Fault Indicators, Sensors, and CTs Overview

SEL-FLT and SEL-FLR

Improve distribution reliability with the SEL-FLT and SEL-FLR system, which enables faster fault locating, reduces outage durations, and improves the average restoration time.

SEL-AR360 and SEL-AR

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 up to 69 kV.

SEL-ER

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

SEL-BTRIP

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.

RadioRANGER®

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-8301

Optimize outage management and improve underground system reliability.

SEL-ARU

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

SEL-TPR

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

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

SEL-SR

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

SEL-TR

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

SEL-MW

Use the SEL-MW in place of PTs to detect system voltage loss where exact system voltage measurement reporting is not required. The SEL-MW indicates voltage loss via a contact output.

SEL-PILC

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

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

SEL-MR

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

SEL-VIN

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

SEL-CT

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

SEL-SCT

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.

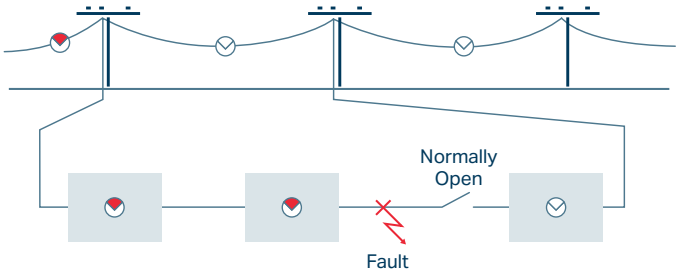
Fault Indicators and Sensors Applications

Overhead, underground, and wireless applications

Easy-to-see displays on SEL fault indicators lead the line crew to the faulted section of the overhead line or underground cable, allowing personnel to visually identify the faulted line section without going through a time-consuming re-fuse and sectionalize process. Applying fault indicators in areas affected by permanent and momentary outages helps resolve disruptions quickly.

Wireless technology further speeds up fault-finding times by reducing the need for patrolling the line to locate the fault. Use SEL fault indicators with distribution protection and automation equipment to improve system reliability indices and reduce operational and maintenance costs.

Improve system planning and operational decision-making by using accurate load data from the SEL-FLT and SEL-FLR Fault and Load Transmitter and Receiver System. These solutions provide underground or overhead load monitoring capability in addition to fault indication.

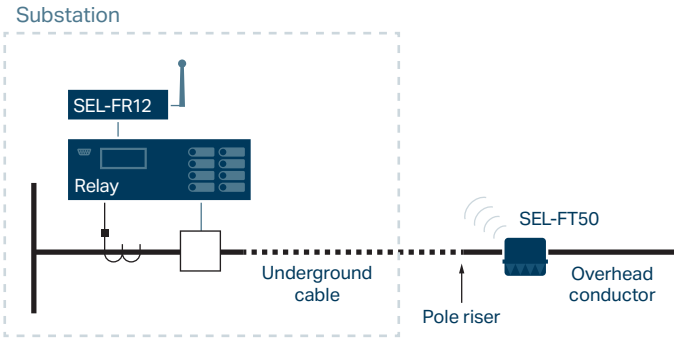


Reduce fault-locating time by 50 percent or more.

High-speed distribution protection

Improve speed, selectivity, and safety in distribution protection by using the SEL-FT50 and SEL-FR12 Fault Transmitter and Receiver System. Using low-latency communications, the system is fast enough to adapt protection schemes to speed up tripping, block reclosing for underground faults, and improve coordination.

To learn more about the SEL-FT50 and SEL-FR12 system, visit **selinc.com/products/FT50**.



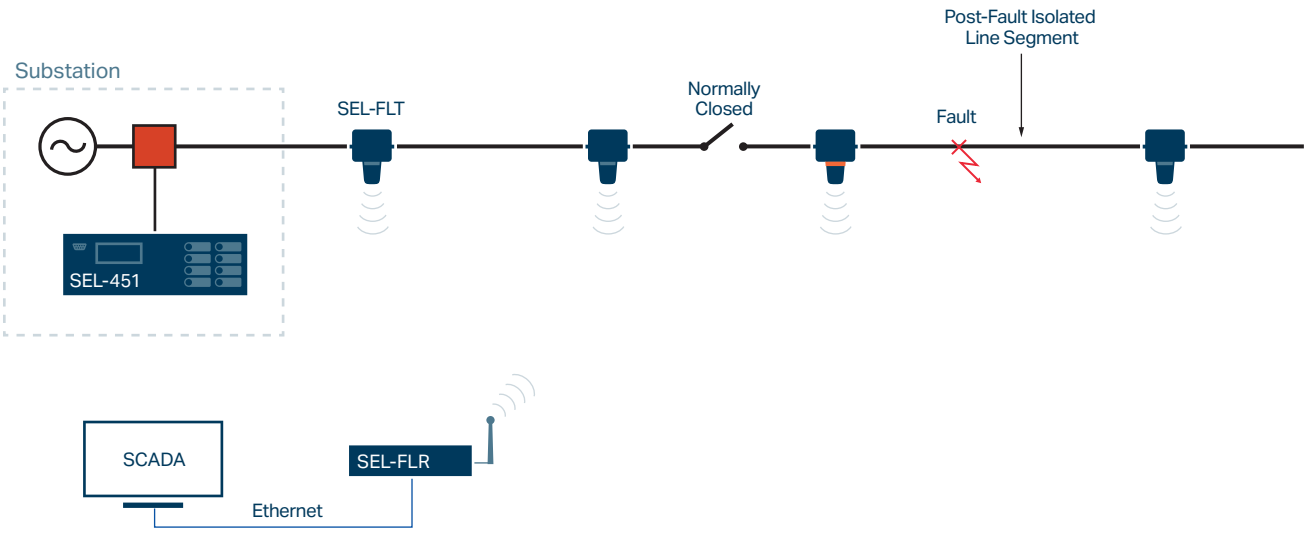
Fast communications: <6 ms from the time of fault detection to relay input for enhanced protection and coordination.

Integration with distribution systems

The SEL-FLT and SEL-FLR Fault and Load Transmitter and Receiver System interconnects with existing SCADA, outage management, and distribution management systems to improve situational awareness.

Place SEL-FLT transmitters next to manual- or remote-operated switches to quickly communicate fault and load status to a single SEL-FLR connected to a distribution management system through an IP backhaul. This provides operations personnel with the status confirmation needed to reconfigure the circuit and restore power to as many customers as possible.

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



Communicate the fault location to a SCADA system for quick power restoration.

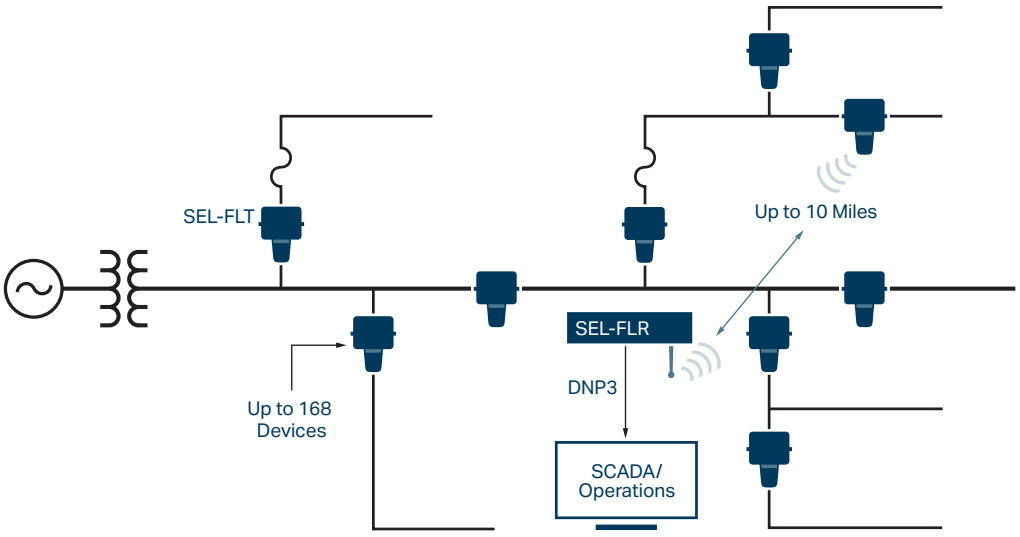
SEL-FLT and SEL-FLR

Fault and Load Transmitter and Receiver System

Starting price
SEL-FLT Fault and Load Transmitter: $850 USD
SEL-FLR Fault and Load Receiver: $1,200 USD

selinc.com/products/FLT

The SEL-FLT and SEL-FLR system improves the overall reliability of your distribution system through accurate fault indication and load monitoring. The SEL-FLT Fault and Load Transmitter and the SEL-FLR Fault and Load Receiver work together over unlicensed 900 MHz wireless communications to locate faults faster and make informed switching decisions. Restoring power quickly is essential to ensuring satisfied customers and better Customer Average Interruption Duration Index (CAIDI) reliability metrics. Locating momentary faults also allows you to address system issues and improve Momentary Average Interruption Frequency Index (MAIFI) metrics. Highly accurate (1% typical) load data enable phase balancing and system planning. Line powering, with as little as 3.5 A of continuous current, reduces ongoing maintenance and allows you to use the SEL-FLT throughout your distribution system. SEL-FLR receivers are easy to integrate in existing systems with DNP3/IP output and comprehensive security.



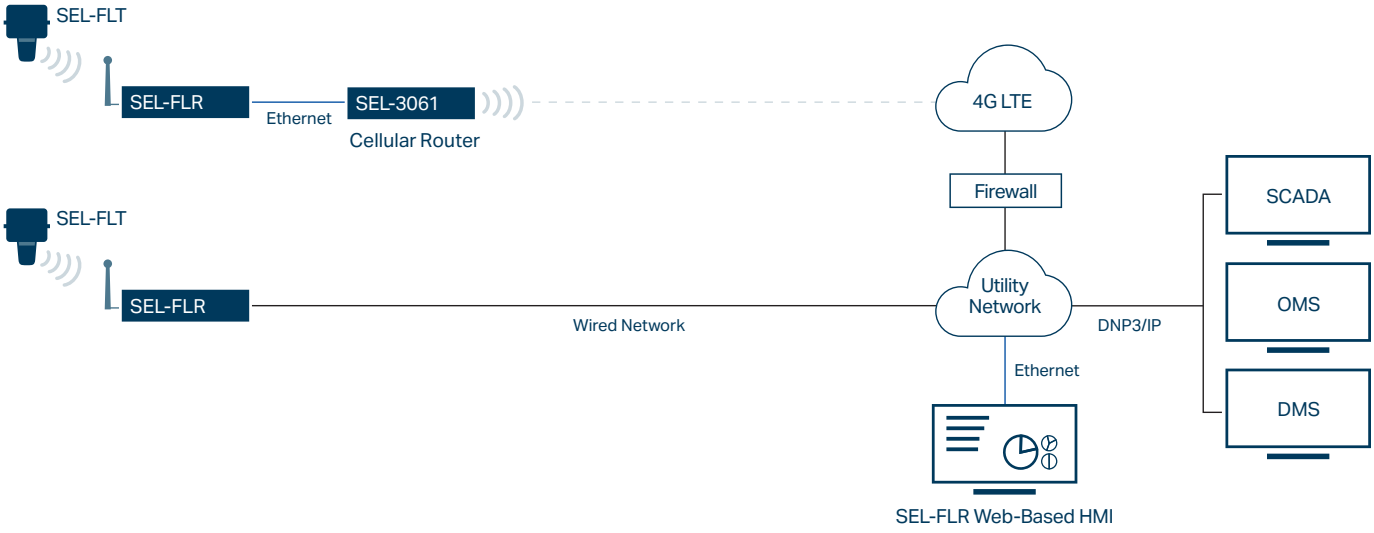
SEL-FLT and SEL-FLR system integrates with your existing system

The SEL-FLR integrates easily into existing networks and centralized SCADA systems with standard Ethernet ports and DNP3/IP output. The SEL-FLR can pair with a cellular modem/router or Ethernet radio or can plug directly into a wired Ethernet network. Once connected, data from the SEL-FLT transmitters can flow into a SCADA system, outage management system (OMS), or distribution management system (DMS). You can perform configuration and troubleshooting of the SEL-FLT and SEL-FLR system over the network.

With fault information from the SEL-FLT and SEL-FLR system, utility operations teams can dispatch crews to fault locations faster, speeding up restoration. Flashing LEDs on the SEL-FLT transmitters help line crews confirm the fault location reported through a SCADA system or OMS.

The SEL-FLT and SEL-FLR system can also help locate momentary faults. Addressing the causes of these faults, such as overgrown tree limbs or aging insulators, reduces future faults and momentary interruptions.

Highly accurate and frequent load data from SEL-FLT transmitters on taps and laterals enables better decision-making in emergency switching situations. Load data are also essential for phase balancing, system planning, and identifying power theft.



SEL-AR360 and SEL-AR

Overhead AutoRANGER® Fault Indicators

Starting price
SEL-AR360: $220 USD
SEL-AR: $170 USD

selinc.com/products/AR

The SEL-AR360 and SEL-AR are self-adjusting fault indicators for distribution systems. The advanced algorithms in the microprocessor-based technology continually measure the load current and automatically step up or down the trip threshold to coordinate with the load. After an event, the fault indicators analyze system conditions to determine a display notification of either a momentary or permanent fault. They also use inrush restraint technology that activates on the loss of current or voltage to prevent tripping on reclosing attempts.

SEL-AR360

The SEL-AR360 works on systems up to 34.5 kV and offers 1,800 flashing hours and a 360-degree ultrabright flashing LED display.

Momentary fault indication.

Permanent fault indication.

SEL-AR

The SEL-AR works on systems up to 69 kV and offers 2,500 flashing hours and a forward-facing LED display.

Momentary fault indication.

Permanent fault indication.

SEL-ER

Overhead Electrostatic Reset Fault Indicator

selinc.com/products/ER

Starting Price
$100 USD

The line-powered SEL-ER displays a permanent fault condition by showing a large reflective red target. The red target remains visible until after the line is re-energized. The hermetically sealed UV-stabilized housing and stainless-steel clamp make the SEL-ER tough enough to handle harsh outdoor environments.

SEL-CRD

Overhead Current Reset Fault Indicator

selinc.com/products/CRD

Starting Price
$160 USD

Powered by load current, the SEL-CRD reduces fault-finding time on overhead power distribution systems. It indicates a faulted line condition by showing a large red reflective target display. The SEL-CRD automatically resets upon restoration of load current.

SEL-BTRIP

Overhead BEACON® Field-Programmable Timed-Reset Fault Indicator

selinc.com/products/BTRIP

Starting Price
$200 USD

The SEL-BTRIP locates momentary or permanent faults in 4,160 V to 69 kV overhead system applications. It is quick and easy to apply using a single hot stick. The field-selectable trip threshold provides control of settings while allowing you to stock only one model. A super-bright flashing LED display provides clear indication of an overcurrent event. The SEL-BTRIP is completely powered by a 3.6 V high-capacity 8.5 Ah lithium battery with a 20-year shelf life.

SEL-BTRI

Overhead BEACON Timed-Reset Fault Indicator

selinc.com/products/BTRI

Starting Price
$130 USD

The battery-powered overhead SEL-BTRI provides automatic reset at the end of a fixed reset period to allow time for crews to locate permanent and momentary faults. It is ideal for locations where false resets from backfeed are a concern, such as applications with single-phase sectionalizing on a three-phase circuit. The loss-of-voltage-activated inrush restraint feature prevents the SEL-BTRI from responding to automatic reclosing events.

RadioRANGER®

Underground Wireless Fault Indication System

Starting price
Interface, Reader, and 3 FCIs: $943 USD

selinc.com/products/RadioRANGER

The RadioRANGER system reduces the need to access vaults to retrieve the status of faulted circuit indicators (FCIs), decreasing fault-locating times and improving utility personnel safety. Utility personnel can quickly and safely retrieve the subsurface FCI status at street level through communication between the SEL-8300 RadioRANGER Wireless Interface and the handheld SEL-8310 RadioRANGER Remote Fault Reader. A two-way communications link transmits both faulted (tripped) and normal (reset) status information, preventing any uncertainty in determining if FCIs are plugged into the interface and functioning.

The IP68-rated SEL-8300 and waterproof interconnection system (rated to 4.5 m [15 ft] of submersion in water) ensure environmental integrity for vault applications. Up to 12 SEL FCIs equipped with magnetic RadioRANGER Interface Probes inductively communicate their status to an SEL-8300. The rugged SEL-8310 provides the ID of nearby SEL-8300 Wireless Interfaces as well as the phase and direction of the fault path. To maximize application efficiency, the modular and scalable system works in a variety of vault configurations and offers an estimated 15 years of product life.

Look for this symbol to identify RadioRANGER-compatible fault indicators and sensors.

SEL-8300 RadioRANGER Wireless Interface

The Wireless Interface communicates fault indicator information to the Remote Fault Reader.

1. Integrated antenna (or optional remote antenna).
2. Sealed, waterproof, and IP68-rated case.
3. Eight easy-to-set IDs allow application in dense areas.
4. Circuit and cable phase labels debossed next to ports to make it simple to match FCIs with cables and circuits during installation.
5. Connects up to 12 fault indicators wired with RadioRANGER Interface Probes.

SEL-8310 RadioRANGER Remote Fault Reader

The Remote Fault Reader identifies the phase and location of underground faults.

6. Flexible antenna.
7. Durable, buoyant case rated to IP54.
8. Wireless Interface health monitor.
9. Displays up to eight unique Wireless Interface IDs.
10. Communicates fault indicator presence and status:
    Red—Tripped fault indicator
    Green—Untripped fault indicator
    Off—No fault indicator present
11. Operates on three alkaline or rechargeable AA batteries.
12. Easy-to-use keypad.

SEL-8301
Underground Distribution Sensor

Starting price
Three-Phase System: $2,190 USD

selinc.com/products/8301

The SEL-8301 optimizes outage management and improves power system reliability. Using a wireless RPMA network, the SEL-8301 sends fault, load current, and water depth information to your control center so you can efficiently dispatch repair crews and reduce outage durations. With a line current measurement accuracy of 1.5 percent, it enables effective switching decisions, letting you restore power to more customers. The flexible design makes the SEL-8301 ideal for underground vaults, pad-mounted switchgear and transformers, and high-rise distribution feeders and transformer rooms.

1. Twist-lock keyed connectors and magnetic mounting make installation easy, even when wearing gloves.
2. Water depth sensor uses ultrasonic waves to determine the water volume in the vault.
3. SEL-8302 Current Transformers can continuously monitor up to 12 different phases. The split-core design makes it easy to attach the sensors to insulated, shielded distribution cables.
4. You can mount remote antennas up to 20 feet from the unit for improved wireless signal strength in underground vaults.

SEL-ARU

Underground AutoRANGER® Fault Indicator

Starting price
$120 USD

selinc.com/products/ARU | Compatible With RadioRANGER®

The SEL-ARU is a reliable, settings-free fault indicator that automatically selects a minimum trip threshold based on the sampled load current. This feature simplifies ordering and inventory, reduces maintenance, and simplifies applications. The Dynamic Delayed Trip feature automatically adjusts the trip response time to better coordinate with upstream protection, maximize performance, and increase the reliability of underground distribution systems.

Display options provide flexibility for pad-mounted or vault installations. The power options (line-powered or battery) and restoration reset features ensure reliable performance for any application.

SEL-ARU with integrated display.

SEL-ARU with fiber-optic display. Other display options are available.

SEL-TPR

Underground Test Point Reset Fault Indicator

Starting price
$72 USD

selinc.com/products/TPR | Compatible With RadioRANGER®

The SEL-TPR is an underground fault indicator that attaches to capacitive test points in single- or three-phase systems. It replaces the protective cap on capacitive test points, with the benefit of providing fault indication. The SEL-TPR eliminates the need to account for the position of the concentric neutral, as is common with cable-mounted fault indicators. It automatically resets upon system voltage restoration. The SEL-TPR is easy to install with a hot stick attached to its molded rubber hook eye. Powered by line voltage, the SEL-TPR does not have a minimum current requirement, making it great for lightly loaded circuits.

You can choose from a variety of display options, including a built-in, battery-free mechanical flag display or a remote bright BEACON® LED display. Remote display options reduce fault-finding times by eliminating the need for crews to open medium-voltage enclosures during patrols.

SEL-CR

Underground Current Reset Fault Indicator

selinc.com/products/CR

Compatible With RadioRANGER®

Starting Price
$110 USD

The SEL-CR uses continuous load current to automatically reset so it is ready to respond to faults. Powered by the load current on an energized underground distribution cable, the SEL-CR responds to a fault and remains in the faulted-display condition until the line is energized with normal line load.

SEL-SR

Underground Secondary/Low-Voltage Reset Fault Indicator

selinc.com/products/SR

Starting Price
$88 USD

Apply the SEL-SR in single- and three-phase pad-mounted transformer applications where there is insufficient load current or no capacitive test points to power fault indicators. The SEL-SR's reset cable feeds off the transformer secondary voltage to operate, eliminating the need for a battery.

SEL-TR

Underground Timed-Reset Fault Indicator

selinc.com/products/TR

Starting Price
$120 USD

The SEL-TR holds its tripped status indication for a set time, regardless of the presence of current or voltage on the distribution circuit, making it ideal for underground systems. You can use this functionality for applications where backfeed voltage or current can falsely reset restoration-reset faulted circuit indicators in the fault path. The SEL-TR is available with a long-lasting nonreplaceable battery for installations that require zero maintenance.

SEL-MW

Microcontroller-Based Wye Voltage Sensor

selinc.com/products/MW

Starting Price
$350 USD

More economical than a PT or analog sensor, the SEL-MW detects system voltage loss where exact system voltage measurement reporting is not required. You can easily install the SEL-MW on capacitive test points of distribution elbows. It learns and adapts to the unique voltage output level of the capacitive test points to simplify product calibration.

SEL-PILC

Underground Paper-Insulated Lead-Covered Cable Fault Indicator

Starting price
$620 USD

selinc.com/products/PILC | Compatible With RadioRANGER®

SEL-PILCs support a wide range of paper-insulated lead-covered cable (PILC) configurations and applications, including triplexed, single-phase, and three-phase sector (or round) cables from 5.58 to 11.78 cm (2.2 to 4.64 in.) in diameter. A split-core design lets you quickly and easily install the SEL-PILC without disconnecting the cable. Its rugged construction can withstand submersion in up to 4.5 m (15 ft) of water. The SEL-PILC is compatible with the RadioRANGER Underground Wireless Fault Indication System. Together, they make it easier and faster to find faults on urban systems.

SEL-GFD

Underground Ground Fault Detector

Starting price
$220 USD

selinc.com/products/GFD

The SEL-GFD detects ground faults by sensing the vector sum of the current flowing through a three-conductor cable. You can install the split-core sensor on three-phase cables or a bundle of three single-phase cables without opening the primary. Three reset options are available: secondary voltage, load current, or time.

Remote Display Options

Underground Fault Indicators

Choose from a variety of display options, including nonbattery mechanical flag displays and bright BEACON® LED displays.

Remote displays eliminate the need for crews to open high-voltage enclosures or enter subsurface vaults, improving fault-finding times and reducing arc-flash risks.

Standard “V” Display (BEACON versions also available)

Large “L” Display (BEACON versions also available)

SEL-8310 RadioRANGER® Remote Fault Reader

BEACON Bolt® Display

Tamperproof Bolt Display

BEACON Fiber-Optic Display

Accessories and Tools

SEL-MR Manual Reset Fault Indicator

Troubleshoot overhead and underground applications.

Starting Price
$38 USD

MT Manual Reset Tool

Reset the SEL-MR.

Starting Price
$63 USD

SEL-VIN Voltage Indicator

Install this line-powered tool on test point elbows, T-bodies, or basic insulating plugs to indicate the presence of voltage.

Starting Price
$39 USD

HHT Silver Tamperproof Bolt Test Tool

Determine the status (tripped or untripped) of fault indicators with tamperproof bolt displays.

Starting Price
$63 USD

BTT BEACON Bolt® Test Tool

Field-test fault indicators with BEACON Bolt displays.

Starting Price
$32 USD

CRSRTT Current and Secondary Reset Test Tool

Field-test and manually reset the SEL-AR, SEL-ARU, SEL-BTRI, and other current reset and timed-reset products.

Starting Price
$52 USD

ERLTT Electric Field Reset Test Tool

Field-test the SEL-ER Overhead Electrostatic Reset Fault Indicator.

Starting Price
$52 USD

MCL120 Mini Current Loop

Use the MCL120 for demonstration purposes or to trip or reset fault indicators.

Starting Price
$320 USD

SEL-MCG Magnetic Cable Guide

Keep remote display and sensor cables neat and secure.

Starting Price
$7 USD

SEL-MR Manual Reset Fault Indicator With Reset Button

Troubleshoot underground applications.

Starting Price
$45 USD

FCRT Fault Counter Reset Tool

Reset an SEL-FC without removing it from the line.

Starting Price
$260 USD

SEL-FC Overhead Fault Counter Fault Indicator

Narrow down the source of intermittent, hard-to-find temporary or permanent faults on overhead circuits.

Starting Price
$220 USD

SEL-CT

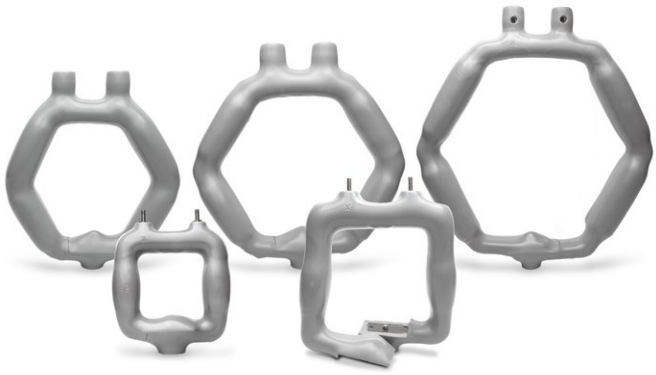
Split-Core Current Transformer

Starting price
$150 USD

selinc.com/products/CT

SEL-CTs are designed for applications where it is difficult or uneconomical to open the primary conductor to install a solid-core-type current transformer. The flexible split-core design uses M-6 silicon steel formed into a hexagonal or rectangular shape. This allows you to open the core to install it over cables.

The SEL-CT is encapsulated in a flexible vinyl plastic with 600 V-class insulation. The secondary terminals and hardware are nickel-plated brass.



SEL-SCT

Submersible Separable-Core Current Transformer

Starting price
$220 USD

selinc.com/products/SCT

SEL-SCTs are designed for applications where it is difficult or uneconomical to open the primary conductor to install a solid-core-type CT. The separable-core design allows you to open the SEL-SCT to the nominal window diameter and install it over bushings or cables without interrupting the connection. SEL-SCTs are held in place with cable ties. The submersible design provides reliable use in subsurface vaults where flooding can occur.

The SEL-SCT is encapsulated in flexible vinyl plastic with 600 V-class insulation and consists of a separable two-part assembly. The SEL-SCT base and body can be pulled apart, placed around a cable, and reconnected. Two included stainless-steel worm gear clamps secure the base and body of the CT while also preventing water intrusion into the CT core.