■	■	■
Display Points	■	■	■	■
Multiple Settings Groups	■	■	■	■
Substation Battery Monitor	+	■	■	■
Breaker Wear Monitor	+	■		
Voltage Sag, Swell, and Interruption (VSSI) Recording		■		■
Event Report (Multicycle Data)	■	■	■	■
Sequential Events Recorder	■	■	■	■
Instantaneous Meter	■	■	■	■
Demand Meter		■		■
Harmonic Metering				■
Software-Invertible Polarities		■		
IEC 60255-Compliant Thermal Model		■		
IEEE C37.118 Synchrophasors		■		■
IEC 61850		+	+	+
IEC 61850-9-2 Sampled Values Technology		+	+	
Built-In Web Server		■	■	■
Simple Network Time Protocol (SNTP)		■	■	■
Parallel Redundancy Protocol (PRP)		■	■	■
IEEE 1588 Precision Time Protocol Version 2 (PTPv2)		+	+	
Time-Domain Link (TiDL) Technology		+	+	
SEL-2600 RTD Module Communications	+	■		■

Miscellaneous Features

	SEL-352	SEL-451	SEL-487B	SEL-487V
Connectorized (Quick Disconnect) Available	+	+	+	+
Synchrophasor Real-Time Control		■		■

■ Standard feature   + Model option

f May be created using relay elements and timers

Distribution Protection and Control

selinc.com/solutions/distribution

The complex demands of distributed generation, renewable resources, and an evolving customer base present challenges to distribution systems everywhere. From protection fundamentals to advanced automation, SEL offers the most reliable and efficient solutions for every section of a utility-, industrial-, or commercial-scale distribution system.

Applications

- Feeder protection
- Transformer protection
- Busbar protection
- Recloser control and protection
- Digital secondary systems
- Arc-flash protection
- Downed conductor detection
- Microgrid control systems (POWERMAX®)
- Distributed generation
- Power quality
- Distribution automation
- Substation automation

DISTRIBUTED ENERGY RESOURCES

Video

SEL-651R—A Better Way to Connect DERs

video.selinc.com/detail/video/6084720804001

Substation
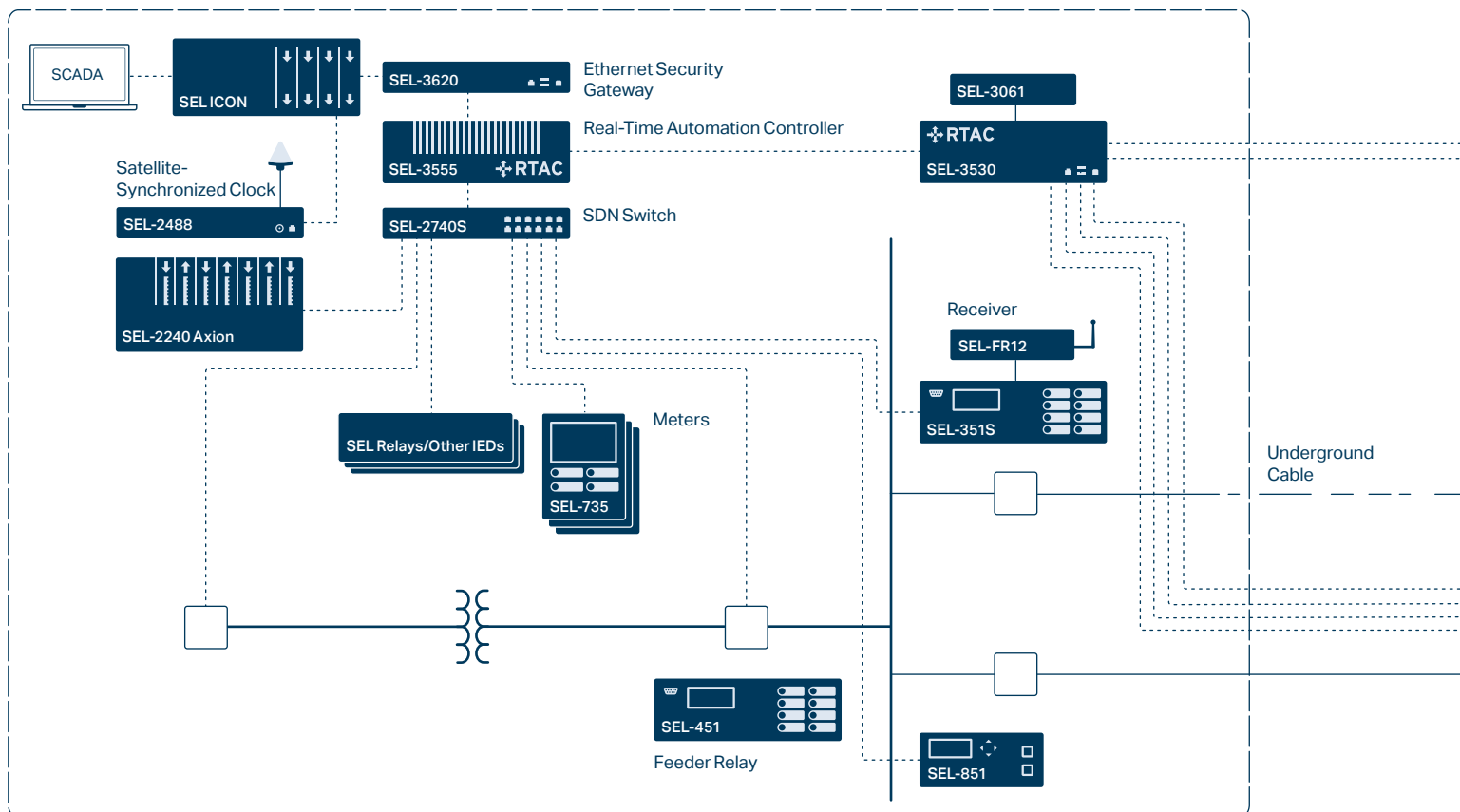
Example System Diagram
Combine SEL distribution protection and control products with other SEL automation, monitoring, and wireless communications products for a comprehensive solution.

Webinars

Finding Simplicity in the Complex World of Feeder Protection

selinc.com/events/on-demand-webinar/134425

Simple and Scalable—Fault Location, Isolation, and Service Restoration Solutions

selinc.com/events/webinar/134693

Enhance Distribution Protection With the SEL Wireless Protection System

selinc.com/events/on-demand-webinar/133828

Technical Papers

Solutions to Common Distribution Protection Challenges

selinc.com/api/download/114346

Real-World Troubleshooting With Microprocessor-Based Recloser Controls

selinc.com/api/download/125792

Case Study: High-Density Distribution Coordination Using High-Speed Communications

selinc.com/api/download/130375

White Papers

Fire Mitigation for Distribution

selinc.com/api/download/126445

Wireless Current Sensing for Improved Distribution Capacitor Bank Control

selinc.com/api/download/130665

SEL-3061

SEL-FLR

Receiver

SEL-651R

SEL-3622

SEL-3061

SEL-2401

SEL-3505

Voltage Regulator Control

SEL-2431

Transmitter

Overhead Line

Transmitter

R

SEL-651R

SEL-3622

SEL-3061

SEL-2401

SEL-3505

R

R

R

Recloser Control

Security Gateway

Cellular Router

Clock

RTAC

SEL-734W

Capacitor Bank Control

SEL-651R

SEL-3622

SEL-3061

SEL-2401

SEL-3505

Sensor

SEL-651R

SEL-3622

SEL-3061

SEL-2401

SEL-3505

R

SEL-651R

SEL-3622

SEL-3061

SEL-2401

SEL-3505

SEL-851 Feeder Protection Relay NEW
Starting at $910 USD

A compact relay for utility and industrial applications that provides overcurrent, voltage, and arc-flash protection as well as versatile communications.

SEL-751 Feeder Protection Relay
Starting at $1,040 USD

Ideal for industrial and utility feeder protection, offering an intuitive color touchscreen, fast and secure arc-flash detection, flexible I/O, and advanced communications.

SEL-451 Protection, Automation, and Bay Control System
Starting at $4,550 USD

Flexible overcurrent protection with complete substation bay control.

SEL-351 Protection System
Starting at $2,690 USD

Transmission or distribution overcurrent protection, monitoring, and control.

SEL-351A Protection System
Starting at $1,680 USD

An economical solution for distribution feeder protection.

SEL-351S Protection System
Starting at $2,750 USD

Comprehensive feeder and overcurrent protection perfect for industrial and utility feeder applications.

SEL-501 Dual Universal Overcurrent Relay
Starting at $1,090 USD

Two complete and independent groups of protection in one low-cost unit for feeders, buses, transformers, motors, and breakers.

SEL-551/551C Overcurrent/ Reclosing Relay
Starting at $910 USD

Distribution protection and control in new and retrofit installations.

SEL Wireless Protection System
Starting at
SEL-FT50 Fault Transmitter: $236 USD
SEL-RP50 Fault Repeater: $236 USD NEW
SEL-FR12 Fault Receiver: $574 USD

Enhance distribution protection by enabling relays to block reclosing for underground faults, by enabling fast bus tripping, or by coordinating high-density recloser trip blocking.

Applications

Applications	SEL-451	SEL-351	SEL-351A	SEL-351S	SEL-851	SEL-751	SEL-751A	SEL-501/501-2	SEL-551/551C
Distribution Feeder Protection	■	■	■	■	■	■	■	■	■
Breaker Failure (BF) Protection	■	■	*f*	■	■	■	■	+	*f*
Generator Intertie Protection	■	■	■	■		+	+		
Synchronism Check (25)	■	■	■	■		+	+		
Underfrequency Load Shedding	*f*	■	■	■	+	■	■		
Undervoltage Load Shedding	*f*	■	■	■	+	+	+		

Protection

Protection	SEL-451	SEL-351	SEL-351A	SEL-351S	SEL-851	SEL-751	SEL-751A	SEL-501/501-2	SEL-551/551C
27/59 Under-/Overvoltage	■	■	■	+	+	+	+		
32 Directional Power Elements	■	+		+	+	+	+		
49 IEC Line/Cable Thermal Overload	■					■			
50 (P,N,G,Q) Overcurrent Element (Phase, Neutral, Ground, Negative Sequence)	■	■	■	■	■	■	■	■	■
51 (P,N,G,Q) Time Overcurrent Element (Phase, Neutral, Ground, Negative Sequence)	■	■	■	■	■	■	■	■	■
67 (P,N,Q) Directional Overcurrent (Phase, Neutral, Negative Sequence)	■	■	■	■		+			
78VS Vector Shift						+			
81 Over-/Underfrequency	■	■	■	■	+	■	+		
Separate Neutral Overcurrent	■	■	■	■	■	■	■		■
Load Encroachment Supervision	■	■	■	■		+			
Low-Energy Analog (LEA) Voltage Inputs	+					+			
Directional Sensitive Earth Fault Protection		+	+	+		+			
Pilot Protection Logic	■	■		■					
81R Rate-of-Change of Frequency (df/dt)	■	■	■	■		+	+		
81RF Fast Rate-of-Change of Frequency	*f*					+	+		
Harmonic Blocking	■	■	+	■	■	■			
Arc Sense™ Technology (AST) High-Impedance Fault Detection	+					+			
Arc-Flash Detection					+	+	+		
Phantom Phase Voltage		■	■	■					
Current/Voltage Channels	6/6	4/4	4/4	4/4	4/0 4/3+	4/3 4/5+	4/0 4/5+	6/0	4/0
Complete Two-Breaker Control	■						■		

Instrumentation and Control

Instrumentation and Control	SEL-451	SEL-351	SEL-351A	SEL-351S	SEL-851	SEL-751	SEL-751A	SEL-501/501-2	SEL-551/551C
79 Automatic Reclosing	■	■	■	■	■	+	+		■
Fault Locating	■	■	■	■		+			
SELOGIC® Control Equations With Remote Control Switches	■	■	■	■	■	■	■		■
SELOGIC Counters	■			■	■	■			
Voltage Check on Closing	■	■	■	■		+	+		
SELOGIC Nonvolatile Latch	■	■	■	■	■	■	■		+
Nonvolatile Local Control Switches	■	■	+	■	■	■	■		■
Substation Battery Monitor	■	■	■	■		+	+		
Breaker/Recloser Wear Monitor	■	■	■	■		■	■		
Trip Coil Monitor	*f*	*f*	*f*	*f*		*f*	*f*		*f*
Voltage Sag, Swell, and Interruption (VSSI)	■	+		+					
Load/Signal Profile Recorder	■	+		+	■	■	■		
Sequential Events Recorder	■	■	■	■		■	■		■
Software-Invertible Polarities	■			■					
IEC 60255-Compliant Thermal Model	■								
DNP3 Level 2 Outstation	■	■	■	■	+	+	+		
Parallel Redundancy Protocol (PRP)	+	■	■	■		+			
IEEE 1588 Precision Time Protocol Version 2 (PTPv2)	+					+			
Time-Domain Link (TiDL®) Technology	+								
IEEE C37.118 Synchrophasors	■	■	■	■		■	■		
Bay Control	■					+			
Ethernet	+	■	■	■	■	+	+		
EtherNet/IP						+			
Built-In Web Server	■				■	■			
IEC 61850	+	+	+	+	+	+	+		
IEC 61850 Edition 2	+				+	+			
IEC 61850-9-2 Sampled Values Technology	+								
Firmware Option With MIRRORED BITS® Communications Available	■	■		■	■	■	■		
Simple Network Time Protocol (SNTP)	■	■	■	■		+	+		
Harmonic Metering		■	■	■	■				
RMS Metering	■	■	■	■	■	■	■		

■ Standard feature   + Model option   *f* May be created using settings

SEL-651R Advanced Recloser Control

Starting at $6,340 USD

The SEL-651R provides Automatic Network Reconfiguration and three- and single-phase tripping. It can be used at distributed energy resource (DER) interconnections, for detecting down conductors, and in other distribution automation applications. It is compatible with popular reclosers.

SEL-651RA Recloser Control

Starting at $4,230 USD

The SEL-651RA is a powerful, cost-effective, and flexible recloser control for 14-pin reclosers used in three-phase tripping applications. It can be used at DER interconnections, for detecting down conductors. and in other distribution automation applications. It is compatible with popular reclosers.

SEL-351RS Kestrel® Single-Phase Recloser Control

Starting at $2,710 USD

The SEL-351RS provides integrated logic and communications and comprehensive protection for single-phase applications.

SEL-734B Advanced Monitoring and Control System

Starting at $1,740 USD

The SEL-734B includes low-energy analog inputs and provides advanced monitoring and control capabilities for applications such as capacitor bank control and feeder monitoring.

SEL-734W and SEL-8340 Capacitor Bank Control and Wireless Current Sensor

Starting at $2,499 USD

This solution is a quick and simple way to provide accurate current-based control for capacitor bank installations and improve power quality.

SEL-2431 Voltage Regulator Control

Starting at $1,020 USD

The SEL-2431 optimizes system voltages by using directional voltage profiles and detailed tap change event reports.

Applications	SEL-351RS Kestrel®	SEL-651R	SEL-651RA
Distribution Feeder Protection	■	■	■
Breaker Failure Protection	ƒ	ƒ	ƒ
Generator Intertie Protection		■	■
Recloser Control	■	■	■
Synchronism Check		■	+
Underfrequency Load Shedding	■	■	■
Undervoltage Load Shedding	■	■	■

Protection	SEL-351RS Kestrel®	SEL-651R	SEL-651RA
25 (G,T) Generator/Intertie Synchronism Check		■	■
27/59 Under-/Overvoltage	■	■	■
32 Directional Power Elements	■	■	+
50 (P,N,G,Q) Overcurrent Element (Phase, Neutral, Ground, Negative Sequence)	■	■	■
51 (P,N,G,Q) Time Overcurrent Element (Phase, Neutral, Ground, Negative Sequence)	■	■	■
67 (P,N,Q) Directional Overcurrent (Phase, Neutral, Negative Sequence)		■	■
78VS Vector Shift		■	■
81 Over-/Underfrequency	■	■	■
81R Rate-of-Change of Frequency (df/dt)	■	■	■
81RF Fast Rate-of-Change of Frequency (ROCOF)		■	■
Separate Neutral Overcurrent		■	■
Load-Encroachment Supervision		■	■
Low-Energy Analog (LEA) Voltage Inputs		+	+
Directional Sensitive Earth Fault Protection		■	■
Pilot Protection Logic		ƒ	ƒ
Harmonic Blocking	■	■	■
Fast Islanding Detection		■	■
Arc Sense Technology (AST) High-Impedance Fault Detection		+	+
Phantom Phase Voltage	■	■	■
Current/Voltage Channels	1/1	4/6	4/1 4/6*

Instrumentation and Control	SEL-351RS Kestrel®	SEL-651R	SEL-651RA
79 Automatic Reclosing	■	■	■
Fault Locating	■	■	+
SELogic Control Equations With Remote Control Switches	■	■	■
SELogic Counters	■	■	■
Voltage Check on Closing	■	■	■
SELogic Nonvolatile Latch	■	■	■
Nonvolatile Local Control Switches	■	■	■
Display Points	■	■	■
Breaker/Recloser Wear Monitor	■	■	■
Trip Coil Monitor	ƒ	ƒ	ƒ
Voltage Sag, Swell, and Interruption (VSSI)	■	■	■
Load/Signal Profile Recorder	■	■	■
Sequential Events Recorder	■	■	■
DNP3 Level 2 Outstation	■	■	■
IEEE C37.118 Synchrophasors	■	■	■
IEEE 1547-2018		■	■
Ethernet	■	■	■
IEC 61850	+	+	+
Simple Time Network Protocol (SNTP)	■	■	■
Harmonic Metering	■	■	■
RMS Metering	■	■	■

■ Standard feature   + Model option   ƒ May be created using settings

Fault Indicators, Sensors, and CTs

selinc.com/products/distribution/fault-indicators | selinc.com/products/FIS/accessories

SEL fault indicators, sensors, and CTs work in a wide range of applications—from overcurrent fault protection to enhanced system protection—and are suitable for overhead and underground installations.

Applications

- Unfused taps
- Long feeders with midline reclosers or sectionalizers
- Overhead-to-underground transitions
- Feeders that experience recurring faults
- Subsurface or pad-mounted transformers
- Switchgear
- Sectionalizing cabinets
- Junction boxes
- Splices

Video

How to Install the AR360 AutoRANGER® Fault Indicator

video.selinc.com/detail/videos/fault-indicators/video/2925549374001

Example System Diagram
Combine SEL fault indicators and sensors with SEL protective relays to enhance protection solutions.
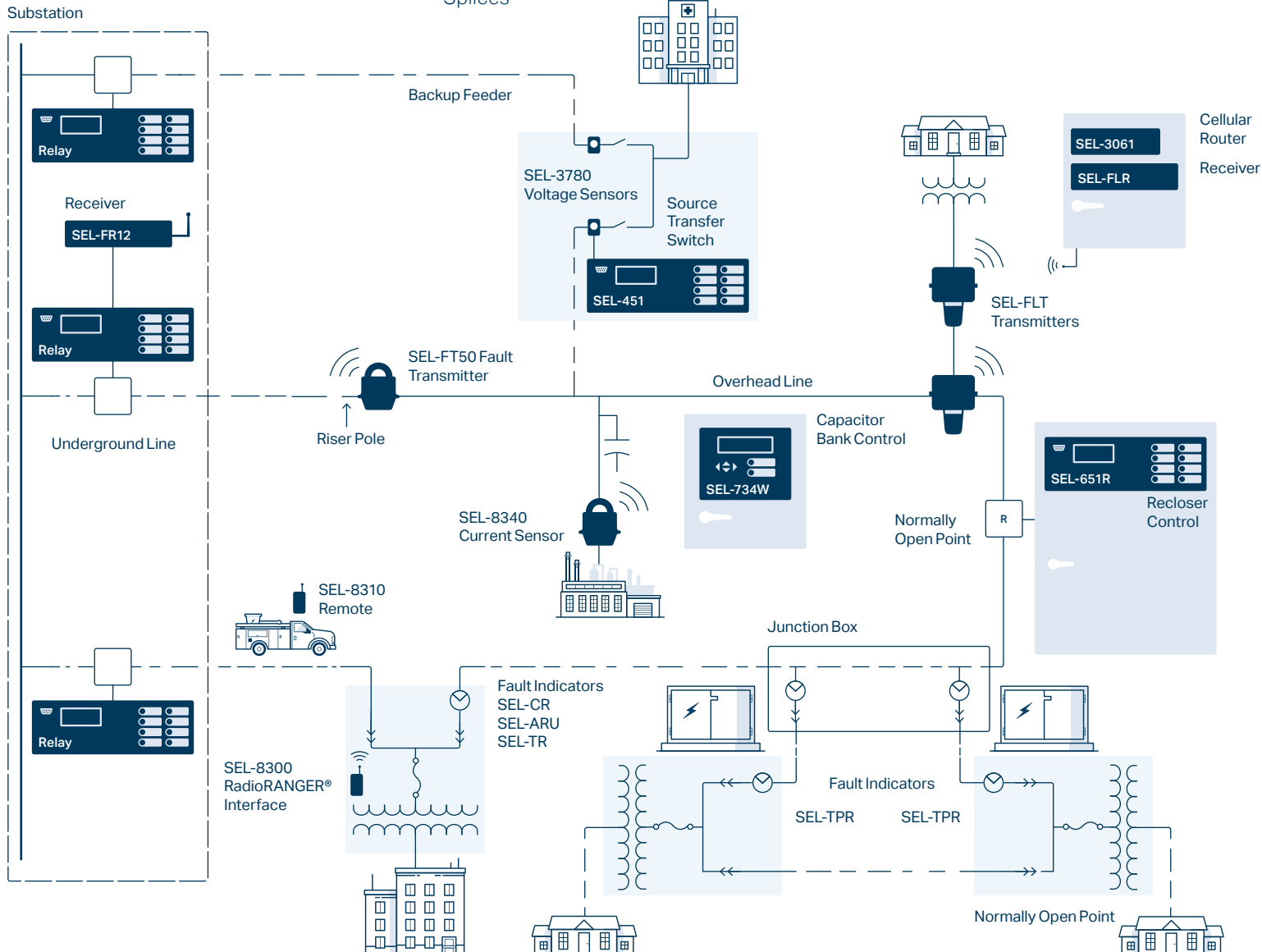
Webinars

Improve System Visibility and Reliability With SEL's Wireless Fault Indication System
selinc.com/events/webinar/134158

Enhance Distribution Protection With the SEL Wireless Protection System
selinc.com/events/webinar/133828

Technical Papers

Emerging Communications and Sensor Technologies That Advance Distribution Automation
selinc.com/api/download/124511

Fast Wind Farm Restoration Using Wireless Fault Sensors to Identify Faulted Segments
selinc.com/api/download/130379

Locating Faults in Urban Underground Vaults at CFE
selinc.com/api/download/4481

White Paper

Fire Mitigation for Distribution
selinc.com/api/download/126445

SEL-FLT and SEL-FLR Fault and Load Transmitter and Receiver System

Starting at $2,149 USD

Improve overall distribution system reliability with the SEL-FLT and SEL-FLR system, which accurately indicates faults and monitors load. Speed up deployment in pole-mount applications with the system's new enclosure.

SEL-AR360 and SEL-AR Overhead AutoRANGER Fault Indicators

Starting at $178 USD

Locate momentary and permanent faults in overhead applications. The SEL-AR360 and SEL-AR automatically adjust their trip thresholds to coordinate with the load current in distribution systems.

SEL-ER Overhead Electrostatic Reset Fault Indicator

Starting at $105 USD

Provide maintenance-free fault indication with a battery-free design and automatic voltage reset.

SEL-BTRIP Overhead BEACON® Field-Programmable Timed-Reset Fault Indicator

Starting at $209 USD

Locate momentary and permanent faults in overhead applications. The SEL-BTRIP provides four field-selectable trip thresholds so you can stock one fault indicator for multiple applications.

SEL Wireless Protection System

Starting at
SEL-FT50 Fault Transmitter: $236 USD
SEL-RP50 Fault Repeater: $236 USD **NEW**
SEL-FR12 Fault Receiver: $574 USD

Enhance distribution protection by enabling relays to block reclosing for underground faults, by enabling fast bus tripping, or by coordinating high-density recloser trip blocking.

SEL-734W and SEL-8340 Capacitor Bank Control and Wireless Current Sensor

Starting at $2,499 USD

This solution is a quick and simple way to provide accurate current-based control for capacitor bank installations and improve power quality.

RadioRANGER® Underground Wireless Fault Indication System

Starting at $856 USD

Reduce the need to access vaults or open pad-mounted enclosures to retrieve the fault indicator status, decreasing fault-locating time and improving safety.

SEL-ARU Underground AutoRANGER Fault Indicator

Starting at $126 USD

Use the Dynamic Delayed Trip feature to improve coordination with upstream protection, maximizing reliable performance.

SEL-TPR Underground Test Point Reset Fault Indicator

Starting at $75 USD

Easily install the SEL-TPR on most brands of 200 A or 600 A elbows with capacitive test points. It is ideal for pad-mounted transformer and switchgear applications.

SEL-CR Underground Current Reset Fault Indicator

Starting at $115 USD

Monitor underground systems with the SEL-CR, which is powered by the load current present on an energized line.

SEL-SR Underground Secondary/Low-Voltage Reset Fault Indicator

Starting at $92 USD

Apply the SEL-SR to pad-mounted transformers when there is insufficient primary current to power and reset current-powered fault indicators.

SEL-TR Underground Timed-Reset Fault Indicator

Starting at $126 USD

Indicate both momentary and permanent faults in underground distribution systems with low load and low voltage.

COMING SOON

SEL-3780 Test Point Voltage Sensor NEW

Starting at $1,500 USD

Detect system voltage loss on distribution elbows with capacitive test points. The SEL-3780 is part of an economical solution for source transfer schemes.
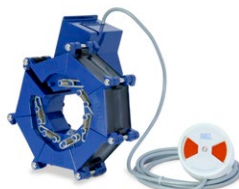
SEL-PILC Underground Paper-Insulated Lead-Covered Cable Fault Indicator

Starting at $648 USD

Apply the SEL-PILC on paper-insulated lead-covered cables. It features a rugged design and can be submerged in up to 15 feet of water.

SEL-GFD Underground Ground Fault Detector

Starting at $230 USD

Apply the SEL-GFD over a three-phase cable bundle at ground potential in switchgear to identify faults on circuits feeding medical facilities, mining equipment, and other industrial equipment.

SEL-MR Manual Reset Fault Indicator
Starting at $40 USD

Troubleshoot overhead and underground applications up to 38 kV with this portable, fault-powered manual reset fault indicator.

SEL-VIN Voltage Indicator
Starting at $41 USD

Apply the line-powered SEL-VIN to indicate the presence of voltage at or above 2 kV (phase to ground) using a flashing neon lamp. Easily install SEL-VINs on the test point of a 200 A elbow, 600 A T-body, or 600 A basic insulating plug.

SEL-CT Split-Core Current Transformers
Starting at $157 USD

Economically add SEL CTs to existing wiring and electrical equipment without interrupting service.

SEL-SCT Submersible Separable-Core Current Transformer
Starting at $230 USD

Easily add the SEL-SCT in subsurface vaults where flooding can occur. The separable-core design allows the SEL-SCT to be opened and installed without interrupting the connection.

Metering

SEL metering products help operators identify power quality issues and improve energy usage in generation, interchange, transmission, distribution, industrial, and commercial applications.

Applications

- Power quality monitoring and troubleshooting
- Usage reporting and billing management system integration
- Load profiling and monitoring

White Paper

Achieve Accurate Metering in Modern Nonsinusoidal Power System Conditions

selinc.com/api/download/123140

Webinar

Solutions for Optimizing Energy Metering and Demand Management

selinc.com/events/on-demand-webinar/134511

Customer Story

SEL Meter Helps Data Center Supply High-Quality, Uninterrupted Power

selinc.com/solutions/success-stories/Vantage-Data
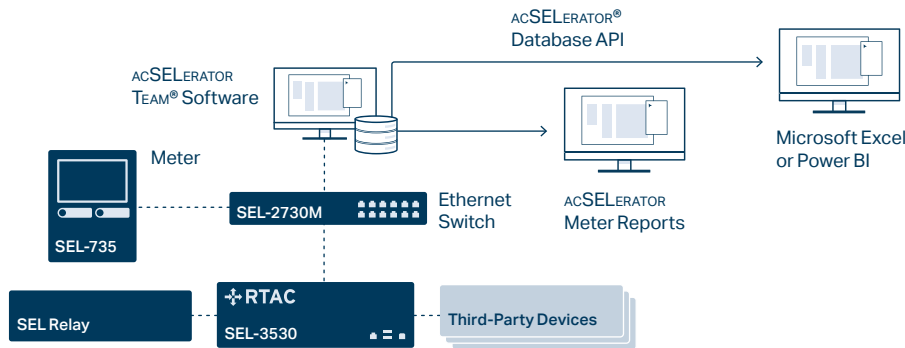
Example System Diagram
Combine the SEL-735 with other SEL devices and software for a comprehensive metering data management solution.

SEL-735 Power Quality and Revenue Meter

Starting at $1,640 USD

SEL meters offer bidirectional, full four-quadrant, and high-accuracy energy metering as well as precise and reliable power quality measurements. Multiple mounting and enclosure options and accessories are available; visit selinc.com/products/73x/meter-options.

AcSELERATOR® Meter Reports SEL-5630 Software

Starting at $2,710 USD for 25 devices

Meter Reports visualizes the SEL-735 metering data collected and stored by AcSELERATOR TEAM® SEL-5045 Software, allowing you to quickly analyze data, identify usage trends, and diagnose system problems.

SEL-5995-0001 Enterprise Data Collection and Reporting Software Bundle **NEW**

Starting at $272 per device

The bundle combines TEAM and Meter Reports software, allowing you to automate data retrieval, quickly visualize data, and create custom reports.

SEL-5230 AcSELERATOR Database API

Starting at $5,420 USD

The API provides third-party software tools with access to data that can be used by enterprise-level systems, such as an energy management system or a billing system, to integrate data reporting.

SEL-735 Power Quality Options

General	Basic	Intermediate	Advanced
Display	Customizable three-line or single-line display	Customizable three-line or single-line display	Customizable three-line or single-line display; 5-inch, 800 × 480 color touchscreen display*
Front Port	ANSI Type II optical port or EIA-232 port	ANSI Type II optical port or EIA-232 port	ANSI Type II optical port or EIA-232 port; Type-C USB*
Memory	128 MB	256 MB	1 GB
Maximum Harmonic Order	15th	63rd	63rd
Interharmonic Quantities	No	No	Yes
Harmonic Angles	No	No	Yes
Power Harmonics	No	No	Yes

Waveform Capture Event Reports

	Basic	Intermediate	Advanced
Samples Per Cycle	16	16, 128	16, 128, 512
Duration (Cycles)	15	15–600	15–600
Number of Events	256	33–6,200	101–10,000
COMTRADE Reports	Yes	Yes	Yes
Wave View Oscillography	No	No	Yes

Load Profile Recorder

	Basic	Intermediate	Advanced
Recorders × Channels	1 × 16	12 × 16	32 × 16
Acquisition Rates	1–120 min	3–59 s, 1–120 min	3–59 s, 1–120 min
Storage Duration for 10-Minute Interval Data			
16 Channels	10 years	20 years	20 years
192 Channels	N/A	1.5 years	9.5 years
512 Channels	N/A	N/A	3.5 years

Voltage Sag, Swell, and Interruption (VSSI) Recorder

	Basic	Intermediate	Advanced
Typical Number of Summary Events	260	260	600
Number of Detailed Rows	60,000	60,000	130,000
Minimum Disturbance Duration	1/4 cycle	1/4 cycle	1/4 cycle
Sampling Rate	4 samples/cycle–1 sample/day, adaptive	4 samples/cycle–1 sample/day, adaptive	4 samples/cycle–1 sample/day, adaptive

Sequential Events Recorder (SER)

	Basic	Intermediate	Advanced
Number of Events	>80,000	>80,000	>80,000
Number of Channels Monitored	≤72	≤72	≤72

IEC 61000-4-30 Power Quality Compliance

	Basic	Intermediate	Advanced
150/180-Cycle, 10-Minute, 2-Hour Aggregation	N/A	Class A	Class A
Flicker	N/A	Class A (10 min, 2 hr updates)	Class A (1 min, 10 min, 2 hr updates)
Voltage Harmonics	Class A	Class A	Class A
Harmonic Currents	Class A	Class A	Class A

*Optional feature

Automation

Increase system reliability and operation efficiency using SEL automation controllers, which offer scalable and modular solutions for data concentration, protocol conversion, and more. SEL automation solutions allow you to implement a broad set of functionalities or choose a subset and add more capabilities over time.

Applications

- Remote terminal unit replacement
- Automated data collection
- Digital fault recording systems
- Network device auditing
- Power management and control systems (POWERMAX®)
- Distributed energy resource integration
- Automatic fault location, isolation, and service restoration
- Bay control

Customer Stories

System-Wide Automation Solution Prolongs Life of Existing Relays

selinc.com/solutions/success-stories/system-wide-automation

A System of Robust Reliability for the Water and Wastewater Industry

selinc.com/solutions/success-stories/brunswick

Example System Diagram

Combine SEL automation controllers with SEL protective relays and software for a comprehensive solution.
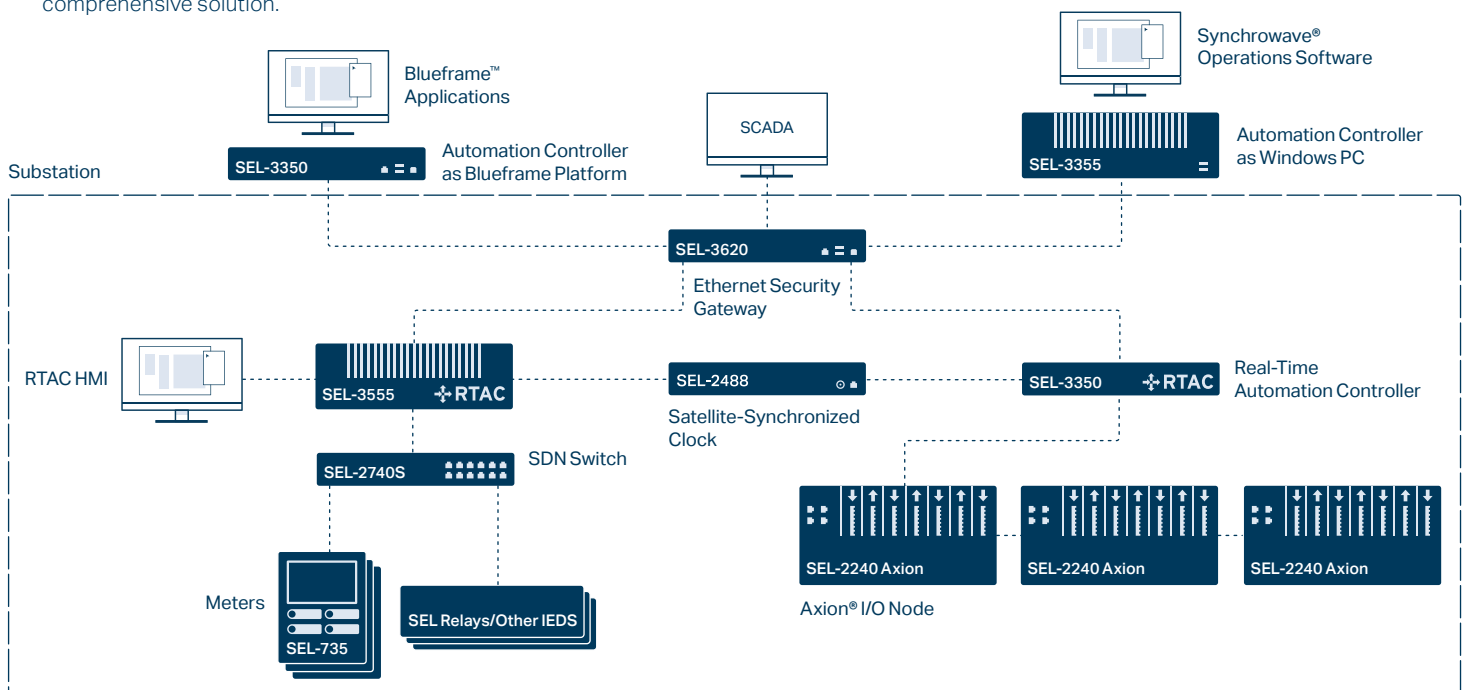
Blueframe™ Applications

Synchrowave® Operations Software

SCADA

SEL-3350 — Automation Controller as Blueframe Platform

SEL-3355 — Automation Controller as Windows PC

Substation

SEL-3620 — Ethernet Security Gateway

RTAC HMI

SEL-3555 ✦ RTAC

SEL-2488 — Satellite-Synchronized Clock

SEL-3350 ✦ RTAC — Real-Time Automation Controller

SEL-2740S — SDN Switch

SEL-2240 Axion

SEL-2240 Axion

SEL-2240 Axion

Meters

SEL-735

SEL Relays/Other IEDS

Axion® I/O Node

Webinars

SEL Blueframe™—A Secure Application Platform Designed for Operational Technology Systems

selinc.com/events/on-demand-webinar/133930

SEL POWERMAX Commercial Microgrids—Sustainable, Economic, and Resilient

selinc.com/events/on-demand-webinar/133374

Technical Papers

Integrating Modern Substation Automation Systems With Enterprise-Level Management

selinc.com/api/download/107933

New Advancements in Solar Grid Controllers

selinc.com/api/download/130047

Wind Farm Volt/VAR Control Using a Real-Time Automation Controller

selinc.com/api/download/99167

White Paper

Using Defense in Depth to Safely Present SCADA Data for Read-Only and Corporate Reporting

selinc.com/api/download/120437

Related Materials

SEL Dynamic Disturbance and Fault Recording Systems

selinc.com/api/download/122510

POWERMAX Solutions

selinc.com/api/download/106293
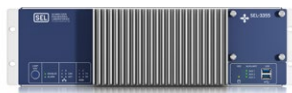
SEL-3355 Automation Controller

Starting at $3,840 USD

The SEL-3355 is a server-class automation controller built to withstand harsh environments in utility substations and industrial control and automation systems. It can be configured as a Real-Time Automation Controller (RTAC), as a computer, or with the SEL Blueframe application platform.

SEL-3360S/3360E Compact Automation Controllers

Starting at $3,410 USD

The controllers match the performance, ruggedness, and configuration flexibility of the SEL-3355 and are ideal for surface- or panel-mount applications.

SEL-3350 Automation Controller

Starting at $2,620 USD

The SEL-3350 is ideal for limited-space, dedicated embedded applications that require midlevel I/O and computation. It can be configured as an RTAC, as a computer, or with the SEL Blueframe application platform.
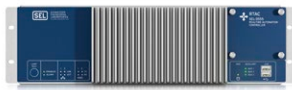
SEL-3555 Real-Time Automation Controller

Starting at $7,910 USD

The SEL-3555 provides powerful processing for large-scale automation projects.

SEL-3560E/3560S Real-Time Automation Controller

Starting at $6,990 USD

These RTACs offer powerful processing for large-scale automation projects in a compact form factor.

SEL-3530/3530-4 Real-Time Automation Controller

Starting at $3,090 USD

These RTACs deliver complete and flexible system control with integrated security, seamless configuration, unified logic, and high reliability.

SEL-2240 Axion®

NEW

Starting at $2,610 USD

The Axion is a fully integrated, modular I/O and control solution for utility and industrial applications. With its new 7-inch color touchscreen display option, the Axion can be applied as a bay controller, providing comprehensive monitoring and reliable control of substation bays.

SEL-2440 DPAC Discrete Programmable Automation Controller

Starting at $1,050 USD

The SEL-2440 offers utility-grade I/O, powerful processing, flexible communications, and microsecond timing.

SEL RTAC HMI

Starting at $1,910 USD

The SEL RTAC HMI offers an easy way to visualize data to monitor and control your system.

acSELerator Diagram Builder™ SEL-5035 Software

Included with RTAC HMI purchase

Diagram Builder enables the creation and management of HMI visualization projects for the SEL RTACs in your system.

SEL-3505/3505-3 Real-Time Automation Controller

Starting at $868 USD

These RTACs offer powerful automation, reporting, and control for low-voltage, limited-space applications.

SEL-2411 Programmable Automation Controller

Starting at $1,040 USD

The SEL-2411 provides flexible I/O for automatic control, SCADA, station integration, remote monitoring, and plant control systems.

SEL BLUEFRAME

Data Management and Automation (DMA) Application Suite NEW

Starting at $5,230 USD

DMA applications automatically collect, store, and manage device-specific information to simplify day-to-day management of a system of devices and to support compliance. Applications include:

- Disturbance Monitoring—Collect oscillography and Sequence of Events (SOE) data.
- Configuration Monitoring—Collect configuration and property data.
- Credential Management—Initiate device credential rotation and central storage.

SEL-3390 PCIe Adapter Cards

SEL-3390E4 Network Adapter Card
SEL-3390S8 Serial Adapter Card
SEL-3390T Time and Ethernet Adapter Card NEW
Starting at $492 USD

These expansion cards let you add ports and connectivity to various industrial automation platforms.

SEL-2411P Pump Automation Controller

Starting at $2,230 USD

The SEL-2411P is a standalone, preconfigured, SCADA-ready system for control and monitoring of water and wastewater pump applications.

Fault Location, Isolation, and Service Restoration (FLISR) Application NEW

Contact SEL for pricing

FLISR is a wide-area control application that locates faults, isolates them, and automatically restores power to healthy portions of affected lines or feeders.

Applications	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Collect, Scale Meter Data	#	#	#	+	■	■	■	■	■	■	■	■	■	■	
Condition Monitoring				■	■	■	■	■	■	■	■	■			
IED Report/Event Collection	+	+	+	■	■	■	■	■	■	■	■	■			
Distributed Fault Recording				+	■	■	■			■					
Collect Targets, Contact Input Status, Fault Location	#	#	#	+	■	■	■	■	■	■	■	■			
Enable Fiber-Optic Links	+	+		+	+	+		■	■	■	■	■	■	■	■
Control Through IED Outputs				■	■	■	■	■	■	■	■	■	■	■	■
IRIG-B Client Time Synchronization	■	■	■	■	■	■	■	■	■	■	■	+	■	■	■
IRIG-B Server Time Distribution	+	+		■								+			
Transparent "Port Switch"	#	#	#	+	■	■	■	■	■	■	■	■	■	■	■
Windows/Linux Applications in Harsh Environments	■	■	■	■											
Running Multiple Applications Simultaneously	■	■	■	■											
Installing Third-Party Software	■	■	■	■											
Security Appliance to Help Satisfy NERC CIP Requirements	#	#	#	+/#	■	■	■	■	■	■	■	■			
Network Monitoring and Intrusion Detection	#	#	#	#											
Virtualization Server	+/#	+/#	+/#												
Engineering Access Point	+/#	+/#	+/#	+/#	■	■	■	■	■	■	■	■			
IRIG-B Time Distribution and Network Time Protocol (NTP) Conversion	+	+		■	■	■	■	■	■	■	■	■/+			
Video Surveillance Control and Archiving/Physical Security Monitoring and Notification	#	#	#	#											
SEL Secure Kiosk	+	+	+	+											

HMI	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Web-Based HMI	#	#	#	#	+	+	+	+	+	+		+			
Web-Based HMI Display Port					+	+	+								
Touchscreen Display	+/#	+/#	+/#	+/#									+		
LCD Display													■	■	

Concentrate IED Data For:	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Distributed Control System (DCS)				+	■	■	■	■	■	■	■	■			
SCADA Master or Remote Terminal Unit (RTU)				+	■	■	■	■	■	■	■	■			
Remote Third-Party HMI				+	■	■	■	■	■	■	■	■			

Features	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Protocol Redundancy (DNP3 and IEC 60870-5-101/104 Server)					■	■	■	■	■	■	■	■			
Primary and Standby LAN Support					■	■	■	■	■	■	■	■	■	■	■
Optoisolated Inputs/Programmable Outputs					■[1]	■[1]	■[1]	+	■	+	+	■[1]	+	+	+
IEC 61131 Logic Engine					■	■	■	■	■	■	■	■			
Cybersecurity Management					■	■	■	■	■	■	■	■			
Real-Time Operating System					■	■	■	■	■	■	■	■	■	■	■

■ Standard feature   + Model option   # Third-party software required   [1] Alarm contact only

Hardware	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Intel Xeon Quad-Core 64-Bit CPU	■	■	■		■	■	■								
Intel Atom Quad-Core 64-Bit CPU				■											
Power PC Single-Core CPU								■	■	■	■				
Maximum Error-Correcting Code (ECC) RAM (GB)	64	64	64	8	64	64	64	1	1	1	0.5				
Supports 3 Independent Displays With Digital Audio	■	■	■	■	■	■	■								
Analog Audio Ports: Line In, Line Out, Microphone	■	■	■												
4 Rear and 2 Front USB 3.1 Ports	■	■	■		■	■	■								
4 Rear USB 2.0 Ports and 2 Front USB 3.1 Ports				■											
Front RJ45 Ethernet Ports				1				1							
Rear Ethernet Ports	2	2	2	4	2	2	2	2	2	2	2				
Fiber-Optic Rear Ethernet Ports				+				+		+					
Additional Ethernet Ports, Copper RJ45, or Fiber-Optic SFP	8	4			8	4									
EIA-232 Serial Ports	2	2	2		2	2	2								
EIA-232/422/485 Serial Ports				16	6	6		17	4	4	4/3				
Additional EIA-232/422/485 Serial Ports	24	12			18	6		16							
IRIG-B Input (on COM1)	■	■	■		■	■	■								
IRIG-B Input and Output (BNC and Serial)	+	+		■	+	+		■	■	■	■				
19" Rack Mount	■			■	■			■	■	■			+	+	+
Panel Mount	+			+	+			+	+	+			+	+	+
Wall Mount		■	■			■	■								
Thermal Conductive Wall Mount		+	+			+	+								
PCI/PCIe Expansion Slots	5	2			3	1									
Solid-State Drives (2.5" SATA, 32 GB–2 TB Drive Options)	4	2	2	2	4	2	2								
High-Voltage 125–250 Vdc, 120–240 Vac Power Supply	■	■	+	■	■	■	+	■	■	■			■	■	■
Medium-Voltage 48–125 Vdc, 120 Vac Power Supply				■				■	■				■	■	■
Low-Voltage 48 Vdc Power Supply	■	■	+		■	■	+								
Low-Voltage 24–48 Vdc Power Supply				■								+			
12–24 Vdc Power Supply												■			
12 Vdc Power Supply			■				■								
External Power Supply			+				+								
Secondary Power Supply	+		+		+		+								
Hot-Swappable Power Supplies	■		■		■		■								
Alarm Contact, Alarm LED, Watchdog	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Configurable Universal Control Input				■											
Programmable Auxiliary Bicolor LEDs	3	3	3	4	3	3	3								
Intel Active Management Technology (AMT) v11.8	■	■	■												
Infineon Trusted Platform Module (TPM) v2.0 (Hardware)	■	■	■	■	■	■	■								

■ Standard feature   + Model option

Supported Operating Systems and Software

	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
SEL Real-Time Automation Controller (RTAC)*				+	■	■	■								
SEL Blueframe Operating System*	+	+	+	+											
SEL Software*	+	+	+	+	+	+	+								
Microsoft Windows 10 IoT Enterprise LTSC*	+	+	+	+											
Windows Server 2019 Standard*	+	+	+	+											
McAfee Whitelist Antivirus*	+	+	+	+											

Network

	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
Telnet				+	■	■	■	■	■	■	■	■	■	■	■
Secure Shell (SSH)				+	■	■	■	■	■	■	■	■			
SMTP/Email Notification				+	■	■	■	■	■	■	■	■			
FTP Server													■	■	■
DNP3 LAN/WAN Client/Server				+	■	■	■	■	■	■	■	■	+	■	+
Modbus TCP				+	■	■	■	■	■	■	■	■	■	■	■
IEC 61850 MMS Client/Server				+	+	+	+	+	+	+	+	+	+		+
IEC 61850 GOOSE				+	+	+	+	+	+	+	+	+	+		+
IEC 60870-5-104 Client/Server				+	■	■	■	■	■	■	■	■			
IEEE C37.118 Client/Server				+	■	■	■	■	■	■	■	■			
Flex Parse				+	■	■	■	■	■	■	■	■			
FTP/SFTP Client/Server				+	■	■	■	■	■	■	■	■			
SNMP Client/Server				+	■	■	■	■	■	■	■	■			
Lightweight Directory Access Protocol (LDAP)				+	■	■	■	■	■	■	■	■			
EtherCAT®				+	■	■	■	■	■	■		■			
EtherNet/IP				+	■	■	■	■	■	■	■	■			
Precision Time Protocol (PTP)/ Network Time Protocol (NTP)				+	■	■	■	■	■	■	■	■			
Simple Network Time Protocol (SNTP)				+	■	■	■	■	■	■	■	■	■	■	■
Parallel Redundancy Protocol (PRP)				+	■	■	■	■	■	■	■	■	■	■	■
Parallel Redundancy Protocol (PRP) for Windows	+	+	+	+											

Serial Port Protocols

	SEL-3355	SEL-3360E	SEL-3360S	SEL-3350	SEL-3555	SEL-3560E	SEL-3560S	SEL-3530	SEL-3530-4	SEL-2240	SEL-3505/3505-3	SEL-3532/3533	SEL-2411	SEL-2411P	SEL-2440
SEL Mirrored Bits® Communications	+	+		■	■	■	■	■	■	■	■	■	■	■	■
DNP3 Server				+	■	■	■	■	■	■	■	■	+	■	+
Modbus RTU Binary Client/Server				+	■	■	■	■	■	■	■	■	■	■	■
IEC 60870-5-101 Client/Server				+	■	■	■	■	■	■	■	■			
LG 8979 Client/Server				+	■	■	■	■	■	■	■	■			
SES-92 Server				+	■	■	■	■	■	■	■	■			
DNP3 Client/Server				+	■	■	■	■	■	■	■	■			
CP 2179 Client				+	■	■	■	■	■	■	■	■			
SEL Fast Messages, Interleaved With ASCII Client/Server				+	■	■	■	■	■	■	■	■			
SEL Synchrophasors Client				*f*	*f*	*f*	*f*	*f*	*f*	*f*	*f*	*f*			
IEC 60870-5 101 Client/Server				+	■	■	■	■	■	■	■	■			
CDC Type 2 Client/ Server				+	■	■	■	■	■	■	■	■			
ASCII Flex Parse				+	■	■	■	■	■	■	■	■			

■ Standard feature   + Model option   *Factory-orderable operating system   *f* May be created using settings

WAN and LAN Networks

selinc.com/products/communications/wide-area-network | selinc.com/products/communications/local-area-networks

SEL devices combine the connectivity, performance, cybersecurity, and ruggedness required for WAN and LAN applications.

Applications

- Teleprotection systems
- Operational technology (OT) networking
- Software-defined networking (SDN)
- Analog leased-line service migration
- IT/OT convergence
- IEC 61850 digital secondary systems
- Special protection systems
- Microgrids
- Distributed renewables
- Remedial action schemes
- Facility-related control systems
- NERC CIP

Webinars

Best Practices for Successful IT/OT Network Convergence
selinc.com/events/webinar/128773

Redefining Ethernet Performance With Software-Defined Networking
selinc.com/events/webinar/130273

Technical Papers

Deterministic Communications for Protection Applications Over Packet-Based Wide-Area Networks
selinc.com/api/download/121072

Implementing Security for Critical Infrastructure Wide-Area Networks
selinc.com/api/download/21474836912

Taking Full Control of Your Process Bus LAN Using New Ethernet Packet Transport Technologies
selinc.com/api/download/119756

White Paper

Simplifying NERC CIP Compliance With SEL SDN
selinc.com/api/download/130206

Video

Engineer a Better Network—It Starts With SDN
video.selinc.com/detail/video/5187896739001

Customer Stories

Belgium Integrates Offshore Wind Power Into European Grid
selinc.com/featured-stories/elia

A Modern WAN—Simple, Economical, Elegant
selinc.com/solutions/success-stories/a-modern-wan
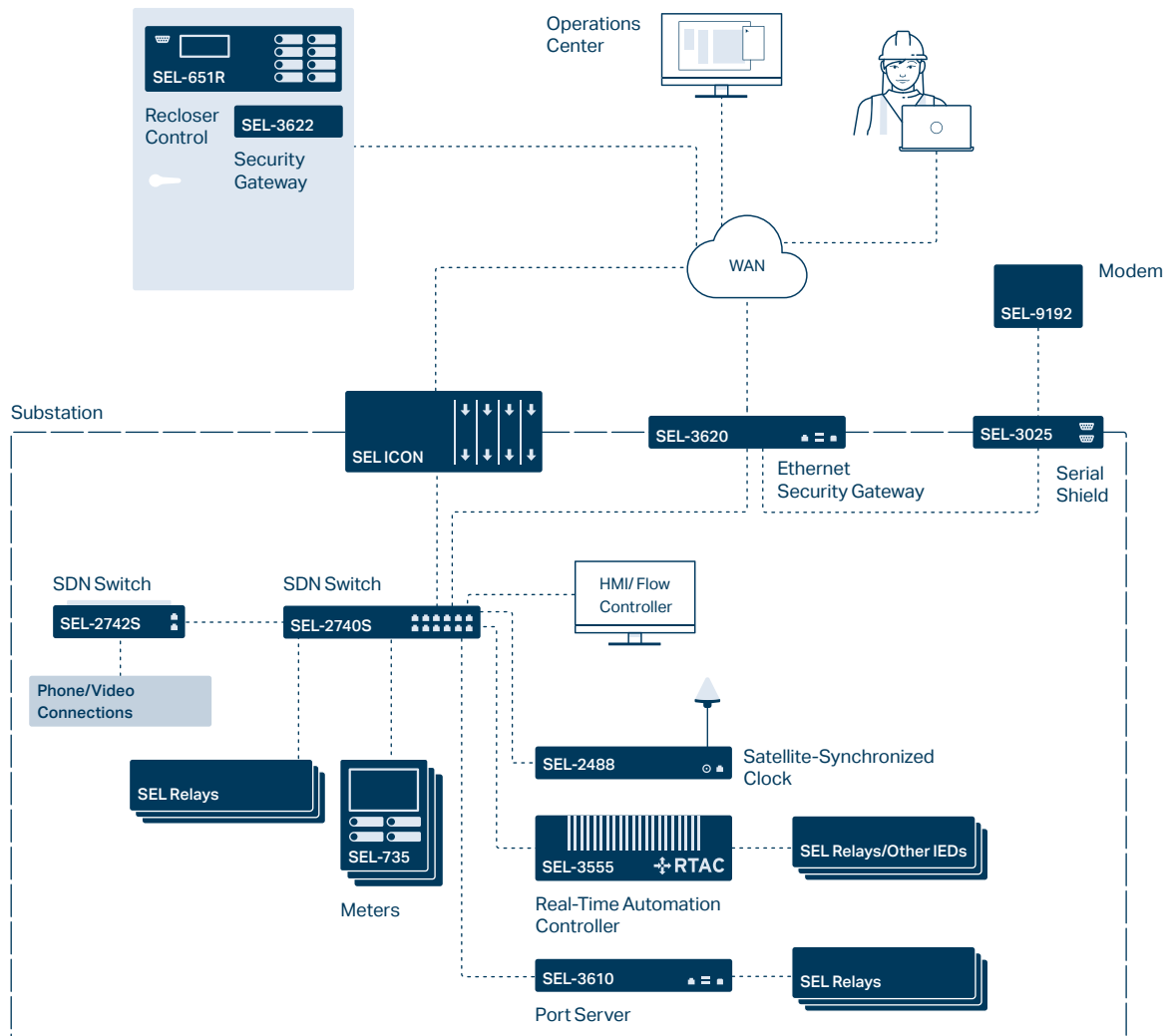
Example System Diagram
Combine SEL LAN and WAN
devices with other SEL protection,
automation, and control products
for a comprehensive solution.

SEL ICON® Integrated Communications Optical Network

Starting at $7,600 USD

The ICON is a WAN multiplexer optimized for industrial and utility applications. By combining time-division multiplexing (TDM) and Ethernet transport options with a comprehensive range of data interfaces, the ICON makes it easy to migrate legacy network technologies to a packet-based solution.

SEL-2740S Software-Defined Network Switch

Starting at $4,071 USD

The SEL-2740S is the industry's first field-hardened SDN-enabled switch and improves cybersecurity and Ethernet performance in mission-critical applications.

SEL-2742S Software-Defined Network Switch

Starting at $2,300 USD

The SEL-2742S is a 12-port, DIN-rail mount SDN switch for industrial environments. It combines with SEL-5056 Software-Defined Network Flow Controller software to simplify network engineering and improve LAN security.

SEL-3620 Ethernet Security Gateway or SEL-3622 Security Gateway

Starting at $868 USD

The gateways each function as a router, VPN endpoint, and firewall device. They can provide secure and proxy user access for serial- and Ethernet-based IEDs.

SEL-2730M Managed or SEL-2730U Unmanaged 24-Port Ethernet Switch

Starting at $1,640 USD

These switches let you build reliable, safe Ethernet networks in electrical substations, plants, and other mission-critical sites.

SEL-3610 Port Server

Starting at $1,960 USD

The SEL-3610 increases the number of serial ports available to communications processors and computers and allows serial products to communicate securely through Ethernet networks.

SEL-2725 Five-Port Ethernet Switch

Starting at $492 USD

The SEL-2725 allows you to easily connect devices to Ethernet networks.

SEL-3025 Serial Shield®

Starting at $983 USD

The SEL-3025 protects serial communications with bump-in-the-wire security and strong, authenticated access controls.

Applications	SEL ICON	SEL-3620	SEL-3622	SEL-3610	SEL-2725	SEL-2730M	SEL-2740S	SEL-2742S	SEL-2890
SONET WAN	■								
Ethernet LAN	■	■	■	■	■	■	■	■	■
Precise Time Distribution	■	■	■	■			■	■	
Engineering Access Control		■	■	■			■	■	
Connect Multiple Wired-Ethernet Devices to Network	■				■	■	■	■	
Convert Wired 10/100BASE-T Ethernet to Fiber-Optic 100BASE-FX Ethernet	■	■	■	■	■	■	■	■	
Convert Serial Links to Ethernet Links	■	■	■	■					■

Features	SEL ICON	SEL-3620	SEL-3622	SEL-3610	SEL-2725	SEL-2730M	SEL-2740S	SEL-2742S	SEL-2890
Cryptography (Encryption and Authentication)	■	■	■	■					
User-Based Accounts	■	■	■	■		■	■	■	
Centralized Authentication Via Lightweight Directory Access Protocol (LDAP)	■[1]	■	■	■		■	■	■	
Centralized Authentication Via Remote Authentication Dial-In User Service (RADIUS)		■	■	■		■			
Deny-by-Default Firewall		■	■				■	■	
Import/Export Configuration Files		■	■	■		■	■	■	
VPN		■	■						
Syslog Logging	■	■	■	■		■	■	■	
Network Management System (NMS) Software	■					■	■	■	
GPS Receiver	■								
Real-Time Latency Monitor	■								
Spanning Tree Protocol (STP)		■	■	■		■[2]			
VLANs	■	■	■	■		■	■	■	
Ethernet Class of Service	■					■	■	■	

Ethernet Ports, Connector	Quantities								
	SEL ICON	SEL-3620	SEL-3622	SEL-3610	SEL-2725	SEL-2730M	SEL-2740S	SEL-2742S	SEL-2890
Copper 10BASE-T, RJ45									1
Copper 10/100BASE-T, RJ45	0–16[3]	1–3	1–3	1–3	3–5	0–16[4]	0–20	2–12	
Fiber-Optic 100BASE-FX, LC	4	0–2	0–2	0–2	0–2	0–16[4]	0–20	0–6	
Copper 10/100/1000BASE-T, RJ45	4					4–8	0–4	0–4	
Fiber-Optic 1000BASE-X, LC	2[5]/4[6]					0–4[7]	0–4	0–4	
Small Form-Factor Pluggable (SFP) Cages	2–6[8]					4[7]			
Total Ethernet Ports Supported	16	3	3	3	5	24	20	12	1

[1]SEL-5052 Server NMS Software provides LDAP centralized authentication for the ICON.

[2]SEL-2730M supports STP plus IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP).

[3]SEL ICON can support up to 16 Ethernet ports using 8-port Ethernet Access Modules or Ethernet Bridging Access Modules.

[4]SEL-2730M base configuration supports 16 10/100BASE-T copper ports, with the option to substitute 100BASE-FX fiber-optic ports in various groupings.

[5]SEL-8021-1 Line Module supports 2 fiber-optic Gigabit interfaces.

[6]SEL-8036-1 Ethernet Bridging Access Module supports 4 fiber-optic 100BASE-FX/Gigabit interfaces.

[7]SEL-2730M base configuration includes 4 copper GigE ports and 4 SFP cages for optional gigabit fiber-optic or copper 10/100/1000BASE-T Ethernet ports. SEL SFP transceivers are required.

[8]SEL ICON uses SFP cages for SONET and GigE fiber-optic interfaces.

Wireless Communications

Wireless communications extend networks in areas where wired communications networks are not available or are cost-prohibitive. SEL wireless devices use radio signals to communicate and send data over the air, eliminating the need for traditional cabling.

Applications

- Cellular router for remote connectivity
- Serial radio for protection schemes

Technical Paper

Expanding Protection and Control Communications Networks With Wireless Radio Links

Video

Communication Made Easy Over Difficult Terrain

Customer Story

SCADA System Sheds Light on Texas Utility's Power System

Example System Diagram

Combine SEL wireless communications devices with SEL protection, automation, and control products for a comprehensive solution.

SCADA

SEL ICON

Cellular Router
SEL-3061

SEL-3620 Ethernet Security Gateway

SEL-2488
Satellite-Synchronized Clock

SEL-3555 RTAC

RTAC
SEL-3350

SEL-2740S
SDN Switch

SEL-2240 Axion

SEL-2414
Transformer Monitor

SEL-2411
Automation Controller

SEL-735
Meter

SEL Relays

SEL Relays
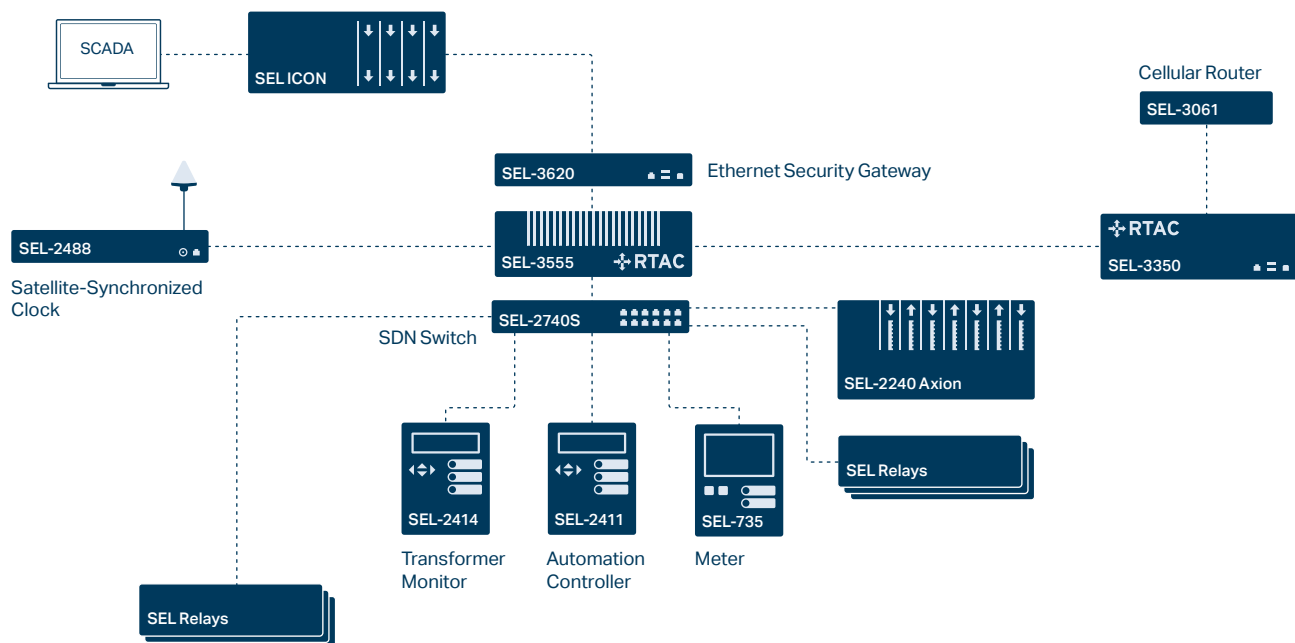
SEL-3031 Serial Radio Transceiver

Starting at $1,060 USD

The SEL-3031 is a 900 MHz ISM serial data radio that supports point-to-point (P2P) and point-to-multipoint (P2MP) operational modes. In P2P mode, the SEL-3031 supports three serial data ports in one radio channel.

SEL-3061 Cellular Router

Starting at $816 USD

The SEL-3061 provides secure, remote access for devices using public cellular radio networks. It supports 4G LTE and 3G cellular technologies.
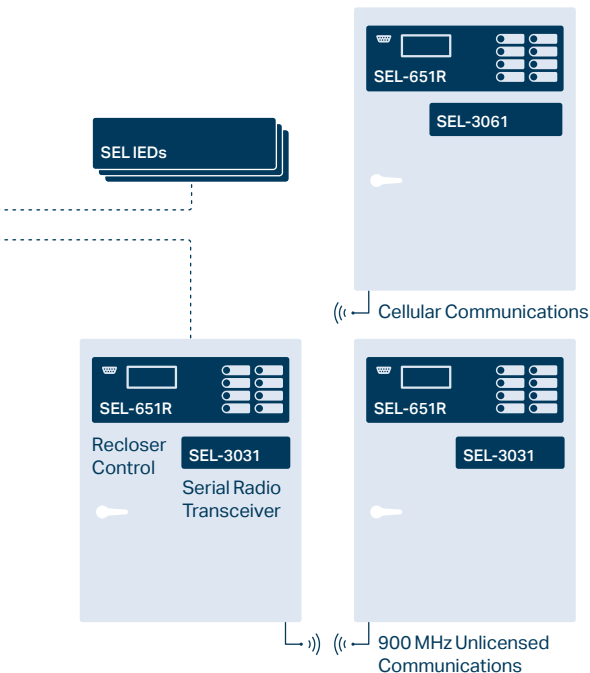
Applications	SEL-3031	SEL-3061
Wireless Communications for SCADA	■	■
High-Speed Teleprotection	■	
Distribution Automation	■	■
Wireless Communications for Synchrophasor Data	■	■
Substation-to-Substation Communications Link		■
Anti-Island Detection	■	■
Wireless Communications for Distributed Generation	■	■
Permanent Wireless Cable Replacement	■	■
Remote Engineering Access	■	■
Short-Range Engineering Access	■	■
LAN Extension		■
Wireless Backhaul Communications for Fault and Load Transmitters		■

Features	SEL-3031	SEL-3061
915 MHz ISM Band (License-Free)	■	
Serial Communication	■	■
Ethernet Communication		■
Low Latency for Teleprotection	■	
Compatible With SEL Mirrored Bits® Communications	■	
Compatible With Modbus	■	■
Compatible With DNP3 and Typical Byte-Oriented Protocols	■	■
Encryption	ƒ	■
Point-to-Multipoint Capability	■	
Cellular Capability		■
EIA-232 Port (Quantity)	3	1
Wired EIA-485 Port	+	
High Maximum Throughput (1 Mbps or Greater)		■
Device Status LEDs	■	■
Visible Link Quality Indicator		■

Setup Method	SEL-3031	SEL-3061
USB Port	■	
Secure Web Interface Via Ethernet Port		■
Wireless Configuration	■	■
Simple Network Management Protocol (SNMP)		■

■ Standard feature   + Model option

ƒ With SEL-3044 Encryption Card option

SEL-651R

SEL-3061

Cellular Communications

SEL IEDs

SEL-651R

Recloser Control

SEL-3031

Serial Radio Transceiver

SEL-651R

SEL-3031

900 MHz Unlicensed Communications

Precise Time

selinc.com/products/communications/precise-timing

SEL precise timing solutions keep power system devices time-synchronized within a microsecond, satisfying demanding applications like synchrophasors and IEC 61850-9-2 and ensuring that your event reports have accurate timestamps.

Applications

- Electrical substations
- Generation facilities
- Control centers
- Industrial facilities
- Manufacturing
- Military bases
- Transportation systems

Technical Papers

Secure and Reliable GPS-Based Time Distribution
selinc.com/api/download/119039

Mitigating GPS Vulnerabilities
selinc.com/api/download/104197

SEL-2488 Satellite-Synchronized Network Clock
Starting at $2,660 USD

The SEL-2488 receives GNSS time signals and distributes precise time via multiple output protocols with ±40 ns accuracy.

SEL-2407® Satellite-Synchronized Clock
Starting at $1,310 USD

The SEL-2407 provides a time display and high-accuracy timing (±100 ns).

SEL-2401 Satellite-Synchronized Clock
Starting at $544 USD

The SEL-2401 is a satellite clock with high-accuracy timing (±100 ns) for compact spaces.

SEL-2404 Satellite-Synchronized Clock
Starting at $1,310 USD

The SEL-2404 is a high-accuracy (±100 ns) satellite clock with a highly visible time display.

SEL-3401 Digital Clock
Starting at $429 USD

The SEL-3401 provides a highly visible time display for use anywhere there are time-critical functions set by IRIG-B synchronization signals.

SEL-9929 Satellite-Synchronized Clock Display Kit
Starting at $1,140 USD

The SEL-9929 kit includes a satellite-synchronized clock, a large digital clock display, and all accessories.
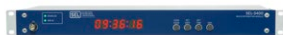
SEL-3400 IRIG-B Distribution Module
Starting at $763 USD

The SEL-3400 verifies time signals and distributes precise time to 240 devices.

SEL-3405 High-Accuracy IRIG-B Fiber-Optic Transceiver
Starting at $209 USD

SEL-3405 transceivers send delay-compensated demodulated IRIG-B signals up to 4 km (2.5 mi).

SEL-9524 GNSS Antenna
Starting at $272 USD

The SEL-9524 is a rugged and reliable antenna for GNSS devices in critical infrastructure applications.

	SEL-2401	SEL-2404	SEL-2407®	SEL-3400	SEL-3401	SEL ICON®	SEL-2488
Applications							
Time Source for Substation	■	■	■	■		■	■
Time Source for Industrial Applications	■	■	■	■		■	■
Time Source for Phasor Measurement Unit (IEEE C37.118.1-2011 Synchrophasors)	■	■	■	■		■	■
Time Source for Recloser	■		■				
Time Source for Line Current Differential Protection	■	■	■	■		■	■
Time Source for Traveling-Wave Fault Location	■	■	■	■		■	■
Time-Synchronized Event Reporting	■	■	■	■		■	■
Long-Distance Viewing, 61 m (200 ft)		■			■		

	SEL-2401	SEL-2404	SEL-2407®	SEL-3400	SEL-3401	SEL ICON®	SEL-2488
Time Sources and Time Distribution							
Demodulated IRIG-B Outputs (Quantity)	1	4	6	12	4*	4	up to 9
Modulated IRIG-B Outputs (Quantity)			1				up to 4
GPS Satellite Tracking	■	■	■			■	■
GLONASS Satellite Tracking (Reference Only)							■
Demodulated IRIG-B Input				■	■	■	
Synchronized Pulse Output	■	■	■				■
Network Time Protocol (NTP) Server							■
IEEE 1588-2008 Precision Time Protocol (PTP) (With IEEE C37.238-2011 Power System and IEC/IEEE 61850-9-3:2016 Power Utility Automation Profiles)						■	+
Satellite Signal Verification							■

	SEL-2401	SEL-2404	SEL-2407®	SEL-3400	SEL-3401	SEL ICON®	SEL-2488
Features							
76.2 mm (3.0 in) LED Display		■			■		
14 mm (0.56 in) LED Display			■	■			■
Rack-Mount Hardware	■	■	■	■	■	■	■
Panel-Mount or Wall-Mount Hardware	■	■	■	■	■	■	+
Universal Power Supply				■	■	■	■
Dual, Redundant, Hot-Swappable Power Supplies						■	■
Power Over Ethernet (PoE) Power Sourcing Equipment (PSE)						■	
Secure Web Interface for Configuration							■
Serial Ports for Configuration	■	■	■				
User-Based Accounts						■	■
TCXO Holdover	■	■	■			■	■
OCXO Holdover							+
Time-Code Cable Delay Compensation				■		■	■[1]
IEEE C37.90 and IEC 60255 Surge and Environmental Standards Compliance	■	■	■	■	■	■	■

	SEL-2401	SEL-2404	SEL-2407®	SEL-3400	SEL-3401	SEL ICON®	SEL-2488
Accuracy							
Average Accuracy (ns)	±100	±100	±100				±40
Peak Accuracy (ns)	±500	±500	±500			±1,000	±100

■ Standard feature   + Model option/accessory

[1] SEL-2488 includes antenna cable delay compensation

Transceivers and Adapters

Many SEL devices come with standard or optional fiber-optic communications ports. Transceivers convert between copper and fiber optics or between other communications interface standards.

Applications
- Single- or multimode fiber
- Distances ranging from 1 m (3.28 ft) to 110 km (68.35 mi)

Related Material
Fiber-Optic Products and Applications
selinc.com/api/download/2848

	SEL-2800	SEL-2810	SEL-2812	SEL-9220	SEL-2814	SEL-2815	SEL-2820	SEL-2824	SEL-2829	SEL-2830	SEL-2831	SEL-2894
Connector and Optics												
V-Pin, 650 nm Wavelength	▪	▪					▪					
ST, 850 nm Wavelength			▪	▪	▪	▪		▪				▪
ST, 1,300 nm Wavelength									▪	▪		
ST, 1,550 nm Wavelength											▪	
Fiber Compatibility												
200 µm Core Multimode Fiber (SEL-C805)	▪	▪	▪	▪	▪	▪	▪	▪				
50 or 62.5 µm Core Multimode Fiber (SEL-C807, SEL-C808)			▪	▪	▪	▪		▪				▪
9 µm Core Single-Mode Fiber (SEL-C809)									▪	▪	▪	
Electrical Features												
EIA-232 Asynchronous Serial Data	▪	▪	▪		▪	▪			▪	▪		▪
EIA-485 Asynchronous Serial Data				▪			▪	▪				
DTE/DCE Switch					▪	▪			▪	▪	▪	
IRIG-B Transfer With Data		▪	▪	▪								
Hardware Flow Control Lines With Data					▪			▪				
Power From Electrical Port Pins	▪	▪	▪	▪	▪	▪			▪	▪	▪	▪
External Power Jack or Terminals					▪		▪	▪				
Distances												
Minimum (metric)	1 m	1 m	1 m	1 m	1 m	2 km	1 m	1 m	1 m	16 km	16 km	1 m
Minimum (U.S.)	3.28 ft	3.28 ft	3.28 ft	3.28 ft	3.28 ft	1.24 mi	3.28 ft	3.28 ft	3.28 ft	9.94 mi	9.94 mi	3.28 ft
Maximum (metric)	500 m	500 m	4 km	4 km	4 km	15 km	500 m	4 km	23 km	80 km	110 km	2 km
Maximum (U.S.)	0.3 mi	0.3 mi	2.48 mi	2.48 mi	2.48 mi	9.3 mi	0.3 mi	2.48 mi	14.3 mi	49.7 mi	68.3 mi	1.2 mi

▪ Standard feature

SEL-2800/2815 Fiber-Optic Transceivers
Starting at $115 USD

Improve safety, signal integrity, and reliability of EIA-232 communications by using multimode SEL-2800 or SEL-2815 transceivers instead of wire.

SEL-2810/2812/2814 Fiber-Optic Transceivers
Starting at $147 USD

Use EIA-232 multimode fiber-optic transceivers instead of wire. The SEL-2810 and SEL-2812 support IRIG-B time signals, while the SEL-2814 works with hardware flow control signals.

SEL-2829/2830/2831 Single-Mode Fiber-Optic Transceivers/Modems
Starting at $408 USD

Apply the SEL-2829, SEL-2830, or SEL-2831 to use two optical fibers instead of wire to transfer bidirectional serial data.

SEL-2820/2824 Multimode Fiber-Optic EIA-485 Transceivers
Starting at $272 USD

Apply an SEL-2820 or SEL-2824 to safely add isolated segments to multidrop and point-to-point EIA-485 networks.

SEL-2890 Ethernet Transceiver
Starting at $220 USD

Add Ethernet connectivity to an SEL device using its EIA-232 serial port with the SEL-2890.

SEL-9192 Utility-Grade USB Modem
Starting at $272 USD

Connect remote terminal units (RTUs), communications processors, and other equipment with the SEL-9192 for dial-up or dial-out engineering access.

SEL-9220 Fiber-Optic Adapter for SEL-300 Series Relays
Starting at $356 USD

Convert the EIA-485 port of an SEL-300 series relay to a point-to-point fiber-optic port with the SEL-9220.

SEL-2894 Interface Converter
Starting at $387 USD

Apply the SEL-2894 to transfer SEL Mirrored Bits® communications via an IEEE C37.94 fiber-optic link through a communications multiplexer.

SEL-2886 EIA-232 to EIA-485 Interface Converter
Starting at $147 USD

Connect EIA-232 devices to an EIA-485 network with SEL-2886 converters.

Cables

selinc.com/products/cables

SEL manufactures high-quality cables for connecting a variety of devices. Each cable is quality-tested to ensure reliability and proper operation. Choose the cable types and lengths to match your applications using the SEL-5801 Cable Selector program.

Applications

- GPS and radio antenna connections and IRIG-B time distribution
- Serial communications over long distances without risk of electromagnetic interference
- Adaption and connection to USB ports

Software

SEL-5801 Cable Selector

selinc.com/software/downloads/?filter=SEL-5801

SEL-C804 Multimode Arc-Flash Detection Fiber-Optic Cable

Starting at $56.43 USD

Use SEL-C804 cables with SEL-751 and SEL-851 Feeder Protection Relays and with SEL-710-5 Motor Protection Relays.

SEL-C805 200 µm Multimode Fiber-Optic Cable

Starting at $42.85 USD

Connect V-pin or ST ports with SEL-C805 cable assemblies.

SEL-C807 62.5/200 µm Multimode Fiber-Optic Cable

Starting at $53.30 USD

Use SEL-C807 cable assemblies to connect ST or LC ports.

SEL-C808 62.5/125 µm Multimode Fiber-Optic Cable

Starting at $55.39 USD

Connect ST, SC, or LC ports with SEL-C808 cable assemblies.

SEL-C809 9 µm Single-Mode Fiber-Optic Cables

Starting at $58.52 USD

Use SEL-C809 cable assemblies to connect ST, SC, or LC ports.

Category 5e Ethernet

Starting at $33.44 USD

Apply high-quality, shielded twisted-pair (STP) Category 5e Ethernet cables for copper Ethernet connections.

Coaxial Cables

Starting at $16.72 USD

Use SEL Coaxial Cables for GPS and radio antenna connections and IRIG-B time distribution.

USB Serial Cables

Starting at $68.97 USD

Add a 1.8 m (6 ft) or 4.6 m (15 ft) EIA-232 serial port cable to a PC USB port to communicate with SEL relays and other devices with EIA-232 serial ports.

Electrical Data Cables

Starting at $27.17 USD

Apply SEL Electrical Data Cables to reliably connect SEL products and other devices, including relays, information processors, computers, I/O modules, meters, clocks, and modems.

Connector

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
V-Pin	■	■	■	■								
ST	■	■	■	■	■	■	■	■	■	■	■	■
LC					■	■	■	■	■	■	■	■
SC							■	■	■	■	■	■

Fiber Diameter (Core/Outer)

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
1,000 µm	■											
200 µm		■	■	■								
62.5/200 µm					■	■						
62.5/125 µm							■	■	■			
9/125 µm										■	■	■

Wavelength

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
650 nm (Multimode)		■	■	■								
850 nm (Multimode)		■	■	■	■	■	■	■	■			
1,300 nm (Multimode)					■	■	■	■	■			
1,300–1,550 nm (Single-Mode)										■	■	■

Fiber Count

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
Simplex (1 Fiber)	■	■			■		■	■		■	■	
Duplex (2 Fibers)	■	■	■	■	■	■	■	■	■	■	■	■
Quad (4 Fibers)			■	■		■			■			

Cable Ratings

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
Riser-Rated (OFNR)		■	■		■		■			■		
Plenum-Rated (OFNP)								■			■	
Water-Blocked			■									
Waterproof				■		■			■			■

Jacket Material

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
Polyvinyl Chloride (PVC)		■	■			■	■	■	■	■	■	■
Polyethylene (PE)	■			■	■							

Termination Kits

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
V-Pin Termination Kit	■	■	■	■								
ST Termination Kit	■	■	■	■	■	■						
LC, ST, and SC Termination Kit							■	■	■	■	■	■

Options

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
Bulk (No Connectors)	■	■	■	■	■	■	■	■	■	■	■	■
Pulling Loop			■	■		■			■			

Fiber-Optic Compatibility

	SEL-C804	SEL-C805Z	SEL-C805D	SEL-C805G	SEL-C807Z	SEL-C807G	SEL-C808Z	SEL-C808P	SEL-C808G	SEL-C809Z	SEL-C809P	SEL-C809G
SEL-2800/2810/2820		■	■	■								
SEL-2812/2814/2815/2824/3405/9220		■	■	■	■	■	■	■	■			
SEL-2829/2830					■	■	■	■	■	■	■	■
SEL-2831										■	■	■
SEL-751/751A/710-5 Arc-Flash Detection	■											
Multimode Fiber-Optic Ethernet					■	■	■	■	■			
Single-Mode Fiber-Optic Ethernet										■	■	■

■ Standard feature

Remote I/O

selinc.com/products/distribution/protection/remote-i-o

Remote I/O modules transfer data from remote locations over fiber and expand the I/O of SEL relays, automation controllers, and other devices without modification to the control panel face.

Applications

- Provide additional I/O for SEL protective relays and information processors
- Save wiring via I/O multiplexing
- Implement teleprotection
- Improve safety with optical fiber

Case Study

Remote I/O Modules Enable DC Substation Transfer Trip for Expanding Denver Light Rail System
selinc.com/api/download/2723

SEL-2505/2506/2507 Remote I/O Module
Starting at $575 USD

Connect a remote I/O module to a fiber-optic port or transceiver on a protective relay to add digital I/O. Or, wire the module I/O to relay I/O to add SEL MIRRORED BITS® teleprotection.

SEL-2515/2516 Remote I/O Module
Starting at $575 USD

Connect these remote I/O modules, which are suitable for use in automation systems, to SEL information processors to easily expand inputs and outputs.

SEL-3094 Interface Converter
Starting at $742 USD

Implement the SEL-3094 to convert electrical teleprotection interfaces to the IEEE C37.94 optical standard for improved safety, signal integrity, and communication over longer distances.

SEL-2595 Teleprotection Terminal
Starting at $1,820 USD

Use the SEL-2595 to securely transfer teleprotection signals through a high-speed IEEE C37.94 optical-fiber interface.

Number of I/O Channels	SEL-2505	SEL-2506	SEL-2507	SEL-2515	SEL-2516	SEL-2595
Digital Inputs (DI) Base	8	8	8	8	8	8
DI Maximum	8	8	8	8	8	8
Digital Outputs (DO) Base	8	8		8	8	8
High-Speed DO Base			8			
DO Maximum	8	8	8	8	8	8

Serial Communications Protocols	SEL-2505	SEL-2506	SEL-2507	SEL-2515	SEL-2516	SEL-2595
SEL MIRRORED BITS Communications	▪	▪	▪			
SEL Fast Messages				▪	▪	
IEEE C37.94						▪

Mounting	SEL-2505	SEL-2506	SEL-2507	SEL-2515	SEL-2516	SEL-2595
Surface/Wall Mount	▪			▪		
Rack Mount		+	+		+	+
Panel Mount/Projection Panel Mount		+	+		+	+

▪ Standard feature   + Model option

Annunciation and Notification

selinc.com/products/automation/operations/annunciation

Annunciation and notification devices provide local and remote notification to improve situational awareness, efficiency, and safety.

They display alarm conditions, and their communications ports enable integration with relays and control systems.

SEL-2523 Annunciator Panel

Starting at $4,010 USD

Provide local and remote notifications with the SEL-2523, which includes programmable logic and up to four communications ports.

SEL-2522 Alarm Panel

Starting at $2,280 USD

Apply the SEL-2522 with up to 36 inputs to easily view the status of alarms and operating events.

SEL-2533 Annunciator

Starting at $1,640 USD

Use the compact, ten-window SEL-2533 to provide local and remote annunciation.

Applications	SEL-2522	SEL-2523	SEL-2533
Local Visual Indication	■	■	■
Remote Visual Indication		■	■
Local Audible Indication	■	■	■
Remote Audible Indication	■	■	■
Telephone Dial-Out Messages		■	■
Local SELOGIC® Control Equations and Time Tagging		■	■

Mounting and Labeling	SEL-2522	SEL-2523	SEL-2533
Rack Mount	+	+	
Panel Mount	+	+	■
User-Defined Slide-In Labels	■	■	■

Inputs, Outputs, and HMI	SEL-2522	SEL-2523	SEL-2533
General-Purpose Digital Inputs	36	42	14*
Acknowledge, Reset, Test Digital Inputs	3	6	4*
General-Purpose Digital Outputs	1	11	14*
Alarm Digital Output	1	1	1
General Display LEDs/Windows	36	36	10
Enabled LED	1	1	1
Pushbuttons	3	4	4
Base Serial Ports		3	3
Optional Additional EIA-232 or EIA-485 Port		1	1
IRIG-B Time Input		1	1
ISA Annunciation Alarm Sequence Choices	2	8	8

Serial Communications Protocols

	SEL-2522	SEL-2523	SEL-2533
SEL MIRRORED BITS® Communications		■	■
SEL Fast Messages		■	■
Send SEL Messenger Points		■	■
Modbus RTU		■	■
DNP3 Level 2 Outstation		+	+

■ Standard feature   + Model option

Software

SEL software optimizes the configuration and management of device and system settings. Use it to display and analyze relay event data, element operation, and more to gain a better understanding of the power system.

SEL Compass® keeps software applications and relay configuration drivers up to date and includes SEL instruction manuals, application guides, hardware drivers, and more.

Webinars

SEL Blueframe—A Secure Application Platform Designed for Operational Technology Systems

selinc.com/events/on-demand-webinar/133930

Discover Life After QuickSet—Introducing SEL Grid Configurator

selinc.com/events/on-demand-webinar/129271

Case Study

Real-Time Operational Use Cases for Time-Synchronized Measurements With Synchrowave Operations

selinc.com/api/download/134864

Software Product	Configuration	Data Collection and Management	Visualization and Analysis
ACSELERATOR QuickSet® SEL-5030 Software	■		
SEL Grid Configurator	■		
ACSELERATOR Architect® SEL-5032 Software	■		
ACSELERATOR RTAC® SEL-5033 Software	■		
ACSELERATOR Diagram Builder™ SEL-5035 Software	■		
ACSELERATOR® Bay Screen Builder SEL-5036 Software	■		
SEL-5056 Software-Defined Network Flow Controller	■		■
SEL-5051/5052 Client/Server Network Management System (NMS) Software	■	■	■
ACSELERATOR TEAM® SEL-5045 Software		■	
SEL Blueframe™ Application Platform - Data Management and Automation (DMA) Application Suite - Fault Location, Isolation, and Service Restoration (FLISR) Application		■	
SEL-5057 SDN Application Suite—Flow Auditor		■	
SEL-5230 ACSELERATOR Database API		■	
SEL-5231 Configuration API		■	
SEL-5073 SYNCHROWAVE® Phasor Data Concentrator (PDC) Software		■	
SEL-5601-2 SYNCHROWAVE Event Software			■
ACSELERATOR Meter Reports SEL-5630 Software			■
SEL-5702 Synchrowave Operations Software			■
SEL-5703 Synchrowave Monitoring			■

Example System Diagram
Use SEL software solutions to optimize the configuration and management of SEL devices and networks, provide advanced automation and data collection capabilities, and offer robust tools for data visualization and analysis.

AcSELerator QuickSet
Included with supported products

QuickSet is a tool to configure, commission, and manage devices for power system protection, control, metering, and monitoring.

SEL Grid Configurator NEW
Included with supported products

Grid Configurator makes creating, managing, and deploying settings more efficient with its spreadsheet-style editor, protection visualization, comprehensive reporting, custom filters, and multiple-device settings management.

AcSELerator Architect
Included with supported products

Architect streamlines the configuration and documentation of IEC 61850 messages, controls, and reports.

AcSELerator RTAC
Included with SEL RTAC purchase

AcSELerator RTAC is an intuitive, easy-to-use application designed to configure the SEL Real-Time Automation Controller (RTAC) family of products, including the SEL-2240 Axion®.

AcSELerator Diagram Builder
Included with RTAC HMI purchase

Diagram Builder enables the creation and management of HMI visualization projects for the SEL RTACs in your system.

Bay Screen Builder
Included with QuickSet and AcSELerator RTAC

Bay Screen Builder, which works with QuickSet and AcSELerator RTAC, enables the custom creation of bay screens for SEL devices with touchscreen displays.

Software-Defined Network Flow Controller
Included with SEL software-defined networking (SDN) switch purchase

The Flow Controller is the central interface for the commissioning, configuration, and monitoring of all SEL SDN-enabled Ethernet switches.

Client/Server Network Management System
Starting at $5,420 USD

The SEL ICON® client/server NMS software helps maintain a secure, reliable, and efficient communications infrastructure.

AcSELerator Team
Starting at $2,710 USD for 25 devices

Team automates the collection of power system data from multiple devices and stores the data in a central location for easy access.

SEL Blueframe Application Platform NEW
Starting at $1,050 USD

Scalable and flexible, SEL Blueframe provides a secure operational technology (OT) platform for installing applications and for managing and exchanging data between supported applications.

Blueframe: DMA Application Suite NEW
Starting at $5,230 USD

SEL DMA applications automatically collect, store, and manage device-specific information to simplify day-to-day management of a system of devices and to support compliance efforts.

Blueframe: FLISR Application NEW
Contact SEL for pricing

FLISR is a wide-area control application that locates faults, isolates them, and automatically restores power to healthy portions of affected lines or feeders.

SDN Application Suite
Flow Auditor starting at $1,940 USD

This suite is a collection of software applications that integrate with the SEL-5056 Software-Defined Network Flow Controller to add capabilities to SEL SDN solutions.

acSELerator Database API
Starting at $5,420 USD

Third-party and enterprise-level systems access acSELerator Team data via the Database API to integrate data reporting.

SEL Configuration API
Starting at $5,420 USD

This API provides an integrated approach to managing SEL device configuration data, offering read/write access to device identification information, connection parameters, passwords, and settings stored in the acSELerator Database.

synchroWAVe PDC
Starting at $4,330 USD

synchroWAVe PDC provides synchrophasor aggregation and time alignment for downstream applications and inter-entity data sharing.

synchroWAVe Event
Starting at $544 USD

synchroWAVe Event displays SEL relay event reports and COMTRADE files to assist with analysis.

acSELerator Meter Reports
Starting at $2,710 USD for 25 devices

Meter Reports offers interactive charts, fast database interrogation, and the ability to customize meter reports for utilities, industrial operations, and site-wide campus monitoring.

Synchrowave Operations
Starting at $52,250 USD for 50 devices

Synchrowave Operations increases grid safety and reliability through situational awareness with high-resolution time-series data, real-time analytics, and geographical information system (GIS) location information.

Synchrowave Monitoring NEW
Starting at $10,450 USD

Synchrowave Monitoring brings synchrophasor data and relay event reports together into one place so engineers can analyze both the high-level system impact of an event and the detailed oscillography data.

SEL RTAC HMI
Starting at $1,910 USD

The SEL RTAC HMI offers an easy way to visualize data to monitor and control your system.

Accessories and Tools
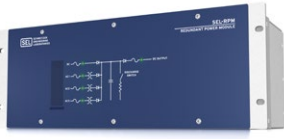
SEL-RPM Redundant Power Module

Starting at $1,890 USD

Use the SEL-RPM to combine as many as three ac sources and one dc source to provide a single reliable dc output (unregulated 125 Vdc).

SEL-4388 MIRRORED BITS® Tester

Starting at $324 USD

Accelerate commissioning and bench testing of SEL MIRRORED BITS links and improve training, maintenance, and cable identification with the SEL-4388.

SEL-4520 Arc-Flash Test Module

Starting at $439 USD

Use the SEL-4520 to conveniently test the operation of arc-flash detection relays installed in metal-clad and metal-enclosed switchgear.

SEL-2652 Trip Coil Monitor

Starting at $220 USD

Verify circuit breaker or lockout relay trip coil and trip circuit connections with the SEL-2652.

SEL-9510 Control Switch Module

Starting at $335 USD

Use the SEL-9510 where independent local control is needed. High-visibility status indication and arc-suppressed contacts are ideal for breaker control.

SEL-2126 Fiber-Optic Transfer Switch

Starting at $2,960 USD

Apply the SEL-2126 to reroute IEEE C37.94 communications for bypass breaker protection during circuit breaker or station bypass operations.

SEL-2910 Port Isolator

Starting at $94 USD

Use the SEL-2910 to protect the EIA-232 ports of data terminal or communications equipment from induced voltages.

SEL-9501 or SEL-9502 Contact Arc Suppressor

Starting at $90.92 USD

Decrease maintenance costs, increase contact reliability, and reduce destructive dc circuit overvoltages with the self-powered SEL-9501/9502 arc suppressors.

SEL-9321 Low-Voltage DC Power Supply or SEL-9322 15 VDC Power Supply

Starting at $168 USD

Provide low-voltage dc power from station battery or ac sources for communications devices and accessories with SEL-9321 and SEL-9322 power supplies.

Custom Panels and Enclosures

SEL designs, manufactures, tests, and delivers custom protection, control, and metering panels, control cabinets, retrofit doors, and enclosures. We integrate multiple pieces of equipment (from SEL and other manufacturers) into a single assembly or kit, enabling one-stop shopping for parts and labor with a quick turnaround time. Our experts will work with you to understand your requirements and challenges and provide innovative, economical solutions built to stringent SEL quality standards.

Customer Story

Distribution Modernization in Kentucky

selinc.com/featured-stories/lge-ku

Complete Design, Manufacturing, Testing, and Commissioning Services

To exactly meet your needs, we offer complete panel and enclosure solutions, from design through commissioning. We test the final implementation of every product or system before it ships, reducing your overall project costs and engineering time. This testing makes commissioning easier and faster.

Complete Panel Solutions

SEL custom panel solutions come with the following options and services:

- Consulting and engineering design
- Testing and verification, including loading settings, functionality, point-to-point wire connectivity, ac/dc circuit operation, and Megger and HiPot testing
- Protection, automation, and control equipment manufacturing
- Field service
- Cabinet design
- Indoor and outdoor applications
- Submersible cabinets for underground distribution and automation
- Delivery in 10–12 weeks

Complete Enclosure Solutions

SEL custom enclosure solutions offer the following options and capabilities:

- Enclosures, racks, bezels, plates, portable enclosures, swing panels, and doors
- Custom adapters that integrate SEL equipment into your existing systems
- Prewired assemblies for easy installation and minimal field wiring
- Wiring conversion assemblies and terminals
- Fully assembled and wired test racks and simulator systems
- Easily extractable assemblies for SEL-700 and SEL-2400 series products
- Assembly for your pre-existing designs
- Stainless steel, mild steel, aluminum, fiberglass, and polycarbonates
- UL508A and CSA-C22.2 No. 14 certification

Configure-to-Order Panels and Retrofit Plates

selinc.com/products/7200

SEL-7200 Configure-to-Order (CTO) Panels and Retrofit Plates provide predesigned, advanced solutions for protection, control, automation, communications, and cybersecurity for substation applications. These panels offer a consistent, methodical design and manufacturing approach, resulting in higher quality, reliability, and performance than traditional custom panels. They are predesigned and come with prevalidated settings, speeding up deployment while guaranteeing functionality. Additionally, CTO panels ship within 4 weeks and achieve up to a

40 percent savings in total cost of ownership versus a comparable custom panel.

CTO panels include all the equipment required for their specified function, including protective relays, test blocks, control switches and lockouts, terminal blocks, and miniature circuit breakers. They are also available with automation and communications options, including an SEL Real-Time Automation Controller (RTAC), SEL-2488 Satellite-Synchronized Network Clock, SEL-2740S Software-Defined Network Switch, and SEL-3620 Ethernet Security Gateway.

Application modules support common protection and automation practices while universal wiring to terminal blocks allows customization flexibility to adapt to any common primary equipment configuration and operation practice.

SEL-7201 Feeder Protection Panel

Starting at $13,590 USD

Provide advanced protection, control and communications for up to four feeders using either SEL-351S Protection Systems or SEL-751 Feeder Protection Relays, provide control using SEL-9510 Control Switch Modules, and provide automation and communications using modules that fit your requirements.

SEL-7203 Distribution Transformer Protection Panel

Starting at $42,950 USD

Provide advanced protection and control for distribution transformers with a single high-/low-side transformer zone boundary using redundant SEL-787 Transformer Protection Relays and SEL-751 relays for overcurrent protection.

SEL-7207 Automation and Communications Panel

Starting at $25,080 USD

Provide advanced time synchronization using the SEL-2488; automation using the SEL RTAC; communications using the SEL-2740S; and cybersecurity using the SEL-3620.

SEL-7202 Line Protection Panel

Starting at $30,730 USD

Provide the most advanced and fastest protection and control for two-terminal, two-breaker transmission lines using phasors and time-domain technology. Relay options include the SEL-T401L Ultra-High-Speed Line Relay; SEL-411L Advanced Line Differential Protection, Automation, and Control System; SEL-421 Protection, Automation, and Control System; or SEL-311C Transmission Protection System.

SEL-7206 Distribution Bus Differential Protection Panel

Starting at $25,500 USD

Provide optimized low-impedance bus differential protection for distribution buses with one main, one tie, and up to five feeders using the SEL-487B Bus Differential and Breaker Failure Relay.

SEL-7210 Retrofit Protection Plate

Starting at $8,570 USD

Retrofit and modernize existing panels or switchgear using plates that provide advanced protection, control, and communications using either SEL-351S or SEL-751 relays.

Engineering Services

With a history of support and partnership involving projects throughout the world, SEL Engineering Services offers turnkey solutions for power system protection, automation, communications, and control. Every solution is custom-engineered with an array of field-proven SEL products—all backed by our ten-year warranty and 24/7 emergency technical support.

Our local engineering teams provide consulting services and specialized solutions for projects of any scale, ranging from retrofits and upgrades to microgrids and nation-wide power systems. Offering onsite and remote support, SEL Engineering Services is your partner throughout the entire process—from design and testing to commissioning and maintenance.

FEATURED SERVICES AND SOLUTIONS

Substation Automation, Protection, and Control Solutions

Our engineers leverage their expertise in advanced relay and automation technology to design, test, and implement comprehensive substation solutions. They offer complete protection systems and scalable automation solutions for generation, transmission, and distribution applications—as well as a range of services to support your ongoing substation improvements.

Power Management and Microgrid Control Solutions

POWERMAX® Power Management and Control Systems intelligently balance generation and load at subcycle speeds to maintain grid stability, prevent widespread outages, and reduce energy costs. These solutions are designed for a variety of applications, including industrial power management systems, remedial action schemes for utilities, and microgrid control systems for commercial, military, and mobile microgrids.

Cybersecurity Services

Our cybersecurity specialists offer an array of products and services to help you develop more secure networks for your operational technology (OT) systems. They provide site vulnerability assessments, comprehensive mitigation strategies, and streamlined solutions for maintaining regulatory compliance and managing system security.

ADDITIONAL OFFERINGS

- NERC CIP compliance
- Substation engineering services
- SCADA systems and substation HMIs
- Distribution network automation
- Wide-area monitoring systems (WAMS)
- Arc-flash solutions
- Remote terminal unit (RTU) replacements
- Digital fault recording (DFR) systems
- System modeling and studies
- Design and drafting services
- Civil engineering services

Ordering

Online Configuration and Ordering

Configure products to meet your exact application needs and order them online with an SEL account. Once logged in, select "Configure and Order" on a product webpage to choose from available model options, including items like power supply voltages, inputs and outputs, communications ports and protocols, and conformal coating. Save individual products to your cart, create projects to house specific product orders, and request a quote—all online. For products that do not require configuration or have been identified as common product configurations, select "Popular Models" on a product webpage to quickly and easily find the model you want.

Ordering Support

Our sales representatives and customer service teams are always happy to answer questions and help configure the right SEL solution for your application. See pages 70–71 for regional sales contact information, or visit selinc.com/support.

Fast Build Times

We measure our manufacturing build time in days, not weeks. Thanks to our streamlined assembly lines and build processes, and influenced by world-class manufacturing principles, many of our products ship in just five days.

Ship From Stock

Our ship-from-stock products typically ship within two business days. Short build times combined with ship-from-stock products and on-time deliveries means we work hard to get you what you need when you need it.

Popular Models

The Popular Models program makes selecting and ordering SEL products simple, fast, and convenient. SEL popular models are products preconfigured for popular applications and available for many SEL devices. Specific popular models may ship from stock, typically leaving our warehouse within two business days. When available, the popular model configurations are displayed on the related SEL product webpage, where you can also view their technical details and popular applications. You can order these models directly from SEL or through your SEL sales representative.
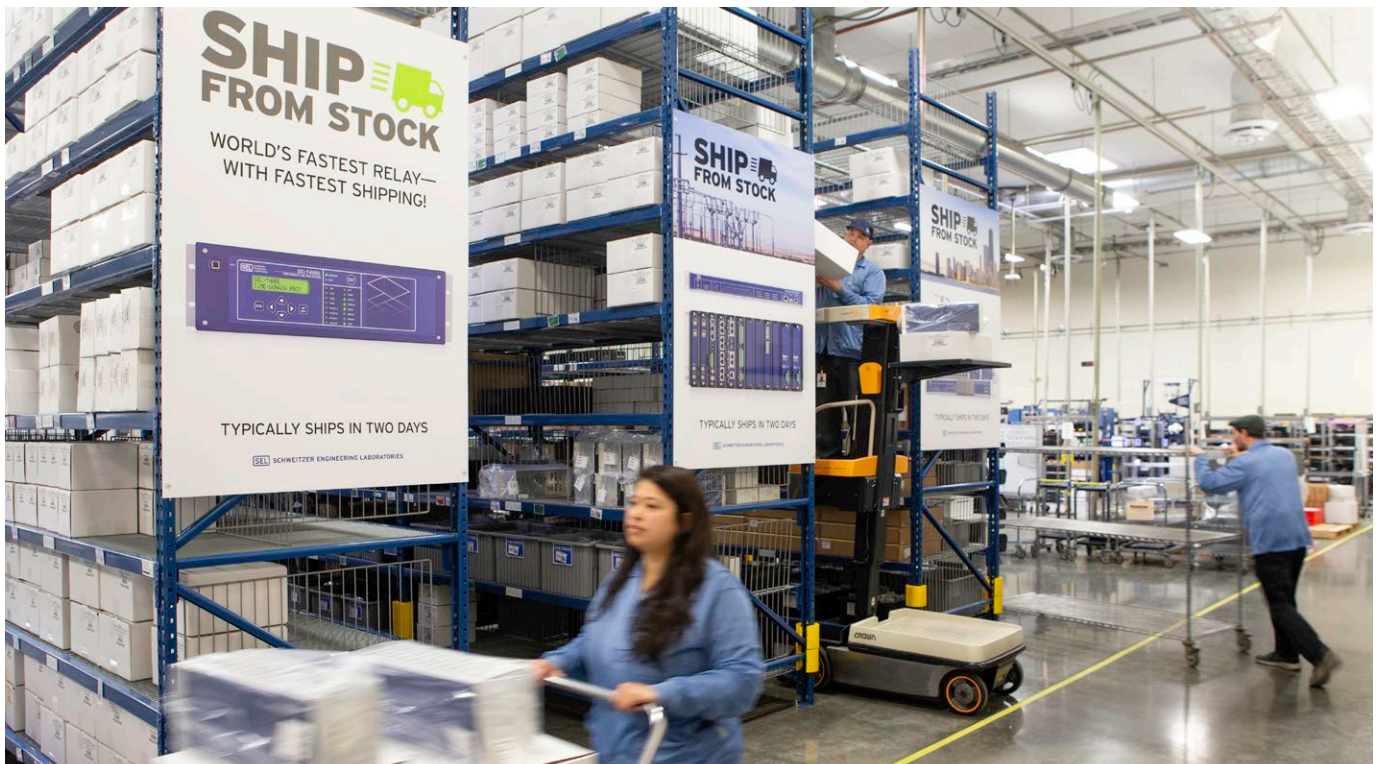
Education and Training

Online Technical Resources

Get access to secure product information, configure and order products, and register for trainings with an SEL account. Head to selinc.com and click "Login" at the top right corner of your screen. You'll be able to:

- Access secure product information, like application guides and instruction manuals.
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- View on-demand virtual seminar presentations.
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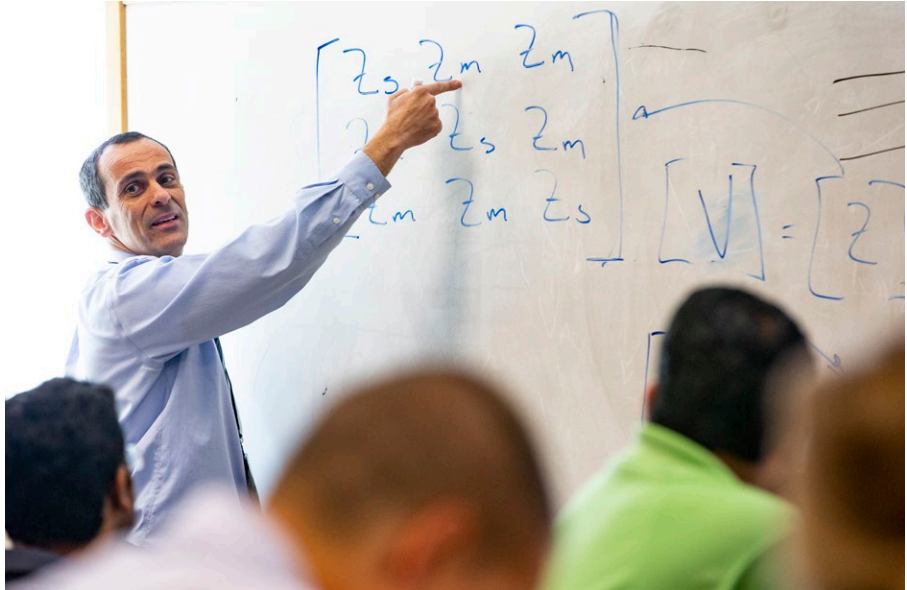
Schweitzer Drive Podcast

Our "Schweitzer Drive" podcast explores what goes on between the generation of electricity and the light switch. In each episode, SEL CEO Dave Whitehead talks with the entrepreneurs, innovators, and experts who are inventing the future of electric power. Visit selinc.com/company/podcast to listen.

SEL University

Learn about everything from power system fundamentals to advanced product applications—while earning Professional Development Hours (PDHs)—with courses from SEL University. Our flexible learning format includes virtual, on-demand, and in-person classes that are taught by the same engineers who design SEL equipment and solutions, support customers, and author industry publications. Our power system experts have trained tens of thousands of industry professionals worldwide to help them meet the technical challenges of integrating digital technologies into their expanding power system infrastructure.

SEL University covers topics such as:

- Introduction to SEL relays.
- Cybersecurity and securing operational technologies (OT) networks.
- SEL Real-Time Automation Controller (RTAC) applications.
- Protecting power systems for engineers.

See available courses and register at selinc.com/selu.

Technical Papers, Webinars, and Videos

SEL power system experts have authored more than 1,000 technical papers, hosted hundreds of webinars, and developed dozens of support videos. They are dedicated to teaching about how our technologies solve complex power system challenges and about how we partner with our customers to solve tough problems. Head to selinc.com to access our library of educational material, including these top 10 downloaded technical papers:

Fundamentals and Advancements in Generator Synchronizing Systems
selinc.com/api/download/9145

Considerations for Using High-Impedance or Low-Impedance Relays for Bus Differential Protection
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Beyond the Knee Point: A Practical Guide to CT Saturation
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Current Transformer Accuracy Ratings
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Review of Ground Fault Protection Methods for Grounded, Ungrounded, and Compensated Distribution Systems
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Charging Current in Long Lines and High-Voltage Cables—Protection Application Considerations
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Understanding Generator Stator Ground Faults and Their Protection Schemes
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Percentage Restrained Differential, Percentage of What?
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Bookstore

Visit the SEL bookstore at selinc.com/bookstore for focused, technical paper anthologies, like the following:

- Modern Solutions for Protection, Control, and Monitoring of Electric Power Systems
- Synchronous Generator Protection and Control
- Wide-Area Protection and Control Systems
- Sensible Cybersecurity for Power Systems
- Line Current Differential Protection
- Locating Faults and Protecting Lines at the Speed of Light

Modern Solutions for Protection, Control, and Monitoring of Electric Power Systems offers a comprehensive reflection of technologies developed by SEL engineers and spans topics of interest to people working in protection, control, communications, regulation, education, and design.

Online you'll also find these books written by Stanley E. Zocholl, an SEL Distinguished Engineer and IEEE Life Fellow:

- Analyzing and Applying Current Transformers
- AC Motor Protection

Customer Support
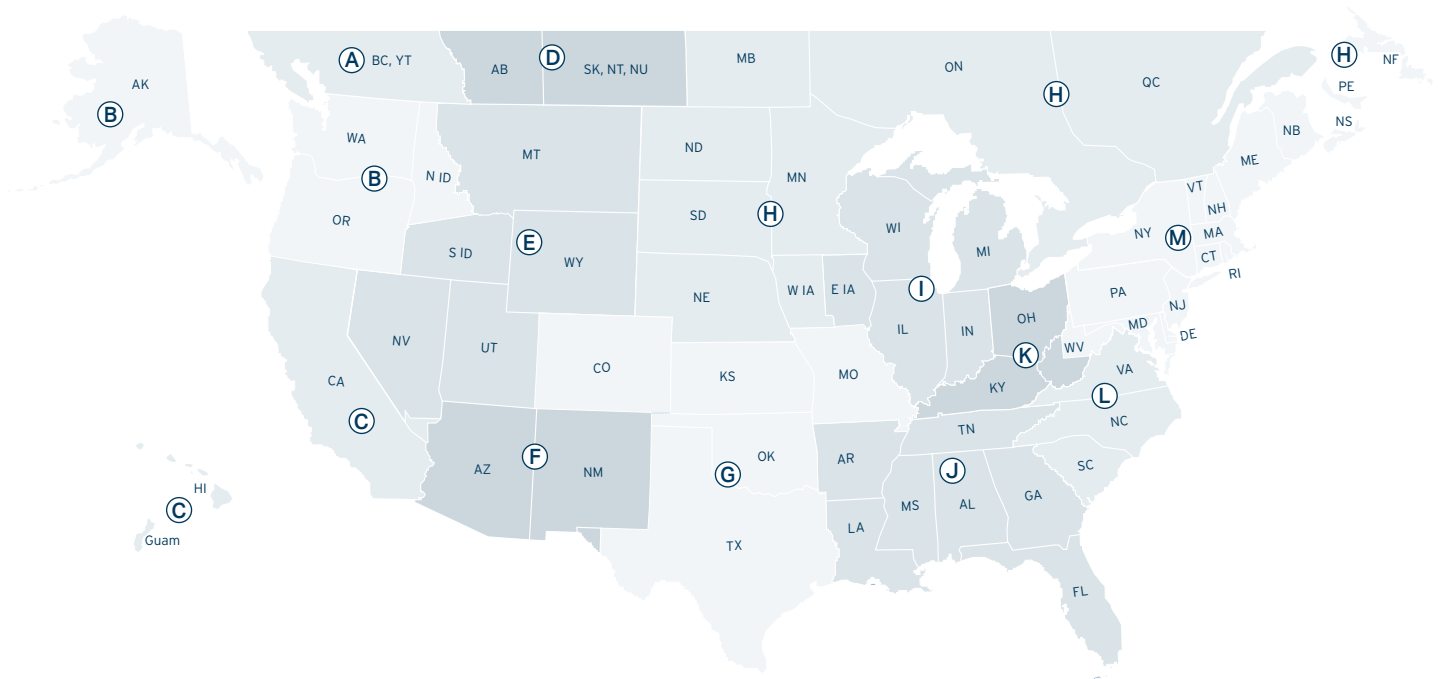
United States and Canada Sales Contact Information

A British Columbia Territory
Tel: +1.604.297.3020
Fax: +1.509.332.7990
nw_quotes@selinc.com
selinc.com/support

B Peak Measure, Inc.
Tel: +1.360.263.0123
Fax: +1.360.263.0124
orders@peakmeasure.com
peakmeasure.com

C Matzinger-Keegan, Inc.
Tel: +1.949.852.1006
Fax: +1.949.852.1446
sales@mkireps.com
mkireps.com

D PowerNet Measurement & Control, Ltd.
Tel: +1.403.571.4735
Fax: +1.403.571.4736
powernet@powernet-mcl.com
powernet-mcl.com

E Rocky Mountain Territory
Tel: +1.509.336.2666
Fax: +1.509.332.7990
nw_quotes@selinc.com
selinc.com/support

F Arizona Sun Sales, Inc.
Tel: +1.602.437.0469
Fax: +1.602.437.0485
sales@arizonasunsales.com
arizonasunsales.com

G KD Johnson, Inc.
Tel: +1.903.587.3373
Fax: +1.903.587.2509
quotes@kdjinc.com
kdjinc.com

H Pro-Tech Power Sales, Inc.
Tel: +1.651.633.0573
Fax: +1.651.633.0610
sales@pro-techpower.com
pro-techpower.com

I A Star Electric Co.
Tel: +1.847.439.4122
Fax: +1.847.439.4631
support@astareg.com
astareg.com

J Power Connections, Inc.
Tel: +1.334.702.6650
Fax: +1.334.702.0051
info@powerconnections.com
powerconnections.com

K Utility & Industrial Products, Inc.
Tel: +1.888.520.6231
Fax: +1.866.862.3790
sales@uandiproducts.com
uandiproducts.com

L Atlantic Power Sales, LLC
Tel: +1.704.812.8694
Fax: +1.704.754.4146
sales@atlanticpowersales.com
atlanticpowersales.com

M Robinson Sales, Inc.
Tel: +1.802.463.9621
Fax: +1.802.463.1413
support@robinsonsales.com
robinsonsales.com

Global Sales Contact Information

Corporate Headquarters
USA and Canada
Email: info@selinc.com
Pullman, WA, USA
Tel: +1.509.332.1890 | Fax: +1.509.332.7990

Latin America
Mexico
Email: mexicoinfo@selinc.com
San Luis Potosí | Tel: +52.444.804.2100
Mexico D.F. | Tel: +52.55.9171.8900
Monterrey | Tel: +52.818.625.2550
Villahermosa | Tel: +52.993.478.3940
Guadalajara | Tel: +52.33.1253.3550
Hermosillo | Tel: +52.66.2500.6150
Torreon | Tel: +52.871.478.6100

Central America and Caribbean
Email: latinamericainfo@selinc.com
Trinity, FL, USA | Tel: +1.727.494.6000

Andina—Colombia, Ecuador, and Venezuela
Email: latinamericainfo@selinc.com
Bogotá, Colombia | Tel: +57.1.823.7561

Andina—Bolivia and Peru
Email: latinamericainfo@selinc.com
Lima, Peru | Tel: +51.1.447.7753

Austral—Argentina, Chile, Uruguay, and Paraguay
Email: latinamericainfo@selinc.com
Buenos Aires, Argentina | Tel: +54.11.4765.2146

Brazil
Campinas-SP | Curitiba-PR | Salvador-BA
Email: brasilinfo@selinc.com
Tel: +55.19.3515.5000 | Fax: +55.19.3515.2011

Europe and Eurasia
Northern Europe
Email: sel_northerneurope@selinc.com
Stafford, U.K. | Tel: +44.178.524.9876 Ext. 3
Eindhoven, Netherlands | Tel: +31.40.258.1188

Southern Europe
Email: sel_southerneurope@selinc.com
Madrid, Spain | Tel: +34.910.165.051
Milan, Italy | Tel: +39.02.3652.0632

Eurasia
Email: sel_eurasia@selinc.com
Atyrau, Kazakhstan | Tel: +7.712.230.3121
Tbilisi, Georgia | Tel: +995.32.243.0660

India, Middle East, and Africa (IMEA)
Indian Subcontinent
Email: indiainfo@selinc.com
Delhi | Tel: +91.11.4520.5500
Bangalore | Tel: +91.80.4246.4200
Mumbai | Tel: +91.22.2536.3736

Saudi Arabia
Email: middleeastinfo@selinc.com
Khobar | Tel: +966.13.821.8900
Riyadh | Tel: +966.11.263.2044

Middle East and Northern Africa
Email: middleeastinfo@selinc.com
Manama, Bahrain | Tel: +973.17.587077
Dubai, UAE | Tel: +971.4.392.6333

Western Africa
Email: africainfo@selinc.com
Accra, Ghana | Tel: +233.55.456.0054

Sub-Saharan and Southern Africa
Email: africainfo@selinc.com
Centurion, South Africa | Tel: +27.12.664.5930

Asia Pacific
Southeast Asia
Email: southeastasiainfo@selinc.com
Singapore
Tel: +65.6902.1433 | Fax: +65.6204.6949
Anyang-si, South Korea
Tel: +82.31.340.8180 | Fax: +82.31.340.8183

Oceania
Email: oceaniainfo@selinc.com
Melbourne, Australia
Tel: +61.3.9485.0700 | Fax: +61.3.9480.6560
Brisbane, Australia
Tel: +61.7.3903.9601
Perth, Australia
Tel: +61.8.9201.6800 | Fax: +61.8.9444.6161
Sydney, Australia
Tel: +61.477.023.326
Christchurch, New Zealand
Tel: +64.3.357.1427 | Fax: +64.3.312.0179
Auckland, New Zealand
Tel: +64.9.522.4392 | Fax: +64.3.312.0179
Hamilton, New Zealand
Tel: +64.7.855.5946

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